# Mississippi Flyway

# Giant Canada Goose Management Plan

Prepared by the
Giant Canada Goose Committee
Mississippi Flyway Council Technical Section

July, 1996

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Guy Zenner, Iowa, Chair & Editor
Jeff Levengood, Illinois
Bob Williamson, Illinois
Ray Marshalla, Illinois
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Gildo Tori, Ohio
Ken Abraham, Ontario
Ed Warr, Tennessee
Bill Wheeler, Wisconsin
Bob Montgomery, Max McGraw WF
Don Rusch, NBS, U of W, Wisconsin



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# EXECUTIVE SUMMARY

Long-range planning, cooperation, and coordination are essential elements for the successful management of migratory wildlife. These elements have been used extensively in developing and implementing management plans and strategies for populations of interior Canada geese (*Branta canadensis interior*) in the Mississippi Flyway. Formulating a management plan for giant Canada geese (*B. c. maxima*) is the next logical step toward developing a more comprehensive approach to Canada goose management in the Flyway. This plan provides basic principles and strategies to guide management of giant Canada geese in the Mississippi Flyway during 1996-2000. **The goal of the plan is to manage the population of giant Canada geese in the Mississippi Flyway at a level that provides maximum recreational opportunities consistent with social acceptability.** The giant Canada goose population is defined as Canada geese nesting in Mississippi Flyway states as well as Canada geese nesting south of latitude 50° N in Ontario and 54° N in Manitoba.

Giant Canada geese were extirpated from nearly all of their original breeding range in the Mississippi Flyway by the early 1930's. Federal, state, provincial, and private efforts have restored this species to its former breeding range as well as introduced these birds to other parts of the Flyway. Giant Canada geese have adapted well to modern habitats and now nest in all states and provinces in the Flyway. The spring population was estimated at over 1 million in 1995, making this the largest Canada goose population in the Flyway. Restoration of this species is a landmark accomplishment of 20th century wildlife management.

Giant Canada geese are a valuable, shared, migratory resource that enhance the natural environment and increase recreational opportunities throughout their range. However, increasing numbers of giant Canada geese have complicated traditional Canada goose management and created new management challenges where human/goose conflicts have developed. The size and distribution of this population, its variable migratory and harvest patterns, and the adaptability and behavior of these geese compels managers to adopt some new and distinctive approaches toward management of this resource.

**The population objective for giant Canada geese in the Mississippi Flyway is to maintain a population of approximately 1 million geese as measured by coordinated spring surveys, with the population distributed in proportion to state and provincial objectives**. The public has grown accustomed to the recreational opportunities provided by the current size and distribution of the giant Canada goose population and the population should be maintained near this level. To monitor the population, an annual spring population survey will be initiated in 1997 in states or provinces with populations of at least 10,000 giant Canada geese. It is also important in managing these geese to maintain the giant Canada goose subpopulations of special significance, such as the Interlake population in Manitoba, to ensure they are sustained and continue to use their historical breeding areas.

The size, distribution and growth rate of the giant Canada goose population requires this population be given more consideration when formulating Canada goose harvest regulations. Harvest regulations have historically been based on the status of interior populations. **The harvest objective for the giant Canada goose population is to provide maximum harvest**

**opportunity for these geese that is consistent with the population objectives identified in this plan, the objectives for other Canada goose populations in the Flyway (i.e., EPP, MVP, SJBP and TGPP), and the control of overabundant goose populations in areas with high human/goose conflicts.** The present size and growth rate of the giant Canada goose population suggests that harvest opportunities should be liberal. Hunting mortality is considered the primary mortality factor acting on Canada geese and harvest control is recognized as the most important tool for regulating goose numbers. Effective harvest management may require more flexible hunting regulations, as well as special seasons, that will allow states and provinces to achieve desired harvests of giant Canada geese while minimizing harvests of Canada goose populations of concern. Regulations changes proposed for special or regular seasons should be reviewed by the Flyway Council and federal agencies to ensure they are consistent with harvest strategies for other Canada geese.

Banding is a fundamental tool for assessing the impact of harvest regulations on Canada goose populations. To obtain information on survival, direct recovery rates, harvest rates, harvest distribution, and the impacts of hunting regulations on giant Canada geese, a coordinated giant Canada goose banding program should be developed and implemented. A separate banding code should be assigned to giant Canada geese so that molting giant Canada geese captured on the Hudson Bay lowlands can be readily identified in the banding database. Harvest derivation procedures should be refined so that Canada goose harvests in states/provinces can be allocated to the various Canada goose populations in the Flyway.

The giant Canada goose population has grown to the extent that these geese have become overabundant in some areas, resulting in degraded habitat, increased numbers of human/goose conflicts and devaluation of the species. **The population control objective for giant Canada geese is to control local populations of giant Canada geese where they create significant nuisance situations, endanger human health or safety, significantly damage crops or significantly damage habitats important to other wildlife populations.** To effectively reduce local giant Canada goose populations, adult and immature mortality rates must be increased. Giant Canada geese provide valuable and prized recreational opportunities for hunters and, wherever possible and practical, special or regular hunting seasons should be the primary tools used to manage population levels. Where population control through harvest management has not resolved site-specific human/goose conflicts, abatement techniques, habitat manipulation or other site-specific methods should be considered to alleviate these situations. Where hunting and other methods are ineffective at controlling local giant Canada goose populations, other lethal methods may be used to reduce these populations. Giant Canada goose population management through hunting is not an option in some areas. Increasing adult mortality, however, is a prerequisite for reducing populations. Large-scale, lethal control programs should only be used in urban areas where local giant Canada geese are less vulnerable to harvest during regular or special seasons. The Mississippi Flyway Council should review large-scale, lethal control programs before they are implemented. State, provincial, and federal agencies responsible for resolving human/goose conflicts should balance solutions with the magnitude of the problems. States, provinces and federal agencies should jointly develop policies that give states and provinces the authority to implement appropriate actions to alleviate human/goose conflicts. These agencies and the Mississippi Flyway Council should carefully weigh the implications of their solutions to the management of other Canada goose populations in the Flyway.

# FOREWORD

Long-range planning, cooperation, and coordination are essential elements for the successful management of any migratory resource. These elements have been used extensively in the Mississippi Flyway for more than 40 years to successfully manage populations of *Branta canadensis interior*, commonly referred to as interior Canada geese. Management of giant Canada geese (*B. c. maxima*), however, was given little consideration at the Flyway level during the 1960's and 1970's because numbers and harvests of giant Canada geese were small compared to those of other Canada goose populations and giant Canada geese were not widely distributed across the Flyway. That situation began to change in the 1980's, when state, provincial, federal and private efforts to restore this subspecies came to fruition. Giant Canada geese are now the most widespread, and very likely the largest, Canada goose population in the Mississippi Flyway. They have impacted and complicated the management of all other Canada goose populations in the Flyway. Management plans and strategies were developed for populations of interior Canada geese during the 1970's and 1980's. Drafting a management plan for giant Canada geese is the next logical step toward developing a more comprehensive approach to Canada goose management in the Flyway.

State, provincial and federal wildlife agencies responsible for the management of giant Canada geese have cooperatively drafted this plan and agreed to support the basic concepts as guidelines for management of this international resource. It is only through such cooperative efforts that coordinated programs can be implemented to ensure the wise use and future well-being of migratory waterfowl populations.

# PURPOSE

This plan provides basic principles and strategies to help guide management of the giant Canada goose population in the Mississippi Flyway during 1996-2000. It is not intended to provide prescriptive regulations or to dictate management policies. Principles and strategies are provided in the form of management guidelines that allow for adjustments as more is learned about the size and distribution of the giant Canada goose population, its biology and harvest, and the impact this population has on management of other Canada goose populations in the Flyway.

# GOAL

**To manage the population of giant Canada geese in the Mississippi Flyway at a level that provides maximum recreational opportunities consistent with social acceptability.**

# Part I. History, Biology, Status and Distribution

## A. History

Of all the geese inhabiting North America, none is more recognizable than the Canada goose. For most people, the term "wild goose" evokes a picture of a large gray-bodied bird with a black head and white cheek patch. No other waterfowl species, with the exception of swans, was written about more by early European settlers (Hanson 1965). Of the Canada goose subspecies, the giant Canada goose was particularly noteworthy, probably because of its large size and widespread distribution.

Historical accounts indicate that giant Canada geese nested throughout much of central North America (Cooke 1906, Hanson 1965). At the time of European settlement, the nesting range of the giant Canada goose was believed to have extended from central Alberta, Saskatchewan, and Manitoba, south to central Kansas and Missouri, and east to the shores of Lake Erie, exclusive of the shield lake areas of northeastern Minnesota, Wisconsin, Michigan and Ontario (Fig. 1) (Hanson 1965). No other North American goose's nesting range covered so large an area or included such a diversity of habitats and climates.

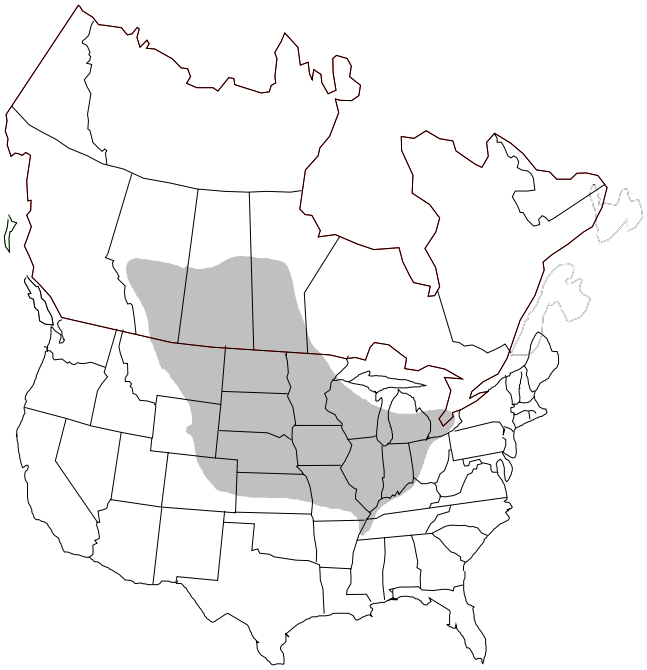

Fig. 1. Approximate breeding range (shaded area) of the giant Canada goose prior to European settlement (Hanson 1965).

However, even the giant Canada goose's widespread distribution and adaptability were no match for the unregulated hunting, egg gathering and wetland destruction that accompanied 19th century settlement of its breeding range. By 1906, Cooke (1906) reported the numbers of Canada geese nesting south of the latitude of central Iowa were very small. Extirpation progressed northward until giant Canada geese eventually disappeared as nesting birds from both Minnesota and North Dakota in 1929 and northern Wisconsin in the early 1930's (Hanson 1965). So infrequent were observations of these birds after 1900 that by 1950 the former existence of a large race of Canada geese, with individuals weighing up to 17 pounds, was doubted by many authorities (Delacour 1954). Early 20th century reports of very large Canada geese, most from northern Manitoba and Saskatchewan, were believed to be wandering nonbreeding western Canada geese (*B. c. moffitti*). Even when the largest race of Canada geese in North America, the

giant Canada goose, was finally recognized by taxonomists, no fewer than 9 authors had published reports on its extinction (Delacour 1954).

That perception changed, however, when a wintering, free-flying population of giant Canada geese was discovered at Rochester, Minnesota, in January of 1962 (Hanson 1965). It was later determined that this remnant population of giant Canada geese nested in the Interlake region of Manitoba, an area of lowlands between Lake Manitoba and Lake Winnipeg. This discovery fueled fledgling Canada goose restoration programs all across the Mississippi Flyway.

## Restoration Programs in the Mississippi Flyway

Even before the giant Canada goose had been extirpated from the lower 48 states, private citizens and conservation agencies began expressing interest in restoring these birds to their former breeding range. Ironically, the 19th century practice of capturing and domesticating wild Canada geese to use as food and live decoys, a practice that contributed to the population's demise, also provided a source of birds for restoration projects. Efforts to establish small, free-flying, self-sustaining flocks of giant Canada geese began as early as the 1920's in Michigan and 1930's in Wisconsin, Ontario and Minnesota (Table 1). In 1936, H. M. Wallace of Howell, Michigan, gave the offspring of geese he obtained from a game breeder in Owatonna, Minnesota, to the Seney National Wildlife Refuge (NWR), Michigan, to establish a local flock (Hanson 1965). Offspring from Wallace's birds were also used to start a flock at Barkenhausen Preserve in Wisconsin in 1932 and to stock the Michigan DNR's Mason State Game Farm. The Seney NWR geese eventually made their way to Agassiz NWR, Minnesota, to be used to restore goose populations in their state of origin. During the 1940's and 1950's, agencies in Wisconsin, Manitoba, Minnesota, Missouri and Ohio brought giant Canada goose restoration programs on line. In the 1960's state agencies in Iowa, Illinois, Indiana, Louisiana and Tennessee joined the restoration effort while the U. S. Fish and Wildlife Service (USFWS) initiated programs to establish nesting populations of giant Canada geese on national wildlife refuges in Mississippi, Tennessee and Alabama. These projects were soon followed by state's efforts to establish populations of giant Canada geese in Kentucky, Arkansas, Alabama and Mississippi in the 1970's and 1980's.

Most of the restoration projects that were successful in reestablishing nesting populations of Canada geese in the Mississippi Flyway adhered to 4 basic practices: 1) giant Canada geese were used as breeding stock, 2) young geese were released from captive flocks until self-sustaining, free-flying populations developed, 3) release sites were surrounded by sufficient habitat to enable flocks to grow and expand, and 4) surrounding lands were often closed to Canada goose hunting to reduce mortality on locally produced birds (Brakhage 1965, Dill and Lee 1970). Detailed reports of the strategies used by the various federal, state, and provincial agencies involved in these restoration projects are summarized in Appendix I.

**Table 1. A synopsis of giant Canada goose restoration efforts in the Mississippi Flyway.**

| State | Year | Release Sites | No. Geese | Agency/Group Directing Project | Source of Geese |
|---|---|---|---|---|---|
| MI | 1936 | Seney NWR | 332 | USFWS | H. M. Wallace, Livingston Co., MI - B. c. maxima from Owatonna, MN (Hanson 1965) |
| MI | 1928-64 | 30 sites | 2,500 | MI DNR | H. M. Wallace, Livingston Co., MI |
| MI | 1972-93 | Various sites | 32,000 | MI DNR | Translocated from within state |
| WI | 1932 | Barkenhausen Pres. | 6 | Jack Miner | H. M. Wallace, Livingston Co., MI |
| WI | 1939 | Necedah NWR | Unk.* | USFWS | B.c. moffitti from UT |
| WI | 1932-57 | 12 sites | Unk.* | WI DNR | T. Yeager, Owatonna, MN, H.M. Wallace, MI Rock Prairie, WI and Barrington, IL |
| WI | 1969-95 | 56 sites | 3,500 | WI DNR | Translocated from within state |
| MN | 1930's | Agassiz NWR | Unk.* | USFWS | B.c. moffitti from OR, UT, & MT |
| MN | 1949 | Agassiz NWR | Unk.* | USFWS | Seney NWR |
| MN | 1950's | Rice Lake & Tamarack NWR's | Unk.* | USFWS | Seney NWR |
| MN | 1958-70 | Thief Lake, Roseau River, Lac qui Parle & Talcot Lake WMA's | Unk.* | MN DNR | Carlos Avery Game Farm |
| MN | 1955-77 | 13 sites in Twin Cities | Unk.* | Private | Unknown |
| MN | 1982-95 | Various sites | 34,000 | MN DNR, Univ. of MN | Translocated from within state |
| IN | 1935 | Jasper-Pulaski WA | Unk.* | IN DFW | Offspring of captive giant C. geese |
| IN | 1966-73 | Jasper-Pulaski WA | 650 | IN DFW | Offspring of captive giant C. geese |
| IN | 1970's | Pigeon River, Atterbury and Glendale WA's | 267 | IN DFW | Jasper-Pulaski WA |
| IN | 1979-82 | 82 sites | 200 pair | IN DFW | Translocated from within state |
| ON | 1930's | Lake St. Clair, Holstein, Amherstburg & Guelph | Unk.* | Private | Offspring of decoy flocks |
| ON | 1954 | Pembroke Hatcher | Unk.* | OMNR | Pea Island, NC |
| ON | 1959-60 | Morrisburg & St. Lawrence Seaway Park | 61 | OMNR | Bombay Hook, DE & Mason Game Farm, MI |
| ON | 1968-80's | Southern ON, Thunder Bay & Sault Ste. Marie | Unk.* | OMNR & ON Waterfowl Res. Found. | Primarily Toronto & Codrington Game Farm |
| MB | 1945 | Delta Marsh | Unk.* | MB DNR | Offspring of domesticated giant C. geese |
| MB | 1940's | Rennie | Unk.* | Alf Hole | Offspring of giant C. geese captured in area |
| MB | 1951 | Marshy Point | Unk.* | MB DNR | Island Park, Delta Marsh & Dog Lake, MB |
| MB | 1965 | Oak Lake | Unk.* | MB DNR | Regina, SK |
| MO | 1949 | A.A. Busch Memorial WA | Unk.* | MO DOC | Private aviculturist |
| MO | 1952 | Trimble Lake WA | Unk.* | MO DOC | Private aviculturist |
| MO | 1949-91 | 44 sites | 4,650 | MO DOC | Trimble Lake & Bush Memorial WA |
| OH | 1956 | Mercer, Mosquito Creek and Killdeer Plains WA | 20 each | OH DOW | Offspring of domesticated giant C. geese |
| OH | 1967 | Ottawa NWR | 100 | OH DOW | Mosquito Creek WA |
| OH | 1979 | Muskingum Co. | 1,500 | OH DOW | Toronto, ON |
| OH | 1980's | Wildlife areas across the state | many | OH DOW | Tanslocated from within state |
| IA | 1965 | Ingham Lake WA | Unk.* | IA DNR | Offspring of domesticated giant C. geese |
| IA | 1971-72 | Ruthven, Spirit Lake & Rice L. | Unk.* | IA DNR | Offspring of Ingham Lake flock |
| IA | 1977-79 | Rathbun, L. Icaria & Bays Branch WA's | Unk.* | IA DNR | Offspring of previously established flocks |
| IA | 1983-93 | 33 sites | 5,964 | IA DNR | Tanslocated from within state |

continued on next page

**Table 1. continued.**

| State | Year | Release Sites | No. Geese | Agency/Group Directing Project | Source of Geese |
|---|---|---|---|---|---|
| IL | 1967-72 | Fulton, Knox & Henry Co. | 464 | IL DOC | Des Plaines Game Farm, Wilmington, IL |
| IL | 1970's | Mined areas in S. IL | Unk.* | IL DOC | Des Plaines Game Farm, Wilmington, IL |
| IL | 1970's | Kankakee & Grundy Co.'s | Unk.* | IL DOC | Des Plaines Game Farm, Wilmington, IL |
| IL | 1980-91 | 46 counties | 8,000 | IL DOC | Offspring of previously established flocks |
| TN | 1951 | Old Hickory Reservoir | 12 | Wick Comer | North Caroline game farm |
| TN | 1964-67 | Cross Creeks NWR | 26 | USFWS | 15 - Swan Lake NWR, 11 - Minnesota |
| TN | 1968 | Old Hickory Res./ Nursery | 60 | TWRA | Missouri game farm brood stock |
| TN | 1971 | Buffalo Springs Game Farm | 23 | TWRA | Olk Hickory, MI & OH brood stock |
| TN | 1972-77 | Various reservoirs | 1,073 | TWRA, TVA | Buffalo Springs Game Farm |
| TN | 1974-80's | Various ponds & reservoirs | Unk.* | TWRA, TVA | TVA & COE reservoirs |
| MS | 1966 | Noxubee NWR | 76 | USFWS | Sand Lake NWR, SD |
| MS | 1966-68 | Yazoo NWR | 70 | USFWS | 20- Sand Lake NWR, SD, 20- MN, 30- OH |
| MS | 1960's | Sardis Waterfowl Refuge | Unk.* | MS DWFP | Ohio and Louisiana |
| MS | 1985-95 | Various sites | 20,000 | MS DWFP | From GA, IL, PA, NC, MN, MI, TN, ON |
| LA | 1966-69 | Rockefeller Refuge | 960 | LA DFW | Translocated from MN & SK |
| LA | 1973-88 | 16 private sites | 607 | LA DFW | Translocated from Rockefeller Refuge |
| AL | 1967-69 | Eufaula NWR | 75 | USFWS | New Jersey & Minnesota |
| AL | 1980 | Central Alabama | 53 | AL DCNR | Land-Between-the -Lakes, KT & TN |
| AL | 1981 | Jackson Co. & central AL | 313 | AL DCNR | Michigan |
| AL | 1987-90 | Northern & central AL | 1,740 | AL DCNR | TN, IL, MI, and PA |
| AL | 1991-95 | Southern & central AL | 1,600 | AL DCNR | Translocated from within state |
| KY | 1970's | Franfort, Lexington and Louisville areas | Unk.* | KDFWR | Unknown |
| KY | 1977 | Daniel Boone Nat. Forest | Unk.* | USFS | Unknown |
| KY | 1979 | Land Between the Lakes | Unk.* | TN Valley Authority | Michigan and others |
| KY | 1980's | 10 locations | Unk.* | KDFWR | Michigan, Illinois & Tennessee |
| AR | 1970 | Holla Bend NWR | 18 | USFWS | Unknown |
| AR | 1973 | Wapanocca NWR | 30 | USFWS | Unknown |
| AR | 1981-83 | Arkansas River Valley | Unk.* | ARGF, USFWS, COE | Ontario, Mississippi, and Illinois |
| AR | 1983-90 | Arkansas River Valley | 4,200 | ARGF, USFWS, COE | TN, KT, ND, IL, MN, MI, AL, ON, OH |

Unk*= Unknown number released.

