IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Director

Project W-160-R-30

Subproject 47

Progress Report

UPLAND GAME BIRD ECOLOGY

Study I: Pheasant Response to Intensive Habitat Management

Study III: Effectiveness of Transplanting Pheasants as a Management Tool

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

July 1, 2002 to June 30, 2003

By:

David D. Musil, Senior Wildlife Research Biologist

September 2003
Boise, Idaho
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STUDY I: PHEASANT RESPONSE TO INTENSIVE HABITAT MANAGEMENT

ABSTRACT

Several sections in Gooding County have been mapped using hand-held global positioning system units. This project was suspended when Study III, Jobs 1 & 2, were started. The previous research biologist retired in December 1999, and the position was not refilled until March 2000. No progress has been accomplished on this project since the last report.

RECOMMENDATIONS

1. Map cover of remaining section.

2. Analyze data.

PROGRESS REPORT
STATEWIDE WILDLIFE RESEARCH

STATE: Idaho JOB TITLE: Upland Game Bird Ecology
PROJECT: W-160-R-30
SUBPROJECT: 47 STUDY NAME: Effectiveness of Transplanting
STUDY: III Pheasants as a Management
JOBS: 1-2 Tool
PERIOD COVERED: July 1, 2002 to June 30, 2003

STUDY III: EFFECTIVENESS OF TRANSPLANTING PHEASANTS AS A MANAGEMENT TOOL

Job 1: Hunter Harvest of Pen-Reared and Wild Pheasants in Idaho

ABSTRACT

During the 1999 pheasant hunting season (16 October - 30 November), 143 pen-reared male ring-necked pheasants were released (30 radio-marked) on four tracts (1,679 ha) of public land in south-central Idaho. Of the 26 fates known for radio-marked birds, 19 (73%) roosters were harvested, five (19%) were killed by predators, and two (8%) survived. Fifty-nine (41%) of all the released birds were known to be harvested. Nineteen (32%) of the known harvested birds were radio-marked. Field interviews of 103 hunters showed a harvest effort of 0.64 ± 0.56 pen-reared birds/hour and 0.50 ± 0.55 wild birds/hour harvested on the tracts (mean ± 95% confidence interval). A combined success of 1.15 ± 0.76 birds/hour and 0.49 ± 0.24 birds/hunter occurred for the ten-day sampling period on the tracts. No additional data analysis has been completed since the last progress report.

RECOMMENDATIONS

1. Finish analysis of comparing harvest of wild and pen-reared birds on the tracts.

2. Finish analysis of comparing harvest on and off the tracts.

Job 2: Survival of Pen-Reared and Wild Pheasants Translocated into Idaho

ABSTRACT
Wild and pen-reared pheasants were released into six areas in southern Idaho during 2000 and 2001 to augment low resident populations. Two hundred fifty-three (201 hens, 52 roosters) wild pheasants and 2,600 (2,130 hens, 470 roosters) pen-reared pheasants were released. Monitoring of 430 radio-marked birds during March-September showed 36% wild hen survival, 50% wild rooster, 6% pen-reared hen, and 3% pen-reared rooster survival. The Kaplan-Meier survival estimate for wild hens was significantly higher ($P < 0.001$) than pen-reared hens and was also higher ($P < 0.001$) for wild roosters than pen-reared roosters. Wild pheasants were held four days longer in captivity before release in 2001 than 2000, but radio-marked hens showed similar survival rates and higher release weights despite being held longer. For 323 documented deaths of wild and pen-reared pheasants combined, 54% were unknown causes, 26% mammalian predation, 11% avian predation, 3% natural causes, 3% were killed by hay swathers, 2% died from vehicle collisions, and 1% drowned. Predators were controlled prior to release and throughout the nesting season in 2001. Analysis will continue to determine if predator removal benefited pheasant survival.

RECOMMENDATIONS
1. Complete multiple comparisons for survival data, pheasant and predator abundance estimates, and effects of predator control on pheasant survival.
3. Publish results in a peer reviewed journal.

