

B. SOCIOECONOMIC ENVIRONMENT

1. Migratory Bird Program Management and Administration

a. Management History

The Service currently recognizes 836 species of migratory birds, of which 778 are not hunted and classified as non-game and 58 are hunted and classified as game species according to Federal regulations. While the most numerous migratory bird is probably the red-winged blackbird, with numbers in the hundreds of millions, some species have dangerously low numbers and have been listed as threatened or endangered. However, numbers alone cannot be used as a sole indicator of the well being of a species.

The evolution of the migratory bird program in the Service is tied to its ancestral roots: fish and birds--enforcement, refuges, regulatory oversight to protect fish and wildlife resources, and endangered species protection. Formed by the Agricultural Appropriation Act of 1885, the new agency set up specifically to study birds was later officially designated as the Bureau of Biological Survey and expanded to undertake many new functions in the field of wildlife research and conservation.

In 1939, the bureau was transferred to the Department of Interior, and in 1940, the Bureau of Biological Survey was combined with the Bureau of Fisheries, and became the Fish and Wildlife Service in the Department of Interior. In 1956, a reorganization resulted in the U.S. Fish and Wildlife Service, with a Bureau of Sport Fisheries and Wildlife and a Bureau of Commercial Fisheries. In 1970, the Bureau of Commercial Fisheries was transferred out of the Service and the "Bureau" designation was dissolved.

In 1972, the Service established the Office of Migratory Bird Management. This reorganization aligned over 100 personnel from the Division of Wildlife Research and the Branch of Management and Enforcement, with major migratory bird responsibilities into a cohesive unit. To support this realignment, Regional Migratory Bird Coordinators were established in 1974 and Non-game Coordinators in 1992. The Office was an umbrella organization with primary responsibilities related to providing:

- Guidance on international, national, and regional policy matters related to migratory bird management, including the promulgation of hunting regulations.
- Technical capabilities related to the conduct of operational surveys to monitor status and trends of migratory bird populations and their habitats.
- Analytical capabilities to integrate analyses and interpret data on migratory birds and their habitats.

In total, the Service's Migratory bird program was based on the Nation's legal authorities and clear recognition of several basic migratory bird trust responsibilities, including population protection, habitat protection, international coordination, and regulations.

Since 1948, the Service has used the Pacific, Central, Mississippi, and Atlantic Flyways as the basis for establishing regionally different frameworks for the hunting of most, but not all game birds. The four "administrative flyways," with their boundaries generally following along State boundaries, are geographical variations of that envisioned by Frederick Lincoln in his 1935 report "Waterfowl Flyways of North America." In each Flyway, there is a Flyway Council comprised of representatives from the

wildlife agencies in the U.S. States and Canadian Provinces associated with that Flyway. The Councils were established to coordinate research and management activities in the respective Flyways. The importance of the Councils' contributions was summed up at the 1969 meeting of the National Waterfowl Council in a statement by John Gottschalk, then Director of the Fish and Wildlife Service:

"The Flyway Councils established about twenty years ago were formulated for the expressed purpose of better waterfowl management. Next to the Migratory Bird Treaties, their creation is the most significant step that has ever been taken in waterfowl management. They have been an excellent forum for communication, for seeing and understanding the situation and problems throughout the flyways, and tackling problems in a cooperative, scientific way to husband the resource and the sport. The concepts and understanding developed by and through the Councils are vital to proper waterfowl management"

b. Sport Hunting Program

Prior to 1918, the hunting of migratory birds was regulated by individual States or not at all. As could be expected, State regulations varied widely and regional conflicts between States inevitably developed (U.S. Department of the Interior 1988). After the 1916 treaty with Canada and the passage of implementing legislation in 1918, Federal authority over migratory birds was established and exercised. Resulting early regulations were simple, brief, relatively uniform among States, and quite liberal. However, changes in habitat conditions, populations, and a growing general interest in the welfare of migratory birds gradually began to foster a more conservative management approach (U.S. Department of the Interior 1988). Likewise, increased State involvement and investment in migratory bird management programs, along with increased management capabilities, resulted in increased knowledge about migratory bird populations. All of these considerations slowly began to translate into more complex and less uniform regulations (for a more detailed discussion of the evolution of migratory bird hunting regulations, the reader is referred to U.S. Department of the Interior (1988)).

The Migratory Bird Treaty Act specifies that all migratory bird hunting seasons are closed unless opened by the Secretary, and that the Secretary must give "due regard" to considerations such as distribution and abundance of migratory bird populations when opening seasons. Further, the 1916 Treaty established a March 11 to August 31 closed period, during which no hunting seasons may be held, and an overall season limit of 3 ½ months, which has been officially interpreted as 107 days. Thus, migratory bird hunting regulations must be established annually and each year the regulatory process must start anew. Population and habitat assessment and consideration of these factors helps assure that hunting regulations are appropriate with the long-term conservation of the migratory bird resource (U.S. Department of the Interior 1988).

Annual migratory bird hunting regulations are categorized as either framework regulations or special regulations. Framework regulations include outside dates for opening and closing seasons, and maximum season length and daily bag limit. These are the core of all annual regulations. Special regulations are adaptations or deviations from these framework regulations developed in response to either species, area, or State-specific needs or desires (U.S. Department of the Interior 1988). Most special regulations began as experiments and are aimed at either providing additional opportunity to harvest underutilized or overabundant species (such as snow geese or resident Canada geese) or providing additional protection for species of concern.

In 1988, the Service adopted a "controlled use of special regulations" alternative in the SEIS *Issuance of*

Annual Regulations Permitting the Sport Hunting of Migratory Birds. Under this alternative, the development of new special regulations and harvest strategies and expansion of existing approaches were subject to stricter experimentation and evaluation. However, the Service further states that,

“. . . new harvest strategies may continue to be possible or necessary as migratory bird populations respond to modifications in their habitats. The use of new or old refinements in regulations should be based on as much biological data as possible, and should be adjusted as populations change. . . . There can be no guarantee that combinations of regulations are applicable in all areas, yet many of these regulatory tools have served well to date and likely will in the future (U.S. Department of the Interior 1988).”

Today, annual migratory bird hunting regulations have grown quite lengthy and complex. For the 2001-02 hunting season alone, over 20 pages in the **Federal Register** were devoted exclusively to Canada goose seasons (Federal Register 2001a, Federal Register 2001b). This is a significant change from the two pages of text issued in 1918.

(1) Regular Hunting Seasons

For administrative and management purposes, current hunting seasons for Canada geese are designated as either “regular seasons” or “special seasons.” Special seasons are discussed in section **B.1.(b)(2) Special Hunting Seasons.**

Regular hunting seasons for Canada geese in the lower 48 States are those seasons that generally begin on or after the Saturday nearest October 1. Unlike special seasons, they usually are not specifically aimed at one Canada goose population, but are more general in nature. Seasons are established by the respective States within the general Canada goose frameworks. For example, in Iowa, the 2001-02 frameworks for Canada geese stated that the season could extend for 70 days and the daily bag limit was two Canada geese. Based on these outside frameworks, the State then selected its season. In general, unlike frameworks for ducks or other geese, frameworks for Canada geese vary among States. These differences are based on the increased information base for Canada geese regarding population sizes, distribution, harvest pressure, and the high philopatry of this species. Many States may actually have several frameworks within the State for different goose populations.

Frameworks, especially those for quota zone areas where total harvest is limited by population concerns, are established annually based on population status and breeding-ground information. For example, in the Lac Qui Parle Zone in western Minnesota, the 2000-01 season was limited to 30 days or a harvest of 16,000 birds, whichever occurred first.

For the 2001-02 season, frameworks for Canada geese varied from 30 days with a 1-bird daily bag limit (Delaware and parts of Maryland and Virginia) to 107 days with a 5-bird daily bag limit in Colorado, Montana, New Mexico, Wyoming, and parts of Texas (Federal Register 2001b).

(2) Special Hunting Seasons

In 1986, the Service gave notice of pending criteria for special Canada goose seasons in the **Federal Register** (Federal Register 1986) to provide additional harvest opportunities on resident Canada geese while minimizing impacts to migrant geese. Criteria for special early seasons were finalized in 1988 (Federal Register 1988) and later were expanded to include special late seasons in 1991 (Federal Register

1991). The criteria were necessary to minimize the harvest of other Canada goose populations and required States to conduct annual evaluations. Initially, all seasons were considered experimental, pending a thorough review of the data gathered by each participating State. Early seasons were generally held during September 1-10, while late seasons could occur only after the regular season, but no later than February 15.

While the original intent of these special seasons was to provide additional harvest opportunities on resident Canada geese, increasing numbers of these birds resulted in increased efforts by the States and Service to slow population growth and decrease the overall numbers of resident Canada geese. In 1992, the criteria were modified to allow seasons after September 10, but required two years of prior data gathering (Federal Register 1992). The criteria were further modified in 1993 to provide for early seasons longer than 10 consecutive days (Federal Register 1993). In 1995, based on the lack of identified impacts, the Service approved September 1-15 early-season frameworks on an operational basis to reduce administrative burdens (Federal Register 1995). Seasons extending beyond September 15 continue to be experimental. To allow sufficient time for evaluation of cumulative impacts, the Service stated that no additional modifications to the criteria would be considered for at least 5 years (see **Appendix 9**).

However, in 1996, the Service granted the Atlantic Flyway a temporary exemption to the special early Canada goose season criteria. Specifically, the Service allowed States in the Atlantic Flyway to extend the framework closing date from September 15 to September 25, except in certain areas where migrant geese are known to arrive early (Federal Register 1996). Seasons extending beyond September 25 continue to be classified as experimental. The Service granted this temporary exemption for the Atlantic Flyway because of the suspension of the regular season on Atlantic Population Canada geese and the Flyway's need for greater flexibility in dealing with increasing numbers of resident Canada geese. The exemption is proposed to remain in effect until the regular season on migrant Canada geese is reinstated. The Service encouraged all States selecting framework dates after September 15 to continue data-gathering and monitoring efforts in order to further evaluate any proportional changes in the harvest of migrant geese.

The overall guidance for all special hunting seasons is provided in SEIS 88, where the preferred alternative included the controlled use of special seasons. In general, the Service's approach has been to support special seasons, and as experience and information are gained, to allow expansion and simplification consistent with established criteria.

Special seasons for Canada geese are presently offered in all four Flyways, with 35 States participating (**Table III-18**). They are most popular among States when regular Canada goose seasons are restricted to protect "migrant" populations of Canada geese. Currently, restrictive harvest regimes are in place for Atlantic Population, Southern James Bay, Dusky, Cackling and Aleutian Canada goose populations.

(3) Harvest

(a) Atlantic Flyway

Resident geese have become an important component of the sport harvest of Canada geese in the Atlantic Flyway. Harvest of resident geese increased sharply as the population grew and regulations were modified to direct more hunting pressure at these birds.

Table III-18. Special Resident Canada Goose Seasons for the 2000-2001 Hunting Season (MBMO 2000).

	Season Dates	Bag	Limits	
				Possession
<u>ATLANTIC FLYWAY</u>				
<u>Connecticut</u>				
North Zone	Sept. 1 & Sept. 5-Sept. 25	5		10
South Zone	Sept. 18-Sept. 25	5		10
Special Late Season Area	Jan. 15-Feb. 15	5		10
<u>Delaware</u>				
	Sept. 1-Sept. 15	5		10
<u>Georgia</u>				
Special Late Season Area	Nov. 22-Jan. 28	3		6
<u>Maine</u>				
	Sept. 5-Sept. 25	3		6
<u>Maryland</u>				
Eastern Unit	Sept. 1-Sept. 15	5		10
Western Unit	Sept. 1-Sept. 25	5		10
Special Late Season Area	Jan. 15-Feb. 15	3		6
<u>Massachusetts</u>				
Central Zone	Sept. 5-Sept. 25	5		10
Coastal Zone	Sept. 5-Sept. 25	5		10
Special Late Season Area	Jan. 15-Feb. 10	5		10
Western Zone	Sept. 5-Sept. 25	3		6
<u>New Hampshire</u>				
	Sept. 5-Sept. 25	3		6
<u>New Jersey</u>				
Special Late Season Area	Sept. 1-Sept. 30 Jan. 15-Feb. 15	5 5		10 10
<u>New York</u>				
Lake Champlain Zone	Sept. 5-Sept. 15	2		4
Northeastern Zone	Sept. 1-Sept. 25	5		10
Western Zone	Sept. 1-Sept. 25	5		10
Montezuma Zone	Sept. 1-Sept. 20	5		10
Southeastern Zone	Sept. 1-Sept. 25	5		10
Long Island Zone	Sept. 5-Sept. 30	5		10
Special Late Season Area	Jan. 15-Feb. 15	5		10
<u>North Carolina</u>				
Northeast Hunt Unit	Sept. 1-Sept. 20	3		6
Rest of State	Sept. 5-Sept. 30	3		6
<u>Pennsylvania</u>				
Southeast Hunt Area	Sept. 1-Sept. 25	5		10
Rest of State	Sept. 1-Sept. 25	3		6
Special Late Season Area	Jan. 15-Feb. 15	5		10
<u>Rhode Island</u>				
Special Late Season Area	Sept. 11-Sept. 25 Jan. 15-Feb. 15	5 5		10 10
<u>South Carolina</u>				
Early-Season Hunt Unit	Sept. 16-Sept. 30	5		10
Special Late Season Area	Nov. 22-Jan. 20 & Feb. 3-Feb. 12	5		10

Table III-18. Continued, page 2 of 3.

	Season Dates	Limits	
		Bag	Possession
<u>Vermont (cont.)</u>			
Lake Champlain Zone	Sept. 5-Sept. 15	2	4
Interior Vermont Zone:			
Bennington, Rutland, & Windham Counties	Sept. 5-Sept. 15	5	10
Rest of Zone	Sept. 5-Sept. 15	2	4
<u>Virginia</u>			
Special Late Season Area	Sept. 1-Sept. 25 Jan. 15-Feb. 15	5 4	10 8
<u>West Virginia</u>			
	Sept. 1-Sept. 16	3	6
<u>MISSISSIPPI FLYWAY</u>			
<u>Alabama</u>			
	Sept. 2-Sept. 15	5	10
<u>Illinois</u>			
Northeast Zone	Sept. 2-Sept. 15	5	10
North Zone	Sept. 2-Sept. 15	2	4
Central Zone	Sept. 2-Sept. 15	2	4
South Zone	Sept. 2-Sept. 15	2	4
<u>Indiana</u>			
	Sept. 1-Sept. 15	5	10
<u>Iowa</u>			
North Zone	Sept. 9-Sept. 10	2	4
<u>Michigan</u>			
Upper Peninsula	Sept. 1-Sept. 10	5	10
Lower Peninsula:			
Huron, Saginaw, & Tuscola Counties	Sept. 1-Sept. 10	2	4
Remainder	Sept. 1-Sept. 15	5	10
Southern Michigan GMU:			
Special Late Hunt Area	Jan. 6-Feb. 4	5	10
Central Michigan GMU:			
Special Late Hunt Area	Jan. 6-Feb. 4	5	10
<u>Minnesota</u>			
Twin Cities Metro Zone	Sept. 2-Sept. 22	5	10
Southeast Goose Zone	Sept. 2-Sept. 22	2	4
Special Late Hunt Area	Dec. 15-Dec. 24	2	4
Five Goose Zone	Sept. 2-Sept. 22	5	10
Northwest Goose Zone	Sept. 2-Sept. 15	2	4
Special Late Hunt Area	Dec. 9-Dec. 18	5	10
West Zone:			
Special Late Hunt Area	Dec. 9-Dec. 18	5	10
Rest of State:			
Special Late Hunt Area	Dec. 9-Dec. 18	5	10
<u>Mississippi</u>			
	Sept. 1-Sept. 15	5	10
<u>Ohio</u>			
Special Late Hunt Area	Sept. 1-Sept. 15 Jan. 13-Feb. 1	5 2	10 4
<u>Tennessee</u>			
Middle Tennessee Zone	Sept. 1-Sept. 10	3	6
East Tennessee Zone	Sept. 1-Sept. 15	5	10

Table III-18. Continued, page 3 of 3.

	Season Dates	Bag	Limits	
				Possession
<u>Wisconsin</u>				
Early-Season Subzone A	Sept. 1 & Sept. 5-Sept. 15	5		10
Early-Season Subzone B	Sept 1& Sept. 5-Sept. 15	3		6
<u>CENTRAL FLYWAY</u>				
<u>Kansas</u>				
Sept. Canada Goose Units	Sept. 2-Sept. 13	3		6
<u>North Dakota</u>				
	Sept. 2-Sept. 22	5		10
<u>Oklahoma</u>				
	Sept. 9-Sept. 17	3		6
<u>South Dakota</u>				
North Unit	Sept. 2-Sept. 29	5		10
South Unit	Sept. 16-Sept. 29	5		10
<u>PACIFIC FLYWAY</u>				
<u>California</u>				
Humboldt County	Sept. 2-Sept. 10	2		2
<u>Idaho</u>				
Nez Perce County	Sept. 2-Sept. 9	4		8
<u>Oregon</u>				
Northwest Zone	Sept. 9-Sept. 20	5		10
Southwest Zone	Sept. 9-Sept. 15	5		10
East Zone	Sept. 9-Sept. 15	5		10
<u>Washington</u>				
Western Mgmt. Areas 1 & 3	Sept. 9-Sept. 14	5		10
Rest of State	Sept. 9-Sept. 14	3		6
<u>Wyoming</u>				
	Sept. 1-Sept. 7	3		6 per season

Before 1986, harvest regulations did not differentiate between resident and migrant populations. Since then, criteria have been developed to allow special hunting seasons in the U.S. to increase harvest of resident Canada geese at times and places where migrant goose populations would not be affected. Special late seasons began in 1986 in Connecticut and September seasons began in North Carolina in 1989. Suspension of regular Canada goose hunting seasons in 1995 prompted many Atlantic Flyway States to hold both early and late seasons. During 1999-2000, September seasons were held in 15 of 17 States and late seasons were held in 8 States, in addition to regular seasons in 5 States where only resident geese occur in significant numbers (**Table III-19**).

During the mid-1980s, resident geese comprised 27-42 percent of the regular season harvest in mid-Atlantic States (New York, New Jersey, and Pennsylvania), but only 5-6 percent in the Chesapeake region (Maryland and Delaware), with migrant (mostly AP) geese being the remainder (Sheaffer and Malecki 1998). Applying these proportions to total goose harvest estimates suggests that about 50,000-75,000 resident geese were harvested annually during regular seasons in those States during the mid-1980s, or

Table III-19. Special September, regular, and late resident Canada goose seasons offered in the Atlantic Flyway^a for the take of resident Canada geese.

Year	ME	VT	NH	MA	CT	RI	NY	PA	WV	NJ	DE	MD	VA	NC	SC	GA	FL
1986					L				R								
1987				L	L				R								
1988				L	L				R								
1989				L	L				R					S		L	
1990				S,L	L		S		R					S		L	
1991				S,L	L		S		R					S	L	L	
1992				S,L	L		S	S,L	R					S	L	R	
1993				S,L	L		S,L	S,L	S,R	S		S	S	S	L	R	
1994				S,L	L		S	S,L	S,R	S,L		S	S	S	R	R	
1995				S,L	L	S	S,L	S,L	S,R	S,L	S	S	S	S	R	R	
1996	S		S	S,L	S,L	S,L	S,L	S,L	S,R	S,L	S	S,L	S,L	S	S,R	R	
1997	S		S	S,L	S,L	S,L	S,L	S,L	S,R	S,L	S	S,L	S,L	S	S,R	R	R
1998	S	S	S	S,L	S,L	S,L	S,L	S,L	S,R	S,L	S	S,L	S,L	S	S,R	R	R
1999	S	S	S	S,L	S,L	S,L	S,L	S,L	S,R	S,L	S	S,L	S,L	S	S,R	R	R
2000	S	S	S	S,L	S,L	S,L	S,L	S,L	S,R	S,L	S	S,L	S,L	S	S,R	R	R

^a S - September season offered in all or part of State.
R - Regular (November-January) season for resident geese in all or part of State.
L - Late season (January 15-February 15) offered in all or part of State.

about 15-20 percent of the total Canada goose harvest in the Flyway at that time.

Use of special seasons substantially increased harvests of resident geese during the 1990s. During 1997-99, the average annual Atlantic Flyway goose harvest in September was approximately 190,000 geese (**Table III-20**). Late season harvests (mid January to mid February), plus regular season harvests in States where harvest of migrant geese was negligible, averaged about 75,000 resident birds (**Table III-21**). Assuming migrants accounted for about 10 percent of the geese harvested (September special season criteria allows no more than 10 percent migrant geese while special late season harvest allows no more than 20 percent migrant geese, see **Appendix 9**), approximately 240,000 resident geese/year were harvested during these seasons in the Flyway, or roughly 4 times the number taken during the 1980s.

The impact of sport harvests on survival and population growth rates of resident geese has not recently been studied. During the 1980s, direct recovery rates for resident geese banded in the Atlantic Flyway generally ranged from 5-10 percent annually, varying among locations and age classes (Sheaffer et al. 1987; Chasko and Merola 1989; Johnson and Castelli 1998; G. Balkcom, Georgia Department of Natural Resources, personal communication). Since waterfowl hunters may only report about 32 percent of bands they encounter (Nichols et al. 1991), actual harvest rates may have been 15-30 percent during those years. The total special season harvests of resident geese in 1997-1999 (240,000 birds) would be near 20 percent of the predicted fall flight (1.2 million birds) from a spring population of one million birds, assuming 0.2 young/adult in the fall. Harvest rates are not uniform, however. Some State biologists believe that harvest rates as high as 25 percent may be occurring in some rural areas, while geese in many urban-suburban areas experience no harvest at all in some years.

