

Prairie Beef and Biodiversity:

A Payment for Ecosystem Services Program Design for Ranches on Natural Grasslands in Canada



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For more information:

Commission for Environmental Cooperation

393, rue St-Jacques West, Suite 200
Montreal (Quebec)
H2Y 1N9 Canada
t 514.350.4300 f 514.350.4372
info@cec.org / www.cec.org

Abbreviations and Acronyms

| | |
|-------------|--|
| BMP | Beneficial management practice |
| PES | Payment for Ecosystem Services |
| RSAI | Ranchers Stewardship Alliance Inc. |
| SAR | Species At Risk |
| SARA | Species At Risk Act |
| SoD | South of the Divide Multi Species at Risk Initiative |

EXECUTIVE SUMMARY

A lack of conservation tools and incentives to steward native prairie in Canada has placed a disproportionate cost for environmental stewardship on livestock producers managing natural grasslands. The Ranchers Stewardship Alliance Inc. (RSAI) has investigated conservation tools that would help distribute the cost of maintaining declining ecosystem services from native rangelands more proportionally among those who value and use those services. Of the conservation tools used around the world, payments for ecosystem services (PES) have been used successfully in similar situations and have the most immediate potential to be used effectively on natural grasslands grazed by livestock in Canada. However, the key to successful PES schemes is a carefully designed program which addresses potential pitfalls. RSAI convened a group of individuals representing a broad cross section of stakeholders to design a PES program for future implementation.

Biodiversity on native rangelands, as represented by species at risk, supports many ecosystem services and is receiving considerable attention from environmental organizations. We chose to target two species representative of species at risk on natural grasslands grazed by livestock in Canada: Sprague's Pipit (*Anthus spragueii*) and Swift Fox (*Vulpes velox*).

The geographic target is the area in southwestern Saskatchewan that forms part of the Milk River watershed. This area was chosen because it supports relatively high numbers of the target species. It is the focus area for a joint federal-provincial government multi-species at risk action planning initiative for which a substantial amount of information is available about the habitat requirements and critical habitat availability for the target species.

A results-based program design was developed that includes scientific criteria used to select areas to include in a PES program, site specific habitat attributes that would help maintain or recover the target species and management activities that would benefit the target species. Information gaps in the science that might improve the effectiveness of the program were identified during the workshops. However, these gaps in knowledge were not great enough to prevent the implementation of an effective program.

Substantial thought went in to developing the measurement and monitoring protocols for the program. A monitoring scheme was designed that would be used to measure program performance, monitor compliance, and provide information and learning that would be used to adapt the program to improve effectiveness over time. Because monitoring can be a very expensive component of a conservation program, options for cost-effectiveness were built into many parts of the program design and additional cost-saving measures recommended.

The administrative components of a PES program were also designed and included prioritizing participation in the program, determining the amount of payments, structuring payments, designing of the contract between buyer and sellers, and technical transfer requirements.

Funding and implementing a PES program were also considered, resulting in a list of potential sources of funding and recommendations on implementation partnerships.

This document will be used to guide the implementation of the Prairie Beef & Biodiversity PES program and is available to inform the development of similar programs.

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1.0 BACKGROUND

Increasingly, there is recognition of the compatibility between ranching and conservation of natural grasslands in the Great Plains of North America. For example, the North American Grasslands Alliance, an alliance of conservation organizations, agencies and livestock producer groups from Mexico, the United States and Canada, is dedicated to finding ways to keep ranches on the landscape because of the complementarity of ranching activities and environmental conservation. The key to retaining ranch lands is to ensure ranching is economically competitive with alternative land uses. Opportunity cost is defined as *foregone economic benefits from alternative activities or uses of a resource on a particular site* (Kaphengst *et al.* 2011). The opportunity cost of retaining natural grasslands is substantial. In Saskatchewan, retaining rangelands rather than converting to cropland has an opportunity cost that ranges between C\$21.58/ac/year for low value crops on low productivity soils to \$1836.80 for high value crops on high productivity soils (Nykoluk 2013). The opportunity cost of retaining grassland in a natural, unfragmented state is even higher where residential development and energy development are concentrated. In addition, crop production subsidies in Canada comprise significantly more of an agricultural producer's cash receipts than do livestock subsidies. For example, in 1995 when crop subsidies were at their lowest point in 40 years, subsidies to crop farmers were more than eight times higher than subsidies to livestock producers as a percentage of cash receipts (Nykoluk 2013).

There are currently few tools available and being utilized to conserve the ecological services provided by natural grasslands grazed by livestock. The conservation tool chest that is currently utilized on the Canadian prairies includes:

- Conservation easements,
- Cost-shared beneficial management practices (BMPs), and
- Permanent cover programs.

These tools are effective in specific situations, but do not provide reliable, long term financial incentives to ranchers and of the three only conservation easements are specifically applied to natural grasslands. Expectations for other agricultural producers and rural acreage owners to conserve ecosystem services provided by natural grasslands, particularly those supported by biodiversity, are nearly non-existent because those lands no longer provide those services. The result is a conservation gap that has placed a disproportionate cost for environmental stewardship on livestock producers managing natural grasslands.

The Ranchers Stewardship Alliance Inc. (RSAI) undertook to investigate tools that would help divide the cost of maintaining these declining ecosystem services more proportionally among those who value and use them. Our goal was to learn how other jurisdictions were handling the conservation gap, and to provide options to fill that gap with positive incentive programming. A number of tools are used around the world to help address this issue. These include:

- Carbon credits,
- Biodiversity offsets,
- Beef certification, and
- Payments for ecosystem services.

In 2011, RSAI commissioned feasibility studies on two of those tools: beef certification and payment for ecosystem services (PES). These tools were selected based on our ability and our partners' ability to promote and implement conservation tools, and because they were most applicable to the ecosystem service receiving the most attention on our ranch lands, namely the values species at risk provide. These reviews, *Grasslands Stewardship Conservation Programming on Natural Grasslands used for Livestock Production: Grasslands Stewardship Certification Schemes* (Good and Haddock 2012) and *Grassland Stewardship Conservation Programming on Natural Grasslands Used for Livestock Production: Payment for Ecosystem Services Program Review* (Haddock and Good 2012), were conducted by the Miistakis Institute (hereafter referred to as *the reviews*). The review of beef certification programming highlighted many substantial challenges to the application of this tool in Canada that were beyond the capacity of RSAI and our partners to address. PES showed the most immediate potential and has a proven track record of success globally. PES programs are defined as *voluntary transactions where a well-defined environmental service or product is being purchased by at least one buyer from at least one provider, if and only if the provider supplies the product or service* (Wunder 2005). The Miistakis review demonstrated that, if carefully designed, PES programming could be an effective tool to meet RSAI's dual goals of enhancing the delivery of ecosystem services from ranch lands and improving ranch profitability.

