WINTER HABITAT SELECTION AND SURVIVAL BY SAGE-GROUSE IN SOUTHEASTERN ALBERTA

FINAL PROJECT REPORT FOR

2003 - 2004 SAGE-GROUSE FUNDING PARTNERS

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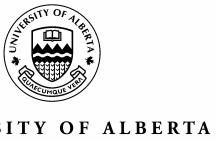

ABSTRACT

Sage-Grouse are dependent upon sagebrush for food and shelter during the winter, yet very few studies have been conducted to assess winter habitat selection by Sage-Grouse. Small changes to the quality and/or availability of winter habitat have been shown to cause drastic reductions in some Sage-Grouse population numbers. There have been no studies performed in southern Alberta to identify important Sage-Grouse winter habitat and determine if this may be a limiting life history stage. The purpose of this project is to develop an understanding of the winter ecology, habitat use, and survival of the endangered Sage-Grouse in southeastern Alberta. We used radio-telemetry to follow sage-grouse over the 2002/03 and 2003/04 winters. We tracked 16 adult females in the first winter and 18 females and 9 juveniles in the second winter. Overwinter survival of adult females was 88% in 2002/03, and 73% in 2003/04. Juvenile survival in 2003/04 was 43%. We obtained 567 tracking relocations for 34 females, and performed detailed vegetation measurements at 422 winter use sites and 422 paired random locations. These data are being used to develop resource selection functions that will be used to identify, manage and enhance critical Sage-Grouse winter habitat in Alberta.

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INTRODUCTION

Sage-Grouse (*Centrocercus* spp.) historically occurred in British Columbia, Alberta, Saskatchewan and 16 U.S. states, but today, they have been extirpated from British Columbia and five states (Braun 1998, Fig. 1). Throughout their range, Sage-Grouse have declined by an estimated 45-80% since the 1950s (Braun 1998). The decline has been most severe at the northern fringe of the species range, with the Alberta Greater Sage-Grouse (*C. urophasianus*, hereafter Sage-Grouse) population experiencing a 66-92% decline over the last 30 years (Aldridge and Brigham 2002, 2003). The Canadian prairies represent less than 10% of the species' global range (Aldridge and Brigham 2003, Fig. 1). However, the historical range within Alberta and Saskatchewan has been reduced by approximately 90% (Aldridge and Brigham 2003, Figure 2). Sage-Grouse are an indicator species for the prairies, and in particular, sagebrush habitat. By understanding the habitat requirements and the factors limiting the population, we can implement management strategies that will benefit the birds, as well as other species of prairie wildlife.

Current research in Alberta has focused on population trends (Aldridge 2001, Aldridge and Brigham 2001) and habitat requirements during the nesting and brood rearing periods (Aldridge and Brigham 2002, Watters et al. 2003). Even though Sage-Grouse are dependent upon sagebrush for food and shelter during the winter, very few studies have been conducted to understand winter habitat selection by Sage-Grouse (Beck 1977). Small changes to the quality and availability of winter habitat have resulted in drastic reductions in Sage-Grouse population numbers (Beck 1977, Swenson et al 1987). No research has been conducted in Alberta to identify important wintering areas and assess the importance of winter habitat as a potential limiting life stage for Sage-Grouse. The purpose of this project is to develop an understanding of

the winter ecology, habitat use, and survival of the endangered Sage-Grouse in southeastern Alberta. This project will build on the current radio-telemetry research project being conducted by Cameron Aldridge at the University of Alberta, which began in spring 2001. His research is directed at understanding habitat requirements of Sage-Grouse throughout their various life history stages. Ultimately, results from these two research projects will be combined to enable wildlife managers to facilitate landscape scale strategies to recover Sage-Grouse to viable population numbers.