INTRODUCTION
The ring-necked pheasant (*Phasianus colchicus*) has been studied extensively throughout North America (Olsen 1977, Trautman 1982) mainly due to its popularity as a game bird. Pheasants, as well as other small game in Idaho, are important for sport hunting and contribution to local economies (Young et. al. 1986). Declines in pheasant numbers in Idaho during the last two decades have sparked much controversy as to the proper management of the game bird. Habitat loss due to advances in farming practices, changes in predator compositions and abundance, increased use of pesticides, and combinations of these have been assumed the reasons for the declines.

The response of pheasants to predator removal has been documented for wild resident birds (Chesness et al. 1968, Trautman et al. 1974, Nohrenberg 1999, Frey et al. 1999) but not for augmenting wild populations with pen-reared and translocated wild pheasants. Use of pen-reared and translocation of wild pheasants have been used by several state agencies to attempt to repopulate former pheasant range, to supplement low populations, to start new populations (Trautman 1982), and to augment hunting opportunities in the fall (Hill and Robertson 1988). Releasing pen-reared birds has not been an effective or efficient method of increasing
populations due to predation (Trautman 1982, Rodgers 1989, Leif 1994) and poor reproductive success (Hill and Robertson 1988, Wilson et al. 1992). Harper et al. (2000) monitored pen-reared pheasant survival and reproduction but limited their predator removal to nest predators. No peer-reviewed studies have compared the combination of stocking pheasants with predator removal. Until this can be thoroughly answered, criticism and speculation about the efficacy of predator removal combined with stocking both pen-reared and wild pheasants will continue.

OBJECTIVES

1. Estimate the survival and reproduction of translocated wild and pen-reared pheasants released into areas with and without predator removal.

2. Estimate effectiveness of predator removal on predator abundance.


STUDY AREAS

Wild and pen-reared pheasants were released in six areas in Idaho within the Snake River Plain in 2000 and 2001. In 2000, four areas were studied and in 2001, two of these same study areas were used and two were added.

The Snake River Plain has been described by Davis (1952) as originally dominated by semi-desert vegetation such as sagebrush (Artemisia tridentata) and grasses like blue-bunch wheatgrass (Agropyron spicatum), blue grasses (Poa spp.), and needle grasses (Stipa spp.). Currently, much of the Snake River Plain has been converted to irrigated agricultural crops dominated by alfalfa, winter wheat, corn, beans, sugar beets, potatoes, road and canal right-of-ways, and irrigated and non-irrigated pasture.

Release areas in 2000 were chosen by local advisory groups which were appointed by State legislators to represent the interests of the local sport-hunting public. The advisory groups chose the sites based on their hunting experience and, in their opinion, areas having adequate habitat but low pheasant numbers.

Three of the four study areas in 2001, each with pheasant monitoring in 2000 and 2001, were mapped (Table 1) to determine cover types within a 4.8 km (three mile) radius of the center of the release sites. These areas will be more thoroughly tested for the effects of predator control on pheasant survival in the completion report. Aerial photos were used to identify edges of cover types, classified on the ground, and digitized with ArcView (ESRI Redlands CA 92373).

C. J. Strike WMA

This study area (87 km² ha) borders C. J. Strike Reservoir in Owyhee County and has a flat to rolling topography (756-856 m). The area is dominated by wetlands at the mouth of the Bruneau River and Jacks Creek, groves of Russian olives (Eleagnus angustifolia), uplands with shrub-steppe cover, and the adjacent private farmland is dominated by irrigated alfalfa. Several food
plots with mixtures of corn and sorghum are intermingled among the tree groves on the WMA. This area was studied as a part of this project in 2001 and by Harper et al. (2000). Both years included predator removal.