Additionally, organizations that use the PES tool indicate that it fits well in low income rural communities where small infusions of funds can make a significant difference to the maintenance of natural grasslands. PES is less effective as a tool in areas where there is high value economic activity such as urban development or heavily concentrated energy development because the cost of the program may be prohibitive (WWF 2013).

PES schemes are known to provide incentives to address market failure by altering the economic incentives or overcoming disincentives faced by land managers who can affect the provision of ecosystem goods or services supported by biodiversity. They can be simple, results-based and effective in focusing on positive outcomes and creating an atmosphere of pride and cooperation.

The Miistakis review indicated that the key to successful PES schemes was a carefully designed program. Indeed this issue has been identified many times globally and much effort has gone into addressing the design of PES (De Koning *et al.* 2011; Forest Trends *et al.* 2008; Huberman 2008; Jack *et al.* 2008; Mayrand and Paquin 2004; OECD 2010; Pirard *et al.* 2012; Prager *et al.* 2012; van der Horst 2011; Wunder 2005). Therefore, the first step to testing and implementing PES programming in prairie Canada is to design a workable program. In addition, the Miistakis review recommended that it is critical to have all stakeholders involved in the design of a PES program from the very beginning. To this end, RSAI conducted two workshops in May 2013 with a suite of experts and interested observers (Appendix A) to provide input into the design of a PES program. This report documents the results of those workshops.

2.0 PURPOSE & GOAL OF THE PRAIRIE BEEF & BIODIVERSITY PROGRAM

Two of the primary recommendations arising from the Miistakis reviews include:

- *Purpose of the program – There is generally an environmental issue that catalyzes the creation of a PES program and becomes the base of the program ‘purpose’.*
- *Clear goal/objective identification – It is critical to identify, at the outset, the goals of the program and for these goals to inform and drive the design of the program.*

The purpose of the Prairie Beef & Biodiversity program is to reduce the declining trend of endemic grassland biodiversity as represented by species at risk.

The goals of the Prairie Beef & Biodiversity program include:

- To provide economic incentives sufficient to engage ranchers in conservation and recovery of species at risk;
- To improve the livelihood of ranchers enabling competition with alternative land uses that threaten species at risk;
- To keep natural grasslands intact and unfragmented;
- To achieve results-based outcomes; and
- To design a program that results in an agreement acceptable under section 11 of the Canadian Species at Risk Act (SARA). An acceptable agreement for our purposes would provide effective protection to species at risk habitat and ensure participating ranchers are recognized as compliant with SARA.

3.0 DESIGN PARAMETERS

The Miistakis review of PES programs made a number of recommendations. Recommendations specific to program design include:

- *Scientific basis for program design – In order to ensure the payments support activities that lead to the desired outcome(s) it is important to establish scientific criteria first and then figure out the payment scheme.*
- *Appropriate scale – Scale will be informed by the ecosystem service of interest, and regional, state/provincial, and federal policy and regulations.*
- *Program design should be adaptable – Adaptability in the design provides stakeholders an opportunity to explore strengths and weaknesses and to apply “lessons learned” in the evolution of the program.*
- *Reward success – A PES program can be designed to reward participants who are already engaging in good stewardship.*

3.1 Results-based Programming

The Prairie Beef & Biodiversity program will be results-based. Results-based programming helps address three of the recommendations from the Miistakis review including a scientific basis for the program, adaptability of program design and rewarding success.

The largest challenge to market-based instruments, including payments for ecosystem services, is ensuring that the activities undertaken and paid for produce the desired result. Often, incentives are provided for a proxy (e.g., abatement of threats or implementation of management practices) of the result. However, the link between the proxy and the desired result is often weak and may not produce the desired result.

Traditional “command and control” policy and regulation is expensive and does not always produce the desired outcome (Wittrup and Murphy 2012). Results-based programming is *an outcome focussed process that specifies the environmental result to be achieved and largely leaves the determination of how it is to be achieved to the land manager* (adapted from Wittrup and Murphy 2012). Result-based programming focuses on producing the desired outcome, not on developing management prescriptions. In the design of the Prairie Beef & Biodiversity program we have avoided prescribing grazing practices or regimes and focussed on desired habitat characteristics. Experts agree that these are what matters to the target species and they can be achieved using many different grazing practices and combinations of practices and regimes that may be specific to and dependent upon local circumstances and situations.

Often results of traditional programming such as technical transfer education and cost-shared BMPs are measured based on inputs (e.g., how many dollars were spent or how many person hours contributed), activities (e.g., what activities were undertaken), and surrogate outcomes (e.g., acres enrolled,

producers participating, number of people receiving communications). However, none of these measures truly indicate progress towards the desired outcome. Results-based programming involves clearly defining expected results, collecting information to measure progress towards those results and adapting programming in a timely manner to improve effectiveness. The Prairie Beef & Biodiversity program is intended to be a results-based program. It is designed to focus on providing the best possible quality habitat and improving productivity of the target species.

Targeting payments to land bases that already support the target species is a more cost effective way to maintain and support species at risk (SAR) than paying for restoration. Securing core habitat and species populations must come first and using incentives in situations where tweaking land management can make significant gains in population is the primary goal. For example, tweaking the timing and intensity of grazing in core Sage-Grouse habitat to increase hiding cover by a small amount can increase Sage-Grouse populations by approximately eight percent (Taylor *et al.* 2010).

In addition, PES programs often meet with resistance from policy makers and environmentalists due to the perception that people are getting paid for doing nothing. Using results-based programming and measuring results as has been done for the Sage-Grouse helps change this perception (WWF 2013).

