

**IDAHO DEPARTMENT OF FISH AND GAME**

**Steven M. Huffaker, Director**

**Project W-160-R-33**

**Subproject 47**

**Completion Report**



*Hen greater sage-grouse on nest under mountain big sagebrush*

**UPLAND GAME BIRD ECOLOGY**

Study I: Pheasant Response to Intensive Habitat Management

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

July 1, 2005 to June 30, 2006

By:

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September 2006  
Boise, Idaho



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**COMPLETION REPORT  
STATEWIDE WILDLIFE RESEARCH**

|                        |                                      |                    |  |
|------------------------|--------------------------------------|--------------------|--|
| <b>STATE:</b>          | <u>Idaho</u>                         | <b>JOB TITLE:</b>  | <u>Upland Game Bird Ecology</u>                              |
| <b>PROJECT:</b>        | <u>W-160-R-33</u>                    |                    |  |
| <b>SUBPROJECT:</b>     | <u>47</u>                            | <b>STUDY NAME:</b> | <u>Pheasant Response to Intensive<br/>Habitat Management</u> |
| <b>STUDY:</b>          | <u>1</u>                             |                    |  |
| <b>JOB:</b>            | <u>2</u>                             |                    |  |
| <b>PERIOD COVERED:</b> | <u>July 1, 2005 to June 30, 2006</u> |                    |  |

**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. The data has been edited and is now being analyzed.

**Recommendations**

1. Analyze data.
2. 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 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° 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 and map editing is complete. Data analysis has started. An example of mapping for one section is provided in Figure 1.

**COMPLETION REPORT  
STATEWIDE WILDLIFE RESEARCH**

|                        |                                      |                    |                                  |
|------------------------|--------------------------------------|--------------------|----------------------------------|
| <b>STATE:</b>          | <u>Idaho</u>                         | <b>JOB TITLE:</b>  | <u>Upland Game Bird Ecology</u>  |
| <b>PROJECT:</b>        | <u>W-160-R-33</u>                    |                    |                                  |
| <b>SUBPROJECT:</b>     | <u>47</u>                            | <b>STUDY NAME:</b> | <u>Greater Sage-Grouse Nest</u>  |
| <b>STUDY:</b>          | <u>III</u>                           |                    | <u>Habitat in Southern Idaho</u> |
| <b>JOB:</b>            | <u>1</u>                             |                    |                                  |
| <b>PERIOD COVERED:</b> | <u>July 1, 2005 to June 30, 2006</u> |                    |                                  |

**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 212 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. Summary statistics have been completed for comparison with guideline variables (Connelly et al. 2000). Cover and height variables for grass and forbs increased in 2005 as a result of increased spring precipitation. Multivariate analysis will commence after landscape variables (grazing, fire, weather data) have been compiled.

**Recommendations**

1. Compile local weather data, grazing strategies, and fire histories for nest and random sites.
2. Analyze data and provide completion report.
3. Publish results in peer reviewed journal.

**Introduction**

Greater sage-grouse 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 (IDFG 1997), later signed by the Bureau of Land Management (BLM). One management objective was to “Manage nesting and early brood habitat to provide 15-25% 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 and 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 15 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 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. Effective height is the height of plant structure that effectively provides horizontal concealment cover. 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. Gaps in the canopy >5 cm were excluded (Connelly et al. 2003). Dead branches were counted separate. 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. Cover canopies were modified from Daubenmire (1959) to include more sensitivity for lower values. These percent

cover classes were: 1 (0-1 %), 2 (2-5 %), 3 (6-25 %), 4 (26-50), 5 (51-75 %), and 6 (76-100 %). 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 and also in similar shrub density and height estimated ocularly. Random plots, independent from nest sites, were generated using ArcView Spatial Analyst (ESRI Redlands CA 92373) software and measured during the hatching period. The same measurements made on nests were made at the random plots.

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.

The GLM procedure with least squares means adjustment for multiple comparisons (SAS Institute 2001) were used to compare means among nests and random plots for each variable as a univariate analysis for this progress report. Only variables used as guidelines (Connelly et al. 2000) were analyzed. The 0.05 level of significance was used for multiple comparisons.

## Results

During 2002-2005, 212 greater sage-grouse nests were measured in 15 study areas (Figure 2) in southern Idaho. Summary of sample sizes are provided in Table 1. Data entry is underway for the landscape parameters including grazing strategies and fire history. Multivariate data analysis will commence when the landscape data is entered.

Forb cover was not different within years ( $P > 0.68$ ) but all 2005 means were greater than all the previous years ( $P < 0.03$ ; Figure 3). Forb cover appears to be less than the recommended guideline of 15% for all years except 2005. There was no difference ( $P > 0.99$ ) within years for grass cover and all 2005 plots were greater than 2004 ( $P < 0.05$ ; Figure 4). Grass cover appears to be greater than the recommended guideline of 10%.

