Species at Risk Act
Recovery Strategy Series

Replacement of Section 2.6 of the Recovery Strategy for the Greater Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada

Greater Sage-Grouse

Parks Canada Parcs Canada

Canada

Replacement of Section 2.6 of the following Recovery Strategy

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

Additional copies:

Additional copies can be downloaded from the SAR Public Registry (http://www.sararegistry.gc.ca/).

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Disponible aussi en français sous le titre Remplacement de la section 2.6 du programme de rétablissement du Tétras des armoises du Canada (*Centrocercus urophasianus urophasianus*) .

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NOTE

The Replacement of Section 2.6 of the Recovery Strategy for the Greater Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada is pursuant to the Order of the Federal Court of Canada, dated 9 September 2009, Docket: T-241-08.

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Thanks to all the ranchers, farmers, and other land managers who have helped conserve Sage-Grouse and sagebrush habitat on their land. Thanks to the Governments of Alberta and Saskatchewan for their important contributions to this document.

INTRODUCTION

This document replaces section 2.6 of the "Recovery Strategy for the Greater Sage-Grouse (*Centrocercus urophasianus urophasianus*) in Canada" (Lungle and Pruss 2008), which was posted on the Species at Risk Public Registry on January 14, 2008 (http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=305)

This document includes a partial identification of critical habitat in Alberta and Saskatchewan for the Greater Sage-Grouse (henceforth called Sage-Grouse). The Federal Government, in cooperation with the provinces and other partners, is continuing work that will lead to the identification of additional critical habitat in future recovery planning documents, in an effort to meet the population and distribution objectives for the recovery of the Sage-Grouse in Canada.

2.6 CRITICAL HABITAT

Critical habitat is defined in the Species at Risk Act (2002) section 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". Ideally, critical habitat will be identified based on a range-wide analysis of the amount, locations, and attributes of habitat required to meet the population and distribution objectives for the species. However, in the absence of range-wide information, critical habitat must be identified to the extent possible, based on the best available information. In such cases, critical habitat can be partially identified (i.e., identified in areas where adequate information is available).

2.6.1 Information Used to Identify Critical Habitat Locations and Attributes

The locations and attributes of critical habitat were identified using the best available information, including the output from a habitat modeling study, other scientific information about the seasonal habitat requirements of the species (summarized in section 1.4.3 of the Recovery Strategy), and field data collected by provinces and federal departments. The following approaches were used to partially identify breeding, nesting, and brood-rearing critical habitat for the Sage-Grouse in Alberta and Saskatchewan.

Breeding habitat (lek) locations
Leks are open areas where male and female Sage-Grouse aggregate, males engage in competitive displays, and mating occurs (Connelly *et al.* 2000). For the purpose of critical habitat identification under the Species at Risk Act (2002), active leks are defined as locations where at least one displaying male Sage-Grouse has been observed since the spring of 2000. Lek locations and bird counts were obtained from Alberta Fish & Wildlife, the Saskatchewan Conservation Data Centre (CDC), and the Parks Canada Agency. The locations and extent of leks were determined using slightly different methods in the two provinces. Saskatchewan provided 'Element Occurrence' (EO) data for leks. This approach uses repeated observations of displaying birds over many years to estimate the location and extent of each lek. Alberta provided point locations for leks. In order to delineate the extent of the critical habitat for each lek in Alberta, a circle of radius 140 m was added to each point. This is the size of the largest of ten leks observed during one breeding season in Alberta.

Nesting and brood-rearing habitat locations
Aldridge (2005) developed nesting and brood rearing habitat models for Sage-Grouse for his study area near Manyberries, Alberta (see also Aldridge and Boyce 2007). These habitat models compared radio-telemetry locations of Sage-Grouse to information on habitat characteristics to develop statistical

models of the relative probability of different areas being used by Sage-Grouse. Aldridge further refined these results to identify what he called 'source' and 'sink' areas, based on nest success and chick survival observed over four years of fieldwork. Source areas were defined as those areas where Sage-Grouse were likely to occur and have high reproduction and survival rates, whereas sink areas were habitats where Sage-Grouse were likely to occur but have relatively lower reproduction and survival rates.