3.2 Geographic Targeting

Geographic targeting will address the Miistakis recommendation that the program have the appropriate scale. There are a number of strategies used around the world to target PES programs geographically. These include:

- Core habitat for target species,
- High biodiversity hotspots,
- Habitat under the greatest threat of land use conversion or habitat degradation, and
- Areas where habitat restoration would be most beneficial.

For the Prairie Beef & Biodiversity program, the most cost-effective opportunity to secure habitat and promote species recovery is to target core habitat areas. If the core area becomes fully subscribed and more funding is available for the program, habitat under threat could be added. However, in these areas, payments to land managers would need to be at minimum \$21/ac/year to offset the opportunity cost of cultivating land (Nykoluk 2013). Grassland restoration is by far the most expensive alternative, often costing more than the value of the land. In addition, existing incentive programs are already in place for restoring land to native vegetation.

The focus area was further targeted to southwest Saskatchewan for the following reasons:

- Portions of southwest Saskatchewan have been recognized as priority areas for conservation by many initiatives. Recognition of the area include Grasslands Priority Conservation Areas (GPCAs) as identified by the Commission for Environmental Cooperation (CEC 2010), priority conservation sites as identified by the Northern Mixed Grass Transboundary Initiative (Smith-Fargey 2004), as a top 10 scoring grasslands within the Mixedgrass Ecoregion and within the province of Saskatchewan by the Nature Conservancy of Canada (Riley *et al.* 2007), and as a key grassland by the World Wildlife Fund (Forrest *et al.* 2004).
- The area contains a significant portion of the remaining natural grasslands in Saskatchewan and in Canada.
- The area supports the highest density of species at risk in Saskatchewan (Environment Canada 2013).
- It is the target area for the South of the Divide Multi Species at Risk Initiative (SoD).

3.3 Ecosystem Service Targeting

Choosing an ecosystem service to target is part of the scientific basis for program design. Species at risk were chosen as the target for the following reasons:

1. They meet the requirement for a well-defined issue to develop a program around.
2. Species at risk, which represent the state of endemic grassland biodiversity, are currently an indicator of (or a proxy for the) ecosystem services provided by natural grasslands that are getting the most attention.
3. The Canadian public deems the recovery of species at risk to be important enough to enact legislation designed to conserve them. SARA and provincial wildlife legislation provide a market demand for species at risk. The preamble for SARA states:

"...wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons."

Biodiversity is not technically an ecosystem service; however biodiversity provides and supports many ecosystem goods and services (e.g., pollination, pharmaceuticals, food, cultural values, aesthetics, genetics, and air and water filtration). When biodiversity is conserved these ecosystem goods and services are protected. Species at risk are indicators for the health of biodiversity, and therefore the ecosystem goods and services supported or provided through biodiversity.

The major hurdle in ecosystem service targeting is identifying the focal species to use as targets of conservation. Measuring all biodiversity or even all species at risk on a land base would be prohibitively expensive. Lipsey (2013) indicates that the ideal focal target would fit at least one of the following categories:

1. Keystone species: a species that has a disproportionately large effect on the ecosystem in which it occurs;
2. Indicator species: a species whose presence, absence, or relative well-being in a given environment is indicative of the health or function of the ecosystem as a whole;
3. High-powered trend detectors: an abundant species with lots of available data;
4. Umbrella species: a species whose requirements are believed to encapsulate the needs of other species;
5. Species of concern: species that are considered to be at risk due to declining population trends, threats to their habitats, and/or restricted distribution; and
6. Flagship species: a charismatic species that acts as an ambassador for less-recognized or less-beloved species in a habitat.

One approach would be to have the program target biodiversity as measured by an index of species richness. RSAI agrees that a measure of endemic grassland biodiversity would be a desirable target. However, given the priority of endemic grassland species on native grassland, which represents the highest value biodiversity, measuring and monitoring species richness would be onerous and expensive.

Also, a new biodiversity index would need to be developed that gave more weight to uncommon and declining species than common species, and gave a negative score to invasive species. Marisa Lipsey (personal communication, 2013) is working on developing core area maps for four indicator bird species (Sprague's Pipit, Baird's Sparrow, McCown's Longspur and Chesnut-collared Longspur) in the Northern Great Plains that would represent the range of habitats required for most endemic grassland species. Perhaps this suite of species could be used to represent the full range of endemic grassland biodiversity.

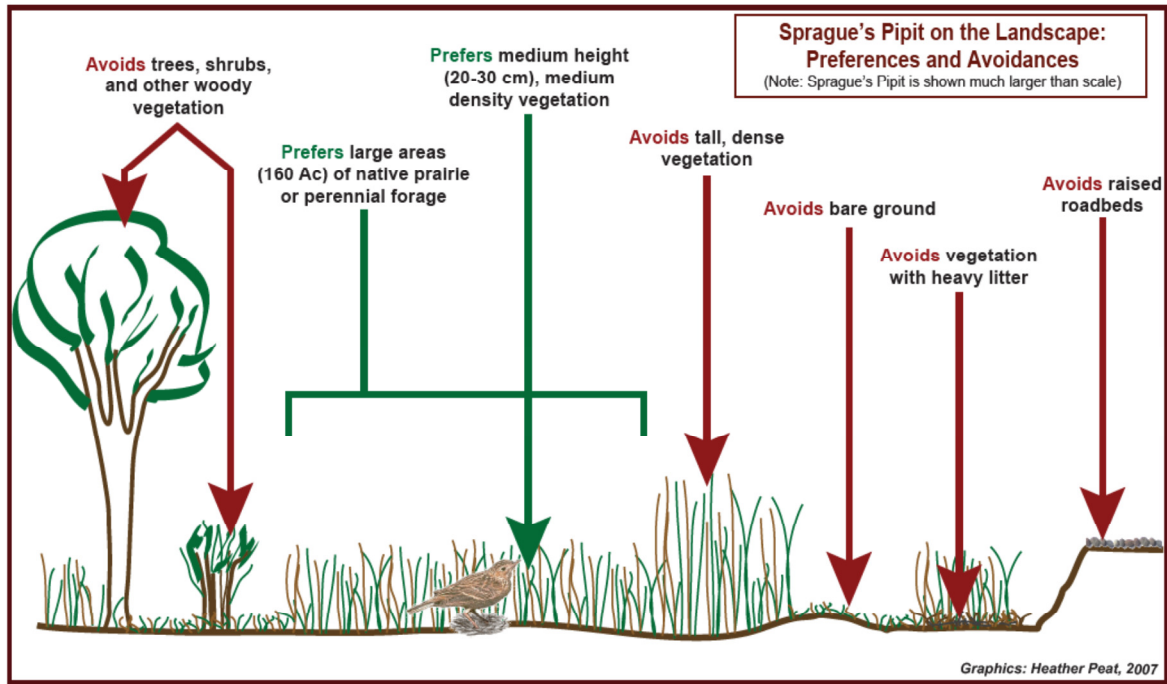
Swift Fox (*Vulpes velox*) and Sprague's Pipit (*Anthus spragueii*) were chosen as the target species for the following reasons:

