IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Director

Project W-160-R-32

Subproject 47

Progress Report

Hen greater sage-grouse

UPLAND GAME BIRD ECOLOGY

Study I: Pheasant Response to Intensive Habitat Management

Study III: Greater Sage-Grouse Nest Habitat in Southern Idaho

July 1, 2004 to June 30, 2005

By:

David D. Musil, Senior Wildlife Research Biologist
Jack W. Connelly, Principle Wildlife Research Biologist

September 2005
Boise, Idaho

Findings in this report are preliminary in nature and not for publication without permission of the Director of the Idaho Department of Fish and Game.

The Idaho Department of Fish and Game adheres to all applicable state and federal laws and regulations related to discrimination on the basis of race, color, national origin, age, gender, or handicap. If you feel you have been discriminated against in any program, activity, or facility of the Idaho Department of Fish and Game, or if you desire further information, please write to: Idaho Department of Fish and Game, PO Box 25, Boise, ID 83707; or the Office of Human Resources, U.S. Fish and Wildlife Service, Department of the Interior, Washington, DC 20240.

This publication will be made available in alternative formats upon request. Please contact the Idaho Department of Fish and Game for assistance.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

PROGRESS REPORT
STATEWIDE WILDLIFE RESEARCH

STATE: Idaho **JOB TITLE:** Upland Game Bird Ecology
PROJECT: W-160-R-32
SUBPROJECT: 47 **STUDY NAME:** Pheasant Response to Intensive
STUDY: I Habitat Management
JOB: 2
PERIOD COVERED: July 1, 2004 to June 30, 2005

PHEASANT RESPONSE TO INTENSIVE HABITAT MANAGEMENT

Abstract

Surveys of pheasants (*Phasianus colchicus*) were conducted during the springs of 1994-1999 on 13 sections of agricultural land in Gooding County, Idaho. Crop reports and aerial photos are being used to determine cover types within the sections throughout the sampling years. All of the data has been entered and is currently being edited.

Recommendations

1. Complete editing data.

2. Analyze data.

3. Prepare completion report and publish results in a peer reviewed journal.

Introduction

One aspect of pheasant (*Phasianus colchicus*) ecology that may be limiting populations is habitat available for territorial males during spring breeding season (Robertson et al. 1993, Robertson 1996). Males display in open areas adjacent to heavier cover. The open cover provides for optimum displaying and attracting mates while adjacent heavier vegetation provides escape security from predators (Leif in press). As habitat is limited in agricultural areas, densities of territorial male pheasants may also be limited, reducing availability for mating with females and ultimately reducing the population size.

Objective

The objective of this project is to determine habitat cover type characteristics associated with territorial male pheasant densities during the breeding season.

Study Area

Pheasant surveys were conducted on square mile sections (259 ha) of agricultural land in northern Gooding County, Idaho. Gooding County is in south-central Idaho within the Snake River Plain, and dominant crops include alfalfa, corn, small grain, potatoes, sugar beets, pastures, and beans. Dispersed between the crops are idle areas of annual herbaceous cover, sagebrush (*Artemisia* spp.), irrigation canal banks of grass, riparian and wetland areas, and grass ditch banks along roads. The topography is relatively flat averaging 1,000 m elevations. The mean annual precipitation is 26.7 cm and annual temperatures average 8.7^{o} C.

Methods

Pheasants were counted from the ground according to protocol described by Robertson et al. 1993 and P. Robertson (pers. comm.). Observations were made ½ hour before sunrise and 2 hours before sunset. Locations were plotted on aerial photos. An effort was made to observe every portion of the section by moving to strategic positions, observing with spotting scopes and/or binoculars, and listening. Counts were conducted 3 times each spring, once during each of the following periods: 15-30 April, 1-14 May, and 15-31 May. Pheasants were classified into 3 groups: females, non-territorial males, and territorial males. Territorial males both crow and wing-flap during display. All males with accompanying females were considered territorial. Males displaying outside the section but within 107 m (320 ft) were also mapped.

Field edges were mapped with hand-held global positioning systems in 1999. These were overlain onto base maps of 1987 orthophotoquadrangle imagery from Idaho Department of Lands using ArcView (ESRI, Redlands CA 92373). Crop types were determined from Farm Services Administration (FSA) databases and field edges corrected for each year from FSA's annual aerial photos. Cover types were also determined 107 m (320 ft) and 214 m (640 ft) outside of the sections to include territories observed outside of the section.

Pheasant locations were transferred from field maps made by observers to global information systems (GIS) maps. P. Robertson (pers. comm.) estimated territories were 3 ha (7 ac) in Nevada. Therefore, we plotted 3 ha circles around each territorial male location so underlying cover can be measured.

Results

Thirteen sections were surveyed for pheasants during 1994-1999. Data entry is complete and map editing is nearing completion. Data analysis has not started. An example of mapping for 1 section is provided in Figure 1.

PROGRESS REPORT
STATEWIDE WILDLIFE RESEARCH

STATE: Idaho **JOB TITLE:** Upland Game Bird Ecology
PROJECT: W-160-R-32
SUBPROJECT: 47 **STUDY NAME:** Greater Sage-Grouse Nest
STUDY: III Habitat in Southern Idaho
JOB: 1
PERIOD COVERED: July 1, 2004 to June 30, 2005

GREATER SAGE-GROUSE NEST HABITAT IN SOUTHERN IDAHO

Abstract

We are investigating the relationship between nest success and habitat characteristics for greater sage-grouse (*Centrocercus urophasianus*) in Idaho. This study also includes the influences of land management practices on nest success. Since 2002, we have measured vegetation on 209 sage-grouse nests. Forb cover is at or below recommended guidelines in a majority of the study areas. Growth of grass near nests were sampled in 2003-2005 for 96 nests to estimate grass height at nest initiation. Analysis will commence after the 2005 data have been entered. A completion report will be provided by September 2006.

Recommendations

1. Compile local weather data, grazing strategies, and fire histories for nest and random sites.

2. Analyze data and provide completion report by September 2006.

3. Publish results in peer reviewed journal.

Introduction

Greater sage-grouse (*Centrocercus urophasianus*) populations have declined throughout the Intermountain West (Connelly and Braun 1997, Connelly et al. 2004), and their distribution is greatly influenced by the occurrence of shrub-steppe habitat types, especially those dominated by sagebrush (Patterson 1952, Connelly and Braun 1997). Habitat quality is an important factor influencing nest success, which ultimately affects recruitment and population levels. Nests are more likely to hatch when sites are under sagebrush (Connelly et al. 1991), have higher canopy coverage and density of sagebrush than the surrounding area (Wallestad and Pyrah 1974), and have greater percent cover of residual grass >18 cm tall within 1 m of the nest (Gregg et al. 1994).

