The mortality, behavior, and homing of transplanted juvenile Canada geese
by Dennis Charles Surrendi

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
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Abstract:
During the summers of 1967 and 1968, 273 flightless seven and eight week-old Canada geese (Branta canadensis maxima) were transplanted about 100 miles from their natal lakes near Brooks, to release sites northeast of Hanna, Alberta. All transplants received leg bands and colored neck collars for field identification. Observations of transplant behavior were calibrated to the nearest minute for quantitative analysis. Preflight mortality was determined from gosling counts made during the behavioral observations. Postflight locations, identity, and behavior of transplants were recorded. The mortality of goslings was negligible during the transplant operations. A preflight mortality of 4 percent was recorded. Feeding was the major daily preflight activity of transplants, and occurred most intensively at sunrise and sunset. Resident geese were dominant over transplants. Nonbreeding resident geese were more tolerant to transplants than were breeding pairs. The postflight movements of transplants from release sites occupied by residents were localized and as a unit under the leadership of the resident birds. Transplants on release sites unoccupied by resident geese dispersed from these lakes in small groups immediately after attaining flight. From 68 males and 68 females transplanted in 1967, 13 homing yearlings were recorded in the spring of 1968. All of the homing transplants were females. This represented a calculated 43 percent theoretical homing rate for yearling female Canada geese. Eighty-five percent of these females were initially sighted on or within one mile of their release sites. Eighty-five percent of the 13 homing females formed pair associations with unmarked ganders. The pair bonds involving some of the yearling females appeared to become unstable just prior to the summer molt migration. No yearling transplants were present on the study area after May 31. On August 23, 1968 one of the yearling females returned to its 1967 release site following a summer molt migration. Conclusions and management recommendations were presented.

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ABSTRACT

During the summers of 1967 and 1968, 273 flightless seven and eight week-old Canada geese (Branta canadensis maxima) were transplanted about 100 miles from their natal lakes near Brooks, to release sites northeast of Hanna, Alberta. All transplants received leg bands and colored neck collars for field identification. Observations of transplant behavior were calibrated to the nearest minute for quantitative analysis. Preflight mortality was determined from gosling counts made during the behavioral observations. Postflight locations, identity, and behavior of transplants were recorded. The mortality of goslings was negligible during the transplant operations. A preflight mortality of 4 percent was recorded. Feeding was the major daily preflight activity of transplants, and occurred most intensively at sunrise and sunset. Resident geese were dominant over transplants. Nonbreeding resident geese were more tolerant to transplants than were breeding pairs. The postflight movements of transplants from release sites occupied by residents were localized and as a unit under the leadership of the resident birds. Transplants on release sites unoccupied by resident geese dispersed from these lakes in small groups immediately after attaining flight. From 68 males and 68 females transplanted in 1967, 13 homing yearlings were recorded in the spring of 1968. All of the homing transplants were females. This represented a calculated 43 percent theoretical homing rate for yearling female Canada geese. Eighty-five percent of these females were initially sighted on or within one mile of their release sites. Eighty-five percent of the 13 homing females formed pair associations with unmarked ganders. The pair bonds involving some of the yearling females appeared to become unstable just prior to the summer molt migration. No yearling transplants were present on the study area after May 31. On August 23, 1968 one of the yearling females returned to its 1967 release site following a summer molt migration. Conclusions and management recommendations were presented.

INTRODUCTION

The natural dispersion of large Canada geese (Branta canadensis maxima) throughout their original breeding range, as indicated by Hanson (1965), can best be described as slow even under optimum habitat conditions. This lack of pioneering may be due to certain physiological and behavioral characteristics. Mayr (1942) stated that strong intrafamily bonds played an important role in the subspeciation of Canada geese over areas where geographic barriers were lacking. With reference to geese in general, Johnsgard (1965) attributed slow increase in numbers and lack of gene mixing to a delayed maturation and permanency of pair bonds respectively. Sherwood (1967) confirmed the formation of both pair and intrafamily bonds. He also found a lack of dispersion from the natal area particularly by females.

Due to the importance of Canada geese for their asthetic and sporting qualities, biologists have attempted to increase the productive efficiency of existing habitat within their breeding range. Workers of various wildlife agencies have attempted to artificially establish local breeding populations by using captive flocks or by transporting and releasing juveniles. These attempts have produced variable results. Phillips' (1928) summary of efforts to transplant wild birds in North America gave no mention of success with Canada geese. From sparse observations of leg banded birds and recoveries of leg bands, Pirnie (1938) concluded that the restocking of Canada geese by captive flocks was successful in southern Michigan. Williams and Kalmback (1943) studied leg band recoveries of both captive and transplanted juvenile Canada geese and

stated, "...they show no tendency to return to the area from which they came." A steady increase in the production of wild goslings at Seney Refuge from 1936 to 1945 was attributed by Johnson (1947) to the development of a local breeding population from a captive flock. In assessing the use of captive flocks for the restoration of Canada geese, Nelson (1963) suggested that quantitative evidence relating to the positive and negative results of such programs was lacking. He recommended that intensive research be conducted to assess future restoration projects.