- Swift Fox is an indicator species, a high-powered trend detector, a species of concern and a flagship species;
- Sprague's Pipit is an indicator species, an umbrella species and a species of concern;
- These two species are widespread on natural grasslands grazed by livestock;
- They are largely dependent on natural grasslands for survival;
- Ranchers can positively influence these species through management;
- They are species for which recovery plans have been prepared (Environment Canada 2012; Pruss *et al.* 2008);
- They are focal species in the South of the Divide Multi Species at Risk initiative (therefore a significant amount of knowledge is available about their habitat requirements and availability of suitable habitat); and
- They are species for which beneficial management practices have been identified.

3.4 Parameters Specific to Sprague's Pipit

As a guide, we have included the figure below which illustrates the basic habitat preferences of Sprague's Pipit.

Figure 1. Sprague's Pipit on the landscape (courtesy Environment Canada)



3.4.1 Landscape Criteria

Landscape criteria are based on the criteria used to define suitable habitat and would be used to select areas to include in the program. Landscape criteria would in most cases not be influenced by management. Application of these criteria could include identifying land managers to include in programming and/or might be used to prioritize bids from land managers to participate in the program.

Landscape criteria for Sprague's Pipit include:

- Blocks of native grassland > 145 ha,
- Loamy range sites,
- Low shrub cover,
- Low road densities,
- Low density of wetlands,
- Low density of water developments, and
- Flat to gently rolling topography.

Note: The amended recovery strategy for Sprague's Pipit in Canada (Environment Canada 2012) identifies unsuitable habitat as including dense patches of woody vegetation, open sand dunes, coulees, riparian areas, water bodies, planted non-native grassland, eroded slopes, badlands, roads, gas and oil wells, buildings, pipelines, fence lines and perennial watering and salting sites for livestock.

3.4.2 Site Criteria

Site criteria are site-specific habitat attributes that may be influenced by management. Application of these criteria could include prioritizing bids from land managers and/or as requirements for determining payments. Site criteria for Sprague's Pipit include:

- Sprague's Pipit must be present on the land. If funding is sufficient, the program could be expanded to adjacent suitable habitat that is currently unutilized by Sprague's Pipit;
- Range Health (Saskatchewan Prairie Conservation Action Plan Greencover Committee 2008): Healthy;
- Range Condition (Thorpe 2007): Good to Excellent;
- Minimal presence of invasive agronomic plant species (<1% cover);
- Vegetation height between 10 and 30 cm and variable within a pasture during May and June; and
- Good distribution of standing dead and litter with litter depths between 0.5 to 1 cm.

3.4.3 Management Options

Management options include management practices that are likely to influence the species. These practices may not be directly related to habitat. Examples include management that influences predators of the target species or food sources / prey of the target species. Management options include:

- Control shrub and tree invasion in Moist Mixed Grassland and Aspen Parkland;
- No planting woody vegetation;
- No insecticide spraying; and
- Minimize additional linear developments (e.g., roads, pipelines and utility lines).

3.4.4 Information Gaps

During the development of the parameters for Sprague's Pipit, a number of information gaps were identified. These gaps in knowledge are not great enough to prevent the implementation of a PES program to maintain and recover Sprague's Pipit. However, addressing these gaps could help land managers more effectively manage for Sprague's Pipit. Information gaps include:

- Trails are currently considered as having little impact, but research results vary. Verification is required.

- Predation by mice and ground squirrels is the biggest factor limiting productivity. Information is required about management actions that can reduce predation including understanding the unintended consequences of controlling predators.
- There is a need to understand the link between range health and predator populations. There are differing opinions on the abundance of predators, namely mice and ground squirrels, in healthy rangelands, and whether mice and ground squirrels have greater or lower abundance in healthy range as compared to rangelands in lower health. Research is required to answer these questions.
- Populations tend to be low around water sources. It is thought this is due to heavier grazing in these areas, although avoidance by Sprague's Pipit extended much further than the grazing impact. The impact of the footprint of water developments, including water pipelines, needs to be better defined and the factors driving the impact clearly identified.
- Heavier grazed areas show lower populations of Sprague's Pipit. In order to reduce the overall impact on Sprague's Pipit research should be done to show if there is a benefit to placing salt and oilers beside water developments by concentrating areas of high use. The effect on Sprague's Pipit would need to be clearly measurable as range managers normally recommend having these attractants in different locations to better distribute cattle.
- Maximum litter depths tolerated by Sprague's Pipit are known. Further research is needed to more accurately define optimal litter depths and relate litter depths to range litter measurements if possible. This could help simplify measurement and monitoring requirements for the program.
- Winter grazing may be beneficial for Sprague's Pipit. More research needs to be done to better define the benefits and interactions.
- Re-vegetation of cropland to native grasses needs further study. Some evidence exists that Sprague's Pipit will use sites re-vegetated to native plant species (Ellison and Zack 2011). However it may take many years for the vegetation to establish and for the suitable conditions (e.g., height and heterogeneity) to develop. More research is required to determine how long it takes, and under what conditions, for native re-vegetation to become suitable for Sprague's Pipit.

