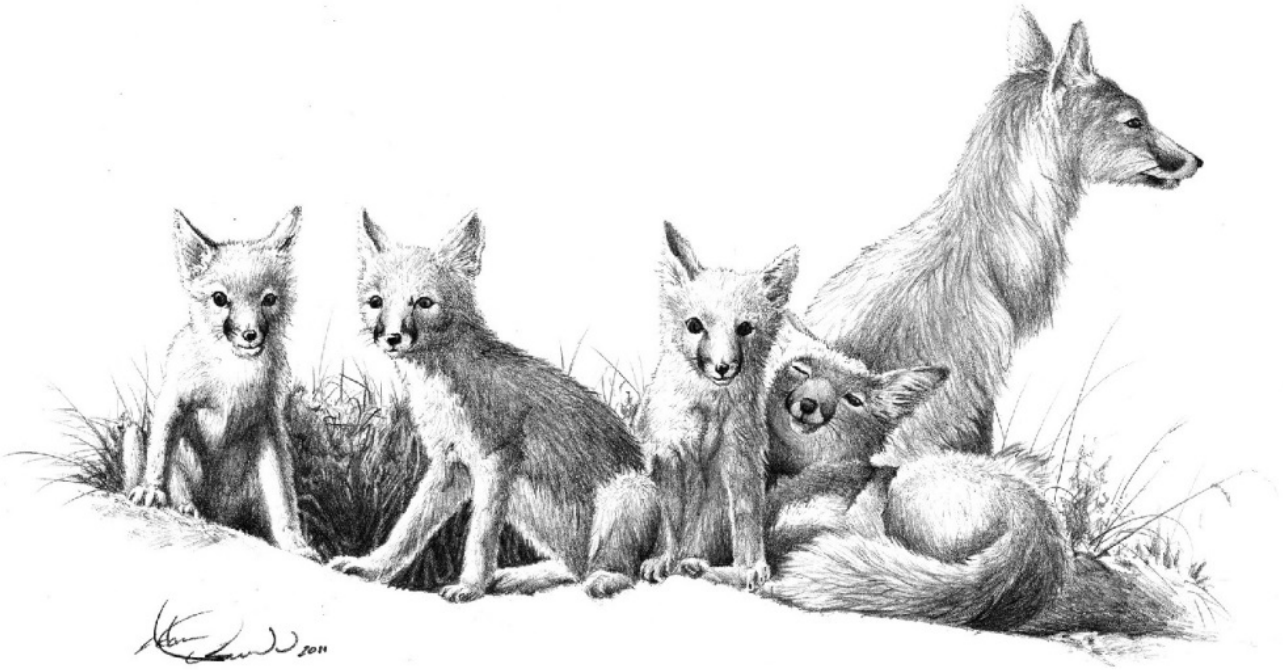
SWIFT FOX CONSERVATION TEAM



REPORT FOR 2015 – 2016

SWIFT FOX CONSERVATION TEAM REPORT FOR 2015 – 2016

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The submissions in this biennial report represent the findings and conclusions of the submitters and have not been examined through a scientific, peer-reviewed process.

Cover drawing by Adam Oswald, SDGFP

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INTRODUCTION

The swift fox (*Vulpes velox*) was petitioned to be listed as threatened under the Endangered Species Act in 1992. After review, the U.S. Fish and Wildlife Service determined the species was warranted for listing but precluded due to higher priority species (U.S. Fish and Wildlife Service 1995). In response to this petition, the Swift Fox Conservation Team (SFCT) was formed in 1994 and is comprised of state, federal, Canadian, tribal, and non-governmental organizations along with other interested organizations within the swift fox range. The SFCT works to assemble existing information, collect new biological data, implement swift fox monitoring and management programs, and advance swift fox conservation and restoration to avoid future listing under the Endangered Species Act. Since 1994, the SFCT developed the "Conservation assessment and Conservation Strategy of Swift Fox (*Vulpes velox*) in the United States" (CACS; Kahn et al. 1997), written 17 annual or biennial SFCT reports, and revised and updated the CACS to reflect new information and updated priorities (Dowd Stukel 2011). This report outlines the activities and accomplishments achieved on behalf of swift fox conservation by SFCT members in 2015 and 2016.

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SWIFT FOX MONITORING IN COLORADO, 2015–2016

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INTRODUCTION

In Colorado, the swift fox has been classified as a furbearer and a season established for regulated take since 2009. The status of swift fox is updated every 5 years through remote camera surveys to determine changes in occupancy within the species primary range in eastern Colorado. In 2016, swift fox were monitored using remote cameras at scent stations. Swift fox habitat was stratified based on the contiguous patch size of shortgrass prairie (SGP) to further refine the estimates of swift fox occupancy and distribution across eastern Colorado.

METHODS

Stratman (2012) noted that all swift fox detections were within or adjacent to SGP habitat and speculated that the patch size was a determining factor in detecting swift fox in eastern Colorado. He suggested that a minimum patch size of $\geq$1.6 km^2 was generally associated with all swift fox detections. Therefore, in 2016, Colorado Parks & Wildlife focused the swift fox surveys exclusively within SGP habitat. All SGP identified from LANDFIRE vegetation classification data for eastern Colorado was stratified into three patch sizes; small (1.6–4.8 km^2), medium (4.8–8.0 km^2), and large (>8 km^2) to determine swift fox occupancy rates of fragmented SGP in eastern Colorado. We identified 349 small patches, 104 medium patches, and 191 large patches available for survey sampling. Based on our power analysis, 124 small patches and 31 medium patches were initially selected to survey. In addition, 41 of the 52, 4.8 x 6.4 km, grids surveyed in 2011 (Stratman and Apker, 2014) that contained >8 km^2 of SGP, along with 11 new grids selected within SGP habitat were used for an initial sampling frame of 52 grids for large patches to compare swift fox occupancy with previous surveys. In addition, eight alternate grids were selected in case landowner permission could not be obtained. Infrared cameras and skunk lure were set using the protocol from Stratman and Apker (2014). We used one camera site for small patches, two cameras sites for medium patches, and four camera sites for grids. The number of cameras for each patch size was based on the average female home range size (Finley et al. 2005). We conducted surveys from August thru October 2016 to coincide with juvenile dispersal and maximize detection probabilities (Finley et al. 2005, Martin et al. 2007) and each patch was surveyed for 3 consecutive nights.

RESULTS

We selected a number of alternative patches for surveying (10 small, 2 medium, 4 grids) because adequate landowner permission could not be obtained on the original patches. We also surveyed three additional alternative grids since landowner permission was obtained. Therefore, we surveyed 95 small patches, 24 medium patches, and 57 grids between 15 August and 15 October 2016 (Fig. 1). We completed the survey with 30 camera nights (CN) in which no data were collected. The inoperable camera nights resulted from livestock interference (15 CN) and human error (15 CN) and all were from grid surveys.

We collected 228 unique swift fox detections during the remaining 1,178 camera nights. We detected ≥1 swift fox on 29 of the 95 small patches, 11 of the 24 medium patches, and 45 of the 57 grids and the number varied from 1–10 unique detections per patch. Of the 85 patches where a swift fox was detection, 67% were detected in the 1st night, 21% were in the 2nd night, and 12% were first detected in the 3rd night.

Detection and Occupancy Estimation

Detection probabilities across all patch sizes varied slightly by night with the first survey night having the highest probability at $p = 0.618$ (SE = 0.0568, 95% CI 0.502–0.722) (Fig. 2). The average probability of detecting a swift fox across all nights and patch sizes was $p = 0.553$ (SE = 0.0398, 95% CI 0.475–0.629). Detection also varied by patch size with grids having the highest probability at $p = 0.598$ (SE = 0.0507, 95% CI 0.496–0.692). Finally, detection was also variable by survey night within each size class of SGP (Fig. 2).

Model selection results for occupancy estimation are shown in Table 1. The overall estimated occupancy rate across all patch sizes was $\hat{\psi} = 0.524$ (SE = 0.0436, 95% CI 0.439–0.608). When detection was allowed to vary by patch size the overall occupancy was $\hat{\psi} = 0.694$ (SE = 0.0735, 95% CI 0.535–0.818). When the occupancy rates were estimated by patch size, occupancy for small patches was $\hat{\psi} = 0.335$ (SE = 0.0526, 95% CI 0.241–0.445), for medium patches was $\hat{\psi} = 0.503$ (SE = 0.1124, 95% CI 0.295–0.710), and for grids was $\hat{\psi} = 0.848$ (SE = 0.0649, 95% CI 0.675–0.937).

DISCUSSION

After the first survey night, detection probabilities declined on average by 16% for the remaining 2 nights of survey. This was consistent with the previous survey when there was nearly a 14% decline after the first detection (Stratman 2012). Although the size of the SGP patch did not improve detection probability over the top model with constant *p*, there was model evidence to suggest that SGP patch size has some positive influence on detection probability.

Comparing the occupancy rates from the minimum AIC_c model for the grids, the 2011 estimate was $\hat{\psi} = 0.872$ (*SE* = 0.0528) compared to the current estimate of $\hat{\psi} = 0.848$ (*SE* = 0.0649). The estimated change is -0.024. Despite the slight decrease in occupancy probabilities, the difference is within the sampling variation of the estimates, thus a significant change in swift fox occupancy in eastern Colorado was not detected. Since 1997, when the first statewide survey was conducted (Finley et al. 2005), swift fox occupancy rates have remained relatively stable in eastern Colorado.

There was a difference in swift fox occupancy relative to the contiguous patch size of SGP. The occupancy rate increased by 33% between small and medium-sized patches and occupancy increased by another 40% between medium and large-sized patches, which demonstrates the negative impact that habitat fragmentation can have on swift fox occupancy. Furthermore, the data suggest that the degree of isolation or juxtaposition to larger patches may also influence occupancy rates as there was a marked difference in swift fox occupancy of small patches in the northern portion of eastern Colorado compared to the southern portion where the majority of larger SGP patches occur. Occupancy rates were 60% lower for small patches of SGP in the northern portion compared to the southern portion of eastern Colorado. Further assessment of swift fox occupancy and distribution in eastern Colorado will continue in the future.

LITERATURE CITED

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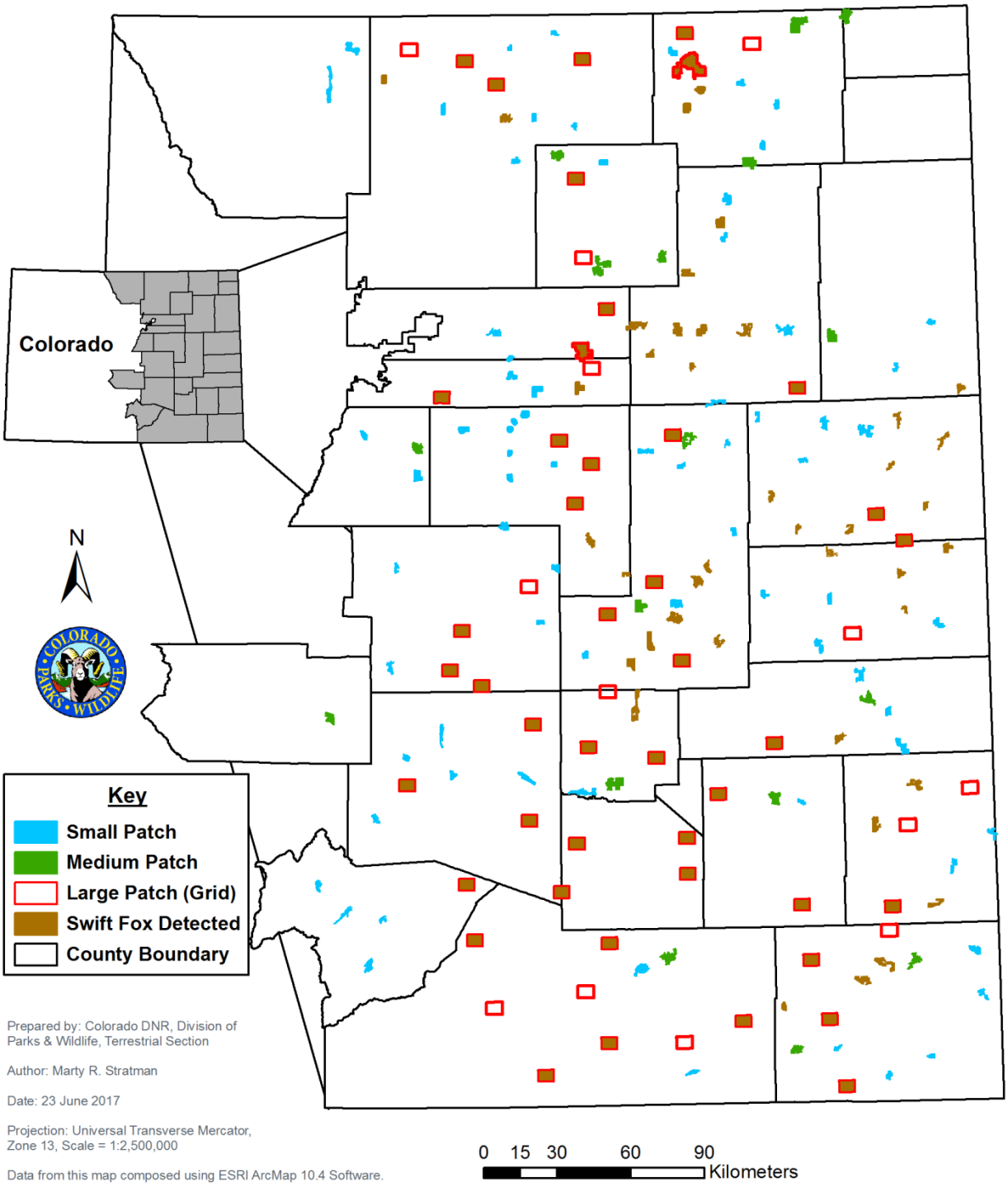

Figure 1. Distribution of small (1.6-4.8 km^2), medium (4.8-8.0 km^2), and large patches (grids) (>8.0 km^2) of shortgrass prairie surveyed for the presence of swift fox in eastern Colorado, August–October 2016.

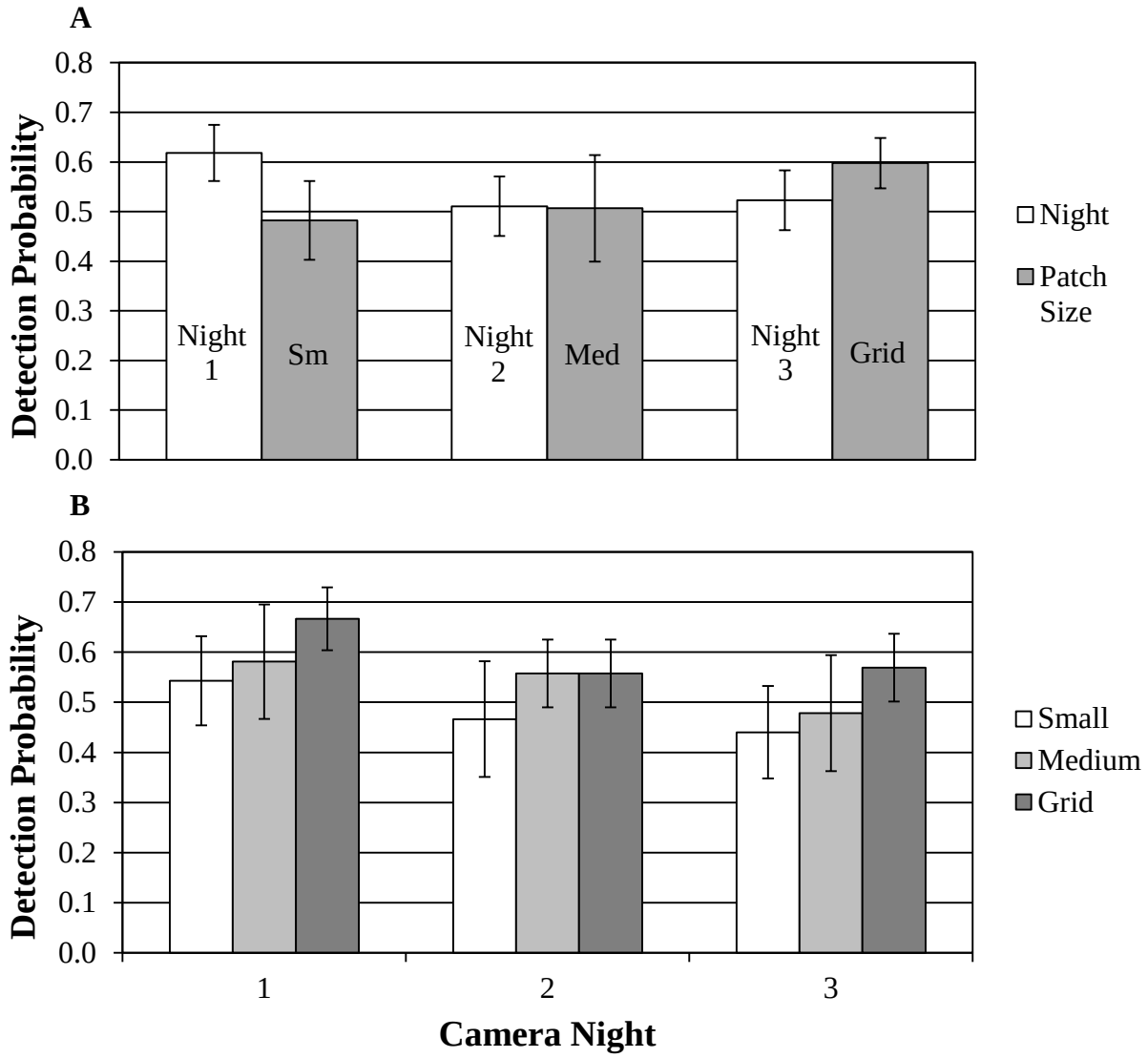

Figure 2. Probability of detecting swift foxes by A) camera night and size of the survey patch and by B) camera night within the small (1.6–4.8 km^2) and medium-sized patches (4.8–8.0 km^2) and grids (31.0 km^2) of shortgrass prairie in eastern Colorado, August–October 2016. Error bars represent $\pm$1 *SE*.

Table 1. Model selection results for 176 patches of shortgrass prairie surveyed for swift fox presence in eastern Colorado, USA, August–October, 2016. Variable definitions are: ψ = occupancy probability, *p* = detection probability, Psize = patch size of shortgrass prairie surveyed, day = detection varied by day.

Model	AIC_c[a]	ΔAIC_c	w_i[b]	Likelihood	k[c]	Deviance
{ψ(Psize) *p*(.)}	516.901	0.000	0.573	1.000	4	508.670
{ψ(Psize) *p*(Day)}	518.671	1.770	0.237	0.413	6	506.180
{ψ(Psize) *p*(Psize)}	519.391	2.490	0.165	0.288	6	506.900
{ψ(Psize) *p*(Day × Psize)}	523.201	6.300	0.025	0.043	9	504.130
{ψ(.) *p*(Psize)}	532.821	15.920	0.000	0.000	4	524.590
{ψ(.) *p*(Day × Psize)}	535.819	18.918	0.000	0.000	7	521.160
{ψ(.) *p*(.)}	545.149	28.247	0.000	0.000	2	541.080
{ψ(.) *p*(Day)}	546.831	29.930	0.000	0.000	4	538.600

[a] Akaike Information Criterion for small samples.
[b] Akaike weight.
[c] Number of parameters.

SWIFT FOX INVESTIGATIONS IN KANSAS, 2015-2016

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Swift fox populations and harvests are monitored through multiple techniques in Kansas. The most reliable and important of these have included roadside track surveys, pelt tagging records, and observation records of Kansas Department of Wildlife, Parks and Tourism (KDWPT) employees.

Due to various technical and logistical issues with track surveys, they have not been recently conducted. The Department had been experimenting with some camera survey efforts in road rights-of-way over the past couple of years. However, we now have a Pittman-Robertson grant approved for a project with Kansas State University entitled Assessing changes in the spatial distribution of swift fox (*Vulpes velox*) in western Kansas. The objectives of this project are to evaluate the role of ecological and environmental factors on the distribution of swift fox in the state and develop a predictive map of swift fox occupancy. In addition, a power analysis based on the results will be conducted to identify the number of sites needed for KDWPT to survey swift fox populations using camera surveys in the future. The analysis will be based on camera surveys conducted at 360 randomly selected sites throughout the potential swift fox range in Kansas. Cameras will be placed out for 28 days at each site, and the survey period will be May-August of 2018 and 2019.

As part of an effort to continually monitor swift fox distribution in Kansas, KDWPT employees have been asked to report all swift fox observations made annually since 1995. Occasionally reports from non-Department employees that can either be verified (i.e. by photos) or are from individuals known to be competent in swift fox identification (i.e. track survey participators) are included with KDWPT employee reports as well. In 2015, 20 reports were received from within 7 Kansas counties. In 2016, 43 reports were received from 8 counties. Twenty-eight of the 63 total reports (44%) were attributed to vehicle-killed foxes.

KDWPT initiated a pelt tagging program in 1994 to acquire more precise information on swift fox distribution and harvest than had been achieved through the annual Furbearer Harvest Survey. Any swift fox taken in Kansas must be presented to KDWPT for tagging within seven days of the close of the season. The number of swift foxes presented annually to KDWPT for pelt tagging since the tagging program was initiated is presented in Figure 1. During the 2015-16 and 2016-17 furharvesting seasons, 75 and 35 swift foxes were pelt tagged, respectively. Pelt prices declined substantially over the past several years, which is reflected in declining furharvester effort and subsequent harvest levels. Despite the low harvest numbers, foxes were harvested from 15 different counties. Recent pelt tagging reports providing more detailed information on the tagging program can be found on the KDWPT website at http://kdwpt.state.ks.us/news/Services/Research-Publications/Wildlife-Research-Surveys.

The Kansas counties in which swift foxes were documented in 2015 and 2016 are found in Figure 2. During this two year period, swift foxes were documented within most of their recognized range in Kansas despite low pelt prices and harvest levels in the state.

