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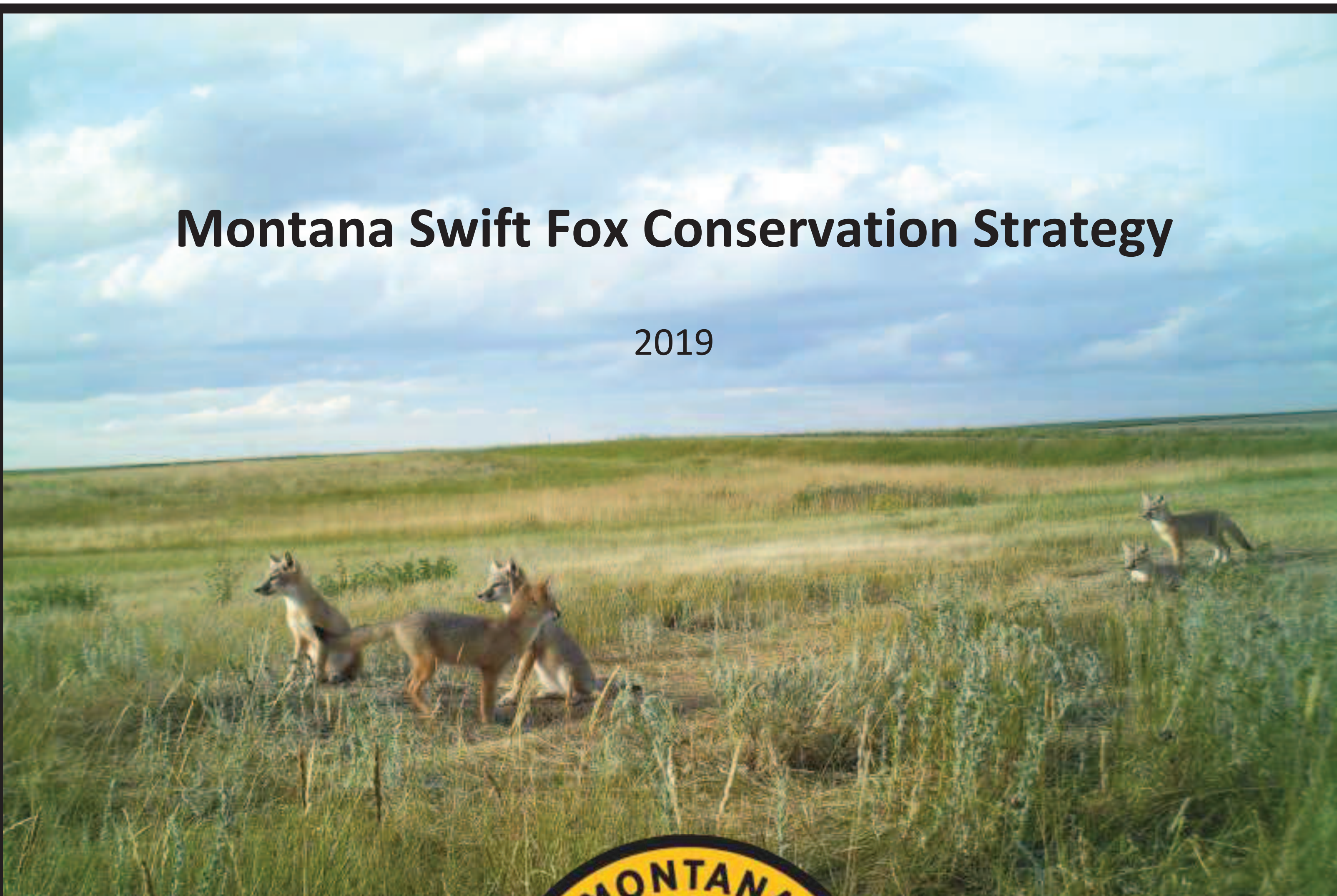
Montana Swift Fox Conservation Strategy

2019



MONTANA FISH, WILDLIFE & PARKS

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Preface and Acknowledgements

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.

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Montana Swift Fox Conservation Strategy

Summary

Swift fox are native to the Northern Great Plains and were once thought to be abundant across their range, however, due largely to federal eradication campaigns focused on coyotes and wolves, they disappeared from much of their historical range in the late 20th Century. Swift fox were officially designated as extirpated from Canada in 1978 (COSEWIC 1978) and in Montana in 1969. In 1992 the USFWS received a petition to list the swift fox as an endangered species. In 1994, they determined a threatened listing was "warranted but precluded by listing actions of higher priority" (Federal Register 1995). This action prompted ten state wildlife agencies, including Montana Fish, Wildlife, and Parks, and interested cooperators to form the form the Swift Fox Conservation Team (SFCT). The SFCT worked cooperatively on swift fox management and conservation and developed a Conservation Assessment and Strategy in 1997. At the same time, an extensive reintroduction of swift fox was concluding in southern Canada, adjacent to North-Central MT. Soon afterward, swift fox established populations in suitable habitats in Northern MT resulting in the majority of the population that presently exists. Since that time subsequent translocations to two tribal nations within MT have occurred in attempts to increase distribution of swift fox. Opportunities to continue improving swift fox distribution and status appear to exist, especially in the northern portion of the species historical range where gaps appear to occur within Montana. This document is intended to promote swift fox conservation and management by formulating a statewide strategy that facilitates coordinated and effective efforts on the part of interested organizations. The following priorities will help guide FWP and partners in conserving swift fox in Montana and contributing to the eight objectives of the SFCT. This strategy is intended to compliment the SFCT strategy while clearly prioritizing those objectives that Montana can affect. Our priorities include: 1) Identify and Map Swift Fox Habitat in Montana, 2) Conserve Swift Fox Habitat and Movement Corridors, 3) Monitor Swift Fox Distribution and Status, and 4) Increase distribution of swift fox into suitable, connected habitats. Management of swift fox harvest is also discussed and informed by a population viability analysis (PVA) based on recent population estimates and appropriate vital rates.

I. Purpose:

This document promotes swift fox conservation and management by formulating a statewide strategy that facilitates coordinated and effective efforts on the part of interested organizations. This includes development and use of the best available science and promotion of efficient allocation of resources based on common priorities.

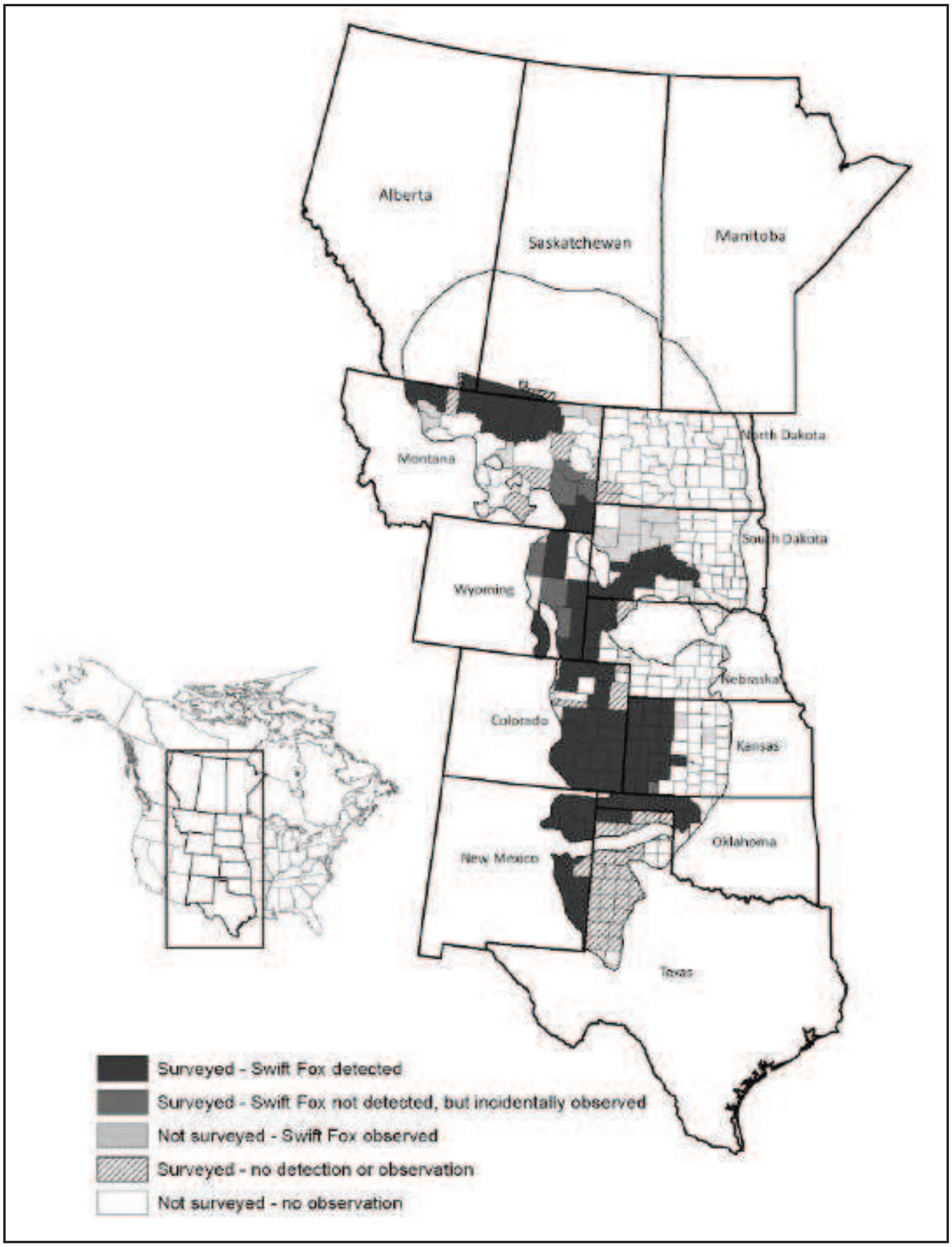
II. Background

Swift foxes disappeared from much of their historical range in the North American Great Plains (Sovada and Scheick 1999, Moehrenschlager and Sovada 2004). Once considered abundant, swift fox numbers and distribution declined substantially in the late 1800s and early 1900s due largely to federal eradication campaigns focused on coyotes and wolves, (Carbyn et al. 1994, Sovada et al. 1998), conversion of native grassland to cropland (Hillman and Sharps 1978, Egoscue 1979), and predation and competitive exclusion by coyotes and red foxes (Pruss et al. 2006). The species was presumably extirpated from the northern Great Plains by the early to mid-1900s, while remnant populations persisted in the central and southern portions of its range (Warren 1942, Armstrong 1972, Bee et al. 1981, Allardyce and Sovada 2003).

Swift fox were listed as endangered in Canada in 1978 and petitioned to be listed in the U.S. in 1992. In 1994, ten state wildlife agencies and interested cooperators, including Montana Fish, Wildlife and Parks (FWP), formed the Swift Fox Conservation Team (SFCT). The SFCT developed a Conservation Assessment and Strategy in 1997. Several reintroductions have occurred, and the swift fox population that presently exists in Montana is primarily the result of reintroductions. The first and most extensive reintroduction occurred in Canada along the border with north-central Montana where almost 1,000 captive bred swift fox were released from 1983-1997 (Moehrenschlager and Moehrenschlager 2001, 2006). A second reintroduction occurred on the Blackfeet Nation where 123 foxes were released from 1998-2002 (Ausband and Foresman 2007). A third reintroduction occurred at the Fort Peck Indian Reservation where 60 foxes were released from 2006-2010 (Giddings 2011). Reintroductions have also occurred in neighboring states including western South Dakota at Bad River Ranches during 2002-2007, Badlands National Park during 2003-2005, Lower Brule Reservation during 2006-2007, and Pine Ridge Reservation during 2009-2010. A native population exists in northern Wyoming (Knox and Grenier 2010).

These efforts and other swift fox conservation work resulted in much new information and led to the removal of swift fox as a candidate for listing during 2001 (Federal Register 2001). Today, swift foxes exist in approximately 40% of their former range (Kahn et al. 1997, Sovada and Scheick 1999, Moehrenschlager and Sovada 2004; Figure 1). Swift fox are currently established in two areas within their historical range, a southern population (Texas, New Mexico, Oklahoma, Colorado, Kansas, Nebraska, Wyoming, South Dakota) and a northern, reintroduced population (Montana, Alberta, Saskatchewan). These two populations are separated at present, and the gap in distribution occurs largely in southeastern and east-central Montana (Figure 1). Opportunities to continue improving swift fox distribution and status appear to exist, especially at the northern portion of the species distribution where gaps appear to occur within Montana.

Figure 1. From Sovada et al. 2009: "Recent occurrences of swift fox by county in the United States and the surveyed area in Canada (Moehrenschlager and Moehrenschlager 2006), bounded by the estimate of the species' historical range. Swift fox occurrences in the United States are from survey results, confirmed observations, and fur-harvest records, 2001-2006. Swift fox occurrences in Canada are from live-trap surveys and incidental observations, 2005-2006."



The SFCT's Conservation Assessment and Strategy was updated in 2011 (Dowd Stukel 2011). The 2011 Conservation Assessment and Strategy defined objectives for 2011-2020 as:

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.

Population monitoring and research efforts continue in Montana, and there is a great amount of interest on the part of various stakeholders to increase swift fox abundance and distribution and further swift fox conservation. This situation suggests the need for a unified strategy in Montana. The purpose of Montana's Swift Fox Conservation Strategy is to help allocate agency and organization resources, facilitate collaborative work based on common objectives, and continue to work towards objectives detailed in the 2011 Conservation Assessment and Conservation Strategy.

