IDAHO DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

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Job Progress Report

CANADA GOOSE ECOLOGY

STUDY I: EVALUATION OF POPULATION TREND AND HARVEST ESTIMATES

STUDY II: FACTORS AFFECTING MORTALITY RATES

STUDY III: IDENTIFICATION OF SUBPOPULATIONS

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PROGRESS REPORT
STATEWIDE WILDLIFE RESEARCH

STATE: Idaho
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SUBPROJECT: 37
STUDY: I
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ABSTRACT

Weekly spring breeding pair counts (SBPC) during March, April, and May were conducted on the Snake, Payette, and Boise Rivers. Surveys were conducted to ascertain the peak period of breeding pair numbers, describe the breeding distribution, determine the amount of variation inherent in this type of survey, give the researcher experience in conducting the surveys, and to determine the problems associated with the survey technique and interpreting the results. Peak pair numbers were observed during the 4/4-4/17 period in 1995 compared to the 4/8 -4/12 period in 1994 and the 4/19-4/27 period in 1993. Comparisons of data generated on research flights were made to similar data collected by the Southwest Region management personnel on their regularly scheduled SBPC surveys. Several potential reasons for the high variances observed in Research and Regional SBPC surveys were identified.

One hundred and twenty-three radio-collared Canada geese were monitored during the 1994-95 period. Fifty percent of the radio-collared birds survived through the 1994-95 period compared to 72% in 1993-94. During the 1993-94 period hunters harvested 22%, 2.5% were lost to unknown causes before the opening of the hunting season, and 3.4% were classified as wounding losses compared to 26%, 4%, and 8% respectively in 1994-95.

Fifteen radio-collared geese were harvested during the first 4 weeks, none during the next 3 weeks, and 8 during the last 6 weeks of the 1993-94 hunting season compared to 16, 3, and 18, respectively, during the 1994-95 season. An additional 3 mortalities from unknown causes were documented between January 30, 1994 and June 1, 1994 and 10 between January 20, 1995 and June 1, 1995.

INTRODUCTION

Over most of North America, Canada goose management is based on population trend data such as pair counts, nest counts and midwinter surveys (Butler et al. 1991). Some studies have attempted to estimate the total goose population through the use of simple population models (Weiss et al. 1991,
Several studies have used neck-collared geese to estimate the size of goose populations. A modified Lincoln-Peterson Index is usually used to compare the proportions of marked to unmarked geese (Sheaffer and Malecki 1991). This method requires that a high proportion of the population be marked to provide estimates with acceptable confidence intervals; the number of "recaptures" must also be high. Several problems exist with this approach. The number of "marks" lost to the population between capture and recapture must be negligible and measurable, often an impossible task (Burnham and Overton 1978). All "marks" encountered must be observed and identified. Normally, the observer must be within 500m to read the collar number code. The ratio of marked to unmarked must be the same for each subpopulation and the subpopulations must be represented in the sample in proportion to their numbers (Overton 1969). Although these problems are not insurmountable, the manpower requirements often preclude the use of this technique in all but a research approach.

Population trend estimates are normally conducted during the breeding season in conjunction with pair counts (Sheaffer and Malecki 1991, Butler et al. 1991). Population estimates (fall flight forecasts) are usually derived from simple models that use pair, production, and gosling survival estimates.

An option exists to survey Canada goose habitats immediately before the opening of the hunting season (i.e., late August or early September). At this time geese have congregated into large groups, are no longer flightless, and the population consists of mostly local birds. Such a survey would depend upon a knowledge of all major habitat use areas. This type of survey may provide a usable estimate of local geese available for harvest (Sheaffer and Malecki 1991).

The use of radio-collared local geese to define pre-hunting season Canada goose distribution and to estimate visibility bias can provide information necessary to evaluate this technique. The variables affecting sightability can also be determined and measured. A preseason trend count corrected for visibility bias with known levels of precision and accuracy would answer the wildlife manager's highest priority question and, in conjunction with band-recovery data (Brownie et al. 1985), assist in the determination of population response to various harvest strategies.