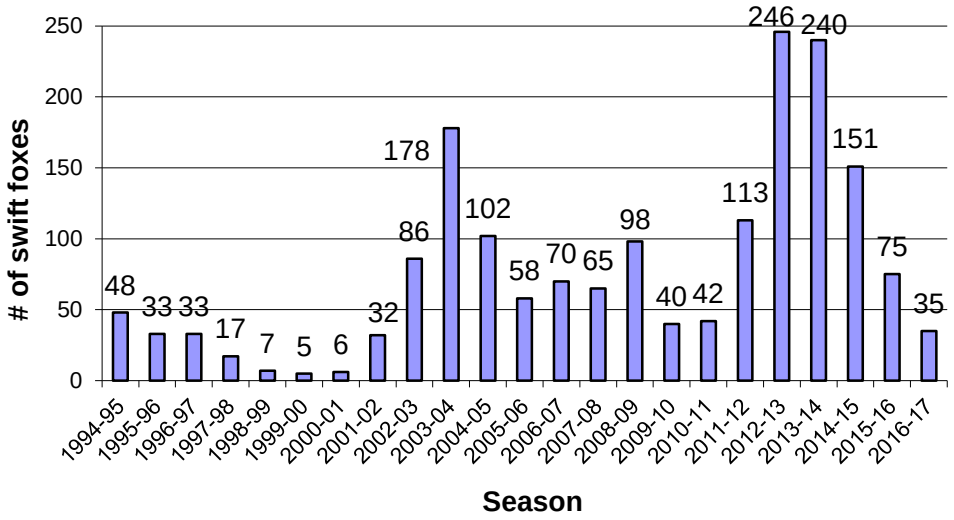

Figure 1. Number of swift foxes pelt tagged by KDWPT since 1994 when pelt tagging requirements were established in Kansas.

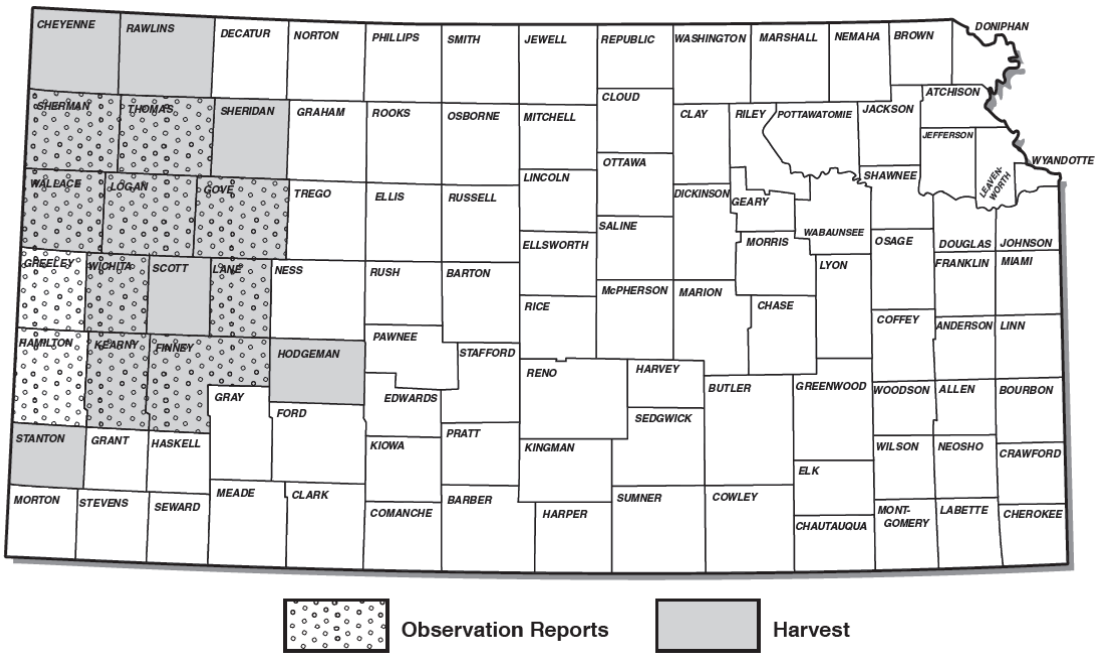

Figure 2. Kansas counties in which swift foxes were documented in 2015 and 2016, and the ways in which they were documented.

SWIFT FOX CONSERVATION AND MANAGEMENT IN MONTANA, 2015-2016

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SUMMARY

During 2015-2016, Montana made significant progress toward the eight objectives of the Swift Fox Conservation Team (SFCT). Representatives participated on the SFCT and agreed to host the 2018 meeting. A draft swift fox conservation strategy was initiated and initial discussions included participants from many agencies, tribes, universities, and private conservation organizations. The third international swift fox census occurred (Meoenschlager et al. in prep) and the largest to date camera survey effort also occurred during the reporting period (Schwalm et al. in prep). A "Working Grasslands Initiative" has been initiated by the Department and is a strategy to guide Montana Fish, Wildlife and Parks' grassland conservation efforts in partnership with private landowners and other conservation cooperators. Work to refine habitat models is ongoing and intended to inform potential release sites. Data collection on dispersal and potential barriers to dispersal was initiated. Sampling protocols have been developed and requests for information on swift fox occurrence have been submitted through various media. Montana Fish, Wildlife and Parks thanks the many partners who have contributed to swift fox conservation during the reporting period.

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ACCOMPLISHEMNTS RELATED TO SFCT OBJECTIVES

The Swift Fox Conservation Team's (SFCT's) Conservation Assessment and Strategy was updated in 2011 (Swift Fox Conservation Team 2011). The 2011 Conservation Assessment and Strategy defined objectives for 2011-2020 as listed below. This report details activities and progress within Montana as related to each objective.

SFCT objectives:

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

Progress in Montana 2015-2016

1. Maintain the SFCT, to include 1 representative of each of the state wildlife agencies within the historical range of swift fox.

Two Montana Fish Wildlife and Parks representatives, Heather Harris and Bob Inman, participated in the biannual Swift Fox Conservation Team meeting in Ft. Collins Colorado during April 2016. Montana agreed to host the 2018 SFCT meeting.

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

At present, there is no definitive and widely accepted map of suitable swift fox habitat in Montana that can be used to assess the status of this objective. Current work described below (#6) is focused on the creation of a suitable map.

3. Periodically evaluate the status of swift fox populations.

Breeding populations of swift fox have been documented in north-central Montana (Figure 1). Swift fox population numbers have been estimated there during three major survey efforts. The International Swift Fox Census was carried out during winters of 2000/2001 (Moehrenschlager and Moehrenschlager 2001), 2005/2006 (Moehrenschlager and Moehrenschlager 2006), and 2014/2015 along the Canadian border including in north-central Montana (Table 1). Swift fox population estimates from the International Census increased from 1996-2006 and fox distribution increased significantly during that period. Preliminary results from the 2015

International Swift Fox Census indicate a significant (~67%) decline in fox numbers from the 2006 survey, and the winter of extremely deep snow during 2010-2011 may have played a large role in this apparent decline. A report detailing methods and population numbers will be available soon.

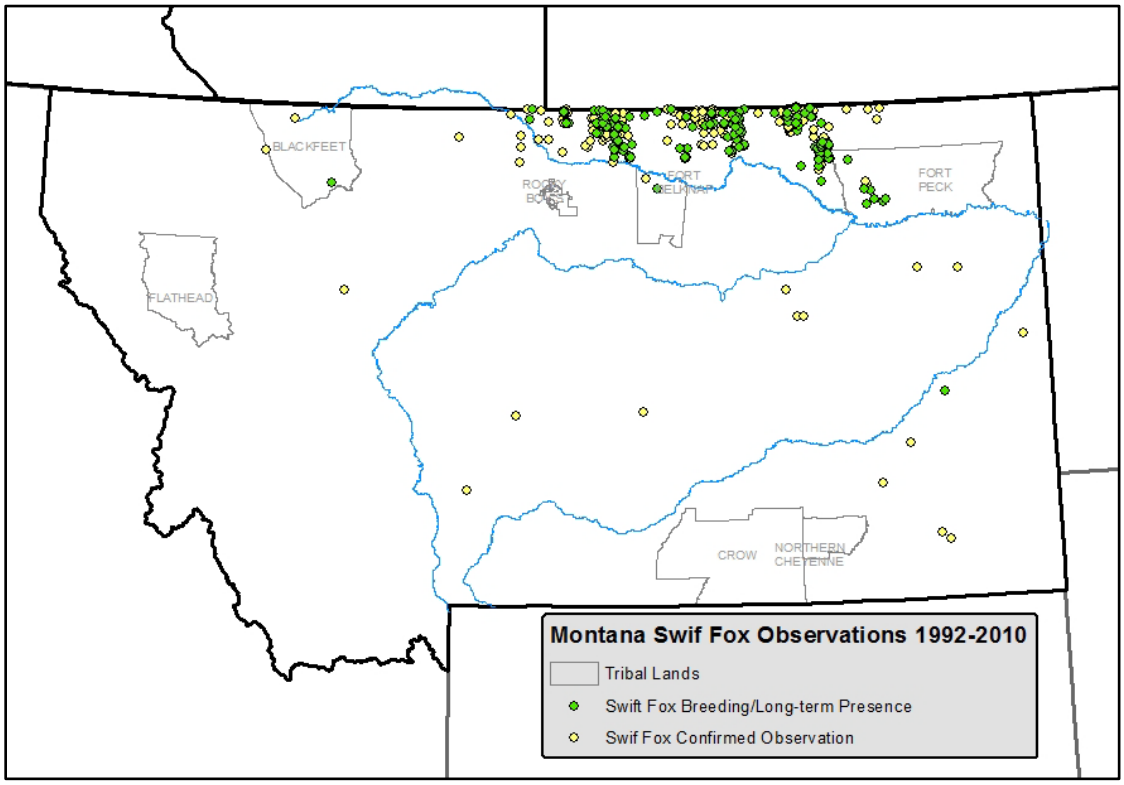


Figure 1. Breeding populations of swift fox in Montana.

Table 1. Swift Fox Population Estimates for the International Census area in north-central Montana and southern Alberta and Saskatchewan. * Preliminary result only.

	1996	2000/2001	2005/2006	2014/2015
North- Central MT	NA	221	515	~175*
AB and SK	281	656	647	NA
Total		877	1,162	

Extensive work on the distribution of swift fox in Montana was conducted during the 2015-2016 reporting period. The 2015 occupancy survey led by Oregon State University is the most extensive effort to date and included nearly 500 survey stations across northern, east-central, and southeastern Montana (Schwalm et al. *in prep*, Figure 2). The survey detected swift foxes at both Tribal reintroduction sites, along with areas east and south of the Blackfeet reintroduction site and in the southeastern corner of Montana (Figure 2). This occupancy survey did not detect swift foxes in any other area, including the area east of Great Falls and south of the Milk River east to Baker and Broadus Montana (Figure 2). While there are a few (~12) previously confirmed observations of swift foxes in this gap, including a den with reproduction

south of the Snowy Mountains, this large area appears to remain devoid of functional populations.

Montana also developed a protocol for collecting genetic and disease samples from swift fox during this reporting period (Appendix 1).

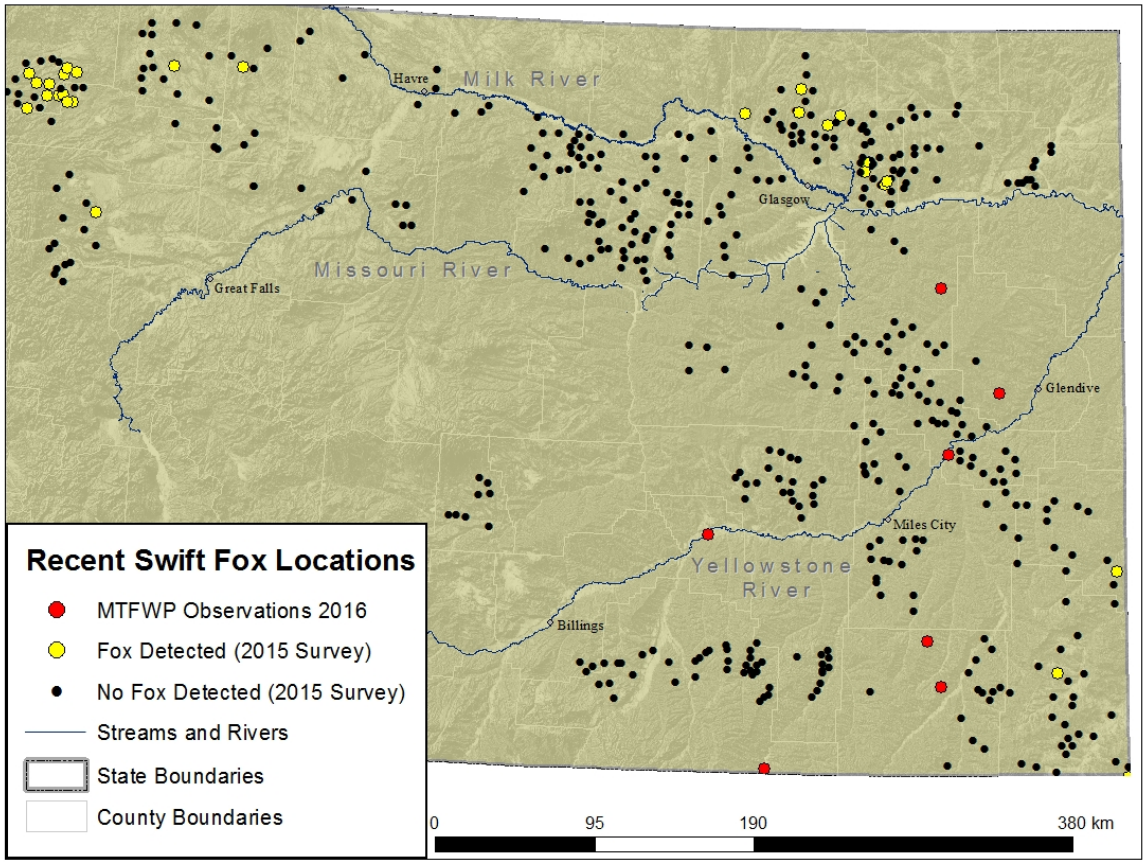


Figure 2. Swift fox surveys and detections during 2015-2016 in Montana (Schwalm et al. *in prep*.).

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

Montana recently initiated a 5-year special incentive designed to retain and enhance grasslands by targeting and leveraging voluntary, incentive-based programs for private landowners. The "Working Grasslands Initiative" is a strategy to guide MFWP's grassland conservation efforts in partnership with private landowners and other conservation cooperators (Appendix 2). Implementation of this program will help to achieve conservation targets identified in Montana's State Wildlife Action Plan, including for swift fox.

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

On February 1, 2016, a group of interested organizations (hereafter referred to as the Montana Swift Fox Working Group) met in Billings, MT. Participants included representatives of the Northern Cheyenne Tribe, the Fort Peck Assiniboine and Sioux Tribes, the Blackfeet Nation, World Wildlife Fund, Oregon State University, American Prairie Reserve, The Nature Conservancy, the U.S. Fish & Wildlife Service C.M. Russell Refuge, and Montana Fish Wildlife and Parks. The purpose of the meeting was to gather information to begin formulating a statewide plan for swift fox conservation. Agenda items discussed included:

- Montana's role in the big picture of swift fox conservation
- Current distribution of swift fox in Montana
- Swift fox habitat, currently available models of habitat, and confidence in models
- Reintroductions and how to prioritize locations
- Other conservation measures needed for swift fox; and
- Summarizing priorities for swift fox conservation in Montana.

The discussions of that day helped form the basis for an initial draft of a swift fox conservation strategy for Montana. We greatly appreciate all who participated and aided in the development of this strategy and look forward to working together to continue moving swift fox conservation forward.

Name	Organization	email
Ray Mulé	Montana Fish Wildlife Parks	rmule'@mt.gov
John Ensign	Montana Fish Wildlife Parks	jensign@mt.gov
Megan O'Reilly	Montana Fish Wildlife Parks	moreilly@mt.gov
Marissa Spang	Northern Cheyenne Tribe	marissa.spang@cheyennenation.com
Kristina Smucker	Montana Fish Wildlife Parks	ksmucker@mt.gov
Heather Harris	Montana Fish Wildlife Parks	heharris@mt.gov
Brandi Skone	Montana Fish Wildlife Parks	bskone@mt.gov
Doni Schwalm	Oregon State University	doni.schwalm@oregonstate.edu
Scott Thompson	Montana Fish Wildlife Parks	sthompson@mt.gov
Kristy Bly	World Wildlife Fund	kristy.bly@wwfus.org
Bob Gibson	Montana Fish Wildlife Parks	bgibson@mt.gov
Ryan Devore	Montana Fish Wildlife Parks	rdevore@mt.gov
Kyran Kunkel	American Prairie Reserve	kyran@americanprairie.org
Ashley Taylor	Montana Fish Wildlife Parks	ataylor@mt.gov
Dustin Weatherwax	Blackfeet Nation	dustin.weatherwax@gmail.com
Oliver Davis	Ft. Peck Tribes	northernplainswarrior2002@yahoo.com
Matchett, Randy	U.S. Fish & Wildlife Service	randy_matchette@fws.gov
Inman, Bob	Montana Fish Wildlife Parks	bobinman@mt.gov

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

World Wildlife Fund has undertaken work to refine habitat modeling for swift fox in Montana (Olimb et al. 2017).

Northern Great Plains Swift Fox Connectivity Project

The goal of this project, directed by researchers at Clemson University (David Jachowski and Andrew Butler) in partnership with MFWP, Calgary Zoo, BLM, WWF, Oregon State University and the National Fish and Wildlife Foundation, is to assess key factors influencing suitable habitats, population dynamics and regional connectivity for swift fox in the Northern Great Plains. Specifically, we are working to (1) estimate adult and juvenile swift fox survivorship and fecundity, space use and dispersal behavior in the core northern portion of their range (Blaine, Phillips and Valley Counties), and (2) create a spatially-explicit model for habitat suitability and population connectivity for Montana that highlights key boundaries, bottlenecks and opportunities for targeted habitat conservation and restoration. This 3-year project was initiated in 2016 and is reported on in more detail in the report submission by Jachowski and Butler later in this document. Researchers working primarily in western South Dakota were also granted a permit to radio-collar and locate swift fox dens in far-eastern Montana.

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

After a flurry of swift fox observations in southeastern Montana during 2016 (Figure 2), FWP initiated a news release informing the public about recognizing swift fox, the species history and ecology, and asking for help documenting current locations of the species.
http://www.krtv.com/story/35015586/more-swift-foxes-observed-in-se-montana

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

Montana worked with partners in 2015-2016 to draft a swift fox conservation strategy that outlined specific priorities across the state. Grassland conservation programs have been initiated. Population surveys have occurred on an approximate 5-year schedule in north-central Montana, and additional extensive distribution surveys occurred during the reporting period (Schwalm et al. *in prep*). After the international census reported declines in swift fox numbers in their stronghold in northcentral Montana, FWP reduced quotas there by a corresponding 66% (from 30 to 10 total in FWP Region 6). All swift fox taken must be reported and data are collected on sex, age, and location. The status of swift fox, with the exception of what appears to be natural fluctuations due to the extreme winter of 2010-11, has improved significantly since the time that the species was considered for listing under the ESA. Montana continues to take proactive steps to fund research and conservation of swift fox in order to aid the SFCT's efforts across the species range.

Appendix 1. Protocols for Swift Fox DNA, Blood/Disease Samples, and Necropsy

Swift Fox Protocols

DNA, Blood/Disease Samples, Necropsy

June 2016

DNA Sampling Protocols for Swift Fox Scat and Tissue

Collecting DNA samples is quick and easy. The main things to be mindful of are 1) not contaminating samples with your DNA, the DNA of another fox, etc. and 2) proper storage. Materials needed include gloves, paper bags, silica desiccant, sterile tissue punch or clean pocket knife, alcohol wipes, plastic vials with lysis buffer or silica desiccant beads, sharpie, GPS.

Dead or alive, swift foxes must always be considered a potential source of plague transmission to humans and should be handled with appropriate precautionary measures to prevent human death. See plague note below.

Scat

- Collect scats that are still dark to medium brown; avoid collecting chalky, white scats.
- While wearing a rubber glove, pick up the scat and place it in a brown paper bag (a paper napkin will work in a pinch, until you get back to the office). If you do not have rubber gloves, use a stick or rock to push the scat into the open mouth of the paper bag.
- Fold and/or tape the top of the bag shut.
- Label the bag with date, GPS location, site ID (if applicable, e.g., Survey Point 152) and collector's name.
- If there are multiple scats, use a separate bag and glove/stick/rock for each scat.
- If scats are stacked on top of each other or otherwise touching, place them in separate bags but indicate on the respective bags that the two scats were touching (e.g., "Scat A was found on top of Scat B").
- Allow the bags to air-dry at room temperature, out of direct sunlight and in a dry location, for about a week. A cardboard box in the office works well. Please be certain not to pack the bags in so tightly that they are smashed together. You want air to move freely to allow the scats to fully desiccate, and you don't want the scats to dry to the sides of the bag.
- As an added measure, after a week you can put multiple paper bags inside a large Ziploc baggie with silica desiccant beads for long-term preservation.
- **Do not freeze the scats**, or keep them in a room where the temperature cycles wildly, gets very cold, very hot, or is very humid. Steady moderate temperatures, no UV light, and no moisture are very important for DNA longevity with scat samples.

Tissue (road kill, intentional or unintentional trapping/shooting, or otherwise deceased critter.)

- Using a sterile tissue punch or your thoroughly cleaned pocket knife, remove a **VERY SMALL** piece of tissue (e.g., no bigger than a pencil eraser). This sample can come from anywhere on the fox (e.g., ear, muscle, skin, nose, lip, toe pad, etc.-I've successfully collected DNA from hair and tissue 'smears' on the highway, as well as mummified carcasses). When possible, focus on sampling an area that is not overly rotten, but even if the fox is decaying, get a sample! The ear is an easy target, as is the rump muscle. Toe pads and noses are a great alternative when the rest is a slimy mess.
- If you are sampling multiple foxes, CLEAN YOUR KNIFE between samples. Don't use bleach – it will degrade your samples. You can use alcohol wipes, even a napkin with water.
- If you are using a sampling kit provided by me, place the sample into a tube filled with lysis buffer or silica desiccant beads (depending on what I sent you).
- Use a permanent marker to label the tube with a date and sample ID on the lid and side of the tube.
- Keep the kit in an upright position and store it in at room temperature in a dark place. You DO NOT need to freeze these samples.
- If you are NOT using a sampling kit provided by me, place the sample in an unused baggie (or invert a used baggie), label it with the date, GPS coordinates, and collector's name then freeze it ASAP. Until it is frozen, try and keep it cool; get it into the freezer the same day you collected it if at all possible, although if it is in a cooler on ice it will last for several days without freezing.

Mail samples to: Donelle Schwalm, Oregon State University, 104 Nash Hall, Corvallis, OR 97331

MFWP thanks D. Schwalm for developing and preparing this DNA protocol.

