NRCS Natural Resources Conservation Service
Wildlife Habitat Management Institute

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Swift Fox (*Vulpes velox*)

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General information

The swift fox (*Vulpes velox*) is one of the smallest members of the canid family in North America. Closely related to the kit fox, swift foxes were once abundant in the Great Plains Region of the United States and Canada. Due to predator control activities directed at other species and conversion of native prairie to agricultural lands following European settlement in the late 1800s and early 1900s, swift fox populations declined rapidly. Swift foxes were recently a candidate for listing under the Endangered Species Act in the United States, but were removed from that list in 2001 based on viable populations still occurring in approximately 40 percent of those areas formerly occupied. In Canada, the swift fox was extirpated in the 1930s, but a successful repatriation program changed their status from extirpated to endangered in 1998, reflecting the continually improving and expanding population.

Swift foxes have buffy-gray backs, orange-tan sides, whitish throats, chests, and bellies, black-tipped, bushy tails, and black patches on either side of their noses. In the winter, their fur becomes thick and soft. Adult swift foxes weigh less than six pounds and body length seldom exceeds 34 inches. Swift foxes are monogamous and pair for life. They are primarily nocturnal and use dens year-round, unlike other members of the canid family.

This leaflet is intended to provide an introduction to the habitat requirements of the swift fox and to assist landowners and land managers in developing management strategies that will benefit the swift fox as part of an overall grassland management plan. The success of any management plan depends on targeting the needs of the species involved while considering the needs of the people managing the land. This leaflet provides management recommendations that can be carried out to maintain existing swift fox range and to create additional habitat. Land managers are encouraged to collaborate with wildlife professionals to identify and attain management objectives.

Axel Moehrenschlager, Wildlife Preservation Trust Canada

Swift fox (Vulpes velox)

Range

The swift fox is native to the short- and mixed-grass prairies of the Great Plains Region. Until the late 1800s to early 1900s, swift foxes were common or abundant in North and South Dakota, Montana, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, Texas, and southern portions of Alberta and Saskatchewan. In the 1850s, fox numbers began to decline and by the 1930s only sporadic observations were reported. This decline is largely attributed to inadvertent poisoning from strychnine-laced baits for gray wolves; intense trapping; and modification, degradation, loss, and fragmentation of native grasslands. Approximately 45 percent of swift fox habitat throughout the historic range has been lost as a result of prairie conversion to cropland. Even where natural prairies remain, they are often fragmented and isolated, reducing habitat and prey while increasing predation and competition. The prairie ecosystem itself has changed due to fire suppression and domestic livestock grazing, making it difficult for populations of swift fox to persist.

Currently, swift foxes occur in low abundance in Montana, Nebraska, and South Dakota; are abundant in Colorado, Kansas, and Wyoming; and are locally common in parts of Texas, New Mexico, and Oklahoma. Approximately 40 percent of the swift fox's historical range in the United States is currently occupied by swift fox.

Habitat requirements

General

Swift foxes typically prefer short- or mixed-grass prairie with flat to gently rolling terrain and low-growing sparse vegetation that allows for good mobility and visibility. Habitats within the short-grass and mixed-grass prairie ecosystems are able to provide the essentials for swift fox survival. These essentials include a diverse prey base, topography that allows long viewing distances to detect predators, and firm, friable soils suitable for dens. Swift foxes tend to avoid areas of dense shrubs and tall vegetation, which, because of their small size, limit their vision and movements.

Food

Swift foxes are opportunistic foragers, meaning they can successfully adapt their diet to the availability of food items. They feed on a variety of mammals, birds, arthropods, plants, and carrion. Mammals, particularly rodents, dominate their diet which also includes jackrabbits, cottontails, insects, small birds, lizards, amphibians, and fish. Insects and birds become an important food source in late summer and early fall.

Current and historic ranges of the swift fox in North America (from Cotterill 1997)

Cover

Swift foxes spend most of the daylight hours in or near dens. They use dens year round for protection from extreme climate conditions (summer and winter), as escape cover from predators, and as a shelter for rearing young.

Dens are usually located in short-grass and mixed-grass prairie, but have been found in cultivated dryland wheat fields or other human-made habitats. They are built on sloping plains, hilltops, or other well-drained sites. Swift foxes prefer sites with loamy soils, where dens are easily dug. Claylike soils are difficult to dig and are avoided by swift foxes. Swift foxes will excavate their own dens or enlarge burrows of ground squirrels, prairie dogs, badgers, or other animals. Dens can be located by looking for mounds of earth in front of each entrance. Entrances are circular or keyhole in shape, approximately 7 to 9 inches in diameter, and there may be more than one entrance to a given den. Pup-rearing dens have numerous entrances, whereas, dens used to escape from predators frequently have only one opening.

