

**DEVELOPING A HABITAT-BASED POPULATION VIABILITY
MODEL FOR SAGE GROUSE
IN SOUTHEASTERN ALBERTA**



**FINAL PROJECT REPORT FOR
2001 SAGE GROUSE FUNDING PARTNERS**

Cameron L. Aldridge

Department of Biological Sciences,
University of Alberta
Edmonton, AB T6G 2E9
Voice: (780) 492-6267 Fax: (780) 492-9234
aldridge@ualberta.ca

December, 2001

ABSTRACT

The Alberta Sage Grouse population has declined by 66-92% over the last 30 years. Previous research in Alberta suggests that the population has declined as a result of poor recruitment. Low levels of recruitment appear to be linked to poor chick survival as a result of limited mesic sites important for brood rearing habitat. Due to the inaccuracies of brood flushing counts, and the limits of technology to produce transmitters small enough for chicks, it has been difficult to accurately assess and understand chick survival. A population model developed from data gathered in 1998 and 1999 suggested that the population would continue to decrease in 2001, resulting in a decrease from 140 males counted on leks in 1999, to only 123 in 2001. I counted 127 males at seven active leks in 2001, which was similar to the model's prediction. However, in 2001, nest success (37%) and chick survival (7.5 - 10%) suggest that the population will likely decrease even further in 2002. To obtain a better grasp of what variables might be related to the population decline, I assessed habitat use and selection at nest sites, brood-rearing locations, and at summer loafing sites. I also collected insect samples at all brood-rearing locations to assess their importance in the diet of Sage Grouse chicks. This January, I will be performing some preliminary winter field studies, assessing habitat use by 16 radiocollared females through to the breeding season. All of these data will be used to develop population and habitat models that will allow me to conduct population viability analyses on the Alberta Sage Grouse population.

Table of Contents

ABSTRACT	II
TABLE OF CONTENTS	III
LIST OF FIGURES AND TABLES	IV
INTRODUCTION.....	1
OBJECTIVES	4
STUDY AREA	4
METHODS	4
RESULTS	7
POPULATION TRENDS.....	7
ADULT CAPTURES.....	7
REPRODUCTIVE ACTIVITIES	7
CHICK TRANSMITTERS.....	10
HABITAT MEASUREMENTS.....	10
DISCUSSION.....	11
RESEARCH PROJECT SUMMARY.....	13
ACKNOWLEDGEMENTS	14
LITERATURE CITED	15
APPENDIX A.....	17
PUBLICATIONS, PRESENTATIONS, INVITED SEMINARS, AND MEDIA STORIES.....	17

List of Figures and Tables

Figure 1. Current and known historic distribution of Sage Grouse2

Figure 2. Range of Sage Grouse in Canada3

Figure 3. Population trends for Sage Grouse in Alberta and Saskatchewan over the past 34 years.
.....8

Table 1. Body mass for birds captured in the 2001 breeding season in Alberta and the number of
birds that received radiotransmitters.....9

INTRODUCTION

Sage Grouse (*Centrocercus urophasianus*) 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). 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 population experiencing a 66-92% decline over the last 30 years (Aldridge and Brigham 2000). The reasons for this decline are uncertain, but previous research in Alberta suggests that poor quality habitat has reduced survival, particularly that of chicks (Aldridge and Brigham 2002). From this research, the population decline appears to be a result of high juvenile mortality leading to poor juvenile recruitment (Aldridge and Brigham 2001). Chick survival may be limited by available escape cover, due to limited grass cover and sagebrush (*Artemisia cana*) cover in southern Alberta (Aldridge and Brigham 2002). However, the lack of mesic sites, and thus, lush forbs (Aldridge and Brigham 2002) that are important in the diet of chicks (Johnson and Boyce 1990, Drut et al. 1994, Sveum et al. 1998) also may have reduced chick survival. This research indicated that nest success was within the normal range for Sage Grouse, however, above-average spring precipitation over this period likely increased vegetation growth, resulting in above-average nesting success (Aldridge 2000a). Grass height was positively correlated with nest success for both artificial and natural Sage Grouse nests (Aldridge and Brigham 2001, Watters et al. 2001), suggesting that habitat management could benefit both Sage Grouse productivity and chick survival (Aldridge 2000a).



Figure 1. Current and known historic distribution of Sage Grouse. 'E' represents the eastern subspecies (*Centrocercus urophasianus urophasianus*) and 'W' represents the western subspecies (*C. u. phaios*). The current distribution is not continuous and is more fragmented than indicated. (Adapted from Johnsgard 1983).