OBJECTIVES

The main purpose of this project was to gain an understanding of the winter ecology of Sage-Grouse in southeastern Alberta, focusing on habitat use and survival. Specific objectives included:

1) Assess winter habitat use by Sage-Grouse at multiple scales through the use of resource selection functions.
2) Monitor female Sage-Grouse to determine winter survival and causes of mortality.
3) Monitor juvenile Sage-Grouse to determine winter survival and causes of mortality.
4) Develop winter habitat use/probability maps to aid in management of winter habitat for Sage-Grouse.
5) Combine the information gained from this project with the work conducted by Cameron Aldridge (University of Alberta) to assist in the development of a habitat-based population viability model for Sage-Grouse.

STUDY AREA

The study area is about 4,000 km^2 in size and is located in the southeastern corner of Alberta, south of the Cypress Hills and east to the Saskatchewan border (Fig. 2). This area represents the core range of Sage-Grouse in Canada and is composed of semi-arid mixed-grass prairie, with an abundance of silver sagebrush (Aldridge 2000).

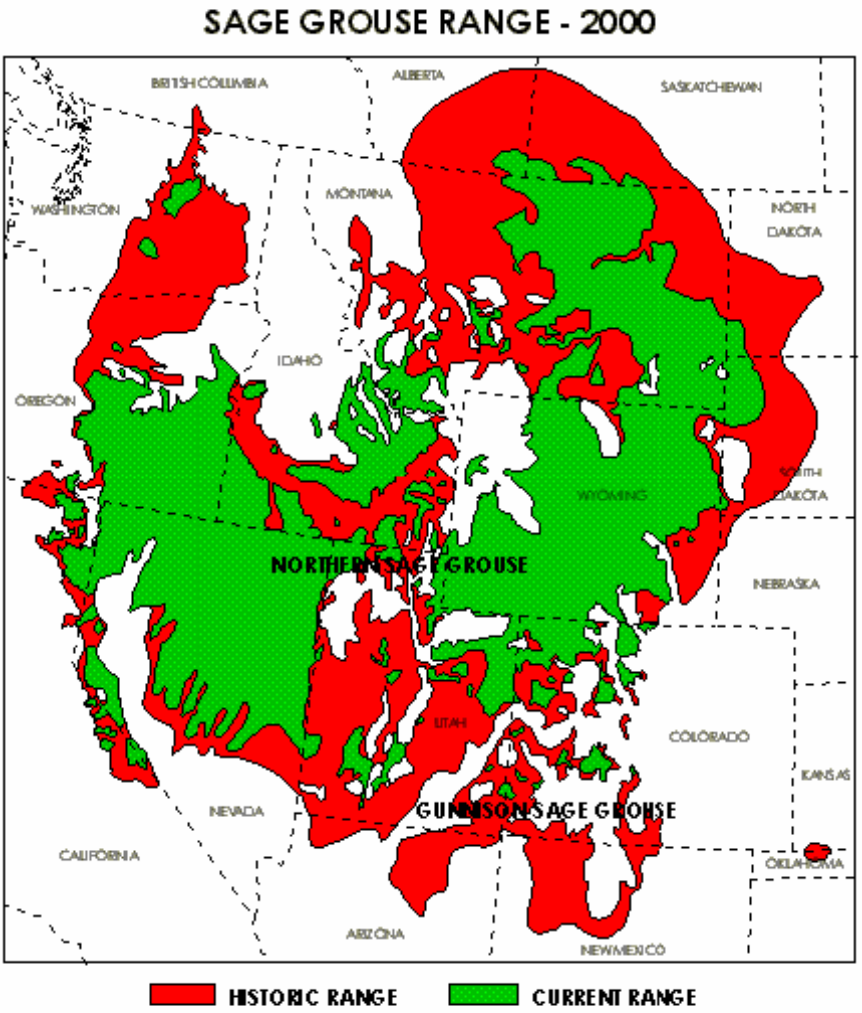

Figure 1. Current and known historic distribution of Northern/Greater Sage-Grouse (*Centrocercus urophasianus*) and Gunnison sage-grouse (*Centrocercus minimus*) in North America. (Map Provided by Michael Schroeder, Washington Department of Fish and Wildlife).