Breeding pair counts have been used to assess trends in Idaho Canada goose populations since at least 1962. Pair counts have been evaluated by Krohn and Bizeau (1980) in Idaho and Wyoming and by Mackey et al. (1987) in Montana. The Montana study found a close correlation between ground nest counts and the number of pairs observed on an aerial survey. The aerial pair counts were consistently higher than ground nest counts. The factors that affected the variability were not identified.

Krohn and Bizeau (1980) compared nest counts with breeding pair counts and with indicated
breeding pair (pairs + singles) counts in eastern Idaho and western Wyoming. The indicated breeding pair counts (IBP) were significantly higher than the breeding pair and nest counts. The breeding pair and nest counts were not significantly different (p<0.05).

A comparison of aerial pair counts on the lower Snake and Payette River trend routes with ground nest counts in the same areas (Harris et al. 1991) indicated a wider variation than that reported by Krohn and Bizeau (1980) or Mackey et al. (1987). Part of the variation observed in the western Idaho surveys may be due to changes in management personnel conducting the counts (Harris et al. 1991).

A standardized sampling method has not been used for Idaho surveys. Harris et al. (1991) used the number of IBP to compare pair trend counts with nest trend counts in southwest Idaho, although the number of breeding pairs may be a more accurate measure of nesting pair numbers (Krohn and Bizeau 1980). It is not clear as to whether IBP or breeding pair numbers were used for early count data (before 1982). Survey altitudes, aircraft types, and methods for determining breeding pair numbers have varied. The definition of a pair or single is dependent on the distance between birds, but this distance has not been standardized. The survey methodology used is seldom reported, consequently, comparisons between observers and survey routes are suspect at best. A similar problem with survey standardization exists throughout North America (Humberg et al. 1991, Butler and Eldridge 1991, Tacha et al. 1991).

Beginning in 1987, 3 replicate surveys were flown at 1-week intervals to assess the variability inherent in southwest Idaho pair count surveys. The variability in these data have not been analyzed or reported. Initially, the mean of 3 surveys was used to measure the number of IBPs. Recently, the high count of the 3 replicates has been used as the trend estimate. The effect of this change on pair count trend estimates has not been assessed. These data need further evaluation.

Idaho currently estimates goose harvest by the use of a random telephone survey of license buyers. This survey has known levels of precision but the accuracy of these estimates is unknown. Several factors can affect the accuracy of these estimates. The number of geese reported by hunters is dependent on their memory. Since the survey is conducted 2 to 3 months after the end of the hunting season, the number of geese reported harvested may be inaccurate. If the individual's success during the season was low a truthful answer may not be given. A hunter may also report birds shot while party hunting for another less successful hunter. The less successful hunter may report birds killed by a hunting partner if he/she took the birds home. A double reporting of the same birds could occur under these conditions.

Managers need a method to assess the impacts of management practices on Canada goose populations. This method should provide an accurate measure of goose population size or trends and be sufficiently sensitive to detect changes before undesirable population levels are reached.

SBPC are used as a population trend index for many Canada goose populations in Idaho (Connelly
and Wackenhut 1990). Minimum and 1995 population trend goals are established for each subpopulation. The goals are based on a 3-year moving average of SBPC. Changes in season lengths and bag limits are triggered by these goal numbers. The usefulness of SBPC trend surveys are dependent upon their precision and sensitivity to actual population changes. Several problems associated with the present methods of collecting and interpreting SBPC data have led the Idaho Department of Fish and Game (IDFG) and the U.S. Fish and Wildlife Service (FWS) to question the precision and accuracy of SBPC data. In most areas a single survey is used to make the pair estimates, although the lower Snake and Payette Rivers have been surveyed 3 times each spring since 1987. These latter surveys give some indication of the between-flight variability but it is not known if the yearly variation in pair counts reflect actual changes in the population.