To increase greater sage-grouse productivity through habitat management, the Idaho Department of Fish and Game Commission approved the Idaho Greater Sage-grouse Management Plan

(Idaho Department of Fish and Game [IDFG] 1997), later signed by the Bureau of Land Management (BLM). One management objective was to "Manage nesting and early brood habitat to provide 15 to 25% sagebrush canopy coverage and about 7 inches or more of grass and forb understory during the May nesting period" (IDFG 1997:12). Natural resource agencies have difficulty (pers. comm. Paul Makela, BLM wildlife biologist) applying the 7-inch (18 cm) herbaceous height guideline to habitat types dominated by understory species with small stature (e.g., Sandberg's bluegrass [*Poa sandbergii*]). Measuring grass height is time consuming and is an added workload (pers. comm. Paul Makela). Also, it is unknown how the 7-inch grass height relates to livestock utilization levels (i.e., light or slight versus moderate or heavy use). Utilization sampling is a common practice for range management personnel and utilization contours are developed for many grazing allotments. These estimates have not been related to greater sage-grouse nest selection or nest success.

Nest initiation begins approximately 10 days after breeding (Autenrieth 1981). Egg laying requires 1.3 days/egg laid with an average of 7 eggs/nest (Patterson 1952), and incubation lasts 26 days (Pyrah 1954). Plant structure surrounding the nest, especially grasses and forbs, changes rapidly during the month between nest selection and hatching. Nest sites are typically measured after the hen leaves to avoid abandonment or attracting predators resulting from observer influence. Measuring nest site vegetation this late may not reflect the habitat condition the hen was responding to at nest initiation and may not allow us to completely understand reasons for unsuccessful nests. The landscape around the nest changes from dormant residual grasses and forbs produced during the previous year, to lush and succulent vegetation as the growing season progresses. Factors that influence nest-site selection are unknown but could involve dormant vegetal structure at the time of nest selection or potential cover at hatch. Succulent forbs are nutritionally important for pre-laying hens (Barnett and Crawford 1994) and may influence nest-site selection. Managing habitat for potential cover is difficult due to variable precipitation patterns. Residual cover is dependent on the previous year's precipitation, grazing practices, and its structure may be negatively impacted by snow depth.

Past research on greater sage-grouse breeding habitat has focused on shrub structure (Wallestad and Pyrah 1974) and general understory cover (Klebenow 1969, Connelly et al. 1991, Gregg et al. 1994) overlooking the possible importance of species diversity and variance of plant structure. Comparing differences in variance estimates allows for testing the homogeneity of habitat (Ratti et al. 1984). Spatial heterogeneity may be more important than nest concealment in reducing nest depredation (Bowman and Harris 1980). Also, past research projects have focused on single study sites dominated by 1 or 2 habitat types. Greater sage-grouse are known to nest in several habitat types throughout Idaho.

No research has been conducted to relate plant structure, range utilization, grazing systems, or habitat type to greater sage-grouse productivity or nest-site selection. This information would assist land management agencies to properly manage rangelands to benefit declining greater sage-grouse populations (Schroeder et al. 1999).

Objective

Determine vegetation and range management parameters associated with successful and unsuccessful greater sage-grouse nests throughout southern Idaho.

Study Areas

This research is being conducted on 14 study sites, of which 2-4/year have ongoing greater sage-grouse telemetry projects (Figure 2). The study areas are distributed throughout southern Idaho ranging in elevation from 1,600-2,400 m in a variety of shrub-steppe habitat types and range conditions. At least 12 habitat types (Hironaka et al. 1983) are present on the study areas and each area has at least 1 habitat type. The study areas are on public and private land and are grazed in accordance with federal leases administered by BLM or U. S. Forest Service (USFS).

Methods

Successful and unsuccessful greater sage-grouse nest sites were obtained from radio-marked hens being monitored as part of other ongoing studies. Each nest was classified according to a specific habitat type. Habitat measurements were taken from the sites after hens ceased nesting efforts.

Vegetation sampling was conducted similar to Wakkinen (1990), Gregg et al. (1994), and Musil et al. (1994). Measurements were taken along 4 10-m transects placed at right angles radiating from the center of the nest. Droop height of the closest shrub and grass for each species was measured within 1 m of the transect at 1, 3, and 5 m from the center of the nest for each transect. Droop height is defined as the tallest naturally growing portion of the plant (Connelly et al. 2000). Droop height of residual (previous season growth) and live (current season growth) leaf and height of tallest flower stalk (tallest of residual or live) for each grass species was measured separately. The number of flower stalks was also counted. Effective height is the height of plant structure that effectively provides horizontal concealment cover. Effective height was measured for grass and shrubs and is measured by placing a meter stick behind the plant and estimating the tallest height most concealing the increments on the stick. Plants with few flower stalks have effective heights measured at the top of the densest portion of residual or live leaves, or branches, below the flower stalks. Plants with numerous flower stalks provide effective cover from these structures above residual and live structure. A Jones (1968) cover board was used to measure horizontal cover within the nest bowl. Horizontal cover outside of the nest bowl was measured with a Robel et al. (1970) pole. The pole was placed at 1, 3, and 5 m from the nest along the transects and read from 20 cm above the ground immediately outside of the nest shrub. The view of the pole from this position mimics the eye level of a greater sage-grouse hen incubating a nest. Shrub canopy cover (Canfield 1941) and shrub density was measured along the 10 m transects. Shrub density was determined by counting the number of plants of each shrub species touching or within 0.5 m on both sides of the transects. Understory cover for each forb and grass species was measured with a 40 x 50 cm modified Daubenmire (1959) frame at 1, 3, and 5 m from the nest on each of the 4 transects. Slope and aspect were measured on-site using a clinometer and compass, respectively. Elevation was obtained from plotting nest locations on 7.5 minute topographic maps.

Measurements of grass height by species were taken at 1 plot 30-50 m from incubating radio-marked hens in 2003-2005 to determine growth phenology. Measurements were made within 1 week of initiation of incubation. The same sampling scheme for grass height measurements at nest sites was conducted at these "near nest" plots. Individual grass species were marked with stick pins so the exact plant could be measured at the end of incubation. Near nest plots were located at the same elevation and aspect as the nest to ensure similar growth patterns. Random plots were generated using ArcView Spatial Analyst (ESRI Redlands CA 92373-8100) software and measured during the hatch.

Land management parameters were obtained from BLM and USFS offices in each study area. Stocking rates, pasture size, and turn-in/turn-out dates for livestock were obtained for the current growing season and previous year. Fire history and rehabilitation efforts were also obtained for each nest and random location. Precipitation records from nearby weather stations were obtained for the previous growing season, winter, and spring prior to the current year's hatch.

Results and Discussion

During 2002-2005, 209 greater sage-grouse nests were measured in 14 study areas (Figure 2) in southern Idaho. Summary of sample sizes are provided in Table 1. Data entry is underway for 2005 nest measurements. Data analysis will commence when the 2005 data is entered. A completion report will be provided by September 2006.