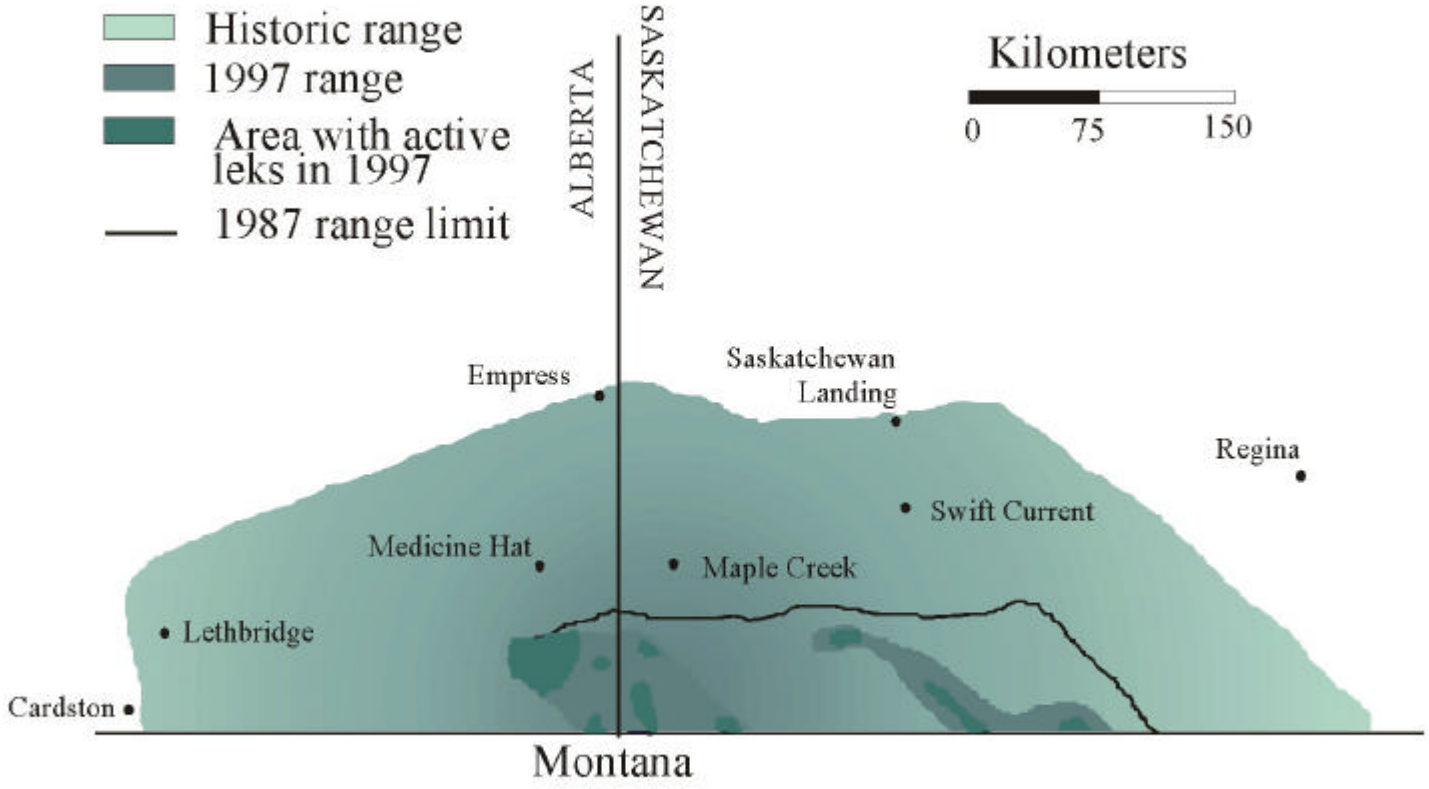

Figure 2. Range of Greater Sage-Grouse in Canada. Historical range is based on anecdotal sightings of birds prior to the 1960s. The present (1997) range is based on the locations of known active leks in 1997. The 1987 range limits are shown to illustrate the range contraction.

