A two-year study of renesting in Canada geese (Branta canadensis) in Phillips County, Montana
by Melvin G Atwater

A THESIS Submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of Master of Science in Fish and Wildlife Management
Montana State University

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TABLE OF CONTENTS

	Page
Abstract	3
Introduction	4
The study area	5
Methods	8
Results	13
Summary	21
Literature cited	23

ABSTRACT

A study of renesting in Canada geese (Branta canadensis) was conducted among 12 reservoirs in Phillips County, Montana during the nesting seasons of 1956 and 1957. Twelve nesting females were live-trapped at their nests during the egg-laying or incubation stage. Eggs were removed from the nest to simulate natural nest destruction. The birds were individually marked, released, and subsequently observed. Two were known to have renested; one renested twice, the other once. These were the only geese trapped and marked during the egg-laying stage. Unsuccessful nesters usually moved away from their original nest sites and were generally characterized by considerable restlessness and movement among reservoirs. The data from the 12 marked birds and the light intensity of "late" nesting suggested that only a small per cent of the Canada geese on the study area renested after their first nests were destroyed.

INTRODUCTION

A survey of the literature indicated that the extent of renesting in Canada geese has not been thoroughly established. Craighead and Craighead (1949) from their studies on the Snake River in Wyoming stated that renesting attempts were observed but only two were known to have been successful. The criteria used for recognizing these renesting attempts were not listed. Kossack (1950) mentioned one instance of renesting under semi-wild conditions on an Illinois refuge where mated pairs were banded with coded-color celluloid bands to insure positive identification. Naylor (1953) mentioned a possible renesting attempt on Honey Lake Refuge in California apparently because of the late seasonal appearance of the nest. Balham (1954) listed one instance at Delta, Manitoba during a three-year study in which birds were wing-clipped and leg-banded with colored thermoplastic. Geis (1956) in a two-year productivity study in the Flathead Valley, Montana, stated that her data indicated between 30 and 40 per cent of unsuccessful nesting pairs made renesting attempts. Although individual geese could not be recognized, a nest was designated a renest when it appeared in the same area of an earlier nest failure.

The present study was conducted during the spring nesting seasons of 1956 and 1957 among reservoirs in South Phillips County, Montana. Nesting females were live-trapped at their nests, individually marked, and released. Subsequent observations of marked individuals aided in an evaluation of renesting. Sowls (1949) conducted similar experiments on seven species of nesting ducks at Delta, Manitoba.

The writer is indebted to Dr. Don C. Quimby, Montana State College, who directed the study and gave valuable aid in preparing the manuscript; to Dale Witt of the Montana Fish and Game Department for assisting in setting up the study and for giving aid in the field; to Frank Koslik, California Department of Fish and Game, for suggesting trapping techniques; to Drs. John C. Wright and W. E. Booth, Montana State College, for verifying plant identifications; and to the landowners of the study area for their cooperation. During this study, the writer was employed by the Montana Fish and Game Department under Federal Aid Projects W-76-R-2 and W-76-R-3.

THE STUDY AREA

Phillips County is located in north-central Montana. This area is characterized by a gently rolling, glaciated plain of sagebrush-grassland type, interrupted by severely eroded gullies and drainage bottoms. It is treeless except for scattered cottonwoods and willows along the drainage bottoms. The Milk River Valley divides the county into north and south portions. The study area was located within the southern part. The elevation of the Milk River Valley at Malta is 2254 feet, increasing gradually both north and south (DeYoung, Youngs, and Glassey, 1932). The climate is characterized by a dry atmosphere, comparatively long, cold winters, hot summers, and a large proportion of sunny days. The moderately low annual precipitation ranges from 10 to 15 inches. Both dry and wet land farming are practiced, with livestock, small grains, and forage crops being the principal resources. Irrigation waters are obtained from

the Milk River and from reservoirs placed along natural drainages. The streams in the study area are mostly intermittent, flowing during the spring runoff at which time the reservoirs are usually filled to capacity or overflowing. The water levels in the reservoirs become very low in late summer as the result of irrigation, evaporation, and livestock use.

