PROPOSED

Species at Risk Act
Action Plan Series

Action Plan for Multiple Species at Risk in Southwestern Saskatchewan: South of the Divide

Black-footed Ferret
Burrowing Owl
Eastern Yellow-bellied Racer
Greater Sage-Grouse
Prairie Loggerhead Shrike
Mormon Metalmark
Mountain Plover
Sprague's Pipit
Swift Fox

2016

Government of Canada
Gouvernement du Canada

Canada

Recommended citation:

Environment and Climate Change Canada. 2016. Action Plan for Multiple Species at Risk in Southwestern Saskatchewan: South of the Divide [Proposed]. *Species at Risk Act* Action Plan Series. Environment and Climate Change Canada, Ottawa. xi + 127 pp.

For copies of the action plan, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, recovery strategies, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

Cover illustration: Landscape photo: South of the Divide, Jones Peak © Native Plant Society, C. Neufeld; Prairie Loggerhead Shrike © G. Romanchuck; Mormon Metalmark © R.L. Emmitt; Swift Fox © Environment and Climate Change Canada, G. Holroyd; Yellow-bellied Racer © Environment and Climate Change Canada, A.Didiuk

Également disponible en français sous le titre
« Plan d'action pour plusieurs espèces en péril dans le sud-ouest de la Saskatchewan – South of the Divide [Proposition] »

ISBN
Catalogue no.

[1] http://www.registrelep-sararegistry.gc.ca

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of action plans for species listed as Extirpated, Endangered, and Threatened for which recovery has been deemed feasible. They are also required to report on progress within five years after the publication of the final document on the SAR Public Registry.

Under SARA, one or more action plans provide the detailed recovery planning that supports the strategic direction set out in the recovery strategy for the species. The plan outlines what needs to be done to achieve the population and distribution objectives (previously referred to as recovery goals and objectives) identified in the recovery strategy, including the measures to be taken to address the threats and monitor the recovery of the species, as well as the proposed measures to protect critical habitat that has been identified for these species. The action plan also includes an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation. The action plan is considered one in a series of documents that are linked and should be taken into consideration together. Those being the COSEWIC status report, the recovery strategy, and one or more action plans.

The Minister of Environment and Climate Change is the competent minister under SARA for the recovery of the species on lands covered by this action plan and has prepared it to partially implement the associated recovery strategies, as per section 49 of SARA. To the extent possible, it has been prepared in cooperation with the Government of Saskatchewan (Ministry of the Environment, Ministry of Agriculture, Water Security Agency, Ministry of the Economy) and with Agriculture and Agri-Food Canada and Parks Canada Agency.

Success in the recovery of these species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions and actions set out in this action plan and will not be achieved by Environment and Climate Change Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this action plan for the benefit of the 13 SARA Schedule 1 species and Canadian society as a whole.

Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When the recovery strategy identifies critical habitat, there may be future regulatory implications, depending on where the critical habitat is identified. SARA requires that critical habitat identified within a national park named and described in Schedule 1 to the *Canada National Parks Act*, the Rouge National Urban Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans*

[2] http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

Act, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* be described in the *Canada Gazette*, after which prohibitions against its destruction will apply. For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies. For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

Acknowledgments

Environment and Climate Change Canada (ECCC) acknowledges the dedicated people who served on the steering committee and various task groups over the course of this project. The voluntary contributions of time and expertise from numerous individuals representing stakeholder organizations in southwestern Saskatchewan are especially appreciated.

Steering Committee: Co-leads Mark Wayland* (ECCC), Yeen Ten Hwang* (MOE), Pat Fargey* (PCA) and Adrian Sturch (PCA) provided technical and operational oversight and direction for the project, and leadership during stakeholder consultations and preparation of the action plan document. They were preceded by Dave Duncan (ECCC), Doug Campbell (MOE) and Randy Seguin (MOE). Membership included, at various times, Rick Ashton* (AAFC), Mary Brick* (MOA), Randy Graham (MOA), David Hanly (MOEC), Bill Houston* (AAFC), Glen McMaster (WSA), Royce Reavley* (MOEC) and Lorne Tangjerd (MOA).

Project Coordinator: Wendy Eskowich* (ECCC) served throughout most of the project planning period. Margaret Put (MOE) and Rick Proven (PCA) served prior to 2011.

Background & Action Plan Assembly Task Group (TG) – Medea Curteanu (ECCC), Pat Fargey (PCA) and Mark Wayland (ECCC) provided editorial leadership, review and assembly guidance in the preparation of this action plan with contributions from Stephen Davis (ECCC), Beatriz Prieto Diaz* (MOE), Adrian Sturch (PCA), and Wendy Eskowich (ECCC). Jeff Thorpe (Saskatchewan Research Council) edited contributions and prepared the action plan document, with partial content from an earlier draft by David Kirk (Aquila Consulting). The original multi-species Action Plan concept was developed by Dave Duncan (ECCC), Doug Campbell (MOE) and Bill Bristol (AAFC). Background information was compiled by Ed Beveridge (MOE), Jeanette Pepper (MOE), Shelly Pruss* (PCA), and Don McKinnon (MOE); contributing report by Jennie L. Pearce (Pearce & Associates Ecological Research).

Critical Habitat TG – Co-leads Stephen Davis* (ECCC) and Pat Fargey (PCA) with contributing members Andy Didiuk* (ECCC), Geoff Holroyd (ECCC), Jeff Keith* (MOE), Paul Knaga (ECCC), Joy Stevens* (ECCC), Helen Trefry* (ECCC), Joanne Tuckwell (PCA), Troy Wellicome* (ECCC), Corie White* (WSA) and Greg Wilson* (ECCC) collected and analyzed information that contributed to the scientific knowledge base of this report. This included the development of abundance and habitat models to assist in the identification, GIS analysis and mapping of critical and important habitat for 13 species in the SoD area. Members also helped identify threats, and formulate and prioritize recovery measures for this multi-species action plan. Editorial review of the final draft was also provided by the above members, Ryan Fisher (ECCC) and Lea Craig-Moore (ECCC).

Data & GIS Support TG – Ben Sawa (MOE) provided data management, storage and GIS support to all task groups. Mark Gilchrist (ECCC) produced critical habitat maps in conjunction with Stephen Davis (ECCC), and assistant Laura Gardiner (ECCC). Contributing members included: Dave Ackerman (AAFC), Mike Anderson (MOE), Gregg Babish (ECCC) Michael Fitzsimmons (PCA), Jeff Keith (MOE), Zhong Li (EC), Danny McLeod (MOE),

Erl Svendsen (AAFC), Gillian Turney (ECCC), Gary Weiss (ECCC), Eric Woodsworth (ECCC) and Karl Zimmer (EC).

Critical Habitat Protection TG –Robin Bloom* (ECCC) with active contributions by members Rick Ashton (AAFC), Mary Brick (MOA), Beatriz Prieto Diaz (MOE), Ken Dillabaugh* (MOE), Royce Reavley (MOEC) and Corie White (WSA) tested methodology and analyzed the process of assessing effective protection of critical habitat for the south of the divide project.

Socio-economic TG – Data collection for the socio-economic impact of the project was provided by Magfur Rahman (MOE) with assistance from Yves Bourassa (ECCC), Darrell Corkal (AAFC), Frank Grigel (PCA), Dave Hanly (MOEC), Tom Harrison* (WSA) and Ela Kinowska (ECCC). Socio-economic analysis of the costs and benefits of implementation of the action plan were provided by Alicia Entem***** (U of A) with oversight by Vic Adamowicz (U of A), Peter Boxall (U of A) and Stephanie Simpson (U of A), with additional review and comments provided by Mike Balfour and Royce Reavley (MOEC).

Communication, Engagement & Implementation TG Phase 1: Suzanne Vuch (ECCC) and Krista Scott (PCA) led on the development of foundational communication and engagement strategies for the SoD project with assistance from: Allison Henderson (U of S), Karin Smith Fargey (PCA), Kerry La Forge* (AAFC) and Krista Connick Todd (WSA). Kelly Williamson* (SWA/EC) led on the initial identification and engagement of stakeholders. Tom Harrison (WSA) led on preliminary investigations into implementation models with assistance from Lawrence Baschak (MOE), Ken Dillabaugh (MOE), Trevor Dyck* (AAFC) and Shelly Larson (PCA).

Communication, Engagement & Implementation TG Phase 2: Stakeholder engagement was headed by Mark Wayland (ECCC) with co-leads Wendy Eskowich, (ECCC), Tom Harrison (WSA), Jeff Keith (MOE), and Kelly Williamson (EC/WSA) who also assisted with engagement of the First Nations and Métis peoples. Contributing members included Krista Connick Todd, Ron Dolter (MOEC), Kerry La Forge, Bob Springer (MOA) and Lorne Veitch* (MOA). Suzanne Vuch directed the production of communication products. Peter Joyce (MOE) facilitated investigations into implementation models.

Stakeholders – We would like to thank the following individuals and organizations for their active participation in numerous stakeholder meetings and workshops*. Your input into the preparation and review of this document has been invaluable. Harvey Anderson (Invasive Alien Plants), Orin Balas*/Sue Michalsky (Rancher's Stewardship Alliance), Ross Beierbach/Howard Eiserman (Sask. Landowner/Lessee Rights Group), Don Connick* (Agriculture Producers Association of Sask.), Larry Grant (Sask. Cattlemans Association), Lynn Grant/Fawn Jackson* (Canadian Cattlemans Association), Steve Grant /Julie Mackenzie (Frenchman Wood River Weed Management Area), Pat Hayes/Steve Gunter (Val Marie Irrigation Groups), Paul Heglund/Scott Sanderson (Consul/Nashlyn/Vidora Irrigation), Chet Neufeld* (Native Plant Society of Sask.), Journey Paulus* (Cenovus), Melissa Ranalli/Rebecca Magnus (Nature Sask.), Bob Santo*/Dale Gross, Carmen Leibel (Nature Conservancy Canada), Sherry Sian/Rob Staniland* (Canadian Association of Petroleum Producers), Ron Tittle (Sask. Irrigation Projects Association), Rick West*/Bruce Howard/Cali Scheidt (Sask. Power),

Brooks Whitney* (Sask. Stockgrowers Association) and
Natasha Wilkie/Michelle Clark/Tara Davidson (Prairie Conservation Action Plan).
Additional individuals who contributed to the action plan in various ways: Ashley Anne Wick (University of Alberta), Trevor Dyck* (AAFC), and Bret Ward* (AAFC).

* These individuals are further acknowledged for participating in the Recovery Measures Workshop.

Acronyms:

AAFC –Agriculture and Agri-Food Canada
ECCC – Environment and Climate Change Canada
MOA – Saskatchewan Ministry of Agriculture
MOE – Saskatchewan Ministry of Environment
MOEC – Saskatchewan Ministry of Economy
PCA – Parks Canada Agency
WSA – Water Security Agency
U of A – University of Alberta
U of S – University of Saskatchewan

Executive Summary

The South of the Divide (SoD) Action Plan focuses on a group of nine federally-listed species that inhabit the Milk River drainage basin of southwestern Saskatchewan. This multi-species Action Plan forms an integral component of implementing the Recovery Strategies for these nine species at risk. The goal of the plan is to conserve these and other species at risk, and their supporting habitats, through cost-effective measures and collaboration with land owners and other land users. Areas managed by Parks Canada Agency within the SOD area are not included in this action plan because Parks Canada Agency is developing its own multi-species action plan for species at risk within Grasslands National Park. . The development of the SoD Action Plan benefited from ongoing participation and advice from the Government of Saskatchewan and key stakeholder groups, including several groups from the South of the Divide region.

The Action Plan encompasses the Saskatchewan portion of the Milk River drainage basin, a 1,415,732 ha (14,157 km^2) area (excluding Grasslands National Park) in the southwest corner of Saskatchewan. In this semi-arid area, more than half of the landscape remains in natural mixed-grass prairie. The Plan covers the following nine extirpated, endangered or threatened species: Black-footed Ferret, Burrowing Owl, Eastern Yellow-bellied Racer, Greater Sage-Grouse, Prairie Loggerhead Shrike, Mormon Metalmark, Mountain Plover, Sprague's Pipit and Swift Fox. The Plan addresses population and distribution objectives that were identified in the Recovery Strategy for each of the nine species, but only to the extent to which those objectives can be realized within the SoD area. The Action Plan also includes management considerations for four species of special concern for which Management Plans have been prepared: Black-tailed Prairie Dog, Long-billed Curlew, McCown's Longspur, and Northern Leopard Frog (boreal/prairie populations). Threats to species have been identified and compiled from the individual Recovery Strategies and Management Plans.

Recovery measures outlined in the SoD Action Plan fall under seven broad strategies that are similar to those in the accompanying recovery strategies: 1) Research; 2) Population Management and Species Protection; 3) Habitat Assessment, Management and Conservation; 4) Regulation and Policy; 5) Communication, Collaboration and Engagement; 6) Conservation Planning; and 7) Monitoring and Assessment. Within each broad strategy, recovery measures are grouped into approaches with expected outcomes. The specific recovery measures, and their priorities and implementation schedule, have been developed in collaboration with a large number of stakeholders. Recovery measures may be added, adapted or revised as new information is gathered.

Critical habitat located within the SoD area is identified in this Action Plan to the extent possible using the best available information, and falls into one of three situations:

1) For Burrowing Owl and Eastern Yellow-bellied Racer, critical habitat was previously identified *within* the SoD area in the Recovery Strategy for each of these species, and *new* critical habitat within the SoD area, is identified in this Action Plan.
2) For Prairie Loggerhead Shrike and Sprague's Pipit, critical habitat was previously identified *outside* of the SoD area in the Recovery Strategy for each of these species, and *new* critical habitat within the SoD area is identified in this Action Plan.

3) For Mormon Metalmark, Mountain Plover and Swift Fox, critical habitat was *not* previously identified in the Recovery Strategy for each of these species, but *new* critical habitat *within the SoD area* is identified in this Action Plan.

For Greater Sage-Grouse and the Black-footed Ferret, critical habitat within the SoD area was fully identified in the Recovery Strategies for these two species, and *no new* critical habitat is identified in this Action Plan. A description of the previously identified critical habitat for these two species is included in Appendix D of this Action Plan for the benefit of the reader.

Critical habitat within the SoD area (excluding Grasslands National Park) is identified for each species independently, however there is substantial overlap (See Section 1.3.9). In this multi-species Action Plan, the total amount of overlapping (non-additive) critical habitat for all species in the SoD area, is found within 595,573 ha (5,955 km^2) of land. For several species, further critical habitat must be identified in the SoD area and across the species' ranges in order to meet the national population and distribution objectives. Critical habitat has been identified on private land, provincial Crown land, and federal Crown land that is not in federal protected areas. The federal government and the Government of Saskatchewan are working together to ensure that all critical habitat in the SoD area is effectively protected.

A socio-economic evaluation of the SoD Action Plan was completed. This evaluation determined that implementation of this plan will have direct costs related to research, population management, habitat management, regulation, communication, planning, and monitoring. It may also lead to opportunity costs, such as foregone profits, taxes, and royalties from petroleum development and possibly from other resource mineral extractions. It will provide benefits related to conservation of species at risk, as well as other ecological goods and services provided by native grasslands, such as livestock forage, general biodiversity, pollination, carbon sequestration, recreation, and water storage and filtration. The distributional impacts on various groups (the Canadian public; the agriculture, petroleum, and tourism industries; federal, provincial, and municipal governments; First Nations and Métis groups; and conservation groups) are assessed.

Table of Contents

List of Figures

List of Tables

1. Recovery Actions

1.1 Context and Scope of the Action Plan

The South of the Divide (SoD) Action Plan addresses multiple species at risk within a 14,157 km^2 area in southwestern Saskatchewan. The goal of this Action Plan is to conserve species at risk and their supporting habitat in the Milk River drainage basin, by using cost-effective measures, and by collaborating with land owners, lessees and other land users.

1.1.1 Focal and Other Species

As of June 2014 there were **23** terrestrial species at risk listed on Schedule 1 of the federal *Species at Risk Act* (SARA) that were known to occur in the SoD area. This document is a SARA Action Plan (under Section 47 of the Act) for the **nine** species listed as Threatened, Endangered or Extirpated, for which recovery strategies have already been prepared and for which recovery was deemed to be feasible (note that this excludes species such as the Plains Grizzly Bear and the Eskimo Curlew, for which recovery is not considered feasible). These nine species are referred to as "Focal Species" in Table 1 and elsewhere in this document.

Although SARA does not require action plans for species of Special Concern, four such species are considered in the SoD Action Plan in order to provide a more holistic approach to conservation planning in the region. These species are referred to as "Other Species" in Table 1.

This Action Plan should be considered along with the documents listed below, as recovery planning documents for the SoD area.

1. Recovery Strategy for the Black-footed Ferret (*Mustela nigripes*) in Canada (Tuckwell and Everest 2009b).
2. Recovery Strategy for the Burrowing Owl (*Athene cunicularia*) in Canada (Environment Canada 2012a)
3. Recovery Strategy for Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*) in Canada (Parks Canada Agency 2010).
4. Amended Recovery Strategy for the Greater Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada (Environment Canada 2014a).
5. Recovery Strategy for the Loggerhead Shrike, *excubitorides* subspecies (*Lanius ludovicianus excubitorides*), in Canada [Proposed] (Environment Canada 2014b)
6. Recovery Strategy for the Mormon Metalmark (*Apodemia mormo*) Prairie Population, in Canada (Pruss et al. 2008b).
7. Recovery Strategy for the Mountain Plover (*Charadrius montanus*) in Canada (Environment Canada 2006)
8. Amended Recovery Strategy for the Sprague's Pipit (*Anthus spragueii*) in Canada (Environment Canada 2012b).
9. Recovery strategy for the Swift Fox (*Vulpes velox*) in Canada (Pruss et al. 2008a).
10. Management Plan for the Black-tailed Prairie Dog (*Cynomys ludovicianus*) in Canada (Tuckwell and Everest 2009a)

11. Management Plan for the Long-billed Curlew (*Numenius americanus*) in Canada (Environment Canada 2013b).
12. Management Plan for the Northern Leopard Frog (*Lithobates pipiens*), Western Boreal / Prairie Populations, in Canada (Environment Canada 2013a)
13. Management Plan for McCown's Longspur (*Rhynchophanes mccownii*) in Canada [Proposed] (Environment Canada 2014c)

The current status of these species, their population trends, population and distribution objectives, and the percentages of their Canadian and global ranges occurring in the SoD area are provided in Table 1.

It is envisioned that other species at risk known to occur in the SoD area will be included in amendments to the SoD Action Plan. Those species include Greater Short-horned Lizard (*Phrynosoma hernandesi*) – Endangered; Ferruginous Hawk (*Buteo regalis*) – Threatened; Common Nighthawk (*Chordeiles minor*) – Threatened; Chestnut-collared Longspur (*Calcarius ornatus*) – Threatened; Dwarf Woollyheads (prairie population (*Psilocarphus brevissimus*) – Special Concern; Peregrine Falcon (*Falco peregrines anatum/tundrius*) – Special concern; Rusty Blackbird (*Euphagus carolinus*) – Special concern; Short-eared Owl (*Asio flammeus*) – Special Concern; and Monarch (*Danaus plexippus*) – Special Concern. Although these species are not directly considered in this plan, it is expected that many of them will benefit from the proposed recovery and habitat protection measures (see Appendix B).

It is important to note that Grasslands National Park (GNP), which occurs inside of the boundaries of the SoD area, is not included in the SoD Action Plan because Parks Canada Agency (PCA) is developing the Multi-species Action Plan for Grasslands National Park of Canada (Parks Canada in prep.). Many of the species occurring in the SoD area also occur within GNP; therefore these two action plans will complement one another.

The SoD area and Grasslands National Park comprise a large percentage (> 50%) of the Canadian ranges of several species: Black-tailed Prairie Dog, Eastern Yellow-bellied Racer, Greater Sage-Grouse, Mormon Metalmark, Mountain Plover and Swift Fox. The SoD area covers a small part (< 10%) of the Canadian ranges of Sprague's Pipit, Prairie Loggerhead Shrike, Long-billed Curlew and McCown's Longspur, however, the large area of native grassland remaining in the SoD area, compared to most other parts of the Canadian Prairies, makes it important to the recovery and management of these grassland-dependent species. The SoD area and GNP will also be very important to the recovery of the Black-footed Ferret (currently listed as extirpated) as this area comprises > 50% of this species' historic range.

Some of the species covered by this Action Plan are "edge-of-range" species whose populations are "Secure" or "Apparently Secure" globally (NatureServe 2012), and are widely distributed south of Canada (Eastern Yellow-bellied Racer and Black-tailed Prairie Dog). In addition, the Mountain Plover, though assessed as "Vulnerable" throughout its North American range, has a population of approximately 8,000 – 15,000 birds (NatureServe 2012); whereas, its numbers in Canada are exceedingly low, with fewer than 50 individuals having ever been recorded in the SoD area (Environment Canada 2010 unpubl. data). For the Mormon Metalmark, the SoD area accounts for < 1% of the butterfly's global distribution and abundance (Pruss et al. 2008b). This

Action Plan will have little effect on the *global* status of these edge of range species, however, it should benefit local and in some cases national, populations in Canada.

Table 1 List of species at risk considered addressed in the SoD Action Plan.

Species	Status	Population and Distribution Status or Trend[a]	Population and Distribution Objective[b]	% of Canadian Range in the SoD area[c]	% of Global Range in the SoD area[c]
FOCAL SPECIES					
Black-Footed Ferret (BFFE)	EX	Population is currently unknown. A minimum population of 12 ferrets were confirmed from 2009-2012, followed by a population decline in 2013-2015 (L. Wein pers comm.)	Establish a wild population with ≥ 80% probability of persisting ≥ 20 years	not applicable because extirpated	
Burrowing Owl (BUOW)	EN	Population declined 90% in 1990s. Range has contracted to only 36% of the historical range	1. Short term: Achieve the population size (800 breeding pairs) and distribution that was estimated in 2004. 2. Long-term: Reverse population decline and maintain self-perpetuating, well-distributed population of ≥ 3000 breeding pairs in 4 provinces encompassing the 1993 distribution for MB, SK & AB)	6.9 (7.3) based on 1993 distribution	< 1 (< 1) based on 1970's range (Wedgewood 1978) and 2004 N. American distribution
Eastern Yellow-bellied Racer (EYBR)	TH	Very small distribution in Canada	Maintain the species' distribution in Canada	60 (79)	< 1 (< 1)
Greater Sage-Grouse (GRSG)	EN	98% decline in population (1988-2012). Also significant range reduction	1. Immediately, stop the decline of the adult Sage-Grouse population in Canada. 2. In the short-term, reverse the population decline, and increase the number of active leks, in both Alberta and Saskatchewan. 3. In the long-term, achieve a stable or increasing Sage-Grouse population in Canada of at least 1,095 adult Sage-Grouse, among 16 or more active leks in Alberta, and at least 1500 adult Sage-Grouse, among 20 or more active leks in Saskatchewan	43 (53)	< 1 (< 1)

Species	Status	Population and Distribution Status or Trend[a]	Population and Distribution Objective[b]	% of Canadian Range in the SoD area[c]	% of Global Range in the SoD area[c]
Prairie Loggerhead Shrike (LOSH)	TH	Population declined > 80% since the 1970s. Breeding range has also contracted.	Maintain the area of occupancy of the species across its distribution and maintain population levels within this area of occupancy.	5 (5)	< 1 (< 1)
Mormon Metalmark, (MOME) prairie population	TH	Very small population size (< 1000 individuals per year) in limited distribution in Canada	Maintain suitable habitat and ecological linkages within the known range of the prairie population of Mormon Metalmark	7 (100)	< 1 (< 1)
Mountain Plover (MOPL)	EN	Extremely rare breeder in SW Saskatchewan and SE Alberta. Population has been declining in the United States and this may affect the ability of the species to persist in Canada	Maintain recent abundance and distribution in southeastern Alberta and southwestern Saskatchewan	85 (94)	< 1 (< 1)
Sprague's Pipit (SPPI)	TH	Population decline of approximately 70-85% between the late 1960s and 2005.	1. Increase and then maintain population size and distribution at or above the 1980- 1989 levels throughout the pipit's historical range in Canada. Prevent further loss and degradation of native prairie within the species' historical range.	10 (11)	(1) 1
Swift Fox (SWFO)	TH	Population re-introduced to Canada beginning in 1983. Population increased 3-fold since 1996	1. Ensure a population of ≥ 250 mature, reproducing animals by 2012 Population of 1000 mature, reproducing foxes, with < 30% population reduction in any 10-year period, by 2027	65 (69)	2 (2)
OTHER SPECIES					
Black-tailed Prairie Dog (BTPD)	SC[d]	Very small population and limited distribution in Canada	Prevent the Canadian population from becoming threatened or endangered by ensuring it maintains at least 90% probability of persistence in 100 years	30 (100)	< 1 (< 1)
Long-billed Curlew (LBCU)	SC	Historical population declines and range contraction. Recent population trends are unclear	Maintain or increase the recent (since 2004) breeding distribution.	3 (3)	< 1 (< 1)

Species	Status	Population and Distribution Status or Trend[a]	Population and Distribution Objective[b]	% of Canadian Range in the SoD area[c]	% of Global Range in the SoD area[c]
McCown's Longspur (MCLO)	SC	Population decline of 96% from 1970-2009. Populations stabilized in recent years (1996-2004)	Maintain or improve the recent (since 1996) population and distribution in Canada	7 (7)	2 (2)
Northern Leopard Frog (NLFR) (boreal/prairie populations)	SC	Considerable range contraction and loss of some populations	Maintain and, where feasible, increase the distribution.	2 (2)[e]	<< 1 (< 1)

[a] – Population and Distribution Status or Trend information taken from national recovery strategies or management plans for the listed species unless otherwise indicated.
[b] – Population and Distribution Objectives, Recovery Goals or Management Objectives taken from national recovery strategies or management plans for the listed species
[c] – Numbers outside parentheses are values for the SoD area not including Grasslands National Park (GNP). Numbers inside parentheses are values for the combined the SoD and GNP areas. Values are based on current ranges unless indicated otherwise in table.
[d] – COSEWIC (2011) assessed the species as Threatened; however listing under Schedule 1 of SARA is still pending.
[e] – Percentages pertain to the Western Boreal/Prairie populations of NLFR.

1.1.2 Introduction to South of the Divide (SoD)

The SoD area covers 14,157 km^2 in the southwest corner of Saskatchewan, bordering Alberta on the west and Montana on the south (Figure 1). It is bounded on the north and east by the drainage divide along the Cypress Hills and Wood Mountain uplands. The area 'south of the divide' is part of the Milk River Basin, which ultimately drains into the Missouri River. Elevations climb from 800 to 850 m along the U.S. border to over 1300 m in the Cypress Hills.

The underlying geology is formed by sedimentary rocks (shales and sandstones), with a thin cover of glacial deposits, and is frequently dissected by ravines or "coulees", with intermittent streams and exposed hillsides. The climate at lower elevations is semi-arid, but becomes more humid at higher elevations. Annual precipitation ranges from 300 mm in the driest areas along the U.S. border to over 400 mm in the Cypress Hills. Summers are short and warm, and winters are long and cold. Average temperatures are 16 to 20˚ C in July, and -10 to -14˚ C in January, with the cooler temperatures at the higher elevations.

The natural vegetation over most of the SoD area is mixed prairie, and the major grass species are Needle-and-thread (*Hesperostipa comata*), Northern Wheatgrass (*Elymus lanceolatus*), Western Wheatgrass (*Pascopyrum smithii*), Blue Grama (*Bouteloua gracilis*), and June Grass (*Koeleria macrantha*). Sedges, such as Low Sedge (*Carex duriuscula*) and forbs, such as Pasture Sage (*Artemisia frigida*), are also abundant. Silver Sagebrush (*Artemisia cana*) is widely distributed, while other shrubs, such as Western Snowberry (*Symphoricarpos occidentalis*),

Woods Rose (*Rosa woodsii*), Willows (*Salix* spp.) and Thorny Buffaloberry (*Shepherdia argentea*) are found along streams. Higher elevations support moister grasslands, with Western Porcupine Grass (*Hesperostipa curtiseta*) and Plains Rough Fescue (*Festuca altaica ssp. hallii*), and small areas of Trembling Aspen (*Populus tremuloides*), White Spruce (*Picea glauca*) and Lodgepole Pine (*Pinus contorta*) forest.

The SoD area contains large tracts of native prairie that have been maintained through the careful stewardship of ranchers and community pasture managers. Just over half of the area is native grassland, and another quarter is annual cropland (Table 2)[3]. Prior to the mid-1990s, cropland was mainly sown to wheat, but emphasis on other cereal grains and oilseeds has subsequently increased. There is also a significant amount of land that has been broken and seeded to introduced forages for hay and tame pasture (Table 2). While the density of roads in the SoD area is less than in other parts of southern Saskatchewan, they still total 8,241 km in length, for a density of 0.59 km per km^2.

[3] The areas and percentages provided here are from a classification of satellite-based remote sensing data and are therefore not exact.

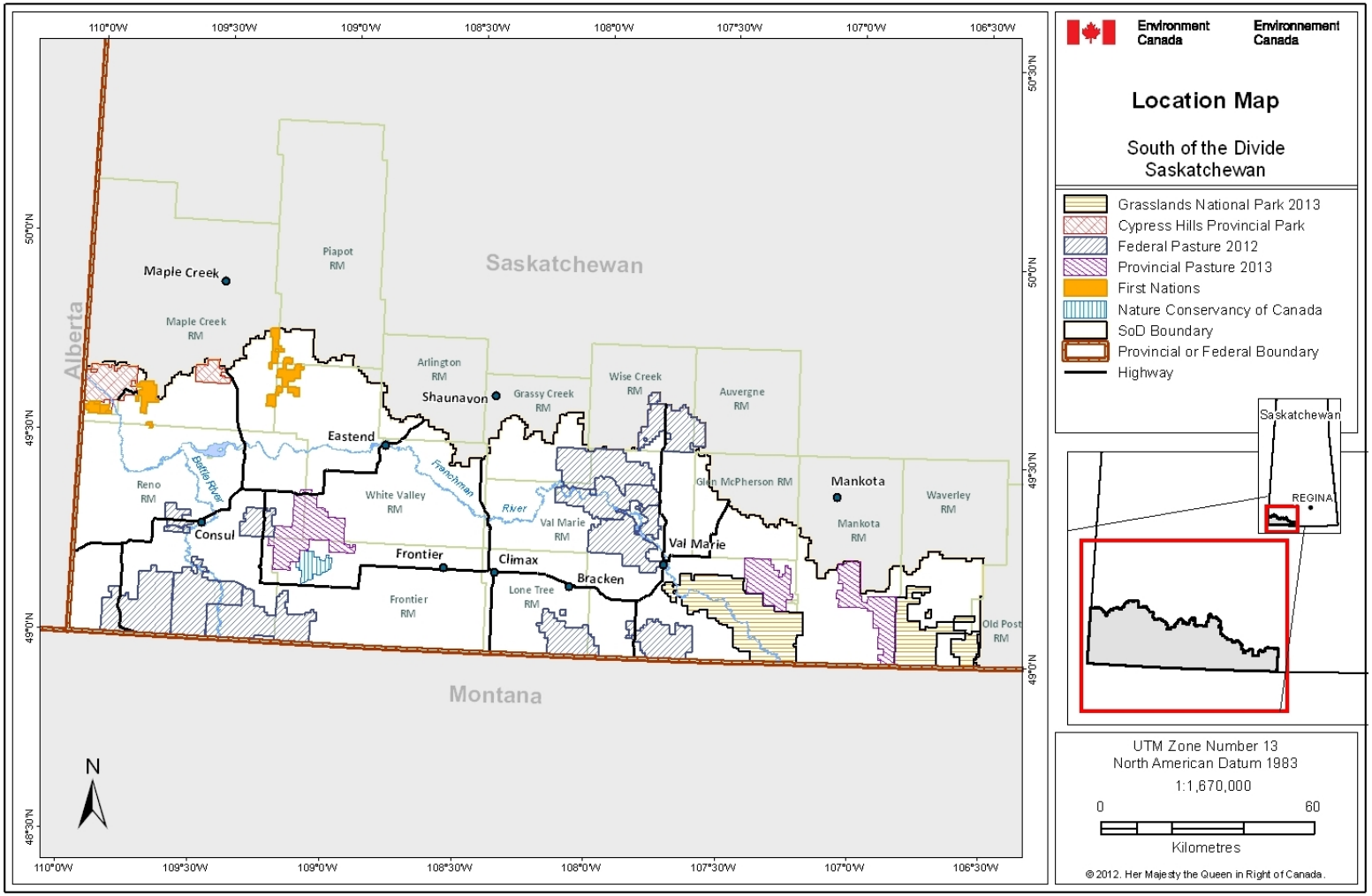

Figure 1 The South of the Divide (SoD) study area.
Federal pastures consist of a mixture of federal and provincial Crown land. Over the period 2013-2018, the federal government will transfer ownership and management of most federal pastures to the province of Saskatchewan.

Table 2 Land cover in the South of the Divide area (SoD), and in the SoD area plus Grasslands National Park (GNP).
Source: Environment and Climate Change Canada, unpublished data

	Area in SoD (ha)	Percent of SoD	Area in SoD + GNP (ha)	Percent of SoD + GNP
Natural land-cover types				
Native grassland	740,728	52.4%	789,535	53.0%
Shrub	32,543	2.3%	51,380	3.4%
Tree	21,599	1.5%	21,599	1.4%
Wetland	380	0.0%	380	0.0%
Riparian areas	10,523	0.7%	11,811	0.8%
Bare soil	601	< 0.1%	1,960	0.1%
Altered land-cover types				
Annual cropland	360,340	25.5%	361,071	24.2%
Hayland and tame pasture	187,950	13.3%	189,655	12.7%
Human features*	105	< 0.1%	105	< 0.1%
Other				
Permanent water	6,644	0.5%	6,836	0.5%
Intermittent water	29,495	2.1%	29,900	2.0%
Unclassified	23,488	1.7%	26,698	1.8%
Total	1,414,356		1,490,889	
*Note that "Human features" includes towns and other developed areas, but does not include the area occupied by roads and ditches.				

About 46% of the land in the SoD area (excluding Grasslands National Park) is privately-owned, 50% is provincial Crown land, and 3% is federally owned. Ranching is the main activity in the SoD area, but crop production is also important. Some of the hayland is irrigated because of the dry climate. The petroleum industry is important to the region. A small percentage of the land base consists of protected natural areas. Four First Nations have reserve land in the SoD area and there is one First Nation community in the area. There are few major roads and little urbanization. Human population is low, with approximately 3,000 – 4,000 residents. Further details are provided in Section 2 – Socio-Economic Evaluation.

1.1.3 Threat Assessment in the SoD area

Range-wide threats to the species included in this Action Plan have been described in the associated recovery strategies and management plans. Because the levels of these threats may differ between the SoD area and the range as a whole, it is important to examine threats within the SoD area specifically, in order to plan appropriate recovery measures. Moreover, for planning recovery measures, it is valuable to consider threats for multiple species within a defined project area. This perspective is missing from national, single-species recovery strategies and management plans.

The threat assessment (see Table 12 in Appendix A) uses a multi-species approach to identify the level of concern regarding the various threats in the SoD area. It does so by contextualizing the range-wide threats identified in recovery strategies and management plans in terms of the types

of activities and level of impact found in the SoD area. Furthermore, it indicates the number of species that are likely to be affected by specific threats.

Below is a description of threats estimated to be of medium or high concern for species in the SoD area; the number and letter code of each threat as it appears in Appendix A is also included for ease in cross-referencing. Threats estimated to be of low concern are not listed here, but can be found in Appendix A. Threats are listed according to the level of concern and number of species affected, from largest to smallest. The descriptions below complement, but do not replace, the detailed descriptions of threats provided in the associated recovery strategies and management plans.

1.1.4 Description of Threats

Conversion of Native Habitat to Crop and Forage Production (6a)

Conversion of native habitat (i.e. grasslands, shrublands, and badlands) to cropland or tame forage is the most widespread and severe threat to species at risk in the SoD area. This threat ranks as a medium level of concern for Burrowing Owl, Greater Sage-Grouse and Long-billed Curlew; and as a high level of concern for McCown's Longspur, Sprague's Pipit and Swift Fox (Appendix A). Approximately 35-40% of the native habitat in the SoD area has been converted to agriculture. For Sage-Grouse, more than 80% of the sagebrush dominated rangeland in Saskatchewan has been converted to agricultural crops since the early 1900's (Harris 1998). The rate of conversion has slowed in recent decades because less of the remaining native grasslands and shrublands are on suitable soils with adequate moisture levels for crops or tame pasture production. That situation could change however if new crops are developed that grow well on marginal lands (Gjetvaj and Bentham 2012) or if prices for crops were to increase substantially.

Conversion of Native Habitat to Industrial Infrastructure (6b)

Industrial infrastructure, related to the oil & gas industry and consisting of such things as drilling rigs, pump jacks, pump shacks, compressor stations, storage and treatment tanks, pipelines, roads and trails, as well as power transmission and distribution lines (Aldridge 2000), result not only in direct removal of habitat, but more importantly, in fragmentation of surrounding habitat-reducing the size, connectivity, and sometimes habitat quality of grassland patches, thereby causing avoidance of such habitat fragments by some species. Industrial infrastructure also provides perches and travel corridors for predators, and creates a foothold for invasive plant species. Conversion of native habitat to industrial development represents a medium or high level of concern for five focal species covered in this Action Plan (Appendix A). Greater Sage-Grouse in particular occur less frequently and their nests and young are at greater risk of predation in areas developed for petroleum extraction compared to undeveloped areas (Naugle et al. 2011). Other species likely to be adversely affected include Long-billed Curlew, McCown's Longspur, Swift Fox, and Sprague's Pipit.

There are estimated to be 2,901 petroleum well sites of all categories and 1,660 km of pipelines in the SoD area, with 144 km yet to be constructed. The density of well sites within sections (2.5 km^2) of land where well sites occur averages 2.4 wells per section (range: 1-37 wells per

section). There are many different types of petroleum infrastructure representing varying degrees of risk to these species. Other industrial infrastructure, such as power transmission lines, also occur in the area. Furthermore, substantial reserves of oil and especially natural gas remain undeveloped in the region (SK Ministry of Energy and Resources and National Energy Board 2008; Marsh and Hill 2014). Thus, there is potential for additional conversion of native habitat to industrial infrastructure in the future.

Exotic and Introduced Diseases (5b)

Emerging exotic diseases present new problems for the survival and recovery of species at risk in SoD area and in Canada as a whole (Daszak et al. 2000). Sylvatic Plague, *Ranavirus* and West Nile Virus (WNv) were ranked as a medium to high level of concern for four species occurring in the SoD area (Appendix A). Black-footed Ferrets and Black-tailed Prairie Dogs are highly susceptible to Sylvatic Plague which is caused by the exotic bacterium *Yersinia pestis*, and for which there is currently no effective defense (Tuckwell and Everest 2009a, 2009b). Although infection is not always lethal, typically entire Black-tailed Prairie Dogs colonies are eradicated after infection, further impacting Black-footed Ferret populations which rely on Prairie Dogs as their main food supply (Tuckwell and Everest 2009b). The risk of plague outbreaks has been identified as the greatest threat to the conservation and recovery of both Black-tailed Prairie Dogs and the re-introduced Black-footed Ferrets (Tuckwell and Everest 2009a and 2009b). The existence of plague has been documented in a Prairie Dog carcass from Grasslands National Park, although there have been no outbreaks as yet (Parks Canada Agency 2011).

Northern Leopard Frog die-offs caused by *Ranavirus* have been documented in southeastern Saskatchewan (Schock and Bollinger 2005), but there is no evidence indicating its prevalence in the SoD area (A. Didiuk, pers. comm.).

West Nile Virus was introduced to North America in 1999, and has spread widely, infecting wild and domestic birds, horses and humans (Naugle et al. 2004), and causing 100% mortality in laboratory-infected Greater Sage-Grouse (Clarke et al. 2006). West Nile Virus has been recently documented in Alberta (Naugle et al. 2004) and in Grasslands National Park (Tack 2009). Mortality due to WNv has been reported to reduce late summer adult and chick survival by as much as 25% in Greater Sage-Grouse (Naugle et al. 2004). It is believed that small, fragmented populations, like those of the Greater Sage-Grouse in Canada- which exhibit very low resistance to the virus, will be most heavily impacted, possibly leading to local extirpations (Environment Canada 2014a).

Increased Predation Pressure (2d)

Increases in predation pressure represent a high level of concern for Greater Sage-Grouse and a medium level of concern for six other species in this Action Plan: Black-footed Ferret, Burrowing Owl, Prairie Loggerhead Shrike, Long-billed Curlew, McCown's Longspur, and Sprague's Pipit (Appendix A). Changes in predator and prey guild composition and abundance, resulting from anthropogenic changes to sagebrush ecosystems, can have an important effect on Sage-Grouse productivity (Aldridge and Brigham 2003; Bui et al. 2010). Some species of predators, such as Coyotes (*Canis latrans*) (COSEWIC 2002), Great Horned Owls (*Bubo*

virginianus) (Houston et al. 1998) and Common Ravens (*Corvus corax*) (Environment Canada 2010) have increased in the past few decades. There have also been increases in populations of Red Fox (*Vulpes vulpes*), Swift Fox, Striped Skunk (*Mephitis mephitis*), and Raccoon (*Procyon lotor*) (Aldridge and Brigham 2003) which may contribute to increased predation pressure on certain species. Ranchers and farmers who attended Sage-Grouse consultation meetings in 2013 and who participated in development of the SoD Action Plan stated that populations of predators, especially coyotes, raccoons, and swift fox, have increased substantially.

High predation rates are usually a secondary symptom of habitat deficiencies in an altered and fragmented habitat that does not provide prey with protection from predators and may increase predator foraging efficiency through amplified amounts of edge, linear travel corridors (e.g., roads, fence lines), or elevated perches for raptors (Sargeant et al. 1993, Greenwood et al. 1995, Braun 1998, Aldridge 1998b, Connelly et al. 2000, Stephens 2003).

Increased Risk of Drought (3b)

The risk of drought ranks as a medium to high level of concern for four species covered by this Action Plan: Greater Sage-Grouse, Black-tailed Prairie Dog, Mountain Plover and Swift Fox (Appendix A). The prairie region in general is characterized by wide fluctuations in precipitation from year to year, and multi-year droughts have occurred in the 1890s, 1910s, 1930s, 1960s, 1980s, and most recently in 2001-2002 (Bonsal 2008). Climate change over the coming century is predicted to increase the frequency and severity of droughts (Bonsal and Regier 2006). Drought in the mixed prairie causes an immediate reduction in grass growth, while multi-year drought causes a shift in composition from taller to shorter grass species (Thorpe 2011). The result is less attractive habitat for those species that require tall vegetation structure.

Patterns of Greater Sage-Grouse persistence within North America is related to the prevalence of severe droughts; Sage-Grouse were more likely to be extirpated from areas of their range where three or more severe droughts occurred per decade (Aldridge et al. 2008). Cause-effect linkages between drought and Sage-Grouse decline are complex and are described in detail in Environment Canada (2014a).

Inclement or Extreme Weather Conditions (3a)

The SoD area represents the northern range limit of several focal species, which therefore may be more limited by extreme weather conditions than populations in more southern localities. Climate change is expected to increase the frequency of extreme weather events. Inclement weather such as severe or unpredictable winter and spring storms, cold and wet springs, and extreme spring floods, may to some degree limit the survival and productivity of many species in the SoD area. This threat was ranked as a medium to high level of concern for four species covered by this Action Plan: Greater Sage-Grouse, Burrowing Owl, Prairie Loggerhead Shrike and Mountain Plover (Appendix A).