III. Swift Fox Ecology

Swift fox (*Vulpes velox*) are typically found in shortgrass and mixed-grass prairie with flat to gently rolling topography (Cutter 1958a, Kilgore 1969, Hillman and Sharps 1978, Kitchen 1999). They also occur in sagebrush steppe in Wyoming (Olson and Lindzey 2002), generally where sagebrush height is low growing and interspersed with grasses.

The species is a dietary generalist, eating a variety of arthropods, small mammals, lagomorphs, and birds, as well as carrion (Cutter 1958b, Kilgore 1969, Hillman and Sharps 1978, Kitchen et al. 1999, Sovada et al. 2001).

Swift fox reproduce in their first year, and average litter size ranges from 2-6 pups (Allardyce and Sovada 2003). Breeding occurs during March in the northern part of the species distribution (Carbyn et al. 1994). Gestation is ~ 51 days (Haysenn et al. 1993), and pup emergence roughly six weeks after birth. Although reproduction is structured around long-term male-female pairs (Kilgore 1969), evidence of female-based cooperative breeding and kinship clustering has been observed (Kilgore 1969, Covell 1992, Kamler et al. 2004, Kitchen et al. 2005, Kitchen et al. 2006).

Annual mortality rates range from 0.31 to 0.60 (Covell 1992, Sovada et al. 1998, Olson and Lindzey 2002, Anderson et al. 2003). Coyotes (*Canis latrans*) are typically the primary source of mortality, ranging from 33% to 74% of total deaths (Sovada et al. 1998, Kitchen et al. 1999, Matlack et al. 2000, Olson and Lindzey 2002, Kamler et al. 2003). This appears to stem from interference competition, as coyotes rarely consume the swift fox they kill (Sovada et al. 1998, Kitchen et al. 1999). Coyotes exclude swift fox from areas with higher prey availability (Thompson and Gese 2007) and are believed to suppress swift fox populations (Kitchen 1999, Anderson et al. 2003), although swift fox can persist in conjunction with coyotes (Kitchen et al. 1999). Coyote removal has been shown to increase swift fox survival, especially juveniles, resulting in an increase in juvenile dispersal (Karki et al. 2007). Further, the creation of artificial escape cover has increased swift fox survival and density, and has facilitated territory establishment (McGee et al. 2006). Additional predators include golden eagles (*Aquila chrysaetos*), American badgers (*Taxidea taxus*) and bobcats (*Lynx rufus*) (Carbyn et al. 1994, Andersen et al. 2003, K. Honness unpublished data). Although the relationship between red fox (*Vulpes vulpes*) and swift fox is unknown, red fox may also pose a mortality risk or, like coyotes, exclude swift fox from areas of higher prey density. Vehicle collision can account for up to 42% of mortalities (Kamler et al. 2003). Additional anthropogenic sources of mortality include poisoning, shooting, and trapping (Kilgore 1969, Ronstad et al. 1989, Carbyn et al. 1994, Sovada et al. 1998).

Swift fox occupancy and movement is negatively associated with agricultural development (Kamler et al. 2003, Nicholson et al. 2007) with the notable exception of Kansas, where swift fox readily inhabit cropland (Sovada et al. 1998, Sovada et al. 2001). However, swift fox in grassland are larger and in better condition than those in cropland (Matlack et al. 2000).

Dispersal is bimodal, with peak dispersal occurring in the fall and involving primarily juveniles, followed by a second pulse of movement preceding mating in mid-winter. Males disperse more frequently and for greater distances than females (reviewed in Allardyce and Sovada 2003). Reported dispersal distances range from 2.1 km to 50 km, with an average < 10km (reviewed in Allardyce and Sovada 2003), although natural dispersal of up to 191 km has been reported (Ausband and Moehrenschlager 2009). Swift fox have been known to move up to 411 km after release during translocation (S. Grassel, unpublished data), although these movements are not necessarily representative of natural movement distances. Connectivity within and between swift fox populations is negatively influenced by sagebrush steppe, agricultural development, rivers, forest, and topographic complexity but positively associated with the proportion of grassland available (Schwalm 2012; Schwalm et al. 2014, Schwalm et al. *in prep*). Roads may positively influence connectivity at a local scale but decrease it at a regional scale (Schwalm et al. *in prep*).

IV. Current Distribution and Status of Swift Fox in Montana

Recent attempts to determine swift fox distribution across Montana included a 2015 occupancy survey. This is the most extensive (concurrent and geographically widespread) effort to date and included nearly 500 camera 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, additional 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 and eastward to areas south of Miles City and Glendive 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 appeared to be devoid of functional populations at the time of the 2015 survey. It is unknown whether the gap represents unsuitable habitat, a lack of connectivity with established populations, or are the result of surveys conducted at too low of a camera station density to be able to detect a sparse swift fox population. A flurry of observations in SE Montana occurred during 2016-18 (Fig.3), suggesting that natural recolonization may be on the upswing. These observations correspond with extensive swift fox population expansions in Wyoming under favorable weather conditions (N. Bjornlie, Wyoming Game and Fish, personal communication).

Figure 2. Swift fox surveys and detections during 2015-2016 in Montana.

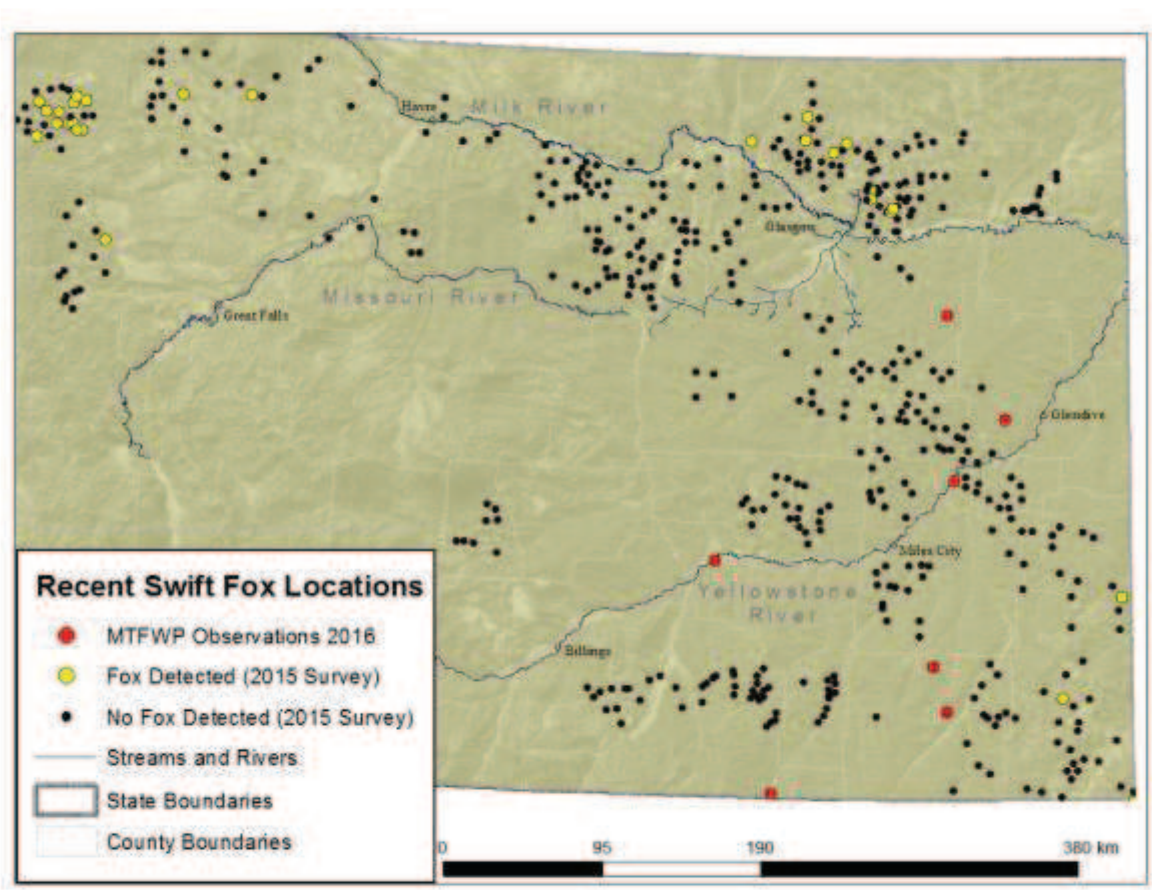
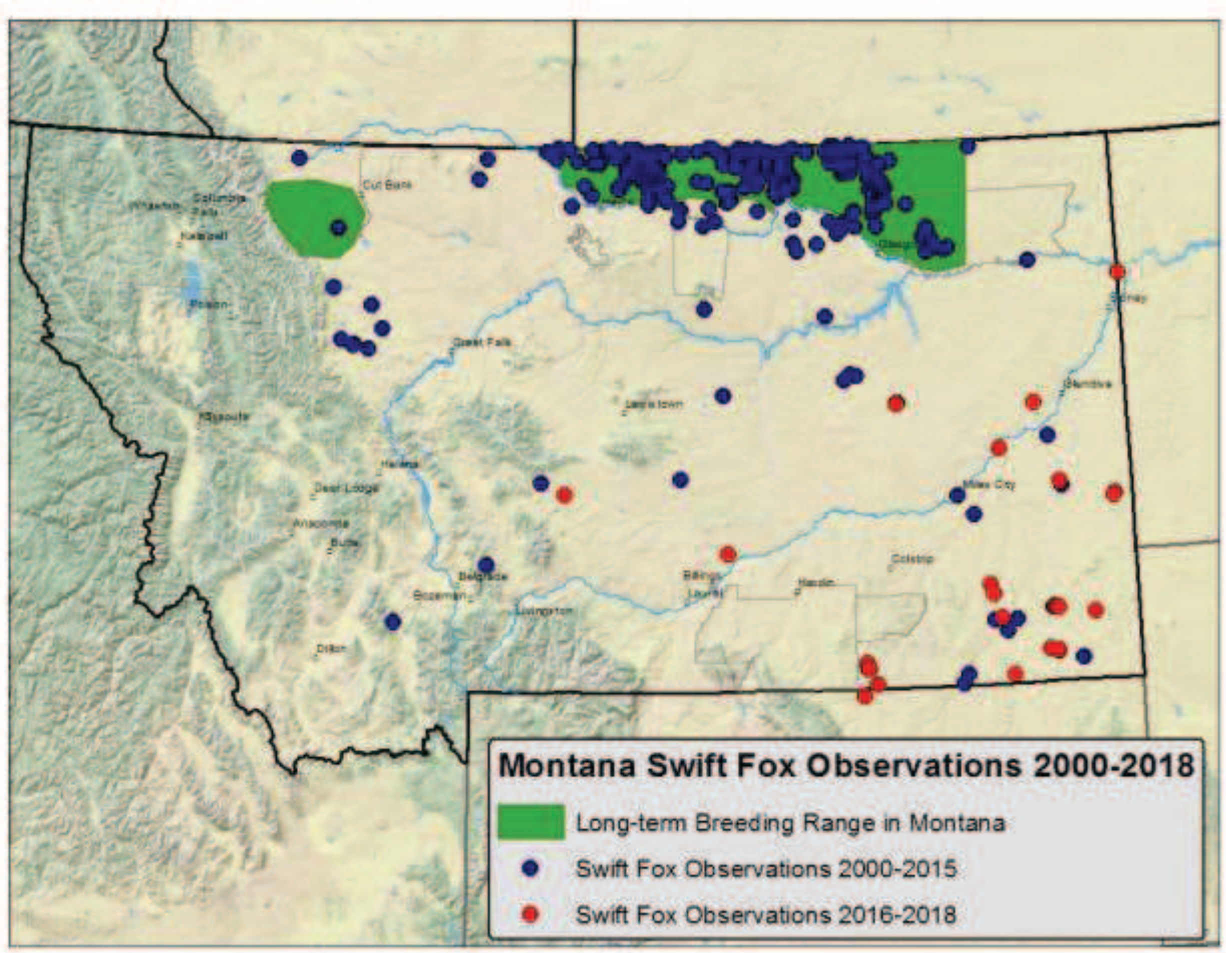


Figure 3. Swift fox long-term breeding range and observations in Montana, 2000-2018.



Three major swift fox population estimate surveys have occurred in Montana. 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 greatly from 1996-2006 and fox distribution increased significantly during that period also. Results from the 2014/2015 International Swift Fox Census indicate a significant (~25%) decline in fox numbers from the 2006 survey. The specific cause or causes of this decline are unknown. As stated in their report, "*Given perpetual growth in the distribution and abundance of the swift fox population from 1996 to 2006, it is difficult to determine if current levels constitute a dramatic decline from normal levels or whether 2006 densities exceeded the yet unknown carrying capacity of the reintroduced population. Moreover, mechanisms driving population reduction to 2014/2015 are difficult to infer. Reductions in abundance or localized distributions appeared uniform across the population, spanning jurisdictional boundaries and those of established western and eastern population clusters. Consequently, localized small-scale habitat loss, habitat degradation, poison use, or swift foxes* *harvested for fur in Montana cannot sufficiently explain population changes across the population*. The winter of extremely deep snow during 2010-2011 may have played a large role in this apparent decline (Moehrenschlager and Moehrenschlager 2018). A fourth international census is was conducted during summer and fall of 2018. Preliminary results suggest somewhat of an increase in swift fox distribution from the 2014-15 survey in Montana.