Each family group often has a number of clustered den sites. The maximum span between dens is approximately 550 yards. A larger den is used during pup-rearing season than at other times of the year. Other, smaller dens are used primarily for escape cover from predators or shelter from the weather. Access to dens is important for evading predators; as the number of available dens increases within a family's area of activity, it is likely that their survival rates also increase. Swift foxes are primarily nocturnal; although, they may occasionally be seen during the daytime. In the winter, foxes may sun in the warm midday period, whereas, during the summer months, late morning and early evening are the only daylight hours spent above ground. They usually emerge from their dens shortly after sunset for hunting.

Swift foxes begin their breeding season in late December or early January in the southern portion of their range, and as late as March in the northern portion of their range. Gestation is approximately 51 days, and litter sizes range from one to seven pups, born in early spring. Pups live in the pup-rearing den until late May/early June, after which they frequent temporary dens in the immediate vicinity, but return to the pup-rearing den every 4 to 5 days. Young foxes typically disperse in autumn, when they are 4 to 6 months old.

Water

The swift fox's native habitat is generally semi-arid where freestanding water is often rare. Therefore, the swift fox can remain in water balance with food alone and can probably survive without freestanding water. However, water may be necessary for the survival of particular mammals and birds on which the swift fox preys.

Axel Moehrenschlager, Wildlife Preservation Trust Canada

Swift fox pups disperse from their parents when they are 4 to 6 months old.

Minimum habitat area

The average adult swift fox frequents a core area of approximately 0.85 square miles. During breeding season or when food resources are scarce, swift foxes travel outside this core area to what is known as the home range. Home range for swift foxes is estimated at 2.9 to 13.2 square miles. If conditions are favorable, swift fox families' home ranges can overlap. However, recent data provide evidence that swift foxes are territorial, as there is a near total exclusion of an individual's core area from other same-sex individuals.

Limiting factors

Major limiting factors for swift fox populations include the availability and quality of the habitat requirements described above. Conversion of native grassland prairies is one of the most important factors for contraction of swift fox range. Further conversion of grassland to cropland threatens the survival of swift foxes. While the swift fox population has declined in human-altered habitats, those of predators and competitors (coyotes, red foxes, gray foxes) have thrived.

Predation by and interspecific competition with coyotes and expansion of red fox populations are the two most serious limiting factors to swift fox recolonization of suitable habitat identified within the species' historic range. More swift foxes are killed by coyotes than by any other means. Coyotes will often kill, but not consume, swift foxes, due to interspecific competition between the species. The swift fox's other predators include golden eagles, American badgers, red foxes, bobcats, large hawks, and great horned owls. While interspecific relations between swift fox and red fox populations are not well understood, cropland dominated landscapes are often occupied by red fox, which may exclude swift fox populations.

Other, more minor limiting factors include inadvertent loss to trapping and road kill. Trappers who are attempting to catch other species sometimes catch swift foxes inadvertently. Using target-specific trapping methods can reduce this. In some areas, swift foxes den along roadsides, making them vulnerable to road kill. While difficult to control, road kill can be limited by posting signs and reducing speeds along rural roads in areas where swift foxes are present.

Table 1 is an example inventory chart for recording limiting factors. For planning purposes, fill in this table to determine the potential of a given area to support swift fox populations. Rate the habitat components and limiting factors for the designated planning area based on the above descriptions. Habitat compo-

Table 1 Inventory of limiting factors

Habitat component	**Availability/quality**			
	High	**Medium**	**Low**	**Absent**
Flat or gently rolling terrain with low-growing, sparse vegetation				
Food				
Escape cover				
Minimum habitat area				
Limiting factor	**Quantity/degree of interference**			
	Absent	**Low**	**Medium**	**High**
Predator populations				
Competitor populations				

nents that are absent from the area, or are available in low quantity or quality, are probably limiting swift fox populations. High prevalence of limiting factors may likewise indicate an unhealthy ecosystem or lead to a habitat imbalance in the future. Management actions should be targeted to address factors determined to be limiting swift fox populations.

Habitat management recommendations

Historically, short- and mixed-grass prairies consisted of a complex pattern of distinct patches of grasses and forbs, created by disturbances. Factors shaping shortgrass prairie landscapes included fire, grazing by native herbivores, and climate. The decrease in grassland habitat, due to destruction and/or lack of management, and the decline of swift fox populations are directly related. Ideally, land management should replicate the timing, intensity, and distribution of natural disturbances that shaped the shortgrass prairie. Detailed below are several ways land managers can establish additional prairie habitat and improve the quality of existing habitats.