The Southwest Region has flown 3 replicate SBPC surveys each spring since 1987 to evaluate the precision of its data (Harris et al. 1991). Counts have varied as much as ± 35% during the same year. This level of variability is not known which of these estimates gives a better estimate of population trends. A survey methodology that provides better population estimates is needed to maximize harvest and population goals.

It is not known if SBPCs relate to actual population numbers. The current trend routes may not be representative of the total population. Population changes may occur at different rates on and off of the trend routes depending upon population levels. SBPC trend routes are normally located on the breeding areas with the highest concentration of nesting pairs. These areas may be near carrying capacity when populations are high and further increases in breeding pair use may occur on more marginal habitats.

A comparison of SBPC and ground nest surveys on SBPC routes indicated a large variance of the estimates between the survey techniques (Harris et al. 1991). SBPCs are commonly higher than nest counts (Krohn and Bizeau 1980, Mackey et al. 1987). Several factors can influence the sightability and correct determination of the number of pairs observed. Flight altitude, vegetative cover, goose behavior, sun angle, cloud cover, wind speed, and the distance between individual birds are potential factors affecting the accuracy of SBPCs in measuring breeding pair population trends.

A similar situation exists with the production surveys conducted on the Snake and Payette Rivers. Nesting islands are searched and nest sites marked. A second survey is conducted after completion of nesting activity and the success of each previously located nest is recorded along with its fate (i.e. successful, depredated, abandoned, or flooded). When possible the predator responsible for destruction of the nest is also recorded. The number of eggs hatched is compared to the number of eggs laid. This information is also used to provide an index to population trend. Whether or not these trends reflect actual trends in the population is not known. The proportion of nests sampled is not known, consequently, nest data cannot be used to estimate the total breeding population or to provide a fall flight forecast.

The IDFG estimates goose harvest using telephone survey of license buyers. The survey is based on
statistically sound methods and produces results with known levels of precision. The accuracy of these estimates is suspect. A major concern is the ability of respondents to accurately remember the number of birds they harvested. It is also questionable that respondents are providing completely truthful answers to questions they perceive as measuring their success as hunters. Harvest estimates are accurate enough to evaluate trends on a statewide basis, but confidence limits are too wide to make observed yearly changes in regional or county harvest estimates meaningful.

Production can be measured in several ways. Number of nests, successful nests, eggs laid, eggs hatched, and goslings fledged have all been used as measures of productivity for Canada geese. These data can also provide useful information relative to factors affecting productivity such as predation or flooding. To provide a reliable index of changes in populations, the survey areas must be representative of the total population and the survey techniques must produce precise estimates. This information is not currently available.

The midwinter aerial survey conducted in conjunction with the FWS is designed to provide information on Canada goose numbers on a flyway-wide basis. These data are not very informative of population changes on a regional or state level. We are unable to estimate the number of local geese outside the state during the survey period or the number of migrant birds within the state. A simple aerial survey that will provide a reliable estimate of Canada goose populations is not available to managers attempting to assess the affects of harvest and productivity on Canada goose numbers.

**STUDY AREA**

The 637,000-hectare study area ranges in elevation from 680 m at C. J. Strike Reservoir to 1100 m at Farewell Bend on the Snake River. The area includes a major portion of southwest Idaho. Included are the Snake River drainage from the upper end of C. J. Strike Reservoir to Farewell Bend below Weiser Idaho, the Boise River from Lucky Peak Dam downstream to the Snake River, and the Payette River from Black Canyon Dam downstream to the Snake River.

Two major urban areas are located within the study area, the Boise and Nampa-Caldwell metropolitan areas. The smaller cities of Weiser, Emmett, and Payette occur along the northern border of the study area. Lake Lowell, C. J. Strike Reservoir, Indian Creek Reservoir, and Hubbard Lake are the major bodies of water.