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

	1996	2000/2001	2005/2006	2014/2015
North- Central MT	.	221	523	347
AB and SK	281	656	647	523
Total	281	877	1,162	870

V. Priorities for Swift Fox Conservation in Montana

The following priorities and actions will help guide FWP and partners in conserving swift fox in Montana and contributing to the eight objectives of the SFCT. This strategy is intended to compliment the SFCT strategy while clearly prioritizing those objectives that Montana can affect. Priorities include:

1. **Identify and Map Swift Fox Habitat in Montana**
2. **Conserve Swift Fox Habitat and Movement Corridors**
3. **Monitor Swift Fox Distribution/Status**
4. **Increase Distribution of Swift Fox into Suitable, Connected Habitats**

Priority 1: Identify and Map Swift Fox Habitat in Montana

At present a gap in swift fox distribution occurs largely in southeastern and east-central Montana (Fig 1). Thus, Montana may play an important role in reaching the SFCT's objective #2 of maintaining swift fox in at least 50% of suitable habitats (depending on suitability of habitat or not in eastern Montana). While several efforts to identify and map suitable habitat have occurred, there are inconsistencies among these models. In addition, understanding the distribution and connectivity of suitable swift fox habitat is paramount to developing a statewide strategy for conserving and managing the species. Without this tool, it is difficult if not impossible to assess which areas should be prioritized for conservation efforts, including the relative benefits of individual sites where reintroductions could be beneficial. Therefore estimating, mapping, and ground-truthing swift fox habitat is the first objective for swift fox conservation in Montana.

Strategy 1A: Core Areas - Identify and Map Core Areas of Swift Fox Habitat.

Swift fox habitat can be generally described as areas of short-grass prairie where topographic, soil, and vegetative characteristics are conducive to swift fox being able to see and escape coyotes, a major source of swift fox mortality (Pruss et al. 2006). This generally translates to topographically flat areas with large expanses of short vegetation (approximately <6 inches) and soils suitable for burrowing. While this general pattern is known, requirements may vary between geo-physiographic areas. Requirements such as the amount and size of sagebrush and the degree of agricultural crops that swift fox can tolerate is unclear. These ambiguities indicate that species-specific habitat requirements need to be determined and mapped to understand where potential core areas for swift fox exist in Montana. Ground truthing should be undertaken no matter what data and method are used to predict core areas.

Strategy 1B: Connectivity - Identify and Map Connectivity of Swift Fox Core Habitats.

Dispersal of swift fox is critical for continuing to expand distribution and linking populations over the long term. Factors that inhibit or are barriers to dispersal are currently unknown. Identifying habitat features and mortality factors that limit or aid dispersal would be beneficial for mapping and prioritizing linkage zones among core areas. Major rivers are likely to be barriers to swift fox dispersal. This is because the breaking terrain may be avoided by fox or their survival may decrease in these areas. Notably, the Missouri River from Ft. Peck dam west to Ft. Benton, also the Milk river and Yellowstone river may be barriers to swift fox at varying degrees. While certainly not absolute, these barriers are likely significant enough to only allow occasional dispersers to pass as opposed to having a contiguous population. Determining habitat corridors will aid targeted habitat conservation efforts and identify areas that could potentially be improved or enhanced to become a functional corridor.

Priority 2: Conserve Swift Fox Habitat and Movement Corridors

Once core habitats and connectivity zones have been identified, resources must be directed toward conservation and management of these lands. Efforts should be directed primarily at occupied habitat and secondarily at suitable habitat. These efforts align with SFCT's objectives #4 and #5 – Identify and conserve existing native shortgrass and mixed-grass grasslands, and facilitate partnerships and cooperative efforts to protect, restore, and enhance suitable habitats within potential swift fox range.

Strategy 2A: Conserve Swift Fox Habitat on Private Lands

Efforts should be implemented to maintain interest and cooperation with private landowners. Federal and State programs should be implemented when possible to protect suitable habitat and enhance marginal habitat including corridors for dispersal. One program currently available that could benefit swift fox through grassland conservation efforts is the Montana's *Working Grasslands Initiative* (WGI; Appendix 3). The goal of the WGI is 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. Accomplishment of Priority 1 above will allow more specific and strategic habitat conservation as part of the *WGI*.

Strategy 2B: Develop Specific Swift Fox Habitat Management Guidelines

At present there are very few specific guidelines for managing or manipulating habitat to maintain or improve it for swift fox. Information on features that benefit or inhibit swift fox survival, reproduction, and dispersal needs to be developed and incorporated into habitat management guidelines.

Strategy 2C: Conserve Swift Fox Habitat on Public Lands

Work with land managers (i.e. BLM, DNRC, and FWS) and utilize federal and state programs available to ensure persistence of suitable habitat on public lands.

Priority 3: Monitor Swift Fox Distribution/Status

Swift fox are currently considered a species of concern (S3) in Montana. Monitoring swift fox populations is essential for gauging success of conservation actions, adapting population management, and identifying future needs. This priority aligns with the SFCT's objectives #2 and #3 – Maintain swift fox in at least 50% of suitable habitat, and periodically evaluate the status of swift fox populations.

Strategy 3A: Develop and Fund a Repeatable, Long-Term Population Distribution Survey Technique

Current and regularly occurring monitoring efforts include 3 main components: 1) the International Census that occurs every 5 years over a limited area of known distribution, 2) collection of location and sex/age data from harvested swift fox, and 3) compilation of anecdotal occurrence records, genetic, and other samples across the state (Appendices 1 and 2). While these activities do provide pieces of information that inform swift fox conservation in various areas of the state, they do not individually or collectively represent a consistent, range-wide depiction of distribution and status that would fully inform swift fox conservation and management. Therefore, the development and funding of a long-term repeatable survey technique that is feasible and effective to monitor population distribution and trends would help monitor existing populations and also evaluate the success of any conservation efforts.

Priority 4: Increase Distribution of Swift Fox into Suitable, Connected Habitats

The SFCT lists maintaining swift fox in at least 50% of suitable habitat as an objective. Priorities 1, 2, and 3 are steps toward achieving that objective and understanding Montana's status relative to the objective. Ideally swift fox populations will increase and disperse naturally and through habitat conservation efforts. However, if necessary, other efforts (i.e. reintroduction) can also be used to increase the distribution and abundance of foxes.

Strategy 4A. Foster Public Support for Swift Fox Expansion and Awareness of Habitat Programs

Develop citizen science projects that can engage the public and promote awareness of swift fox conservation and related habitat conservation programs such as the *Working Grasslands Initiative* (Appendix 3). Doing so should facilitate natural recolonization and potentially improve abundance.

Strategy 4B. Improve Core and Dispersal Habitat Quality on Public and Private Lands

Natural recolonization may be aided by implementation of habitat management guidelines identified as part of (Strategy 2B).

Strategy 4C. Expand Distribution of Swift Fox Via Strategic Reintroductions in Priority Areas

Reintroductions have been used for improving the distribution and abundance of swift fox in Canada, Montana, and South Dakota. Where suitable habitats are identified within Montana, additional reintroductions may accelerate increases in distribution and abundance of foxes if natural recolonization does not appear to be occurring at a significant rate. Areas should be prioritized strategically relative to their potential capacity for swift fox, connectivity with other core areas, and ability to facilitate further range expansion. Prioritization will allow more efficient use of available funding to yield the greatest benefit for swift fox conservation.

VI. Swift Fox Harvest Management

In areas that maintain a local self-sustaining population of swift fox across a Region or large portion of a Region, the following will help guide FWP in managing swift fox harvest. The basis for FWP recommending a limited harvest season for swift fox will be swift fox population status, public support, incidental take, and trapper interest. Harvest season recommendations will follow the established Fish and Wildlife Commission process for implementing any harvest season, which requires Fish & Wildlife commission approval and opportunity for public comment. All harvest season justifications describe:

1. The proposed season or quotas changes and a summary of prior history
2. Why is the proposed change necessary
3. What is the current population's status in relation to the priorities outlined in the Montana Swift Fox Strategy. In addition, a Population Viability Analysis (PVA) will inform persistence of a population under various harvest levels.
4. Provide information related to any weather/habitat factors that have relevance to this change (i.e., habitat security, hunter access, vegetation surveys, weather index, snow conditions, temperature / precipitation information).
5. Contacts made with individual sportsmen or landowners, public groups or organizations regarding this proposal and indicate their comments (both pro and con).

To inform sustainability of a population under various harvest levels, we will use a Population Viability Analysis (PVA) to inform harvest recommendations. A PVA is a modelling technique that uses survival and reproductive rates along with other population parameters taken from field research to predict the likelihood of a population to persist given variables impacting the population over time. The PVA analysis allows for variable harvest levels to be tested to understand population response to any harvest recommendation. An example is shown below for the only current swift fox population with a harvest management component in Montana at this time.

Northern Montana-Region 6 Population Viability Analysis:

We used Vortex 10.3.5.0 (Lacy and Pollak 2018) to model the effects of various allowable harvest levels on swift fox in Region 6. The model uses population parameters described by Moehrenschlager et.al. (2006), unless listed otherwise (Table 2). The parameters were also checked against peer reviewed literature (Ausband and Foresman 2007, Olsen and Lindzey, Kalmer et al. 2003) to ensure the most up to date and accurate information was included. We found Moehrenschlager et.al. (2006) to be the most conservative.

We adjusted the initial population size to the northeast Montana segment of the international census of 2014-15 (Table 2; Moehrenschlager and Moehrenschlager 2018). The population estimate from the 2014-15 international census was 346.9 +/- 79.5 (Moehrenschlager and Moehrenschlager 2018). We therefore ran the PVA's with the initial population size of 347. In addition, to ensure we examined the potential impacts of harvest in a very conservative manner, we also used the lower confidence interval of the estimate as a starting point, i.e., 266 (347-80).

We did not include natural catastrophes for this PVA. The purpose was to see how differing levels of harvest affect the population. We do recognize that disease outbreak and extreme weather conditions can affect the population. If those factors are determined to be significantly influencing the population, this information will come to bear on harvest level decisions. We are currently collecting samples from trapper harvested swift fox to test for disease prevalence, including parvovirus and canine distemper. We are also conducting blood draws opportunistically, as other needs/research require fox to be live trapped. Disease outbreaks tend to be patchy and genetic exchange occurs more north and south (Canada to Montana) with limited gene flow east and west suggesting that if a disease outbreak occurred, it would likely not affect the entire population (Cullingham and Moehrenschlager 2013). However, if collected samples suggest significant mortality we will act appropriately and adjust the harvest. Severe winters and potentially multiple years of extreme drought may have negative effects. It is important to recognize that this population was reintroduced 36 years ago in 1983 and has likely encountered severe weather conditions (i.e. severe winter of 2003-04 and 2010-11, drought of 2017) and therefore are accounted for in some of the above parameters and the initial population estimate. Swift fox have the reproductive potential to bounce back from “reduced populations” under favorable conditions since they can breed at 1 year and have large litters.

Carrying capacity (k) is expected to be closer to 1000 as predicted by Rauscher in the initiation of the 2010 trapping season. However, to ensure we made conservative estimates, we reduced the carrying capacity to 500 for our modeling. This was the population estimate from the 2005-06 International Census (Moehrenschlager and Moehrenschlager 2006) therefore it is known that at least this number can be sustainably supported. We also used the WWF habitat suitably model (Olimb and Bly 2015) and calculated that 500 fox could be supported using the top 12% of habitat classified as highly suitable, within the swift fox census area. This was calculated with the average home range size for one fox as 1371 acres. This is extremely conservative since ranges do overlap, especially between males and females.

We ran the PVA at harvest intervals increasing by 10 starting with 0 harvest up to 100. We used harvest metrics from harvested swift fox from 2011 -2017 and determined ratios of 50/50 juveniles to adults and 64/36 males to females (n=77). These ratios were used for each harvest scenario, rounded to the nearest whole number (i.e. harvest of 10 = 2 Juvenile Females, 2 Adult Females, 3 Juvenile Males, 3 Adult Males).

The model ran 500 iterations and predicted the probability of extinction in 100 years. This model assumed harvest quotas would not be adjusted within the 100-year time period.

Table 2: VORTEX input values for swift fox PVA model for the northeast Montana swift fox population.

Number of iterations:	500
Number of years:	100
Extinction definition:	Only one sex remaining
Number of populations:	1 (based on connectivity information in Moehrenschlager and Moehrenschlager (2001, 2006)
Inbreeding depression:	No
Concordance between environmental variation in reproduction and survival:	No (No evidence that reproduction and survival are linked)
Number of catastrophes:	0 *
Age of first offspring:	1 year (both sexes)
Maximum age of reproduction:	9 years for females; 13 years for males
Maximum litter size:	8
Density-dependent reproduction:	No
Percent adult females breeding:	85%: as reported in Moehrenschlager et al. (2004)
Distribution of litter size:	Numbers of pups and relative frequencies based on 29 observed litters: - 1(6.8%); 2 (20.7%); 3 (13.8%); 4 (31%); 5 (13.8%); 6 (3.4); 7 (6.9); 8 (3.4) (Moehrenschlager unpubl. data)
Mortality:	Density-dependent (No evidence of density-dependent mortality. However, to be conservative, density-dependence is used in the model.)
Annual Adult survival:	0.38 – 0.52
Juvenile survival:	0.5 – 0.63
Monopolization of breeding:	100%
Initial Population Size:	266, 347 (only includes Montana population from 14/15 census population estimate)
Carrying capacity (K):	500
Harvest:	Variable, 0-100/year
Supplementation:	None

PVA results

The existing Montana population is robust to low to moderate levels of harvest when modeled using the program Vortex 10.3.5.0 (Lacy and Pollak 2018; Table 3). The probability of extinction was zero for each scenario until harvest reached 50 fox per year with an initial population of 266, or harvest reached 60 per year with an initial population of 347. In these scenarios the probability of extinction was low, at 0.01. The population persisted with low risk of extinction (<0.10), until a harvest of 80 with an initial population of 266 or a harvest of 100 with an initial population of 347. This represents 30% and 29% of the population being harvested. The ability to tolerate harvest is largely due to the fact that swift fox are relatively prolific; early age at first reproduction and the potential for large litters allow swift fox to incur fairly high levels of mortality.

