Environmental Assessment

WATERFOWL DAMAGE MANAGEMENT IN MINNESOTA

Final

Prepared By:

United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services

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SUMMARY

Canada geese (*Branta canadensis*), mallard ducks (*Anas platyrhynchos*), mute swans (*Cygnus olor*) and domestic or feral waterfowl have many positive values but they can also cause damage to property, agricultural resources, natural resources, and pose risks to human health, and human safety. This EA analyzes the potential environmental impacts of alternatives for United States Department of Agriculture, Animal and Plant Health Inspection Service, WS (WS) involvement in the reduction of conflicts with and damage by waterfowl in Minnesota. The WS activities considered in this EA could be conducted at any site in Minnesota where a need exists and where WS assistance is requested including private and public property.

Alternatives examined in the EA include an alternative in which WS does not become involved in waterfowl damage management (WDM); an alternative in which WS is restricted to the use and recommendation of only non-lethal WDM methods; and an alternative in which WS provides technical assistance (recommendations) but does not provide operational assistance with implementing the recommendations (Chapter 3). The fourth alternative considered, the preferred alternative, is for WS to continue an Integrated Waterfowl Damage Management Program that includes the use of the full range of legal non-lethal and lethal waterfowl damage management techniques. WS would use an integrated wildlife damage management approach to apply these techniques, singly or in combination, to meet requester needs for reducing conflicts with waterfowl. Cooperators requesting assistance would be provided with recommendations and information regarding the use of effective non-lethal and lethal techniques. Non-lethal methods recommended and used by WS may include resource management, physical exclusion, relocation, human behavior modification, frightening devices, and other deterrents (Appendix B). Lethal methods recommended and used by WS may include nest/egg destruction, live capture and transportation to an approved poultry processing facility, live capture and euthanasia, and/or shooting (Appendix B). All WS activities would continue to be conducted in accordance with applicable state, federal, and local laws, regulations and policies pertaining to WDM.

The EA provides a detailed analysis of the impacts of each alternative on Canada goose, mallard, mute swan, and domestic or feral waterfowl populations; non-target species including state and federally-listed threatened and endangered species; public and pet health and safety; wetlands, humaneness of the alternatives used, and the positive and negative aesthetic impacts of waterfowl; and on sociological concerns including humaneness and animal welfare. The analysis also provides information on the relative efficacy of each alternative.

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LIST OF ACRONYMS

AAWV American Association of Wildlife Veterinarians
AC Apha Chloralose
APHIS Animal Plant Health Inspection Service
BCC Biological Carrying Capacity
BPI Breeding Plot Index
CEQ Council of Environmental Quality
CFR Codes of Federal Regulation
DCNR Department of Conservation of Natural Resources
EA Environmental Assessment
EPA U.S. Environmental Protection Agency
EPP Eastern Prairie Population
ESA Endangered Species Act
FAA Federal Aviation Administration
FAR Federal Aviation Regulations
FDA U.S. Food and Drug Association
FEIS Final Environmental Impact Statement
FIFRA Federal Insecticide, Fungicide, and Rodenticide Act
INAD Investigational New Animal Drug
IPM Integrated Pest Management
IWDM Integrated Wildlife Damage Management
NEPA National Environmental Policy Act
NHPA The National Historic Preservation Act
MBTA Migratory Bird Treaty Act
MDNR Minnesota Department of Natural Resources
MIS Management Information System
NOA Notice of Availability
T&E Threatened and Endangered Species
USFWS U.S. Department of Interior, Fish and Wildlife Service
USDA U.S. Department of Agriculture
USGS U.S. Geological Survey
WAC Wildlife Acceptance Capacity
WDM Waterfowl Damage Management
WS U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 INTRODUCTION