The results of Aldridge (2005) have been carefully reviewed and although the study was not designed to identify "critical habitat", as defined under the Species at Risk Act (2002), the locations he classified as source habitat (for both nesting and brood-rearing) are believed to be important for the survival and recovery of Sage-Grouse. These areas, therefore, are included in this initial identification of nesting and brood-rearing critical habitat, recognizing that it is an important first step towards a more comprehensive identification of critical habitat for Sage-Grouse in Canada.

Habitat attributes

Several sources of information were used to identify the attributes of critical habitat for Sage-Grouse, including peer-reviewed published papers, unpublished information from government departments, and recent research results (Aldridge 2000, Connelly *et al.* 2000, Thorpe *et al.* 2005). The identification of the habitat attributes that are considered necessary for the survival and recovery of Sage-Grouse complements the results of the habitat modeling (Aldridge 2005), which identifies the location of nesting and brood-rearing habitat in Alberta and Saskatchewan.

2.6.2 Critical Habitat Identification

The critical habitat identified here is believed to be necessary, but not sufficient, for Greater Sage-Grouse survival and recovery in Canada. Further work is required to identify additional critical habitat necessary to support the population and distribution objectives for recovery of the species.

The location and extent of critical habitat are shown in Figures 1 & 2. Quarter-sections that contain critical habitat are listed in Appendix 1. A fine-scale version of Fig. 2 is available on the SAR Public Registry and more detailed information will be provided to affected parties upon request. In accordance with section 124 of the Species at Risk Act (2002), and upon the advice of the Committee on the Status of Endangered Wildlife in Canada (J. Hutchings, pers. comm. 2009), the precise locations of leks are not provided to protect them from potential human disturbance. Because only leks can be identified as critical habitat in Saskatchewan at this time, there are no Saskatchewan quarter-sections listed in Appendix 1.

Critical habitat includes Aldridge's (2005) 'source' nest and brood-rearing habitat in the area of Manyberries, Alberta and all 29 known active leks as of 2007 (where at least one displaying male had been observed since the spring of 2000) throughout the current range of Sage-Grouse in Alberta and Saskatchewan. Within these areas, existing infrastructure (e.g., roads, gas wells, houses) and existing cultivated areas and haylands are not critical habitat.

Within the identified geographical boundaries, the biophysical attributes of breeding critical habitat (leks) include the following (Ellis 1984, Aldridge 2000, Connelly *et al.* 2000, Holloran 2005, Thorpe *et al.* 2005):

- open areas of sparse vegetation,
- widely spaced sagebrush,
- very limited noise disturbance,
- limited human presence,

- limited presence of artificial perches and nest sites for avian predators of Sage-Grouse.

Within the identified geographical boundaries, the biophysical attributes of nesting and brood-rearing critical habitat include the following (Garber *et al.* 1993, Aldridge and Brigham 2002, Aldridge 2005, Holloran 2005, Aldridge and Boyce 2007):

- moderate sagebrush cover,
- patchy distribution of sagebrush,
- little bare ground,
- moderately moist habitats,
- availability of prey (insects) and forage (forbs),
- limited human-modified areas,
- limited noise disturbance,
- limited presence of artificial perches for avian predators of Sage-Grouse.

It is not currently possible to provide the specific amounts or levels of these critical habitat attributes required by Sage-Grouse. The federal government will continue to work to develop an understanding of such levels and thresholds in quantifiable terms.

The quality of the identified critical habitat is variable, affecting local population density and reproductive success. Some areas of the critical habitat are of lower quality due to natural variation or the proximity of infrastructure and agricultural fields but they are nevertheless necessary for the survival or recovery of the species.