Inclement or extreme weather conditions can have a direct impact on species survival. McNeil et al. (2007) assessed climate trends in the Canadian Greater Sage-Grouse range and concluded that the frequency of extreme weather had increased significantly since 1971, including both cold

and wet springs and hot and dry summers. McNeil et al. (2007) suggest that the greater frequency of cold and wet spring conditions in Saskatchewan between 1999 and 2004 may have led to the Sage-Grouse population decrease in Saskatchewan during that period.

For Burrowing Owls, both adults and young may die during occasional extreme weather events (Wellicome et al. 2014), or due to continuous bad weather that restricts foraging opportunities leading to starvation (Wellicome 2000). Severe or inclement weather can also reduce reproductive success by: destroying nests; causing birds to abandon nests; directly challenging and stressing thermoregulatory abilities of offspring; or limiting prey availability and causing offspring to starve (Wellicome 2000, Fisher and Bayne 2014).

Alterations to Natural Grazing and Fire Regimes (2a)

Natural disturbances due to large ungulate grazing and intentional or wild fires have played a significant role in the evolution of North America's prairies. These disturbances occurred frequently and randomly across the landscape creating a naturally patchy distribution of animal and plant communities that co-existed in a stable balance (Samson et al. 2004). Since European settlement, changes in land-use practices including the eradication of Plains Bison (*Bison bison bison*), American Elk (*Cervus elaphus)* and several species of grasshoppers from the prairies, as well as the suppression of fires, have drastically altered the landscape. Today less than 1 percent of the prairie may be burned in a given year (Samson et al. 2004). Alterations in natural grazing and reduced fire frequencies can result in encroachment by woody vegetation and invasive exotics, as well as an excessive accumulation of litter, which has degraded the breeding habitat for Sprague's Pipit (Environment Canada 2012b), and other species as well. This threat ranks as a medium to high level of concern for four species covered by this Action Plan: Sprague's Pipit, Mountain Plover, McCown's Longspur and Long-billed Curlew (Appendix A).

Conversion of Native Habitat to Roads (6c)

The creation of linear features, such as roads, not only results in direct loss and degradation of habitat, it also divides landscapes, leading to habitat fragmentation and alteration. This threat ranks as a medium concern for two species covered by this Action Plan: Greater Sage-Grouse and Swift Fox (Appendix A). In some cases the creation of linear features can lead to population fragmentation and isolation, and edge effects (Noss and Cooperrider 1994). In addition, roads become travel corridors for various mammalian predators, resulting in increased predation pressure, a major threat identified for several focal species in the SoD area. Roads also facilitate the introduction and spread of exotic plant species; increases in human activity and traffic noise; and direct injury or mortality. Although a low concern, direct mortality due to collisions with vehicles has been identified for seven of the species covered by this Action Plan (Appendix A). While the density of roads in the SoD area is less than in other parts of southern Saskatchewan, the total length of road is approximately 8,240 km, for a density of approximately 0.6 km per km^2.

High-intensity Prolonged Grazing (6d)

High-intensity prolonged grazing within suitable habitats ranks as a medium level of concern for two species covered by this Action Plan (Appendix A). Such a grazing regime may cause habitat avoidance by Sprague's Pipit and Greater Sage-Grouse, which use the presence of vegetative cover as a cue for selecting particular locations during important stages of their life cycles (e.g., nesting or brood-rearing stages). Where individual birds do not avoid areas of altered vegetative cover, it can still negatively affect their reproductive success by altering the vegetative cover necessary for nesting and brood rearing. The lack of adequate cover/shelter may also increase predation rates and brood mortality (Braun 1998; see also increased predation pressure).

Livestock grazing occurs on most native grasslands in the SoD area. Both private ranchers and public land managers in the SoD area place a high value on stewardship. As a result, most of the grazing land is well managed, using sustainable practices that prevent over-grazing. However, there may be local areas subject to heavy grazing over a series of years, such as livestock concentration areas associated with calving, winter feeding, water sources, and salt-blocks.

Industrial Activities (4a)

Industrial activities, such as noise from petroleum infrastructure, have been identified as a high level of concern for Greater Sage-Grouse in the SoD area (Appendix A). Breeding activity on leks is disrupted by noise from nearby pump jacks (Dube 1993, Braun et al. 2002, Aldridge 2005, Holloran 2005) and can lead to lek abandonment (Aldridge 2000, Holloran 2005). In Alberta, disturbance by oil and gas construction and extraction near leks may have caused the abandonment of at least four leks (Dube 1993, Aldridge 1998a, Braun et al. 2002). In Wyoming, a recent experimental study showed that peak male attendance at Sage-Grouse leks decreased when they were subjected to noise levels typical of drilling for natural gas (broadcasts of sound recordings; Blickley et al. 2012a).

Traffic Noise (4d)

In the SoD area, noise due to vehicular traffic has been identified as a high level of concern for Greater Sage-Grouse (Appendix A). Vehicular traffic near leks can disrupt Greater Sage-Grouse breeding activities and in some circumstances cause habitat avoidance and lek abandonment (Aldridge 1998b, Braun 1998, Connelly et al. 2000, Herkert et al. 2003). Male lek attendance was reported to have decreased by as much as 73% at sites experimentally treated with traffic noise (Blickley et al. 2012). Lyon and Anderson (2003) reported that even low levels of vehicular traffic ($\leq$ 12 vehicles/day) at leks can reduce nest initiation rates by hens and increase distances that hens move from leks during nest selection. Several leks within the SoD area are within 3 km of roads which is likely close enough to warrant concern regarding traffic noise (R. Fisher, pers. comm.).

Invasion and Establishment of Exotic Plants (5a)

Some exotic plant species are aggressive invaders that spread quickly and displace native vegetation. Over time, invasive species have the potential to alter ecosystem structure and

essential functions including hydrology, nutrient and energy cycles, and soil composition (Gordon 1998). Invasive plants rank as a high level of concern for Sprague's Pipit (Appendix A). In the SoD area, Crested Wheatgrass (*Agropyron cristatum),* Smooth Brome (*Bromus inermis*), Alfalfa (*Medicago sativa*), Sweet-clover (*Melilotu*s spp.) and Leafy Spurge (*Euphorbia esula*) are prevalent in certain areas. All species have the potential to impact local plant community structure and biodiversity and negatively alter the overall quality of the habitat, rendering it unsuitable for nesting by native prairie obligates like Sprague's Pipit.

Tillage, Seeding, Haying or Mowing Operations (1c)

In the SoD area, tillage and seeding operations have been ranked as a medium level of concern for McCown's Longspur (Appendix A). With the decline in amount of their preferred habitat consisting of sparsely-vegetated short- or mixed-grass prairie, McCown's Longspurs have taken increasingly to nesting in cropland (Environment Canada 2014c) where they and their nests are subject to direct injury and mortality from farm machinery. Over the long term these habitats may be sinks for this species (Environment Canada 2014c). About 39% of the SoD area is in crop production (including hayfields and summer fallow).

Application of Pesticides and Other Chemicals (1e)

Application of pesticides to control agricultural pests (i.e. weeds, insects, and burrowing mammals) can directly or indirectly kill non-target species. In the United States, the best predictor of decline in grassland birds is the lethal risk from insecticide use (Mineau and Whiteside 2013). Areas of pesticide application in the SoD area in 2011 were estimated at 269,779 ha (666,354 ac) for herbicides, 10,555 ha (26,070 ac) for insecticides, and 11,080 ha (27,368 ac) for fungicides (Census of Agriculture 2011). Recently, concern has been raised about the possible effects of a new class of insecticides called neonicotinoids on vertebrate wildlife including birds. Neonicotinoids are widely used as seed dressings. Granivorous wildlife could be exposed to toxic levels of these insecticides by consuming seeds of crop plants (Gibbons et al., in press). Pesticide application may also negatively impact populations by reducing their food supply, particularly if this occurs at a critical period in the reproductive cycle. Particular concern has been raised about the possibility of neonicotinoid insecticides reducing populations of arthropod prey to the point where insectivorous wildlife are adversely affected through a reduction in food availability (Gibbons et al., in press). This threat ranks as a medium level of concern for Sprague's Pipit and as a low threat to seven other species (Appendix A).

Alteration of Natural Hydrology (2b)

Alteration of natural hydrology ranks as a medium level of concern for Greater Sage-Grouse (Appendix A). Silver sagebrush is generally found within moderately moist habitats such as on alluvial landforms and within areas that have high water tables and are subject to occasional flooding (McNeil and Sawyer 2001, 2003). Dams or impoundments, and irrigation changes alter the natural flow of water in an area and may reduce the frequency and magnitude of flood events and instream flow volume during drought (McNeil and Sawyer 2003, White 2007) which are important for the maintenance of sagebrush habitat (McNeil and Sawyer 2001). In arid landscapes natural water systems have been altered for irrigation, watering livestock, and

industrial production. Watters et al. (2004) suggested that the number of dams within 3.2 km of Sage-Grouse leks in southern Saskatchewan has increased 20% in the last 50 years and the number of reservoirs behind those dams has more than doubled. Livestock use is often intensified near impoundments resulting in degradation of surrounding sagebrush habitat (Canadian Sage-Grouse Recovery Team 2001). White (2007) inventoried the water impoundment capacity of 12 creeks and 19 tributaries of the Frenchman River with historic and current Sage-Grouse leks. Impoundment capacity increased rapidly through the 1970s, although it generally represents a small percent of mean annual flow volume (13.5% ± 12% SD, n=17). A study of Coteau and Mundell Creeks (Battle Creek Community Pasture) estimated that reservoirs reduced annual flow volume by 5%, 13% and 35% in years with high, average, and low flow, respectively. Reductions in flows and/or flooding events may have affected the health of these sagebrush habitats and habitat suitability for Sage-Grouse (White 2007). Ditches and elevated roadbeds can also impede natural drainage patterns by intercepting and redirecting overland runoff, which could also result in sagebrush productivity changes upslope of sagebrush ecosites (Environment Canada 2014a).

Decreased Prey Availability (2f)

Decreased availability of prey ranks as a medium level of concern for Burrowing Owls (Appendix A). Survival of young and reproductive success has been correlated to annual food availability, consisting mainly of voles and insects (Wellicome 2000; Poulin et al. 2001, Todd et al. 2003). Several interacting and likely cumulative factors, including cold and wet spring conditions; grazing intensity that can alter habitat structure (Marsh et al.2014b); and extreme weather events (Heisler et al. 2014), influence prey availability for Burrowing Owls in the SoD area.

Small Population Size (7c)

Small population size, resulting from the cumulative impacts of other threats, has been identified as a high level of concern for Greater Sage-Grouse and a medium level of concern for the Black-footed Ferret in this Action Plan (Appendix A). In 2012, Saskatchewan's Sage-Grouse population was estimated to range from 54-80 birds at 2-3 leks, located in Grasslands National Park (Environment Canada 2014a). This is a large decrease from the estimate of 2,619-3,880 birds in 1988 (Environment Canada 2014a).

Although the Black-footed Ferret is listed as extirpated, small numbers have been reintroduced in the SoD area and GNP since the fall of 2009. Black-footed Ferrets are highly dependent on Black-tailed Prairie Dogs for prey and on their burrows for shelter, escaping predators, and rearing their young (Tuckwell and Everest 2009b), which make this species especially vulnerable to declines in Black-tailed Prairie Dog distribution and density. Despite successfully reproducing in the wild, Saskatchewan's population of Black-footed Ferrets may have been as low as 12 individuals in 2012 (A. Sturch, pers. comm.).

The extremely small, isolated, and fragmented populations of Greater Sage Grouse and the Black-footed Ferret are at a significant risk of being extirpated by diverse factors including drought, adverse weather, epidemic diseases, and other cumulative threats. Furthermore, the loss

of genetic material that is theoretically associated with small endangered populations may lead to inbreeding depression and a greater risk of population extirpation (Brook et al. 2002, Miller et al. 2005).

1.1.5 Spatial analysis of multi-species threats

An important component of species conservation is identifying threats to individuals, populations and their habitat, which aids development of policies and management practices to mitigate these threats. It is equally important to understand the distribution of these threats throughout a species' range or conservation planning region, and to identify areas under elevated threat that may require more immediate or enhanced recovery actions compared to other areas. With this in mind, information from the Threat Assessment Table 12 (Appendix A) was used to develop a spatial threats layer in a geographic information system for the SoD area. Although some species are highly threatened by such factors as disease, predation, drought, and inappropriate livestock grazing regimes, the focus of this analysis was on threats that could be *spatially* represented, including capability to support annual cropping or oil and gas development, industrial disturbance (amount and proximity), and roads. These threats are known to represent pressures associated with conversion of habitat to cropland and industrial infrastructure, exotic species invasion, pesticides, road mortality, and human disturbance. In order to limit the spatial representation of threats to areas that are biologically important for species at risk, this spatial threat analysis was bounded within the areas of critical habitat for the nine extirpated, endangered and threatened species. In this analysis, critical habitat polygons serve as surrogates to represent areas containing valuable habitat for species and areas within which species are likely to occur. Threats were weighted based on the severity of the threat and the certainty of the impact that the threat has on individuals and their habitat. The species' status (threatened, endangered or extirpated) was used as an additional weighting factor. Threats to endangered species which were of high severity and certainty were ranked highest, while threats to threatened species of low severity and certainty were ranked lowest. The analysis included threats currently present (e.g. roads and industrial infrastructure), as well as threats that may arise in the future, such as conversion of grassland to cropland (determined by the agricultural capability index) and potential oil and gas development (indexed by proximity to oil and gas reservoirs). Threats were identified for each of the nine species in the SoD Action Plan listed as threatened, endangered or extirpated, and then combined to provide an index of cumulative threats across the SoD region. A Jenks Natural Breaks Classification (De Smith et al. 2007) was used to divide the index into three classes of threat; labeled low, medium, and high.

This analysis does not take into account laws, regulations, and policies that may prevent certain types of activities from occurring on certain lands. As an example, conversion to cropland is currently prohibited on certain Crown lands, even though some of those lands may have high agricultural capability. However that prohibition could be lifted if such lands were sold to private interests.

Figure 2 shows the spatial distribution of the threat classes across areas within which critical habitat has been identified. Those areas are deemed to be of highest value to the species at risk in this Action Plan. White areas on the map are where critical habitat has not been identified and hence are deemed to be of relatively low value to the species at risk in this Action Plan. This map

is intended to reflect broad geographic patterns in risk and is not meant to be used to identify individual land parcels.

The analysis shows that areas of importance to species at risk along the southern portion of the SoD region are under the greatest threat, particularly lands within and in proximity to community pastures, and the region between the east and west blocks of Grasslands National Park. The relatively high level of threat in these areas is due mainly to the relatively large number of species for which these areas are important and which are threatened by conversion of grassland to cropland due to their relatively high agricultural capability index). In general, areas of high value to species at risk along the western and northern portions of the SoD area are under lower levels of threat, except for the community pastures north of Val Marie.

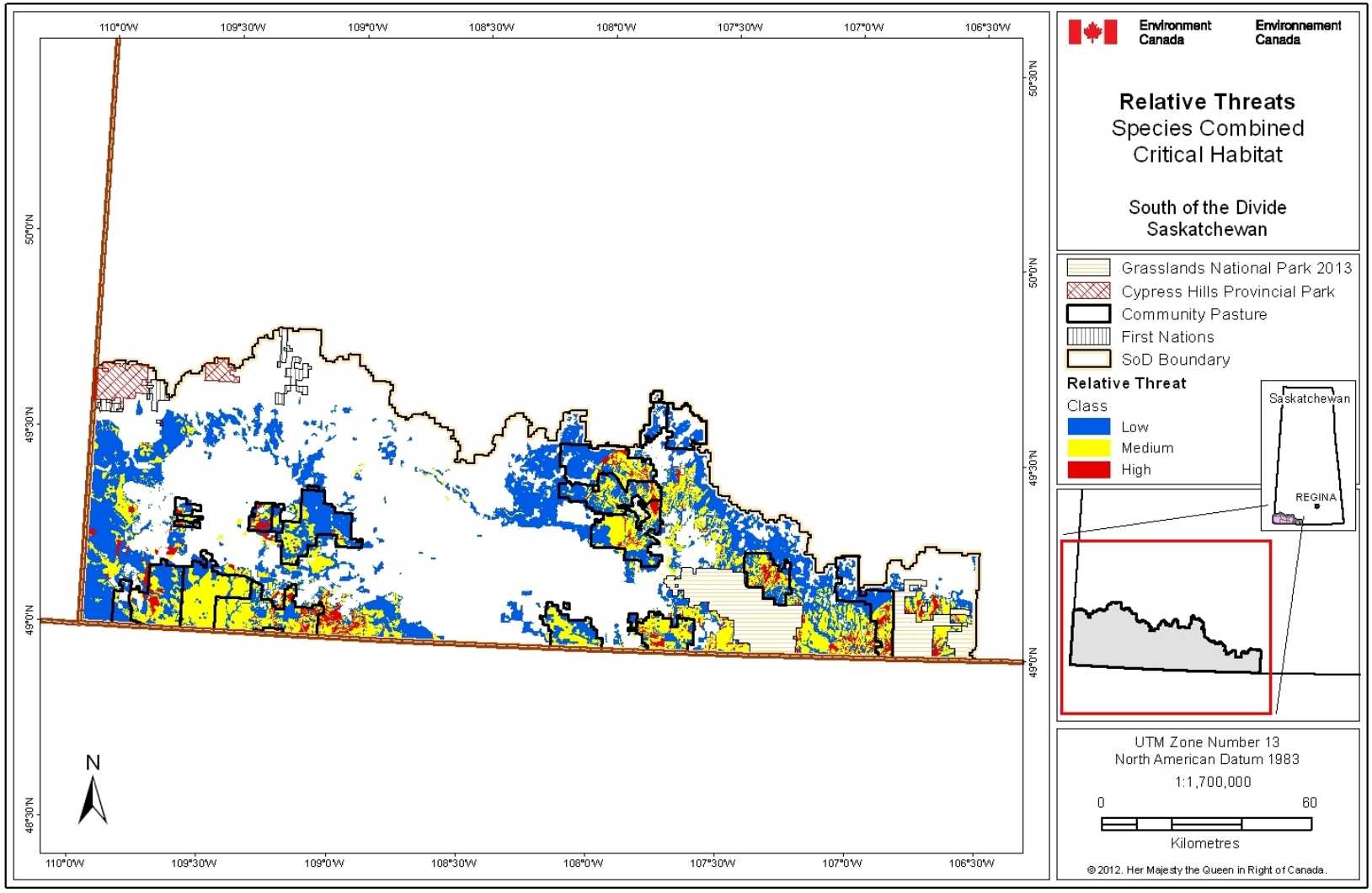

Figure 2. Spatial distribution of relative levels of current and future threats rated according to their potential impact on 9 species at risk and/or their critical habitat in the SoD area.
Note that areas in white have no critical habitat.

The areas mapped in Figure 2 are summarized in relation to land tenure in Table 3**.** Community pastures account for 38% of the critical habitat, including 29% on federal pastures and 8% on provincial pastures. Producers manage 59% of the critical habitat (12% privately owned, 47% crown lease land). It is important to note that different types of land tenure are subject to different regulations and policies that affect land management. Therefore land tenure, though not accounted for in this analysis, is an important determinant of the likelihood that certain threats may be realized. Overall, 62% of the area is in the low threat level, followed by 31% in medium and 7% in high. These proportions are relatively similar on privately managed land and provincial community pastures. Federal community pastures, however, have a higher proportion in the medium threat level (47%). This highlights the importance of future management decisions on these federal pastures as they are shifted to provincial control.

Table 3**. Area containing critical habitat (hectares) for each level of threat in relation to land tenure.** Grasslands National Park is not included in this summary.

Land Tenure	**Level of Threat**			**Total Hectares containing critical habitat**
	Low	**Medium**	**High**	
Provincial Agricultural Crown land (PACL):				
PACL not in pastures (lease land)	196,777	66,331	16,846	279,954
PACL in provincial community pastures	31,369	12,602	4,698	48,669
PACL in federal community pastures	5,238	2,974	733	8,945
Total provincial agricultural Crown land	**233,384**	**81,907**	**22,277**	**337,568**
Federal community pastures:				
Land deeded to the federal government	3,399	1,215	255	4,870
Irrigation land in federal community pastures	595	465	42	1,102
Land that is reversionary to SK	66,059	74,475	12,131	152,665
Land that is reversionary to other federal agencies	8,332	6,996	1,256	16,584
Total federal community pastures	**78,385**	**83,152**	**13,684**	**175,221**
Migratory Bird Sanctuary	**143**	**24**	**0**	**167**
National Wildlife Area	**0**	**148**	**41**	**189**
First Nations land	**57**	**26**	**0**	**83**
Private Land	**51,105**	**17,825**	**2,558**	**71,488**
Road Allowances	**7,111**	**3,784**	**978**	**11,873**
TOTAL	370,217	186,866	39,538	596,621

1.2 Measures to be Taken and Implementation Schedule

Recovery measures were initially developed at a three-day workshop in September, 2012. Stakeholders and species experts worked in groups to identify measures to address each of the major threats (see Table 12 Appendix A). The resulting list of recovery measures was organized and consolidated to create a draft Recovery Measures Table. The recovery measures followed the broad approaches outlined in the related Recovery Strategies. The following "Broad Strategies" were used to organize the recovery measures in this Action Plan:

1. Research as part of an adaptive management framework
2. Population and species management
3. Habitat assessment, management and conservation
4. Regulation and policy
5. Communication, collaboration and engagement
6. Conservation planning
7. Monitoring and assessment

Each Broad Strategy is subdivided into several "Approaches", with individual Actions listed under each Approach. Actions are coded numerically: for example, "Action 3.2.1" represents Broad Strategy 3, Approach 2, Action 1.

For each action, the following information is provided:

- Priority – reflects the degree to which the Action contributes directly to the recovery of the species or is an essential precursor to an Action that contributes to the recovery of the species. **High** priority Actions are considered those most likely to have an immediate and/or direct influence on attaining the recovery objective for species. **Medium** priority Actions may have a less immediate or less direct influence on reaching the recovery population and distribution objectives, but are still important for recovery of the population. **Low** priority Actions will likely have an indirect or gradual influence on reaching the recovery objectives, but are considered important contributions to the knowledge base and/or public involvement and acceptance of species.

- Time-line – shows the year or years in which the Action will be implemented, within the scope of this Action Plan. Some Actions are shown as ongoing, because they are a continuation of Actions already happening, while other Actions are shown as new. While most recovery measures have been developed within a 5-year planning window (2016-2020, inclusive), it is anticipated that this Action Plan will be implemented over a period of time greater than 5 years. The specific recovery measures that will require more than 5 years to implement, and the total number of years over which those measures will have to be implemented, remain to be determined. Furthermore, it is likely that during the first 5 years of implementation, the need for new Actions may arise. Therefore, it will likely be necessary to update the recovery measures and implementation schedule in 2020, following the completion of the first phase of this Action Plan.

- Species – shows the species that will be affected by the Action. Species are represented by four-letter codes:

    - BFFE – Black-footed Ferret
    - BTPD – Black-tailed Prairie Dog
    - BUOW – Burrowing Owl
    - EYBR – Eastern Yellow-bellied Racer
    - GRSG – Greater Sage-Grouse
    - LOSH – (Prairie) Loggerhead Shrike
    - LBCU – Long-billed Curlew
    - MCLO – McCown's Longspur
    - MOME – Mormon Metalmark
    - MOPL – Mountain Plover
    - NLFR – Northern Leopard Frog
    - SPPI – Sprague's Pipit
    - SWFO – Swift Fox

- Threats – shows the threats addressed by the Action, using codes shown in Appendix A.

The Recovery Measures Table has been subjected to several rounds of review by stakeholders and species experts, resulting in numerous modifications. Nevertheless, Table 4 still incorporates most of the ideas generated at the initial Recovery Measures Workshop in September 2012.

Table 4. Recovery Measures and Implementation Schedule

Recovery Measures	Priority	Time-line	Species	Threats

Broad Strategy 1: RESEARCH AS PART OF AN ADAPTIVE MANAGEMENT FRAMEWORK

Approach 1.1: Research on climate change effects

→ **Outcome: Climate change impacts on species at risk are better understood, managed and mitigated.**

1.1.1 Conduct research on the interactive effects of climate change on species at risk and their habitats in southern Saskatchewan in order to understand how to manage threats which are likely to change under different climatic conditions	Medium	New – 2016-2018	All	3a, 3b

Approach 1.2: Research to support adaptive habitat management

→ **Outcome: Habitat conservation and management are informed by better understanding of threats to habitat.**

1.2.1 Develop a baseline geospatial inventory of land use and land cover for the SoD area, and monitor the cumulative effects of development on habitat loss and degradation compared to this baseline on an ongoing basis	High	Ongoing: develop over 2016-2020	BTPD, BUOW, EYBR, GRSG, LOSH, LBCU, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	6a, 6b, 6c
1.2.2 Determine threshold levels at which developments affect the survival and recovery of individual species.	Medium	New – 2016	BTPD, BUOW, EYBR, GRSG, LOSH, LBCU, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	6a, 6b, 6c, 6d, 6e
1.2.3 Identify native habitat at high risk of being lost or degraded due to changes in land use.	Medium	Ongoing 2016-2020	BTPD, BUOW, EYBR, GRSG, LOSH, LBCU, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	6a, 6b, 6c
1.2.4 Test and evaluate efficacy of native grassland and sagebrush restoration methods.	Medium	Ongoing 2016-2018	BTPD, BUOW, EYBR, GRSG, LOSH, LBCU, MCLO, MOPL, NLFR, SPPI, SWFO	5a, 6a, 6b, 6c, 6e
1.2.5 Investigate hydrology in the SoD area and identify areas where alteration of natural hydrology may affect habitat use, and/or survival and reproduction of species at risk.	Low	Ongoing 2016-2020	GRSG, NLFR	2b, 6e

Approach 1.3: Range management research

→ **Outcome: Conservation of habitats on rangelands is informed by better knowledge of the relationships among range management practices, forage and livestock production, and habitat for species at risk.**

1.3.1 Determine relationships between range condition/ health and populations of species at risk.	Medium	Ongoing 2016-	BUOW, GRSG, LBCU, LOSH, MCLO, MOME,	2a, 5a, 6d, 6e

		2020	NLFR, SPPI, SWFO	
1.3.2 Determine the effectiveness of current beneficial management practices related to grazing management as it affects species at risk, and develop new Best Management Practices if necessary.	Medium	New – 2016-2019	GRSG, LBCU, MOME, NLFR, SPPI	2a, 5a, 6d, 6e

Approach 1.4: Research on linear developments and infrastructure

→ **Outcome: Plans to reduce disturbance and mortality of species of risk are informed by better knowledge of the impacts of linear developments and infrastructure, and of techniques for reducing those impacts.**

1.4.1 Conduct systematic information gathering and mapping to assess the magnitude and location of disturbances and mortality to species at risk caused by linear developments, infrastructure, and industrial activities, to be used in a management plan for linear developments and infrastructure (see 2.4.1)	Medium	New – 2016	BUOW, EYBR, GRSG, LOSH, MOPL, NLFR, SWFO	1a, 1d
1.4.2 Assess the design and use of low-cost techniques (e.g., diversion structures, culverts, mowing and native grass planting on road edges) to minimize mortality of species at risk caused by linear developments.	Low	New – 2016-2020	BUOW, EYBR, GRSG, LOSH, MOPL, NLFR, SWFO	1a
1.4.3 Assess new technologies for noise mitigation.	Low	New – 2016-2020	GRSG, LBCU, SPPI	4a, 4d
1.4.4 Assess ways of minimizing the effects of vertical structures, in part by further researching thresholds at which populations are affected for various types of vertical structures.	Low	Ongoing 2016-2020	GRSG	4e

Approach 1.5: Predator research

→ **Outcome: The impact of predation on species at risk is better understood and options for practical predator management are more informed.**

1.5.1 Assess the impacts of predation on survival and reproduction of species at risk in the SoD area, and recommend practical options for management.	Low	Ongoing 2016-2020	BFFE, BTPD, BUOW, GRSG, LBCU, LOSH, MCLO, SPPI, SWFO	2d

Approach 1.6: Socio-economic research to support conservation of species at risk

→ **Outcome: Stakeholders in the SoD area are increasingly engaged in recovery actions for species at risk and view species at risk as assets, rather than liabilities.**

1.6.1 Determine effective methods to promote recovery actions to land managers, other resource users, First Nations and Métis people, and other stakeholders in the SoD area, and remove barriers to their participation in recovery actions, so that stakeholders are increasingly engaged in recovery actions for species at risk.	Medium	Ongoing 2016-2020	All	All
1.6.2 Investigate economic costs and benefits related to grazing management systems and other activities, such as ecotourism, that either support or depend on the maintenance of critical habitat for species at risk.	Medium	New 2016-2020	BUOW, EYBR, GRSG, LOSH, LBCU, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	6a, 6d, 6e

Broad Strategy 2: POPULATION MANAGEMENT AND SPECIES PROTECTION

Approach 2.1: Direct population management

→ **Outcome: Populations of species at risk are increased.**

2.1.1 Look for opportunities to increase the number of Black-tailed Prairie Dogs in appropriate habitat, in order to buffer against disease effects.	Medium	New – 2016-2019	BFFE, BTPD	2c, 7b, 7c
2.1.2 Release Black-footed Ferret, when feasible, in well-connected Black-tailed Prairie Dog colonies along the Frenchman River, to buffer against disease effects in established colonies and increase overall population size. Do follow-up assessments.	Low	New – TBD	BFFE	5b, 7b, 7c
2.1.3 Implement practical (hands on, in the field) approaches to improve survival or reproductive success of ground- and burrow-nesting avian species at risk in the SoD area.	Low	New – 2016-2020	BUOW, GRSG	2d, , 1a,1c,1d,
2.1.4 In high quality habitat, conduct and evaluate population augmentations that use captive breeding and/or captive rearing and release, or translocation to augment the Greater Sage-Grouse population.	Low	Ongoing 2016-2020	GRSG	7c
2.1.5 Temporarily bring wild individuals into captivity for life stages associated with high mortality, to increase population growth and survival rate. (e.g. BUOW Head Start Program whereby the youngest chick(s) are removed from the nest and captive reared over the winter, then soft released the following spring whereby they pair up and breed). Assess if Headstart Program changes the trajectory of the BUOW population.	Low	New – 2016-2020	BUOW	1a, 2d,2f, 3a

Approach 2.2 : Disease management

→ **Outcome: The threat of disease to species at risk recovery in the SoD area is reduced.**

2.2.1 Develop and implement a Disease Management Plan that assesses risks posed by different diseases, sets priorities for disease management activities and evaluates the efficacy of different disease management approaches.	Medium	New – 2016-2019	BTPD, BFFE, GRSG, LOSH, NLFR, SWFO	5b, 7b

Approach 2.3: Beneficial management practices for farmland

→ **Outcome: Mortality and disturbance to species at risk on farmland are reduced by implementation of beneficial management practices.**

2.3.1 Test, implement, evaluate and refine beneficial management practices for cropland and hayland to reduce accidental mortality and disturbance to species at risk, by considering the timing, intensity and frequency of various farming activities.	Low	New – 2016-2017	BUOW, GRSG, LBCU, MCLO	1c
2.3.2 Develop and encourage Integrated Pest Management in the SoD area, to minimize pest control impacts on species at risk while providing cost-effective management of agricultural pests.	Low	New – 2016-2020	BFFE, BTPD, BUOW, LOSH, LBCU, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	1b, 1e, 2c, 2f, 4b

Approach 2.4: Management of linear development and infrastructure

→ **Outcome: Mortality and disturbance to species at risk caused by linear development and infrastructure are reduced.**

2.4.1 Develop an adaptive management for linear development and infrastructure to reduce disturbance and accidental mortality to species at risk, in order to guide permitting procedures. This could include seasonal/temporal access restrictions; reduced speed limits or no stopping in sensitive areas; alternate routes during sensitive periods.	Medium	New – 2016-2020	BUOW, EYBR, GRSG, LBCU, LOSH, MOPL, NLFR, SPPI, SWFO	1a, 1d, 4a, 4d, 4e

Broad Strategy 3: HABITAT ASSESSMENT, MANAGEMENT AND CONSERVATION

Approach 3.1: Results-based stewardship program

→ **Outcome: The commitment to stewardship of natural habitats is recognized and rewarded.**

3.1.1 Develop and implement results-based stewardship approaches that appropriately recognize and support deliberate management to provide high quality habitat for species at risk.	High	Ongoing 2016-2020	BTPD, BUOW, EYBR, GRSG, LBCU, LOSH, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	2a, 2d, 3b, 6a, 6b, 6c, 6d, 6e, 7a, 7c

Approach 3.2: Restoration

→ **Outcome: Reclamation projects prioritize the use of native species when restoring disturbed sites.**

3.2.1 Implement policies and protocols for reclamation of all types of disturbed sites that prioritize use of native species appropriate to the ecosite, and that address removal of unused infrastructure.	Medium	Ongoing 2016-2020	BTPD, BUOW, EYBR, GRSG, LBCU, LOSH, MCLO, MOPL, NLFR, SPPI, SWFO	2d, 5a, 6b, 6c, 6d, 6e
3.2.2 Support and promote partnerships to increase availability of clean native seed mixes that will complement the reclamation and mitigation approaches for the SoD area.	Medium	New – 2016-2019	BTPD, BUOW, EYBR, GRSG, LBCU, LOSH, MCLO, MOPL, NLFR, SPPI, SWFO	5a, 6a, 6b, 6c, 6e
3.2.3 Provide incentives to support targeted conversion of cropland and tame pasture to native-seeded grassland and/or native shrub plantings that will benefit species at risk.	Medium	New – 2016-2019	BUOW, EYBR, GRSG, LBCU, LOSH, MCLO, MOPL, SPPI, SWFO	2d, 5a, 6a

Approach 3.3: Exotic species management

→ **Outcome: Invasion of exotic species is controlled in the SoD area.**

3.3.1 Develop a plan for invasive plant species, including modeling spread patterns, implementing a surveillance system for early detection of invasions, and supporting rapid response to invasions.	Low	Ongoing 2016-2020	LBCU, MOME, MOPL, SPPI	5a
3.3.2 Contribute to provincial invasive species spatial database.	Low	Ongoing 2016-2020	LBCU, MOME, MOPL, SPPI	5a

Approach 3.4: Management of fire

→ **Outcome: Fire is managed to maintain and improve key habitats for species at risk.**

3.4.1 Work with local fire departments, rural municipalities, and First Nations and Métis people to manage fire in the SoD area in ways that benefit species at risk without threatening infrastructure and agricultural values; this may include targeted fire suppression and prescribed burning.	Low	New – 2016-2020	GRSR, LBCU, MCLO, MOME, MOPL, SPPI	2a, 5a, 7c

Broad Strategy 4: REGULATION AND POLICY

Approach 4.1: Regulation and policy

→ **Outcome: Regulations and policies that affect land use are aligned to reduce disturbance to species at risk and degradation of their habitats.**

4.1.1 Review, consolidate, refine, and if necessary develop new regulations and guidelines for industrial activities and other developments, in order to reduce mortality and disturbance to species at risk, and to reduce degradation of their habitats.	Medium	Ongoing 2016-2020	All	1a, 1d, 2b, 2d, 4a, 4d, 4e, 5a, 6b, 6c, 6e
4.1.2 Promote species at risk conservation as a key component of future regional water management plans in the SoD area.	Low	Ongoing 2016-2020	BFFE, BTPD, GRSG, MOME, MOPL, NLFR, SPPI, SWFO	2b, 3b
4.1.3 Identify contradictory policies impacting species at risk habitat in the SoD area, and modify these policies to align with habitat needs of species at risk.	Medium	Ongoing 2016-2020	All	2a, 2b, 2c, 2f, 5a, 6a, 6b, 6c, 6d, 6e
4.1.4 Investigate the utility of conservation agreements, including those under SARA s.11, to effectively protect critical habitat.	High	Ongoing 2016-2020	BFFE, BUOW, EYBR, GRSG, LOSH, MOME, MOPL, SPPI, SWFO	6a, 6b, 6c, 6d, 6e

Broad Strategy 5: COMMUNICATION, COLLABORATION AND ENGAGEMENT

Approach 5.1: General conservation concepts

→ **Outcome: The agricultural sector, other resource sectors, First Nations and Métis people, and the Saskatchewan public are aware of and support native prairie and species at risk conservation initiatives.**

5.1.1 Engage the agricultural community, other resource sectors, First Nations and Métis people, and the Saskatchewan public to raise awareness about and build support for the importance of native prairie, including promoting the connection between ranching and grassland conservation.	High	Ongoing 2016-2020	BTPD, BUOW, EYBR, GRSG, LOSH, LBCU, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	2a, 5a, 6a, 6b, 6c, 6d, 6e
5.1.2 Communicate, collaborate and engage with land managers, the agricultural community, other resource sectors, and First Nations and Métis people about conservation programs, beneficial management practices and regulatory requirements for species at risk. Incorporate local knowledge and interests into conservation practices and programs.	High	Ongoing 2016-2020	All	All

5.1.3 Develop and distribute protocols for field researchers aimed at improving communication about their activities with land managers on whose land they are working, including protocols for seeking permission to access land and for providing timely feedback on research results.	Medium	Ongoing 2014	All	All
5.1.4 Engage local communities in species at risk research, monitoring or education activities, when appropriate.	Medium	New – 2016-2020	All	All

Approach 5.2: Abatement of specific threats

→ **Outcome: Key land users understand how some of their activities threaten species at risk and are aware of management practices that have the potential to reduce the impacts of those threats.**

5.2.1 Inform all land users (agriculture, industry, recreation, road construction) about the need for avoiding direct disturbance to species at risk and their habitat.	Medium	New – 2016-2020	All	1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 4a, 4b, 4c, 4d, 4e, 5a, 6a, 6b, 6c, 6d, 6e
5.2.2 Develop, implement and evaluate a communication/information program aimed at key land users to reduce and mitigate soil disturbance and promote proper cleaning of equipment in order to reduce the spread of exotic plants.	Low	New – 2016-2020	LBCU, MOME, MOPL, SPPI	5a
5.2.3 Develop approaches to increase awareness of the threat to species at risk from pesticides and other chemicals, while recognizing that pest control is currently an important activity in working landscapes. Educate about best practices including Integrated Pest Management, buffer zones for chemical application, chemical waste storage, containment, and disposal. Develop and implement education programs on the safe use of rodenticides, and extend information to lobby groups that are pro-strychnine.	Medium	New – 2016-2020	BFFE, BTPD, BUOW, LBCU, LOSH, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	1b, 1e, 2c, 2f, 4b, 6e
5.2.4 Inform recreational groups and industry about the need to carry out their activities in ways that respect the rights of landowners and land managers, and inform landowners and land managers about their rights in negotiating access conditions with industry, in order to enhance the protection of species at risk on their land.	Low	New – 2016-2020	BTPD, EYBR, GRSG, LBCU, MOPL	4b, 4c, 4d
5.2.5 Promote vaccination of dogs against rabies and distemper as a means of decreasing the spread of these diseases from pets to wild animals.	Low	New – 2016-2020	BFFE, BTPD, SWFO	5b, 7b

Broad Strategy 6: CONSERVATION PLANNING

Approach 6.1: Planning with international partners

→ **Outcome: Cooperative international conservation planning helps to achieve species conservation in the SoD area.**

6.1.1 Cooperate with partners in adjacent jurisdictions on relevant species-at-risk and habitat planning, including coordination of research, in order to help realize conservation goals of the SoD area.	Medium	Ongoing 2016-2020	BFFE, BTPD, BUOW, GRSG, LBCU, LOSH, MCLO, MOPL, SPPI, SWFO	2c, 2d, 3b, 4b, 5b, 6a, 6b, 6c, 7a, 7b, 7c

Approach 6.2: Implementation of multi-species recovery actions

→ **Outcome: A strategy is developed for implementing the SoD Action Plan.**

6.2.1 Develop a multi-species implementation strategy for collaborative delivery of priority recovery measures through an implementation committee with involvement of government, industry, ENGOs, local land managers and other interested parties as appropriate.	High	Ongoing 2016	All	All
6.2.2 Develop and enhance partnerships among jurisdictions and stakeholders, using stewardship incentives (see Action 3.1.1), regulatory, and policy-based approaches, towards protecting critical habitat identified in the SoD area.	High	Ongoing 2016-2020	All	All

Approach 6.3: Land use planning

→ **Outcome: Land use is managed in ways that benefit biodiversity.**

6.3.1 Develop land use plans that consider species at risk by engaging appropriate levels of government to coordinate activities within the SoD area so that any disturbance to species at risk and their habitat is minimized and does not affect their survival and recovery. This may include: risk zoning for activities and infrastructure; habitat zoning for application of beneficial management practices; zoning for recreational activities. Plan the layout of road systems and other linear disturbances to reduce impacts on species at risk, by coordinating access among users, using the minimum road requirements for the purpose, locating developments in non-native habitats where possible, and developing common corridors to stack linear disturbances.	High	New – 2016-2020	All	All
6.3.2 Engage with decision makers about plans for the divestiture of federally-managed community pastures and cooperate in this process to ensure that pastures located within the SoD area are retained as native prairie and managed to optimize joint grazing and biodiversity benefits.	High	Ongoing 2016-2019	BTPD, BUOW, EYBR, GRSG, LOSH, LBCU, MCLO, MOME, MOPL, NLFR, SPPI, SWFO	6a, 6b, 6c, 6d, 6e
6.3.3 Streamline data information systems using standardized tools to ensure that all species at risk data captured through regulatory processes is readily available for species at risk conservation planning.	Low	New – 2016	All	All

Broad Strategy 7: MONITORING AND ASSESSMENT

Approach 7.1: Monitoring occurrence, population abundance and/or trends of species

→ **Outcome: The recovery rates of species at risk and their long-term viability are known**.