Canada geese (*Branta canadensis*), mallard ducks (*Anas platyrhynchos*), mute swans (*Cygnus olor*) and domestic or feral waterfowl are appreciated by many people for their beauty, social behavior (e.g., pair bonds) and intrinsic value as living beings. Canada geese and mallards are also important and popular species with Minnesota waterfowl hunters. Over the last 3 years, an average of 241,247 Canada geese and 217,618 mallards have been taken per year by licensed hunters in Minnesota (USFWS 2005*a*, 2006). Unfortunately, in high concentrations and/or when located in sensitive areas, these waterfowl species can also damage property, crops and natural resources. Waterfowl can also be a hazard to human health and safety because of aggressive behavior by territorial or food-habituated birds, fecal contamination of water sources and areas with high recreational use, or activity in airfields and near the approach and takeoff routes for airports. In some instances, waterfowl may carry disease to or pick up diseases from domestic animals. Resolution of conflicts with and damage by waterfowl requires skill in wildlife management and sensitivity to the many positive values of these species.

Wildlife damage management is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife, and it is an integral component of wildlife management (Leopold 1933, the Wildlife Society 1990, Berryman 1991). The United States Department of Agriculture (USDA) has been authorized by congress (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)) to protect American agriculture and other resources from damage associated with wildlife. The Secretary of Agriculture has delegated his authority under both the statutes listed below to the Animal and Plant Health Inspection Service (APHIS). Within that agency, the authority resides with the Wildlife Services (WS) program. WS activities are conducted in cooperation with other federal, state and local agencies, and private organizations and individuals. Federal agencies, including the United States Department of the Interior, Fish and Wildlife Service (USFWS), recognize the expertise of WS to address wildlife damage issues related to migratory birds. This environmental assessment (EA) evaluates alternatives for WS involvement in the management of damage and conflicts associated with Canada geese, mallard ducks, mute swans, and domestic or feral waterfowl in Minnesota.

WS strives to reach and maintain a balance between wildlife needs and welfare and human needs and welfare. WS conducts wildlife damage management as a means of reducing damage, not in order to punish offending animals, to treat them inhumanely or abuse their welfare. WS is a cooperatively funded and service oriented program. WS cooperates with private property owners and managers and with 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 (MBTA).

Most individual actions of the types encompassed by this analysis could be categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR§372.5(c)). APHIS Implementing Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR§372.5(c)) (60 Federal Register 6,000, 6,003 (1995)). However, WS is preparing this EA to assist in planning waterfowl damage management activities and to clearly communicate with the public the analysis of cumulative impacts of issues of concern in relation to alternative means of meeting needs for such management in Minnesota. This analysis covers current and future waterfowl damage management activities by WS wherever and whenever they might be requested, in Minnesota.

1.1 PURPOSE

The purpose of this EA is to analyze the potential environmental impacts of alternatives for WS involvement in efforts to reduce damage associated with Canada geese, mallard ducks, mute swans, and domestic or feral waterfowl. Resources potentially protected by such activities include property, agriculture, natural resources and human health, and human safety.

1.2 DECISIONS TO BE MADE

Based on the scope of this EA, the decisions to be made are:

I. Should WS implement a Waterfowl Damage Management program in Minnesota?
II. If WS involvement in waterfowl damage management is warranted, what methods (alternative) should WS use to address conflicts and damage by waterfowl in Minnesota?
III. Might the proposed WS program have significant impacts requiring preparation of an EIS?

1.3 BACKGROUND AND NEED FOR ACTION

Wildlife management is often perceived as the struggle to preserve threatened and endangered (T & E) species, regulate species exploited by humans and the humans who exploit them, and conserve the landscape that provides habitat for wildlife resources. Increasingly, however, cities, towns, parks, airports, and private properties have become sites of some of the greatest challenges in wildlife management. Long thought of as a spectacular sight during the spring and fall migration, waterfowl are now frequently and abundantly present in cities and towns throughout Minnesota and across the United States. They are generally regarded as providing ecological, educational, economic, recreational, and aesthetic benefits (Decker and Goff 1987), and there is enjoyment in knowing wildlife exists and contributes to natural ecosystems (Bishop 1987). Waterfowl, like all wildlife, provide people with valued contact with nature and contribute to the quality of life for many Minnesota residents.