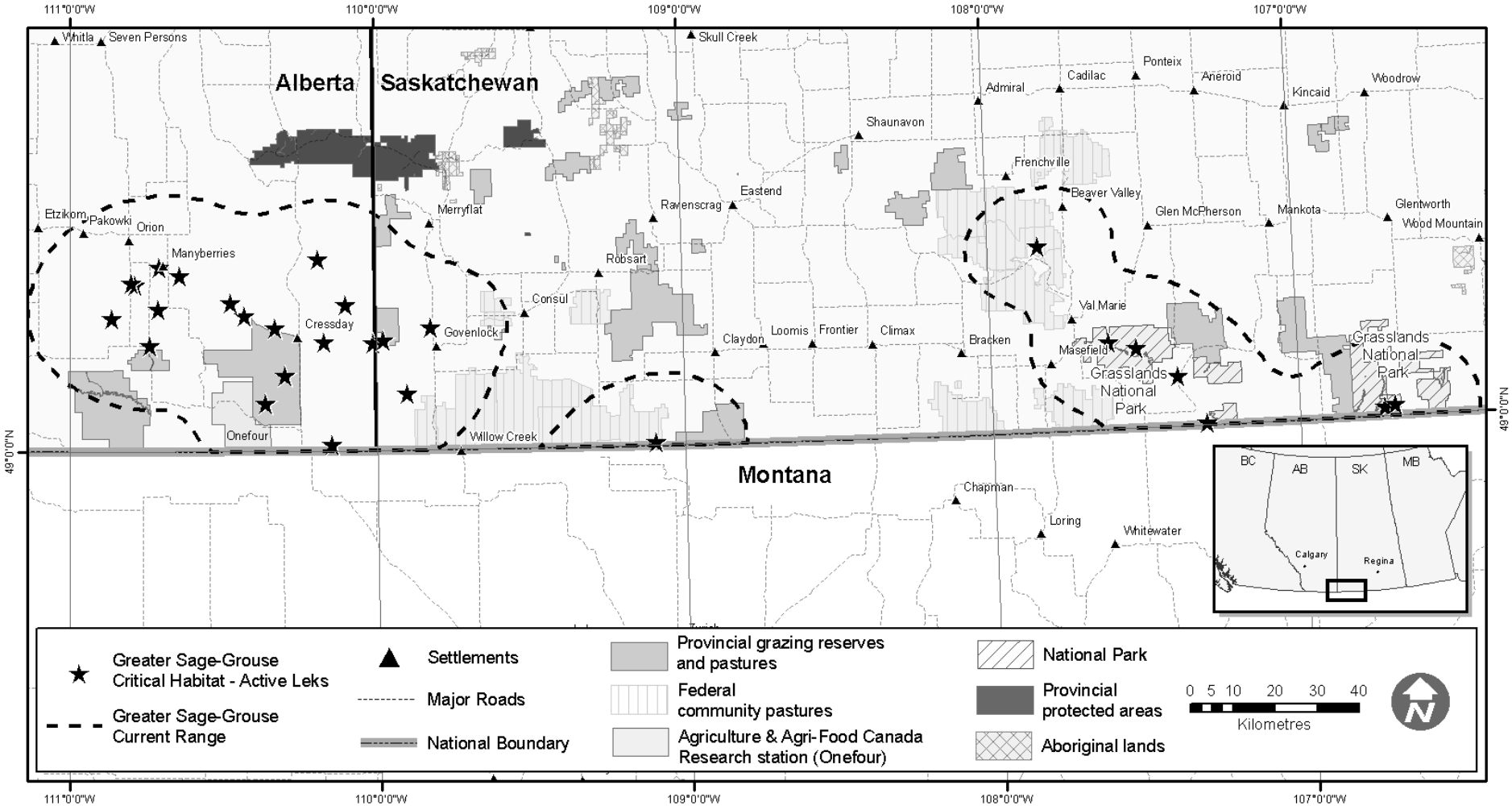

Figure 1. General locations of breeding (lek) critical habitat for the Greater Sage-Grouse in Alberta and Saskatchewan.