We were extremely conservative in all aspects, consequently, even if there is a significant error associated the estimated northeastern Montana population, the population is predicted to be robust if the swift fox population continues to have the same demographic parameters that have characterized the population. This suggests that a minimal harvest has little effect on the population viability.

Table 3. Swift fox population viability analysis results under varying levels of harvest for Northern Montana, Region 6 using program Vortex 10.3.5.0. Carrying capacity was set at 500 for all runs. Initial population sizes based on the Montana portion of the 2014-15 International Census estimate (347) and lower confidence interval (266).

Initial Population Size (n)							
n = 347				n = 266			
Harvest Level	Probability of Extinction	r	SDr	Harvest Level	Probability of Extinction	r	SDr
0	0.00	0.34	0.18	0	0.00	0.34	0.18
10	0.00	0.33	0.18	10	0.00	0.33	0.18
20	0.00	0.31	0.18	20	0.00	0.32	0.18
30	0.00	0.30	0.19	30	0.00	0.30	0.18
40	0.00	0.29	0.19	40	0.00	0.29	0.19
50	0.00	0.25	0.20	50	0.01	0.28	0.19
60	0.01	0.26	0.19	60	0.02	0.26	0.19
70	0.01	0.26	0.18	70	0.03	0.25	0.20
80	0.07	0.22	0.20	80	0.25	0.22	0.20
90	0.05	0.24	0.20	90	0.35	0.20	0.20
100	0.48	0.17	0.21	100	0.69	0.16	0.22

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Appendices

A1. MFWP Swift Fox Sampling Protocols – DNA, Blood/Disease Samples, Necropsy
A2. MFWP Protocol for Recording Swift Fox Observations/Locations
A3. Montana's *Working Grasslands Initiative*

Appendix 1

MFWP Swift Fox Sampling Protocols – DNA, Blood/Disease Samples, Necropsy

Swift Fox Sampling 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 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) to 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 1 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 of Swift Fox

- 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 developing 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

MFWP Protocol for Recording Swift Fox Observations/Locations

MFWP Protocol for Recording Swift Fox Observations/Locations

January 2017

Management of statewide swift fox observations

FWP will manage swift fox observations across the state using OneDrive. This program will organize information in a central location and allow biologists to access information, input their own data, and stay current on statewide occurrences of swift fox. These observations will be shared with the Montana Natural Heritage Program annually by January 15th, making them accessible to other land and resource management agencies within the state.

How to Access OneDrive

To use OneDrive for swift fox observations, personnel will receive an email with a link to a folder containing swift fox observations on OneDrive and an invitation to share that folder. Only authorized personnel (biologists given access to that folder on OneDrive) will be able to access and edit information in this folder. Personnel can be granted access by contacting the FWP Carnivore-Furbearer Coordinator.

Once the invitation is received, clicking on the link will redirect you to OneDrive. Enter your credentials (CF# and password) and the webpage should bring you directly into the 'Swift Fox' folder. Another way to access these folders is to open a web browser and type www.office.com. In the upper right corner, there will be a link to sign in. Click on that and type your email address (i.e. jdoe@mt.gov), this should redirect you to a site where you'll need to select 'Continue to fedservice1.mt.gov'. This will redirect you to a sign-in page that will require your CF# and password. Once you are signed in, you'll need to select the OneDrive App. This will bring you to your OneDrive site where you can manage your own files or shared files. To access the swift fox data, you 'll need to select 'Files Shared with Me' and click on the 'Swift Fox' folder. Figure 1 is what should appear on the web browser.

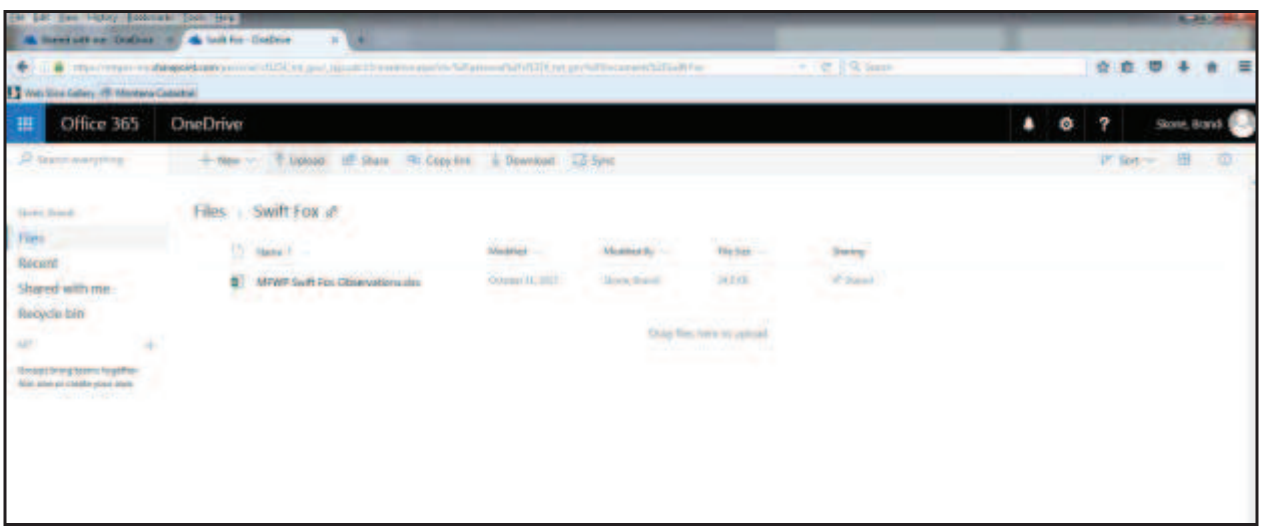


Figure 1. Contents of the 'Swift Fox' folder on OneDrive.

How to Add/Delete Swift Fox Observations

Once you are in the 'Swift Fox' folder, you should have access to the excel document, 'MFWP Swift Fox Observations,' (Figure 1). After clicking on that file, you will be redirected to a web version of the document and have access to statewide swift fox observations. To add additional observations or edit existing observations, click edit document (Figure 2). You'll have the option to 'Edit in Excel' or 'Edit in Browser.' Both options will allow you to edit the document and share with the group.

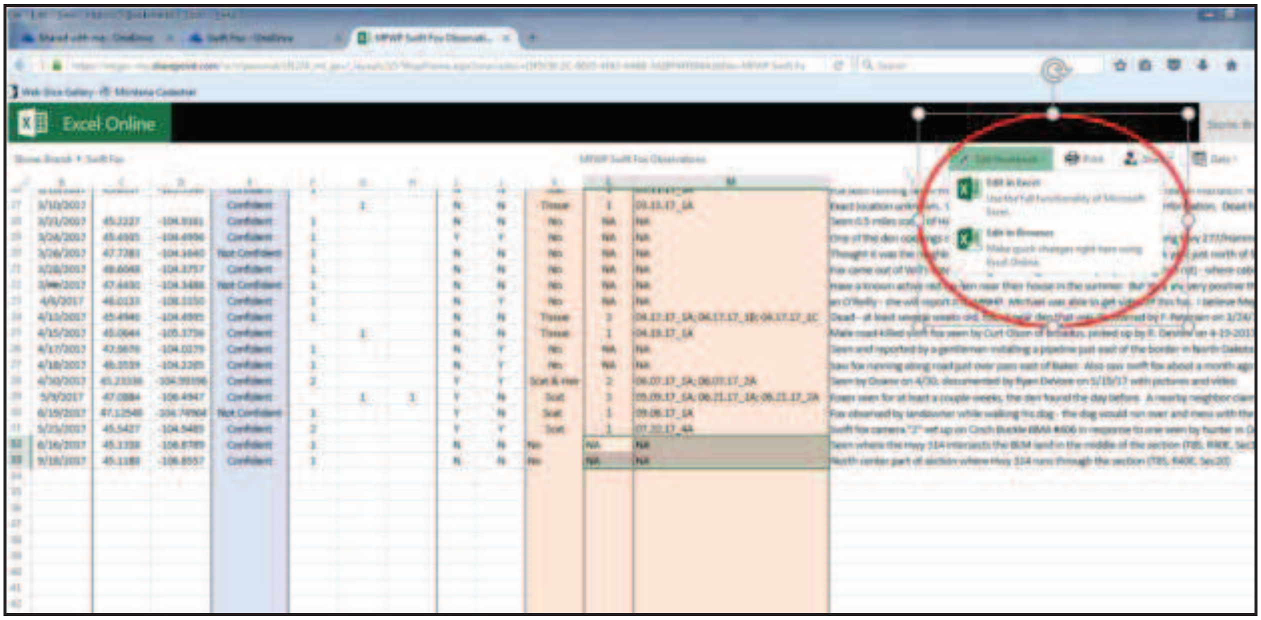


Figure 2. How to edit the swift fox observation datasheet in OneDrive.

If you choose the 'Edit in Excel' option, the document will open in the Excel program on your computer. You can make changes to existing entries or add new ones. The program will automatically save any changes that are made to the document. In the upper-left corner you should see Auto-save switched to the 'On' function (Figure 3). You will also see within the headline of the document, next to the title, that it is 'Saving changes to OneDrive.' After you make all necessary changes/additions, wait until the headline reads, 'Saved changes to OneDrive' next to the title. Then you can close the document.

If you choose the 'Edit in Browser' option, the document will open right in your web browser with a format similar to what you would see in Excel. This option is ideal if you are using a tablet or cell phone that does not have the Microsoft Office Programs (i.e. Excel) installed. This will also allow you to make changes directly to the file in your web browser. Again, it will automatically save any changes that are made to the document.

These changes will be saved and made accessible to other users immediately. If you need to alert the group to a recent addition/change, you can click 'Share' on the top right corner and specify which people to notify. This will send an email out with the notification and a link to access that folder.

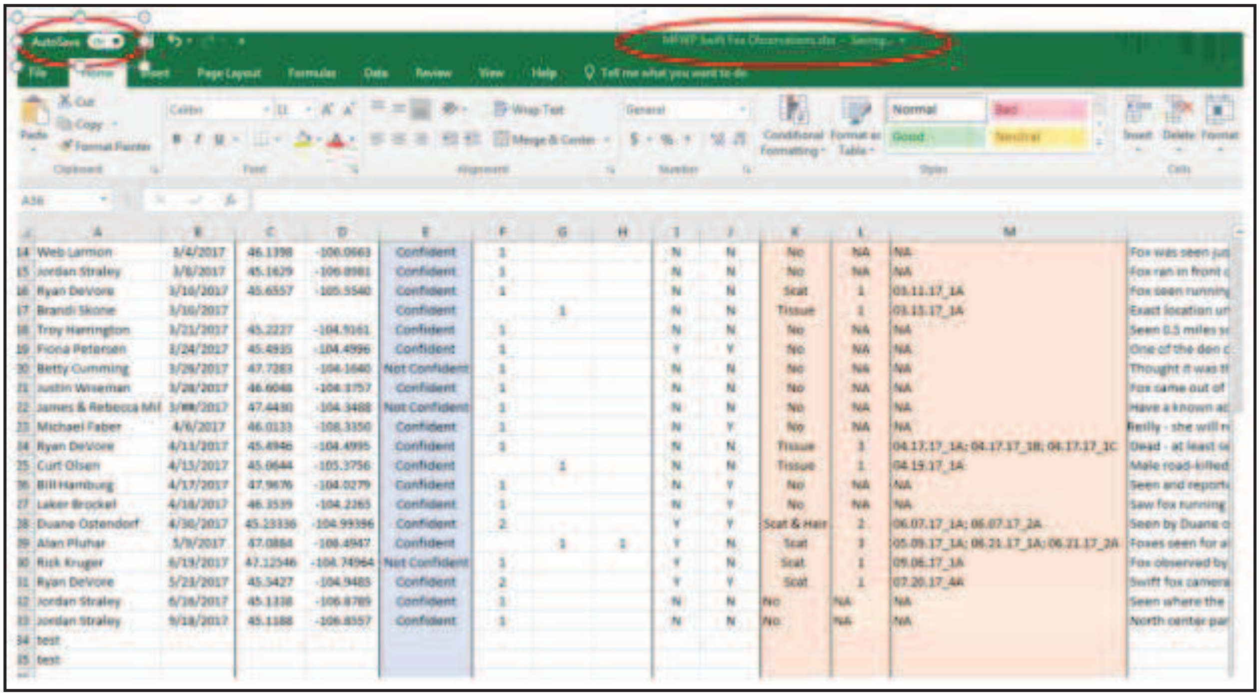


Figure 3. When the document is opened in Excel using OneDrive, the AutoSave feature will automatically save any changes that are made. You will also see a script next to the title that alerts you when it's 'Saving' the document and when the changes have been 'Saved to OneDrive.'