Twelve reservoirs used by geese for nesting and located within 12 miles of each other in the Big Warm Spring Creek, Little Warm Spring Creek, and Alkali Creek drainages, were included in the study area. The geese that nest in this area form part of the Phillips County or Bowdoin population, estimated by Witt (1957), as the result of aerial censuses conducted during the nesting seasons of 1955, 1956, and 1957, to be approximately 500 breeding pairs. It is not known when Canada geese first began using these reservoirs as a nesting area, but Witt and Williamson (1956) reported that nesting has gradually increased in Phillips County with the development of more water areas. They stated that the establishment of Bowdoin National Wildlife Refuge in 1935, about 20 miles northeast of the study area, resulted in an increase from seven original nesting pairs on the refuge in 1935 to approximately 200 nesting pairs at present. Similar trends probably have taken place on these reservoirs as they were developed with the result that goose production on reservoirs now constitutes a very important part of the Phillips County population. Witt and Williamson further stated that Bowdoin Refuge and the adjacent reservoirs are used extensively as resting and feeding areas during spring and fall migrations, but are devoid of geese during the colder winter months when water surfaces are frozen.

The study reservoirs varied in size from 3 to 227 acres. Four were used for irrigation in late spring and early summer, causing serious fluctuations in water levels. Four were built by the Federal Government in 1936 and 1937 and are presently administered by the United States Forest Service, while the others are privately owned and built during the period of 1920 to 1940. All had earth filled dams and natural spillways. Maximum depths ranged from 4 to 13 feet. Shoreline topography was mostly flat or gently sloping with portions of three reservoirs having low, sharply-eroded banks. The area surrounding the original creek bed of several reservoirs was often flooded during the spring runoff bringing into existence a few temporary islands and peninsulas.

Principal plant species growing in and adjacent to the reservoirs were collected, identified, and representatives of each deposited in the Herbarium of Montana State College. Terminology is based on Booth's Flora of Montana, Part I (1950), and Wright and Booth's Flora of Montana, Dicotyledons (1956).

Aquatic vegetation was sparse. Emergents consisted mostly of swamp knotweed (Polygonum coccineum), arum-leaved arrowhead (Sagittaria cuneata), great bulrush (Scirpus validus), and American water plantain (Alisma plantago-aquatica). Submerged vegetation appeared in greater abundance in summer when water levels were low. Predominant species collected were American milfoil (Myriophyllum spicatum), water buttercup (Ranunculus circinatus), floatingleaf pondweed (Potamogeton natans), sago pondweed (Potamogeton pectinatus) and claspingleaf pondweed (Potamogeton richardsonii).

Shoreline vegetation was closely cropped as a result of intensive grazing. It was predominately of the sagebrush-grassland type consisting of silver sage (Artemisia cana), fringed sage (Artemisia frigida), snakebrush (Gutierrezia sarothrae), pricklypear (Opuntia polyacantha), greasewood (Sarcobatus vermiculatus), crested wheatgrass (Agropyron cristatum), bluestem (Agropyron smithii), blue grama (Bouteloua gracilis), desert saltgrass (Distichlis stricta), foxtail barley (Hordeum jubatum), junegrass (Koeleria cristata), needle-and-thread (Stipa comata), and green needlegrass (Stipa viridula). The shorelines were mostly treeless except for occasional plains cottonwoods (Populus sargentii) and sandbar willows (Salix interior). One reservoir in the study area had a dense growth of willows around much of its shoreline (Fig. 1).

METHODS

Observations were begun on March 15, 1956 and April 3, 1957 and continued through July 10, 1956 and June 24, 1957, respectively. Dates of arrival from the wintering grounds and nesting activities were recorded. Nest searches were conducted on foot and from an airplane soon after the geese arrived to insure the location of first nests in the egg-laying stage. Such nests obviously provided more complete histories than those found during incubation. For nests with complete histories, trapping of the nesting females could take place during the egg-laying stage or during various incubation stages, as desired.

A manually-operated, spring-type trap for capturing geese on the nest was developed from a Hancock live beaver trap. A. W. Miller and E. G. Hunt

Fig. 1. Aerial photograph of one of the study reservoirs. Except for the willows along the shoreline, the general features are very similar to other reservoirs of the area.

of the California Department of Fish and Game had developed a smaller spring-type trap from a Bailey beaver trap for use on duck renesting studies in northern California. Only the base springs were retained from the beaver trap. To these was attached the single jaw of the trap which consisted of a hoop of light conduit approximately five feet long and four feet wide at its greatest dimensions. The hoop was loosely covered with 1-inch mesh netting. The hoop and springs were fastened to a heavy angle-iron framework for support. The trap was set adjacent to a goose nest with the jaw held open by means of a hinge bent over the hoop frame and held in position by a small ring (Fig. 2). A long twine was attached to this ring so that the trap could be sprung from varying distances (Fig. 3). When sprung, the netting of the hoop completely covered the goose nest, thus trapping the female.