Table III-20. Estimated harvest of resident Canada geese during September hunting seasons in Atlantic Flyway States.^a

Year	ME	VT	NH	MA	CT	RI	NY	PA	WV	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1989	-	-	-	-	-	-	-	-	-	-	-	-	-	3,022	-	-	-	3,022
1990	-	-	-	0	-	-	0	-	-	-	-	-	-	4,208	-	-	-	4,208
1991	-	-	-	0	-	-	297	-	-	(125?)	-	-	-	1,445	-	-	-	1,867
1992	-	-	-	0	-	-	3,393	11,676	-	-	-	-	-	1,433	-	-	-	16,502
1993	-	-	-	132	-	-	8,908	12,432	0	3,288	-	3,700	3,677	3,298	-	-	-	35,435
1994	-	-	-	217	-	-	12,301	17,919	1,140	6,452	-	8,458	3,832	7,750	-	-	-	58,069
1995	-	-	-	6,879	-	110	22,864	40,865	1,350	7,632	1,774	8,661	11,090	7,929	-	-	-	109,154
1996	1,149	-	1,012	8,698	4,698	702	23,868	50,989	1,530	9,301	1,180	5,823	17,541	10,365	0	-	-	136,856
1997	1,946	-	1,725	7,740	3,652	223	46,177	64,532	2,310	17,069	1,269	15,446	13,247	13,743	0	-	-	189,079
1998	2,966	2,670	730	6,831	3,525	639	50,297	63,201	2,938	12,964	892	20,698	12,234	15,383	0	-	-	195,968
1999	4,800	1,700	1,900	6,200	4,600	1,300	40,600	59,500	3,200	17,300	1,600	15,700	12,800	13,700	0	-	-	184,900

^a USFWS harvest estimates (P. Padding, unpubl. data).

Table III-21. Estimated harvest of resident Canada geese during regular and late hunting seasons in Atlantic Flyway States.^a

Year	ME	VT	NH	MA	CT	RI	NY	PA	WV	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1990	-	-	-	2,860	2,294	-	-	-	896	-	-	-	-	1,907	990	1,503	-	10,450
1991	-	-	-	3,970	1,525	-	-	(4590?)	910	-	-	-	-	578	941	516	-	13,030
1992	-	-	-	2,119	1,857	-	-	2,466	2,160	-	-	-	-	0	1,619	1,409	-	11,630
1993	-	-	-	4,329	2,247	-	274	3,016	3,647	-	-	-	-	0	4,399	3,352	-	21,264
1994	-	-	-	4,177	3,205	-	-	4,487	4,723	(3813?)	-	-	-	0	5,082	4,590	-	30,077
1995	-	-	-	3,416	2,775	-	179	1,097	1,370	1,947	-	-	-	145	3,994	6,363	-	21,286
1996	-	-	-	5,182	3,781	317	707	19,276	2,438	3,582	-	3,445	13,830	0	11,039	8,449	-	72,046
1997	-	-	-	4,672	981	353	1,886	20,025	3,710	6,383	-	2,901	9,348	3,335	6,518	10,383	246	70,741
1998	-	-	-	5,956	1,828	678	6,353	12,820	3,316	6,618	-	10,326	14,013	8,501	6,270	9,022	0	85,701
1999	-	-	-	2,260	3,031	464	801	11,285	1,399	8,477	-	3,874	15,164	6,186	7,212	12,903	506	73,562

^a USFWS harvest estimates (P. Padding, unpubl. data). This table includes regular and late season harvests (Oct. 1 - Feb. 15) for WV, NC, SC, GA, and FL, where harvests of migrant geese are negligible. Estimates for other States are for late seasons only (Jan. 15 - Feb. 15).

Current harvest rates (≤ 20 percent) through sport hunting are far below what is needed to maintain a stable population (≈ 30 percent). A 50 percent increase in annual sport harvests would be desirable, but additional harvest may be difficult to achieve since special seasons (and hunter effort) are close to the maximum possible under existing regulatory criteria. Restoration of longer regular seasons throughout the Atlantic Flyway will result in some additional harvest of resident geese, but those seasons may be restricted for several more years to ensure continued recovery of AP geese.

(b) Mississippi Flyway

Managing harvests of the various Mississippi Flyway Canada goose populations has become increasingly complex in recent years, largely because of growing giant Canada goose populations, and unstable populations of migrant interior Canada geese (MVP, EPP, and SJB). Regulations and frameworks have been utilized to control harvest of migrants, and to ensure these interior populations are maintained at objective levels. Although regulations are largely effective in this regard, the options of State wildlife agencies to provide additional harvest opportunities on giants have been limited.

Giant Canada geese have become a significant part of the Mississippi Flyway Canada goose harvest. During 1980-86, giants comprised only about 15 percent ($\sim 44,000$ geese) of the total Flyway Canada goose harvest (Rusch et al. 1998). This increased to 40 percent (186,000) in 1986-90, 57 percent (348,000) in 1991-95, and to nearly 75 percent (596,000) in 1996-98 (Table III-22).

Special early and late seasons have been increasingly used to harvest resident (giant) Canada geese (Table III-23). The estimated combined special season harvest of giant Canada geese in the Flyway has increased from nearly 23,000 to nearly 261,000 during 1987-99 (Table III-24, Figure III-4).

During 1987-99, the Mississippi Flyway September season harvest estimate increased from 18,000 to nearly 246,000 (1237 percent, Table III-24, Figure III-4). Ten States currently utilize September seasons. Michigan is evaluating the effectiveness of its

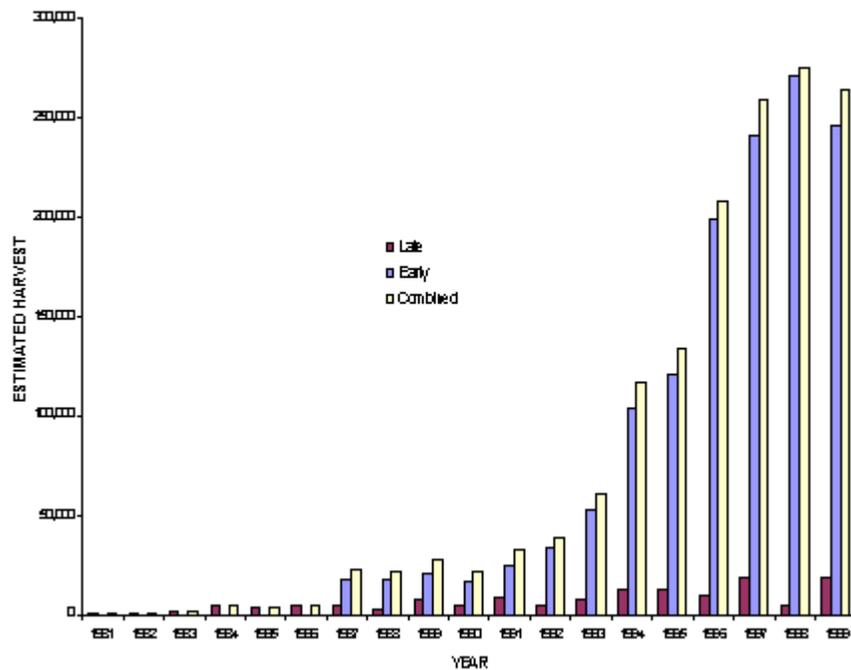


Figure III-4. Special season Canada goose harvest in Mississippi Flyway States, 1981-99.

Table III-22. Estimates of Canada goose harvests in the Mississippi Flyway.^a

YEAR	AL				AR				IL				IN				IA							
	Special Season	Regular Season			Special Season	Regular Season			Special Season	Regular Season			Special Season	Regular Season			Special Season	Regular Season						
		Harvest	% giants ^b	# giants		Harvest	% giants	# giants		Harvest	% giants	# giants		Harvest	% giants	# giants		Harvest	% giants	# giants				
1962		1,700				0				11,500				2,000				6,600						
1963		2,400				0				14,000				800				7,200						
1964		4,300				0				27,500				2,500				4,300						
1965		5,300				0				16,400				1,100				6,600						
1966	5,400	5,400			0	0		28,000		28,000			3,100	3,100			7,200	7,200						
1967	3,200	3,200			100	100		35,400		35,400			2,800	2,800			12,400	12,400						
1968	2,200	2,200			0	0		21,200		21,200			3,100	3,100			10,600	10,600						
1969	4,800	4,800			0	0		29,400		29,400			4,100	4,100			15,500	15,500						
1970	400	400	0.00		0	0		37,700		37,700	0.03	1,131	1,600	1,600	0.11	176	12,600	12,600						
1971	900	900	0.00		0	0		34,400		34,400	0.03	1,032	3,200	3,200	0.11	352	10,400	10,400						
1972	1,600	1,600	0.00		0	0		33,800		33,800	0.03	1,014	3,000	3,000	0.11	330	5,000	5,000						
1973	900	900	0.00		0	0		28,500		28,500	0.03	855	2,100	2,100	0.11	231	11,600	11,600						
1974	1,000	1,000	0.00		0	0		47,100		47,100	0.03	1,413	4,100	4,100	0.11	451	7,700	7,700						
1975	2,500	2,500	0.01	25	2,000	2,000	0.06	120	44,900		44,900	0.03	1,347	6,800	6,800	0.25	1,700	13,500	13,500					
1976	5,000	5,000	0.01	50	8,700	8,700	0.06	522	53,700		53,700	0.03	1,611	3,400	3,400	0.25	850	9,300	9,300					
1977	700	700	0.01	7	2,100	2,100	0.06	126	76,600		76,600	0.03	2,298	3,700	3,700	0.25	925	7,800	7,800					
1978	3,400	3,400	0.01	34	4,100	4,100	0.06	246	118,700		118,700	0.03	3,561	2,300	2,300	0.25	575	11,900	11,900					
1979	2,600	2,600	0.01	26	0	0	0.06		69,000		69,000	0.03	2,070	3,600	3,600	0.25	900	10,000	10,000					
1980	1,800	1,800	0.05	90	0	0	0.05		57,700		57,700	0.01	577	9,300	9,300	0.07	651	11,700	11,700					
1981	1,300	1,300	0.05	65	0	0	0.05		51,500		51,500	0.01	515	8,100	8,100	0.07	567	10,200	10,200					
1982	1,100	1,100	0.05	55	0	0	0.05		27,200		27,200	0.01	272	5,900	5,900	0.07	413	10,200	10,200					
1983	1,600	1,600	0.05	80	0	0	0.05		38,900		38,900	0.01	389	8,100	8,100	0.07	567	11,500	11,500					
1984	300	300	0.05	15	400	400	0.05	20	31,200		31,200	0.01	312	5,700	5,700	0.07	399	13,300	13,300					
1985	2,700	2,700	0.10	270	300	300	0.07	21	38,900		38,900	0.21	8,169	14,100	14,100	0.69	9,729	10,400	10,400					
1986	4,000	4,000	0.10	400	0	0	0.07		49,400		49,400	0.21	10,374	12,000	12,000	0.69	8,280	17,200	17,200					
1987	2,300	2,300	0.10	230	200	200	0.07	14	44,900	3,259	41,641	0.21	8,745	10,400	10,400	0.69	7,176	15,100	15,100					
1988	2,700	2,700	0.10	270	100	100	0.07	7	89,800	1,725	88,075	0.21	18,496	16,700	16,700	0.69	11,523	12,300	12,300					
1989	5,400	5,400	0.10	540	1,500	1,500	0.07	105	97,400	1,637	95,763	0.21	20,110	28,400	28,400	0.69	19,596	20,200	20,200					
1990	100	100	0.43	43	1,900	1,900	0.56	1,064	88,500	703	87,797	0.33	28,973	14,700	14,700	0.72	10,584	26,600	26,600					
1991	1,800	1,800	0.43	774	2,900	2,900	0.56	1,624	91,300	228	91,072	0.33	30,054	17,400	17,400	0.72	12,528	29,300	29,300					
1992	1,200	1,200	0.43	516	3,500	3,500	0.56	1,960	77,300		77,300	0.33	25,509	21,500	21,500	2,566	18,934	0.72	13,632	28,700	28,700			
1993	3,700	3,700	0.43	1,591	3,700	3,700	0.56	2,072	101,300		101,300	0.33	33,429	31,000	31,000	3,965	27,035	0.72	19,465	17,300	17,300			
1994	1,400	1,400	0.43	602	9,500	9,500	0.56	5,320	79,500		79,500	0.33	26,235	31,000	31,000	10,291	20,709	0.72	14,910	26,100	26,100			
1995	2,800	2,800	0.89	2,492	19,800	19,800	0.40	7,920	110,800	3,555	107,245	0.43	46,115	47,200	47,200	0.81	38,232	41,400	41,400					
1996	8,200	8,200	0.89	7,298	21,500	21,500	0.40	8,600	108,300	2,282	106,018	0.43	45,588	34,400	34,400	18,473	15,927	0.81	12,901	59,500	16,485	43,015	0.85	36,563
1997	3,700	3,700	0.89	3,293	19,900	19,900	0.44	8,756	87,800	6,117	81,683	0.42	34,307	52,200	29,846	22,354	0.85	19,001	52,200	13,127	39,073	0.88	34,384	
1998	11,300	1,859	9,441	0.89	8,402	19,100	19,100	0.44	8,404	72,200	14,996	57,204	0.42	24,026	44,300	25,433	18,867	0.85	16,037	33,200	9,436	23,764	0.88	20,912
1999 ^c	7,000	3,390	3,610		23,100	23,100		108,900	10,923		97,977		38,500	19,159	19,341		30,000	5,766		24,234				
Averages:																								
62-69		3,663				13				22,925				2,438				8,800						
70-79	1,900	1,900		28	1,690	1,690		254	54,440		54,440		1,633	3,380			649	9,980		9,980			1,481	
80-89	2,320	2,320		202	250	250		33	52,690	2,207	52,028		6,796	11,870			5,890	13,210		13,210			4,463	
90-99	4,120	3,595		2,779	12,490	12,490		5,080	92,590	5,543	88,710		32,693	33,220	15,676		22,247	17,477	34,430	11,204	29,949		23,503	
96-99	7,550	2,625	6,238	6,331	20,900	20,900		8,587	94,300	8,580	85,721		34,640	42,350	23,228		19,122	15,980	43,725	11,204	32,522		30,620	

^a Source: Ken Gamble and Jeff Peterson, USFWS.

^b Harvest proportions provided by John Wood, WI Coop. Wildlife Research Unit.

^c Preliminary

Table III-22, continued.

YEAR	KY				LA				MI				MN				MO							
	Special		Regular Season		Special		Regular Season		Special		Regular Season		Special		Regular Season		Special		Regular Season					
	Season	Harvest	% giants	# giants	Season	Harvest	% giants	# giants	Season	Harvest	% giants	# giants	Season	Harvest	% giants	# giants	Season	Harvest	% giants	# giants				
1962		1,100			0		0		9700		9,700		5200		5,200		22700		22,700					
1963		2,200			300		300		14,200		14,200		7,300		7,300		34,300		34,300					
1964		1,900			300		300		11,900		11,900		7,300		7,300		33,600		33,600					
1965		1,100			0		0		10,400		10,400		12,100		12,100		32,500		32,500					
1966		3,700			800		800		9,500		9,500		20,000		20,000		40,300		40,300					
1967		4,700			0		0		11,500		11,500		18,900		18,900		71,900		71,900					
1968		4,900			700		700		19,400		19,400		10,100		10,100		47,200		47,200					
1969		6,800			1,500		1,500		13,300		13,300		25,500		25,500		39,800		39,800					
1970		11,200	0.08	896	1,600		1,600		25,100	0.07	1,757		22,000	0.36	7,920		33,500	0.06	2,010					
1971		9,600	0.08	768	0		0		19,600	0.07	1,372		14,000	0.36	5,040		37,900	0.06	2,274					
1972		4,400	0.08	352	0		0		16,400	0.07	1,148		17,600	0.36	6,336		41,000	0.06	2,460					
1973		15,200	0.08	1,216	0		0		21,000	0.07	1,470		19,100	0.36	6,876		40,300	0.06	2,418					
1974		12,600	0.08	1,008	0		0		26,500	0.07	1,855		31,500	0.36	11,340		64,400	0.06	3,864					
1975		12,700	0.05	635	0		0		20,500	0.14	2,870		56,600	0.26	14,716		81,800	0.08	6,544					
1976		15,000	0.05	750	0		0		27,500	0.14	3,850		56,100	0.26	14,586		59,900	0.08	4,792					
1977		18,800	0.05	940	1,500		1,500		31,800	0.14	4,452		36,100	0.26	9,386		65,000	0.08	5,200					
1978		23,400	0.05	1,170	0		0		23,300	0.14	3,262		53,600	0.26	13,936		68,300	0.08	5,464					
1979		9,800	0.05	490	0		0		33,200	0.14	4,648		59,400	0.26	15,444		57,400	0.08	4,592					
1980		17,800	0.01	178	1,700		1,700		32,000	0.02	640		61,800	0.04	2,472		44,700	0.03	1,341					
1981		19,200	0.01	192	0		0		30,400	1,072	29,328	0.02	587		82,700	0.04	3,308		45,000	0.03	1,350			
1982		6,600	0.01	66	1,000		1,000		52,200	382	51,818	0.02	1,036		76,600	0.04	3,064		42,100	0.03	1,263			
1983		25,800	0.01	258	0		0		53,600	2,087	51,513	0.02	1,030		50,100	0.04	2,004		34,500	0.03	1,035			
1984		11,600	0.01	116	0		0		56,700	5,331	51,369	0.02	1,027		79,700	0.04	3,188		41,500	0.03	1,245			
1985		16,100	0.14	2,254	700		700		64,600	3,910	60,690	0.38	23,062		67,800	0.60	40,680		36,900	0.32	11,808			
1986		17,900	0.14	2,506	0		0		61,100	5,145	55,955	0.38	21,263		67,200	0.60	40,320		30,000	0.32	9,600			
1987		17,200	0.14	2,408	500		500		61,800	16,091	45,709	0.38	17,369	66,000	3,392	62,608	0.60	37,565		26,500	0.32	8,480		
1988		20,400	0.14	2,856	300		300		70,900	15,894	55,006	0.38	20,902	86,200	3,603	82,597	0.60	49,558		32,100	0.32	10,272		
1989		41,700	0.14	5,838	0		0		100,200	18,810	81,390	0.38	30,928	75,000	7,868	67,132	0.60	40,279		33,300	0.32	10,656		
1990		11,500	0.15	1,725	2,400		2,400	0.50	1,200	71,500	16,995	54,505	0.53	28,888	88,800	3,487	85,313	0.72	61,425		33,900	0.44	14,916	
1991		16,900	0.15	2,535	600		600	0.50	300	73,700	22,627	51,073	0.53	27,069	99,000	9,651	89,349	0.72	64,331		29,900	0.44	13,156	
1992		9,000	0.15	1,350	1,400		1,400	0.50	700	90,000	25,549	64,451	0.53	34,159	104,400	4,962	99,438	0.72	71,595	27,100	175	26,925	0.44	11,847
1993		33,000	0.15	4,950	500		500	0.50	250	105,800	35,178	70,622	0.53	37,430	108,600	14,715	93,885	0.72	67,597	43,100	199	42,901	0.44	18,876
1994		15,300	0.15	2,295	2,900		2,900	0.50	1,450	150,600	61,843	88,757	0.53	47,041	145,800	18,664	127,136	0.72	91,538	39,400	730	38,670	0.44	17,015
1995		33,600	0.42	14,112	2,500		2,500	0.50	1,250	148,300	65,405	82,895	0.69	57,198	125,300	22,960	102,340	0.83	84,942	46,700		46,700	0.63	29,421
1996		30,700	0.42	12,894	3,600		3,600	0.50	1,800	140,200	70,225	69,975	0.69	48,283	161,900	46,142	115,758	0.83	96,079	53,200		53,200	0.63	33,516
1997		25,100	0.52	13,052	6,300		6,300	0.00	0	183,800	110,594	73,206	0.73	53,440	158,600	51,028	107,572	0.85	91,436	38,700		38,700	0.65	25,155
1998		52,400	0.52	27,248	5,000		5,000	0.00	0	134,700	76,731	57,969	0.73	42,317	159,300	70,014	89,286	0.85	75,893	24,700		24,700	0.65	16,055
1999		24,600			0		0		103,300	52,761	50,539		231,000	109,086	121,914		32,600		32,600					
Averages:																								
62-69		3,300			450						12,488				13,300					40,288				
70-79		13,270		823	310						24,490		2,668		36,600		10,558			54,950		3,962		
80-89		19,430		1,667	420					7,636	51,478		11,785		4,954	69,824		22,244		36,660		5,705		
90-99		25,210		8,907	2,520		772			53,791	66,399		41,758		35,071	103,199		78,315		368	36,820		19,995	
96-99		33,200		17,731	3,725					77,578	62,922		48,014		69,068	108,633		87,803			37,300		24,909	

Table III-22, continued.