Appendix 3

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:

Grassland protection:

- Conservation leases
  - 30-year agreement to maintain existing native habitat*
  - 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.)
  - One-time payment, flat rate/acre
- Conservation easements
  - Perpetual agreement, includes range management plans*
  - Payment based on Fair Market Value

Grassland enhancement/maintenance:

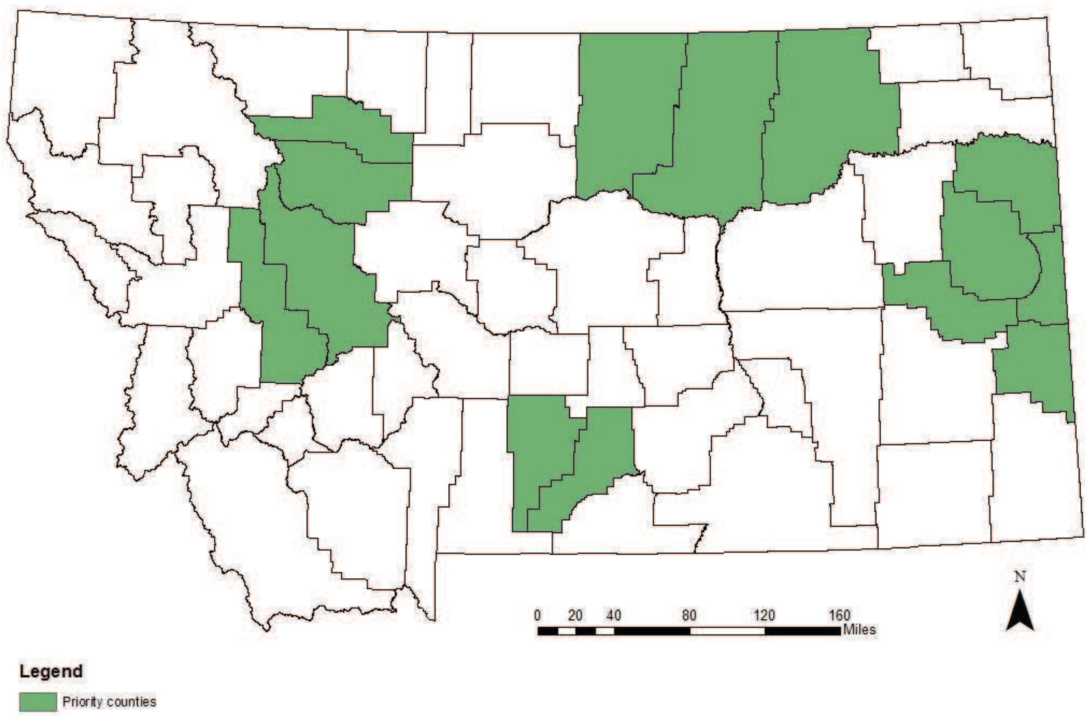
- Range infrastructure cost-share
  - Transition marginal cropland or expiring CRP to grass-based agriculture
  - Up to 75% cost-share on fencing, water supply, etc.
  - Can be in cooperation with other conservation efforts
  - Term agreement to maintain infrastructure*

Grassland restoration:

- Native grassland restoration cost-share
  - Case-by-case basis
  - Up to 75% cost-share on seeding, etc.
  - Usually in cooperation with other conservation efforts
  - 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).

Working Grasslands Initiative

A non-regulatory, incentive-based strategy to guide Montana Fish, Wildlife and Parks' grassland conservation efforts in partnership with private landowners and other conservation cooperators

March 17, 2017

FWP's *Working Grasslands Initiative* is a 5-year special initiative designed to retain and enhance grasslands by targeting and leveraging voluntary, incentive-based programs for private landowners. Implementation of this guide will help to achieve conservation targets identified in Montana's State Wildlife Action Plan.

Table of Contents

Introduction

Globally, grasslands are the least protected and most altered of all major plant communities. Across the Great Plains, approximately 27.2 million acres of grassland have been converted to other uses, primarily cropland between 1950 and 1990 (Claassen et al. 2011). In eastern Montana, 32% of historical native grasslands have been broken or significantly altered (Pearson and Martin 2012). Conversion of the most productive remaining grasslands in Montana continues at an average of 9,455 acres per year (USDA Farm Service Agency, unpubl. data, 2005-2009). At this rate, eastern Montana could lose an additional 280,000+ acres (7,000 mi^2) of native grasslands in the next 30 years. Concurrently, native grassland birds are suffering the steepest and most consistent decline of bird assemblages on the continent; 75% of grassland bird species are showing significant declines (Sauer et al. 2014). Birds that breed on the grasslands of the Northern Great Plains and winter in central Mexico are showing exceptionally steep declines, up to 70% loss since 1970 (North American Bird Conservation Initiative 2016). Despite ongoing grassland conversion, Montana still boasts some of the last vestiges of native prairie in the United States. Northern breeding grassland birds, such as Sprague's Pipit and Baird's Sparrow, depend on Montana's remaining intact grasslands, especially areas with higher proportions of grass at the landscape scale (Lipsey 2015). Breeding waterfowl, sharp-tailed grouse, pronghorn antelope, black-tailed prairie dog, swift fox, and other prairie wildlife species also depend on intact grass landscapes. Clearly, to conserve Montana's grassland-dependent wildlife species, it is imperative to conserve the grassland habitats on which they depend.

Montana Fish, Wildlife and Parks is poised to provide state-wide focus and coordination to grassland conservation through the implementation of Montana's State Wildlife Action Plan (SWAP; 2015). State-based action plans have been completed by state fish and wildlife agencies, in part, to help prevent future Endangered Species Act listing petitions and decisions. Montana's SWAP characterizes 20.9% (30,724 mi^2) of Montana's landscape as lowland/prairie grassland and 7.4% (10,841 mi^2) as montane grasslands. Cumulatively, over one quarter of Montana's landscape supports habitat for grassland associated wildlife species, yet these community types are identified as Tier 1 communities or Communities in Greatest Need of Conservation. There are 27 Montana Species of Concern directly associated with lowland/prairie and intermountain grasslands (Appendix A). The intent of this strategy is to provide targeted guidance for implementing SWAP objectives and strategies for these particular community types and assessing the success of these actions. Most of the guidance for crafting this strategy is based on research from prairie breeding bird species (e.g., passerines, grouse, waterfowl) because landscape-scale habitat requirements of these species make them likely surrogates for other prairie species (e.g., Great Plains toad, shrews, bats, and snakes). Sage-grouse and the associated shrub-steppe system are addressed through other efforts and are not included here except by reference.

Many of Montana Fish, Wildlife and Parks' partners have developed planning tools and strategies to help advance prairie conservation. Some examples are Partners for Fish and Wildlife program focal areas, Prairie Pothole Joint Venture spatial planning tools, and World Wildlife Fund's plow print map and focal counties. These worthwhile endeavors have fed some of the ideas and concepts contained in this document; however, these strategies focus on a subset of grassland species and/or a different geographic scope than the state. FWP's strategy (this document) is designed to compliment these existing efforts with a specific focus on grasslands and a state-wide perspective.

Without a doubt, the most important partner for grassland conservation is Montana's private landowner. It is a testament to the excellent stewardship by Montana's private landowners that Montana maintains the greatest proportion of native grasslands in the Northern plains, as ~78% of Montana's grasslands are in private ownership. This strategy provides voluntary, non-regulatory, incentive-based options to help willing landowners maintain viable agricultural operations while also maintaining important wildlife habitat. It will take all of these efforts involving private landowners, agencies, non-governmental organizations, and partnerships, cumulatively, to affect the grassland landscapes of Montana.

The overarching goal of this strategy is **to provide for viable populations of grassland-associated wildlife by providing voluntary, non-regulatory conservation tools to private landowners interested in retaining and enhancing Montana's native grasslands through working lands agriculture**. Our objectives are to:

1. Work with private landowners and other partners to protect existing resources 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 State Wildlife Action Plan objectives in cooperation with private landowners and other conservation partners.

This strategy is drafted in a linear form. However, application is intended to be iterative, with each step informing the other steps. FWP and interested partners can help to advance grassland conservation by facilitating research, monitoring, and program implementation at any step in the strategy.

Section 1. Threats – What is driving habitat loss and change?

Conversion to cropland agriculture

The rich soils and ephemeral wetlands of the prairie grasslands provide high quality habitat for migratory songbirds, waterfowl, pronghorn antelope, swift fox, and an array of other species. It is these rich soils, however, that makes the area attractive for tillage and crop production. Plowing of native prairie began in the late 1800's with Euro-American westward expansion and the rate of conversion has accelerated in recent years. In the 10 years between 1997 and 2007, approximately 1% of the Northern Great Plains was converted to cropland agriculture (Claasen et al. 2011). Conversion rate doubled to 2% from 2009 – 2015 (Gage et al. 2016). Crop insurance, disaster assistance, and other agricultural subsidies are making conversion more attractive to landowners by providing a safety-net to risk (Classen et al. 2011). The socioeconomic demand for biofuels and rising commodity prices are also encouraging conversion (Lark et al. 2015). Montana boasts some of the largest, most intact remaining grassland habitat in the nation, yet conversion, primarily to wheat, is threatening these remaining grasslands (Figure 1). This loss of native prairie is the greatest threat facing Montana's grassland wildlife species.

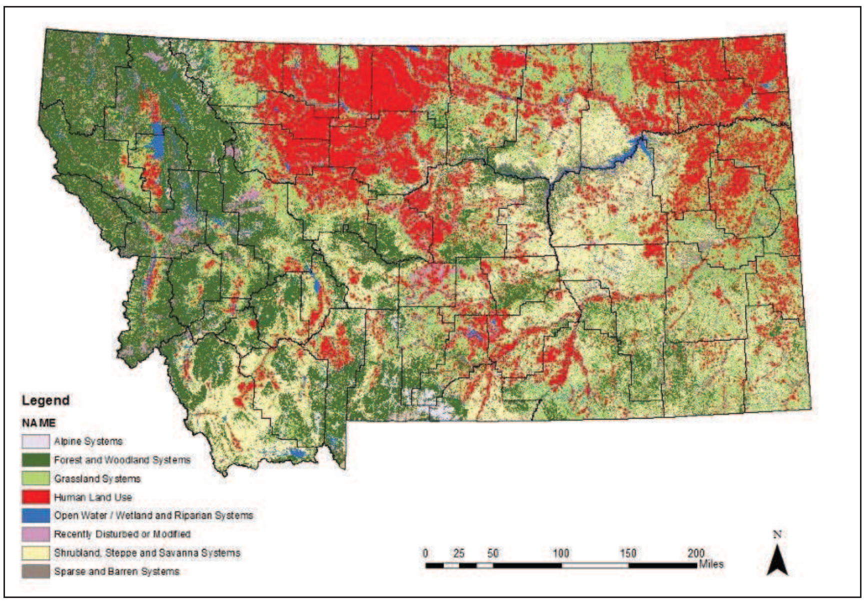


Figure 1. Existing human land use (in red), which is primarily cropland agriculture, is interspersed throughout native grasslands (in light green) in Montana. Expansion of cropland will result in additional grassland losses. (Source: Montana Land Cover Database)

Loss of Conservation Reserve Program (CRP) Acres

The Conservation Reserve Program (CRP) was initiated in 1985 to provide annual rental, cost-share, and in some cases incentive payments to landowners to establish perennial cover on marginal croplands. Contracts are for 10 – 15 years. Enrollment in CRP peaked in Montana in 2006 with almost 3.5 million acres in the program. However, a national limit on CRP acres and increased commodity prices has led to a 57.2% decline in CRP acres in Montana by 2015. Most of the lands expiring from CRP are returned to cropland agriculture. There are currently less than 1.5 million acres of lands remaining in CRP in Montana, 2/3rd of which will expire within the next 5 years (www.fsa.usda.gov).

Benefits of CRP lands to wildlife have been well documented in the Dakotas and include higher duck nesting success (Reynolds et al. 2001), higher densities of grassland songbirds (Johnson 2000), and improved pheasant reproduction (Matthews et al. 2007) on CRP lands than croplands. In Montana, some grassland birds do not appear to use CRP lands planted in non-native cover such as crested wheatgrass at the site scale, indicating that restoration of these stands is a conservation need (M. Sather, pers. comm.). However, CRP lands that are embedded in or adjacent to larger blocks of intact grassland habitat are important for helping to provide landscape scale wildlife habitat regardless of vegetative cover type at the local scale. The end result of returning CRP lands to cropland agriculture is habitat loss for prairie dependent wildlife species.

Energy Development and Associated Infrastructure

Oil, natural gas, coal bed methane, and other non-renewable energy resources are found under Montana's rich grasslands (Figure 2). New development of these resources is closely tied to global supply and demand economics, meaning energy development pressure will continue to ebb and flow in the future. Renewable energy interests, such as wind and solar, are also targeting Montana's grassland for potential development locations (Figure 3). Roads, well pads, tall structures such as transmission lines and wind turbines, and other infrastructure associated with energy extraction fragment existing grasslands.

The influence of energy development on prairie wildlife species is not well understood. However, many bird species associated with grassland or shrub-steppe habitats are sensitive to patch size or fragmentation (Freemark et al. 1995, Johnson and Igl 2001, Winter et al. 2006). Nest and brood predators are also more likely to be successful where there is more edge habitat, an outcome of fragmentation (Faaborg et al. 1995). Wind turbines can cause direct mortality of birds and bats in addition to fragmentation (USFWS 2012). Tall structures on the landscape, including wind turbines, powerlines, and cell towers, also create perches for raptors and can lead to a functional loss of habitat resulting from avoidance behavior by prey species (Ellis 1985, Bayne and Dale 2011, Hagen et al. 2011).