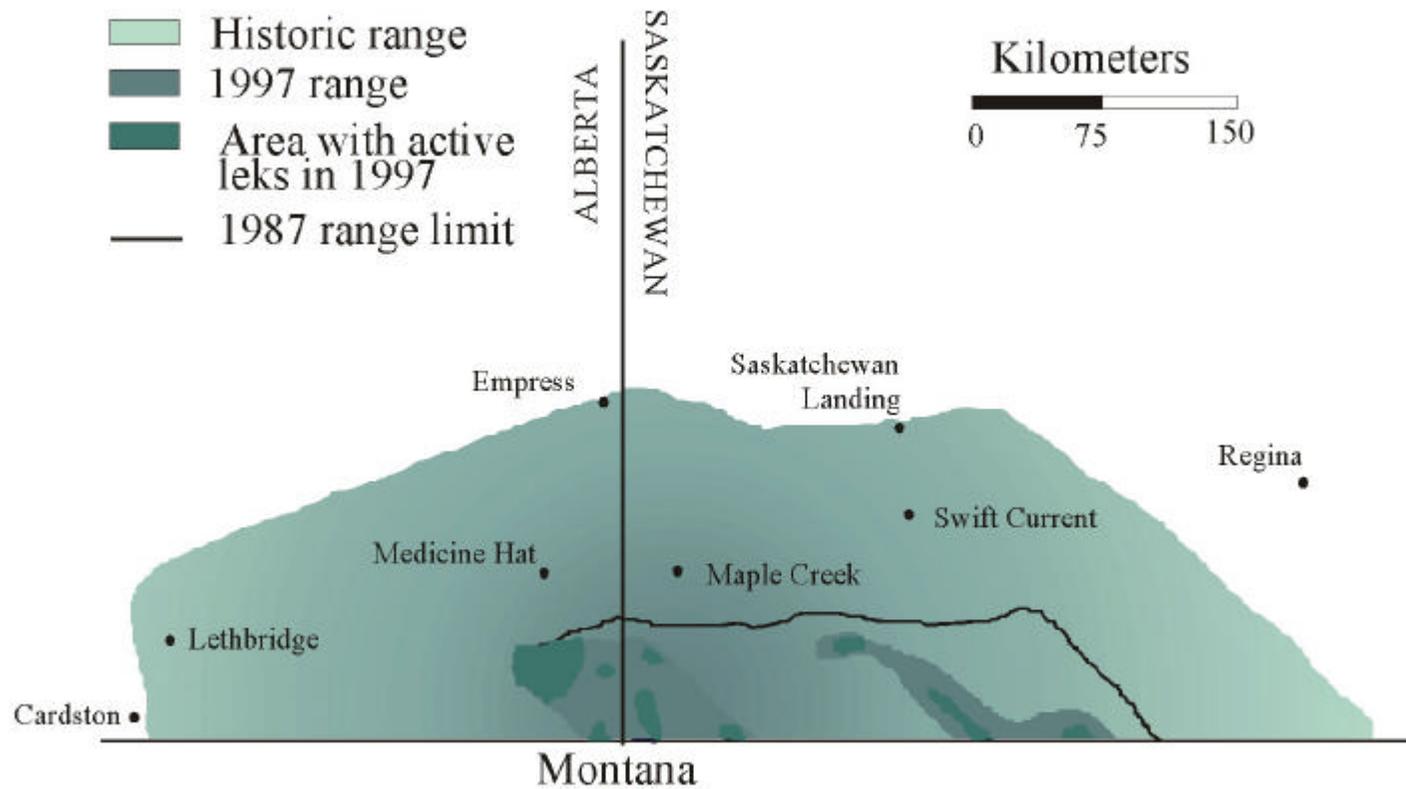


Figure 2. Range of Sage Grouse in Canada. Historical range is based on anecdotal sightings of birds prior to the 1960s. The present (1997) range is based on the locations of known active leks in 1997. The 1987 range limits are shown to illustrate the range contraction.

OBJECTIVES

The overall goal of this research was to relate habitat characteristics to measures of productivity and survival, and ultimately, the population. Once all three years of research are complete, I will use resource selection functions (RSFs) to develop statistically rigorous habitat models and develop a habitat-based population viability analyses (Manly et al 1993, Boyce and McDonald 1999).

Specific objectives of the project proposal were:

- 1) Implement experimental grazing manipulations to decrease grazing intensity on native prairie in SE Alberta. These manipulations will be designed to increase the residual grass cover and litter cover, and result in better moisture retention and forb growth.
- 2) Continue to monitor the population through spring lek counts and trapping efforts.
- 3) Monitor all aspects of Sage Grouse life history (reproductive effort, reproductive success, recruitment, and survival, focusing on females and chicks).
- 4) Model the population based on these parameters.
- 5) Assess habitat use at various life history stages using RSFs (specifically nesting and brood rearing periods and possibly at wintering areas).
- 6) Understand the effect of habitat manipulations; how Sage Grouse respond to/use them (selection of nests/brood sites within manipulations; nest success/chick survival).
- 7) Assess chick survival (hatch to fledge); overwinter survival (estimate recruitment).
- 8) Develop habitat use/probability maps to aid in habitat management for Sage Grouse.
- 9) Develop a habitat-based population model for Sage Grouse.

STUDY AREA

The study area is about 4,000 km² 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 sage (Aldridge 2000a).

METHODS

Lek counts were conducted from 26 March to 23 May 2001 at all previously known Sage Grouse leks to obtain population estimates. Birds were trapped by spotlighting with a long-

handled hoop net (Giesen et al. 1982) or in walk-in traps (Schroeder and Braun 1991). Necklace style radio transmitters (Holohil Systems Inc., Carp, Ontario) were affixed to females only.