YEAR	MS				OH				TN				WI				MF TOTAL GIANTS			
	Special Season	Regular Season			Special Season	Regular Season			Special Season	Regular Season			Special Season	Regular Season			Special Season	Regular Season	Total	
		Harvest	% giants	# giants		Harvest	% giants	# giants		Harvest	% giants	# giants		Reg	% giants	# giants				
1962		400			1100	1,100			1800	1,800			19100	19,100						
1963		800			0	0			2,000	2,000			19,500	19,500						
1964		100			2,200	2,200			3,100	3,100			42,900	42,900						
1965		0			4,100	4,100			1,700	1,700			50,000	50,000						
1966		0			3,500	3,500			2,800	2,800			27,900	27,900						
1967		900			5,200	5,200			4,400	4,400			21,300	21,300						
1968		0			6,200	6,200			7,200	7,200			25,300	25,300						
1969		0			4,700	4,700			1,600	1,600			42,800	42,800						
1970		0			9,100	9,100	0.38	3,458	9,500	9,500	0.06	570	28,600	28,600	0.03	858	21,031	21,031		
1971	1,900	0.67	1,273	6,100	6,100	0.38	2,318	3,800	3,800	0.06	228	52,500	52,500	0.03	1,575	18,104	18,104			
1972	0			5,200	5,200	0.38	1,976	1,900	1,900	0.06	114	35,800	35,800	0.03	1,074	15,704	15,704			
1973	0			13,500	13,500	0.38	5,130	7,200	7,200	0.06	432	60,800	60,800	0.03	1,824	22,540	22,540			
1974	800	0.67	536	9,200	9,200	0.38	3,496	7,100	7,100	0.06	426	77,000	77,000	0.03	2,310	28,085	28,085			
1975	2,000	0.47	940	11,200	11,200	0.30	3,360	9,500	9,500	0.05	475	66,400	66,400	0.02	1,328	35,680	35,680			
1976	18,000	0.47	8,460	8,500	8,500	0.30	2,550	29,800	29,800	0.05	1,490	45,700	45,700	0.02	914	41,541	41,541			
1977	2,800	0.47	1,316	12,600	12,600	0.30	3,780	8,200	8,200	0.05	410	89,900	89,900	0.02	1,798	31,574	31,574			
1978	3,900	0.47	1,833	10,700	10,700	0.30	3,210	16,500	16,500	0.05	825	85,700	85,700	0.02	1,714	37,258	37,258			
1979	0			12,900	12,900	0.30	3,870	5,200	5,200	0.05	260	62,200	62,200	0.02	1,244	34,744	34,744			
1980	1,300	0.10	130	11,500	11,500	0.10	1,150	7,400	7,400	0.02	148	57,600	57,600	0.01	576	9,708	9,708			
1981	2,300	0.10	230	12,600	12,600	0.10	1,260	5,800	5,800	0.02	116	39,800	39,800	0.01	398	1,072	10,118			
1982	2,000	0.10	200	12,600	12,600	0.10	1,260	6,800	6,800	0.02	136	45,800	45,800	0.01	458	382	9,753			
1983	2,200	0.10	220	8,200	8,200	0.10	820	20,800	20,800	0.02	416	33,500	33,500	0.01	335	2,087	8,879			
1984	500	0.10	50	16,700	16,700	0.10	1,670	12,200	12,200	0.02	244	40,600	40,600	0.01	406	5,331	10,687			
1985	1,400	0.65	910	19,800	19,800	0.60	11,880	17,800	17,800	0.33	5,874	44,600	44,600	0.06	2,676	3,910	122,325			
1986	0			17,200	17,200	0.60	10,320	11,400	11,400	0.33	3,762	49,600	49,600	0.06	2,976	5,145	118,057			
1987	0			18,800	18,800	0.60	11,280	16,400	16,400	0.33	5,412	39,600	39,600	0.06	2,376	22,742	108,303			
1988	1,000	0.65	650	27,800	27,800	0.60	16,680	17,700	17,700	0.33	5,841	68,200	68,200	0.06	4,092	21,222	147,051			
1989	2,100	0.65	1,365	34,500	34,500	0.60	20,700	55,100	55,100	0.33	18,183	85,300	85,300	0.06	5,118	28,315	183,115			
1990	900	0.32	288	20,800	20,800	0.82	17,056	23,500	23,500	0.66	15,510	125,300	125,300	0.09	11,277	21,185	210,505			
1991	500	0.32	160	36,000	178	35,822	0.82	29,374	21,900	21,900	0.66	14,454	122,400	189	122,211	10,999	32,873			
1992	200	0.32	64	43,900	5,537	38,363	0.82	31,458	12,200	12,200	0.66	8,052	63,900	63,900	0.09	5,751	38,789	225,536		
1993	1,400	0.32	448	51,300	4,526	46,774	0.82	38,355	23,300	23,300	0.66	15,378	74,900	1,717	73,183	0.09	6,586	60,300		
1994	1,600	0.32	512	47,000	22,483	24,517	0.82	20,104	17,400	1,936	15,464	0.66	10,206	76,900	1,178	75,722	0.09	6,815	117,125	
1995	1,300	0.33	429	56,600	27,691	28,909	0.87	25,151	33,000	7,751	25,249	0.78	19,694	102,500	6,584	95,916	0.24	23,020	133,946	
1996	3,800	0.33	1,254	74,100	31,127	42,973	0.87	37,387	35,000	13,661	21,339	0.78	16,644	80,400	10,229	70,171	0.24	16,841	208,624	
1997	8,100	0.31	2,511	86,200	33,496	52,704	0.83	43,744	31,900	9,268	22,632	0.76	17,200	78,900	6,289	72,611	0.25	18,153	259,765	
1998	12,806	11,594	0.31	3,594	81,600	38,047	43,553	0.83	36,149	31,700	7,858	23,842	0.76	18,120	45,000	18,057	26,943	0.25	6,736	275,237
1999	7,785	2,615		74,000	26,537	47,463			18,100	5,405	12,695			95,000	17,150	77,850				257,962
Averages:																				
62-69		275				3,375					3,075			31,100					0	0
70-79		2,940				9,900					9,870			60,460					28,626	28,626
80-89		1,280				17,970					17,140			50,460			10,023	72,800	81,820	
90-99	10,296	3,201			21,069	38,188			7,647	20,212			7,674	80,381			140,581	290,110	417,649	
96-99	10,296	6,527	2,453		32,302	46,673	39,093		9,048	20,127	17,322		12,931	61,894	13,910		250,397	347,991	595,867	

Table III-23. Special Canada goose seasons (daily bag limits) in Mississippi Flyway States, 1977-98.^a

YEAR	MN		WI		MI		OH		IA	IL	IN	MO	TN	MS	AL
	Early	Late	Early	Late	Early	Late	Early	Late	Early	Early	Early	Early	Early	Early	Early
1977						12/1-9	(2)								
1978						12/1-9	(2)								
1979						12/1-9	(2)								
1980						12/1 - 1/17	(2-3)								
1981						12/1 - 1/17	(2-3)								
1982						12/21 - 1/15	(3)								
1983			12/1-31	(2)		12/21 - 1/15	(3)								
1984			12/1-31	(2)		12/22 - 2/16	(3)								
			11/25-12/9	(2)											
1985			12/1-31	(2)		1/1 - 2/16	(2)								
			11/16-12/15	(2)											
1986			12/1-31	(2)		1/1 - 2/15	(2)								
			11/16-12/15	(2)											
1987	9/1-10 (4)	12/18-27 (2)			12/1-31	(2)	9/1-10 (3)	1/9 - 2/7	(2)		9/1-10 (5)				
					11/7-12/6	(2)									
1988	9/1-10 (4)	12/16-25 (2)			10/19-12/11	(1)	9/1-10 (3)	1/7 - 2/5	(2)		9/1-10 (5)				
					12/1-31	(2)									
1989	9/1-10 (4)	12/15-24 (2)			12/1-31	(3)	9/1-10 (3)	1/6 - 2/4	(2)		9/1-10 (5)				
					11/5-12/10	(1)									
1990	9/1-10 (4)	12/15-24 (2)	9/4 -10 (5)		12/1-31	(3)	9/1-10 (3)	1/5 - 2/3	(2)		9/1-10 (5)				
					11/5-12/9	(1)									
1991	9/1-10 (4)	12/14-23 (2)	9/3 -10 (5)		12/1-31	(3)	9/1-10 (3)	1/4 - 2/2	(2)	9/1-10 (3)		9/1-10 (5)	9/1-10 (5)		
					11/4-12/15	(1)									
1992	9/1-10 (4)		9/1 -10 (5)	12/1-31	(2)	9/1-10 (5)	1/9 - 2/7	(2)	9/1-10 (3)		9/1-10 (5)	10/3-12 (3)			
1993	9/4-13 (4)	12/11-20 (2)	9/1 -10 (5)				9/1-10 (5)	1/8 - 2/6	(2)	9/1-10 (3)		9/1-10 (5)	10/2-11 (3)		
1994	9/3-12 (4)	12/10-19 (2)	9/6 -10 (5)				9/1-10 (5)	1/7 - 2/5	(2)	9/3 -15 (3)		9/1-15 (5)	10/1-10 (3)		
1995	9/2-11 (5)	12/9-18 (2)	9/1 -13 (5)				9/1-10 (5)	1/6 - 2/4	(2)	9/2-15 (4)		9/1-14 (5)	9/1-15 (5)		9/10-19 (2)
			9/5 -13 (5)				9/1-15 (5)			9/2-15 (2)					
1996	9/7-15 (5)	12/14-23 (2)	9/3 -15 (5)				9/1-10 (5)	1/4 - 2/2	(2)	9/1-15 (4)		9/14-15 (2)	9/7-15 (5)	9/1-15 (5)	9/9-13 (2)
	9/7-15 (2)		9/3 -15 (3)				9/1-15 (5)			9/1-15 (2)			9/7-15 (2)		9/5-13 (5)
	9/7-15 (4)														
1997	9/6-15 (5)	12/13-22 (2)	9/2 -15 (5)				9/1-10 (5)	1/3 - 2/1	(5)	9/1-15 (4)		9/13-14 (2)	9/1-14 (5)	9/1-15 (5)	9/7-11 (2)
	9/6-15 (2)		9/2 -15 (3)				9/1-15 (5)		(2)	9/1-15 (2)			9/6-14 (2)		9/3-15 (5)
1998	9/5-15 (5)	12/12-21 (2)	9/1 -15 (5)				9/1-10 (5)	1/9 - 2/7	(5)	9/1-15 (4)		9/12-13 (2)	9/1-15 (5)	9/1-15 (5)	9/6-10 (2)
	9/5-15 (2)		9/1 -15 (3)				9/1-15 (5)		(2)	9/1-15 (2)			9/1-15 (2)		9/2-15 (5)
1999										9/1-15 (4)			9/1-15 (5)		9/5-9 (2)
										9/1-15 (2)					9/1-15 (5)
2000										9/1-15 (5)			9/1-15 (5)		9/10-19 (2)
										9/1-15 (2)					9/10-19 (2)

^a Source: Ken Gamble and Jeff Peterson, USFWS.

Table III-24. Special season Canada goose harvest estimates in Mississippi Flyway States, 1977-99.^a

YEAR	MN		WI		MI		IA	IL	IN	OH		MO	TN	MS	AL	MF TOTAL	
	Early	Late	Early	Late	Early	Late	Early	Early	Early	Early	Late	Early	Early	Early	Early	Early	Late
1977							NA										NA
1978							NA										NA
1979							NA										NA
1980							NA										NA
1981							1,072										1,072
1982							382										382
1983				NA ^b			2,087										2,087
1984				NA ^b			5,331										5,331
1985				NA ^b			3,910										3,910
1986				NA ^b			5,145										5,145
1987	377	3,015		NA ^b	14,731	1,360		3,259								18,367	4,375
1988	2,179	1,424		NA ^b	13,916	1,978		1,725								17,820	3,402
1989	7,257	611		NA ^b	11,610	7,200		1,637								20,504	7,811
1990	2,341	1,146	NA	NA ^b	13,095	3,900		703								16,139	5,046
1991	9,043	608	189	NA ^b	14,696	7,931		228	NA	178						24,334	8,539
1992	4,962		NA	NA ^b	21,009	4,540			2,566	5,537		175				34,249	4,540
1993	14,715	NA ^b	1,717		27,734	7,444			3,965	4,526		199				52,856	7,444
1994	18,664	NA ^b	1,178		48,713	13,130			10,291	22,483		730	1,936			103,995	13,130
1995	22,960	NA ^b	6,584		52,536	12,869		3,555		27,691			7,751			121,077	12,869
1996	46,142	NA ^b	10,229		60,851	9,374	16,485	2,282	18,473	31,127			13,661			199,250	9,374
1997	51,028	NA ^b	6,289		91,810	18,784	13,127	6,117	29,846	33,496			9,268	NA	NA	240,981	18,784
1998	70,014	NA ^b	18,057		72,365	4,366	9,436	14,996	25,433	38,047			7,858	12,806	1,859	270,871	4,366
1999 ^c	99,694	9,392	17,150		49,876	2,885	5,766	10,923	19,159	26,537	2,637		5,405	7,785	3,390	245,685	14,914

^a Source: Ken Gamble and Jeff Peterson, USFWS.

^b Special season overlaps regular season, no estimate available.

^c Preliminary.

September season to target molt migrant giants returning from the region of Hudson and James Bays (G. Soulliere, Michigan Department of Natural Resources, personal communication).

By January 2000, four States in the Mississippi Flyway were using late seasons (**Table III-23**). It is believed that late seasons are effective at harvesting urban giants which venture into rural areas to feed during late winter, although this has not been evaluated. Late season harvests have been more difficult to estimate, because they overlap with regular seasons in some States (**Table III-24**). Although variable among years, the total late season giant harvest in the Mississippi Flyway appears to be increasing.

Despite high harvest throughout the Flyway, wildlife agency population goals have been far surpassed in many States, and numbers of human/goose conflicts continue to increase. Urban “refuges”, where sport harvest is not feasible, have caused unequal distribution of geese which has eroded the public’s tolerance of goose damage and conflicts. Given current frameworks and regulations, and increasing urbanization, it does not appear that sport harvest can adequately control resident giant Canada goose populations in the Mississippi Flyway.

(c) Central Flyway

In the 1990s, as populations remained above objectives and continued to increase, the Central Flyway Council started a slow progression of liberalizing regulations. These first liberalizations occurred in the west tier of States (New Mexico, Colorado, Wyoming, Montana, and west Texas) where SGP and HL birds are harvested. Between 1990 and 1999, the east tier of States (Texas, Oklahoma, Kansas, Nebraska, South Dakota, and North Dakota) changed from a season length of 72 days with a daily bag limit of 1 goose to a 95 day season and a daily bag limit of 3 geese. In addition, South Dakota initiated the first September special season in the Flyway in 1996 with the objective to decrease the local Canada goose population in the northeast and east-central portions of the State. September special seasons were initiated in Kansas and North Dakota in 1999 and in Oklahoma in 2000 (**Table III-25**).

Between 1962 and 1998, Canada goose harvest increased more or less with the increase in population size despite a concurrent decline in the number of adult waterfowl hunters. The percentage of the Flyway’s total goose harvest that was Canada geese increased from about 40 percent prior to the mid-1980s to greater than 60 percent in the late-1990s. There were some minor changes in the distribution of the Canada goose harvest in the Flyway, most notably a decline in Texas (from 21 percent of the Flyway’s total in the 1970’s to 12 percent in the 1990’s) and in North Dakota (19 percent to 14 percent). This harvest was distributed across all the other States except New Mexico and Kansas, which have maintained a relatively stable percentage of the Flyway’s harvest. At the same time, the total harvest of Canada geese and the proportion that are large geese have increased (**Tables III-26 & III-27**) in nearly every jurisdiction over the last two decades. Only in Colorado and Montana has this proportion been stable rather than increasing. The magnitude of the change in Central Flyway States over the period 1995-98 has been influenced by several factors, including more liberal regular season hunting regulations.

Table III-25. September Canada Goose Season Dates, Hunter Activity and Harvest in North and South Dakota From State Harvest Surveys.

Year	North Dakota				South Dakota			
	Days	Hunters	Hunter Days	Harvest	Days	Hunters	Hunter Days	Harvest
1996 ¹					15	6586	20145	12866
1997 ²					10	6506	17360	11281
1998 ³					11	6682	19377	15768
1999 ⁴	15	1025	2794	1893	15	6308	19869	17850
2000 ⁵	21	NA	NA	NA	N: 28 S: 14	NA	NA	NA

Notes:

- 1 In SD 10 counties open in two hunt units with separate 1 and 2-bird bag limits.
- 2 In SD 13 counties open with a 2- bird bag limit.
- 3 In SD 13 counties open with a 4- bird bag limit.
- 4 In SD 14 counties open with a 5- bird bag limit. In ND 2 counties open with a 3-bird bag limit.
In SD 20 counties open in north and south hunt units with a 5-bird bag limit. In ND a statewide season with a 5-bird bag limit.
- 5 In KS and OK state harvest surveys not conducted for September Canada goose seasons. In KS in 1999, limited hunt area around Kansas City, Topeka and Lawrence September 1-13 with a 3-bird bag limit. In 2000, Wichita area was added. In OK in 2000, a statewide season held from September 9-17 with a 3-bird bag limit.

Table III-26. Total and large race Canada goose (regular season) harvest in the Central Flyway.

Period	** Central Flyway States **			* Alberta & Saskatchewan *			***** Total *****		
	Total	Large	% Large	Total	Large	% Large	Total	Large	% Large
1980-84	215340	112040	52%	200395	130305	65%	415735	242345	58%
1985-89	242,982	146,596	60%	204,455	135,029	66%	447,437	281,626	63%
1990-94	297,030	190874	64%	191,392	130,618	68%	488,422	321,492	66%
1995-98	587365	409346	70%	228478	167573	73%	816096	576938	71%

Table III-27. Canada goose regular season harvests for Central Flyway States and Provinces.

Period	***** Alberta *****			***** Colorado *****			***** Kansas *****		
	Total	Large	% Large	Total	Large	% Large	Total	Large	% Large
1980-84	102238	73,166	72%	39546	29366	74%	12810	6166	48%
1985-89	107,706	77,190	72%	49,746	34,381	69%	13,080	8,759	67%
1990-94	105,092	78,237	74%	55,345	40,769	74%	13,284	9,914	75%
1995-98	119,155	94,844	80%	135,895	101,423	75%	37,907	30,146	80%

Period	***** Montana *****			***** Nebraska *****			***** New Mexico *****		
	Total	Large	% Large	Total	Large	% Large	Total	Large	% Large
1980-84	5905	5419	92%	18655	11733	63%	2569	1315	51%
1985-89	7,881	7,302	93%	31,278	24,071	77%	3,507	2,046	58%
1990-94	15,427	14,127	92%	40,763	33,520	82%	2,817	1,771	63%
1995-98	32,858	30,249	92%	81,846	70,521	86%	1,637	1,043	64%

Period	**** North Dakota ****			***** Oklahoma *****			**** Saskatchewan ****		
	Total	Large	% Large	Total	Large	% Large	Total	Large	% Large
1980-84	32343	8238	25%	7763	2700	35%	98157	57139	53%
1985-89	25,993	7,896	30%	10,642	4,619	43%	96,749	57,839	60%
1990-94	37,944	15,319	40%	13,916	6,476	47%	86,300	52,381	61%
1995-98	83,927	36,279	43%	17,587	9,643	55%	109,323	72,729	67%

Period	**** South Dakota ****			***** Texas *****			**** Wyoming ****		
	Total	Large	% Large	Total	Large	% Large	Total	Large	% Large
1980-84	46959	28013	60%	42129	1915	5%	6661	5207	78%
1985-89	49,799	30,273	61%	40,928	3,365	8%	10,126	8,987	89%
1990-94	57,038	41,219	72%	45,097	4,348	10%	15,400	13,981	91%
1995-98	105,061	87,815	84%	62,324	3,875	6%	28,578	24,964	87%

Note: Percent large for west tier states for 1982 was subjectively estimated based on values for nearby years. Percent large for States was estimated from Hand-Tally information collected at the annual Wing Bee (pers. comm. Michael A. Johnson, ND). Percent large for Alberta and Saskatchewan is from CWS reports.

(d) Pacific Flyway

As discussed in section III.A.1.b.(4) Pacific Flyway, Pacific Flyway resident geese are divided into the Pacific Population (PP) and the Rocky Mountain Population (RMP) of the western Canada goose. Since 1982, the Pacific Flyway has recognized and separately managed the two populations.

Harvest of the Pacific Population, of which a large portion is relatively nonmigratory (migrate short distances or none), has increased substantially over the last 20 years (Table III-28). The average harvest has increased from approximately 65,000 in the late 1970s to over 160,000 in the mid 1990s. Most of this increase has resulted from additional harvest in Idaho and Washington.

Table III-28. Harvest of the Pacific Population (PP) of Canada geese from 1970-98^{1,2}.

YEAR	Unit I			Unit II		Unit III		Unit IV				GRAND	Three Yr.
	CA	NV	TOTAL	ID	TOTAL	MT	TOTAL	ID	WA	B.C.	TOTAL	TOTAL	Average
1970	59,551	1,834	61,385			1,494	1,494		14,280		14,280	77,159	
1971	50,453	2,973	53,426			1,468	1,468		12,940		12,940	67,834	
1972	51,797	1,680	53,477			4,563	4,563		13,000		13,000	71,040	72011
1973	56,266	3,612	59,878			2,762	2,762		9,600		9,600	72,240	70371
1974	52,325	4,790	57,115			3,061	3,061		9,300		9,300	69,476	70919
1975	37,647	2,602	40,249			3,452	3,452		12,440	8,913	21,353	65,054	68923
1976	38,152	5,714	43,866			2,387	2,387		12,900	6,848	19,748	66,001	66844
1977	36,700	3,723	40,423			3,583	3,583		12,900	8,758	21,658	65,664	65573
1978	34,260	5,215	39,475			5,019	5,019		17,300	10,800	28,100	72,594	68086
1979	21,698	4,052	25,750			3,205	3,205		19,500	12,931	32,431	61,386	66548
1980	18,974	3,773	22,747			3,783	3,783		16,680	16,656	33,336	59,866	64615
1981	21,506	6,918	28,424			3,090	3,090		17,090	15,843	32,933	64,447	61900
1982	16,323	5,720	22,043			3,148	3,148		16,730	14,479	31,209	56,400	60238
1983	21,600	7,239	28,839			4,856	4,856		18,730	14,877	33,607	67,302	62716
1984	41,632	10,143	51,775			3,262	3,262		22,000	15,841	37,841	92,878	72193
1985	54,778	7,486	62,264			3,866	3,866		26,650	18,510	45,160	111,290	90490
1986	24,670	5,632	30,302			3,307	3,307		17,330	14,853	32,183	65,792	89987
1987	34,332	7,122	41,454			2,811	2,811		16,150	14,830	30,980	75,245	84109
1988	25,568	6,922	32,490			3,245	3,245		21,240	15,266	36,506	72,241	71093
1989	29,254	5,099	34,353			4,310	4,310		22,690	16,418	39,108	77,771	75086
1990	34,782	9,095	43,877	21,788	21,788	7,564	7,564	11,618	23,100	14,835	49,553	122,782	90931
1991	29,254	5,535	34,789	35,000	35,000	4,795	4,795	5,500	23,510	18,211	47,221	121,805	107453
1992	52,631	8,742	61,373	36,500	36,500	4,022	4,022	4,400	34,173	16,130	54,703	156,598	133728
1993	45,921	5,352	51,273	34,000	34,000	3,249	3,249	9,000	26,267	12,943	48,210	136,732	138378
1994	48,798	7,321	56,119	57,400	57,400	7,171	7,171	15,600	34,636	16,568	66,804	187,494	160275
1995	30,903	4,723	35,626	50,300	50,300	5,877	5,877	14,400	30,011	10,732	55,143	146,946	157057
1996	24,761	7,637	32,398	59,891	59,891	6,140	6,140	14,967	37,799	15,477	68,243	166,672	167037
1997	36,702	4,638	41,340	43,211	43,211	6,402	6,402	11,129	44,769		55,898	146,851	153490
1998	7,145	7,145							35,447		35,447	42,592	118705
AVG.	36,830	5,601	41,161	42,261	42,261	3,996	3,996	10,827	21,350	14,124	32,791	91,728	

Notes:

1. Italicized data indicates HIP data.
2. Shaded data indicates no data or survey, calculated as average of previous and following year or trend data.

Harvest of the Rocky Mountain Population, which is primarily migratory in nature, has also increased although not to the same extent as the Pacific Population. The average harvest has grown from approximately 90,000 in the late 1970s to approximately 140,000 in the mid 1990s (Table III-29). The largest increases occurred in Nevada, Montana, Wyoming, and Colorado.

Table III-29. Harvest of Rocky Mountain Population of Canada geese (RMP) by reference area as measured by State surveys.