METHODS

From September through March for the winters of 2002/03 and 2003/04 we monitored winter habitat selection and survival of adult female and juvenile Sage-Grouse. Sage-Grouse were captured and fitted with radio-transmitters as part of a concurrent research project to assess habitat selection and viability of sage-grouse in Alberta (see Aldridge 2003 for details). This concurrent research project took place from April through August each year. We followed birds radio-collared from this study from September through to March using standard radio-telemetry techniques (Aldridge 2003). Sage-Grouse were tracked using a 5-element Yagi antenna and an R-1000 scanning telemetry receiver (Communications Specialists, Inc. Orange, CA). Birds were located using triangulation techniques until visually observed, and relocated weekly throughout the fall and winter. Locations were recorded using a Global Positioning System (Garmin GPS II Plus, Garmin International, Olathe, Kansas). Once a week, we measured microsite characteristics at use sites. We measured the slope, aspect, snow depth and condition, and sagebrush height above the ground and above the snow, as well as ambient temperature and roost site temperature. We also chose a dependent random location within 100-500 m in a random direction of each use, and measured the same habitat characteristics at that random site.

ANALYSES

(Currently underway)

We are using Resource Selection Functions (RSFs) to develop statistically rigorous habitat models to predict the distribution of Sage-Grouse at several different scales across the whole landscape (Johnson 1980, Manly et al. 1993, Boyce and McDonald 1999). We are comparing fourth-order selection (micro-scale level, Johnson 1980) using geomorphic and vegetation characteristics at winter use sites, compared to those available at random sites within

the study area. We also are analyzing third-order selection (Johnson 1980) of winter locations by comparing used sites to available sites within each female's home range using a Geographic information system (GIS). Lastly, we are investigating second-order selection (macro-level selection, Johnson 1980) of winter locations in a GIS compared with available sites across the whole range of Sage-Grouse in Alberta. These models will allow us to identify and map important winter habitat, which will be used as a management tool to maintain or improve winter habitat for Sage-Grouse.

RESULTS

Radio Tracking Data

We gathered a total of 256 tracking relocations from 16 different adult females during the first fall/winter of this study (2002/2003, Fig. 3). Fourteen of these 16 females (88%) survived over the winter into the 2003 Breeding season. Due to low productivity in the summer of 2002 (nest success 13.5%, chick survival = 9%, Aldridge 2002), we were unable to locate and capture any juveniles in the summer/fall of 2002 for monitoring that winter. In the second winter (2003/2004) we were able to capture 9 juvenile female Sage-Grouse in the late summer/early fall and attached a necklace style transmitter to each bird. However, 2 of these juveniles died in late August after being infected with West Nile virus (see Aldridge 2003). Eleven of the 15 adults (73%) and 3 of the remaining 7 juveniles (43%) survived through the winter into the spring (March). We gathered 311 tracking relocations for 18 different females (both adult and juvenile) in this second year (Fig. 3). More detailed survival analyses will be conducted on these data.