Prairie restoration

Degraded lands or land used for other purposes can be converted to prairie to increase habitat for swift fox and other grassland species. The Conservation Reserve Program (CRP) has revegetated millions of acres of cropland to grass cover. However, in many areas of the shortgrass prairie ecosystem, CRP fields have been planted to tallgrass prairie species. While tallgrass species are native, they exist only to a limited extent in shortgrass soils and climates, and are unsuitable for swift fox habitat. Seeding mixtures should be selected based on the soil type and climate of the region. Native short and mixed grasses usually associated with swift fox habitat include blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*), needle-and-thread grass (*Hesperostipa comata*), needleleaf sedge (*Carex duriscula*), and western wheatgrass (*Pascopyrum smithii*).

U.S. Fish and Wildlife Service

Predation by coyotes is the number one cause of death of swift foxes.

When attempting to restore grasslands, site preparation is critical. Selected sites should be wide open and higher in elevation than the surrounding land. Prior to seeding, the designated area should be cleared of undesirable vegetation to reduce competition when new seeds are planted. This can be performed manually or by applying a nonpersistent herbicide. It may be necessary to repeat this step several times if regrowth occurs, but seeding should be delayed at least 2 weeks following an herbicide treatment. Seeding can be done in the spring or fall with a specialized seed drill. Prairies may take several years before becoming fully established, but they offer a significant contribution to wildlife. For more information on native warm season grasses, refer to Fish and Wildlife Habitat Management Leaflet Number 25: *Native Warm Season Grasses and Wildlife.*

Managed grazing

Today, livestock grazing is a major source of disturbance in the shortgrass prairie. However, domestic livestock grazing does not necessarily mimic the intense grazing and trampling by migratory herds of bison, under which the dominant sod-forming perennial grassland plant species of the shortgrass prairie evolved. Absence of once-abundant prairie dogs on the shortgrass prairie has also limited the type of disturbance generated by their colonies. Managing for swift fox and other shortgrass prairie wildlife species requires a mosaic of habitats produced by varying grazing regimes and other disturbances across the landscape. Much of today's grazing tends to be spread evenly in intensity, producing a comparatively uniform landscape. In addition to improving forage for livestock, adopting rotational and other managed grazing patterns can help maintain prairie habitat for swift foxes. Season-long grazing and overstocking can diminish habitat quality. Thus, a rotational or deferred grazing system is recommended. These systems are managed by dividing pastures up into several paddocks and then grazing them rotationally or deferring grazing in some areas for a period of time. Because large grassland patches are more attractive to swift fox and other short, grassland-dependent species, pastures and other grassland parcels should be managed as large units (minimum 125 acres). To achieve the patch mosaic required to attract swift foxes, some grazing allotments need to be grazed more intensely than others. Maintaining a variety of grazing regimes, including some heavy grazing and some idle pastures, on a rotational schedule, will provide the mosaic of structural states across the landscape beneficial to swift fox and other shortgrass prairie wildlife.

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A rancher practices rotational grazing by moving livestock from one paddock to another.

Prescribed burning

Burning is also an effective tool in grassland management. In the shortgrass prairie, fire historically played a smaller role than in the more lush tallgrass prairie systems found to the east. When applied properly, fire can control invasive and woody vegetation and cacti, maintain various stages of plant growth, and promote biodiversity and prairie health. Shortgrass prairie grasses recover slowly from burning, requiring 2 to 3 years with normal precipitation for recovery. Managed burns should be conducted rotationally at intervals of 5 to 8 years, allowing approximately 65 to 75 percent of grassland, in blocks at least a half mile wide, to remain undisturbed annually. Firebreaks should be used to contain fires on prescribed areas. Burning during the growing season, when vegetation is physiologically active, results in significant declines in buffalograss, grama grasses, and forbs. Therefore, dormant-season burning may be the preferable method for restoring fire in shortgrass prairie ecosystems where fire has been excluded for a prolonged time period. Prescribed burning is a technical process that should be conducted under the direction of wildlife management professionals and in compliance with all state and local regulations.

Patch burning

Patch burning, also known as rotational grazing without fences or fire-grazing interaction, is a management practice that combines rotational grazing with prescribed burning. Large-scale uniform burns and poorly managed grazing systems can be detrimental to livestock production and wildlife habitat. Patch burning provides an alternative to traditional fire and grazing programs and a practical way to restore swift fox habitat. Patch burning allows grazing and fire to interact to cause a shifting vegetation pattern across the landscape.

