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MOVEMENTS AND HARVEST OF CANADA GEESE ASSOCIATED WITH REND LAKE, ILLINOIS

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ABSTRACT

Movements and harvest of Canada geese (*Branta canadensis*) associated with Rend Lake, Illinois were studied during fall and winter 1982-83 and 1983-84. High inter-refuge movement in southern Illinois, and low between year homing, suggest that Rend Lake is an integral part of the total southern Illinois Canada goose wintering area. Harvest at Rend Lake is a function of goose use during the hunting season, and hunting season goose use is highly dependent on arrival of geese from Wisconsin during November/December. Arrival chronology from Wisconsin is highly variable and results in unstable goose harvest. Inclusion of Rend Lake in a Quota Zone is recommended.

INTRODUCTION

The Mississippi Valley Population (MVP) of Canada geese breeds along and inland from the western shore of James Bay, and the southwestern shore of Hudson Bay (Hanson and Smith 1950). They migrate through Wisconsin and Michigan to major wintering areas in southern Illinois and western Kentucky. Early and late migrating subflocks have been identified within the MVP (Kennedy and Arthur 1974). Early arrivals reach southern Illinois in late September or early October and either overfly Wisconsin or remain there a short time (Kennedy and Arthur 1974, Craven 1978, Bellrose 1980). The late migrants usually do not reach southern Illinois until late November or early December, spending most of the fall in Wisconsin (Craven 1978, Bellrose 1980). Kennedy and Arthur (1974) suggested differences in

migration chronology and wintering patterns of early and late subflocks might allow separate harvest management.

Rend Lake, completed by the Army Corps of Engineers in 1971, supports large numbers of geese in late winter with January populations having reached 120,000 birds. The large number of MVP geese using this area make understanding of its influence important to management of the MVP.

Of particular interest are movements between Rend Lake and refuges within the Southern Illinois Canada Goose Quota Zone. Hunter harvest in the Quota Zone is monitored daily and is discontinued upon reaching a preset annual quota. Anderson (1983) concluded the potential exists for continued harvest of Quota Zone geese at Rend Lake after cessation of hunting in the Zone. Trost et al. (1981) and Thornburg and Estel (1983) also noted possible associations between Rend Lake geese and those of other refuges. However, the extent of these relationships remains unknown.

The purpose of this study was to monitor Canada goose interchange between Rend Lake and other southern Illinois and western Kentucky goose refuges, to identify the relationships between Rend Lake and early and late migrating Canada geese, and to evaluate factors influencing the harvest of Canada geese at Rend Lake.

STUDY AREAS AND METHODS

The study area included Rend Lake, a 7,560 ha impoundment of the Big Muddy River, located in Jefferson and Franklin counties of Illinois (Paine 1985). The southern Illinois Canada Goose Quota Zone, created in 1960 to regulate harvest in Alexander, Union, Jackson and Williamson counties of Illinois (Nelson 1962), contained study sites at Crab Orchard National Wildlife Refuge (CONWR), Union County Conservation Area (UCCA) and Horseshoe Lake Conservation Area (HLCA). The Ballard County Wildlife Management Area (BCWMA) study area was located across the Ohio River from southern Illinois in Ballard County, Kentucky.

Geese were captured by rocket net and swim-in trap on the Rend Lake Wildlife Refuge in 1982-83 and 1983-84. Captures were aged and sexed (after Hanson 1967), and marked with U.S. Fish and Wildlife Service aluminum leg bands and plastic neck collars (Ballou and Martin 1964) bearing a unique four symbol alpha-numeric code.

Neck collared geese were observed from a vehicle using a 15-60x spotting scope. Collar codes and colors, flock size, habitat type, time of day, and location were recorded. Searches for marked geese were conducted at least four times per week at Rend Lake in both years. Weekly searches were made at UCCA, CONWR, and HLCA in 1983-84; in contrast to sporadic searches in 1982-83.