Once released, 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. Females were located and observed every other day during the nesting period (Musil et al. 1994, Schroeder 1997, Aldridge 2000a) in order to allow for nest fate to be determined. When approaching a nest, I remained at least 30 m from the nest site (Aldridge 2000a). Nest locations were recorded in Universal transverse Mercator coordinates (UTMs). Nest fate was determined and various measures of reproductive success were estimated (see Aldridge 2000a). Nest success was estimated as the percent of all nests that hatched ≥ 1 egg. Chick survival was estimated as the percent of hatched chicks that lived ≥ 50 days.

After nesting efforts ceased, nest site characteristics were measured (see Aldridge 2000a). At each nest site, the percent sagebrush canopy coverage, as well as the percent cover of grasses, forbs, non-palatable forbs (to Sage Grouse), other shrubs and bare ground/dead materials was estimated within a 1 m² quadrat using a method similar to Daubenmire's (1959). New in 2001, I also measured the amount of residual grass cover and litter build up. The mean maximum height of the aforementioned variables was also calculated for each plot. To determine if habitat characteristics near nest sites are important, eight additional dependent non-random 1 m squared plots were placed at 7.5 and 15 m in each of the four ordinal directions and the same measurements were performed (Aldridge 2000a). A modification of Canfield's (1941) line intercept method was used to estimate the live sagebrush canopy coverage along four 15 m transects radiating from the nest site in each ordinal direction (Aldridge 2000a). A similar set of

habitat characteristics were also taken at a set of plots at a randomly related site, 100 to 500 m in a random direction from the nest site (dependent random plots). The dependent non-random plots represent non-nest site characteristics within the same 'stand', and the dependent random plots represent non-nest site characteristics from different 'stands'. At all brood locations and paired random locations, I also placed nine insect pitfall traps (300 ml plastic beer cups) with 200 ml of a mild soap solution. One trap was placed at the use site, and one trap was placed at each of 5 m and 10 m away, for each of the 4 ordinal directions.

I followed radio-collared birds throughout the spring and summer to determine habitat use. Each week, females, with or without broods were tracked (Musil et al. 1994, Schroeder 1997, Aldridge 2000a) and the same habitat measurements described for nest sites were performed. Brooding females were not intentionally flushed until chicks were at least three weeks of age, and then brood flush counts were performed to estimate chick survival when females were located. I captured two chicks from each brood and fitted each with a transmitter.

Chick transmitters were attached along the dorsal midline with two sutures (5-0 non-absorbable sterile surgical thread, Aldridge 2000b). I applied a small drop of Skin-Bond surgical adhesive (Smith and Nephew Inc., Largo, FL) between the transmitter and the chick's back before tying the sutures to ensure that the transmitter and sutures did not catch on any vegetation as the chick grew. Chicks were triangulated every second day to determine if they were still together with the hen. If signals were separated, I would locate the chick radio-signal to determine if the chick was still alive. For brood less than 3 weeks of age, I would move close enough to observe the female and chicks with binoculars. The goal was to recapture these radio-tagged chicks at 12 weeks of age, and replace their transmitters with a full size necklace-style adult transmitter.

RESULTS

Population Trends

In 2001, lek counts over the strutting period resulted in a maximum number of 127 males being counted on seven active leks (Fig. 3). Despite the drastic decrease in population numbers from the mid 1980's, counts have only slightly decreased over the last seven years (Fig. 3). All historical lek locations were checked for signs of use, and seven of the eight leks that were actively used in 2000 were used in 2001. The lek that had only one male in 2000 was inactive.

Adult Captures

I was able to locate the radio signals of all five females that I was radio tracking in August 2000, one of which was killed in late March, prior to breeding. All of these females were originally captured in 1999, and thus their radio signals were slowly decreasing in strength. One signal died before I could gather any breeding season data, and I recaptured one female and attached a new transmitter; a predator killed her prior to nesting. I captured a total of 36 females (29 adults and 7 yearlings; one was a recaptured adult) and 16 males (14 adults and 2 yearlings) during the 2001 breeding season (Table 1). Masses of males and females (adults and yearlings) were similar to masses in previous years (Table 1). All females received a radio transmitter. Thus, I had a total of 39 females radiocollared at the beginning of the 2001 breeding season. Of the 37 captures in 2001, 17% were yearlings.

Reproductive Activities

One transmitter from a 1999 captured bird died early in the breeding season. Six females disappeared prior to the breeding season, possibly due to faulty transmitters, or being killed.

