Swift fox re-introduction at Bad River Ranches, South Dakota, USA

Indrani Sasmal[1] & Mike Phillips[2]

[1] - Department of Natural Resource Management, South Dakota State University, Brookings, SD 57007, USA indrani.sasmal81@gmail.com
[2] - Turner Endangered Species Fund, 1123 Research Dr., Bozeman, MT 59718, USA mike.phillips@retranches.com

Introduction

The swift fox (*Vulpes velox*), once abundant throughout the short and mixed grass prairies of the Great Plains of North America, has disappeared from 60% - 90% of its historical range since settlement (Kahn, 1997). Much of this decline is due to conversion of native prairie to agriculture and associated decline in prey species, unregulated hunting and trapping, and predator control programs focused on larger carnivores. The state of South Dakota lists this small fox (~2 kg) as threatened and is thus mandated to "manage, protect, and restore" the species (South Dakota Codified Law 34A-8).

From 2002 through spring 2008 the Turner Endangered Species Fund (TESF) implemented a cooperative project with state, federal, and other private entities to use re-introductions of wild caught foxes from Wyoming and Colorado to restore a population to the privately owned Bad River Ranches (BRR) and environs in west -central South Dakota, USA. Re-introductions to suitable habitat that are now depauperate of the species may offer a viable approach for maintaining, re-establishing, or facilitating range-expansion of imperiled wildlife populations by helping mitigate the effects of habitat loss, habitat fragmentation with localized surplus, and extirpations.

Goals

- Goal 1: Establish a self-sustaining population of swift foxes on and around the Bad River Ranch (BRR) in western South Dakota.
- Goal 2: Contribute to the viability of a regional population that serves as a source for swift fox recovery and expansion in South Dakota and

Adult radio-collared swift fox

neighboring states and assists in removing foxes from threatened status in South Dakota.

- Goal 3: Establish a population that enhances the long-term survival of the species, restores natural biodiversity to the area (part of restoration of full array of native species to the area), and promotes prairie conservation awareness.
- Goal 4: Collect and disseminate scientific information on re-introduction techniques and the ecological requirements for successful swift fox restoration.

Success Indicators

- Indicator 1: Initial success (1 - 3 years)
  - ⇒ This is reached when we achieve breeding of the first wild-born generation of foxes in the release area.
- Indicator 2: Short-term criteria (3 - 5 years)
  - ⇒ For success include survival and recruitment rates similar to other wild self-sustaining populations and population growth or $r > 0$.
- Indicator 3: Long-term success (>10 years)
  - ⇒ This is reached when fox populations expand and connect with other populations in the region.

Project Summary

Feasibility: As a charismatic species that generates little socio-political or economic controversy, the swift fox is an ideal flagship species for conservation of prairie ecosystems. Nonetheless, obtaining a permit to import foxes to South Dakota was difficult. The Animal Industry Board (AIB) denied our first request for an importation permit over concerns that our fox project would lead to the re-introduction of other larger carnivores like the gray wolf. After the denial we launched an 12 month public relations campaign to dispel erroneous notions about the project. During our second hearing for an importation permit 25 attendees testified in favor of our request, whereas only five testified in opposition. Four of the five agricultural groups that had opposed our initial request supported our second request. At the conclusion of the second hearing the AIB voted unanimously to issue us an importation permit. Our Swift Fox Restoration Area (SFRA) included about 10,000 km² in west-central South Dakota and included the BRR, Ft. Pierre National Grasslands, and Lower Brule Indian Reservation. From a habitat suitability model we estimated that 82% (437 km^2) of the BRR and 77% (7,848 km^2) of the restoration area was suitable for foxes. Road density within the project area was <3.5 km/km^2. Our feasibility study indicated that SFRA could support >200 foxes, the minimum recommended by Ginsberg (1994) to maintain genetic integrity.

Implementation: After we captured swift foxes in Wyoming (2002 - 2006) and Colorado (2006 - 2007), we assessed physical condition, determined body weight and then ear-tagged, micro-chipped, and radio-collared (ATS and Telonics collars weighing 42 - 50 g) each individual. To minimize disease risk during translocation we dusted foxes for fleas with carbaryl powder (SEVIN Dust) (Miller *et al.*, 2000, Pybus &Williams, 2003). We used four different types of release methods: hard-release, short-duration-soft-release (short-soft-release), extended-duration-soft-

release (long-soft-release), and captive born. We defined hard-releases as those in which foxes were held for less than 45 days between capture date and release date, where they were released directly from a transport kennel. Short-soft-release foxes were held for more than 50 days and released from soft-release pens by opening the door and allowing the foxes to leave voluntarily. Foxes in extended-duration-soft-release treatment group were held for more than 250 days on-site in soft-release pens through the winter and released the following year in early summer. Pups born to fox pairs in the long-soft-release category formed the "captive born" release cohort.