Jefferson County

The study area (75 km²) is dominated by small farm fields of alfalfa, grass hay, winter wheat, and large irrigated and non-irrigated pastures dominated by orchard grass (Dactylis glomerata) and cheatgrass, respectively. The Snake River and Dry Bed Creek converge on the area. Dryland pastures also contain rabbitbrush and scattered sagebrush. Riparian zones are dominated by willow, Woods’ rose (Rosa woodsii), and golden current (Ribes aereum). The topography is flat along the rivers (1,453 m) and rises to the southeast to Lewisville Knolls (1,498 m) which are dominated by cheatgrass and sagebrush. This area was studied in 2000 and 2001.

Minidoka/Cassia County

This area (77 km²) is a mixture of wetlands surrounding small ponds and, in turn, surrounded by shrub-steppe habitat paralleling the Snake River. Agricultural crops dominating the area include sugar beets, alfalfa, and winter wheat. Topography is mostly flat with an elevation range of 1,262-1,281 m. A Pheasants Forever corn food plot is also at the release site. This area was studied in 2000 and 2001. The study area straddles the Snake River with Minidoka County on the north shore and Cassia County on the south. Burley (population 8,702) is on the southeast edge of the study area.

Minidoka County

This area (31 km²) is 16 km north of the Minidoka/Cassia County release area. Farm fields are larger with less escape cover. The topography is mostly flat with small knolls of lava rock protrusions intermixed among farm fields and rises to the northwest to Kimama Butte, a rocky knoll dominated by sagebrush with an understory of cheatgrass. Elevations range from 1,290-1,550 m. This area was only studied in 2000.

Madison County Release Area

The area (18 km²) is at the confluence of the Teton River and Henrys Fork of the Snake River and is dominated by grazing pastures with willows, cottonwoods (Populus trichocarpa), red osier dogwood (Cornus sericea), sedges (Carex spp.), and rushes (Juncus spp.). Dryer portions are farmed with small fields of winter wheat, potatoes, and alfalfa. The topography is flat with an elevation range of 1,471-1,476 m. The rivers have numerous oxbows that flood in late spring-early summer (May-June). This area was studied only in 2000.

Mud Lake WMA Release Area

This study area (36 km²) is on the north side of Mud Lake in Jefferson County, having a flat topography (1,463-1,476 m). The area is dominated by wetlands along the shore of the lake,
alfalfa fields grown as nesting cover on the WMA, and shrub-steppe along the edge of the desert. Annual release of pen-reared rooster pheasants occurs on the WMA during the pheasant hunting season. This area was studied only in 2001.

METHODS

Wild Pheasant Translocation

Wild pheasants were captured from two source areas in 2000: 1) Oregon (Malheur National Wildlife Refuge, n = 13) and released 29 February and 3 March, and 2) California (four areas in Sacramento Valley, n = 136) and released 29-31 March 2000. Three of the same areas in California were trapped again in 2001 (n = 104) and released 22, 25, and 28 March 2001. Mist nets and walk-in baited traps were used in Oregon and night-lighting was used exclusively in California. All wild birds were tested for diseases before release in Idaho. Birds were weighed prior to transport and reweighed before release in 2000. Only radio-marked birds were weighed prior to release in 2001. The wild birds were transported in padded wooden crates and given sliced melons during transportation by open bed truck. Wild pheasants (Table 2) were released within 72 hours of capture and divided evenly among the four release areas in 2000. In 2001, most of the birds were released within 144 hours of capture. While in captivity and awaiting results of blood tests, the birds were held in transport boxes and given small grain, grit, water, and a mixture of watermelons and cantaloupe. Straw bedding was replaced daily to remove waste. Battery-powered 14 g necklace radio transmitters were attached to 102 hens and 13 roosters in 2000 and 80 hens and 20 roosters in 2001. Only pheasants weighing >700 g were radio-marked, so the transmitter was <2% of the body weight. The transmitters were equipped with four-hour mortality sensors.