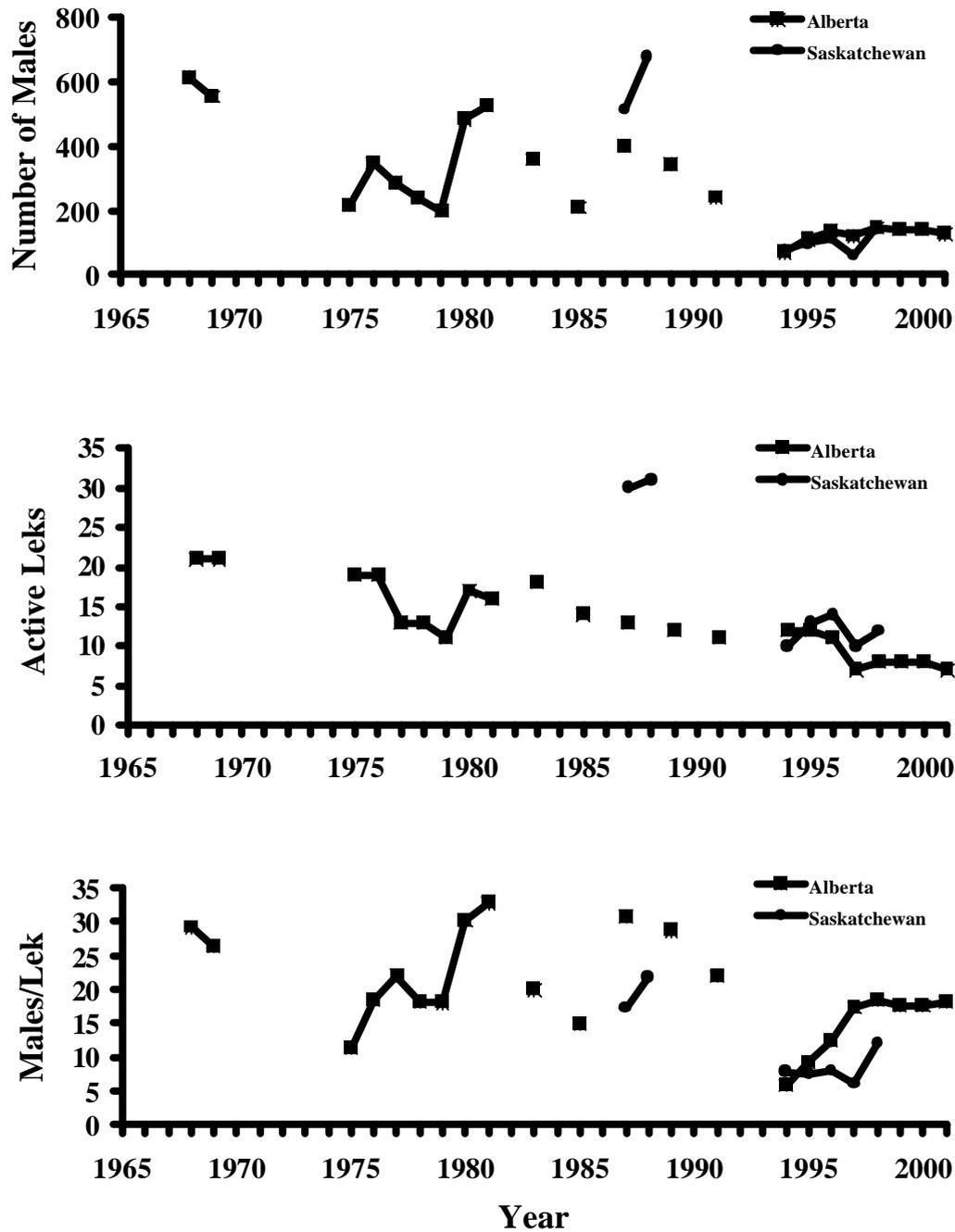


Figure 3. Population trends for Sage Grouse in Alberta and Saskatchewan over the past 34 years. Shown as the number of males, number of males per lek, and number of active leks. Years when sampling efforts consisted of less than eight surveyed leks were not included.

Five females were killed early in the breeding season and one female chose to move onto land that I did not have access to. She likely nested there, as I relocated here from a fixed-wing aircraft throughout the breeding season and summer.

Table 1. Body mass for birds captured in the 2001 breeding season in Alberta and the number of birds that received radiotransmitters. One adult female originally capture in 1999, was recaptured and included in the mass calculations. Standard Errors are shown in brackets.

	Adults		Yearlings	
	Males	Female	Male	Female
Captures	14	29	2	7
Mass	3101 (50.8)	1583 (16.7)	2563 (57.0)	1526 (38.5)
Radios	0	29	0	7

I was able to gather reproductive data for 26 different radiocollared females; two of which did not appear to initiate nesting activities. I located 25 nests from 24 different radiocollared individuals (only one female renested) and two nests from unmarked birds for a total of 27 nests. Nest success was 37% (10/27 nests). Shortly after their first nesting attempt failed, three females were killed and six additional females disappeared. Thus, only 12.5% (1/8) of females renested.

Clutch size for all nests was 7.5 eggs per nest (± 0.49 , $n = 21$) and averaged 8.6 eggs (± 0.18 , $n = 10$) for successful nests. Egg viability was 93%, with 80 of 86 eggs laid in successful nests hatching.

One radio failed while a female was on the nest, but I was able to observe her eggs successfully hatch. I subsequently tracked her after I affixed radiocollars to two of her chicks,

until the chicks both died. I continued to track the remaining females throughout the summer, and 16 radiocollared females were still alive at the end of August.

Chick Transmitters

I captured a total of 58 chicks from eight different broods. I affixed transmitters to 14 chicks; two chicks from each of six broods and one chick from each of two broods. All chicks were captured within three days of hatching, and averaged 31 ± 1.9 g at the time of capture. Transmitters weighed 1.6 g, and represented 5.1% increase in mass of the newly hatched chicks.