7.1.1 For Black-footed Ferret, if releases occur in the SoD area, conduct annual fall survey for population numbers and coordinate the SoD Action Plan efforts with those being done within GNP.	Medium	Ongoing – implement annually	BFFE	Info. needed to measure recovery
7.1.2 For Black-tailed Prairie Dog, map perimeter of colonies in the SoD area every second year, estimate population density in colonies annually, and coordinate the SoD Action Plan monitoring efforts with those being done within GNP.	Medium	Ongoing – implement annually for density estimates and every 2 years for mapping	BTPD	Info. needed to measure recovery

7.1.3 For Burrowing Owl, continue to monitor at a range-wide level through Operation Burrowing Owl. Monitor the number of Burrowing Owl pairs initiating a nest in Black-tailed Prairie Dog towns. Monitor Burrowing Owl critical habitat sites within the SoD area and coordinate the SoD Action Plan monitoring efforts with those being done within GNP.	Medium	Ongoing – implement annually	BUOW	Info. needed to measure recovery
7.1.4 For Eastern Yellow-bellied Racer, monitor persistence at known hibernacula using camera technology and/or field observations at 5-year intervals. Obtain population estimates at selected hibernacula at 5-year intervals.	Low	Ongoing – implement every 5 years	EYBR	Info. needed to measure recovery
7.1.5 For Greater Sage-Grouse, continue spring counts at all known active leks on an annual basis and opportunistically at inactive leks.	High	Ongoing – implement annually	GRSG	Info. needed to measure recovery
7.1.6 For Loggerhead Shrike, ensure that the SoD area continues to be represented in the existing 5-year prairie-wide monitoring of long-term trends, with design and implementation of additional surveys as warranted.	Medium	Ongoing – implement every 5 years	LOSH	Info. needed to measure recovery
7.1.7 For Mormon Metalmark, coordinate with monitoring efforts in GNP. Survey known Mormon Metalmark sites every 5 years. Identify new sites in previously unsurveyed areas where suitable habitat is thought to exist and develop a plan for surveying those sites.	Low	Ongoing – implement every 5 years	MOME	Info. needed to measure recovery
7.1.8 For Mountain Plover, conduct surveys in traditional breeding areas and in habitats with high suitability opportunistically as part of monitoring for other species or through volunteer birdwatcher efforts. Mountain Plover occurs so rarely in Canada that a systematic monitoring approach is not warranted.	Low	Ongoing – implement opportunistically as part of monitoring and research on other species	MOPL	Info. needed to measure recovery
7.1.9 For Sprague's Pipit and McCown's Longspur, ensure that the SoD area continues to be included in annual surveys as part of the Breeding Bird Survey and Grassland Bird Monitoring Program that will be used to monitor the recovery of Pipits on a Canadian range-wide basis. Increase the number of BBS routes within the SoD area and ensure that routes continue to be done. Augment existing surveys as necessary.	High	Ongoing – implement annually for roadside surveys.	MCLO, SPPI	Info. needed to measure recovery
7.1.10 For Swift Fox, continue to use the existing method of assessing the population size based on live-trapping, at 5-year intervals, until a more cost-effective method can be developed.	Medium	Ongoing – implement every 5 years	SWFO	Info. needed to measure recovery
7.1.11 For Northern Leopard Frog, ensure that occurrence data from opportunistic surveys are gathered and submitted to the Saskatchewan Conservation Data Centre in order to determine if/when a monitoring program might be feasible.	Low	Ongoing – implement opportunistically	NLFR	Info. Needed to measure population status
7.1.12 For Long-billed Curlew, work with partners to implement a Canada- or North America-wide breeding population survey at 5-year intervals, adopting or modifying protocols described in Jones et al. (2008). Ensure that survey routes are included within the SoD area.	Low	Implement every 5 years	LBCU	Info. needed to measure population status

1.3 Critical Habitat

1.3.1 Introduction

Section 49 (1)(a) of SARA requires that Action Plans include an identification of the species' critical habitat (to the extent possible) unless such critical habitat was fully-identified in a recovery strategy. SARA also requires the inclusion of examples of activities that are likely to result in the destruction of critical habitat. Critical habitat is defined in SARA (Subsection 2(1)) as "*the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species*".

The critical habitat identified in this Action Plan falls into one of three situations:

1) Critical habitat was previously identified *within* the SoD area in the Recovery Strategy, plus new critical habitat is being identified in this Action Plan (BUOW, EYBR)
2) Critical habitat was previously identified *outside* of the SoD area in the Recovery Strategy, and new critical habitat within the SoD area is being identified in this Action Plan (LOSH, SPPI)
3) No critical habitat was previously identified in the Recovery Strategy but new critical habitat within the SoD area is being identified in this Action Plan (MOME, MOPL, SWFO)

Critical habitat descriptions for each species include biophysical attributes such as topography, soil and vegetation characteristics. Maps are also provided in Appendix C showing the approximate locations of each species' critical habitat. Because of various limitations (e.g., accuracy of classified satellite imagery), the areas shown on the map could include small areas that are actually not critical habitat, such as annual cropland, water bodies, and anthropogenic infrastructure. Only those areas with the appropriate biophysical attributes are considered critical habitat.

Examples of activities likely to result in destruction of critical habitat are also described for each species. Understanding how critical habitat can be destroyed is necessary for its protection and management. Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, to the point at which it would not serve its function when needed by the species. Destruction may result from a single activity or multiple activities at one point in time, or from the cumulative effects of one or more activities over time.

For most species, the point or threshold at which an activity will destroy the function of the critical habitat is currently unknown. Such thresholds may be dependent on the spatial scale of the species' critical habitat, the condition or integrity of the critical habitat, and the extent or intensity of the habitat alteration caused by the activity. It is acknowledged that such information would be beneficial to fully understand the point at which an activity would degrade the critical habitat such that it would no longer serve its function. Therefore, research to "determine threshold levels at which developments affect the survival and recovery of individual species" has been identified as a medium priority measure in this Action Plan (see 1.2.2 in Table 4). In the meantime a precautionary approach, considering each activity on a case by case basis, is recommended for human activities that have the potential to destroy critical habitat.

Activities required to operate, inspect, or maintain, existing facilities and infrastructure, which are not critical habitat but may be adjacent to it, are not likely to result in the destruction of critical habitat. In addition, construction or repair of anthropogenic structures required to improve or maintain the condition of critical habitat, are not likely to destroy critical habitat. Examples of such activities include:

- Operation and maintenance of existing fence lines, shallow water pipelines, dugouts, salting locations, prairie trails for vehicles including two-rut trails, and emergency fireguards
- Reseeding of existing non-native pastures as part of normal pasture rejuvenation
- Prescribed burns (with consideration of timing and extent)

Critical habitat, as well as activities likely to result in its destruction, for Black-footed Ferret and Greater Sage-Grouse were fully identified in each species' recovery strategy (Tuckwell and Everest 2009b, Environment Canada 2014a) and therefore, are not repeated in the body of this Action Plan. For the benefit of the reader, information on critical habitat for these two species, as described in their respective recovery strategies, as well as maps of their critical habitat in the SoD area, are included in Appendix D.

1.3.2 Burrowing Owl

1.3.2.1 Identification of critical habitat for Burrowing Owl

Critical habitat for Burrowing Owl was partially identified in the Recovery Strategy (Environment Canada 2012a) and more is being identified in this Action Plan. Previously identified critical habitat consisted of all Black-tailed Prairie Dog colonies that provide nesting burrow complexes in southern Saskatchewan, including in the SoD area. Since the completion of the Recovery Strategy, research listed in the Schedule of Studies (Section 2.5.3 in Environment Canada 2012a) has enabled the identification of certain requirements of Burrowing Owls outside of prairie dog complexes, thus allowing additional critical habitat in the SoD area to be identified in this Action Plan.

The Recovery Strategy outlined habitat requirements at three spatial scales: 1) at the local level where Burrowing Owls defend a burrow complex from other owl pairs and use that area for pair-bonding, mating, nesting, loafing, shelter from inclement weather, avoiding predators, and caching prey; 2) at a larger nocturnal foraging home-range level that is undefended, but is used for hunting; and 3) at the landscape level where land-use and habitat configurations have the potential to influence site selection, survival, or reproductive success (Environment Canada 2012a). The best available information enables the identification of critical habitat only at the local burrow-complex level. Because Burrowing Owls readily occupy and forage and breed successfully in a wide variety of land-cover types and sizes, it has proven difficult to identify critical habitat at the foraging home-range and landscape scales. In light of the extreme plasticity in foraging and landscape habitat use exhibited by Burrowing Owls (Todd et al. 2007, Stevens et al. 2011, Marsh et al. 2014a and 2014b,), extensive analyses, based on the best available information, reveal that critical habitat is not identifiable at these large scales. However, additional critical habitat, in additional areas, may be identified in the future if new information comes to light.

In this Action Plan, Burrowing Owl critical habitat was determined based on reliable nesting occurrence data that met all three of the following established criteria:

1. An owl sighting, in any year, in a location that has been accurately documented with a precision of ≤ 25 m (e.g., coordinates from a hand held GPS unit),
2. At least one occupied burrow was noted at the sighting location. These burrows are predominantly natural burrows originally dug by burrowing mammals, but a small number of these locations have had natural burrows converted into artificial (man-made) burrows that were subsequently re-used by Burrowing Owls, and
3. The burrow location had evidence of nesting (i.e., burrow sites associated with a burrowing owl pair, or owlets, or eggs).

Critical habitat was defined by a 250-m radius around each nest occurrence, which corresponds to the typical maximum distance from a nest that a male Burrowing Owl will use during the daytime) (Scobie et al. 2014). This nesting territory includes an average of 2.8 burrows (1 nest + 1.8 satellite[4] burrows) used by the owl pair each year (Scobie et al. 2014), as well as all unoccupied mammal burrows, permanent grassland habitat, and burrowing mammal populations contained within the 250-m radius. Burrowing mammals continually replenish the supply of available burrows within each nesting territory, as existing burrows become filled in or collapse over time through natural processes.

Critical habitat identified in this Action Plan consists of 27 nesting sites that meet all of the above criteria. The total area containing Burrowing Owl critical habitat within the SoD region is 491 ha (1213 ac) [58 ha (143 ac) identified previously in the Recovery Strategy and 433 ha (1070 ac) identified in this Action Plan] distributed over 65 quarter-sections (Figure 3 and Figure 4 in Appendix C).

Within the boundaries of the critical habitat identified in this action plan, the biophysical attributes of critical habitat include the following, which are consistent with those presented in the recovery strategy (Environment Canada 2012a):

- open areas (few trees or tall structures, good visibility of surroundings)
- relatively flat terrain
- areas that are seldom prone to local flooding
- perennial grassland with very limited woody vegetation
- burrows available for nesting, shelter, protection from predators, and for caching prey.

Critical habitat associated with these 27 sites, together with the critical habitat previously identified within the SoD area in the Recovery Strategy (Environment Canada 2012a), represents all of the confirmed, spatially-precise nesting territories that are known to be used by Burrowing Owls in the SoD area. Because of the aforementioned plasticity in foraging and landscape habitat use by Burrowing Owls and the uncertainty around the relevance or utility of identifying critical habitat at larger scales, it remains to be determined the degree to which the critical habitat

[4] Satellite burrows are secondary burrows which are used only for roosting and caching prey, whereas a nest burrow is the primary burrow used for nesting, though it may also be used for roosting and caching prey. In consecutive years, secondary burrows often become primary burrows, and *vice versa*, if the owls choose to modify the usage of the burrows.

identified in this Action Plan is sufficient to ensure that the SoD area contributes substantially to achieving the population and distribution objectives for the species. If it is determined in the future that further critical habitat is relevant and necessary, additional areas will be identified as new locations, information and potentially, alternative approaches, become available.

1.3.2.2 Examples of activities likely to result in destruction of critical habitat for Burrowing Owl

Activities that are likely to result in destruction of Burrowing Owl critical habitat may include, but are not limited to:

1. Activities that remove, convert, or cover any perennial grassland (native or non-native), thereby lowering the suitability of that portion of the nesting territory for use by burrowing mammals which are needed to create the types of burrows that Burrowing Owls require.

   Examples of such activities may include:
   - conversion of grassland to cropland
   - construction of a road through perennial grassland
   - installing a petroleum well in perennial grassland

2. Activities that cause the blockage of any burrow entrances or tunnels, reducing burrow availability for current or future roosting or nesting use by Burrowing Owls.

   Examples of such activities may include:
   - soil, gravel, or rock in-filling of burrow entrances
   - intentional flooding of burrows, or of an entire nesting territory
   - manual or mechanized excavation of burrows
   - driving over burrows with heavy machinery so that burrow entrances collapse

3. Exterminating or severely reducing burrowing mammal populations within Burrowing Owl nesting territories so that burrows are no longer created for potential future use by Burrowing Owls.

   Examples of such activities may include:
   - Killing enough ground squirrels or prairie dogs (with rodenticides, smoke canisters, shooting, or by any other means) so that burrows are no longer created or maintained by the mammal population within that site
   - Shooting or poisoning American Badgers (*Taxidea taxus* ssp. *taxus*) within critical habitat areas

4. Planting trees or erecting tall structures within Burrowing Owl nesting territories, thus lowering the suitability of the site for nesting and causing a functional loss of habitat, as Burrowing Owls avoid tall structures within their nesting territories.

Examples of such activities may include:

- Constructing, installing or erecting a utility pole, nesting platform, cell phone tower, transmission tower, wind turbine, or new buildings taller than one storey.
- Planting any tree or tall-shrub species

1.3.3 Eastern Yellow-bellied Racer

1.3.3.1 Identification of critical habitat for Eastern Yellow-bellied Racer

Critical habitat for the Eastern Yellow-bellied Racer was partially identified in the Recovery Strategy (Parks Canada Agency 2010). Additional critical habitat has been identified in this Action Plan, although more will have to be identified in order to fully provide for the recovery of this species. Additional critical habitat is also being identified in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep).

Since the Recovery Strategy, one additional hibernaculum, known to be in use in 2011, has been found in the SoD area. This hibernaculum, and the adjacent area within a radius of 500 m, has been included as critical habitat, following the approach used in the Recovery Strategy.

The total area containing Eastern Yellow-bellied Racer critical habitat identified within the SoD region is 228 ha (563 ac) [152 ha (375 ac) identified previously in the Recovery Strategy and 76 ha (188 ac) identified in this Action Plan] distributed over 12 quarter-sections (Figure 5 in Appendix C).

As described in the Recovery Strategy (Parks Canada Agency 2010), the biophysical attributes of critical habitat include the following:

- mammal burrows, rock crevices or ledges, caves, or deep holes in soft hillside soil that provide fracturing, humidity, cover and thermal conditions required for suitable hibernation sites
- soft soil or burrows in which to lay eggs
- dense vegetation (mixed-grass prairie and sagebrush thickets) to maintain concealment from predators and suitable prey
- large rocks for cover or basking.

The new hibernaculum, together with the two sites previously identified in the Recovery Strategy, represent all the known hibernacula used by the Eastern Yellow-bellied Racer in the SoD area. However, it is recognized that the critical habitat identified in this Action Plan is insufficient to ensure that the SoD area contributes meaningfully to achieving the population and distribution objectives for the species. Thus, further critical habitat must be identified in the SoD area and across the species' range in order to meet the national population and distribution objectives. The Schedule of Studies presented in the Recovery Strategy (Section 2.5 in Parks Canada Agency 2010) outlines the steps required to identify additional critical habitat. Additional critical habitat in the form of newly found hibernaculum or foraging areas and dispersal routes for known populations may be identified in the future.

1.3.3.2 Examples of activities likely to result in destruction of critical habitat Eastern Yellow-bellied Racer

Examples of activities that are likely to result in destruction of Eastern Yellow-bellied Racer critical habitat include, but are not limited to, the following:

1. Activities that cause in filling-in or flooding of a hibernaculum, resulting in collapse, blocking the entrance, or changing thermal conditions (slope, aspect, position and surface albedo), such that the hibernaculum can no longer be used.

   Examples may include:
   - Soil, gravel or rock in-filling of hibernaculum and its entrance.
   - Intentional flooding.

2. Excessive trampling resulting in the collapse of the hibernaculum or compaction of soil, reducing the suitability of the hibernaculum or the surrounding area which may contain egg laying sites.

   Examples may include:
   - Intensive livestock grazing that causes collapse of the hibernaculum opening or soil compaction at egg-laying sites.
   - Industrial activities that cause collapse of the hibernaculum or soil compaction.
   - Four-wheel-vehicle use that causes collapse of the hibernaculum or trampling of egg-laying sites.

3. Activities that result in the loss of mixed-grass prairie or sagebrush thickets or permanently change the composition and structure of vegetation, leading to reduction of cover and soil stability such that the Eastern Yellow-bellied Racer's ability to detect predators and prey is compromised.

   Examples may include:
   - Agricultural activities that convert prairie to cropland.
   - Unsustainable grazing practices that cause severe reductions in vegetation structure or composition.
   - Industrial activities that remove native prairie through the development of new trails, roads, and infrastructure.

1.3.4 Prairie Loggerhead Shrike

1.3.4.1 Identification of critical habitat for Prairie Loggerhead Shrike

Critical habitat for the Prairie Loggerhead Shrike was partially identified in the Recovery Strategy (Environment Canada 2014b), but none of that critical habitat falls within the SoD area. Additional critical habitat has been partially identified in this Action Plan for the SoD area, although more may have to be identified to fully provide for the recovery of the species.

Additional critical habitat is also being identified in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep).

The Prairie Loggerhead Shrike occurs in two different habitat types in the SoD area and across the species' range. The first is where tall shrubs occur in farmland. The second is where tall shrubs are interspersed within large contiguous areas of natural grassland. While this species shows the distinctive behavior of impaling prey items on sharp objects, and may use thorny bushes such as Buffaloberry for this purpose, the essential role of tall shrubs is in providing nesting habitat and perching locations.

The Recovery Strategy calls for maintaining the recent prairie distribution and regional population levels (Environment Canada 2014b). Within the SoD area, the current distribution must be maintained in order to contribute to meeting the national recovery objective. Therefore, all natural grassland habitat known to be used by Prairie Loggerhead Shrikes that meets the established criteria, was identified as critical.

In this Action Plan, critical habitat within natural grassland habitats was determined following the two criteria described in the Recovery Strategy (Environment Canada 2014b). These criteria are based on expert opinion, which constitutes the best available information at this time, but may be refined in the future as better information becomes available:

- Large contiguous areas of natural grassland within 400 m of well-dispersed tall shrubs, 2 to 3 m in height and low in density (less than 30% cover, variable among sites);
- Shrike density at least 0.5 apparent breeding pairs / km^2, based on 2003-2010 surveys.

Critical habitat was identified using high-resolution satellite imagery to manually create a minimum-area polygon bounding tall shrubs used for nesting with the addition of a 400 m radius area of grassland. The 400 m radius zone is based on observed movements of shrikes from nest sites, and is expected to provide foraging habitat for shrikes nesting along the periphery of the area of tall shrubs. Most of this area of critical habitat is estimated to have < 5% tall shrub cover, which is within the above criteria.

Prairie Loggerhead Shrike critical habitat identified in the SoD area is found within 9,616 ha distributed over 261 quarter-sections. The critical habitat is within natural grassland areas located along the glacial meltwater channel of the Frenchman River, in Val Marie and Beaver Valley Community Pastures, and in private and leased Crown land adjacent to these pastures (Figure 6 in Appendix C) (A. Didiuk, unpubl. data 2010a, 2010b, 2010c).

It is recognized that the critical habitat identified in this Action Plan is insufficient to ensure that the SoD area contributes meaningfully to achieving the population and distribution objectives for the Prairie Loggerhead Shrike. Thus, further critical habitat must be identified in the SoD area and across the species' range in order to meet the national population and distribution objectives. The Schedule of Studies in the Recovery Strategy (Section 7.3 in Environment Canada 2014b) outlines the activities required to identify additional critical habitat. At this time, critical habitat in farmland cannot be identified in the SoD area because of uncertainty about the biophysical attributes, distribution and abundance of such habitat, its occupancy by shrikes, and the amount

of such habitat required for shrike recovery. In particular, studies must be carried out across the species' range to determine if critical habitat can be identified in farmland, by completing analyses of data from prairie-wide farmland surveys. Once studies are completed and more is known about the species' use of different habitats, additional critical habitat may be identified.

1.3.4.2 Examples of activities likely to result in destruction of critical habitat for Prairie Loggerhead Shrike

Examples of activities that may result in destruction of Prairie Loggerhead Shrike critical habitat include, but are not limited to:

1. Significant reduction of shrub coverage and prevention of shrub growth. These activities can destroy critical habitat because they eliminate nesting and/or perching habitat, thereby reducing the probability that shrike population levels will be maintained across the range.
   Such activities include but are not limited to:
   - repeated annual burning or mechanical removal of tall shrub patches;
   - alteration of hydrological regimes of riparian areas;
   - alteration by any other means.

2. Conversion of large areas of natural grasslands to cropland, infrastructure or buildings. This may reduce the quality of habitat to the extent that it is avoided by shrikes or can no longer support a sufficient prey base for foraging.
   Examples of such activities include, but are not limited to:
   - conversion of grassland to cropland;
   - development of human infrastructure such as homes, other buildings, roads, fire breaks and industrial infrastructure.

3. Excessive grazing to the extent that prey availability is significantly reduced in grassland foraging areas, or that nesting and perching sites in tall shrubs are reduced due to excessive mechanical damage from livestock. These effects can reduce shrike productivity, thereby reducing the probability that shrike population levels will be maintained across the range.

Insufficient information is available to provide thresholds of activity levels that would result in destruction of critical habitat. Alterations or proposed alterations to shrub and grassland cover within critical habitat will have to be assessed on a case-by-case basis in order to determine whether they qualify as destruction of such habitat.

Any given single action may or may not result in the destruction of critical habitat; however, when considered in the context of all current and future actions, the cumulative impacts of such actions may result in the destruction of critical habitat.

1.3.5 Sprague's Pipit

1.3.5.1 Identification of critical habitat for Sprague's Pipit

Critical habitat for the Sprague's Pipit was partially identified in the Recovery Strategy (Environment Canada 2012b) for select locations in southeastern Alberta and southwestern Saskatchewan, but none of that critical habitat fell within the SoD study area. Additional critical habitat within the SoD area has been identified in this Action Plan, although more will have to be identified outside of the SoD area in order to fully provide for the recovery of the species. Additional critical habitat is also being identified in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep).

The national Recovery Strategy calls for Sprague's Pipit populations to recover to 1980-1989 numbers, which would be a 2.5-fold increase in Prairie Canada compared with 1996-2005 levels (Environment Canada 2012b). Although historical (1980s) and more recent numbers are not available for the SoD area, it is precautionary to assume that the SoD population will have to, at a minimum, remain stable, or perhaps increase to some extent, in order to contribute to meeting the national recovery objective. Therefore all habitat that is reasonably likely to be used by breeding Sprague's Pipits was included.

In this Action Plan, Sprague's Pipit critical habitat was determined using "Approach 2" described in the Recovery Strategy (Environment Canada 2012b), and was guided by a spatially explicit predictive model based on pipit occurrence data collected from 2002-2011 as well as remotely-sensed habitat data. The models were based on 1,153 randomly selected sites where territorial Sprague's Pipits occurred, and a further 3,997 randomly selected sites that were used to characterize the habitat generally available in the SoD area. Reliance on predictive models was necessary because surveys and observations are widely scattered and tend to sample only a small proportion of a given area. Use of predictive models is a precautionary approach that allows one to determine the potential suitability of sites that were not sampled but can reasonably be expected to be inhabited by pipits. Models were validated using independent data sets, which demonstrated that the final model correctly predicted 90% of known pipit locations.

Critical habitat for Sprague's Pipit identified in the SoD area is found within 418,169 ha (1,032,877 ac) distributed over 9,121 quarter-sections (Figure 11 and Figure 12 in Appendix C). As described in the Recovery Strategy (Environment Canada 2012b), the biophysical attributes of critical habitat include the characteristics listed below. However, it is not currently possible to provide the specific amounts or levels of all of these required by Sprague's Pipit.

- open areas of upland native prairie ≥ 65 ha (160 ac)
- native prairie management units in fair to excellent range condition
- limited woody vegetation
- limited invasion by exotic grasses
- flat to gently rolling topography

The critical habitat identified in this Action Plan identifies all suitable habitat for Sprague's Pipit in the SoD area and is therefore deemed sufficient to ensure that the SoD area contributes meaningfully to national population and distribution objectives of the species. However, critical habitat must be identified in other areas of the Canadian prairies (outside of the SoD region) in

order to meet the range-wide recovery objective. This additional habitat may be identified in future action plans for Alberta and GNP, as appropriate.

1.3.5.2 Examples of activities likely to result in destruction of critical habitat for Sprague's Pipit

Sprague's Pipit critical habitat may be destroyed by anthropogenic activities that have the following effects (see Dale 1983, Davis et al. 1999, Davis and Duncan 1999, Davis 2005, Linnen 2008, Dale et al. 2009):

- loss of native vegetation or disturbance of soil substrate
- degradation of native prairie to poor range condition
- excessive increase in bare ground
- intentional planting of woody vegetation
- introduction of exotic plant species such as crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), alfalfa (*Medicago* spp.), sweet clover (*Melilotus* spp.), and leafy spurge (*Euphorbia esula*)
- covering of critical habitat with new anthropogenic structures

Examples of activities that may result in destruction of Sprague's Pipit critical habitat include, but are not limited to:

1. **Removal, cultivation and/or conversion of native prairie to annual cropland or non-native grassland**. Sprague's Pipits require native grassland habitat. The species is not found breeding in any type of annual cropland and is less abundant in non-native compared to native grasslands (Robbins and Dale 1999, Davis et al. 1999, Davis and Duncan 1999, Madden et al. 2000). Pipit abundance has been shown to decrease on native pastures with increasing amounts of non-native grassland in the landscape (B. Dale pers. comm., Davis et al. 2013). Furthermore, reproductive success and juvenile survival have been found to be lower in non-native than native grassland habitat (Davis unpub. data, Fisher and Davis 2011).

2. **Construction of roads**. Roads (paved, gravel or dirt surfaces of > 2 m width with ditches or raised road bed) destroy and fragment native grassland habitat, facilitate invasion of native grassland by exotic plant species, concentrate activities of certain predators and increase the chance of pipits colliding with vehicles. As a possible consequence of these effects, abundance of pipits has been found to be lower along roads than along trails (Sutter et al. 2000).

3. **Intentional flooding of upland habitat**. Water impoundment and creation of wetlands in upland native prairie cause the terrestrial vegetation to be unavailable to pipits for nesting and foraging. Pipit abundance has been found to increase with increasing distance from wetlands (Koper et al. 2009), suggesting that the presence of wetlands negatively affects habitat suitability beyond the wetland itself.

4. **High-intensity prolonged grazing**. Livestock grazing may reduce habitat quality if intensity, frequency, and duration of grazing are excessively high. Prolonged over-grazing over a number of years may degrade habitat to a point where the vegetation structure and community is no longer compatible with the habitat requirements of the species. Rangeland classified as "Poor" range condition (Abouguendia 1990) is not suitable for pipits (Davis et al. 2014) and is likely difficult to recover without substantial resources and time (Abouguendia 1990).

5. **Construction of new infrastructure** (e.g. buildings, oil and gas wells, pipelines, waste and water storage facilities). Anthropogenic structures placed on native grassland exclude pipits from using the habitat directly associated with the structure. Occurrence of pipits is negatively affected by the density of wells in the landscape (Dale et. al.2009) and individual wells are avoided by pipits, with exclusion zones extending up to 60 m from natural gas wells (Kalyn-Bogard 2011).

1.3.6 Mormon Metalmark

1.3.6.1 Identification of critical habitat for Mormon Metalmark

Critical habitat for Mormon Metalmark was not previously identified in the Recovery Strategy due to lack of data. Since the posting of the final Recovery Strategy, sufficient data has been gathered and habitat criteria developed to allow identification of critical habitat in this Action Plan.

Mormon Metalmark critical habitat was determined from the 2007 to 2012 occurrence data, and is based on two approaches described in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep.):

1. occurrence of colonies that have been accurately mapped based on the distribution of the larval host plant, Branched Umbrella-plant (*Eriogonum pauciflorum*),
2. occurrence of a single Mormon Metalmark butterfly individual plus a 222 m radius around the occurrence. The 222 m radius represents the average "inferred" area calculated from all the known colonies in both the SoD area and GNP (Parks Canada Agency in prep.).

Mormon Metalmark critical habitat identified for the SoD area is found within 298 ha (736 ac) at 30 locations distributed over 30 quarter-sections (Figure 8 in Appendix C). This critical habitat is primarily located along the clay and eroded hills of the Frenchman River, in Val Marie Community Pasture and in private and leased provincial Crown land adjacent to GNP.

Biophysical attributes of Mormon Metalmark critical habitat include (Pruss et al. 2008b, Parks Canada Agency in prep.):

- badland areas on eroded barren, sandy or gravelly soils; and
- partially weathered shale and clay where moderate to high densities of larval host plants, Branched Umbrella-plant and Rubber Rabbit-brush (*Ericameria nauseosa*) are found.

The critical habitat identified in this Action Plan encompasses all known Mormon Metalmark occurrences in the SoD area. It is anticipated that the critical habitat identified in this Action Plan, together with that identified in the GNP Action Plan (Parks Canada Agency in prep.), can achieve the national population and distribution objectives for the Mormon Metalmark in Canada (Pruss et al. 2008b). Additional critical habitat may be identified in the future if new colonies are discovered.

1.3.6.2 Examples of activities likely to result in destruction of critical habitat for Mormon Metalmark

Examples of activities that may result in destruction of Mormon Metalmark critical habitat include, but are not limited to, the following:

1. **Activities that remove or cause long term destruction to larval and adult nectar host plants, making the area inhospitable for Mormon Metalmarks to complete their life cycle**. This butterfly has highly specific host plant requirements: adults are known to feed only on Branched Umbrella-plant and Rubber Rabbit-brush, while larva feed only on Branched Umbrella-plant. Thus any mechanism that removes or kills these plants could reduce the survival of this butterfly, and could cause local extirpation (Pruss et al. 2008b). Examples may include:
    - Trampling of host plants by livestock through the establishment of winter feeding sites, salt blocks, or calving sites.
    - Industrial activities that result in the removal or destruction of host plants and native vegetation through the development of new trails, roads and infrastructure.
    - Application of herbicides in a manner that results in direct mortality of host plants.

2. **Activities that remove or compact soil such that the host plants cannot survive or become re-established in the altered habitat, or that Mormon Metalmark larvae or pupae may not be able to complete their life cycles**. Because the seeds and adult plants of the branched umbrella plants and rubber rabbit-brush are adapted to eroded barren, sandy or gravelly soils, removal or compaction of soil can result in direct mortality to host plants, destruction of the seed bank, and impairment of the ability of host plants to propagate. Examples include:
    - Soil or gravel extraction.
    - Activities that trample and/or compact the soils, increasing erosion or disturbance.

3. **Activities that alter the vegetation composition such that the density of the host plants is reduced and the area cannot be used by Mormon Metalmark**.
   Examples include:
    - Farming or ranching practices that result in the deliberate introduction or promotion of invasive plant species that will out-compete the native vegetation and host plants. Such examples include the deliberate dumping or spreading of feed bales containing viable seed of invasive alien species, or seeding invasive alien species that did not occur in the past.

- Construction of new trails or roads that have the potential to introduce and spread invasive species through the disturbance of the habitat and the transportation of mud that contains invasive seeds.

1.3.7 Mountain Plover

1.3.7.1 Identification of critical habitat for Mountain Plover

Critical habitat for Mountain Plover was not identified in the Recovery Strategy due to lack of data. Since the posting of the final Recovery Strategy, sufficient data has been gathered and habitat criteria developed to allow identification of critical habitat in this Action Plan. Additional critical habitat is also being identified in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep).

The national recovery objective for Mountain Plover is to maintain this species' recent Canadian abundance and distribution (Environment Canada 2006). Historical and current abundance data is lacking due to low population density, likely because the species is at the northern edge of its range, coupled with the difficulty in observing individuals. However, it can be assumed that at a minimum the distribution within the SoD area must be maintained in order to meet the national recovery objective. Therefore, all available habitat likely to be used by breeding Mountain Plovers was identified as critical.

Mountain Plover critical habitat was identified using two approaches: 1) a habitat-based approach, whereby Black-tailed Prairie Dog colonies are identified as critical habitat because they are known to provide high quality habitat for Mountain Plovers, or 2) known breeding occurrences of Mountain Plovers, based on documented occurrences of pairs from 1959-2010, plus a 500 m radius around the occurrence (Knapton et al. 2006). The first approach is based on the fact that prairie dog colonies represent a highly suitable and much preferred habitat type for Mountain Plover (Knowles and Stoner 1982, Dinsmore et al. 2005, Childers and Dinsmore 2008, Tipton et al. 2009). The majority of breeding or potential breeding Mountain Plovers in Saskatchewan have been on prairie dog colonies. Colonies also support the highest rate of chick survival when compared with other habitats (Dreitz 2009). Given the species' preference for prairie dog colonies, and the ease with which this species can be missed in surveys, all colonies are considered high quality breeding habitat in which the likelihood of species occurrence is high.

Mountain Plovers may also breed outside of prairie dog colonies, which are limited in their distribution and extent in the SoD area (Knapton et al. 2006). In order to maintain the species' distribution, it is important to also include probable breeding sites. Identification of critical habitat using this approach was based on reliable or probable breeding occurrence data plus a 500 m radius around the occurrence. The 500 m radius zone is based on observed movements of breeding individuals from nest sites and is expected to provide the area needed for completing nesting and brood-rearing activities (Graul 1975, Knopf and Rupert 1996, Dreitz et al. 2005). The following two criteria were used to identify critical habitat:

- Breeding occurrence (e.g. territorial pairs, nests, eggs, or fledged young) or probable breeding occurrence (e.g. individuals in suitable habitat at the appropriate time of year) has been precisely documented with an accurate geographic referencing system or accurate mapping, and
- Suitable nesting habitat still exists in the area.

The Mountain Plover critical habitat identified for the SoD area is found within 215 ha (531 ac) distributed over 18 quarter-sections (Figure 9 and Figure 10 in Appendix C). This critical habitat is primarily located within Govenlock, Val Marie, and Masefield Community Pastures and within private and leased Crown land adjacent to GNP.

The biophysical attributes of Mountain Plover critical habitat are as follows (Graul 1975, Knowles and Stoner 1982, Knopf and Rupert 1995, Dechant et al. 1998; Environment Canada 2006):

- occurrence of Black-tailed Prairie Dogs and their associated colony habitat characteristics; and/or
- a combination of the following:
    - large tract of open native prairie (≥ 80 ha) (> 198 ac)
    - native prairie management units that are moderate to heavily grazed (mixed- or short-grass that is usually less than 10 cm high)
    - presence of bare ground (between 30% and 70%)
    - high horizontal visibility (open areas with a slope less than 5%)
    - limited woody vegetation
    - limited invasion by exotic grasses.

The critical habitat identified in this Action Plan represents all the known habitat used by the Mountain Plover in the SoD area and is therefore deemed sufficient for ensuring that the SoD area contributes meaningfully to national population and distribution objectives of the species. Additional critical habitat outside of the SoD region will need to be identified (e.g. in south-eastern Alberta and GNP) in order to achieve the range-wide recovery goal.

1.3.7.2 Examples of activities likely to result in destruction of critical habitat for Mountain Plover

Examples of activities that may result in destruction of Mountain Plover critical habitat include, but are not limited to:

1. **Activities that remove and/or convert native prairie, making it inhospitable to Mountain Plovers or limiting their ability to forage, breed, nest and rear young**. Examples may include:
    - Conversion of native prairie to annual cropland or tame forage.
    - Extraction of gravel.
    - Construction of new infrastructure such as roads, wells, large diameter pipelines, and large building complexes.
    - Deliberate flooding or filling.

2. **Activities that fragment large tracts of native prairie, thereby increasing predation pressure and reducing reproductive success**.
   For example:
   - Construction of new permanent fire breaks and roads

3. **Activities that destroy the extent and function of Black-tailed Prairie Dog colonies**.
   For example:
   - Deliberate killing or removal of Black-tailed Prairie Dogs such that the colonies are reduced in size or abandoned, allowing vegetation to grow thick and tall in areas where it was bare and sparse. Mountain plovers will not use such areas for breeding.

4. **Activities that promote or enhance vegetation growth, both native and non-native, such that the area becomes unsuitable for nesting or foraging**. Such areas are also known to be more attractive to predators such as foxes and squirrels that feed on plover eggs.
   For example:
   - Deliberate planting of forbs, shrubs or trees, or introducing invasive species that will out-compete native vegetation.

1.3.8 Swift Fox

1.3.8.1 Identification of critical habitat for Swift Fox

Critical habitat for Swift Fox has been partially identified in this Action Plan. Additional critical habitat on a range-wide basis will be identified in the Grasslands National Park Action Plan (Parks Canada Agency in prep.), as well as in Alberta.

According to the national Recovery Strategy for Swift Fox, the long-term population objective is to restore a self-sustaining population of at least 1,000 mature, reproducing individuals that does not experience a population reduction greater than 30% in any 10-year period (Pruss et al. 2008a). To achieve this recovery goal, all habitat that is reasonably likely to be used by Swift Fox was considered for identification of critical habitat.

In this Action Plan, Swift Fox critical habitat was determined using the approach described in the GNP Action Plan (Parks Canada Agency in prep.), and is summarized below. Critical habitat identification was based on a spatially-explicit habitat suitability model initially developed by Moehrenschlager et al. (unpubl. data 2007) and later refined by Parks Canada Agency (Parks Canada Agency unpubl. data 2010). An advantage of using such a model is that it can identify suitable sites not only where individuals have been observed, but also where occurrence data is not currently available. Using a model to identify where suitable habitat is reasonably expected to occur ensures that critical habitat will be identified to meet the national recovery objectives.

The model was developed using data on known Swift Fox habitat use from a population survey (2005-2006) (Moehrenschlager and Moehrenschlager unpubl. data 2006), and 14 landscape-scale

summer habitat variables, determined from remote sensing data for the area within 3 km of known occurrences. The model was tested by comparing its predictions against three separate Swift Fox population surveys (1996-97, 2000-01, and 2008-09) that had not been used for model development (Cotterill 1997, Moehrenschlager and Moehrenschlager 2001, Camaclang et al. 2010). For all three datasets, the model strongly identified known Swift Fox occurrences. The model was applied to the 2010 Canadian range, and critical habitat was identified as those areas in the SoD area where the habitat attributes were at least as favourable for Swift Fox as the majority of observed occurrences. The habitat model indicated that Swift Fox avoid habitats that have a high proportion of cropland, high average wetness, high standard deviation in wetness, and high average terrain slope. This habitat selection is consistent with the species' known affinity for intact dry-prairie habitats that are relatively homogeneous and gradually sloping (Pruss 1999, Moehrenschlager et al. unpubl. data 2007).

Swift Fox critical habitat identified in the SoD area is found within 368,756 ha (910,827 ac) distributed over 6,552 quarter-sections (Figure 13 and Figure 14 in Appendix C). This may be an overestimate because the remote sensing analysis could not distinguish between native and tame pasture, and only the former is considered to be critical habitat (see biophysical attributes below). Existing non-suitable habitats such as urban areas, annual cropland, roads, and water bodies that occur within the mapped boundaries of critical habitat, which may not have been mapped separately because of inadequate data, do not constitute critical habitat.

The biophysical attributes of Swift Fox critical habitat are as follows (Pruss 1999, Moehrenschlager et al. unpubl. data 2007, COSEWIC 2009):

- Large tracts of intact (i.e. native) prairie
- Short (< 25 cm high), sparse and relatively homogeneous vegetation
- Level or low variation in terrain roughness (gently sloping terrain or few topographic features such as canyons, steep hills, or coulees)
- Dry, well-drained soils
- High density of burrows created by fossorial mammals
- Limited cropland
- Limited invasive species
- Adequate availability of prey items (small mammals and insects)

The critical habitat identified in this Action Plan represents all the known habitat used by the Swift Fox in the SoD area and is therefore deemed sufficient for ensuring that the SoD area contributes meaningfully to national population and distribution objectives of the species. However, critical habitat must be identified in other areas of the Canadian prairies (e.g. in south-eastern Alberta and GNP), in order to meet the range-wide recovery objective.

1.3.8.2 Examples of activities likely to result in destruction of critical habitat for Swift Fox

The habitat model showed that activities within 3 km of Swift Fox occurrences could have an impact on habitat suitability. Therefore, certain activities outside of the identified critical habitat could still negatively impact that habitat. Examples of activities likely to result in the destruction of critical habitat may include but are not limited to:

1. **Activities that remove or convert intact prairie to annual cropland or tame pasture, rendering the habitat inhospitable to Swift Fox, or limiting their ability to forage, breed, disperse, burrow or rear young**. Swift Fox prefer large tracts of intact prairie, while avoiding cropland or highly fragmented areas (Carbyn 1998, Moehrenschlager et al. unpubl. data 2007, COSEWIC 2009). Activities that remove or convert intact prairie may reduce prey and burrow availability, increase risk of predation, increase interspecific competition with Coyotes and Red Foxes, and reduce gene flow among populations. This can result in extirpation at the local scale, which may impede metapopulation dynamics (Hanski and Ovaskainen 2002, DeWoody et al. 2005, Babak and He 2009, Schwalm 2012).

   Examples include:
   - Agricultural activities that plough or cultivate intact prairie, either as a one-time or annual activity, or change it to non-native grasses.
   - Industrial activities that fragment large tracts of intact prairie through the development of new trails, roads and infrastructure. Large-scale oil-field developments have been found to reduce carrying capacity of the San Joaquin Kit Fox (*Vulpes macrotis*) (Warrick and Cypher 1998). Swift Foxes are negatively associated with habitat edges, roads, and a lack of habitat homogeneity (Moehrenschlager et al. unpubl. data 2007). Increased number of roads also produces increased levels of traffic and subsequent road mortality, which can impact population dynamics.
   - Gravel extraction.
   - Construction of new permanent fireguards.

2. **Activities that fill in, destroy or lead to a reduction in the number of prairie dens, holes or burrows that Swift Foxes rely on, compromising the ability of individuals to use them for shelter from weather extremes, rearing young, or refuge from predators** (Egoscue 1979, Russell 1983, Herrero et al. 1986, Pruss 1999, Harrison and Whittaker-Hoagland 2003)**.** The Swift Fox is the most burrow-dependent canid; it relies on a number of burrows and dens that are used throughout the year. Although Swift Foxes are thought to be able to dig their own burrows, they often modify burrows dug by other species such as American Badgers (*Taxidea taxus*), prairie dogs (*Cynomys* spp.), and ground squirrels (*Spermophilus* spp.) (Herrero et al. 1986, Pruss 1999).

   Examples include:
   - Deliberate destruction of dens, holes or burrows that Swift Fox rely on by filling them in with dirt or collapsing them.
   - Activities that flood or change the hydrology of an area such that dens, holes or burrows that Swift Fox rely on, become too wet or are inundated by water.

3. **Activities that permanently change vegetation composition and structure, leading to inability of Swift Fox to detect predators and prey, as well as increase predation risks and interspecific competition**. Swift Foxes are known to avoid densely vegetated habitats. Trees can be used as perches for raptors while dense, tall vegetation can attract predators and competitors such as Coyotes and Red Foxes.

One example is:

- The deliberate planting of trees and shrubs.

4. **Activities that reduce prey abundance such that foraging opportunities and food delivery to young are decreased, leading to starvation, den abandonment, or disappearance of individuals from area.** The Swift Fox diet is primarily comprised of grasshoppers (suborder Caelifera), beetles (order Coleoptera), and ground squirrels (Hines and Case 1991, Pruss 1994). A reduction in mammalian prey populations has been found to negatively impact the closely related San Joaquin Kit Fox (White and Ralls 1993, White et al. 1996).

   One example is:

   - The misuse of pesticides or any other activity that reduces prey abundance to the point where Swift Fox populations decline in the long-term or are extirpated from the area.

1.3.9 Overlap of Critical Habitat

Critical habitat within the SoD region (excluding GNP) is defined for each species independently, and also for all species combined, since this is a multi-species Action Plan. The area of critical habitat for each species within the SoD region, is summarized in Table 5. The first column shows the area previously identified in recovery strategies as critical habitat within the SoD region; the second column shows the area of critical habitat newly identified in this Action Plan, and the third column shows the total area of critical habitat within the SoD region, for *each individual species*. Species with extensive habitats have large areas, whereas areas are much smaller for species with more narrowly defined habitats.

Critical habitat for all species combined is shown on the last row of the table, however it is important to note that because there is overlap among species' critical habitat, this amount is not a cumulative (additive) value, but rather an overlapping value*. The total amount of overlapping critical habitat (non-additive) for all focal species in SoD area, is found within 595,573 ha (1,471,065 ac) (5,955 km^2) of land; 573,570 ha (1,416,717 ac) of which is newly identified in this Action Plan; and 95,052 ha (234,778 ac) identified in previous recovery documents as indicated below.

Table 5 Area (ha) of critical habitat within the SoD region, identified for individual species.

