airplane flying at the conditions of altitude and airspeed used in the present study, and in habitat similar to that existing in the Kissimmee River Valley.

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STATUS OF A FREE FLYING, RESIDENT FLOCK OF CANADA GEESE (Branta canadensis) IN TENNESSEE

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ABSTRACT

A free flying, resident flock of Canada geese (*Branta canadensis*) has been successfully established in Middle Tennessee. The flock is now composed of over 400 geese. It was initiated in the late 1950's by a private citizen via the release of three or four pair of game farm origin birds on a 1,200 acre estate. This improved pasture type farm, which has several large ponds, is typical of much of the agricultural land usage in Middle Tennessee. The goose population has increased, thus filling available nesting habitat on the original estate and has since expanded to nearby Old Hickory Reservoir. The Tennessee Game and Fish Commission has conducted production, mortality, and banding studies on the flock since 1966. The initial success of this nesting population indicates that the local flock concept has merit for establishment of Canada geese in the Southeast.

INTRODUCTION

Major changes in the southern distribution of Canada geese in the Mississippi Flyway have occurred in recent times (Hankla and Rudolph. 1967; Crider, 1967). Flocks that once nested in portions of Kentucky, Arkansas and Tennessee, have long since disappeared (Hanson, 1965). Only remnant populations now continue to migrate to and winter in northern Florida, coastal marshes of Louisiana, and the lower Mississippi River Valley. Opinions as to the reasons for this situation vary widely among professional waterfowl biologists. Well intented theories and the expenditures of thousands of dollars in land acquisition and transplant efforts have not had any major beneficial effect, (Hankla, 1968).

Thus we evidently have been honking up the wrong goose, or for the purist, barking up the wrong tree! At the present stage of goose management technology, we suggest that emphasis should now be placed

on gaining a thorough understanding of the few groups of Canada geese that still find the sunny south to their liking. Examples of such groups of geese would be the Tennessee Valley concentration, remnant wintering populations found at St. Marks NWR, Lacassine NWR, White River NWR, and Wapanocca NWR, and the successful resident flocks in Louisiana and Tennessee.

The Game and Fish Commission became aware of the potential of a privately started flock in 1966 and immediately offered management assistance to this private citizen. The offer was readily accepted. Since then the Commission has conducted basic studies of productivity and mortality, attempted to increase production by use of elevated nesting structures, initiated intensive public relations efforts, and endeavored to establish additional protection by closing goose hunting in a large five county zone. Our ultimate goal is to have enough geese to provide recreational hunting. Information gained from this study will be used to intelligently expand similar programs throughout the state.

FLOCK HISTORY

In the late 1950's, a Middle Tennessee resident secured three or four pairs of pinioned Canada geese from a game farm operator in North Carolina. These geese were put on his 1,200 acre estate near Hendersonville, Sumner County, Tennessee. They were given maximum protection from people and other predators. During the breeding season, fence rails were stacked around nests to keep cattle away and kerosene lanterns were hung nearby in an effort to frighten foxes. Access to the farm was highly restricted in order to minimize year round disturbance. The initial stocking found the habitat on the estate, with its several large farm ponds and expanse of improved pastures, to their liking. The flock survived and increased. Additional habitat was available on nearby Old Hickory Reservoir, a 22,500 acre U. S. Army Corps of Engineers Project, and adjoining pasture farm lands and ponds. Agricultural crops such as corn, wheat, and soybeans are minimal in this area.

RESULTS AND DISCUSSION

Project data is still being collected and a detailed report will be published upon completion. However, general progress can be reported here.

Based upon criteria described by Hanson (1965), preliminary analysis of the biological measurements and plumage coloration obtained at the time of banding suggests that the flock is comprised mainly of the subspecies *Branta canadensis maxima.*

Summer drive trapping during the years of 1967, 1968, and 1969 has resulted in the banding of approximately 430 geese of all age classes. All band recoveries that have been recorded are from within the local vicinity and obtained only thru the banding operation, or from a few birds found dead. No recoveries, hunting or otherwise, have been noted from other sections of Tennessee or other states. This band recovery data, plus general year around observations and inventories indicate that the flock is non-migratory.

To determine the effectiveness of season closure, x-ray analysis of known age birds has been conducted for the past two years in connection with drive trapping. Preliminary analysis of the data indicates that hunting is still an important mortality factor.