Grass flower height, which is equivalent to “drupe height” in Connelly et al. (2000), was not different within years ( $P > 0.94$ ; Figure 5). The grass flower height was significantly greater ( $P < 0.01$ ) for plots in 2005 than 2004 and 2002. Nests in 2002 appeared to be below the recommended grass height guideline of 18 cm. Height of green and growing grass blades which were called live grass height, were similar within years ( $P > 0.87$ ) except for 2005 where random plots were significantly shorter than nests ( $P < 0.003$ ; Figure 6). Live grass heights for nests in 2005 were taller than all plots in 2004 ( $P < 0.04$ ) and random plots in 2003 ( $P < 0.01$ ). If no

flowers were present and the only structure available for cover was live grass height, then only the successful nests in 2002 and 2003, and all nests in 2005 would meet the recommended guidelines of 18 cm grass height, based on the overlap of the SE and the guideline. Residual grass height, which is the drupe height of the blades of grass not attached to the flower stalks and left over from the previous year's growing season, were not different within years ( $P > 0.67$ ; Figure 7). Residual grass height for unsuccessful nests in 2005 and unsuccessful nests in 2003 were taller than random plots in 2004 and successful nests in 2002 ( $P < 0.047$ ). If only residual grass was available for cover, only successful nests in 2005 would appear to meet the recommended guidelines of 18 cm.

There was no difference within years for sagebrush canopy cover ( $P > 0.23$ ) and little difference among years (Figure 8). The only significant differences were between the unsuccessful nests in both 2002 and 2005 with the random plots in 2003 ( $P < 0.027$ ). Random plots in 2003 and 2004 along with the 2004 successful nests appear to be below the recommended guideline of 15-25% sagebrush cover. Sagebrush height was not different within years ( $P > 0.20$ , Figure 9). Successful nests in 2005 had taller sagebrush than random plots in 2003 and 2004 ( $P < 0.005$ ). All the plots appear to exceed the recommended guidelines of 30 cm sagebrush height.

Comparing only nests, 26.9% were dominated by little sagebrush (*Artemisia arbuscula*) canopy cover, 33.0% by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), and 40.1% by 18 other shrub species. Of the other shrubs, *Artemisia* spp. were dominant on 25.0% of the total number of nests. Nests dominated by little sagebrush canopy cover had shorter sagebrush height ( $P < 0.03$ ) than nests dominated by other shrub cover for every year except 2005 ( $P = 0.14$ ; Figure 10). Nests dominated by little sagebrush still reached the recommended guidelines of 30 cm sagebrush height, despite their short stature.

Nests were dominated by Sandberg's bluegrass (*Poa secunda*) at 30.7% of the sites and 17.5% by bluebunch wheatgrass (*Pseudoroegneria spicata*). Needlegrasses (*Stipa* spp.) dominated 9.0% of the nest sites, cheatgrass (*Bromus tectorum*) and Idaho fescue (*Festuca idahoensis*) each dominated 8.5%, Indian ricegrass (*Achnatherum hymenoides*) 6.1%, bottlebrush squirreltail (*Elymus elymoides*) 3.8%, and crested wheatgrass (*Agropyron cristatum*) 2.8%. All the remaining 15 grass species combined dominated 13.4% of the nest sites.

## Discussion

Idaho experienced lower than normal precipitation during 2002-2004 and normal to above normal during spring 2005. This was evident in lower than recommended guideline values for forb cover and grass height at greater sage-grouse nests prior to 2005. There were no differences among successful nests, unsuccessful nests, and random plots within the same year except for live grass height in 2005. Possibly, as more analysis is completed, differences will be detected as have been shown by Connelly et al. (1991) and Gregg et al. (1994). Measuring grass heights other than the flower height resulted in lower than adequate heights when compared to recommended guidelines except during an above average spring precipitation year. Sites dominated by little sagebrush still provide adequate cover for successful nests, despite its dwarf stature.

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1994



1998

### Legend

- Pheas\_98\_nhab24.shp
- 3ha\_terr\_98\_nhab24.shp
- Rural\_denhab24.shp
- △ Roadsnhab24.shp
- Pocketnhab24.shp
- Pasture98nhab24.shp
- △ Ditchnhab24.shp
- △ Crop98nhab24.shp
- alfalfa
- beets
- oats
- unknown
- wheat
- △ Canalnhab24.shp
- T5sr14es24nh.shp

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.