	Previously identified as critical habitat within the SoD region	Newly identified as critical habitat within the SoD region	Total critical habitat within the SoD region for individual species
Black-footed Ferret	58		58
Burrowing Owl	58	433	491
Eastern Yellow-bellied Racer	152	76	228
Greater Sage-Grouse	94,842		94,842
Prairie Loggerhead Shrike		9,616	9,616
Mormon Metalmark		298	298
Mountain Plover		215	215
Sprague's Pipit		418,169	418,169
Swift Fox		368,756	368,756
Overlapping (non-additive) Critical Habitat of all species	95,052*	573,570 *	595,573 *

* To obtain this overlapping critical habitat value for all species combined, critical habitat maps for all species were overlaid and the area of overlapping critical habitat was calculated from this new polygon (i.e. for at least one or more species, not including GNP). This combined area makes up about 62% of the grassland/shrubland in the SoD region. It should be noted that tame pasture was included in the calculation of this total. According to the biophysical attributes of critical habitat for Sprague's Pipit (Section 1.3.7) and Swift Fox (Section 1.3.8), tame pasture is not critical habitat. However, the separation of native and tame pasture in the land-cover mapping (Table 2) was not considered accurate enough to use in habitat modeling, so the area mapped as tame pasture was included in the calculation.

Areas that provide critical habitat for several species may be higher in priority for conservation measures. The percent overlap between pairs of species is presented in Table 6. Species with larger areas of critical habitat, such as Sprague's Pipit and Swift Fox, overlap with many species. Even species with smaller areas of critical habitat can overlap with other species, particularly those that have similar habitat associations. For example, 100% of the critical habitat of Black-footed Ferret overlaps with that of Burrowing Owl and Mountain Plover, because all three species are associated with prairie dog towns.

Table 6 Overlap between critical habitat defined for one species and that defined for other species.

The upper part of the table shows the overlap area in hectares. The lower part of the table shows percentage overlap. *Percentages should be read horizontally*: for example, of the critical habitat defined for BFFE, 100% overlaps with that of BUOW, 25.4% with that of GRSG, etc.

Species*	BFFE	BUOW	EYBR	GRSG	LOSH	MOME	MOPL	SPPI	SWFO
BFFE		58	0	15	0	0	58	20	57
BUOW	58		0	37	0	0	58	156	356
EYBR	0	0		169	0	18	0	141	37
GRSG	15	37	169		2,271	185	93	55,756	48,963
LOSH	0	0	0	2,271		13	17	1,285	0
MOME	0	0	18	185	13		0	89	0
MOPL	58	58	0	93	17	0		20	116
SPPI	20	156	141	55,756	1,285	89	20		221,995
SWFO	57	356	37	48,963	0	0	116	221,995	

Species*	BFFE	BUOW	EYBR	GRSG	LOSH	MOME	MOPL	SPPI	SWFO
BFFE		100.0%	0.0%	25.4%	0.0%	0.0%	100.0%	33.9%	98.4%
BUOW	11.8%		0.0%	7.5%	0.0%	0.0%	11.8%	31.6%	72.3%
EYBR	0.0%	0.0%		73.9%	0.0%	7.7%	0.0%	61.6%	16.2%
GRSG	0.0%	0.0%	0.2%		2.4%	0.2%	0.1%	58.8%	51.6%
LOSH	0.0%	0.0%	0.0%	23.6%		0.1%	0.2%	13.4%	0.0%
MOME	0.0%	0.0%	5.9%	62.1%	4.3%		0.0%	29.9%	0.0%
MOPL	27.1%	27.1%	0.0%	43.3%	7.9%	0.0%		9.2%	54.0%
SPPI	0.0%	0.0%	0.0%	13.3%	0.3%	0.0%	0.0%		53.1%
SWFO	0.0%	0.1%	0.0%	13.3%	0.0%	0.0%	0.0%	60.2%	

*For definitions of species codes, see introductory explanation for Table 4.

Overlap can also be expressed in terms of number of quarter-sections containing critical habitat for one or more species (Table 7). Almost 50% of the quarters within which critical habitat has been identified, contain critical habitat for only one species, but almost as many quarters contain critical habitat for two species, largely because of overlap between Sprague's Pipit and Swift Fox. No quarter section includes critical habitat for all of the species, but there are a few quarter sections with critical habitat for five or six of the nine species. Areas with overlapping critical habitat for several species could play an important role in recovery as focal areas for enhanced recovery measures.

Table 7 Number of quarter-sections containing critical habitat for various numbers of species.

	# quarters
CH for 1 species	5250
CH for 2 species	4614
CH for 3 species	1605
CH for 4 species	22
CH for 5 species	2
CH for 6 species	5
CH for 7 species	0
CH for 8 species	0
CH for 9 species	0

1.4 Proposed Measures to Protect Critical Habitat

Action plans must include, with respect to the area to which the Action Plan relates, a statement of the measures that are proposed to be taken to protect the species' critical habitat and an identification of any portions of the species' critical habitat that has not been protected.

1.4.1 Proposed Protection Measures on Federal Lands

In the SoD region, portions of critical habitat have been identified within the boundaries of the Prairie National Wildlife Area (Unit No. 11). As required under SARA, a description of the critical habitat found at these locations will be published in the *Canada Gazette* and protection under section 58(1) will come into effect 90 days after the date of publication.

Other portions of critical habitat are located on other federal land owned or managed by the Government of Canada. Within 180 days of the final posting of the Recovery Strategy or Action Plan identifying the critical habitat in the Species at Risk Public Registry, Section 58(5) of SARA requires the competent minister to make an order for any part of this critical habitat that is not legally protected by the provisions or measures under SARA or any other federal Act. If the competent minister does not make the order, he or she must include in the Public Registry a statement setting out how the critical habitat or portions of it are legally protected.

1.4.2 Proposed Protection Measures on Non-federal Lands

With regard to the portions of critical habitat on non-federal lands, Environment and Climate Change Canada will assess the protection currently in place. This involves first working with the Government of Saskatchewan to determine which provincial laws and legal instruments are in place to prevent destruction of critical habitat. If there are gaps in the protection of critical habitat, provisions or measures in place under SARA or other federal legislation will be reviewed to determine whether they prevent destruction of critical habitat. The laws and legal agreements in place that protect critical habitat will be monitored for efficacy at least every five years. Conservation measures, including stewardship initiatives, that contribute to preventing critical habitat destruction will also be considered and monitored.

If it is determined that any portions of critical habitat are not protected, and steps are being taken to protect those portions, those steps will be communicated via the Species at Risk Public Registry through the reports referred to in section 63 of SARA.

1.5 Important Habitat for Other Species

1.5.1 Introduction

Although not required in an Action Plan, characterizing and identifying important habitat for Species of Special Concern enables habitat conservation efforts to be more directed, especially when dealing with many species occupying the same landscape. Moreover, the extent to which important habitat overlaps with the critical habitat for Extirpated, Endangered and Threatened species may be an additional consideration in conservation planning. Characterization and prioritization of important habitat provides geographically defined units for targeting of efforts and engagement with local communities. Higher priority is assigned to areas that provide habitat for several Species of Special Concern.

1.5.2 Black-tailed Prairie Dog

Black-tailed Prairie Dog habitat needs have been described in the Management Plan (Tuckwell and Everest 2009a). There are two general areas within the SoD area (excluding Grasslands National Park) where Black-tailed Prairie Dog colonies are located. The burrow system is central to all life history components for the species. The colonies are generally found in areas with relatively flat or gently sloping terrain and in a variety of soils including gravel (e.g. Masefield Community Pasture). Colonies are located on well drained soils that enable Black-tailed Prairie Dogs to develop their complex and deep burrow systems (Parks Canada unpublished data quoted in COSEWIC 2011). Short vegetation height (generally < 10 cm) is important, as the shorter grass helps prairie dogs watch for predators (Agnew et.al. 1986).

Historically, prairie dogs coexisted with large grazers (Fahnestock and Detling 2002), and all of the colonies within the SoD area currently coexist with bison or cattle grazing. Prairie dogs are believed to obtain water from plant foods, so drinking water is not considered necessary. However, they do not avoid water features, and many of the colonies are adjacent to drainages. These may facilitate dispersal (Garrett and Franklin 1988), but the formation of a new colony in Canada has not been documented. Major roads are thought to limit dispersal, but the dirt tracks found adjacent to or within existing colonies are probably not limiting.

In this Action Plan, important habitat for Black-tailed Prairie Dog was determined based on occupancy of the species and the boundaries of the colonies as determined in 2007 (Tuckwell and Everest 2009a). Important habitat in the SoD area is located within 58 ha (143 ac) distributed over 8 quarter-sections (Figure 15 in Appendix C; also see Tuckwell and Everest 2009a).

1.5.3 Long-billed Curlew

Long-billed Curlew habitat has been described in the Management Plan (Environment Canada 2013b). The species typically breeds in short mixed-grasslands and pastures where grasses are < 30 cm tall and there are some shrubs. Long-billed Curlew tends to be associated with relatively large undisturbed and moderately grazed short mixed-grasslands and fescue prairie, but also breeds in tame pastures. In southwestern Saskatchewan, brood-rearing areas are often close to spring and summer crops.

In this Action Plan, important habitat for Long-billed Curlew was determined using a predictive modeling approach identical to that used for Sprague's Pipit and McCown's Longspur. Data were compiled from a number of sources from the region, totalling 320 detections between 2002 and 2011 inclusive (S. Davis, unpubl. data). Long-billed Curlew occurrence was found to increase with the amount of grassland cover within 400 m of the survey site and the amount of woody cover. Long-billed Curlew preferred areas with increased vegetative cover. Caution should be used in interpreting the results because an analysis of independent data found that the model was a relatively poor predictor of occurrence, due in part to a low number of records for the species.

Despite this shortcoming, the model represents the best currently available information on important habitat for the species within the SoD area. Important habitat for Long-billed Curlew in the SoD area is located within 483,941 ha (1,195,334 ac) distributed over 10,711 quarter-sections (Figure 16 and Figure 17 in Appendix C), and has the following features:

- open contiguous rangeland with few tall shrubs and short (≤ 30 cm) vegetation dominated by grasses
- flat to gently rolling topography
- nest sites typically associated with shorter and sparser vegetation than sites used for foraging by adults and young

1.5.4 McCown's Longspur

McCown's Longspur habitat needs have been described in the Management Plan (Environment Canada 2014c). The species breeds in the arid regions of the mixed-grass prairie, in south-western Saskatchewan and south-eastern Alberta. Breeding habitat typically includes short-grasses like Blue Grama *(Bouteloua gracilis*), interspersed with cacti *(e.g., Opuntia polyacantha)* and limited mid-grasses *(e.g., Hesperostipa comata, Koeleria macrantha, Pascopyrum smithii*) (Felske 1971).

In this Action Plan, McCown's Longspur important habitat was identified using a predictive modeling approach identical to that used for Sprague's Pipit and Long-billed Curlew. Data were compiled from a number of sources from the region, totalling 1,470 detections from 1,127 unique sites. All detections were between 2002 and 2011 inclusive (S. Davis, unpubl. data). Occurrence was found to increase with the amount of grassland cover within 400 m of the survey site, and from the eastern portion of the SoD area to the western portion. McCown's Longspur preferred areas with less vegetative cover, and declined from the southern portion of the SoD area to the northern portion. Based on an analysis of independent data, this model correctly predicted 89% of known longspur locations, suggesting reasonably good predictive power.

Important habitat for McCown's Longspur in the SoD area is located within 394,651 ha (974,787 ac) distributed over 8,216 quarter-sections (Figure 18 and Figure 19 in Appendix C) (28% of the SoD area), and has the following features:

- open short-grass or mixed-grass prairie
- Solonetzic and loamy Chernozemic soils with sparse litter and vegetation cover
- short grasses (≤ 5 cm).

1.5.5 Northern Leopard Frog

Northern Leopard Frog habitat needs have been described in the federal Management Plan (Environment Canada, 2013a). The Northern Leopard Frog uses both aquatic and terrestrial environments. Three habitat types are required for breeding, foraging and overwintering. Since the dispersal capability of this species is limited, these habitats must be available close to each other and there must be some connectivity between them.

In winter, Northern Leopard Frogs hibernate in water bodies which do not freeze solid, are cold (ca. < 4 °C), and are well oxygenated. These typically include permanent ponds and lakes, as well as springs, rivers and streams. In spring, adult frogs travel up to 1.6 km from winter sites to breed in shallow, warm waters of a variety of wetlands including marshes, springs, flooded ditches, dugouts, borrow pits, beaver ponds, margins of lakes, and slow-moving waters of streams and rivers. Optimal breeding wetlands have some degree of permanence but contain no predatory fish. Emergent vegetation is important for protective cover and is used as a substrate for attachment of egg masses. In summer, adults and sub-adults may disperse up to 8 km from breeding ponds to forage in riparian or upland habitats. These habitats include meadows, pastures, scrublands, riparian corridors, and drainage or irrigation ditches. Northern Leopard Frogs avoid areas of very sparse vegetation such as heavily grazed pastures or cultivated fields.

Within the SoD area, most Northern Leopard Frog occurrences have been recorded along the Frenchman River and along streams near the United States border in the east block of Grasslands National Park. There are isolated records within and near the Claydon Grazing Cooperative and the headwaters of Battle Creek and Lodge Creek.

In this Action Plan, Northern Leopard Frog important habitat was identified using the Alberta Northern Leopard Frog Habitat Suitability Index (HIS) (Stevens et al. 2010). The four most important HSI variables were calculated for the SoD area:

- Distance to permanent stream
- Permanent stream density
- Perimeter density of water areas mapped as polygons
- Road density

Habitat suitability scores are assigned to the each of the four variables, increasing with proximity to streams and stream density, and decreasing with road density. Scores for the four variables are summed to give an overall index of habitat suitability from 0 to 1. Areas with HSI greater than 0.6, were delineated as Important Habitat. This threshold level was selected because it encompassed 86 of 91 known observations of Northern Leopard Frog in the SoD area.

Important habitat for the Northern Leopard Frog in the SoD area is located within 447,118 ha (1,104,381 ac) distributed over 9,311 quarter-sections (Figure 20 in Appendix C).

1.5.6 Overlap of Important Habitat for Other Species, and with Critical Habitat

The areas of important habitat defined for each species of special concern are summarized in Table 8. Species with extensive habitats have large areas, whereas the area for the Black-tailed Prairie Dog is much smaller because its habitat is more narrowly defined.

Important habitat was defined for each species independently, but there is overlap among species, so the total in the last row of Table 8 is not additive *.

Table 8 Amount of Important Habitat identified for each species.

	Area (ha)
Black-tailed Prairie Dog (BTPD)	58
Long-billed Curlew (LBCU)	483,941
McCown's Longspur (MCLO)	394,651
Northern Leopard Frog (NLFR)	447,118
*Over-lapping (non-additive) Important Habitat of all species	744,628

*To obtain the amount of over-lapping important habitat for all species combined, habitat maps of all four important species were overlaid and the amount of important habitat for all four species combined was calculated from this new polygon (i.e. the area of important habitat showing for at least one or more species, not including GNP).

In many cases, the important habitat described for Species of Special Concern also overlaps with the critical habitat described for Extirpated, Endangered and Threatened Species (see Section 1.3). Table 9 shows the extent of such overlap among species. The relatively small area of important habitat for Black-tailed Prairie Dog overlaps completely with critical habitat for Black-footed Ferret, Burrowing Owl, and Mountain Plover, because of the dependence of these three species on prairie dog towns. Long-billed Curlew and McCown's Longspur have larger areas of important habitat, which overlap extensively with the large areas of critical habitat defined for Sprague's Pipit and Swift Fox. About 90% of the Important Habitat for Long-billed Curlew and McCown's Longspur overlaps with the critical habitat of all Extirpated, Endangered and Threatened Species combined, while this overlap is 59% for Northern Leopard Frog. This implies that protection of critical habitat in the SoD area may confer the added benefit of protecting most of the important habitat for Species of Special Concern.

Table 9 Overlap of Important Habitat of Species of Special Concern with Critical Habitat of Endangered, Extirpated and Threatened Species.

The left portion of the table shows overlap area in hectares. The right side of the table shows percent overlap. Percentages should be read vertically: for example, of the Important Habitat for BTPD, 100% overlaps with Critical Habitat for BFFE and BUOW, 25% with CH for GRSG, and so on. The last row is based on the combined/overlayed (non-additive) critical habitat of all Endangered and Threatened Species.

	Area of overlap (ha)				Percent overlap			
	BTPD	LBCU	MCLO	NLFR	BTPD	LBCU	MCLO	NLFR
BFFE	58	57	36	22	100.0%	0.0%	0.0%	0.0%
BUOW	58	340	339	254	100.0%	0.1%	0.1%	0.1%
EYBR	0	148	63	101	0.0%	0.0%	0.0%	0.0%
GRSG	15	66,118	47,612	47,478	25.4%	13.7%	12.1%	10.6%
LOSH	0	6,966	254	9,561	0.0%	1.4%	0.1%	2.1%
MOME	0	266	31	257	0.0%	0.1%	0.0%	0.1%
MOPL	58	140	108	52	100.0%	0.0%	0.0%	0.0%
SPPI	20	327,331	235,600	171,134	33.9%	67.6%	59.7%	38.3%
SWFO	57	281,655	286,707	162,292	98.4%	58.2%	72.6%	36.3%
All EN, EX & TH species	58	421,049	346,420	254,653	100.0%	87.0%	87.8%	57.0%

*For definitions of species codes, see Table 5 and Table 8

The overlap of total Important Habitat with total Critical Habitat is 507,451 ha (1,253,404 ac). This is 68% of the total combined (non-additive) Important Habitat (Table 8). In other words, of the area with Important Habitat for at least one Species of Special Concern, 68% overlaps with Critical Habitat of some Extirpated, Endangered or Threatened species. Thus, this Important Habitat area will probably benefit from protection or management extended to Critical Habitat. The remaining 32% of Important Habitat could require additional attention in management plans.

2. Evaluation of Socio-Economic Costs and Benefits

2.1 Introduction

The *Species At Risk Act* requires that an Action Plan include an evaluation of the socio-economic costs of the Action Plan and the benefits to be derived from its implementation (SARA 49(1)(e), 2003). This evaluation addresses only the incremental socio-economic costs of implementing the SoD Action Plan from a national perspective, as well as the social and environmental benefits that would occur if the Action Plan were implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address cumulative costs of species recovery in general, nor does it attempt a cost-benefit analysis. Its intent is to inform the public and to guide decision-making on implementation of the SoD Action Plan by partners.

The protection and recovery of species at risk can result in both benefits and costs. The *Act* recognizes that "*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*" (SARA 2003). Self-sustaining and healthy ecosystems with their various elements in place, including species at risk, contribute positively to the livelihoods and the quality of life of all Canadians. A review of the literature confirms that Canadians value the preservation and conservation of species in and of themselves. Actions taken to preserve a species, such as habitat protection and restoration, are also valued. In addition, the more an action contributes to the recovery of a species, the higher the value placed on such actions (Loomis and White 1996, Fisheries & Oceans 2008). Furthermore, the conservation of species at risk is an important component of the Government of Canada's commitment to conserving biological diversity under the *International Convention on Biological Diversity*. The Government of Canada and the provinces have also made a commitment to protect and recover species at risk through a federal-provincial agreement, the Accord for the Protection of Species at Risk. The specific costs and benefits associated with the SoD Action Plan are described below.

2.2 Policy Baseline

Several historical and current laws and associated regulations, policies and governmental actions are relevant to the status and recovery of species at risk in the SoD area. Historically, the creation of the Prairie Farm Rehabilitation Administration (PFRA) in the 1930s in an attempt to conserve soil and recover degraded farmland, was an important development of significant relevance to the species at risk in this Action Plan. Several large, relatively intact tracts of native grassland in the SoD area came under the administration of the PFRA, which managed the land as federal community pastures for livestock production. Grassland-dependent wildlife, including the species in this Action Plan, have been an unintended beneficiary of the maintenance of these large tracts of prairie.

A recent decision with implications for the conservation of species at risk in the SoD area is the Government of Canada's plan to transfer management of its community pastures back to provincial governments, starting in the fall of 2013. One community pasture in the SoD area, Lone Tree, was transferred to the provincial government after the 2013 grazing season. The remaining federal pastures within SoD area are scheduled to be transferred in 2017, the final year, with the exception of Masefield, which is scheduled for transfer in 2016. The Government of Saskatchewan has indicated that it will lease or sell these pastures, subject to "no-break, no-drain" easements, as soon as possible after the transfers occur (http://www.agriculture.gov.sk.ca/community-pasture-transition, accessed Feb. 26, 2014). The Government of Saskatchewan has developed a policy related to the transfer of these lands (http://www.agriculture.gov.sk.ca/Default.aspx?DN=8c76f347-9a75-4880-b636-5b96f87ac2ab: accessed Jan 18, 2014). The policy states that current and conditional federal pasture patrons that form a legal entity in order to operate their community pasture will automatically be provided with an allocation in their pasture, providing they meet the *Pasture Association Grazing Policy*. The consequences of this impending management transfer for species at risk remain uncertain.

Another decision important to the conservation of species at risk was the establishment, in 1988, of Grasslands National Park, currently a 765 km^2 federal protected area located within the Milk River Basin in Saskatchewan. The Parks Canada Agency has numerous research, conservation and educational activities within the park's boundaries and to a lesser extent on surrounding land outside the park that support species at risk. Details will be available in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep.). The Park has recently expanded into adjacent native grasslands that are used for grazing, and that are of high value to several species at risk.

In addition, there are several acts and associated regulations and policies that are relevant to the conservation of species at risk and their habitat in the SoD area. These instruments, summarized in Table 10, are best viewed in the context of the sectors and types of land ownership to which they apply. For example, certain instruments govern agricultural practices and apply principally to agricultural Crown lands, while others principally regulate industrial development. Typically, these instruments may prevent the cultivation of native pasture or establish cattle stocking guidelines on Crown land or may establish codes of practice or set rules related to industrial development that vary according to land tenure. The brief description of the various land tenure categories in the SoD area that follows is intended to provide background information to better

interpret the relevance of these instruments. The purpose is to be able to clarify the costs and benefits of implementing the SoD Action Plan over and above those already resulting from existing policies and programs.

Table 10 Provincial, federal and other instruments relevant to the conservation of species at risk and their habitat in the South of the Divide area, according to land tenure and the main sectors in the area.

Land Tenure	Tenure Category	Sector		
		Agriculture (cultivation, crop and grazing management)	**Energy and Mining** (energy resource development, mining, aggregate resource extraction etc.)	**Transportation** (road network expansion and widening)
Federal Land	**Federal Protected Areas**	*Canada Wildlife Act*; *Species at Risk Act*; *Migratory Bird Convention Act*	*Canada Wildlife Act*; *Species at Risk Act*; *Migratory Bird Convention Act*	*Canada Wildlife Act*; *Species at Risk Act*; *Migratory Bird Convention Act*
	Other federal land	Pasture Management Plans; *Species at Risk Act*; *Migratory Bird Convention Act*	*Canadian Environmental Assessment Act*, Pasture Management Plans; *Species at Risk Act*; *Migratory Bird Convention Act*	*Canadian Environmental Assessment Act*, Pasture Management Plans; *Species at Risk Act*; *Migratory Bird Convention Act*
Provincial Land	**Provincial Protected Areas**	*Migratory Bird Convention Act*; The *Parks Act* and Regulations; *The Wildlife Act* and *Wildlife Management Zone and Special Areas Boundaries Regulations*; *The Natural Resources Act*; *The Provincial Lands Act*	*Migratory Bird Convention Act*; The *Parks Act* and Regulations; *The Wildlife Act* and *Wildlife Management Zone and Special Areas Boundaries Regulations*; *The Natural Resources Act*; *The Provincial Lands Act*	*Migratory Bird Convention Act*; The *Parks Act* and Regulations; *The Wildlife Act* and *Wildlife Management Zone and Special Areas Boundaries Regulations*; *The Natural Resources Act*; *The Provincial Lands Act*
	Provincial Community Pastures	*Migratory Bird Convention Act*; *The Provincial Lands Act* and Regulations; *The Wildlife Act*; Pasture Plan habitat protection provisions	*Migratory Bird Convention Act*; *The Provincial Lands Act* and Regulations; *The Wildlife Act* and *The Environmental Assessment Act*	*Migratory Bird Convention Act*; *The Wildlife Act* ; *The Environmental Assessment Act*
	Provincial Grazing and Cultivation Leases	*Migratory Bird Convention Act*; *The Provincial Lands Act* and Regulations; *The Wildlife Act* ;The Federal-Provincial Agreement for the Establishment of GNP (1988); provincial stocking rate policy; habitat protection lease clauses.	*Migratory Bird Convention Act*; *The Provincial Lands Act* and Regulations; The Wildlife Act; *The Environmental Assessment Act*; The Federal-Provincial Agreement for the Establishment of GNP (1988)	*Migratory Bird Convention Act*; The Wildlife Act; *The Environmental Assessment Act*; The Federal-Provincial Agreement for the Establishment of GNP (1988)

	Wildlife Habitat Protection Act (lands)*	*Migratory Bird Convention Act*; *The Wildlife Act* ; *The Wildlife Habitat Protection Act*	*Migratory Bird Convention Act*; *The Wildlife Act* ; *The Wildlife Habitat Protection Act*; *The Environmental Assessment Act*	*Migratory Bird Convention Act*; *The Wildlife Act* ; *The Wildlife Habitat Protection Act*; *The Environmental Assessment Act*
Private Land	**Private conservation lands**	*Migratory Bird Convention Act*; *The Wildlife Act*; *The Conservation Easements Act*	*Migratory Bird Convention Act*; *The Wildlife Act* ; *The Surface Rights Acquisition and Compensation Act*; *The Environmental Assessment Act*	*Migratory Bird Convention Act*; *The Wildlife Act* ; *The Surface Rights Acquisition and Compensation Act*; *The Environmental Assessment Act*
	Private lands	*Migratory Bird Convention Act*; The Wildlife Act	*Migratory Bird Convention Act*; *The Wildlife Act*; *The Environmental Assessment Act*	*Migratory Bird Convention Act*; *The Wildlife Act* ; *The Environmental Assessment Act*

*Note that *The Wildlife Habitat Protection Act* applies to certain lands within Provincial Community Pastures and Provincial Grazing and Cultivation Leases.

Provincially, there are two main categories of land in the SoD area: provincial protected areas such as provincial parks, managed by the Ministry of Parks, Culture and Sport; and provincial Crown land managed by the Ministry of Agriculture. The SoD area includes part of one provincial park, Cypress Hills Interprovincial Provincial Park, located in the northwest corner of the area. Agricultural Crown land consists of two categories: provincial grazing and cultivation leases; and provincial Community Pastures. Agricultural Crown land exists for the purpose of promoting sustainable and integrated use while providing opportunities for diversification and economic growth. Most provincial Crown land is managed through leases with individuals who use the land for agriculture. While *The Provincial Lands Act* and related land use policies can serve to protect habitat for species at risk, through such tools as stocking rate policies, it is worth mentioning that the *Agricultural Crown land Sales to Lessee Policy* allows for the sale of certain agricultural Crown lands to private interests. These sales may or may not have conditions that preclude conversion of the land to other uses. Three provincial Community Pastures (Arena, Dixon and Mankota) are included in the provincial Crown land holdings. Provincial Community Pastures offer supplemental grazing to Saskatchewan livestock producers and promote environmental and agricultural sustainability of marginal Crown land. Some agricultural Crown land has been further protected under *The Wildlife Habitat Protection Act* (WHPA). The WHPA was created to conserve wildlife habitat in its natural state while enabling traditional compatible uses such as cattle grazing and haying.

The Saskatchewan Ministry of Environment is currently moving towards a Results-Based Regulations Model which involves several major initiatives, including new and amended legislation, compiling regulations into a streamlined code, and improving how compliance and enforcement are conducted. This new way of protecting the regulated environment will define the desired outcome by law, and will empower the operator to determine how that standard will be achieved or surpassed. Results-based stewardship is based on the concepts contained in this

model. By inference, results-based stewardship is an outcome-based approach that specifies the environmental protection and performance standards needed to attain effective protection of critical habitat, and leaves it up to the land manager or user to determine how to achieve those standards. In general, results-based stewardship is outcome-based and non-prescriptive, and specifies clear environmental targets, protection commitments and monitoring expectations through long-term agreements.

The identification of critical habitat through this Action Plan will enable informed planning and decision-making, by allowing industries that are planning a development to know in the early stages of the project the locations and characteristics of critical habitat that need to be maintained. This practice may reduce timing constraints and other limitations that are currently identified in the provincial permitting process.

Federally, in addition to the agricultural community pastures and national park expansion described above, there are portions in one National Wildlife Area (NWA) which would be classified as a federal protected area under SARA. Species at risk in the NWAs receive protection under SARA and under the *Canada Wildlife Act*. There are also reserve lands belonging to three First Nations.

Private land has the fewest types of protective instruments for species at risk. Conservation easements and other types of voluntary conservation agreements are especially important on such lands. In the SoD area, conservation agreements have been registered on approximately 10,000 ha (24,700 ac) of land.

In addition, certain legally-binding and non-binding instruments protect individuals of species at risk as well as their residences. Federally, SARA (2003) and the *Migratory Bird Convention Act* (1994) are two such instruments. Saskatchewan's *Wildlife Act* also protects individuals and residences of many wildlife species in the province and provides enhanced protection for the four species in the SoD area listed as 'at-risk' under provincial legislation. Details are available in the acts themselves. Saskatchewan also establishes activity restriction guidelines to guide industrial activity on provincial and private land in the vicinity of residences of species at risk, as well as leks, dispersal and migration areas, and staging areas (MOE 2013).

In December of 2013, the Government of Canada published an emergency order to protect Greater Sage-Grouse habitat on provincial and federal Crown land. The protection order applies to 245 km^2 of Greater Sage-Grouse critical habitat in the SoD area and prohibits certain human activities that are detrimental to Sage-Grouse. The order came into force on February 18, 2014.

The following is a summary of the linkages between the policy baseline, elements of which have been described above, and the seven broad strategies recommended in this Action Plan (Table 4).

The research activities that fall under the first broad strategy 'Research as part of an Adaptive Management Framework' have been and continue to be carried out on an *ad-hoc* basis depending on factors such as the identification of important knowledge gaps, funding availability and researcher initiative. Broadly-speaking, research has addressed such topics as range health and

range management, grassland ecology, species at risk ecology, habitat enhancement and restoration, and sociological research focused on species at risk conservation.

Under the second Broad Strategy 'Population Management and Species Protection', some aspects of population management and species protection are being addressed through various provincial and federal acts as well as various policies and guidelines already in existence. The provincial *Wildlife Act* and the federal *Migratory Birds Convention Act* and the *Species at Risk Act* include measures to protect individuals and populations of species at risk on federal and provincial Crown land as well as on private land. Federal and provincial *Environmental Assessment Acts* provide means of protecting species at risk from impacts related to certain types of human activities that are regulated under those acts. In addition, population management and species protection is addressed, in part, through certain regulations, policies and programs including provincial *Activity Restriction Guidelines*, provincial Crown land *Lease Agreements*, federal and provincial *Permitting Guidelines*, provincial *Survey Protocols*, the federal *Greater Sage-Grouse Emergency Protection Order*, and Agriculture and Agri-Foods Canada's *Decision Support Tool* for managing species at risk on federal community pastures as well as its *Environmental Management Guidelines* for community pastures. Finally, stewardship activities, promoted mainly by non-government organizations and implemented by willing producers and other land managers, contribute to population management and species protection.

Some aspects of the activities under the 'Habitat Assessment, Management and Conservation' broad strategy are addressed by Acts related to habitat management and conservation including the provincial *Wildlife Habitat Protection Act*, *The Provincial Lands Act*, *The Natural Resources Act*, *The Conservation Easements Act*, *The Weeds Act* and the federal Canada *Wildlife Act*. Important regulations, policies and programs that address aspects of habitat management and conservation include the provincial *Agricultural Crown land Management Policy*, *Crown land Agricultural Lease Agreements*, *The Saskatchewan Pastures Program*, the program for the restoration of agricultural Crown rangelands, the oil and gas conservation regulations (2012), provincial and municipal programs dealing with invasive species, Agriculture and Agri-Foods Canada's *Environmental Management Guidelines* and the federal *Greater Sage-Grouse Emergency Protection Order*. Finally, stewardship activities promoted and supported by non-government organizations and governments, and implemented by willing producers and other land managers, contribute to habitat management and conservation.

The fourth broad strategy 'Regulation and Policy', focuses on aligning regulations and policies that affect land use in order to reduce disturbance to species at risk and degradation of their habitat. Multi-stakeholder committees have been created to examine options for better aligning agricultural Crown land management policies and resource development policies with the needs of species at risk and the habitat on which they depend. The work of these committees supports ongoing efforts to reduce impacts from industrial and other developments on species at risk through such initiatives as activity restriction guidelines, permitting processes and the provincial results-based regulations model described above.

Some activities under the 'Communication, Collaboration and Engagement'broad strategy have been undertaken primarily by non-government organizations, to build awareness of the value of native grasslands and to foster conservation of species at risk. These activities have been or are

being delivered through a wide diversity of targeted communication and engagement programs and projects that are carried out by some non-government organizations and industry.

The sixth broad strategy ‘Conservation Planning’ is intended to address international conservation planning efforts, implementation of this Action Plan and land use planning. Some international conservation planning efforts are underway, including the Northern Sage Steppe Initiative and the Western Association of Fish and Wildlife Agencies. Recently, the South of the Divide Conservation Action Program Inc.(SODCAP) was created to plan and carry out the implementation of some aspects of this Action Plan. Finally, some land use planning efforts that consider the needs of species at risk are underway. Notably, the transition of the management of the community pastures from the federal to the provincial government is being done according to principles and practices that will maintain native grassland in good condition. As a result, species at risk should benefit.

Lastly, activities under the ‘Monitoring and Assessment’ broad strategy, are required in order to track the recovery of species. Several monitoring programs, including provincial, federal and citizen-based volunteer programs already exist for species in the SoD region. Enhancements to some of those programs may be beneficial in assessing populations.

2.3 Socio-economic Profile

The SoD area is sparsely populated, with about 3,000 to 4,000 residents. The 2011 census (http://www.stats.gov.sk.ca/stats/pop/Censuspopulation2011.pdf) lists only one town (Eastend, popn. 527), and five villages: Frontier (popn. 351), Climax (popn. 182), Val Marie (popn. 98), Consul (popn. 84), and Bracken (popn. 30), plus the Nekaneet Cree Nation (popn. 118).

2.3.1 Agriculture

The main economic activity in the SoD area is agriculture[5]. Between 2006 and 2011, about 90% of the SoD area was used for some form of agricultural production. There were about 750 farm units, with an average size of about 1,400 ha (3458 acres). Agricultural land was about 27% annual cropland, 10% summer fallow, 10% tame hayland and seeded pasture, and 50% native pasture. The pasture and hayland supported about 130,000 cattle, plus smaller numbers of sheep and horses. Gross farm receipts totaled about $160 million in 2011. Farming supported an estimated 1,000 operators and 650 paid employees. Employees' wages from farming totaled about $6.5 million per year.

Water management is an essential aspect of farming in the SoD area. Small reservoirs are operated along the Frenchman River and Battle Creek to provide a secure source of water for farm operations. Responsibility for managing these reservoirs is jointly shared by the Saskatchewan Water Security Agency and Agriculture and Agri-Food Canada, in cooperation with local irrigation groups.

A major goal of this Action Plan will be to ensure that native grasslands important to species at risk are maintained or, in some cases, improved. It is anticipated that this goal will be achieved largely through existing policies and programs on Crown lands. In addition, stewardship agreements or easements will be considered, where necessary, on Crown land and private land. Through these approaches, the impact on the agricultural sector will be negligible or perhaps, beneficial.

2.3.2 Petroleum and Other Mineral Resources

Oil and gas production is another important economic activity. Natural gas wells and estimated remaining gas reserves are concentrated in the western third of the SoD area (Entem 2012). However, the most important gas reserves in Saskatchewan are outside of the SoD area. Oil wells and oil reserves are concentrated in a fairly small central area, east of the town of Eastend (Entem 2012). The SoD area represents between 1% and 2.5% of oil and gas activity in Saskatchewan. As of 2013, there were 1,350 oil and gas wells capable of production, and 750 wells actively producing, in the SoD area. In 2012, 60 oil and gas wells were drilled in the

[5] Data were taken from the Agriculture Census of Canada, interpolated to the area of the Missouri drainage basin (http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1226522391901&lang=eng). The SoD area is 53% of the basin area in Canada, so was assumed to account for about 53% of the various agricultural statistics. Alternatively, data were taken from the Census of Agriculture, 2011 (http://www.statscan.gc.ca/ca-ra2011/index-eng.htm (accessed Nov 25, 2012)) at the level of the rural municipality. Data were adjusted depending on the percentage of land in each rural municipality that is within the SoD area.

SoD area. In 2012, oil production in the SoD area totaled 500,000 cubic metres, and gas production totaled 60 million cubic metres (D. Hanly,pers. comm.).

The petroleum industry is a significant contributor to the Saskatchewan economy. The net present value of existing and future petroleum resources in the SoD area has been estimated to range from $500 million to $600 million (Entem 2012). The acquisition of existing rights to explore and develop oil and natural gas resources in the SoD area has been valued at approximately $115 million of revenue flowing to the Province of Saskatchewan. In addition, some mineral rights in the SoD area are owned by private interests. Their value is unknown but may be assumed to be significant (R. Reavley, pers. comm.). In addition, royalties and freehold production tax revenue paid to the Province of Saskatchewan based on petroleum operations in the SoD area amounted to $20 million in 2012. Investment expenditures totaled $120 million in 2012, while the total value of oil and gas production was $225 million. This activity provided 300 person-years of employment in the SoD area (D. Hanly, pers. comm.).

Petroleum operations occur on a relatively small amount of the critical habitat in the SoD area. Protection of critical habitat in the SoD area will probably limit significant expansion of the industry's footprint into critical habitat areas. Specific protective measures have not been developed to date; therefore the impact of implementing this Action Plan on the petroleum industry remains unknown.

Although the federal government in the United States has denied the application to construct the Keystone XL pipeline, the proponent remains committed to building it and has challenged the US decision in court. Should construction eventually be approved, the pipeline would pass through the SoD area. The planned Keystone-XL pipeline would carry oil from Canada to the United States and is slated to cross portions of proposed critical habitat in the SoD area. The economic costs and benefits of this pipeline are considered to be significant on a continental scale.

Aside from potential oil and gas resources not yet formally estimated within public reports of identified geological resources, there are also other mineral resources whose values have not yet been formally identified. For example there are near surface deposits of industrial minerals such as clay and kaolin, near to surface deposits of coal, and subsurface potential for minerals contained within brines such as bromines.

The absence of present activity within the broad SoD area, and the absence of formal estimates of potential resources in the area, does not mean that there is no potential for future mineral resource activity; therefore the impact of implementing this Action Plan on mineral and other resource extraction industries remains unknown.

2.3.3 Provincial Government

The regulatory and policy interests of the Government of Saskatchewan in the SoD area, as they relate to species at risk, have been described above (see *2.2 Policy Baseline*), and will not be described further here.

In addition to its roles in establishing policies and regulating land use that can affect species at risk, the provincial government is an important stakeholder in the SoD area through its management and ownership of agricultural Crown lands, provincial community pastures and Cypress Hills Interprovincial Park, its administration of lands designated under *The Wildlife Habitat Protection Act*, its responsibilities under *The Wildlife Act*, its ownership of subsurface mineral rights, and its commitment to the creation and implementation of this Action Plan. The provincial government incurs significant costs in carrying out these activities and, in some cases, receives revenues through leases, royalties and other means.

In the SoD region (excluding Grasslands National Park), 50% of the land is provincial Crown land (including provincial community pastures) and 14% of the land in the SoD region is provincial Crown land that has been further designated as lands under *The Wildlife Habitat Protection Act*. Approximately 90% of the provincial agricultural Crown land is classified as native grassland. The Saskatchewan Government also owns and operates Cypress Hills Interprovincial Park, located in the north-western portion of the SoD area (see 2.3.7 Tourism and Recreation, below). In addition, the Saskatchewan Government controls the majority of mineral rights, which are sources of substantial revenue to the government (see 2.3.2 Petroleum, above).

Implementation of this Action Plan will further the need for the provincial government to continue to work collaboratively with its partners in developing and implementing its Results-Based Regulations Model, including results-based stewardship, to protect species at risk and their habitats.

2.3.4 Federal Government

The regulatory and policy interests of the Government of Canada in the SoD area, as they relate to species at risk, have been described above in the *Policy Baseline* section and will not be described further here.

In addition to its roles in establishing policies and regulations that can affect species at risk, the federal government is an important stakeholder in the SoD area through its role in the management or ownership of federal community pastures, and portions of one small National Wildlife Area.As of 2013, there were 10 federal community pastures comprising approximately 15% of the land in the SoD area. More than 86% of this land is native grassland and approximately 34% of the critical habitat in the SoD region is located in federal community pastures. As mentioned above, the federal community pasture program will be phased out between 2013 and 2018 and management and ownership of these lands will be transferred during that period.

The impact of this Action Plan on the federal government will be related primarily to its obligations under the *Species at Risk Act*. Specifically, the federal government will monitor the implementation of the Action Plan and the progress towards meeting its objectives; and will assess and report on its implementation and its ecological and socio-economic impacts.

2.3.5 Rural Municipalities

Rural municipalities are important stakeholders in the SoD area as they control land development and zoning, make decisions about the provision of municipal services, and set local tax policies and rates to cover those services. The SoD area covers portions of 15 rural municipalities, with four wholly contained in the SoD area. It will be important to provide information on species at risk needs to rural municipalities, to enable them to incorporate conservation considerations into their plans.

2.3.6 First Nations and Métis

Seven First Nations and Métis groups have traditional and/or present-day interests in the SoD area. First Nation lands occupy about 1% of the area. There is one First Nation community located within the SoD area while three other First Nations own small holdings, which are used as grazing lands by lessees. Some critical habitat is located on lands owned or managed by each of the four First Nations. Socio-economic consequences of protecting that habitat have yet to be determined.

2.3.7 Tourism and Recreation

Tourism is another economic activity, focused on Cypress Hills Interprovincial Park and Grasslands National Park, as well as point features such as the T. Rex Discovery Centre at Eastend. Cypress Hills is considered an “interprovincial” park because the Alberta and Saskatchewan parks adjoin each other. The Saskatchewan portion which is included in the SoD area occupies 18,400 ha (45,448 ac) of montane forest and fescue grassland at the highest elevations of the Cypress Hills. It provides cottage subdivisions, campgrounds, a lodge, a riding stable, and a variety of other visitor attractions. Average visitation over the period 2004-2009 was 227,683 visits, and the trend in visitation appears to be upward (MTPCS 2013).

Socio-economic aspects of tourism in Grasslands National Park will be considered in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep.).

The SoD Action Plan may be beneficial to tourism and recreation if it helps to enhance the area’s reputation for its extensive wild spaces.

2.3.8 Conservation

The Nature Conservancy of Canada operates a 5,316 hectare conservation area, known as *Old Man on his Back Prairie and Heritage Conservation Area*, in the SoD area. This conservation area is maintained as native grassland and benefits several grassland-dependent species, including several species at risk included in this Action Plan.

Conservation easements exist on approximately 10,000 ha (24,700 ac) of land. The value of those easements is not known but it is reasonable to assume a value in the range of $2.5 - $3.5 million based on 25% of fair market value of agricultural land.

The SoD area is attracting increasing attention from conservation organizations with interests in species at risk and other interests in this region. They may have an important role to play in implementing parts of this Action Plan. This Action Plan may enhance opportunities for conservation organizations to become more involved in conservation programming in the SoD area.

