Habitat requirements of molting Canada geese at Lima Reservoir, Montana
by Bernard Dewey Hildebrand

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Range Science
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Abstract:
Habitat relations of molting Canada geese Branta canadensis moffitti were studied at Lima Reservoir in southwestern Montana during 1977-78. Molters started arriving in mid-May and reached peak numbers by mid-June. The majority of these geese were flightless seven to ten days after arrival. Habitats selected while molting were large water areas and uplands. Following molt completion a shift to the exposed mud flats occurred. No competition between geese and livestock was detected. This population breeds primarily in Idaho and Utah and winters in California. These geese maintain small groups with strong cohesion. The groups had a high fidelity for their particular small area of the reservoir. Droppings were highly negatively correlated to the distance from the high water line and 20% of the transects had heavy use. Geese carrying capacity of Lima Reservoir was computed and will be reached when the flock numbers 15,000. Unrestricted vision is a requirement for feeding sites. Goose hunters spent more time and got fewer birds than duck hunters. Most hunters were aware of land ownership and the majority of these were hunting on BLM land.

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Date Sept. 24, 1979

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by

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ABSTRACT

Habitat relations of molting Canada geese Branta canadensis moffitti were studied at Lima Reservoir in southwestern Montana during 1977-78. Molters started arriving in mid-May and reached peak numbers by mid-June. The majority of these geese were flightless seven to ten days after arrival. Habitats selected while molting were large water areas and uplands. Following molt completion a shift to the exposed mud flats occurred. No competition between geese and livestock was detected. This population breeds primarily in Idaho and Utah and winters in California. These geese maintain small groups with strong cohesion. The groups had a high fidelity for their particular small area of the reservoir. Droppings were highly negatively correlated to the distance from the high water line and 20% of the transects had heavy use. Geese carrying capacity of Lima Reservoir was computed and will be reached when the flock numbers 15,000. Unrestricted vision is a requirement for feeding sites. Goose hunters spent more time and got fewer birds than duck hunters. Most hunters were aware of land ownership and the majority of these were hunting on BLM land.

INTRODUCTION

The Intermountain population of Canada geese "occupies the marshes and streams channels interspersed among the mountain ranges and basins of the far west" (Bellrose 1976). This population is made up primarily of the race referred to as the Great Basin Canada goose Branta canadensis moffitti (Hanson 1965).

Numerous studies have been conducted on various aspects of the bird's life history; including renesting (Atwater 1959), breeding age (Craighead and Stockstad 1964), hunting pressure (Craighead and Stockstad 1956, Tautin and Low 1975), nesting and production (Childress 1971, Geis 1956, Hook 1973, and Steel et al. 1957) and management (Dimmick 1968, and Krohn 1977). However, little information has been published relative to the molt migration or molting areas utilized by this bird.

This study was conducted to investigate a population segment of non-breeding Great Basin Canada geese during the summer molt. The study was conducted on Lima Reservoir, Montana. It was designed to relate the number of geese and their chronology to habitat utilization and determine responses to other land uses.

LITERATURE REVIEW

"The process of natural feather loss (shedding) and replacement is called molting" (Palmer 1972). In this process old feathers are forced out of the follicles by the growth of the new feathers (Payne 1972).

All birds molt at least once, many species twice and a few three times a year. Molts are not necessarily complete each time. Most birds molt their remiges (wing flight feathers) once a year. Depending on the species of birds involved, flight feathers will be molted on one of two ways. They may be molted serially, where corresponding feathers on opposing wings are lost singly so that the bird never loses flight, or all the remiges may be molted simultaneously, as is found in the family Anatidae (ducks, geese and swans). Several other unrelated groups have one common characteristic that of utilizing an aquatic habitat which provides security during this flightless period (Van Tyne and Berger 1976).

MOLT MIGRATION

Several species of ducks, geese and swans have been reported to participate in molt migration, a post-breeding movement to a site which is often used exclusively by molting birds (Oring 1964, Mathiasson 1973, Ogilvie 1978). Oring (1964) suggested a southward molt migration for ducks

while Ogilvie (1978) stated that nine of 14 goose species have a northward migration. Sterling and Dzubin (1967) recorded a northward molt migration for Canada geese.