Many people, even those experiencing damage, consider waterfowl to be a charismatic and valuable component of their environment. However, tolerance of waterfowl behavior differs among people and often depends upon the individuals personal experience with the specific damage situation (Smith et al. 1999). Because of their increasing populations, site tenacity, longevity, size, and tolerance of human activity, waterfowl are often associated with problem situations. Increasing populations of resident waterfowl are resulting in increasing numbers of conflicts with human activities (Conover and Chasko 1985), and increasing concerns related to human health and safety (Ankney 1996). Because they can fly, waterfowl are mobile, they exploit a variety of habitats and sites within a given area, and they cannot be permanently excluded from large areas. Additionally, management of waterfowl-related problems often exceeds the capabilities of single landowners to reduce damage to tolerable levels. In Minnesota, problem situations associated with waterfowl typically involve, but are not limited to, unacceptable and potentially dangerous accumulations of feces, waterfowl aggression during the nesting season, grazing of landscaped vegetation, damage to agricultural and natural resources, and unacceptable safety hazards for vehicles (e.g., airplanes). These problems frequently occur on private home properties, apartment/condominium complexes, municipal parks, schools, hospitals, natural/habitat restoration sites, corporate and industrial sites, office complexes, roadways, airports, and other areas.

1.3.1 Wildlife Acceptance Capacity (WAC) and Biological Carrying Capacity (BCC)

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 (WAC), sometimes known as cultural carrying capacity, is the maximum wildlife population level in an area that is acceptable to people who live in and use the affected area (Decker and Purdy 1988). For wildlife damage situations, there will be varying thresholds of tolerance for wildlife conflicts and damage for people directly and indirectly affected by the damage. Thresholds for action and tolerance of wildlife damage will also vary depending upon individual values and philosophies regarding wildlife and natural resources. This threshold of tolerance is a primary limiting factor in determining the WAC. Once this WAC is met or exceeded, people seek to implement waterfowl population reduction methods to alleviate property damage, nuisance problems and threats to human health or safety.

Biological Carrying Capacity (BCC) is the wildlife population level that the land or habitat can support without degradation to the populations health, individual animals' health or the environment over an extended period of time (Decker and Purdy 1988). While the biological carrying capacity for waterfowl in Minnesota may be greater than the current statewide population, in some locations, the WAC is probably lower than the current population.

1.3.2 Waterfowl in Minnesota

Minnesota is home to a wide diversity of waterfowl species. Thirty species of waterfowl are regular migrants through Minnesota and 12 species of waterfowl regularly breed and nest in Minnesota (MDNR website 2006, www.dnr.state.mn.us). This document only addresses management of damage by and conflicts with Canada geese, mallard ducks, mute swans and other feral or domestic waterfowl.

1.3.2.1 Canada Geese

There are two behaviorally distinct types of Canada goose populations: resident and migratory. A resident Canada goose is one that nests and/or resides on a year round basis within the contiguous United States (Rusch et al. 1995, Ankney 1996). More specifically, the Mississippi Flyway Council defines a "resident" Canada goose in the Mississippi Flyway as geese that are hatched or nest in any Mississippi Flyway state or in Ontario, Canada at or below 50^0 N latitude and 54^0 N latitude in Manitoba. As their name implies, resident Canada geese spend most of the year near their breeding areas, although many in northern latitudes do make seasonal movements (Mississippi Flyway Council 1996). Migratory Canada geese are those which nest and raise their young in the arctic and sub-arctic regions of Canada. Migrant geese begin moving north in time to arrive on their breeding grounds concurrent with the disappearance of ice cover and the availability of nest sites.