Game Farm Pheasant Releases

In 2000, ten-month-old pen-raised stock were purchased ($9.50/bird) from Dorris Gamebird Farm, Marsing, Idaho, and released 5, 6, and 10 April 2000. Birds were raised in typical open flight pens with rubber nasal blinders to prevent pecking. Birds were transported from the game farm to the Jerome Regional Office (2.5-hour drive) and held overnight for fitting of bands, radio collars, and removal of blinders the next day. Only radio-marked birds were transported to release sites in padded crates to avoid damage to the transmitters. The others were transported in wooden crates provided by the game farm. Birds were held overnight and released within 32 hours of removal from the game farm. Only radio-marked birds were weighed before transport to release sites (three hours maximum drive). Of the 389 birds released (319 hens, 70 roosters) and divided among the four areas (Table 2), 99 hens and 16 roosters were fitted with radio collars and all were leg-banded.

Similar-aged pen-reared birds were released 2001, but pheasant stock was purchased ($9.50/bird) from the Simpson Gamebird Farm, Grandview, Idaho. This was the same source stock released at C. J. Strike WMA in 2000 (Harper et al.2000). Birds were radio-marked three days prior to release and held in pens to allow acclimation to the radios. Of the 1,811 hens and 400 roosters released in 2001, 80 hens and 20 roosters were radio-marked (Table 2). The birds were released within seven hours of leaving the game farm. The pheasants were divided evenly and released in
two stages, corresponding with favorable ground conditions at the release sites. The C. J. Strike WMA and Minidoka (south)/Cassia County sites were stocked 15 and 16 March, respectively. The second stage birds were stocked two weeks later on 29 and 30 March at Mud Lake WMA and Jefferson County, respectively. The areas stocked later are at higher elevations and are snow-free later than C. J. Strike WMA and Minidoka County.

Telemetry

Radio tracking was conducted on the ground with two- and three-element yagi antennas once every three days in 2000 and 3-5 times/week in 2001. A dual yagi four-element null/peak truck mounted system was used in addition to hand held antennas in 2001. Mortalities were recovered to determine cause of death (Einarsen 1956). Whole carcasses were frozen for later necropsy and any other fragments were retrieved for analysis. Necropsy of mortalities were conducted to determine cause of death. Mortality causes were classified as mammalian, avian, accident (e.g. hit by vehicle or hay swather), natural (no predator induced injuries), or unknown. Field notes describing the death location, condition of carcass, and other information (e.g. tracks, if found, were used to assist with determining cause of death. UTM coordinates for each radio recovery site were recorded to measure distances to release site.

Survival estimation

Kaplan-Meier survival estimates (St) were used to compare wild with pen-reared bird survival rates (Pollock et al. 1989). Gehan-Wilcoxon Tests were used for two-sample and multiple comparisons. Time of death was defined as the mid-point between the last live contact and first mortality signal.

Pheasant production

Immediately upon hatching, abandonment, or destruction of the nest, the following observations were made during 2001: fate of nest (Rearden 1951), number of eggs hatched as determined by membrane counts, cover board measurement (Jones 1968) on the nest, height of cover over nest, cover type, minimum distance to change in cover, distance to nearest raptor perch, and the UTM coordinate of the site with a GPS unit. Nest success was defined as the successful hatch of at least one egg. Nest initiation was determined by back-dating from hatch date using an incubation period of 23 days and laying interval of 1.3 days/egg (Dumke and Pills 1979). Hens with successful nests were monitored for brood survival by flushing four weeks and eight weeks post-hatch and broods were counted (Nohrenberg 1999). A radio-marked hen with at least one chick was considered a successful brood.

Pheasant Abundance

Roadside crow counts (Luukkanen et al. 1997) were conducted three times during the breeding season (15 April - 30 May) as an index to pheasant abundance in 2001. Three roadside brood counts were conducted the first two weeks of August on the same routes as the crow counts in 2001.
Predator Abundance

Predator abundance was estimated only in 2001. Scent station surveys (Roughton and Sweeny 1982, Travaini et al. 1996, Sargeant et al. 1998) and spotlight counts were conducted on the same routes used for crow counts and brood surveys. Spotlight counts involved one person driving 10-15 mph while one person shined a one-million candle-power spotlight from the open bed of a pick-up. Animals were identified with binoculars. Raptors were counted (Hatfield et al. 1996) along the same survey routes throughout the entire study period (April – August).