There have already been some directed investments in species at risk conservation in the SoD area. From 2008 to 2013, inclusive, approximately $2,500,000 was spent on gathering biological information pertinent to the development of this Action Plan and associated recovery strategies, as well as species at risk studies. In 2013-14, selected actions, valued at approximately $250,000, were undertaken to begin implementing the SoD Action Plan. In 2014-15, governments committed to investing $240,000 on various conservation actions for species at risk in the SoD region.

2.3.9 Other sectors

Other sectors that may be relevant to implementing this Action Plan include the transportation sector and the electrical power transmission sector.

2.4 Socio-economic Costs of Implementing the Action Plan

The costs associated with the SoD Action Plan can be divided into two categories. The first category includes the direct costs of conservation actions, such as monitoring and research costs, habitat assessment, conservation and protection costs, population conservation costs, and communication and engagement costs. The second group includes opportunity costs (i.e. foregone benefits) that may be associated with the conservation actions implemented in the region.

Estimation of the direct incremental costs of implementing this Action Plan was based on the measures proposed to conserve and protect species and their habitat, as described in the Recovery Measures Table (Section 1.2). The cost of implementing incremental recovery measures were determined based on expert opinion and advice provided by several individuals, representing a broad range of expertise, who have been involved in developing this Action Plan. The direct costs of implementing the recovery measures are considered medium (approximately $7 - $23 million) for the short-term (first 5 years). Costs were not determined over the long-term (25 years) because experts were unable to determine the likelihood that recovery measures, including habitat protection measures, would require implementation over a long timeframe. Nevertheless it is reasonable to consider that the direct costs of implementing the recovery measures over the long-term (25 years) would be low to medium (approximately $10 - $50 million).

Predicting future investments in and costs of conservation actions to protect species at risk is fraught with uncertainty. Thus it must be acknowledged that the cost estimates are speculative. While it is probable that some critical habitat will require financial incentives for protection, it is also probable that some critical habitat is already adequately protected (e.g., through existing regulations or lifestyle choices) or will be adequately protected through other mechanisms such as those that develop, recognize and promote the value of sustainable rangeland management. However, the relative proportion of each has yet to be quantified. Until that occurs, an accurate assessment of the costs involved will remain elusive. Furthermore, a monetary value for species at risk conservation has yet to be determined. While there are numerous tools (e.g., market-based instruments) available for establishing the value of conserving species, an assessment of such values in the SoD area has not been done. Until such an assessment is carried out, the true costs of conserving species at risk and their habitat in the region will remain unknown. It is expected that the SoD Action Plan implementation committee (see Table 4, action 6.2.1) will determine reasonable costs and implement cost-effective means of conserving species at risk and their habitat in the region. Once delivery experience has been gained in the SoD area, this will provide some price discovery knowledge and provide a better basis for extrapolating costs across the region.

A second type of cost that needs to be considered is the opportunity cost of foregone economic activity, should a reduction in such activity be deemed necessary to recover the species. These costs include, for example: reduction in profits resulting from the need to alter grazing management practices in some specific situations; foregone financial benefits from converting native grassland to cropland; or foregone profits, taxes and royalties that would result from increasing petroleum development in the region. At present it is not possible to quantify opportunity costs because it remains unclear how or to what extent this Action Plan will influence the above-noted activities. However, the following brief discussion is based on the assumption that

the SoD Action Plan will be fully implemented and that further conversion of native grassland to other uses in critical habitat, without appropriate mitigation, will not be sustainable for certain species.

Approximately 107,400 ha (265,278 ac) of the critical habitat in the SoD area is on land with reasonable potential to support crops (Class 2 or 3 agricultural capability). Of this amount, approximately 49,500 ha (122,265 ac) is on private land or on agricultural Crown lease land that is not protected under the WHPA. While the lease land cannot be converted to cropland while it remains Crown land, it could be sold to private owners and then converted. Opportunity costs of cropland and tame hayland conversion have been estimated to be $71/ac ($175/ha) and $50/ac ($123/ha), respectively. Not converting such land to crop or hayland in order to accommodate the needs of species at risk would thus have an opportunity cost considered to be low over the long term ($0-$25 million, Government of Canada 2012). The precise opportunity cost cannot be estimated because an unknown number of landowners choose to retain their native grassland as pasture, rather than convert it to cropland. Retaining native grassland for species at risk conservation would not represent an incremental opportunity cost to such landowners. Nevertheless, the ongoing conversion of native grassland to cropland (e.g., Riley et al. 2007) in the Canadian prairies signifies that a real, though unmeasurable opportunity cost would result if habitat protection measures denied landowners an opportunity to convert their native grassland to cropland.

With regards to crude oil and natural gas production, assuming the potential economic loss through limiting new development in critical habitat is based only on currently surveyed areas, the estimated costs and forgone profits, royalties and taxes would be in the medium range, amounting to $26 million – $145 million (Adamowicz et al. 2012). However, this estimate does not take into consideration the historical pattern of crude oil and natural gas development within geographic regions where some development has already occurred. New technologies and a persistent trend of rising prices now support the costlier development of historically perceived marginal resources which were not previously valued. For example, Saskatchewan Bakken shales presently provide for approximately 15% of Saskatchewan crude oil production compared to essentially nil production one decade ago. This historical trend suggests that more marginal resources are likely to be developed as prices rise and as technology is developed. In such a case, protecting critical habitat in native grasslands from additional petroleum development beyond the existing footprint would result in significantly greater opportunity costs than estimated here (M. Balfour, pers. comm.).

The absence of formal potential geological resource information for the SoD area, beyond that indicated in presently identified oil and gas pools, and not including the potential value of “other minerals and resources” inhibits the accuracy of the socio-economic cost estimate for implementing this Action Plan (M. Balfour, pers. comm.).

2.5 Benefits of the Action Plan

This SoD Action Plan, together with its companion action plan, *The Multi-species Action Plan for Grasslands National Park* (Parks Canada Agency in prep.), are expected to contribute to varying degrees to the management and recovery of those species for which the Canadian ranges are largely limited to the SoD area, including Greater Sage-Grouse, Swift Fox, Eastern Yellow-bellied Racer, Mormon Metalmark, Mountain Plover, Black-footed Ferret and Black-tailed Prairie Dog. They will be essential to the continued survival and recovery of the Greater Sage-Grouse and Black-footed Ferret, two species for which continued existence in Canada is highly precarious. Survival and recovery of other localized species, including Swift Fox, Eastern Yellow-Bellied Racer, Mormon Metalmark and Mountain Plover, for which populations are presently stable or increasing, will depend to a somewhat lesser extent on the implementation of this plan. The SoD Action Plan will have less influence on the overall management and recovery of more widely-distributed species including Sprague's Pipit, Burrowing Owl, Prairie Loggerhead Shrike, McCown's Longspur, Long-billed Curlew and Northern Leopard Frog. Other species at risk that occur in the SoD area but were not covered in this Action Plan are likely to benefit to some extent from many of the conservation actions associated with the Plan. Those species include Greater Short-horned Lizard, Chestnut-collared Longspur, Ferruginous Hawk, Sage Thrasher, Common Nighthawk, Dwarf Woollyheads, and Monarch. Further information is available in Appendix B.

The conservation of native grassland, which is essential for conserving species at risk in this Action Plan, will provide other ecological goods and services, including forage for livestock, biodiversity, wildlife habitat, pollination and habitat for pollinators, carbon sequestration to slow the rate of climate change, recreation and water storage and filtration (Maczko et al. 2004, Havstad et al. 2007). Most of these goods and services, with the exception of forage production, are either public goods and services or passive-use values not bought and sold in traditional markets. Although difficult to quantify, the value of public goods and services and passive-use values derived from grassland conservation should not be ignored, because they may be significant (Simpson et al. 2011). For example, the benefit of public goods and services derived from Agriculture and Agri-Food Canada's Community Pasture Program was estimated to be larger than the private benefits that accrued to pasture patrons from grazing (Kulshreshtha et al. 2008). The types of public goods and services provided by the Community Pasture Program were similar to those that would be associated with grassland conservation in general, and were valued at $34 million (Kulshreshtha et al. 2008). Carbon sequestration ($20 million), soil conservation ($2 million), hunting ($4 million) and other recreation ($2.5 million) were significant benefits; while biodiversity was valued much lower ($0.2 million). The land base in this study was about 33% greater than the extent of native grassland in the SoD region. By simple extrapolation, this would translate to an approximate estimate of $25 million in public benefits related to the conservation of native grasslands in the SoD area. Not included in this estimate is the benefit associated with substantially reduced government financial support paid primarily to crop growers (Rancher's Stewardship Alliance 2013). Furthermore, native grasslands in the SoD area provide private benefits, estimated at approximately $80/ha/yr ($32/ac/yr) ((Ranchers Stewardship Alliance 2013), in the form of forage production for cattle. Extrapolated across the SoD region, this private benefit amounts to an estimated $60 million per year.

In order to assess the value of species at risk conservation (a public, passive use benefit) that could be derived from implementing the SoD Action Plan, a stated preference survey was carried out (Adamowicz et al. 2012). For the purposes of the survey, participants were asked to state their preferences for increasingly costly conservation options with increasingly beneficial outcomes in terms of species at risk conservation. The survey was administered to 327 respondents who were representative of the Saskatchewan population. People's preferences for the different conservation options were used to calculate people's willingness to pay for the conservation strategies (Table 11). The aggregated benefits in terms of willingness to pay were estimated as $0.5 - $1.2 billion dollars over a 30-year period. This translated into an additional tax rate of $77-$188 per Saskatchewan household per year.

Table 11 Benefits (in terms of willingness to pay) of three potential conservation strategies.

After Adamowicz et al. (2012)

Conservation Benefits	Individual Willingness to Pay ($/household/year)	Aggregate Benefits ($million over the next 30 years)
Small	$77 - $100	$515 - $669
Moderate	$116 - $165	$777 - $1,105
Large	$150 - $188	$1,004 - $1,259

2.6 The Distributional Impact

Understanding the relative impacts of conservation actions on the public and private sectors can provide a basis for choosing amongst policy instruments that are likely to be effective in achieving the desired results. A range of policy instruments such as education, awareness raising, technology transfer, research and development, regulation and subsidies are typically used to achieve environmental goals. A framework, called the public-private benefits framework, has been developed to help choose among the array of instruments available to achieve those goals (Pannell 2008). The framework could be useful in implementing this Action Plan by helping identify effective approaches for achieving the desired results. Understanding the distribution of impacts of particular aspects of the Plan on various sectors represents a first step towards being able to use the framework to recommend cost-effective approaches for conserving species at risk in the SoD area.

2.6.1 The Canadian public

Wildlife and biodiversity are public goods. Moreover, most of the other benefits that arise from grassland conservation are public goods or services. As such it is expected that the Canadian public will bear a significant portion of the direct costs through federal and provincial government programs that support species at risk conservation. The Canadian public will also benefit significantly from the implementation of this Action Plan. Notwithstanding this expectation, it will be important to use a consistent, objective approach, such as the Pannell (2008) approach described above, to determine the most effective ways of allocating public and private resources to this Action Plan.

2.6.2 Agriculture

Nearly all of the critical habitat in the SoD area occurs in native grasslands that are used primarily for grazing. In fact, light to moderate grazing is beneficial in maintaining healthy grassland ecosystems in the Mixed Grass Ecozone. Therefore, the cooperation and participation of ranchers will be necessary in order for this Action Plan to be successfully implemented.

Much of the native grassland used for grazing is on Crown land where standard practices for sustainable grazing and other farming activities have been established as a matter of policy. Sustainable grazing is also typically practiced on private land, although it is voluntary on such lands, because of the strong tradition of stewardship among ranchers in this region. In most situations, these practices are conducive to maintaining habitat conditions suitable for species at risk. In situations requiring the implementation of different grazing practices to maintain or create suitable habitat conditions, stewardship agreements may be pursued. It is anticipated that implementation of this Action Plan will have few if any negative impacts on the ranching community. Instead, ranchers in the SoD area could benefit from participating in conservation agreements, where needed, through which they could access funds to undertake land management actions that benefit species at risk. In addition, ranchers may benefit through the development of markets in which ‘green-labeled’ products are recognized and sold. More generally, ranchers will benefit from the knowledge that their operations are considered

beneficial for species at risk, as this makes continued access to Crown land for their operations more predictable.

Furthermore, agricultural programs targeted towards restoring marginal cropland to perennial crops or to native plants under existing provincial programs may benefit farmers who manage cropland while improving habitat for some species at risk.

2.6.3 Petroleum and Other Mineral Resources

Construction and operation of oil and gas wells are activities with potential negative effects on some of the focal species in this Action Plan. Impacts in the form of decreased revenues, job losses, and the requirement for increased investments in technological changes may arise if some future developments were curtailed or altered to better accommodate the needs of species at risk and their habitat. If such a situation was to arise, decisions would be required as to how to mitigate these impacts.

Conservation considerations have not traditionally been part of business planning and have tended to create a degree of uncertainty arising from the perceived risk regarding access to resources (e.g., land, petroleum resources, etc.). Such uncertainty could have an effect on the availability of investment capital which is mobile. The magnitude of this potential impact remains unclear. In the long term, however, implementation of the SoD Action Plan may increase predictability of investment decisions by the petroleum industry, because it will identify the areas where they need to be concerned about species at risk, and areas where there are no such concerns.

Overall, however, most of the oil and gas development within the identified oil and gas pools is located outside of critical habitat. Therefore, at a regional level, the impact of the-SoD Action Plan on the industry is not expected to be severe. Moreover, the SoD area represents only 1.0-2.5% of oil and gas activity in the Province of Saskatchewan. Therefore this Action Plan will likely have little impact on the industry at the provincial level. Nevertheless, as noted above, the inevitable demand for more petroleum and other mineral resources will increase pressure to search for and develop new resources. Those future developments could result in a greater impact on the petroleum and mining sectors than have been forecast here.

2.6.4 Provincial government

The Government of Saskatchewan will be impacted by the SoD Action Plan through (i) its roles in establishing policies and regulating land use that can affect species at risk, (ii) its management and ownership of agricultural Crown lands, provincial community pastures and Cypress Hills Interprovincial Park, (iii) its administration of lands designated under *The Wildlife Habitat Protection Act*, (iv) its responsibilities under *The Wildlife Act*, (v) its ownership of subsurface mineral rights, (vi) its commitment to the creation and implementation of this Action Plan, and (vii) in implementing its Results-Based Regulations Model, including results-based stewardship. Implementing the Results-Based Model may be a challenge in situations where the needs of species at risk are at odds with traditional land management approaches. The provincial

government incurs significant costs in carrying out these activities and, in some cases, receives revenues through leases, royalties and other means.

2.6.5 Federal government

The federal government will be impacted by the SoD Action Plan through (i) its role in establishing policies, regulations and funding opportunities that can affect species at risk, (ii) its commitment to implementing this Action Plan, (iii) its role in the management or ownership of federal community pastures and portions of one small National Wildlife Areaand (iv) possibly through its management of Grasslands National Park, which, although not part of the SoD Action Plan, shares many of the same species, types of habitat, conservation commitments and recovery actions as those described in this plan.

As mentioned above, the federal community pasture program will be phased out between 2013 and 2018 and management and ownership of these lands will be transferred during that period, thus reducing the role of the federal government in implementing this Action Plan on those lands.

2.6.6 Municipalities

It will be important to engage rural municipalities in order to successfully implement the SoD Action Plan. This will be done primarily through outreach to build awareness of species at risk. Rural municipalities may be challenged in creating and implementing plans that can address the complexities of rural growth and development, and species at risk conservation.

2.6.7 First Nations and Métis

A small amount of critical habitat is located on First Nations land, where grazing is the main land use. The SoD Action Plan will present an opportunity for First Nations to work with the government and other stakeholders to ensure use of grazing management practices that are conducive to the maintenance of suitable habitat conditions. Funding opportunities may be available to facilitate such opportunities.

Some First Nations in Saskatchewan have been purchasing grazing land as part of the Treaty Land Entitlement process. Their decision to purchase certain lands may be influenced by the identification of critical habitat on such lands.

2.6.8 Tourism and recreation

Southwestern Saskatchewan is noted for the aesthetic value of its natural landscapes. There is a small but emerging ecotourism industry. Local ecotourism businesses may benefit from the implementation of the SoD Action Plan, as the region gains a reputation for its extensive wild spaces.

2.6.9 Conservation groups

Implementation of the SoD Action Plan may create an opportunity for conservation groups to develop conservation programming in the SoD area and to access funding to enable them to do their work.

2.6.10 Other sectors

At present, it is not anticipated that the transportation and electrical power transmission sectors will be affected by implementation of the SoD Action Plan. That would change if either sector plans on new developments through critical habitat.

3. Measuring Progress

The performance indicators presented in the associated Recovery Strategies provide a way to define and measure progress toward achieving the population and distribution objectives (formerly referred to as recovery goals).

Reporting on *implementation* of the SoD Action Plan (under s. 55 of SARA (2003) will be done by assessing progress towards implementing the broad strategies.

Reporting on the ecological and socio-economic impacts of the SoD Action Plan (under s. 55 of SARA (2003) will be done by assessing the results of monitoring the recovery of the species and its long term viability, and by assessing the implementation of the Action Plan.

4. References

Abouguendia, Z. M. 1990. A practical guide to planning for management and improvement of Saskatchewan rangeland: Range plan development. Saskatchewan Research Council Report E-2520-1-E-90.

Adamowicz, V., P. Boxall, A. Entem, and S. Simpson. 2012. South of the Divide Action Plan: Economic cost and benefit assessment. Department of Resource Economics and Environmental Sociology, University of Alberta.

Aldridge, C.L. 1998(a). Status of Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Alberta. Wildlife Status Report No. 13. Alberta Environmental Protection, Wildlife Management Division, and Alberta Conservation Association, Edmonton, Alberta. 23 pp.

Aldridge, C.L. 1998(b). The status of Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada. Proceedings of the 5th Prairie Conservation and Endangered Species Workshop. Provincial Museum of Alberta, Edmonton, Alberta. Natural History Occasional Paper 24: 197–205.

Aldridge, C. L. 2000. Reproduction and habitat use by sage grouse (*Centrocercus urophasianus*) in a northern fringe population. M.Sc. thesis. University of Regina, Regina Saskatchewan. 121 pp.

Aldridge, C.L. 2005. Identifying habitats for persistence of greater Sage-Grouse (*Centrocercus urophasianus*) in Alberta, Canada. Ph.D. thesis. University of Alberta. Edmonton, Alberta. 250 pp.

Aldridge, C.L., and R. M. Brigham. 2003. Distribution, abundance, and status of the Greater Sage-Grouse, *Centrocercus urophasianus*, in Canada. Canadian Field-Naturalist 117(1): 25–34.

Aldridge, C.L. and M.S. Boyce. 2007. Linking occurrence and fitness to persistence: habitat-based approach for endangered Greater Sage grouse. Ecological Applications 17(2): 508-526.

Aldridge, C.L. and D.L. Gummer. 2010. Lessons learned in the application of habitat models to identify critical habitat for Greater Sage-Grouse (Abstract). International Congress for Conservation Biology, Edmonton, Alberta.

Aldridge, C.L., S.E. Nielsen, H.L. Beyer, M.S. Boyce, J.W. Connelly, S.T. Knick, and M.A. Schroeder. 2008. Range-wide patterns of greater sage-grouse persistence. Diversity and Distributions 14: 983–994.

Agnew, W., D.W. Uresk, and R.M. Hansen. 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. Journal of Range Management 39:135-139.

Babak, P., and F. He. 2009. A neutral model of edge effects. Theoretical Population Biology 75:76-83

Betts, M.G., Forbes, G.J. & Diamond, A.W. 2007. Thresholds in songbird occurrence in relation to landscape structure. Conservation Biology **21**: 1046–1058.

Blickley J.L., D. Blackwood, and G.L. Patricelli. 2012. Experimental evidence for the effects of chronic anthropogenic noise on abundance of Greater Sage-Grouse at leks. Conservation Biology 26:461-471.

Bonsal, B. 2008. Droughts in Canada: An overview. CMOS Bulletin SCMO. 36:79-86.

Bonsal, B., and M. Regier. 2006. The 2001 and 2002 Canadian drought: historical context and potential future occurrence. CCIAP A932 " Canadian agricultural adaptations to 21st century droughts: preparing for climate change". Environment Canada.

Braun, C.E. 1998. Sage-Grouse declines in western North America: What are the problems? Proceedings of the Western Association of State Fish and Wildlife Agencies 78: 139-156.

Braun, C.E., O.O. Oedekoven, and C.L. Aldridge. 2002. Oil and gas development in western North America: Effects on sagebrush steppe avifauna with particular emphasis on Sage-Grouse. Transactions of the North American Wildlife and Natural Resources Conference 67: 337–349.

Brook, B.W., D.W. Tonkyn, J.J. O'Grady, and R. Frankham. 2002. Contribution of inbreeding to extinction risk in threatened species. Conservation Ecology 6(1):16.

Bui, T.V.D., J.M. Marzluff, and B. Bedrosian. 2010. Common raven activity in relation to land use in western Wyoming: implications for Greater Sage-Grouse reproductive success. The Condor 112(1): 65–78.

Camaclang, A.E., A. Moehrenschlager, and P. Fargey. 2010. Swift fox use of gas structure sites at a small Community Pasture in southwest Saskatchewan. Centre for Conservation Research Report No. 3. Calgary, Alberta, Canada.

Canadian Sage-Grouse Recovery Team. 2001. Canadian Sage-Grouse recovery strategy. Alberta Sustainable Resource Development, Fish and Wildlife Division, Edmonton, Alberta. 55 pp.

Carbyn, L.N. 1998. Updated COSEWIC status report: Swift Fox (*Vulpes velox*). Committee on the Status of Endangered Wildlife in Canada. Ottawa. 62 pp.

Carpenter, J., C. Aldridge, and M. S. Boyce. 2010. Sage grouse habitat selection during winter in Alberta. Journal of Wildlife Management. 74(8): 1806–1814.

Census of Agriculture. 2011. http://www.statscan.gc.ca/ca-ra2011/index-eng.htm (accessed Nov. 25, 2012).

Childers, T.M., and S.J.Dinsmore. 2008. Density and abundance of Mountain Plovers in northeastern Montana. Wilson Journal of Ornithology 120:700-707.

Clark, L., J. Hall, R. McLean, M. Dunbar,K. Klenk, R. Bowen, and C.A. Smeraski. 2006. Susceptibility of Greater Sage-Grouse to experimental infection with West Nile Virus. Journal of Wildlife Diseases 42: 14–22.

Coates, P.S., and D.J. Delehanty. 2010. Nest predation of Greater Sage-Grouse in relation to microhabitat factors and predators. Journal of Wildlife Management 74(2): 240-248.

Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage Sage-Grouse populations and their habitats. Wildlife Society Bulletin 28(4): 967–985.

COSEWIC. 2002. COSEWIC assessment and update status report on the Long-billed Curlew *Numenius americanus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa31COSEWIC. 2009. COSEWIC assessment and status report on the Swift Fox *Vulpes velox* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 49 pp.

COSEWIC. 2009. COSEWIC assessment and status report on the Swift Fox *Vulpes velox* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 49 pp.

COSEWIC. 2011. COSEWIC assessment and status report on the Black-tailed Prairie Dog *Cynomys ludovicianus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 58 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

Cotterill, S.E. 1997. Population census of swift fox (*Vulpes velox*) in Canada: Winter 1996-1997. Prepared for the Swift Fox National Recovery Team. Alberta Environmental Protection, Natural Resources Service, Wildlife Management Division. 50 pp.

Dale, B.C. 1983. Habitat relationships of seven species of passerine birds at Last Mountain Lake, Saskatchewan. M.S. thesis, University of Regina, Regina, Saskatchewan.

Dale, B.C., T.S. Wiens, and L.E. Hamilton. 2009. Abundance of three grassland songbirds in an area of natural gas infill drilling in Alberta, Canada. Proceedings of the Fourth International Partners in Flight Conference: Tundra to Tropic 194-204.

Daszak, P., A.A. Cunningham, and A.D. Hyatt. (2000). Emerging infectious diseases of wildlife – threats to biodiversity and human health. Science 287:443–449.

Davis, S.K. 2005. Nest-site selection patterns and the influence of vegetation on nest survival of mixed-grass prairie passerines. Condor 107: 605–616.

Davis, S.K. and D.C. Duncan. 1999. Grassland songbird occurrence in native and crested wheatgrass pastures of southern Saskatchewan. Studies in Avian Biology 19: 211–218.

Davis, S. K., B. C. Dale, T. Harrison, and D. C. Duncan. 2014. Response of grassland songbirds to grazing system type and range condition. Proceedings of the North American Prairie Conference. 23:110-119.

Davis, S.K., D.C. Duncan, and M. Skeel. 1999. Distribution and habitat associations of three endemic grassland songbirds in southern Saskatchewan. Wilson Bulletin 111: 389–396.

Davis, S. K., R. J. Fisher, S. L. Skinner, T. L. Shaffer and R. M. Brigham. 2013. Songbird abundance in native and planted grassland varies with type and amount of grassland in the surrounding landscape. Journal of Wildlife Management 77: 908-919.

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldale, M.P. Nenneman, and B. R. Euliss. 1998. Effects of management practices on grassland birds: Mountain Plover. Northern Prairie Wildlife Research Center, Jamestown, North Dakota.

De Smith, M.J., M.F. Goodchild, and P. Longley. 2007. Geospatial analysis: a comprehensive guide to principles, techniques and software tools. Troubador Publishing Ltd., London.

DeWoody, Y.D., Z. Feng, and R. K. Swihart. 2005. Merging spatial and temporal structure metapopulation model. The American Naturalist 166:42-55.

Dinsmore, S.J., G.C. White, and F.L. Knopf. 2005. Mountain Plover population responses to Black-tailed Prairie Dogs in Montana. Journal of Wildlife Management 69:1546-1553.

Dreitz, V. J. 2009. Parental behaviour of a precocial species: implications for juvenile survival. Journal of Applied Ecology 46: 870–878.

Dreitz, V.J., M.B. Wunder, and F.L. Knopf. 2005. Movements and home ranges of Mountain Plovers raising broods in three Colorado landscapes. Wilson Bulletin 117:128-132.

Dube, L.A. 1993. Provincial Sage-Grouse population trend counts April–May 1991. Unpublished Report., Fish and Wildlife Division, Alberta Forestry, Lands and Wildlife, Lethbridge, Alberta. 21 pp.

Egoscue, H.J. 1979. Mammalian Species: *Vulpes velox*. Lawrence, Kansas, American Society of Mammalogists 122:1–5.

Entem, A. 2012. Cost-effective conservation planning for species at risk in Saskatchewan's Milk River watershed: The efficiency gains of a multi-species approach. MSc. Thesis. Department of Resource Economics and Environmental Sociology, University of Alberta, Edmonton, Alberta, Canada.

Environment Canada. 2006. Recovery Strategy for the Mountain Plover (*Charadrius montanus*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. iv + 16 pp.

Environment Canada. 2010. North American Breeding Bird Survey - Canadian Results and Analysis Website version 3.00. Environment Canada, Gatineau, Quebec, K1A 0H3

Environment Canada. 2012a. Recovery Strategy for the Burrowing Owl (*Athene cunicularia*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. viii + 34 pp.

Environment Canada. 2012b. Amended Recovery Strategy for the Sprague's Pipit (*Anthus spragueii*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi + 46 pp.

Environment Canada. 2013a. Management Plan for the Northern Leopard Frog (*Lithobates pipiens*), Western Boreal / Prairie Populations, in Canada. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. iii + 28 pp.

Environment Canada. 2013b. Management Plan for the Long-billed Curlew (*Numenius americanus*) in Canada. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. iii + 24 pp.

Environment Canada.2014a. Amended Recovery Strategy for the Greater Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi + 53 pp.

Environment Canada. 2014b. Recovery Strategy for the Loggerhead Shrike, *excubitorides* subspecies (*Lanius ludovicianus excubitorides*), in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. v+ 22 pp.

Environment Canada. 2014c. Management Plan for the McCown's Longspur (*Calcarius mcownii*) in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Parks Canada Agency, Ottawa.

Fahnestock, J.T., and J.K. Detling. 2002. Bison – prairie dog – plant interactions in a North American mixed-grass prairie. Oecologia 132:86-95.

Felske, B. E. 1971. The population dynamics and productivity of McCown's Longspur at Matador, Saskatchewan. Master's Thesis. Univ. Saskatchewan, Saskatoon.

Fisher, R.J. and E.M. Bayne. 2014. Burrowing Owl climate change adaptation plan for Alberta. Prepared for the Biodiversity Management and Climate Change Adaptation project. Alberta Biodiversity Monitoring Institute, Edmonton, AB, 58pp.

Fisher, R.J., and S.K. Davis. 2011. Post-fledging dispersal, habitat use, and survival of Sprague's pipits: are planted grasslands a good substitute for native? Biological Conservation 144:265-271.

Fisheries and Oceans Canada. 2008. Estimation of the economic benefits of marine mammal recovery in the St. Lawrence Estuary. Policy and Economics Regional Branch, Quebec.

Garrett, M.G., and W.L. Franklin. 1988. Behavioral ecology of dispersal in the black-tailed prairie dog. Journal of Mammology 69:236-250.

Gibbons, D., C. Morrissey, P. Mineau. In press. A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife. Environmental Science Pollution Research DOI 10.1007/s11356-014-3180-5

Gjetvaj, B., and Bentham, M. 2012. Potential impact of second-generation biofuel crop production on marginal lands in Saskatchewan. *Poster presentation* at the *State and Trends of Canadian Grasslands Worksho*p, June 26-27, 2012, Saskatoon, SK

Gordon, D. R. 1998. Effects of invasive, non-indigenous plant species on ecosystem processes: lessons from Florida. Ecological Applications 8: 975-989.

Government of Canada. 2012. *Species at Risk Act* Operational Procedures Completing the Action Plan Template (federal) (2.3). Government of Canada, Ottawa.

Gummer, D.L. and C.L. Aldridge. 2010. Putting lines on a map: an approach for classifying species occurrence models to identify critical habitat for endangered species (Abstract). International Congress for Conservation Biology, Edmonton, Alberta

Graul, W.D. 1975. Breeding biology of the Mountain Plover. Wilson Bulletin 87: 6-31.

Greenwood, R.J., A.B. Sargeant, D.H. Johnson, L.M. Cowardin, and T.L. Shaffer. 1995. Factors associated with duck nest success in the Prairie Pothole Region of Canada. Wildlife Monographs No. 128. 57 pp.

Hanski, I., and O. Ovaskainen. 2002. Extinction debt at extinction threshold. Conservation Biology 16:666–673.

Harris, W.C. 1998. Status of Sage-Grouse in Saskatchewan. Proceedings of the Western Sage and Sharp-tailed Grouse Workshop. Billings, Montana.

Harrison, R.L., and J. Whitaker Hoagland. 2003. A literature review of Swift Fox habitat and den-site selection. Pp. 79–92 in M.A. Sovada and L.N. Carbyn (eds.). The Swift Fox: Ecology and Conservation of Swift Foxes in a Changing World. Canadian Plains Research Centre, University of Regina, Regina, Saskatchewan

Havstad, K.M., D.P.C. Peters, R. Skaggs, J. Brown, B. Bestelmeyer, E. Fredrickson, J. Herrick, and J. Wright. 2007. Ecological services to and from rangelands of the United States. Ecological Economics 64:261-268.

Herkert, J.R., D.L. Reinking, D.W. Wiedenfeld, M. Winter, J.L. Zimmerman, W.E. Jensen, E.J. Finck, R.R. Koford, D.H. Wolfe, S.K. Sherrod, M.A. Jenkins, J. Faaborg, and S.K. Robinson. 2003. Effects of prairie fragmentation on the nest success of breeding birds in the Mid-Continent United States. Conservation Biology 17(2): 587–594.

Herrero, S., C. Schroeder, and M. Scott-Brown. 1986. Are Canadian foxes swift enough? Biological Conservation 36:159-167.

Heisler, L.M., C.M. Somers and R.G. Poulin. 2014. Rodent populations on the northern Great Plains respond to weather variation at a landscape scale. Journal of Mammology, 95(1):82-90.

Heisler, L.M., C.M. Somers, T.I. Wellicome, and RG. Poulin (2013) Landscape-scale features affecting small mammal assemblages on the northern Great Plains of North America. Journal of Mammalogy: October 2013, Vol. 94, No. 5, pp. 1059-1067.

Hines, T.D., and R.M. Case. 1991. Diet, home range, movements, and activity periods of swift fox in Nebraska. Prairie Naturalist 23: 131-138.

Holloran, M.J. 2005. Greater Sage-Grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. Ph.D. thesis. University of Wyoming. Larmie, Wyoming. 209 pp.

Houston, C.S., D.G. Smith, and C. Rohner. 1998. Great Horned Owl (*Bubo virginianus*). In A. Poole and F. Gill, eds. The Birds of North America, No. 372. The Birds of North America Inc., Philadelphia, Pennsylvania. 28 pp.

Huggett, A.J. 2005. The concept and utility of ecological thresholds in biodiversity conservation. Biological Conservation **124**: 301–310.

Jager, H.I., E.A. Carr, and R.A. Efroymson. 2006. Simulated effects of habitat loss and fragmentation on a solitary mustelid predator. Ecological Modelling **191**: 416–430

Jones, S.L., C.S. Nations, S.D. Fellows, and L.L. McDonald. 2008. Breeding abundance and distribution of Long-billed Curlews (*Numenius americanus*) in North America. Journal of the Waterbird Society 31(1):1-14

Kalyn-Bogard, H. J. 2011. Natural gas development and grassland songbird abundance in southwestern Saskatchewan: the impact of gas wells and cumulative disturbance. Thesis, University of Regina, Regina, Canada.

Knapton, R., G.L. Holroyd, and H.E. Trefry. 2006. Mountain Plover in Canada: surveys and records up to 2005. Canadian Wildlife Service Technical Report Series No. 448. Canadian Wildlife Service – Prairie and Northern Region, Edmonton, Alberta. iii + 49 pp.

Knopf, F.L, and J.R. Rupert. 1995. Habits and habitats of Mountain Plovers in California. Condor 97:743-751.

Knopf, F.L. and J.R. Rupert. 1996. Productivity and movements of Mountain Plovers breeding in Colorado. Wilson Bulletin 108:28–35.

Knowles, C.J. 1985. Observations on prairie dog dispersal in Montana. Prairie Naturalist 17:33-40.

Knowles, C.J., and C.J. Stoner. 1982. Selective use of Black-tailed Prairie Dog towns by Mountain Plovers. Condor 84:71-74.

Koper, N., D. J. Walker, and J. Champagne. 2009. Nonlinear effects of distance to habitat edge on Sprague's Pipits in southern Alberta, Canada. Landscape Ecology 24:1287-1297.

Krinsky, I., and A. Robb. 1986. On approximating the statistical properties of elasticities. The Review of Economics and Statistics 86: 135 -139.

Kulshreshtha, S., G. Pearson, B. Kirychuk, and R. Gaube. 2008. Distribution of Public and Private Benefits on Federally Managed Community Pastures in Canada. Rangelands 30(1):3-11.

Lindenmayer, D.B. and G. Luck. 2005. Synthesis: Thresholds in conservation and management. Biological Conservation 124: 351–354.

Linnen, C. G. 2008. Effects of oil and gas development on grassland birds. Prepared for: Petroleum Technology Alliance Canada, Calgary, Alberta.

Loomis, J.B., and D.S. White. 1996. Economic benefits of rare and endangered species: summary and meta-analysis. Ecological Economics 18:197-206.

Lyon, A.G. and S.H. Anderson. 2003. Potential gas development impacts on Sage-Grouse nest initiation and movement. Wildlife Society Bulletin 31(2): 486–491.

MacFarlane, B. 2007. An overview of directional and slant drilling for natural gas development in the Great Sand Hills Saskatchewan. A report prepared for scientific advisory committee, Great Sand Hills regional environmental study. Canadian Plains Research Center, University of Regina. http://www.environment.gov.sk.ca/GSHRESWellOverview

Maczko, K.A., L.D. Bryant, D.W. Thompson, and S.J. Borehand. 2004. Putting the pieces together: assessing social, ecological and economic rangeland sustainability. Rangelands 26:3-14.

Madden, E. M., R. K. Murphy, A. J. Hansen, and L. Murray. 2000. Models for guiding management of prairie bird habitat in northwestern North Dakota. American Midland Naturalist 144:377-392.

Marsh, A. and P. Hill. 2014. Off the Beaten Track: Oil Shows in the Upper Shaunavon Member, West of the Main Oil Field Trend, Southwestern Saskatchewan; abstract and presentation at CSPG CSEG CWLS GeoConvention 2014.

Marsh, A., E. Bayne and T. Wellicome. 2014a. Using vertebrate prey capture locations to identify cover type selection patterns of nocturnally foraging Burrowing Owls. Ecological Applications 24:950-959

Marsh, A., T. I. Wellicome, and E. Bayne. 2014b. Influence of vegetation on the nocturnal foraging behaviours and vertebrate prey capture by endangered Burrowing Owls. *Avian Conservation and Ecology* 9(1):2

McNeil, R.L. and B.J. Sawyer. 2001. Soils and landscapes associated with silver sagebrush and Sage-Grouse. Report prepared for Public Lands Division, Alberta Sustainable Resource Development, Lethbridge, Alberta. 36 pp.

McNeil, R.L. and B.J. Sawyer. 2003. Effects of water management practices and precipitation events on sagebrush habitat in southeastern Alberta. Report prepared for Alberta Conservation Association and Alberta Sustainable Resource Development, Lethbridge, Alberta. 181 pp.

McNeil, J., H. Yin, and R. McNeil. 2007. Analysis of the climate in the Greater Sage-Grouse range of southwestern Saskatchewan and southeastern Alberta. LandWise Inc., unpublished report to the Government of Canada Interdepartmental Recovery Fund. 43 pp.

Miller, P. S., Canadian Black-footed Ferret/Black-tailed Prairie Dog Recovery Team, J. Cornego, and R. List. 2005. International black-footed ferret recovery workshop: final report. Page 116. International Black-footed Ferret Recovery Workshop. IUCN/SSC Conservation Breeding Specialist Group, Calgary, AB.

Mineau, P. and M. Whiteside. 2013. Pesticide acute toxicity is a better correlate of U.S. grassland bird declines than agricultural intensification. PLoS ONE 8(2):e57457. Doi:10.1371/journal.pone.0057457.

MOE. 2013. Activity restriction guidelines for sensitive species. Saskatchewan Ministry of Environment, Fish and Wildlife Branch. http://www.biodiversity.sk.ca/Docs/SKactivityrestrictions.pdf.

Moehrenschlager, A., and C. Moehrenschlager. 2001. Census of Swift Fox (*Vulpes velox*) in Canada and Northern Montana: 2000-2001. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 24. Edmonton, AB. 21 pp.

MTPCS. 2013. Saskatchewan Parks: 2009 summer visitation and outdoor recreation statistical report. Saskatchewan Ministry of Tourism, Parks, Culture and Sport. http://www.saskparks.net/2009ParksVisitationReport.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 23, 2012).

Naugle, D.E., C.L. Aldridge, B.L. Walker, T.E. Cornish, B.J. Moynahan, M.J. Holloran, K. Brown, G.D. Johnson, E.T. Schmidtmann, R.T. Mayer, C.Y. Kato, M.R. Matchett, T.J. Christiansen, W.E. Cook, T. Creekmore, R.D. Falise, E.T. Rinkes, and M.S. Boyce. 2004. West Nile virus: pending crisis for greater Sage-Grouse. Ecology Letters 7(8): 704–713.

Naugle, D.E., K.E. Doherty, B.L. Walker, M.J. Holloran, H.E. Copeland. 2011. Energy development and greater sage grouse. Pages 489–503 in S.T. Knick and J.W. Connelly (eds). Ecology and Conservation of Greater Sage Grouse: A Landscape Species and its Habitats. Studies in Avian Biology (38). University of California Press, Berkeley, California.

Noss, R.F., and A.Y. Cooperrider. 1994. Saving nature's legacy: protecting and restoring biodiversity. Island Press, Washington, DC.

Pannell, D.J. (2008). Public benefits, private benefits, and policy intervention for land-use change for environmental benefits, *Land Economics* 84(2): 225-240. Updated 2013: Public: private benefits framework version 3, INFFER Working Paper 0805, University of Western Australia. http://dpannell.fnas.uwa.edu.au/dp0902.htm

Parks Canada Agency. 2009. "Replacement of Section 2.6 of the Recovery Strategy for the Sage Grouse (*Centrocercus urophasianus urophasianus*) in Canada" as found in: Lungle, K. and S. Pruss. 2008. Recovery Strategy for the Greater Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada. *In Species at Risk Act* Recovery Strategy Series. Parks Canada Agency. Ottawa. vii + 43 pp. Website: http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=1458.

Parks Canada Agency. 2010. Recovery Strategy for Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*) in Canada. *Species at Risk Act* Recovery Strategy Series. Parks Canada Agency. Ottawa. vii + 22 pp.

Parks Canada Agency. 2011. Plague mitigation action plan for the Black-tailed Prairie Dog ecosystem. Grasslands National Park of Canada.

Parks Canada Agency. in prep. Multi-species Action Plan for Grasslands National Park of Canada [Draft]. *Species at Risk Act* Action Plan Series. Parks Canada Agency, Ottawa.

Pearce, J. L., D. T. McKinnon, and D. A. Kirk. 2010. Analysis of threats to species-at-risk on the South of the Divide project area. Report to Saskatchewan Ministry of Environment by Pearce & Associates Ecological Research.

Poulin, R.G., T.I. Wellicome and L. D. Todd. 2001. Synchronous and delayed numerical responses of a predatory bird community to a vole outbreak on the Canadian prairies. Journal of Raptor Research 35(4):288-295.

Pruitt, L. 2000. Loggerhead Shrike status assessment. U.S. Fish and Wildlife Service. 169 pp.

Pruss S.D. 1999. Selection of natal dens by the swift fox (*Vulpes velox*) on the Canadian prairies. Canadian Journal of Zoology 77:646-652.

Pruss, S.D. 1994. An observational natal den study of wild swift fox (*Vulpes velox*) on the Canadian Prairie. M. Env. Design. University of Calgary. Alberta.

Pruss, S.D., P. Fargey, and A. Moehrenschlager. 2008a. Recovery strategy for the Swift Fox (*Vulpes velox*) in Canada. Prepared in consultation with the Canadian Swift Fox Recovery Team. *Species at Risk Act* Recovery Strategy Series. Parks Canada Agency. vi + 25 pp.

Pruss, S.D., A. Henderson, P. Fargey, and J. Tuckwell. 2008b. Recovery Strategy for the Mormon Metalmark (*Apodemia mormo*) Prairie Population, in Canada. *Species at Risk Act* Recovery Strategy Series. Parks Canada Agency. Ottawa. vi + 23 pp.

Rancher's Stewardship Alliance Inc. 2013. What Are Native Prairie Grasslands Worth? Report prepared for RSA by Chris Nykoluk Consulting. 59 pp Downloaded Nov 2014 from: http://www.pcap-sk.og/rus_docs/documents/Native_Grassland_EGS_RSA-sm.pdf

Rhodes, J.R, J.G. Callaghan, C.A. McAlpine, C. de Jong, M.E. Bowen, D.L. Mitchell, D. Lunney, and H.P. Possingham. 2008. Regional variation in habitat–occupancy thresholds: a warning for conservation planning. Journal of Applied Ecology 45: 549-557.

Riley, J.L., S.E. Green, and K.E. Brodribb. 2007. A conservation blueprint for Canada's prairies and parklands. Nature Conservancy Canada, Toronto.

Robbins, M.B. and B.C. Dale. 1999. Sprague's Pipit (Anthus spragueii). In The Birds of North America, No. 439 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Russell, R.H. 1983. Swift Fox. Hinterland Who's Who. Canadian Wildlife Service. Environment Canada. 4 pp.