Resident Canada Geese

Early European settlers to the upper Midwest found numerous giant Canada geese (*B. c. maxima*). However, because of unregulated hunting, egg-collecting, and wetland destruction, resident Canada geese had disappeared from much of their historic range by the early 1920's and 1930's. Privately maintained flocks of captive Canada geese, kept for food and use as live decoys, subsequently provided a source for States seeking to reestablish resident populations. Efforts to establish small, free-flying, self-sustaining flocks of giant Canada geese began as early as the 1920's in Michigan and 1930's in Minnesota, Wisconsin, and Ontario. During the 1940's and 1950's, State and Federal agencies established giant Canada goose restoration programs in Manitoba, Minnesota, Missouri, Ohio, and Wisconsin (Mississippi Flyway Council 1996). In the Mississippi Flyway, most resident Canada geese are giant Canada geese (*Branta canadensis maxima*) but may include *Branta canadensis moffitti* and possibly other subspecies because the origins of the Canada geese used in some of the restoration projects in the Flyway are unknown (USFWS 2005*b*). Resident Canada geese are now the most widespread and largest single population of Canada geese in the Mississippi Flyway. The breeding population of giant Canada geese in the Mississippi flyway now exceeds 1.5 million individuals and has been growing at a rate of about 6% per year over the past 10 years (USFWS 2005*b*). In 1996, the Mississippi Flyway Council approved a giant Canada goose management plan in an effort to develop

a comprehensive approach to managing the population (Mississippi Flyway Council 1996). In spring 2004, the MN resident Canada goose population was estimated at 374,747 birds (USFWS 2005*b*). The spring population goal for resident Canada geese in Minnesota is 182,000 geese (USFWS 2005*b*).

Resident Canada geese become sexually mature and breed at two or three years of age and have a relatively high nesting success compared to migrant Canada geese (USFWS 2001). Breeding resident Canada geese occur throughout Minnesota, and nest primarily during March-May each year. The breeding population is monitored annually through the Breeding Waterfowl Survey. In Minnesota, resident Canada geese nest in traditional sites (along shorelines, on islands and peninsulas), as well as on rooftops, adjacent to roadways, swimming pools, and in parking lots, playgrounds, planters, and abandoned property (tires, automobiles, etc.).

Molting is the process whereby geese annually replace their primary and secondary flight (wing) feathers (Welty 1982). In MN, resident Canada geese molt, and are flightless, from mid-June through mid-July each year. Portions of a flock of geese can be flightless from about one week before and two weeks after the primary molt period due to the asynchronous molting by individual birds. Non-breeding resident Canada geese and geese which have failed nesting attempts sometimes move to other areas in late spring prior to molting (Zicus 1981, Nelson and Oetting 1991, Abraham et al. 1999).

In the early 1980's MN began managing resident Canada geese when it became apparent that they were contributing significantly to sport harvests and human/goose conflicts. Resident geese are now the most numerous portion of the goose population in the flyway, and in 1996 the Mississippi Flyway Council approved a management plan to guide their management (Mississippi Flyway Council 1996).

The Minnesota statewide total resident Canada goose population in spring 2004 was estimated at 374,747; up 23% from 2003 and was the highest recorded since 1993 (USFWS 2005*b*). The 2005 spring population objective for resident Canada geese is 182,000. In 2005 there were an estimated 338,254 resident Canada geese present in Minnesota during the spring survey; this is 86% above the population objective (USFWS 2005*b*)

The goal of the Mississippi Flyway Canada Goose Management Plan is to "manage the population of giant Canada geese in the Mississippi Flyway at a level that provides maximum recreational opportunities consistent with social acceptability" (Mississippi Flyway Council 1996). Based on this goal there are three objectives:

1. The population objective for giant Canada geese in the Mississippi Flyway is to maintain a population of approximately 1 million geese as measured by coordinated spring surveys, with the population distributed in proportion to state and provincial objectives.

2. The harvest objective for the giant Canada goose population is to provide maximum harvest opportunity for these geese that is consistent with the population objectives identified in this plan, the objectives for other Canada goose populations in the Flyway, and the control of overabundant goose populations in areas with high human/goose conflicts.