Classification of geese marked at Rend Lake in 1982-83 as early or late migrants was based on subsequent observation during 1983-84. Marked birds observed in Wisconsin after 15 November 1983, or first observed in southern Illinois 6-31 December 1983, were classified as late migrants. Marked birds observed in southern Illinois prior to 15 November 1983 were classified as early migrants.

Canada goose population estimates were obtained from IDOC aerial inventories, augmented by ground counts in 1983-84. Southern Illinois population data prior to 1983-84 were from IDOC Waterfowl Program Periodic Reports. Wisconsin goose population data were from Wisconsin Department of Natural Resources Canada

Goose Inventory Reports. Rend Lake harvest and hunter use data were from IDOC records and Periodic Reports. Weather data, recorded at the main Rend Lake Dam, were compiled from NOAA Climatological Reports.

Chi-square analyses were used to test for differences in distributions of marked geese and age and sex ratios. Stepwise multiple regression was used to evaluate factors influencing harvest of geese.

RESULTS AND DISCUSSION

Banding and Neck Collar Observations

In 1982-83, 476 neck collars were placed on Canada geese captured at two sites on the Rend Lake Refuge 10 December - 22 February. In 1983-84, 531 geese were marked at one site on the refuge 29 November - 10 January. Geese neck collared by the IDOC and U.S. Fish and Wildlife Service at HLCA, UCCA and CONWR were also used to detect movement between refuges. Marking at CONWR was completed by early November both years; UCCA marking began in October and continued into January while marking at HLCA occurred in January, 1983.

In 1982-83, 807 observations of neck collared geese were obtained at refuges in southern Illinois and western Kentucky. A total of 4015 observations was obtained in fall/winter 1983-84 in Wisconsin, southern Illinois, and at more southern refuges.

Southern Illinois Inter-Refuge Movements and Refuge Fidelity

Eighty-four movements in 1982-83, and 292 in 1983-84 were detected between Rend Lake and 4 southern Illinois and western Kentucky goose refuges. Movements involving Rend Lake were primarily to or from CONWR (Table 1), supporting Anderson's (1983) conclusions based on radio-marked geese. The number of movements to and from other area refuges was inversely proportional to distance from Rend Lake. Trost et al. (1981) reported frequency of inter-refuge movements involving Ballard County WMA to be dependent on distance.

Of the 476 geese marked at Rend Lake during the first year of this study, 272 (57%) were observed the following year; 207 (44%) reached southern Illinois. Of the 207 returning geese, 96 (46%) were observed at least once at Rend Lake, 89 (43%) at CONWR, 31 (15%) at UCCA, 52 (25%) at HLCA, and 10 (5%) at Ballard County WMA. Only 31 (15%) were observed solely at Rend Lake; 176 (85%) used at least one other southern Illinois or western Kentucky refuge. Age/sex ratios of marked geese using each refuge were not significantly different ($P>0.05$). Both within year movement and between year refuge fidelity data suggest geese using Rend Lake are strongly associated with other area refuges, particularly CONWR.

Movement of Early and Late Migrants

Of the 207 marked geese reaching southern Illinois in 1983-84, 60 (29%) were classified early migrants, 88(42%) late migrants, and 59 (28%) unknowns. Fifty percent of both early and late migrants returned to Rend Lake in 1983-84 (Table 2). Use of HLCA and UCCA by early and late Rend Lake marked geese was not significantly different ($P>0.05$). However, early migrants used CONWR significantly more ($P<0.01$) than late migrants (73% versus 25% respectively).

There were significant differences ($P<0.05$) in where early and late migrants were first observed in southern Illinois (Table 2). Only 15% of early migrants were first observed in southern Illinois at Rend Lake, although 50% eventually moved there; 67% of early migrants were first observed at CONWR. Despite Rend Lake's

more northerly position, many early migrants eventually reached Rend Lake after arriving at CONWR. In 1983, fall movement from CONWR to Rend Lake began in early October and continued through November (Paine 1895).