Recovery of the giant Canada goose population and its subsequent consideration in Canada goose management in the Mississippi Flyway is a recent phenomenon. Prior to 1965, giant Canada geese were not considered in goose management plans for the Mississippi Flyway. Hanson and Smith's (1950) treatise on Canada geese of the Mississippi Flyway does not even mention giant Canada geese; *B. c. maxima* is absent from their list of Canada geese belonging to the genus *Branta*. Hanson (1965), however, predicted that "the outstanding programs that have been underway on the various state, provincial and federal refuges for a number of years, and the privately initiated programs in many communities, provide assurance that the future for the giant Canada goose is indeed bright." Time has proven this to be quite an understatement. Giant Canada geese have come back from taxonomic obscurity and published extinction to become one of the most abundant subspecies of Canada geese in North America. Restoration of the giant Canada goose population is one of the most remarkable accomplishments of 20th century wildlife management. Its future management may prove to be an equally challenging task.

## B. Biology and Behavior

Waterfowl managers must understand the biology of giant Canada geese, relative to other geese, to formulate effective management strategies. Like other geese, giant Canada geese are long-lived birds with relatively low reproductive rates and high survival rates. However, of the 3 subspecies of Canada geese found in the Mississippi Flyway, giant Canada geese have both the highest reproductive rate and highest adult survival rate (Table 2). Unlike arctic and subarctic nesting geese, whose annual production is greatly influenced by weather conditions, giant Canada geese inhabit temperate environments with relatively stable breeding habitat conditions. Giant Canada geese are also very tolerant of human disturbance and willing to nest in close proximity to other goose pairs (densities as high as 100 nests per acre have been found on islands) (Klopman 1958, Ewaschuk and Boag 1972, Zenner et al. 1996). These factors, combined with the ability of this subspecies to utilize a wide range of wetland habitats, result in consistently high annual production across most of the breeding range.

**Table 2. A comparison of biological and population aspects of giant Canada geese, interior Canada geese and small Canada geese (*B. c. hutchinsii*) in the Mississippi Flyway.**

| Population | Large Geese | Medium Geese | Small Geese |
|---|---|---|---|
| Trait | *B. c. maxima* | *B. c. interior* | *B. c. hutchinsii* |
| Weight (pounds) | 9-12 | 7-9 | 4-7 |
| Nesting area | S. of latitude 54 | Latitude 50-60 | N. of latitude 60 |
| Age at first nesting | 2-3 years | 2-5 years | 2-5 years |
| Clutch size | 5-7 eggs | 3-5 eggs | 3-5 eggs |
| Reproductive success | High, constant | Medium, fluctuates | Low, boom-bust |
| Migration distance | Short | Medium | Long |
| Wintering areas | Latitude 37-45 | Latitude 35-43 | S. of latitude 35 |
| Exposure to hunting | 50-120 days | 160 days* | 160 days* |
| Adult survival | 0.9 | 0.7-0.9 | 0.7 |
| Population trend | Increasing | Fluctuating | Fluctuating |

*plus subsistence hunting

Giant Canada geese usually begin nesting at 3 years of age, although some begin nesting when 2 years old (Hanson 1965). Nonbreeding giant Canada geese (i.e., 1 and 2 year old birds) and failed breeders often migrate north to molt during May and June. When these birds reach breeding age, they almost always return to the area where they first learned to fly to initiate nesting (Hanson 1965). This behavior contributed significantly to the success of restoration efforts, especially efforts to repopulate vacant habitat by translocating goslings. However, it also slowed natural range expansion and, in some cases, resulted in high population densities, especially in urban areas. Nesting adults and their goslings have strong ties to natal areas and frequently remain on or near these areas until severe cold temperatures or deep snow force them to leave. When they do migrate, giant Canada geese fly relatively short distances to wintering areas compared to the migrations of interior and small Canada geese.

Giant Canada geese are primarily grazers, preferring the succulent new growth of grasses

and sedges, but they also grub for roots and tubers. During the fall and winter, they feed extensively on waste cereal grains and soybeans. Their adaptable feeding behavior has allowed them to successfully exploit contemporary habitats, especially urban landscapes with manicured turfgrass and agricultural landscapes with large crop fields and pastures.

## C. Status and Distribution

For the purposes of this plan, the giant Canada goose population is defined as Canada geese nesting within Mississippi Flyway states as well as Canada geese nesting south of latitude 50° N in Ontario and 54° N in Manitoba. This population may include geese belonging to the subspecies *B. c. maxima, B. c. moffitti*, or possibly other subspecies because the origins of the Canada geese used in some of the restoration projects in the Mississippi Flyway are unknown. However, Moser and Rolley (1990) found that Canada geese that nest in the area described above were similar in size and coloration to the giant Canada goose described by Hanson (1965), confirming Hanson's (1965) premise that the majority of Canada geese nesting in this region were *B. c. maxima*.

Populations of Canada geese in the Mississippi Flyway have historically been monitored on their wintering grounds and their names reflect those wintering areas. For management purposes, Canada geese in the Mississippi Flyway that belonged to the subspecies *B. c. interior* were divided into 3 populations: the Eastern Prairie Population (EPP), the Mississippi Valley Population (MVP), and the Tennessee Valley Population, (recently renamed the Southern James Bay Population (SJBP)). Small Canada geese (*B. c. hutchinsii*) were named the Tall Grass Prairie Population (TGPP) because they migrated through the tall grass prairie region in the western part of the Flyway. Geese observed in specific parts of the Flyway were assigned to certain populations (i.e., MVP, EPP, etc.) depending upon historical use of staging or wintering areas. The status of these populations was monitored through coordinated annual winter surveys (i.e., mid-December and Midwinter) because each population exhibited a strong affinity for specific wintering sites. Winter surveys appeared to produce reliable estimates of the magnitude of most Canada goose populations in the Flyway through the 1970's. During 1970-79, less than 10% of the Canada geese counted during the winter surveys in the Flyway were allocated to the giant Canada goose population; estimated numbers of giant Canada geese in the winter surveys averaged 63,000 during 1970-79 (Gamble 1995).

In the 1980's, increasing numbers of giant Canada geese began to complicate winter estimates for other Canada goose populations in the Flyway. During 1980-89, an average of 17% of the Canada geese counted during the winter surveys were thought to be giant Canada geese (Gamble 1995). The average number of giant Canada geese estimated in the winter counts during the 1980's was nearly 3 times the average number estimated in the 1970's, whereas the average total number of Canada geese counted in the winter surveys only increased 40% during the 1980's compared to the 1970's. In the early 1970's, a few states in the Flyway (AL, AR, and KY) reported no giant Canada geese in their winter counts. By the 1980's, giant Canada geese were reported from all Flyway states and provinces during the winter surveys.

In the late 1980's, biologists became concerned that increasing numbers of giant Canada

geese might be masking changes in populations of interior Canada geese. Many winter concentrations of Canada geese were known to be mixtures of 2 or more subspecies. Some of these subspecies are difficult to distinguish in the hand, much less from a distance. It was becoming increasingly difficult to divide large concentrations of Canada geese into appropriate populations (i.e., MVP, EPP, SJBP and Giants) during winter surveys and biologists were becoming uncomfortable with relying on population estimates obtained from winter counts. Biologists suspected that estimates of giant Canada geese obtained from winter surveys might be conservative. Conversely, it was suspected that estimates of other Canada goose populations, notably SJBP, might be inflated.

Despite these concerns, winter surveys for Canada geese continued to be conducted in the early 1990's and numbers of Canada geese observed were reported by population. The average total number of Canada geese counted on winter surveys during 1990-94 was nearly twice the number seen in the 1980's and 5 times the average observed in the 1970's (Gamble 1995). Giant Canada geese were estimated to account for nearly a quarter of the Canada geese observed during the 1990-94 surveys. Population estimates obtained from winter counts must be interpreted cautiously because survey effort has been inconsistent in recent years, varying from state to state as well as within states, and the methods used to allocate geese to the various populations have changed in some cases.

To more accurately monitor changes in interior populations of Canada geese, the emphasis for counting these birds was shifted to the breeding grounds. By the early 1990's, breeding grounds surveys were established for all 3 populations of *B. c. interior* in the Flyway; EPP surveys began in 1971, MVP in 1989 and SJBP in 1990. In 1992, pilot breeding grounds surveys were conducted in Ohio and Michigan to determine the feasibility of monitoring giant Canada geese on their breeding grounds. This survey was implemented in 7 states and 1 province in 1993, 8 states and 1 province in 1994, and 8 states in 1995. Extrapolating the results of the aerial survey to unsurveyed states and provinces in the Flyway produced estimates of the spring population of giant Canada geese that exceeded 800,000 in 1993 and 1 million in 1995 (Table 3). These estimates indicate the giant Canada goose population has become the largest Canada goose population in the Flyway.

More importantly, there appears to be a marked discrepancy between the numbers of Canada geese counted on the winter surveys and Canada goose population estimates obtained from breeding ground surveys. For example, the sum of the 1993 breeding ground estimates for the EPP, MVP, and SJBP populations totaled approximately 1.2 million geese. The 1992 mid-December count of all Canada geese in the Flyway, for comparison, barely exceeded 1.2 million. These numbers suggest that there were very few giant Canada geese in the Flyway (or small Canada geese), that significant numbers of Canada geese were not counted during the winter survey, or that the breeding population estimates are inflated. The 1993 giant Canada goose breeding population survey, however, indicated there were more than 700,000 giant Canada geese in the Flyway. There is certainly some imprecision involved with the breeding population estimates, but probably not enough to account for 500,000 to 1 million geese. The discrepancy between the population estimates obtained on the breeding grounds and those obtained from winter counts may be the result of incomplete coverage or inconsistent effort during winter surveys. Nonetheless, this example clearly illustrates some of the risks involved with relying on

winter counts to monitor Canada goose populations in the Flyway.

**Table 3. Estimated spring populations of giant Canada geese in the Mississippi Flyway from helicopter surveys and other data sources during 1993, 1994 and 1995. (Source: Wood et al. 1995, Michigan estimates by J. Martz, MI DNR, pers. comm.).**

| State/ Province | 1993 Total Geese | 95% C. L. | 1994 Total Geese | 95% C. L. | 1995 Total Geese | 95% C. L. |
|---|---|---|---|---|---|---|
| Alabama | 16,000 | 1 | 17,000 | 1 | 18,000 | 1 |
| Arkansas | 3,000 | 2 | 3,000 | 2 | 3,300 | 2 |
| Illinois | 106,200 | 67,700 | 114,200 | 47,900 | 107,000 | 55,700 |
| Indiana | 67,500 | 48,000 | 69,600 | 25,300 | 101,800 | 33,600 |
| Iowa | 38,000 | 4 | 28,025 | 6,460 | 32,100 | 6,680 |
| Kentucky | 18,000 | 2 | 20,675 | 19,600 | 15,000 | 7,000 |
| Louisiana | 3,000 | 1 | 3,000 | 1 | 3,300 | 1 |
| Manitoba | 60,000 | 1 | 60,000 | 1 | 70,000 | 1 |
| Michigan[3] | 131,000 | 63,800 | 224,000 | 107,000 | 180,800 | 72,870 |
| Minnesota | 138,000 | 2 | 201,600 | 2 | 207,200 | 2 |
| Mississippi | 9,000 | 1 | 9,000 | 1 | 9,000 | 1 |
| Missouri | 30,300 | 18,000 | 35,050 | 19,400 | 32,200 | 14,200 |
| Ohio | 58,000 | 30,000 | 71,000 | 22,300 | 69,300 | 26,050 |
| Ontario | 56,200 | 22,600 | 74,000 | 38,800 | 107,950 | 2 |
| Tennessee | 38,000 | 2 | 40,200 | 2 | 44,300 | 2 |
| Wisconsin[5] | 60,700 | 55,000 | 54,600 | 40,700 | 29,350 | 16,800 |
| Total | 832,900 | | 1,024,950 | | 1,030,600 | |

[1] Biologist's best estimate.
[2] Estimate derived using weighted means from combined surveys and stratified maps provided by state or province.
[3] Estimate derived from spring fixed-wing transect survey, with helicopter visibility corrections. Not a complete statewide survey.
[4] Estimate based on extrapolation from survey conducted in part of state.
[5] Estimates derived from fixed-wing duck surveys were 41,000, 41,000 and 62,000 during 1993, 1994 and 1995, respectively.

Spring and summer distributions of giant Canada geese are very different from that of interior Canada geese. Most giant Canada geese breeding in the Mississippi Flyway nest in the southern parts of the Canadian provinces and the northern states, but they have also adapted to nesting as far south as Alabama and Louisiana (Fig. 2). Breeding habitat varies from agricultural landscapes to forests to urban environments. Giant Canada geese are particularly adaptable in their choice of wetlands, using a wide variety of wetland types.

In recent years, significant numbers of giant Canada geese have been found on the breeding grounds of all *B. c. interior* populations during summer banding operations and their numbers appear to be increasing. The majority of these geese are believed to be non-breeding molt migrants that move north in late May or early June. These molting giant Canada geese may begin to compromise spring breeding grounds surveys for interior Canada geese, which are normally conducted during the first half of June, as well as impact the availability and quality of nesting and brood rearing habitat for interior Canada geese.

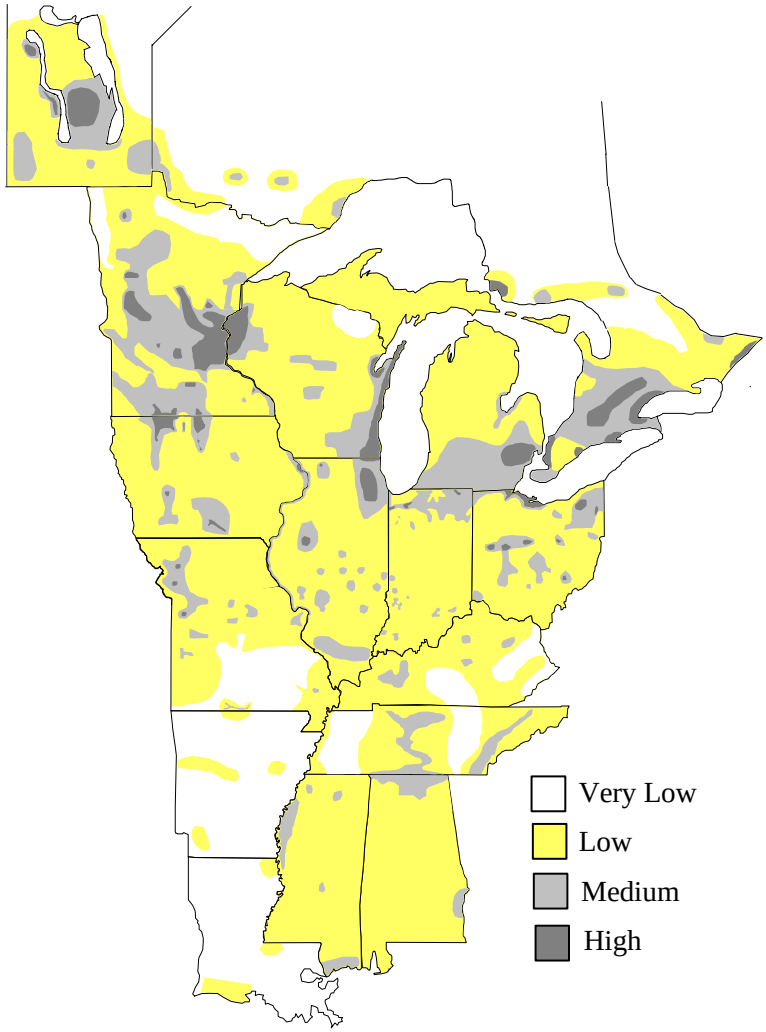


Fig. 2. Distribution of breeding giant Canada geese in the Mississippi Flyway, 1995.

The migratory behavior of giant Canada geese is variable across the Flyway. Generally, giant Canada geese nesting in the northern states and provinces tend to be more migratory than those nesting at mid or southern latitudes. However, many giant Canada geese nesting at northern latitudes exhibit a reluctance to leave their breeding areas, often foregoing migration until severe winter weather develops or deep snow makes foraging for food difficult. This tendency reduces the overall exposure of giant Canada geese to hunting and increases their survival rates. It also reduces their potential to provide predictable recreational opportunities at southern latitudes and is probably contributing to the overall delay observed in the migration of interior Canada geese in recent years. In addition, these birds readily use metropolitan areas for staging and wintering because metro areas are typically free from hunting disturbance, often contain good roosting sites in the form of rivers, ponds and lakes which remain ice-free well into the winter, and have readily available supplies of food in the form of waste grain on crop fields within city limits. This adaptability and behavior results in giant Canada geese being widely scattered across the Flyway, even in early winter when traditional population surveys are conducted. The scattered distributions of this population and the propensity of giant Canada geese to use non-traditional goose wintering sites, such as urban areas, may account for some of the discrepancy that exists between the spring population estimates and the winter counts for Canada geese in the Flyway.