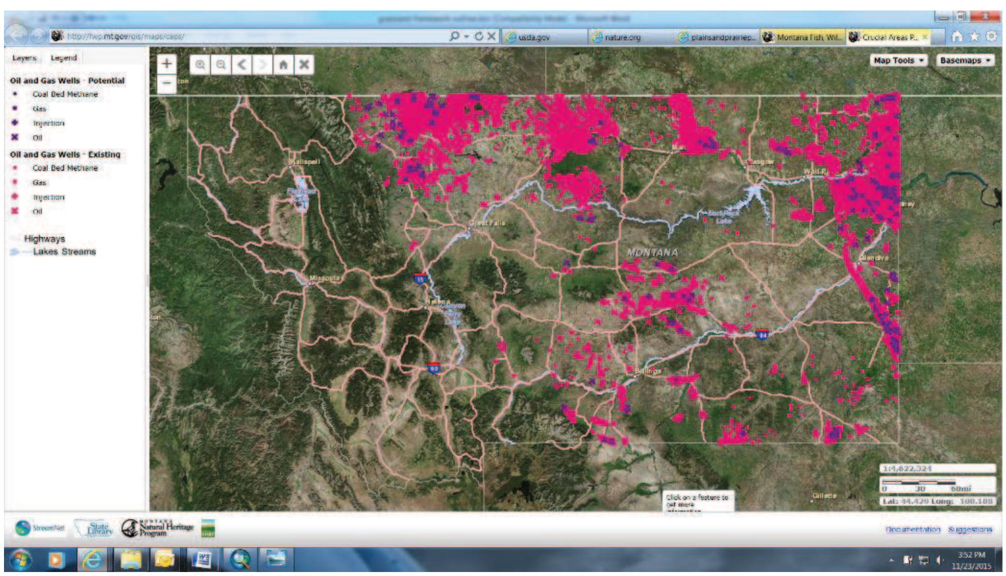


Figure 2. The location of existing and potential nonrenewable energy development in Montana is strongly correlated with converted and existing grasslands. Thus, the impact of energy development will be most strongly felt by Montana's prairie wildlife species. (Source: Department of Natural Resources and Conservation)

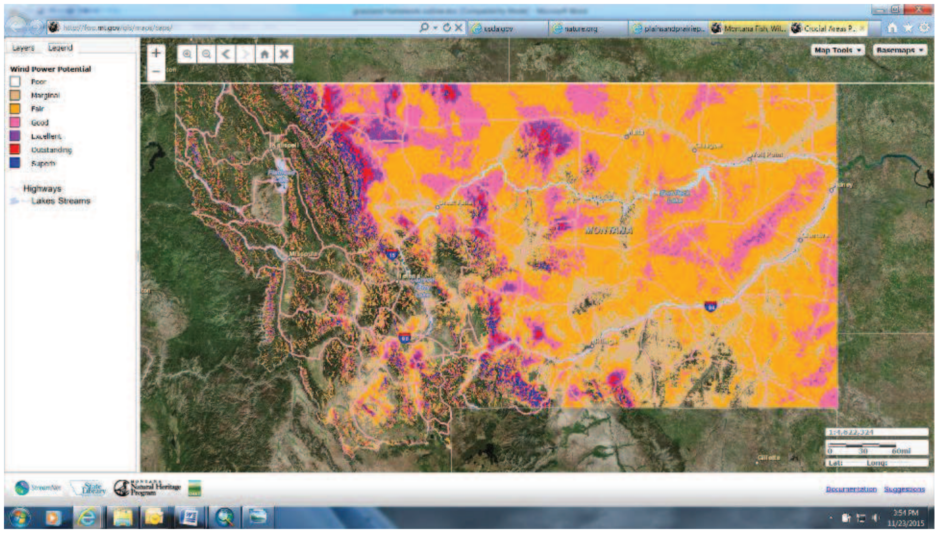


Figure 3. Wind power potential in Montana is relatively high throughout eastern Montana; new wind development will likely impact prairie and shrub-steppe wildlife species. (Source: www.windpower.org)

Subdivision Development

There are almost 1 million people living in Montana as of 2015 (www.census.gov). The human population of Montana has been growing by an average of 0.7%/year for the last 5 years. This means that although Montana is 44th in the nation for number of people, it is roughly 22nd in the nation for recent population growth. Subdivision development in Montana will continue to expand, as economics allow, accommodating the growing number of people in the state. While subdivision development can have positive economic impacts on local communities, it can also fragment large blocks of wildlife habitat, create barriers to animal movement, increase disturbance to native wildlife (e.g., traffic, pets), increase the prevalence of invasive plant species, and degrade water quality and natural stream processes (Montana Fish, Wildlife and Parks 2012).

Invasive Species

Invasions of exotic plant species, such as crested wheatgrass (*Agropyron cristatum*) have degraded rangelands across the northern Great Plains (Vaness and Wilson 2007). Some grassland birds avoid exotic vegetation (Lipsey 2015) or have lower reproductive and survival rates in exotic vegetation (Fisher and Davis 2011). Woody trees can invade prairie systems or be planted as wind breaks and pheasant winter cover. Trees on the prairie can facilitate avian nest predators and result in decreased nesting densities (Ellison et al 2013). Japanese brome (*Bromus japonicus*) and Kentucky bluegrass (*Poa pratensis*) are invasive grass species found in the montane grasslands of the Rocky Mountains (Stohlgren et al. 1999).

Changing Climate

Over the next century temperature increases of 4-8°F are possible for the northern Great Plains (U.S. EPA 2015; Figure 4). Increased precipitation in winter and spring months is predicted for the northern U.S. but precipitation is not expected to increase during the hot summer months (Figure 5). Snow pack is expected to decrease by 15% nation-wide which can lead to water shortages for irrigation (U.S. EPA 2015). Changes in the timing and amount of precipitation along with warming temperatures can have significant implications for the resilience of prairie vegetation and associated wildlife species. Moisture levels during the breeding season are an important factor influencing the distribution and abundance of birds on the Northern Great Plains (Niemuth et al. 2008). Over 21% of North American birds are considered climate endangered, which means they are projected to lose more than half of their current range without the potential to expand in to new areas by 2050 (Langham et al. 2015). Climate endangered species native to the northern prairie include species with currently declining populations such as Baird's sparrow, chestnut-collared longspur, McCown's longspur, and Sprague's pipit, and grassland species with more stable numbers such as long-billed curlew, golden eagle, short-eared owl, and prairie falcon. In general, bird species distributions are expected to expand northward during the breeding season with more species lost than gained from the northern prairie. The prairies, however, may become more important for birds during the non-breeding season (Langham et al. 2015).

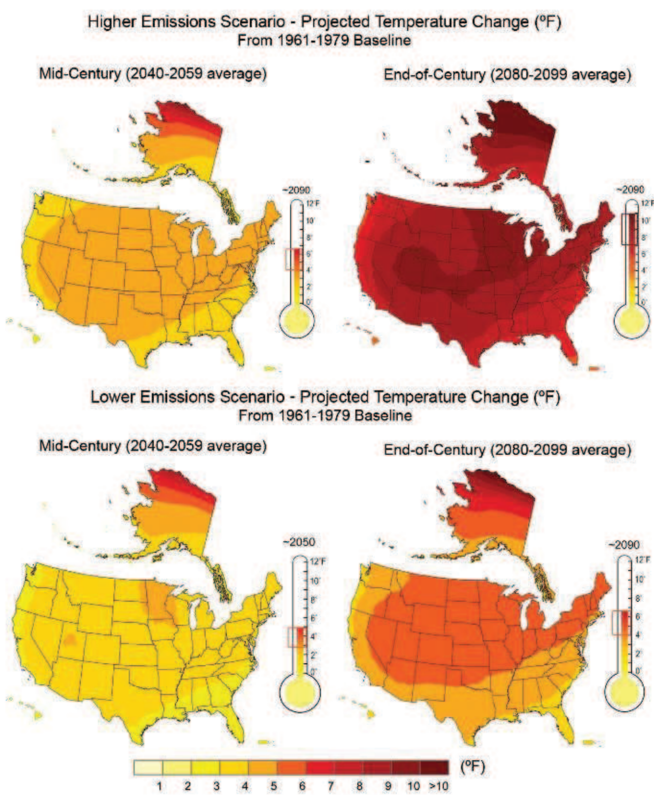


Figure 4. Temperature is expected to increase over the next century throughout the U.S. under all emission scenarios. (Source: U.S. EPA 2015).

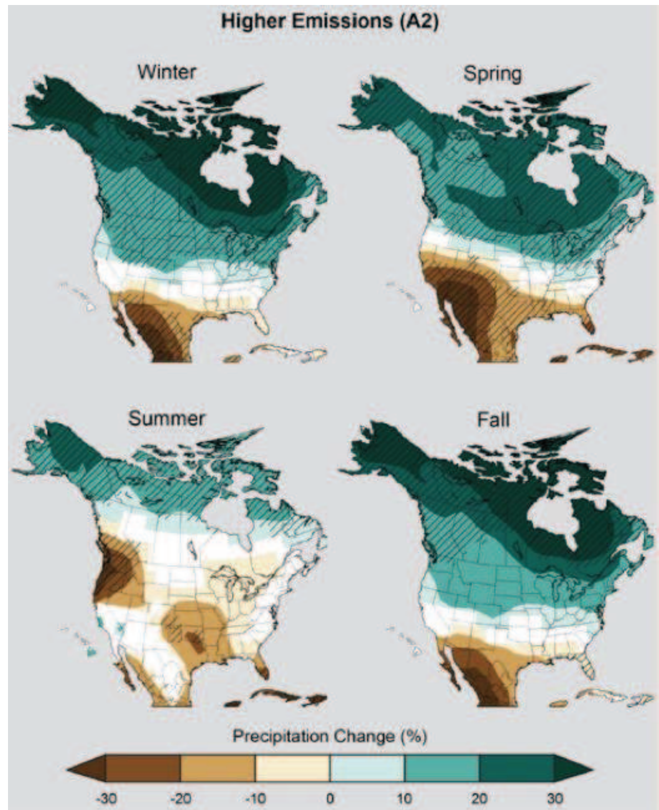


Figure 5. Predicted precipitation change over the next 100 years. Areas with hatching indicate higher confidence in model predictions, meaning there is high confidence of increased precipitation in winter and spring in Montana. (Source: U.S. EPA 2015).

Section 2. Conservation Approach – Where do we need to work? What do we need to do?

Grassland Priority Counties

Native grasslands, especially those in larger, intact landscapes, provide the most benefits to grassland birds (Freemark et al. 1995, Askins et al. 2007, Lipsey 2015) and other wildlife. We identified priority counties with relatively more grassland landscapes that are likely important to the long-term persistence of grassland wildlife.

We used the Montana Land Cover Database to map the location of prairie and montane grasslands in Montana (30-m resolution; Figure 1). It was important to scale up the 30-m grassland pixels to identify larger landscapes with abundant grass and to protect landowner privacy. Waterfowl and grassland birds have higher nest success and occupancy rates with higher proportions of grass on the landscape, respectively (Thompson et al. 2012, Lipsey 2015). In the case of grassland birds, the strongest association was at larger scales (Lipsey 2015). Based on Lipsey's research, we calculated the percent of grass on the landscape within 7.5" geographic quadrangles (~70 mi^2). Quadrangles (quads) with 50% or greater of grassland were identified as priority landscapes (Figure 6).

We then scaled the priority landscapes up to focal counties that were more meaningful from an implementation perspective. Federal (NRCS), state (DNRC), and local (Conservation districts) entities work at county scales. Statistics are also often available on human population, economic, and agricultural trends at this scale. Therefore, we identified counties with higher number of priority grassland quads as our focal counties (Figure 6). Counties were excluded if the priority grass areas were exclusively on tribal lands, as the sovereignty of tribal governments makes it difficult to focus state agency actions in these areas. The Mission Valley in northwestern Montana has many federal and private in-holdings within Confederated Salish and Kootenai lands so it was not excluded.

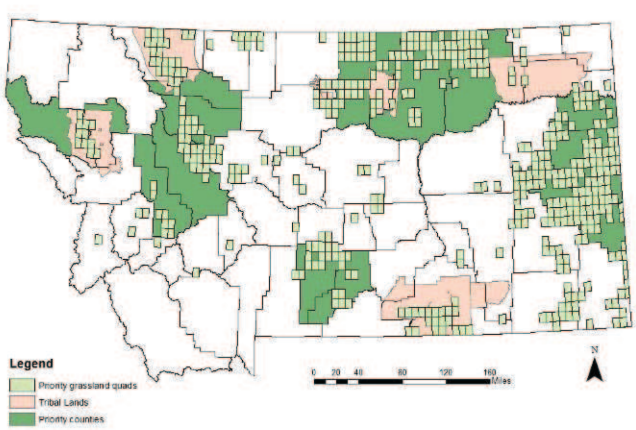


Figure 6. Priority county distribution is shown with grassland quadrangles (7.5") and tribal lands.

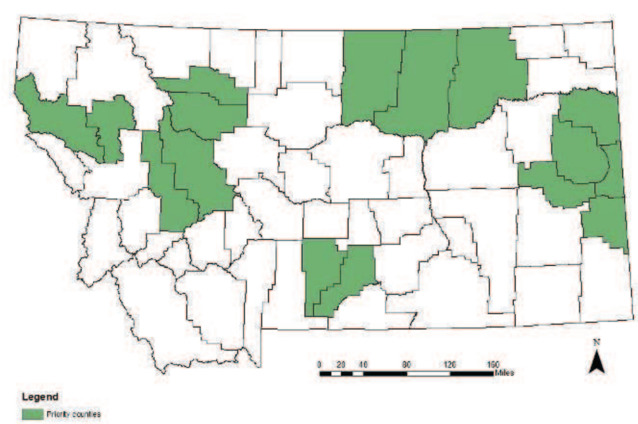


Figure 7. Priority grassland counties for targeting grassland conservation in Montana.

Our final 14 priority counties are distributed across the state (Figure 7). Cumulatively these counties cover 26 million acres, 9.7 million acres of which are grasslands (37%; Appendix B). Approximately 85% of grasslands in these priority areas are in private landownership, emphasizing the critical role of private landowners in grassland conservation.

Priority counties overlap with other currently available conservation planning tools relatively well. The Prairie Pothole Joint Venture optimal habitat map for priority bird species overlays many of our priority counties (Figure 8). The Montana Natural Heritage Program's maps of habitat suitability for Sprague's pipit, which are a grassland Species of Concern, show the majority of moderate and high suitability habitat for Sprague's pipit are in our priority counties (Figure 9).

Grasslands are also found in association with sagebrush steppe systems in Montana. These sagebrush-grassland habitats are not the focus of this strategy, in part, because resources are already targeted in these areas through on-going sage-grouse conservation efforts. When sage-grouse Core Areas and priority grassland counties are combined, the majority of Tier 1 focus areas in Montana's SWAP are captured (Figure 10). The resulting maps demonstrate how this grassland strategy compliments existing conservation efforts and when applied in coordination with other efforts should help deliver Fish, Wildlife and Parks' conservation goals.