In contrast to early migrants, 47% of late migrants were first observed in southern Illinois at Rend Lake (Table 2). Only 2 of the 43 late migrants observed at Rend Lake in 1983-84 were first observed in southern Illinois at another refuge. In fall 1983, Rend Lake was a staging area for many late migrants on first arrival in southern Illinois prior to continued migration to other southern Illinois refuges. The Rend Lake goose population increased from 20,000 on 5 December to 80,000 on 9 December 1983, coinciding with reported departure from Wisconsin. The Rend Lake population had dropped to 50,000 by 14 December and to 30,000 by the end of December. Peak January population in 1984 was only 40,000 geese, in contrast to the 80,000 - 120,000 birds occuring in some years. Census data suggest high population levels have been reached when large numbers of late migrants remained at Rend Lake through January. In some years, movement to Rend Lake from more southern refuges may contribute to January population peaks, but geese arriving from the north seem of primary importance in all years. Food availability and weather at Rend Lake when late geese arrive from Wisconsin may be critical factors determining population levels at Rend Lake during the remainder of the wintering period (Paine 1985).

Movements from Wisconsin to Southern Illinois

Sixty-three movements of geese marked at Rend Lake in 1982-83 were detected between Wisconsin and refuges in southern Illinois during fall/winter 1983-84 (Table 3). Only 6 geese reported in Wisconsin during fall 1983 were first observed in southern Illinois prior to 1 November 1983; 5 were first observed at CONWR and 1 at Rend Lake. No moves from Wisconsin were detected between 1 November and 5 December, although 1 goose was first observed in southern Illinois during this period. The number of geese censused in Wisconsin during November 1983 declined by 35,000, while the Rend Lake population increased by 12,000. However, the overall southern Illinois population also declined by 35,000 during this period when no movement of marked geese from Wisconsin was detected. Movement from more southern refuges, particularly Crab Orchard, was high during November; thus increases at Rend Lake can probably be attributed to movements from CONWR rather than ingress from Wisconsin. Major arrivals of late migrants in southern Illinois (57 of 63 marked geese), began around 6 December 1983 and continued through December.

Early/Late Subflock Fidelity

No major migrations of geese from Wisconsin occurred in 1982-83; over 100,000 geese were in Wisconsin as of 4 January 1983. This was only 34,000 fewer than peak censused fall populations that Craven (1978) believed represented most of the geese using east-central Wisconsin. Goose populations in southern Illinois declined continuously from 8 November 1982 until 17 January 1983. Despite southern Illinois population figures not reflecting arrival of late migrants, a substantial portion of the geese trapped at Rend Lake during December 1982, were late migrants the following year. Of the 145 geese trapped in December 1982, 30 (21%) were identified as late migrants the following year while only 19 (13%) were identified as early migrants. Of marked geese reaching southern Illinois in 1983-84, 19 were identified

as early and 22 as late migrants. If the geese which returned to southern Illinois in 1983-84 were a representative sample of the birds trapped in December 1982, and the probability of being correctly identified was the same for early and late migrants, then about 50% of geese trapped at Rend Lake in December 1982 were late migrants in 1983-84. Either a substantial number of late migrants arrived at Rend Lake prior to or during December 1982, or they were not consistent early/late migrants in the 2 years of this study.

Harvest Trends

Season length, bag limit, goose-day-use, and methods used to determine harvest at Rend Lake have changed since the lake was completed in 1971 (Hamer and Arthur 1976, Thornburg 1980, Thornburg and Estel 1983). No overall trend in goose harvest has occurred since 1975. However, variation in the methods used to collect data make comparison of yearly kill unreliable. The method of determining harvest on public land surrounding the lake has been consistent since 1979, and these data were used for further harvest analysis (Table 4).