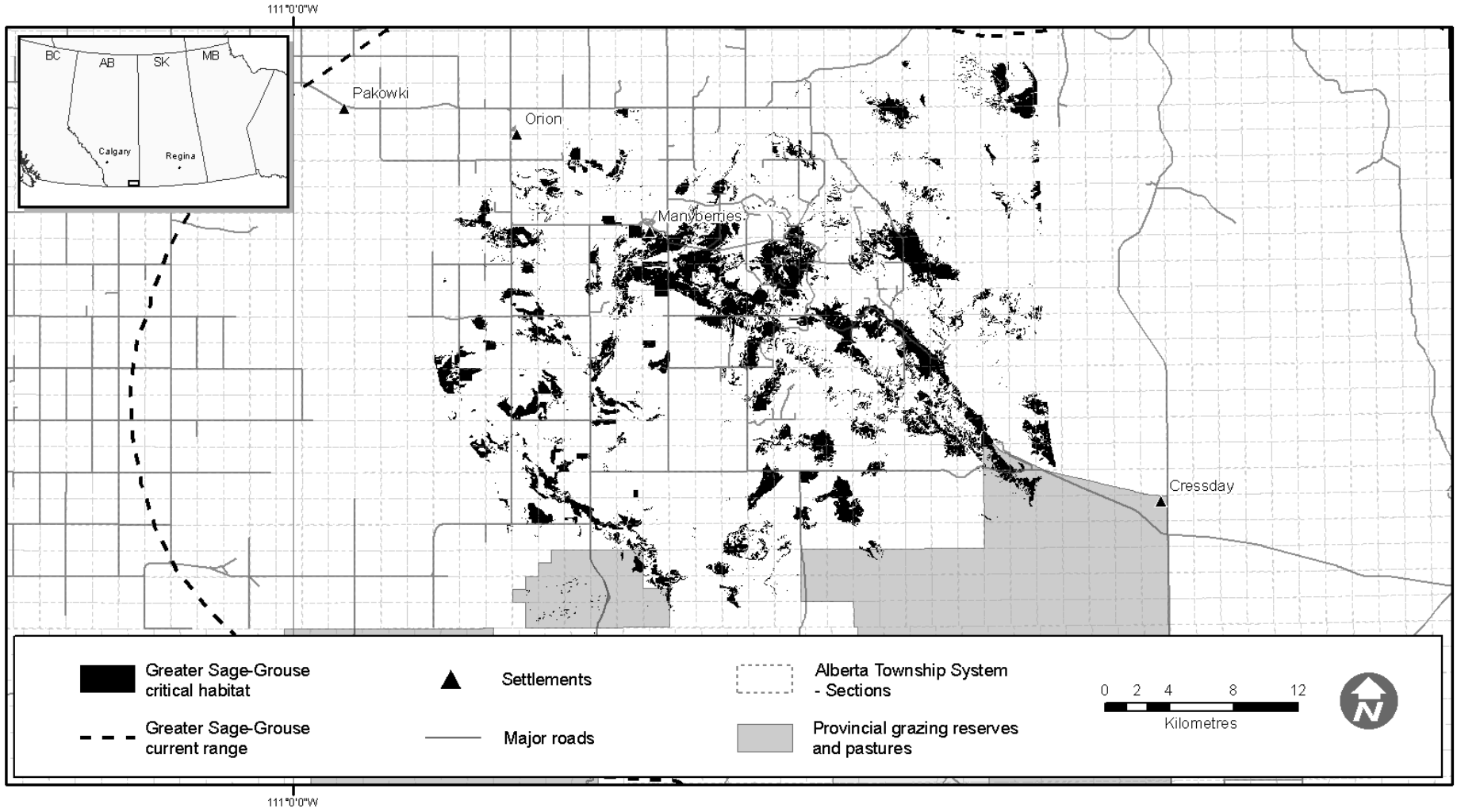

Figure 2. Location and extent of nesting and brood rearing critical habitat for the Greater Sage-Grouse in Alberta

2.6.3 Activities Likely to Destroy Critical Habitat

The current range of Sage-Grouse in Canada has been reduced to approximately 6% of the historic range, due primarily to the loss and degradation of native sagebrush habitat (Aldridge and Brigham 2002). However, certain land management and stewardship activities of local residents have conserved sagebrush habitat. For example, some range management practices for the production of livestock on native prairie are compatible with Sage-Grouse nesting and brood-rearing habitat when they maintain moderate cover of sagebrush with a patchy distribution and do not result in large increases in the amount of bare ground. However, as has occurred throughout most of the historic range, other human activities may result in the destruction of critical habitat.