3. The population control objective for giant Canada geese is to control local populations of giant Canada geese where they create significant nuisance situations, endanger human health or safety, significantly damage crops or significantly damage habitats important to other wildlife populations.

Table 1. Spring resident Canada goose population estimates in Minnesota.

Year	Number of Canada Geese		Year	Number of Canada Geese
1993	138,000		**2000**	294,900
1994	201,600		**2001**	285,000
1995	207,200		**2002**	334,685
1996	190,200		**2003**	304,230
1997	169,000		**2004**	374,747
1998	214,600		**2005**	338,254
1999	210,200			

Migratory Canada Geese

Migratory Canada geese in Minnesota are primarily *Branta canadensis interior*, the interior subspecies. The *B. c. interior* geese in Minnesota are what have been described as the Eastern Prairie Population (EPP). The Eastern Prairie Population of Canada geese breeds primarily in Manitoba and winters in Missouri and passes through Minnesota during the spring fall migrations (MDNR website 2006, www.dnr.state.mn.us). The cackling goose (*B. c. minimi*), another subspecies of Canada goose, is primarily found west of Minnesota, but in recent years several hundred-1,000 have been harvested while migrating through Minnesota.

Migratory Canada geese only pass through the state, so there are no statewide population estimates specifically for migratory Canada geese in Minnesota. MDNR and USFWS annual spring waterfowl surveys are used to estimate Minnesota Canada goose (and other waterfowl species) populations. This survey information is submitted to the Mississippi Flyway Council, the administrative body which handles migratory bird management under the flyway system. The flyway council considers this information and similar Canada goose population information from other states and provinces in the flyway to determine harvest rates for the fall hunting season. Harvest rates for Canada geese in the flyway are made using population data from the flyway as a whole, not just Minnesota data. Early and late Canada goose seasons are allowed by the MDNR to increase the harvest of resident Canada geese. Lower limits during the primary migration periods (established by the flyway council) are designed to minimize population impacts on migratory Canada geese.

Migrant geese arrive on the breeding grounds from early May to late April. Most subspecies of migratory geese do not nest until the ages of 3-5 years (Hardy and Tacha 1989, Moser and Rusch 1989, Rusch et al.1996). Migrating Canada geese move northward fairly gradually following the retreating snow cover (Bellrose 1980). For the last portion of migration, northern-nesting geese often over fly areas of snow in boreal forests to arrive on Arctic and Subarctic nesting areas just as spring breaks. The most southerly wintering geese leave their wintering areas in January and geese wintering at middle-latitudes move northward in March or April (Bellrose 1980).

1.3.2.2 Mallard Ducks

Historically, Minnesota has been an important part of the breeding, nesting and migration range of the mallard in North America. Mallard populations in Minnesota fluctuated greatly in Minnesota in the 20th century. Minnesota has lost over 52% of its original wetlands (MDNR 2001) many of these wetlands were in the western part of Minnesota in North America's primary waterfowl producing areas known as the prairie pothole region. As wetlands were filled or drained for agriculture and development; waterfowl habitat in Minnesota decreased and subsequently so did the Minnesota mallard population. Mallards have fared better than most other duck species in Minnesota when faced with wetland loss in their historic range and have adapted well to urban areas including parks, storm water basins and airports.

The mallard is Minnesota's most abundant and widespread breeding species of duck (Hartman 1992). Mallards occur across the continent in every U.S. state and Canadian province (Bellrose 1976). Mallards are most common in farmlands with numerous ponds, lakes, and slowly flowing streams; in areas with extensive or numerous marshes near grasslands; and in idle and brushy areas dotted with ponds and laced with meandering streams (Hartman 1992). Like geese, mallards

are also found in urban and suburban areas such as parks, golf courses, natural wetlands, retention ponds and lakes, housing complexes, and industrial parks. Mallards breed in all 87 counties in Minnesota and begin their breeding season in late March and early April; with most nesting occurring from mid-April through late May. Mallard renesting occurs into early July (Hartman 1992). Mallards breed readily with American black ducks and domestic ducks. The offspring of the cross with domestics may resemble the mallard, but their markings and coloration are noticeably different. Mallard-black duck hybrids are considered to be wild ducks; evidence suggests that the two are closely related (Hartman 1992).