Preliminary results from the 2002-2004 field seasons have been separated by study area, but only parameters used as recommended guidelines (Connelly et al. 2000) for sage-grouse breeding habitat have been presented (Figures 3-16). The guidelines recommend a minimum of 10% forb cover, 15% grass cover, 15% sagebrush cover, 30 cm sagebrush height, and 18 cm grass droop height. Only 7 study areas have random plots along with the nest plots. Most study areas are at or below the minimum recommendation for forb cover (Figures 3 and 4). Most study areas meet or exceed the recommended guideline for grass cover (Figures 5 and 6), sagebrush cover (Figures 7 and 8), and sagebrush height (Figures 9 and 10). Most study areas did not meet the guideline for grass height using only residual grass measurements. Live grass height (current year growth) also did not meet the minimum grass droop height for a majority of the study areas. Flower stalk height (live or residual) did exceed the grass droop height recommendation for most of the study areas.

Idaho experienced lower than normal precipitation during 2002-2004. Also, 31% of nest sites were dominated by low sagebrush (*Artemisia arbuscula*), a short stature shrub, and 37% were dominated by Wyoming big sagebrush (*A. tridentata wyomingensis*), a taller shrub. Twenty-five percent of nest sites were dominated by short bluegrasses (*Poa* spp.) and 19% were dominated by taller bluebunch wheatgrass (*Pseudoroegneria spicata*). The drought conditions and variability in plant species may account for several of the study areas not meeting the recommended guidelines. In the final analysis, grass and shrub parameters will be separated by species. Multivariate statistical analysis will be conducted to determine variables separating successful from unsuccessful nesting habitat.

LITERATURE CITED

AUTENRIETH, R. E. 1981. Sage-grouse management in Idaho. Federal Aid Wildlife Restoration Project W-125-R and W-160-R. Wildlife Bulletin No. 9, Idaho Dept. Fish and Game, Boise, USA.

BARNETT, J. K., AND J. A. CRAWFORD. 1994. Pre-laying nutrition of sage-grouse hens in Oregon. Journal of Range Management 47:114-118.

BOWMAN, G. B., AND L. D. HARRIS. 1980. Effect of spatial heterogeneity on ground-nest depredation. Journal of Wildlife Management 44:806-813.

CANFIELD, R. H. 1941. Application of the line interception method in sampling range vegetation. Journal of Forestry 39:388-394.

CONNELLY, J. W., AND C. E. BRAUN. 1997. Long-term changes in sage-grouse *Centrocercus urophasianus* populations in western North America. Wildlife Biology 3/4:123-128.

_____, W. L. WAKKINEN, A. D. APA, AND K. P. REESE. 1991. Sage-grouse use of nest sites in southeastern Idaho. Journal of Wildlife Management 55:521-524.

_____, M. A. SCHROEDER, A. R. SANDS, AND C. E. BRAUN. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.

_____, S. T. KNICK, M. A. SCHROEDER, AND S. J. STIVER. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming, USA.

DAUBENMIRE, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Science 33:43-64.

GREGG, M. A., J. A. CRAWFORD, M. S. DRUT, AND A. K. DELONG. 1994. Vegetational cover and predation of sage-grouse nests in Oregon. Journal of Wildlife Management 58:162-166.

HIRONAKA, M., M. A. FOSBERG, AND A. H. WINWARD. 1983. Sagebrush-grass habitat types of southern Idaho. College of Forestry, Wildlife, and Range Sciences Bulletin No. 35. University of Idaho, Moscow, USA.

IDAHO DEPARTMENT OF FISH AND GAME. 1997. Idaho sage-grouse management plan 1997. Idaho Department of Fish and Game, Boise, USA.

JONES, R. E. 1968. A board to measure cover used by prairie grouse. Journal of Wildlife Management 32:28-31.

KLEBENOW, D. A. 1969. Sage-grouse nesting and brood habitat in Idaho. Journal of Wildlife Management 33:649-662.

LEIF, A. P. In press. Spatial ecology and habitat selection of breeding male pheasants. Wildlife Society Bulletin.

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 Naturalist 54:228-233.

PATTERSON, R. L. 1952. The sage-grouse in Wyoming. Sage Books, Inc., Denver, Colorado, USA.

PYRAH, D. B. 1954. A preliminary study toward sage-grouse management in Clark and Fremont counties based on seasonal movements. Thesis, University of Idaho, Moscow, USA.

RATTI, J. T., D. L. MACKEY, AND J. R. ALLDREDGE. 1984. Analysis of spruce grouse habitat in north-central Washington. Journal of Wildlife Management 48:1188-1196.

ROBEL, R. J., J. N. BRIGGS, A. D. DAYTON, AND L. C. HULBERT. 1970. Relationships between visual obstruction measurements and weight of grassland vegetation. Journal of Range Management 23:295.

ROBERTSON, P. A. 1996. Does nesting cover limit abundance of ring-necked pheasants in North America? Wildlife Society Bulletin 24:98-106.

_____, M. I. A. WOODBURN, W. NEUTEL, AND C. E. BEALEY. 1993. Effects of land use on breeding pheasant density. Journal of Applied Ecology 30:465-477.

SCHROEDER, M. A., J. R. YOUNG, AND C. E. BRAUN. 1999. Sage-grouse *Centrocercus urophasianus*. Pages 1-28 *in* A. Poole and F. Gill, editors. The birds of North America, No. 425. The Birds of North America, Philadelphia, Pennsylvania, USA.

WAKKINEN, W. L. 1990. Nest site characteristics and spring-summer movements of migratory sage-grouse in southeastern Idaho. Thesis, University of Idaho, Moscow, USA.

WALLESTAD, R., AND D. PYRAH. 1974. Movement and nesting of sage-grouse hens in central Montana. Journal of Wildlife Management 38:630-633.