When a goose was trapped on a nest which was not located during the egg-laying stage, the approximate length of incubation at the time of trapping was determined from the hatching date of the eggs which were placed in an incubator. Dow (1943) stated that the average incubation period for Canada geese nesting in their natural habitat is 28 days. Verification of a 28-day incubation period was provided in this study by hatching dates of eggs in their natural habitat and in the incubator. When captured, geese were banded with United States Fish and Wildlife Service leg bands and marked individually with a Du Pont Duco yellow car lacquer. The latter was applied in the field with a brush to various combinations of tertial, secondary, and primary wing feathers and tail feathers (Figs. 4 and 5). The paint was quick-drying and long-lasting,

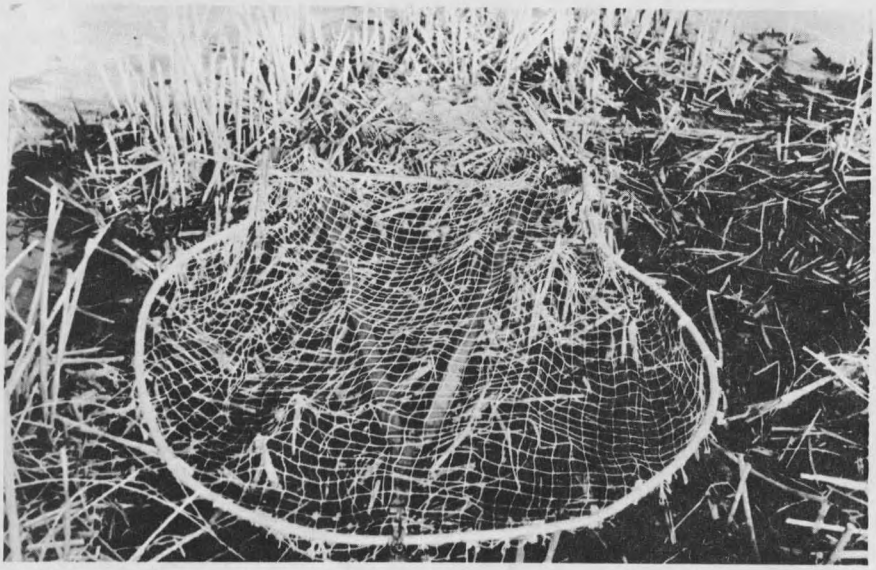

Fig. 2 Trap adjacent to goose nest in set position.

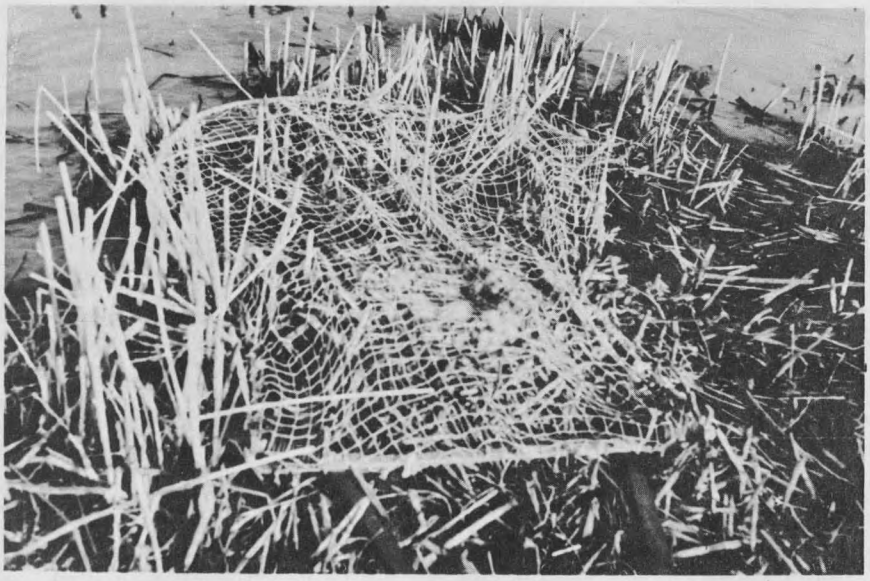

Fig. 3 Trap in sprung position with mesh of jaw covering goose nest.