In 2005, the Minnesota breeding mallard population (corrected for visibility) was 238,500, down 36% from 2004. Mallard numbers were 30% below the 10 year average, but similar to the long-term average (223,368) (MDNR 2005). The MDNR manages all duck species as a group. The following management goal is stated in the 2006 MDNR Draft Duck Management Plan: "Recover historical breeding and migrating populations of ducks in Minnesota for their ecological, recreational and economic importance to the citizens of the state. Progress toward this goal will be measured by the following long-term objectives." The breeding population goal for all species of ducks in Minnesota is 1 million birds, which should produce a fall population of 1.4 million ducks.

1) Breeding Population Objective: Restore a breeding population of ducks (all species combined) averaging 1 million birds that will produce a fall population of 1.4 million ducks from Minnesota (MDNR Duck Plan 2006)
2) Migration Objective: Restore the historical importance of Minnesota to the spring and fall migration of ducks through the Mississippi Flyway.
3) Hunter Satisfaction Objective; restore high quality duck hunting opportunities in Minnesota

Table 2. Number of breeding mallard ducks in Minnesota.

Year	Breeding Mallards		Year	Breeding Mallards
1990	232,059		**1998**	368,450
1991	224,953		**1999**	316,394
1992	360,870		**2000**	318,134
1993	305,838		**2001**	320,560
1994	426,455		**2002**	366,625
1995	319,433		**2003**	280,517
1996	314,816		**2004**	375,313
1997	407,413		**2005**	238,500

1.3.2.3 Mute Swans

Mute swans (*Cygnus olor*) were introduced, from Europe, into the United States in the late 19th century near New York City. Feral breeding took place after 544 more individuals were introduced in the lower Hudson Valley in 1910 and on Long Island in 1912. Since that time mute swans have expanded their range to many Eastern and Midwestern states.

The swan's diet consists mostly of rooted aquatic vegetation. Small islands, narrow peninsulas, and clumps of aquatic vegetation are preferred nesting sites. Nesting territories vary in size from 4 to 10 acres and are used year-around or reoccupied each year. The mute swan lays the largest of all swan eggs, and a typical clutch of four to eight eggs takes 35 to 38 days to hatch.

Historically, and as directed by federal court decisions, the United States Fish and Wildlife Service protected mute swans under the Migratory Bird Treaty Act (MBTA). However, in response to court decisions regarding the management of mute swans, Congress passed the Migratory Bird Treaty Reform Act of 2004 which clarifies the original purpose of the MBTA as only pertaining to the conservation and protection of migratory birds *native* to North America. Congress directed the USFWS to establish a list of bird species found in the United States which are non-native, human-introduced species and therefore not federally protected under the MBTA. On March 15, 2005, the Secretary of Interior published a final list in the Federal Register of the non-native bird species that have been introduced by humans into the United States or its territories and to which the MBTA does not apply. Mute swans were included on that list. At present, mute swans in Minnesota are not protected by state or federal wildlife regulations.

Mute swans are currently regulated, in part, by the Minnesota game farm statutes in Minnesota Statutes 97A.105 and they are designated as a *regulated invasive species* in Minnesota Rules 6216.0260. In Minnesota, mute swans may only be kept in an enclosed facility (Section 1.6.3). It is illegal to release mute swans into the wild in Minnesota under the game farm and regulated invasive species statutes.