TYPE OF MOLT MIGRATION

Two types of migration have been reported for geese. The most common involves the birds first returning to the breeding areas, from which a segment of the population later migrates to the molting areas. The second type involves immature geese migrating directly from the wintering area to the molting area (Ogilvie 1978).

BASIS FOR MOLT MIGRATION

Hardy (1966), Sterling and Dzubin (1967) Salomonsen (1968) and Ogilvie (1978) all have suggested that the molt migration is an adaptation to reduce competition between non-breeders and the adults with young for the available food on the breeding ground. Ogilvie (1978) suggested that geese utilizing molting areas to the far north use habitat and food resources that, because of the latitude and resulting short season, were less suitable for the activities of breeding birds. He also believed that requirements of a molting area were more likely to be found in the far north. These basic requirements include large areas of suitable water which provides safety and little disturbance (Salmonsen, 1968).

MOLT MIGRATION TIMING

Timing of the molt migration from the breeding grounds appears to vary among locations. Dimmick (1968), reported geese leaving Jackson Hole, Wyoming in June. Krohn (1977) in discussing the Rocky Mountain Canada goose population, stated that geese left the breeding areas on molt migration in late May to early June. Surrendi (1970) reported that geese departed for molting areas from southeastern Alberta by late May. Derksen et al. (1979), working north of the Brooks Mountain Range in Alaska, noted that Black Brant, Branta nigricans, migrated to molting areas in late June and early July. Sterling and Dzubin (1967) recorded Canada geese arriving on molting areas along the Thelon River in the Northwest Territories in mid-June.

MOLTING FLOCK COMPOSITION

As implied by Derksen et al. (1979), molting populations are made up of "small flocks that probably are family units or multiples thereof." Thus, each of these groups "may be a distinct segment of a flyway or sub-flyway population" (Sterling 1963).

AGE STRUCTURE OF MOLTERS

Only unsuccessful breeders and non-breeders or subadults participate in the molt migration (Sterling 1963, Sterling and Dzubin 1967, Dimmick 1968, Salomonsen 1968). Sterling (1963) defined non-breeding geese as yearlings and some two-year-olds. Krohn (1977) reported that molting flocks were comprised of 65 percent yearlings, 20 percent two-year-olds and 15 percent three-year-olds and older geese. He also stated that a portion of the three-year-olds and older birds were successful breeders that had lost their broods to more dominant pairs.

SEX RATIO OF MOLTERS

Sterling and Dzubin (1967) reported a male:female ratio of 111:100. King and Hodges (1979) reported that over a four-year period, males averaged 54.1% of a molting flock of White-fronted geese, Anser albifrons, and over a seven year period, 52.6% for Black Brant. However, these percentages varied greatly among years. Conversely, Arenson (1970), in Utah reported that females outnumbered males by 6%.

With respect to timing, Mathiasson (1973) indicated there was a distinct tendency in Mute swans, Cygnus olor, for females to start molting later than males. Salomonsen (1968) reported that in geese, the female initiated the molt

approximately one week earlier than the male.

LENGTH OF FLIGHTLESS PERIOD

Hansen et al. (1971) noted that loss of flight in Trumpeter swans, Olor buccinator, occured following the molt of a few secondaries and the alula. Length of the flightless period for these swans was the same for both breeders and non-breeders: about 30 days after the loss of the primaries. Sterling and Dzubin (1967) believed the flightless period of the Canada geese in the Thelon drainage was about 25, but no more than 30, days. The length of time required to complete the molt varies with individuals; an entire population may require five or six weeks (Williams 1967, Dimmick 1968). MacInnes (1966) speculated that the smaller forms of Canada geese may complete the molt in a shorter period than the larger forms.

