

IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Director

Project W-160-R-31

Subproject 53

Progress Report



SAGE-GROUSE ECOLOGY

Study I: Greater Sage-grouse Habitat and Population Trends in Southern Idaho

Study II: Mortality Patterns of Juvenile Greater Sage-grouse

July 1, 2003 to June 30, 2004

By:

T. P. Hemker, Wildlife Program Coordinator
M. Commons-Kemner, Wildlife Research Biologist
N. Burkepile, Graduate Student
K. P. Reese, Professor, University of Idaho

September 2004
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Findings in this report are preliminary in nature and not for publication without permission of the Director of the Idaho Department of Fish and Game.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

GREATER SAGE-GROUSE (*CENTROCERCUS UROPHASIANUS*) HABITAT AND POPULATION TRENDS IN SOUTHERN IDAHO1

 ABSTRACT.....1

 RECOMMENDATIONS1

 INTRODUCTION2

 OBJECTIVE2

 STUDY AREA AND METHODS2

 RESULTS4

 POPULATION TRENDS.....4

 HABITAT TRENDS5

 DISCUSSION5

 LITERATURE CITED7

MORTALITY PATTERNS OF JUVENILE GREATER SAGE-GROUSE.....10

 ABSTRACT.....10

 RECOMMENDATIONS10

**PROGRESS REPORT
STATEWIDE WILDLIFE RESEARCH**

STATE:	<u>Idaho</u>	JOB TITLE:	<u>Sage-Grouse Ecology</u>
PROJECT:	<u>W-160-R-31</u>		
SUBPROJECT:	<u>53</u>	STUDY NAME:	<u>Greater Sage-grouse Habitat</u>
STUDY:	<u>I</u>		<u>and Population Trends in</u>
JOB:	<u>1</u>		<u>Southern Idaho</u>
PERIOD COVERED:	<u>July 1, 2003 to June 30, 2004</u>		

**GREATER SAGE-GROUSE (*CENTROCERCUS UROPHASIANUS*) HABITAT AND
POPULATION TRENDS IN SOUTHERN IDAHO**

Abstract

Additional funding provided by the Bureau of Land Management (BLM) and the U.S. Geological Survey (USGS) has allowed the Department to begin expansion of this work from the initial assessment of sage-grouse populations and sagebrush rangeland on and near the Curlew National Grasslands (CNG) and the eastern portion of Owyhee County. In these areas, breeding populations showed distinct declines in the early 1980s with more severe declines during the early 1990s. Twenty-three percent of the CNG and 32% of BLM land remain in 11-25% sagebrush canopy cover and, thus, may provide suitable nesting and early brood-rearing habitat for sage-grouse. However, this is likely an overestimate of good nesting and brood cover available to grouse because the herbaceous understory was not considered in habitat classification. Habitat in the eastern portion of Owyhee County is highly fragmented. Understory forbs and grasses in sagebrush-dominated areas vary from sparse to relatively dense native stands. Because of increased funding, initial efforts began in FY 2001 to map sage-grouse distribution across southern Idaho. Maps were developed at the 1:100,000 scale. The maps have six basic layers. Sage-grouse stronghold habitats are those areas with sufficient breeding habitat and stable to increasing population trends. Isolated habitats are those areas where breeding habitat remains but are isolated from other sage-grouse populations. Key areas are those areas where sagebrush (*Artemisia* spp.) occurs with relatively intact understory, and sage-grouse use all or a portion of these areas sometime throughout the year. The other three layers are those areas surrounding sage-grouse use areas that have potential for rehabilitation (juniper invasion areas, crested wheat (*Agropyron cristatum*) seedings, and sagebrush with annual grass understory). The maps will be used as base maps to identify nesting areas and their relation to leks, brood-rearing areas, and winter-use areas. They will also be used to help biologists and land managers with landscape level management decisions.

Recommendations

1. Continue statewide sage-grouse population and habitat assessment at a level supported by the current budget.
2. Continue to seek outside funding to support the expanded work.

3. Identify and prioritize areas within the state for assessment.
4. Complete analysis of eastern Owyhee County habitat use by early 2005.