Farming is the major land use in the area. The most common crops are small grains including wheat and barley, field and sweet corn, sugar beets, soybeans, onions, mint, and alfalfa. Crops are irrigated by water from the Lucky Peak, C. J. Strike, Black Canyon and Lake Lowell reservoirs as well as the Snake, Boise, and Payette Rivers.

The islands along the Snake, Boise, and Payette Rivers have high concentrations of Canada goose nesting habitat. The rivers and reservoirs also provide winter habitat for local and migrant geese.
Goose hunting is an important recreational resource in southwest Idaho. Telephone survey estimates indicate as many as 29,000 geese may be harvested per year in IDFG's Southwest Region.

**JOB NO. 1 EVALUATION OF SPRING BREEDING PAIR COUNTS**

**Objectives**

To determine the effects of habitat types, Canada goose behavior, and sampling techniques on the accuracy and precision of Canada goose spring breeding pair counts in southwestern Idaho.

**Methods**

(1) Capturing and Radio Collaring Canada Geese

Canada geese will be captured using a rocket-launched net or by driving molting adult geese into traps during the spring and summer of 1992-1998. Adult geese will be equipped with radio transmitter collars with a time-delay mortality sensor. A minimum sample of 90 radio-collared adult geese will be maintained throughout the study. Radio collars will be allotted in proportion to the estimated breeding population on major nesting areas.

(2) Nest Location

The nesting location of all radio-collared geese will be recorded, photographed, and marked. Information recorded will include map location on topographic maps, Geographical Positioning System or LORAN location, physiographic type (island, tree, platform, lake, reservoir, river etc.), percent canopy coverage, and vegetative type. A minimum of 5 river segments (1 to 2 mi in length) located on the SBPC survey routes will be systematically sampled from the ground. The data recorded will be the same as for the radio-collared goose nest locations.

(3) Breeding Pair Population Estimate

All known or suspected Canada goose nesting habitats within the study area will be divided into 320-acre sampling units. Units will be stratified into subunits with expected densities of 0, \(<4\) or \(>4\) nests per mi². A random sample of units will be systematically surveyed from the ground and all nest locations recorded and photographed. The data recorded will be the same as that listed for radio-collared goose nest locations.

(4) Breeding Pair Count Surveys

A minimum of 5 fixed-wing (Cessna 182) surveys per year will be conducted on established trend lines in the Southwest Region. Information recorded will include group location, size, physiographic type (island, tree, platform, etc.), vegetative type (willow, grass, sagebrush, crop type,
etc.) and canopy coverage. Flight procedures will be standardized for altitude (100 feet AG), speed (80 mph), aircraft type, number of observers and weather conditions. The surveys will be conducted at 1-week intervals beginning the last week of March. Aerial survey data will be compared to known numbers of nesting pairs observed during ground surveys on randomly selected river segments.

(5) Statistical Methods

Breeding season population size will be estimated by using a stratified random sampling procedure (Zar 1984). This 2-stage approach recognizes the impracticality of surveying every land unit within the study area (Bowden et al. 1984). Regression analyses will be used to test for dependence between breeding pair population estimates and SBPCs. Regression analysis will also be used to test for dependence between aerial SBPCs and observed pair counts on selected river segments (Zar 1984). The effects of independent variables on visibility bias will be evaluated using Chi-square tests for univariate analyses (Zar 1984) and stepwise logistic regression (Dixon 1981) for multivariate analyses. Stepwise logistic regression will be used to develop a model to predict breeding pair numbers on trend routes with known levels of accuracy and precision.

Results

Weekly SBPCs during March, April, and May were conducted on the Snake, Payette, and Boise Rivers. These surveys were conducted to ascertain the peak period of breeding pair numbers, describe the breeding distribution, determine the amount of variation inherent in this type of survey, give the researcher experience in conducting the surveys, and to determine the problems associated with the survey technique and interpreting the results. Breeding pair counts were compared to similar data collected by the Southwest Region management personnel on their regularly scheduled SBPC surveys.