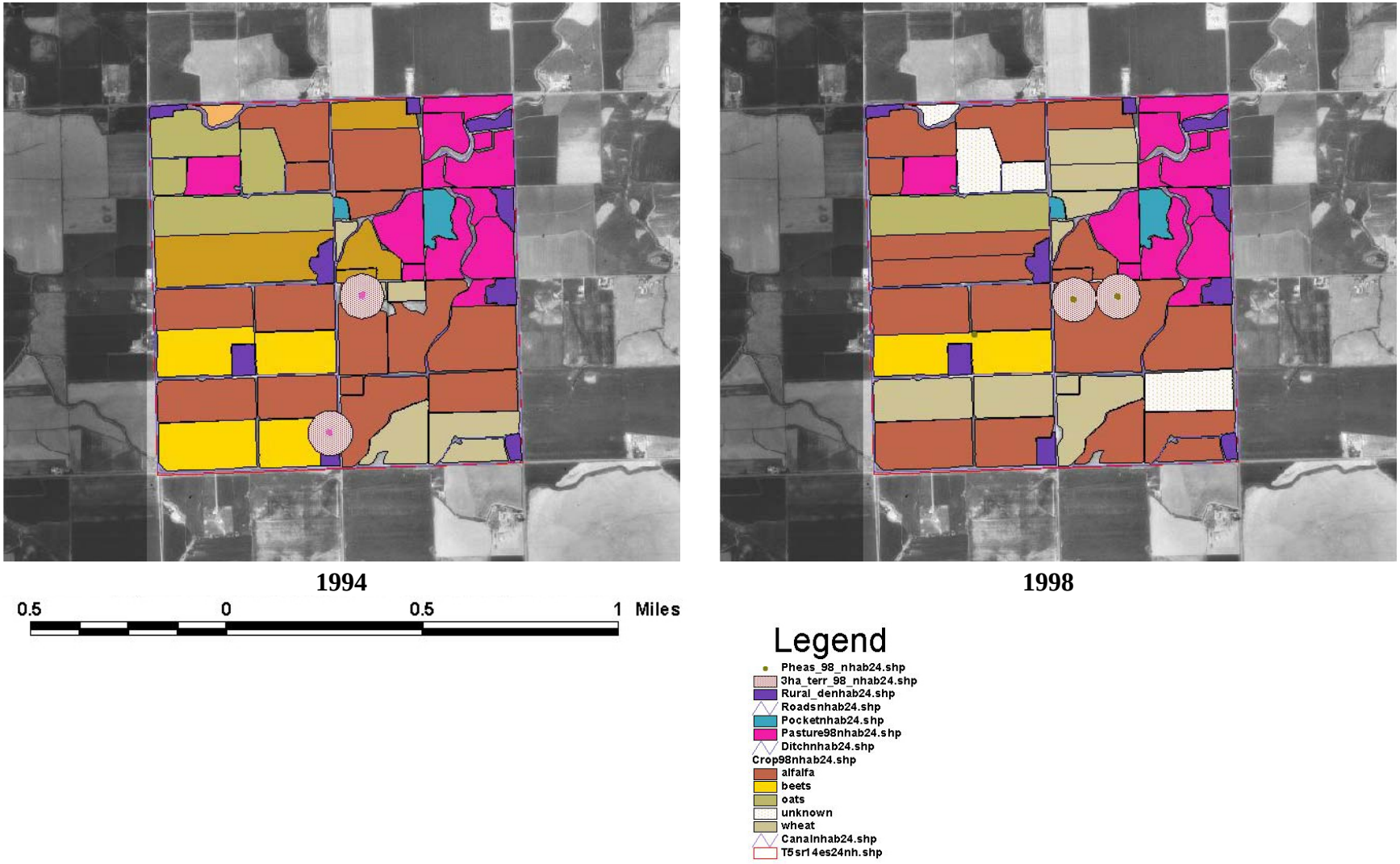

Figure 1. Example of territorial male pheasant locations with 3 ha (7 ac) circle around location overlain on cover types for Township 5 South, Range 14 East, Section 24 for 1994 and 1998, Gooding County, Idaho.

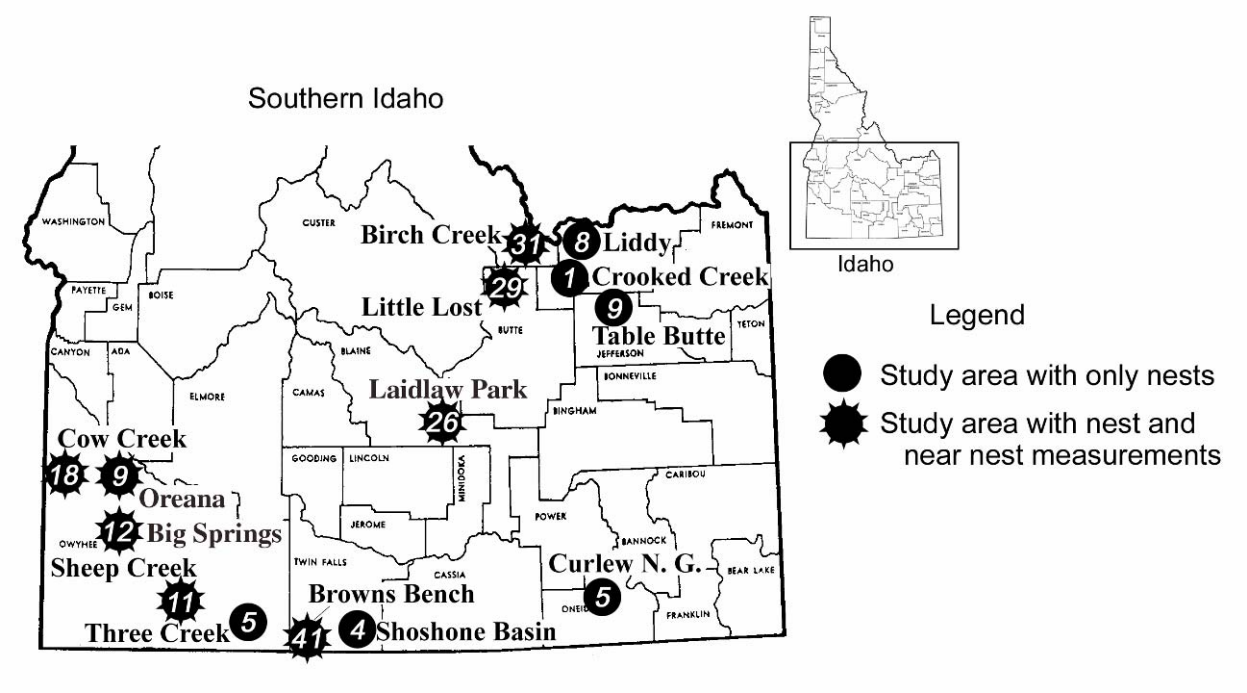

Figure 2. Study areas in southern Idaho for greater sage-grouse nesting habitat, 2002-2005. Numbers within markers are sample sizes for nests.