Blood/Disease Samples and Necropsy of Swift Fox

Dead or alive, swift foxes must always be considered a potential source of plague transmission to humans and should be handled with appropriate precautionary measures to prevent human death. See plague notes below.

Live-captured swift fox must be sampled for diseases, and dead swift fox should be sampled when possible.

Live-captured Swift Fox Processing and Blood Collection Procedures:

- Swift foxes must always be considered a potential source of plague transmission to humans.
- At minimum, nitrile or latex gloves should be worn while handling swift foxes.
- Always record each animal's unique ID number, location information, and date of capture while in the field, and make sure all collected samples are labeled with the ID number.
- Use 18 – 20 gage needle (smaller needles will damage blood cells).
- Draw 3 ml of blood.
- When transferring blood from syringe to the serum separator tube, remove needle from syringe and also remove the stopper from the serum separator tube and gently inject blood into tube to prevent damage to red blood cells.
- Allow blood to sit at room temperature for 3-4 hours before centrifuging to allow natural clotting process to begin and serum to begin to separate. If outdoors, place blood tubes in a cooler and temper with one ice pack.
- Spin at 3400 rpms for at least 20 minutes. If serum is not well separated spin for 10 more minutes or until serum is clearly separated from the blood cells. Transfer serum to different test tube. If serum separator tubes are used, and serum is well separated, the rubber stopper can be removed from the blood tube and serum can be poured directly into a cryovial for shipping. Make sure the new cryovial is labeled with the animal ID. If serum is not well separated, either centrifuge longer or remove the serum from the tube by holding the tube upright, removing the stopper, and using a clean pipette to draw the serum from the tube.
- Confirm with the diagnostic lab the minimum amount of serum needed for testing (often this is much less than is requested). If available, ship 0.5 ml of extra serum to the MTFWP's Bozeman Wildlife Health Lab (Montana Fish Wildlife Parks Health Lab, 1400 South 19th Avenue, Bozeman, MT 59718-5496) for archiving.
- Contact the diagnostic lab to ensure proper submission forms are completed and that samples are packaged and shipped properly. Most serum samples should be shipped overnight via FedEx or UPS, no later than Wednesday to ensure arrival before the weekend. Generally, samples are placed in a sealable plastic bag (zip lock) in an insulated shipping box with ice packs.
- Package and ship the serum samples. Place a 'Biological Substance, Category B' UN3373 label on the box.
- Note age of fox to best degree possible (e.g. 0, 1, 2-3, 4+ yrs of age; at minimum distinguish young of the year and yearlings from adults). Age info helps ascertain important disease factors for the population.
- For projects with an established diagnostic lab other than MFWP's Bozeman Wildlife Health Lab, insure that copies of the lab reports for all Montana swift fox are sent to the Bozeman Lab (Montana Fish Wildlife Parks Health Lab, 1400 South 19th Avenue, Bozeman, MT 59718-5496). Reports should note the particulars of tests used to assess pathogen exposure (e.g. ELISA, Serum Neutralization Assay, IHC, etc.), including any titer/dilution values and the final diagnosis.
- Give each animal a unique identification number while in the field. Label all samples with this number, and record results in database. If forwarding data to MTFWP's Wildlife Health Lab, please

fill out or provide all information requested on the FWP Wildlife Health Submission Form (e.g. dates of sampling, location information, etc.).

- Samples should be tested for sylvatic plague, tularemia, canine distemper virus, canine adenovirus type 1, and canine parvovirus. While animals are in hand, please note any visible external parasites, including symptoms of sarcoptic mange, lice, ticks or fleas.

Necropsy

- Swift foxes must always be considered a potential source of plague transmission to humans.
- At minimum, latex or nitrile gloves should be worn when investigating a swift fox mortality. See notes below.
- Check for radio-implants, eartags, or other marks from research efforts.
- If the animal is fresh (intact, no maggots or foul odors) and cause of death is unknown, contact the MTFWP Wildlife Health Lab to discuss whether it should be submitted for a full necropsy. The Health Lab will advise on how to safely package and ship the specimens, which may include treating the animal with flea spray to minimize plague risk. Double bag the fox after spraying with flea spray if it is to be sent to Bozeman.
- Record details of death (suspected cause of death, date, location, etc.) and please supply this information if samples are submitted to the Wildlife Health Lab.

MFWP thanks Shaun Grassel and others for helping develop the disease sampling protocol.

Notes on Plague:

-Routes of potential exposure include flea bites from infected fleas on freshly dead animals and contact with any infected bodily secretions (blood, mucus, respiratory exudates, etc.).

-At minimum, latex or nitrile gloves should be worn when handling live or dead foxes (if dead, also consider wearing eye protection, a long-sleeved shirt, pants, boots, and a N95 respirator or equivalent, especially if plague is suspected).

-If cause of death is unknown, contact the MTFWP Wildlife Health Lab to discuss whether it should be submitted for a full necropsy. The Health Lab will advise on how to safely package and ship the specimens. If unable to contact the lab prior to collection, spray the dead fox with flea spray (both sides), wait 10 minutes, and then double-bag the carcass before collection. Montana Fish Wildlife Parks Health Lab, 1400 South 19th Avenue, Bozeman, MT 59718-5496; 406-994-6358.

-Record all details of death (suspected cause of death, date, location, etc.) and please supply this information if samples are submitted to the Lab.

-Any materials used during necropsy should be disinfected or disposed/incinerated.

- If any staff is exposed to infectious material, they should watch their health closely for 2 weeks following the exposure and discuss post-exposure prophylaxis or fever watch with a health care provider and public health officials.

Here's the CDC's page on plague: http://www.cdc.gov/plague/healthcare/veterinarians.html

Appendix 2. Summary of FWP's *Working Grasslands Initiative*

Summary of FWP's *Working Grasslands Initiative*

Goal: To help support viable populations of grassland-associated wildlife by providing non-regulatory conservation tools to private landowners interested in retaining and enhancing Montana's native grasslands through working lands agriculture.

Objectives:

1. Work with private landowners and other partners to protect existing grasslands from new habitat loss or degradation;
2. Work with private landowners and other partners to restore and enhance degraded grasslands, especially those in close proximity to existing, intact grasslands;
3. Work with private landowners and other partners to maintain or increase population trends of indicator grassland wildlife species through habitat conservation efforts; and,
4. Create a roadmap for achieving Montana State Wildlife Action Plan grassland objectives in cooperation with private landowners and other conservation partners.

Conservation tools available under this initiative:

<u>Grassland protection:</u>

- Conservation leases
  - o 30-year agreement to maintain existing native habitat*
  - o Could include species-specific stipulations and/or additional cost-share activities when relevant to grassland wildlife conservation objectives (e.g., prohibition on prairie dog poisoning, fence modifications to facilitate pronghorn connectivity, etc.)
  - o One-time payment, flat rate/acre

- Conservation easements
  - o Perpetual agreement, includes range management plans*
  - o Payment based on Fair Market Value

<u>Grassland enhancement/maintenance:</u>

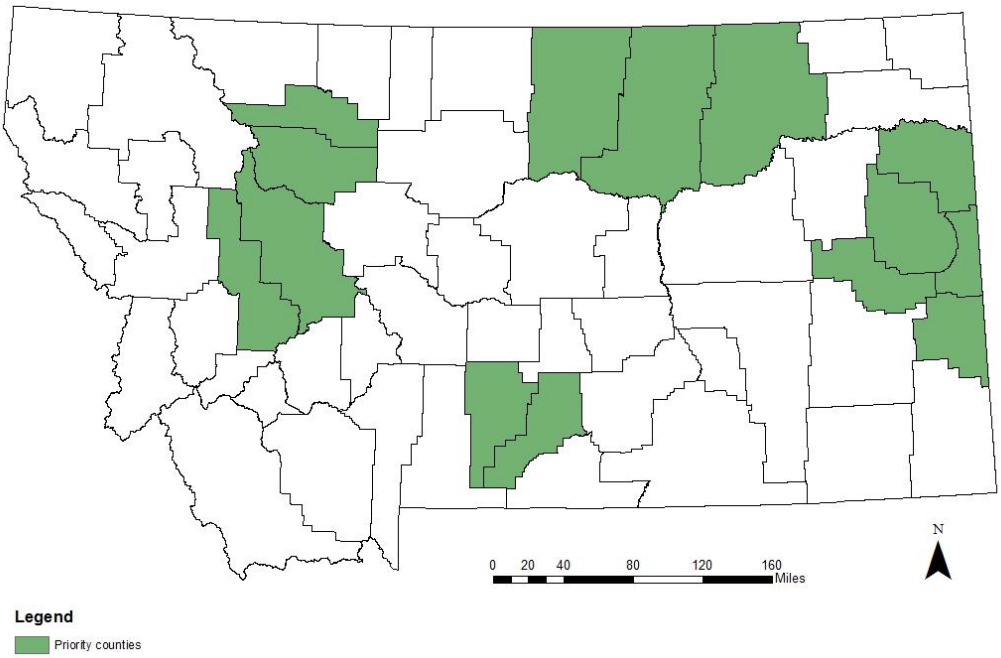
- Range infrastructure cost-share
  - o Transition marginal cropland or expiring CRP to grass-based agriculture
  - o Up to 75% cost-share on fencing, water supply, etc.
  - o Can be in cooperation with other conservation efforts
  - o Term agreement to maintain infrastructure*

<u>Grassland restoration:</u>

- Native grassland restoration cost-share o Case-by-case basis
  - o Up to 75% cost-share on seeding, etc.
  - o Usually in cooperation with other conservation efforts
  - o Term agreement appropriate to restoration activities*

*All agreements with FWP include negotiated free public access for hunting and/or recreational activities (e.g., birdwatching); specific details negotiated based on habitat values and landowner interest.

Priority Counties: Preference will be given to projects within priority counties (see below). These priority counties have the largest extents of grass based on remotely-sensed imagery. Projects outside of priority counties will be considered for funding under this initiative on a case by case basis.



Project Selection Process and Ranking Criteria: Conservation easements will be evaluated and selected through FWP's existing Wildlife Lands process and scoring criteria. Additional criteria may be added to that process, if deemed necessary, to reflect grassland habitat values.

The Wildlife Habitat Bureau will issue a call for conservation lease projects at least twice annually in coordination with the lands process. Competing projects will be evaluating using the following criteria to ensure that limited technical and financial resources are prioritized for projects that provide the greatest wildlife habitat benefits. Scoring guidelines will be prepared for the following criteria:

- Project is within a priority county,
- Ranching is the predominant land use,
- Project will expand existing protected areas,
- Project will encompass a relatively large landscape (projects ≥ 3,000 acres will receive highest priority),
- Existing or restored vegetation is dominated by native species,
- Existing property provides habitat for a diversity of wildlife species, especially Montana Species of Concern,

- Project has adequate habitat for specific wildlife recovery needs, if relevant to project objectives (e.g., 1,500+ acres of prairie dog habitat suitable for potential black-footed ferret reintroduction), and,
- Property is considered at high risk of conversion or subdivision development.

Range infrastructure cost-share projects will be evaluated when received. Ranchers Stewardship Alliance is working with the USFWS Partners for Fish and Wildlife Program to offer a similar cost-share opportunity to landowners in Blaine, Phillips, and Valley counties. FWP's cost-share opportunity is intended to compliment but not compete with this effort. Range infrastructure cost-share projects will typically have the following characteristics:

- Landowner is interested to transition marginal cropland or expiring CRP acres to grass-based agriculture,
- Existing vegetation is dominated by native species or the landowner is willing to manage non-native stands to favor native establishment,
- Landowner grazes cattle or leases pastures for grazing on other parts of their operation,
- Project expands contiguous acres of pastureland, and,
- Project activities will maintain or enhance habitat values for a diversity of wildlife species.

Native grassland restoration cost-share projects will be evaluated on a case-by-case basis. These will typically be in cooperation with other FWP and/or partner conservation efforts. For example, a landowner might be interested to restore a quarter-section of cropland to native grass and then enroll his/her entire operation in a conservation lease.

Partnership Opportunities: There are other conservation options complimentary to this initiative that are available through state and federal agencies, and non-governmental organizations. FWP will work cooperatively with our partners to cumulatively conserve larger landscapes of grassland wildlife habitat. Some of the complimentary programs and opportunities currently available include:

- NRCS provides range infrastructure (EQIP) and conservation easement (ACEP) funding assistance. NRCS is currently contemplating a special state initiative to target EQIP range infrastructure funding to marginal cropland or expiring CRP acres in the Prairie Pothole region.
- Ducks Unlimited recently received a Regional Conservation Partnership Program award to help target NRCS funding for grassland and wetland conservation in the Prairie Pothole region, including parts of Montana.
- The USFWS Partners for Fish and Wildlife Program leads several active North American Wetlands Conservation Act partnership projects to conserve wetlands and grasslands in many of our priority counties through conservation easement and some enhancement work (e.g., Rocky Mountain Front, Hi-Line).
- The USFWS Partners for Fish and Wildlife Program also uses program and grant funding to work with private landowners on conserving native grasslands and transitioning non-native to native grass stands.
- FWP manages three programs that are also complimentary to this grassland initiative and may provide funding support as appropriate to these programs: Upland Game Bird Enhancement Program, Migratory Bird Wetland Program, and State Wildlife Grants program.

Implementation: FWP will commit to targeted delivery of this initiative for a minimum of 5 years. Implementation will begin as soon as funds are available.

FWP Wildlife Biologists and Upland Game Bird Specialists will continue to work with private landowners and, when appropriate and relevant, discuss initiative options, identify projects, prepare proposals, and develop long-term working relationships with private landowners enrolled under this initiative. They will continue to be the main point of contact between landowners and the Department.

Regional Wildlife Managers will approve project proposals and final agreement terms for projects in their region.

Two seasonal wildlife technicians will be hired to support Wildlife Biologists and Upland Game Bird Specialists with the additional work load associated with this initiative, pending available funding. Location of these positions will be determined through consultation with the Wildlife Managers.

FWP Habitat Bureau staff in Helena will administer the initiative, including calling for projects, ranking and prioritizing projects (in cooperation with Wildlife Managers and Bureau Chiefs), maintaining a project database, tracking budgets, preparing reports, and facilitating outreach efforts. Habitat Bureau staff will also be responsible for acquiring funding and assessing the success of the initiative in 5 years.

FWP Wildlife staff in Helena will work in consultation with the Research Bureau and Wildlife Biologists to track populations of grassland species of interest at project, regional, state, and continental scales. Multi-scale species monitoring data will help assess whether actions in addition to this initiative are necessary to conserve populations of Species of Concern.

Conservation partners host several private land stewardship positions that can help FWP with outreach for this grassland initiative. These include:

- A Private Lands Biologist employed by Bird Conservancy of the Rockies with a primary focus on grassland birds and grassland conservation (Jordan),
- Three Pheasant Forever Habitat Specialists who work with private landowners, primarily helping to deliver NRCS programs (Conrad, Chinook, Scobey),
- Three Ducks Unlimited staff who work with private landowners on wetland-grassland conservation (statewide, northcentral), and,
- Three USFWS Private Lands Biologists working directly with private landowners on wildlife habitat projects (Glasgow, Malta/Jordan, Lewistown).

SWIFT FOX MONITORING IN NEBRASKA

SAM WILSON, Nebraska Game and Parks Commission, 2200 N 33rd Street, Lincoln, NE 68503; Phone: (402) 471-5174; E-mail: sam.wilson@nebraska.gov

INTRODUCTION

The swift fox (*Vulpes velox*) is listed as a state endangered species in Nebraska. The species currently occurs in the Panhandle and southwestern counties of Nebraska, and occurred historically in the western two-thirds of the state. Swift fox in Nebraska declined due to overharvest, poisoning, and habitat alteration, and are believed to have been absent from Nebraska between 1901 and 1953. Camera trap surveys, scent station surveys, and observations from the public are used to determine the presence of swift fox in Nebraska.

ACTIVITIES IN 2015–2016

A graduate project with the Nebraska Cooperative Fish and Wildlife Research Unit, the University of Nebraska-Lincoln, Chadron State College, the U.S. Forest Service, Nebraska Department of Roads, the Nebraska Game and Parks Commission, and Nebraska landowners is presently underway to study limiting factors of swift fox distribution in the state. Ph.D. candidate Lucia Corral, along with her advisor, Dr. T.J. Fontaine, have coordinated the first complete survey of swift fox distribution in Nebraska as part of this project (Figure 1). Additional research objectives for swift fox and other local canids include: 1) developing predictive models of the direct (i.e., habitat loss) and indirect (i.e., changes in intraguild interactions) impacts of development on canid communities, and 2) developing spatially explicit dispersion models which examine landscape connectivity for species that have different dispersal capabilities. The project is scheduled to be completed at the end of 2018. For more information see the project website at: http://swiftfox.unl.edu

ADDITIONAL INFORMATION

Swift foxes were detected via observation, camera traps or carcass collection in Cheyenne, Dawes, Garden, Hitchcock, Kimball, Morrill, and Sioux counties during 2015–2016 (Figure 1).

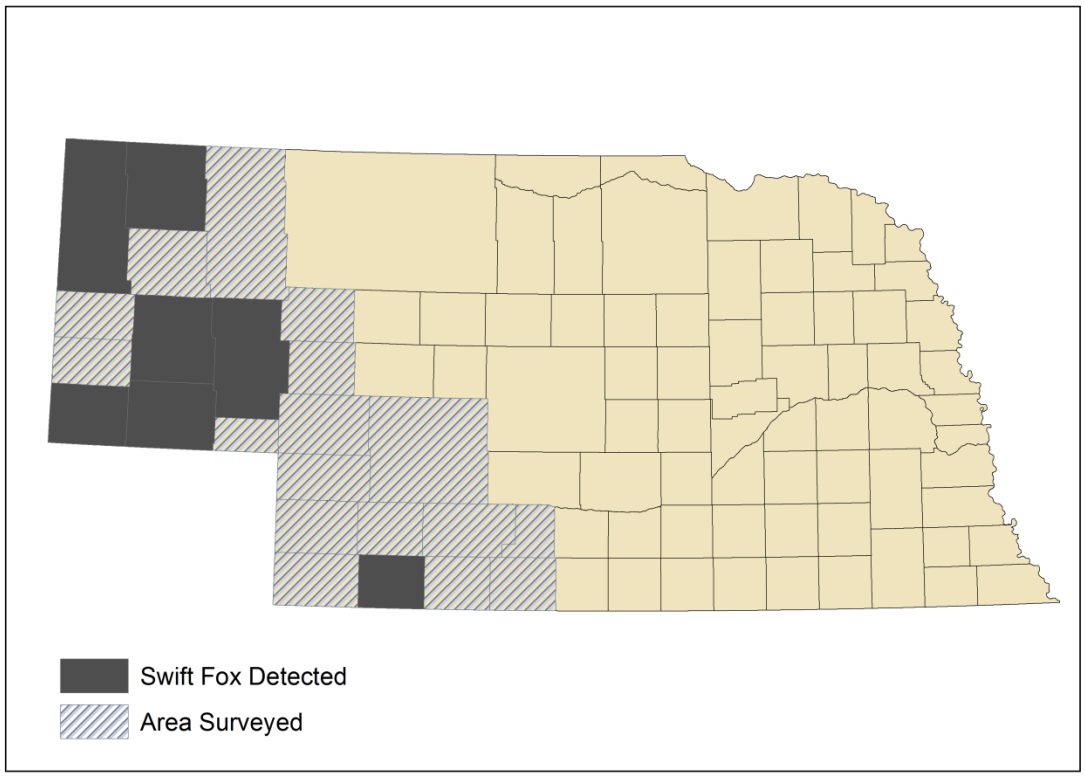


Figure 1. Counties where swift fox presence was documented in Nebraska, 2015–2016.

STATUS OF SWIFT FOX IN NEW MEXICO: 2016 UPDATE

JAMES N. STUART and SEAN M. MURPHY, New Mexico Department of Game and Fish, Wildlife Management Division, PO Box 25112, Santa Fe, NM 87504. Tel: 505-476-8107 and 505-476-8041; FAX: 505-476-8128; E-mail: James.Stuart@state.nm.us; Sean.Murphy@state.nm.us

ABSTRACT

The swift fox occurs in shortgrass prairies in the eastern one-quarter of New Mexico and is still found in the majority of areas where it was documented historically. The species is a harvestable furbearer in New Mexico and harvest data for 2014-2016 are presented and discussed. Formal surveys of the species were not conducted in New Mexico during the reporting period but are planned for 2018.

INTRODUCTION

The swift fox (*Vulpes velox*) inhabits shortgrass prairie communities in 12 counties of eastern New Mexico. The species presently occurs throughout its historic range in New Mexico with the exception of areas in eastern Curry and Roosevelt counties, which have been developed as cropland, and in southeastern Quay County where taller grasses and shrub encroachment have replaced shortgrass prairie. Severe drought in recent years has impacted grassland habitats used by this species in eastern New Mexico.

The range of New Mexico's subspecies of kit fox (*Vulpes macrotis neomexicana*), which includes grassland, shrubland, and desert habitats in the central, southern, and western parts of the state, overlaps with that of *Vulpes velox* in southeastern New Mexico (primarily in Chaves County), and hybridization between the two forms has been documented in this region. For conservation and management purposes, the New Mexico Department of Game and Fish (NMDGF) considers swift fox and kit fox as separate species but recognizes that genetic evidence supports the conclusion by some researchers that these two foxes are probably best considered as conspecific (i.e., *V. velox velox* and *V. velox neomexicana*, respectively). See Stuart (2013) for additional information.

MANAGEMENT STATUS IN NEW MEXICO

All fox species in New Mexico are classified by state statute as protected furbearers and can be legally harvested by licensed trappers during the regular furbearer trapping season (November 1 – March 15). Pelt-tagging is not required. Swift fox was formerly considered a Species of Greatest Conservation Need under the New Mexico State Wildlife Action Plan (SWAP) but was removed from this classification in the 2016 revision of the SWAP due to its existing legal status as a protected furbearer.

FURBEARER HARVEST DATA

The status of swift fox as a legally-harvestable furbearer in New Mexico was discussed by Stuart (2013). We provide below information from the most recent two trapper harvest years. Results of the 2016-2017 trapping season are not yet available.

Harvest results for 2014-2015 season – A total of 303 swift/kit fox (combined) was reported as harvested in New Mexico by the 1,562 trappers who responded to the harvest survey (88% of all licensed trappers). Of these 303 foxes, 47 animals were taken within swift fox range in the following counties: Chaves (where kit fox and hybrids also occur), Colfax, De Baca, Mora, and Union.