Destruction 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.

For example, Sage-Grouse breeding, nesting, and brood-rearing critical habitat may be destroyed by activities that have the following effects at certain times of the year (Ellis 1987, Aldridge and Brigham 2002, Holloran 2005, Walker *et al*. 2007, Doherty *et al.* 2008):

- loss or disturbance of vegetation and/or soil substrate,
- disturbance or reduction of appropriate levels of sagebrush cover,
- increase in bare ground,
- increase in human-modified areas,
- increase in noise disturbance,
- changes in vertical structure of prairie habitat that lead to an increase in predator density (e.g., by increasing perching and nesting areas for avian predators),
- reduction in prey or forage availability.

Examples of activities on critical habitat that will result in destruction of critical habitat (Holloran 2005, Kaiser 2006, Aldridge and Boyce 2007, Walker *et al*. 2007, Doherty *et al.* 2008) include, but are not limited to:

- cultivation and/or conversion of native prairie to annual cropland or non-native pasture,
- construction of roads,
- industrial development such as the construction of oil and gas wells.

Examples of activities on or near critical habitat that may result in destruction of critical habitat (Holloran 2005, Kaiser 2006) include, but are not limited to:

- gravel extraction,
- some industrial exploration and development,
- construction of fire guards,
- infrastructure and other anthropogenic development (including roads or buildings).

It is recognized that existing facilities and land uses in and adjacent to critical habitat already affect critical habitat, to various degrees, and may decrease the quality of certain portions of critical habitat. Lower quality or sub-optimal areas are nonetheless included as critical habitat because they serve a biological function for the species, and because there is currently not enough optimal habitat to adequately support population and distribution objectives. Any new, additional, or increases in activity (including the construction of new facilities) may cause the destruction of critical habitat. Thus, in high

quality critical habitat, *any* degradation may constitute destruction; while in low quality or disturbed areas, *further* degradation may constitute destruction.

Some human activities in or adjacent to critical habitat will require careful assessment for possible effects, including cumulative effects (Huggett 2005, Lindenmayer and Luck 2005) on critical habitat and the potential for destruction. The federal government will work with provincial regulatory authorities and land users to develop a better understanding of cumulative effects, thresholds of destruction, and mitigation guidelines (such as restrictions on activities in certain areas and over certain time periods).

2.6.4 Schedule of Studies to Further Identify Critical Habitat

This document includes a partial identification of critical habitat for Sage-Grouse. Further work is required to identify additional critical habitat necessary to support the population and distribution objectives of the species. This additional work includes;

1. In or before 2011, delineate nesting, brood-rearing and winter critical habitat in Alberta (to the extent possible) for inclusion in an Amendment to the Recovery Strategy after completing the following:
    - To the extent possible, develop and apply a habitat model(s) and produce a map of critical habitat within the current range in Alberta;
    - Evaluate the model inputs and outputs against independent information and expert opinion.

2. In or before 2011, delineate nesting, brood-rearing, and winter critical habitat in Saskatchewan (to the extent possible) for inclusion in an Amendment to the Recovery Strategy or a Multi-Species Action Plan after completing the following:
    - Create corrected data layers for areas where data are currently available;
    - To the extent possible, develop and apply a habitat model(s) and produce a map of critical habitat within the current range in Saskatchewan;
    - Evaluate model inputs and outputs against independent information and expert opinion.

3. By 2013 undertake the following work to identify additional critical habitat throughout the range of Sage-Grouse:
    - Continue fieldwork to locate leks;
    - Develop additional sagebrush datasets for priority areas within the current or historical range;
    - Estimate the amount and locations of habitat restoration needed to meet the recovery population and distribution objectives;
    - Develop updated or expanded critical habitat models where needed, as data become available.

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PERSONAL COMMUNICATIONS

Jeffrey Hutchings. 2009. Chair, Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Department of Biology, Dalhousie University, 1355 Oxford Street, Halifax, Nova Scotia, B3H 4J1

APPENDIX 1: QUARTER-SECTIONS IN ALBERTA CONTAINING CRITICAL HABITAT

The following is a list of Quarter sections that contain Sage-Grouse critical habitat in Alberta.