Several unconfined mute swans were reported to the MDNR in 2005 and in previous years. The MDNR's goal for mute swan management is to avoid establishment of naturalized populations of mute swans in Minnesota. The MDNR monitors reports of mute swans in the wild to facilitate management of birds that may establish naturalized populations. During 2005, the MDNR recorded reports of wild or escaped mute swans at seven locations in the state. A total of 29 birds were reported in the wild in three counties (Table 3). Sources of the reports include: conservation officers, birders, the public, and other MDNR staff who observed unconfined birds. In 2005, pairs of mute swans successfully

nested at Square Lake (3 cygnets), Big Carnelian (3 cygnets), and Little Carnelian (3 cygnets) lakes in Washington County.

During October 2005, MDNR staff captured and removed 12 mute swans from the wild at Square and Big Carnelian lakes in Washington County (Invasive Species Program 2006). In the future, the MDNR has the following goals for the management of mute swans:

• Encourage reporting and verify occurrences of mute swans in the state.
• Take appropriate actions to have the birds confined under game farm licenses or remove the birds from the wild.
• Develop and distribute informational materials about mute swans and related state and federal laws.

Table 3. Unconfined mute swans reported in Minnesota counties during 2005.

County	Number of Mute Swans Reported	Month(s) Reported
Anoka	1 to 3 - Lake Amelia	April, November
Nobles	2 - near Lake Okabena	May
LeSueur	1 - Diamond Lake WMA and waters near Waterville	Spring through Fall
Wright	4 - near Crow River and Co Rd 4	October
Washington	2 to 6 - Square Lake 4 to 8 - Big Carnelian Lake 5 - Little Carnelian Lake	July through October July through October July through October
Total for all counties - 29		

1.3.2.4 Domestic and Feral Waterfowl

Many waterfowl of domestic or semi-wild genetic backgrounds have been released by humans into rural and urban environments; including numerous species of ducks, geese, and swans. Selective breeding has resulted in the development of numerous domestic varieties of the mallard ducks that no longer exhibit the external characteristics or coloration of their wild mallard ancestors. Examples of domestic or feral waterfowl include but are not limited to Muscovy ducks, Pekin ducks, Rouen ducks, Cayuga ducks, Swedish ducks, Chinese geese, and Toulouse geese. Federal law protects all migratory birds, except domestic varieties of waterfowl (Title 50, Code of Federal Regulations, Part 21). Domestic and Feral waterfowl in Minnesota may be of mixed heritage and may show feather coloration of wild waterfowl. Some domestic and feral ducks are incapable of sustained flight, while some are incapable of flight at all due to hybridization. Domestic waterfowl may at times cross breed with migratory waterfowl species creating a hybrid cross breed (i.e. mallard X domestic duck, Canada goose X domestic goose). These types of hybrid waterfowl species will

be taken in accordance definitions and regulations provided in CFR 50 Part 10 and 21.

An example of a feral duck is the "urban" mallard duck. The coloration of the feathers of urban ducks is highly variable and often does not resemble that of the wild mallard ducks. Urban mallard ducks in Minnesota often display the following physical characteristics: male may be missing the white neck ring or the neck ring will be an inch wide instead of the narrower 1/4 inch wide ring found on wild mallards, males may have purple heads instead of green heads, females may be blond instead of mottled brown, the bills of females may be small and black instead of orange mottled with black, either sex may have white coloration on the wings, tail, or body feathers, and ducks may weigh more than wild ducks (2.5-3.5 pounds).

Domestic waterfowl have been purchased and released by property owners for their aesthetic value, but may not always remain at the release sites, thereby becoming feral. Feral waterfowl is defined as a domestic species of waterfowl that can not be linked to a specific ownership. Waterfowl releases are made in business parks, universities, wildlife management areas, parks, military bases, and housing developments. Many times, these birds are released with no regard or understanding of the consequences or problems they can cause to the environment or the local community. There are no population estimates, in Minnesota, for domestic or feral waterfowl.