Samson, F.B., F.L. Knopf, and W.R. Ostlie. 2004. Great Plains ecosystems: past, present and future. Wildl. Soc. Bull. 32: 6-15.

Sargeant, A.B., R.J. Greenwood, M.A. Sovada, and T.L. Shaffer. 1993. Distribution and abundance of predators that affect duck production – Prairie Pothole Region. U.S. Department of the Interior. Fish and Wildlife Service. Washington, D.C. Resource Publication No. 194. 96 pp.

Saskatchewan Ministry of Energy and Resources and the National Energy Board. 2008. Saskatchewan's Ultimate Potential for Conventional Natural Gas-Miscellaneous Report 2008-8 Nov. NEB, Calgary AB Cat. No. NE23-146/2008E or MoER Regina, SK. viii + 30 pp.

Schock, D.M, and T.K. Bollinger. 2005. An apparent decline of Northern Leopard Frogs *Rana pipiens* on the Rafferty Dam mitigation lands near Estevan, SK. Blue Jay 63(3):145-153.

Schwalm, D.L. 2012. Understanding functional connectivity in short-grass and mixed-grass prairies using the swift fox as a model organism. Ph.D. Thesis, Texas Tech University.

Scobie, C., E. Bayne, and T. Wellicome. 2014. Influence of anthropogenic features and traffic disturbance on burrowing owl diurnal roosting behavior. Endangered Species Research 24:73-83

Simpson, S., N. Zimmer, J. Baird, V. Adamowicz, and P. Boxall. 2011. Economic benefits of conservation activities in the South of the Divide. Paper prepared for Environment Canada under contract K4E21-10-0825.

Stephens, S.E. 2003. The influence of landscape characteristics on duck nesting success in the Missouri Coteau of North Dakota. Ph.D. thesis. Montana State University, Bozeman, Montana. 169 pp.

Stevens, A.F.J., E. Bayne, and T.I. Wellicome. 2011. Soil and climate are better than biotic land cover for predicting home-range habitat selection by endangered burrowing owls across the Canadian Prairies. Biological Conservation 144 (2011) 1526-1536

Stevens, S.D., D. Page, and D.R.C. Prescott. 2010. Habitat suitability index for the northern leopard frog in Alberta: model derivation and validation. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 132, Edmonton, AB. 16 pp.

Sutter, G.C., S.K. Davis, and D.C. Duncan. 2000. Grassland songbird abundance along roads and trails in southern Saskatchewan. Journal of Field Ornithology 71: 110–116.

Tack, J.D. 2009. Habitat use, demography and movements of a trans-boundary population of sage-grouse in the Milk River Basin: a final project report to Grasslands National Park of Canada. Wildlife Biology Program, University of Montana.

Thorpe, J. 2011. Vulnerability of prairie grasslands to climate change. Saskatchewan Research Council Publication No. 12855-2E11.

Tipton, H.C., P.F. Doherty and V.J. Dreitz. 2009. Abundance and density of Mountain Plover (*Charadrius montanus*) and Burrowing Owl (*Athene cunicularia*) in eastern Colorado. Auk 126:493-499.

Todd, L.D., R.G Poulin, R.M. Brigham, E.M. Bayne, and T.I. Wellicome. 2007. Pre-migratory movements by juvenile Burrowing Owls in a patchy landscape. Avian Conservation and Ecology 2(2): 4. [online] URL: http://www.ace-eco.org/vol2/iss2/art4/ .

Todd, L. D., R.G. Poulin, T. I. Wellicome and R. M. Brigham. 2003. Post-fledgling survival of burrowing Owls in Saskatchewan. Journal Wildlife Management, Vol. 67, No. 3 (Jul., 2003), pp. 512-519

Treasury Board of Canada. 2007. Canadian cost-benefit analysis guide: Regulatory proposals. Available at http://www.tbs-sct.gc.ca/ri-qr/documents/gl-ld/analys/analys-eng.pdf

Tuckwell, J., and T. Everest. 2009a. Management Plan for the Black-tailed Prairie Dog (*Cynomys ludovicianus*) in Canada [Draft]. *Species at Risk Act* Management Plan Series. Parks Canada Agency, Ottawa. vi + 32 pp.

Tuckwell, J., and T. Everest. 2009b. Recovery Strategy for the Black-footed Ferret (*Mustela nigripes*) in Canada. *Species at Risk Act* Recovery Strategy Series. Parks Canada Agency, Ottawa. vii + 36 pp.

Warrick, G.D., and B.L. Cypher. 1998. Factors affecting the spatial distribution of San Joaquin kit foxes. Journal of Wildlife Management 62:707-717.

Watmough, M.D. and M.J. Schmoll. 2007. Environment Canada's Prairie and Northern Region Habitat Monitoring Program Phase II. Recent habitat trends in the Prairie Habitat Joint Venture. Technical Report Number 493. Environment Canada, Canadian Wildlife Service, Edmonton, Alberta Canada.

Watters, M., G. McMaster, and G. Springer. 2004. Site plans for Sage-Grouse (*Centrocercus urophasianus*) in southern Saskatchewan. Unpublished Report, Saskatchewan Watershed Authority, Regina, Saskatchewan.

Wedgewood, J. A. 1978. The status of the Burrowing Owl in Canada. Committeee on the status of Endangered Wildlife in Canada. Ottawa, Ontario. 83 pp.

Wellicome, T.I. 2000. Effects of food on reproduction in Burrowing Owls (*Athene cunicularia*) during three stages of the breeding season. Ph.D. dissertation, University of Alberta, Edmonton, AB Canada. 113 pp.

Wellicome, T.I., R. J. Fisher, R.G. Poulin, L. D. Todd, E.M. Bayne, D.T.T. Flockhart, J.K. Schmutz, K. De Smet, and P.C. James. 2014. Apparent survival of adult Burrowing Owls breeding in Canada is influenced by weather during migration and on their wintering grounds. The Condor Ornithological Applications. Volume 116: 446-458

White, C. 2007. Impacts of reservoir development and long-term trends on hydrology in southwestern Saskatchewan: implications for Silver Sagebrush (*Artemisia cana*) habitat and Greater Sage-Grouse (*Centrocercus urophasianus*). Saskatchewan Watershed Authority, unpublished report to the Government of Canada Interdepartmental Recovery Fund. 33 pp.

White, P.J., and K. Ralls. 1993. Reproduction and spacing patterns of kit foxes relative to changing prey availability. Journal of Wildlife Management 57:861-867.

White, P.J., C.A. Vanderbilt White, and K. Ralls. 1996. Functional and numerical responses of kit foxes to a short-term decline in mammalian prey. Journal of Mammalogy 77:370-376.

Personal Communications:

Balfour, M. *Director, Energy Economics.* Saskatchewan Ministry of the Economy (Energy and Resources), Regina, SK.

Dale, B.C. Wildlife Biologist. Canadian Wildlife Service, Edmonton, AB.

Didiuk, A. *Wildlife Biologist.* Canadian Wildlife Service, Saskatoon, SK.

Fisher, R. *Wildlife Biologist,* Canadian Wildlife Service, Edmonton, AB

Hanly, D. *Senior Energy Economist, Energy Policy Branch.* Saskatchewan Ministry of the Economy (Energy and Resources), Regina, SK.

Reavley, R. *Manager of Crown Sales.* Saskatchewan Ministry of the Economy (Energy and Resources), Regina, SK.

Sturch, A. *Manager, Resource Conservation*. Parks Canada Agency, Grasslands National Park, SK.

Wein, L. *Implementation Manager, Species Conservation*. Parks Canada Agency, Grasslands National Park, SK.

Unpublished Data:

Davis, S. Unpubl. Data. Sprague's Pipit reproductive success data from Last Mountain Lake. *Wildlife Biologist and Adjunct Professor*. Canadian Wildlife Service, Regina, SK; University of Regina, Regina SK and University of Saskatchewan, Saskatoon, SK

Davis, S. Unpubl. Data. Long-billed Curlew detections between 2002 and 2011 inclusive. *Wildlife Biologist and Adjunct Professor*. Canadian Wildlife Service, Regina, SK; University of Regina, Regina SK and University of Saskatchewan, Saskatoon, SK.

Davis, S. Unpubl. Data. McCown's Longspur detections between 2002 and 2011 inclusive. *Wildlife Biologist and Adjunct Professor*. Canadian Wildlife Service, Regina, SK; University of Regina, Regina SK and University of Saskatchewan, Saskatoon, SK.

Didiuk, A. Unpubl. Data. 2010a. Habitat and occupancy of prairie loggerhead shrikes along the Frenchman River between Provincial Highway #37 and Huff Lake, Saskatchewan. Canadian Wildlife Service, Prairie and Northern Region. Technical Report.

Didiuk, A. Unpubl. Data. 2010b. Habitat potential and occurrence of prairie loggerhead shrikes at Val Marie PFRA Pasture, Saskatchewan. Report to the Integrated Recovery Fund, Environment Canada. Canadian Wildlife Service, Prairie and Northern Region.

Didiuk, A. Unpubl. Data. 2010c. Habitat potential and occurrence of prairie loggerhead shrikes at Beaver Valley PFRA Pasture, Saskatchewan. Report to the Integrated Recovery Fund, Environment Canada. Canadian Wildlife Service, Prairie and Northern Region

Environment Canada. Unpubl. Data. 2010. Mountain Plover sightings with complete references. Canadian Wildlife Service, Saskatoon, SK.

Moehrenschlager, A., and C. Moehrenschlager. Unpubl. Data. 2006. Population Census of Reintroduced Swift Foxes, Vulpes velox, in Canada and Northern Montana 2005/2006. Centre for Conservation Research Report No. 1, Calgary Zoo, Calgary, Alberta. Internal Calgary zoological society report

Moehrenschlager, A., S.M. Alexander, and T. Brichieri-Columbi. Unpubl. Data 2007. Habitat suitability and population viability analysis for reintroduced Swift Foxes in Canada and northern Montana. Calgary Zoo Centre for Conservation Research Report No. 2. Calgary, Alberta, Canada. Internal Calgary Zoological Society report. 30 pp.

Parks Canada Agency. Unpubl. Data. 2010-Dec 24 Grasslands National Park, SK.

Appendix A: Threat Assessment Table

Table 12 Threat assessment for all species covered in the SoD Action Plan*

THREATS	Black-footed Ferret	Black-tailed Prairie Dog	Burrowing Owl	Greater Sage-Grouse	Prairie Loggerhead shrike	Long-billed curlew	McCown's Longspur	Mormon Metalmark	Mountain Plover	Northern Leopard Frog	Sprague's Pipit	Swift Fox	Eastern Yellow-bellied Racer	Number of Species	Number of Species (high & med)
1 Accidental Mortality															
1a Collisions with vehicles on roads or trails			Low	Low	Low				Low	Low		Low	Low	7	0
1b Accidental trapping/poisoning												Low		1	0
1c Tillage, seeding, haying or mowing operations			Low	Low		Low	Med				Low			4	1
1d Collisions with infrastructure (e.g. fences)				Low										1	0
1e Application of pesticides and other chemicals			Low		Low	Low	Low	Low	Low	Low	Med			8	1
2 Changes in Ecological Dynamics or Natural Processes															
2a Alterations to natural grazing and fire regimes				Low		Med	Med		High		High			5	4
2b Alterations of water regimes (e.g. dams and irrigation)				Med						Low				2	1
2c Pest control on ground squirrels and prairie dogs	Low		Low											2	0
2d Increased predation pressure	Med	Low	Med	High	Med	Med	Med				Med	Low		9	7
2e Competitive exclusion												Low		1	0
2f Decreased prey availability			Med											1	1
3 Climate and Natural Disasters															
3a Inclement or extreme weather conditions		Low	Med	High	Med	Low	Low	Low	Med		Low		Low	10	4
3b Increased risk of drought	Low	Med		High				Low	Med	Low	Low	Med		8	4

THREATS	Black-footed Ferret	Black-tailed Prairie Dog	Burrowing Owl	Greater Sage-Grouse	Prairie Loggerhead shrike	Long-billed curlew	McCown's Longspur	Mormon Metalmark	Mountain Plover	Northern Leopard Frog	Sprague's Pipit	Swift Fox	Eastern Yellow-bellied Racer	Number of Species	Number of Species (high & med)
4 Disturbance or Harm															
4a Industrial activities (e.g. oil and gas noise)				High		Low					Low			3	1
4b Pest Control (targeted poisoning/shooting)		Low												1	0
4c Recreational activities						Low			Low				Low	3	0
4d Traffic noise				High										1	1
4e Visual disturbance from increased number of vertical structures				Med										1	1
5 Exotic, Invasive and Introduced Species															
5a Invasion and establishment of exotic plants						Low		Low	Low		High			4	1
5b Exotic and introduced diseases	High	High		High	Low					Med				5	4
6 Habitat Loss and Degradation															
6a Conversion of native habitat to crop and forage production			Med	Med	Low	Med	High		Low	Low	High	High	Low	10	6
6b Conversion of native habitat to industrial infrastructure		Low	Low	Med		Med	Med	Low	Low		High	Med		9	5
6c Conversion of native habitat to roads		Low	Low	Med						Low	Low	Med	Low	7	2
6d High-intensity prolonged grazing				Med		Low		Low		Low	Med			5	2
6e Destruction or degradation of wetland habitat										Low				1	0
7 Natural Processes or Activities															
7a Reduced genetic diversity	Low			Low										2	0
7b Disease	Med	Low										Low		2	1
7c Small population size	Med			High									Low	2	2
TOTAL NUMBER OF THREATS	**7**	**8**	**10**	**18**	**6**	**11**	**7**	**6**	**9**	**9**	**12**	**9**	**6**		

* Threat level (Low, Medium, High) as determined for the SoD region, NOT nationwide.

Appendix B: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*[6]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the Federal Sustainable Development Strategy's[7] (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of action plans may inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the action plan itself, but are also summarized below in this statement.

Some recovery actions specified in Recovery Strategies or Management Plans may benefit, or alternatively be detrimental, to other species at risk found within the same area. For example, recovery efforts that are designed to conserve and restore native prairie habitats, which is the main focus of this Action Plan, will benefit the majority of the species covered within this Action Plan, as well as other federally listed species that are not currently covered, including Dwarf Wooly-heads (*Psilocarphus brevissimus,* prairie population), Chestnut-collared Longspur (*Calcarius ornatus*), Common Nighthawk (*Chordeiles minor*), Ferruginous Hawk (*Buteo regalis*), Greater Short Horned Lizard (*Phrynosoma hernandesi*), Sage Thrasher (*Oreoscoptes montanus*), and Short-eared Owl (*Asio flammeus*). Few species are expected to be detrimentally affected.

It is acknowledged that some specific land management initiatives such as prescribed burning, control and elimination of woody vegetation, or release of Black-footed Ferrets, may have negative consequences at the local scale for certain species at risk in that area. In those specific circumstances appropriate mitigation measures (e.g. timing, intensity, severity, exact location) will be taken into careful consideration on a case by case basis in order to minimize any negative impacts on species at risk or the environment. Follow-up monitoring is recommended after any management initiative in order to carefully document any negative impacts and ways to minimize them.

One must also keep in mind that our understanding of species and their interactions with each other is continually expanding; some of the positive and negative effects described in the original recovery documents may actually have changed, or could change in the future, as we add to our knowledge base.

[6] http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[7] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

This South of the Divide Multi-Species-at-Risk Action Plan directly contributes to the goals and targets of the *Federal Sustainability Development Strategy for Canada*. Specifically, it contributes to Goal 5: "Wildlife Conservation – Maintain or restore populations of wildlife to healthy levels", and to Goal 6: "Ecosystem/Habitat Conservation and Protection- Maintain productive and resilient ecosystems with the capacity to recover and adapt".

Appendix C: Maps of Critical and Important Habitat

NOTE: Within the areas mapped as critical habitat, there may be areas of non-suitable habitat such as urban areas, annual cropland, roads, and water bodies. Such areas may have been included within mapped areas because of inadequate data, or because they are too small to map separately, and should not be considered critical habitat. **Only those areas with the biophysical attributes described in Section 1.3 should be considered critical habitat**.

These maps include both critical habitat identified in previous documents, and critical habitat that is newly identified in this Action Plan.

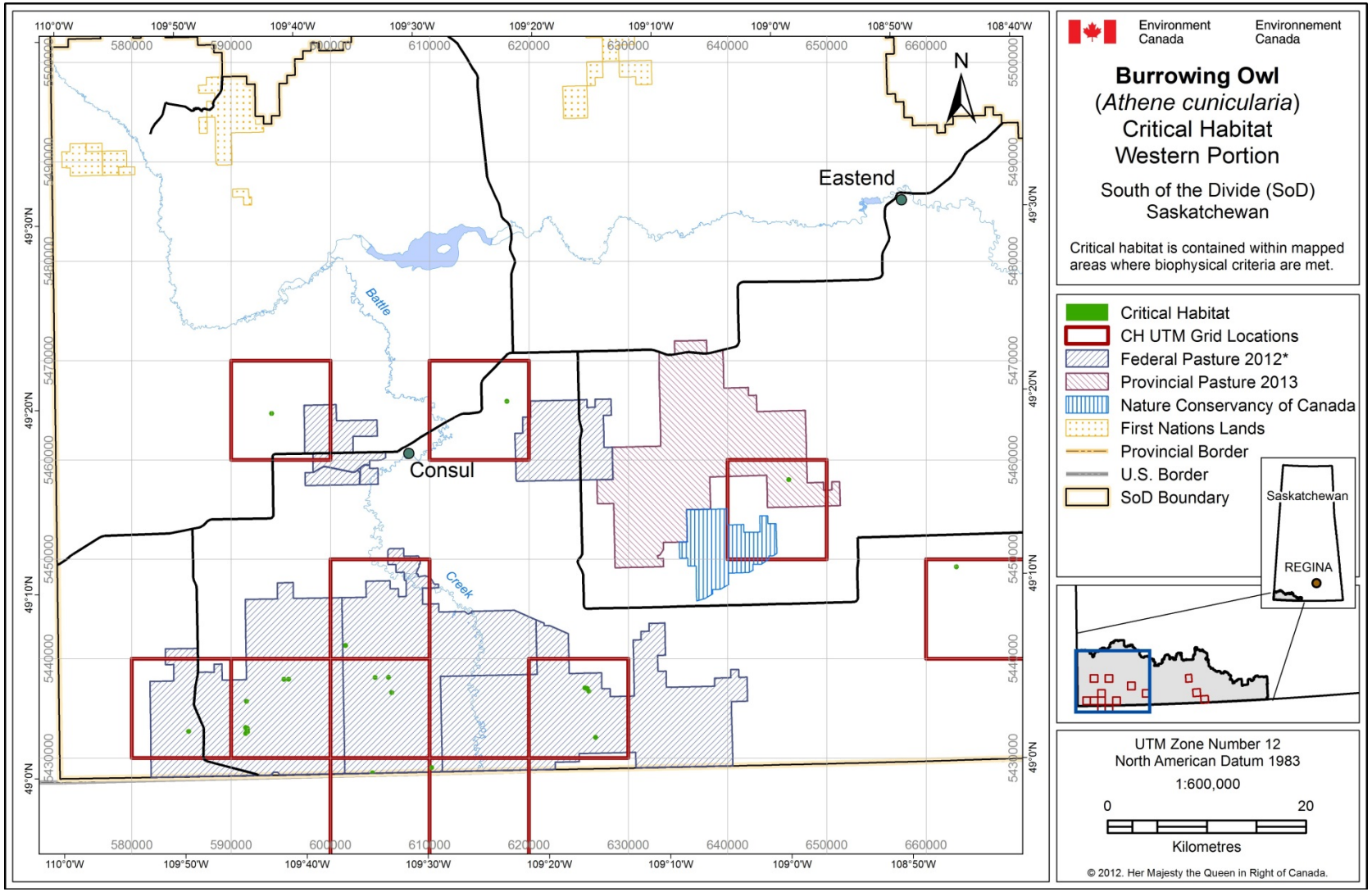

Figure 3. Critical Habitat for Burrowing Owl – western portion of the SoD area.

Figure 3 (and Figure 4) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 433 ha, are provided to show newly identified areas that meet the criteria set out in Section 1.3.2. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded circles do not contain critical habitat.

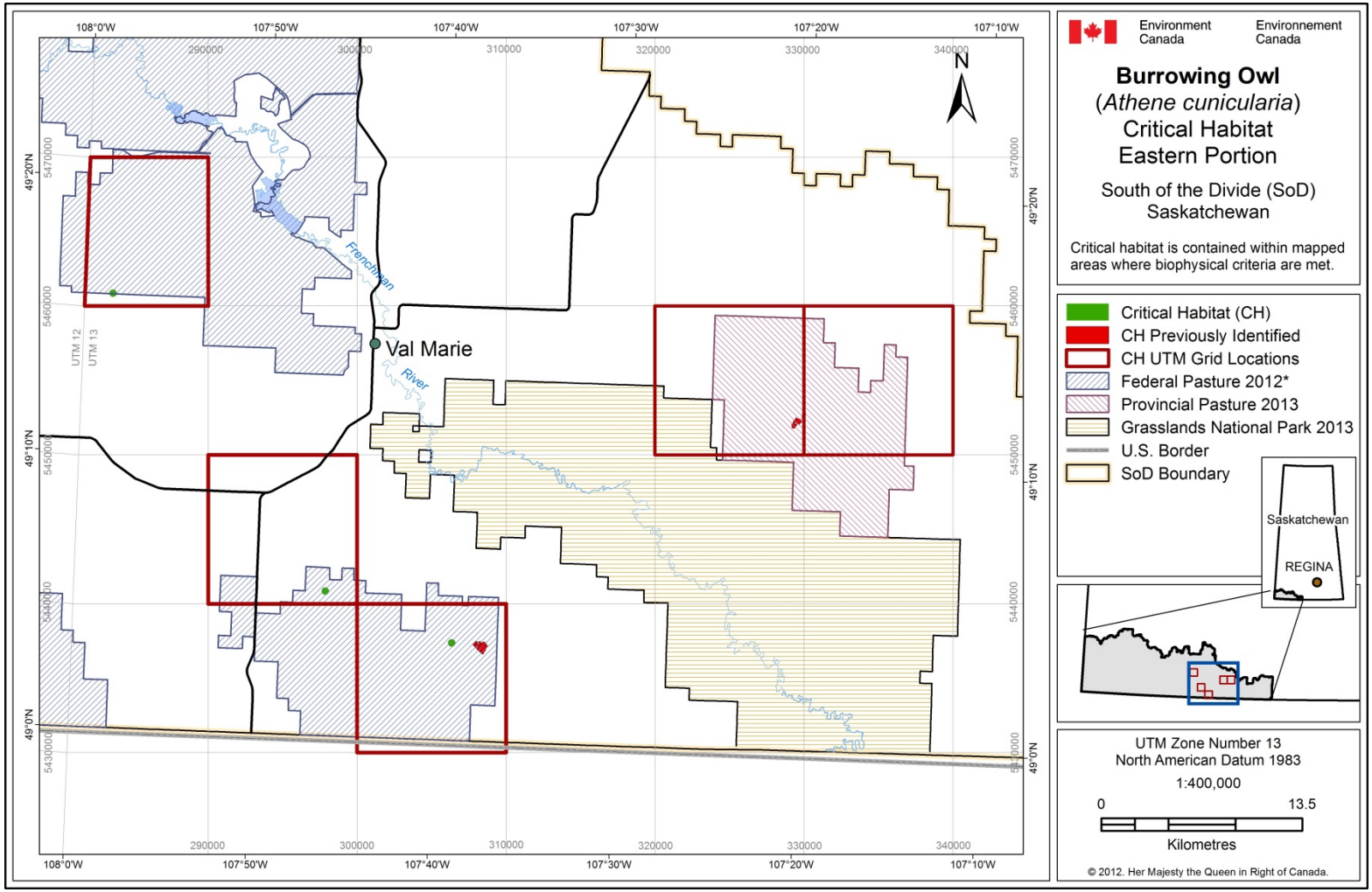

Figure 4. Critical Habitat for Burrowing Owl – eastern portion of the SoD area.

Figure 4 (and Figure 3)show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 433 ha, are provided to show newly identified areas that meet the criteria set out in Section 1.3.2. Critical habitat previously identified for Burrowing Owl (shaded red), comprising approximately 58 ha, is shown within the SoD area (excluding Grasslands National Park) for the convenience of the reader. For details on previously identified critical habitat, refer to Environment Canada (2012a). The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green and red shaded circles do not contain critical habitat.

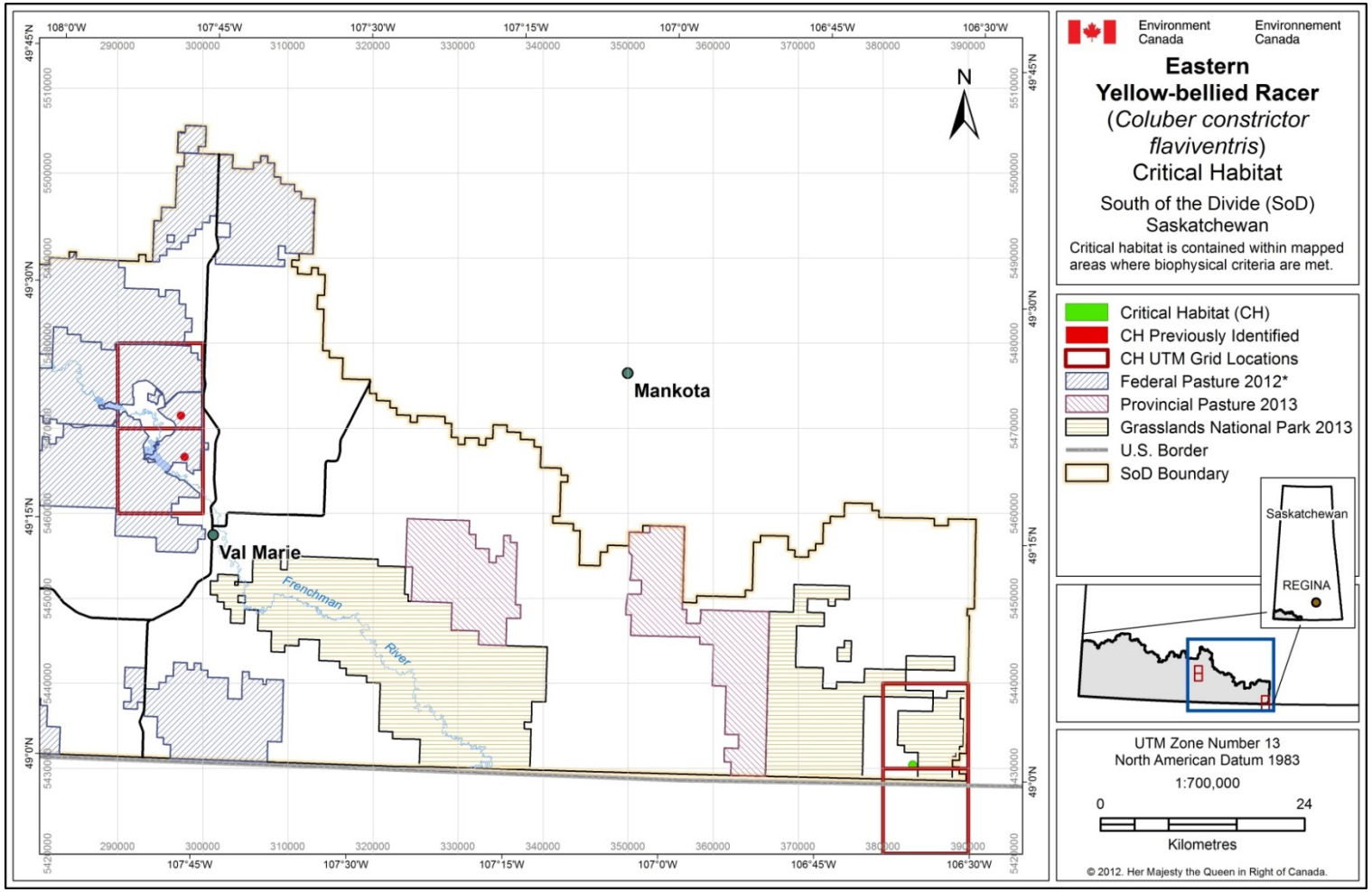

Figure 5. Critical Habitat for Eastern Yellow-bellied Racer

Areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 76 ha, are provided to show newly identified areas that meet the criteria set out in Section 1.3.3. Critical habitat previously identified for Eastern Yellow-bellied Racer (shaded red), comprising approximately 152 ha, is shown within the South of the Divide area (excluding Grasslands National Park) for the convenience of the reader. For details on previously identified critical habitat, see Parks Canada Agency (2010). The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green and red shaded circles do not contain critical habitat except for additional critical habitat identified in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep.).

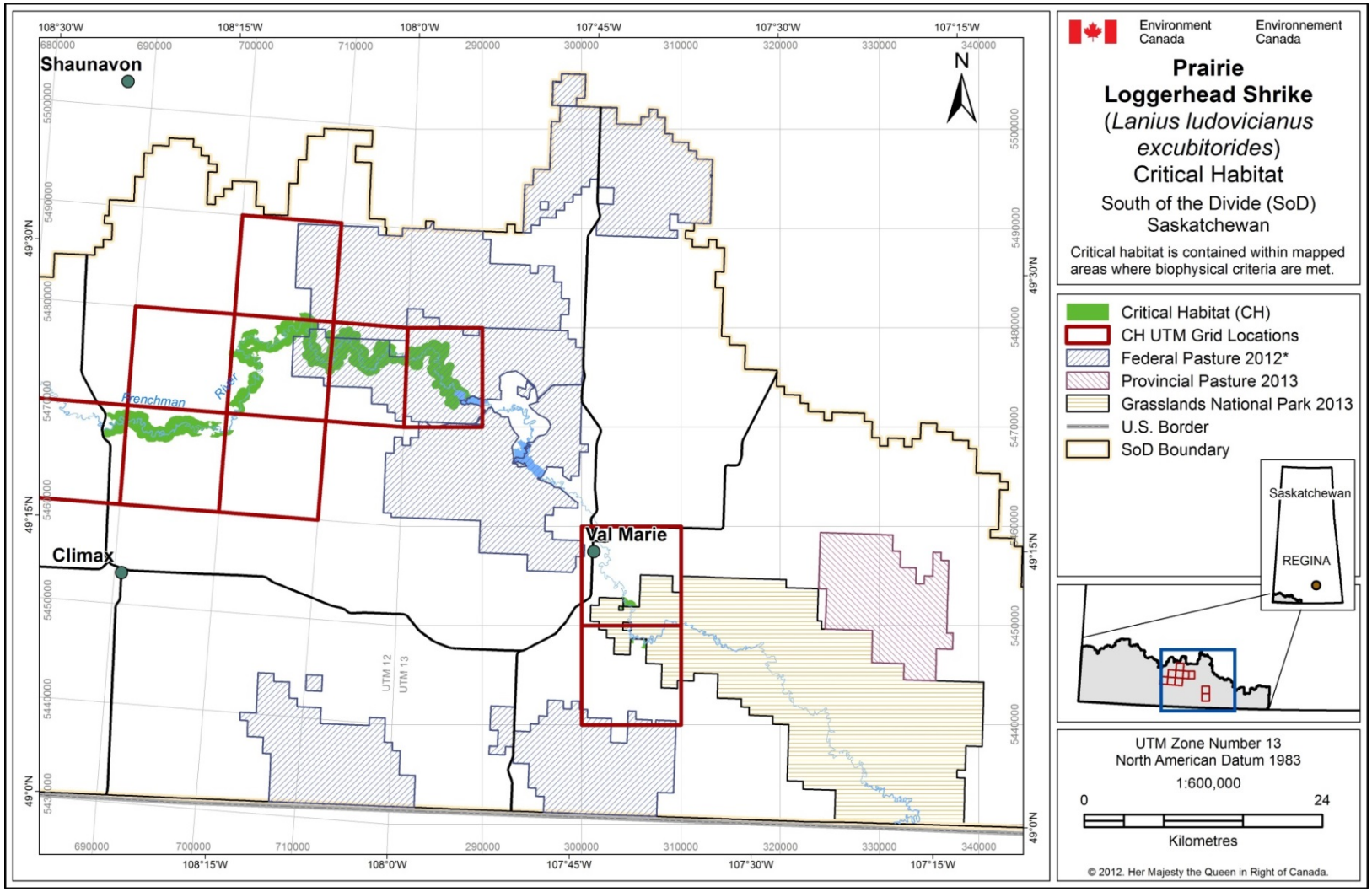

Figure 6. Critical Habitat for Prairie Loggerhead Shrike

Areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 9,616 ha are provided to show areas that meet the criteria set out in Section 1.3.4. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded polygons do not contain critical habitat except for additional critical habitat identified in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep.).

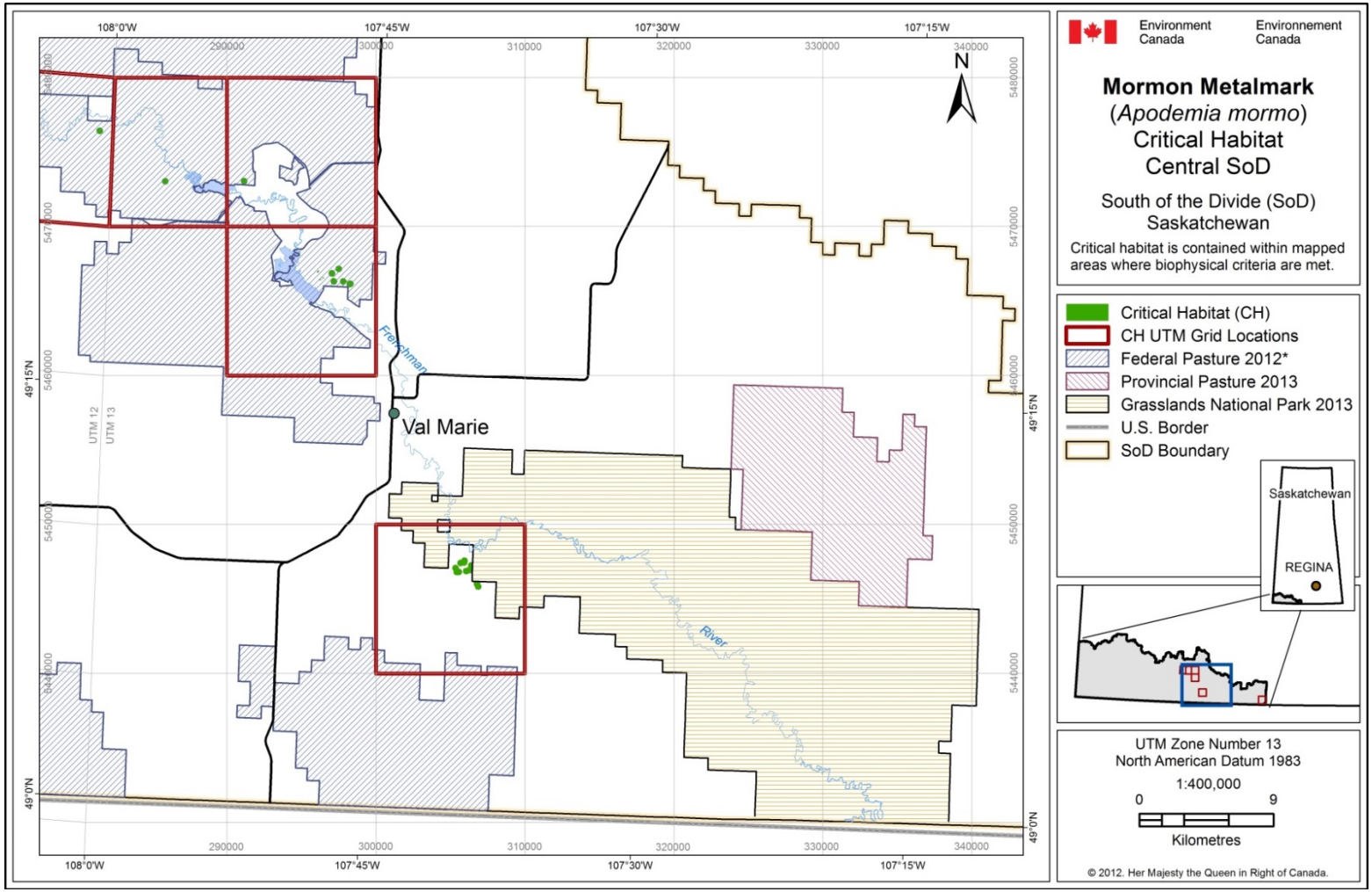

Figure 7. Critical Habitat for Mormon Metalmark – central part of the SoD area

Figure 7 (and Figure 8) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 298 ha are provided to show areas that meet the criteria set out in Section 1.3.6. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded circles do not contain critical habitat except for additional critical habitat identified in the Multi-species Action Plan for Grasslands National Park (Parks Canada Agency in prep.).

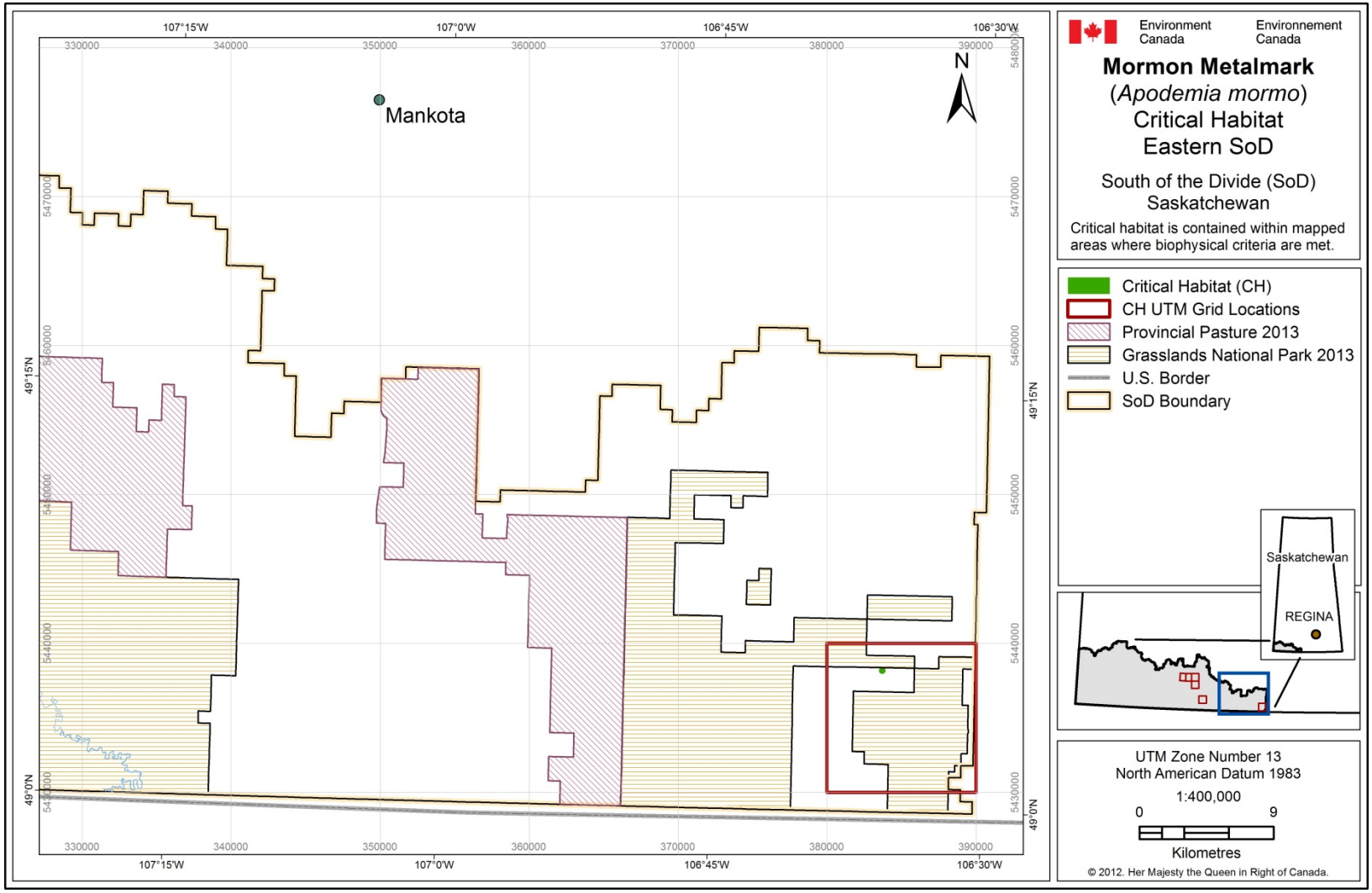

Figure 8. Critical Habitat for Mormon Metalmark – eastern part of the SoD area

Figure 8 (and Figure 7) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 298 ha are provided to show areas that meet the criteria set out in Section 1.3.6. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded circles do not contain critical habitat.

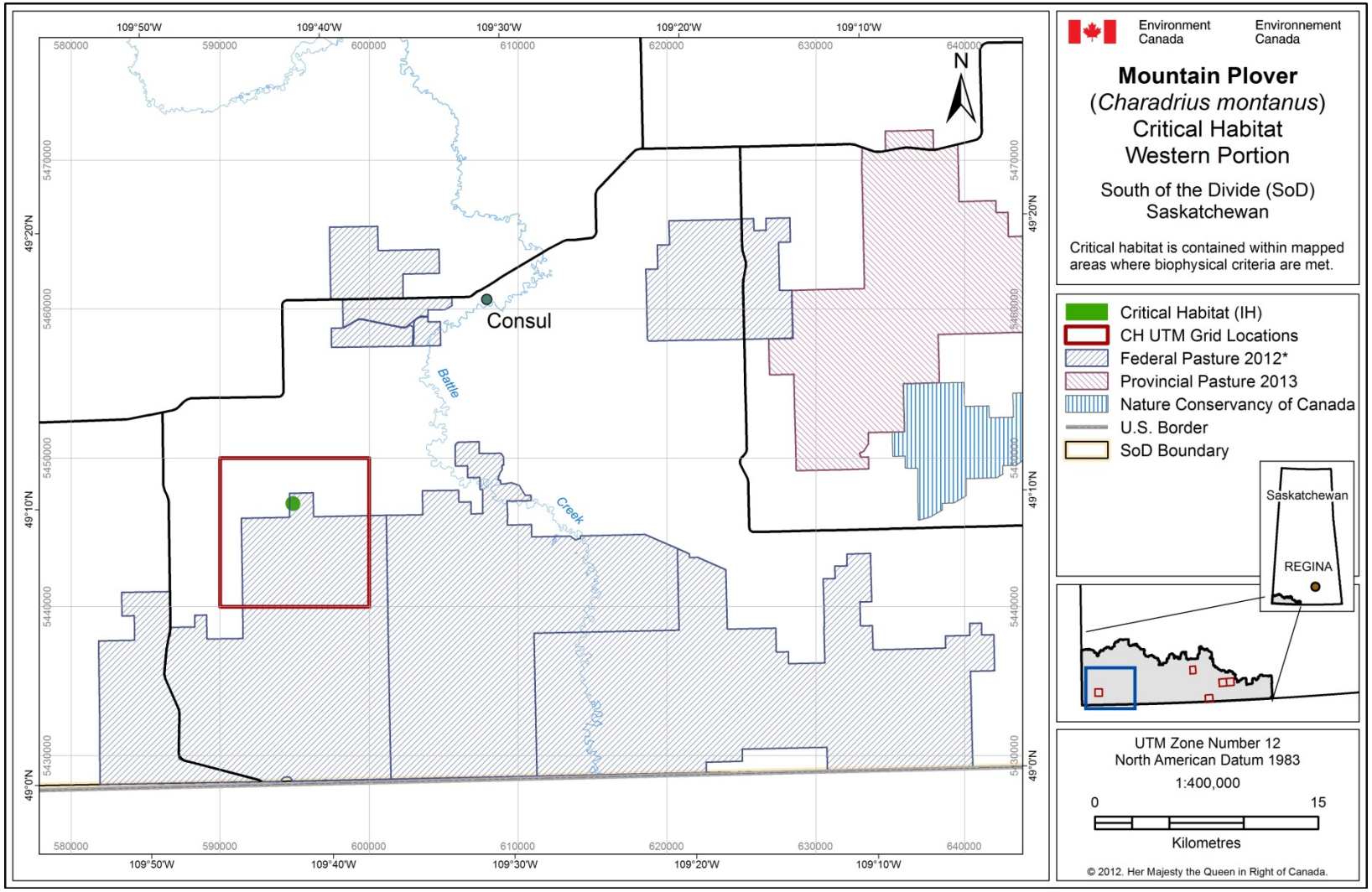

Figure 9. Critical Habitat for Mountain Plover – western part of the SoD area

Figure 9 (and Figure 10) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 215 ha are provided to show areas that meet the criteria set out in Section 1.3.7. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded circle do not contain critical habitat.