Patch burning is accomplished by applying spatially discrete fires to approximately a third of a management unit and allowing grazers free access to both burned and unburned patches. Livestock will focus grazing on higher-quality forage on recently burned patches until new patches are burned. When grazing shifts to newly burned patches, patches previously burned have abundant forbs and begin to return to grass dominance. When patches return to grass dominance they are burned again, restarting the cycle. Landscapes with these distinct patches resemble the mosaic characteristic of historical grasslands and provide a diverse choice of habitats for wildlife that cannot be created by continuous grazing or rotational grazing within years. The appropriate frequency of fire in a patch burn landscape varies by climate.

Mowing

Although not as effective as burning, mowing and haying can be used to achieve similar results in prairie management. Mowing is useful in controlling weeds and promoting growth of desirable vegetation. As with burns, it is most advantageous to mow on a rotational schedule at 3- to 5-year intervals.

Disking

Light disking can be performed to maintain sections of non-native grasslands at an early successional stage. Strips should be rotationally disked to a depth of 2 to 4 inches at an interval of 3 to 5 years. No more than a third of a field should be disked annually. Disking can also be performed to create firebreaks around prescribed burn areas.

Reducing predation and competition

Interspecific competition with and predation by coyotes is one of the most important limiting factors to swift fox populations. Reducing coyote populations may be an important element of efforts to enhance swift fox populations in some areas. However, coy-

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When applied properly, prescribed burns can maintain vegetation preferred by the swift fox.

ote control may actually be detrimental to swift fox habitat under certain circumstances, as red fox may move into areas vacated by coyotes. Coyote control for swift fox should only be done in conjunction with swift fox habitat restoration and enhancement. Where undertaken, coyote control measures must be conducted in a manner that does not inadvertently harm swift foxes.

Available assistance

Technical and financial assistance is available to landowners through a variety of government agencies and other organizations. Landowners and managers should enlist the expertise of state and local natural resource professionals to help assess habitat quality and management practices for sustaining swift fox populations and enhancing habitat quality. Table 2 lists programs and organizations that can provide assistance with improving habitat conditions for swift fox and other wildlife in rangeland settings.

Table 2 Technical and finanacial assistance to develop fish and wildlife habitat on private lands

Program	Land eligibility	Type of assistance	Contact
Conservation Reserve Program (CRP)	Highly erodible land, wetland, and certain other lands with cropping history, stream-side areas in pasture land	50% cost-share for establishing permanent cover and conservation practices, and annual rental payments for land enrolled in 10- to 15-year contracts. Additional financial incentives for some practices	NRCS or FSA state or local office
Conservation of Private Grazing Land (CPGL)	Private grazing lands	Technical assistance on managing grazing lands for natural resource protection as well as economic and community benefits	NRCS state or local office
Environmental Quality Incentives Program (EQIP)	Cropland, range, grazing land, and other agricultural land	Up to 75% cost-share for conservation practices in accordance with 1- to 10-year contracts. Incentive payments for certain management practices	NRCS state or local office
Grassland Reserve Program (GRP)	Restored, improved or natural grassland, rangeland, pastureland, and prairie	Easement payments to landowners who restore and protect grasslands	NRCS state or local office
Partners for Fish and Wildlife Program (PFW)	Most degraded fish and/or wildlife habitat	Up to 100% financial and technical assistance to restore wildlife habitat under a minimum 10-year cooperative agreement	Local office of the U.S. Fish and Wildlife Service
Waterways for Wildlife	Private lands	Technical and program development assistance to coalesce habitat efforts of corporations and private landowners to meet common watershed level goals	Wildlife Habitat Council
Wetlands Reserve Program (WRP)	Previously degraded wetland and adjacent upland buffer, with limited amount of natural wetland and existing or restorable riparian areas	75% cost-share for wetland restoration under 10-year contracts and 30-year easements, and 100% cost-share on restoration under permanent easements. Payments for purchase of 30-year or permanent conservation easements	NRCS state or local office
Wildlife at Work	Corporate lands	Technical assistance on developing habitat projects into programs that allow companies to involve employees and the community	Wildlife Habitat Council
Wildlife Habitat Incentives Program (WHIP)	High-priority fish and wildlife habitats	Up to 75% cost-share for conservation practices under 5- to 10-year contracts, and up to 100% cost-share on 15-year contracts	NRCS state or local office.

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