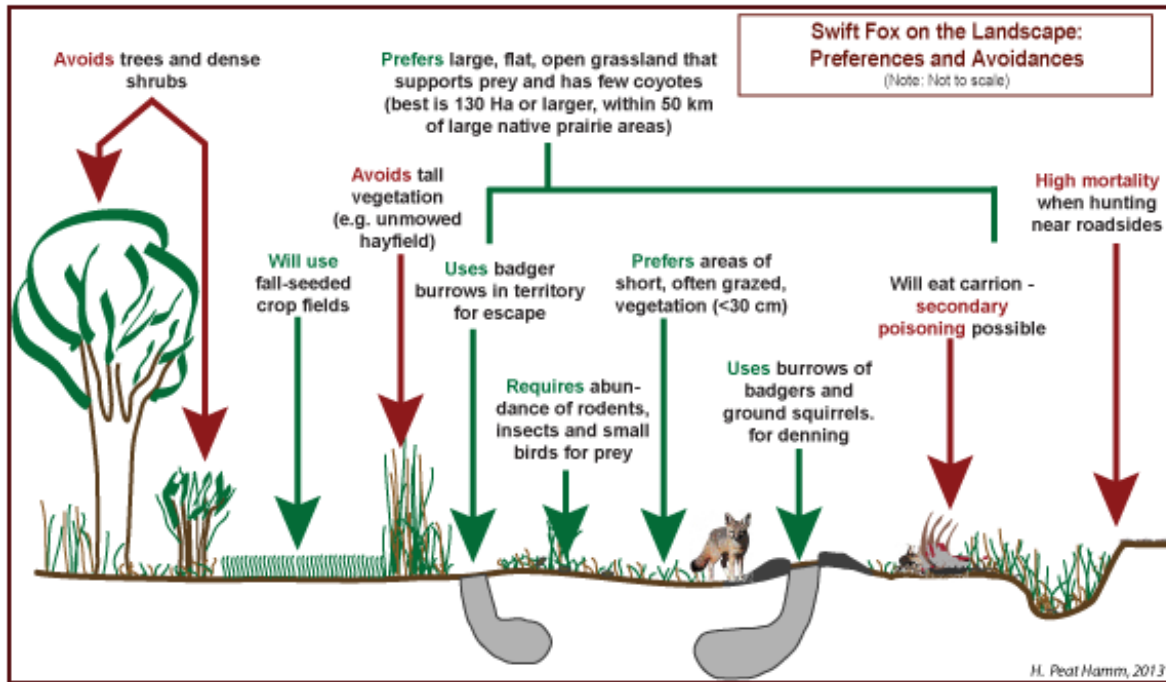
While there are a number of information gaps for Sprague's Pipit, there is sufficient knowledge to proceed with a PES program. Note that the preamble to SARA states:

"...the Government of Canada is committed to conserving biological diversity and to the principle that, if there are threats of serious or irreversible damage to a wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty..."

3.5 Parameters Specific to Swift Fox

As a guide, we have included the figure below which illustrates the basic habitat preferences of Swift Fox.

Figure 2. Swift Fox on the landscape



3.5.1 Landscape Criteria

Landscape criteria for Swift Fox are based on Moehrensclager *et al.* (2007) and expert input. Landscape criteria for Swift Fox include:

- Native grassland blocks > 40 km² (10,000 acres) with a minimal component of cropland or tame grassland;
- Dry/ Semiarid Mixedgrass;
- Low road densities; and
- Flat or gently sloping topography.

3.5.2 Site Criteria

Site criteria for Swift Fox include:

- Swift Fox must be present on the land. If populations begin to expand, the program could be expanded to adjacent suitable habitat that is currently unutilized;
- Range Health: (Saskatchewan Prairie Conservation Action Plan Greencover Committee 2008) Healthy with Problems or Better;
- Range Condition(Thorpe 2007): Fair or Better; and

- Optimum density of escape burrows¹.

3.5.3 Management Options

Management options include:

- Control coyotes by shooting but do not eliminate populations,
- No poisoning of predators,
- No control of badgers,
- No insecticide spraying,
- No planting woody vegetation,
- Minimize night traffic, and
- No new roads.

3.5.4 Information Gaps

Information gaps include:

- Red Fox are thought to be one of the factors limiting dispersal of Swift Fox. Information is needed on management activities that discourage the presence of Red Fox. Coyotes are the main predator of Swift Fox, but their presence limits the dispersal of Red Fox.
- New infrastructure on the landscape, particularly as related to oil and gas development, may be influencing the ratio of Red Fox to coyotes. Research is required to address this information gap.
- There are differing opinions on the abundance of prey species, namely insects and rodents, in healthy rangelands, and whether these species have greater or lower abundance in healthy range as compared to rangelands in lower health. Research is required to answer this question.
- Research from the more southern range of the Swift Fox in North America indicates that tall, dense tame forages provide low quality habitat for Swift Fox (Allardyce and Sovada 2003). However research is required in the Northern Great Plains to determine if Swift Fox will utilize lower growing tame forages such as crested wheatgrass or meadow brome, or seeded native forages.
- Swift Fox do not appear to be colonizing the Moist Mixed Grasslands, yet they historically occurred there. Research is required to determine the limiting factors which may be related to habitat suitability or predation.

¹ The values for optimum densities of escape burrows were not available at the time of this report. However, the data, housed at the Calgary Zoo, exist to determine these values.

3.6 Areas Where Sprague's Pipit and Swift Fox Overlap

Consideration of conflicting requirements between species should be a component of any truly multispecies program. More than 50 percent of suitable habitat for Sprague's Pipit and Swift Fox overlap within the SoD focus area (Environment Canada, 2013). Swift Fox prefer shorter grass than Sprague's Pipit and require less heterogeneity. However, Sprague's Pipits do not generally use sagebrush communities whereas Swift Fox commonly use them. In overlap areas the overriding management requirements should include:

- No rodent control, and
- Manage for Good to Excellent range condition and Healthy range.

3.7 Measurement and Monitoring

One of the primary recommendations arising from the PES review completed for the Ranchers Stewardship Alliance Inc. by the Miistakis Institute is:

- *Simple monitoring / auditing processes – Create a monitoring scheme that is as simple as possible to administer but that is robust enough to deliver results with sufficient rigor to determine if the PES program is achieving its goals.*

A significant amount of work has been done globally on monitoring PES programs (Jones 2010; Meijerink 2008; Sommerville *et al.* 2011). Monitoring is critically important for results-based programs as it measures the success and effectiveness of the program.