Introduction

Sage-grouse populations throughout the west are closely tied to sagebrush habitats (Patterson 1952, Braun et al. 1977, Braun 1987). The dependence of sage-grouse on sagebrush for winter habitat has been well documented (Eng and Schladweiler 1972, Beck 1975, Beck 1977, Robertson 1991). Similarly, the relationship between sagebrush and sage-grouse nest success has been thoroughly described (Klebenow 1969, Wallestad and Pyrah 1974, Wakkinen 1990, Connelly et al. 1991). Despite the well-known importance of this habitat to sage-grouse and other sagebrush obligates (Braun et al. 1976), the quality and quantity of sagebrush habitats continue to decline (Braun 1987, Swenson et al. 1987). Schneegas (1967) reported that 2-2.5 million ha of sagebrush grassland had been treated from 1937-1967, and Braun et al. (1976) stated that an additional 3.9-8.4 million ha had been altered since 1967. Patterson (1952) indicated that sage-grouse have not adjusted, and doubtlessly will not adjust, their life processes to fit a pattern of land use that eliminates or seriously disturbs large tracts of sagebrush habitats.

Braun et al. (1977) previously described guidelines for maintenance of sage-grouse habitats. Since the publication of those guidelines, much more information has been obtained on the relative size of sagebrush habitats used by these grouse (Connelly 1982, Connelly et al. 1988, Wakkinen et al. 1992), the seasonal importance of sagebrush habitats (Benson et al. 1991, Connelly et al. 1991), the effects of pesticides on this species (Blus et al. 1989), and the effects of fire on sage-grouse (Benson et al. 1991, Robertson 1991, Fischer 1994). The new information was incorporated into revised guidelines for managing sage-grouse populations and habitats (Connelly et al. 2000b). Unfortunately, good baseline data on the quantity and quality of sage-grouse habitat that currently exist are still lacking. Moreover, long-term population trend data have not been compiled and analyzed for most of the state. Much of these data are available from files of various state and federal agencies. Collecting and compiling this information is a relatively simple, although time consuming, task. However, this sort of assessment has been completed for part of southeastern Idaho (Crowley and Connelly 1996, 1997) and it provides a solid basis for more intensive habitat assessment using GIS and satellite imagery (Homer et al. 1993).

Objective

To assess long-term trends in quantity and quality of sage-grouse habitats and associated changes in populations throughout southern Idaho.

Study Area and Methods

In FY 1998, the statewide assessment considered the Greater Curlew Valley area containing 524,050 acres in Oneida County. In FY 1999, this work was expanded to include approximately 1,300 km² of the eastern portion of Owyhee County. In the Curlew Valley, mean annual precipitation ranges from 33 cm in the valleys to 46 cm in the mountains, half of which falls during winter as snow. Precipitation patterns are similar, but the amount is slightly greater in

Owyhee County. The Curlew Valley area contains farmland, Conservation Reserve Program (CRP) fields, and rangeland classified as a sagebrush/bluebunch wheatgrass (*Artemisia tridentata/Agropyron spicatum*) habitat type. The eastern portion of Owyhee County consists of sagebrush-dominated areas fragmented by crested wheatgrass (*Agropyron cristatum*) seedings and large burns, often dominated by cheatgrass (*Bromus tectorum*). Other areas in Owyhee County are dominated by low sage (*A. arbuscula*) and a mixture of mountain (*A. vaseyana*) and Wyoming (*A. wyomingensis*) big sage with bluebunch wheatgrass and Idaho fescue (*Festuca idahoensis*) understory.

Disturbance to native stands of vegetation has been widespread in both areas (Gardner et al. 1997, J. W. Connelly, personal observation). Most of the remaining sagebrush habitat is now found on public lands administered by the U.S. Forest Service (USFS) and BLM. Sagebrush stands on these lands have been periodically subjected to prescribed fire, wildfire, herbicide treatments, and other sagebrush eradication techniques.

Breeding populations have been monitored throughout most of southern Idaho for the last 25-50 years using standard lek censusing procedures (Jenni and Hartzler 1978). Lek counts were used to assess sage-grouse population trends in both areas. The mean number of males per lek was determined by year, and data from satellite leks were not included (Gardner et al. 1997). During the mid-1980s, many lek routes were established across the state. A lek route is a series of leks counted in one breeding area. Maximum number of males per route are recorded each year and general trends are obtained from these counts. Numerous lek routes occur throughout southern Idaho. Data from all lek routes have been collected since the mid-1990s to assess statewide population trends.