Hunting season goose-day-use (sum of geese present at Rend Lake on each day of the hunting season) was the only significant predictor of harvest in a stepwise regression model which included bag limit, hunter effort, and goose day use ($R^2 = 0.955$, $f = 79.2$, $df = 2$, $P = 0.023$). Over 95% of yearly variation in public lands harvest could be explained by differences in hunting season goose-day-use. Hunter effort and bag limit did not significantly affect harvest.

Over the entire season, goose-day-use was a good predictor of harvest. However, over shorter periods of time it was less reliable. Other factors affecting goose harvest, such as weather and hunting vulnerability, presumably prevent accurate harvest prediction over short periods of time. Because of this, it was impossible to accurately estimate the early/late migrant composition of the harvest based on their relative contributions to hunting season goose-day-use.

CONCLUSIONS

High within year inter-refuge movement and low between-year refuge fidelity of geese suggest that Rend Lake is an integral part of the southern Illinois Canada goose wintering complex. MVP harvest planning should include consideration of the impact of Rend Lake harvest.

Population levels and harvest at Rend Lake during fall are primarily dependent on late migrants from Wisconsin whose arrival dates vary greatly. This makes control of harvest through manipulation of season length and dates difficult, and may result in overharvest in some years and underharvest in others. Creation of a Rend Lake Quota Zone would allow the control of harvest needed to compensate for major variations in goose populations, benefiting both geese and hunters.

Although late migrants are clearly important to harvest levels at Rend Lake, their exact contribution is unknown, especially when no major late migration occurs. Data also suggests that geese are not consistent early or late migrants from year to year. Further research is needed to determine if early and late migrants represent manageable subflocks.

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Table 1. Number of movements of marked Canada geese detected between Rend Lake and other refuges in southern Illinois and western Kentucky during fall/winter 1982-83 and 1983-84.

	Year			
	1982-83		1983-84	
Refuge	To Rend	From Rend	To Rend	From Rend
Crab Orchard NWR, IL	26 (72%)	28 (58%)	105 (78%)	76 (48%)
Union County CA, IL	4 (11%)	11 (23%)	20 (15%)	39 (25%)
Horseshoe Lake CA, IL	6 (17%)	6 (13%)	6 (5%)	32 (20%)
Ballard County WMA, KY	0 (0%)	3 (6%)	3 (2%)	11 (7%)
Sub-Total	36 (100%)	48 (100%)	134 (100%)	158 (100%)
Total	84		292	

Table 2. Southern Illinois refuge observations during fall/winter 1983-84 of early and late migrating Canada geese marked at Rend Lake during fall/winter 1982-83.

	Refuge Use[b]		First Refuge[c]	
Refuge[a]	Early	Late	Early	Late
RLWMA	30 (50%)	43 (49%)	9 (15%)	41 (47%)
CONWR	44 (73%)	22 (25%)	40 (67%)	13 (15%)
UCCA	4 (7%)	11 (12%)	0 (0%)	10 (11%)
HLCA	13 (22%)	29 (33%)	11 (18%)	24 (27%)
S. ILL.[d]	60 (100%)	88 (100%)	60 (100%)	88 (100%)

[a] RLWMA = Rend Lake Wildlife Management Area, CONWR = Crab Orchard National Wildlife Refuge, UCCA = Union County Conservation Area, HLCA = Horseshoe Lake Conservation Area, S. ILL = southern Illinois.

[b] Number of early and late migrants observed at each refuge. Columns do not sum to 100%, individuals were sited at multiple refuges.

[c] Refuge where a marked goose was first observed in southern Illinois during fall/winter 1983-84.

[d] Individual marked geese observed in southern Illinois.

Table 3. Movements of Canada geese (marked at Rend Lake during fall/winter 1982-83) from Wisconsin to southern Illinois during fall/winter 1983-84.