In general, the distribution of giant Canada geese across the Flyway is not as uniform as management agencies or the public would prefer. There are areas in the Flyway where local nesting giant Canada goose populations are high and human/goose conflicts proliferate. At the same time, there are areas where giant Canada geese are sparsely distributed and potential reproductive habitat remains unused. (The status and distribution of giant Canada geese in each state and province are summarized in Appendix II). Some management agencies feel it is time to suppress, or at least stabilize, numbers of giant Canada geese nesting within their jurisdictional borders while other agencies are still encouraging populations to grow. Unlike most waterfowl, giant Canada geese exhibit characteristics, and subsequently management challenges, of both migratory and resident wildlife. Variable migratory behavior and varying harvest rates and harvest distributions within and outside states and provinces complicate the management challenge. Spring/summer molt migrant movements of giant Canada geese may be confounding interior population estimates, and fall/winter movements and concentrations may be influencing the migrations and staging concentrations of interior and small Canada geese.

Combined, these issues paint a complex and challenging management picture. *[Distribution Principle No.1:] The present size and distribution of the giant Canada goose population, coupled with its variable migratory and harvest patterns, compels managers to adopt broader, more innovative approaches toward management of this waterfowl resource and to formulate goose management plans that consider impacts beyond jurisdictional boundaries. The same philosophy that has driven international cooperative management of other waterfowl populations must also be applied to this shared migratory resource.* The task facing waterfowl management agencies in the future will be to develop and implement strategies that ultimately produce more manageable distributions of giant Canada geese in the Flyway while simultaneously maintaining or enhancing recreational opportunities.

# Part II. Population Management

## A. Population Objective

Historically, giant Canada geese have been viewed as discrete populations residing within individual states or provinces. In this regard, they were often referred to as "resident" Canada geese, as opposed to migrant Canada geese from arctic and subarctic breeding grounds. Band recoveries indicate that a high percentage of the giant Canada geese recovered during the 1990-94 seasons, about 70% on average, were taken within the state or province of banding (Table 4). However, these same data indicate that significant numbers of these geese were harvested outside many of the states and provinces in which they were banded, suggesting that these birds cannot be managed simply as "resident" wildlife. *[Population Principle No. 1:] Band recovery information suggests that giant Canada geese are a valuable shared migratory resource that enhance the natural environment and increase recreational opportunities throughout their summer and winter ranges.* This compels managers to think of the giant Canada goose population on a broader scale. However, the reality of giant Canada goose management is that individual states and provinces have been largely responsible for solving the human/goose conflicts associated with giant Canada geese residing within their borders. Thus, unlike

**Table 4. Band recoveries (direct + indirect) for giant Canada geese leg-banded in states or provinces in the Mississippi Flyway (excluding translocated geese ) and the number and percent harvested within the state or province of banding during 1990-94 hunting seasons.**

| State/ Province | Total Recov. | No. Within | Percent Within | State/ Province | Total Recov. | No. Within | Percent Within |
|---|---|---|---|---|---|---|---|
| Alabama | 57 | 42 | 74% | Michigan | 1805 | 1369 | 76% |
| Arkansas | 7 | 7 | 100% | Minnesota | 1185 | 830 | 70% |
| Illinois | 1467 | 1254 | 85% | Mississippi | 0 | 0 | |
| Indiana | 501 | 400 | 80% | Missouri | 810 | 650 | 80% |
| Iowa | 914 | 544 | 60% | Ohio | 7589 | 7045 | 93% |
| Kentucky | 228 | 180 | 79% | Ontario | 4091 | 1306 | 32% |
| Louisiana | 0 | 0 | | Tennessee | 873 | 842 | 96% |
| Manitoba | 1639 | 401 | 24% | Wisconsin | 1441 | 778 | 54% |

**Table 5. Giant Canada goose spring population objectives for states and provinces in the Mississippi Flyway.**

| State/ Province | Number of Geese | State/ Province | Number of Geese |
|---|---|---|---|
| Alabama | 20,000 | Michigan | 180,000 |
| Arkansas | 4,000 | Minnesota | 150,000 |
| Illinois | 110,000 | Mississippi | 20,000 |
| Indiana | 80,000 | Missouri | 40,000 |
| Iowa | 70,000 | Ohio | 60,000 |
| Kentucky | 60,000 | Ontario | 110,000 |
| Louisiana | 4,000 | Tennessee | 45,000 |
| Manitoba | 70,000 | Wisconsin | 68,000 |
| | | TOTAL | 1,091,000 |

population objectives for interior

Canada geese, a Flyway objective for the giant Canada goose population must give due consideration to the breeding population objectives and management capabilities of individual states or provinces (Table 5).

## POPULATION OBJECTIVE:

**To maintain a population of approximately 1 million giant Canada geese, as measured by coordinated spring surveys, distributed in the Flyway in proportion to state and provincial objectives**.

The hunting and non-hunting public have grown accustomed to the recreational opportunities provided by the present size and distribution of the giant Canada goose population. *[Population Principle No. 2:] The Mississippi Flyway giant Canada goose population should be maintained near its present level to continue to provide comparable recreational opportunities in the future. However, there are recognized*

*problems associated with the present distribution of giant Canada geese in some states and provinces and management efforts should be directed to resolve these situations.* Many areas with high goose population densities are experiencing increasing numbers of human/goose conflicts. One of the major challenges for goose managers in the future will be to provide the recreational opportunities the public has grown accustomed to and, at the same time, modify population densities of giant Canada geese to minimize human/goose conflicts. Meeting this challenge will require a better understanding of the size and distribution of the giant Canada goose population in the Flyway.

**Strategy 1:**

**Implement an annual operational spring population survey for giant Canada geese by 1997 that produces a population estimate with confidence limits of approximately ± 25% at the state or province level for each state or province that has a population of at least 10,000 geese.**

Rationale: Results of spring population surveys conducted during 1993-95 indicate that the giant Canada goose population can be estimated at the Flyway level with the same precision as interior Canada goose populations are estimated on their subarctic breeding grounds. A reliable estimate of the giant Canada goose population has been a top priority

for goose managers since 1990 because managers have little confidence in the Canada goose population estimates presently obtained from winter counts. Additionally, giant Canada geese comprise an increasing pro

portion of all Canada geese harvested in the Flyway and the lack of population data for these geese has severely compromised managers' abilities to calculate harvest derivations for all Canada geese in the Flyway. For decades, there has been a comprehensive coordinated program of surveys to provide data for the management of duck populations. Such a program is lacking for Canada geese despite the fact that more Canada geese than mallards have been harvested in some states and provinces in recent years. A reliable estimate of the giant Canada goose population is essential to develop and evaluate management strategies and must include additional

efforts to develop goose population surveys for urban areas so that the effectiveness of goose population control strategies can be assessed.

**Strategy 2:**

**Maintain giant Canada goose subpopulations of special significance in accordance with state/provincial plans to ensure these remnant populations are sustained and continue to use their historical breeding areas.**

Rationale: Subpopulations of giant Canada geese, such as those that nest on the bluffs along the lower Missouri River, those nesting in the Interlake region of Manitoba, and the flock wintering at Rock Prairie, Wisconsin, are of special interest to managers because these flocks have persisted in the wild to the present day. To promote the growth of these flocks in the past, states and provinces have restricted hunting on breeding and wintering areas, such as Marshy Point and Rennie in Manitoba and Rock Prairie in Wisconsin. These practices have proven effective in sustaining these subpopulations and should continue to be used to ensure these subpopulations are maintained in the future. Additional management strategies need only be implemented if these populations begin to decline significantly.

**Information Needs:**
1. Identify the most cost-efficient giant Canada goose breeding population survey techniques and procedures for obtaining precise state/province estimates.

2. Determine the impacts of molt migrant giant Canada geese on *B. c. interior* breeding population estimates and *B. c. interior* nesting and brood rearing habitats and estimate potential impacts if the giant Canada goose population continues to increase.

3. In urban areas with high numbers of human/goose conflicts and increasing giant Canada goose breeding populations, determine the proportion of the urban and surrounding rural goose populations that are essentially unhunted as a result of use of areas inaccessible to hunters and the potential these geese have to continue to increase local Canada goose populations, both within and adjacent to urban areas.

# B. Harvest Management

Managing harvests of the various Canada goose populations in the Mississippi Flyway has become increasingly complex in recent years, largely because of the growing giant Canada goose population. Traditionally, the status of EPP, MVP and SJBP Canada geese determined Canada goose harvest strategies and hunting regulations in the Flyway. Harvest strategies are still primarily aimed at ensuring that the EPP, MVP and SJBP are maintained at objective levels. However, the harvest of giant Canada geese, especially for population control and human/goose conflict reduction, should be given increased consideration in formulating regulations. Although the increase in numbers of giant Canada geese has complicated harvest management strategies, these geese have, in many cases, provided hunting opportunities where none previously existed and may, in some areas, buffer the effects of hunting on other Canada geese. *[Harvest Management Principle No. 1:] The giant Canada goose population is a large and valuable migratory resource that must be given due consideration in future Canada goose harvest strategies and hunting regulations in the Flyway*.

**HARVEST OBJECTIVE:**
**Provide maximum harvest opportunity for giant Canada geese that is consistent with the population objectives identified in this plan, the objectives for other Canada goose populations in the Flyway (i.e., EPP, MVP, SJBP and TGPP), and the control of over-abundant goose populations in areas with high human/goose conflicts.**

Hunters have become accustomed to the widespread harvest opportunities made possible by the present size and distribution of the giant Canada goose population. It would be ideal if all parts of the Flyway would have equal Canada goose hunting opportunities. However, that has not been the case with interior or small Canada geese and the uneven distribution of giant Canada geese also results in unequal harvest opportunities. Management agencies cannot realistically meet all the desires for better goose hunting opportunities across the Flyway, even if the giant Canada goose population were double its present size. However, waterfowl managers will undoubtedly be challenged in the next decade to balance manageable population levels in individual states and provinces with the demand for additional Canada goose harvest opportunities in regions that could benefit from these birds. The present size and growth rate of the giant Canada goose population in the Flyway suggests that harvest opportunities should be liberal and remain liberal until the population's growth rate is reduced. *[Harvest Management Principle No. 2:] Hunting mortality is generally considered the primary mortality factor acting on Canada goose populations and harvest control is recognized as the most important technique for regulation of goose numbers.*

**Strategy 1:**
**Develop more flexible hunting regulations and special seasons that will permit states and provinces to achieve desired harvests of giant Canada geese while minimizing harvests of populations of concern.**

Rationale: Present framework regulations and restrictions on splits, zones, and special seasons were primarily designed to control harvests of interior and small Canada geese. Largely effective in this regard, they also limit options to provide additional harvest opportunities on growing giant Canada goose populations. More flexible framework regulations should be developed so states and provinces can better tailor their seasons to increase or decrease their harvests of giant Canada geese while simultaneously meeting management objectives for other Canada goose populations in the Flyway. For example, framework dates should permit opening the season as early as possible within the limitations of the Migratory Bird Treaty to increase harvests of local giant Canada geese while minimizing harvests of migrating interior Canada geese. Three-way season splits could enable some states to better utilize regular season days to target giant Canada geese before or after migrant interior geese arrived or left, respectively. Increased flexibility in these two areas alone would reduce the need for special seasons in some areas. Differential bag limits within the season, additional zones, and longer seasons would also increase options for designing seasons to increase or decrease harvests of specific Canada goose populations. Special early and late seasons have also been used to increase harvests of giant Canada geese and these tools should continue to be used in the future. However, the criteria for evaluating such seasons should be minimal when these seasons do not involve Canada geese from populations that are below objective levels. Recent analyses of the distribution of band recoveries from EPP, MVP and SJBP Canada geese indicate there are areas within the Flyway

where few, if any, interior Canada geese are harvested. Special seasons held in those areas to provide additional harvest of giant Canada geese should only be subject to minimal evaluation requirements. *[Harvest Management Principle No. 3:] Canada goose harvest regulation changes proposed by states/provinces for special or regular seasons should be thoroughly reviewed by the Flyway Council and federal agencies to ensure that such changes are consistent with harvest strategies for Canada goose populations of concern.*

**Strategy 2:**
**Review and revise the operational banding program for giant Canada geese to address the needs identified in population and harvest management portions of this plan. A separate banding code for giant Canada geese should also be included in banding records so that molting giant Canada geese captured on the Hudson Bay lowlands can be readily identified in the banding database.**

Rationale: For decades, a coordinated continental banding program has been in place for ducks. No such coordinated banding effort has been in place for Canada geese even though demands for harvest and harvest information have increased dramatically. Giant Canada geese have been banded in most states and provinces for many years, but the effort has often been inconsistent and, in some cases, not distributed in proportion to population densities. In many cases, giant Canada geese are disproportionately banded in urban or management areas, while other areas with substantial numbers of geese have few, if any, geese banded in them. As a result, present banding efforts may not be providing a true picture of the impacts of harvest regulations on the giant Canada goose population. A more coordinated and comprehensive giant Canada goose banding program that reflects the entire population needs to be developed and implemented to obtain accurate information on survival, direct recovery rates, harvest rates, harvest distribution, and the impacts of hunting regulations. *[Harvest Management Principle No. 4:] Banding is a fundamental tool for assessing the impact of harvest regulations on Canada goose populations.*

**Strategy 3:**
**Develop or refine harvest derivation procedures so that Canada goose harvest estimates for states and provinces can be accurately divided among the various Canada goose populations in the Flyway (i.e., EPP, MVP, SJBP, TGPP and Giants).**

Rationale: Current harvest derivations for states and provinces provide, at best, a rough estimate of harvest by population. There are numerous assumptions in the present technique that are difficult to verify. A standardized technique, using band recovery data, precise population estimates and parts collection survey data (if necessary) should be developed to accurately assess the annual harvest of giant, SJBP, MVP, EPP, and TGPP Canada geese. Other techniques, such as DNA analysis of parts collection items, might also be used in apportioning the harvest of specific populations among states and provinces. Whatever technique is used, the procedure should be capable of providing harvest estimates for the previous season in time for annual regulations deliberations in July.

**Information Needs:**

1. Determine the reporting rate for banded Canada geese recovered by hunters and determine if this reporting rate varies by state/province or by regions within the Flyway. Also determine if the reporting rate for giant Canada geese is significantly different from the reporting rate for other Canada goose populations.

2. Determine the contributions of urban giant Canada goose populations to Canada goose harvests within and outside state or provincial boundaries. This information would help identify any impacts that the reduction of urban goose populations would have on harvest opportunities in other parts of the Flyway.

3. Determine if specific harvest area/breeding population relationships exist for giant Canada geese in the Flyway using multiresponse permutation procedures (MRPP) (Biondini et al. 1988, Zimmerman et al. 1985) or other applicable techniques so as to identify potential regional population management and harvest strategies. Additionally, identify management actions (i.e., population surveys, banding quotas, harvest regulations, etc.) that may be needed to better define these relationships and refine harvest management for these regional populations.

# C. Population Control

Giant Canada geese have the highest reproductive potential and lowest mortality rate of all the Canada goose subspecies in the Mississippi Flyway. The biology, adaptability, and range of this species makes it a prime candidate for overpopulation in the modern environment. In addition, hunting mortality is the only major mortality factor acting on this population. *[Population Control Principle No. 1:] The restoration of the giant Canada goose population was one of the major accomplishments of 20th century wildlife management and giant Canada geese enhance the natural environment and the quality of life for many people. However, giant Canada geese have become overabundant in some areas, resulting in degraded habitat, increased numbers of human/goose conflicts and devaluation of the species.* For much of the 20th century, Canada geese were a symbol of the remote northern wilderness. However, in some areas with high goose densities and significant numbers of human/goose conflicts, their status has fallen to that of a nuisance or pest species by some people. Long-term Canada goose management in the Flyway could be seriously impacted if giant Canada geese become so abundant that Canada geese, in general, become devalued. It is essential, therefore, that this plan include strategies for controlling giant Canada goose populations where they are overabundant, with full knowledge that such actions may impact Canada goose recreational opportunities in other regions and at other times of the year.

## OBJECTIVE:

**At the discretion of the state or provincial wildlife agency and with the concurrence of the respective federal wildlife agencies, control local populations of giant Canada geese where they create conflicts such as endangering human health or safety, damaging crops, damaging habitats important to other wildlife populations, or creating other injurious or nuisance situations.**

All states and provinces in the Flyway have dealt with nuisance or depredation situations arising from land use conflicts between people and giant Canada geese. Such conflicts have occurred in nearly all habitats, from urban to rural and from agricultural to forested. They have involved situations ranging from crop depredations to airport safety concerns to threats to human health and safety. The frequency and magnitude of depredation or nuisance situations and complaints about these situations varies widely across the Flyway. Some people are very intolerant of any inconvenience resulting from a coexistence with wildlife while others accept it at differing levels. In most cases, agencies have employed abatement and/or direct population manipulation techniques to reduce or minimize human/goose conflicts. *[Population Control Principle No. 2:] In areas where giant Canada geese have become over-abundant and/or human/goose conflicts occur, action should be taken to resolve these situations and/or reduce local giant Canada goose populations. It is important that the solutions used to resolve the human goose conflicts are balanced with the magnitude of the problems. It is equally important that solutions include consideration of their possible implications on the management of other Canada goose populations in the flyway.*

**Strategy 1:**
**Manage harvests of local giant Canada goose populations using appropriate hunting regulations to help achieve population objective levels and minimize harvests of Canada goose populations of concern.**

Rationale: To effectively reduce local giant Canada goose populations, adult and immature mortality rates must be increased. Hunting, the primary cause of mortality for giant Canada geese, can and should be used to regulate populations to achieve desired objectives. *[Population Control Principle No. 3] Giant Canada geese provide valuable and prized recreational opportunities for hunters and, wherever possible and practical, special or regular hunting seasons should be the primary tools used to manage population levels.* Special seasons have been used by several states to target giant Canada geese in specific zones for additional harvest (Table 6). It should be recognized, however, that reducing the size of the local Canada goose population through additional harvest will not necessarily eliminate depredation/nuisance situations or proportionately reduce their frequency. Harvest sites can be temporally and geographically distant from depredation/nuisance sites, especially in urban areas, reducing the effectiveness of this tool to target the specific geese causing the depredation/nuisance situations. In some cases, it may be more prudent to kill the specific geese responsible for the depredation/nuisance situations by other means than to reduce a local or regional population to a significantly lower level, especially if such action would seriously impact goose harvest opportunities outside the immediate area. *[Population Control Principle No. 4:] Increasing goose harvests via special seasons or liberal regulations should not be considered the only suitable control practice, but should be the first component of a comprehensive giant Canada*

*goose population control program.*

**Table 6. Special early and late Canada goose seasons in Mississippi Flyway states (E = experimental,**
**X = non-experimental).**

| State/Area | Type of Season | Year 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Michigan** | | | | | | | | | | | | | | |
| East Upper Peninsula | Early | | | | | E | E | E | E | E | E | E | E | X |
| Northern Lower Peninsula | Early | | | | E | E | E | E | E | E | E | E | E | X |
| Southern Lower Peninsula | Early | | | | E | E | E | E | E | X | X | X | X | X |
| Southern Michigan GMU | Late | *E | E** | E | E | E | E** | E | E | E | E | E | E | X |
| * Season began In 1977 | | | | | | | | | | | | | | |
| ** Zone expanded in 1984 and again in 1987. | | | | | | | | | | | | | | |
| **Wisconsin** | | | | | | | | | | | | | | |
| Brown County Subzone | Late | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Rock Prairie Subzone | Late | | X | X | X | X | X | X | X | X | X | X | X | X |
| Early-Season Goose Subzone | Early | | | | | | | | E | E | E | X | X | X |
| **Ontario** | | | | | | | | | | | | | | |
| South Zone | Early | | | | | | | | | X | X | X | X | X |
| South Zone | Late | | | X | X | X | X | X | X | X | X | X | X | X |
| **Minnesota** | | | | | | | | | | | | | | |
| Twin Cities Metro Zone | Early | | | | | E | E | E | E | X | X | X | X | X |
| Twin Cities Metro Zone | Late | | | | | E | E | E | E | E | E | X | X | X |
| Olmsted | Late | | | | | E | E | E | E | X | X | X | X | X |
| Fergus Falls/Alexandria Zone | Early | | | | | | | E | E | E | E | X | incl. in FF/B | |
| Fergus Falls/Benson Zone | Early | | | | | | | | | | | | E | X |
| Fergus Falls/Alexandria Zone | Late | | | | | | | | | | | E | E | E |
| Southwest Border Zone | Early | | | | | | | E | E | E | E | incl. in SWCG Zone | | |
| Southwest C. Goose Zone | Early | | | | | | | | | | | E | E | X |
| **Illinois** | | | | | | | | | | | | | | |
| NE Illinois C. Goose zone | Early | | | | E | E | E | E | E | E | X | X | | X |
| **Indiana** | | | | | | | | | | | | | | |
| Early-Season C. Goose Area | Early | | | | | | | | | E | E | E | | |
| Statewide | Early | | | | | | | | | | | | X | X |
| **Ohio** | | | | | | | | | | | | | | |
| NE Early-Season C. Goose Zone | Early | | | | | | | | | E | E | E | | |
| SW Early-Season C. Goose Zone | Early | | | | | | | | | | | E | | |
| Statewide | Early | | | | | | | | | | | | E | X |
| **Missouri** | | | | | | | | | | | | | | |
| Central Zone | Early | | | | | | | | | | E | E | E | |
| **Tennessee** | | | | | | | | | | | | | | |
| Middle, Cumberland Plateau & East Zone | Early | | | | | | | | | | | | E | X |

**Strategy 2:**
**State, provincial and federal wildlife agencies should jointly develop policies and programs that will give states and provinces the authority to implement appropriate actions to alleviate human/goose conflicts.**

Rationale: In many situations where human/goose conflicts have developed in the past, the public has been shuffled from one agency to another in their attempts to alleviate the problems.