HABITAT REQUIREMENTS

During the molt, flightless geese are very wary (Hardy 1966), and some authors believe areas with sufficient food and large expanses of open water, which provide protection from predation and harassment, are prime requirements for molting (Krohn and Bizeau 1979, Dersen et al. 1979, Salomonsen 1968). Bergman (1973) found similar requirements for redhead, Aythya americana, and canvasback, Aythya valisineria,

molting areas, and indicated that use of molting areas by redheads was related to the degree of isolation from human activity. Arneson (1970), from studies at Neponset Reservoir, Utah and Woodruff Narrows Reservoir, Wyoming, concluded that isolation did not appear to be an important factor in selection of a molting area by geese. Neponset was built first, and is more isolated and less frequented by man than Woodruff Narrows. With the construction of Woodruff there was a shift of molting geese from Neponset to Woodruff. This shift was attributed to a "greater area of open water and more suitable vegetation." Krohn (1977) presented a possible alternative explanation: that the geese were forced from Neponset, because of consecutive years of banding, to Woodruff where human use was greater but actual harassment was less. Sterling and Dzubin (1967) found that Canada geese have a strong fidelity to molting areas in subsequent years but a change can be induced by continual harassment. In the summer of 1963, 600 of 2,000 molters were captured and banded at the Thelon Island site. The following year only 1,000 molters remained and 300 refused to be driven near the traps. In 1965, the third consecutive year only 275 birds were at the site and all refused to be driven. Coinciding with this reduction of numbers in this area was an

equivalent increase at another area 20 miles away. So, as Krohn (1977) has stated, "the degree of harassment, and not isolation as such, is probably one of the most critical factors influencing geese in the selection of their molting areas."

LIVESTOCK INTERFERENCE

Many farmers in England believe that sheep and cattle will avoid fields which have large amounts of goose droppings (Ogilvie 1978). However, Rochard and Kear (1970) found that sheep only avoid goose droppings that are fresh (less than 24 hours old). The avoidance by sheep of fresh goose droppings is beleived to be related to the amount of uric acid in the droppings. Once the uric acid has evaporated the livestock become indifferent to the droppings. In some areas stock have been known to eat droppings, probably to fill the need for some trace elements (Ogilvie 1978). Arneson (1970) found that there was little competition for grass between cattle and geese. He did find that areas where cattle watered were avoided by geese because of hoof marks. However, the amount of shoreline that was utilized by cattle in this manner was insignificant.

MORTALITY

Mortality of birds on the molting grounds is believed to be slight. In Mathiasson's (1973) study with Mute swans no evidence of mortality was observed. Dimmick (1968), in Wyoming, noted only one incidence of mortality in molting Canada geese: one was caught by a coyote, Canis latrans, while attempting to hide from the observer.

Ogilvie (1978) suggested that the molting population of Canada geese at Yorkshire, England suffers a higher mortality than birds of equal age that remain on the breeding grounds. He implied that molters making a double journey would entail more risk than those staying at the breeding grounds. The difference in mortality rates was significant: 23% for molt migrators compared to ten percent for non-migratory geese. These mortality rates are contrary to Krohn and Bizeau's (1979) findings that the Rocky Mountain Canada goose population experiences a higher mortality rate on breeding grounds (34%) than on molting areas (30%).

For whatever reason, the molt migration must have a selective advantage or it would have been eliminated by natural selection (Krohn 1977).

DESCRIPTION OF STUDY AREA

Lima Reservoir is located in the west portion of the Centennial Valley, 22 Km (14 mi) east of Lima in Beaverhead County, Montana (Figure 1).

The Centennial Valley lies in a broad east-west trough, bounded by faults. The north face of the Centennial mountain range to the south is a continuous series of echelon faults, while on the north, a series of faults lies along the front of the Gravelly mountain range (Banko 1960). Along the front and to the east of Lima Reservoir, there is evidence of a much dryer period in recent geologic time with the presence of many square kilometers of barchan sand dunes that are now stabilized by vegetational cover (Banko 1960). This valley is drained by the Red Rock river which has a very moderate gradient.