Predator Control

Predator control was conducted by private trappers within the 2001 study areas. Target species are listed in Table 3. Predators were removed within a 4.8 km (72 km²) radius around the release sites. Municipalities occurring within predator removal areas were not trapped. Padded leg-hold (#1.5, #3), conibear (#120), and walk-in live traps (corvids) were used.

Trapping was concentrated on suitable cover, i.e., travel lanes and den sites, not randomly. Domestic cats and dogs without proper identification were destroyed, collared ones were released. All captured predators were euthanized quickly and disposed of properly by the trapper.

RESULTS

Wild Hen Captivity

Wild hen pheasants were held in captivity four days longer in 2001 than in 2000, due to a delay of blood test results from California. I compared the release weight of hens captured from the same location in California (Upper Butte Basin WMA) between years. Hens (n = 64) held six days in 2001 weighed 921 + 20 g and were significantly heavier ($P = 0.0002$, Wilcoxon Rank Sum test) than hens (n = 46) held two days in 2000 and weighing 856 + 26 g.

There was no difference ($P = 0.1979$, Wilcoxon Rank Sum Test) in exposure days after release for the 2000 (109 + 17 days) and 2001 (114 + 17 days) hens. Exposure days is defined as the number of days a bird was tracked. Contact with some birds were lost and fate could not be determined past the last point of contact. Kaplan-Meier survival estimates were not different ($P = 0.7483$) between 2000 (35.2 + 14.9 %) and 2001 (39.9 + 12.4 %).

Survival

Wild hen pheasants had higher survival than pen-reared hen pheasants (Table 4, Figure 1) for both years combined. Likewise, wild roosters had significantly higher survival than pen-reared roosters. Most of the mortality occurred within one month after release.
Cause Specific Mortality

The causes of mortality were not definitively determined for a majority of the pheasant mortalities (Table 5). These included radios with a few marks and found adjacent to a few undamaged feathers. Mammalian-caused mortalities had characteristic caching of whole pheasant carcasses underground or broken bone evidence. Avian predation was characterized by the carcasses picked clean of flesh with no broken bones. Natural causes of mortality included whole carcasses found with no predator induced injuries. One wild hen died of a herniated cloaca and was found next to her nest of viable eggs. One wild hen found dead was determined to have avian tuberculosis. One pen-reared rooster was found with a willow branch completely penetrating his torso. Bruising of the muscle surrounding the stick and an internal blood clot was definitive evidence that the bird was alive when it struck the willow patch. Though no radio-marked birds were killed by the predator traps, several pen-reared pheasants were found dead with legs clasped by the leg-hold traps.

DISCUSSION

Being held in captivity four days longer in 2001 did not affect the body weight or survival of wild birds captured in California. The birds readily ate the small grain and melons while in captivity in padded transport crates and survived just as long as birds held two days.

Pen-reared pheasants released into the same Idaho habitats as translocated wild pheasants had significantly lower survival for hens and roosters. Leif (1994) had similar results in South Dakota when comparing pen-reared (8% survival) and wild released (55% survival) birds for April-early October. A majority of the causes of mortality could not be determined, but most of the known causes were predator related in our study. Further analysis will be completed to determine the effects of predator control on pheasant survival.
LITERATURE CITED


Figure 1. Kaplan-Meier survivorship for wild and pen-reared pheasants March-September, 2000-2001, Idaho.
Table 1. Percent cover within 4.8 km (three miles) of release sites of pen-reared and wild pheasants and with predator removal in Idaho, 2001.