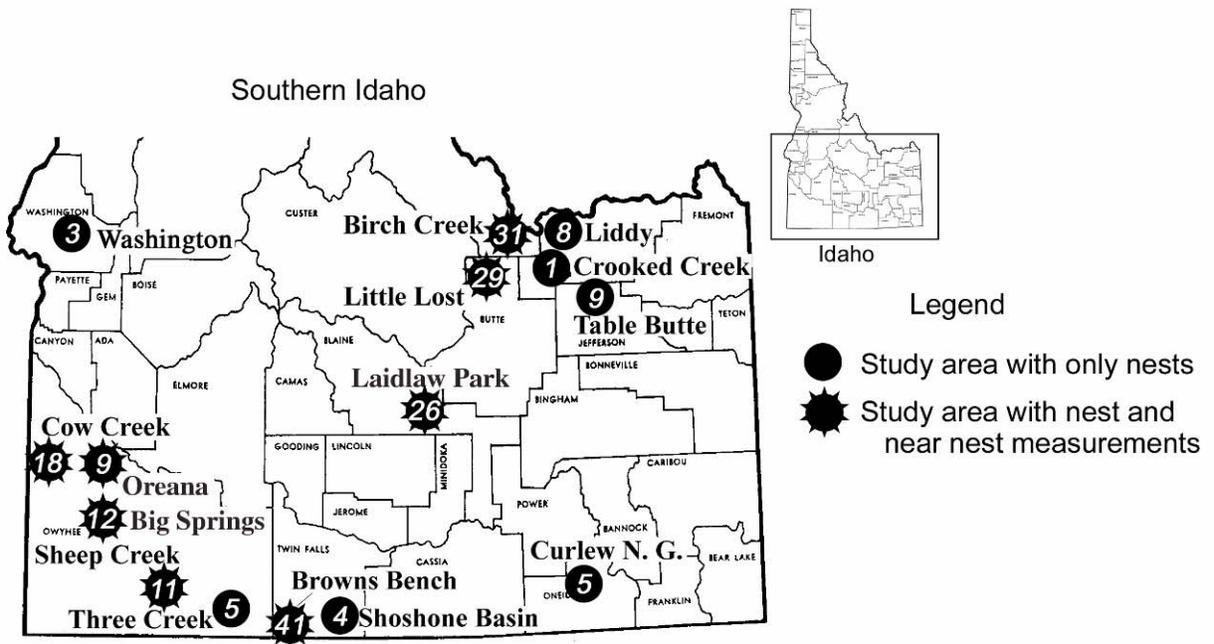


Figure 2. Study areas in southern Idaho for greater sage-grouse nesting habitat, 2002-2005. Numbers within markers are sample sizes for nests.