Before determining what and how to monitor, decisions must be made on what the monitoring information will be used for. Monitoring can be used for any or all of the following purposes:

- To measure the success of the program (maintain or improve species populations),
- To determine payments,
- To measure the trend of the species or program over time,
- To research linkages between practices or habitat attributes and species productivity, and
- To assure buyers their dollars are well spent.

It was determined that monitoring was required for the following uses in order of priority:

- a. To measure program performance,
- b. To monitor participant compliance with the program, and
- c. To provide information and learning that would be used to adapt the program over time.

3.7.1 Habitat-Based versus Species Production

A variety of indicators may be used in the design of a monitoring program:

- The species of concern itself (e.g., presence/absence, nest/active burrow abundance and successful reproduction);
- The evolution of threats to the species (e.g., predator abundances and habitat fragmentation by development);
- Habitat attributes (e.g., vegetation height, range health, litter accumulation, woody vegetation cover, and number and distribution of suitable burrows for denning and escape); and
- Presence of positive actions (e.g., deferred grazing and predator control).

RSAl's preference would be for land managers to be paid for the desired result (i.e., productivity of the target species). This avenue of implementation ensures that funds invested in the program are used effectively and also allows ranchers the flexibility to determine which practices to use based on local

knowledge and experience. However, monitoring results-based PES programs can cost as much or more than the incentive payments to land managers, particularly in programs where species at risk are the target. Species at risk can be difficult to find and time-consuming to monitor. On the other hand, PES programs rarely have infrastructure or capital costs. Therefore, in comparison to BMP-based programs, the total program costs of PES programs may be similar or lower. The challenge is to develop a cost-effective, yet meaningful monitoring system.

It has also been recognized that monitoring active nests and burrows could reduce productivity and increase mortality. In addition, species presence may vary annually based on weather. Sprague's Pipit, in particular, is known to select breeding locations based on the abundance of precipitation, avoiding areas that have received low spring precipitation. Even when present on a given site, reproduction of both species may be low if weather is wet and cold.

As a result, the Prairie Beef & Biodiversity program would need to be primarily habitat-based. In this context, monitoring Sprague's Pipit and Swift Fox productivity would be prohibitively expensive. SARA requires reporting of program results for effective protection of critical habitat, but there are no requirements to report on population recovery. This might be considered a shortcoming of the legislation.

However, there should be some capacity to reward increased productivity of species through, for example, a lower frequency of productivity monitoring and/or research programs that would tie management practices to productivity. A recommendation of the program design is to compare a habitat-based approach with a species productivity-based approach in the first phase of the program.

3.7.2 Components to Monitor

It will be critical to have a baseline inventory of the habitat parameters for each participating property. The baseline would include:

- The areas of the property which contain suitable habitat eligible for inclusion on the program;
- Presence of the target species²;
- Map of land cover, water bodies including water developments, linear features, planted woody vegetation, fences, and range sites or ecosites;
- Documentation of the condition of the land as it relates to the site criteria for each species; and
- Selected permanent sample and photo sites.³

Habitat parameters to monitor are listed below and prioritized for each species:

² Presence need only confirm that the species uses the property and does not have to include measurements such as locations or number of individuals.

³ Not all sampling locations need to be permanent. It is preferable to have randomly located range transects within ecosites and pastures.

Sprague's Pipit

- Land use conversion;
- Heterogeneity of vegetation height⁴;
- Litter depth; and
- Range condition and health.⁵

Swift Fox

- Land use conversion;
- 'Nearest neighbour' burrow density⁶; and
- Range condition and health.

It is estimated that a baseline inventory of 10,000 acres may take four to five days of field work including two to three range transects per ecosite per pasture. Vegetation height, heterogeneity, litter depth and burrow density measurements could be associated with each range transect.

A margin of error would need to be built in to these measurements because they provide estimates of the parameters across the entire land base in the program. In addition there is some level of interpretation by the monitor. The margin of error would need to be sufficient so that two different people taking the same measurements on the same land base at the same time of year have comparable results within the margin.

There is no monitoring of management options in the PES program design. The program would assume participants were in compliance until evidence is presented to the contrary.

Some less costly options for measuring the abundance or productivity of species could be considered. Presence/absence data collection is much less costly than productivity monitoring. A recommendation of the program design is that every five years, in association with the full habitat monitoring effort, the following information be collected for the target species:

- Sprague's Pipit – Bird presence/absence could be measured at a certain percentage of the permanent and random sampling points.
- Swift Fox – A scent station and motion activated camera could be established on each participating property.

Monitoring for all components will require personnel with expertise in range assessment, vegetation ecology and wildlife biology.

⁴ An index for optimal heterogeneity would need to be developed.

⁵ Range assessment tools do not address sacrifice areas such as water developments or perennial salt locations. If measurement of these areas is deemed important, a specific measurement will need to be developed.

⁶ A nearest neighbour index would need to be developed from existing data on optimal density and distribution.

3.7.3 Frequency of Monitoring

Considering cost and effectiveness of the program, the PES program design outlines the following monitoring schedule for the Prairie Beef & Biodiversity program.

- A full monitoring, including revisiting all parameters measured for the baseline inventory, should occur every five years. This frequency would allow sufficient time for habitat trends to become measurable.
- An annual audit should be done involving a one-day walk through in randomly located locations. An audit would detect any major issues with compliance and would allow for discussions with land managers.
- An annual self-audit would be required to trigger a payment and would include a short report on habitat conditions and observations and the submission of photos from the permanent sample/photo points. Protocols around audit content and photo protocols (e.g., time of year and orientation of photo) would need to be developed.
- Occasional associated research to fill information gaps, detect trends or determine linkages between species productivity and management.

3.7.4 Maximizing Cost Effectiveness of Monitoring

As indicated earlier, the cost of administering a PES program can be as much as the payments to participants. The largest cost component of administering a program is in monitoring. The following considerations should be taken into account with respect to maximizing cost effectiveness:

- On-site versus remote sensing monitoring;
- Permanent sampling sites versus random distributions ;
- Baseline and trend data versus target results; and
- When and how often to monitor.