Peak pair numbers were observed during the 4/4-4/17 period for all 3 survey areas. Peak total numbers of geese observed occurred on the first flight on 3/29. It appeared that a large number of migrating geese were still in the area on this date. The first broods were observed on the 4/8 flight. Comparisons of data generated on research flights and on regular Regional SBPC surveys were made for each year (1993-95). Several potential reasons for the high variances observed in Regional SBPC surveys were identified:

1. Differences in classification of singles, pairs or groups between trained observers.
2. Use of untrained observers on Regional surveys.
3. Wind conditions during the survey.
4. Location of survey route in relation to the center of the river.
JOB NO. 2 EVALUATION OF PRODUCTION SURVEYS

Objectives

To determine the accuracy and precision of nest surveys.

Methods

(1) Capturing and Radio Collaring Canada Geese

See Job 1, Procedures (1).

(2) Radio Collared Goose Nest Locations

Locations of all radio-collared geese nesting on the Southwest Region production survey routes will be mapped.

(3) Production Surveys

All nesting areas on survey routes will be searched for nests. Nest locations will be marked and revisited after the nesting period. Data recorded will include location, habitat type, topographic type, percent canopy coverage, nest success, fate, the number of eggs laid, and the number of eggs hatched.

(4) Statistical Methods

The effects of independent variables on the survey's ability to locate nests will be evaluated using Chi-square tests for univariate analyses (Zar 1984) and stepwise logistic regression (Dixon 1981) for multivariate analyses.

Results

(1) Capturing and Radio Collaring Canada Geese

See Job No. 1 Results Section

JOB NO. 3 EVALUATION OF PRESEASON TREND SURVEYS

Objective

To determine the feasibility of using pre-hunting season aerial surveys to estimate local Canada goose population trends.
Methods

(1) Trend Survey

Radio-collared birds will be monitored by fixed-wing aircraft weekly during August and September to locate concentration areas. Each radio location site will be mapped, goose numbers estimated, and habitat type recorded.

Fall trend survey routes will be determined based on habitat use data generated from fall radio-collared goose locations. Based on the radio relocation data, the study area will be divided into subunits and the subunits stratified on expected population densities. Randomly selected subunits will be sampled by fixed-wing aerial surveys during August and October of 1994. Population estimates will be determined using a stratified random sampling technique (Zar 1986). The location of all Canada goose groups observed will be mapped and the habitat type, group activity, time, sun angle, altitude and number of radio-collared geese in the group will be recorded.

(3) Statistical Methods

Regression analysis will be used to test the accuracy of fall trend surveys as predictors of fall population estimates (Zar 1984). A visibility bias correction factor will be determined for fall trend surveys. The effects of independent variables on visibility bias will be evaluated using Chi-square tests for univariate analyses (Zar 1984) and stepwise logistic regression (Dixon 1981) for multivariate analyses.

Results

Canada geese were caught using drive nets for flightless birds and a rocket net over bait for birds able to fly. Flightless geese were captured on all known major production areas and flighted birds at Lake Lowell during August. One hundred and twenty-three locally-produced Canada geese were equipped with neck-collar-mounted radio transmitters and FWS aluminum leg bands and then released (Table 1).

Age and sex composition were representative of birds captured and the radio collars were apportioned on the relative nesting density of the individual band location.
Table 1. Numbers of Canada geese radio collared by sex, age and band location in southwestern Idaho, 1992-93.

<table>
<thead>
<tr>
<th>Band Location</th>
<th>Young</th>
<th>Adults</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Lowell</td>
<td>5</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Upper Snake</td>
<td>8</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>Payette River</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Lower Snake</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Boise River</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CJ Strike</td>
<td>3</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>38</td>
<td>31</td>
</tr>
<tr>
<td>1994</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Lowell</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Upper Snake</td>
<td>6</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Payette River</td>
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<td>4</td>
</tr>
<tr>
<td>Lower Snake</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Boise River</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>CJ Strike</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>19</td>
<td>21</td>
</tr>
</tbody>
</table>

**Discussion**

A random-stratified aerial survey of the study area was conducted during October 8-12, 1995. The study area was stratified into 6 high, 26 medium and 155 low units. A random sample of 6 high (100%), 13 medium (50%), and 16 (10%) low units were surveyed. A total population estimate of 16,323 geese was projected from the sampled units. Additional surveys will be conducted in September and October of 1995.