A GIS database developed at Utah State University, using Landsat thematic imagery from July 1993, was used to assess the extent and condition of sagebrush rangelands in the Curlew study area (Gardner et al. 1997). Rangeland was classified as having <10%, 11-25%, or >25% sagebrush canopy coverage. The 11-25% classification represented optimal sagebrush canopy cover for sage-grouse. In addition to sagebrush cover types, areas dominated by grass/forb cover (e.g., CRP fields) were also identified. Land ownership boundaries were added to the database for descriptive analysis. Analysis methods generally follow those of Homer et al. (1993), Crowley and Connelly (1996, 1997), and Reynolds et al. (1996). Vegetation data are currently being analyzed to complete this assessment.

Additional funding was obtained in FY 2000 from the BLM and USGS. This funding allowed a biologist to be assigned to work on this project full-time. Therefore, data on sage-grouse populations (lek counts) and sagebrush habitats (mapping prescribed burns and wildfires; mapping other land-use changes; and detailed mapping of sage-grouse range including breeding, summer, and winter, throughout southern Idaho) are now being compiled and analyzed for all of southern Idaho. The relationship between known leks and other seasonal habitats will be investigated.

Results

Population trends

Statewide - Recent analysis of lek data indicated that the existing database contains incomplete counts along lek routes as well as data from counts made during unfavorable weather. To improve the quality of these data, original data sheets are being reviewed and unreliable counts are being deleted from analysis of population trends. Nineteen lek routes scattered across southern Idaho had sufficient data to assess population trends since 1994. Most populations had a slight dip during 1994-1996. Following a relatively wet year in 1996, populations for the most part increased until 2000 and began to drop off again during 2001 and 2002. During 2004, lek counts across the state were stable to increasing with a few exceptions in the Southwest Region (Cow Creek), Magic Valley Region (Grassy Hills, Brown's Bench, Black Pine), Upper Snake Region (Stibal), and Southeast Region (Curlew). The overall five-year average across the state appears to be stable.

Curlew Valley Area - Twenty-one leks (not including satellite leks) have been documented within the study area between 1966 and 1998. Seven leks (33%) were on BLM land, nine (43%) on USFS land, and five (24%) on private land. For these leks, male attendance averaged 15 birds/lek from 1966 to 1997, approximately half of the statewide average for the same period. During spring 1999, 11 new leks were located in the study area. Of these, none were on BLM land, eight on USFS land, and three on private land. Maximum male counts on the new leks ranged from two to 34 birds and the average size of the new leks was 12 males. Two routes have been established from these leks in the Curlew area, the Curlew lek route and the Rockland lek route. The Rockland lek route has increased substantially since 1999. The 2003 lek count was 118, more than double the previous two years counts of 58 and 50 in 2002 and 2001, respectively. However, the Curlew lek route has declined from 21 in 2000 to five in 2003. This could be related to a wildfire during the mid-1990s that burned much of the habitat within the Curlew Route. It is speculated that many of the birds from the original Curlew Route have shifted to the Rockland Route.

Breeding populations showed distinct declines in the early 1980s, with more severe declines during the early 1990s. Sage-grouse lek attendance reached an all-time low in the study area during 1995. From 1996 through 1999, only two of seven (29%) known leks on BLM land and three of nine (33%) known leks on USFS lands were active. Due to the continued decline of active sage-grouse leks and numbers of males/lek, the hunting season in and around the Curlew was closed during fall 2002. The season will remain closed until sage-grouse populations in the area begin to stabilize.

Owyhee County - Seven new leks were identified near Grasmere during 1999. Of these, six occurred on dry lakebeds and one was in a crested wheatgrass seeding. The new leks ranged from one to 19 males and the average size was <12 males. One new route (Sheep Creek) was established as a result of these new leks. Counts of males along the route are static with about 50 males counted each spring since 1999. Some birds attending these leks move south to summer range in the alfalfa fields near Riddle and into Nevada.

Habitat Trends

Curlew Valley Area - Privately-owned land comprises 41% of the study area; the BLM administers 40% of the area, and the USFS manages 17% of the study area. Nine percent (47,896 acres) of the USFS land is a separate administrative unit called the CNG. About 67% of the study area could be considered historic sagebrush habitat and about 51% (177,540 acres) remains sagebrush rangeland. Fifty-seven percent of the historic sagebrush habitat on the CNG and 49% of BLM land is now either classified as grass/forb or <10% sagebrush canopy cover and thus considered poor sage-grouse habitat. Twenty-three percent of the CNG and 32% of BLM remain in the 11-25% sagebrush canopy cover class and, thus, may provide suitable nesting and early brood-rearing habitat for sage-grouse. Overall, about 17% of the historic sagebrush habitat within the study area contains sagebrush cover suitable for nesting and early brood rearing.