In addition, the following questions should be considered:

- Land managers will be doing their own form of monitoring to ensure they produce results. Are there ways to formalize their work to help reduce the overall monitoring effort required?
- Other organizations such as petroleum producers may be monitoring the same species on the same landscape. Can partnerships be developed that help reduce overall costs and are mutually beneficial?
- Is a volunteer monitoring program possible? Effective? Efficient?

Some of these considerations have been discussed and incorporated into the frequency and design of the monitoring program itself (see the previous three sections).

When evaluating the evolution of threats to one of the target species, the most important criteria are land use conversion (i.e., is it still native grassland?) and linear developments (i.e., are there more roads,

pipelines and shelterbelts). These criteria can be monitored or evaluated through remote sensing as a cost effective measure.

Volunteer monitoring might be an option to reconsider once the Prairie Beef & Biodiversity PES program is operational. Some of the drawbacks of volunteer monitoring as a cost-saving measure is that volunteer programs can be very expensive to administer and might not be popular with ranchers, thereby limiting rancher participation in the program. However, there is educational/informational value in involving consumers in monitoring the program.

The cost-effectiveness of potential monitoring partnerships warrants careful consideration, for example:

- Provincial and federal governments may do periodic species population counts. Ensuring some of the counts are done on participating rangelands would reduce the overall monitoring costs to the program and increase the value of the data.
- If conservation easements or other stewardship programs (e.g., Native Prairie Stewards and Operation Burrowing Owl) are already being monitored on the participating property, joint monitoring could be done to reduce overall costs.
- The petroleum industry may be conducting inventories or surveys on the participating land base. Monitoring partnerships could reduce overall costs.
- Governments, nongovernmental organizations and industry may have information that can help prioritize participation and/or be used in the baseline inventory.
- It is likely that other organizations, particularly government and universities would be more willing to help fill information gaps than assist with monitoring. This would be an option once the program is established.
- A monitoring manual should be developed for the program to ensure everyone is following the same protocols. This manual would facilitate monitoring partnerships between different organizations and also limit the variability from changing monitoring staff or volunteers.

Conservation organizations are currently doing a lot of work on developing better results-based program monitoring methods. Before the monitoring protocols for the Prairie Beef & Biodiversity program are finalized and implemented, the emerging monitoring science should be reviewed and incorporated.

3.8 Program Administration

Another component of program design is to determine how a program would be administered and what aspects of program design and administration might be necessary to facilitate successful implementation. In this regard, the Miistakis review made several recommendations:

- *Reward success – A PES program can be designed to reward participants who are already engaging in good stewardship.*
- *Value threshold – The reward to participants must be above the “value threshold” at which potential participants see reason to become involved.*
- *Consider options for how payments are calculated – Land managers must feel the payment is adequate for the service provided before they will participate in the program. “Buyers” must feel the services provided are worth the payment or they may withdraw funding.*
- *Commitment to time and energy required – It is important to acknowledge that the development and on-going management of a PES program will take both time and energy.*

3.8.1 Prioritizing Participation in the Program

There are two components to prioritizing participation in the Prairie Beef & Biodiversity program; the first being to determine land locations that are eligible to participate. This initial prioritization will be based on geographic location and landscape criteria. Participation in the Prairie Beef & Biodiversity program will not be limited by the presence of a conservation easement on the property or by participation in other environmental programming.

The second prioritization will involve selecting participants from the pool of land managers interested in the program. This prioritization exercise assumes there are more willing participants than available funding. Some of the landscape criteria, management criteria, surrounding land use and the bid value would form the basis of this prioritization. The goal would be to obtain the most benefit to the species in the most cost effective manner possible.

An environmental benefits index would need to be developed for the second prioritization using the criteria. The advantage of using an environmental benefits index would be to reduce the complexity of the environmental and economic parameters to a single number which can then be used to compare applications to participate.

3.8.2 Determining Payments

Nykoluk (2013) indicates that the most applicable and reliable valuation of prairie stewardship would place PES payments between C\$5.40 and \$13.88/acre/year. PES payments for participants in Sage-

Grouse stewardship in the United States begin at US\$3.00/acre/year. However it is very difficult to place a value on the effort required to manage for these species. Therefore, workshop participants agreed that a reverse auction process would be the most appropriate way to determine payment. In a reverse auction *sellers compete to supply buyers with a specified good or service, enabling buyers to locate the most competitive sellers* (Greenhalgh *et al.* 2007). In addition, a reverse auction process would address the value threshold recommendation from the Miistakis review because potential participants would determine what an adequate payment must be in order to warrant their participation.

Greenhalgh *et al.* (2007) recommend that reverse auctions be used in situations where there is a constrained or limited budget because they provide a method to efficiently and cost-effectively allocate funding. Recommendations for ensuring functional reverse auctions (Greenhalgh *et al.* 2007) include:

- Clearly define the rules and explain the goals of the reverse auction to all stakeholders;
- Streamline the auction rules and process as much as possible to reduce lack of participation because of real or perceived complexity; and
- Identify appropriate, user friendly methods to calculate the environmental outcomes desired.

The environmental benefits index (see previous section) would be the method used to calculate environmental outcomes and the index would need to be communicated to stakeholders in advance of the reverse auction.

An added benefit to using reverse auctions is that this market-based instrument has been shown to be more efficient than uniform payment programs. Nolet *et al.* (2008) demonstrated that an ecological goods and services program aimed at improving wildlife habitat and water quality in Western Canada would be two to five times more expensive if standard payment schedules such as annual or one-time payments were used instead of reverse auctions. The cost-effectiveness is due to agricultural producers having the best information about their own preferences, costs and opportunities. Reverse auctions do entail higher transaction costs per dollar of payment due to the requirement to prepare bid packages and evaluate bids, but the overall cost was less than one percent higher than uniform payment programs. The cost-benefit ratio for habitat programming in Western Canada using reverse auctions was estimated to be 3.25 compared to 0.16 for one time payments and 0.12 for annual payments (Nolet *et al.* 2008).

Additional recommendations around determining payments include:

- Livestock producers should consider a group bid which would simplify the reverse auction process for individuals and may give them an advantage because the parcels of land participating would be concentrated geographically enhancing the environmental benefits provided and reducing administration costs;
- RSAI would be available to advise potential bidders reducing the complexity of the reverse auction; and

- A brokerage house, often a nongovernmental organization, could be created or adapted to negotiate between buyers and sellers.