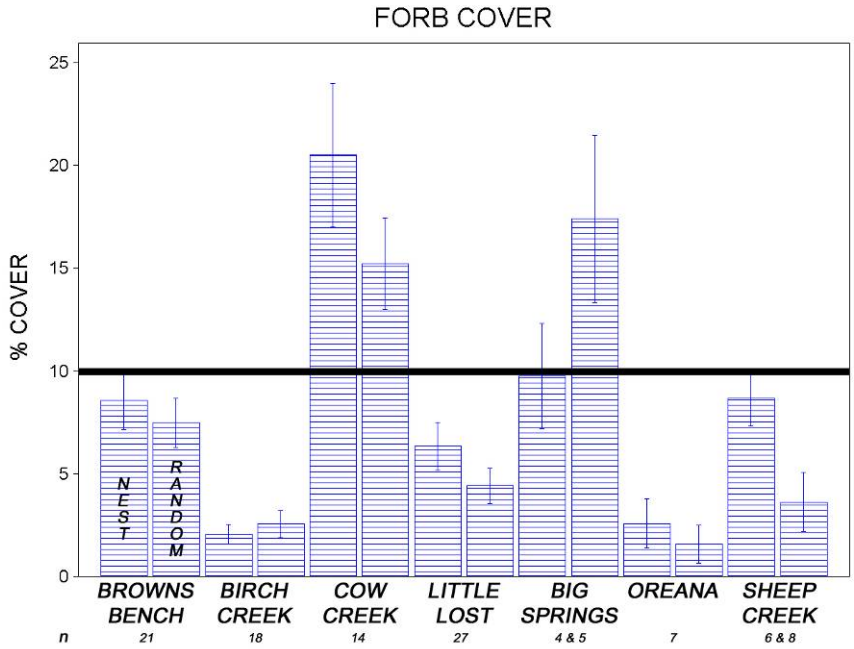

Figure 3. Forb cover compared among 7 study areas with nest and random plots during 2003-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. For each study area, the first bar indicates nest measurements, second bar for random plots.

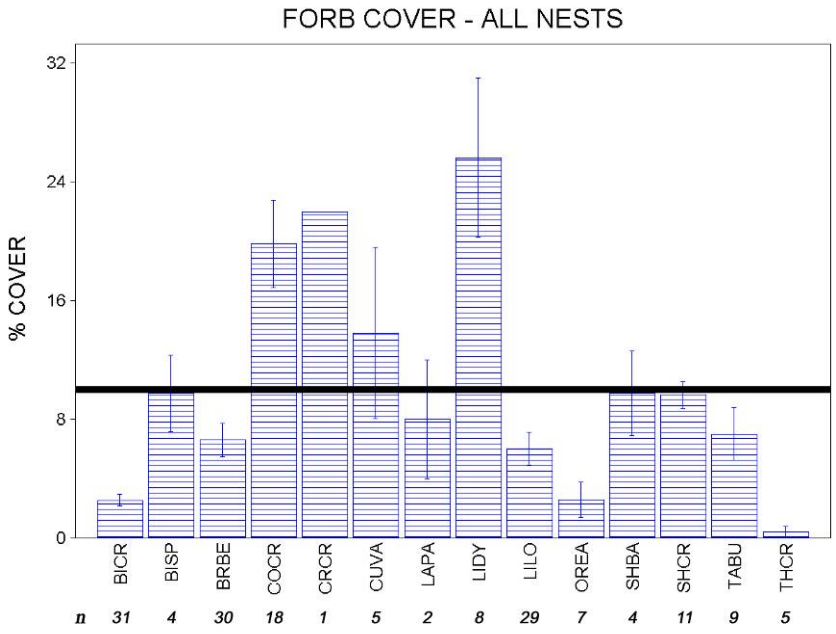

Figure 4. Forb cover for all sage-grouse nests during 2002-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. See Table 2 for study area abbreviations.

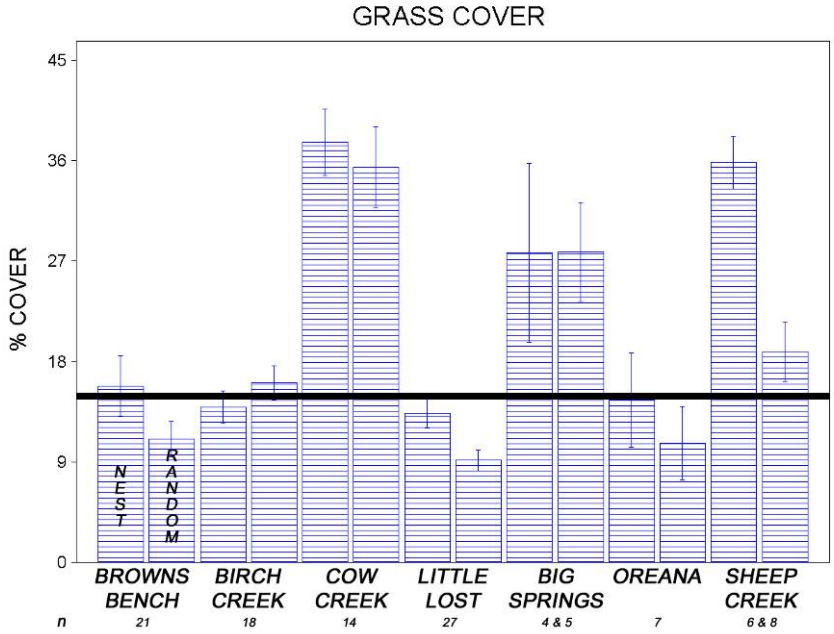

Figure 5. Grass cover compared among 7 study areas with nest and random plots during 2003-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. For each study area, the first bar indicates nest measurements, second bar for random plots.

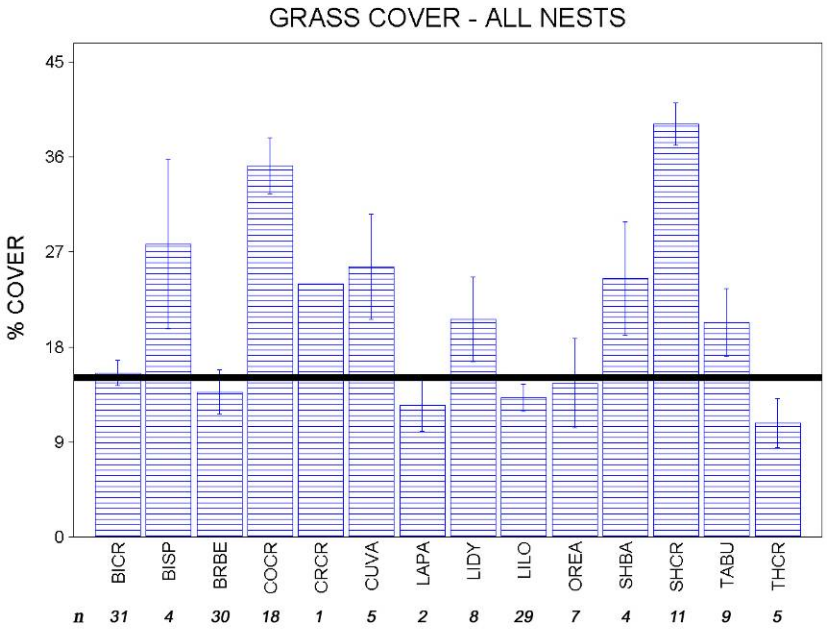

Figure 6. Grass cover for all sage-grouse nests during 2002-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. See Table 2 for study area abbreviations.