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Study Area</th>
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<tr>
<td></td>
<td>C. J. Strike WMA a</td>
<td>Jefferson County</td>
<td>Minidoka/Cassia County</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>13.6</td>
<td>21.2</td>
<td>14.0</td>
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<td>0.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Beets b</td>
<td>3.0</td>
<td>0.0</td>
<td>10.7</td>
</tr>
<tr>
<td>Corn</td>
<td>2.3</td>
<td>3.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Dry Pasture c</td>
<td>0.0</td>
<td>3.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Grass Hay</td>
<td>0.0</td>
<td>15.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Idle d</td>
<td>2.7</td>
<td>3.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Oats</td>
<td>0.4</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Pasture e (irrigated)</td>
<td>5.9</td>
<td>2.7</td>
<td>5.1</td>
</tr>
<tr>
<td>Potatoes</td>
<td>2.2</td>
<td>0.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Right-of-way f</td>
<td>4.2</td>
<td>5.9</td>
<td>8.0</td>
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<td>Shrub-steppe</td>
<td>50.6</td>
<td>11.2</td>
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<td>1.3</td>
<td>3.3</td>
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<tr>
<td>Water h</td>
<td>9.2</td>
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<tr>
<td>Woodland i</td>
<td>0.4</td>
<td>1.6</td>
<td>0.1</td>
</tr>
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</table>

a Wildlife Management Area operated by Idaho Department of Fish & Game and includes adjacent private land.

b Sugar beets.

c Grass pasture that is not irrigated, few shrubs present.

d Previously farmed land but not cultivated now or areas dominated by herbaceous annual plants.

e Grass pasture that is irrigated and does not include shrubs.

f Access roads, county roads, interstate highways, and their ditches.

g Farmsteads, livestock holding facilities, subdivisions, and municipalities.

h Open water in livestock ponds, sewage lagoons, creeks, rivers, and reservoirs.

i Riparian zones, woodlots, and shelterbelts.
Table 2. Demographics of wild and pen-reared pheasants (radio-marked) translocated during 2000-2001, Idaho.

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<tr>
<td>Madison County</td>
<td>6 (2)</td>
<td>23 (17)</td>
<td>30 (4)</td>
<td>119 (25)</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>Jefferson County</td>
<td>12 (6)</td>
<td>37 (33)</td>
<td>20 (4)</td>
<td>119 (24)</td>
<td>5 (5)</td>
<td>21 (20)</td>
<td>100 (5)</td>
</tr>
<tr>
<td>Minidoka/Cassia Co.</td>
<td>9 (0)</td>
<td>34 (29)</td>
<td>10 (4)</td>
<td>40 (25)</td>
<td>5 (5)</td>
<td>21 (20)</td>
<td>100 (5)</td>
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<tr>
<td>Minidoka County</td>
<td>5 (5)</td>
<td>23 (23)</td>
<td>10 (4)</td>
<td>41 (25)</td>
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<td>-</td>
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</tr>
<tr>
<td>C. J. Strike WMA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5 (5)</td>
<td>23 (20)</td>
<td>100 (5)</td>
</tr>
<tr>
<td>Mud Lake WMA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5 (5)</td>
<td>20 (20)</td>
<td>100 (5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>32 (13)</td>
<td>117 (102)</td>
<td>70 (16)</td>
<td>319 (99)</td>
<td>20 (20)</td>
<td>84 (80)</td>
<td>400 (20)</td>
</tr>
</tbody>
</table>