Harvest Results for 2015-2016 season – A total of 237 swift/kit foxes (combined) was reported as harvested in New Mexico by the 1,451 trappers who responded to the harvest survey (87% of all licensed trappers). Of these 237 foxes, 49 animals were taken within swift fox range in the following counties: Chaves (where kit fox and hybrids also occur), Colfax, De Baca, Mora, and Union.

As with previous trapping seasons, most swift/kit foxes reportedly taken in New Mexico are from counties west of the Pecos River and are therefore assignable to kit fox. Foxes taken by trappers in Chaves County are considered to be swift fox for purposes of tabulating harvest results although both species and hybrids are present there.

Even with an allowance for underestimates of harvest due to incomplete annual reporting data from trappers, the numbers of both swift and kit fox taken in New Mexico during 2014-2016 continue to be far below the estimated sustainable annual harvest limit for both species. Figure 1 illustrates the reported harvest rates by trapper-reporting year for swift and kit fox combined (both species) and for swift fox alone, from 2006 to 2016.

STATUS BY COUNTY

Swift fox habitat in eastern New Mexico is found in parts of 12 counties listed below. The year indicates the most recent documentation of swift fox in that county based on trapper harvest reports (h); reliable observations, photographs, or specimens (o); or track/scat survey efforts (s).

Chaves – 2016 (h)
Colfax – 2016 (h)
Curry – No recent data; not documented in surveys from 2002-2008.
De Baca – 2016 (h)
Guadalupe – 2014 (h)
Harding – 2013 (h)
Lea – 2014 (h)
Mora – 2016 (h)
Quay – 2008 (s)
Roosevelt – 2013 (o)
San Miguel – 2007 (o; D. Schwalm, pers. comm.)
Union – 2016 (h)

CURRENT AND FUTURE ACTIVITIES

Simulations using previously published estimates of swift fox population density, detection probability, and home range size are currently being conducted to develop a logistically feasible and financially efficient spatial capture-recapture survey design to produce spatially explicit estimates of swift fox density and abundance in eastern New Mexico. Although no surveys are currently scheduled, we (NMDGF) expect to begin implementation thereof, based on results of the simulation study, beginning in 2018. Additionally, we will continue to compile roadkill and reliable observation data (obtained opportunistically) as done so during previous years. We also currently support research and habitat improvements of native grasslands via conservation projects that provide associated benefits to swift foxes and other prairie wildlife species, under the NMDGF Wildlife Action Plan.

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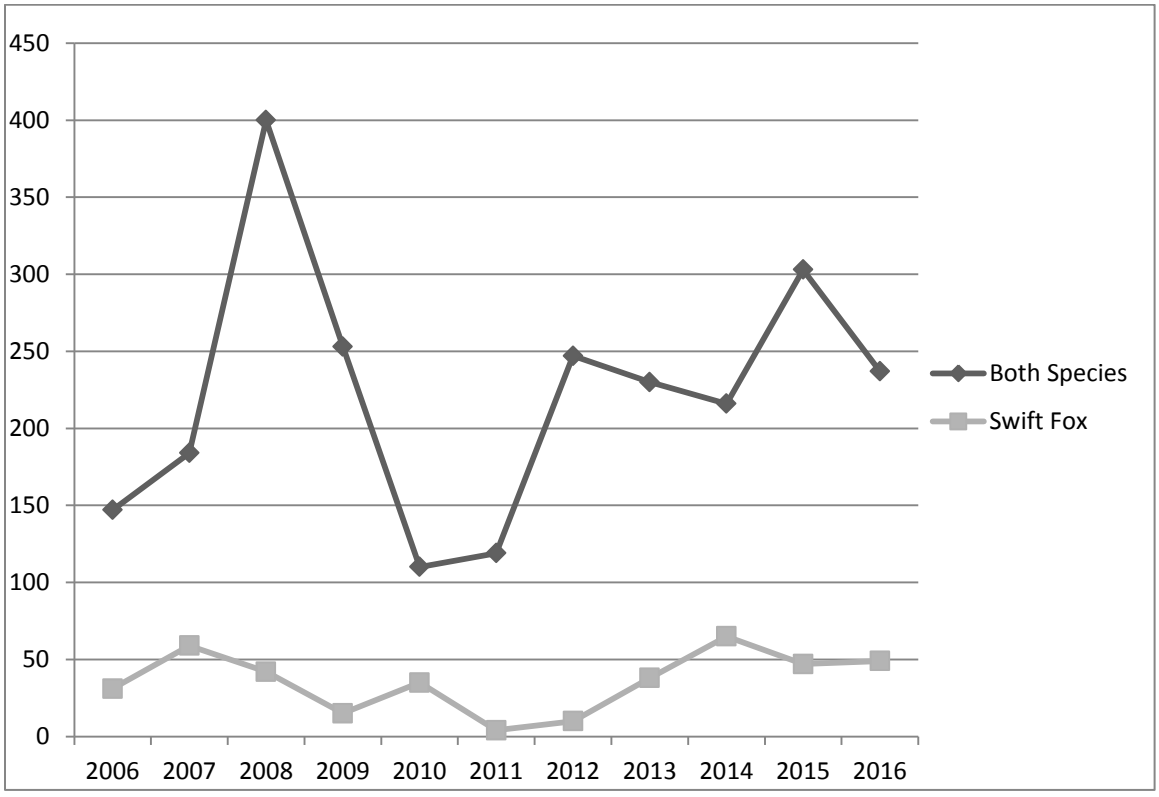

Figure 1. Annual harvest numbers for Swift and Kit Fox combined (Both Species) and for Swift Fox alone in New Mexico as reported by licensed trappers for trapper-reporting years 2006 to 2016.

NORTH DAKOTA GAME AND FISH DEPARTMENT REPORT TO THE SWIFT FOX CONSERVATION TEAM 2015-2016

PATRICK ISAKSON and STEPHANIE TUCKER

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INTRODUCTION

Nationwide conservation of swift fox (*Vulpes velox*) began gaining momentum in 1994, when the United States Fish and Wildlife Service found that listing swift fox as threatened or endangered "may be warranted" throughout its entire range. The Swift Fox Conservation Team (SFCT) was formed and met annually with the objective of comparing and improving upon research and management techniques for swift fox throughout its range (Dowd Stukel 2011).

Locally, swift fox were common in North Dakota during pre-settlement times (Bailey 1926, Thwaites 1953); however, the species became rare about 1880-1900 (Bailey 1926). We have documented 25 reports of swift fox occurrence in North Dakota since 1970, of which 17 were verified to be swift fox. The majority (76%) of those verified reports have taken place since 2007 and were the result of incidental live-captures (n = 1) or deaths from automobile collisions (n = 7), incidental captures (n = 4), or mistaken identity by hunters (n = 1; Figure 1). We necropsied the dead swift foxes (9 males, 1 female, 2 unknown) and discovered that all of the foxes were young, dispersal-aged animals that showed no evidence of reproductive activity. Because those reports of swift foxes were intermittent, widely dispersed, and did not indicate presence of a resident population, we did not conducted additional surveys during those times.

Then, during August-September 2012, we investigated reports of resident swift foxes on private land in southwestern Bowman County via a site visit and deployment of several trail cameras. We discovered swift fox dens on the property and confirmed presence of the species using trail cameras. The following year in July 2013, we revisited the same area and once again confirmed the presence of swift fox via trail cameras. The presence of swift foxes in consecutive years indicated year-round residency and we suspected breeding activity. As a result, in fall of 2015 we conducted our first formal trail camera survey for swift fox in North Dakota. Additionally, in 2016, a graduate project conducted by South Dakota State University (SDSU) was initiated looking at the distribution of swift foxes in northwestern South Dakota and southwestern North Dakota.

OBJECTIVES

To determine occurrence and/or distribution of swift fox in North Dakota.

METHODS

In fall 2015, we completed our first formal trail camera survey for swift fox in North Dakota. Our survey relied on a habitat suitability index (HSI) created by the World Wildlife Fund to determine camera locations (Olimb et al. 2010). This HSI focused on habitat suitability

in Montana, but the models were extended to include counties in western North Dakota. The top 4 quantiles from the HSI in North Dakota were extracted to develop a shapefile of only highly suitable habitat (Figure 2; Schwalm, D., personal communication). Then, a grid was overlaid onto the highly suitable habitat shapefile to determine survey points (Figure 3). Survey points were spaced 6.68km apart from one another, which is the approximate distance of two swift fox home ranges (Schwalm, D., personal communication).

Due to logistical constraints, we were not able to investigate all survey points. Therefore, we focused on those survey points in southwestern North Dakota, near where we had evidence of swift fox residency (Figure 4).

We hired a seasonal technician to conduct the survey for us from August-November, 2015. Trail cameras (Covert Red 40, Lewisburg, KY) were set along likely travel corridors (trails, fence lines, field edges, etc.) within 200 m of the original survey point. A wooden lathe was placed in front of the camera approximately 3 m and pounded into the ground until approximately 50 cm was left above ground. A small amount of call lure (Carman's Canine Call, New Milford, PA) was placed on top of the lathe. Cameras were left running at each survey point for at least 7 days.

In the summer of 2016 SDSU began work on its distribution study. Information obtained from the 2015 camera survey was shared with SDSU. This included contact information of two landowners who previously have had swift fox dens on their property. This was in the hopes of obtaining permission to trap these properties to locate existing den sites. Foxes trapped would be marked and potentially radio collared. Collared individuals would be tracked throughout the study to obtain additional information.

RESULTS

2015

We surveyed 86 points in Bowman, Slope, Hettinger, Adams, Billings, and Golden Valley counties using 100 individual trail cameras for a total 798 camera nights. We detected swift fox at a single survey point in southwestern Bowman County (Figure 5). At this site, we discovered an active den with at least 5 foxes residing within the den. Because we placed the camera near the entrance to the den, we captured an unusually high number of pictures of swift fox (n = 1,101).

2016

SDSU acquired permission to trap one of the two properties provided by the North Dakota Game and Fish Department (Department). Seven swift fox were trapped (3 adult and 4 juveniles). Juveniles were pit tagged and 2 adults and 1 juvenile were fitted with a radio collar. Adults were tracked to detect den sites but none were located. Radio collared animals were tracked through the fall and winter of 2016.

DISCUSSION

Recent work by the Department and SDSU as well as previous swift fox verifications indicate that swift fox have recolonized a small area in extreme southwestern North Dakota. We will attempt to repeat the camera survey in a few years to determine if swift fox are expanding their distribution in the state.

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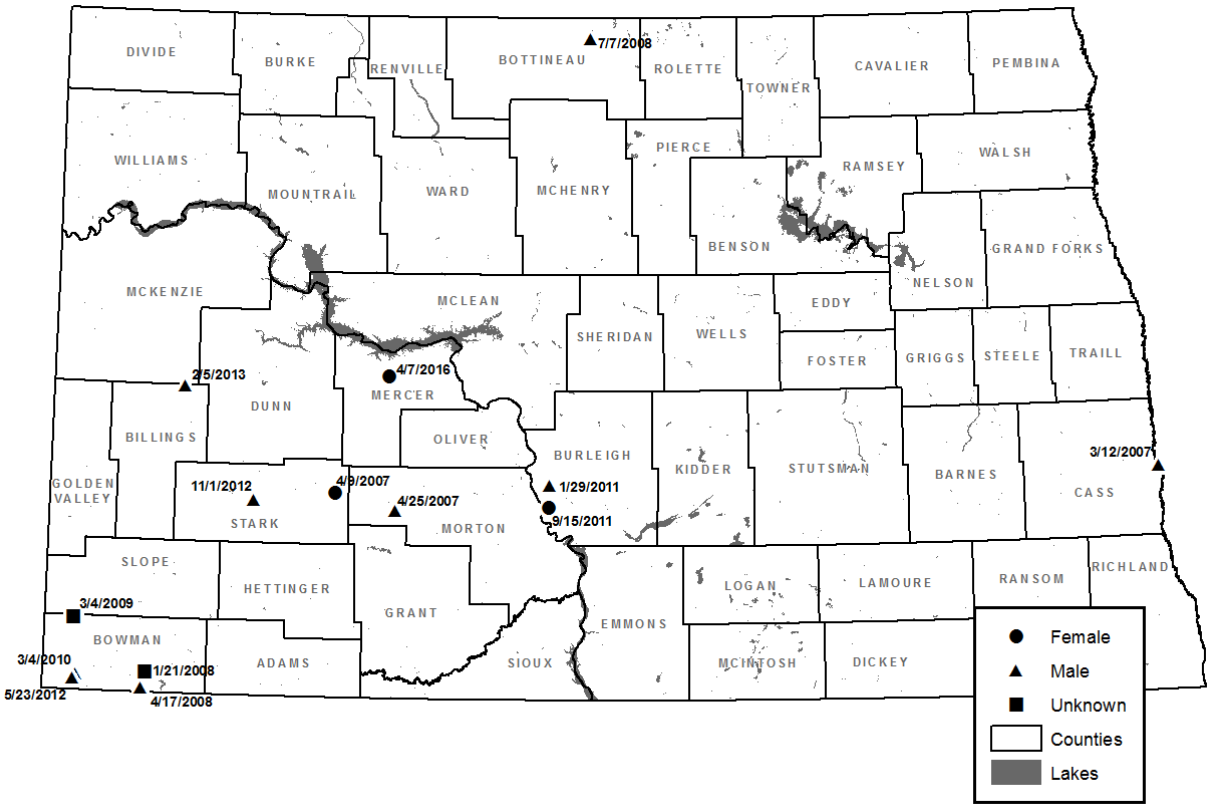

Figure 1. Location of swift foxes that were killed as a result of automobile collisions, misidentification, or accidental trapping in North Dakota January 2007- June 2016

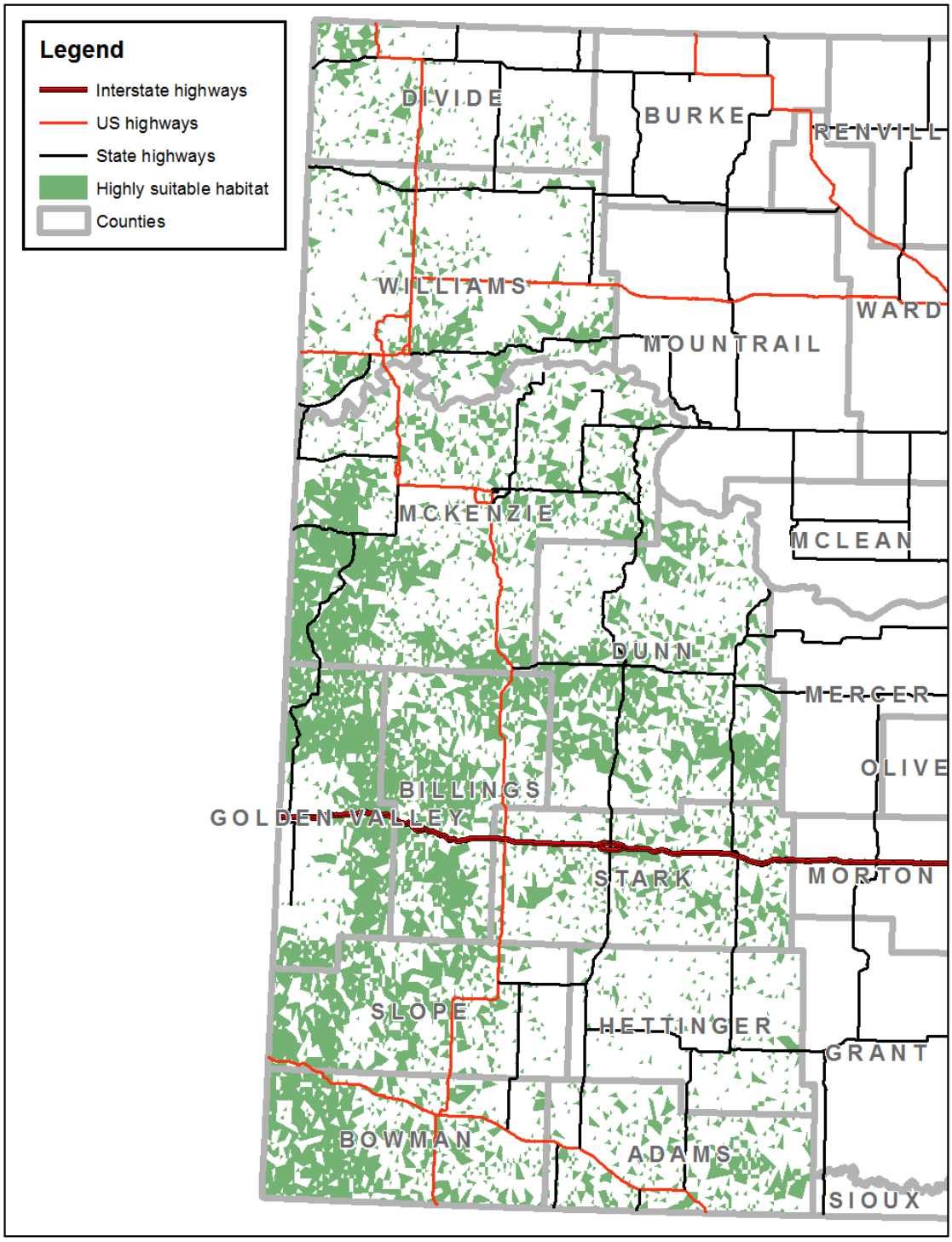

Figure 2. Highly suitable habitat for swift fox in western North Dakota based on the top 4 quantiles from a habitat suitability index created by Olimb et al. (2010).

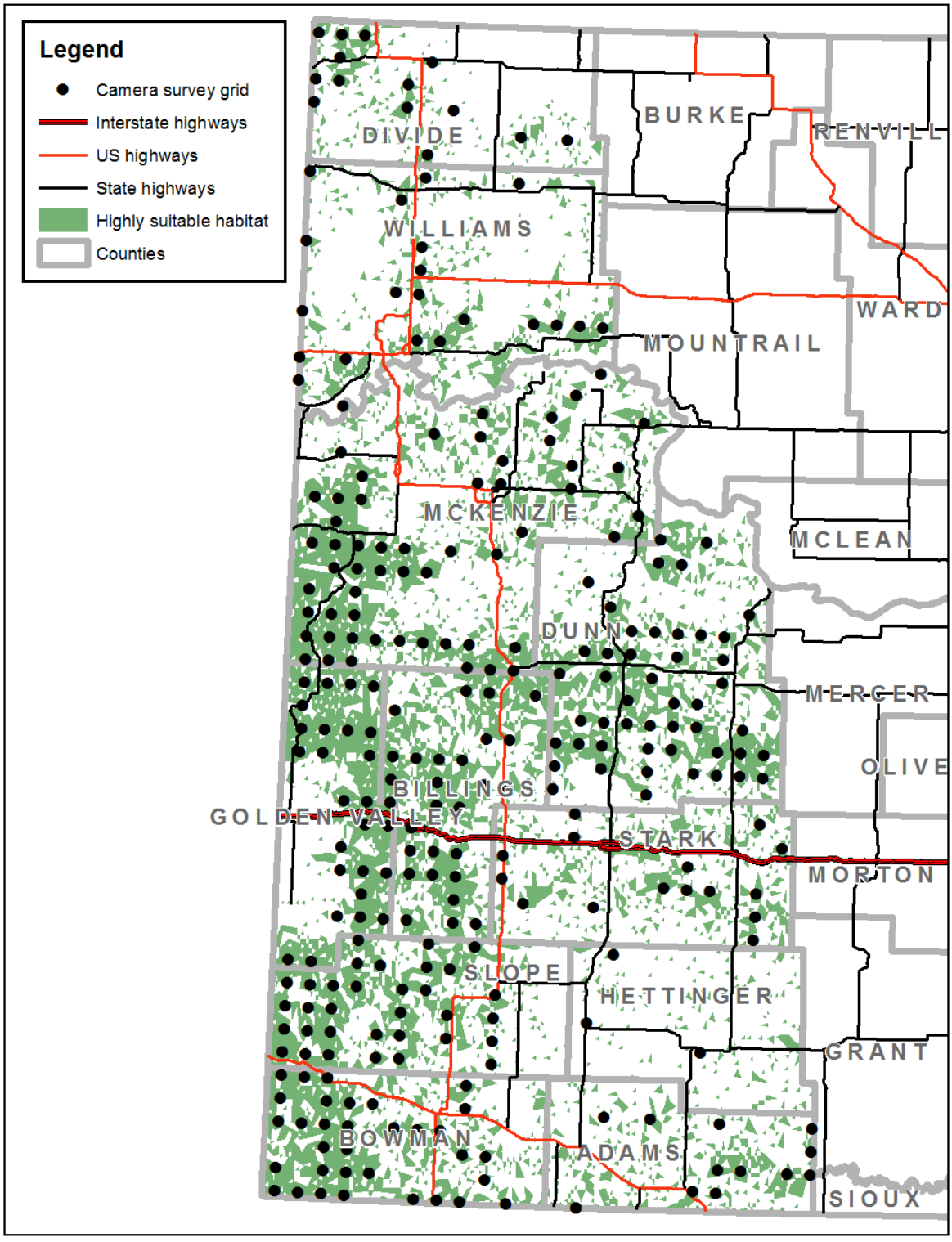

Figure 3. Survey points for swift fox in North Dakota based on highly suitable habitat (Olimb et al. 2010) and spaced 6.68 km apart, which is the approximate distance of 2 home ranges for swift fox.