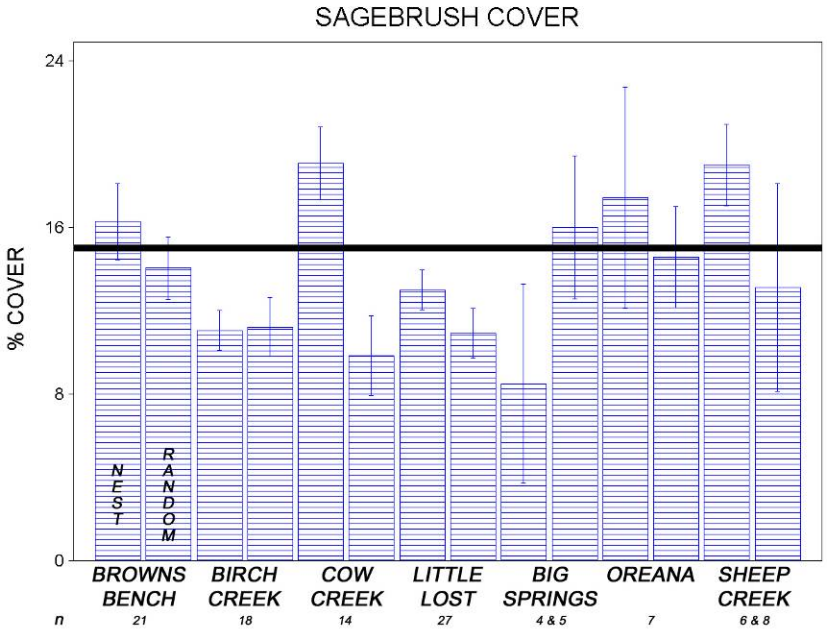

Figure 7. Sagebrush cover compared among 7 study areas with nest and random plots during 2003-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. For each study area, the first bar indicates nest measurements, second bar for random plots.

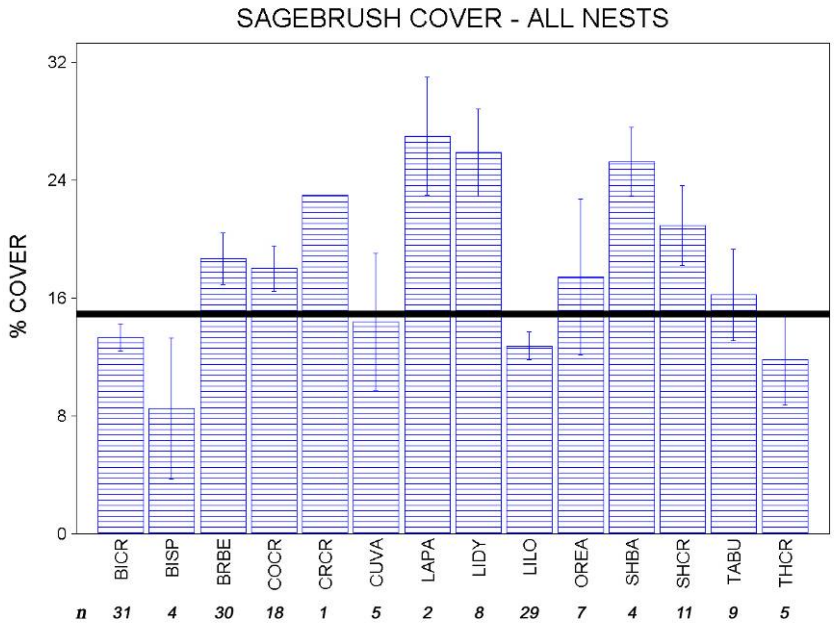

Figure 8. Sagebrush cover for all sage-grouse nests during 2002-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. See Table 2 for study area abbreviations.

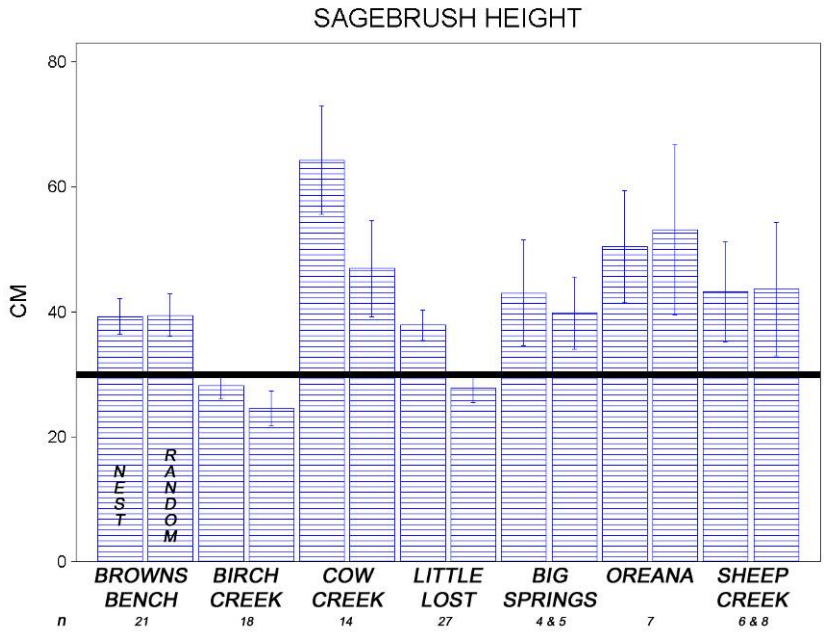

Figure 9. Sagebrush height compared among 7 study areas with nest and random plots during 2003-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. For each study area, the first bar indicates nest measurements, second bar for random plots.

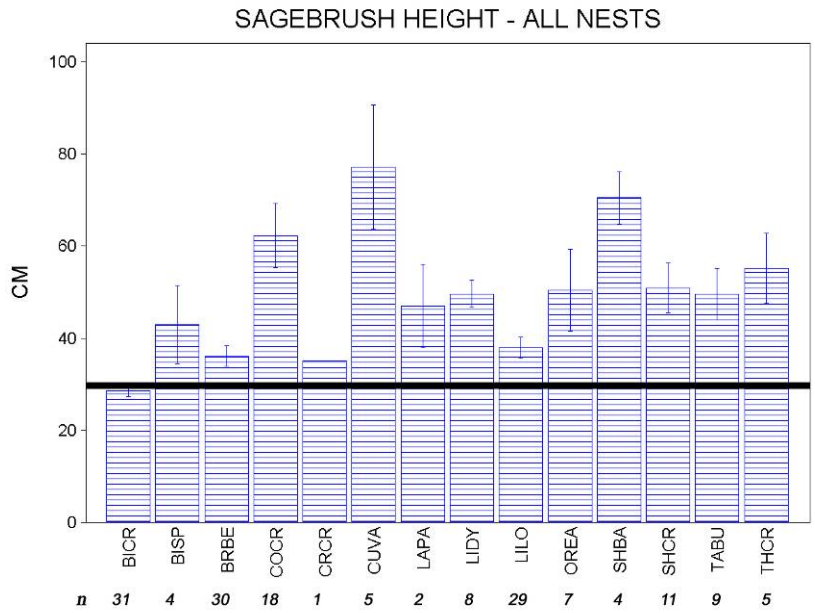

Figure 10. Sagebrush height for all sage-grouse nests during 2002-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. See Table 2 for study area abbreviations.