Swift fox kit and prairie vole © Georg Joutras

We translocated and released 179 foxes (85 males, 94 females, 91 adults & 88 sub-adults) onto the SFRA. Additionally, we released 43 pups (26 males & 17 females) born in long-soft-release pens. Because coyote predation is a factor limiting fox population growth (Kunkel *et al.*, 2001*b*), we initiated a coyote population reduction effort. Our coyote control program was aimed at short-term reductions timed to coincide with early summer and fall releases of foxes. Our primary method of control was aerial shooting from a fixed-winged aircraft combined with targeted use of recreational coyote callers and opportunistic shooting.

Post-release monitoring: Our protocol included 60-day initial post-release monitoring from October - December, maintenance monitoring and re-collaring from January - April, daily den observations from May - June, and 60-day post-release monitoring for soft-released foxes from July - September. Monitoring was accomplished by combining of aerial- and ground-based telemetry supplemented by direct observations at den sites. Tracking utilized triangulation using a mobile 3 -element null-peak systems mounted in 4x4 vehicles where roads and landscape characteristics allowed. Aerial telemetry typically was used once weekly to locate wide-ranging foxes. All radio collars contained a mortality sensor.

The short-duration-soft-releases resulted in the highest 60-day post-release survival (0.757 survival probability, SE=0.04) compared to long-soft-releases (0.659 survival probability, SE=0.07), hard-releases (0.609 survival probability, SE=0.1), and captive born releases (0.484 survival probability, SE=0.09). From 2003 through 2007 we documented 25 wild-born litters with a total of 102 pups and 12 captive-born litters with a total of 48 pups. We documented a population

growth of 26 foxes (λ=1.47), 16 foxes (λ=1.67), 23 foxes (λ=1.88), 12 foxes (λ =1.36), and 40 foxes (λ =2.05) in 2003, 2004, 2005, 2006 and 2007 respectively. We documented a decreased coyote population in 2003, 2005 and 2007, whereas an increased coyote population in 2004 and 2006. In 2005 the coyote population was at an all time low since 1999 due to the outbreak of mange. Our findings suggested that low coyote abundance along with high prey availability were necessary for higher population growth rate. The release area was found to be marginally suitable habitat for swift fox which resulted in long distance dispersal of both released and resident foxes hindering the long-term viability of the population. By 2010, two years after the restoration effort ended due to the tragic death of the project leader (Kevin Honness), there was scant evidence of swift foxes on BRR and environs.

Major difficulties faced

- Obtaining permits to translocate foxes from Wyoming to South Dakota from South Dakota Game, Fish, and Parks (SDGFP) and Wyoming Department of Fish and Game (WDFG), and Colorado Division of Wildlife.
- Low trapping success and high levels of plague in the Wyoming population made it difficult to translocate as many fox individuals as permitted.
- Aerial control of coyote population could not be done in 2004 and 2005 due to pilot availability prior to soft-release.
- Tragic death of the project leader resulted in termination of the restoration effort before a population could be established.

Major lessons learned

- Release of sub-adult swift foxes comprised of a balanced ratio of male and female foxes using short-soft-release methods is useful to enhance post-release survival and hence, short-term survival of translocated swift foxes.
- Periodic long term food supplementation as well as monitoring and management of the re-introduced population is necessary for long-term success of re-introduction.
- Given the difficulty of swift foxes surviving in areas with a limited view shed, habitat management to reduce the height of vegetation (e.g. through prescribed fire or livestock grazing) is crucial for re-introduction success and population viability.

Success of project

Highly Successful	Successful	**Partially Successful**	Failure
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Reason(s) for success/failure:

- Local support was crucial to this re-introduction effort. By far, the most important and effective method of promoting our work was from one-on-one contacts with area residents and adjoining landowners while conducting daily field activities. By the conclusion of the project nearly 100 neighboring private landowners had signaled support for the restoration effort. This level of support

is unequivocal evidence that the swift fox in a outstanding flagship species for the conservation of the grasslands of the Great Plains of the US and Canada.

- We documented some unusual long distance dispersal of some individuals from the release site areas eliminating them form contributing to the productivity of the re-introduced population, which might have been due to availability of marginally suitable habitat of the release site disproving our previous assessment of suitable habitat at the release site.

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