One transmitter failed 3 days after deployment, and I recaptured that chick and removed the radio. At 50 days of age, brood flush counts indicated that only three females still had broods, with a total of only six chicks being observed. Thus, I estimated chick survival from flush counts to be 7.5% (6/80 chicks). Chick survival estimated from the radio-tagged chicks was 10% (1/10 chicks), as two of the remaining 13 chicks could not be relocated, nine were confirmed dead, and one survived to > 50 days of age.

I was unable to locate any kill site for dad radio-tagged chicks. However, three chick transmitters were found in coyote scat, one was found in fox or badger scat, and four transmitters were located with bite marks in them. The last chick fell down an unused badger borrow and died in there.

Habitat Measurements

I gathered vegetation data at 157 Sage Grouse use sites and 157 random locations. This included 27 nest sites, 43 brood rearing locations from 7 different broods, and 87 from broodless female locations. We collected data on insect availability at each brood use and corresponding

random location. This insect/food selection and availability data will be analysed in the future with habitat data, and incorporated into resource selection models.

DISCUSSION

The population model that I developed based on my M.Sc. research predicted that the Alberta Sage Grouse population should decline in 2000 (Aldridge 2000a). The model suggested that the population should decrease from a spring estimate of 420 to 622 individuals in 1999, to between 397 and 598 individuals in 2000, and to 368 to 545 individuals in 2001 (Aldridge 2000a). Thus, the number of males attending leks was predicted to decline from 140 males in 1999 to 132, in 2000, and to 123 in 2001. I counted 140 males on leks in 2000, which was slightly higher than predicted, but in 2001 I counted 127 males on 7 active leks (Fig. 3). I estimate the 2001 Alberta spring Sage Grouse population at between 381 to 465 individuals, down from the 2000 estimate. However, my 2001 population estimate (381 - 564) is very close to the predicted estimate (368 - 545) from my 1999-population model (Aldridge 2000a).

While my model is useful for predicting the general population trends, caution needs to be used when predicting the actual population size, especially when all of the assumptions of lek counts are considered (Braun et al. 1977, Jenni and Hartzler 1978, Aldridge 2000a). Each parameter in the model is highly variable, and I am just now beginning to obtain a better understanding of the variability inherent in each parameter.

This model also assumes that female over winter survival is 100%, as I did not have any data on female overwinter survival at the time. This stresses the importance of following birds throughout the winter. One of our objectives of this research was to track radio-collared Sage Grouse over the winter to understand winter habitat selection and requirements. Specifically, we

had intended to follow juvenile Sage Grouse to obtain estimates of juvenile overwinter survival, and improve our model. However, poor nesting success and poor chick survival precluded us from following juveniles this year. Initially, I also intended to track radiocollared females over the winter, however, my \$20,000 grant from SRD was frozen by the government and did not allow me to perform any winter work. These funds should arrive in January 2002, and I am aiming to spend 3 months tracking the 16 radiocollared females that were alive in August, 2001.

Nest success in 2001(37%) was lower than that over 1998-1999 (46%, Aldridge and Brigham). However, it was higher than nest success in 2000 (20%), even though sample sizes were small in 2000 (Aldridge 2000b). This was the first year that some females did not attempt to nest. The extreme drought may resulted in reduced nesting effort, reduced renesting attempts and, resulting in poor recruitment. Only 17% of 52 birds captured in 2001 were yearlings. This number should be around 50% for a stable population (Aldridge 200a). From 1998 to 2000, 25% of 133 birds captured during the breeding season were yearlings; suggesting that recruitment in to the 2001 spring population was lower than the previous 3 years.

Mean clutch size for Sage Grouse typically ranges from 6-9 eggs (Patterson 1952, Connelly et al. 1993, Anonymous 1997, Schroeder 1997, Schroeder et al. 1999). In the past, clutch size in Alberta has averaged between 6.9 eggs per nest (Aldridge 2000b) and 7.75 eggs per nest (Aldridge and Brigham 2001). Despite the dry winter a spring, which may limit food resources that are important to pre-laying hens (Barnett and Crawford 1994), clutch size in 2001 average 7.5 eggs per nest. However, this drought likely resulted in increased nest failures and decreased the ability of females to initiate a renesting attempt; only one female renested.

Estimates of chick survival from the radio-tagged chicks (10%) yielded similar results to those from the brood flush counts (7.5%). Chick survival was the lowest it has been in the last

four years, probably due to the drought. It is encouraging to see that flush counts may be an accurate measure of chick survival, but increased sample sizes are required to fully understand the causes of chick mortalities. With these low reproductive rates, the 2002 spring population may decline even further, and fall below values predicted from my population model.

Research Project Summary

I feel that I have been very successful at achieving all of our objectives outlined above. I have not yet gathered female winter habitat use and survival data, but will begin some work in January, when funds arrive. Hopefully, southeastern Alberta will receive more moisture this year and productivity will be slightly higher next year. Thus, we will have more juveniles in the fall to follow throughout the winter.

The Alberta Government (SRD-Public Lands) is taking the lead on the grazing manipulations (Objectives 1 & 6) and is currently working with local landowners to implement experimental grazing treatments that will decrease the grazing intensity, particularly in important mesic brood habitats. This will increase the amount of residual cover and provide added concealment for nests and escape cover for adults and broods. This will be a long-term process, but I have committed to staying involved and assisting with this project over the long term, as it is essential to the survival of Sage Grouse in Canada. Once implemented, it will allow us to evaluate the consequences of management alternatives (grazing) on long-term probability of Sage Grouse extirpation/extinction in Alberta and develop suitable management strategies. Adaptive management is the key maintaining a viable Sage Grouse population in Canada.