Year	Alberta South ¹	Mont. Cent.	Idaho SE	Wyoming			Colo. NW	Utah			Nevada				Arizona	Calif. S & C	NW New Mexico	Total	THREE YR. AVERAGE
				Cent.	West.	Total		North.	South.	Total	NW	NE	South.	Total					
1975	19,633	4,860	13,300	1,094	969	2,063	683	19,604	1,457	21,061	2,604	181	846	1,027	1,488	14,875	39,817		
1976	20263	4,371	16,300	1,317	713	2,030	450	17,865	1,517	19,382	5,714	129	536	665	1,940	17,162	88,277		
1977	17,065	5,365	19,200	1,408	1,067	2,475	386	14,856	1,052	15,908	3,723	140	279	419	1,508	10,295	76,344	68,146	
1978	25,337	4,867	25,500	1,557	2,183	3,740	713	30,433	4,032	34,465	5,215	178	605	783	3,732	14,994	119,346	94,656	
1979	21,629	7,648	25,100	1,385	2,202	3,587	1,481	22,703	4,025	26,728	4,052	172	1,014	1,186	6,597	8,007	106,015	100,568	
1980	30,212	6,969	25,900	1,598	1,584	3,182	1,070	20,848	3,804	24,652	3,733	93	649	742	1,583	9,208	107,251	110,871	
1981	25,975	4,663	23,700	2,633	1,323	3,956	1,564	16,227	4,699	20,926	6,918	417	1,562	1,979	5,189	9,401	104,271	105,846	
1982	33,278	4,577	33,800	2,176	3,086	5,262	2,464	28,331	5,341	33,672	5,720	383	455	838	3,714	6,305	129,630	113,717	
1983	33,116	4,962	25,000	3,289	3,258	6,547	2,403	24,061	7,599	31,660	7,239	472	1,190	1,662	3,354	13,629	129,572	121,158	
1984	25,625	6,948	17,100	3,875	3,127	7,002	1,930	26,018	11,180	37,198	10,143	456	1,059	1,515	4,300	11,749	123,510	127,571	
1985	29,734	5,222	34,200	1,995	2572	4,567	3,103	36,300	12,951	49,251	7,486	659	1,725	2,384	4,994	14,650	155,591	136,224	
1986	25,762	6,719	24,000	3,723	2702	6425	2,900	15,151	6,796	21,947	5,632	704	633	1,337	6,621	7,537	108,880	129,327	
1987	35,337	9,343	12,000	1,692	2,586	4,278	2,676	15,108	7,938	23,046	7,122	598	1,064	1,662	4,778	7,232	107,474	123,982	
1988	30,186	7,149	18,600	2,540	2,242	4,782	3,115	9,706	5,559	15,265	6,922	507	1,261	1,768	4,054	9,667	101,508	105,954	
1989	33,978	7,574	25,600	2,441	2,842	5,283	5,874	12,011	3,193	15,204	5,999	578	555	1,133	2,273	12,022	114,940	107,974	
1990	38,701	12,330	31,400	1,972	2,167	4,139	8,214	13,314	6,318	19,632	9,095	669	888	1,557	2,219	10,761	138,048	118,165	
1991	32,296	12,676	28,500	3,129	2,308	5,437	4,148	14,792	3,967	18,759	4,965	227	381	608	1,936	8,715	118,040	123,676	
1992	26,452	8,009	20,100	1,892	1,672	3,564	5,937	12,046	4,316	16,362	8,742	787	611	1,398	3,631	13,188	107,383	121,157	
1993	28,134	11,039	31,100	2,465	1,613	4,078	5,558	20,618	5,188	25,806	5,352	499	742	1,241	2,723	8,055	123,086	116,170	
1994	30,130	11,884	29,400	2,723	2,308	5,031	2,445	29,190	6,060	35,250	7,321	399	853	1,252	3,009	7,586	133,308	121,259	
1995	35,486	12,463	33,400	3,965	2,482	6,447	4,829	20,488	2,483	22,971	4,723	158	325	483	3,184	6,543	130,529	128,974	
1996	42,952	13042	40,127	4,437	4,642	9,079	6575	33,226	7,090	40,316	7,637	874	517	1,391	3,247	6,290	170,656	144,831	
1997	42,255	13,621	16,345	3,773	2,523	6,296	6550	14,168	3,815	17,983	4,638	666	745	1,411	2,796	7,758	119,653	140,279	
1998	33,419	14,199	14771	5,023	3,137		6,577	21,047	5,561	26,608	7,145	867	623	1,490	2,761	6,824	125,154	138,487	
1999		14,778	8,142	6,273	3,750	10,023	6,846				6,410	610	555	1,165	5,164	6,479	61,468	102,091	
Avg.:	29,873	8,611	23,703	2,735	2,362	4,970	3,540	20,338	5,248	25,586	6,170	457	787	1,244	3,472	9,957	113,590	117,438	

Notes:

1. Lightly shaded italicized areas indicate no data or survey. Number was calculated from previous and following year or previous 10-year trend, or from Federal surveys.
2. Italicized areas with no shading indicates numbers derived from HIP surveys.
3. Southern Alberta: Estimate was revised in 1994. Assumes that about 41 percent of all large Canada goose harvest in Provincial Zones 4, 6, and 8 and RMP geese.
4. NW Nevada harvest is combination of PP and RMP geese and is assigned to PP harvest.
5. 1996 Idaho harvest is from Federal survey.

c. Migratory Bird Permit Program

Until recently, to resolve conflicts between people and resident Canada geese, wildlife managers relocated geese from areas where problems existed to areas that had few or no geese. Today, few, if any, such areas remain. With the current shortage of places to move offending geese, managers have sought and used alternative methods to resolve conflicts between birds and people.

There are several effective management and control techniques used to discourage resident Canada geese from settling in an area. Generally, control activities can be divided into three broad categories: (1) Resource management, (2) Physical exclusion, and (3) Wildlife management (APHIS/WS 1994). Resource management would include such activities as habitat management to make areas less attractive to resident Canada geese and modification of human behavior such as the elimination of artificial feeding of geese in park situations. Physical exclusion techniques might include the use of fencing or netting to prohibit or restrict Canada goose access to specific areas. Wildlife management would include the use of lure crops or other alternative foods, the use of frightening devices such as propane exploders, firecrackers, or dogs, the use of chemical repellents, reproductive inhibitors, and finally, take or relocation methods. All of these techniques have been used for control and management of resident Canada geese with varied success (see **section II.A. Description of Goose Management Techniques** for further detail).

Complex Federal and State responsibilities are associated with resident Canada goose damage-management activities. All control activities, except techniques intended to either scare or exclude geese from a specific area, such as habitat management, or repellents, require a Federal permit, issued by the Service. Additionally, permits to alleviate migratory bird depredations are issued by the Service in coordination with Wildlife Services. The current procedure is designed so that depredation-permit requests made to the Service for resident Canada goose damage management are reviewed by Wildlife Services, which in turn makes a recommendation to the Service for either approval or denial.

Until recently, permits for controlling problems associated with injurious resident Canada geese were issued by the Service as special-purpose permits or depredation permits as described in 50 CFR, Parts 21.27 and 21.41, respectively. The introductory text of Part 21.27 reads,

“Permits may be issued for special purpose activities related to migratory birds, their parts, nests, or eggs, which are otherwise outside the scope of the standard form permits of this part. A special purpose permit for migratory bird related activities not otherwise provided for in this part may be issued to an applicant who submits a written application containing the general information and certification required by part 13 and makes a sufficient showing of benefit to the migratory bird resource, important research reasons, reasons of human concern for individual birds, or other compelling justification.”

As indicated above, Part 21.27 provides for the permitted taking of migratory birds with “compelling justification.” The Service has used this provision in the past to authorize and permit resident Canada goose damage control/management activities, including lethal control. Currently, the Service primarily uses the provisions contained under depredation permits for resident Canada goose control efforts. Part 21.41 outlines the requirements for obtaining a depredation permit which states,

“Each such application must contain the general information and certification required by Sec. 13.12(a) of this subchapter plus the following additional information:

- (1) A description of the area where depredations are occurring;
- (2) The nature of the crops or other interests being injured;
- (3) The extent of such injury; and
- (4) The particular species of migratory birds committing the injury.”

As indicated above, Part 21.41 allows the permitted taking of migratory birds which are injuring “crops or other interests.” The Service has historically taken “other interests” to mean the risk of aircraft/bird collisions; physical injury inflicted by geese to people; damage to lawns, gardens, and plants; deposition of fecal material in areas intensively used by people; and damage to commercial entities such as golf courses and aquaculture facilities.

All private individuals, organizations, and Federal and State agencies seeking permits to control migratory birds must file an application with the Service. Additionally, a recommendation from Wildlife Services is required before the Service issues depredation permits. Permits are issued by the Service based on the information provided by the applicant. In nearly all instances, a State-issued permit is also needed before one can legally take migratory birds under a Federal permit.

Service-issued permits to take and/or control migratory birds are designed to relieve depredation problems and injurious situations and are not to be construed as opening, reopening, or extending any hunting season. Normally, control actions are either carried out by agents of the State fish and wildlife agency or Wildlife Services staff. Permits are not issued for sport hunting. All sport-hunting regulations are issued through the annual regulations-development process.

In 1999, we established a new special Canada goose permit. Designed specifically for the management and control of resident Canada geese, the new permits are only available to individual State conservation or wildlife management agencies. Under the permits, States and their designated agents can initiate resident goose damage management and control injurious goose problems within the conditions and restrictions of the permit program. The permits, while restricted to the period between March 11 and August 31, increase the use and availability of control measures, help decrease the number of injurious resident Canada geese in localized areas, have little impact on hunting or other recreation dependent on the availability of resident Canada geese, allow injury/damage problems to be dealt with on the State and local level, and result in more responsive and timely control activities. State applications for the special permits require detailed information regarding the size of the resident Canada goose breeding population in the State and the number of resident Canada geese, including eggs and nests, to be taken. In addition, the State must show that such damage-control actions will either provide for human health and safety or protect personal property, or compelling justification that the permit is needed to allow resolution of other conflicts between people and resident Canada geese. Some of the more pertinent restrictions in the new permits are:

1. State wildlife agencies (States) may take injurious resident Canada geese as a management tool but should utilize non-lethal management tools to the extent they consider appropriate in an effort to minimize lethal take.
2. Control activities should not adversely affect other migratory birds or any species designated under the Endangered Species Act as threatened or endangered.
3. States may conduct control activities March 11 through August 31 and should make a concerted effort to limit the take of adult birds to June, July, and August in order to minimize the potential impact on other migrant populations.
4. States must conduct control activities clearly as such (e.g., they cannot be set up to provide a hunting opportunity).

5. States must properly dispose of or utilize Canada geese killed in control programs. States may donate Canada geese killed under these permits to public museums or public scientific and educational institutions for exhibition, scientific, or educational purposes, or charities for human consumption. States may also bury or incinerate geese. States may not allow for Canada geese taken under these permits, nor their plumage, to be sold, offered for sale, bartered, or shipped for purpose of sale or barter.
6. States may use their own discretion for methods of take but utilized methods should be consistent with accepted wildlife-damage management programs.
7. States may designate agents who must operate under the conditions of the State's permit.
8. States must keep records of all activities, including those of designated agents, carried out under the special permits. We will require an annual report detailing activities conducted under a permit.
9. We will annually review States' reports and will periodically assess the overall impact of this program to ensure compatibility with the long-term conservation of this resource.
10. We reserve the authority to immediately suspend or revoke any permit if we find that the State has not adhered to the terms and conditions specified in 50 CFR 13.27 and 13.28 or if we determine that the State's population of resident Canada geese no longer poses a threat to human health or safety, to personal property, or of injury to other interests.

We believe the special permits further result in biologically sound and more cost-effective and efficient resident Canada goose damage management than the existing permit-by-permit system. Overall, the special Canada goose permit provides some additional management flexibility needed to address problems and at the same time simplifies the procedures needed to administer the goose damage management program. In the short term, we believe this permit satisfies the need for an efficient/cost-effective damage management program while allowing us to maintain a high degree of management control. To date, several States (Ohio, Michigan, Minnesota, Missouri, and South Dakota) have applied for, and obtained, the new permits.

(1) Wildlife Services Program

(a) History and Role

Wildlife Services' mission is to "provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety." This is accomplished through:

- A) training of wildlife damage management professionals;
- B) development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
- C) collection, evaluation, and dissemination of management information;
- D) cooperative wildlife damage management programs;
- E) informing and educating the public on how to reduce wildlife damage and;
- F) providing data and a source for limited use management materials and equipment, including pesticides (USDA 1989).

(b) Wildlife Services Integrated Pest Management

Wildlife damage management, defined as the alleviation of damage or other problems caused by or related to the presence of wildlife, is an integral component of wildlife management (Leopold 1933, Wildlife Society 1990, Berryman 1991).

Integrated Wildlife Damage Management Approach: The Wildlife Services program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as Integrated Pest Management or IPM) in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1, page 17 of Wildlife Services' Animal Damage Control Program Final Environmental Impact Statement (USDA 1995). These methods include the alteration of cultural practices as well as habitat and behavioral modification to prevent damage. The reduction of wildlife damage may also require that the offending animal(s) be removed or that localized populations of the offending species be reduced through lethal methods.

Wildlife Services conducts resident Canada goose damage management, after consultation with the USFWS and appropriate State wildlife management agencies, using a formalized Decision Model (USDA 1995a) (**Figure III-5**). The Decision Model is used to determine the most appropriate implementation strategy to resolve wildlife damage. This proposal would implement safe and practical methods for the prevention and control of damage caused by wildlife, based on local problem analysis, environmental and social factors, and the informed judgement of trained personnel. In selecting management techniques for specific damage situations, consideration is given to:

- magnitude of threat or damage;
- geographic extent of threat;
- life cycle of the resident Canada goose, time of year, and location;
- other land uses (such as proximity to recreation areas or residences);
- feasibility of implementation of the various allowed techniques;
- occurrence of non-target species (other species, pets, or protected or endangered species);
- local environmental conditions such as terrain, vegetation, and weather;
- potential legal restrictions such as availability of tools or management methods;
- humaneness of the available options; and
- costs of control options.

The Decision Model is adopted from the Wildlife Services decision making process, which is a standardized procedure for evaluating and responding to damage complaints (USDA 1995a). Wildlife Services personnel evaluate the appropriateness of strategies, and methods are evaluated in the context of their availability (legal and administrative) and suitability based on biological, economic, and social considerations. Following this evaluation, the methods deemed to be practical for the situation form the basis of a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for management is ended in that particular case, records are kept, and reported to the appropriate wildlife management agencies.

Wildlife Services strives to reach and maintain a balance between wildlife needs and welfare and human needs and welfare. Humans and Canada geese are both part of the natural environment and both sets of

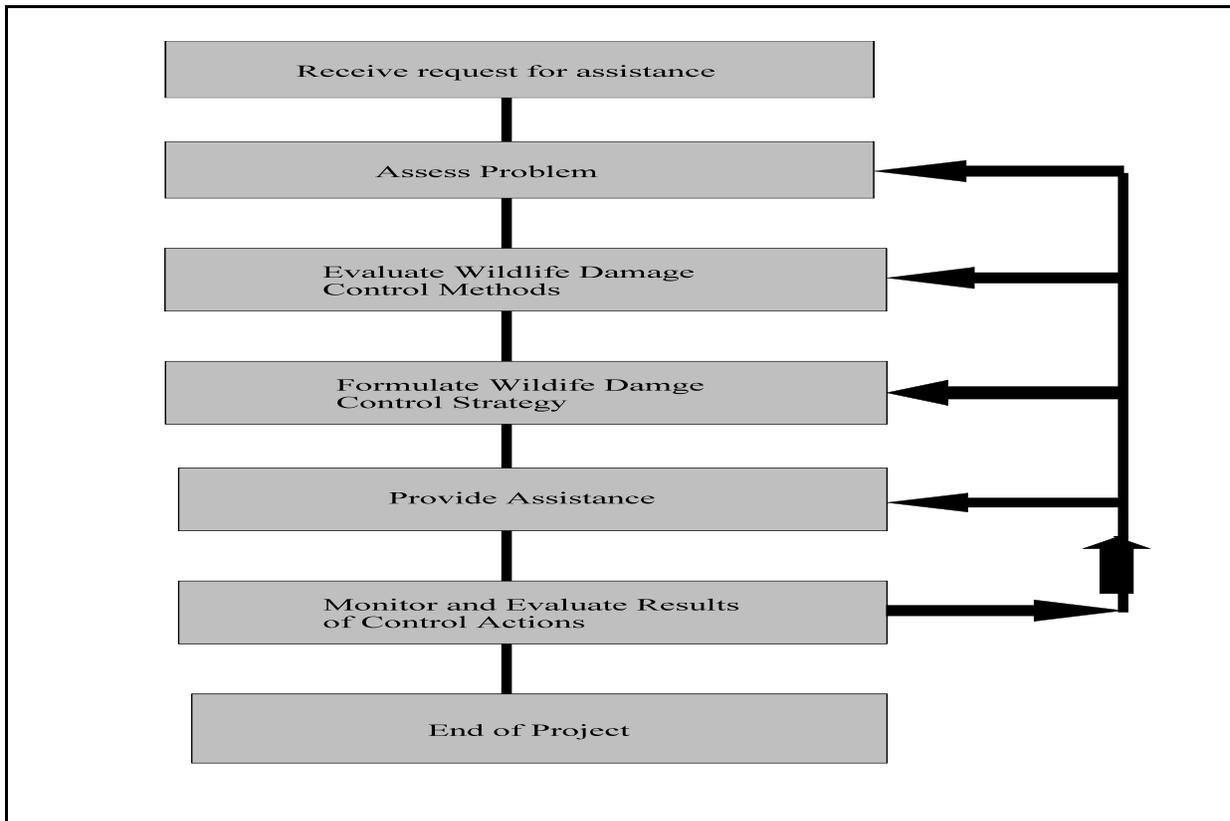


Figure III-5. Wildlife Services Decision Model.

needs and welfare must be considered when selecting methods to be used in a resident Canada goose damage management program. Wildlife Services does not conduct any wildlife damage management to punish offending animals or to treat them inhumanely, but rather as a means of reducing damage when and where requests for assistance are received.

Funding: Wildlife Services is a cooperatively funded, service-oriented program. Before any operational wildlife damage management is conducted, Agreements for Control or APHIS/WS Work Plans must be completed by Wildlife Services and the land owner/administrator. Wildlife Services cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested and appropriate, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with federal, State, and local laws, regulations, policies, orders, and procedures including the Endangered Species Act (ESA) and Migratory Bird Treaty Act.

Stakeholder Role in Deciding on a Damage Management Plan: When one person privately owns a parcel of property, the authority selecting the damage management plan would be the property owner. Wildlife Services would provide technical assistance and recommendations for deterring geese, using non-lethal methods, and lethal control, to this person to reduce damage. If no homeowner or civic association

represents the affected resource owners of the local community, then Wildlife Services would provide technical assistance to the self or locally appointed authority(ies). Direct damage management would be provided by Wildlife Services if requested, funded, and the requested direct damage management was consistent with Wildlife Services recommendations, policy and federal and State laws. Additionally, a minimum of 67 percent of the affected resource owners must agree to the direct damage management. The affected resource owners would be those whose property is adjacent to the water body where the Canada geese primarily inhabit or damage resources. Affected resource owners who disagree with the direct damage management may request Wildlife Services not conduct this action on their property and Wildlife Services will honor this request.

The authority selecting the damage management plan for local, State, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals and legal mandates for the property. Wildlife Services would provide technical assistance and recommendations to this person to reduce damage. Direct damage management would be provided by Wildlife Services if requested, funding was provided, and the requested direct damage management was consistent with Wildlife Services recommendations, policy and federal and state laws.

This process for involving local communities and local stakeholders in the decisions for resident goose damage management assures that local concerns are considered before individual damage management actions are taken.

Wildlife Services Wildlife Damage Management Methods:

Non-chemical methods:

<u>Cultural Practices</u>	Lure crops / Supplemental Feeding
<u>Habitat Modification</u>	Barriers, fencing (conventional) Barriers, fencing (permanent electrical) Barriers, fencing (temporary electrical) Barriers, netting Barriers, overhead wires Barriers, exclusion (other) Manipulation, environmental (food) Manipulation, environmental (vegetative cover) Manipulation, environmental (water) Manipulation, environmental (other)
<u>Behavior Modification</u>	Balloons (all) Dog, chase Electric harassment devices (all) Exploders, gas (all) Flags, mylar Flags, non-mylar Harassment / shooting Pyrotechnics (all) Scarecrows (all) Tape, mylar Vehicles (all) (boat, auto, ATV)

Population Management

Hand caught, (bare hands, snare pole, etc.)
Harvest, legal
Nest removal
Nest, Egg destruction / removal (includes egg addling)
Nets, cannon / rocket
Nets, gun
Nets, other
Shooting
Spotlighting, night vision equipment / shooting
Spotlighting, hand caught
Trap & euthanize
Trap & release
Trap, drive / corral
Trap, other

Behavior modification (human) Eliminate wildlife feeding

Chemical Methods

Behavior modification Repellent, Methyl Anthranilate`
Repellent, Anthraquinone

Population management Alpha chloralose (capture drug)

Between and during fiscal years 1996 and 1999, the Wildlife Services program loaned, sold, or otherwise distributed the following equipment to the public to use to deter geese by non-lethal means: gas exploders, electronic harassment devices, electrical and conventional fencing, pyrotechnics, mylar and non-mylar flags, scarecrows (owl, snake, silhouette), cage traps, balloons, and nets (APHIS/WS Management Information System).

(c) Requests for Assistance

In 1995, the Wildlife Services received 2,884 complaints of injurious goose activity which resulted in the dispersal of 525,000 Canada geese (APHIS/WS, 1995). In addition, during that same period, the Wildlife Services program reviewed 2,224 permit requests dealing with the control of injurious Canada geese (APHIS/WS, 1995). Of those 2,224 requests, Wildlife Services recommended that the Service issue 250 permits. Those recommendations included 68 for take, 5 for capture/relocation, and 195 for egg/nest destruction.

Comparing these figures with previous years' data shows a steady increase since 1991. For example, in 1991 Wildlife Services received 1,698 complaints of injurious goose activity (APHIS/WS, 1991). In 1993, there were 2,802 complaints (APHIS/WS, 1993). In response to those complaints, Wildlife Services dispersed 730,692 and 862,809 geese, respectively, and recommended the Service issue 92 and 192 permits, respectively.

Table III-30 shows the numbers of requests for assistance to alleviate property damage by Canada geese that were received by the Wildlife Services program during 1996-99 in eight States. Most of the requests for assistance to alleviate damages to property are associated with resident Canada geese.