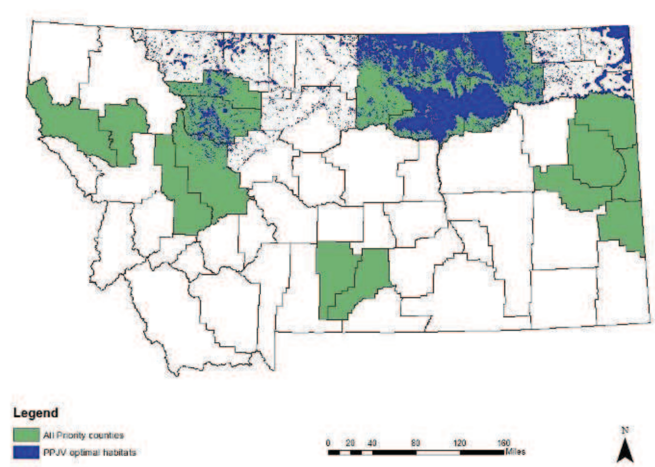


Figure 8. Prairie Pothole Joint Venture optimal habitats overlay relatively consistently with our priority grassland habitats. (PPJV models were only produced for the Prairie Pothole region of Montana).

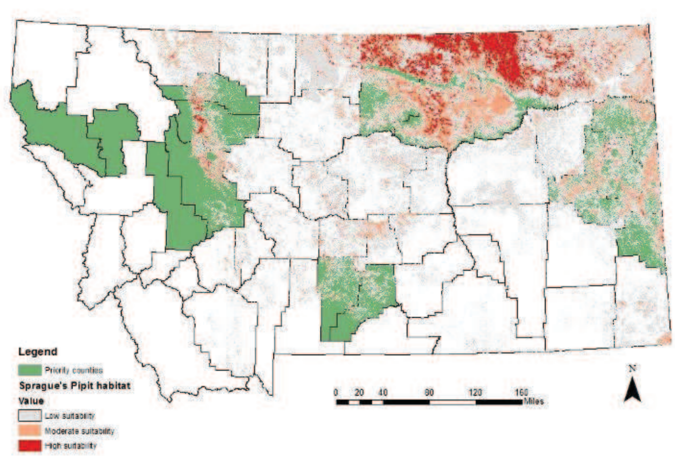


Figure 9. Sprague's pipit habitat models show a high degree of overlap with priority grassland counties.

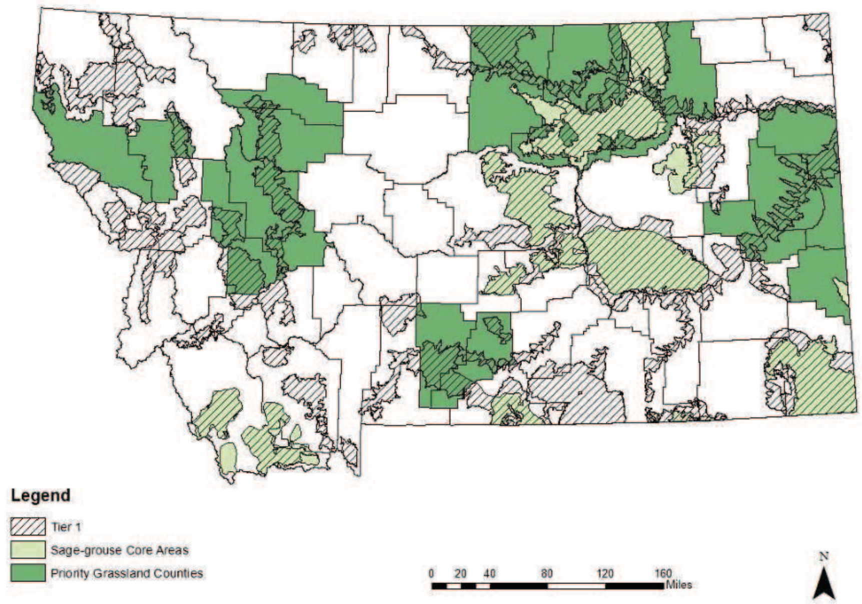


Figure 10. Priority Grassland Counties combined with Sage-grouse Core Areas cover much of the landscape identified as Tier 1 focal areas in Montana's SWAP.

<u>Conservation Tools and Implementation Strategies</u>

Approximately 85% of Montana's grasslands in our priority counties are in private ownership; thus, working with private landowners to maintain profitable agricultural operations while simultaneously conserving grasslands is our most important strategy. Participation in conservation programs by landowners is voluntary. FWP programs and a subset of partner programs that can be leveraged to assist landowners with conservation actions are listed in Appendix C. 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.

Grassland protection: Conservation easements and long-term leases are voluntary conservation tools effective for slowing the rate of habitat loss from conversion to cropland agriculture and subdivision development.

- Conservation leases
    - 30-year agreement to maintain existing native habitat
    - 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.)
    - One-time payment, flat rate/acre
- Conservation easements
    - Perpetual agreement, includes range management plans
    - Payment based on Fair Market Value

Grassland enhancement: FWP is exploring opportunities to work with private landowners who are interested to convert marginal croplands, including those expiring from the CRP, to grass-based agriculture. These opportunities might include assisting with range infrastructure (e.g., fencing and water structures) and seed cost-share assistance. Limited funding may also be available to assist with fence modifications to meet species-specific habitat needs.

- Range infrastructure cost-share
    - Transition marginal cropland or expiring CRP to grass-based agriculture
    - Modify fences to facilitate pronghorn antelope connectivity (typically will be in combination with a conservation lease or easement)
    - Up to 75% cost-share on fencing (including external fences), water supply, etc.
    - Can be in cooperation with other conservation efforts (e.g., protection or restoration activities)
    - Term agreement to maintain infrastructure will be required

Grassland restoration: FWP is also interested to work with willing landowners and conservation partners to help transition non-native vegetation (e.g., crested wheatgrass) to native grass stands (e.g., western wheatgrass).

- Native grassland restoration cost-share
    - Projects will be identified on a case-by-case basis
    - Up to 75% cost-share on seeding, fencing for early spring grazing, etc.
    - Usually in cooperation with other conservation efforts (e.g., protection activities)
    - Term agreement appropriate to restoration activities will be required

Non-regulatory recommendations for subdivisions and energy development: Grasslands near urban areas may be under current or future pressure for subdivision development. Locations for energy development will vary depending, in part, on the type of energy and economics. When new subdivision or energy development projects are proposed, FWP can help guide responsible development.

- Staff will use FWP's *Fish and Wildlife Recommendations for Subdivision Development in Montana* (2012) or most current agency recommendations when commenting on proposed subdivision.
- FWP staff will continue to use FWP's *Fish and Wildlife Recommendations for Oil and Gas Development in Montana* (2013a) and *Fish and Wildlife Recommendations for Wind Energy Development in Montana* (2013b) when commenting on oil and gas or wind energy projects.
- FWP staff will also recommend that energy project proponents follow the U.S. Fish and Wildlife Service mitigation sequencing whenever a new project is proposed in any of the priority landscapes. The mitigation sequencing is:
    1) Avoid priority grasslands,
    2) Minimize impacts,
    3) Reclaim and Restore degradation that occurs from development, and,
    4) Compensate for remaining project impacts elsewhere on the landscape.

Other considerations: Invasive species and climate change are threats addressed indirectly by the conservation tools listed above. Invasive species occur at local scales and cannot accurately be mapped at statewide scales. Impacts to Montana's grasslands from climate change are difficult to predict. Keeping high priority grassland in good range condition that increases resiliency to new and increasing threats is likely our best strategy for preparing for a changing climate and minimizing the spread of invasive species.

<u>Project Ranking Criteria</u>

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. 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,
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- 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.

Section 3. Habitat Outcomes – Did we accomplish our habitat targets?

Implementation monitoring can be used to answer the question did we do what we set out to do. For this grassland conservation strategy, implementation monitoring will help us assess whether our actions and those of our partners are meeting our objectives to maintain and enhance the distribution, abundance, and in places the condition of existing grasslands. Remotely-sensed data can be used for landscape scale assessments; however local scale data is also needed to understand range composition. The process and elements for implementation monitoring include:

a. Manage a central database, updated annually (in cooperation with FWP Application and Development)
b. Complete a landscape scale assessment in a GIS framework every 5 years. Landscape tracking metrics would include:
    i. Total acres and trends in acres (+/-) of native grassland,
    ii. Location and number of quads that meet the priority grassland criteria,
    iii. Acres & locations of grassland protected,

iv. Acres & locations of restored/enhanced grasslands,
v. Changes in landownership patterns,
vi. Acres & locations of new conversion to cropland,
vii. Expiring CRP – new land use patterns

c. Cooperate with NRCS, Montana Association of Conservation Districts, and other range monitoring staff to assess local scale habitat metrics, as feasible. Tracking metrics at local scale might include:
    i. Range assessments
    ii. Invasive plant species control, establishment &/or encroachment
    iii. New anthropogenic disturbance
d. Conservation easements and other land protection options will be monitoring by FWP biologists in cooperation with FWP Conservation Easement Stewardship Manager.
e. Provide range assessment data to landowners as available to assist with ranch management decisions.
f. Prepare a report every 5 years that identifies habitat goals outlined in Part 2 above and progress made toward achieving those goals.

Section 4. Biological Outcomes – Are our actions influencing wildlife populations?

Effectiveness monitoring tells us if the implemented actions are having the intended biological response. This grassland strategy is intended to provide the quality and quantity of habitat required by grassland species of interest so that those species' populations are maintained or increased as a result of this targeted action. Management objectives for a group of indicator grassland species are listed in Appendix D. Species monitoring data will be included in the 5-year assessment. Regional trends in populations will be compared with range-wide trends to help differentiate the influence of habitat programs versus abiotic factors (e.g., climate factors), as available data allows. For example, the Integrated Monitoring by Bird Conservation Region (IMBCR) program provides species specific estimates for grassland birds across a broad expanse of the Great Plains. Regional data can be compared to state and range-wide estimates through this program. FWP staff will support quantitative assessments to determine which existing monitoring programs can evaluate the effectiveness of this strategy, and if needed, expand or develop new programs to achieve monitoring objectives (see Research Needs).

Section 5. Research Needs – How can we improve?

New information is needed to continue to effectively deliver grassland conservation. Information on habitat use and the relationship between demographic rates and habitat quality for many of our prairie wildlife species will help us better target conservation to the habitats most important for population persistence. This strategy will be revised as new information becomes available. Some of the priority research needs are listed in Appendix E. Projects that address these research needs will be considered through FWP's Research Review Process for FWP endorsement and, when appropriate, possible funding support.

Section 6. Implementation Capacity – How can we implement this strategy?

Potential Funding Sources and Partnerships

FWP will pursue new, targeted funds to help implement this grassland strategy. One potential source is Pittman-Robertson funding with match coming from the Montana Outdoor Legacy Foundation and/or non-federal granting entities. State Wildlife Grants (SWG), as available, and funding from Recovering America's Wildlife Act, if authorized by Congress, could also help deliver components of this strategy. Program funds will be used for on-the-ground projects, new personnel (as needed), and implementation and effectiveness monitoring. Support for research projects related to this strategy will likely come from other sources (e.g., LCCs, SWG non-habitat projects, etc.).

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.

Capacity Needs

Existing FWP staff will likely be involved in all aspects of this strategy from identifying and implementing projects to monitoring and research, as time, interest, and opportunity allow. However, FWP biologists are typically time-limited so additional requests on their time will be minimal. If a new funding source is identified, FWP may hire two seasonal wildlife technicians to support FWP Wildlife Biologists with the additional work load. Technicians will conduct program outreach, work with interested landowners, implement projects, conduct habitat and species monitoring, and other tasks associated with the implementation of this strategy. FWP Wildlife Biologists and Technicians may also work closely with our conservation partners to take advantage of opportunities to leverage programs and dollars and cooperate on monitoring, especially Pheasants Forever Farm Bill Biologists, Bird Conservancy of the Rockies Private Lands Wildlife Biologist, and Ducks Unlimited Conservation Specialists.

FWP Data Services staff can develop a web-based project evaluation tool that will include data layers of existing conservation efforts and spatially mapped threats such as cropland risk or expiring CRP lands. This tool would be available internally to FWP staff to facilitate easy project review and proposals for potential projects. Data Services can also provide outreach assistance tools based on region-specific criteria.

<u>Timeline</u>

FWP will commit to targeted delivery of this strategy for a minimum of 5 years. At that time, a program review will be conducted and priorities, personnel needs, and conservation strategies will be reassessed. Initial efforts will focus on raising matching funds, hiring grassland specialists, and range infrastructure and grazing management projects (Figure 11). Existing staff, such as upland game bird specialists and wildlife biologists, can begin range infrastructure and grazing management work associated with this strategy as soon as funds are available and ideally in time to help interested landowners keep some expiring CRP acres in grass. Seasonal technicians, partner biologists, and potentially agricultural-based groups (via contract with FWP) may do much of the networking to find landowners interested in longer-term restoration or lease projects.