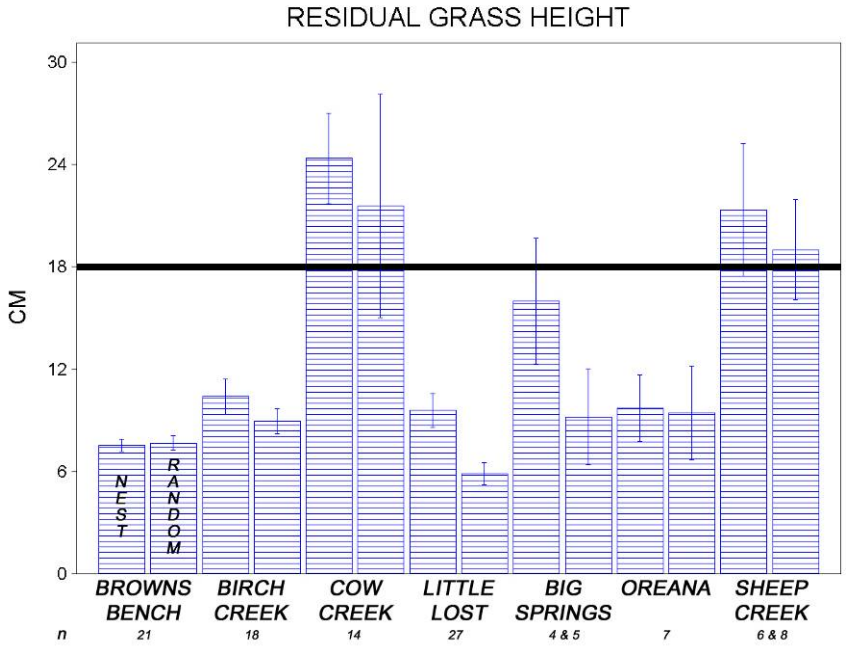

Figure 11. Residual grass height compared among 7 study areas with nest and random plots during 2003-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. For each study area, the first bar indicates nest measurements, second bar for random plots.

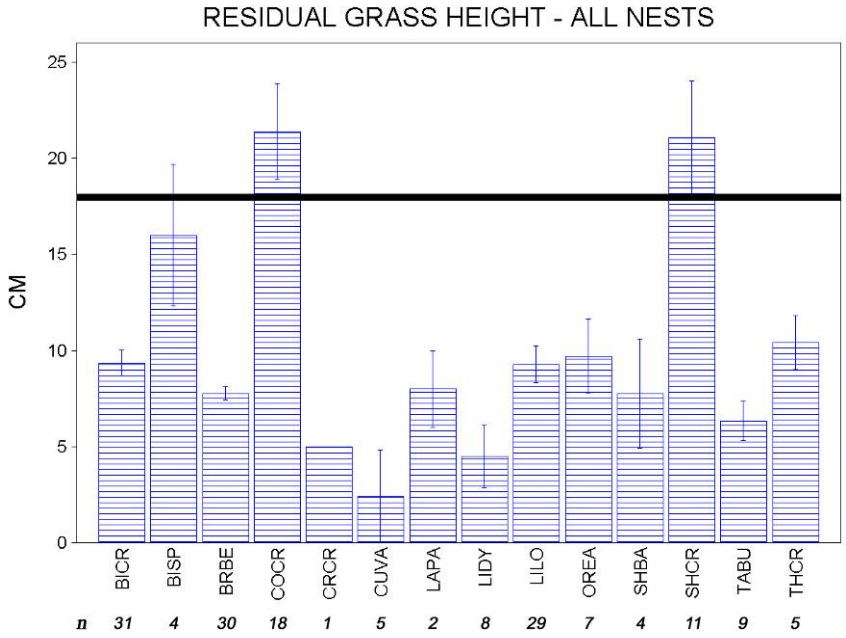

Figure 12. Residual grass height for all sage-grouse nests during 2002-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. See Table 2 for study area abbreviations.

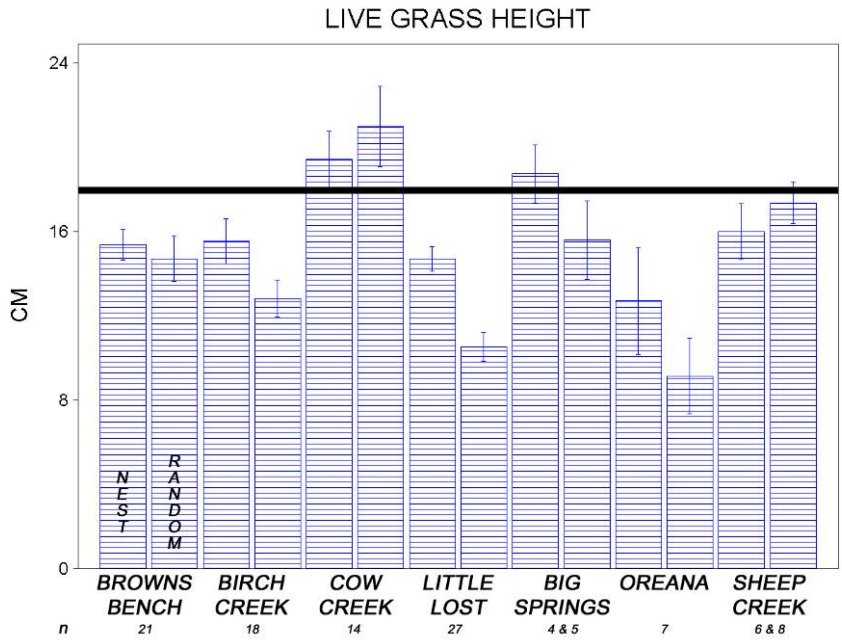

Figure 13. Live grass height compared among 7 study areas with nest and random plots during 2003-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. For each study area, the first bar indicates nest measurements, second bar for random plots.