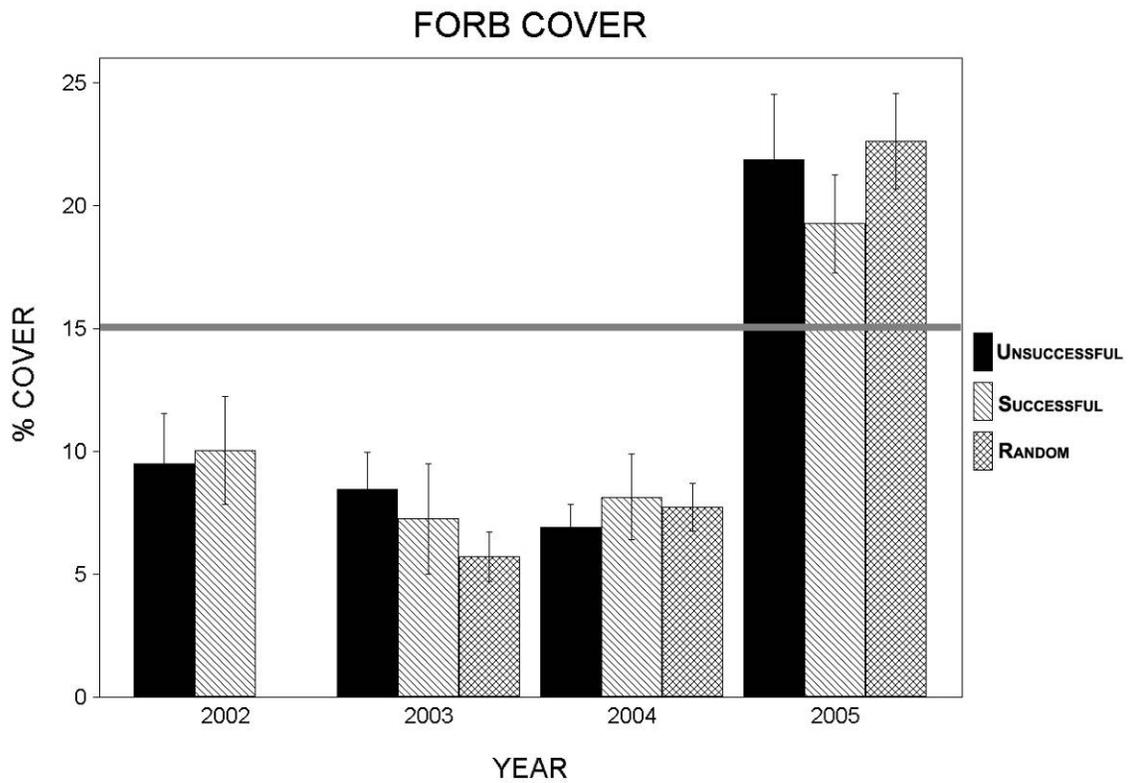


Figure 3. Forb cover (means bounded by SE) compared among unsuccessful and successful greater sage-grouse nests, and random plots in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 15% forb cover for sage-grouse breeding habitat (Connelly et al. 2000).

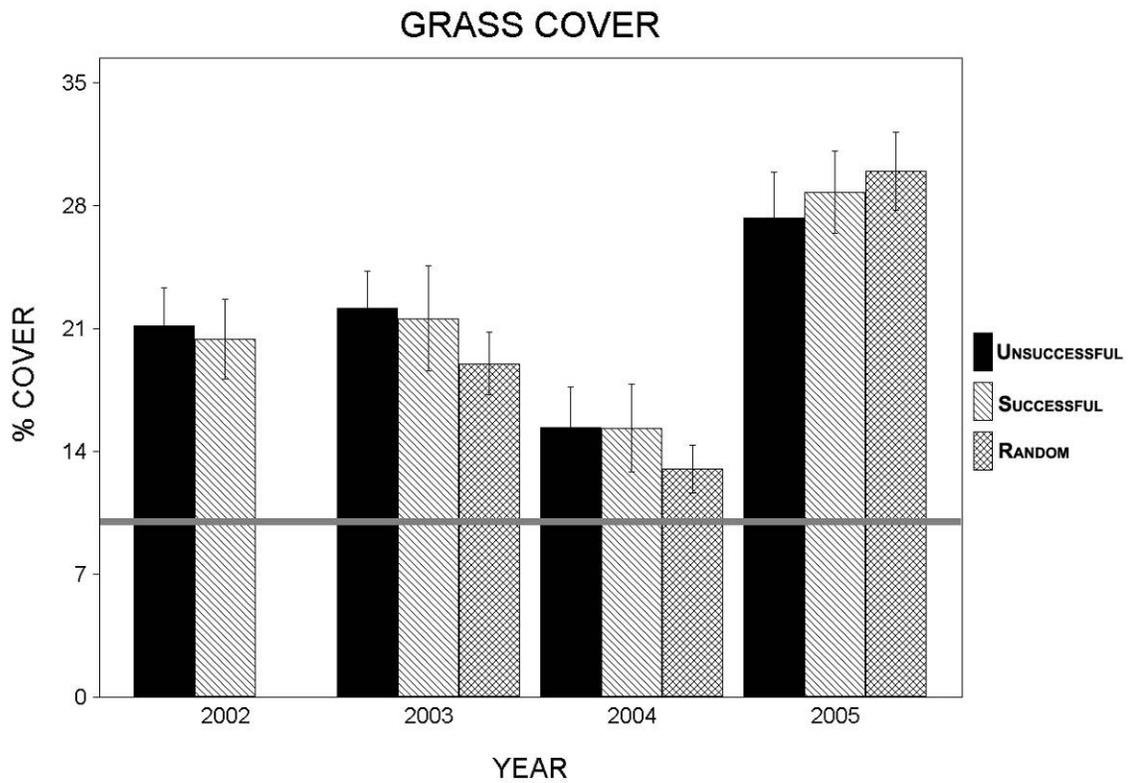


Figure 4. Grass cover (means bounded by SE) compared among unsuccessful and successful greater sage-grouse nests and random plots in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 10% grass cover for sage-grouse breeding habitat (Connelly et al. 2000).