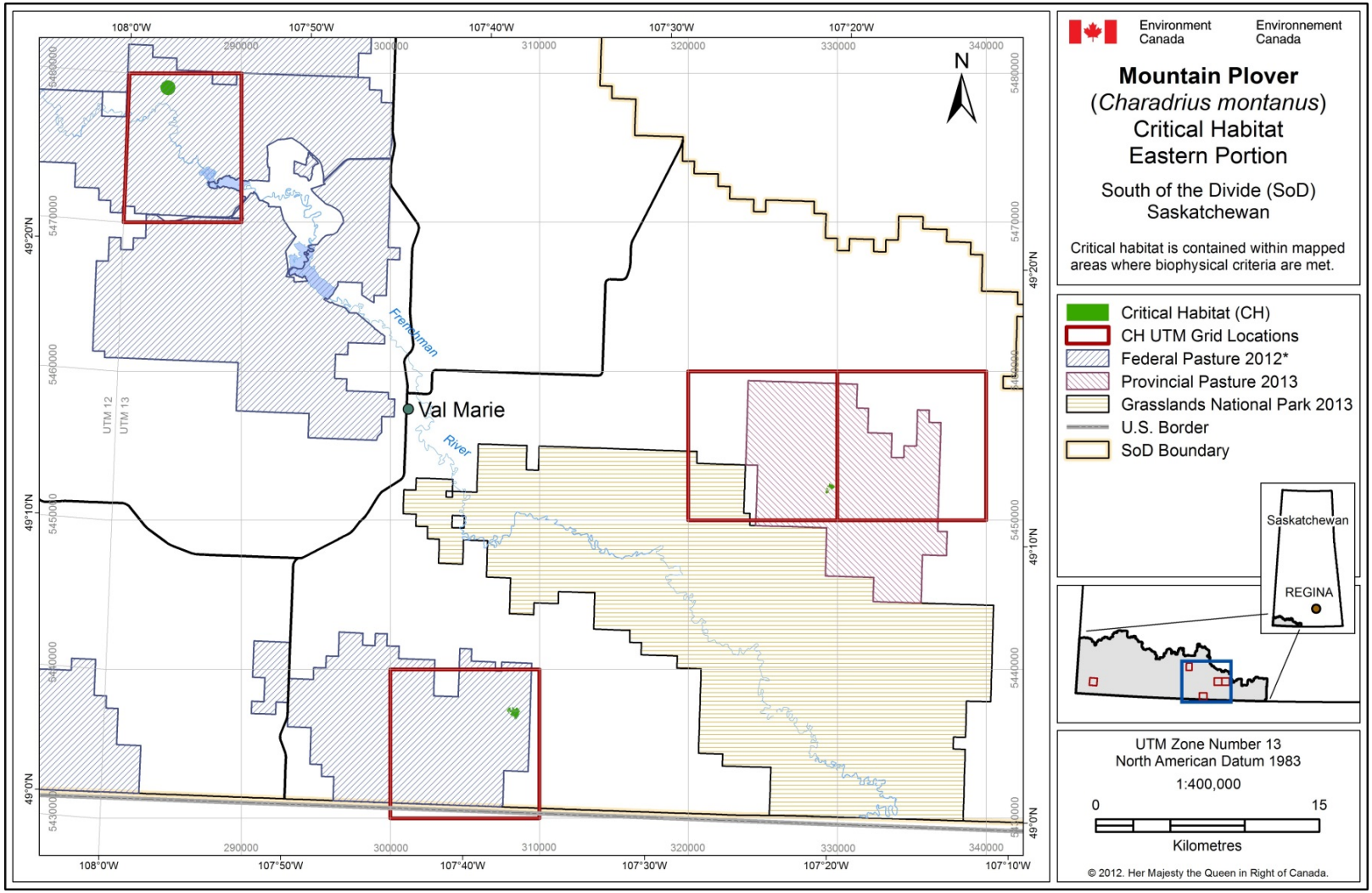

Figure 10. Critical Habitat for Mountain Plover – eastern part of the SoD area

Figure 10 (and Figure 9) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 215 ha are provided to show areas that meet the criteria set out in Section 1.3.7. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded circles do not contain critical habitat.

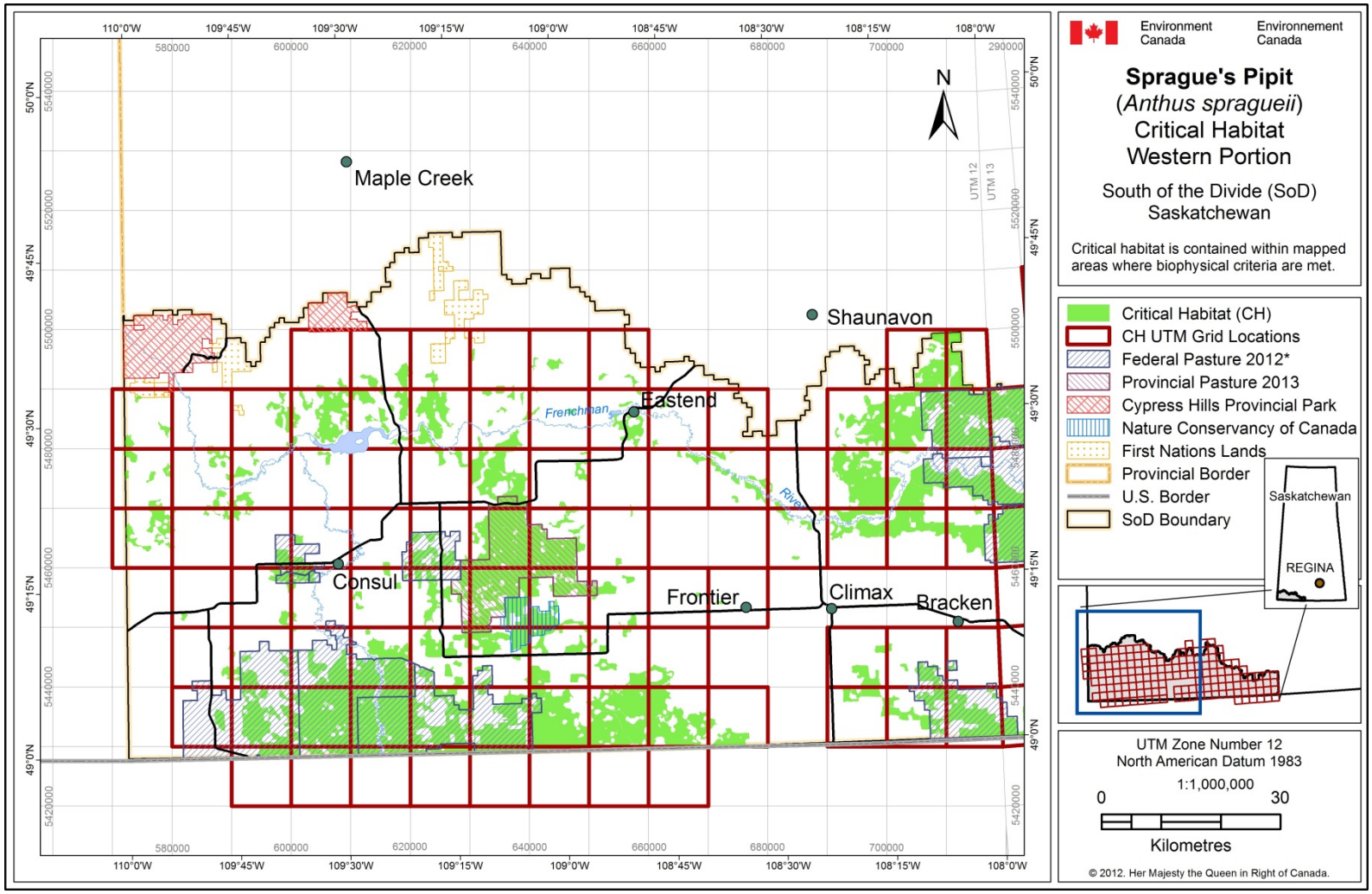

Figure 11. Critical Habitat for Sprague's Pipit - western part of the SoD area

Figure 11 (and Figure 12) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 418,169 ha are provided to show areas that meet the criteria set out in Section 1.3.5. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded polygons do not contain critical habitat.

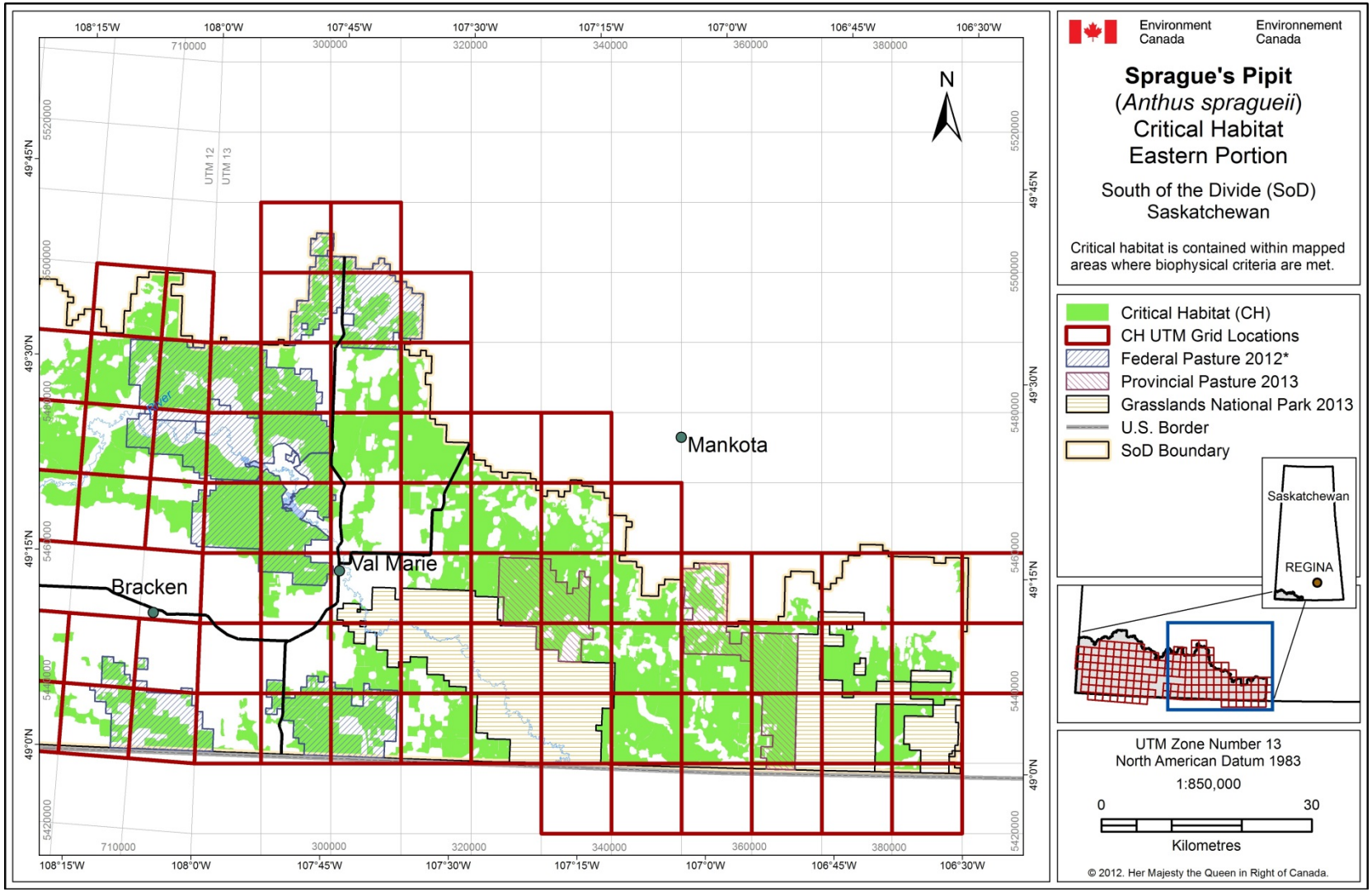

Figure 12. Critical Habitat for Sprague's Pipit – eastern part of the SoD area

Figure 12 (and Figure 11) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 418,169 ha are provided to show areas that meet the criteria set out in Section 1.3.5. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded polygons do not contain critical habitat.

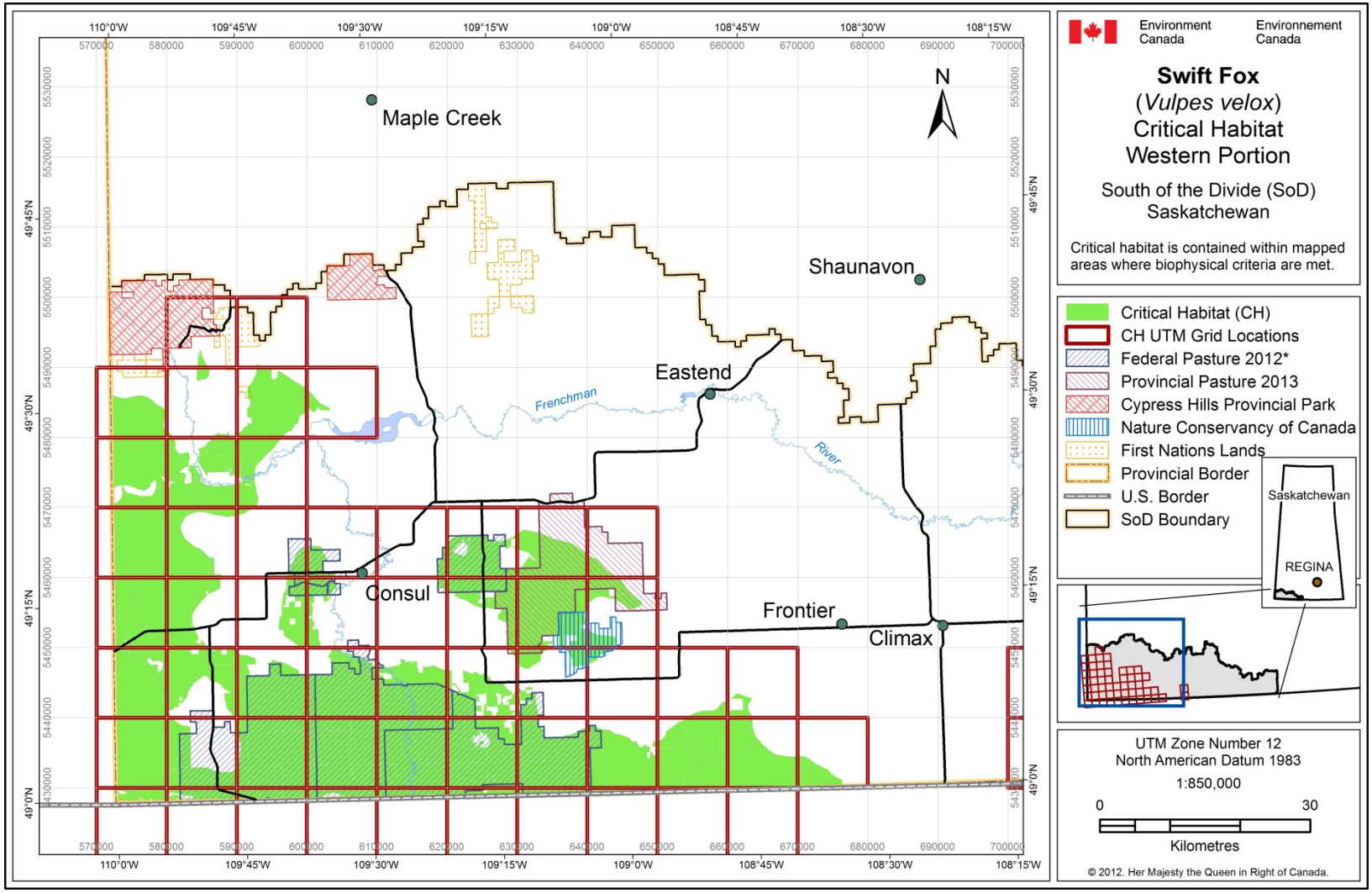

Figure 13. Critical Habitat for Swift Fox - western part of the SoD area

Figure 13 (and Figure 14) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 368,756 ha are provided to show areas that meet the criteria set out in Section 1.3.8. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded polygons do not contain critical habitat.

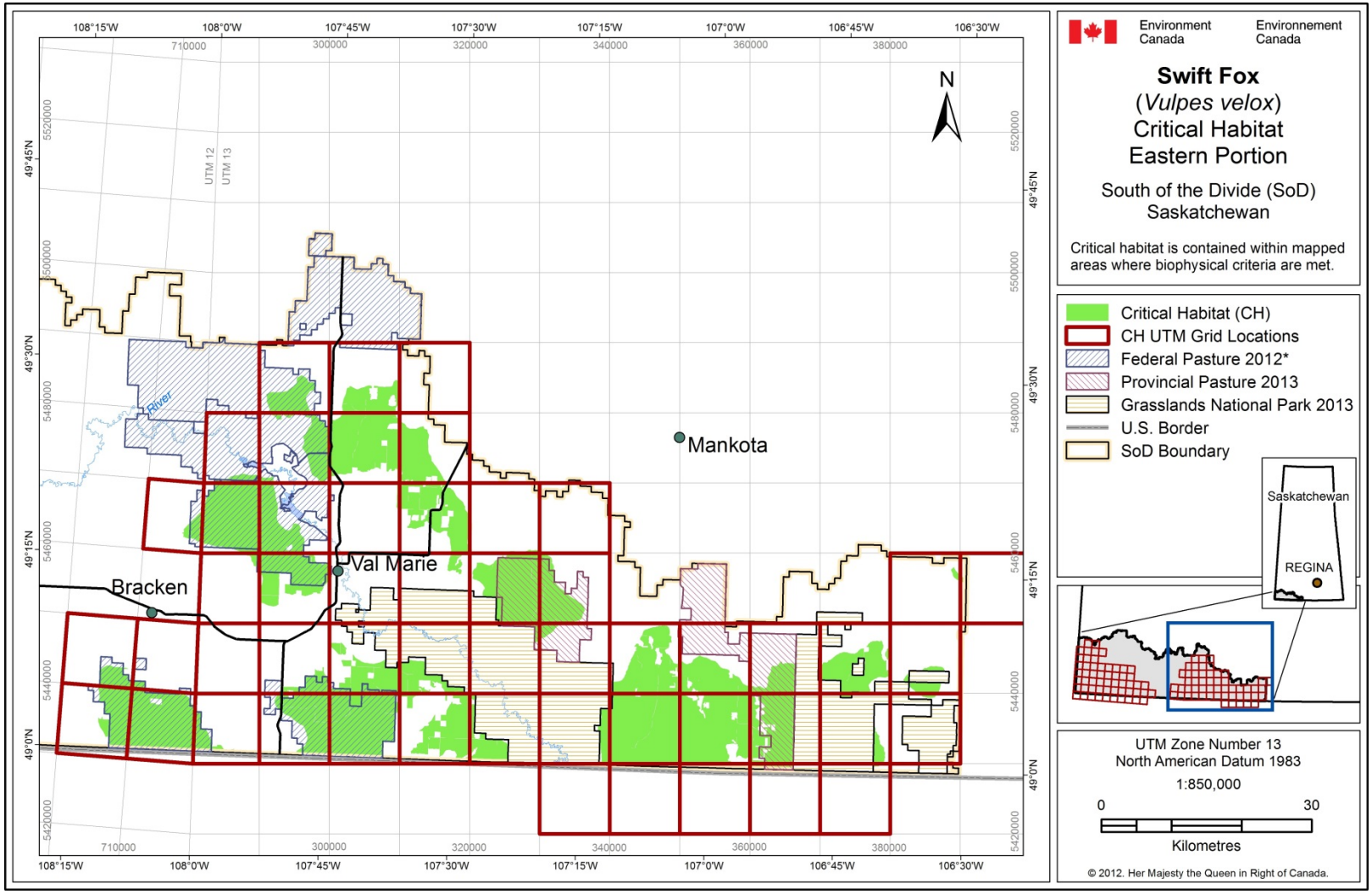

Figure 14. Critical Habitat for Swift Fox – eastern part of the SoD area

Figure 14 (and Figure 13) show areas within which critical habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 368,756 ha are provided to show areas that meet the criteria set out in Section 1.3.8. The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded polygons do not contain critical habitat.

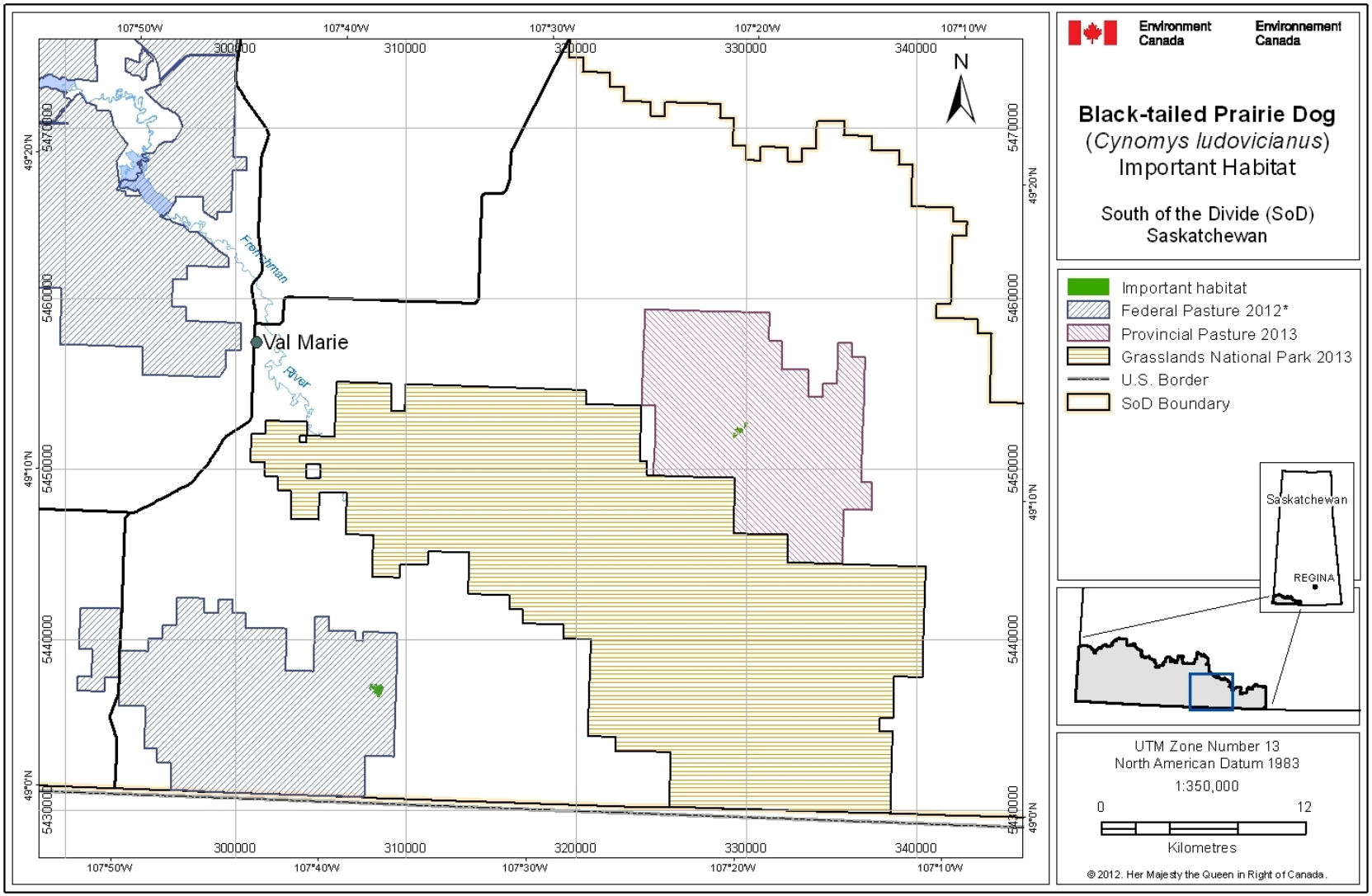

Figure 15. Important Habitat for Black-tailed Prairie Dog
Areas within which important habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green), comprising approximately 58 ha, are provided to show areas that contain important habitat, where the criteria set out in Section 1.5.2 are met and which were defined in 2007.

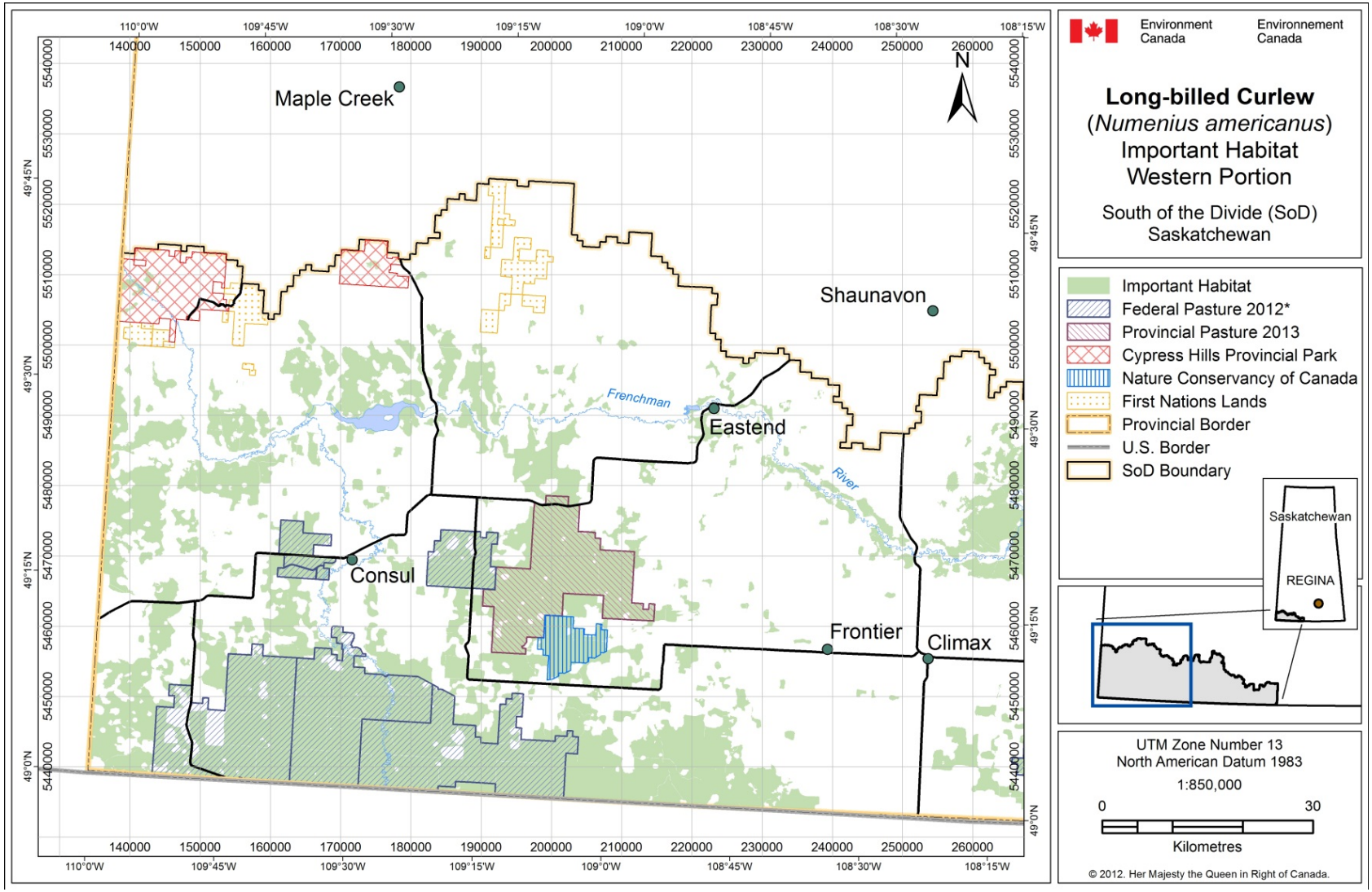

Figure 16. Important Habitat for Long-billed Curlew – western part of the SoD area

Figure 16 (and Figure 17) show areas within which important habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 483,941 ha are provided to show areas that contain important habitat, where the criteria set out in Section 1.5.3 are met.

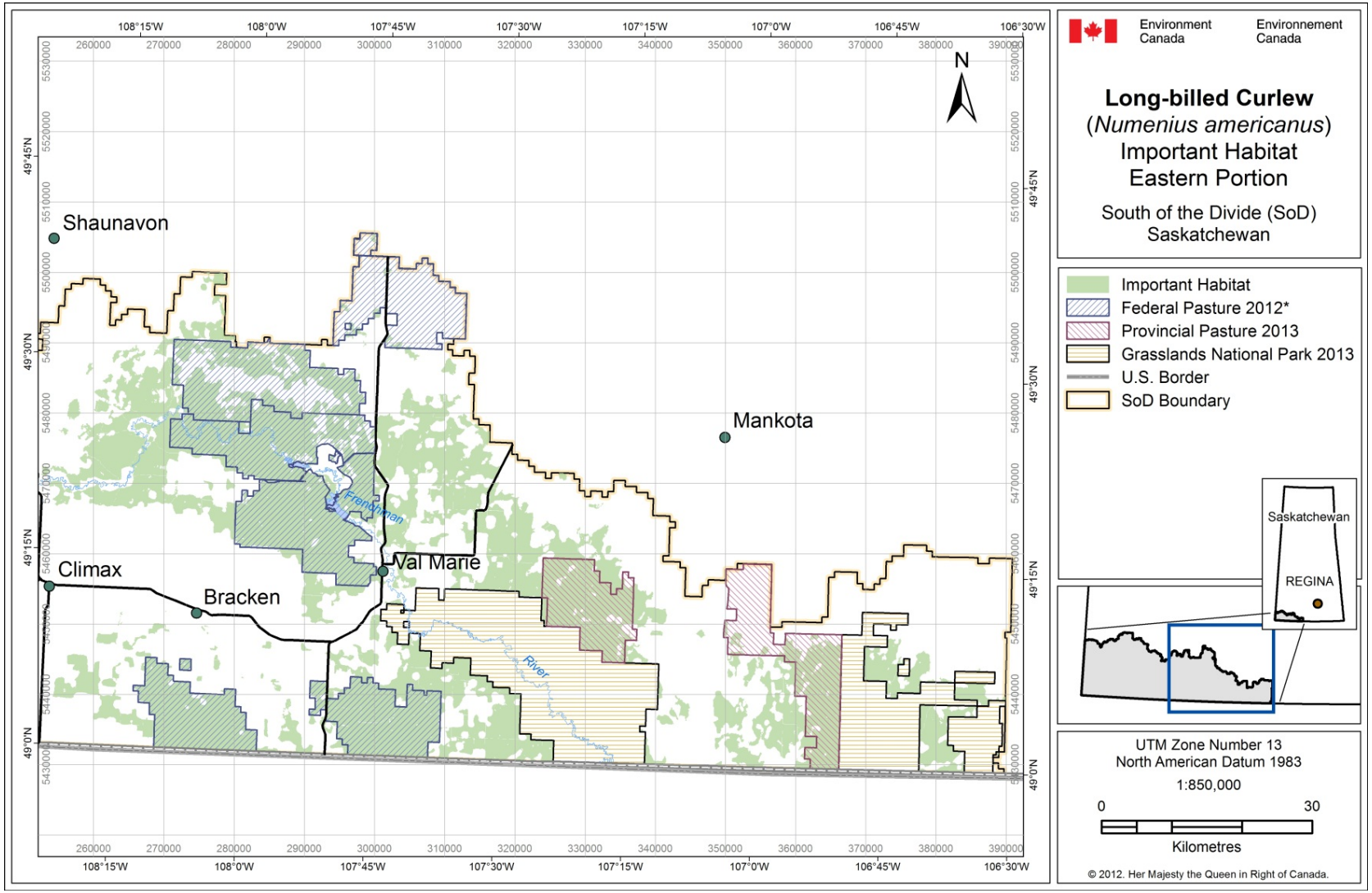

Figure 17. Important habitat for Long-billed Curlew - eastern part of the SoD area

Figure 17 (and Figure 16) show areas within which important habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 483,941 ha are provided to show areas that contain important habitat, where the criteria set out in Section 1.5.3 are met.

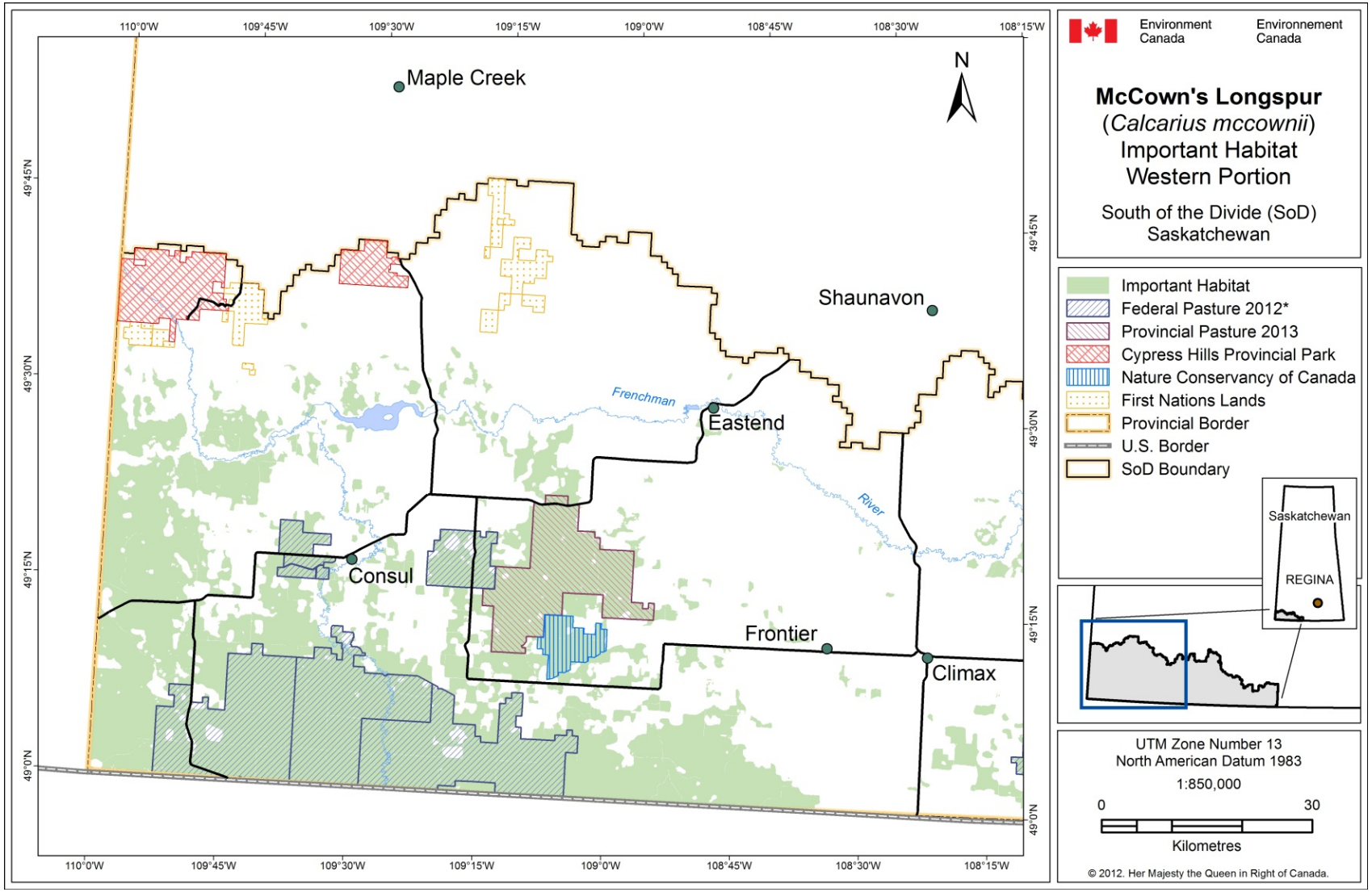

Figure 18. Important Habitat for McCown's Longspur – western part of the SoD area

Figure 18 (and Figure 19) show areas within which important habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 394,651 ha are provided to show areas that contain important habitat, where the criteria set out in Section 1.5.4 are met.

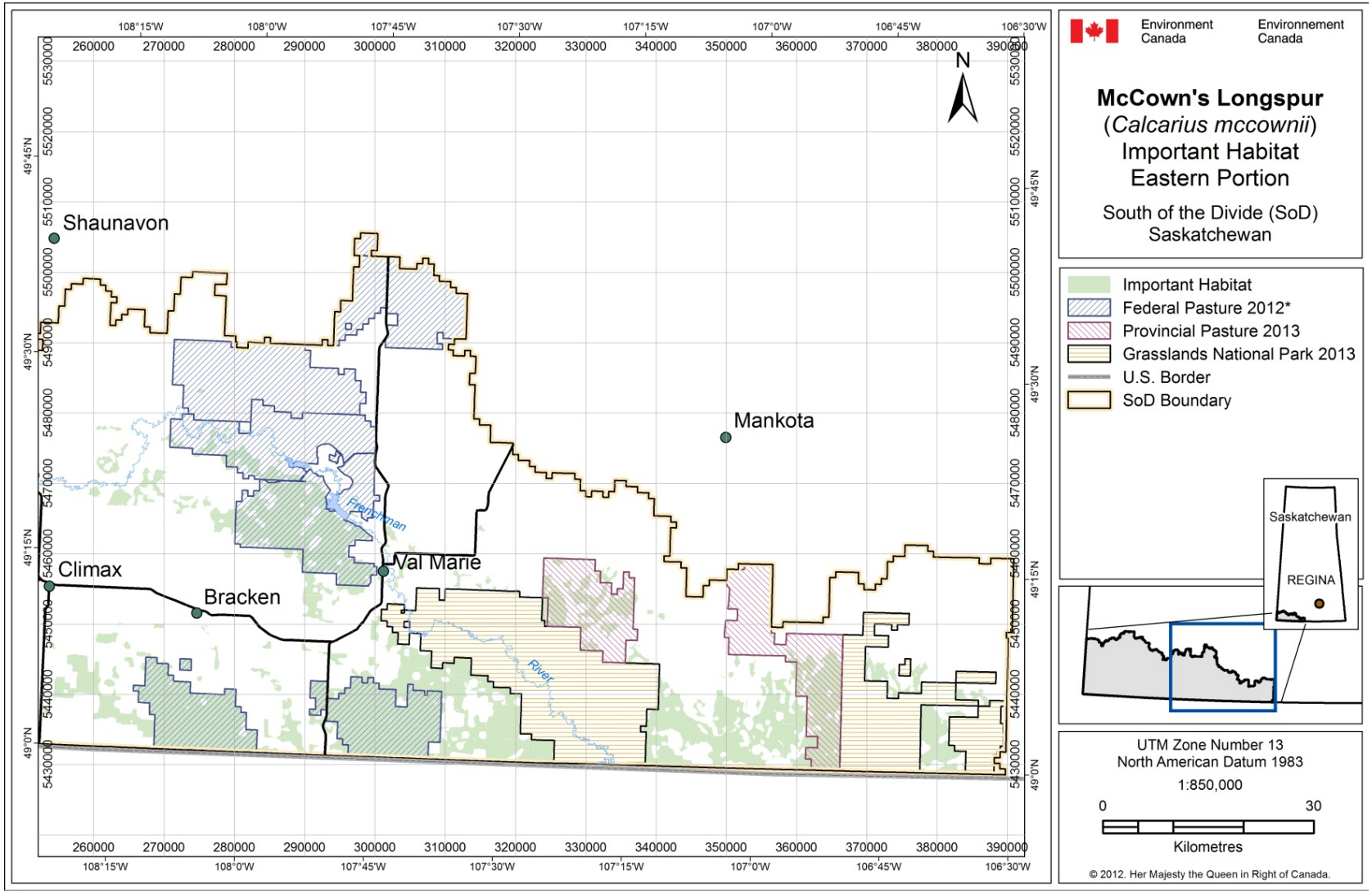

Figure 19. Important Habitat for McCown's Longspur - eastern part of the SoD area

Figure 19 (and Figure 18) show areas within which important habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 394,651 ha are provided to show areas that contain important habitat, where the criteria set out in Section 1.5.4 are met.