TWP-1 RGE-2 W4M

Section	Quarters
1	NE
12	SE

TWP-2 RGE-3 W4M

Section	Quarters
4	NW
5	NE
8	SE
9	SW
35	SE
36	SW

TWP-2 RGE-6 W4M

Section	Quarters
28	NE
33	NE, SE
34	SE

TWP-3 RGE-1 W4M

Section	Quarters
24	NE

TWP-3 RGE-2 W4M

Section	Quarters
23	NE
26	SE

TWP-3 RGE-3 W4M

Section	Quarters
29	NE
30	NE, SE, SW
31	NE, NW, SE
32	NE, NW, SE, SW
33	NW, SW

TWP-3 RGE-4 W4M

Section	Quarters
16	NW
17	NE, NW
19	NE
20	NW, SE, SW
21	SW
25	SE
29	NW, SW
30	NE, NW, SE, SW
31	NE, NW, SE, SW
32	NE, NW, SW
33	NW
35	SE
36	NE

TWP-3 RGE-5 W4M

Section	Quarters
4	NE, NW
6	NW
7	NE, NW, SW
8	NE, SE
9	NE, NW, SE, SW
10	NE, NW, SE
11	NE, NW, SE, SW
14	NE, NW, SE, SW
15	NE, NW, SE, SW
16	NE, NW, SE, SW
17	NE, SE, SW
18	SW
19	NE, SE
20	NW
21	NE, NW, SE, SW
22	NE, NW, SE, SW
23	NW, SE, SW
24	NE, NW
25	NE, NW, SE, SW
26	NE, SE
27	NW, SE, SW
28	NE, NW, SE
33	SE, SW
34	NE, NW, SE, SW
35	NE, NW, SW
36	NE, NW, SE, SW

TWP-3 RGE-6 W4M

Section	Quarters
1	NE, NW
3	NW
4	NW, SW
5	NE, NW, SE, SW
6	NE, SE
7	NE, SE
8	NE, NW, SE
9	NE, NW, SE, SW
10	NW, SE, SW
12	NE, NW, SE
13	NE, NW, SE, SW
14	NE, NW, SE
19	NE, NW, SE
20	NE, NW, SW
21	NE, NW, SE
22	NE, NW, SE, SW
23	NE, NW, SE, SW
24	SW
25	NW, SE, SW
26	NE, SE, SW
27	NW, SE, SW
28	NE, NW, SE, SW
29	NE, NW, SE, SW
30	NE, NW, SE, SW
31	NE, SE
32	NE, NW, SE, SW
33	NE, SW
35	NW, SE

TWP-3 RGE-7 W4M

Section	Quarters
24	NE
25	NE, SE
36	NW, SW

TWP-4 RGE-1 W4M

Section	Quarters
20	SE

TWP-4 RGE-3 W4M

Section	Quarters
3	SE, SW
4	NE, NW, SE, SW
5	NE, SE, SW
6	NE, NW, SE, SW
7	NW, SE, SW
8	NE, NW, SE
9	NE, NW, SE, SW
16	NW, SW
17	NE, NW, SE, SW
19	NE, NW, SE
29	NE, NW
30	NW, SE, SW
31	NE, NW , SE, SW
32	NE, NW, SE, SW
33	NW, SW

TWP-4 RGE-4 W4M	
Section	Quarters
1	NE, NW, SE
2	NE, SE
4	NW, SW
5	SE
6	NW, SW
7	NE, NW, SE, SW
8	NE, NW, SE, SW
9	NE, NW, SW
10	NE, NW, SE, SW
11	NE, NW, SE, SW
12	NE, NW, SE, SW
13	NW, SE, SW
14	NE, NW, SE, SW
15	NE, NW, SE, SW
16	NE, NW, SE, SW
17	NE, NW, SE, SW
18	NE, NW, SE, SW
19	NW, SE, SW
20	NE, NW, SE, SW
21	NE, NW, SE, SW
22	NE, NW, SE, SW
23	NE, NW, SE, SW
24	SW
25	NE
26	NE, NW, SE, SW
27	NE, NW, SE, SW
28	NE, NW, SE, SW
29	NW, SE, SW
30	NE, NW, SE, SW
31	NE, NW, SE, SW
32	NE, NW, SE, SW
33	NE, NW, SE, SW
34	NE, NW, SE, SW
35	NE, NW, SE, SW
36	NE, NW, SE, SW