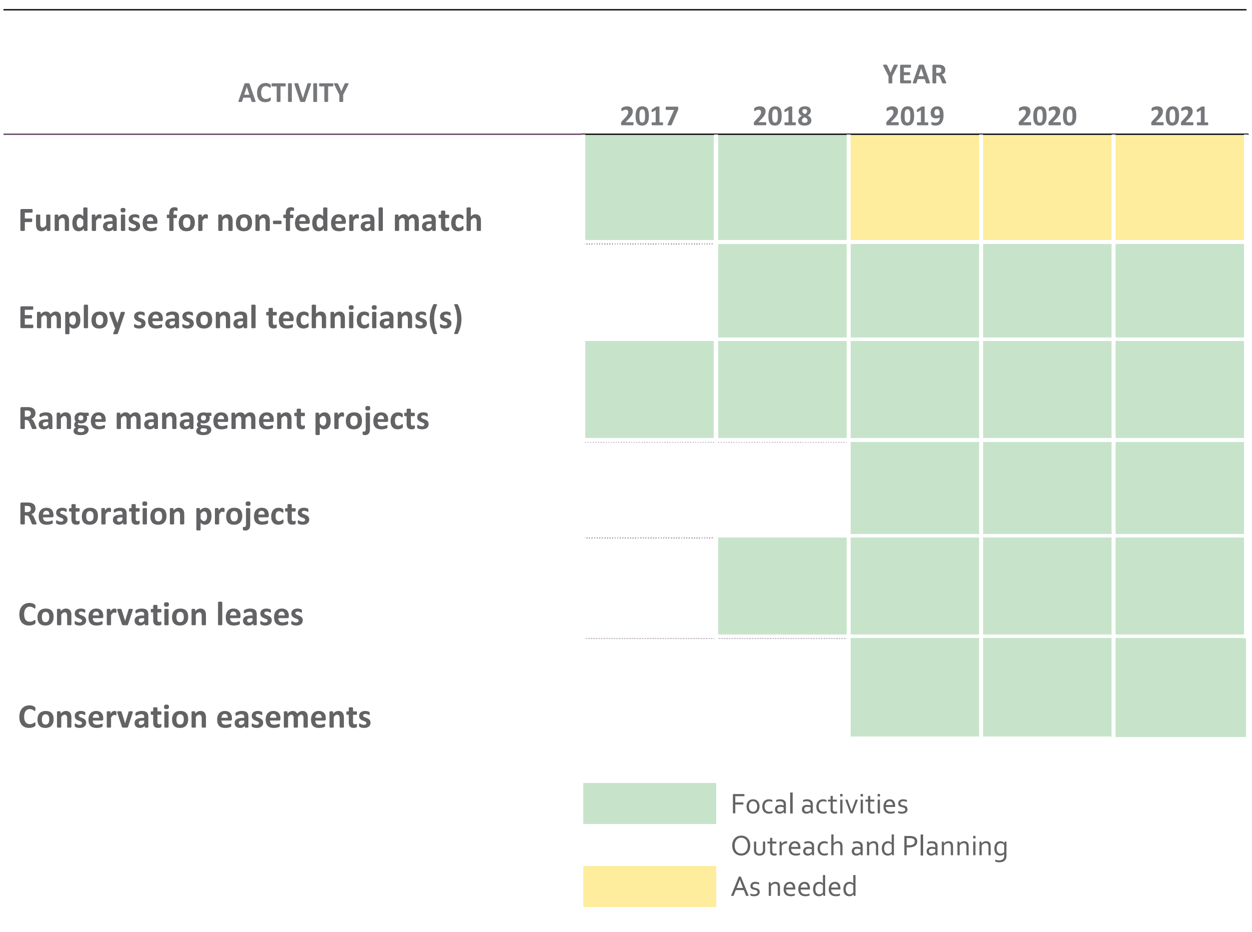

Figure 11. Proposed implementation timeline for FWP's *Working Grasslands Initiative*.

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Appendix A. A selected list of Montana Species of Concern associated with Montana's grasslands. (Source: FWP 2015)

Class	Species	Habitat Association
Amphibians	Great Plains Toad	prairie grassland
	Plains Spadefoot	prairie & montane grassland
Birds	Baird's Sparrow	prairie & montane grassland
	Bobolink	prairie & montane grassland
	Burrowing Owl	prairie grassland
	Chestnut-collared Longspur	prairie grassland
	Ferruginous Hawk	prairie & montane grassland
	Golden Eagle	prairie & montane grassland
	Loggerhead Shrike	prairie & montane grassland
	Long-billed Curlew	prairie & montane grassland
	McCown's Longspur	prairie grassland
	Mountain Plover	prairie grassland
	Sharp-tailed Grouse	prairie grassland
	Sprague's Pipit	prairie grassland
Mammals	Black-tailed Prairie Dog	prairie grassland
	Dwarf Shrew	prairie & montane grassland
	Fringed Myotis	prairie & montane grassland
	Hoary Bat	prairie & montane grassland
	Little Brown Myotis	prairie & montane grassland
	Merriam's Shrew	prairie & montane grassland
	Pallid Bat	prairie grassland
	Preble's Shrew	prairie & montane grassland
	Spotted Bat	prairie grassland
	Swift Fox	prairie grassland
	Townsend's Big-eared Bat	prairie & montane grassland
Reptiles	Greater Short-horned Lizard	prairie & montane grassland
	Western Hog-nosed Snake	prairie grassland

Appendix B. Grassland and human use statistics for Priority Grassland Counties.

NAME	Total County Areas	Acres of Grassland	%	Unprotected Grasslands*	%	Acres of Grass on Public Lands	%	Acres of Grass in Conservation Easement	%	% of County Farmed or Ranched	% of County in Cropland	Acres of CRP expiring in 2017	% of County enrolled in CRP, WRP, WREP or Farmable Wetland	Human Population (2010 Census)	Human population change 2000-2010 (%)
Blaine	2,711,177	1,208,453	44	977,900	80	216,272	17	14,278	1	81.5	23.17	7,731	4.34	6,491	-
Dawson	1,523,580	789,114	51	751,132	95	37,980	4	0	0	82.9	23.31	1,053	4.71	8,966	-
Fallon	1,037,004	547,795	52	465,533	84	77,587	14	0	0	94.4	16.59	395	1.29	2,890	+
Lake	1,057,362	232,507	21	209,307	90	15,459	6	7,742	3	58.3	8.46	0	0.54	28,746	+
Lewis & Clark	2,235,819	609,060	27	467,142	76	94,384	15	47,531	7	38.1	4.17	227	0.60	63,395	++
Phillips	3,333,174	1,345,212	40	738,298	54	556,956	41	50,180	3	62.8	21.34	14,539	5.10	4,253	-
Pondera	1,049,803	235,833	22	205,834	87	16,452	6	13,544	5	92.1	37.74	20,495	6.49	6,153	-
Powell	1,490,925	353,227	23	215,311	60	77,622	21	62,710	17	39.6	3.59	60	n/a	7,027	-
Prairie	1,113,703	682,480	61	377,715	55	295,130	43	9,632	1	69.2	10.74	3,650	1.85	1,179	-
Richland	1,342,068	661,856	49	622,806	94	32,955	4	6,093	0	96.9	41.72	16,193	7.40	9,746	+
Sanders	1,778,204	308,661	17	255,503	82	41,811	13	11,343	3	19.2	1.95	0	0.10	11,413	++
Stillwater	1,154,886	370,954	32	346,119	93	8,341	2	16,488	4	70.4	16.3	16,283	4.37	9,117	++
Sweet Grass	1,191,004	447,536	37	402,124	89	12,993	2	32,414	7	72.1	6.63	0	0.08	3,651	+
Teton	1,465,404	459,799	31	331,655	72	55,738	12	72,399	15	67.1	54.70	39,127	8.01	6,073	-
Valley	3,237,198	1,121,152	34	716,613	63	387,389	34	17,148	1	51.9	25.01	29,343	8.82	7,369	-
Wibaux	567,163	335,323	59	319,537	95	15,784	4	0	0	95.8	23.85	622	3.06	1,017	-
Source	Montana Land Cover Database	Montana Land Cover Database		Montana Cadastral		Montana Cadastral		Fish, Wildlife and Parks database		USDA NASS Census of Ag.	USDA NASS Census of Ag.	USDA Farm Services Agency	USDA NASS Census of Ag.	U.S. Census 2010	U.S. Census 2010

*Grasslands considered protected from cropland conversion include public lands (except School Trust Lands outside of sage-grouse Core Areas) and private lands in conservation easement or long-term lease.

++ = 10 - 25% increase, + = 0 - 10% increase, - = 0 to 10% decrease

Appendix C. Conservation tools and potential funding sources for voluntary landowner conservation actions.

Voluntary Landowner Action	Conservation Tool	Potential Funding Sources*
Protection from cropland conversion and/or subdivision development	FWP Conservation Easements	• NRCS Agricultural Land Easement Program (requires non-federal match) • Habitat Montana (matching funds) • Pittman-Robertson funding
	FWP 30-year Conservation Leases	• Grant funding • Upland Game Bird Enhancement Program and/or Migratory Bird Wetland Program (matching funds)
Transition expiring CRP and/or marginal cropland to grass-based agriculture	FWP contract for range infrastructure cost-share on expiring CRP lands (e.g., fencing and water sources)	• Grant funding • Pittman-Robertson funding
	Special NRCS EQIP initiative for infrastructure cost-share (includes short-term rental rates)	• NRCS EQIP
	Partner programs for range infrastructure cost-share and restoration on expiring CRP lands	• Grant funding (e.g., NFWF) • Partners for Fish and Wildlife
	Restoration of non-native CRP stands or other marginal cropland areas to native grass	• Grant funding (e.g., NFWF) • Pittman-Robertson funding • State Wildlife Grants
Range management & enhancements	FWP grazing management plans and range infrastructure cost-share	• Grant funding • Pittman-Robertson funding • Upland Game Bird Enhancement Program
	NRCS EQIP grazing management practices (CP528)	• NRCS EQIP
Range maintenance (e.g., to maintain existing prairie dog &/or upland game bird habitat)	FWP Conservation Leases for maintaining priority wildlife habitats	• Pittman-Robertson funding • Upland Game Bird Enhancement Program • State Wildlife Grants
	NRCS CSP upland wildlife habitat management	• NRCS CSP
Invasive weed control	Targeted grazing, biological and chemical control, restoration techniques	• Montana Weed Control Association; DNRC; conservation districts

*Recovering America's Wildlife Act, if authorized by Congress, could be used to help fund most of the FWP sponsored activities in this table including conservation easements, leases, and range infrastructure.

Appendix D. Grassland indicator species and associated management objectives and tools.

Species	% of Global Breeding Range in Montana^	Metrics	Management Objective	Monitoring Tools#	Reference
Baird's sparrow	27%	Population trends # birds/mi^2 Probability of occurrence	Reverse decline*: By 2026 - slow rate of decline by 60-75% By 2046 - increase 2016 population by 5-15%	BBS IMBCR	Partners in Flight 2016
chestnut-collared longspur	32%	Population trends # birds/mi^2 Probability of occurrence	Reverse decline*: By 2026 - slow rate of decline by 60-75% By 2046 - increase 2016 population by 5-15%	BBS IMBCR	Partners in Flight 2016
McCown's longspur	41%	Population trends # birds/mi^2 Probability of occurrence	Reverse decline*: By 2026 - slow rate of decline by 60-75% By 2046 - increase 2016 population by 5-15%	BBS IMBCR	Partners in Flight 2016
Sprague's pipit	18%	Population trends # birds/mi^2 Probability of occurrence	Reverse decline*: By 2026 - slow rate of decline by 60-75% By 2046 - increase 2016 population by 5-15%	BBS IMBCR	Partners in Flight 2016
waterfowl (mallard, northern pintail, blue-winged teal, northern shoveler, gadwall)	3-7%	# pairs/4-mi^2	Maintain duck production capacity (581,000 breeding pairs in Prairie Pothole region of Montana in 2016)	USFWS 4-mile^2 surveys	Prairie Pothole Joint Venture Implementation Plan 2017
sharp-tailed grouse	6%	# birds/lek # of leks	Adaptive Harvest Management targets	Lek monitoring	FWP Management Bureau/Regions
black-tailed prairie dog	15%	Acres of colonies	Maintain habitat for associated species	Mapping (remotely or on-the ground)	Montana Prairie Dog working group
pronghorn antelope	7%	# of individuals	Adaptive Harvest Management targets	Annual trend surveys	FWP Management Bureau/Regions
swift fox	1%	Presence/absence	Maintain/increase	Targeted surveys	Swift Fox Conservation Team

^Montana Natural Heritage Program estimates.

#BBS=USGS Breeding Bird Survey, IMBCR=Integrated Monitoring by Bird Conservation Region

*Range-wide objectives. Montana objectives are to meet or exceed range-wide objectives.

Appendix E. Priority research needs for grassland indicator species.

Research Topic	Species
The influence of habitat characteristics, landscape heterogeneity, *and conservation actions* on breeding season vital rates to identify high quality breeding habitat characteristics, population modeling, and the impact of conservation actions on populations.	Grassland birds*, sharp-tailed grouse, black-tailed prairie dog
Impacts of energy development (infrastructure and fragmentation) on populations.	All grassland indicator species
Vital rates and limiting factors during all seasons (breeding, migration, or winter) for migratory species to identify what point of the life cycle is driving population declines. This will help to inform if our strategy should focus on maintaining breeding habitat or if additional restoration of breeding habitat is needed.	Grassland birds*
Identification of habitat needed for maintenance of connectivity, and the impact of anthropogenic features and conservation actions on maintenance of connectivity.	Swift fox (ongoing Region 6), pronghorn antelope
Value of existing CRP and other conservation lands as habitat in Montana.	Grassland birds*, swift fox, pronghorn antelope, sharp-tailed grouse
Relative value of transitioning non-native grass to native grass stands.	All grassland indicator species
Evaluation of existing monitoring programs for their effectiveness in evaluating the impacts of this grassland conservation strategy on grassland indicator species and targets, and development of new/ refined protocols as necessary.	All grassland indicator species

*Grassland birds = Baird’s sparrow, chestnut-collared longspur, McCown’s longspur, Sprague’s pipit