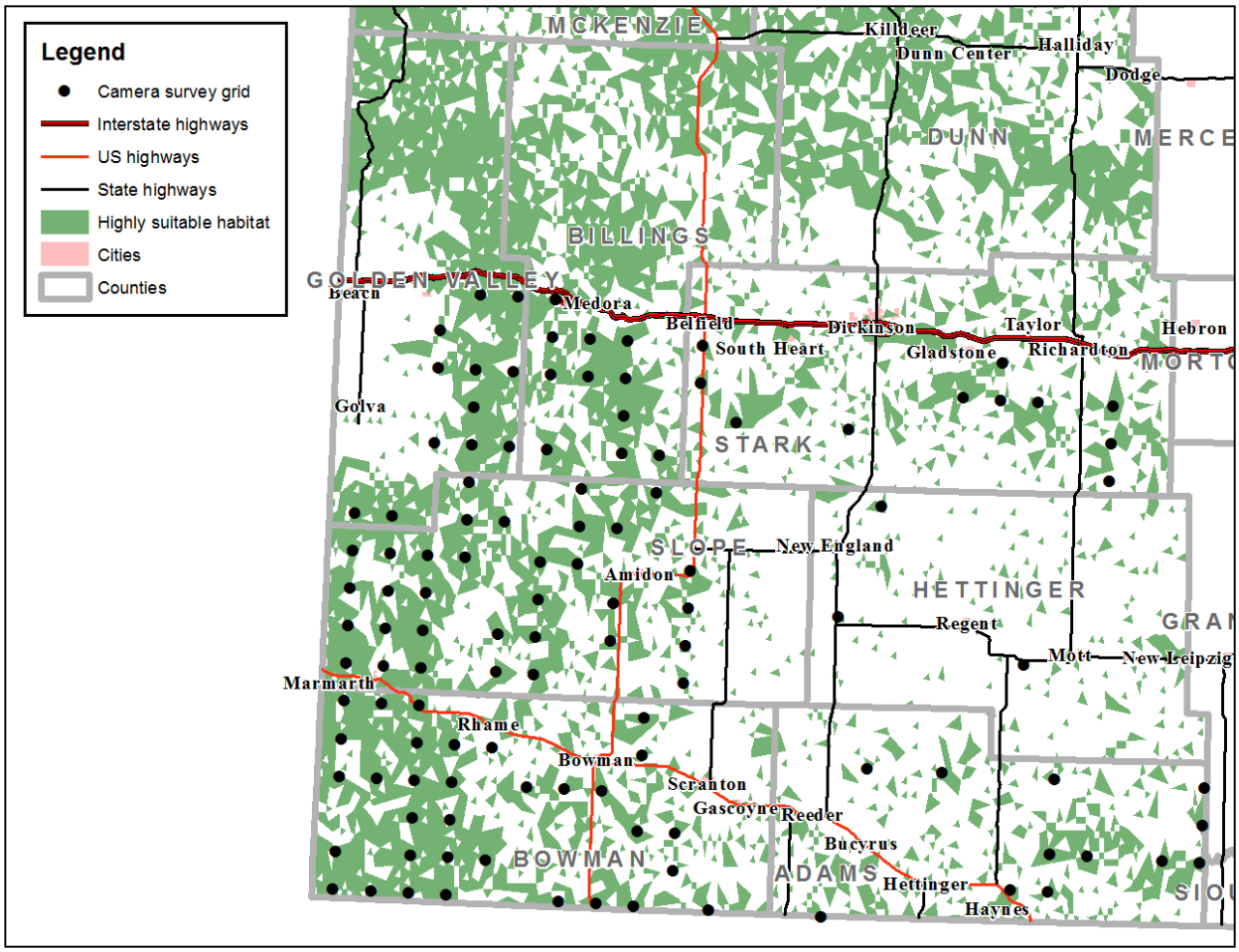

Figure 4. Survey points chosen to be surveyed in 2015 based on location of previous swift fox verifications and logistical constraints.

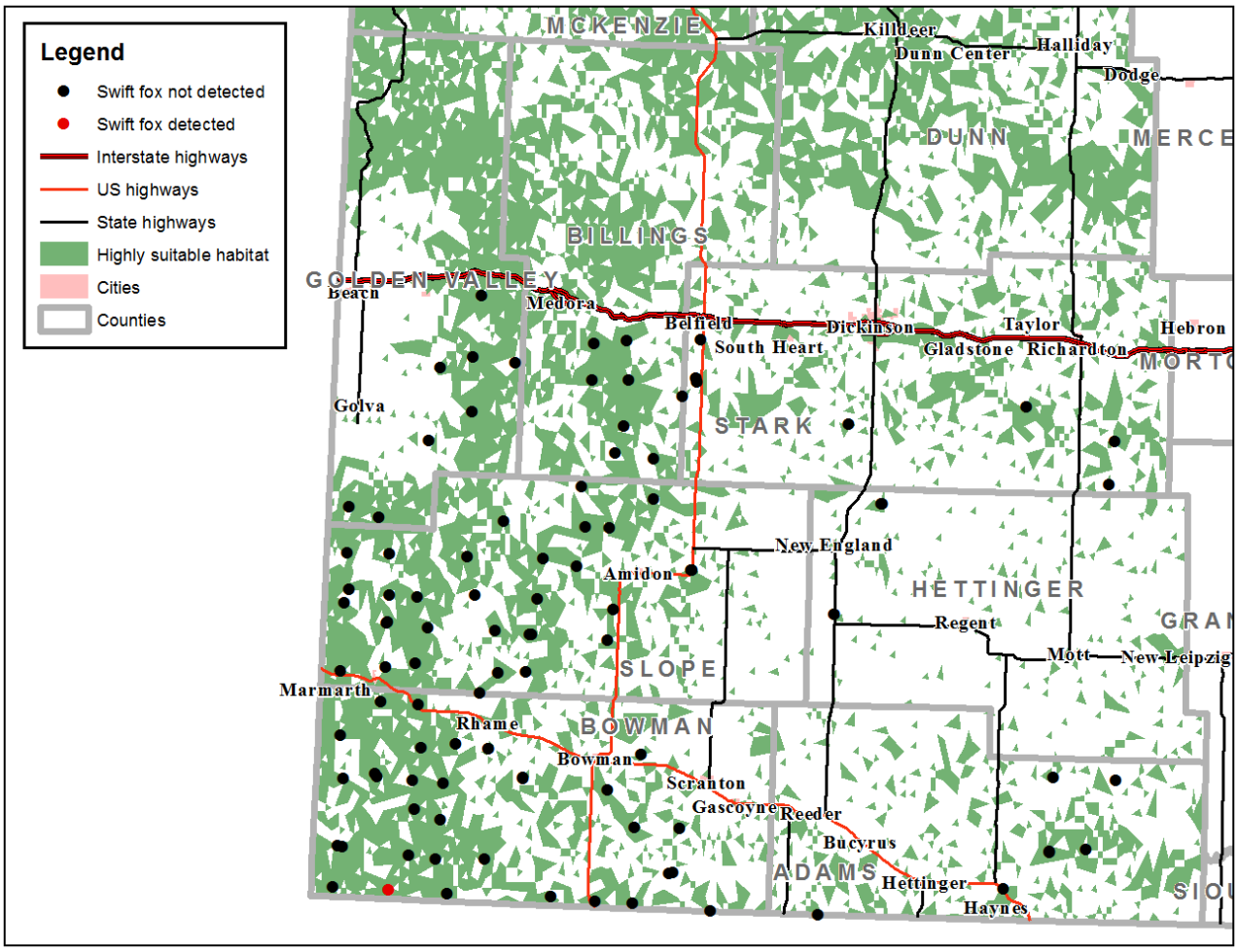

Figure 5. Locations where cameras were deployed in the fall of 2015 to determine presence of swift fox in North Dakota.

SWIFT FOX MONITORING IN OKLAHOMA – 2015 - 2016

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INTRODUCTION

The Swift Fox has been a species of conservation interest in Oklahoma for more than 20 years and is considered to be a Tier II Species of Greatest Conservation Need in the Oklahoma Comprehensive Wildlife Conservation Strategy (ODWC 2015). Under Oklahoma's Wildlife Regulations (State Title 800), the Swift Fox is classified as both a State Species of Special Concern (since 1992) and a furbearer with a year-round closed season (since 1994). The historic range of the Swift Fox in Oklahoma extended throughout the panhandle (Cimarron, Texas and Beaver counties) and into the northwestern corner of the main body of the state (Harper, Ellis and western Woodward counties). The Oklahoma Department of Wildlife Conservation has conducted track-search surveys for the Swift Fox regularly since 1998. These surveys have covered the three panhandle counties extensively. Portions of Ellis, Harper and Woodward counties that appear to have suitable habitat (e.g. those local landscapes that are dominated by shortgrass prairie, grazed prairie and non-irrigated crop fields) have been surveyed less frequently, and it is likely that Swift Foxes are very scarce or absent in these areas.

These surveys appear to demonstrate that the Swift Fox has continued to occupy most suitable habitat throughout at least 50% of its historical geographic range in Oklahoma. Currently, Swift Foxes appear to be in the highest densities in the western half of Beaver Co., all of Texas Co., and majority of Cimarron County (excluding the Black Mesa region) in the Oklahoma panhandle. While it's possible that Swift Foxes still occupy portions of Harper, Ellis, and Woodward counties, track surveys are generally more difficult in these counties due to sandier soils. Sighting reports are also extremely scarce in those counties, providing evidence that Swift Foxes are likely to be very rare or absent. Within Oklahoma, the Swift Fox typically is associated with landscapes that are relatively level and have some combination of shortgrass prairie rangeland and non-irrigated winter wheat fields as their dominant land use/land cover. Within the Oklahoma panhandle, it also occurs in some areas of grazed mixed-grass prairie and sand sagebrush shrubland along the Beaver River.

METHODS

Since 2007, the Oklahoma Department of Wildlife Conservation (ODWC) has conducted annual track-search surveys in portions of the Swift Fox's current range in order to monitor its population and to track trends in its relative abundance and geographic distribution. These surveys are accomplished through timed-searches for Swift Fox tracks along county roads in areas of suitable habitat. When planning our initial surveys, we examined the grid of townships that cover the Swift Fox's current Oklahoma range and estimated that this range encompasses 182 townships. Of these 182 townships, we selected one half of them (91) to be standard survey townships. These townships are surveyed on a three-year cycle such that we cover approximately 1/3 of the townships each year. These townships are evenly distributed (every other township) across the three counties that comprise the Oklahoma panhandle (Cimarron,

Texas and Beaver counties) and the adjacent portion of Harper County in northwest corner of the main body of the state. Since the initiation of the survey, four townships have been deleted from the survey because they either lack suitable habitat (two townships) or public road access (two townships).

The timed-search surveys for Swift Fox tracks are conducted during the fall (October and November). The surveys are based along county roads and are typically conducted by a trained team of ODWC staff. The tracking substrates that are searched during the survey are the margins of unpaved county roads, access roads leading to natural gas well sites or irrigation wells, and the edges of plowed fields. Each township is surveyed for a minimum of 30 minutes and a maximum of 120 minutes. Within each township, the observer records the time that elapses between the beginning of the survey and the time at which the first Swift Fox track line is detected. If a Swift Fox track line is detected during the first 30 minutes of the survey, the observer continues to search for additional track lines in that township until the minimum 30-minute searching period has elapsed. As a result, it is possible to record multiple Swift Fox locations within a township. If no Swift Fox tracks are observed after 120 minutes of searching, the survey in that township ceases, the observer records that no tracks were found and moves to the next township to initiate a new timed-search survey. During the survey, each observer carries a watch or stopwatch and records the actual time that was spent searching suitable tracking substrates for Swift Fox tracks. Typically, an observer will search a stretch of road or the edge of a plowed field for 5 to 10 minutes, stop the stopwatch, return to the vehicle and drive to a new location. At the new location, the observer resumes keeping time and searching for tracks. Track searches are commonly conducted at five to twelve locations within a township. During the search for Swift Fox tracks, the tracks of all other carnivores are recorded as well. Additionally, we record the presence of Black-tailed Jackrabbit tracks because of the potential confusion between the size and shape of Swift Fox tracks and those left by the front paws of jackrabbits. To minimize misidentification, we only consider a Swift Fox track to be verified if we can locate a continuous track line of 12 feet or 16 consecutive individual track impressions.

RESULTS AND DISCUSSION

2015 – Cimarron County

Between 27 October and 29 October 2015, timed track-searches were conducted in 22 townships by ODWC biologists Matt Fullerton, Jerrod Davis, Rich Fuller, and Jena Donnell. All townships were within Cimarron County. Swift Fox track lines were located in 18 townships (81%, Table 1.). The average search time for locating the first Swift Fox track line in each township was 29 minutes.

2016 – Beaver County

Between 24 October and 27 October 2016, timed track-searches were conducted in 21 townships by ODWC biologists Matt Fullerton, Mark Howery, Rich Fuller, and Jeff Tibbits. All townships were within Beaver County. Swift Fox track lines were located in 15 townships (83%, Table 2.). The average search time for locating the first Swift Fox track line in each township was 33 minutes.

Similar to the results that we observed in previous years of the survey, most Swift Fox track detections occurred in locations that were dominated by rangeland or a mosaic of rangeland, non-irrigated winter wheat fields and Conservation Reserve Program fields. In the Oklahoma panhandle, most rangeland consists of native prairie communities dominated by a

combination of Hairy Grama (*Bouteloua hirsuta*), Blue Grama (*Bouteloua gracilis*), Buffalograss (*Buchloe dactyloides*), Sideoats Grama (*Bouteloua curtipendula*) and Little Bluestem (*Schizachyrium scoparium*). A few of the areas that we classified as rangeland had historically been crop fields, but they had been planted to either native grasses or Yellow (Old World) Bluestem (*Bothriochloa ischaemum*) as part of the Soil Bank program in the 1950s. In these cases, the former Soil Bank fields are currently being grazed and structurally function as if they were rangeland.

Along with making note of other carnivore species tracks, we also record track lines left by Black-tailed Jackrabbits (*Lepus californicus*). While the tracks of Swift Foxes are relatively easy to distinguish from other carnivore species due to their small size and the number of toes (relative to mustelids), our experience has been that the tracks that are most easily confused with Swift Foxes are those of the Black-tailed Jackrabbit. The track impressions left by Swift Foxes and the front paws of Black-tailed Jackrabbits are nearly identical in size and their toe arrangement is similar (especially for the tracks that are left in sand or dust that don't have well defined toe impressions). As a result of this similarity, we evaluated each set of suspected Swift Fox tracks to ensure that these were not the tracks of Black-tailed Jackrabbits. Our most certain method for distinguishing between these tracks is to record only those Swift Fox track lines that contain 16 individual track impressions or consist of a solid line of tracks that is at least 12 feet in length. Typically, a line of Black-tailed Jackrabbits will contain some larger impressions (those left by the larger hind feet), and some paired track impressions that are oriented side-by-side (jackrabbits typically move their hind legs together when they hop).

We agree with the conclusions made by Criffield *et al.* (2010) that timed track surveys from September – October continue to provide a moderate estimate of Swift Fox density and distribution; however, we understand that track surveys can have their limitations. While the results of such surveys provide evidence that Swift Foxes continue to occupy much of their historic Oklahoma range, we would like to explore the possibility of deploying scent stations with cameras in many of the survey townships to further verify the presence and current distribution of the species. Such surveys would act as supplemental evidence and could further bolster the presence/absence data that ODWC has been collecting on the Swift Fox for the past decade.

Table 1. Summary of Swift Fox Track Presence/Absence in 2015.

Date	Township	County	Swift Fox Detection (Yes/No)	Number of Swift Fox Detections	Time Until First Swift Fox Detection	Adjacent Habitat Type
10/27/15	T02N R01E	Cimarron	Yes	1	32 minutes	Rangeland (Native)
10/28/15	T02N R05E	Cimarron	Yes	1	23 minutes	Irrigated Crop/Rangeland (native)
10/28/15	T01N R04E	Cimarron	Yes	1	23 minutes	CRP (native)
10/28/15	T01N R02E	Cimarron	Yes	1	10 minutes	CRP (native)/Crop (winter wheat)
10/28/15	T02N R03E	Cimarron	Yes	1	29 minutes	CRP (native)/Fallow Field
10/28/15	T03N R02E	Cimarron	Yes	1	64 minutes	Rangeland (native)/Fallow Field
10/29/15	T05N R06E	Cimarron	Yes	1	10 minutes	Native Rangeland
10/29/15	T06N R05E	Cimarron	Yes	1	57 minutes	Native Rangeland
10/29/15	T06N R03E	Cimarron	Yes	1	70 minutes	Native Range/Juniper Mesa
10/29/15	T05N R02E	Cimarron	Yes	1	26 minutes	Native Rangeland/Juniper Mesa
10/29/15	T01N R06E	Cimarron	Yes	1	26 minutes	Native Rangeland
10/29/15	T02N R07E	Cimarron	Yes	1	12 minutes	Crop (winter wheat)
10/29/15	T03N R06E	Cimarron	Yes	2	21 minutes	CRP (native)/Irrigated Crop
10/29/15	T03N R04E	Cimarron	Yes	1	21 minutes	Fallow Field/CRP (native)
10/29/15	T04N R07E	Cimarron	Yes	1	5 minutes	Irrigated Crop/Fallow Field
10/29/15	T05N R08E	Cimarron	Yes	1	64 minutes	Fallow Field
10/29/15	T06N R09E	Cimarron	Yes	2	17 minutes	CRP (native)/Fallow Field
10/29/15	T04N R09E	Cimarron	Yes	2	14 minutes	Crop (winter wheat)/Fallow Field
10/29/15	T03N R08E	Cimarron	No	0	N/A	N/A
10/29/15	T06N R07E	Cimarron	No	0	N/A	N/A
10/29/15	T01N R08E	Cimarron	No	0	N/A	N/A
10/29/15	T02N R09E	Cimarron	No	0	N/A	N/A

Table 2. Summary of Swift Fox Track Presence/Absence in 2016

Date	Township	County	Swift Fox Detection (Yes/No)	Number of Swift Fox Detections	Time Until First Swift Fox Detection	Adjacent Habitat Type
10/24/16	T2N R23E	Beaver	Yes	1	31 minutes	Native Rangeland
10/24/16	T2N R27E	Beaver	No	0	N/A	N/A
10/24/16	T1N R22E	Beaver	Yes	2	15 minutes	Fallow Field/Crop (winter wheat)
10/24/16	T2N R21E	Beaver	Yes	1	26 minutes	CRP (native)/Fallow Field
10/24/16	T1N R28E	Beaver	No	0	N/A	N/A
10/24/16	T03N R22E	Beaver	No	0	N/A	N/A
10/25/16	T1N R24E	Beaver	No	0	N/A	N/A
10/25/16	T1N R26E	Beaver	No	0	N/A	N/A
10/25/16	T2N R25E	Beaver	Yes	1	15 minutes	Native Rangeland
10/26/16	T3N R20E	Beaver	Yes	1	39 minutes	CRP (native)/Native Rangeland
10/26/16	T04N R25E	Beaver	No	0	N/A	N/A
10/26/16	T04N R27E	Beaver	Yes	1	5 minutes	Native Rangeland
10/26/16	T03N R28E	Beaver	Yes	1	60 minutes	Native Rangeland
10/26/16	T05N R20E	Beaver	Yes	1	43 minutes	Native Rangeland
10/26/16	T04N R21E	Beaver	Yes	1	41 minutes	Native Rangeland
10/26/16	T04N R23E	Beaver	Yes	1	43 minutes	CRP (native)
10/26/16	T03N R26E	Beaver	Yes	4	4 minutes	Native Rangeland
10/27/16	T03N R24E	Beaver	Yes	1	37 minutes	Native Rangeland
10/27/16	T06N R23E	Beaver	Yes	1	48 minutes	Native Rangeland/CRP (native)
10/27/16	T05N R22E	Beaver	Yes	1	56 minutes	Native Rangeland/Crop (winter wheat)
10/27/16	T06N R21E	Beaver	Yes	1	39 minutes	Fallow Field/Crop (winter wheat)

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SOUTH DAKOTA GAME, FISH AND PARKS SWIFT FOX UPDATE, 2015-2016

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INTRODUCTION

The swift fox is a state threatened species and a species of greatest conservation need in South Dakota's Wildlife Action Plan. This species is legally classified as a "fur-bearing animal" but with a closed season. South Dakota Game, Fish and Parks (SDGFP) has participated on the Swift Fox Conservation Team (SFCT) since the team's inception.

ADMINISTRATIVE ACTIVITIES AND FUNDING ASSISTANCE

SDGFP's representative to the SFCT serves as the Education Chair. A SFCT Newsletter was produced during the reporting period and is posted on the team website, hosted by Colorado Parks and Wildlife (http://cpw.state.co.us/learn/Pages/SwiftFoxConservationTeam.aspx).

SDGFP Wildlife Diversity staff recently initiated status reviews of all state threatened or endangered species in the state. Each review includes a description of basic life history, known distribution in the state, conservation efforts, recovery challenges, monitoring and research needs, and, if suitable information exists, delisting or downlisting goals. The SFCT was asked to comment on the draft status review for the swift fox, and those comments were considered. As of the time of this report, this species is considered in need of additional information before defensible state delisting goals can be proposed.

SDGFP provided financial assistance to the "Swift Fox Monitoring in Southwestern South Dakota" project described later in this report.

SDGFP provided funding for the following project: "Associating swift fox presence with the distribution of other carnivores in western South Dakota" being conducted by South Dakota State University (SDSU) M.S. candidate Emily Mitchell, with co-PIs Jonathan Jenks, SDSU and Donelle Schwalm, Oregon State University. Project objectives are as follows.

By June, 2018:

- Assess swift fox distribution in Meade, Butte, Harding, Perkins counties, South Dakota and Bowman County, North Dakota, as it relates to sympatric carnivores, specifically coyote and red fox, by June of 2018;
- Assess red fox relative abundance in areas with lethal coyote control in Meade, Butte, Harding, Perkins, and Bowman counties, by June of 2018; and
- Determine if swift foxes occupying Meade, Butte, Harding, Perkins, and Bowman counties have larger home ranges than those in other populations, by June of 2018.

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(SDGFP) South Dakota Department of Game, Fish and Parks. 2014. South Dakota Wildlife Action Plan. Wildlife Division Report 2014-03. South Dakota Dept. of Game, Fish and Parks, Pierre.

SWIFT FOX MANAGEMENT IN WYOMING

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The Wyoming Game and Fish Department (WGFD) conducted surveys for swift fox throughout the eastern $^{2}/_{3}$ of the state in 2010 and 2013 to evaluate occupancy. Results from those efforts are provided in previous Swift Fox Conservation Team reports. Since 2013, the WGFD has continued to receive reports of swift fox from around the state, including western Wyoming, an area not believed to have contained swift fox historically. These reports are critical to our understanding of the species in the state and provide information that is used to update range maps and document reproductive populations.

The WGFD will be repeating and expanding occupancy surveys in 2017 to address a number of objectives, including estimating current occupancy throughout the state, including areas of western Wyoming where surveys were not conducted previously but where swift fox are expanding; evaluating changes in occupancy since previous surveys in 2010 and 2013 to determine population trends; updating statewide distribution and range maps as necessary to reflect new observations; and evaluating the impact of disturbance on changes in occupancy.

US FOREST SERVICE SWIFT FOX ACTIVITIES IN THE NEBRASKA NATIONAL GRASSLANDS
(South Dakota, Nebraska)

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The swift fox (*Vulpes velox*) remains a sensitive species under the US Forest Service's Rocky Mountain Region (R2) Regional Forester's sensitive species list. A couple of swift fox research projects with State and academia were in progress and nearing conclusion within this time frame.