Because state or provincial agents are usually the first contact in such situations, and state or provincial agencies usually implement and pay for the control measures, it is important that states and provinces have the authority to act without unnecessary administrative constraints or delays. With the exception of Environment Canada, most federal agencies, such as the U.S. Department of Interior's Fish and Wildlife Service (USFWS) and U.S. Department of Agriculture's Animal Damage Control (ADC) division, have provided limited staff and limited funding for control programs in most states despite having oversight authority for migratory bird management. It would be reasonable and expedient, therefore, to have as much authority as possible passed to the states and provinces for control of giant Canada geese during the spring and summer. Many of the current problems experienced with government action in regards to responding to human/goose conflict situations will be eliminated when the USFWS issues Special Purpose Nuisance Canada Goose Permits to all state wildlife agencies and ADC State Directors.

**Strategy 3:**
**Where population control through harvest management has not resolved site-specific human/goose conflicts, abatement techniques, habitat manipulation or other site-specific methods should be considered to alleviate these situations.**

Rationale: Many complaints concerning giant Canada geese can be resolved by employing standard abatement techniques such as scare devices (propane cannons, scarecrows, dogs, mylar tape, balloons, cracker shells), aversive agents and/or fences. Habitat manipulation and permanent fences have been shown to be effective long-term solutions for solving human/goose conflict situations and fostering coexistence. In some cases, translocating goslings can suppress population growth if most of the goslings produced in an area are removed annually for several successive years. *[Population Control Principle No. 5:] As a tool for resolving human/goose conflicts and controlling goose populations, translocation has limited long-term applicability because most of the suitable wetland habitat in the Flyway is occupied by giant Canada geese and adult geese have strong homing instincts, nearly always returning to the areas where they previously nested.*

**Strategy 4:**
**Where hunting and other methods are ineffective at controlling local giant Canada goose populations, other lethal methods may be used to reduce these populations.**

Rationale: Giant Canada goose population management through hunting is not an option in some areas, such as cities, because of restrictions on hunting or use of firearms. However, increasing adult mortality rates is a prerequisite for reducing local giant Canada goose populations. Shooting or capturing adult giant Canada geese during the spring is an effective method of reducing site-specific goose populations, but such practices are costly, labor intensive and, in some areas, may not be socially acceptable. Capturing adult giant Canada geese in metropolitan areas during the summer flightless period and processing these birds so they can be used by local food bank programs has been shown to be a cost-efficient method of increasing adult mortality. Minnesota and Michigan experimented with this technique and found that it also had good public acceptance (Keefe 1996). This practice may be particularly useful in urban areas because large numbers of flightless geese can be efficiently captured and the specific geese causing problems can be removed. Egg destruction is another lethal method occasionally

advocated to reduce local goose populations. Unlike the above practices, this technique does not increase adult mortality, so it must be repeated annually, at a significant cost, to reduce a population. Large-scale, lethal control programs should only be used in urban areas where local giant Canada geese are less vulnerable to harvest during regular or special seasons. Such programs must be carefully planned and implemented so that the public understands the need, the process and the expected results. The Mississippi Flyway Council should review large-scale, lethal control programs before they are implemented to ensure they are well planned and will not negatively impact the long-standing, cooperative management programs that are presently in place for other Canada goose populations in the Flyway. Canada geese from the EPP, MVP and SJBP are occasionally involved in depredations during the fall in some parts of the Flyway. Care must be exercised in advocating lethal population control practices outside hunting seasons as a viable means of solving all human/goose conflict situations. *[Population Control Principle No. 6:] The strategies and principles presented in this plan, especially those involving population control measures, were specifically written to guide management of giant Canada goose populations and may not be applicable to populations of B. c. interior or B. c. hutchinsii. Any population control strategies proposed for use in the management of interior or small Canada geese should be addressed in the respective management plans for those populations and must be thoroughly reviewed by the Mississippi Flyway Council.*

All above methods, with the exception of harassment and exclusion practices, can only be done with appropriate Federal permits. Completing Strategy 2 of this Population Control Section would give states and provinces more flexibility in using lethal methods to resolve goose depredation/nuisance situations associated with high goose populations.

**Information Needs:**

1. States, provinces and federal agencies should determine the attitudes of the general public in areas with high numbers of human/goose conflicts toward Canada geese and proposed methods of population control. Canada geese are a highly visible wildlife species and, at present, there is little information available on the general public's attitude toward these birds and the methods of population control they might find acceptable or unacceptable. Determining public attitudes towards this issue will enable managers to more effectively educate the public about the need to control giant Canada goose populations and assist managers in developing guidelines for conducting population control programs.

2. In the future, large numbers of Canada geese may be available to the public via food bank programs. Guidelines for capturing, handling, finishing, processing, monitoring and distributing giant Canada geese to the public through food banks should be developed for the Flyway, based on the experience gained through existing control programs.

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# APPENDIX I

## Giant Canada Goose

## Restoration and Management Summaries

**for**

## States and Provinces

**in the**

## Mississippi Flyway

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN ALABAMA

Prepared by Keith McCutcheon, Waterfowl Biologist, Alabama Dept. of Conservation and Natural Resources

Prior to the late 1960's, efforts to establish resident geese in Alabama were attempted by trapping and pinioning interior Canada geese (B. c. interior) on state and federal refuges. These efforts proved unsuccessful. In June, 1966, 75 3 to 6-week old giant Canada goose goslings (B. c. maxima) were brought from Brigantine, New Jersey, and released on Eufaula National Wildlife Refuge (NWR) located on the Chattahoochee River along the Alabama-Georgia border. Surveys conducted later that year indicated that 30 goslings had survived. A January, 1967 counted indicated 140 Canada geese on the refuge, but whether these additional birds originated from supplemental releases or were migrants wintering on the refuge is unknown. Refuge surveys indicated that for the next decade (1967-77), numbers of Canada geese fluctuated between 130 and 250 birds. In 1975, some of the geese were diagnosed as having a form of coccidiosis and measures were taken to eliminate the disease. By 1978, the number of Canada geese using Eufaula NWR had reached 350 birds and 50 nest attempts were documented. Since that time, the numbers of giant Canada geese on the refuge have increased steadily, necessitating periodic translocation efforts to maintain the desired population level of 600-700 geese.

In 1980, 53 giant Canada geese were obtained from the Land-Between-the-Lakes region in Kentucky and Tennessee, with the cooperation of the Tennessee Valley Authority, and released in central Alabama. In 1981, 313 giant Canada geese were obtained from Michigan; 98 of these birds were released in central Alabama and 215 in Jackson County in northeastern Alabama. In 1984, 81 geese were translocated from Eufaula NWR to Jackson County.

During the late 1980's, both interstate and intrastate translocations of giant Canada geese were being made. During 1987-1990, 1,740 giant Canada geese were translocated from Tennessee, Illinois, Michigan, and Pennsylvania to northern and central Alabama. During the same period, 465 Canada geese were move from the Tennessee Valley and Eufaula NWR to central and southern Alabama. During 1991-95, translocations within state increased; 1,600 Canada geese were translocated from northern Alabama and Eufaula NWR to southern and central counties. By the fall of 1995, goose hunting was allowed in 65 of 67 counties in Alabama. The resident giant Canada goose population in Alabama is now estimated to be 18,000 to 20,000 birds.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN ARKANSAS

Prepared by Tim Moser, Waterfowl Biologist, Arkansas Game and Fish Commission

The original nesting range of giant Canada geese included very little of Arkansas (Hanson 1965) and few giant Canada geese nested in the state prior to the 1980's. The winter use of Arkansas by migrant Canada geese declined during the mid-1900s and season closures were common (Canada goose season was open only 5 years from 1962 to 1987). The Arkansas Game and Fish Commission (AGFC) initiated a giant Canada goose introduction program in 1981 to improve hunting and viewing opportunities from Canada geese. The U.S. Fish and Wildlife Service (FWS) and the U.S. Army Corps of Engineers (COE) cooperated on these efforts.

The focal area of the introduction was the Arkansas River Valley (ARV) of northwestern Arkansas. Flock establishment efforts during 1981-83 included the importation of eggs and subsequent gosling release, as well as the release of goslings and adults obtained from Ontario, Mississippi, and Illinois. Although some nests (n = 25) were found within the study area by 1983, early releases met with limited success due to poor survivorship and/or emigration from Arkansas.

During 1983-90 the AGFC, USFWS, and COE operated a captive-breeding program in northwestern Arkansas. During that period, breeding stock was obtained from Tennessee, Kentucky, North Dakota, Illinois, Minnesota, Michigan, Alabama, Ontario, and Ohio. Most geese were released as goslings but adults were released periodically. In 1990, the captive-breeding program was terminated and all breeding stock were released. From 1981 to 1990, approximately 4,750 giant Canada geese were released in western Arkansas, including 4,200 in the ARV.

Standardized population monitoring began in 1985 including spring and fall population surveys, nest searches, and reproductive success assessment, in addition to three annual surveys during the wintering period. Population evaluations indicated a flock was well established in the ARV and that geese had also pioneered to adjacent areas.

Another small giant Canada goose flock, predominantly birds associated with Missouri's restoration efforts, use COE reservoirs on the White River in northern Arkansas. Other relatively small flocks of giant Canada geese have become established in eastern Arkansas as a result of goose pioneering and introduction efforts of private individuals.

In 1992, AGFC initiated a 14-day experimental season in northwest Arkansas (West Zone), to provide harvest opportunity of the area's giant Canada geese and the variable numbers of migrant Canada geese. Estimated harvest pressure and harvest in the West Zone had increased from about 2,100 hunter-days and 350 geese in 1992 to about 6,050 hunter-days and 1,325 geese in 1994 (AGFC 1995). Check station data during 1992-94, indicated that about 86% of the harvest was comprised of giant Canada geese, 13% were interior Canada geese, and 1% were Richardson's Canada geese (AGFC 1995).

Although early introduction efforts in western Arkansas were accompanied by some crop depredation and nuisance complaints, landowner tolerance appears to have increased with the population. Nuisance situations, such as fouling of parks and private boat docks, promise to be a continuing but manageable problem. We anticipate similar nuisance problems in eastern Arkansas where goose populations are increasing. Because Arkansas is predominantly rural with generally small urban areas, we believe giant Canada goose populations can be managed adequately using regular and/or special seasons.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN ILLINOIS

Prepared by Bob Williamson, Illinois Dept. of Conservation

Giant Canada geese nested throughout prairie wetlands of Illinois prior to settlement (Hanson 1965). In the late 1800's, the Kankakee River Marshes in Indiana and Illinois possibly were one of the most important breeding areas of the giant Canada goose in the Midwest (Hanson 1965). Unfortunately, giant Canada geese disappeared from Illinois during the early 1900's primarily because of uncontrolled hunting and large-scale wetland destruction that occurred in the 1800's (Hanson 1965). In 1967, the Illinois Department of Conservation began a program to reestablish resident flocks of giant Canada geese. Perkins (1981) summarized four factors that were considered necessary to successfully establish nesting populations of Canada geese: (1) use of giant Canada geese as breeding stock, (2) confinement of geese at potential breeding sites until a nesting tradition developed, (3) provision of sufficient habitat for flock expansions, and (4) protection from hunting until populations were established. The primary project goal was establishment of self sustaining free flying resident Canada goose flocks. It was believed that the flocks would provide aesthetic values as well as a harvestable resource if population growth allowed. A related benefit of the reintroduction effort was increased waterfowl use of thousands of acres of reclaimed surface mined lands. Most of these reclaimed strip-mine lands contained small lakes and ponds with surrounding uplands seeded to grass. On many areas, cattle grazing maintained a short grass height creating ideal nesting and brood rearing habitat for Canada geese. Islands and peninsulas formed by spoil deposition provided an abundance of suitable nest sites.

Restoration efforts began in west central Illinois when 80 juvenile geese were placed in holding pens at four locations in Fulton and Knox counties. They were held in pens until the spring of 1969 when 64 of these birds were released by the Illinois Department of Conservation. The geese used for these initial restoration efforts came from stock purchased from private breeders in Illinois in the 1950s. Beginning in September 1969, townships in Fulton, Knox and Henry counties were closed to Canada goose hunting (Perkins 1981). Between 1969 and 1972, at least 400 additional birds were released in these counties. The Department of Conservation and private conservation organizations made releases in other mine areas in northeastern and southern Illinois during the 1970's.

A relocation program of geese captured in suburban areas near Chicago was initiated in 1980. The program began as an effort to relocate geese into unoccupied surface mined habitats, but within two to three years it evolved into a nuisance goose removal program. Between 1980 and 1991, nearly 8,000 geese were relocated in 46 counties. Some releases were made in refuges and private lands where hunting was not allowed, but area closures were not deemed necessary to establish populations in new areas. In addition to relocations within Illinois, approximately 3,000 adult birds were traded or given to seven other states. By 1991 giant Canada geese were reported to nest in all counties of Illinois and relocation efforts ceased.

There have been several research projects in Illinois dealing with resident geese. Two significant studies were done in west-central Illinois by Perkins (1981) and Lawrence (1987). Most of the life history information on Illinois resident geese was obtained during these two studies.

Over 40,000 Illinois resident geese have been banded since the inception of the reintroduction program. Currently about 3,000 resident Canada geese are banded annually. Band recovery information has been important to understanding distribution and harvest of Illinois resident geese. A spring population survey conducted in 1993 indicated a population of

106,200 (±67,700). In 1994, the population estimate was 114,200 (±47,900); fall flights were estimated to exceed 200,000 during these two years. In 1995, spring surveys indicated a population of 107,000 (±55,700) with a fall flight estimate of over 223,000. Morphological measurements of harvested birds and analysis of weighted band returns during the 1993 season indicated approximately 40% of the Canada goose harvest in Illinois (nearly 40,000) were giant Canada geese. Current harvest strategies are designed to maximize giant Canada goose harvests without exceeding quotas established for MVP Canada geese. MVP geese have been utilizing giant Canada goose areas to a greater extent in recent years , causing a redistribution of MVP harvest within the state.

Urban and suburban Canada goose populations have generated hundreds of nuisance and depredation complaints annually. Translocation programs and special September goose seasons were tried but were unsuccessful in reducing populations. Egg destruction and habitat modification in urban areas have provided some satisfactory results, but urban goose problems remain one of the most difficult wildlife management challenges. Future management strategies will need to be socially and politically acceptable.

A study conducted by Amundson (1988) in the Chicago metropolitan area examined fifty molting adult Canada geese during June, 1987 for detectable levels of organochlorine pesticide (OCP) and polychlorinated bipheryl (PCB) residues. Residues of PCBs found in the skin fat of these geese fell below tolerance levels set by EPA, however, under highest exposure conditions both short term and cancer risks were slightly above acceptable levels. Amundson (1988) concluded, "Short term risk and cancer risk were substantially reduced by eliminating skin consumption and gravy consumption."

In anticipation of possibly resorting to lethal removal of nuisance giant Canada geese in the future, the Illinois Department of Conservation decided to collect geese and have their breast muscles analyzed for PCB and various hydrocarbon residues. Ninety samples were analyzed from geese collected near Chicago in June, 1994 by the Illinois Department of Agriculture. The Cooperative Wildlife Research Lab at Southern Illinois University analyzed their findings and concluded, "that, based on available data, there is little risk to humans consuming geese collected in Illinois, the presence of detectable levels of contaminants that occasionally exceed published ADTs should be acknowledged so people can individually assess their own level of acceptable risk." "Recommendations for preparation and cooking (remove skin and eliminate drippings) should be provided if IDOC is involved in carcass distribution." (Woolf, n.d.)

Harvest management of giant Canada geese in Illinois is challenging because strategies must also consider the MVP harvest quotas. Although the giant Canada goose flock could withstand additional harvest it is difficult to accomplish this during years when MVP quotas are low. Seasons held in September and early October should be used when it is desirable to increase the harvest of giants without impacting the MVP flock. In order to accomplish this it would be helpful if states could hold part of their season before the late season framework. Bag limits during these earlier seasons could be larger than during later seasons. Three-way split seasons would provide the ability to set these early seasons while still allowing hunters the opportunity for some late season hunting.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN INDIANA

Prepared by Ron R. Bielefeld, Waterfowl Research Biologist, Indiana Dept. of Natural Resources

Hanson (1965) included Indiana in the original nesting range of the giant Canada goose (Branta canadensis maxima), and called the Kankakee River marshes "possibly one of the most important breeding areas of the giant Canada goose in the Midwest." Butler (1897) reported Canada geese still breeding in the Kankakee region and less frequently in other locations. However, extensive drainage initiated in 1884 (Lindsey 1966) and continuing through the early 1900s eliminated much of the breeding habitat. In addition, unregulated harvest on waterfowl prior to the Migratory Bird Treaty Act of 1918 likely contributed to the extirpation of the geese from Indiana.

Several captive flocks of Canada geese existed in northwest Indiana in the early 1900s, the progeny of live decoy flocks. The Indiana Department of Natural Resources (IDNR) purchased 50 of these birds in 1935 in an attempt to reestablish breeding geese in the Kankakee region. The site chosen for the release was the Jasper-Pulaski Fish and Wildlife Area (J-P) in northwestern Indiana. Offspring of these birds established a free-flying population by the mid-1940s. Flock size rose to about 500 birds in the mid-1950s and maintained itself until excessive hunting pressure in the late 1950s and early 1960s decimated the flock (Barnes 1957).