Once the second and third years of this research are completed, I will be able to develop my Resource Selection Function models and develop a habitat based PVA (Objectives 5, 8, & 9).

ACKNOWLEDGEMENTS

I thank D. Joanne Saher, Quinn E. Fletcher, and Craig W. Dockrill for their assistance and devotion to my research this summer. I also thank the many individuals that assisted with fieldwork and the logistics of my research. This research in 2001 was generously supported financially and/or logistically by the Alberta Conservation Association, Alberta Sport Recreation Parks & Wildlife Foundation, Alberta Sustainable Resource Development, Cactus Communications (Medicine Hat, Alberta), Canadian Wildlife Foundation, Ducks Unlimited Canada (North American Waterfowl Management Plan), Endangered Species Recovery Fund (World Wildlife Fund Canada and the Canadian Wildlife Service), Esso Imperial Oil (Manyberries, Alberta), Murray Chevrolet Oldsmobile Cadillac (Medicine Hat, Alberta), a Natural Science and Engineering Research Council Scholarship to C.L. Aldridge, and the University of Alberta. We are appreciative of the many individuals and families who gave us permission to work on their land throughout the course of our study.

LITERATURE CITED

- Aldridge, C. L. 2000a. Reproduction and habitat use by Sage Grouse (*Centrocercus urophasianus*) in a northern fringe population. M.Sc. thesis, University of Regina, Regina, SK. 109 pp.
- Aldridge, C. L. 2000b. Assessing chick survival of Sage Grouse in Canada. Alberta Sustainable Resource Development, Fish and Wildlife Service, Alberta Species at Risk Report No. 19. Edmonton, Alberta. 25 pp.
- Aldridge, C. L. and R. M. Brigham. 2000. Status and distribution of Sage Grouse in Canada. *Submitted to Can. Field Nat.* 44 pp.
- Aldridge C. L., and R. M. Brigham. 2001. Nesting and reproductive activities of Greater Sage Grouse in a declining northern fringe population. *Condor* 103: 537-543.
- Aldridge, C. L., and R. M. Brigham. 2002. Sage Grouse nesting and brood habitat in southern Canada. *In Press Journal of Wildlife Management* 66(2).
- Anonymous. 1997. Gunnison Sage Grouse conservation plan. Colorado Division of Wildlife. 108 pp.
- Barnett, J. K., and J. A. Crawford. 1994. Pre-laying nutrition of Sage Grouse hens in Oregon. *J. Range Manage.* 47: 114-118.
- Braun, C. E., T. Britt, and R. O. Wallestad. 1977. Guidelines for maintenance of Sage Grouse habitats. *Wildl. Soc. Bull.* 5: 99-106.
- Braun, C. E. 1998. Sage Grouse declines in Western North America: What are the problems? *Proc. West. Assoc. State Fish and Wildl. Agencies.* 78: 139-156.
- Boyce, M. S., and L. L. McDonald. 1999. Relating populations to habitats using resource selection functions. *Tree* 14: 268-272.
- Canfield, R. H. 1941. Application of the line interception method in sampling range vegetation. *J. For.* 388-394.
- Connelly, J. W., R. A. Fischer, A. D. Apa, K. P. Reese, and W. L. Wakkinen. 1993. Renesting by Sage Grouse in southeastern Idaho. *Condor.* 95: 1041-1043.
- Daubenmire, R. F. 1959. A canopy coverage method of vegetational analysis. *Northwest Science.* 33: 43-46.
- Drut, M. S., J. A. Crawford, and M. A. Gregg. 1994. Brood habitat use by Sage Grouse in Oregon. *Great Basin Nat.* 54: 170-176.

- Giesen, K. M., T. J. Schoenberg, and C. E. Braun. 1982. Methods for trapping Sage Grouse in Colorado. *Wildl. Soc. Bull.* 10: 223-231.
- Jenni, D. A., and J. E. Hartzler. 1978. Attendance at a Sage Grouse lek: implications for spring census. *J. Wildl. Manage.* 43: 46-52.
- Johnsgard, P. A. 1983. *Grouse of the world*. University of Nebraska, Lincoln. Nebraska. 413 pp.
- Johnson, G. D., and M. S. Boyce. 1990. Feeding trials with insects in the diet of Sage Grouse chicks. *J. Wildl. Manage.* 54: 89-91.
- Manly, B. F. J., L. L. McDonald, and D. L. Thomas. 1993. *Resource selection by animals: statistical design and analysis for field studies*. Chapman and Hall, London, UK.
- Musil, D. D., K. P. Reese, and J. W. Connelly. 1994. Nesting and summer habitat use by translocated Sage Grouse (*Centrocercus Urophasianus*) in central Idaho. *Great Basin Nat.* 54: 228-233.
- Patterson, R. L. 1952. *The Sage Grouse in Wyoming*. Sage Books, Denver. 341 pp.
- Schroeder, M. A. 1997. Unusually high reproductive effort by Sage Grouse in a fragmented habitat in North-Central Washington. *Condor.* 99: 933-941.
- Schroeder, M. A., and C. E. Braun. 1991. Walk-in traps for capturing greater prairie-chickens on leks. *J. Field Ornithol.* 62: 378-385.
- Schroeder, M. A., J. R. Young, and C. E. Braun. 1999. Sage Grouse (*Centrocercus urophasianus*). In *The Birds of North America*, No. 425 (A. Poole and F. Gill, eds). The Birds of North America, Inc. Philadelphia, PA. 28 pp.
- Sveum, C. M., J. A. Crawford, and W. D. Edge. 1998. Use and selection of brood-rearing habitat by Sage Grouse in south-central Washington. *Great Basin Nat.* 58: 344-351.
- Watters, M. E., T. L. McLash, C. L. Aldridge, and R. M. Brigham. 2001. The effect of vegetation structure on the fate of artificial Greater Sage Grouse nests. *Submitted to Ecoscience*, October 2001.