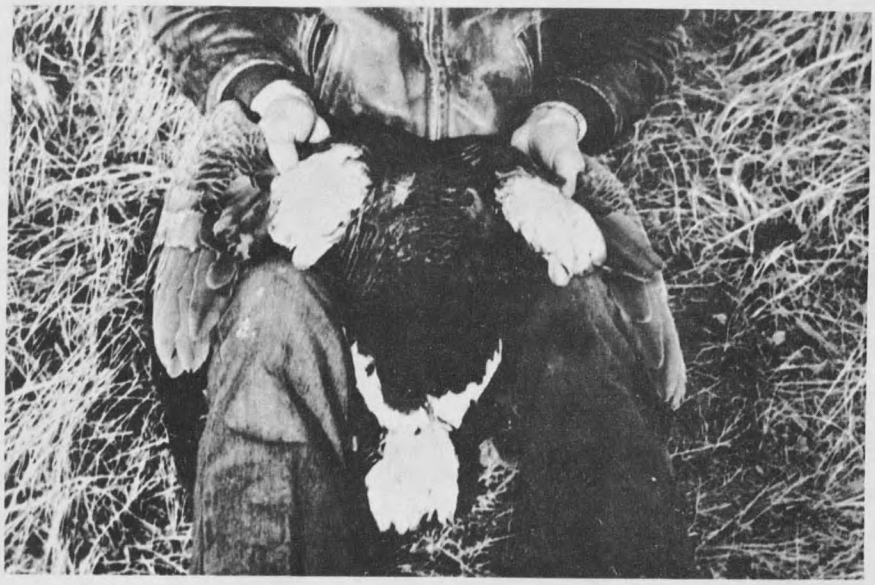

Fig. 4. Goose with painted tertials and center tail feathers.

Fig. 5. Color-marked goose in flight after release.

showing up well on at least one bird for over 80 days. Geese with painted tertials showed up especially well. To simulate natural nest destruction, eggs were removed to an incubator for hatching after release of marked geese. The birds were subsequently observed from the ground and from an airplane as closely as possible throughout the nesting season for behavior, movements, and possible renesting attempts.

RESULTS

According to records of Bowdoin National Wildlife Refuge and personal observations, the first geese arrived in Phillips County on March 18, 1956 and March 9, 1957. Banding records for seven years indicated that the principal wintering area of Phillips County geese is the Rio Grande River in New Mexico. Weekly aerial censuses conducted by Dale Witt each year showed that the peak of migration occurred during late March. The geese appeared to be paired upon arrival. Hanson (1953) stated that indirect evidence indicated that pairing takes place chiefly on the wintering grounds or in the earlier stages of spring migration. Nesting activities were soon commenced with territories being established and defended before the ice and snow were entirely gone. The first nests were observed on April 11 of both years, but in 1957 one of these nests contained seven eggs on this date. The peak of the hatch occurred in mid-May. The length of the nesting season was at least 75 days both years. One goose was observed incubating on July 4, 1956.

Reservoirs as small as two and three acres commonly supported at least one nesting pair. There was definite preference for the islands and peninsulas as nesting sites, including temporary islands and peninsulas created by flooding. The majority of nests were placed within 25 yards of the water in open, short grass areas, although a few were found in dense willow cover or on matted bulrushes. Nests were composed of the nearest available materials usually consisting of grasses, twigs, and supplemented with down. Because the irrigation reservoirs were subject to radical changes in water levels over comparatively short periods of time, some nests were flooded.

Trapping of nesting females was started on April 16, 1956 and April 12, 1957. The trap was set at 25 nests over the 2-year period. Sixteen of the nesting females returned to their nests after the trap was set. Twelve were successfully trapped. Seven desertions, two nest predations while the trap was set, one trap casualty, and one escape from the trap were recorded. Two geese were not trapped due to the inability of the observer to spring the trap before the geese moved off the nests. No eggs were broken or cracked during any trapping procedures. This added considerably to the efficiency of the trapping technique.