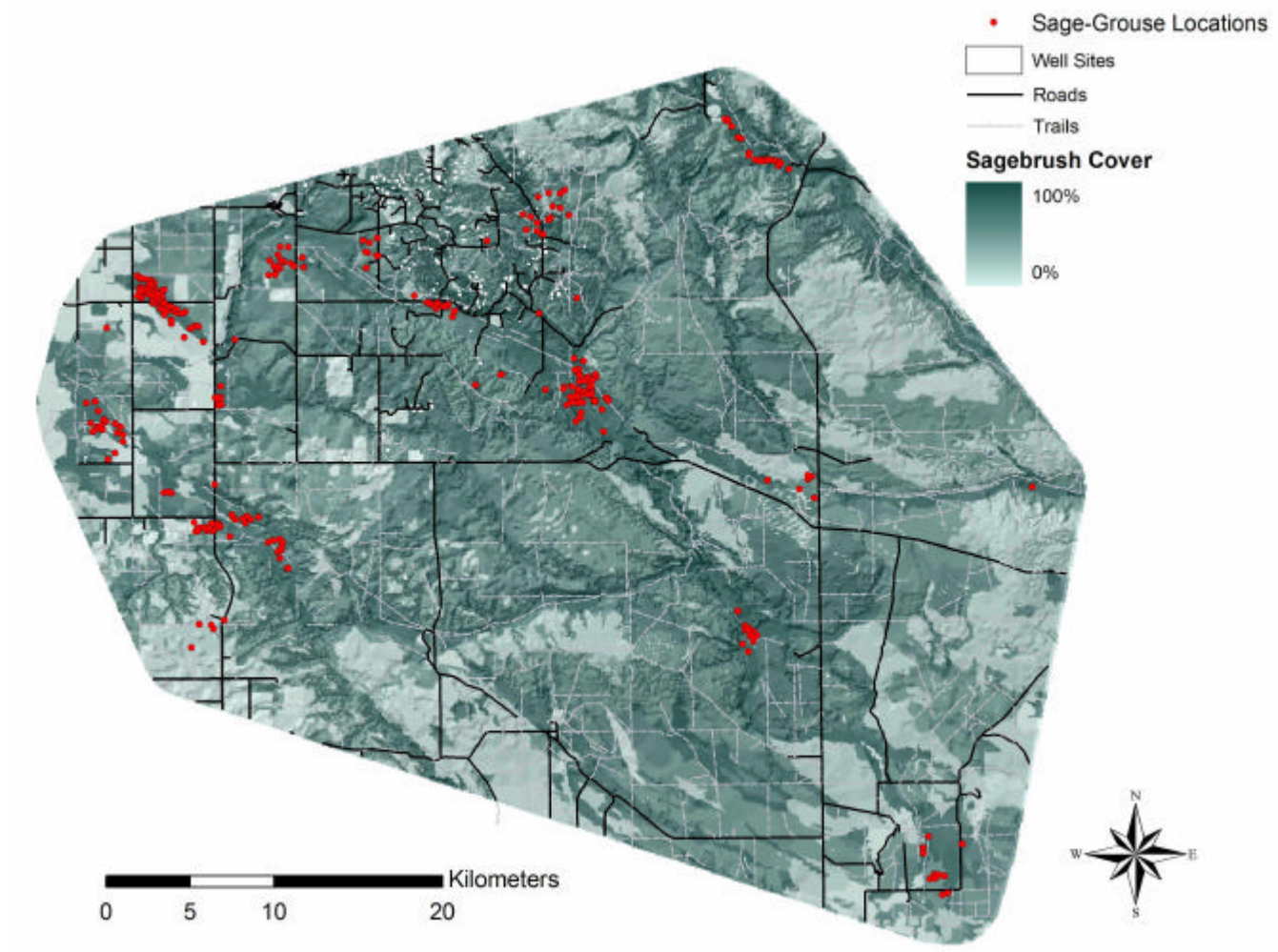

Figure 3. Greater Sage-Grouse fall/winter habitat distribution in southeastern Alberta. Telemetry locations (567 in total) are for 34 female seasons from September through March over two winters 2002/03 and 2003/04, shown with sagebrush cover.

Habitat Measurements

We gathered microsite habitat data on 422 Sage-Grouse winter use sites and 422 random locations over the 2 years of our study (2002/03, 221 use sites from 16 different females and 221 random sites; 2003/04, 201 use sites from 18 different female [adults and juveniles] and 201 random sites). All habitat tracking data (see Fig. 3) and habitat data are currently being compiled into a GIS and we are developing models to assess both local and landscape scale winter habitat selection.