Oglala National Grassland

Nebraska Cooperative Fish & Wildlife Research Unit, University of Nebraska–Lincoln. Canid Distribution and the Potential Impacts of Energy Development in Nebraska. A portion of this research was conducted on the Oglala National Grassland with logistical assistance from the Nebraska National Forests and Grasslands in the past. This project should be discussed in more detail under the Nebraska State Agency Report.

Buffalo Gap National Grassland – Fall River Ranger District

Limited survey and monitoring activities by Forest Service resource managers occurred with incidental live observations and road kill observations confirming continued presence of swift fox. This area is reputed by Forest Service personnel to be one of the higher success areas for swift fox in South Dakota.

Buffalo Gap National Grassland – Wall Ranger District

Limited survey and monitoring activities by Forest Service resource managers occurred with incidental live observations and road kill observations confirming continued presence of swift fox. In general, the reintroduced foxes were doing well but populations have dropped considerably through the 2015-16 period.

Cooperative sylvatic plague research and flea pest management is ongoing in Conata Basin, Steer Pasture area, Scenic area, and Badlands National Park prairie dog complexes. Goals are to bolster black-footed ferret recovery and fox reintroduction efforts in the vicinity by stabilizing the black-tailed prairie dog prey base.

Ms. Sarah Nevison, SDSU Graduate Research Assistant, had been conducting Swift Fox Monitoring in Southwestern South Dakota (Badlands National Park and Buffalo Gap National Grassland). The Wall Ranger District biologists and staff contributed occasional assistance to this study regarding activities within the Buffalo Gap National Grasslands, primarily by reporting fox sightings, den sites and road fatalities. This study concluded in late 2016 and Ms. Nevison will be compiling and presenting the findings from her research in the near future.

SPECIES SURVIVAL PLAN FOR SWIFT FOX

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The Association of Zoos and Aquariums (AZA) swift fox Species Survival Plan (SSP) population currently consists of 66 animals in 21 institutions. There were ten births (three litters) in 2015 and three births (two litters) in 2016. The next Master Plan session will be held in 2018.

In 2017, Kim Shotola retired from her position as Studbook Keeper. She has served as Studbook Keeper since the inception of the SSP in 2004. Her expertise contributed greatly to the partnership with the SFCT and she will be missed.

WORLD WILDLIFE FUND SWIFT FOX PROJECTS (2015-2016)

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Since 2007, World Wildlife Fund (WWF) has been collaborating with state, federal, tribal, and private entities to aid in the restoration and conservation of swift fox (*Vulpes velox*) in the North American Great Plains. During 2015 and 2016, WWF and partners completed an assessment of swift fox distribution in Montana, partnered with Clemson University on a swift fox connectivity project in Montana, and worked with South Dakota State University and others to determine the status and disease risk of swift fox in South Dakota and North Dakota. All three complimentary studies seek to understand and address the gap in swift fox distribution in the northern portion of their historic range. WWF also revised its swift fox Habitat Suitability Index and gave several presentations related to our collective swift fox survey efforts. This work is described below.

Swift Fox Distribution Assessment and Reintroduction Strategy in Montana

Re-establishing species when they are extirpated by human activity is a common goal in wildlife conservation. One method for achieving this goal is reintroduction, where individuals are moved from existing populations to suitable, unoccupied habitat. The monetary, logistical, and ethical considerations of reintroductions provide impetus for careful planning to ensure biologically and ecologically meaningful results. Swift fox (*Vulpes velox*), a species of conservation concern, were extirpated from >50% of their historic range in the Great Plains because of predator control programs and altered land cover/land use patterns. Multiple reintroduction programs have attempted to reintroduce swift foxes in the Northern Great Plains (NGP), where the species is still largely absent. Reintroduction success varied, resulting in spatially isolated populations not connected to the core of the remnant populations located in the Central Great Plains. Considerable interest by stakeholders in the NGP exists to conduct additional reintroductions to connect populations. We identified two primary goals for swift fox reintroduction in the NGP: (1) establishing populations with long-term viability and (2) generating linkage between existing isolated populations and the core of the species distribution. To achieve these goals, we used camera traps to survey for swift foxes within high-quality habitat in Montana during August 2015 – January 2016 (Figure 1). Next (in 2017), we will use a swift fox Habitat Suitability Index developed with these swift fox occupancy data to identify potential release sites, based on habitat quality and the number of home ranges they could support. Using HexSim, a spatially explicit, individual based modelling framework, we will then test the influence of order in which individual release sites are selected, number of swift foxes released each year, and number of years swift foxes are released. The results of these simulations will be used to develop a restoration strategy for swift foxes in the NGP with input from five tribal entities, three state agencies, three nonprofit organizations, and one university.

Funded by the National Fish and Wildlife Foundation, this project was initiated in 2015 and will be completed in 2017. For more information, please contact Dr. Donelle Schwalm at Doni.Schwalm@oregonstate.edu or Kristy Bly at kristy.bly@wwfus.org. Project partners include: Oregon State University, World Wildlife Fund, Montana Fish, Wildlife and Parks, North Dakota Game and Fish Department, South Dakota Game, Fish and Parks, the Tribes of

Blackfeet, Crow, Fort Belknap, Fort Peck, and Northern Cheyenne, American Prairie Reserve, Bureau of Land Management, and Defenders of Wildlife.

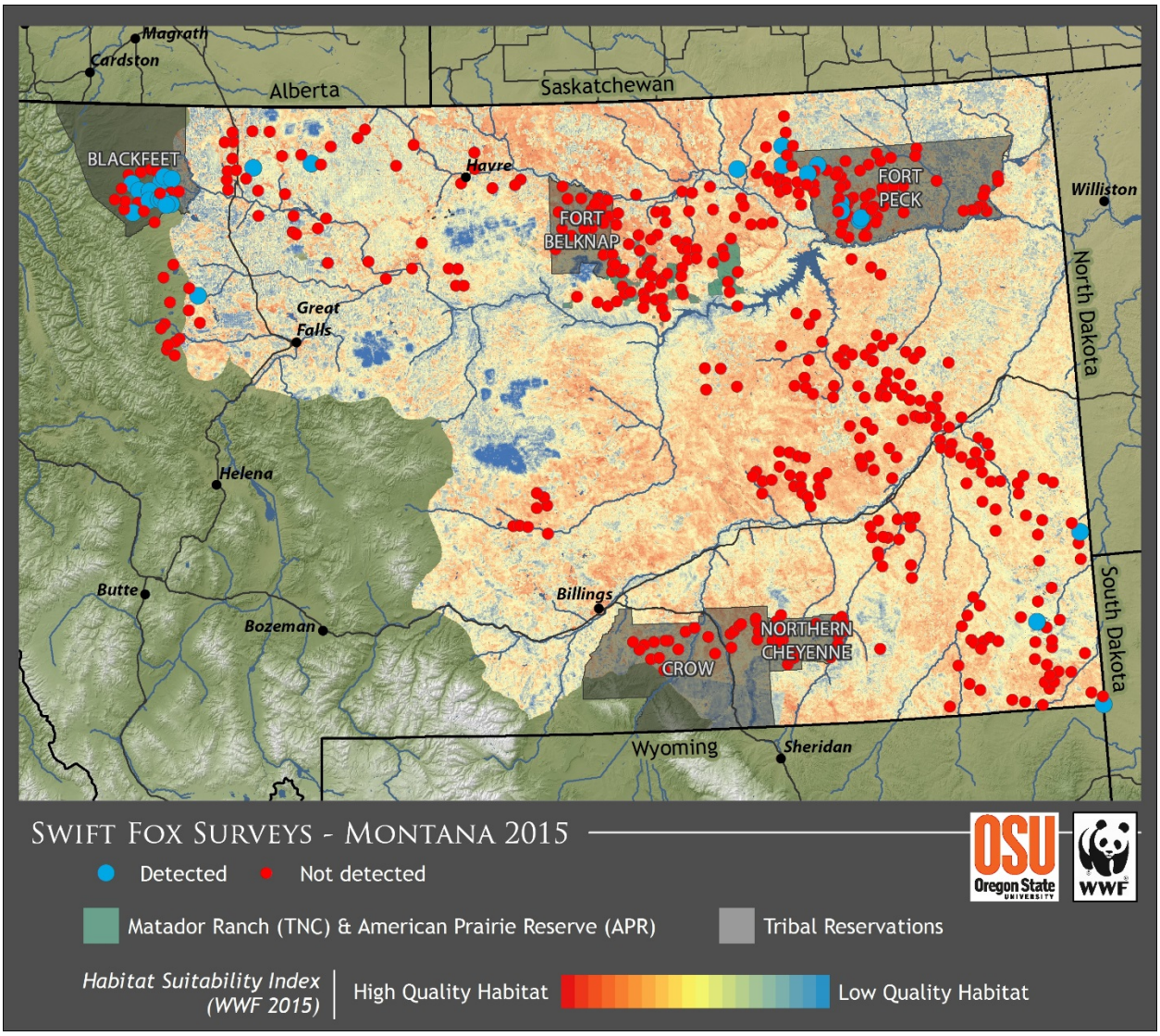

Figure 1. Location of individual swift fox survey points in Montana. Blue points indicate locations where swift foxes were detected while red points indicate no swift foxes were detected. Map credit: Sarah Olimb/World Wildlife Fund.

Northern Great Plains Swift Fox Connectivity Project

Despite six swift fox (*Vulpes velox*) reintroductions to southern Canada, northern Montana, and portions of South Dakota over the past 60 years, there are still substantial range gaps between populations in the Northern Great Plains. The goal of this project is to assess key factors influencing suitable habitats, population dynamics, and regional connectivity for swift fox in the Northern Great Plains. Specifically, we are working to (1) estimate adult and juvenile swift fox survivorship and fecundity, space use and dispersal behavior in the core northern portion of their range in Montana (Blaine, Phillips and Valley counties) and (2) create a spatially-explicit model for habitat suitability and population connectivity for Montana that

highlights key boundaries, bottlenecks, and opportunities for targeted habitat conservation and restoration.

Funded by the National Fish and Wildlife Foundation, this project was initiated in 2016 and will be completed in 2018. For more information, please contact Dr. David Scott Jachowski at djackow@clemson.edu or Andrew Butler at abutle5@g.clemson.edu. Project partners include: Clemson University, World Wildlife Fund, Montana Fish, Wildlife and Parks, Calgary Zoo, Oregon State University, and the Bureau of Land Management.

Distribution, disease risk, and conservation planning for Swift fox in the Northern Great Plains

While swift foxes (*Vulpes velox*) were once abundant throughout the Great Plains of North America, the species has declined dramatically and is now estimated to occupy only 44% of its historic range. In South Dakota and North Dakota, systematic occupancy studies are largely lacking, with only a few surveys conducted to date. With increasing land use changes (i.e., energy development, agriculture), the lack of connectivity among existing populations, and the species' vulnerable status in portions of its range, there is a need to identify the current distribution of swift fox as well as identify potential areas for reintroduction. An additional concern for swift foxes is sylvatic plague (*Yersinia pestis*), which exists within black-tailed prairie dog (*Cynomys ludovicianus)* colonies in western South Dakota and North Dakota. The status of swift fox in areas where prairie dog colonies have been decimated by plague is unknown; however, preliminary information indicates potential impacts on recruitment resulting in older-age demographics. This study is evaluating the status of swift fox populations in northwestern South Dakota and southwestern North Dakota, identifying existing suitable swift fox habitat, and assessing disease risk and genetic diversity of resident swift foxes using camera trap surveys, collared swift foxes, disease and genetic testing, and population modeling. While the work proposed here focuses on swift fox in the Dakotas, we are partnering with systematic surveys in Montana (see studies above), pooling efforts to generate region-wide results, which will ultimately advance conservation of the species.

Funded by the National Fish and Wildlife Foundation, this project was initiated in 2016 and will be completed in 2018. For more information, please contact Dr. Donelle Schwalm at Doni.Schwalm@oregonstate.edu or Emily Mitchell at Emily.Mitchell@sdstate.edu. Partners include: South Dakota State University, Oregon State University, World Wildlife Fund, South Dakota Game, Fish and Parks, and North Dakota Game and Fish.

World Wildlife Fund's Swift Fox Habitat Suitability Index for portions of Montana, North Dakota, South Dakota, and Wyoming

The swift fox (*Vulpes velox*) is a shortgrass and mixed-grass prairie habitat specialist of the North American Great Plains. Considered rare in the northern portions of their historic range, surveys of the species have often yielded few or even no sightings. A suite of habitat Suitability Indexes (HSIs) for swift foxes have subsequently been developed to assess potential habitat, increase detection probabilities, and to prioritize survey areas (Moehrenschlager et al. 2006; Olimb and Bly 2010, 2015; Olimb et al. 2013; Ritter 2010; Russell 2006). Despite several habitat modeling efforts in Montana, there were few swift fox sightings to validate them and no quantifiable way to account for sagebrush, which resulted in the models' overpredicting suitable habitat. Given recent swift fox survey efforts in the northern portion of the species' range there is a desire by stakeholders interested in swift fox conservation to improve Montana's HSI by

addressing the state's ecotype variation and sagebrush distribution. In 2016, World Wildlife Fund developed a new HSI to address these issues. This model incorporates historic and recent swift fox observations from Montana, North Dakota, South Dakota, and Wyoming along with a suite of variables relevant to swift fox habitat preferences (e.g., crop density, road density, brightness, greenness, wetness, distance to nearest prairie dog colony, land capability classification, sand/silt/clay composition percent landcover type, and roughness). We divided the HSI area into northern and southern parts based on North American Terrestrial Ecoregion; the region was split to test our theory that habitat requirements for swift fox varied between the two areas based on anecdotal evidence observed during swift fox camera and live-trapping efforts and poor overall fit of previous HSI modeling efforts. Analysis for this swift fox HSI will be complete in early 2017. For more information, please contact Sarah Olimb at sarah.olimb@wwfus.org or Kristy Bly at kristy.bly@wwfus.org.

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NORTHERN GREAT PLAINS SWIFT FOX CONNECTIVITY PROJECT

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Project Update Covering September 2016 – March 2017
04/03/2017

Prepared for project collaborators by
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BACKGROUND

Historically, the swift fox (*Vulpes velox*) was common throughout the short- and mixed-grass prairies of the Northern Great Plains of North America. During the late 1800s and early 1900s, its populations began to decline and the swift fox was extirpated from much of its range in the Northern Great Plains. In the past 60 years, despite six swift fox reintroductions to southern Canada, the Blackfeet and Fort Peck Reservations in Montana, and Bad River Ranches, Lower Brule Reservation and Badlands National Park in South Dakota, there is still a substantial range gap between northern populations in Montana and Canada, and those in Wyoming and South Dakota which are relatively contiguous with populations southward into Texas.

In order to enhance the distribution and connectivity of existing populations and identify habitat management priorities in the Northern Great Plains, more information is needed on what constitutes suitable habitat, and which factors limit swift fox population dynamics and colonization potential (i.e., dispersal, survival, and/or reproduction). These needs overlap with three primary objectives of the Swift Fox Conservation Team's 2011 Conservation Assessment Strategy, which are to: (1) identify and conserve existing suitable swift fox habitat; (2) maintain swift fox distribution in at least 50 percent of available suitable habitat by promoting natural dispersal and translocations; and (3) encourage research studies that contribute to conservation and management.

Accordingly, the goals of the *Northern Great Plains Swift Fox Connectivity Project* are to assess key factors influencing suitable habitats, population dynamics and regional connectivity for swift fox in the Northern Great Plains. Clemson University, Montana Fish, Wildlife and Parks, Calgary Zoo, World Wildlife Fund, Oregon State University, and the Bureau of Land Management are working with tribal, state, and private landowners to accomplish two objectives:

1) Estimate adult and juvenile swift fox survivorship and fecundity, space use and dispersal behavior in the core northern portion of their range (Blaine, Phillips and Valley Counties).
2) Create a spatially-explicit model for habitat suitability and population connectivity for Montana that highlights key boundaries, bottlenecks and opportunities for targeted habitat conservation and restoration.

STUDY AREA

We are conducting research on federal, state, and private land in Blaine, Phillips and Valley Counties in Montana. The dominate vegetation types in the study area are native short-grass and mixed-grass prairie intermixed with dryland agriculture on gently rolling terrain interspersed with steep riparian systems and areas of shrubland consisting mostly of silver sagebrush. The study area is bisected east to west by the Milk River, and the majority of the research is occurring north of this river. There are few paved roads in the study area, most are gravel or unimproved two-track trails through pastures.

Progress on Objective 1: **Estimate adult and juvenile swift fox survivorship and fecundity, space use and dispersal behavior in the core northern portion of their range (Blaine, Phillips and Valley Counties).**

We used a combination of historical records and camera trapping to determine where to focus our swift fox capture effort. To determine where the southern edge of swift fox distribution was located, we placed cameras on public lands just north of the Milk River (Figure 1). We then systematically deployed cameras moving north across the wider study area, focusing our efforts on both large and small contiguous grassland patches to ensure that we sampled across a large range of habitat conditions. Many of these smaller patches of grassland occurred on Montana Department of Natural Resources and Conservation school block parcels. Cameras were placed on fence posts or metal stakes 3-4m from a wooden stake baited with commercial trapping lures and left out for two weeks, or longer depending on access. In total, between September 2016 and March 2017, we placed cameras at 90 locations accumulating 3,223 camera nights and swift fox detections at 25 cameras (Figure 1, Figure 2). Areas where detections were most frequent leading up to our fall capture season (in addition to areas of known swift fox occurrence based on historical records) were the focus of our subsequent trapping efforts (Figure 1).

We captured 11 adult (5 male, 6 female) and 9 juvenile (7 male, 2 female) swift foxes and fit them with GPS collars during November and December 2016 (Table 1, Figure 1). Five of the foxes were collared north of Glasgow and east of the Bitter Creek Wilderness Study Area, three foxes were collared north of Malta off of Assiniboine Road, and 12 were collared north of Whitewater. Two foxes have died so far. A juvenile male north of Malta was hit by a car and an adult male north of Whitewater was predated on, though the exact predator is unknown. On February 23rd, 2017, three of the foxes collared north of Glasgow were detected on trail cameras and distinguished by the number on their ear tag. This is only one of two status updates available on those five foxes because drifting snow made roads in that area unpassable for the majority of the winter. One adult male dispersed from Whitewater during this period. He was detected on a trail camera north of Saco, approximately 45km from the capture site. Follow up monitoring via VHF and cameras did not produce additional detections. Additionally, two juvenile foxes most likely have dispersed from the area for they have not been heard for several weeks. The rest of the foxes have been located weekly or on camera to confirm their survival status.

Goals for 2017:

- Arrange flight to locate dispersed and other missing foxes
- Place trail cameras at dens in the spring and summer to estimate litter size
- Continue to deploy cameras to delineate swift fox distribution, especially in Valley County.
- Trap previously collared adults to remove collars
- Trap previously collared juveniles to remove collars and put adult collars on
- Collar up to 20 adult and 20 juvenile foxes at the southern fringe of the population such as northeast of Harlem, and north of Hinsdale and Glasgow

- Complete survival, reproductive, and dispersal rate estimations, and adult home range size analysis for data collected between November 2016 and August 2017.

Progress on Objective 2: Create a spatially-explicit model for habitat suitability and population connectivity for Montana that highlights key boundaries, bottlenecks and opportunities for targeted habitat conservation and restoration.

So far, GPS data have been downloaded from 13 foxes resulting in 4,977 locations (Table 1). The foxes collared north of Glasgow have not had their GPS data downloaded due to restricted access in the winter. Many of the foxes collared north of Whitewater have several months of data downloaded so far but several have not had their data downloaded or had limited data because they dispersed early on or were not accessible during the winter for download because of snow.

To provide a better understanding of swift fox habitat needs, I will examine the effects of season, resource dispersion, age, and movement state on habitat use. I will do this by partitioning data by age, and season; then I will identify different movement states using quantitative methods and conduct resource selection analysis for each state to test several hypotheses on how several landscape characteristics influence swift fox movements. Using the resulting selection coefficients, I will then create a model of habitat suitability and connectivity for eastern Montana.

Goals for 2017:

- Continue to download GPS data from foxes
- Complete habitat use analysis for adult fox data collected between November 2016 and August 2017.

Project Timeline:

- ✓ September 2016-March 2017: Live trap adult and juvenile swift foxes, fit them with GPS collars, and begin monitoring survival, morality and movements.
- April-September 2017: Locate dens and monitor litter size. Monitor collared adult and juvenile swift fox survival, mortality, and movements.
- September 2017: Present research in progress poster at Wildlife Society Conference.
- October-December 2017: Live trap juveniles and fit them with GPS collars and begin monitoring survival, morality and movements. Remove collars from adult foxes collared in 2016. Live trap new adults and monitor their survival, mortality and movements.
- January-March 2018: Monitor adult and juvenile swift fox survival, mortality and movements.
- April-August 2018: Locate dens and monitor litter size. Live trap all collared foxes and remove radio collars.
- September 2018-December 2018: Complete data analysis, write project reports, present results, and defend thesis.

Appendix: Tables and Figures

Table 1. Summary of swift fox capture and telemetry data collected between November 2016 and March 2017.