Owyhee County - No quantitative assessments were made of habitat within this study area. Generally, higher-elevation breeding habitat on the southern portion of the study area appears in better ecological condition with a healthy herbaceous understory compared to the more xeric northern portion of the study area. The eastern portion of this study area is highly fragmented by wildfire and crested wheatgrass seedings.

Statewide - No quantitative assessments of habitat are currently being collected across the state. However, ArcView® GIS shapefiles of prescribed burns and wildfire occurring from 1990 to 2002 have been obtained from BLM. Personnel from BLM and IDFG have developed a detailed map of sagebrush distribution and sage-grouse range in Idaho. This map identifies areas where sage-grouse populations appear to be strong or stable (source habitats, stronghold areas, isolated habitats) and areas where sage-grouse populations appear to be declining or threatened due to major habitat loss and fragmentation (conifer invasion, crested wheatgrass seedings, sagebrush with annual grass understory). Additional layers may be added to the map such as all historic and active lek sites, nest locations and how they relate to active leks, and winter-use areas. The purpose of this mapping effort is to provide wildlife and habitat managers with information to prioritize sage-grouse populations for protection from wildfire and other land-use changes, and where to improve existing degraded habitat to increase or stabilize the range of sage-grouse in Idaho. It can also be used as a visual tool to identify changes in habitat, sage-grouse range, and land-use change from the 1950s to present. The 2003 version of the statewide map and 1:100,000 scale maps can be downloaded from the SAGEMAP website (<http://SAGEMAP.wr.usgs.gov>). The shapefiles for the habitat and population layer can be downloaded as well as .pdf files of each 1:100,000 BLM map. The shapefiles for the 2004 version of the habitat planning maps can be obtained through BLM or IDFG.

Discussion

Sage-grouse populations have declined throughout the species' range (Connelly and Braun 1997); the Greater Curlew Valley study area and eastern Owyhee County were no exceptions. However, the declines within both study areas appeared more severe than those in the remainder of Idaho (Gardner et al. 1997). Fire and drought may have major impacts on sage-grouse populations (Connelly and Braun 1997, Connelly et al. 1994, Connelly et al. 2000a). Both study areas, along with much of the intermountain west, suffered from drought in the late 1980s and

early 1990s. Moreover, the CNG has a routine prescribed burning program to control sagebrush, and wildfires on both USFS and BLM lands were relatively frequent from 1961 to 1996 (Gardner et al. 1997). Wildfires were also relatively frequent in the Owyhee County study area during the 1970s, 1980s, and 1990s.

Less than 35% of federally-managed rangelands within the Curlew study area currently support acceptable sagebrush cover for sage-grouse nesting and early brood-rearing habitat. However, this is likely an overestimate of good nesting and brood cover available to grouse because the herbaceous understory was not considered in habitat classification. Some of the sagebrush understory in the study area is degraded because of land management practices and the presence of bulbous bluegrass (*Poa bubosa*), a highly competitive exotic (Gardner et al. 1997, Apa 1998). Sage-grouse hens select habitat with healthy herbaceous understories for nesting and early brood rearing (Klebenow 1969, Connelly et al. 1991, Gregg 1991). Remaining sagebrush rangelands within the study area should be assessed to determine how much of the remaining habitat provides quality nesting and brood-rearing conditions for sage-grouse.

A detailed map of sage-grouse range, which includes active lek sites, known nesting areas, and wintering areas, will be helpful to land managers from all agencies. This will allow federal and state agencies to work closely together to better manage the sagebrush steppe habitat in Idaho.

The 2004 version of the map showing sage-grouse stronghold areas, isolated habitats, key sage-grouse use areas, crested wheatgrass seedings, annual grass understory, and conifer invasion has been completed. The map is updated annually as new fires occur and we obtain additional information on sage-grouse habitat across the state (change from perennial grassland to stronghold, etc.).