Table III-30 indicates that a need for assistance to alleviate damages to property by resident Canada geese exists. It does not include requests received or responded to by local, State or other Federal agencies. Although the resident goose population and related damages may be increasing, the trend in the numbers of requests for assistance may not reflect that increase. When Wildlife Services does not have the ability to respond readily or effectively to requests for assistance, the number of calls for help does not tend to reflect the extent of need for action, but rather, the requests provide an indication that a need exists. Once the program has the support to respond adequately to requests for assistance (such as permits in place, funding, and personnel), and then shows an ability to respond to requests, the numbers of requests often increase.

Table III-30. Number of requests for assistance to the Wildlife Services Program from 1996-99 for property damage by resident Canada geese in selected States.

State	1996	1997	1998	1999	Total
Illinois	48	95	--	132	275
New Jersey	246	279	296	312	1133
New York	134	177	135	132	576
Pennsylvania	198	224	153	73	648
South Dakota	--	--	--	1	1
Virginia	85	135	118	166	504
Washington	51	67	159	97	374
Wisconsin	150	189	214	205	758
8 State Total	912	1166	1075	1118	4271
WS Total	1790	2042	1278	1958	7068

Table III-31. Number of stakeholders receiving technical assistance for property damage from the Wildlife Services Program for Canada geese from 1996-99.

State	Projects 1996*	Projects 1997*	Project/Participants 1998**	Projects/Participants 1999**
Illinois	48	95	75/84	132/263
New Jersey	246	279	296/393	313/417
New York	166	178	154/167	162/167
Pennsylvania	234	285	153/153	75/77
South Dakota	--	--	--	36525
Virginia	85	135	118/128	166/184
Washington	51	67	164/181	97/120
Wisconsin	150	189	212/214	146/146
8 State Total	980	1228	1,172/1,320	1,092/1,375
WS Total	1856	2097	2,001/2,232	1,957/2,320

*1996 & 1997 data tables did not separate project/participants, therefore total number of participants could be higher.

Table III-31 shows the number of stakeholders that received technical assistance for property damage by Canada geese in selected States from 1996 through 1999.

(2) U.S. Fish and Wildlife Service

The number of permits issued by the Service has also increased in recent years as resident Canada goose populations have grown to high levels in some areas.

(a) Northeast U.S.

In Region 5 of the Service, the Northeastern/New England area (comprised of Maine, New Hampshire, Vermont, Rhode Island, Connecticut, Massachusetts, New York, Pennsylvania, Maryland, New Jersey, Delaware, Virginia, and West Virginia), the increase in permit issuance for resident Canada goose conflicts has been dramatic (see **Appendix 10**). Overall, the number of permits issued increased from 187 in 1995 to 999 in 2000, an increase of over 430 percent in only 5 years. These actions conservatively resulted in the reported take of eggs in 11,618 nests, relocation of 1,130 geese, live trap of 2,674 geese for food-shelf programs, and take of another 5,166 depredating geese for appropriate disposal over the 5-year period.

Permits specific to egg addling and nest destruction increased from 116 in 1995 to 593 in 2000, an increase of over 400 percent (see **Figure III-6**). Likewise, the number of nests authorized to be addled has grown from 6,624 in 1995 to 54,384 in 2000, an increase of 721 percent. While these 1,268 permits (thru 1999) authorized control actions on over 74,912 nests, the reported take was only 10,098 nests, or roughly 13 percent of the allowable take (see **Figure III-7**). Using an average of 6.0 eggs per nest, these actions conservatively resulted in the reported take of over 60,000 eggs.

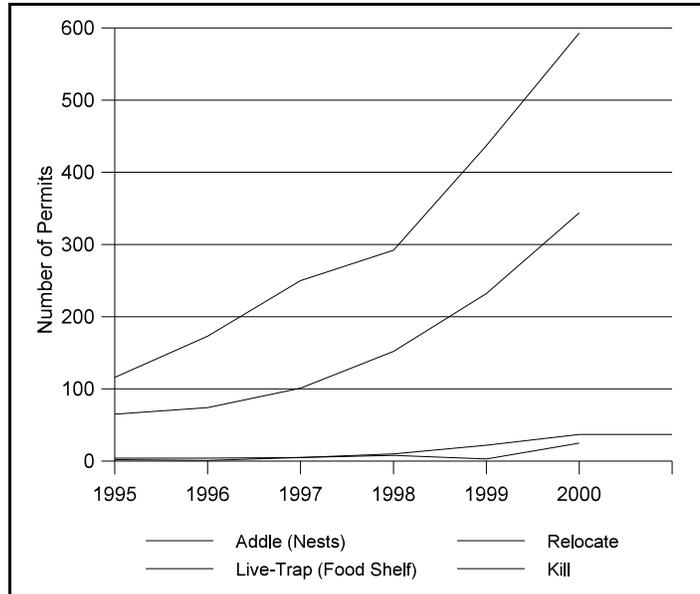


Figure III-6. Number of permits for resident Canada geese issued by Region 5 (Northeast U.S.) from 1995-2000.

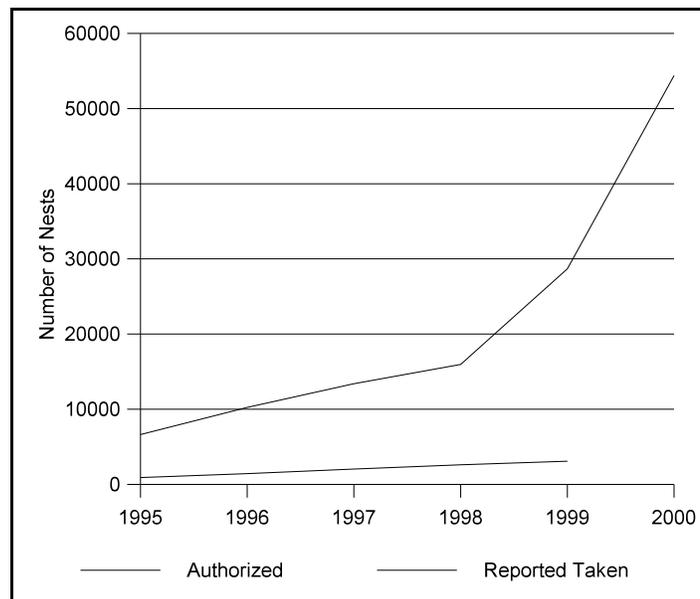


Figure III-7. Number of nests authorized to be addled and the number reported addled in Region 5 (Northeast U.S.) from 1995-2000.

Unlike nest and egg destruction, the number of geese relocated within the Atlantic Flyway Resident Population has decreased dramatically over the period of 1995-2000 as the number of places willing to accept additional Canada geese has dwindled. In 1995, Region 5 issued permits authorizing the relocation of 1,652 geese, which resulted in the reported relocation of 671 birds. By 1999, only 125 geese were authorized to be relocated and only 10 birds were reportedly moved. In 2000, only one State (Maryland) requested to move geese.

Permits to kill birds or live trap birds for food-shelf purposes has increased since 1995. In 1995, Region 5 issued 2 permits allowing the live capture of up to 80 birds in Pennsylvania and West Virginia. No birds were reportedly taken under these permits. By 2000, 37 permits were issued in 8 States (Connecticut, Delaware, Maine, Maryland, New Jersey, New York, Pennsylvania, and Virginia) allowing the take of 7,278 geese (an

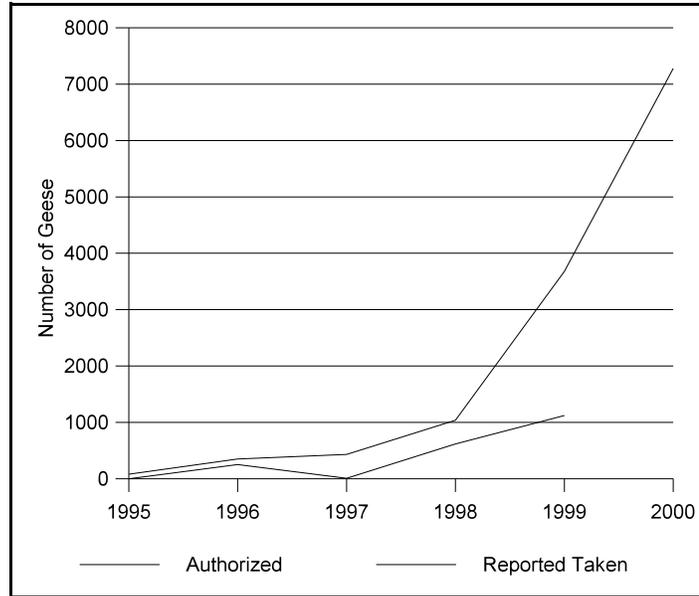


Figure III-8. Number of resident Canada geese authorized to be taken for food shelf programs and the number reported taken in Region 5 (Northeast U.S.) from 1995-2000.

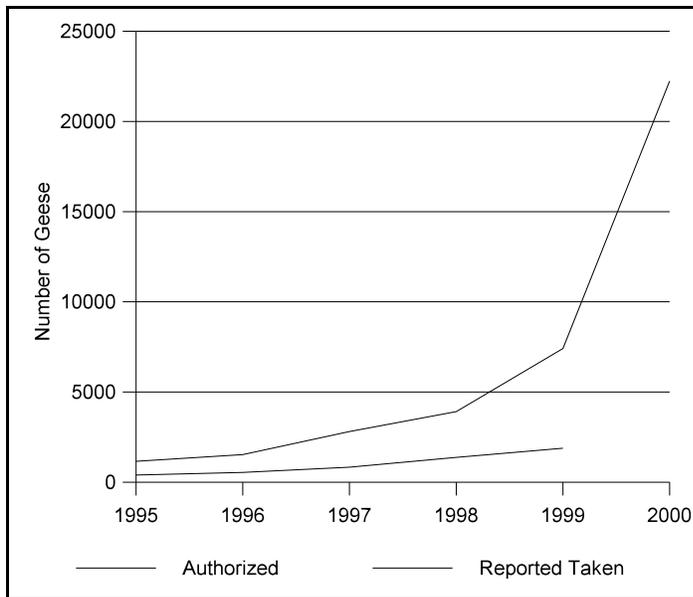


Figure III-9. Number of resident Canada geese authorized to be taken for depredation purposes and the number reported taken in Region 5 (Northeast U.S.) from 1995-2000.

almost 9,000 percent increase). However, of the 5,581 geese authorized to be taken for food shelf purposes (thru 1999), only 2,000 geese, or 36 percent, were actually reported taken (see **Figure III-8**). Permits allowing the take of depredating resident Canada geese show similar results. In 1995, Region 5 issued 65 permits authorizing the take of 1,163 geese in 8 States (Connecticut, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, and Virginia). Three hundred and ninety-six birds were reportedly taken under these permits. By 2000, 344 permits were issued in 12 States (all of the above named States plus Delaware, Maine, New Hampshire, and Vermont) allowing the take of 22,236 geese (an 1,800 percent increase). However, of the 16,835 geese authorized to be taken (thru 1999), only 5,035 geese, or 30 percent, were actually reported taken (see **Figure III-9**). Thus, of the 22,416

authorized to be taken for either food shelf programs or depredation purposes, only 7,035 geese, or 31 percent of the allowable take, were actually taken.

(b) Midwest/Great Lakes

In the Service's Region 3, the Midwest/Great Lakes area (comprised of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin), the conflicts caused by growing numbers of resident Canada geese has resulted in increasing trends in the annual issuance of permits over the past six years (see **Appendix 10**). Overall, the number of depredation permits for resident Canada geese issued increased from 149 in 1994 to 318 in 2000, a 113 percent increase. Additionally, several States (Michigan, Minnesota, Missouri, and Ohio) have applied for, and received, the new Special Canada Goose Permit and

began conducting goose control work under these permits in 2000 (Minnesota began in 1999). For ease of discussion purposes, unless stated otherwise, we have consolidated available data for both permit types.

Specific to depredation permits, in 1995, permits for nest and egg destruction authorized the take of up to 1,797 nests. By 2000, this authorized take had grown to 7,059 nests, a 292 percent increase. Further, in 1999, available data indicates that although permits authorized control actions on 4,005 nests, the reported take was only 1,852 nests, or 46 percent of the allowable take.

Alternately, the take of adult geese for either food-shelf purposes or general depredation has remained fairly level over the same period, averaging about 2,500 geese since 1996 (see **Figure III-10**).

It is important to note that in 2000, the States of Michigan, Minnesota, Missouri, and Ohio, operating under a Special Canada Goose Permit, issued 528 authorizations to individuals within their respective States. These authorizations enabled the named individual(s) to conduct control and management activities on resident Canada geese under the auspices of the State wildlife agency. Had these States not held the special permit, we believe some number of these individuals would have applied for depredation permits.

In summary, all of these actions resulted in the reported addling of 39,349 eggs, relocation of 78,672 geese, and take of 13,729 depredating geese for appropriate disposal or food shelf programs over the 6-year period.

(c) Southeast

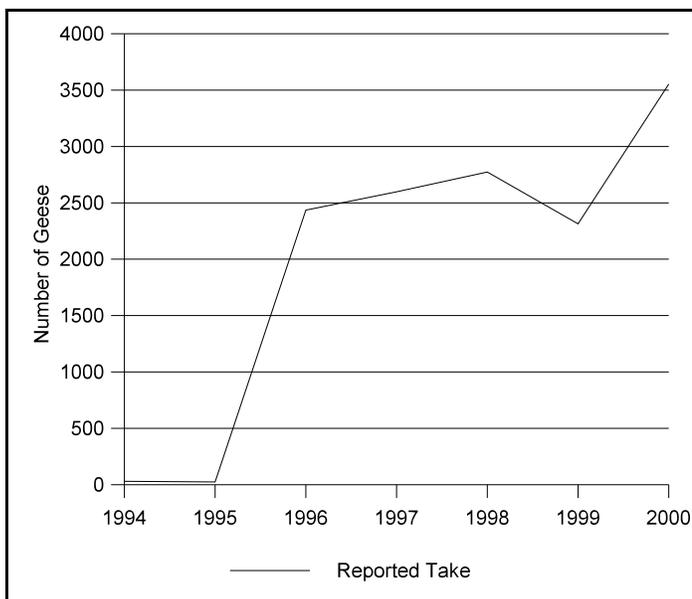


Figure III-10. Number of resident Canada geese reportedly taken for food shelf purposes or depredation in Region 3 (Midwest/Great Lakes) from 1994-2000.

In the southeastern U.S. (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee), number of complaints and requests for permits has increased dramatically in the last 10 years (see **Appendix 10**). From 1993 to 1998, over 3,500 Canada geese were captured and relocated. It is interesting to note, however, that since 1998, no permits were issued to relocate geese. We believe this is indicative of the fact that there are no further locations willing to receive Canada geese. For egg addling/nest destruction, the number of permits issued has grown from 1 permit with no associated take in 1990 to 42 permits with 811 eggs reportedly taken in 1999. Lastly, permits authorizing the take of adult Canada geese has grown from 1 permit authorizing the take of 11 geese in 1992 to 41 permits in 5 States (Georgia, Florida, Kentucky, North Carolina, and Tennessee) authorizing the take of 920 geese in 2000. Additionally, although the Service authorized the take of 1,088 geese from 1992 to 1999, available data shows that only 317 geese (or 29 percent) were reported taken.

(d) Southwest

Over the last 10 years, Region 2 (Arizona, New Mexico, Oklahoma, and Texas) of the Service has issued very few permits allowing the take of resident Canada geese as most populations in these areas have not reached levels experienced in other areas around the country (see **Appendix 10**). Further, of those permits issued by the Region, almost all have been issued in Oklahoma where the resident population has begun to conflict with various public and private uses.

(e) Rocky Mountains/Great Plains

Since 1990, Region 6 (Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, and Wyoming) of the Service has annually authorized the take of approximately 6,500 resident Canada goose adults, goslings, and eggs (see **Figure III-11**). Although the vast majority of the authorized take was for trapping and relocation within Colorado and Kansas, take was also authorized at airports in Nebraska, North Dakota, and South Dakota (see **Appendix 10**). However, the actual total take (i.e., kill) of adult geese has been less than 50 birds through 1999 (J. Cornely, personal communication). In 2000, South Dakota became the first State within the Region to obtain a Special Canada Goose Permit.

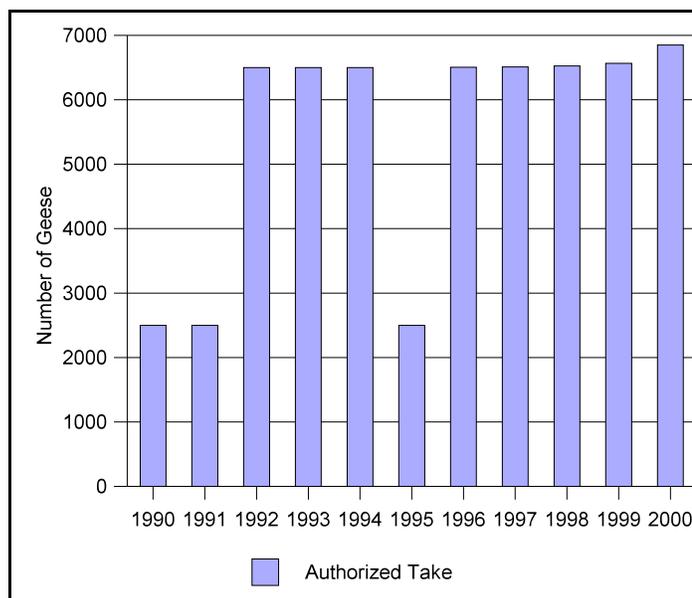


Figure III-11. Number of resident Canada geese authorized to be taken for depredation purposes in Region 6 (Rocky Mountains/Great Plains) for 1990-2000.

(f) Pacific Northwest

In Region 1 (Washington, Oregon, Idaho, Nevada and California), the Service has been issuing permits for the control of resident Canada geese since the late 1970s. While most of these permits were issued to

airports (see **Appendix 10**), until the mid 1990s take was primarily limited to the adding of eggs. In most instances, no take resulted from authorized control actions.

In the mid 1990s, the number of permits issued by the Region increased significantly from previous years (see **Figure III-12**). The number of birds taken by permittees has similarly increased over the same time period. Records indicate that from 1976 to 1988 only 21 birds and 19 eggs were taken for depredation reasons. By contrast, from 1989 to 1999, reports filed from permittees show that 1,144 geese and 9,965 eggs were taken, an average of 104 geese and 905 eggs annually (see **Figure III-13**). More specifically, since 1997, the take of resident Canada geese has averaged 328 birds and 2,152 eggs annually, indicative of increasing problems and conflicts with these populations.

(g) Alaska

Although Alaska is not within the geographic scope of this DEIS, we believe it is important to recognize that Region 7 (Alaska) of the Service has issued permits to control urban Canada geese in the Anchorage area since 1985 (see **Appendix 10**). Permits to control Canada geese have resulted in the translocation of 1,788 birds, the destruction of 1,495 eggs, and the take of 1,331 geese. Annual take of adult birds has been limited to airports and has ranged from 7 birds in 1990 to 378 in 1996.

2. Social Values and Considerations

Human dimensions of wildlife management include identifying how people are affected by problems or conflicts with wildlife, attempting to understand people's reactions, and incorporating this information into policy and management decision making processes and programs (Decker and Chase 1997). Wildlife acceptance capacity is the maximum wildlife population level in an area that is acceptable to people (Decker and Purdy 1988). Wildlife acceptance capacity is also known as the "cultural carrying

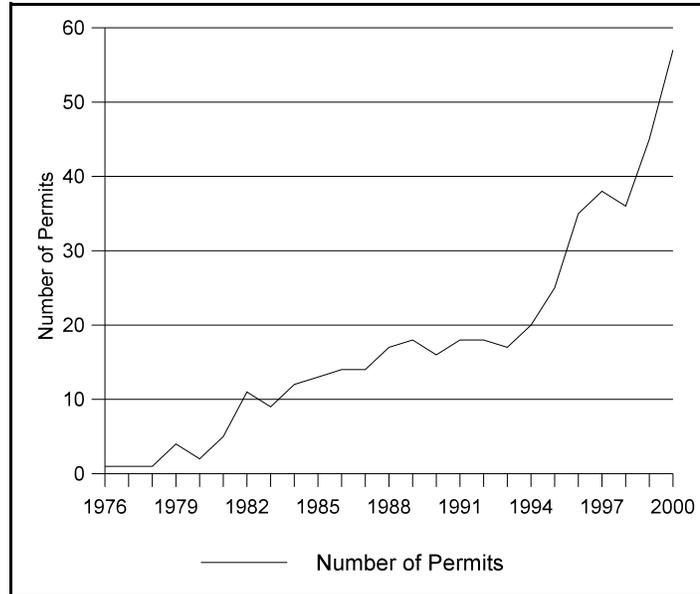


Figure III-12. Number of permits for resident Canada geese issued by Region 1 (Pacific Northwest) in 1976-2000.

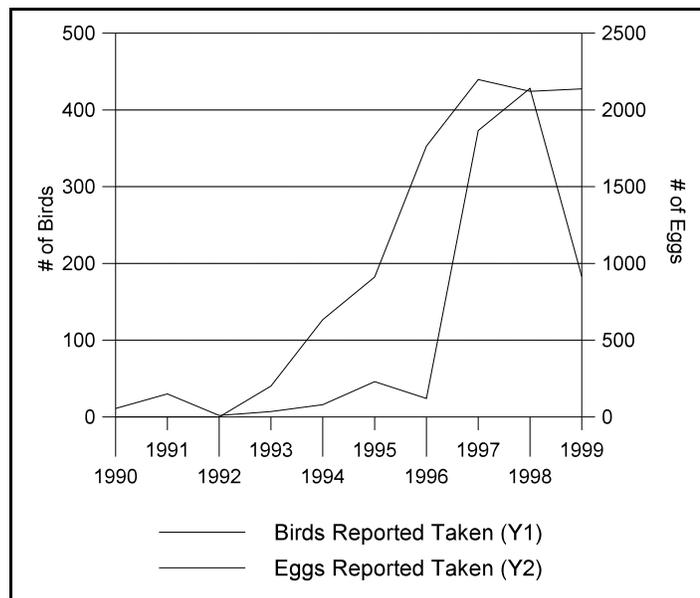


Figure III-13. Number of resident Canada geese and eggs reported taken in Region 1 (Pacific Northwest) in 1990-1999.

capacity.” These terms are important because they define the sensitivity of a local community to a specific wildlife species or problem. For any given damage situation, there will be varying thresholds and acceptance levels of those directly and indirectly affected by the damage or conflict.