DISCUSSION

Overwinter survival was fairly high for adults in both years of our study (88% in 2002/03, 73% in 2003/04). This is the first study to directly follow individuals and estimate overwinter survival for adult female Greater Sage-Grouse (see Schroeder et al. 1999). Mark-recapture through banding (Zablan et al. 2003) and radio-telemetry (Connelly et al. 1994) have been used to estimate coarse annual female survival (spring to following spring) at 59% and 76%, respectively, but these studies do not separate annual estimates into spring to fall and overwinter survival estimates. Female spring to fall survival (apparent) in Alberta has been estimated at 57% (Aldridge 2001). By combining this with our overwinter survival estimates, we estimate annual adult female survival a between 43 and 50%. This is somewhat lower than previously mentioned estimates (Connelly et al. 1994, Zablan et al. 2003), but somewhat expected, given the declining nature of the Alberta population. However, by incorporating survival across these distinct life stages into precious Alberta Sage-Grouse population models (see Aldridge 2001), we will be able to better understand the most limiting demographic parameters for this population.

High productivity in 2003 allowed us to capture and collar 9 juvenile females prior to the winter of 2003/04 (Aldridge 2003). However, 2 of these died in the late summer of 2003 due to WNV infection (Aldridge 2003). Only 43% of the 7 collared juveniles survived the winter. Again, this is the first study to gather information on juvenile overwinter survival. While sample sizes are low, it is not surprising that juvenile overwinter survival was less than that of adult females. However, this could also be an important factor contributing the observed low recruitment rates seen in the Alberta population (Aldridge 2001, Aldridge and Brigham 2001, 2003).

Winter habitat can be limiting for Sage-Grouse, and loss of important wintering areas may limit populations (Beck 1977, Swenson et al. 1987). Sage-Grouse in Alberta displayed distinct movements to wintering areas (Fig. 3) and these areas tend to be reused each year, and may warrant protection. They also appear to select for areas with greater sagebrush cover. Once completed, our winter habitat models, developed across several different scales (Johnson 1980), will help to understand winter habitat requirements and identify critical wintering habitat and potential habitat and population limitations.

RESEARCH PROJECT SUMMARY

We feel that this project has been very successful thus far at achieving the objectives outline in our original proposal. We assessed survival and habitat use by 16 females in the first winter, and were able to track 15 females and 7 juveniles over the second winter, meeting objectives #1 through #3. We are currently developing winter habitat models to assess habitat selection and identify key wintering habitat (Objectives #1 & #4). Once completed, these models will be incorporated into Cameron Aldridge's habitat based-population viability models

part of his Doctoral research at the University of Alberta (Objective #5). Survival data will also be used combination with Cameron Aldridge's summer survival data and incorporated into these models (Objective #5).

ACKNOWLEDGEMENTS

We thank Michael Swystun, Jason Sanders, and Jennifer Carpenter for their assistance in the field. We also thank the many individuals that assisted with fieldwork and the logistics of this research. This research was generously supported financially and/or logistically by the Alberta Conservation Association, Alberta Sustainable Resource Development, Endangered Species Recovery Fund (World Wildlife Fund Canada and the Canadian Wildlife Service), the University of Alberta, a Natural Science and Engineering Research Council Scholarship, a Macnaughton Conservation Scholarship, an Edmonton Bird Club Scholarship, an Izaak Walton Killam Memorial Scholarship, and a Dorothy J Killam Memorial Graduate Prize to C.L. Aldridge. We appreciate cooperation of the many individuals and families who gave us permission to work on their land throughout the course of this research.

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APPENDIX A

A list of all

Publications, Presentations, Invited Seminars, and Media Stories

Emanating from Sage-Grouse Research.