**JOB NO. 4 EVALUATION OF HARVEST ESTIMATES**

**Objective**

To determine the accuracy of telephone harvest surveys of Canada goose hunters.

**Methods**

(1) Canada Goose Harvest and Hunter Success Estimates

A random sample of Idaho state waterfowl stamp buyers will be requested to record the species and number of all geese killed and the dates hunted on a supplied report card. Nonrespondents will be
contacted by telephone. The total statewide goose harvest and hunter success will be estimated using the IDFG harvest survey. Sampling effort will be increased to provide an estimate with 90% CI bounds of $\pm 15\%$.

3) Statistical Methods

Differences in reported harvest and success rates for Canada goose hunters based on report card and telephone survey data will be tested by using the t-test (Zar 1984).

Results

This study has been cancelled since the FWS's new harvest estimate procedures will be implemented during the 1996 season.
ABSTRACT

Field work was limited to the capture and banding of locally-produced Canada geese. A total of 1831 geese was banded during the spring of 1993, 1280 during the spring of 1994, and 1300 in 1995. Hunters harvested 26% of the radio-collared geese and overall survival was estimated at 50% for the June 1, 1994 to January 30, 1995 period.

INTRODUCTION

Population estimates for local breeding Canada geese in southern Idaho have fluctuated widely during the past 40 years. Consequently, season length as well as bag and possession limits have also varied. When the population declined to the point that the decline was obvious to hunters, they have supported reductions in harvest opportunities. Declines in local breeding populations are often masked by migrant geese that move through southwest Idaho during the fall. Since it is not possible for hunters to differentiate between local and migrant geese, and migrant geese are believed to outnumber local geese, a significant decline in local breeding birds may not be readily apparent to hunters or wildlife managers.

To meet the Canada goose population and harvest goals of the Department's 1991-1995 Waterfowl Management Plan (Connelly and Wackenhut 1990), detailed information on the various factors that contribute to the overall mortality of Canada geese in Idaho is needed. Little information exists on causes of mortality for local Canada goose populations in southwest Idaho.

The effects of hunting on Canada goose populations are not well-documented and waterfowl experts are not in total agreement on how mortality factors, including sport or subsistence hunting, are related. Substantial disagreement exists as to whether hunting mortality is compensatory or additive to other mortality.
Maximizing Canada goose harvest while meeting population goals for local goose populations requires that the wildlife manager have detailed information on: 1) trend of local and migrant goose populations; 2) differential vulnerability of local versus migrant Canada geese related to geography, food availability, time of hunting season, or other factors; 3) amount of hunter effort; 4) relationship of harvest to population trend.

This study will provide managers with information on the effects of different harvest levels on the population size of locally-breeding Canada geese. Improved knowledge of the effects of harvest will help managers avoid undesirable hunter-caused population fluctuations and allow more stable season structures and bag limits. Better knowledge of harvest effects (Study 2) and population numbers (Study 1) will assist the managers in designing a proactive rather than reactive harvest structure that is more biologically correct and publicly acceptable.

This study will attempt to determine whether hunter-caused mortality is compensatory or additive to other mortality of Canada geese in southwestern Idaho. If hunting harvest is compensatory, a more flexible and liberal harvest strategy can be employed.

Initial research will occur in southwestern Idaho. Changes in mortality patterns of radio-collared adult and juvenile geese between conservative and liberal season structures will be measured. Changes in survival and recovery rates of local leg-banded adult and juvenile geese between conservative and liberal season structures will also be measured. Changes in the direction and magnitude of population trends (Study 1) will be compared to survival rates. If possible, the experiment will be expanded to include the south-central and southeastern Idaho Canada goose populations.