Biological carrying capacity is the land or habitat’s limit for supporting healthy populations of wildlife without degradation to the animals’ health or its environment over an extended period of time (Decker and Purdy 1988). While the biological carrying capacity for resident Canada geese in some States may be higher than the spring population goal, the public’s wildlife acceptance capacity may often be lower. The wildlife acceptance capacity for resident Canada geese in Wisconsin appears to be about 5 -20 birds for an 18-hole golf course or similar sized park (J. Weiskittel, Wildlife Services personal observation as cited in USDA 2000). The wildlife acceptance capacity for resident Canada geese in Virginia appears to be approximately 25-30 birds for an 18-hole golf course (USDA 1999b). Conover and Chasko (1985) found a similar wildlife acceptance capacity for resident Canada geese at golf courses in Connecticut. Once this wildlife acceptance capacity is met or exceeded, people begin to implement population reduction methods to alleviate property damage, and/or perceived human health or safety threats. The Canada goose wildlife acceptance capacity for other damage situations and resources is undetermined.

a. Sport Hunting

Migratory birds, including resident Canada geese, are a renewable, international, common property resource. While migratory bird hunting is an activity of considerable socioeconomic importance across the country, it is an activity that is often difficult to economically and socially quantify and describe (U.S. Department of the Interior 1988).

In 1999, approximately 1.5 million waterfowl hunters spent 14.3 million days afield and harvested over 18 million ducks and 3.4 million geese, including almost 1.9 million Canada geese (Martin and Padding 2000). Nationwide, the harvest of Canada geese has almost doubled from of the late 1970s and early 1980s and tripled that of the 1960s. For a more detailed discussion of resident Canada goose harvest, see section **III.B.1.b.(3) Harvest**.

The socioeconomic characteristics of migratory bird hunters has been reported in U.S. Department of the Interior et al. (1997). In general, migratory bird hunters are predominantly male (94 percent), from rural areas (46 percent), more educated than the general public (59 percent had more than a high school education), and are from higher income brackets than the general public (44 percent had an annual household income of more than \$50,000) (U.S. Department of the Interior et al. 1997). For more discussion, see section **III.B.3.c. Sport Hunting**.

b. Aesthetics

Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. However, wildlife may also be responsible for adverse effects on people. The activities of some wildlife result in economic losses to agriculture and damage to property. Human safety is jeopardized by wildlife collisions

with aircraft and automobiles, aggressive goose behavior may result in human injury, and wild animals may harbor diseases transmissible to humans.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Positive values of wildlife would also include having enough wildlife to view, but also to enjoy the aesthetics of the local environment without excessive animal excrement or loss of vegetation (lawns and flower gardens) due to wildlife feeding on plants.

However, the same wildlife populations that are enjoyed by many can also create conflicts with a number of land uses and human health and safety. The activities of some wildlife, such as white-tailed deer and Canada geese, result in economic losses to agriculture and damage to property (Wisconsin APHIS/WS Annual Tables, 1992-1999). Human safety is jeopardized by wildlife collisions with aircraft and automobiles, and wild animals may harbor diseases transmissible to humans. Predation by, or to, wildlife species that have special status, such as threatened and endangered species, is a public concern. Certain species of wildlife can be regarded as a nuisance in certain settings. Excessive numbers of wildlife can ruin the aesthetic appearance and enjoyment of some recreational activities because of excessive fecal droppings or disruption of vehicle traffic.

Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using up the animal) or non-consumptive use (viewing the animal in nature, a zoo, or for photography) (Decker and Goff 1987). Indirect benefits or indirectly exercised values arise without the user being in direct contact with the animal and come from experiences as looking at photographs and films of wildlife, reading about wildlife, or benefitting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Public reaction is variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife. Population management methods (egg destruction, capture and relocation, capture and processing for human consumption, and shooting) provide relief from damage to property or threats to human safety for those who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by damage to property and threats to human safety caused by resident Canada geese insist upon their removal from the property or public location when the Wildlife acceptance capacity is reached or exceeded. Some people have the opinion that resident Canada geese should be captured and relocated to a rural area to alleviate damage or threats to human safety. Some people directly affected by the damage from resident Canada geese strongly oppose removal of the birds regardless of the amount of damage. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of resident Canada geese from specific locations or sites. Some people opposed to any goose removal want responsible agents to teach tolerance for goose damage and threats to human health or safety, and believe that geese should never be killed. Additionally, some people who oppose removal of geese do so because of human-affection bonds

with individual geese. These human-affection bonds are similar to those of pet owners and result in aesthetic enjoyment.

Some individual members or groups of wildlife species habituate and learn to live in close proximity to humans. Some people in these situations feed such wildlife and/or otherwise develop emotional attitudes toward such animals that result in aesthetic enjoyment. In addition, some people consider individual wild birds as "pets," or exhibit affection toward these animals. Examples would be people who visit a city park to feed waterfowl or pigeons and homeowners who have bird feeders or bird houses. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them.

Property owners that have populations of resident Canada geese higher than their identified wildlife acceptance capacity are generally concerned about the negative aesthetic appearance of bird droppings and property damage to landscaping and turf. Managers of golf courses, swimming beaches and athletic fields are particularly concerned because negative aesthetics can result in lower public use. Costs associated with property damage include labor and disinfectants to clean and sanitize the area, loss of property use, loss of aesthetic value of plants, gardens, aquatic vegetation, and lawns where geese feed and loaf, loss of customers or visitors irritated by having to walk on fecal droppings, and loss of time contacting wildlife management agencies on health and safety issues and damage management advice, and implementation of non-lethal and lethal wildlife management methods.

c. Recreational Use of Impacted Areas

The Pennsylvania Department of Conservation and Natural Resources (DCNR) documented goose problems at 44 of 117 State parks. In 1999, the DCNR spent \$767,840 to manage problem resident Canada geese at these parks. This figure represents only direct costs to the parks, such as materials and personnel, and does not estimate revenue loss resulting from decreased visitor use and beach closures. DCNR notes that such losses are not limited to the State but also affect concessionaires and other park-related businesses (Pennsylvania Department of Conservation and Natural Resources 2000). DCNR also states that the most significant problems caused by geese is fecal contamination and cites high fecal coliform counts as the primary cause for beach closure.

In Connecticut, the Town of Trumbull has documented the reduction of visitors to a locally maintained park and swimming area from 150 visitors per day to approximately 5-10 per day. The presence of geese has repeatedly closed the swimming area due to elevated fecal coliform levels, and efforts by the Town to control the goose population have generally failed.

d. Animal Rights and Humaneness

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if ". . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process." Suffering is described as a ". . . highly unpleasant emotional response usually associated with pain and distress" (AVMA 1987). However, suffering ". . . can occur without pain . . .," and ". . . pain can occur without suffering . . ." (AVMA 1987). Because suffering carries with it the

implication of a time-frame, a case could be made for ". . . *little or no suffering where death comes immediately . . .*" (CDFG 1991), such as shooting.

Defining pain as a component in the humaneness of wildlife management methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would ". . . *probably be causes for pain in other animals . . .*" (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991). Pain and suffering, as it relates to damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since ". . . *neither medical or veterinary curricula explicitly address suffering or its relief*" (AVMA 1987, CDFG 1999). Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

Some people have expressed concern over the potential separation of goose families through management actions. This could occur through relocation of problem geese or through removal and euthanasia of the same. Geese are well known for forming long term pair bonds. Bellrose (1976) presented annual mortality rates of juvenile Canada geese ranging from 7 to 19% during the hatching to fledging stage. We believe that juvenile geese have a good likelihood of survival without adult geese once the juvenile reaches fledging stage which generally occurs in June. Therefore juvenile geese which escape capture during the molt will most likely survive to adult-hood. Separated adults will form new pair bonds and will readily breed with new mates at the appropriate time of year (CDFG 2000). The effects on social structure of geese would be reflected by reproduction efforts and therefore, trends in the population indices, but would not have a significant adverse impact on goose social structures (CDFG 2000).

3. Economic Considerations

(Unless specifically indicated otherwise, information in this section is from State wildlife agency responses submitted during public scoping. See **Appendix 1.**)

a. Residential, Commercial, and Public Property

The relative abundance of preferred habitat provided by current landscaping techniques (i.e., open, short-grass areas adjacent to small bodies of water) has provided resident Canada goose populations the opportunity to become established in many urban areas of the country. This habitat availability, combined with the lack of natural predators, the absence of waterfowl hunting in many of these areas, and free handouts of food by some people has also served to significantly increase urban and suburban resident goose populations. Habitat examples include public parks, airports, public beaches and swimming facilities, water treatment reservoirs, corporate business areas, golf courses, schools, college campuses, private lawns, amusement parks, cemeteries, hospitals, residential subdivisions, and areas along or between highways.

While most people find a few geese to be an asset, problems can quickly develop when numbers increase. Habitat can be easily overgrazed, resulting in denuded lawns and increased soil erosion. Undesirable accumulations of droppings and feathers can foul reservoirs, adversely affect water quality and aquatic

life, and clog filters, pumps, and intakes. Significant quantities of goose droppings can kill vegetation and serve as an insect attractant. Large numbers of geese can make it difficult to use public recreational facilities such as fishing ponds, sports fields, golf courses, and beaches. Reports of geese attacking people while defending their territories have become more common in recent years (Ohio Division of Wildlife, public scoping).

State wildlife management agency estimates of dollar damages for years preceding the survey ranged from thousands to millions of dollars. The majority of the costs involved clean-up and repairs of managed turf areas (parks, golf courses, athletic fields, congregated residences, etc.) or agricultural damage.

Atlantic Flyway: Although few States in the Atlantic Flyway had a systematic method of logging and recording complaints or damages caused by resident Canada geese, most States provided some information.

The Delaware Division of Fish and Wildlife estimated they receive approximately 20-30 complaints annually (probably 80 to 90 percent of all complaints) for resident Canada geese. They believe that financial losses exceed \$100,000 annually.

The Georgia Division of Wildlife reported receiving 1,280 complaints during 1995-99, but estimated that they only receive about 40 percent of the total complaints. They conservatively estimated total damage from resident Canada geese at \$456,000 in 1999. A portion of this estimate was based on a recent Georgia survey of golf courses. That survey found that 56 percent of the 319 member courses of the Georgia Golf Association considered geese to be a nuisance. A follow-up telephone poll of selected courses with an average number of geese indicated that the average course spent about \$1,500 per year cleaning or repairing greens damaged by geese for an estimated total of \$268,500 in damages annually.

The Massachusetts Division of Fisheries and Wildlife reported that 85 of 180 calls regarding Canada geese in 1999 were of a complaint nature. A questionnaire distributed to members of the Massachusetts Golf Course Owners Association found that 84% of the respondents reported either "very serious" or "moderately serious" problems with Canada geese (Massachusetts Golf Course Owners Association 1995).

In Maryland, the Maryland Department of Natural Resources estimated that based on anecdotal information and available documentation, clean-up costs to remove goose dropping from lawns, walkways and beaches and the expenditures to prevent goose damages probably exceed \$150,000 annually.

The New York Division of Fish, Wildlife and Marine Resources estimated they receive in excess of 100 complaints annually, about 75 percent of which related to suburban-urban conflicts and damage. They estimate, based on anecdotal information, cleanup costs associated with resident geese probably exceeds \$1,000,000 annually.

Although the North Carolina Wildlife Resources Commission does not keep detailed records, they estimated handling approximately 110 complaints each year, 90 percent of which they classified as property and/or nuisance related. Likewise, the Rhode Island Division of Fish and Wildlife reported receiving between 30 and 60 complaints annually, and the Vermont Department of Fish and Wildlife estimated receiving about a dozen complaints annually, most of which regarded damage.

The Pennsylvania Game Commission recorded 219 complaints during 1994-98, an average of 44 annually. Approximately 50 percent of these complaints related to residential and commercial conflicts. Pennsylvania estimated losses to private property at \$500,000 annually. Additionally, the Pennsylvania Department of Conservation and Natural Resources (DCNR) documented goose problems at 44 of 117 State parks. In 1999, the DCNR spent \$767,840 to manage problem resident Canada geese.

The Virginia Department of Game and Inland Fisheries and Wildlife Services estimated they receive over 800 complaints annually with the majority related to property, health and safety, and nuisance concerns. Annual damage estimates reported by Wildlife Services included \$304,000 for health and human safety and \$23,000 for personal property.

The West Virginia Division of Natural Resources averaged 114 complaints from 1995-99 with almost all related to property damage, health and safety concerns, and use conflicts. They estimated the total property damage attributed to resident Canada geese in 1999 was \$25,000.

In total, the States responding to our survey conservatively logged approximately 1,600 calls annually and estimated that damages exceed \$3.3 million annually. Comparing these numbers with those supplied from Wildlife Services, the results are very similar. During 1994-98, Wildlife Services logged an average of 1,437 complaints annually related to Canada geese (excluding agricultural complaints) in Atlantic Flyway States (Atlantic Flyway Council 1999). Complaints about property damage accounted for over 80 percent of the complaints.

Mississippi Flyway: From 1994 to 2000, States in the Mississippi Flyway documented 13,873 complaints and estimated at least \$8,753,068 in associated damage from resident Canada geese (see **Table III-32**). States experiencing the most complaints were Indiana, Michigan, Minnesota, Ohio, and Wisconsin, while Illinois, Michigan Minnesota, and Missouri had the most associated damage and costs from resident Canada geese. This was despite the fact that some State wildlife agencies do not receive all the complaints or in some cases, even the majority. For example, the Missouri Department of Conservation estimates that they only receive about 30 percent of the complaints, while the Iowa Department of Natural Resources and the Illinois Department of Conservation receives about 75 percent. Further, some State wildlife agencies do not document complaints from the public, such as Alabama, although they reported receiving numerous complaints. Lastly, many States do not document all associated damage. For example, the Minnesota Department of Natural Resources stated that due to the difficulty in estimating economic losses, many complainants do not provide any estimate.

Central Flyway: In the Central Flyway, obtaining specific information about damage and problems caused by resident Canada geese is somewhat difficult. Wildlife Services operates in all the Central Flyway States but does not deal with Canada goose issues in each. Each State has an agency that also deals with wildlife issues and in some States there is formal agreement between the State agency and Wildlife Services about who will deal with problems caused by Canada geese. In other States, Wildlife Services deals with some problems (e.g. airports) while the State agency deals with other types of problems. Many State agencies consider dealing with these problems “all in a day’s work” and do not have reporting systems established to track their occurrence. In Oklahoma alone, 1,000-2,000 resident Canada geese that cause problems in urban areas are relocated annually (Mike O’Meilia, Oklahoma Department of Wildlife Conservation, personal communication), but the specific breakdown of costs to do this work is not closely tracked.

The Oklahoma Department of Wildlife Conservation (ODWC) first reported urban problems in 1990. **Table III-33** shows that the number of urban incidents addressed by the ODWC has increased from one to nearly 50 in 1999. All ten States in the Central Flyway and Alberta and Saskatchewan have reported incidents of resident, large Canada geese causing problems in urban situations with the number of incidents of urban problems increasing throughout the 1990s (**Table III-33**). Although, these types of problems seldom result in reportable, direct economic damage, Wildlife Services in Oklahoma reported \$44,000 in damage in 16 incidents on golf courses in 1992 and a total of \$68,000 in damage in urban settings between 1992 and late-1999. The Colorado Division of Wildlife reported receiving 60 to 80 complaints per year.

Table III-32. Number of documented complaints, and estimated dollar value of associated damage and/or harassment costs, associated with resident giant Canada geese, Mississippi Flyway States, 1994-2000.

Year	AL ^{ab}	AR	IL ^b	IN ^g	IA	KY ^b	LA ^b	MI ^{d,e}	MN ^c	MO	OH	TN	WI	Total
1994	NA	NA	61 (\$26,800)	19	NA	15	9 (\$8,200)	12 (\$4,500)	165 (\$108,900)		453	232 (\$2,201)	474 (\$11,821)	1,440 (\$162,422)
1995	NA	NA	108 (\$1,322,535)	12	106	6	12 (\$1,500)	21 (\$10,700)	149 (\$125,200)	71	369	187 (\$2,300)	408 (\$60,536)	1,449 (\$1,522,771)
1996	4	NA	155 (\$193,125)	22	128	57 (\$72,550)	1 (\$1,000)	35 (\$4,790)	115 (\$110,400)	112	299	124 (\$31,103)	285 (\$8,952)	1,337 (\$421,920)
1997	6	NA	157 (\$433,904)	32	134	74 (\$41,850)	2 (NA)	935 (\$460,000)	129 (\$142,400)	84	392	213 (\$15,822)	297 (\$30,456)	2,455 (\$1,124,432)
1998	4	21	112 (\$390,755)	21 (\$68,650)	129 (\$12,000)	45 (\$4,730)	5 (\$8,000)	249 (\$62,700)	295 (\$922,850)	96	474	102 (\$15,541)	413 (\$47,682)	1,966 (\$1,532,908)
1999	16	43	187 (\$670,882)	550 (\$15,780)	101 (\$7,500)	93 (\$99,579)	7 (NA)	213 (\$55,000)	310 (\$267,800)	166 (\$377,025)	692 (\$115,200)	103 (\$14,500)	310 (\$143,650)	2,791 (\$1,766,916)
2000	NA	NA	189 (\$701,975)	506 (\$87,135)	NA	NA	2 (NA)	315 (\$122,000)	NA	244 (\$1,150,250)	771 (\$92,950)	94 (\$12,950)	314 (\$54,439)	2,435 (\$2,221,699)

^a Conflict complaints were not documented or compiled in Alabama until 1996; therefore, these data are a conservative estimate of total goose complaints in that State.

^b Goose complaints mainly documented and compiled by USDA Wildlife Services and not by the State wildlife agency.

^c Dollar estimates are for crop damage only except for the 1998 estimate which also incorporated a survey of urban goose complaints in the Twin Cities.

^d Number of goose complaints estimated at 400 - 500 annually. A reporting system was begun in 1997; however, reporting effort (i.e., form completion) has not been consistent over time.

^e No data available on estimated value of property damage. Cost estimates based on landowner estimates of harassment costs (estimated on reporting forms).

^f Estimated through October, 2000.

^g 1994-97 data represent a minimum number of complaints handled by the State wildlife agency.

Almost all were conflicts with property in urban and suburban situations. Wildlife Services reported over \$4,000 in damage between 1993 and 1997 in Colorado.

The Kansas Department of Wildlife and Parks also does not maintain detailed records of complaints, but they estimated an average of 255 situations per year over the past 5 years with an increasing trend. Approximately 80 percent of these complaints involve urban and suburban conflicts.

Table III-33. Frequency and costs of human-Canada goose conflict incidents in the Central Flyway from 1992-99.

Year	Urban ¹			Agriculture						
	Oklahoma		Central Flyway	Oklahoma		North Dakota		Central Flyway		
	State ²	Wildlife Services ³		State	Wildlife Services	Wildlife Services	Wildlife Services	Wildlife Services		
	# ⁴	#	Costs \$\$	#	#	#	Costs \$\$	#	Costs \$\$	#
1992	1	24	47,600	71	0	16	2,400			59
1993	6			56	4	32	17,600			84
1994	3	24		76	2	32	13,600			80
1995	8	8	2,000	294	2	24	13,600	12	31,250	176
1996	8	8		301	4	40	43,400	13	16,000	258
1997	21	8	6,000	349	3	64	110,880	4	3,915	278
1998	28	88	2,000	409	10	56	212,800	17	38,175	343
1999	49	56	10,400	170	6	56	5,000	12	4,2250	423
Totals	126	216	68,000	1,710	31	320	419,280	58	13,1590	1701

1. All incidents that do not involve agriculture.
2. Oklahoma Department of Wildlife Conservation
3. U.S. Department of Agriculture, Wildlife Services
4. # = Incident count

Park Districts, Lake Associations, Homeowners Associations, and Townships: During public scoping, a number of public, private, and local governmental groups provided information on costs expended on resident Canada goose damage management and abatement. Some of these costs are detailed in **Table III-34**. This list is not meant to be exhaustive, but merely to provide a nationwide sample of the costs expended on goose-damage abatement techniques.

A 1997 survey conducted in DuPage County, Illinois, found that only 88 percent of the schools, corporations, golf courses, park districts, etc., responding to the survey reported resident goose problems (Armstrong 1998). The most objectionable problems identified by respondents was excrement on lawns and sidewalks (83 percent), overpopulation (48 percent), destruction of vegetation (47 percent), and hostility toward people (35 percent).

b. Agricultural Crops

Canada geese have been reported causing damage to crops and livestock in several ways which are discussed in the following sections.

Table III-34. Costs identified regarding resident Canada goose damage management by selected organizations (from public scoping).

<u>Location</u>	<u>Associated Costs</u>	<u>Notes</u>
Arlington Heights Park District, Arlington, IL	\$41,433	Annual Clean-up costs
Department of Parks and Community Services, Bellevue, WA	\$25,000	Daily canine patrol in 1999
Brick Township, NJ	\$7,025	Use of border collies in 1999
Fairway Mews Community Association, Spring Lake Heights, NJ	\$10,000	Annual cost of border collies
City of Renton, WA	\$84,598	Associated impacts at beach park
Department of Parks and Recreation, Seattle, WA	\$33,000	Annual summer beach clean-up costs
Woodlake Community Association, Midlothian, VA	\$10,000	Maintenance and materials

Damage to crops: Direct damage to agricultural resources by resident Canada geese include grain crops, grazing of pastures and alfalfa meadows (deprive livestock of food and causes an increased economic hardship on livestock producers), spring seedlings, and trampling. Resident Canada geese have grazed a variety of crops: barley, corn, soybeans, wheat, rye, oats, and peanuts. Heavy grazing by Canada geese can result in reduced yields and in some instances a total loss of the grain crop. A single heavy grazing event by Canada geese in fall, winter, or spring can reduce the yield of winter wheat by 13-30 percent (Allen et al. 1985, Flegler et al. 1987), and reduce the growth of rye plants by more than 40 percent (Conover 1988). However, Allen et al. (1985) also found that grazing by geese during winter may increase wheat seed yield. Since 1985, changing wheat-growing practices have resulted in much higher yields (approximately 100 bushels per acre) but crops are unable to sustain even light grazing pressure without losing yield. Associated costs with agricultural damage involving resident Canada geese include costs to replant grazed crops (soybeans, corn, peanuts), implement non-lethal wildlife management practices, purchase replacement hay, place long distance calls to government agencies to seek assistance, and decreased yields.