The purpose of this study was to quantitatively assess the mortality, behavior, and homing of juveniles that had been transported by artificial means from their natal area to some distant point and released.

DESCRIPTION OF THE STUDY AREA

The study area was located in southeastern Alberta within 30 miles of the Town of Hanna (Figure 1). This region is of glacial origin (Wyatt et al., 1938-1943) and is characterized topographically by gentle undulations interspersed with hills and creek drainages. Local land use practices are primarily agricultural with the greatest emphasis on dryland grain farming and cattle ranching.

A complete and quantitative description of the vegetation found on the area is given by Coupland (1950). He described the vegetative cover as "mixed prairie" with the dominant grasses being Stipa comata, Stipa spartea var. curtiseta and Bouteloua gracilis. Artemisia frigida is the most abundant forb, while Symphoricarpos occidentalis and Rosa spp. are the most common shrubs.

The climate of the area represents that typically found in north temperate continental regions and is classed as a cool, semiarid type (Coupland, 1950). It is characterized by daily and seasonal extremes in temperature and a low annual precipitation. The mean average annual temperature is 36.4 degrees F. with monthly averages varying from 6.0 degrees F. in January to 64.3 degrees F. in July. The average annual precipitation is 14.54 inches. During June 1 to August 31 of 1967 and 1968, the precipitation totalled 3.24 inches and 7.54 inches respectively. Climatic information was obtained from the Canadian Department of Transport Weather Offices at Edmonton and Coronation.