Publications, Presentation, and Conference Proceedings Emanating from Sage-Grouse Research in Alberta

Publications

Theses

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, SK. 109 pp.

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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: *In Press.*

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Non-refereed Publications

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Presentations

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Aldridge, C.L. 2004. Modeling Sage-Grouse Habitat in Alberta: A Landscape Approach. 5th Prairie Conservation and Endangered Species Conference. Calgary, AB.

Aldridge, C.L. Naugle, D.E., B.L. Walker, , T.E. Cornish, B.J. Moynahan, M.J. Holloran, K.Brown, G.D. Johnson, E.T. Schmidtman, R.T. Mayer, C.Y. Kato, M.R. Matchett, T.J. Christiansen, W.E. Cook, T. Creekmore, M.S. Boyce, R.D. Falise, and E.T. Rinkes. 2004. West Nile Virus: An Emerging Issue for Sage-Grouse Population Viability. 38th Annual Prairie Universities Biological Symposium (PUBS). Edmonton, AB.

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Aldridge, C.L., and M. S. Boyce. 2003. Using resource selection functions to identify sage-grouse breeding habitat. 1st International Conference on Resource Selection by Animals. Laramie, Wyoming.

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Aldridge, C.L. 2001. Do Sage Grouse have a future in Canada? Population dynamics and management suggestions. 6th Prairie Conservation & Endangered Species Conference: Sharing Common Ground. Winnipeg, Manitoba.

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Press Releases Related to
Sage-Grouse Research in Canada

	PRESS RELEASE	AUTHOR	TITLE
	Biodiversity – Alberta NAWMP Publication (Volume 5)	Lavere McAthey	Understanding the decline: Is there hope for Albe Sage-Grouse?
	Edmonton Journal & National Post	Ed Stuzik	Sage-grouse cling to survival
	Alberta Naturalist - FAN Publication	Dawn Dickinson	Sage-Grouse….Going…Going…Gone?
	CBC Radio Alberta - WildRose Country The Commentator (Prairie Newspaper)		Declining Sage-Grouse Researcher concerned about low numbers of sage
	Medicine Hat News (Newspaper)		Sage grouse in danger of disappearing
	Operation Grassland Community NwsLtr.	Cameron L. Aldridge	Saving the Sage Grouse in Alberta
	Discovery Channel Story (on @discovery.ca)	Tom Hince	Sage Grouse
)	Edmonton Journal	Ed Struzik	Wildlife under siege
	Recovery: An Endangered Species Newsletter	Cameron L. Aldridge	Sage Grouse continue to decline
99	PICA; The Calgary Field Naturalist's Society	Cameron L. Aldridge	Status of Sage Grouse in Canada
	CBC Radio Saskatchewan	Peter Dick	Sage Grouse
	Nature Views; Nature Sask. Newsletter	Cameron L. Aldridge	Status of Sage Grouse in Canada
98	The Third Degree; U of R Alumni Magazine	Erika Smishek	Research aims to reverse Sage Grouse saga
98	The Western Producer	Michael Raine	Sage Grouse listed as endangered
98	Lethbridge Herald		Future uncertain for once-vibrant population of Sage G
	QR77 Radio; Calgary & Edmonton		Sage Grouse
	CBC Radio		Sage Grouse
	CBC News (T.V.) Alberta & Saskatchewan	Gary Sieb	Sage Grouse
	Alberta Report	Les Sillars	Prairie dancers of the sagebrush
	Regina Sunday Sun	Frank Flegel	Getting closer to the vision
998	Calgary Herald	Monte Stewart	Researcher gets funding to track nesting Sage Gro
98	The Regina Leader-Post		Sage Grouse population in rapid decline
	CBC NewsWorld (T.V.)		Sage Grouse
1998	The Saskatoon StarPhoenix	Colette Derworiz	Shrinking ranks of Sage Grouse baffles researche