Damage to livestock: Resident Canada geese are also a concern to livestock producers. Goose droppings in and around livestock ponds can affect water quality and are a source of a number of different types of bacteria. Although no direct links have been made, salmonella outbreaks have occurred in cattle on farms in northern Virginia when large numbers of geese were present. State of Virginia veterinarians are concerned about the potential disease interactions between Canada geese and cattle. Salmonella causes shedding of the intestinal lining and severe diarrhea in cattle. If undetected and untreated, salmonella can kill cattle and calves.

The transmission of disease through drinking water is one of the primary concerns regarding livestock water supplies. Bacteria levels of concern for livestock depend on the age of the animal since adults are more tolerant of bacteria than young animals (Anonymous 1998). The bacteria guidelines for livestock water supplies are <1000 fecal coliforms/100 ml for adult animals and < 1 fecal coliform/100 ml for young animals (Anonymous 1998).

Wild and domestic waterfowl are the acknowledged natural reservoirs for a variety of avian influenza viruses (Davidson and Nettles 1997). Avian influenza circulates among these birds without clinical signs and is not an important mortality factor in wild waterfowl (Davidson and Nettles 1997). However, the potential for avian influenza to produce devastating disease in domestic poultry makes its occurrence in waterfowl an important issue (Davidson and Nettles 1997, USDA-APHIS-Veterinary Services 1993). During 1983-84, an outbreak of avian influenza resulted in the slaughter of 1.7 million domestic turkeys and chickens at a loss of \$63 million in Virginia (Trice 1999a). An outbreak of avian influenza in January 1999 on a Rockingham County, Virginia, farm resulted in the slaughter of 30,000 turkeys (Trice 1999). The Rockingham County farm was near a pond used by waterfowl. While the flock of 30,000 turkeys was being slaughtered, a flock of Canada geese was observed on a pond near the poultry operation (Eggborn, VDACS, personal communication). The strain of avian influenza which necessitated killing the 30,000 turkeys was a different strain of the virus which killed 6 people in Hong Kong in 1997 (Trice 1999). Also, a flock of 30,000 game birds, including pheasants, chukars, quail, partridge, wild turkeys, Canada geese, mute swans and assorted chickens in Maryland was most likely infected by ducks which returned to the game farm after co-mingling with wild waterfowl (R. Olson, Maryland Department of Agriculture, Animal Health Program, letter to whom it may concern, December 22, 1998). Farmers are warned to keep poultry away from wild or migratory birds or water contaminated by wild or migratory birds (USDA-APHIS-Veterinary Services 1993).

While Canada geese have been implicated in causing Bovine Coccidiosis in calves, the coccidia which infect cattle is a different species of coccidia than the coccidia which infects Canada geese (Doster 1998). Causes of coccidia in cattle are from other infected cattle (Doster 1998).

Associated costs involving livestock health include veterinary costs, implementation of non-lethal wildlife management practices, and altering husbandry and recreational use of horses so that wildlife management practices (harassment, use of dogs, legal hunting) will not negatively affect horses and threaten the safety of riders. Producers are particularly concerned about the potential for high value purebred horses and cattle becoming infected and dying.

During scoping, some State wildlife agencies were able to provide specific information on the agricultural damage done by resident Canada geese. These were briefly discussed in section **I.C.2.b. Property Damage.**

Atlantic Flyway: In the southeast, the Georgia Division of Wildlife reported agricultural damage including geese feeding on winter grains and competition with cattle for grain in open troughs. Georgia estimated an average total agricultural loss of approximately \$20,000 annually.

In the mid-Atlantic, the Maryland Department of Natural Resources reported that 23 percent of all complaints related to agricultural damage and estimated that managed turf and agricultural damage exceeds \$200,000 per year. The threat of disease transmission to poultry was another concern in Maryland with major poultry companies instructing growers to keep wild ducks and geese away from broiler houses. The Virginia Department of Game and Inland Fisheries and Wildlife Services reported annual damage estimates by Wildlife Services at \$241,000, with costs including damaged winter grains and spring crops such as corn, peanuts, vegetables, and pasture. In West Virginia, Wildlife Services estimated agricultural damage at \$8,400 in 1999.

Canada geese to be the second highest cause of wildlife damage to cranberry production in Massachusetts (Decker and Langlois 1993). Costs associated with repairing damage caused by geese was \$359,661 over a 3-year period, or \$119,887 per year.

The New York Division of Fish, Wildlife and Marine Resources estimated managed turf and agricultural damage exceeds \$1,000,000 annually.

The Pennsylvania Game Commission recorded 54 agricultural complaints during 1994-98, an average of 11 annually. Summarizing damage amounts from surveys conducted by the Pennsylvania Farm Bureau, total crop damage in Pennsylvania was estimated at approximately \$477,764 annually with 6,262 acres reportedly impacted. Crops affected included corn, wheat, rye, hay, and soybeans.

In total, Wildlife Services recorded a total of 1,332 instances of Canada goose damage to agriculture from 1994-98, an average of 271 annually. Most complaints were registered in Maryland, New Jersey, North Carolina, and Pennsylvania (Atlantic Flyway Council 1999). However, it is not possible to directly link all of these complaints strictly with resident geese, as Wildlife Services does not separate them. Given the large number of complaints in Maryland and North Carolina, we believe it is likely these numbers are inflated due to migrant goose problems in the fall in these areas.

Mississippi Flyway: The Indiana Department of Natural Resources estimated 1999 damage to corn, soybeans, pasture, and turf at \$5,480 after implementation of a tracking system. The Iowa Department of Natural Resources indicated that at least 80 percent of calls complaining about resident Canada geese involved agricultural damage, primarily depredation of newly germinated crops. Losses to Iowa producers were estimated at \$7,500 in 1999 and \$12,000 in 1998.

The Minnesota Department of Natural Resources reported that during 1994-98, 63 percent of the 853 resident Canada goose complaints involved crop damage. In 1998, Minnesota farmers estimated an average of \$1,200 in crop loss per complaint, resulting in a total damage estimate of \$230,400. However, Minnesota reported that many farmers are tolerating crop damage from geese and have not filed complaints. Minnesota also provides technical assistance to farmers experiencing crop losses due to Canada geese and promotes the use of woven wire, electric fencing, food plots, lure crops, and buffer strips to help reduce goose damage. Since 1997, Minnesota has provided up to \$500 of abatement materials to growers experiencing damage from flightless Canada geese.

In Wisconsin, farmers who sustain damage to their agricultural crops caused by Canada geese are eligible for assistance in preventing/reducing losses and for financial compensation for the losses through the Wisconsin Wildlife Damage Abatement and Claims Program (WDACP). Wildlife Services conducted 1,108 visits to sites receiving resident Canada goose damage during 1992-99. To determine goose damage to crops for this program, each crop field sustaining damage is examined and a thorough on-site damage appraisal is conducted (ss. 29.889 (7a), Wis. Stats.). WDACP appraised crop damage to wheat, hay, corn, soybeans from resident geese in 1999 primarily occurred in the southern and eastern 31 counties of Wisconsin and exceeded \$40,000. However, Wisconsin believes this loss is likely an underestimate of total damage to agricultural crops because damages resulting from Canada geese are only appraised by the WDACP on less than 0.04% of the farms in Wisconsin.

Central Flyway: In the Central Flyway, much of the agricultural damage occurs in the fall and spring in the north and winter in the south, making it difficult to attribute damages to resident rather than migrant

geese. However, some of this damage does occur in summer months. In South Dakota, practically all of the damage to agricultural crops occurs between May and July as geese forage on soybeans and corn. From July 1, 1998 to June 30, 1999, the South Dakota Department of Game, Fish and Parks spent \$148,116 on resident Canada goose damage management in 21 South Dakota counties. Included in the total expense for this one year was the involvement of 4,690 man-hours of personnel time, 62,719 miles driven responding to complaints, and expenses of \$35,583 for equipment and supplies. As indicated above, the State estimated \$396,500 in damages occurred to agricultural crops in this fiscal year.

In Oklahoma, Wildlife Services reported over \$400,000 in damage to agricultural crops during the period 1992-99. Over \$130,000 in damage was identified in North Dakota between 1995 and 1999. The number of incidents in the Central Flyway States is increasing (**Table III-33**). South Dakota's reported crop depredation complaints have grown from less than 100 received in 1995 to 300 in 1999.

In South Dakota, most complaints about resident Canada geese involved conflicts with agriculture. During 1995-98, the South Dakota Department of Game, Fish and Parks (SDGFP) handled 825 complaints. Complaints from South Dakota producers commonly peak in May, June, and July when Canada goose breeding pairs, along with goslings, and molters, actively forage on newly emerged soybeans, corn, and small grains. Typical complaints involve geese that move from wetlands into adjacent grain fields. Agricultural damage estimates from 300 South Dakota farmers totaled \$396,500 for 1999; however, actual losses are estimated to be probably 25-50% higher since all losses are not reported. Not included in this figure was the \$183,000 and 4,690 man-hours expended by the SDGFP for damage management activities in 1999.

Pacific Flyway: The Wyoming Game and Fish Department receives about 30-40 complaints about agricultural damage from Canada geese annually. During 1994-99, the Department paid 25 damage claims for Canada goose depredation totaling \$7,942. The Utah Division of Wildlife Resources receives about 25 complaints annually regarding agricultural damage by Canada geese. Most is related to summer months when adults and broods move into agricultural crops adjacent to major goose production areas.

c. Sport Hunting

Migratory bird hunting has a significant impact on the U.S. economy. In 1996, migratory bird hunters spent \$1.2 billion for guns, ammunition, travel, and recreational services (U.S. Department of the Interior et al. 1997). Including items such as hunting camps, off-road vehicles, and land, this spending swells to \$3.0 billion. Southwick Associates (1997) estimated that as this spending flows through the national economy, it generates \$8.2 billion of economic output and 95,700 jobs. Hunting for resident Canada geese would account for some portion of this total. In some Flyways, Canada goose harvest rivals that of mallards.

4. Human Safety

a. Airports

Concern over resident Canada geese at airports and the potential for air strikes were the top concerns of State wildlife management agencies in the area of human safety (public scoping). Wildlife strikes cost the civil aviation industry in the United States over \$300 million each year from 1990-98 (Cleary et al. 1999). When military aviation is included, the costs in North America exceed \$500 million/year

(MacKinnon 1998). Waterfowl (geese and ducks) comprise 35 percent of all bird-aircraft strikes and 12 percent of bird-aircraft strikes where civil aircraft were damaged (Cleary et al. 1997). No other bird group, except gulls, cause as many damaging bird-aircraft strikes as waterfowl (Cleary et al. 1997). For example, three Canada goose-aircraft collisions at airports near New York City resulted in over \$15 million dollars in damage in 1995 (National Wildlife Research Center, Research Update, 1998). One of these collisions, the Air France Concorde striking Canada geese, resulted in a lawsuit and an eventual \$5.3 million settlement against the Port Authority of New York and New Jersey/John F. Kennedy International Airport (Frank 1994). Also in 1995, a Boeing 707 E-38 AWACS jet taking off from Elmendorf Air Force Base in Alaska ingested at least 13 Canada geese into the number 1 and 2 engines and crashed, killing all 24 crew members and destroying the \$184 million aircraft.

Canada geese are one of the more dangerous bird species for aircraft to strike because of their large size (up to 15 pounds) and because they travel in flocks of up to several hundred birds. Dolbeer et al. (2000) determined that geese, primarily Canada geese, were the third most hazardous wildlife species to aircraft, preceded only by deer (runways) and vultures. According to data from the National Wildlife Strike Database, 1991-98, goose strikes caused some damage to aircraft in over 56 percent of reported incidents, and either destroyed or substantially damaged planes in 21.4 percent of reported incidents (Dolbeer et al. 2000). Where costs were estimated, the mean cost per goose strike was \$257,144 (Dolbeer et al. 2000). The presence of resident Canada geese on and near airports creates a threat to aviation and human safety. It is estimated that only 20 - 25 percent of all bird strikes are reported (Conover et al. 1995, Dolbeer et al. 1995, Linnell et al. 1996, Linnell et al. 1999), hence the number of strikes involving Canada geese is likely greater than Federal Aviation Administration records show.

b. Road Hazards

Geese aggressively defend their nests, mates, and goslings and may threaten and attack pets, children, and adults (Smith et al. 1999). Wildlife Services records show that goose attacks on people are fairly common occurrences during the nesting season and have resulted in injuries (USDA 2000, 1999a, 1999b). Goose aggression towards people can be a particular problem for children and senior citizens because they may lack the strength and maneuverability to avoid attacks. Injuries reported by State wildlife management agencies during public scoping included small nips and scratches, bruises and cuts, and broken bones suffered during falls. Traffic problems result from resident Canada geese crossing roads and the resultant action of some drivers to avoid them. Wildlife Services records show traffic hazards result from geese straying onto busy streets and highways and can result in accidents as vehicles stop suddenly or swerve to miss them (Wisconsin Wildlife Services, unpublished data as cited in USDA 2000). The Ohio Division of Wildlife reported 107 instances of Canada goose attacks on people in 1999 and 94 cases of geese being a traffic hazard.

Another human safety concern sometimes raised is slippery ground from goose feces. Slipping hazards can be caused by the buildup of fecal matter from geese on docks, walkways, and other foot traffic areas. Injuries resulting from these types of hazards have resulted in litigation (Missouri Wildlife Services, unpublished data as cited in USDA 2000). Elderly people are especially vulnerable to broken bones if they slip and fall or are knocked down by geese. They are also more vulnerable to medical complications from such injuries. In some situations, geese have nearly drowned dogs which were being used as a non-lethal method of harassment to disperse birds from the area (Wisconsin Wildlife Services, unpublished data as cited in USDA 2000). Financial costs related to human safety threats involving

resident Canada geese may include time costs from delaying departure and arrival times of commercial aircraft, personal injuries, aircraft repairs, and vehicle repairs (USDA 2000).

5. Human Health

a. Waterborne Disease Transmission

Resident Canada geese may potentially impact human health. A foraging Canada goose defecates between 5.2 and 8.8 times per hour (Bedard and Gauthier 1986). Kear (1963 In Allan 1995) recorded a maximum fecal deposition rate for Canada geese of 0.39 pounds per day (dry weight). Waterfowl can threaten human health through fecal matter when contaminated water or fecal droppings are ingested or causative organisms are inhaled. There are several pathogens involving waterfowl which may be contracted by humans, however, the risk of infection is believed to be low.

Cryptosporidiosis is a disease caused by the parasite (*Cryptosporidium parvum*) and was not known to cause disease in humans until as late as 1976 (Centers for Disease Control and Prevention (CDCP) 1998).

A person can be infected by drinking contaminated water or direct contact with the droppings of infected animals (CDCP 1998). The public is advised to be careful when swimming in lakes, ponds, streams, and pools, and to avoid swallowing water while swimming (Colley 1996). The public is also advised to avoid touching stools of animals and to drink only safe water (Colley 1996). *Cryptosporidium* can cause gastrointestinal disorders (Virginia Department of Health 1995) and produce life-threatening infections in immunocompromised and immunosuppressed people (Roffe 1987, Graczyk et al. 1998).

Cryptosporidiosis is recognized as a disease with implications for human health (Smith et al. 1997).

Using molecular techniques, it was shown that Canada geese in Maryland could disseminate infectious *Cryptosporidium parvum* oocytes through mechanical means in the environment (Graczyk et al. 1998).

Giardiasis is an illness caused by a microscopic parasite (*Giardia lamblia*) (Centers for Disease Control and Prevention 1998). During the last 15 years, *Giardia lamblia* has become recognized as one of the most common causes of waterborne disease in humans in the United States (Centers for Disease Control and Prevention 1998). Several community-wide outbreaks of Giardiasis have been linked to municipal water contaminated with *Giardia* (Centers for Disease Control and Prevention 1998). Giardiasis causes diarrhea, cramps, and nausea (Centers for Disease Control and Prevention 1998). Giardiasis is contracted by swallowing contaminated water or oral contact with the stool of an infected animal or person (Centers for Disease Control and Prevention 1998). *Giardia sp.* oocytes were present in the feces of Canada geese in Maryland (Graczyk et al. 1998) and may have serious implications for the contamination of watersheds (Upcroft et al. 1997, cited from Graczyk et al. 1998, Davidson and Nettles 1997, Smith et al. 1997).

Salmonella (Salmonella spp.) may be contracted by humans by handling materials soiled with bird feces (Stroud and Friend 1987). *Salmonella* causes gastrointestinal illness, including diarrhea.

Chlamydia psittaci, which can be present in diarrhetic feces of infected waterfowl, can be transmitted if it becomes airborne (Locke 1987). Severe cases of Chlamydiosis have occurred among wildlife biologists and others handling snow geese, ducks, and other birds (Wobeser and Brand 1982).

Chlamydiosis can be fatal to humans if not treated with antibiotics. Waterfowl, herons, and rock doves (pigeons) are the most commonly infected wild birds in North America (Locke 1987).

Geese can also act as a host in the life cycle of the schistosome parasites which cause cercarial dermatitis (“swimmers itch”) in humans (Blankespoor and Reimink 1991, CDC 1992). The schistosome requires two hosts, one being one of several species of snail, and the other being one or more species of waterfowl (Guth et al. 1979, Blankespoor and Reimink 1991, Loken et al. 1995).

Escherichia coli (*E. coli*) are fecal coliform bacteria associated with fecal material of warm-blooded animals. There are over 200 specific serological types of *E. coli* and the majority are harmless (Sterritt and Lester 1988). Probably the best known serological type of *E. coli* is *E. coli* O157:H7, which is harmful and usually associated with cattle (Gallien and Hartung 1994). It has been demonstrated that Canada geese can disseminate *E. coli* into the environment and result in elevated fecal coliform densities in the water column (Hussong et al. 1979), however, unknown is whether these types are harmful to humans. Many communities monitor water quality at swimming beaches, but lack the financial resources to pinpoint the source of elevated fecal coliform counts. When fecal coliform counts at swimming beaches exceed established standards the beaches are temporarily closed, adversely affecting the human quality of life.¹ Many communities, such as the Wisconsin cities of Milwaukee and Madison, monitor water quality at swimming beaches on a regular basis and regularly close some beaches, which receive high use by waterfowl, to public use because of elevated bacteria counts (USDA 2000). Unfortunately, linking the elevated bacterial counts to frequency of waterfowl use and attributing the elevated levels to human health threats has been problematic until recently. Advances in genetic engineering have allowed microbiologists to match genetic code of coliform bacteria to specific animal species and link these animal sources of coliform bacteria to fecal contamination (Jamieson 1998, Simmons et al. 1995). Simmons et al. (1995) used genetic fingerprinting to link fecal contamination of small ponds on Fisherman Island, Virginia to waterfowl. Microbiologists were able to implicate waterfowl and gulls as the source of fecal coliform bacteria at the Kensico Watershed, a water supply for New York City (Klett et al. 1998). Also, fecal coliform bacteria counts were correlated with the number of Canada geese and gulls roosting at the reservoir. According to the Wisconsin Department of Health and Family Services, no surveillance or testing of recreational water bodies is being done in the State to examine the threat waterfowl may pose to human health, therefore potential health threats in Wisconsin are unknown (Jim Kazmierczak, WDHFS, April, 2000, personal communication as cited in USDA 2000).

Avian tuberculosis, usually caused by the bacterium *Mycobacterium avium*, is contracted by direct contact with infected birds, ingestion of contaminated food and water, or contact with a contaminated environment. All avian species are susceptible but the prevalence of tuberculosis in waterfowl has not been determined (Roffe 1987). There are many authenticated cases of *M. avium* infection in people (Roffe 1987).

Influenza A viruses are known to emerge from the aquatic avian reservoir and cause human pandemics (Schafer et al. 1993). Virtually all influenza viruses in mammalian hosts originate from the avian gene pool (Webster et al. 1993). Ito et al. (1995) studied the strains of avian influenza virus in Alaskan waterfowl, to learn whether they harbored Asian strains that would indicate a connection to birds migrating from Asia. They found North American strains of avian influenza virus in small numbers in

¹Commonly adopted standards in the United States set indicator bacterial standards for drinking water at less than 20 fecal coliforms per 100 milliliters (Sterritt and Lester 1988) (Total Coliform Rule of the Safe Drinking Water Act [40 CFR 141.21]), for body contact recreational waters (swimming) at 200 fecal coliforms per 100 milliliters (Feachem et al 1983, 9 VAC 25-260-170), and for fishing and boating at less than 1000 fecal coliforms per 100 milliliters (USDA 1999b).

ducks, geese and lakes in southcentral Alaska, including geese and lake water of Lake Hood in Anchorage.

A new form of a disease called *hypersensitivity pneumonitis* has been attributed to droppings from Canada geese migrating through a suburban environment. In the past this immunologic reaction has been attributed to other organic agents in occupational, agricultural and home environments (Saltoun et al. 2000). Saltoun et al. (2000) stress that recognition of this disease is important because of the growing Canada goose population and increasing exposure to goose droppings in the United States, and that exposure to goose droppings may be causing other undiagnosed pulmonary disease.

Converse et al. (2000) summarized the current background and state of potential health concerns surrounding resident Canada geese as follows:

“Several studies have been conducted to detect the presence of bacterial pathogens in fecal material of migratory waterfowl. *Campylobacter jejuni*, which causes acute diarrhea in humans, was isolated from caeca of 154 (35%) of 445 ducks killed by hunters in Colorado (Luechtefeld, et al., 1980). During a banding study in Washington, Pacha et al. (1988) collected cloacal swabs from ducks and recovered *Campylobacter* spp. from 82 (73%) of 113 samples. In addition, they collected recently deposited fecal material from fields with flocks of Canada geese and sandhill cranes (*Grus canadensis*); *Campylobacter* spp. were isolated from five of 94 (5%) fecal samples from Canada geese and 74 of 91 (81%) fecal samples from sandhill cranes (Pacha, et al., 1988). An earlier study by Hill and Grimes (1984), in the Wisconsin-Minnesota region of the upper Mississippi River, found no *Campylobacter* spp. in 50 cecal samples from ducks killed by local hunters. *Campylobacter* spp. have been previously isolated from other birds (Waldhalm, et al., 1964; Smibert, 1969; Simmons & Gibbs, 1977; Knill, et al., 1978; Fenlon, 1981; Skirrow, 1982; Kapperud & Rosef, 1983).