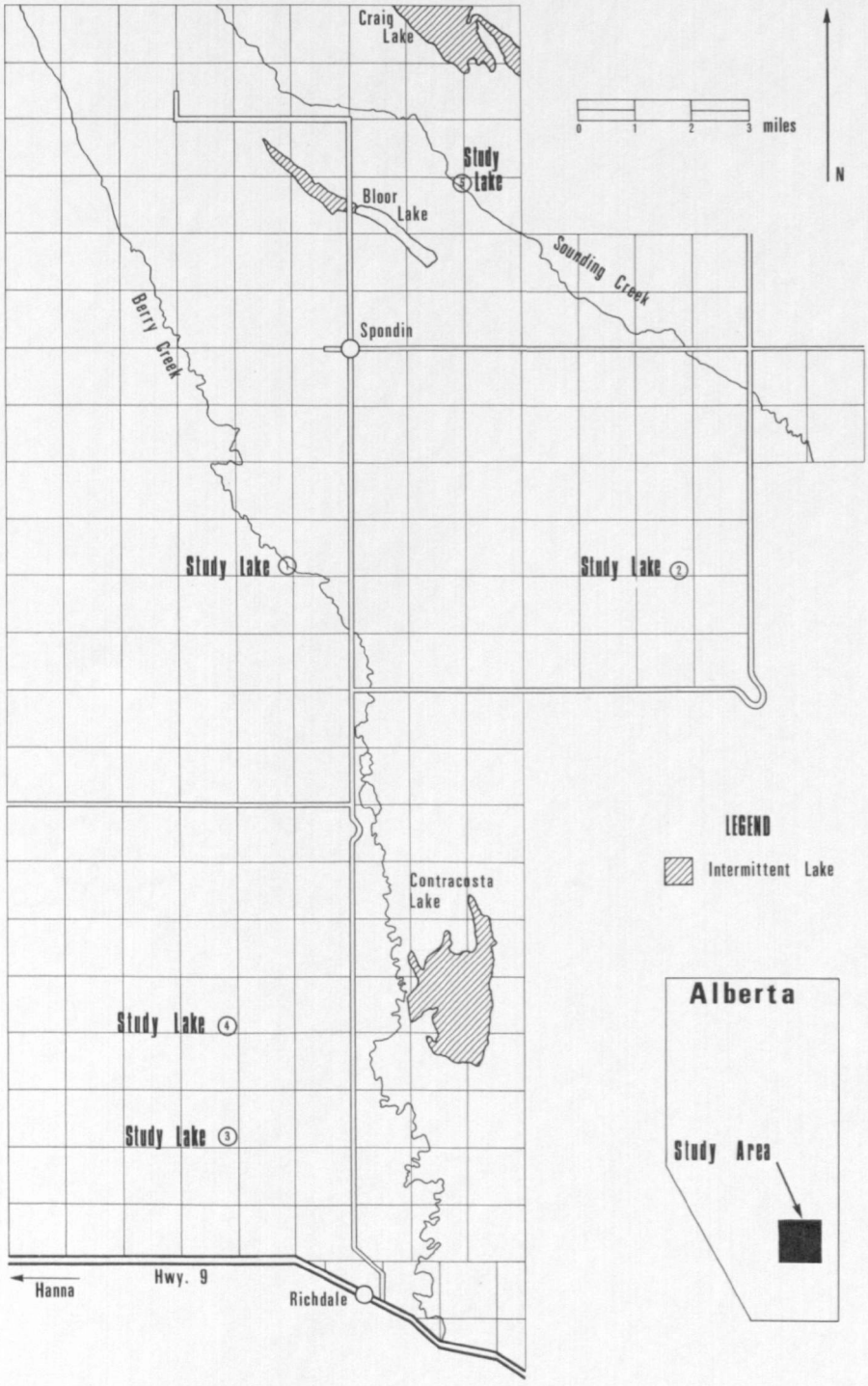

Figure 1. Map showing the study area and location of study lakes.

A lack of permanent natural water bodies throughout this region has prompted Ducks Unlimited (Canada) to construct over 175 dams in the area since 1940 to provide stable habitat for waterfowl production.

METHODS

Lakes with resident geese and those without were deliberately chosen. The lakes also satisfied these criteria: (1) a minimum flooded area of 50 acres, (2) the presence of potential goose nesting habitat, and (3) accessibility to the observer.

Geese used for transplanting were trapped on Ducks Unlimited impoundments about 100 miles south of the study area near Brooks, Alberta. The birds were aged and sexed using plumage and cloacal characteristics as summarized by Hanson (1962). Goslings were further aged to the nearest week from plumage descriptions presented by Yocum and Harris (1965). In addition to leg bands, all transplants received colored flexible plastic collars (Sherwood, 1966) bearing letter-numeral combinations to permit field identification of individual geese. Sherwood found that goslings older than seven weeks exhibited higher collar retention than goslings in younger age groups. Only flightless goslings between the ages of seven and eight weeks were used. The transplants were crated at the trapping sites, banded, and transported by motor vehicle to the study area where each cohort was released on a preassigned study lake in late afternoon or at night.

Throughout the study, all written accounts of transplant behavior were continuous and calibrated to the nearest minute for quantitative analysis. A 25 power spotting scope was used to aid observations.

Specific observational techniques were used during the preflight period. All cohorts were observed during each day from one hour before sunrise to one hour after sunset. Observational periods were of unequal

duration. They were rotated among the study lakes to obtain data on the daily behavior of each cohort. Variations in this procedure occurred due to inclement weather and equipment malfunctions. To avoid influencing the transplant behavior, I remained concealed during all preflight observations. Preflight mortality was determined from transplant counts during the behavioral observations.

Data concerning activities of transplants from sunrise until two hours after sunrise and from two hours before sunset to sunset were analyzed in half hour intervals. The analysis of activities prior to sunrise, throughout the midday (from two hours after sunrise until two hours before sunset), and after sunset was determined by grouping the data obtained for each respective time period (Appendix, Table III).

Transplant activities during the morning and evening were divided into three general categories: (1) Feeding, (2) Resting, and (3) Preening, Bathing, and/or Drinking. The activities in category three were assessed as one general activity because they all frequently occurred simultaneously within a group. Midday activities were separated into four categories: (1) Feeding, (2) Resting on Water, (3) Resting on Land, and (4) Preening, Bathing, and/or Drinking.

Greater mobility of the observer was required to obtain postflight data. All accessible water bodies and fields within the boundary of the study area were checked daily for geese (Figure 1). The location, identity, and behavior of all transplants were noted. Only during extended observations of postflight behavior did I attempt to remain concealed.

RESULTS AND DISCUSSION

Throughout the study, five Ducks Unlimited reservoirs were used as study lakes (Table I). In 1967, 136 goslings comprised of 68 males and 68 females were transplanted to Study Lakes 1, 2, and 3. The 1968 transplants were placed on Study Lakes 1, 3, 4, and 5. This latter group totalled 137 goslings, 64 of which were males. Because of insecure water levels resulting from a lack of spring runoff in the area of Study Lake 2, this lake was not used in the 1968 transplant program.

Preflight Period

Mortality

One gosling died during transplant operations. Of 273 released, 261 or 96 percent survived to flight (Table II). The preflight mortality varied on individual study lakes from a high of 13 percent (Study Lake 3 in 1967) to a low of 0 percent (Study Lake 1 in 1968). Gosling counts made three days after the time of their release on Study Lake 3 in 1967, and Study Lakes 3 and 5 in 1968, indicated that the major transplant losses occurred within two days following their release.