Fox ID	Capture Date	Age	Sex	Weight (kg)	Trap Location	Last Downloaded	Last Live Signal	# of Successful Fixes
M1	10/25/2016	Juvenile	Male	2.25	North of Whitewater	1/31/17	3/28/17	514
M2	10/27/2016	Adult	Male	2.5	North of Whitewater	1/6/16	1/4/17	497
F3	10/27/2016	Juvenile	Female	2.2	Assiniboine Road	3/15/17	3/30/17	605
M4	11/19/2016	Juvenile	Male	2.25	Assiniboine Road	12/18/16	12/12/16	156
M5	11/19/2016	Juvenile	Male	2.0	Assiniboine Road	3/9/17	3/23/17	573
M6	11/27/2016	Juvenile	Male	2.35	North of Whitewater	1/11/17	1/11/17	236
M7	11/29/2016	Juvenile	Male	2.45	North of Whitewater	2/26/17	3/8/17	411
F9	11/30/2016	Adult	Female	2.25	North of Whitewater	1/2/17	1/2/17	488
F8	11/30/2016	Adult	Female	2.5	North of Whitewater	N/A	12/1/16	N/A
F10	11/30/2016	Adult	Female	2.5	North of Whitewater	12/2/16	12/30/16	40
M23	12/1/2016	Juvenile	Male	2.45	North of Whitewater	3/6/17	3/29/17	429
F27	12/2/2016	Adult	Female	2.35	North of Whitewater	1/31/17	1/31/17	766
M31	12/3/2016	Adult	Male	2.7	North of Whitewater	N/A	12/11/16	N/A
F26	12/3/2016	Adult	Female	2.75	North of Whitewater	N/A	2/18/17	N/A
M24	12/4/2016	Adult	Male	2.6	North of Whitewater	1/18/17	1/18/17	262
M17	12/1/2016	Adult	Male	2.5	Bitter Creek	N/A	2/17/17	N/A
M13	11/17/2016	Juvenile	Male	2.4	Bitter Creek	N/A	N/A	N/A
M12	12/1/2016	Adult	Male	2.3	Bitter Creek	N/A	N/A	N/A
F15	12/1/2016	Adult	Female	2.3	Bitter Creek	N/A	N/A	N/A
F14	11/30/2016	Juvenile	Female	2.2	Bitter Creek	N/A	N/A	N/A

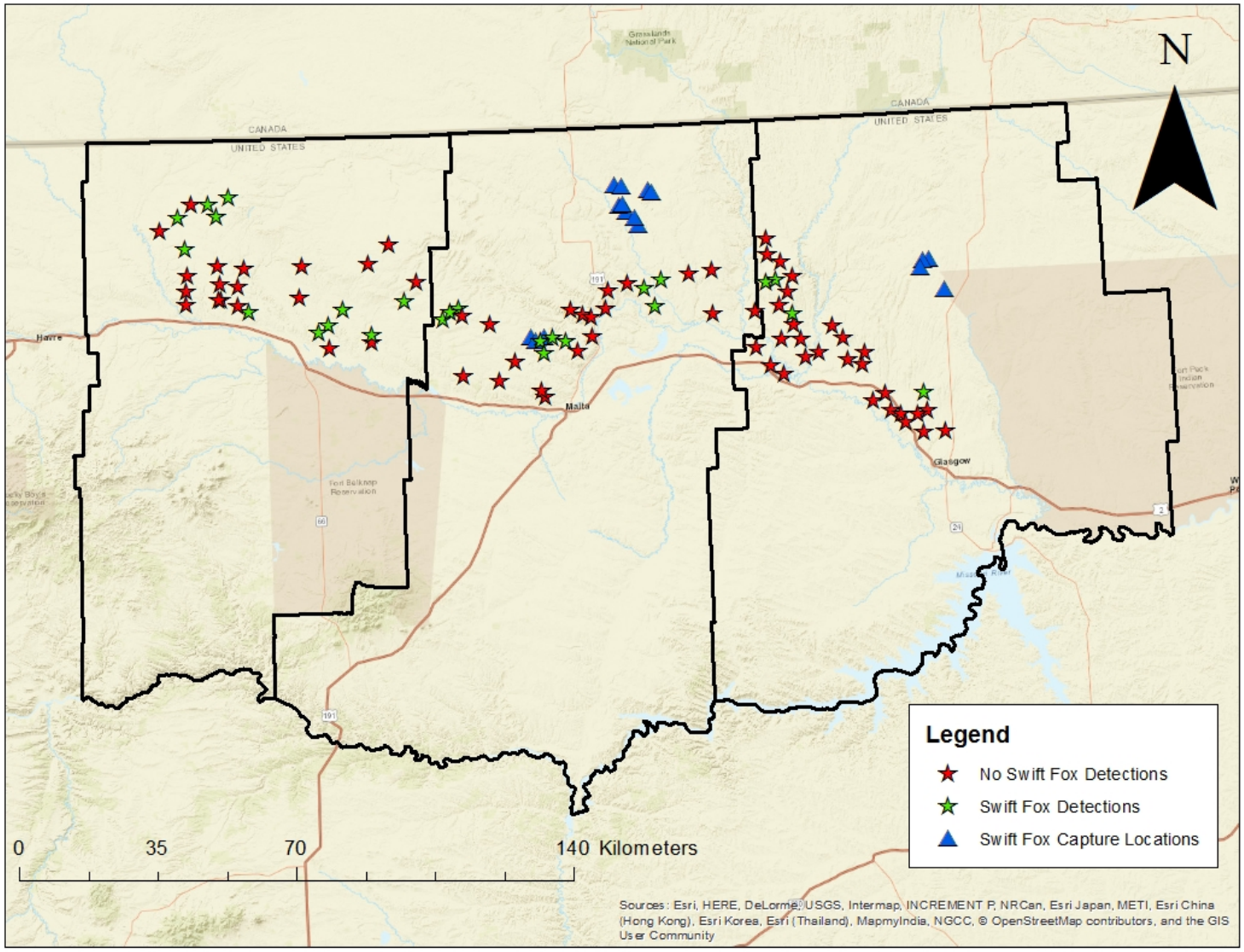

Figure 1: Map showing the location and detection status of trail cameras (stars) deployed between October 2016 and March 2017 as well as capture sites (triangles) of collared foxes in Blaine, Phillips, and Valley counties (solid black lines, from left to right).

Figure 2. Trail camera photo of a swift fox.

Figure 3. Picture of swift fox in hand once all processing has finished.

SWIFT FOX MONITORING IN SOUTHWESTERN SOUTH DAKOTA (BADLANDS NATIONAL PARK AND BUFFALO GAP NATIONAL GRASSLAND)

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INTRODUCTION

Swift foxes (*Vulpes velox*) were reintroduced into Badlands National Park (BNP) and Buffalo Gap National Grassland (BGNG) in southwestern South Dakota between 2003 and 2006 after being nearly extirpated from South Dakota in the early 1900's. Genetic analysis provided strong evidence that the reintroduction was successful, but viability analysis indicated the population may be in jeopardy with a high probability of extinction. Recently, the population has declined due to various biotic and abiotic factors (e.g., recent weather patterns, effects of plague [*Yersina pestis*], and increased coyote [*Canis latrans*] numbers). No information on the status of swift foxes has been collected since 2009.

Therefore, in 2014 South Dakota State University and Badlands National Park initiated a three-year graduate research project to assess the current status of reintroduced swift fox in southwestern South Dakota. The objectives of the study are to (a) document the current distribution of swift foxes across southwestern South Dakota, (b) document active dens to determine reproductive rates, (c) determine survival and cause-specific mortality, and (d) assess the presence of swift fox in areas affected by plague.

A formal thesis will be available from South Dakota State University in 2017.

SUMMARY OF RESULTS

Over 1000 scent stations were deployed across a seven county area in southwest SD; only 1.7% of the stations detected swift foxes, and in only two counties: Pennington and Fall River. Foxes were trapped in Pennington, Jackson, Fall River, and Oglala Lakota (formerly Shannon) counties. Foxes were not detected in two of the counties which had presence within the last ten years: Haakon and Bennett. Forty-eight swift foxes were trapped, radio-collared, and tracked around BNP and BGNG, and 12 natal dens were monitored. Yearly reproductive success averaged 4.3 ± 0.3 pups/mated pair. Apparent annual survival for collared adults was 0.47 (n = 14), and for collared pups was 0.19 (n = 8). Cause-specific mortality for 21 collared foxes was attributed to vehicle collision (n = 7; 33%), coyote intraguild predation (n = 7; 33%), raptor

depredation (n = 3; 14%), and unknown origin (n = 4; 19%). Positive plague titers were detected in 16 of 62 (25.8%) tested blood samples, with no difference (P = 0.12) between distance to the nearest prairie dog town for foxes with positive (1.03 km) and negative (1.78 km) titers.

Data from this study raise concern for the status of the population. An apparent decline in distribution, a decline in numbers around BNP and BGNG, a decreased survival rate in pups, and presence of plague may lead this population to extinction in the near future. Another reintroduction is not recommended until biotic and abiotic factors correlated to the decline are mitigated, and swift fox presence is determined in other regions of South Dakota.

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MODELING SWIFT FOX REINTRODUCTION STRATEGIES USING AN INDIVIDUALLY BASED, SPATIALLY EXPLICIT FRAMEWORK: GENERAL CONSIDERATIONS FOR RE-ESTABLISHING POPULATIONS

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ABSTRACT

Re-establishing species when they are extirpated by human activity is a common goal in wildlife conservation. One method for achieving this goal is reintroduction, where individuals are moved from existing populations to suitable, unoccupied habitat. The monetary, logistical, and ethical considerations of reintroductions provide impetus for careful planning to ensure biologically and ecologically meaningful results. Swift fox (*Vulpes velox*), a species of conservation concern, were extirpated from >50% of their historic range in the Great Plains because of predator control programs and altered land cover and land use patterns. Multiple reintroduction efforts have attempted to establish swift fox populations in the Northern Great Plains (NGP), where the species is still largely absent. Reintroduction success varied, resulting in spatially isolated populations disconnected to the core of the remnant populations located in the Central Great Plains. Considerable interest by stakeholders in the NGP exists for additional reintroductions to connect populations. We identified three primary goals for swift fox reintroduction in the NGP: (1) establishing populations with long-term viability, (2) expand the species distribution, and (3) generating linkage between existing isolated populations and the core of the species distribution. We used a Habitat Suitability Index developed with occupancy data from swift foxes in the study area to identify potential release sites, based on habitat quality and the number of home ranges they could support. We then simulated a series of nine potential reintroduction strategies across a range of reintroduction intensities (defined as the number of years of reintroductions and the number of foxes released per year). Here, we describe general observations that have implications for the development of future swift fox reintroduction efforts.

INTRODUCTION

The Swift Fox Conservation Team (SFCT), an interagency cooperative representing federal, state, tribal, private and academic entities, provides direction for swift fox conservation and management across the species range. One of the priority activities identified by the SFCT is increasing the species distribution (Dowd Stukel 2011). Currently, the potential for population expansion is highest in the Northern Great Plains (NGP), where swift foxes remain largely absent despite the presence of considerable suitable habitat. Efforts to increase the species distribution in the NGP previously relied on reintroductions, which can be expensive, logistically demanding, and may impact donor populations. Considerable gains can be made when concentrated reintroduction efforts are undertaken in suitable habitats (e.g., Moehrenschlager and Moehrenschlager 2006). To date, reintroduction site selection has been largely driven by the interest of parties with available habitat for release sites. While some efforts have resulted in

robust populations, others have failed or the status of the reintroduced population is unknown. The result is a series of spatially disjunct populations with varying levels of long-term viability. Multiple tribal, state, federal, and private entities have expressed an interest in conducting additional swift fox reintroductions to re-establish populations. Given the limited resources available to conduct reintroductions, the finite number of swift foxes available for reintroductions, and opportunity to facilitate population expansion in the NGP to meet SFCT goals, an improved understanding of how factors such as release site characteristics, proximity of individual release sites, landscape composition, years of reintroductions, and number of foxes released influence the likelihood of long-term success.

Here we provide preliminary observations generated from simulations of different approaches to swift fox reintroduction in the NGP. Using HexSim v 4.0.9 (Schumaker 2017), a spatially explicit, individual based modelling framework, we tested the influence of release site order, size, shape and proximity, number of swift foxes released each year, and number of years that swift foxes are released on reintroduction success. We used three criteria to measure reintroduction success: long-term population viability, range expansion, and inter-population connectivity. Using results from these simulations, we provide preliminary insights that have implications for reintroduction efforts in general. We emphasize that this research is ongoing. Final conclusions and recommendations will be developed after review from the tribal, state, federal, and private partners involved in collecting swift fox presence or absence data for this research. Because the results of this work are currently under review from project partners, we do not provide information for each scenario tested, nor do we make recommendations specific to the study area. Rather, we provide general comments derived from the results of these scenarios, which are universal to future reintroduction scenarios regardless of location.

REINTRODUCTION SCENARIO MODELING

1. Potential Release Site Identification

We selected potential release sites based on three factors: habitat suitability, contiguity of suitable habitats, and number of swift fox home ranges supported. Habitat suitability was defined using values in a swift fox Habitat Suitability Index (Olimb et al. in prep) that were associated with the known presence of swift foxes. We used the Point Intersect tool in Geospatial Modelling Environment v 0.7.2 (GME; Beyer 2012) to extract the habitat suitability index value at each swift fox location available in the study area (Figure 1, yellow dots). We then used a value equivalent to one standard deviation from the mean of these values as the threshold for 'highly suitable' habitat. Next, we used the Region Group tool in GME to identify patches of contiguous, high suitability habitat and calculated the area of each patch in hectares using ArcGIS v 10.0 (ESRI, Redmond, CA). We assumed an average swift fox home range size of 1,371 ha (averaged from Kitchen et al. 1999, Pechacek et al. 2000, Olson and Lindzey 2002, Schauster et al. 2002, Andersen et al. 2003, Kamler et al. 2003, Moehrenschlager et al. 2007), and divided the area of each potential release site by the average swift fox home range size to estimate the number of home ranges each site could support, which we defined as release site capacity. We removed all potential release sites with a capacity <10 swift fox home ranges, leaving a candidate pool of 41 potential release sites. We then assigned each potential site to one of four categories, based on capacity (10+, 20+, 30+ or 100+ home ranges). These assignments are shown in Figure 1. Finally, we prioritized use of potential release sites with a capacity of 30+ home ranges.

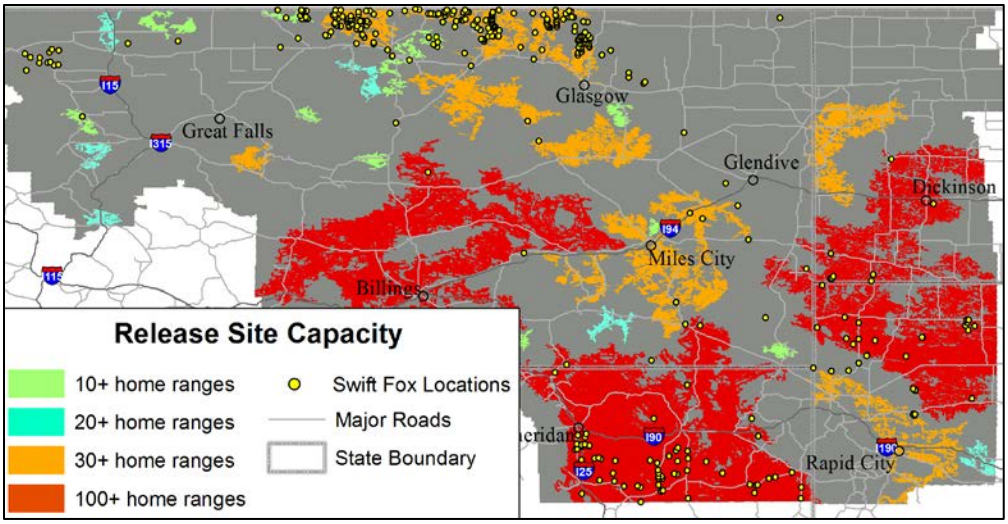

Figure 1. Categorization of 41 potential release sites in the Northern Great Plains, based on the number of swift fox home ranges each potential release site can hold (defined as release site capacity).

2. HexSim Population Parameters

HexSim models operate using distinct events, which are created by the user to represent the timing of major life history events, management actions, and so forth. The sequence of events for the HexSim model we created to simulate swift fox reintroductions is presented, below. Because newly reintroduced individuals exhibit different movement and survival rates than resident swift fox (i.e., individuals that are established after the previous years' reintroduction or were born to reintroduced individuals and their descendants), we modeled movement and survival for reintroduced individuals separately from resident individuals for the six-month period immediately following reintroduction (see "Reintroduced Population", below). Individuals that survived this initial period were then transferred to the Resident Population (see below) and exhibited the associated survival, reproduction, and movement parameters therein.

Reintroduced Population

A. *Reintroduction*: Individuals were reintroduced in male-female pairs, and only juveniles were used. In each year of reintroduction, male-female pairs were distributed at random across the target potential release site(s).
B. *Post-release movement*: Post-release philopatry, the tendency of a reintroduced individual to stay at the original location of release, is very low (Moehrenschlager and Macdonald 2003), thus we assumed all released swift fox would move away from the original release location. We stratified movement based on sex, with males moving more frequently and at greater distances than females (Moehrenschlager and Macdonald 2003). Extraordinarily long post-release movements have been observed for swift fox of both sexes (Ausband and Moehrenschlager 2009, K. Honness and S. Grassel unpublished data), but these extreme movements are less common. Thus, we assumed 85% of individuals would exhibit average movement distances, while 15% of individuals would exhibit extreme movement distances. Average movement distance for females was set at 17km, and a total of two movements were allowed. Average movement distances for males were set at 26 km, and a total of 3 movements were allowed. Extreme movement distances were set to $\geq$150km for either sex, and one movement was allowed. For both

sexes, we assumed that the likelihood of moving through a given area increased as habitat quality increased, and that high-quality habitat was more attractive than low-quality habitat. Thus, habitat suitability values ≥184 (the threshold value for being considered 'highly suitable' habitat, above) were considered 10 times more attractive than areas with suitability values <184. Because we assumed that newly reintroduced individuals have little to no knowledge of the proximity of potential mates immediately prior to release, we did not include conspecific attraction at this stage of the model.

C. *Post-release survival*: We set male survival at 0.80 and female survival at 0.60 (Moehrenschlager and Macdonald 2003). Sasmal et al. (2016) reported a survival rate of 0.82 regardless of sex, but we chose the more conservative estimate because lower post-release survival parameters will produce more conservative model results.
D. All three of the events described, above, were timed to occur immediately after post-reproduction dispersal and pair formation in the resident population (described below).

Resident Population

A. *Age*: At the start of each year in the model, following the first reintroduction, individual swift fox ages were increased by one year.
B. *Reproduction*: Only females with an established mate (e.g., those that shared a home range with an adult male, see pair formation events, below) were considered candidates for reproduction. Of those females with a mate, 71% were allowed to reproduce and 29% were not allowed to reproduce (Olson and Lindzey 2002). Litter size ranged from one to six pups, with an average of four pups per litter (Moehrenschlager and Sovada 2004).
C. *Post-reproduction dispersal and pair formation*: Dispersal in native swift fox populations occurs in two primary time periods: (1) immediately after pups reach independence and (2) immediately prior to the breeding season (Kamler et al. 2004). This event captures the first of these two time periods. In all instances, a dispersing individual's path was informed by both habitat suitability and the proximity of potential mates. The latter was included to mimic conspecific attraction and capture the ability of swift fox to locate each other over broad spatial areas, which has been observed anecdotally but is not well documented in the literature. Areas of highly suitable habitat were considered 10 times more attractive than low-quality habitats, and the explored area (defined below) of a solitary, territorial individual of the opposite sex was three times as attractive. The effect of both criteria was multiplicative, such that areas that were both highly suitable and associated with the explored area of a potential mate were 30 times as attractive as areas of unsuitable habitat with no potential mate.

   Unpaired individuals were assigned to one of four dispersal distance classes: philopatric (0km – 4km), short distance (4km – 15.5km), long distance (15.5km – 150km), and extreme (150km – 259km). The probability of being assigned to a given dispersal distance classification varied by sex and age (Table 1). These distance classes were generated from averages of reported dispersal distances (Harrison 2003, Sovada et al. 2003, Kamler et al. 2004, Schauster et al. 2002, Ausband and Foresman 2007a, Nicholson et al. 2007). We assumed that females dispersed shorter distances overall and were more likely to remain in their natal territory (the "philopatric" classification; Kamler et al. 2004). Solitary adult swift fox were more likely to remain in their existing territory than juvenile swift fox of either sex, although this likelihood was higher for adult females

than adult males (Kamler et al. 2004, Kitchen et al. 2005). Overall, we expected females to exhibit fewer dispersal attempts than males, thus females were allowed one attempt to disperse and form a pair, while males were allowed two attempts.

Table 1. Probability of assignment to one of four dispersal distance classes, based on swift fox sex and age.

		Dispersal distance classification			
Sex	Age	Philopatric	Short	Long	Extreme
Female	<1 year	0.20	0.36	0.34	0.10
	1+ years	0.90	0.04	0.03	0.03
Male	<1 year	0.07	0.42	0.41	0.10
	1+ years	0.68	0.12	0.10	0.10

After an individual dispersed, they attempted to either form a territory or join the territory of a solitary individual of the opposite sex. Individuals were allowed to explore up to 11,500 ha with a maximum span of 5 km using a uniform exploration algorithm; this produced relatively circular explored areas and home ranges. A dispersing individual was allowed to established a territory if they located 1,371 ha of contiguous, suitable habitat (the average size of a swift fox home range, defined previously) that did not belong to the territory of another individual of the same sex, or to the territory of an established male-female pair. The final product of exploration and successful territory formation was a1,371 ha territory surrounded by an explored area of ~4km width, a rough approximation of the neighborhood of which a swift fox has knowledge outside of its own territory.

Due to a characteristic of the model framework, group formation cannot be restricted to male-female automatically. Thus, to limit group formation to male-females pairs we set the model such that only females created groups, and only males joined them. Then, during each dispersal event, we simulated female dispersal and territory formation first. Males then explored at their current location to allow them to join the territory of neighboring, solitary females. Those that failed do so dispersed and joined the territory of a solitary female, if encountered during dispersal. Males otherwise failed to join a territory and were eligible for movement during the next dispersal event. Similarly, females that failed to form a territory, or were not joined by a male, were eligible for movement during the next dispersal event.

D. *Mortality*: Although mortality occurs year-round for swift fox, for simplicity's sake we included only one mortality event that represents the cumulative survival rate across the year. Survival varied by age, with juvenile survival set at 44% (averaged from Ausband and Foresman 2007a,b) and adult survival set at 72% (averaged from Moehrenschlager and Macdonald 2003; Ausband and Foresman 2007b). Survival estimates vary widely across the species distribution (e.g., Sovada et al. 1998, Schauster et al. 2002, Harrison 2003, Kamler et al. 2003); we selected values from the general study area (e.g., the NGP) from populations that originated from reintroductions. Individuals that exceeded eight years of age were removed from the population during this event, based on the age of the oldest known wild swift fox (S. Nevison, pers. comm.).

E. *Pre-breeding dispersal and pair formation*: This event represents the second of the two primary dispersal periods for swift fox. The dispersal distance classifications, probabilities of assignment by sex and age and dispersal frequencies follow those of *Post-reproduction dispersal and pair formation*, described in C, above. At the end of this event, the model would cycle back to the beginning for the start of a new year beginning with increasing the age of all resident foxes by one year.