TWP-4 RGE-5 W4M	
Section	Quarters
1	NE, NW, SE
2	NE, NW, SW
3	NE, NW, SE
6	SE
9	NW
10	NW, SE, SW
11	NE, NW, SE, SW
12	NE, NW, SE, SW
13	NE
14	NW
15	NE, NW, SE, SW
16	NE, SE, SW
18	SW
21	NE, NW, SE, SW
22	NE, NW, SE, SW
23	NE, NW, SE, SW
24	NE, NW, SE
25	NE, NW, SE, SW
26	NE, NW, SE, SW
27	NE, NW, SW
28	NE, NW, SE, SW
30	NW, SW
31	NW
32	NE, NW, SE
33	NE, NW, SE, SW
34	NE, NW, SE, SW
35	NE, NW, SE, SW
36	NE, NW, SE

TWP-4 RGE-6 W4M

Section	Quarters
2	SE, SW
3	NE, SE, SW
4	NE, SE, SW
5	NE, NW, SE, SW
6	NE, NW, SE, SW
7	NE, NW, SE, SW
8	NW, SE, SW
9	SW
10	NE, NW, SE
11	NE, NW, SW
12	NW
13	SE, SW
14	NE, NW, SE, SW
15	NE, NW, SE, SW
16	NE, NW, SE, SW
17	NE, NW, SW
18	NE, NW, SE, SW
19	NE, NW, SE
20	NE, NW, SE, SW
21	NE, SE
22	NE, NW, SE, SW
23	SE
24	NE, NW
25	NE, NW, SE, SW
26	NW
27	NE, NW, SE, SW
28	NE, NW, SE, SW
29	NE, NW, SW
30	NE
31	NE, NW, SE, SW
32	NE, NW, SE, SW
33	NW, SW
34	NE, SE, SW
35	NW, SW
36	NW, SW

TWP-4 RGE-7 W4M

Section	Quarters
1	NE, NW, SW
2	NE, NW
10	NE
11	NE, SE, SW
12	NW, SE, SW
13	NE, NW, SE, SW
14	NW, SE, SW
15	NW, SE
22	NE, NW, SE, SW
23	NE, NW, SW
25	NE, NW
26	NE, NW, SE, SW
27	NE, NW , SE, SW
35	NE, NW, SE
36	NW, SW

TWP-5 RGE-2 W4M

Section	Quarters
22	NE
26	SW
27	SE

TWP-5 RGE-3-W4M

Section	Quarters
4	SW
5	NW, SE, SW
6	NE, NW, SE, SW
7	SW
8	SE, SW
19	NE
20	NW
21	NW, SW
28	NW, SW
29	NE, NW, SE, SW
30	NE, NW, SE
31	NE, NW, SE, SW
32	NE
33	NW, SW

TWP-5 RGE-4 W4M	
Section	Quarters
1	NE, SE, SW
2	NE, NW, SE, SW
3	NE, NW, SE, SW
4	NE, SE, SW
5	SE, SW
6	NE, NW, SE, SW
7	NE, NW, SW
8	NE, NW, SE, SW
9	NE, NW, SE, SW
10	NE, NW, SE, SW
11	NE, NW, SE, SW
12	NW, SW
14	NE, NW, SE, SW
15	NE, NW, SE, SW
16	NE, NW, SE, SW
17	NE, NW, SE, SW
18	NE, NW, SE
19	NE, NW, SE, SW
20	NW, SE, SW
21	NE, NW, SE, SW
22	NW, SE, SW
23	NE, NW
26	NE, NW, SE, SW
27	NE, NW, SE, SW
28	NE, SE, SW
30	NE, NW, SE, SW
31	SE, SW
32	NE, SW
33	NE, SE
34	NE, SW
35	NE, NW
36	NW