The IDNR initiated a program in 1964 to reestablish a giant Canada goose population at J-P. Goose hunting seasons were closed in 1965 on an area encompassing 98,718 acres around J-P and were not reopened until 1977. Population reestablishment was accomplished by releasing pen-raised goslings; 650 geese were released between 1966 and 1973. These releases eventually resulted in wild reproduction.

The success achieved at J-P prompted the start of a second flock at Pigeon River Fish and Wildlife Area (FWA) in 1974. Nesting islands were constructed and elevated nesting platforms erected prior to goose releases. By 1979, the resident population had grown to about 650. Between 1977 and 1979, 170 geese were released at Atterbury FWA. In addition, 67 and 30 geese were released at Glendale FWA in 1978 and 1979, respectively. Resident geese continue to use these areas.

In 1978 Indiana's goose restoration program expanded to private lands. The IDNR in cooperation with the Indiana Conservation Council, Inc. began a program entitled "Goose for You Too." Unlike early attempts to reestablish geese, the "Goose for You Too" program included the release of adult pairs only, rather than young and groups of adults. Between 1979 and 1982 two-hundred pairs of geese were released on 82 sites throughout the state. Many of these geese successfully bred resulting in a growing wild Canada goose flock in most areas of the state. The program was discontinued in 1982 because of lack of funds.

No formal surveys of Canada goose populations were conducted in Indiana before 1989, and surveys conducted between 1989 and 1992 did not provide a state population estimate. However, there is no doubt that Indiana's breeding goose population grew quickly between the late 1970s and late 1980s. The spring 1994 estimated population was 75,300 $\pm$ 26,800 (95 percent C.I.) geese with, 35,200 indicated breeding pairs. Canada geese currently nest at varying densities in all 92 Indiana counties, with highest densities in the northern one-third of the state.

Canada goose depredation and nuisance complaints began during the initial private-land releases. In addition, some landowners dropped out of the "Goose for You Too" program because the geese created a mess and were extremely noisy. The number of complaints grew quickly, and in 1980 the IDNR began trapping and moving nuisance geese. Other procedures such as termination of artificial feeding, erection of barriers, and use of scaring devices also were

implemented but met with little success. Although IDNR's “surplus waterfowl” policy has changed slightly over the past 14 years, more than 1000 resident Canada geese continue to be relocated annually.

The majority of geese raised and relocated over the duration of IDNR's giant Canada goose management program received U.S. Fish and Wildlife Service leg bands. More recently (1987-1993), neck collars also have been affixed to a minimum of 200 geese annually. Between 1980 and 1993, 15,358 Canada geese were banded in Indiana during late June and early July. For the period 1989 - 1993, more than 80 percent of the reported recoveries were made by hunters hunting in Indiana.

Indiana s large breeding goose population coupled with rising numbers of complaints regarding high goose densities in urban areas prompted the implementation of an early goose season. Indiana conducted experimental hunting seasons from 1-10 September in 12 counties in 1991-93 and statewide from 1-15 September in 1994-95. Goose harvest ranged from 4,619 ± 560 in 1991 to 17,439 ± 2,790 in 1994. Hunters were required to check-in geese harvested on specified dates during the early goose season in 1991-94. Results from those checks indicated that the composition of interiors ranged from 3 percent to 9.6 percent.

Management policies and goals currently are under review. However, future management strategies will be directed towards maintaining a giant Canada goose population level in Indiana that is consistent with Flyway goals, and at a level that will continue to provide the recreational hunting and viewing opportunities that people have grown accustomed to.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN IOWA

Prepared by Guy G. Zenner, Waterfowl Biologist, Iowa Dept. of Natural Resources

Giant Canada geese nested throughout Iowa in the 1800's but were extirpated from the state by 1907 (Hanson 1965, Bishop 1978). The Iowa Department of Natural Resources (IDNR) initiated a giant Canada goose restoration program in 1964 with the goal of establishing a nesting population of at least 7,000 adult birds (Bishop and Howing 1972). The primary restoration strategy involved holding clipped geese in pens surrounded by large areas closed to Canada goose hunting. Initially, 16 pairs of pinioned giant Canada geese whose origins could be traced to geese or eggs taken from the wild in northern Iowa, southern Minnesota, and South Dakota were placed in a 14-acre pen at Ingham Lake Wildlife Management Area (WMA) (Fig. 1) (Bishop and Howing 1972). Goslings were wing-clipped to increase numbers of reproductive-age penned geese. To protect free-flying geese, all public and private lands in a 120 $mi^2$ area around Ingham Lake were closed to Canada goose hunting in 1967 (Table 1). The first nest of a free-flying goose was found on East Slough near Ingham Lake in 1967.

Using the same procedure, and geese from the Ingham Flock, new flocks were started on the Smith Slough, Hogsback and Rice Lake WMAs in northern Iowa during 1971-72 (Bishop 1978). During 1977-79, flocks were also started at Rathbun Reservoir, Bays Branch, and Lake Icaria WMAs in southern Iowa. To accelerate the Rathbun Flock's growth, 275 and 1,717 Canada geese were translocated from Toronto, Ontario, to Rathbun Reservoir and surrounding farm ponds in 1980 and 1981, respectively. Additional flocks were started during 1980-90 at Red Rock Reservoir in central Iowa, Badger Lake WMA near the Missouri River, and Green Island WMA on the Mississippi River (Fig. 1) (Zenner and LaGrange, 1995). In 1993, 12 areas were closed to Canada goose hunting, ranging in size from 18-321 $mi^2$ and totaling 1,141 $mi^2$.

To accelerate the expansion of nesting Canada geese into unoccupied habitat, as well as alleviate goose depredation complaints, the IDNR translocated 5,964 geese to 33 sites during 1983-93. Flightless young-of-the-year and adult geese, in a 9:1 ratio, were moved. Geese were not translocated to urban sites despite requests to do so. Neck-collar observations of translocated geese confirmed that successful nesting occurred within 3 years at release sites.

Estimates of Iowa's giant Canada goose population were made annually. Geese were counted by IDNR personnel from the ground during April and May on all major WMAs and estimates of geese on private lands were obtained by direct observation or consulting landowners. Goose production was estimated by counting goslings in mid-late June. These estimates indicate that Iowa's giant Canada goose population increased from 860 birds in 1970 to 6,000 in 1980 to 20,000 in 1990 and grew at average annual rates of 25%, 18%, and 15% during 1972-81, 1982-86, and 1987-91, respectively . In 1975, giant Canada geese nested in 8 counties in northern Iowa. By 1985, they nested in 55 of Iowa's 99 counties. In 1993, Canada geese nested in all Iowa counties. Highest nesting populations occurred in north-central and northwestern Iowa.

Complaints of goose depredations began in the late 1970's. Most depredations involved goslings and adults grazing on newly germinated crops. Few goose depredation or nuisance complaints were received in urban areas. In 1982, a depredation control program was implemented using IDNR labor and materials. Numbers of complaints in northern Iowa peaked in 1986, declined in the late 1980's, but rose again in recent years (Zenner and LaGrange 1995). In addition to technical assistance, IDNR personnel attempted to remedy depredations using 7 practices: 1) permanent fences with standard woven wire, 2) temporary fences of 2-3 ft high

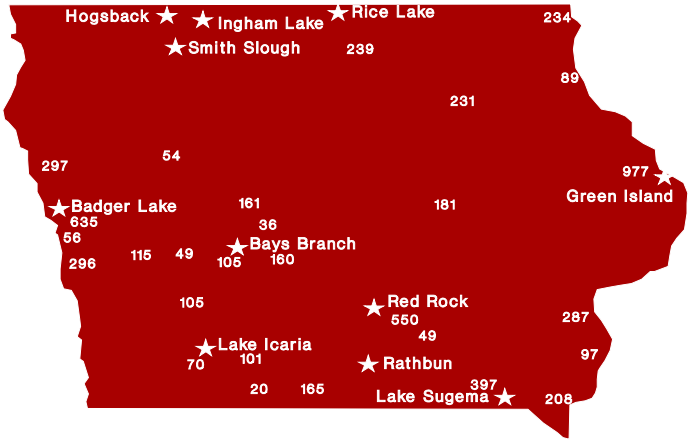
chicken wire supported by electric fence posts, 3) lure crops, 4) scare devices, 5) land acquisition, 6) translocation, and 7) reductions in sizes of areas closed to Canada goose hunting. No special early or late Canada goose seasons were implemented to reduce numbers of depredating geese or depredation complaints. Translocating geese did not reduce depredations on a regional basis, but appeared to reduce complaints and may have slowed population growth on wetlands where geese were removed.

Canada geese were banded annually at all restoration sites during late June and early July. During 1980-89, 9,666 Canada geese (status code 300) were banded in the Northwest (4,295), Rice Lake (3,313), Bays Branch (733), Rathbun (1,028), and Lake Icaria (297) flocks. Mean annual direct recovery rates of giant Canada geese banded in the Northwest, Rice Lake, Bays Branch, Rathbun, and Lake Icaria flocks during 1980-89 were 0.052, 0.018, 0.012, 0.046, and 0.005, respectively (Zenner and LaGrange 1995). Mean annual direct recovery rate for 2,577 (status 200) geese translocated between 1983-88 was 0.056. Iowa goose hunters accounted for the majority of reported recoveries of giant Canada geese banded in Iowa, but 45% of the recoveries also occurred outside the state (LaGrange and Zenner 1995). Minnesota and Missouri goose hunters reported 22% and 11% of the recoveries, respectively. Harvest derivation estimates based on weighted band recoveries indicate that from 60-75% of the Canada geese harvested in Iowa are giant Canada geese. Iowa Canada goose hunters became increasingly dependent upon giant Canada geese for recreational opportunities in the 1980's and the IDNR considers management of the giant Canada goose population in Iowa a high priority for providing Canada goose hunting and viewing opportunities in the future.

Table 1. Initial and present size of areas closed to Canada goose hunting around goose flocks in Iowa, 1967-93.

| Restoration Flock | Year Established | Initial Size | Size in 1993 |
|---|---|---|---|
| Ingham Lake | 1967 | 120 | 18 |
| Smith Slough | 1971 | 63 | 20 |
| Hogsback | 1971 | 57 | 33 |
| Rice Lake | 1972 | 113 | 38 |
| Rathbun | 1977 | 2.5 | 54 |
| Bays Branch | 1978 | 150 | 75 |
| Lake Icaria | 1979 | 88 | 88 |
| Red Rock | 1981 | 3 | 235 |
| Badger Lake | 1987 | 32 | 213 |
| Green Island | 1991 | 46 | 46 |
| Lake Sugema | 1992 | 322 | 321 |

Figure 1. Locations of giant Canada goose flocks and closed areas along with numbers of translocated geese by release site in Iowa, 1964-93.



# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN KENTUCKY

Prepared by Ronald D. Pritchert, Migratory Bird Program Coordinator, KY Dept. of Fish and Wildlife Resources

Historical accounts of giant Canada geese in Kentucky are sparse. Hanson and Nelson (1964) reported giant Canada geese historically nested in the Great Lakes region. Mengel (1965) suggested that *B. c. maxima* formerly nested in western Kentucky and Tennessee. However, no specimens have been documented. It is likely giants did historically winter on large rivers and adjacent wetlands in Kentucky. Funkhouser (1925) documented frequent observations of wintering Canada geese on several locations in central Kentucky. This is the same region in which migrant giant band recoveries are reported today.

Kentucky Department of Fish and Wildlife Resources initiated a giant Canada goose release program back in the mid-1970's. A captive flock of pinioned birds was established at the main office complex in Frankfort. The origin of birds used to start this flock are unclear. Progeny from the flock were permitted to become free flyers in the early 1980's. It was hoped these birds would pioneer new areas on the numerous farm ponds and small lakes which are characteristic of the adjacent counties. In addition, small releases of giant Canada offspring from the initial flock held in Frankfort were permitted on several residential lakes in the greater Lexington and Louisville areas.

Captive flocks were also established by two federal agencies at opposite ends of the state (Figure 1). In 1977, the U.S. Forest Service established a flock at Cave Run Lake in the Morehead District of Daniel Boone National Forest in eastern Kentucky. The Tennessee Valley Authority established the second flock in 1979 on Land Between the Lakes (LBL) in western Kentucky. The Canada goose season was closed around the Cave Run Lake region to permit these birds to become established. Goose seasons remained open in the LBL region but area closures were used to protect the flock.

In addition to the captive flocks, Kentucky Department of Fish and Wildlife Resources in cooperation with coal companies established flocks in several other areas. Giant Canada geese obtained from Michigan, Illinois, Tennessee and others were released on selected reclaimed coal mine lands in eastern and western Kentucky (figure 1). Wing-clipped geese were released in enclosures on final cut lakes or ponds. Artificial nest structures and suitable habitat were provided on each release site. First year flightless birds received supplemental feedings to insure their survival over winter. All goose hunting within the region of the release sites were closed to permit growth of the flock. It is estimated a total of 1,800 Canada geese were obtained from various states and released in western and eastern Kentucky as part of this program.

Today, Kentucky's giant Canada goose population has expanded across most of the state. Many of the major reservoirs are reported to have breeding resident geese. Farm ponds and watershed lakes provide additional habitat throughout the central and northwestern parts of the state. Final-cut lakes on reclaimed surface-mined areas, major reservoirs and river systems provide open water for wintering geese.

Statewide estimates of Kentucky's breeding giant Canada goose population were initiated in 1994. The initial survey indicated Kentucky's current population at about 20,000 birds. The largest concentrations of geese continue to be associated with the areas where initial releases occurred.

A short goose season was initiated in region of the release sites for the 1993-94 hunting season. A free mandatory permit and survey card was required for each person participating in the hunt. Harvest data from the survey indicated about 850 geese were harvested during the first year of the hunt. The season is planned to continue in 1994-95 with mandatory permits still

required to hunt in these areas.

The first complaints of goose depredation attributed to resident Canada's were recorded in the late 1980's. Currently, KDFWR receives about 12-15 depredation complaints per year. In addition, the U.S. Department of Agriculture, Animal Damage Control receives an equal number of complaints. KDFWR offers technical assistance in an effort to alleviate nuisance goose problems.

Each year KDFWR bands resident geese on major molting areas across the state (Figure 2). To date KDFWR and other participating agencies have banded over 7,000 giant Canada's in Kentucky. Most band recoveries of these birds occur in Kentucky within the region of banding. In addition to local recoveries band returns have been reported from Indiana, Michigan, Illinois, Wisconsin, Ohio, and Ontario, Canada.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN LOUISIANA

Prepared by Robert Helm, Waterfowl Study Leader, La Dept. of Wildlife & Fisheries

The hunting season for Canada geese was closed statewide in 1962 following decreasing wintering populations in the 1940 and 1950's. Related to this reduced number of migrant Canada geese, the Louisiana Department of Wildlife and Fisheries (LDWF) initiated a Canada goose restoration program in 1960 to establish nesting populations within the state (Chabreck et al 1974). Between 1960-65 1,850 wild-trapped Canada geese (primarily *B.c. interior*) from Wisconsin, Minnesota, Missouri and Saskatchewan were transported to the LDWF's Rockefeller Refuge in southwestern Louisiana. Due to the northward migration of many of these wild-trapped geese and also their limited nesting success, 130 giant Canada geese (*B.c. maxima*) were purchased from Minnesota in 1966 (Belsom 1974). An additional 830 giant Canada geese from Minnesota and Saskatchewan were added to the Rockefeller Refuge captive flock from 1967-69. Geese were pinioned and released in enclosures that totalled 300 acres.

Production was intensively monitored on the Refuge through 1973 (Chabreck et al 1974). Eggs were removed from early nests and placed in incubators to encourage renesting and increase production. During 1967-73, almost 1,200 nests containing 5,260 eggs had been located on the Refuge (Belsom 1974). Geese became acclimated to the warmer southern temperatures and nested earlier each succeeding year with nest initiation occurring in February. Hatching rates from incubators were low (27%) while nesting success within enclosures was high (60%). Goslings were placed in enclosures to increase survival rates. The Canada goose population on the Refuge was 2,250 in 1973. The initial nesting of geese off of the Refuge occurred in 1969.

Supplemental feeding, along with incubation of eggs and maintaining enclosures for goslings, continued on the Refuge through 1988. Between 1961 and 1987, 6,362 Canada geese were produced and banded on Rockefeller Refuge (unpublished reports, Rockefeller Refuge). Population levels were maintained at approximately 3,500 from the mid 1970's to 1988 with an estimated 1,000 of these Canada geese being found off-Refuge by 1988. Supplemental feedings and other propagation means were discontinued in 1988 and the population declined to 1,000 by 1994. Increased predation rates on geese nesting off the Refuge apparently caused this recent population decline.

To expand the range of nesting geese in the state, the LDWF began translocating geese from Rockefeller Refuge to other sites within the state in 1973. Between 1973-1988, 607 (range 24-145 geese/release) Canada geese were released at 16 privately owned sites. Geese were wing-clipped prior to release and supplementally fed. Most release sites were farm ponds, and reservoirs with no protective measures (enclosures) employed. The success of these releases was poor and few viable flocks remain.

Goose depredation and nuisance problems have been minimal in Louisiana as related to the low population of giant Canada geese within the state. The few complaints received have been in urban settings related to residential developments, golf courses and marinas. Approximately 30 geese have been captured, wing-clipped and transported to Rockefeller Refuge from 1990-94 to alleviate nuisance problems.

The LDWF has no future plans to continue the effort to establish a resident Canada goose population in Louisiana.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN MANITOBA

Prepared by Murray Gillespie, Manitoba Department of Natural Resources

Historic records indicate that giant Canada geese nested throughout the parkland region of southern Manitoba in the late 1800's and early 1900's. In *The Birds of Manitoba*, Ernest Thompson Seton referred to nesting giant Canada geese on West Shoal Lake, the Assiniboine River and the Shell River in the 1800's. However, giant Canada geese were intensively exploited in the late 1800's and early 1900's, prior to hunting regulations. By 1917, Taverner reported that breeding giant Canada geese were scarce on Shoal Lake. The disappearance of breeding giant Canada geese across southern Manitoba coincided with the rapid human settlement that occurred between 1870 and 1900.

Giant Canada goose restoration programs began as early as the 1940's at Delta Marsh and in southeastern Manitoba. Giant Canada geese were known to be nesting at Delta Marsh in 1935, but additional birds were released on the marsh in 1945. The large Canada geese brought to Delta came from the Steinbach area where they had been seized from a local resident who was using them as a decoy flock.

Early 1940's reports indicated low numbers of nesting giant Canada geese at Marshy Point and on neighboring marshes. Beginning in 1951, Canada geese from 3 different locations in Manitoba were translocated to Marshy Point; these geese came from Island Park in Portage la Prairie, Delta Waterfowl Station and Dog Lake. Facilities were constructed to over-winter the birds and nesting structures were erected to improve nest success and gosling production. In 1953, a 142 sq. km Canada goose sanctuary was created around Marshy Point to protect this expanding flock. Following the initial releases, annual translocations were made until 1959 when all geese were released. Band recoveries from geese moved to Marshy Point indicated that the majority of these geese were wintering at Rochester, Minnesota. This wintering area was given additional protection in 1961 when the existing sanctuary was expanded to 172 km2.