Brower (1896) noted that the first attempt at building Lima Dam on the Red Rock River was unsuccessful. A later attempt resulted in the dam being completed in 1902 (United States Geological Survey 1977). Around 1934 this dam was washed out and was reconstructed with an additional ten feet added to the crest.[1] The present dam is earth filled with a concrete spillway. The usable capacity of Lima Reservoir is 103.4h^3 (84,050 acre-feet). The elevation

[1]Per. comm. Mrs. Leonard Starks

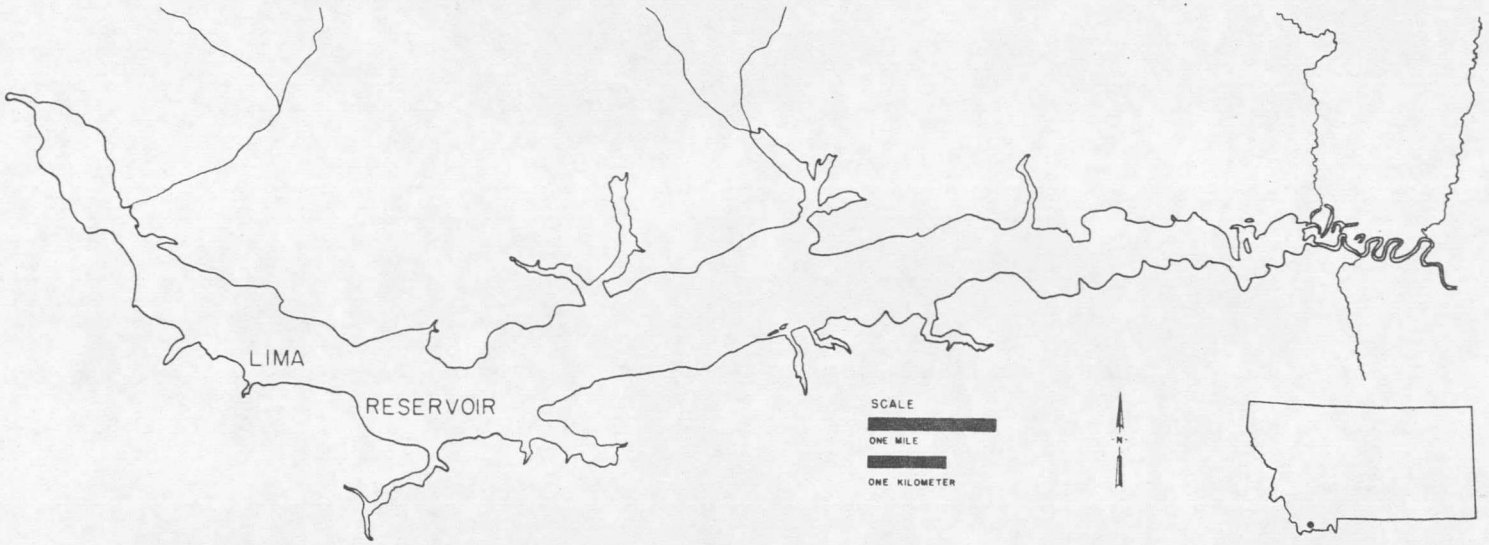

Figure 1. Study Area

at the spillway is 2,006.4m (6,582.7 ft) and at the tunnel bottom 1,992.6m (6,537.3 ft). Water level data are presented in Figure 2. The 15-year monthly averages from 1958 to 1972 show the extreme low water levels occurring in October ($32.4h^3$; 26,240 acre-feet) and the high in May ($74.2h^3$; 60,150 acre-feet). The reservoir is long (18.5km; 11.5 mi) and narrow (1.5km). Nine major bays contribute to a shoreline length of 82.7km (51.7 mi).

Climatological data for Lima, Montana show that from a 30 year average, June is the month of heaviest precipitation, and 68.3% of the yearly total occurs from April 1 to August 31 (Table 1). The monthly mean temperature is highest in July with 16.7°C (62.1°F) and lowest in January with -8.6°C (16.5°F).

A soil survey of the area surrounding Lima Reservoir was conducted for the Bureau of Land Management in 1977. Soils of the reservoir area were found to be Aridic Argiborolls-Cumulic Cryaquolls (BLM unpub. data).

Vegetational characteristics of the study area can be divided into two general zones: shrub-grasslands and riparian, with several community types. Some common shrubs and half-shrubs found on the study area are low sagebrush, Artemsia arbuscula , rubber rabbitbrush, Chrysothamnus