**STUDY AREA**

Described under Study I.

**JOB NO. 1 FACTORS AFFECTING MORTALITY RATES**

**Objective**

To determine the factors that affect mortality of Canada geese in southwestern Idaho.

**Methods**

(1) Treatments

Liberal hunting seasons will be scheduled for southwestern Idaho for 1992-95 and conservative seasons for 1996-99. If the spring breeding pair counts in the Southwest Region drop below 700 pairs during the liberal season treatment, a conservative season structure will be implemented the following year.
(2) Population Monitoring

Population numbers will be estimated as described under Study I, Job 1, Job 2, and Job 3.

(3) Harvest and Hunter Density

Harvest and hunter density estimates will be estimated under Study I, Job 4.

(4) Mortality Factors

A minimum of 50 adult and 50 juvenile Canada geese per year will be equipped with radio collars. Radio-collared birds will be located from the ground or air at least weekly. Radio collars will be equipped with mortality sensors. Radio collars emitting mortality signals will be retrieved. Cause of death will be determined when possible. Date, location, vegetative type and distance from water will be recorded.

(5) Weather

Minimum, maximum, and mean daily temperatures, mean daily precipitation data, water levels and percent of surface area frozen of major water bodies (C.J. Strike Reservoir, Lake Lowell and the Snake River at Homedale) will be recorded.

(6) Statistical Methods

Differences in population size between treatments will be tested for significance by using the Mann-Whitney U test or the Wilcoxon's signed-ranks test (Hurlbert 1984, Daniel 1990). Differences among years and areas will be tested by Chi-square analysis. The Kaplan-Meier procedure (Pollock et al. 1989) will be used to estimate the survival distributions of radio-collared Canada geese. These distributions will be compared to survival distributions determined from leg-band return data (Brownie et al. 1985) by Chi-square analysis.

Results

Field work was limited to the capture, banding, and radio collaring of locally-produced Canada geese. A total of 1831 geese was banded during the spring of 1993, 1280 in 1994, and 1,300 in 1995 in southwestern Idaho (Table 2). Eighty-nine geese were equipped with radio collars during the reporting period.

The overall survival rate from June 1, 1993 to January 30, 1994 was 50% compared to 72% in 1993. Hunter harvest accounted for 26%, pre-season mortality 4.0%, and wounding loss 8.0%. Fifty-two percent of the hunter harvest occurred during the first 4 weeks of the season and the remaining 48%
occurred during the last 6 weeks of the season. Three radio-collared birds were reported as being harvested during the middle 3 weeks of the season. Mortality of adult birds increased from 19% in 1993 to 41% in 1994 (Fig. 2.). Mortality of young birds increased from 42% to 58% during the same time period (Fig. 1.).

Discussion

Failure of the antennas on radio collars during 1993-94 precluded the monitoring of radio collars after January 30, 1994. Internal antennas will be used in the future.

The decreased survival rates (Fig.1) observed during 1994-95 may reflect increased mortality due to a 1-week season extension and an increase in the daily bag limit from 2 to 3 geese. Alternatively, it may reflect a weather caused increase in vulnerability during the 1994-95 season.
Table 2. A summary of Canada geese banded by date, location, age class, and sex in southwestern Idaho, 1993.

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Young</th>
<th>Adults</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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PROGRESS REPORT
STATEWIDE WILDLIFE RESEARCH

STATE: Idaho
PROJECT: W-160-R-22
SUBPROJECT: 37
STUDY: III
JOB: 1

PERIOD COVERED: July 1, 1994 to June 30, 1995

ABSTRACT

This study was not active during this reporting period. Job 1 has been cancelled due to insufficient funds being available to cover the high cost of mitochondrial DNA tests and since this study would be a duplication of current efforts of the U.S. Fish and Wildlife Service to identify subpopulations based on nuclear DNA tests.

LITERATURE CITED