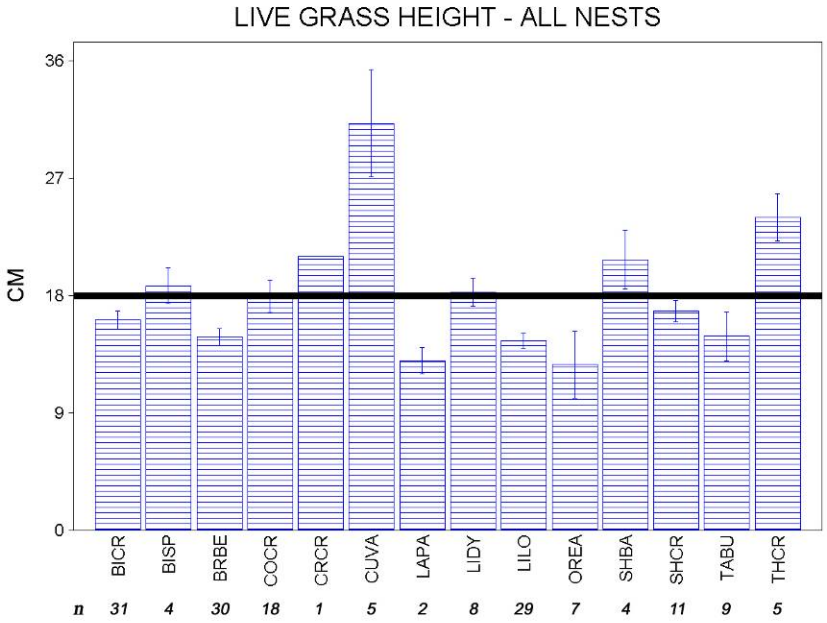

Figure 14. Live grass height for all sage-grouse nests during 2002-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. See Table 2 for study area abbreviations.

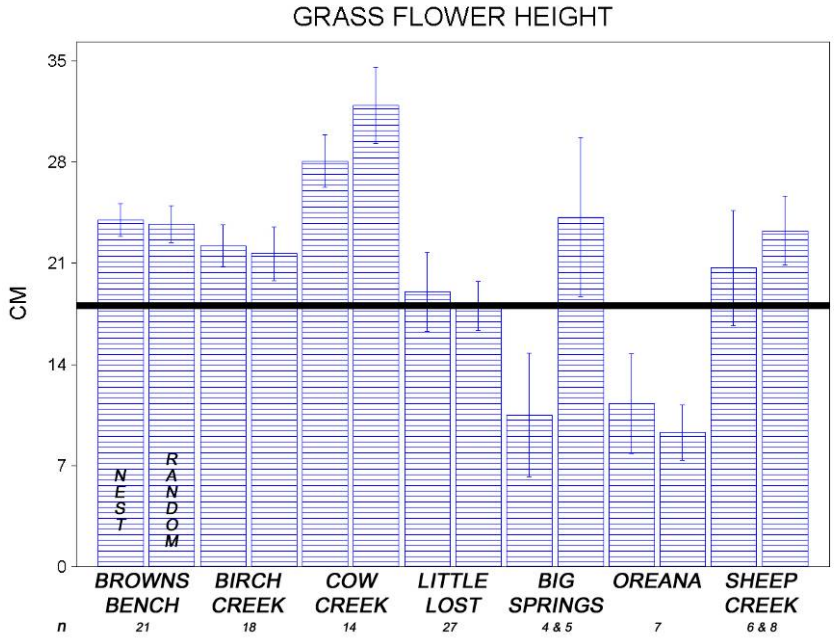

Figure 15. Grass flower height compared among 7 study areas with nest and random plots during 2003-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. For each study area, the first bar indicates nest measurements, second bar for random plots.

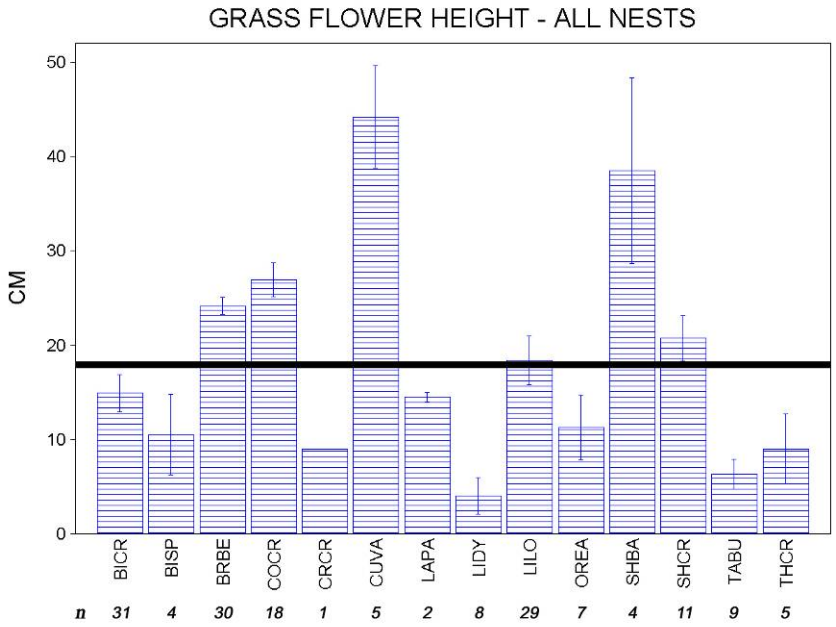

Figure 16. Grass flower height for all sage-grouse nests during 2002-2004 in Idaho. Horizontal bar indicates the minimum recommended guideline (Connelly et al. 2000) for sage-grouse breeding habitat. Values are means bounded by 1 SD. See Table 2 for study area abbreviations.

Table 1. Vegetation sampling of greater sage-grouse nests, Idaho.

		Vegetation samples (*n*)		
Year	Nest success (%)	Nests	Near Nests	Random
2002	48	56		
2003	34	62	40	55
2004	49	46	35	45
2005	48	45	21	38
Total	45	209	96	138

Table 2. Abbreviations for study areas of greater sage-grouse research during 2002-2005, Idaho.

Study area	Abbreviation	County
Birch Creek	BICR	Clark, Lemhi
Big Springs	BISP	Owyhee
Browns Bench	BRBE	Twin Falls
Cow Creek	COCR	Owyhee
Curlew Valley	CUVA	Power
Laidlaw Park	LAPA	Blaine, Lincoln, Minidoka
Lidy	LIDY	Clark
Little Lost	LILO	Butte
Oreana	OREA	Owyhee
Shoshone Basin	SHBA	Twin Falls
Sheep Creek	SHCR	Owyhee
Table Butte	TABU	Jefferson
Three Creek	THCR	Owyhee

Submitted by:

David D. Musil
Senior Wildlife Research Biologist

John W. Connelly
Principle Wildlife Research Biologist

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Dale E. Toweill
Wildlife Program Coordinator
Federal Aid Coordinator

James W. Unsworth, Chief
Bureau of Wildlife

FEDERAL AID IN WILDLIFE RESTORATION

The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sale of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program then allots the funds back to states through a formula based on each state's geographic area and the number of paid hunting license holders in the state. The Idaho Department of Fish and Game uses the funds to help restore, conserve, manage, and enhance wild birds and mammals for the public benefit. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes necessary to be responsible, ethical hunters. Seventy-five percent of the funds for this project are from Federal Aid. The other 25% comes from license-generated funds.