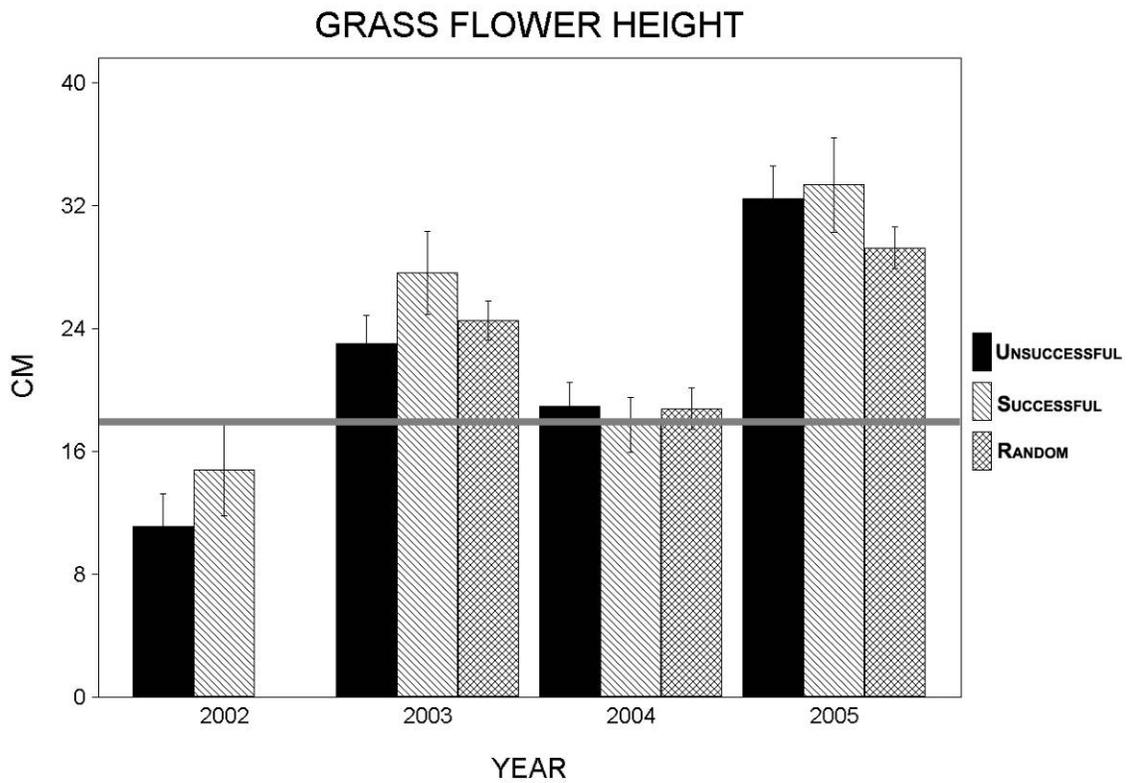


Figure 5. Drupe height of grass flowers (means bounded by SE) compared among unsuccessful and successful greater sage-grouse nests, and random plots in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 18 cm grass drupe height for sage-grouse breeding habitat (Connelly et al. 2000).