Literature Cited

- Apa, A. D. 1998. Habitat use and movements of sympatric sage- and Columbian sharp-tailed grouse in southeastern Idaho. Ph.D. dissertation, University of Idaho, Moscow. 199 pp.
- Beck, T. D. I. 1975. Attributes of a wintering population of sage-grouse, North Park, Colorado. M.S. thesis. Colorado State University, Fort Collins. 49 pp.
- Beck, T. D. I. 1977. Sage-grouse flock characteristics and habitat selection during winter. *Journal of Wildlife Management* 41:18-26.
- Benson, L. A., C. E. Braun, and W. C. Leininger. 1991. Sage-grouse response to burning in the big sagebrush type. *Proceedings of Issues and Technology in the Management of Impacted Western Wildlife*, Thorn Ecological Institute 5:97-104.
- Blus, L. J., C. S. Staley, C. J. Henny, G. W. Pendleton, T. H. Craig, E. H. Craig, and D. K. Halford. 1989. Effects of organophosphorus insecticides on sage-grouse in southeastern Idaho. *Journal of Wildlife Management* 53:1139-1146.
- Braun, C. E. 1987. Current issues in sage-grouse management. *Proceedings of the Western Association of Fish and Wildlife Agencies* 67:134-144.
- Braun, C. E., M. F. Baker, R. L. Eng, J. W. Gashwiler, and M. H. Schroeder. 1976. Conservation committee report on effects of alteration of sagebrush communities on the associated avifauna. *Wilson Bulletin* 88:165-171.
- Braun, C. E., T. Britt, and R. O. Wallestad. 1977. Guidelines for maintenance of sage-grouse habitats. *Wildlife Society Bulletin* 5:99-106.
- Connelly, J. W., Jr. 1982. An ecological study of sage-grouse in southeastern Idaho. Ph.D. thesis, Washington State University, Pullman. 84 pp.
- Connelly, J. W. and C. E. Braun. 1997. A review of long-term changes in sage-grouse populations in western North America. *Wildlife Biology* 3:229-234.
- Connelly, J. W., H. W. Browsers, and R. J. Gates. 1988. Seasonal movements of sage-grouse in southeastern Idaho. *Journal of Wildlife Management* 52:116-122.
- Connelly, J. W., 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.
- Connelly, J. W., K. P. Reese, W. L. Wakkinen, M. D. Robertson, and R. A. Fischer. 1994. Sage-grouse ecology final report. Idaho Department of Fish and Game Job Completion Report. W-160-R-19. Subproject 9. 91 pp.
- Connelly, J. W., A. D. Apa, R. B. Smith, and K. P. Reese. 2000a. Effects of predation and hunting on adult sage-grouse *Centrocercus urophasianus* in Idaho. *Wildlife Biology* 6: 227-232.

- Connelly, J. W., K. P. Reese, R. A. Fischer, and W. L. Wakkinen. 2000b. Response of a sage-grouse breeding population to fire in southeastern Idaho. *Wildlife Society Bulletin* 28:90-96.
- Crowley, C. M. and J. W. Connelly. 1996. Sage-grouse population and habitat trends in southeastern Idaho and southwestern Montana. Unpublished report, Idaho Department of Fish and Game, Pocatello. 205 pp.
- Crowley, C. M. and J. W. Connelly. 1997. Trends in agricultural lands in sage-grouse range in southeast Idaho and southwest Montana. Unpublished report, Idaho Department of Fish and Game, Pocatello. 56 pp.
- Eng, R. L. and P. Schladweiler. 1972. Sage-grouse winter movements and habitat use in central Montana. *Journal of Wildlife Management* 36:141-146.
- Fischer, R. A. 1994. The effects of prescribed fire on the ecology of migratory sage-grouse in southeastern Idaho. Ph.D. thesis, University of Idaho, Moscow. 150 pp.
- Gardner, S. C., D. Meints, T. Apa, S. Feltis, J. Kumm, and J. Connelly. 1997. Sage-grouse population trends and current habitat conditions in the Greater Curlew Valley assessment area, Idaho. Unpublished report, Idaho Department of Fish and Game, Pocatello. 20 pp.
- Gregg, M. A. 1991. Use and selection of nesting habitat by sage-grouse in Oregon. M.S. thesis, Oregon State University, Corvallis. 46 pp.
- Homer, C. G., T. C. Edwards, Jr., R. D. Ramsey, and K. P. Price. 1993. Use of remote sensing methods in modeling sage-grouse winter habitat. *Journal of Wildlife Management* 57:78-84.
- Jenni, D. A. and J. E. Hartzler. 1978. Attendance at a sage-grouse lek: implications for spring census. *Journal of Wildlife Management* 42:46-52.
- Klebenow, D. A. 1969. Sage-grouse nesting and brood habitat in Idaho. *Journal of Wildlife Management* 33:649-661.
- Patterson, R. L. 1952. *The sage-grouse in Wyoming*. Sage Books, Inc. Denver. 341 pp.
- Reynolds, R. E., D. R. Cohan, and M. A. Johnson. 1996. Using landscape information approaches to increase duck recruitment in the prairie pothole region. *Transactions North American Wildlife and Natural Resource Conference* 61:86-93.
- Robertson, M. D. 1991. Winter ecology of migratory sage-grouse and associated effects of prescribed fire in southeastern Idaho. M.S. thesis, University of Idaho, Moscow. 88 pp.
- Schneegas, E. R. 1967. Sage-grouse and sagebrush control. *Transactions North American Wildlife and Natural Resource Conference* 32:270-274.