TWP-5 RGE-5 W4M	
Section	Quarters
1	NW, SE, SW
2	NE, NW, SE, SW
3	NE, NW, SE, SW
4	NE, NW, SE, SW
5	NE, NW, SE, SW
6	NE, NW, SW
7	NE, NW, SE, SW
8	NE, NW, SE, SW
9	NE, NW, SE, SW
10	NE, NW, SE, SW
11	NE, NW, SE, SW
12	NE, NW, SE, SW
13	NE, NW, SE, SW
14	NE, NW, SE, SW
15	NE, SE, SW
16	NW, SE, SW
17	NE, NW, SE, SW
18	NE, NW, SE, SW
19	NE, NW, SE, SW
20	NE, NW, SE, SW
21	NE, NW, SE, SW
22	NW
23	NE, NW, SE, SW
24	NE, NW, SE, SW
25	SE, SW
26	NE, SE, SW
27	SE, SW
28	NE, NW, SE, SW
29	NE, NW, SE, SW
30	NE, NW, SE, SW
31	SE, SW
32	NW, SE, SW
33	NE, NW, SE, SW
34	SE, SW
35	NE, NW
36	NE, NW

TWP-5 RGE-6 W4M

Section	Quarters
1	NE, NW, SW
2	NE, NW, SE, SW
3	NE, NW, SE
4	NE, NW
5	NW, SE, SW
6	NE, NW, SE, SW
7	NE, NW, SE, SW
8	NW, SW
9	SE
10	NE, NW, SE, SW
11	NE, NW, SE, SW
12	NE, NW, SE, SW
13	NE, NW, SE, SW
14	NE, NW, SE, SW
15	NE, NW, SE, SW
17	NW, SW
18	NE, NW, SE, SW
19	NE, SE, SW
20	NE, NW, SW
21	NW
22	NE, NW, SE
23	NE, NW, SE, SW
24	NW, SE, SW
25	NW, SE, SW
26	NE, NW, SE
27	NE
28	NE, NW
29	NE, NW, SE, SW
30	NE, NW, SE, SW
31	NE, NW, SE, SW
32	NE, NW, SE, SW
33	NE, NW
34	NE, NW, SE
35	NW, SE, SW
36	SW

TWP-5 RGE-7 W4M

Section	Quarters
1	NE, SE
2	SE
10	SE, SW
11	NE
12	NE, NW, SE
13	NE, NW, SE, SW
14	NE
15	SE
22	NE
23	NE, NW, SE, SW
24	NW, SE, SW
25	NW, SW
26	NE, SE, SW
36	SE

TWp-6 RGE-3 W4M

Section	Quarters
4	NW, SW
5	NE, SE
6	NE, NW, SE, SW
7	NE, NW, SE
8	NE, NW, SE
9	NW
16	NW, SW
17	NE, NW, SE, SW
18	NE, NW, SE, SW
19	NE, NW, SE, SW
20	NE, NW, SE, SW
21	SW

TWP-6 RGE-4 W4M

Section	Quarters
2	SW
3	NE, SE, SW
4	SE, SW
8	NE
9	NE, NW, SE, SW
10	NE, NW, SW
13	NE, NW, SE
15	NE, SE, SW
16	NW, SE, SW
17	NE, NW, SE, SW
19	SE
20	SE, SW
21	NE
22	NW, SW
23	SE
24	NE, NW, SE, SW
25	SE

TWP-6 RGE-5 W4M

Section	Quarters
1	NW, SE, SW
2	NE, NW, SE, SW
3	NE
4	NE, SE, SW
5	NE, SE
7	SE
8	SE
9	NE
10	NE, SE
11	NE, SW
13	NW
14	NE, SE
17	SW
24	SE

TWP-6 RGE-6 W4M

Section	Quarters
2	SE, SW
3	NE, NW, SW
4	NW, SE, SW
9	SW
10	NE
11	NE, NW, SE, SW
14	SE