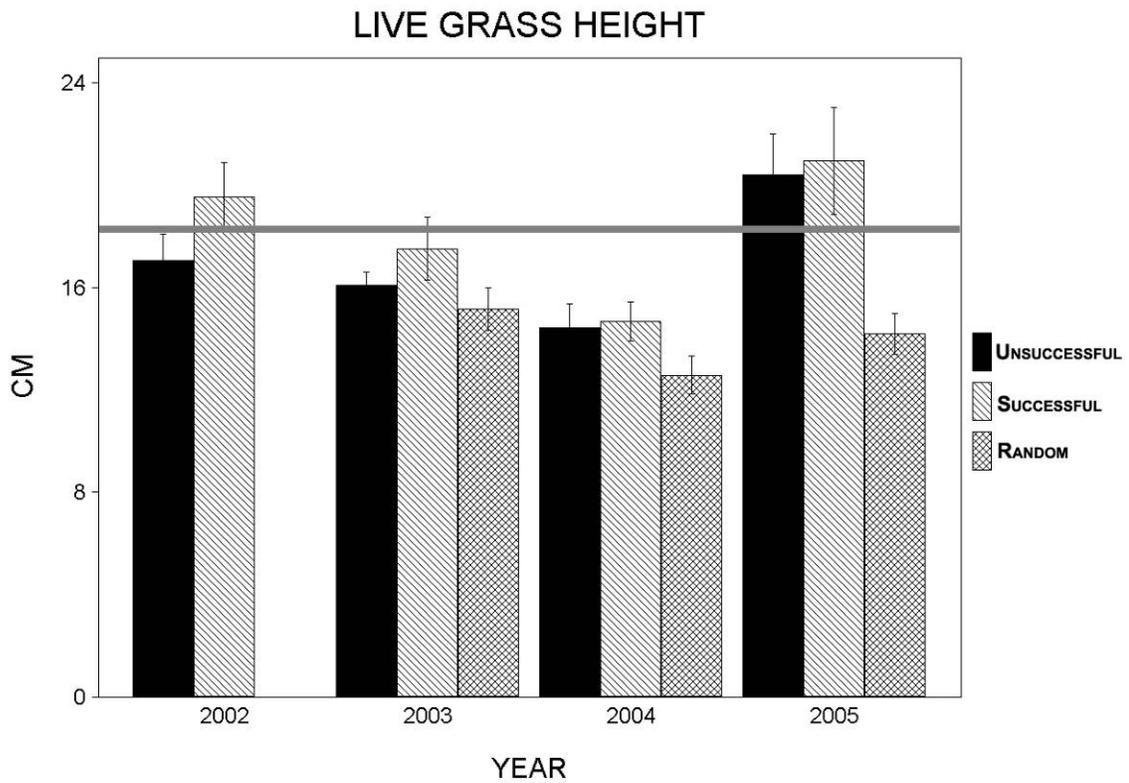


Figure 6. Drupe height of green and growing grass blades (means bounded by SE) compared among unsuccessful and successful greater sage-grouse nests, and random plots in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 18 cm grass drupe height for sage-grouse breeding habitat (Connelly et al. 2000).

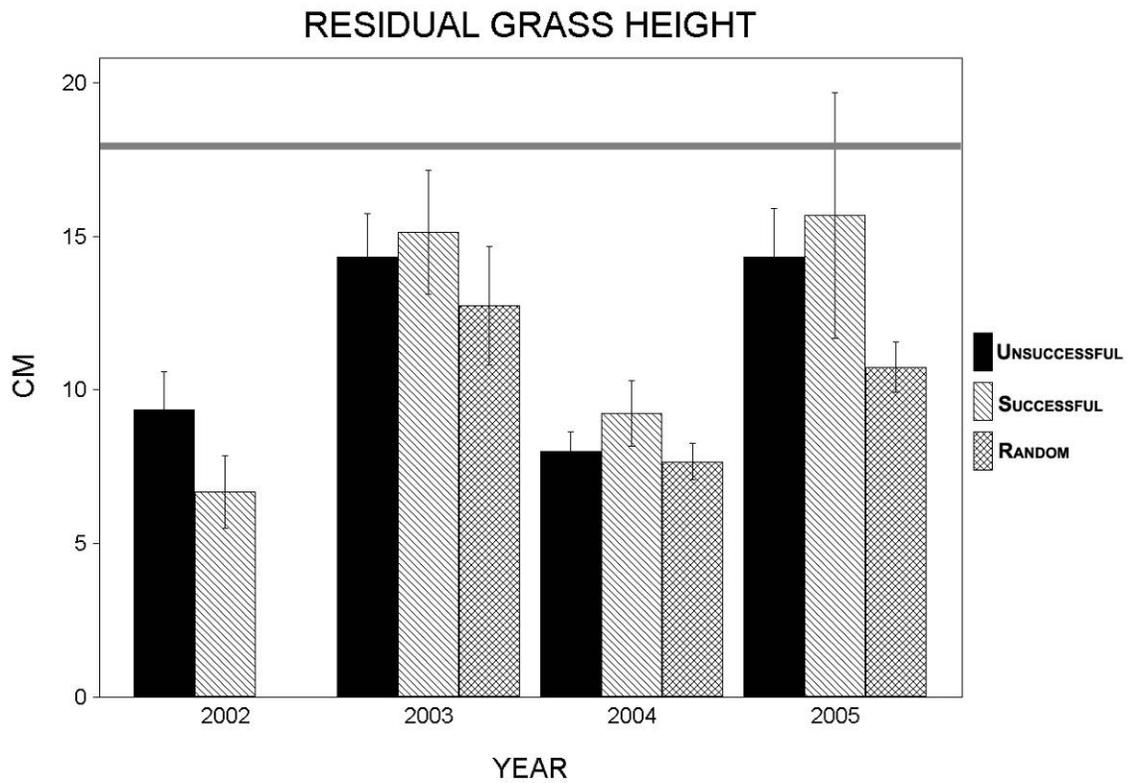


Figure 7. Drupe height of residual grass blades (means bounded by SE) compared among unsuccessful and successful greater sage-grouse nests, and random plots in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 18 cm grass drupe height for sage-grouse breeding habitat (Connelly et al. 2000).