Another early attempt to protect and enhance giant Canada geese in Manitoba occurred in 1939 when Alf Hole raised 4 goslings he found along the railway in southeastern Manitoba. From this small beginning he established a flock of giant Canada geese at Rennie, Manitoba, on his private refuge. This area was designated as a provincial Wild Goose Sanctuary in 1954. Band recoveries indicated these geese wintered at Rock Prairie, Wisconsin.

The success of the goose restoration program at Marshy Point resulted in the expansion of nesting giant Canada geese into the Interlake region. This flock was given additional protection with the creation of game bird refuges at Grant's Lake in 1950, Delta in 1952, West Shoal Lake in 1955, Dog Lake in 1957, Sleeve Lake in 1965, Lee Lake and Reykjavik in 1966, and Hecla Island in 1983. By 1970, the "Interlake-Rochester" flock was estimated to number 10,000 birds. By the late 1980's, it had grown to over 35,000 geese.

It appeared that the refuges played a major role in the expansion of locally breeding giant Canada geese. The expansion of the Interlake population was enhanced by the favorable survival rates of geese staying at Rochester for the winter period. Raveling found that geese that migrated further south to areas like Missouri and Illinois had much higher mortality rates. In fact, these southern cohorts were probably declining while the birds that wintered further north formed a reservoir of geese that quickly occupied habitat that became available as a result of the higher mortality experienced by the southern birds.

Interest in restoring giant Canada geese to their former nesting range resulted in an effort to move geese from Regina, Saskatchewan, to Oak Lake, Manitoba, in 1965. Several releases

were made during 1965-76. Adult giant Canada geese were captured with goslings and transported to Oak Lake. A "special goose refuge," 117.6 m2 in size, was created in 1966 to protect these birds. Nesting structures, including round bales, were provided to enhance nest success. High translocation mortality and low reproductive success resulted in initial slow population growth. However, continued protection has resulted in a positive growth trend for this flock.

As efforts were being made to reestablish giant Canada geese in southern Manitoba, expansion of existing populations was also occurring. The late 1950's and 1960's saw continued growth and expansion of Manitoba's giant Canada geese. Population growth escalated even more in the 1970's and 1980's. By 1980, giant Canada geese were distributed all across southern Manitoba and north to the Churchill River. Evidence of this natural expansion was clearly illustrated at Oak Hammock Marsh. Oak Hammock was restored as a marsh in early 1970's and within just a few years, a pair of Canada geese was observed nesting on the area. The number of nesting pairs on this areas had grown to 20+ by the early 90's. Similar expansion has occurred on other marsh habitat developments throughout southern Manitoba.

Manitoba has also experienced the expansion of nesting Canada geese into urban areas. Giant Canada geese began nesting in the City of Winnipeg at the Fort Whyte Nature Centre in the early 1970's. Efforts to encourage expansion of these urban geese included translocations from captive flocks in southern Manitoba as well as construction of nesting structures. As a result of these efforts, nesting pairs have increased from 4-5 in the early 1980's to 50+ in the 1990's. Development of a large number of storm retention ponds in residential areas of Winnipeg, coupled with the public's efforts to encourage goose use by installing nesting structures resulted in rapid expansion of this urban goose population. These urban geese have also begun to attract increasing numbers of migrant geese. The number of geese in the Winnipeg city limits during the fall has jumped from a few hundred in the early 70's to nearly 100,000 by the mid 1990's. The result of all these geese within city limits has been increasing numbers of complaints concerning goose grazing and goose feces on lawns. In addition, complaints from golf courses within the city have been on the increase.

The problems associated with geese within the city are under review and a management plan is being developed. Alternatives being considered include reducing the number of nesting structures (already initiated), capturing and translocating geese, destroying nests, and allowing hunting in the agricultural areas within the city limits.

Many aspects of the expansion of the giant Canada goose population can be viewed positively. However, for Manitoba, there is a major negative aspect to this success story. Increased numbers of all geese in southern agricultural areas of Manitoba have resulted in an increased numbers of complaints regarding damage to agricultural crops. These populations have established traditions of staging on marshes that provide easy access to surrounding cereal crops, of feeding in protected areas such as fields within city limits, and of remaining in the province later during the fall. All these activities are of great concern for managers and they create significant economic problems for both the farmers and the agencies attempting to control depredations.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENTIN MICHIGAN*

Prepared by: Jerry Martz, Waterfowl Biologist, Michigan Dept. of Nat. Resources, and
W. C. "Joe" Johnson, Director, Michigan State University, Kellogg Bird Sanctuary

Like several other species of wildlife, the Giant Canada was probably driven to near extinction by early settlers in Michigan. Barrows (1912) was aware that nesting geese had become very rare in other Great Lakes states, but believed that they once nested throughout Michigan. He thought it was not impossible that single pairs still did. In 1922, W. B. Mershonf Saginaw argued the existence of a race of giant Canada geese still living in the Dakotas. By 1954, however, no fewer than nine authors had stated that the subspecies was extinct (Delacour 1954). Pirnie (1938) and Wood (1951) concluded that there were no authentic records of nesting geese prior to the development of restoration programs. However, Hanson (1965) assembled evidence of the continued existence of the population, and included the southern Lower Peninsula (LP) as a part of the presettlement breeding range for the giant Canada goose.

To understand current distribution, it is instructive to review historical restoration efforts. W. K. Kellogg of Battle Creek (Calhoun County) and H. M. Wallace of Howell (Livingston County) began restoration programs in the 1920s. Wallace's geese were obtained from H. J. Jager of Owatonna, Minnesota. In 1936, Wallace gave 332 geese to the Seney National Wildlife Refuge (NWR) in Schoolcraft County. Wallace also provided birds to the Mason State Game Farm (Michigan Conservation Department) in Ingham County. Between 1928 and 1964 the Michigan Department of Natural Resources (DNR) released 2,500 geese on 30 sites, resulting in 14 breeding populations by 1969 totaling 7,150 birds (from Mikula, in Home Grown Honkers, Dill and Lee, 1970). This program was not unlike that conducted in other states and on many national wildlife refuges, as a result of "rediscovery" of the giant Canada goose by Harold Hanson (1965).

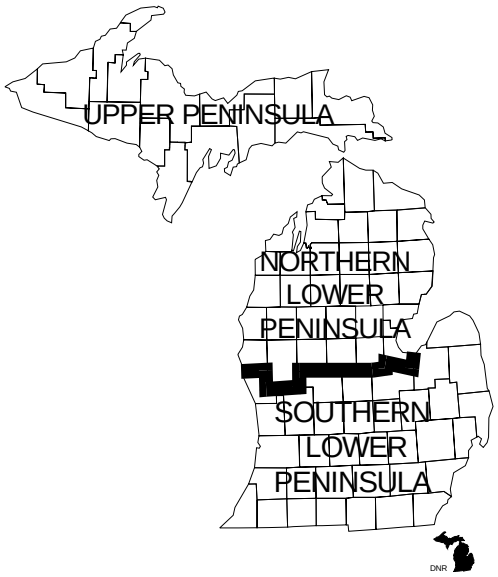
Populations grew rapidly in southern Michigan. Highest densities of nesting geese in the southern LP are associated with the abundant lakes and wetlands in the rolling plains of Barry, Kalamazoo, St. Joseph, Calhoun, Jackson, Livingston, and Oakland counties. Biologists' estimates of the statewide fall flight of resident birds expanded from 9,420 in 1969 to 111,000 in 1993 (Table 1). These are probably underestimates, since the 1993 breeding population estimate from statewide systematic aerial survey routes was about 138,000, and exceeded 200,000 in 1994. This 1994 breeding population should have yielded a fall flight in excess of 300,000 birds. Presently, about 75 percent of the state's breeding population is located in the southern farm-urban region of the LP, and about 25 percent in the northern forests, but nesting occcurs in all 83 of Michigan's counties.

In 1972 the DNR began a translocation program to reduce goose concentrations and associated nuisance problems, in suburban lakeshore and urban habitats. During 1972-1985, these birds were used to stock unoccupied habitat in southwest and northern Michigan counties or were furnished to other states. Over 32,000 birds were translocated during 1972-1993.

From 1988 to the present many young geese were translocated to state wildlife areas to supplement hunting recreation. Groups of adults were sent out-of-state. However, by 1993 out-of-state demand lessened considerably. Translocated birds provide significant local hunting recreation, resulting in reduced survival rates for young-of-the year geese. Survival rates of translocated adults have been higher and many return to the general capture area to nest again. Thus, translocation of adult geese appears to be less effective as a population control measure.

Table 1. Michigan's giant Canada goose fall flight from estimates of district wildlife supervisors.

| Area of the State | YEARS 1969 | 1977 | 1981 | 1985 | 1990 | 1993 |
|---|---|---|---|---|---|---|
| Upper Peninsula | 1500 | 2764 | 3855 | 12060 | 12200 | 15400 |
| Northern Lower Peninsula | 1000 | 2037 | 3505 | 7523 | 14660 | 16140 |
| Southern Lower Peninsula | 6920 | 7870 | 12845 | 35595 | 48650 | 79350 |
| STATE TOTAL | 9420 | 12671 | 20205 | 55178 | 75510 | 110890 |




Special Canada goose hunting opportunities have been permitted in Michigan with concurrence of the Mississippi Flyway Council and U. S. Fish and Wildlife Service since 1977 to assist in giant Canada goose population control. The first special hunting opportunities included an additional bird in the bag and additional days of hunting at the end of the 1977 regular season in southeast Michigan. These opportunities were expanded to include a special late hunting season in southern Michigan (1982 to the present). An early September hunt is now permitted statewide, having first begun in 1986. In 1994, about 44 percent of the Canada goose harvest occurred in special seasons, along with 55 percent of all band recoveries of resident birds.

By 1995 Rusch (University of Wisconsin) estimated that 52 percent of Michigan's annual Canada goose harvest was derived from its own resident population, and another three percent from giants of other states and Canadian provinces. In the 1960s, Michigan's annual Canada goose harvest was about 12,000; in the late 1980s and early 1990s it was greater than 70,000--a six-fold increase over the 1960s. Recreational hunting has slowed growth of resident populations in many parts of Michigan. However, the limitation of hunting opportunities in the southeast metro counties of the LP has resulted in inadequate control of population growth.

*The two introductory paragraphs are paraphrased from Johnson, W.C. in Michigan Bird Atlas, Brewer, et. al. (1991).

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN MINNESOTA

Prepared by J. S. Lawrence, Waterfowl Specialist, Minn. Dept. of Nat. Resources

Giant Canada geese historically nested throughout Minnesota, exclusive of the far northeast (Hanson 1965). The last confirmed record of a nesting pair was at Swan Lake, Nicollet Co., in 1929 (Roberts 1936). Early restoration efforts occurred on several National Wildlife Refuges, beginning at Agassiz NWR (then Mud Lake) in the late 1930's with Canada geese (*B. c. moffitti*) from Oregon, Utah, or Montana (Nelson 1963). In 1949 and 1950, additional Canada geese (probably *B. c. maxima*) were moved to Agassiz NWR from Seney NWR in Michigan (Nelson 1963, Dill and Nelson 1970). Seney goslings were also released at Rice Lake and Tamarac NWR's in the 1950's, which combined with geese from other sources to establish flocks in these areas. Additional geese were held in captive flocks and later released on these refuges in the late-1950's and early-1960's.

In 1958, the Minnesota Division of Game and Fish began efforts to establish breeding Canada geese on selected state wildlife areas (Mikula et al. 1970). A captive flock was established at Carlos Avery Game Farm and goslings from this flock were moved to major Wildlife Management Areas where they were held captive for three years. This program resulted in the successful restoration of geese at Thief Lake, Roseau River, Lac qui Parle, and Talcot Lake (MN DNR 1977*a,b,c*, Hansen et al. 1980, Parker et al. 1980).

In 1968, breeding age geese (n=112) were captured at Roseau River WMA (NW MN) in February and moved to Fox Lake (SC MN, power plant) in an effort was to establish a migration pattern between these two sites (Mikula et al. 1970). Instead of returning to Roseau River in the Spring, the geese nested at Fox Lake. In June 1968, 112 adults and 115 goslings were captured and moved back to Roseau.

Much of the Canada goose restoration in Minnesota has been through private efforts. Many individuals were responsible for the maintenance of the giant subspecies in captive flocks (Hanson 1965). The North Heron Lake Game Producers Association reestablished breeding geese in their area (Thompson and Sather 1970). Other notable private flocks included those in west-central Minnesota (Mikula et al. 1970). A 1968 report noted 8 private release sites in Otter Tail, Grant, Douglas, Carver, Anoka, Washington, and Jackson counties which accounted for 1,500 geese in the fall population (MN DOC 1968*b*). In addition, 53 Game Farm licenses were issued to individuals holding 20 or more Canada geese in 1968. In the Twin Cities metropolitan area, restoration began in 1955 and 13 major flocks were established prior to 1977 (Sayler 1977). The Department issued a publication to assist private individuals in establishing local-breeding flocks (MN DOC 1968*a*).

The Department established 3 goose refuges specifically to enhance locally-breeding giant Canada goose populations, including the Otter Tail Co. (Fergus Falls, est. 1965, »127 sq. mi.), Douglas Co. (Alexandria, est. 1990, »150 sq. mi.), and Sauk Rapids-Rice (est. 1974, »50 sq. mi.) goose refuges. As goose populations increased, seasons on these goose refuges were gradually increased in length until they encompassed the entire goose season in 1989-90. The North Metro Goose Zone (all or part of Ramsey, Washington, and Anoka counties), which was closed to Canada goose hunting, was established in 1966. In the late 1970's and early 1980's the zone was gradually opened and it was abandoned in 1984.

The second phase of goose releases began in 1982, when Dr. J. Cooper, Univ. of Minn., in cooperation with Minn. DNR and local municipalities (who provide funding), began capturing geese in the Twin Cities to alleviate nuisance problems. A total of 27,220 geese was captured in

the Metro area during 1982-94; almost all adults were shipped to other states. In recent years, all goslings have been relocated within Minnesota. Since 1990, 11,733 goslings have been released in the state (NW=2,711, NE=270, EC=1,264, SW=20, SE=360, Metro=298, and Geese Unlimited=6,810, most released in NE Minn.). Current plans call for releases in some areas of Minnesota; however, as agricultural depredations, safety, and nuisance problems develop, tolerance for releases has declined.

The May waterfowl breeding population survey, which includes 39% of the state, indicates the giant Canada goose population increased dramatically in Minnesota during the 1980's (Fig. 1). This does not include the Twin Cities metro area, which has a substantial population of breeding geese (20,000+). In addition, Canada geese have expanded their breeding range throughout the state, exclusive of some areas in the far northeast, and are reportedly increasing in many unsurveyed areas. In addition to geese that breed in Minnesota, the Interlake/Rochester goose flock, which nests in the Interlake region of Manitoba and winters in Rochester, has increased to a winter peak of almost 35,000.

Area managers use standard techniques (tape, scare devices, food plots, etc.) to deal with specific depredation complaints. DNR recently hired 3 depredation specialists who will be dealing with animal damage, including goose, issues. However, management has emphasized special Canada goose seasons to increase the harvest of locally-breeding geese when few migrant geese are present. The first seasons were held in 1987 in the Twin Cities Metro (Sep, Dec) and Olmsted County (Dec) goose zones. Since then, September seasons have been added in the Fergus Falls/Benson (expanded from Fergus Falls/Alexandria) and Southwest goose zones (expanded from Southwest Border). Harvest during 1993 was estimated at 22,907 Canada geese for the 3 zones during the September seasons. A December season in the Fergus Falls/Alexandria area was added in 1993.

Minnesota uses zones to separate harvest of Eastern Prairie Population (EPP) and giant Canada geese. The Southeast goose zone was established in 1973 based on harvest of the Interlake-Rochester and Twin Cities giant Canada geese and the Lac qui Parle quota zone was established in 1975 as the major Minnesota EPP harvest area. More recently, the West Central Goose Zone (1988) and the West and Northwest goose zones (1993) were added to further isolate EPP harvest. Approximately 50-60% of Minnesota's goose harvest is comprised of giant Canada geese, suggesting recent harvests between 50,000 and 65,000.

Currently, the state is reviewing giant Canada goose management. There is a need to remove geese from the Twin Cities metro area; however, potential release sites, especially for the adults, may be limited. Alternatives being considered include large-scale releases of goslings on some Wildlife Management Areas and providing processed geese to food shelves.

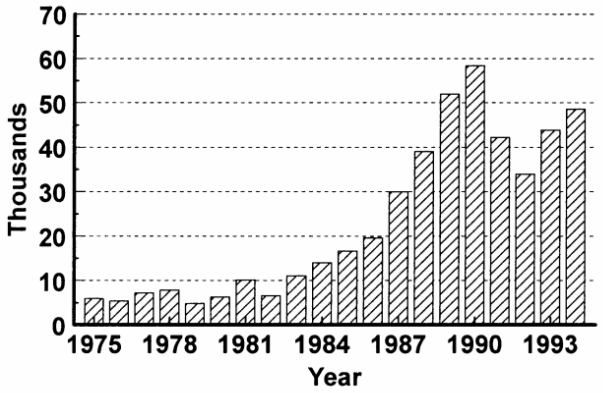



Fig. 1. Canada geese observed (unadjusted for visibility) during May waterfowl breeding population surveys in Minnesota, 1975-94

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN MISSISSIPPI

Prepared by Richard K. Wells, Waterfowl Coordinator, Mississippi Dept. of Wildlife, Fisheries and Parks

During the early 1960's on Sardis Waterfowl Refuge, located near College Hill, Lafayette County, Mississippi, a fledgling Giant Canada Goose program was started by the Mississippi Game and Fish Commission. A 40-acre enclosure protected by an eight-foot high predator-proof electric fence was constructed to hold paired pinioned Canada geese. Giant Canada geese were obtained from Ohio and Louisiana wildlife agencies for this initial project. These tub nesters were moderately successful in producing free-flying young that pioneered to Sardis Lake and the surrounding area.

During the 1980's, continental waterfowl populations of various species along with quality waterfowl habitat continued a steady decline due to drought conditions in the breeding grounds. Many wildlife agencies across North America had established successful local Giant Canada goose flocks in their respective states that provided hunters additional hunting opportunities and nonconsumptive recreational users additional wildlife resources to enjoy.

In 1987 the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) set a goal to establish a state population of 15,000 Giant Canada geese. Giant Canada geese were obtained from wildlife agencies in Georgia, Illinois, Pennsylvania, North Carolina, Minnesota, Michigan, Tennessee and Toronto, Ontario, Canada. Most of the release sites were on catfish ponds throughout the Mississippi Delta. These sites located in rural Mississippi provide permanent water, food and protection for the released birds. Other release sites included major reservoirs (Arkabutla, Ross Barnett, and Sardis) , the Tennessee-Tombigbee Waterway, and the coastal counties of Jackson, Hancock and Harrison.

Approximately 20,000 Giant Canada geese have been stocked across Mississippi since 1985. Populations of Canada geese are becoming established and their offspring are doing well. In 1995 new hunting seasons on these Giant Canada geese are offered in 79 of Mississippi's 82 counties.

The translocation of Giant Canada geese into Mississippi ended in July of 1995. The annual recruitment of new birds each year from the local flocks does not require further stocking.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN MISSOURI

By David Graber, Wildlife Research Biologist, Missouri Department of Conservation.