Listeria spp. have been isolated from avian species including geese (Gray, 1958; Seeliger 1961), however the geese typically mentioned in studies were domestic species. Isolation of *Listeria* spp. from wild Canada geese has not been documented although other species of wild birds have been reported as having *Listeria* spp. in their feces (Weis & Seeliger, 1975; Fenlon, 1985; Gautsch, et al., 2000). To investigate the possibility of *Listeria* spp. transfer from seagulls and rooks to silage, a study was conducted in Scotland to compare the presence of *Listeria* spp. in feces collected from gulls feeding at sewage treatment facilities with feces collected from gulls resting at other sites (Fenlon, 1985). Samples from 26 of 99 (26%) gulls using sewage sites were positive for *Listeria* spp. and 15 of 99 (15%) were positive for *L. monocytogenes*. At non-sewage sites, 14 (8%) gulls were positive for *Listeria* spp. with only 8 (5%) positive for *L. monocytogenes*. This study indicates that exposure to sewage was a possible source of these pathogens.

The natural reservoir for salmonellae is the intestinal tract of warm-blooded and cold-blooded animals. Most infected animals, however, seem to be subclinically ill excretors of salmonella. Most cases of human salmonellosis are the result of ingesting food, water, or milk contaminated with animal wastes and are manifested by gastroenteritis. Although human salmonellosis is usually self-limiting in healthy adults (though septicemia can occur), lost time from work and the usual involvement of many people in outbreaks can cause significant economic losses. *Salmonellae* have been shown to be able to survive in the environment for at least nine months (Quinn, et al., 1994) providing for increased dissemination potential. In the Czech Republic, *Salmonella* spp. were found in 1 of 8 gulls using sewage treatment ponds and 4% of 189 adult black-headed gulls (*Larus ribibundus*) and 19% of their young collected from other bodies of water (Cizek, et al., 1994). *Salmonella* Typhimurium was identified in 2% of 849 herring (*L. argentatus*), black-headed, common (*L. canus canus*), black-backed (*L. marinus*) and lesser black-backed gulls (*L.*

fuscus) using a Copenhagen dump (Nielsen, 1960). In a two-year study in New Jersey, Bigus (1996) isolated eight *Salmonella pullorum* isolates from Canada geese. *Salmonella* spp. were not recovered in two other studies of Canada geese conducted in the Chesapeake Bay area of Maryland (Hussong, et al., 1979) and in eastern Massachusetts (unpublished report, L.C. Johnson and G. C. duMoulin, 1989, Beth Israel Hospital, Boston, MA). Hussong et al. (1979) reported only 44 samples were tested from migratory waterfowl; the total number of samples from geese was not specified. Johnson and duMoulin (1989) cultured 72 intestinal samples from 18 geese collected at three different sites during one summer. Although some authors have attempted to link the occurrence of *Salmonella* spp. in wild birds with the transmission of *Salmonella* spp. in domestic animals (Williams, et al., 1977; Macdonald & Bell, 1980) and humans (Hatch, 1996), to our knowledge, conclusive evidence that includes DNA studies is not available.

Escherichia coli is a member of the fecal coliform group and is considered a normal inhabitant of the intestinal track of all mammals and others, including Canada geese (Hussong, et al., 1979). Concern over *Escherichia coli* contamination, particularly when reported as high fecal coliform counts in recreational waters, is typically related more to its presence in feces and index of potential presence of other more serious pathogens, such as *Salmonella* and *Vibrio cholera*, than concern over inherent *Escherichia coli* pathogenicity. In the last few years, however, several well-documented food borne outbreaks occurred that were traced to strains of *Escherichia coli* capable of producing severe diarrhea and kidney damage leading to death in some immunocompromised or young people. The most well documented toxigenic *Escherichia coli* is serotype O157:H7 which belongs to the shiga toxin producing group, one of the four groups of *Escherichia coli* that are capable of causing illness. There are currently at least 112 serotypes of shiga toxin producing *Escherichia coli* (Bopp, et al., 1999).

Feare et al. (1999) collected 50 swabs of fecal material from Canada geese the summer of 1993 at six parks in London, England and the summer of 1994 at twelve sites throughout England. Samples collected in 1993 contained potentially pathogenic organisms, including *Escherichia coli* (Class 1), *Enterobacter cloacae*, *Salmonella* spp., *Aeromonas hydrophilia* and *Providencia alcalifaciens*, in 6% to 44% of the samples. In 1994, samples collected at each of the 12 sites had bacteria that were potentially pathogenic; no *Campylobacter* spp. were found in 1993 or 1994. Although reports of *Escherichia coli* of serotype O157:H7 from deer have been reported by Rice et al. (1995), other reports from wildlife are rare (Wasteson, et al., 1999). In another study, Hussong, et al. (1979) examined a random selection of *Escherichia coli* from waterfowl and seven isolates of enterotoxin-producing *Escherichia coli* were identified but further details were omitted.

The ability of geese to act as transport or mechanical vectors for parasites was tested by Graczyk et al. (1997) by dosing Canada geese orally with *Cryptosporidium parvum* oocysts and subsequently monitoring feces for the presence of oocysts. In a follow-up study, Graczyk et al. (1998) collected fecal material of Canada geese during the winter at nine sites in Maryland; *Cryptosporidium* spp. oocysts were present in samples from seven of nine sites and *Giardia* spp. cysts were present in samples from all nine sites. *Cryptosporidium parvum* was identified in Canada goose feces from one site by using a mouse bioassay and by polymerase chain reaction (PCR), a molecular detection method. The mouse bioassay allowed Graczyk et al. (1998) to test if oocysts that passed through the gut would remain viable and infectious. Although *Cryptosporidium parvum* is not pathogenic to birds, presence of this organism suggests that it could be transmitted to mammals through contamination of drinking water. It should be noted that there are species of *Giardia* and *Cryptosporidium* which can infect and multiply within geese, however, these species are not human pathogens.

Skene et al. (1981) conducted a study at a waterfowl park and sanctuary in Ontario to detect the presence of coccidia in freshly deposited fecal material collected from randomly selected adult

Canada geese during winter months and fecal material collected from newly hatched goslings from five families in the spring. They confirmed low numbers of coccidia in 21 (20%) of 104 samples from adult geese. Goslings from 3 of 5 families were shedding oocysts within eight days of hatching. Adult geese shed *Eimeria magnalabia* (3%), *Eimeria hermani* (14%), *Eimeria truncata* (2%), and *Tyzzeria parvula* (2%). Goslings only shed *Eimeria hermani* but the presence of oocysts within eight days of hatching indicated availability of oocysts on soil. *Eimeria* spp. and *Isospora* spp. are very host specific; *Isospora belli* is the only known human pathogen (Koneman, et al., 1997).

Chlamydia, rotavirus, and avian influenza virus are all well described human pathogens. Avian influenza infection occurs in a variety of wild and domestic bird species with the outcome ranging from no obvious clinical signs to 100% mortality (Swayne, et al., 1998). A 1997 occurrence of avian influenza in Hong Kong involved 18 human cases (Snacken, et al., 1999) and raised concerns about transmission of avian influenza from birds to humans (Webster, et al., 1993). Rotaviruses are capable of causing gastroenteritis in the young of mammalian (Endtz, et al., 1991) and avian species (Stott, 1999). *Chlamydia psittaci* is capable of causing serious or fatal disease in most birds and mammals including humans (Grimes, et al., 1979; Wobeser & Brand, 1982; Brand, 1989; Franson & Pearson, 1995; Grimes, et al., 1997). *Chlamydia psittaci* has been isolated from at least 159 bird species including waterfowl (Friend and Franson 1999).

In addition to viruses that pose a risk to human health, isolation and identification of Newcastle disease virus and duck plague virus was included because they are diseases of importance to wild birds and domestic poultry and waterfowl (Awan, et al., 1994). Newcastle disease virus is one of the most important pathogens for birds of all types but the only known outbreaks have occurred in double crested cormorants (*Phalacrocorax auritus*) (Kuiken, et al., 1998; Glaser, et al., 1999). Duck plague only occurs in ducks, geese and swans. It has been isolated from many areas in the United States (Converse & Kidd, 2001).”

While transmission of disease or parasites from geese to humans has not been well documented, the potential exists (Luechtefeld et al. 1980, Wobeser and Brand 1982, Hill and Grimes 1984, Pacha et al. 1988, Blandespoor and Reimink 1991, Graczyk et al. 1997, Saltoun, et al. 2000). In worst case scenarios, infections may even be life-threatening for immunocompromised and immunosuppressed people (Roffe 1987, Virginia Department of Health 1995, Graczyk et al. 1998). Even though many people are concerned about disease transmission from fecal droppings, the probability of contracting disease from fecal droppings is believed to be small.

Converse et al. (2000) looked at 12 study sites in the northeastern and mid-Atlantic States (Massachusetts, New Jersey and Virginia). In each State, they selected four areas that had daily use by resident Canada geese as well as frequent use by the public. Selected sites included several town parks; a municipal park in a residential area with a children’s playground and picnic area; a park with two lakes, picnic areas, recreational sports field, a petting zoo, and a horse track; a park along the Delaware River with picnic areas, and playgrounds; a municipal park with a lake, picnic areas and hiking trails; a group of summer condominiums with several small lakes surrounded by mown grass; an area along a lake adjacent to a small shopping area and restaurant; a park with hiking trails, food concession, swimming and boat rentals; and a summer camping site for trailers with a swimming pool and a lake. They concluded they following:

“This study was done to determine the presence of some selected organisms that could cause disease in humans exposed to fecal material of Canada geese collected at sites with a history of high public use and daily use by Canada geese in the northeastern United States. The methods

used for transect delineation, site preparation, and sample collection, preservation and transportation were very successful. Attempts to isolate four bacterial organisms resulted in no isolates of *Campylobacter* spp. or *Escherichia coli* O157:H7; two isolates of *Salmonella*, one *S. Typhimurium* and one *S. Hartford*; and forty-seven isolates of *Listeria* spp., including 13 isolates of *Listeria monocytogenes*. Attempts to detect two viruses and chlamydia resulted in no isolation of paramyxovirus; one detection of a rotavirus, and 13 samples that are suspected to contain *Chlamydia* spp. Parasitological examinations resulted in detection of four samples with *Giardia* spp. and three samples with *Cryptosporidium* spp. (Table 6).

Bacteria and viruses were successfully isolated in 24 hour and 5-day samples. There were decreasing numbers of samples positive for bacteria in five day samples, particularly in the second and third sample periods as drought conditions continued. A rotavirus was detected in a 24-hour sample and a total of 13 *Chlamydia psittaci* positive samples were detected in both 24 hour and 5-day samples. Eleven *Chlamydia psittaci* positive samples were detected in those collected after 24 hours while only two were detected after 5 hours. The detection methods used in this study do not differentiate between infectious and noninfectious *Chlamydia psittaci* or rotaviruses. Both of these agents, in an infectious state, pose a serious human health threat. As soon as possible further field and laboratory studies should be carried out to determine whether the fecal material, found where urban Canada geese congregate, contains infectious *Chlamydia psittaci* or rotaviruses.

There was no consistent distribution of positive samples over time, within sample periods or geographic locations (Table 7 (*editor's note* - see **Table III-35**)). Low frequency of positive cultures indicate that risk of humans to disease through contact with Canada goose feces appeared to be minimal at the four sites in Massachusetts, New Jersey and Virginia during the summer and early fall of 1999. We suggest further studies be conducted in other areas with resident Canada geese during different seasons to detect differences in prevalence and survival of organisms.”

Financial costs related to human health threats involving resident Canada geese may include testing of water for coliform bacteria, cleaning and sanitizing beaches regularly of fecal droppings, contacting and obtaining assistance from public health officials, and implementing non-lethal and lethal methods of wildlife damage management. *Given the wide divergence of opinion within the public health community, the Service and cooperating agencies recognize and defer to the authority and expertise of local and State health officials in determining what does or does not constitute a threat to public health.*

Many State wildlife management agencies indicated during the scoping period that they regard the risk of disease transmission from resident Canada geese to humans as “concerned, but unable to substantiate.” That is, there is a perception among the public and a concern among resource management personnel that resident Canada geese do have the ability to transmit diseases to humans, but a direct link is difficult to establish due to the expense of testing and the difficulty of tracing the disease back to Canada geese. Studies have confirmed the presence of human pathogens in goose feces, so the presence of these feces in water or on the ground where humans may come into contact with them is a legitimate health concern. State natural resource agencies often do not have the expertise to deal with human health/disease questions and have to rely on other more pertinent agencies.

Table III-35. Number of positive isolations by organisms within groups and States (from Converse et al. 2000).

	Organism	Massachusetts	New Jersey	Virginia
Viruses	Rotavirus			1
	Avian influenza			
	Hemagglutinating agent, unidentified	9	1*	
	Duck plague			
Bacteria	<i>Chlamydia</i>	8*	5	
	<i>Campylobacter</i>			
	<i>Listeria</i>	9	13	10
	<i>Salmonella</i>	1	1	
	<i>E. coli</i> O157:H7			
Parasites	<i>Giardia</i>	2	1	1
	<i>Cryptosporidia</i>	3		

*pooled sample

b. Goose Meat and Food Safety

There is no evidence in the literature to indicate that resident Canada geese captured on golf courses, parks, or other turf areas are unfit for human consumption (Cooper 1995). Moreover, Canada geese captured and tested for pesticide residues and heavy metals in Virginia during 1998 had no pesticide residues and no heavy metals except zinc and copper which were within dietary requirements established by the National Academy of Science according to the Virginia Department of Health (M. Lowney, State Director, Wildlife Services, Moseley, Virginia, and P. Eggborn, Virginia Department of Agriculture and Consumer Services, Richmond, Virginia, unpublished data). Additionally, a risk analysis conducted by USDA-APHIS-Policy and Program Development determined "...there is a very low risk of human health effects associated with the consumption of goose meat." And the risk analysis further concluded that "...there is no evidence of risk which support the expenditure of additional resources to further quantify risk" (L. Miller, 1998, unpublished report).

However, waterfowl captured from industrial sites should not be used for human consumption since harmful chemical residues may occur in the tissue of such Canada geese (Amundson 1988, cited from Cooper 1995). At a contaminated site in Cedarburg, Wisconsin, tests conducted in 2000 found Canada geese to contain high levels of polychlorinated biphenyls (PCBs) (Behm 2001). Tissue levels ranged from 0.27 to 0.46 parts per million (ppm) and exceeded the State health department's "Do Not Eat" level of 0.22 ppm. By comparison, only one of nine geese tested from Milwaukee, Wisconsin parks were found to contain any level of PCBs (0.054 ppm) (Behm 2001).

To ensure that Canada geese captured and processed will be safe for human consumption, the Wisconsin Department of Natural Resources (WDNR) established a protocol requiring geese from each community/locale to be sampled for contaminants known to be harmful to human health (WDNR 2000). The contaminant analyses is conducted by certified laboratories. Previously conducted contaminant analysis (UWTF) is evaluated with recent results of contaminant sampling. The WDNR Wildlife Health Team, in consultation with the Wisconsin Department of Health and Family Services (WDHFS), evaluates whether contaminant levels meet safe human consumption levels and makes recommendations if utilization for donation to food pantries is safe. In addition, geese are only processed by facilities licensed by the State governing authority.

6. Costs of Management Program

a. Administrative Costs

In Fiscal Year (FY) 2001 (October 1, 2000 to September 30, 2001), the Service allocated \$1,048,000 for the migratory bird permit program. This budget was divided among the seven Service regions and the Washington office for management and administration of the migratory bird permit program. This represented about a two percent increase from FY2000. Since 1996, when the permit program was transferred from the Law Enforcement program to the Migratory Bird program, the overall budget has increased only \$156,000, or 18 percent.

Further, of the 34,572 permits (active as of 8/22/2000), 2,541 were depredation permits, about 7 percent. Since all depredation permits are valid for no longer than one year from the date of issuance, we believe this number serves as a representative index of the number of depredation permits issued in 2000. Further analysis shows that of the 2,541 depredation permits, 1,571 were issued for resident Canada geese, about 62 percent. Based on permit workload analysis, we estimate that it takes an average of 5.5 hours to review and issue a depredation permit. Thus, the 1,571 permits for resident Canada geese represent 8,640 man-hours or slightly more than 4 full-time-equivalent (FTE) positions. Since this figure does not account for time spent denying permits, issuance of special Canada goose permits, or preliminary discussions with people who subsequently decide not to submit a permit application, it is undoubtedly an underestimate of the time currently allocated to the administration of depredation permits for resident Canada geese.

For Wildlife Services, the costs of conducting resident Canada goose damage management activities is highly variable between States and is often a combination of Federal and cooperative dollars. For example, in Virginia in FY2000, Wildlife Services estimated they spent \$66,856 conducting resident Canada goose management. However, \$57,951 of these expenditures were from cooperators. In Illinois, of \$10,500 expended to conduct resident Canada goose damage management activities, \$4,800 was from cooperators. Nationwide, Wildlife Services reports that 18 State Wildlife Service programs received \$491,850 from 230 individual cooperative funding sources to conduct services and activities related to damage management of resident Canada geese in FY2000. However, 26 State programs reported receiving no cooperative funding for resident Canada goose management activities in FY2000.

b. Monitoring Costs

Measures to monitor resident Canada goose populations can be categorized into four general groups: 1) Breeding population and production surveys to assess status and growth of the population; 2) banding,

neck-collaring, and observation activities to assess goose distribution, movements, and survival estimates; 3) winter surveys to assess distribution and habitat use of wintering/staging waterfowl; and 4) harvest surveys to assess mortality. Most monitoring programs that are specific to resident geese are conducted by State agencies, while programs that incorporate migrant waterfowl are supported cooperatively by Federal and State agencies. Some programs, such as wintering counts and harvest surveys, are difficult to allocate to resident or migrant waterfowl. It is apparent however, that State and Federal agencies contribute significant resources to monitoring resident goose, migrant goose, and other waterfowl populations (**Table III-36**).

State expenditures for annual breeding population surveys for resident Canada geese alone are estimated to exceed \$220,000 dollars (**Table III-36**: Data extracted or extrapolated from Cooperative migratory bird surveys in North America. U.S. Fish and Wildlife Service, unpublished report, February 2000). Many other expenditures regarding resident Canada geese (e.g., localized nesting surveys, nuisance abatement education, translocation, experimental regulation monitoring) are not included below.

Table III-36. Estimated annual expenditures (dollars) of State and Federal agencies on monitoring programs for resident Canada geese.

	Breeding Population Surveys	Banding, Collaring, & Observation	Wintering Surveys	Harvest Surveys
Atlantic Flyway	\$75,000 ^a	\$45,000 + \$50,000 ^b	--	\$2,000 + \$5,500 ^c
Mississippi Flyway	\$90,000 ^a	\$150,000 ^b	\$30,000 ^c	\$9,500 ^c
Central Flyway	\$10,000 ^a	\$55,000 ^b	\$15,000 ^c	\$6,000 + \$5,500 ^c
Pacific Flyway	\$47,000 ^a	\$20,000	\$45,000 ^c	\$6,000 ^c
Federal	\$5,000 ^a	\$8,000 + \$2,000 ^b	\$225,000 ^c	\$300,000 ^c
Total	\$227,000^a	\$73,000 + \$257,000^b	\$315,000^c	\$8,000 + \$326,000^c

^a Expenditures are for resident geese only.

^b Expenditures are for resident and migrant geese.

^c Expenditures are for resident geese, migrant geese, and other waterfowl.

c. Other Costs

Public Costs for Depredation Permits: Based on the information contained in section **III.B.6.a.**

Administrative Costs, 62 percent of depredation permits were issued for resident Canada geese in 2000. Information supplied to the Office of Management and Budget (OMB) for information collection purposes shows that the Service normally expects approximately 788 applications for depredation permits each year (not including the number of permittees requesting renewal of a permit due to expire). The amount of time it takes an applicant to provide the information collected will depend on the specifics of the permit. Some applicants only need to take one or several birds, in which case it takes about 30 minutes to complete the application. Other applicants may need authorization for large numbers of birds, in which case it may take about 3 hours to complete the application. We estimated it takes the average applicant an average of 1.5 hours to complete the application, with a total burden assumed by all applicants of 733 hours (788 x 1.5 hours x 0.62).

Holders of depredation permits are also required to submit an annual report detailing the number of birds, eggs, or nests actually taken under the permit. The Service uses this information to determine whether a permit holder is in compliance with the permit and to track the number of birds actually taken from the wild and monitor the impact on the resource. All permits require an annual report. As with the application, the amount of time it takes to complete the annual report depends on the scope of the permit and the number of birds taken under it. We estimate it takes an average of 1 hour to complete the annual report. Therefore, the total annual report burden assumed by all depredation permittees would be 1,571 hours or less (1,571 x 1 hour). Thus, the total annual burden to resident Canada goose depredation permit holders is 2,304 hours.

Additionally, the annual "out-of-pocket" cost to the applicants is approximately \$12,225 (788 x 0.62 applicants multiplied by a \$25 application processing fee).

Special Canada Goose Permits: Information supplied to OMB for information collection purposes shows that the Service normally expects approximately three State wildlife agencies to apply for a Special Canada Goose Permit each year (not including the number of permittees requesting renewal of a permit due to expire). We estimate it takes an average of 8 hours to complete the application, with a total burden assumed by all applicants of 24 hours. Eventually, we anticipate approximately 45 permits may be valid in future years.

As with the depredation permits, each permittee is also required to submit an annual report detailing the number of birds, eggs, or nests actually taken under the permit. The Service uses this information to determine whether a permit holder is in compliance with the permit and also to enable us to monitor the impact on the resource. We estimate it takes an average of 2 hours to complete the annual report. Therefore, the total annual report burden assumed by all applicants is 90 hours or less, and the total annual burden to Special Canada Goose Permit holders is 114 hours.

There is no annual "out-of-pocket" cost to the respondents because State agencies are exempt from the \$25 application processing fee (50 CFR 13.11).

Conflict Abatement Costs: Each homeowner, landowner or business, whether they ultimately obtain a permit or not, usually must expend some funds on one or more goose abatement techniques. The Ohio Division of Wildlife reported that, in 1998, 64 landowners spent \$21,083 in to haze geese and 37 landowners spent \$14,290 in 1999. On the average, Ohio estimates that each landowner spent \$350 annually trying to keep geese off of their property.

Another example of conflict abatement costs are those expended by State wildlife agencies. For example, the State of South Dakota, through the South Dakota Department of Game, Fish and Parks, has an active landowner assistance program. Each year, the SDGFP provides man-hours, materials, and cost-sharing to assist landowners with conflict abatement. In 1999, SDGFP expended over 4,690 man-hours and \$183,000 in equipment, supplies and damage management expenses. Assuming expenditures from South Dakota are indicative of expenses (either currently expended, or necessary but unavailable) in other States, we estimate that conflict abatement cost expenditures from State wildlife agencies currently exceeds \$6.4 million and 164,000 man-hours (based on 35 States).