3. Reintroduction Intensity

We tested reintroduction outcomes for two reintroduction durations (3 years or 5 years) and three values for total number of foxes per year (30, 60 or 90). Each combination of duration and number of foxes is defined as a reintroduction intensity; there are six reintroduction intensities total per scenario. With few exceptions, reintroduction duration represents the number of years of reintroduction *per potential release site*. Most of the swift fox reintroductions in the United States have drawn from source populations in three states: Colorado, Kansas, and Wyoming, thus we assumed a total of three potential source populations for our simulations. We further assumed that each of these three source populations could supply a maximum of 30 individuals per year. Thus, the minimum number of individuals reintroduced per year is 30 (one source population used) while the maximum is 90 (three source populations used).

4. Individual Restoration Scenarios

Using the above parameters, we built HexSim models for each of nine potential approaches to swift fox reintroduction (hereafter, "scenarios"). Each scenario uses a different combination of potential release sites and a different sequence in the order in which individual release sites receive swift fox. In some instances, release scenarios were developed to reflect individual or regional interest in swift fox restoration. Most scenarios, however, focused on improving connectivity and distribution across the study area. We then repeated analysis for each combination of scenario and reintroduction intensity five times, producing five predicted outcomes for that combination (Figure 2). This iteration of scenario/reintroduction intensity combinations provides a measure of the reliability of the results, where iterations that consistently predict success are given more weight than iterations that intermittently predict success or failure. As a baseline measure of the success of a given outcome, we required population persistence for 100 years post-reintroduction, thereby meeting the reintroduction criteria of long-term population viability. Overall, we considered a given reintroduction intensity successful if it met the three primary restoration goals defined earlier: long-term population persistence, increased swift fox distribution and establishment of connectivity between extant populations in the study area.

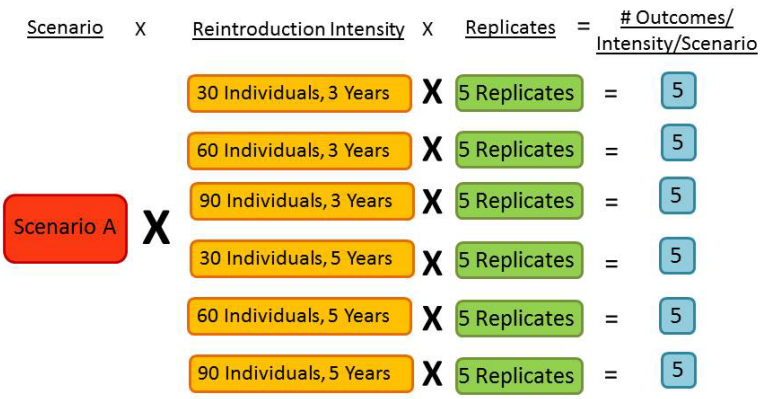

Figure 2. Visual schematic of the reintroduction modeling approach. For each reintroduction scenario, six reintroduction intensities are repeated five times, producing five potential outcomes for that combination of scenario and reintroduction intensity.

DISCUSSION

Below, we provide general observations that were universal, or nearly so, to the nine reintroduction scenarios we have tested thus far.

Population persistence and expansion outside of the immediate release site(s) was positively influenced by both the number of foxes released and the duration of reintroductions. Low reintroduction intensities were more likely to produce small populations, which in turn exhibited slower and less consistent expansion patterns, and were less likely to persist for 100 years post-reintroduction. Conversely, reintroductions that resulted in saturation of potential home ranges in a given release site, especially in release sites with the capacity for a large number of home ranges, generated robust source populations that facilitated population expansion at a faster rate, and exhibited long-term persistence. In general, five-year reintroduction scenarios were more likely to produce successful outcomes, based on population persistence and level of spatial expansion post-release.

The size, shape, and proximity of release sites played a key role in overall success of reintroduction. For example, where reintroduction occurred at large release sites with limited edginess, three-year reintroductions produced robust populations comparable to those of five-year reintroductions *at the release sites*. However, five-year reintroductions were more likely to be successful where patches were small or exhibited high edge complexity. Overall, reintroduction scenarios at potential release sites that were highly edgy were less likely to succeed in both the short and long term, and supported fewer breeding pairs than predicted by the area of the patch. Finally, edgy habitats and small patches that were not used as release sites were colonized poorly, and generally only with significant reintroduction intensity and/or with the generation of a robust population in larger, neighboring habitat patches.

Overall, models consistently indicated that population expansion after reintroduction was slow and occurred from the edge of the reintroduced population. This may explain why swift fox have not naturally recolonized available habitat in the study area. Isolation from potential source populations located in Wyoming and Canada, combined with evidence of poor colonization of patchy habitats may both play a role in limiting natural recolonization in the study area. The model results imply that even 50 years after a stable population is established via reintroduction,

robust expansion only occurs when the reintroduced population has a high number of breeding pairs and neighbors large, contiguous habitat patches.

Initial success was not a guarantee of long term success. For example, some populations generated by low-intensities scenarios persisted for 50 years but were extinct by 100 years. Populations that failed to persist showed the following characteristics: broad spatial dispersion of breeding pairs, low total number of breeding pairs, and release sites that were small and/or edgy, and isolated. Interestingly, some scenarios showed initial population decline for up to 10 years after reintroduction ceased, after which point the trend reversed to exhibit steady growth through 100 years post-reintroduction. This pattern was consistently associated with high reintroduction intensities, and is the result of several contributing factors. First, swift fox from one release site colonized nearby release sites prior to the completion of reintroduction efforts. Thus, some of the high intensity effort was superfluous, as swift fox were released in areas that were already being colonized and release sites were over-saturated. Second, reintroduction of as many as 90 individuals per year for up to 35 years in the most extensive reintroduction scenarios lead to exponential population growth that could not be matched by natural population vital rates once reintroductions ceased; thus, population numbers initially declined post-reintroduction. However, the population trend reverted to positive as the reintroduced population expanded into neighboring habitats. This subsequent colonization, when it occurred in large, contiguous habitat patches, resulted in rapid expansion and population growth.

RECOMMENDATIONS

1. Release sites should be large (e.g., capacity $\geq$ 30 home ranges), located proximate to additional high-quality habitat, and have low edge complexity. Release sites that are connected by large patches of suitable quality and exhibit the potential to merge as individual reintroduced populations expand are especially desirable.
2. Low reintroduction intensities (i.e., 30 individuals for 3 or 5 years) should be avoided, with the possible exception of reintroductions which release 30 individuals for 5 years in large habitat patches.
3. Potentially, the duration of reintroductions could be reduced by releasing swift fox simultaneously into multiple habitat patches with the characteristics described above. Based on model results, the lowest appropriate intensity per patch for this approach is 30 individuals for 5 years. Simulations should be used to test the success of this approach.
4. Finally, for any reintroduction effort undertaken, mortality, reproduction, and pairing rates should be monitored carefully during and after reintroduction; adjustments to reintroduction intensity may be necessary if any of these rates are lower than predicted. Likewise, surveys that monitor expansion post-reintroduction should be used to assess long-term success.

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Swift Fox Conservation Team
Minutes from the 2016 biennial meeting

Fort Collins, CO
April 20-21, 2016

MATT PEEK, Kansas Department of Wildlife, Parks and Tourism, PO Box 1525, Emporia, KS 66801; Phone: (620) 342-0658; E-mail: matt.peek@ksoutdoors.com

Wednesday, April 20, 2016

The meeting was called to order by SFCT Co-Chair, Eileen Dowd Stukel. Chair Jim Stuart was unable to attend due to family obligations. Attendees introduced themselves. The meeting was hosted by Colorado Parks and Wildlife. Jerry Apker and Marty Stratman provided logistical info.

Presentations

Update on Montana distribution survey - Doni Schwalm, Oregon State University

Doni is partnering with Kristy Bly, World Wildlife Fund on this project. They are assessing current distribution with camera trap surveys. Selected sites are based on World Wildlife Fund (WWF) habitat suitability index. They used Powder River paste bait and canine call, along with a small can of cat food to elicit defecation. They surveyed 491 sites; most foxes found in northern MT with a few in the southeast. Phase two is the restoration strategy. The HexSim metapopulation modelling framework will be used to inform potential reintroduction efforts. They are not necessarily encouraging reintroduction, but gathering info for Montana Fish, Wildlife and Parks to use if they opt for reintroductions.

Distribution, disease risk, and conservation planning for swift fox in the Northern Great Plains - Emily Mitchell, South Dakota State University

Emily's study will evaluate the status of swift fox populations in southwestern ND and northwestern SD - four counties in each state. Her objective is to map distribution and occupancy of swift fox and other canids, assess disease risk and genetic diversity in swift fox, develop den site/habitat selection model for the region, and identify possible reintroduction sites. All of this will be used, along with findings from Montana to write a reintroduction plan. She's using camera surveys as done in MT. Where detected, foxes will be trapped and collared, and biological samples will be collected. Collared foxes will be used to locate dens, then a den site/habitat selection model will be developed. She will use HexSim to identify potential reintroduction sites. She has surveyed 83 sites in ND and found swift fox at 2 sites; one was a den. In SD, they have recent confirmations in all four counties, but surveys haven't been done yet.

Assessing the status of reintroduced swift fox in South Dakota - Sarah Nevison, South Dakota State University

Sarah's study area is seven counties in southwestern SD; in vicinity of Badlands NP. Her objectives are to determine distribution, document dens, estimate reproductive rates, and estimate

survival and cause specific mortality. Adult foxes are surviving well but pup survival is only about 20% based on small sample size (n=10). High coyote numbers, increased vegetation height due to rainfall, and/or plague may be responsible. She has documented five dispersal events. They occurred between Dec and Mar; three died, two established; average distance excluding one outlier, was 19 km. She's developing a new model for aging swift fox based on tooth wear.

Follow-up on group input to swift fox delisting criteria in SD - Eileen Dowd-Stukel, South Dakota Game, Fish and Parks

Eileen gave an overview of comments received from the group on the draft document describing SD swift fox delisting criteria. Additional input was requested, and discussion ensued over several comments received. She may want to look at Yellowstone grizzly bear delisting criteria as an example.

Assessment of swift fox distribution in Nebraska - Lucia Corral, NE Cooperative Fish and Wildlife Research Unit

Lucia is trying to determine why swift fox fail to occupy apparently suitable habitat in NE. She is evaluating the current distribution, and trying to identify the ecological mechanisms driving this distribution. She is also trying to evaluate the potential impacts of development. Her study area is divided into grids and ranked based on suitable habitat and slope. Selected grids were camera trapped and hair-snared, and scats collected. She has detected swift foxes at 30+ locations per year. She also collects sighting reports and roadkill locations. She's trying to develop a species distribution model using Time-lapse image analyzer to deal with photos. Time-lapse is available for free download. It's still labor intensive but allows for a lot of analyses.

Citizen science swift fox project in NE - Michelle Lute, University of Nebraska, Lincoln

Michelle passed out an assignment to the group to build a conceptual map of a swift fox ecosystem. She asked that attendees complete this project and send it to her in a week (due April 27).

Administrative Items

2017 Biennial report – Marty has done this for the past couple reports. He provided a brief explanation of the process. He has tried to get the report out by June 1 each year. The 2017 report will include work done from Jan 1, 2015-Dec 31, 2016. Troy Grovenburg agreed to do the next report.

Chair and assistant-chair – Patrick agreed to be chair, Marty agreed to be the co-chair. This is a 2 year assignment. There was some discussion over the chair/co-chair terminology; whether it would be more accurate to call the co-chair an assistant chair. Past combinations have included a more experienced member as a Co-Chair or a relatively new state agency representative as a Co-Chair.

Committees – We currently have education, research, and monitoring committees. Eileen noted that some of the committee members are no longer on the team, and some of the

committees haven't been particularly active. Are these still the committees we want, and how should we deal with a change in personnel? The group decided to keep the committees and add new members as needed.

Education Committee – Eileen used to do a newsletter, but had difficulty getting submissions. She is willing to continue assisting with this committee but would like to have specific tasks/needs from the group. She asked that the group send tasks for the Education Committee to her. Sarah proposed having a SFCT Facebook page. There was some discussion over whether the group would provide sufficient info (photos, etc.) to make it useful and how it would help us achieve our objectives as set forth in the conservation strategy. It could be beneficial at promoting public support for swift fox conservation. Kristy stated that a Facebook page needs a moderator. Sarah offered to moderate if someone would assist. Tracy agreed to assist. She mentioned the recent Global Canid Integrated Collection Assessment Plan Workshop. One of their recommendations was to do more education, especially in range states. AZA would like to assist with education efforts, such as Facebook. In fact, Tracy would like to start an AZA SSP Facebook page and would be happy to post SCFT items if the team wanted to do that instead of hosting their own page. She is already set up to host the page, so this would make sense. Tracy and Sarah will work together to establish a Facebook page. Once they get it set up, they'll let us know how to submit posts. Make sure to not include data, locations or maps without permission.

Research Committee – Doni is chair. Dave Ausband is willing to help. Tasks: Need a state agency rep. Doni provided a list of potential research priorities, including update of swift fox bibliography and identifying team research priorities. She would like input from team on additional ideas. Eileen suggested secondary poisoning by Rozol as an issue. Jonah mentioned a need habitat improvement options. Chris suggested a more ecosystem based approach might be good, tying multiple species together and identifying potential umbrella effects of swift fox mgmt. Jerry suggested the objective is long term conservation. Topics that have to do with reintroduction are timely. Focus on things you can do something about rather than weather and things you can't change. Doni will compile recommendations and send to group. Group can rank. Should also compare to CACS to identify priorities. Group should also consider whether there is a rangewide need to apply for State Wildlife Grant (SWG) funding. Jonah will join this Committee.

Monitoring Committee – Kristy is chair. WWF is willing to develop and host a database and map with up to date survey efforts. Marsha did all the groundwork for creating a map. Kristy will contact Marsha and work on updating the map. There is a funding opportunity coming up in May through NFWF. Also, AZA conservation fund may have $20k or so. BLM may have money available. Eddie may also have money available. Bill indicated SWG funds are also an option. SWG program funding goes to states. They've obtained a lot of funding for ferrets. There is a match requirement but in-kind will work, so AZ uses volunteer hours, AZA expenditures, etc. Is there a rangewide monitoring need, a need to evaluate rangewide coyote population levels, etc.? They did prairie chicken survey through Great Plains LLC. Funding for standardized monitoring may be an option. Marsha reviewed standardized methodology and found it to be non-feasible. This may be published in an old annual report. With most states gravitating towards camera surveys, this may be worth revisiting.

State Updates

North Dakota, Patrick Isakson – They are surveying for swift fox using 6.68 km grid. 87 points surveyed in 2015. One swift fox found; along with den at camera site. Third year in a row they've documented a den. This den was a mile or two from original den. Coyotes are controlled there. Both ranchers are sheep farmers. Undetermined whether they will continue to survey to the North. They have developed a "Wanted" poster requesting info on swift foxes. They sent this to private landowners who sign up to the public access program, sent to bars, NRCS, coffee shops, etc. Swift fox is a furbearer with a closed season in N.D.

Texas, Jonah Evans – He wrote an article on foxes in Texas that he will send to the Team. It can also be posted on our webpage and Facebook. They last ran a survey 10 years ago, but may have one in the works.

Colorado, Jerry Apker – Swift fox is a game species in CO with an open harvest season. Trapping methods are limited. Most are taken in cage traps or incidentally by coyote trappers. Harvest information can be found in furbearer report posted on their website under small game statistics. There is no mandatory reporting. Confidence intervals are large but estimated harvests of over 600 have occurred. They have a mgmt. protocol based on harvest density on a county by county basis, but harvest results are on a regional basis, so they really don't have much of a mechanism in place right now to reduce season length. However, estimated harvest has also never neared threshold to end harvest in a given area.

Colorado, Marty Stratman – It is time in their 5 year cycle to survey again this year. They had no detections in non-short-grass prairie. Looking at a little different sampling frame as a result. They previously surveyed 52 grid cells with 8 cameras per grid for 5 days. They will now survey for 3 days with no difference in capture probability based on previous survey results. Wildlife biologists and game wardens make landowner contacts in the summer.

Kansas, Matt Peek – They last conducted track surveys in 2004. There are some issues with this technique and they have struggled to come up with a functional replacement. They do opportunistically collect observation reports from game wardens and biologists, and also collect county-of-harvest from harvested swift foxes, which must be pelt tagged. Swift foxes are documented in most counties at least every couple years by one of these two techniques alone. Swift fox harvest has declined along with furharvesting effort in the past couple years. Preliminary harvest this year is 75, down from 151 last year. Matt is interested in a survey technique that can be used in roadsides without landowner permission. Cameras require landowner permission. Using an attractant at stations that elicits defecation might be an option. Would need to come up with a lab to send DNA. Doni is working on this. For scats, put in a paper bag and let them dry in the dark. Action item for Doni – scat collection protocol.

South Dakota, Eileen Dowd Stukel – SD does not have a systematic sampling scheme. They participate in surveys where they can. Trying to better communicate with state trappers to make sure they avoid swift foxes.

Montana, Bob Inman – They are trying to develop a statewide conservation plan for swift fox in MT. They do have a harvest season in NC MT. There is a quota and a mandatory 24 hour harvest reporting requirement. The MT Natural Heritage program keeps track of roadkills and other verified sightings in the state.

Montana, Heather Harris – International Census last done in 2014-15. Same survey as done in Canada. They run one trapline per township. They did 66 townships. Six live traps are placed 1 km apart. They found a 63% decline in Canada and a 71% decline in MT. This may be the result of a harsh winter. They submitted a proposal to drop harvest from 30 to 10, but the data collected from harvested foxes are valuable. They've met with trappers and they didn't object to a reduced harvest.

Wyoming, Zack Walker – They are rewriting the state wildlife action plan. Swift fox will be a species of greatest conservation need. Currently, swift foxes can be incidentally taken in WY. Trappers must report harvest within 3 days. WY conservation stamp is currently a swift fox. They hope to do some more monitoring in the Fall. Some of their areas have some energy development. They have some new areas in the state where foxes have been documented, but there is some uncertainty whether they were swift or kit foxes.

NE, OK, and NM not present.

Western Assoc. of Fish and Wildlife Agencies, Bill VanPelt – WAFWA is looking to progress in the future into more of an ecosystem approach. Bill will be looking to integrate the different plans. Swift fox would be one of the species conserved as part of a broader approach.

Bureau of Land Management, Chris Keefe – Money will be available for long term ecosystem approaches. Not a lot going on. Please approach BLM for funding. Especially where there are underlying minerals, there may be an opportunity to influence approach.

National Parks Service, Eddie Childers – They funded Sarah through USGS proposal. It takes years to get funding. He would like research ideas from Doni. There will be a USGS proposal call in May, and another funding opportunity later.

Forest Service, Thunder Basin, Cristy Painter – Swift fox populations are doing very well. Prairie dogs have recovered from plague. Foxes ate mountain plover, so that was not good.

Canadian Wildlife Services, Greg Wilson — They've done surveys in area where foxes were sighted in about the 80's. They collected scat and will do genetic analysis, and they've done surveys. None yet confirmed. Identified critical habitat within Grasslands National Park, which is most of the park. They have a list of things that would destroy critical habitat, and a list of things that would improve critical habitat.

Fort Peck Reservation, Les Bighorn– They were getting ready to reintroduce swift foxes onto Fort Peck (in Montana) when they found a few resident foxes of unknown origin already there. They proceeded with reintroduction plans, releasing 60 foxes from 2004-2009. In 2015, they surveyed again with Doni's help. They also captured and collared 6. This research is ongoing.

Recognition - Kristy Bly recognized Eileen for all of her work over many years with a very nice framed print. Eileen is the last original member of the SFCT and "an unsung swift fox conservation hero." Eileen was enthusiastically applauded by all who were present.

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Thursday, April 21, 2016

World Wildlife Fund – Kristy Bly – WWF has been involved in swift fox conservation since about 2007. Have funded multiple students to do swift fox surveys and modeling in MT. Have received a NFWF grant to do additional work. Work with MFWP and partner with many

Association of Zoos and Aquariums, Tracy Rein – The current swift fox zoo population is 61; goal is 75. The trend is stable. They have a student doing a behavioral ethogram. They have done a population viability analysis, which indicated that 89.9% of founding gene diversity has been retained. The average inbreeding value is 0.417. Inconsistent breeding is the main challenge at this time. In the current situation, the population could maintain its current size for 100 years. They could breed foxes for export if needed. They are willing to accept more foxes as available. There was a recent Global Canid and Hyaenid Conservation Conference. Sam Wilson (Nebraska) represented the SFCT at the meeting and Tracy represented the swift fox SSP. The recommendations from the conference were to take a more global rather than regional approach to conservation, establish more proactive education efforts, and there is a need to monitor the effectiveness of efforts and modify as needed. AZA can be more involved in conservation efforts (funding, assisting with field work, etc.). Contact Tracy if you have needs/projects. Bill suggested AZA spending could be used as non-federal match to get federal funds.

Action items

Standardized surveys are an item for consideration. Need to develop a concept summary for those not in attendance. May want to start out with a power analysis. Doni might be able to do this for about $10 thousand. Troy and Doni will take this on. BLM might be able to fund this in 2017, or NFWF (1:1 non-fed match needed). Send Bill a proposal and WAFWA can probably fund. The results will be used in a proposal for a rangewide monitoring evaluation.

Action Items from 2014

1) Update the contact list - Jim has completed this.
2) Update a status and distribution document - Kristy is working on this.
3) Obtain status updates from reintroduction sites - Updates on most sites were given at the meeting in presentations and state reports. The results of these efforts will also be reflected in Item 2 above.

Swift fox symposium update – Kristy – hosted at TWS in Winnipeg. Presentations were basically a summary of conservation efforts. About 50 people attended. Doni may compile talks.

Jerry asked the group how many swift foxes may be needed for reintroductions in the next 5 years. There seems to be no immediate need, but in a few years, there could be a need for a couple hundred foxes from a couple different donor sites for reintroduction into one or more northern states. Texas may also be interested near the end of that time period.

Jerry would like guidelines/BMPs for minimizing impacts on swift fox during energy development. This will be added as an action item for the research committee.

New Action Items

1) Submit specific tasks/education needs to Eileen as well as themes/topics for Education Committee - Team.
2) Tracy and Sarah will work together to set up an AZA hosted Facebook page. Once they get it set up, they'll let us know how to submit photos and info. (Make sure there are no data, locations, or maps without permission!)
3) Submit ideas or needs for the Research Committee to Doni – Team.
4) Develop a scat collection protocol – Doni
5) Send Bill a proposal for WAFWA to fund development of a concept summary - Troy and Doni
6) Possibly compile talks from TWS Swift Fox Symposium – Doni
7) Summarize guidelines/BMPs for minimizing impacts on swift fox during energy development – Research Committee

Meeting Attendees

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