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
Cameron L. Aldridge's Research on Sage Grouse

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.
- Watters, M.E. 2000. The effect of Vegetative characteristics on predation of artificial Sage Grouse (*Centrocercus urophasianus*) nests. B.Sc. Thesis, University of Regina, Regina, SK. 30 pp.
- Seida, T.L. 1998. The influence of vegetative characteristics on predation at artificial Sage Grouse nests. B.Sc. Thesis, University of Regina. Regina, SK. 26 pp.

Refereed Publications

- Aldridge, C.L.**, and R.M. Brigham. 2002. Sage Grouse nesting and brood habitat in southern Canada. In Press Journal of Wildlife Management 66(2).
- Aldridge C.L.**, and R.M. Brigham. 2001. Nesting and reproductive activities of Greater Sage Grouse in a declining northern fringe population. Condor 103: 537-543.
- Aldridge, C.L.**, S.J. Oyler-McCance, and R.M. Brigham. 2001. Occurrence of two Greater Sage Grouse X Sharp-tailed Grouse hybrids in Alberta. Condor 103: 657-660.

Papers Submitted to Referred Scientific Journals

- Fletcher, Q.E., C.W. Dockrill, J.D. Saher, and **C.L. Aldridge**. 2001. Observations of Northern Harrier attacks on Greater Sage Grouse in southern Alberta. Submitted to Canadian Field Naturalist, December 2001.
- Watters, M.E., T.L. McLash, **C. L. Aldridge**, and R.M. Brigham. 2001. The effect of vegetation structure on the fate of artificial Greater Sage Grouse nests. Submitted to Ecoscience, October 2001.
- Aldridge, C.L.** and R.M. Brigham. 2000. Status and distribution of Sage Grouse in Canada. Submitted to Canadian Field Naturalist, July 2000.

Edited Publications

- Aldridge, C.L.** 2001. Do Sage Grouse have a future in Canada? Population dynamics and management suggestions. Proceeding of the 6th Prairie Conservation and Endangered Species Conference. Winnipeg, MB. In Press.
- Aldridge, C.L.** 2000. Assessing chick survival of Sage Grouse in Canada. Alberta Sustainable Resource Development, Fish and Wildlife Service, Alberta Species at Risk Report No. 19. Edmonton, Alberta. 25 pp.
- Aldridge, C.L.** 2000. The Status of the Sage Grouse (*Centrocercus urophasianus urophasianus*) in Canada. Proceedings of the 5th Prairie Conservation and Endangered Species Workshop. J. Thorpe, T. A. Steves, and M. Gollop (eds). Provincial Museum of Alberta Natural History Occasional Paper. 24:197-205.

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

Non-refereed Publications

- Aldridge, C.L.** 2000. Assessing chick survival of Sage Grouse in Canada. Unpubl. Report. Prepared for 2000 Sage Grouse funding partners. Department of Biology, University of Regina, Regina, SK. 28 pp.
- Aldridge, C.L.** 1999. Reproductive ecology of Sage Grouse in Canada. Unpubl. Report. Prepared for 1999 Sage Grouse Funding Partners. Department of Biology, University of Regina, Regina SK. 38 pp.
- Aldridge, C.L.** 1998. Reproduction and habitat use by Sage Grouse in Canada. Unpubl. Report. Prepared for 1998 Sage Grouse Funding Partners. Department of Biology, University of Regina, Regina, SK. 19 pp.
- Aldridge, C.L.** 1997. 1997 Sage Grouse inventory: A comparison of two techniques used to monitor Sage Grouse in southeastern Alberta. Unpubl. report. Alberta Environmental Protection, Fish and Wildlife Division, Edmonton AB. 39 pp.