3.8.3 Payment Structure

There is a need to further develop the PES program design with regard to the payments structure, and specifically the length of agreements and the timing/frequency of payments. A number of considerations should be taken into account when finalizing the payment structure for the Prairie Beef & Biodiversity program:

- The length or term of an agreement should be no longer than the term of funding committed to the program. Aligning these terms (e.g., five-year program funding would have five-year agreements) means sellers are not required to make a longer commitment than buyers.
- A long term agreement that allows for adaptation in programming must also then allow for adjustment in the amount of payment.
- A graduated payment could be considered for long term agreements as the program is adapted and information gaps are filled.
- Longer term agreements may provide more financial security for sellers.
- It may take many years to have or to demonstrate an impact on species. Long term agreements with flexibility built in may be the key to adaptability. Time is required to monitor, assess and adapt the program to improve effectiveness.
- A core payment could be made for a select set of site and management criteria with bonus payments for additional criteria, especially those criteria that are only required in certain situations and may have variable costs (e.g., controlling woody vegetation and invasive plants, or minimizing night traffic).

Based on the monitoring strategy for the Prairie Beef & Biodiversity program, a payment frequency of every five years would be optimal. A portion would be paid out upon signing the agreement to offset future costs. However, some practical considerations need to be addressed:

- The buyer will normally have a one year window to spend funds, with no option to accumulate allocated funds.
- The seller will have higher payable taxes on a five-year payment than on smaller, more frequent payments.
- The payment structure or agreement should be designed so there will never be a situation where a payment would need to be clawed back.

3.8.4 Program Agreement

The written contract between the buyer and the seller is a critical component of the Prairie Beef & Biodiversity program. The goal will be to have agreements that are accepted under appropriate federal and provincial legislation. Section 11 of SARA addresses the need to adequately secure critical habitat. Ideally a Prairie Beef & Biodiversity program agreement would be acceptable under section 11 of SARA. These agreements should be voluntary, protect and enhance critical habitat, and be monitored. The agreement may also fit appropriately under Part 3 of the Alberta Land Stewardship Act, if the Prairie Beef & Biodiversity program is implemented in Alberta.

If the agreement is not registered on land title, a transfer of land clause would need to be included in the agreement which allows the new owner to either continue meeting the terms of the agreement or to withdraw from the program.

3.8.5 Other Administration Considerations

The availability of technical transfer information with respect to range management and species management will be critical to the success of the Prairie Beef & Biodiversity program and must be made available to participants on an ongoing basis. There are many organizations, both government and non-profit, who can fill this role. Technical transfer should include local symposia sharing relevant research with land managers.

3.9 Funding and Implementation

The Miistakis review identified a critical requirement of PES programs:

- *An identified, sustainable “buyer” is essential – It is critical for a market to have a buyer willing to pay for the environmental service being produced for ‘sale’.*

The greatest challenge to the Prairie Beef & Biodiversity program is that there is no obvious organization which utilizes the PES tool and would be willing to implement the program in the target area. The Northern Plains Conservation Network refers to southwest Saskatchewan and southeastern Alberta as “The Forgotten Corners” – an area of high conservation value receiving low conservation programming effort. The solution may require a new grass roots entity.

In addition to the obvious buyers including the federal and provincial governments responsible for species at risk legislation, the following list of potential buyers could be considered:

- Foundations that fund conservation action,
- Petroleum companies through habitat offsets or good will payments / social licence to operate,
- Retailers of beef products who wish to promote sustainability (e.g., Walmart and McDonalds),
- Environmental groups,
- Levies on products causing harm (e.g., strychnine, rural development or zoning changes), and
- Levies on taxes (e.g., municipal property taxes).

The Canadian Cattlemen’s Association is establishing the Canadian Cattlemen’s Foundation, a charitable organization that could act as the banker for programs like the Prairie Beef & Biodiversity program and could provide tax receipts to donors.

A last consideration for the PES program may be the development of a communications campaign to market the program to potential buyers, particularly because the PES concept is relatively new to Canada.

4.0 CONCLUSIONS AND NEXT STEPS

A robust cross section of stakeholders were brought together to provide input into the design of the Prairie Beef & Biodiversity PES program. The result of discussions during two intense workshops was the design of a program which addresses both the basic requirements of a PES scheme as well as addressing issues and challenges that have been identified by RSAI and partners and by others around the world who have evaluated PES programming.

This document will be used to guide the implementation of the Prairie Beef & Biodiversity PES program and will also be made available to inform other initiatives with similar goals. It is a unique assemblage of diverse viewpoints on conservation program scientific and administrative parameters of that are often not publicly available because they are determined internally to an agency.

The next steps towards implementation of the Prairie Beef & Biodiversity PES program will be to engage additional partners and obtain funding for an initial phase of implementation.

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APPENDIX A: WORKSHOP PARTICIPANTS AND OBSERVERS

| | |
|------------------|---|
| Pat Fargey | Alberta Environment and Sustainable Resource Development (formerly with Parks Canada) |
| Brenda Dale | Canadian Wildlife Service |
| Kim Good | Miistakis Institute |
| Jeff Thorpe | Saskatchewan Research Council |
| Kelly Williamson | South Of the Divide Ecosystem Stewards |
| Ross Macdonald | Range Agrologist, 98 Ranch Inc. |
| Fawn Jackson | Canadian Cattlemen's Association |
| Bob Lowe | Canadian Cattlemen's Association |
| Lindsye Dunbar | Western Stock Growers Association |
| Michael Burgess | Ranchers Stewardship Alliance Inc. |
| Orin Balas | Ranchers Stewardship Alliance Inc., Saskatchewan Stock Growers Association |
| Sue Michalsky | Ranchers Stewardship Alliance Inc. |
| Twyla Anderson | Agriculture and Agri-Food Canada |
| Jeremy Brown | Water Security Agency of Saskatchewan |
| Peter Joyce | Saskatchewan Ministry of Environment |
| Diana Ghikas | Environment Canada |
| Tom Harrison | Water Security Agency of Saskatchewan |
| Carolyn Campbell | Alberta Wilderness Association |