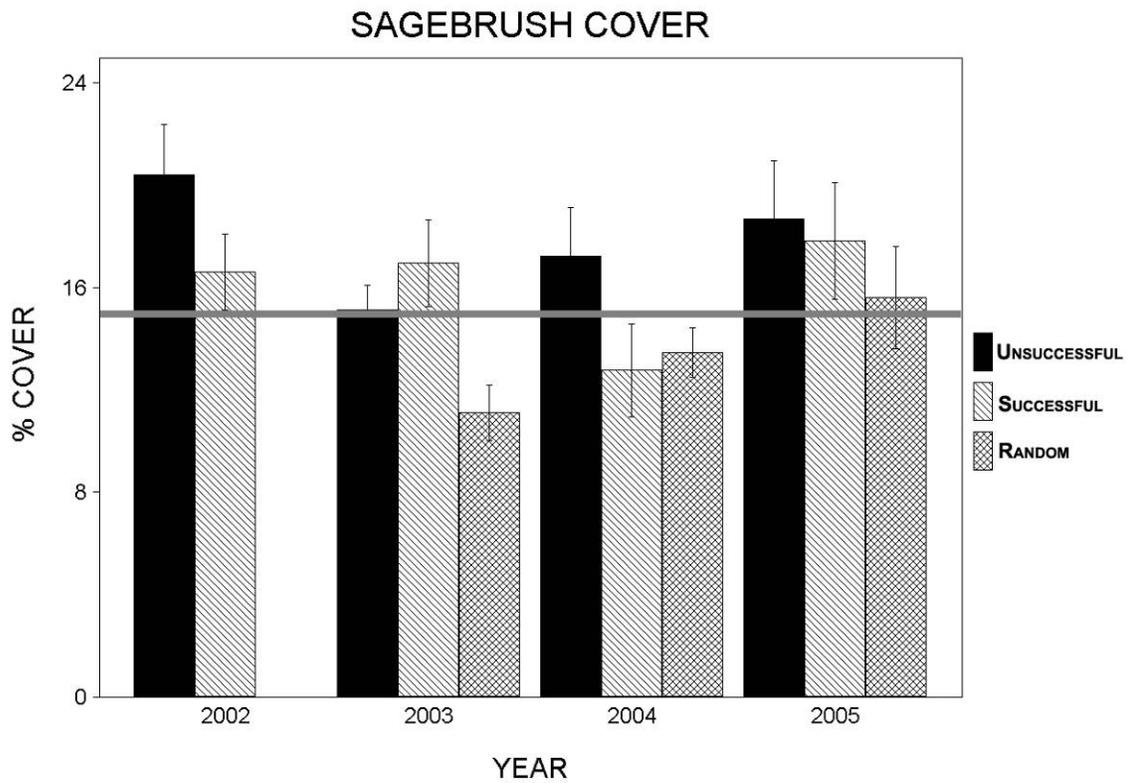


Figure 8. Canopy cover of sagebrush (means bounded by SE) compared among unsuccessful and successful greater sage-grouse nests, and random plots in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 15% sagebrush cover for sage-grouse breeding habitat (Connelly et al. 2000).