The formation of creches or gang broods (Brakhage, 1965) by wild and semidomestic juvenile Canada geese has made studies of gosling mortality difficult. By comparing the total number of goslings hatched with the total number attaining flight, Geis (1956) and MacInnes (1962) found the preflight mortality of two subspecies to be about 19 and 10 percent respectively. Other estimates have ranged from 3 percent (Williams and Marshall, 1938) to 83 percent (Kossack, 1950). The 4

TABLE I. STUDY LAKE SIZE, AND THE NUMBER AND SEX COMPOSITION OF GOSLINGS TRANSPLANTED TO THE STUDY LAKES DURING THE 1967 AND 1968 STUDY PERIODS.

Year	Study Lake	Lake Size (acres)1/	Shoreline Length (miles)1/	Number of Transplants	Sex of Transplants m	f
1967	*1	228.5	5.7	43**	19	24
	*2	216.7	4.1	46	24	22
	3	91.5	5.1	47	25	22
			Subtotals	136	68	68
1968	*1	above	above	41	21	20
	3	above	above	40	18	22
	4	52.0	3.9	33	11	22
	*5	178.5	5.1	23	14	9
			Subtotals	137	64	73
			Total	273	132	141

1/ Information obtained from the Hanna office of Ducks Unlimited (Canada).

* Resident geese present.

** Three transplants, hatched four miles from Study Lake 1, were included in this group.

TABLE II. THE 1967 AND 1968 TRANSPLANT PREFLIGHT MORTALITY

Year	Study Lake	Number of Goslings Released	Number of Transplants Present, 3 Days After Release	Number of Transplants Present 1 Wk. After Release	Number of Transplants Surviving To Flight	Number Lost	Per-Cent Lost
1967	*1	40	-- 1/	40 + 3 2/	42	1	2
	*2	46	--	46	45	1	2
	3	47	41	41	41	6	13
1968	*1	41	--	41	41	0	0
	3	40	38	38	38	2	5
	4	33	--	32	32	1	3
	*5	23	22	--	22	1	4
	Total =	270 + 3 2/ = 273			261	12	4

1/ Unable to make an accurate count of the transplants.

2/ Three transplants, hatched four miles from Study Lake 1, were released on Study Lake 1 18 days after the release of the original 40 transplants.

* Resident geese present.

percent loss of transplants in this study indicates a relatively low preflight mortality.

Though little data are available concerning differential mortality among age classes of Canada geese goslings, studies on ducks by Low (1945), Earl (1950), Miller and Collins (1954), Glover (1956), and Keith (1961) show the greatest loss of ducklings to occur within the first two weeks after hatching. Foley et al. (1961) recorded the survival to flight of transplanted mallard (Anas platyrhynchos) ducklings to be 39, 52, and 68 percent for three, five, and seven week-old ducklings respectively. Ryder (1967) also found a continuous drop in the brood size of Ross' geese (Chen rossii) to the age of three weeks, after which flock clumping made brood size counts invalid. With this information in mind, it appears likely that if goslings younger than seven weeks were used as transplants, a preflight mortality higher than 4 percent could be expected.

Coyotes (Canis latrans), long-tailed weasels (Mustela frenata), badgers (Taxidea taxus), striped skunks (Mephitis mephitis), marsh hawks (Circus cyaneus), and Swainson's hawks (Buteo swainsoni) were abundant on the study area. Eleven unsuccessful attempts by mammalian predators to capture transplants were observed. Goslings typically reacted to the presence of a predator by heeding alert warnings of other birds and moving off shore into secure water. Once on the water, the transplants became very curious of the intruder usually following it as it traversed the shoreline.

Daily Activities

A total of 9909 minutes (Approx. 165 hours) of observations on preflight activities was obtained (Appendix, Table III). These activities and their relative magnitude throughout the daylight hours are graphically presented in Figure 2.

Feeding was the major daily activity of transplants. A sharp increase occurred from dawn until sunrise when 100 percent of the observed goslings were feeding intensively. Intensive feeding was maintained until a half hour after sunrise. A steady decline in feeding followed. At two hours after sunrise 69 percent of the transplants were feeding. During the midday period, feeding comprised 58 percent of the gosling activity. Though feeding activity fluctuated throughout the midday period, at no time did its duration or intensity equal that observed in the morning or evening. Feeding activity increased steadily from 58 percent, two hours before sunset, to 100 percent at sunset. This was followed by a rapid decrease in feeding activity as darkness approached. The intensity and duration of feeding during the early morning suggested little or no feeding occurred at night.

The tremendous energy requirements for growth and feather development by Canada geese goslings (Williams, 1967; Hanson, 1965) is reflected in their daily activity. In my study, transplants from the age of seven weeks until flight spent over 58 percent of their daytime activity feeding. Similar feeding activities were reported by Low (1945) for redhead (Aythya americana) ducklings.