Date of first southern Illinois observation	Refuge[a]				
	RLWMA	CONWR	UCCA	HLCA	Total
Prior to 1 Nov, 1983	1	5	0	0	6
1 Nov - 1 Dec, 1983	0	0	1	0	1
1 Dec - 1 Jan, 1983-84	12	8	2	5	27
After 1 Jan, 1984	14	7	2	6	29
Total	27	20	5	11	63

[a] Number of geese first observed in southern Illinois at refuge. RLWMA = Rend Lake Wildlife Management Area, CONWR = Crab Orchard National Wildlife Refuge, UCCA = Union County Conservation Area, HLCA = Horseshoe Lake Conservation Area.

Table 4. Harvest of Canada geese, goose-day-use, and hunting regulations at Rend Lake during the 1975-83 goose hunting seasons.

Year	Season Length (days)	Goose Day Use	Public Land[a] Harvest	Bag Limit	Method[b]
1975	69	822,167	1710	2	WC
1976	70	1,225,650	2017	2	WC
1977	55	2,593,150	1630	2	WC
1978	56	1,578,500	4604	2	WC
1979	62	1,211,750	1917	2	MR
1980	63	1,644,892	3508	2	MR
1981	50	1,406,892	2827	2	MR
1982	40	715,142	1109	1	MR
1983	40	1,044,800	1856	1	MR

[a] Harvest on public land surrounding Rend Lake.

[b] Method used to determine harvest on public land; WC = window card survey, MR = mandatory registration of hunters and harvest.

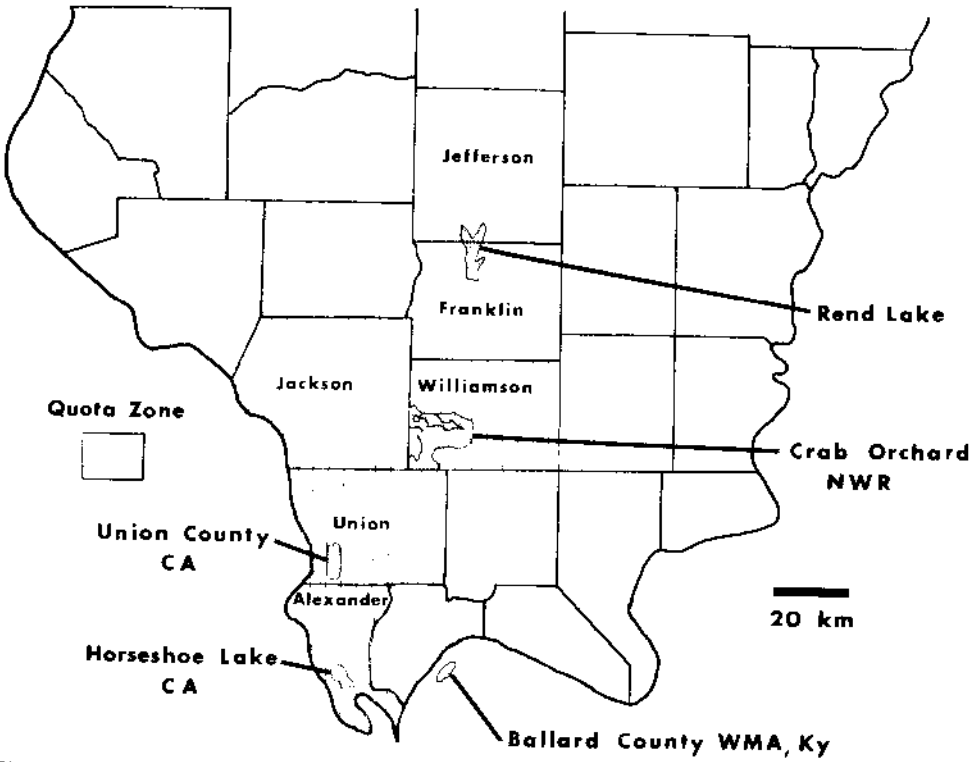

Figure 1. Canada goose refuges in southern Illinois and western Kentucky.