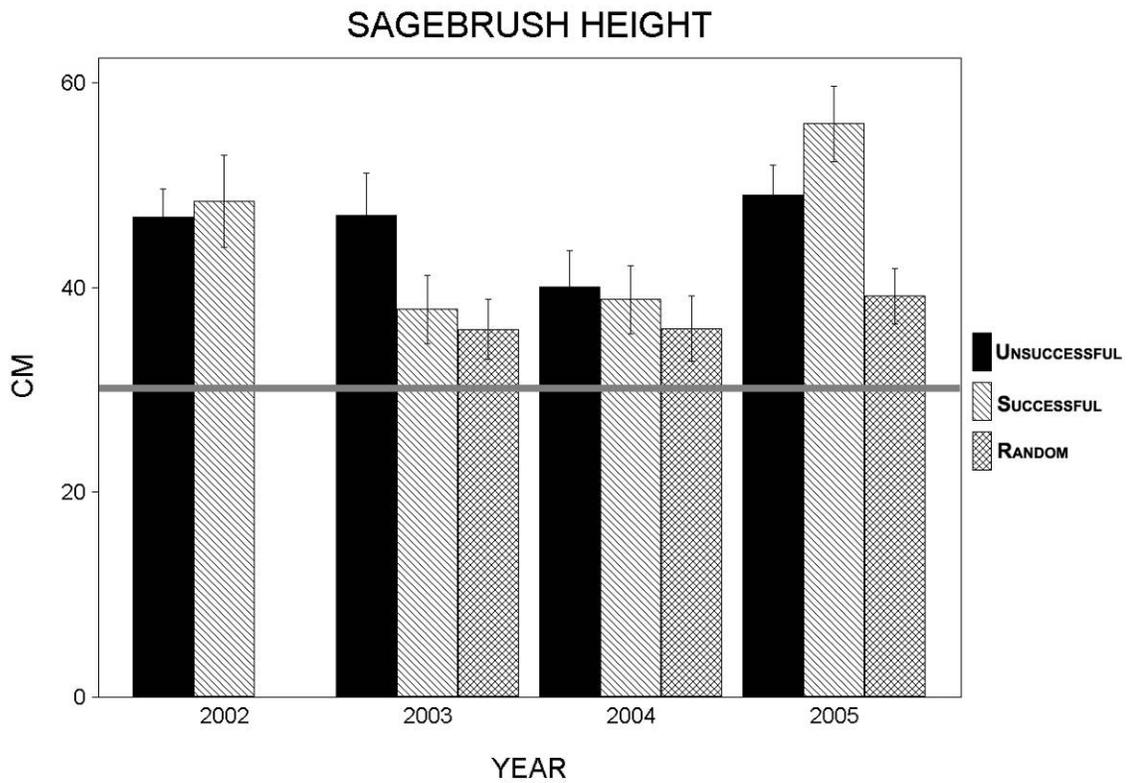


Figure 9. Height of sagebrush (means bounded by SE) compared among unsuccessful and successful greater sage-grouse nests, and random plots in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 30 cm sagebrush height for sage-grouse breeding habitat (Connelly et al. 2000).

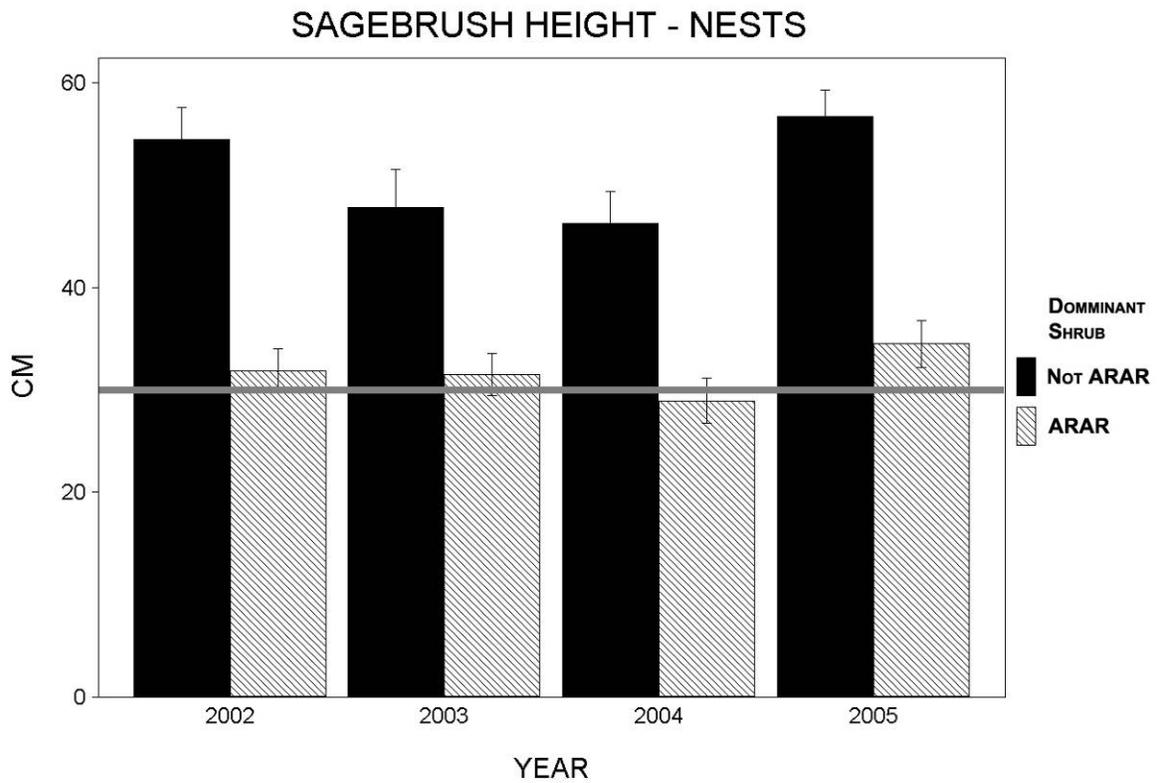


Figure 10. Height of sagebrush (means bounded by SE) compared between nest sites dominated by little sagebrush *Artemisia arbuscula* (ARAR) and shrubs other than ARAR in Idaho, 2002-2005. Horizontal bar indicates the minimum recommended guideline of 30 cm sagebrush height for sage-grouse breeding habitat (Connelly et al. 2000).

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

| Year  | Nest success (%) | Vegetation samples ( <i>n</i> ) |            |        |
|-------|------------------|---------------------------------|------------|--------|
|       |                  | Nests                           | Near Nests | Random |
| 2002  | 48               | 56                              |            |        |
| 2003  | 34               | 62                              | 40         | 55     |
| 2004  | 49               | 46                              | 35         | 45     |
| 2005  | 48               | 48                              | 21         | 38     |
| Total | 45               | 212                             | 96         | 138    |

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## 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.