A summary of the subsequent activities of the 12 marked geese is given in Table I. Two (Nos. 1 and 6) were known to have renested; No. 1 twice, No. 6 once. Only these two were trapped and marked during the egg-laying stage. Eight (Nos. 2, 4, 5, 7, 8, 10, 11 and 12) of the remaining 10 geese were observed for 16 to 34 days after nest destruction and no signs of renesting were detected. Since these eight were last observed

Table I. Resume of Activities of 12 Marked Geese.

Bird No.	Date Marked	No. of Eggs in Nest	Nest Stage	No. Times Re-observed Between Dates	Activities
1	4/19/56	4	Egg-laying	20 4/19/56-7/10/56	Pair observed 4/19-5/1 alone near destroyed nest. Observed 5/23-6/4 on same reservoir incubating 6 eggs. Nest destroyed by predation 6/4-6/5. Observed 6/15-7/4 on same reservoir incubating 3 eggs. Nest deserted 7/5-7/9.
2[1]	4/21/56	5	Incubation 1-2 days	7 4/21/56-5/21/56	Pair observed alone on original reservoir but not in vicinity of destroyed nest.
3	4/24/56	3	Incubation 2 days	3 4/24/56-5/1/56	Pair observed on reservoir 3 miles from original reservoir. Appeared very restless and usually seen with other geese.
4	4/25/56	4	Incubation 1 day or less	9 4/25/56-5/26/56	Pair observed on original reservoir usually alone near destroyed nest.
5	4/27/56	5	Incubation 1-2 days	6 4/27/56-5/14/56	Pair observed 4/27-5/4 alone on original reservoir. Pair observed 5/7-5/14 usually alone on 2 reservoirs 1 and 3 miles from original reservoir.
6[1]	4/13/57	6	Egg-laying	9 4/13/57-6/1/57	Pair observed 4/13-4/17 near destroyed nest. Observed 4/29, 24 miles from original nest. Observed 5/4-5/31 on nest. Six eggs hatched 5/31-6/1.

Table I. (continued)

Bird No.	Date Marked	No. of Eggs in Nest	Nest Stage	No. Times Re-observed Between Dates	Activities
7	4/18/57	5	Incubation 8-9 days	6 4/18/57-5/22/57	Pair observed on overflow marsh about 0.5 miles from destroyed nest.
8	4/26/57	6	Incubation 8-9 days	8 4/26/57-5/24/57	Pair observed alone among 3 small reservoirs within 5 miles of each other, including original reservoir.
9	4/27/57	4	Incubation 10-11 days	No reobservations	———
10	4/28/57	4	Incubation 5-6 days	5 4/28/57-5/22/57	Pair observed alone and in small groups on original reservoir but never in vicinity of destroyed nest.
11	5/3/57	5	Incubation 19 days	1 5/3/57-5/22/57	Pair observed alone among several small reservoirs about 5 miles from original reservoir.
12	5/6/57	6	Incubation 24-25 days	4 5/6/57-5/22/57	Pair observed usually alone on 2 reservoirs, 3 and 4 miles from original reservoir.

1/ Same goose.

during the peak of hatch in mid-May or later, the writer believes that the possibility of renesting was slight. Data for two birds were incomplete. No. 9 was not reobserved after trapping, while No. 3 was observed for only seven days.

Goose No. 1, which renested twice, was known to have laid four eggs in her first nest. The renesting interval, the interval from the destruction of the first nest until the first egg is laid in the second nest (Sowls, 1949), could not be determined exactly but was calculated to be 2 to 2.5 weeks. The second nest was located on the same 82.5-acre reservoir 35 days after the first nest had been "destroyed". It was approximately 0.3 miles from the first nest. The second nest contained six eggs when discovered and was observed under incubation for 13 days, at which time it was destroyed by predation. This clutch was believed to have been under incubation for at least three weeks or longer when destroyed. The scattered egg shells contained considerable blood which indicated that these eggs may have been close to hatching. The third nest was found 9 to 10 days after the second nest was destroyed, at which time the goose was already incubating three eggs. It would appear that this third nest was started within a week after the second nest was destroyed. This nest was located on the same reservoir approximately 0.1 miles from the first nest and 0.2 miles from the second, in an old nest which had hatched out earlier in the same season. It was observed under incubation for 20 days and then found deserted six days later. Examination of the three eggs revealed two rotten eggs and one fully developed embryo. Lack of fertility may have been responsible for the two rotten eggs. Possibly the shortness of the renesting interval