Since 1966 the number of breeding pairs on the estate has remained constant at 16-18 pair. This suggests that the estate is supporting the maximum number of breeding pairs that it presently will allow. Furthermore, since 1966 the number of nesting geese on nearby Old Hickory Reservoir has increased substantially. This large reservoir has numerous small islands, providing ideal nesting habitat, that are being used for nesting sites. Three nests were found on the lake in 1966; in 1969, 36 nests were found. Also, a few other farm ponds in Sumner County are providing nesting sites.

In July, 1966, about 125 geese (including goslings) were counted on the private estate. The reservoir and other farm ponds were not inventoried, so this was a minimum count. A thorough inventory in June, 1969, indicated slightly over 400 geese (including goslings).

Because of the advantages and success of tub nesting programs (Bednarik, 1965; Brakhage, 1965), efforts are being made to get geese to nest in elevated structures. The advantages of such sites are threefold: 1) reduces losses due to predators; 2) minimizes flooding of nests; and 3) reduces territorial demand, thus permitting more nests per unit of habitat. Most of the tub work has been done on the private estate. Elevated tubs over ground and water, and tubs sitting on the ground were available to breeding geese in 1967. Two geese initially selected tubs placed on the ground and several other nests were manually transferred to tubs by project personnel. First acceptance of elevated over water tubs occurred in 1969, when two tubs were used.

The Commission has actively pursued public relation endeavors. House to house visits with people living on the reservoir, explanatory letters delivered by paper boys to area residences and good periodic newspaper coverage has been utilized. Many people were reached via a feature article in the Nashville Sunday News magazine supplement. The value of this latter coverage was evident from the numerous telephone calls offering assistance.

Cooperation from residents around Old Hickory Lake has been encouraging. Many people put out feed for the birds. Some help by locating nests and broods. Several people have turned in boat registration numbers of people bothering geese.

As one would expect, man is the biggest problem these geese have to overcome for survival. This is especially true in this locality. Old Hickory Lake receives one of the highest general public use levels in the nation. Some people find nests and take eggs home to hatch, some catch goslings, and others attempt to kill them. The Commission has maintained a closed season on Canada geese in counties surrounding Old Hickory Reservoir for the past three years. However, as indicated previously, we believe that illegal hunting is still an important limiting factor.

CONCLUSION

Canada goose flocks can be established in the South, but by methods other than those tried in the past. If geese can not be enticed into migrating further south, let's grow our own. Tennessee has a good start on a home grown flock. Other southeastern states are encouraged to scour their state to find private goose breeder's having partial success or areas that could be developed, etc. Help them by season closures, nesting tubs, public support and whatever other means you have.

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AN EVALUATION OF SEVERAL TECHNIQUES FOR DETERMINING THE AGE OF BOBCATS (Lynx Rufus) IN THE SOUTHEAST [1]

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ABSTRACT

A total of 57 of 75 bobcats (*Lynx rufus*) available were utilized in an evaluation for determining age in this species. Pelage characteristics, body measurements, frozen eye lens weight, and epiphyseal closure of the forelegs and humeri were of little value in determining age. Skull measurements were used in determining three age classes: (1) kittens (0-12 months); (2) young adults (13-24 months); and (3) adults (over 25 months). Skull morphology was also useful in defining these classes. The number of cementum annuli in the upper canine *was correlated* with age and allowed a more accurate age to be assigned to each animal than the other methods evaluated. Comparing the cementum annuli with the skull measurements indicated that the tooth sectioning technique was far better. In general, by skull examination, bobcat ages were consistently underestimated. Of 19 specimens placed in the young adult age class (13-24 months) by skull characters, 10 of these were actually over two years old as shown by cementum annuli. We saw no evidence that false annuli are formed in bobcats at least in Georgia and South Carolina.

INTRODUCTION

Reliable methods of age determination are essential for successful management of any wildlife species. Age distribution is a population characteristic which influences natality and mortality; reproduction being limited to certain age classes and mortality usually being prominent in other age classes. Therefore, age ratios are important indicators of future population trends and developments. The bobcat formerly ranged over much of southern Canada, the United States, and Mexico (Young, 1958). Previously, age classes assigned to this interesting predator have been based on general appearance, body weight, fur wear, and other morphological characters which are highly subjective.

MATERIALS AND METHODS

A total of 57 to 75 bobcats available were utilized in this study. The majority of the specimens were obtained during other studies at the Savannah River Project of the U. S. Atomic Energy Commission at Aiken, South Carolina. Additional specimens were collected in Georgia and in one county in north Florida. All animals were frozen until they could be processed.

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