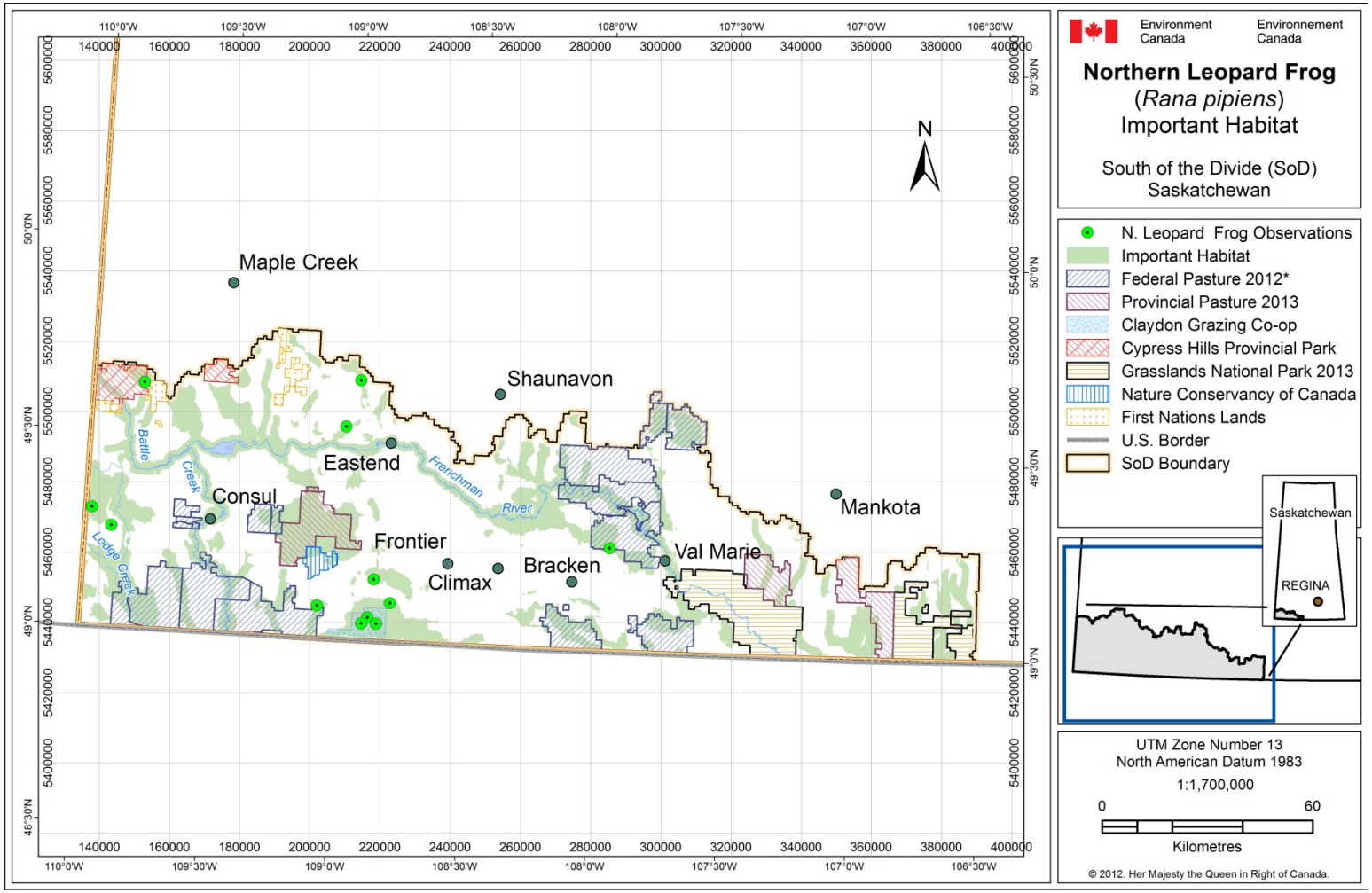

Figure 20. Important Habitat for Northern Leopard Frog
Areas within which important habitat is found in the South of the Divide area, Saskatchewan. Detailed polygons (shaded green) comprising approximately 447,118 ha are provided to show areas that contain important habitat, where the criteria set out in Section 1.5.5 are met. Note that only Northern Leopard Frog observations outside of Grasslands National Park are shown.

Appendix D: Critical Habitat Previously Identified for Black-footed Ferret and Greater Sage-Grouse

D.1 Black-footed Ferret

D.1.1 Identification of critical habitat for Black-footed Ferret

Critical habitat for Black-footed Ferret was described by Tuckwell and Everest (2009b) as follows:

> The critical habitat … is defined by the boundaries of the prairie dog colonies in Canada as of 2007 …, but excludes all existing roads and their ditches within these boundaries. This includes prairie dog colonies within the current boundary of Grasslands National Park, the Masefield Community Pasture (Agri-Environment Services Branch, Agriculture and Agri-Food Canada), the Dixon Community Pasture (Province of Saskatchewan), on provincially leased land and privately deeded land. The colonies that occur on lands managed by two landowners, which are on a combination of private and provincially leased lands, are within the boundary of the proposed Grasslands National Park. As part of the 1988 Parks Canada – Province of Saskatchewan Grasslands National Park establishment agreement, section 12.1 specifies that "Saskatchewan agrees to manage the proposed national park in a manner that recognizes the need to maintain the lands in their existing natural state for park purposes prior to the transfer of administration and control of such lands to Canada." This implies that those lands and prairie dog colonies within the proposed park boundary are afforded some protection.

Critical habitat for Black-footed Ferret in the SoD area is found within approximately 58 ha distributed over 9 quarter-sections (Figure 21).

D.1.2 Examples of activities likely to result in destruction of critical habitat for Black-footed Ferret

Activities likely to result in destruction of critical habitat for Black-footed Ferret were described by Tuckwell and Everest (2009b) as follows:

> Critical habitat for black-footed ferrets is destroyed when ferrets can no longer use any portion of a prairie dog colony for feeding, obtaining shelter and raising young. This happens when burrows collapse, fill in with soil or water or are excavated or otherwise blocked. Critical habitat is also destroyed if the vegetation community is changed dramatically and becomes too tall or obstructive, causing difficulty for ferrets in movement between burrow holes to obtain shelter, or increasing potential cover and perching opportunities for predators. The prairie dogs maintain this vegetation at levels suitable for the ferrets. Destruction of the critical habitat could happen due to physical alteration of the land or if the prairie dogs on a colony are destroyed and the colony is therefore no longer maintained. The fact that some pastures contribute to ferret habitat is evidence of the importance of large-scale grazing ecosystems. Proper grazing management and associated activities are compatible with critical habitat. Creation of new shallow pipelines may be compatible with critical habitat. Management practices that do not constitute destruction of critical habitat include the use and maintenance of:
>
> - existing fence lines;
> - existing shallow water pipelines and dugouts;
> - salting locations;
> - existing prairie tracks for vehicles including two-track trails; and
> - existing and emergency fire guards

Some examples of activities that may result in destruction of critical habitat, include, but are not limited to:

- cultivation;
- gravel extraction;
- industrial exploration, development and infrastructure;
- construction of new permanent fire gurads;
- deliberate flooding or filling;
- anthropogenic development (including roads or buildings; and
- destruction of enough prairie dogs (i.e. shooting, poisoning or other killing activity) to destroy the function of the prairie dog town for a ferret (i.e. ability to obtain food and maintain habitat)

In contrast, pre-existing agricultural activities, like sustainable livestock grazing, are compatible with critical habitat for ferrets. Existing roads are not included in the description of critical habitat and therefore road maintenance activities are not likely to result in destruction of critical habitat.

Only some of these activities alone, such as cultivation and flooding, are likely to destroy critical habitat. However, there are probably thresholds or threshold zones of habitat loss, habitat fragmentation, and changes to habitat conditions beyond which their cumulative effects would jeopardize the ability to achieve the recovery population and distribution objectives (Huggett 2005, Lindenmayer & Luck 2005, Jager et al. 2006, Bets et al. 2007, Rhodes et al. 2008). The cumulative effects of some combination of these activities could alter the habitat attributes and functions beyond a threshold necessary to achieve the population and distribution objectives for the species' recovery. Unfortunately these threshold values are unknown for ferret critical habitat at the time of writing of this [BFFE RS 2009] document.

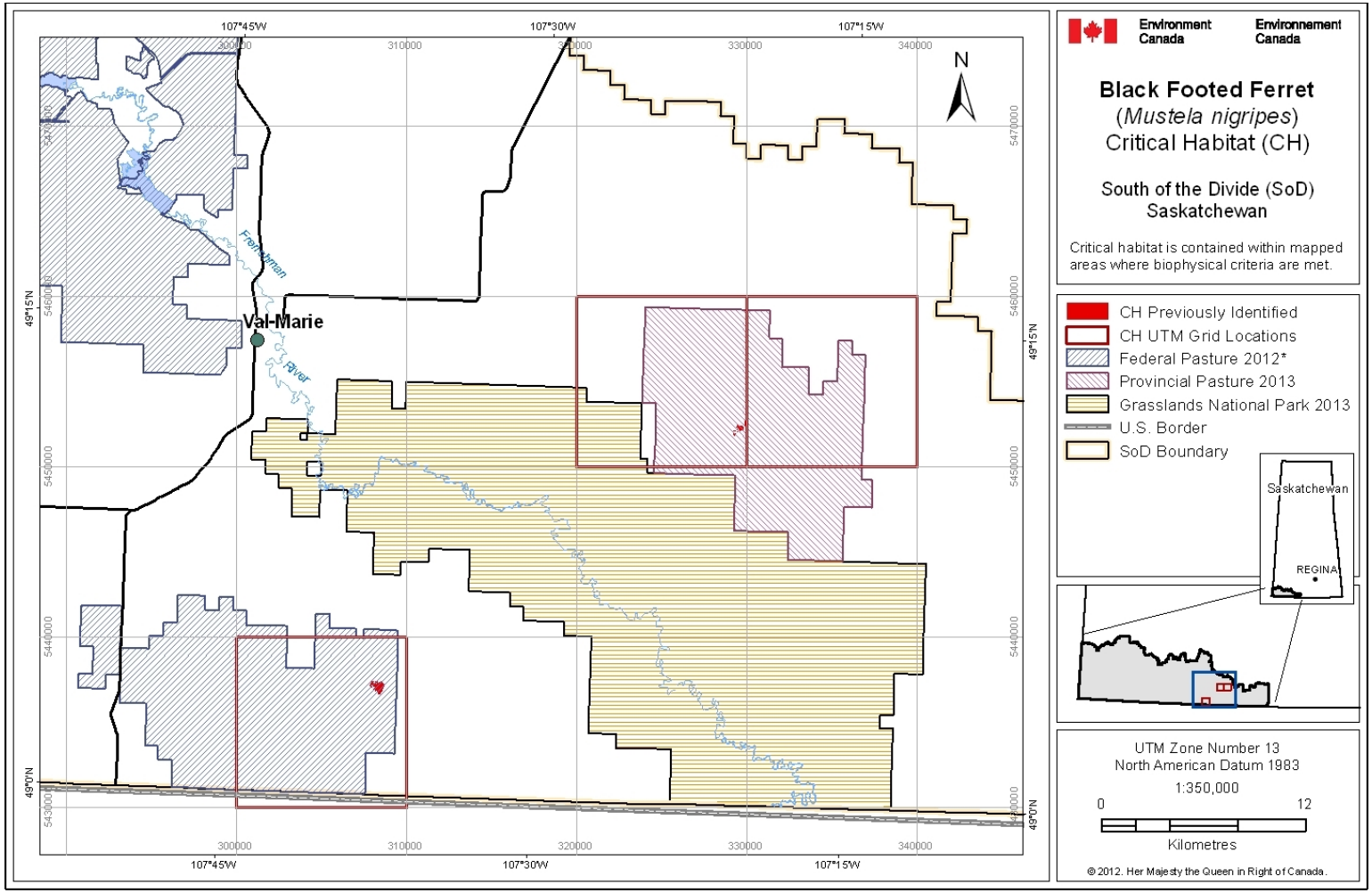

Figure 21. Critical Habitat for Black-footed Ferret
Areas within which critical habitat was previously identified for Black-footed Ferret (shaded red), comprising approximately 58 ha distributed over 9 quarter-sections within the SoD area (excluding Grasslands National Park). This is shown for the convenience of the reader. For details on previously identified critical habitat, see Tuckwell and Everest (2009b). The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the red shaded polygons do not contain critical habitat.

D.2 Greater Sage-Grouse

D.2.1 Identification of critical habitat for Greater Sage-Grouse

Within the SoD area, Greater Sage-Grouse critical habitat is found within approximately 94,842 ha distributed over 3,351 quarter-sections (**Error! Reference source not found.** & 23).

Critical habitat for Greater Sage-Grouse was fully identified in the Amended Recovery Strategy (Environment Canada 2014a), but has been included here for the benefit of the reader. For full context, the reader is encouraged to view the entire Greater Sage-Grouse Amended Recovery Strategy document, which may be found on the SARA Registry http://www.sararegistry.gc.ca

From p.23 (Section 7 Critical Habitat Environment Canada 2014a):

> Sage-Grouse are at very high risk of extirpation from Canada, with the current total population considerably lower than the population and distribution objectives for this species. Suitable habitats in which Sage-Grouse are most likely to have recently (2000–2012) occurred during any life stage (e.g., lekking, nesting, brood-rearing, or wintering), as well as additional leks last active in the 1980's or 1990's that have intact, suitable habitat currently surrounding them, represent critical habitat for survival and recovery of the species in Canada.
>
> **Identification of the Species' Critical Habitat**
>
> Critical habitat for the Sage-Grouse is fully identified in this Amended Recovery Strategy for nesting, brood-rearing, and wintering habitat (i.e., year-round habitats) that broadly surrounds all leks active in any year between 2000 and 2012 plus additional nearby leks last active in the 1980's or 1990's. The critical habitat attributes and locations are identified using the best available information, including documented field observations of Sage-Grouse from Alberta and Saskatchewan, the output from habitat modeling, and other scientific information on seasonal habitat requirements for the species. The following approaches were used to identify 1) lek critical habitat, and 2) year-round (nesting, brood-rearing, and winter) critical habitat for the Sage-Grouse, in Alberta and Saskatchewan.
>
> ***Lek critical habitat***
>
> Lek critical habitat was previously identified in the '*Replacement of Section 2.6 of the Recovery Strategy for the Greater Sage-Grouse in Canada*' (Parks Canada Agency 2009). All recently-active leks (where at least one displaying male Sage-Grouse was observed between 2000 and 2012) were identified as lek critical habitat, totaling 18 lek locations in Alberta and 11 lek locations in Saskatchewan. In this Amended Recovery Strategy, 12 additional leks last active in the 1980's or 1990's are also identified as critical habitat, 3 of which are in Alberta and 9 of which are in Saskatchewan (see Parks Canada Agency 2009 for details on how lek locations and extents were determined in the field within each province).
>
> Thus, a combined total of 41 suitable lek sites (21 in Alberta and 20 in Saskatchewan) are identified as mating critical habitat for Sage-Grouse survival and recovery, with a total area of 12.5 km^2. The total number of lek sites identified as critical habitat (41 potential leks) is greater than the number required to be active on a per-year basis (36 leks) under the long-term population and distribution objectives; this acknowledges the inherent uncertainty around predicting exactly which abandoned leks will become reoccupied in future years and also allows for some variation in which leks are active each year.
>
> All habitat within the boundaries of these 41 identified leks, which have a history of use by displaying Sage-Grouse, is identified as critical habitat. Although the most important feature of these leks is the recurrent occupancy that occurred in the past, to aid in locating these areas on the ground, the general biophysical attributes of leks are listed below:

• Typically lower elevation than surrounding areas
• Treeless and flat, with sparse vegetation (e.g., dried mud flats or valley bottoms)
• Adjacent to shrub-dominated habitats that are primarily silver sagebrush

The presence of certain human activities or structures on or near leks decreases the probability that Sage-Grouse will continue to occupy otherwise suitable leks, most likely because of behavioural avoidance of such areas by Sage-Grouse. As a result, the presence of Sage-Grouse is associated with lower amounts of these human factors, meaning that the following conditions (or 'attributes') are considered functionally important to lek critical habitat:

• Limited noise disturbance
• Limited human presence
• Limited presence of artificial perches, or artificial nest structures for avian predators of Sage-Grouse

Year-round (nesting, brood-rearing, and winter) critical habitat

In this Amended Recovery Strategy, a predictive occurrence-based model was used to identify critical habitat in Canada for Sage-Grouse nesting, brood-rearing, and winter life stages (i.e., year-round critical habitat). One benefit of such predictive models is that they identify suitable habitat not only in areas where Sage-Grouse occurrence data are available, but also where occurrence data are currently unavailable.

The updated model used in this Amended Recovery Strategy followed previous approaches of identifying suitable Sage-Grouse habitat in Alberta (Aldridge 2005, Aldridge and Boyce 2007, Parks Canada Agency 2009; see also Carpenter et al. 2010) but incorporated modifications and improvements that allowed it to be applied across a much larger geographic extent (Aldridge & Gummer 2010; Gummer & Aldridge 2010; Parks Canada Agency and Environment and Climate Change Canada unpubl. data). The model analysis (Parks Canada Agency unpubl. data) related Sage-Grouse nest locations (113 nests; 2001–2004) to habitat variables, and determined that nesting Sage-Grouse hens select relatively large patches of moderate and heterogeneously-distributed shrub cover (predominantly silver sagebrush), favour relatively moist areas, and avoid lush green vegetation cover. Environment and Climate Change Canada employed the updated model, which Parks Canada Agency originally developed, within the estimated recent nesting distribution for Sage-Grouse in Alberta and Saskatchewan, then tested this modeled habitat area against a set of other known Sage-Grouse occurrences against a set of other known Sage-Grouse occurrences (114 nests; 1998–2009) that had not been used for model development. The modeled habitat performed well, as it captured 88% of the known nests in this independent dataset. In addition, Environment and Climate Change Canada tested the habitat model against Sage-Grouse occurrences from other life stages (i.e., brood-rearing and winter), and showed that the modeled nesting habitat also contained a large proportion of the known brood-rearing (82% of 864 locations) and wintering (96%- of 296 locations) Sage-Grouse occurrences. This confirms that the modeled habitat provides a good representation of suitable 'year-round' habitat for Sage-Grouse.

Year-round (nesting, brood-rearing, and winter) critical habitat for Sage-Grouse was identified by the habitat suitability model through the calculation of optimal combinations of two or more of the following biophysical attributes:

• Moderate shrub cover, typically silver sagebrush with a patchy distribution
• Limited amounts of bare ground
• Moderately moist habitats (under average weather conditions)
• Limited amounts of lush green vegetative cover
• Adequate availability of prey (insects) and forage (forbs)

These areas were mapped using a geographic information system. Within these mapped boundaries, some habitats that are known to be unsuitable (human settlements, annual cropland, non-native hayland, water bodies, roads or roadsides) were identified using independent satellite imagery and then removed from the suitable habitat map. The remaining areas of suitable habitat were mapped within the western portion and the eastern portion of the species 2000–2012 range to indicate the year-round critical habitat for Sage-

Grouse in Canada. These identified areas encompass 2812 km2 of land (1410 km^2 in Alberta + 1402 km^2 in Saskatchewan), covering portions of 8360 quarter-sections (4026 in Alberta; 4334 in Saskatchewan). Within these mapped areas any remaining human settlements (including cities, towns, rural and agricultural residences, garages, shelters, barns etc.), annual cropland, non-native hayland, water bodies, roads or roadsides (i.e., land within 15m of roads), which were not identified using satellite imagery, and therefore had not been removed from the mapped areas (see previous paragraph), are not to be considered critical habitat.

The presence of other human activities or structures can decrease the probability that Sage-Grouse will occupy otherwise suitable habitat, most likely because of behavioural avoidance of such areas by Sage-Grouse. As a result, the presence of Sage-Grouse in suitable habitat is related to low amounts of these human factors, so the following conditions (or 'attributes') are considered functionally important to nesting, brood-rearing, and winter critical habitat:

- Limited human-modified areas
- Limited chronic noise disturbances
- Limited presence of artificial structures that serve as perches for large birds of prey

The critical habitat identified in this Amended Recovery Strategy is considered sufficient for meeting the long-term population and distribution objectives. Not only does the year-round critical habitat broadly surround the 41 leks identified as lek critical habitat, but it also encompasses much of the habitat in Canada within 10 km[8] of 50 historical leks that were last active in one or more years between 1968 and 1999 (but inactive fromm 2000 to present). The habitat areas in the vicinity of these 50 additional historical leks have high potential to provide recovery habitat for Sage-Grouse because they are adjacent to, or interspersed among, currently or recently occupied habitat and hence can be considered most likely to be re-colonized in the future. If the 41 leks identified as lek critical habitat herein were the only ones to become active in the future, then the average of 63.3 adults per lek (i.e. 21.1 males per lek: see "Spring popn. Low estimate" in Appendices B & C) would achieve the population objective. On the other extreme, if all of the 50 additional historical leks within these same areas also become occupied in the future, 28.5 adults per lek (9.5 males per lek) would achieve the population objective..

D.2.2 Examples of activities likely to result in destruction of critical habitat for Greater Sage-Grouse

From page 31 (Environment Canada 2014a):

This subsection of a recovery strategy describes the kinds of activities that are likely to cause the destruction of the critical habitat and provides examples of such activities. Information is provided on potential impacts to critical habitat and species populations that may result from these activities. This information is presented to help guide the recovery measures to be taken by Environment and Climate Change Canada and Parks Canada Agency, and other jurisdictions, organizations, and/or individuals involved in the conservation of Sage-Grouse and the protection of critical habitat for the species.

Destruction of critical habitat is determined on a case-by-case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from single or multiple activities at one point in time or from the cumulative effects of one or more activities over time (Government of Canada 2009).

Existing facilities and land uses in and adjacent to Sage-Grouse critical habitat may already affect that critical habitat to some degree, causing habitat quality to vary among specific sites within critical habitat. Since Sage-Grouse populations will require critical habitat to remain in at least as high a quality as it is

[8] 90% of nesting attempts are predicted to occur within 10 km of leks in Canada

currently, new types of activities that degrade any of the biophysical attributes, could destroy critical habitat. Some of these same activities could occur adjacent or outside critical habitat (i.e. sensory disturbance, tall structures immediately adjacent to critical habitat).

An *Emergency Order for the Protection of the Greater Sage-Grouse* (Emergency Order) was made to address the imminent threats of the Sage-Grouse within the habitat that is necessary for their survival or recovery. The Emergency Order contains prohibitions that apply on provincial and federal crown lands within a number of legal subdivisions[9], and along road allowances that lie between those legal subdivisions, that are listed in Part 1 or 2 of Schedule 1 of the Emergency Order. These legal subdivisions and associated road allowances include and broadly surround all leks occupied by one or more male Sage-Grouse in at least one of the years between 2007 and 2012. The area included in the Emergency Order overlaps with much of the critical habitat identified in this recovery strategy. There is also considerable overlap between the restrictions in the Emergency Order and the activities listed in the following four subsections of the Amended Recovery Strategy. Wherever the two documents address the same activities, the restrictions set out in the Emergency Order prevail over those set out in this recovery strategy. The critical habitat identified in this recovery strategy, most of which is also included in the Emergency Order, covers a total of 2812 km^2 plus 12.5 km^2 for leks.

In addition to the activities prohibited in the emergency order, example activities provided in the following non-exhaustive lists are likely to result in destruction of critical habitat:

1. Removal, reduction, or degradation of sagebrush and surrounding habitat

Sage-Grouse require year-round access to sagebrush for food and cover. Therefore, at any given time of year, the killing or moving of sagebrush results in direct habitat loss, reduced food availability and nesting cover, and increased exposure of Sage-Grouse to predation and inclement weather. In addition, activities that do not result in complete loss of sagebrush, but that significantly increase the proportion of bare ground, significantly decrease the proportion of native grasses and/or native forbs, or remove most of the leaves off sagebrush plants, may cause habitat degradation to the point where that habitat is no longer functional for Sage-Grouse. The population impact from such forms of habitat destruction can range from low to very high, depending on the amount of habitat removed or the severity and extent of habitat degradation by the given activity..
Given the above, the following are examples of activities likely to result in destruction of year-round critical habitat or lek critical habitat, at any time of year:

• Cultivating or converting sagebrush and surrounding habitatto an alternative vegetation type
• Constructing a gas or oil well
• Constructing a new road or widening an existing road
• Killing sagebrush by moving, cutting or applying herbicide
• Prolonged over-grazing to a point where the vegetation structure and plant community is no longer compatible with the habitat requirements of Sage-Grouse[10].

In some situations, appropriate management of Sage-Grouse habitat requires infrastructure to support particular grazing activities. More specifically, waterwells or dug-outs may need to be maintained, narrow-diameter waterlines may need to be installed or re-located, or salt blocks may need to be placed or moved. Individual activities such as these, which are necessary to maintain or improve habitat conditions

[9] - A unit of land described in the Dominion Land Survey System that is ¼ of a quarter-section and has an area of approximately 16 ha or 400 m by 400 m.

[10] Grazing systems that result in light spring grazing or that defer grazing to later in the summer or fall, and have an average range health score of good to excellent (Adams et al 2004), are most likely to provide high quality habitat for Sage-Grouse and avoid destruction of critical habitat. Specific beneficial practices will vary among ranch operations depending upon factors such as fire and grazing history, current range condition and the degree to which critical habitat areas are preferred by livestock for grazing relative to other portions of pasture untis.

for Sage-Grouse over relatively large areas, should be assessed on a case-by-case basis, within the context of habitat management for the overall site, to determine whether or not they are considered to be destruction of critical habitat.

2. Altering natural hydrology

Activities that alter the natural hydrology of the habitat may negatively alter site conditions for silver sagebrush growth or regeneration, and for forb production, thereby reducing food availability and foraging ability for Sage-Grouse, as well as degrading vegetative cover that Sage-Grouse use for concealment from predators.

Therefore, the following are examples of activities likely to result in destruction of year-round critical habitat or lek critical habitat, at any time of year:

• Constructing a dike, canal, ditch or dam within, or upstream or downstream from critical habitat, such that the natural hydrology within critical habitat is altered to the extent that silver sage and surrounding native grass and/or natural forb habitat is degraded (the distance at which a water control structure may impact critical habitat is dependent on the nature of the project)
• Digging a depression in the ground to create a large dugout or man-made wetland inside any critical habitat such that silver sagebrush and forb habitat conditions in the vicinity are directly or indirectly degraded
• Creating a linear impediment to drainage (e.g., an earthen berm or elevated road bed) that alters overland runoff or flow within critical habitat such that silver sagebrush and forb habitat conditions are directly or indirectly degraded

3. Acoustically degrading habitat

Constructing or installing a new structure or machine, that creates long-term continuous or intermittent (i.e., chronic) noise will likely result in avoidance of habitat by Sage-Grouse and, thus, in functional destruction of critical habitat.
Therefore, the following are examples of activities likely to result in destruction of critical habitat when conducted anywhere within year-round or lek critical habitat at any time of year:

- Constructing a new road, or widening an existing road
- Placing or installing a generator that produces continuous, regular, or intermittent sounds greater than 45 decibels (A-weighted)
- Installing an oil pump-jack or natural gas compressor station that produces continuous, regular, or intermittent sounds greater than 45 decibels (A-weighted)
- Erecting a wind turbine that produces continuous, regular, or intermittent sounds greater than 45 decibels (A-weighted)

During the mating period, repeated sound levels greater than 45 decibels (A-weighted) on or near lek critical habitat can lead to reduced attendance by Sage-Grouse at leks and to long-term lek abandonment, and thus to functional destruction of lek critical habitat. Therefore, when Sage-Grouse are typically at leks, which is during evening and morning display periods and the intervening ni-ght-time hours (i.e., from 1.5 hours prior to sunset until 1.5 hours after sunrise, between April 1st and May 30th, operating infrastructure or performing activities that produce noises greater than 45 decibels (A-weighted) inside or within 3.2 km of any lek critical habitat likely destroys lek critical habitat. When conducted during the mating season within these times and locations, the following are examples of activities likely to result in destruction of lek critical habitat:

• Drilling for natural gas or oil
• Conducting 2-D or 3-D seismic exploration
• Operating an oil pump-jack or natural gas compressor station
• Operating loud vehicles on a road
• Operating loud off-road or all-terrain vehicles

Also, during the mating period, repeated pedestrian or non-motorized traffic on or near lek criticak habitat may lead to avoidance of the lek, reduced mating opportunities, and long-term lek abandonment, and thus to functional destruction of lek critical habitat. Therefore, when Sage-Grouse are typically at leks, which is during evening and morning display periods and the intervening night-time hours (i.e., from 1.5 hours prior to sunset until 1.5 hours after sunrise, between April 1st and May 30th), pedestrians or non-motorized traffic inside, or woithin 1 km of, any lek critical habitat likely destroys lek critical habitat. Examples of such activities likely to result in the destruction of lek critical habitat include:

- Photography and other recreational or professional viewing

4. Constructing, erecting, or installing vertical structures

The introduction of new elevated anthropogenic structures results in both direct habitat loss, and a more substantive functional loss of habitat because Sage-Grouse are more likely to avoid the area surrounding structures upon which birds of prey seem likely to perch. Furthermore, habitat suitability is reduced around such vertical structures because survival of Sage-Grouse is reduced.

Therefore, at any time of the year, inside of any critical habitat or at locations less than 1.0 km from lek critical habitat, the followiuing are examples of activities likely to result in the destruction of critical habitat:

• Constructing or installing a gas or oil well with any component reaching a height that exceeds 1.2 m
• Constructing a new building, or adding to an existing building, such that the final height is greater than 1.2 m
• Constructing, installing or erecting a post, pole, tower, or wind turbine that has a final height greater than 1.2 m (e.g., utility pole, hawk nesting platform)

In addition, at any time of year, at locations further than 1 km from but closer than 3.2 km to lek critical habitat, the following are examples of activities likely to result in destruction of lek critical habitat:

• Constructing, installing or erecting a wind turbine or tower (e.g., cell phone tower, radio tower, transmission tower) taller than 10 m

Lastly, fences installed inside or near leks have the potential to improve the efficiency of avian or mammalian predators where grouse are out in the open and most conspicuous (i.e. at leks), and thus represent an increased risk of predation for Sage-Grouse. This increased risk of mortality near fences equates to a decrease in habitat quality.

Therefore, at any time of the year, at locations inside of lek critical habitat or within 1.0 km of lek critical habitat, the following are examples of activities likely to result in destruction of lek critical habitat:

• Constructing or installing a fence without post-top perch-deterrents or without fence-wire markers (i.e. a fence that is not designed to minimize Sage-Grouse mortality) in a location where no fence existed.

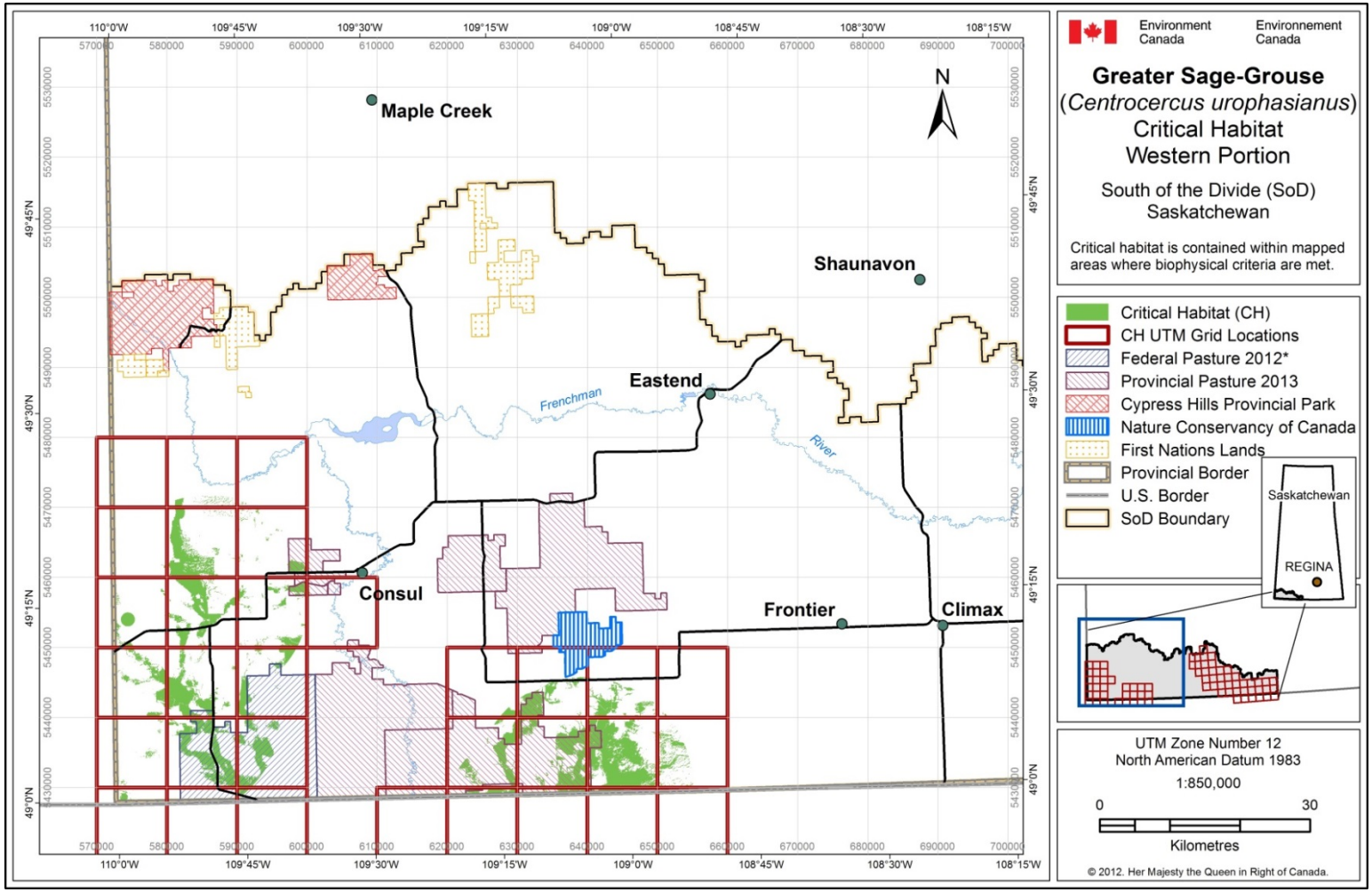

Figure 22. Critical Habitat for Greater Sage-Grouse: western part of the SoD area

Figure 22 (and Figure 23) show areas within which critical habitat was previously identified for Greater Sage-Grouse (shaded green), comprising approximately 94,842 ha distributed over 3,351 quarter sections within the SoD area (excluding Grasslands National Park). **This is shown for the convenience of the reader**. For details on previously identified critical habitat, including that contained within the boundaries of GNP, see Environment Canada (2014a). The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded polygons do not contain critical habitat, unless contained within GNP as noted above.

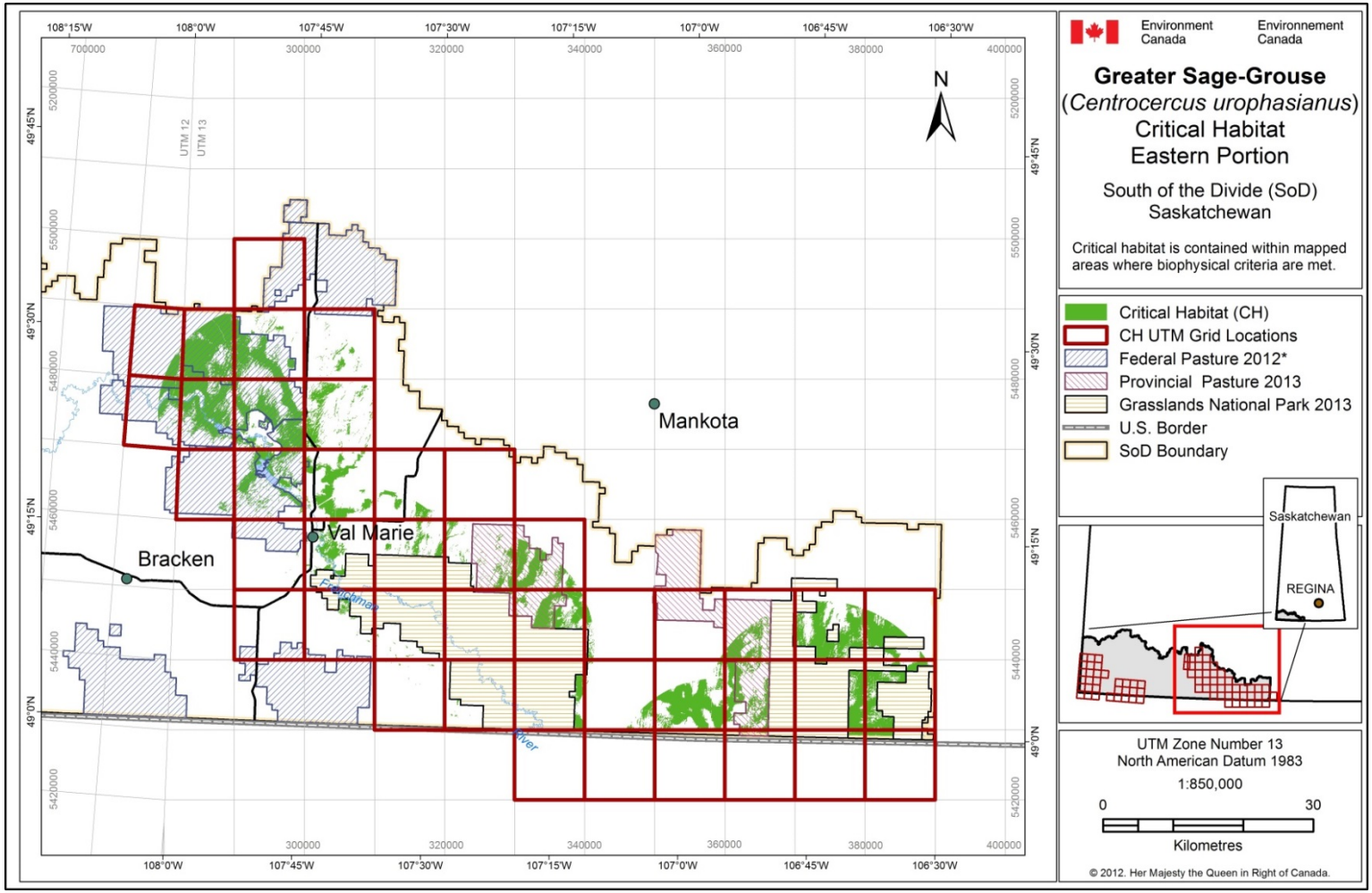

Figure 23. Critical Habitat for Greater Sage-Grouse: eastern part of the SoD area

Figure 23 (and Figure 22) show areas within which critical habitat was previously identified for Greater Sage-Grouse (shaded green), comprising approximately 94,842 ha distributed over 3,351 quarter sections within the SoD area (excluding Grasslands National Park). **This is shown for the convenience of the reader.** For details on previously identified critical habitat, including that contained within the boundaries of GNP, see Environment Canada (2014a). The 10 x 10 km UTM grid squares (red outline) shown on this figure are part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the green shaded polygons do not contain critical habitat , unless contained within GNP as noted above.

Appendix E: Glossary of terms

action plan – a recovery planning document that sets out the recovery measures that are to be taken to implement the recovery strategy, including those that address the threats to the species and those that help to achieve the population and distribution objectives, as well as an indication as to when these measures are to take place. If critical habitat was not fully identified in the recovery strategy, the action plan must include and identification of critical habitat, to the extent possible, based on the best available information and consistent wit the information presented in the recovery strategy, and examples of activities that are likely to result in its destruction. An action plan also includes a statement of measures proposed to protect critical habitat, and a socio-economic assessment of the action plan. For a complete description of what an action plan under SARA must include, please refer to section 49 (1) of the Act.

biophysical attributes – biological and physical characteristics (e.g., vegetation type, terrain, elevation, soil type, microhabitat features, etc.) used to describe the critical habitat of a species at risk.

competent minister – as defined in in section 2 of SARA, competent minister means (a) the Minister responsible for the Parks Canada Agency with respect to individuals in or on federal lands administered by that Agency; (b) the Minister of Fisheries and Oceans with respect to aquatic species, other than individuals mentioned in paragraph (a); and (c) the Minister of the Environment with respect to all other individuals. One of the responsibilities of a competent minister is to ensure that recovery strategies and action plans or a management plan is prepared for species listed on Schedule 1 of SARA.

conservation agreement – an agreement between a landowner and an agency intended to encourage conservation on privately managed land. One example of a conservation agreement is a conservation easement, which is a legally binding agreement (or instrument) whereby the landowner transfers specific rights to an easement holder, usually a nature conservation organization or agency, that may benefit a species at risk or enhance its survival in the wild. An easement may be granted to protect, enhance or restore a natural area, or simply preserve an open stretch of land. A voluntary easement may qualify as an ecological gift under the *Income Tax Act* of Canada.

COSEWIC - Committee on the Status of Endangered Wildlife in Canada. This Committee was established in 1977 to provide scientifically sound assessments on the status of wildlife species in Canada. The role of COSEWIC is to recommend to the Minister of Environment and Climate Change which species to include in SARA.

critical habitat - the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as critical habitat in the recovery strategy or action plan for the species.

critical habitat identification - the first step in a process intended to ensure that critical habitat is protected from human activities that would result in its destruction. Critical habitat must be identified to the extent possible and be based on the best available information, within the timelines required for the completion of a recovery strategy or action plan.

endangered species - a wildlife species that is facing imminent extirpation or extinction.

extirpated species - a wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.

federal land – as defined in section 2 of SARA, federal land means (a) land that belongs to Her Majesty in right of Canada, or that Her Majesty in right of Canada has the power to dispose of, and all waters on and airspace above that land; (b) the internal waters of Canada and the territorial sea of Canada; and (c) reserves and any other lands that are set apart for the use and benefit of a band under the Indian Act, and all waters on and airspace above those reserves and lands. Examples of federal lands include: National Parks, National Wildlife Areas, some Migratory Bird Sanctuaries, some Agriculture and Agri-Food Canada community pastures, First Nations reserve lands, and some military training areas.

habitat – as defined in section 2 of SARA (for non-aquatic species), habitat is the area or type of site where an individual or wildlife species naturally occurs or depends on directly or indirectly in order to carry out its life processes, or formerly occurred and has the potential to be reintroduced.

implementation schedule - a schedule that sets out the timing of specific recovery measures.

important habitat - areas that are deemed of importance to "species of special concern".

management plan – as desribed in section 65 of SARA, a management plan must be prepared for species listed as special concern and must include measures for the conservation of the species that the competent Minister considers appropriate. The management plan may apply with respect to more than one wildlife species.

measures proposed to protect critical habitat (on non-federal lands) - instruments of a legally-binding nature under provincial or territorial laws or under SARA or other acts of Parliament, as well as conservation measures such as conservation agreements, that prevent critical habitat from being destroyed and ultimately contribute to the recovery of the species.

provincial lands - Crown Lands held by the province, where the land title and/or the abstract identify these lands as "Her Majesty the Queen in Right of the Province of Saskatchewan". Provincial lands include: park lands (e.g. Provincial Parks, Protected Areas), Fish and Wildlife Development Fund (FWDF) lands, Resource Crown Lands, and Agricultural Crown Lands.

provincial wildlife minister - any minister of the government of a province who is responsible for the conservation and management of a wildlife species in that province.

public comment period – consistent with SARA (s. 50(2)), a proposed Action Plan must be posted on the SAR Public Registry for a period of 60 days; any person may file written comments with the competent minister during that time. Within 30 days of the end of the public comment period all comments must be considered and the Action Plan finalized.

public registry - an online service that provides access to information and documents developed under SARA. It supports public participation in decision making, by providing an opportunity to comment on SARA-related documents being developed by the Government of Canada. Available at www.sararegistry.gc.ca

recovery strategy – a recovery planning document that describes the species and its needs, identifies the threats to the species and its habitat, identifies the species' critical habitat to the extent possible based on the best available information, identifies population and distribution objectives for the species and a general description of the research and management activities needed to meet those objectives. Please refer to section 41 (1) of SARA for a complete description of what a recovery strategy must address.

SARA – the *Species at Risk Act* is a federal act that takes a cooperative approach to working with land managers and provincial governments to protect species at risk and their habitats. The purposes of the Act are: 1) to prevent wildlife species from becoming extinct or extirpated (gone from the wild in Canada); 2) to help recover extirpated, endangered or threatened species, and 3) to manage species of special concern to prevent them from becoming endangered or threatened.

socio-economic evaluation - analysis required by SARA (s. 49(1)(e)) to be undertaken and included in an action plan. The competent minister must undertake an evaluation of the social and economic costs of recovery measures proposed in an action plan, ensuring that the scale and scope of the analysis is proportionate to the magnitude and complexity of potential impacts.

species at risk - an extirpated, endangered, or threatened species, or a species of special concern.

special concern - a wildlife species that may become a threatened or endangered because of a combination of biological characteristics and identified threats.

stakeholder – anyone who can affect the objectives of the SoD project or is affected by them (definition agreed on at SoD Stakeholders Meeting #5, June 4, 2013)

threatened species - a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

threats assessment - assessment of natural and anthropogenic (man-made) threats to a species at risk, that if not reversed or mitigated may lead to the further endangerment of the species, or may prevent the recovery of the species. Threats are often cumulative in their effects; that is they operate together with other threats to adversely affect the species.

wildlife species - a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and (a) is native to Canada; or (b) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.