Presentations

Scientific Meetings

- Aldridge, C.L.** 2001. Conservation and Management of Sage Grouse in Canada: An integrated approach. The Wildlife Society's 8th Annual Conference. Reno NV.
- Aldridge, C.L.** 2001. Conservation of Sage Grouse in Alberta: managing the decline of a northern fringe population. Annual conference and meeting of the Northwest Section and Alberta Chapter of the Wildlife Society. Banff, Alberta.
- 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.
- Aldridge, C.L.** 2001. Conservation of Sage Grouse in Alberta: what do we know and how can we manage for them. 1st Partners in Conservation Conference. Nisku, Alberta.
- Aldridge, C.L.** 2000. The decline in the Canadian Sage Grouse population: Is lack of reproductive effort involved? 23rd Western States Sage and Columbian Sharp-tailed Grouse Workshop. Redmond, Oregon.
- Aldridge, C.L.** 2000. Conservation ecology of Sage Grouse in Canada. 34th Prairie Universities Biological Symposium. (PUBS). Regina, SK.
- Aldridge, C.L.** 2000. Reproductive ecology of Sage Grouse (*Centrocercus urophasianus*) in Canada. Alberta North American Waterfowl Management Biodiversity Conference. Edmonton, AB.
- Aldridge, C.L.** 1999. A drastic decline in a northern Sage Grouse (*Centrocercus urophasianus*) population: Is recruitment the problem? 23rd Prairie Grouse Technical Council Meeting. Gimli, Manitoba.
- Aldridge, C.L.** 1999. Conservation ecology of Sage Grouse in Canada. The Wildlife Society's 6th Annual Conference. Austin, TX..
- Aldridge, C.L.** 1999. A drastic decline in a northern Sage Grouse (*Centrocercus urophasianus*) population: Is recruitment the problem? 32nd Annual Prairie Universities Biological Symposium (PUBS). Saskatoon, SK.

Aldridge, C.L. 1998. The status of Sage Grouse (*Centrocercus urophasianus*) in Alberta. 22nd Western States Sage and Columbian Sharp-tailed Grouse Workshop. Billings, Montana.

Aldridge, C.L. 1998. Status of the Sage Grouse in Canada. 5th Prairie Conservation And Endangered Species Conference (PCAES). Saskatoon, SK. Edmonton, AB.

Invited Seminars

Invited Speaker - Cypress Hills Interpretive Center: Invited Lecture Series - "Where have all Sage Grouse Gone?" August 2001

Invited Speaker - Sherwood Park Fish and Game Association - "Conserving Sage Grouse in Canada: What do we know, what has to be done" February 2001

Lecture – ENCS 464 (Endangered Species Conservation and Management) – "Conservation Ecology of Sage Grouse In Canada" Oct. 2000

Guest Speaker – Alberta Chapter of the Wildlife Society – "Conservation Ecology of Sage Grouse In Canada: Understanding the decline of an Endangered Species" Sept. 2000

Cypress Hills Interpretive Center: Invited Lecture Series - "The Strut of the Sage Grouse" June 2000

Lecture – Ornithology and Conservation – University of Calgary – "Sage Grouse; Conservation in Action" Aug. 1999

Lecture Biology 150, University of Regina- Biological Concepts - "Conservation Biology on the Prairies" Nov. 1999

Regina Natural History Society – "Sage Grouse" Nov. 1999

Sacred Hearts Elementary School – Sask. Innovation in Science Series – "Endangered Species" Oct. 1999

Cypress Hills Interpretive Center: Invited Lecture Series - "The Sage Grouse" Aug. 1999

Grasslands Naturalists, Medicine Hat - "The Status of Sage Grouse in Canada." May 1999

Southern Saskatchewan Old Timers and Naturalists - "The Status of Sage Grouse in Canada." Feb. 1999

**Press Releases Related to
Cameron L. Aldridge's Research on Sage Grouse in Canada**

DATE	PRESS RELEASE	AUTHOR	TITLE
July 2001	Operation Grassland Community NwsLtr.	Cameron L. Aldridge	Saving the Sage Grouse in Alberta
Oct., 2000	Discovery Channel Story (on @discovery.ca)	Tom Hince	Sage Grouse
Nov., 1999	Edmonton Journal	Ed Struzik	Wildlife under siege
Sept., 1999	Recovery: An Endangered Species Newsletter	Cameron L. Aldridge	Sage Grouse continue to decline
Spring, 1999	PICA; The Calgary Field Naturalist's Society	Cameron L. Aldridge	Status of Sage Grouse in Canada
Feb., 1999	CBC Radio Saskatchewan	Peter Dick	Sage Grouse
Dec., 1998	Nature Views; Nature Sask. Newsletter	Cameron L. Aldridge	Status of Sage Grouse in Canada
Spring, 1998	The Third Degree; U of R Alumni Magazine	Erika Smishek	Research aims to reverse Sage Grouse saga
May 7, 1998	The Western Producer	Michael Raine	Sage Grouse listed as endangered
May 3, 1998	Lethbridge Herald		Future uncertain for once-vibrant population of Sage Grouse
May, 1998	QR77 Radio; Calgary & Edmonton		Sage Grouse
May, 1998	CBC Radio		Sage Grouse
May, 1998	CBC News (T.V.) Alberta & Saskatchewan	Gary Sieb	Sage Grouse
May, 1998	Alberta Report	Les Sillars	Prairie dancers of the sagebrush
May, 1998	Regina Sunday Sun	Frank Flegel	Getting closer to the vision
April 17, 1998	Calgary Herald	Monte Stewart	Researcher gets funding to track nesting Sage Grouse
April 9, 1998	The Regina Leader-Post		Sage Grouse population in rapid decline
April 1998	CBC NewsWorld (T.V.)		Sage Grouse
March 27, 1998	The Saskatoon StarPhoenix	Colette Derworiz	Shrinking ranks of Sage Grouse baffles researchers