The native breeding range for giant Canada geese included much of what is now the state of Missouri. Giant Canadas were most abundant in the prairie regions of northern and western Missouri and along the major rivers. Early reports of giant Canada geese in Missouri came from explorers traversing the Missouri River (Lewis and Clark 1893, McKinley 1961). During the 1800s, increasing settlement, market gunning, and nest robbing resulted in a dramatic decline in giant Canada geese. Nesting geese were reported from Southeast Missouri into the early 1900s, and a small population of native giant Canada geese apparently persisted by nesting on cliffs along the lower Missouri River.

Restoration of giant Canada geese in Missouri began during the late 1940s and early 1950s. Initial restoration attempts occurred in 1949 on the August A. Busch Memorial Wildlife Area (WA), located near St. Louis, and in 1952 at the Trimble WA, located north of Kansas City. The use of elevated nesting structures resulted in high nest success and produced a source of 6-9 week old goslings for restoration purposes elsewhere (Brakhage 1965). Stock from the Trimble WA was initially used to establish nesting Canada goose flocks on other Missouri Department of Conservation (MDC) lands and later, to supply geese for restoration purposes on private lands (Brakhage 1970, MDC unpub. rept., 1987). From 1949 to 1991, approximately 4,650 giant Canada goose goslings (6-9 weeks of age) were released at 44 locations. Twenty-seven locations were on land owned or leased by MDC and 18 were on private or other public land. Breeding pairs are now present on at least 24 MDC conservation areas and in at least 83 of Missouri's 114 counties.

The original goals were to restore this species to its native range with the added benefit of public viewing and hunting. The objective to restore nesting giant Canada geese to at least 75 of Missouri's 114 counties was exceeded by 1991. Numerical population objectives were not established initially because surveys were not in place to provide reliable population estimates to measure progress. Statewide surveys conducted since 1993 resulted in giant Canada goose breeding population estimates of 30,800, 35,050 and 32,200, during April of 1993, 1994 and 1995, respectively. With only 3 years information, the statewide population appears to be relatively stable, but surveys should be conducted for several more years to determine whether or not a trend exists.

The current distribution of breeding Canada geese in Missouri is primarily within their native range. Populations are highest in the western and northern prairie regions and in counties bordering the Missouri River (Fig 1.). Goose numbers are also high around major urban areas such as St. Louis and Kansas City. The above urban centers are near major rivers where geese were reported in high numbers during pre-settlement times. Intensive wetland drainage and conversion to agriculture has limited re-establishment of populations in native range in the Mississippi Lowlands in southeast Missouri. An established breeding population in the White River Lakes area in southwest Missouri is likely outside the original range of giant Canada geese in the state. Few or no giant geese are present in the forested Ozark Plateau of southcentral and southeast Missouri.

Most Missouri citizens are pleased by the restoration of giant Canada geese. Public viewing and hunting of Canada geese now is available throughout the state instead of being limited to major goose concentration areas. In Central Missouri, 3/4 of the citizens surveyed in 1994 reported that they had seen geese in the area where they live, and 3/4 of the respondents reported that they would like to see about the same number (42.4%) or more (32.4%) geese in

the area. Only 8.6% reported that they would like to see fewer geese in the area. Positive aspects of increasing numbers of geese are offset by a growing number of complaints. In Missouri, most complaints originate from urban locations and include problems similar to those described in other urban areas (Conover and Chasko, 1985). Strategies to deal with nuisance Canada goose problems include: providing educational material and technical advice to prevent or alleviate problems, recommending hunting seasons to control populations in specific areas, working cooperatively with other agencies (APHIS, USFWS, Extension) to control nuisance problems, and conducting research to better identify and alleviate problems caused by geese. Translocation has been rejected as a method of nuisance control because it was used unsuccessfully in the past, it can be expensive and it is believed to contribute to problems in new locations. Removal of incubating females and humane disposal during the flightless period are currently being investigated as potential approaches of controlling nuisance problems and population size in urban locations.

The growing giant Canada goose population in Missouri presents both opportunities and challenges for Canada goose harvest management. Population and harvest monitoring programs must cover a greater geographical area than in the past. The presence of giant Canada geese also confounds the interpretation of data collected on intermediate sized migrant Canada geese. The challenge is to develop accurate population monitoring programs for all goose populations using Missouri, and to design harvest strategies that target or restrict harvest of specific populations.

According to band derivation estimates by Rusch (1995), about 44 % of the Canada goose harvest in Missouri during 1989-93 consisted of giant Canada geese. Giant geese banded in Minnesota comprised 21% of the total Canada goose harvest in Missouri while locally banded giants provided 14%. Less than 10% of the harvest consisted of giants banded in Manitoba, Iowa, Illinois and Wisconsin, combined. Intermediate sized migrants made up 56% of the total Canada goose harvest in Missouri. By population, the EPP, TGP, and MVP averaged 31%, 13%, and 12% of the total statewide Canada goose harvest during 1989-1993 (Rusch 1995). Harvest management strategies for giant Canada geese in Missouri will be designed to take advantage of greater numbers of local and migrant giant Canada geese, while minimizing the impact on intermediate sized and small migrants. While it is appropriate to allow additional harvest on this growing resource, it should also be recognized that harvest management alone will not solve the problems of increasing numbers of giant Canada geese in urban locations. New methods may need to be developed to deal with Canada geese in urban environments.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN OHIO

Prepared by Gildo Tori and Mark Shieldcastle, Ohio Division of Wildlife

Giant Canada geese were reportedly extirpated from Ohio between the end of the Civil War and the turn of the century (Hanson 1965). The Ohio Division of Wildlife initiated a giant Canada goose restoration program on 3 state-owned wetland areas in 1956. Original restoration efforts consisted of 10 mated pairs of Canada geese confined to 5-acre pens on each of the Mercer Goose Management Area (GMA), Mosquito Creek GMA and Killdeer Plains GMA. All Canada geese used for restoration originated from private decoy stocks that had been kept for 30 to 60 years by their owners and ancestors prior to purchase by the state (Bednarik 1980). Breeding enclosures were later enlarged to 60 acres to accommodate the rapidly growing flocks.

Traditional ground-nesting Canada geese were imprinted to elevated nesting structures to minimize predation and decrease intraspecific strife. No hunting buffer zones around each goose area were established to attract and hold free-flying wild geese within the boundaries of the buffer zone during the autumn migration and waterfowl hunting season. All goose flock sites were maintained free of disturbance from bird watchers, hunters, fishermen, trappers, field trials and tourists. In 1967, the Division of Wildlife entered into a Canada goose restoration effort in the Lake Erie Marsh region through a cooperative agreement with the U.S. Fish and Wildlife Service on the Ottawa National Wildlife Refuge (ONWR). Fifty mated pairs of giant Canada geese were transferred from the Mosquito Creek Wildlife Area to a 60-acre enclosure on the ONWR. In 1979, the Division of Wildlife entered into a cooperative agreement with the Ohio Power Company to introduce Canada geese into reclaimed strip mine lands in Muskingum County. Giant Canada geese (1,500) of mixed age classes were obtained in Toronto from the Ontario Ministry of Natural Resources and placed into a 70-acre enclosure on the Ohio Power Co. Lands to establish a flock in southeastern Ohio.

Production surveys were conducted on the five management areas from 1957-93 to estimate annual production (Tori et al. 1993). The first statewide survey was conducted in 1979 and indicated Canada geese nested in 49 of Ohio's 88 counties and the population consisted of 3,300 nesting pairs and 18,000 total geese (Bednarik 1980). Recent surveys indicate geese nesting in all Ohio counties with population estimates ranging from 50,000 to 100,000 birds (Wood et. al. 1995). Canada geese have been banded at all goose management areas since restoration began and elsewhere as concentrations could be found. Average bandings per year were: pre-1970 (1,500), 1970-79 (3,000), 1980-1984 (4,000), 1985-1989 (7,000); 1990-1993 (10,000) (Tori et al. 1993)..

As the population spread across the state, conflicts and depredation complaints increased. To alleviate overpopulation problems and depredation complaints, geese were translocated from urban areas starting in the mid 1980's and released on goose management areas or translocated to southern states. In this time period, approximately 1,500 adult geese were translocated to southern states (primarily Mississippi and Oklahoma) and thousands of immature geese were translocated to goose management areas. Since 1990 nuisance complaints have been tabulated by administrative districts, and have grown to approximately 460 despite translocation efforts. A collaring study was initiated in 1989 to assess movements of translocated geese in the state to determine the effectiveness of translocation. Observations indicated adult geese captured in nuisance situations returned to similar or original habitats if not harvested after release, and immatures tended to be incorporated into local flocks. To assist landowners in reducing or solving conflict situations, a technical guidance sheet was developed that stressed hunting, hazing and habitat alteration as the primary means to reduce goose problems. Relocation and

egg shaking are also employed, but to a much lesser extent because of their limited success. The Ohio Division of Wildlife assumed the responsibility of permit issuance from the U.S. Fish and Wildlife Service in 1994 for all waterfowl related conflict situations to simplify the permit procedure, ensure compliance with control methods and increase effectiveness.

Ohio initiated an experimental September 1-10 season in nine northeast counties in 1991 to provide extra harvest opportunity for giants and to reduce populations of geese that were causing nuisance complaints. Thirty-one additional southwest Ohio counties were added in 1993, and the season was expanded statewide and extended until September 15th in 1994. Harvest during the early seasons was 2,861 in 1991, 2,801 in 1992, 6,505 in 1993 and 15,023 in 1994. The statewide early Canada goose season became operational in 1995.

Since 1991, Canada geese have been the number one waterfowl in the Ohio hunter's bag. Average annual harvests in the past 2 decades have risen dramatically (1961-70 was 3,795; 1971-80 was 10,140; 1981-90 was 18,870; 1991-94 was 43,400). Recent estimates (Rusch and Wood 1995) indicate 91% of Canada geese harvested in Ohio are giants with 91% of those being Ohio resident geese. Giants from Michigan, Indiana, West Virginia, Pennsylvania, and Ontario comprise the remaining giants taken in Ohio. Southern James Bay Population (SJBP) and Mississippi Valley Populaion (MVP) Canada geese comprise 7% and 4% of Ohio harvest, respectively.

Ohio's migrant interior goose population, the SJBP, declined to low levels in the early 1990s. precipitating restrictive harvest regulations in parts of Ohio and other Mississippi and Atlantic Flyway states. These restrictive regulations substantially reduced harvest of not only the SJBP geese, but also local Ohio giants, furthering their growth and aggravating potential problems. Early seasons have offset the loss of hunting opportunity and have been effective at harvesting large numbers of giants, but it is still too early to document the effects of liberal early seasons and restrictive regular seasons on both the SJBP and Ohio giants. This scenario does point out the difficult dilemma of managing two very different Canada goose populations within a state.

Future management and harvest in Ohio will target the Division of Wildlife's Strategic Plan goal of maintaining 60,000 breeding geese statewide and will direct harvest to check giant populations through both early and regular seasons, while maintaining Flyway goals for the Southern James Bay population of interiors.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN ONTARIO

Prepared by Ken Abraham, Ontario Min. of Natural Resources

The historical nesting range of the giant Canada goose in Ontario was probably limited to prairie areas of southwestern Ontario (Lumsden 1981). It apparently persisted widely as a breeding species until the 1840s but was virtually extirpated by the 1890s. It is possible that some still existed in the Lake St. Clair area into the 1920s, but the evidence of this is obscured by the growth of feral populations (Lumsden 1981, Lumsden and Dennis, In Press).

From the 1920s and 1930s up to the mid 1970s, Canada geese were held privately by aviculturists for hobby or breeding, by others as decoy flocks (in early years), and (rarely) for food in southwestern Ontario. Among these were flocks at Lake St. Clair, Holstein, Amherstburg, and Guelph. The young produced were sometimes allowed to fly free and to a limited extent, feral nesting populations developed in these circumstances. By the early 1960s, geese from all these sources probably totalled about 1,000 - 1,200 birds (Lumsden and Dennis In Press).

The first effort to establish nesting flocks in southern Ontario involving the Ontario Department of Lands and Forest (now Ministry of Natural Resources) was a transfer of wild caught birds in 1954 from Pea Island, North Carolina to Pembroke Fish Hatchery, Ontario. Some of these bred and spread to the surrounding area. Another transfer occurred in 1959 from Bombay Hook, Delaware to Morrisburg, Ontario, at what later became the Upper Canada Migratory Bird Sanctuary. To these were added birds from a provincial game farm at Codrington and all were released in spring 1960 on the St. Lawrence Seaway Park. In the same year pairs from Michigan's Mason Game Farm were established at the Upper Canada sanctuary site as a captive breeding population. This captive flock produced goslings from 1960 (25) to 1969 (420) and young were allowed to fly free from 1962 onwards. By September 1969, there were about 1,550 free flying geese present in the Lake St. Lawrence area before migrants arrived, including approximately equal numbers from Ontario and the Wilson Hill, New York, area across the river (McLeod 1971). The Toronto waterfront population probably resulted from the release of birds from the Riverdale Zoo in 1959 and early 1960s. This area had at least 312 nesting pairs (plus over 1000 non breeders) by 1980.

A formal restoration program for southwestern Ontario began in 1968 when the Department and the Ontario Waterfowl Research Foundation agreed to establish a large flock of captive breeders to supply a restoration program. The goals were to establish self-sustaining nesting populations of Canada geese in the agricultural areas of southern Ontario, to enhance goose hunting opportunities, and to provide viewing and non-consumptive recreation opportunities. Initially, sources of geese for establishment of local flocks were many and varied, but after 1978 most birds came from the Toronto waterfront population. Throughout the rest of the 1980s, Toronto waterfront birds were shipped throughout Ontario including the north shores of Lake Huron, Lake Superior and the Fort Frances area. Although never thought to have nested there (i.e., north of the upper Great Lakes) there was an interest in establishing local nesting flocks and such flocks were established at Sudbury and Thunder Bay among other places.

Several strategies for restoration were used. The first was the establishment, on public areas, of captive breeding flocks (often of pinioned geese) whose young were allowed to fly free to establish a local nesting tradition. The second was the establishment of captive breeding stock from which eggs and/or pairs were distributed to private cooperators to do the same thing, such as was done in the cooperative program begun in 1968. The third was the release of wing clipped breeding age adults with or without young. This was used extensively at the receiving end of relocation programs for geese from the Toronto waterfront. The fourth was the release of two year old pairs in spring and yearling "pairs" in habitat deemed suitable for nesting. This last strategy was used early in the cooperative program, but sporadically and not for long. Areas as large as several counties were sometimes closed to all Canada goose hunting for 5 year periods after local establishment efforts commenced in the late 1960s and early 1970s.

Population growth and distribution has expanded remarkably since the 1970s. The estimated free flying population at the end of summer in the early 1960s was 1000, by the late 1960s it was perhaps

twice that many, but by 1986 it was thought to be 60,000 and by 1994 it was estimated to be almost 200,000. Nesting density is highest in the agricultural zone west of Toronto in southern Ontario. The upper Great Lakes north shore rim populations, more recently established in isolated agricultural and urban areas, constitute a very small proportion of the total population. There is still a substantial area, most of which is continuous boreal forest, between the northern limits of nesting giants and the southern limits of nesting *B.c. interior* Canada geese. However, the summer range of giant Canada geese includes a northward moult migration from southern Ontario to the Hudson-James Bay lowlands.

Nuisance problems reported for urban parks, golf courses and green belts are like those in other jurisdictions, but also include an aircraft hazard at the Toronto Islands airport. The general complaints center on goose droppings fouling recreational areas and contaminating water bodies, and aggressiveness of nesting pairs towards people, especially children. These complaints have been common since the mid 1970s in Toronto, but are now widespread. Agricultural depredation occurs on emerging green crops. The average timing of hatch (first week of May) precedes the emergence of corn (third week of May) and soybeans (fourth week of May) in much of southwestern Ontario such that families with young goslings can make use of them sequentially. Depredation of specialty vegetable crops such as tomatoes is also reported. The Canadian Wildlife Service maintains a record of complaints, provides advice on methods of deterrence and has authority to issue appropriate control permits to affected property owners, including lethal methods.

The growth of restored Canada goose populations in southern Ontario has provided enhanced hunting opportunities, but at the same time caused a harvest management dilemma. Interior Canada geese nesting in southern James Bay migrate through and winter in portions of southwestern Ontario and those from eastern James Bay and western Quebec migrate through eastern Ontario. Separation of subarctic nesting geese from giants is not complete, although the majority of the SJBP geese concentrate in extreme southwestern Ontario, and there is little or no wintering of subarctic origin geese in eastern Ontario. Solutions to allow maximum opportunities to hunt the southern Ontario origin birds have included the use of special late seasons (mid-January) since the 1980s and the use of special early September seasons in the 1990s. These special seasons have been used, where appropriate, based on knowledge of arrival and departure dates of northern populations, to target giant Canada geese.

Harvest of giant Canadas is thought to account for up to 60% of Ontario's overall harvest, or approximately 60,000 geese annually. Harvest derivation estimates based on band recoveries indicate a lower proportion of giants in Ontario's total harvest, but the accuracy of these estimates is questionable because banding efforts in many years have not been distributed in proportion to population densities nor evenly distributed among subspecies populations, and population estimates have wide variance. No independent special survey of giant Canada goose harvest in Ontario has been undertaken. Ontario hunters harvest Canada geese from five arctic/subarctic populations (MVP, SJBP, EPP, TGPP, Atlantic) plus Ontario's and U.S. (mainly Great Lakes) states' giant Canada goose populations. Harvest is expected to increase in the future concurrent with more emphasis placed on controlling the growth of Ontario's giant Canada goose population.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN TENNESSEE

Prepared by Edward L. Warr, Waterfowl Biologist, Tennessee Wildlife Resources Agency

During the 1800's, Canada geese were reported to nest in Tennessee at Reelfoot Lake (Bent 1925). Hanson (1965) wrote that Canada geese at Reelfoot were very plentiful in the fall, and large numbers remained the entire year. The Reelfoot resident was considerably heavier than its migratory relative (Hanson 1965) and apparently nested on cypress snags (Hankla and Rudolph 1967). Nests were still being found there by the early 1930's (Gainer 1933). Today, Canada geese still nest at Reelfoot, but it is not known if these birds are descendants of the ones reported earlier. Except for this Reelfoot population, Canada geese were not known to nest in Tennessee (Hanson 1965).

In 1951, a central Tennessee resident, Wick Comer purchased 12 pinioned Canada geese from a game farm operator in North Carolina. These geese were released on his 1,200-acre estate four miles east of Hendersonville. The flock survived, multiplied, and eventually spread to nearby Old Hickory Reservoir (Gore and Barstow 1969, Coe and Pollock 1975). Gore and Barstow (1969) identified these birds as giant Canada geese using the criteria described by Hanson (1965).

Aware of the potential of this flock on Old Hickory, the Tennessee Wildlife Resources Agency (TWRA) in 1966 initiated the resident Canada goose project. The goal was to have enough geese for recreational hunting (Gore and Barstow 1969) which was in response to the low numbers of wintering geese attributed to "short-stopping" in northern states (Crider 1967, Hanson 1965, Hankla and Rudolph 1967, Hubbard 1976, Yates and Whitehead 1979).