Table 3. Target predator species to be removed 1 March – 1 July 2000, Idaho.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coyote</td>
<td><em>Canis latrans</em></td>
</tr>
<tr>
<td>Red fox</td>
<td><em>Vulpes fulva</em></td>
</tr>
<tr>
<td>Striped skunk</td>
<td><em>Mephitis mephitis</em></td>
</tr>
<tr>
<td>Feral cat</td>
<td><em>Felis catus</em></td>
</tr>
<tr>
<td>Feral dog</td>
<td></td>
</tr>
<tr>
<td>Raccoon</td>
<td><em>Procyon lotor</em></td>
</tr>
<tr>
<td>Badger</td>
<td><em>Taxidea taxus</em></td>
</tr>
<tr>
<td>Weasel</td>
<td><em>Mustela spp.</em></td>
</tr>
<tr>
<td>Townsend ground squirrel</td>
<td><em>Citellus townsendi</em></td>
</tr>
<tr>
<td>Mink</td>
<td><em>Mustela vison</em></td>
</tr>
<tr>
<td>Black-billed magpie</td>
<td><em>Pica pica</em></td>
</tr>
<tr>
<td>American crow</td>
<td><em>Corvus brachyrhynchos</em></td>
</tr>
<tr>
<td>Common raven</td>
<td><em>Corvus corax</em></td>
</tr>
</tbody>
</table>
Table 4. Kaplan-Meier survival estimates\textsuperscript{a} for translocated wild and pen-reared radio-marked pheasants 3 February - 1 October 2000 and 29 March – 1 October 2001, Idaho\textsuperscript{b}.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Wild (n)</th>
<th>Pen-reared (n)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>35.5 ± 7.8 (183)</td>
<td>5.9 ± 3.8 (179)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Males</td>
<td>49.8 ± 17.4 (31)</td>
<td>3.0 ± 5.6 (36)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Percent Survival ± 95% Confidence Interval.
\textsuperscript{b} All study areas combined, excluding C. J. Strike WMA 2000.
\textsuperscript{c} Two sample Gehan-Wilcoxon test between release stock within gender.

Table 5. Cause of death for radio-marked wild and pen-reared radio-marked pheasants for March-October 2000 and 2001, Idaho. Percentages are in parentheses.

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>2000</th>
<th>2001\textsuperscript{a}</th>
<th>2001\textsuperscript{a}</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wild</td>
<td>Pen-reared</td>
<td>Wild</td>
<td>Pen-reared</td>
</tr>
<tr>
<td>Unknown</td>
<td>49 (66)</td>
<td>74 (69)</td>
<td>21 (42)</td>
<td>31 (34)</td>
</tr>
<tr>
<td>Mammalian predation</td>
<td>17 (23)</td>
<td>30 (28)</td>
<td>7 (14)</td>
<td>31 (34)</td>
</tr>
<tr>
<td>Avian predation</td>
<td>0 (0)</td>
<td>2 (2)</td>
<td>8 (16)</td>
<td>26 (28)</td>
</tr>
<tr>
<td>Natural causes</td>
<td>5 (7)</td>
<td>1 (1)</td>
<td>3 (6)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Hay swather</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>9 (18)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Vehicle collision</td>
<td>3 (4)</td>
<td>0 (0)</td>
<td>1 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Drowned</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (2)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Total</td>
<td>74 (100)</td>
<td>107 (100)</td>
<td>50 (100)</td>
<td>92 (100)</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Predator control occurred in 2001 on all study areas.
GREATER SAGE-GROUSE NEST HABITAT IN SOUTHERN IDAHO

ABSTRACT

Several greater sage-grouse projects are underway throughout southern Idaho. These projects rely on radio-marking hen Greater sage-grouse and determining hen and brood survival and winter habitat use. We are taking advantage of these samples to determine the relationship between nest success and habitat characteristics. This relationship will also include the influences of land management practices on nest success.

RECOMMENDATIONS

1. Determine soil types, local weather data, and grazing strategies for the nest sites.
2. Enter field data for analysis of 2003 nest measurements.
4. Publish results in peer reviewed journal.

INTRODUCTION

Greater sage-grouse (*Centrocercus urophasianus*) populations have declined throughout the intermountain west (Connelly et al. 2000) and their distribution is greatly influenced by the occurrence of shrub-steppe habitat types, especially those dominated by sagebrush (*Artemisia spp.*) (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 (Greg 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 to 25% sagebrush canopy coverage and about seven inches or more of grass and forb understory during the May nesting period” (IDFG 1997, p. 12). Natural resource agencies have difficulty (pers. comm. Paul Makela, Burley BLM wildlife biologist) applying the seven-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 seven-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 takes approximately ten days after breeding (Authenrieth 1981). Egg laying requires 1.3 days/egg laid with an average of seven 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 one or two 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**

Document 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 several study sites which have ongoing greater sage-grouse telemetry projects. The study areas are distributed throughout southern Idaho ranging in elevation from 1,600 to 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 one habitat type. The study areas are on public and private land and are grazed in accordance with federal leases administered by the BLM or by the 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 the hens ceased nesting efforts.