- Swenson, J. E., C. A. Simmons, and C. D. Eustace. 1987. Decrease of sage-grouse (*Centrocercus_urophasianus*) after ploughing of sagebrush steppe. *Biological Conservation* 41:125-132.
- Wakkinen, W. L. 1990. Nest site characteristics and spring-summer movements of migratory sage-grouse in southeastern Idaho. M. S. thesis, University of Idaho, Moscow. 57 pp.
- Wakkinen, W. L., K. P. Reese, J. W. Connelly, and R. A. Fischer. 1992. An improved spotlighting technique for capturing sage-grouse. *Wildlife Society Bulletin* 20:425-426.
- Wallestad, R. O. and D. B. Pyrah. 1974. Movement and nesting of sage-grouse hens in central Montana. *Journal of Wildlife Management* 38:630-633.

**PROGRESS REPORT
STATEWIDE WILDLIFE RESEARCH**

STATE:	<u>Idaho</u>	JOB TITLE:	<u>Sage-Grouse Ecology</u>
PROJECT:	<u>W-160-R-31</u>		
SUBPROJECT:	<u>53</u>	STUDY NAME:	<u>Mortality Patterns of Juvenile</u>
STUDY:	<u>II</u>		<u>Greater Sage-grouse</u>
JOBS:	<u>1-2</u>		
PERIOD COVERED:	<u>July 1, 2003 to June 30, 2004</u>		

MORTALITY PATTERNS OF JUVENILE GREATER SAGE-GROUSE

Abstract

Based on available data throughout the species' range and documented habitat changes in Idaho, many sage-grouse population declines may be due to low juvenile survival associated with decreasing quantity and quality of brood-rearing habitat and/or changing predator populations. Mortality patterns are being documented for both sexes of juvenile sage-grouse and compared between a relatively xeric habitat dominated by Wyoming big sagebrush (*A. t. wyomingensis*) and a moister habitat characterized by mountain big sagebrush (*A. t. vaseyana*). Field work began in summer 1997. During 1997-1998, 50 juveniles and nine adult hens were captured by night-lighting on summer range and equipped with radio-transmitters, and an additional 42 females were captured during spring. Overall nest success for 1997 and 1998 was 55%, but some birds did not nest. Survival to the breeding season was relatively high for juveniles marked in sagebrush/agriculture lowlands and slightly lower for birds marked in the mountain valley. Survival for juvenile males (83%) was similar to that of juvenile females (79%). Predation was the most common cause of death of juvenile and adult sage-grouse during the 1997 and 1998 field seasons. Accidental deaths due to powerline collisions also accounted for some juvenile deaths. Seventy percent of juvenile females returned to their natal range during summer 1998, while only 10% of the males did so. During spring 1999, efforts to document mortality of chicks began with a pilot field study and intensive field study of sage-grouse chick mortality occurring during FY 2000-2002. Initial data analysis suggests that 70-80% of sage-grouse chicks die by three weeks of age, a much higher mortality rate than that associated with older juveniles. Red fox (*Vulpes vulpes*), raptors, and environmental conditions appear to be the major causes of chick mortalities. Completion reports for this project will be finished in December 2004.

Recommendations

1. Complete analysis of juvenile survival and dispersal data.
2. Complete analysis of chick survival, dispersal, and habitat use data.
3. Complete final report by December 2004.

Submitted by:

Tom Hemker

Wildlife Program Coordinator

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.