In 1967, the TWRA began constructing elevated nesting structures on the reservoir and closed goose hunting in the five surrounding counties. In 1968, approximately 60 pinioned geese were obtained from the state of Missouri. Half of these birds were used in a propagation facility at the Old Hickory Nursery. The other half were used to supplement the flock on Mr. Comer's property. Progeny from both sources colonized the reservoir, and the flock continued to expand each year. The propagation facility at Old Hickory was dismantled in 1972, but the naturalized flock was large enough that artificial supplementation was unnecessary (C. J. Whitehead, TWRA, Nashville, Tenn., pers. commun.). By 1975, over 2,500 geese were inventoried during the summer (Coe and Pollock 1975). From 1967 through 1977, the TWRA banded 4,568 geese there (Cromer 1978).

The U.S. Fish and Wildlife Service started a resident goose flock on Cross Creeks National Wildlife Refuge (NWR) in 1964, two years after the refuge was established. The objective was to attract geese that were displaced from the Kentucky Woodlands NWR, Kentucky, where Barkley Reservoir had inundated goose habitat. The initial stocking of 15 geese came from Horseshoe Lake Refuge, Illinois, and Swan Lake NWR, Missouri. In 1967, 11 giant Canadas were received from Minnesota, and in 1970, six more were transferred from Wapanocca NWR, Arkansas. The first successful broods were raised in 1969, and by 1973 the post-nesting population had reached 73 birds (Oberheu 1973). A survey in 1987 revealed 239 adults and 39 goslings (Robinson 1990). These geese moved outside of Cross Creeks NWR to areas around Tennessee NWR and the Tennessee Valley Authority's (TVA) Land Between the Lakes. The estimated summer population in the area is estimated to exceed 1,600 birds (TWRA 1995).

In 1970, the TWRA and TVA began a cooperative project to artificially propagate giant Canada geese at the Buffalo Springs Research Center. The brood stock was the original pinioned birds from the dismantled Old Hickory Nursery and an unknown number donated from the

Michigan and Ohio Departments of Natural Resources. Over 1000 geese were artificially propagated and released from this facility (Yates and Whitehead 1978). Releases began in 1972 on Melton Hill Reservoir and Cove Lake State Park and continued through 1975 (Hubbard 1976). Goslings from Buffalo Springs were used to successfully establish 26 different flocks, 19 in Tennessee, four in Georgia, and one each in Kentucky, Alabama, and Virginia (Yates and Whitehead 1978). A few were transported to Hatchie NWR and Millington Naval Air Station in West Tennessee. When the goslings reached breeding age, the population grew at a rate of 24 percent per year, doubling every three years (Hubbard 1976). During the period 1972-74 Buffalo Springs served as the primary source of birds for Tennessee's restoration.

In the mid-1970's the TWRA began capturing and moving goslings and some adults from Old Hickory to Cordell Hull, Percy Priest, Tims Ford, and Woods reservoirs in Middle Tennessee. Geese were also stocked on private ponds of one acre or greater with the permission of the landowner (Coe and Pollock 1975, West 1976). Similar roundups were held at Melton Hill Reservoir, and geese were translocated to unoccupied habitats. To hasten the expansion, additional geese were imported from Michigan, Ohio, and Ontario and were released on Watts Bar and Melton Hill reservoirs. Counties where the restoration was occurring were closed to goose hunting. By 1989 every reservoir and major river system in the state had a least one stocking of Canada geese. Numerous farm ponds were also stocked with goslings and wing-clipped adults during this period. Exact numbers are not available because most of the records were destroyed in a fire at the Buffalo Springs Game Farm. Resident Canada geese can be found in all 95 counties of the state with the highest concentrations being along the U.S. Army Corps of Engineers and TVA reservoirs in Middle and East Tennessee.

The giant Canada goose quickly adapted to living in close proximity to humans and became concentrated in urban areas such as city parks, golf courses, shopping centers, and residential areas. The problems which occurred primarily in Middle and East Tennessee were grazing damage and fecal contamination on residential lawns, golf courses, beaches and in swimming pools, city parks, cemeteries, shopping centers, and industrial areas. Animal Damage Control (USDA-APHIS) manages the Canada goose depredation program in Tennessee.

Since the early 1980's, special resident Canada goose seasons have been held in Middle and East Tennessee to provide recreational hunting and to control the growth of established populations. Areas hunted were regulated by a harvest check-in or a hunter quota system, which used kill tags that were required to be attached to the dead birds immediately upon retrieving. Beginning in 1986, some areas in south central and southeast Tennessee were opened to limited hunting with no harvest controls except limited days. The TWRA expanded the harvest check-in system statewide in 1993 to monitor the harvest of all Canada geese during the regular season. Estimated harvests have ranged from 220 in 1980/81 at Old Hickory to nearly 3,750 for the 1993 season which included 70 of the state's 95 counties. Presently, these counties have seasons directed exclusively towards giant Canada geese including September seasons. Weighted band recoveries show that 57% of Tennessee's total Canada goose harvest is from giants of which 44% are Tennessee birds. The TWRA recognizes the giant Canada goose as a valuable wildlife resource for hunting and viewing and has set goals to maintain viable goose populations for the future.

# GIANT CANADA GOOSE RESTORATION AND MANAGEMENT IN WISCONSIN

Prepared by William E. Wheeler, Wisconsin Dept. of Natural Resources

The historical peak in Wisconsin's nesting Canada goose populations appeared to be in the 1850s, when early settlers found them plentiful on prairie sloughs (Kumlein and Hollister 1903). Canada geese were so abundant that eggs were gathered by the bushel (Schorger 1944). Unlimited hunting and egg collecting along with wetland drainage soon reduced the goose population. As a result, breeding geese disappeared in the 1890's and 1930's from southern and northern Wisconsin, respectively.

Efforts to restore breeding populations began with private game breeders. Many of the early projects can be traced to geese from a single source: the Thomas Yaeger Game Farm, Owatonna, Minn. (Wheeler and Cole 1990). Transfers of these geese by Jack Miner of Kingsville, Ontario to the Barkhausen Preserve (near Green Bay), and transfers by others from Barkhausen to other Wisconsin and Illinois sites, established this lineage in several areas. The original birds for this lineage were geese Yaeger obtained from game breeders in western Minnesota, and cripples from Winnepeg, Manitoba hunters (Miner 1972).

State and federal efforts in Wisconsin began in the 1930's with captive flocks established to attract migrant geese to refuges. These flocks were made up of hunting season cripples, spring and fall trapped migrants, *B.c. moffitti* from Utah and geese from private breeders (Wheeler and Cole 1990). Fall trapped migrants failed to breed whereas the geese from private flocks succeeded.

In addition to captive flocks, restoration also involved stocking geese throughout the state. These efforts began at 6 sites in the 1940's-1950's with 150 geese primarily from private flocks. Further efforts took place from 1969-95 at 56 sites, with 3,500 local geese captured and transplanted in summer (Figure 1).

During early restoration efforts, races of geese were not identified. Most likely, they were *B.c. interior* and giant Canada geese (*B.c. maxima*). Subsequent examinations of captive flocks in Wisconsin indicated they, too, were giants--including flocks at Bay Beach, Barkhausen Preserve, Horicon, Crex Meadows, and Powell Marsh (Hanson 1965, Hunt and Jahn 1966). Wisconsin's resident flocks today are thought to be descendants of giants imported from Nebraska, Minnesota, and Manitoba and resident giants which were allowed to free-fly from captive flocks held by private game farms in Wisconsin. Many of the early private flocks, which had been kept in family ownership for decades, are thought to have contained giants. The unknown origins of such flocks suggests all sorts of genetic combinations may be involved. This may explain recent evidence of considerable variation in size and morphology of resident breeding geese in Wisconsin and across the Midwest.

Wisconsin's resident goose populations are increasing statewide at an annual rate of 13% according to spring fixed-wing duck surveys (Fig. 2). During 1948-64, only 29 broods were reported statewide outside of propagation areas, rarely more than one per county and seldom from the same sites in consecutive years. Since then, the number of counties (including propagation areas) that have breeding resident geese has increased from 24 in 1964 to 32 in 1980. At present, geese breed in 70 of 71 counties. Spring surveys indicate the population has grown from 12,000 in 1986 to over 61,000 in 1995.

The Giant Canada Goose Management Plan for Wisconsin (1993-2000) stated a goal of a spring population of 68,000 geese. This goal likely will already be exceeded by 1996. Resident goose populations have been so successful in the urban areas of SE Wisconsin and Green Bay that they are becoming a nuisance on lawns, golf courses, and parks. Some incidences of

agricultural crop damage have even occurred during the summer.

To slow this population growth and provide hunting opportunity, Wisconsin has opened its regular Canada goose season as early as possible and implemented an Early September Canada goose season (1990) to increase giant harvests. Some nuisance geese have been moved from Green Bay and SE Wisconsin to under-utilized habitat in Wisconsin and to other states such as Kansas.

The contributions of resident geese to the total harvest during regular goose seasons averaged 7.2% from 1988-92 (Wheeler unpublished) and would mean an annual harvest of approximately 6,000 giants. The Early September Canada goose season has added around 800 - 5,000 giants to the states harvest annually.

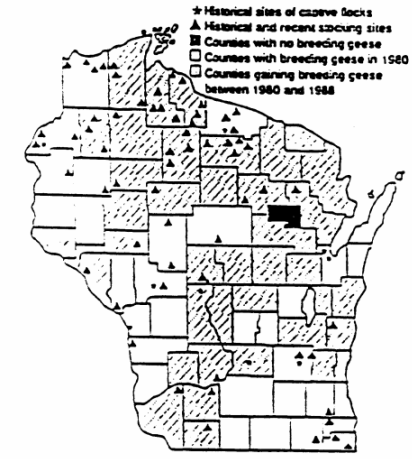



*FIGURE 1. Sites of historical and recent restoration efforts, and changes in statewide distribution of breeding geese.*

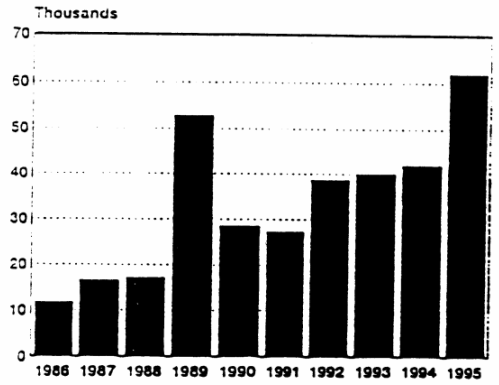



FIGURE 2. Trends in relative abundance of giant Canada geese in Wisconsin.

# APPENDIX II

## Distribution and Status of Giant Canada Geese in States and Provinces in the Mississippi Flyway

**ALABAMA -** Giant Canada geese are presently distributed over most of Alabama. The 1995 spring population was estimated at 18,000 birds with most of the geese found in 8 regions. The population is growing at a slow rate; observations of giant Canada geese are increasing annually. Problem populations have developed in 3 counties in northeast Alabama and one county in extreme southeast Alabama.

**ARKANSAS -** Giant Canada goose flocks are scattered throughout much of Arkansas, with the densest populations in the Arkansas River valley in western Arkansas and near the White River Lakes along the Missouri Border. The 1995 spring breeding population was conservatively estimated at 3,300 birds. Most of the current distribution of geese was initiated by translocation efforts of state and private individuals. Giant populations are still fairly well dispersed and depredation and nuisance complaints (i.e., beaches, boat docks, lawns) average less than 15 per year.

**ILLINOIS -** Illinois' 1995 spring population estimate for giant Canada geese was 107,000 ± 55,700 (± 95% C.L.). This is the fourth largest state/province estimate in the Mississippi Flyway. Goose depredation and nuisance situations have occurred primarily in the 6 northeastern counties where major human population centers are found. Complaints average about 100 annually and are centered around metropolitan areas, primarily golf courses, parks, office complexes, residential complexes and airports. Damage to agricultural crops, primarily from flightless goslings, occurs in some rural areas.

**INDIANA -** Giant Canada goose populations in Indiana are well established across the state and showing steady growth. The 1995 spring population estimate was 101,800 ± 33,600 (± 95% C.L.). Giant Canada geese are distributed across most of the state, with concentrations found in the northeast and central regions. Depredation and nuisance complaints have been estimated in excess of 100 per year during 1989-1993. Depredations occur most frequently around golf courses, metropolitan centers, residential centers and parks, with some light damage done to agricultural crops. Public health issues center around droppings on public beach areas.

**IOWA -** As of 1993, giant Canada geese nested in all of Iowa's 99 counties. Iowa's 1995 spring population was estimated at 32,094 ± 6686 (± 95% C.L.). Population growth has been rapid, with an average increase of 25% during the past 30 years. Population densities are highest in the north-central and northwest regions, lowest in the southwest and northeast regions, and moderate in other areas. Large areas of vacant breeding habitat still exist the eastern and southern parts of the state. About 75% of the giant Canada goose depredation complaints involve crop damage with the remainder involving urban areas such as parks, golf courses and residential and commercial developments.

**KENTUCKY -** Kentucky's giant Canada goose population has been increasing rapidly in recent years. The 1995 spring population was estimated at 15,000 ± 7,000 (± 95% C.L.). Populations exist in almost all counties between the lakes region in the west-central part of the state, through the central region and into the foothills of the Appalachian mountains in eastern Kentucky. Nuisance/depredation problem areas include metropolitan areas, golf courses, parks and some agricultural fields. Depredation complaints are few and scattered across the state, but increasing annually.

**LOUISIANA** - Louisiana may have the smallest giant Canada goose population of any state in the Mississippi Flyway. The 1995 spring population estimates are 3,300. Giant Canada geese are found in three general areas in Louisiana; 2 southwestern parishes contain about 50% of the state's population while the remainder of the birds are scattered in small flocks in the northeastern and central parts of the state. Populations are often associated with golf courses, urban lakes and parks. At the present population levels, nuisance and depredation complaints are minimal. A considerable amount of vacant breeding habitat still exists in Louisiana.

**MANITOBA** - The 1995 spring breeding population was estimated at 70,000. Distribution of breeding birds covers the southern half of the province and continues to expand. Manitoba has a large population of giants in the southern one-half of the province with the EPP occupying the northern one-fourth of the province.

**MICHIGAN** - Michigan appears to have the second largest population of giant Canada geese in the Mississippi Flyway. The 1995 spring population estimate was 180,800 $\pm$ 72,865 ($\pm$ 95% C.L.). This estimate was made from numbers of Canada geese observed on a spring duck breeding population survey using standard systematically-spaced fixed-wing aircraft transects with visibility corrections supplied from helicopter segments. The population is very dense in the south half of the lower peninsula, with more moderate densities found in the remainder of the state. Giant Canada geese are found nesting in every county in the state. The population appears to be growing rapidly as indicated by changes in spring survey estimates, an increasing September Canada goose harvest, and increasing numbers of depredation complaints. Goose depredation/nuisance complaints have increased from 125 in 1989 to over 200 in 1994. Nuisance complaints involve beach/lakeshore areas, residential centers, parks and golf courses. Depredation complaints have occurred throughout the state.

**MINNESOTA** - Minnesota is believed to have the largest population of giant Canada geese of any state/province in the Mississippi Flyway although a statewide aerial survey specific for giant Canada geese has not been conducted. The 1995 spring population was estimated at 207,200 using aerial survey data obtained in other states. Giant Canada geese are widespread throughout the state with highest densities in the Twin Cities metro area and in the west-central part of the state. Densities are lowest in the northeast quarter of the state. Damage complaints have increased yearly with most complaints involving damage to agricultural crops during the spring. Nuisance complaints are most common in metropolitan areas involving airports, residential areas, golf courses, parks and resorts/lake lots. Minnesota has implemented extensive measures to reduce metropolitan populations.

**MISSISSIPPI** - The 1995 spring population was estimated by DNR staff to be 9,000 geese.

**MISSOURI** - Giant Canada geese are well established in Missouri and the 1995 spring population was estimated at 32,200 $\pm$ 14,000 ($\pm$ 95% C.L.). Densities are considered low in most of the state, with highest densities of breeding geese found in prairie regions of western and northern Missouri and in counties along the Missouri River. Depredation complaints have grown from approximately 200 in 1989 to over 300 in 1994. Complaints primarily involve golf courses, parks, and residential centers in metropolitan areas; with a few complaints involving agricultural crops in rural areas. Depredations and nuisance situations are highest in the west-

central and east-central regions of the state.

**OHIO -** Giant Canada geese can be found throughout Ohio. Their numbers were estimated at 69,300 ± 26,050 (± 95% C.L.) for the 1995 spring population survey. The densest populations are found in the northeast quarter of the state, western Lake Erie and several counties in central Ohio. Depredation and nuisance complaints are highest in these same areas, but complaints have been received from other areas as well. Complaints have grown from 95 in 1990 to almost 470 in 1995. The majority of complaints involve human/goose interactions in such areas as parks, residential complexes and golf courses but depredation complaints involving crops have also been received from rural areas as well.

**ONTARIO -** Ontario has large populations of giant Canada geese in the southern part of the province and large populations of interior Canada geese; MVP and SJBP, in the north. The giant Canada goose spring population for 1995 was estimated at 107,950 using a combination of survey methods. The arrival of non-breeding and molt migrant giant Canada geese pushes the August population in the southern portion of the province to over 200,000. These geese are distributed all across the southern one-fourth of the province, with the heaviest concentrations in the southeastern corner and along the Great Lakes. The growth of the giant Canada goose population has rapidly increased numbers of depredation and nuisance complaints, from 63 in 1989 to 137 in 1992. The Canadian Wildlife Service has issued limited numbers of scare and kill permits to deal with depredating/nuisance geese in recent years. Depredation/nuisance goose situations occur in both rural and urban settings, but most conflicts arise in residential areas.

**SASKATCHEWAN -** Saskatchewan giant Canada geese are primarily associated with the Central Flyway. Minor numbers of Saskatchewan's giant Canada geese migrate down the Mississippi Flyway. Saskatchewan is considered only a minor contributor to the Mississippi Flyway giant Canada goose population. The few Saskatchewan giant Canada geese associated with the Mississippi Flyway come from the southeastern quarter of the province.

**TENNESSEE -** Tennessee's 1995 giant Canada goose spring population was estimated at 44,300 using a combination of survey methods, making it one of the moderately populated states. Giant Canada geese can be found in every county in Tennessee with highest densities in central and eastern Tennessee around major reservoirs, state parks and metropolitan centers. Tennessee has reported significant growth in the past few years and has instituted a special season in an effort to reduce the goose population growth rate. Depredation complaints have increased dramatically to over 300 annually and involve almost all habitat and community types. In 1994, the first September season was held in East Tennessee and resulted in a harvest of 408 giant Canada geese. Moderate harvest of giants occurs during the remaining statewide seasons for Canada geese.

**WISCONSIN -** The 1995 giant Canada goose population estimate of 42,400 derived from Wisconsin's spring waterfowl breeding pair survey indicated a six-fold increase in numbers of geese between 1986 and 1995 for the surveyed portion of the state. These estimates also indicated an average annual growth rate of 13% during the same period. Estimates derived from the experimental helicopter survey indicated a spring population of only 29,000 ± 16,800 (± 95% C.L.) in 1995. Wisconsin DNR biologists believe the giant Canada goose population is well

above 60,000 in the state. The differences in these estimates remain unresolved. Highest densities of geese are found in southeast Wisconsin, but extensive population growth is also occurring in the northeast, near Green Bay. Depredation and nuisance problems associated with concentrations of geese are highest in the southeastern 12 counties and grade to isolated scattered complaints in the northwestern part of the state. Depredation and nuisance complaints involve urban areas, such as parks, golf courses and beaches, as well as croplands in rural areas. Significant unoccupied breeding habitat exist within the western half of Wisconsin.