Vegetation sampling was conducted similar to Gregg et al. (1994). Measurements were taken along four 10 m transects placed at right angles radiating from the center of the nest. 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 of residual and live leaf and height of tallest residual and live flower stalk for each grass species was measured. 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 will mimic 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 four 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 one plot >30 m but within 50 m of incubating radio-marked hens in 2003 to determine growth phenology. Measurements were made within one 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 or slivers of popsicle sticks so the exact plant could be measured at the end of incubation. Near nest plots were measured 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.

RESULTS

Fifty-six nests were measured in 11 study areas (Table 6) in 2002. Data was summarized (Table 7) for parameters used as guidelines for sage-grouse nesting habitat (Connelly et al. 2000).
Six study areas were studied in 2003 (Table 8). Data will be entered and summarized for the next report.

DISCUSSION

Preliminary results from the 2002 field season show greater sage-grouse habitat are within most of the guidelines used to manage sage-grouse breeding habitat but shrub species have yet to be segregated within the data set. Percent cover of forbs appears to be lower than recommended as well as height of residual grass. Successful nests appeared to have shorter residual grass height than unsuccessful nests, opposite of what was expected.
LITERATURE CITED


Table 6. Study areas where greater sage-grouse nest habitat was measured and number of successful and unsuccessful nests measured during 2002, Idaho.

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Nests Measured (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Successful</td>
</tr>
<tr>
<td>Little Lost</td>
<td>1</td>
</tr>
<tr>
<td>Birch Creek</td>
<td>9</td>
</tr>
<tr>
<td>Crooked Creek</td>
<td>1</td>
</tr>
<tr>
<td>Liddy</td>
<td>3</td>
</tr>
<tr>
<td>Table Butte</td>
<td>1</td>
</tr>
<tr>
<td>Sheep Creek</td>
<td>2</td>
</tr>
<tr>
<td>Browns Bench</td>
<td>1</td>
</tr>
<tr>
<td>Shoshone Basin</td>
<td>-</td>
</tr>
<tr>
<td>Jarbidge</td>
<td>3</td>
</tr>
<tr>
<td>Curlew Valley</td>
<td>4</td>
</tr>
<tr>
<td>Cow Creek</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
</tr>
</tbody>
</table>

Table 7. Selected results of greater sage-grouse nest habitat in 2002, Idaho.

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Nests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Successful(^a) (n = 27)</td>
</tr>
<tr>
<td>Percent Shrub Canopy Cover(^b)</td>
<td>25.8 ± 3.7</td>
</tr>
<tr>
<td>Shrub height (cm)(^b)</td>
<td>45.9 ± 8.7</td>
</tr>
<tr>
<td>Residual grass height (cm)</td>
<td>8.9 ± 0.3</td>
</tr>
<tr>
<td>Percent Grass canopy cover</td>
<td>20.5 ± 4.8</td>
</tr>
<tr>
<td>Percent Forb canopy cover</td>
<td>10.0 ± 4.7</td>
</tr>
</tbody>
</table>

\(^a\) Mean ± 95% Confidence Interval
\(^b\) All shrub species combined.
Table 8. Distribution of samples for greater sage-grouse nest habitat during 2003, Idaho.

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Near Nest</th>
<th>Nest</th>
<th>Random</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow Creek</td>
<td>11</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Sheep Creek</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Browns Bench</td>
<td>1</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Shoshone Basin</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Little Lost Creek</td>
<td>14</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Birch Creek</td>
<td>6</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>62</strong></td>
<td><strong>53</strong></td>
</tr>
</tbody>
</table>
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.