1.3.3 Waterfowl Hunting in Minnesota

1.3.3.1 Resident and Migratory Canada Geese (2005)

Canada geese are a valuable part of Minnesota's hunting heritage. In 2005 an estimated 58,600 Minnesota hunters harvested 207,266 geese which was the second highest state harvest in the Mississippi Flyway (USFWS 2006). There are three distinct seasons for Canada goose hunting in Minnesota; the early September season, the regular season, and the late season (Table 4). The regular goose season allows hunters to target both resident and migratory Canada goose populations. The early and late goose seasons were established to increase hunting pressure on resident Canada goose populations by allowing hunting at times where there are fewer migratory Canada geese in the state.

Table 4. 2005 Minnesota Canada goose seasons.

EARLY			REGULAR		LATE	
Zone	**Season**	**Daily limit**	**Season**	**Daily limit**	**Season**	**Daily limit**
Northwest Zone	Sept. 3-15	5	Oct. 1-Nov. 9	1	Dec. 10-19	5
Southeast Zone	Sept. 3-22	2	Oct. 1-Dec.9	2	Dec. 15-24	2
West-central Zone	Sept. 3-22	5	Oct. 20 – Nov. 28	1	No late season	N/A
West Zone	Sept. 3-22	5	Oct. 1-Nov. 9	1	Dec. 10-19	5
Remainder of State	Sept. 3-22	5	Oct. 1-Nov. 9	2	Dec. 10-19	5

While hunting seasons have helped increase harvest of resident geese, additional strategies are needed to effectively manage the resident goose population (Atlantic Flyway Council 1999). Resident Canada goose harvest rates are not uniform throughout a large area such as a state. Harvest rates greater than 25% may occur during special seasons in some rural areas, while geese in urban-suburban areas may experience no harvest at all in some years (Atlantic Flyway Council 1999). Many resident geese extensively use urban and suburban environments where hunting is not permitted and are not subject to hunting mortality. Urban-suburban areas often provide exceptional goose habitat and allow geese to remain in "refuges" and avoid peak harvest periods (i.e., weekends). Geese that live near people also often benefit from the availability of supplemental feeding. Urban-suburban geese however, are subjected to herbicides, pesticides, pollution, automobiles, illegal take, pets, and transmission of disease from domestic birds (USFWS 2001). Non urban-suburban geese are also subject to these same affects, albeit at differing rates.

Table 5. Number of Canada geese harvested in Minnesota 1992-2005 (Dexter 2005, USFWS 2006).

Year	Estimated Total number of Number of Geese Harvested		Year	Estimated Total number of Number of Geese Harvested
1992	150,000		**1999**	285,000
1993	156,000		**2000**	301,000
1994	166,000		**2001**	308,000
1995	180,000		**2002**	257,000
1996	241,000		**2003**	290,000
1997	230,000		**2004**	235,500
1998	218,000		**2005**	207,500

1.3.3.2 Mallard Ducks

Mallards are the most commonly hunted species of duck in the state. In 2005, an estimated 71,000 Minnesota hunters harvested approximately 169,582 mallards (USFWS 2006). The hunting season on mallards in Minnesota (2005) began on October 1 and continued through November 29. Daily bag limit of mallards was 4, of which no more than one could be a hen.

Table 6. Harvest Estimates for Mallard Ducks in Minnesota (2002-2005).

Year	Number of Mallards Harvested	Number of all Duck Species Harvested
2002	278,399	914,000
2003	303,995	1,024,000
2004	179.277	683,600
2005	169,582	531,500

1.3.3.3 Mute Swans and Domestic or Feral Waterfowl

The take of feral ducks and geese (including cross-breeds) is not restricted by any state regulations. These species can be taken during and outside of existing hunting seasons.

1.3.4 Waterfowl Damage and Conflicts - General

1.3.4.1 Risks to human health from Waterfowl

While transmission of disease or parasites from waterfowl 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). There are several pathogens involving waterfowl which may be contracted by humans, however, even though many people are concerned about disease transmission from feces, the risk of infection is believed low (Centers for Disease Control and Prevention (CDCP) 1998). Financial costs related to human health threats involving waterfowl may include testing of water for *coliform* bacteria, regularly cleaning feces from beaches and other recreational areas, loss of revenue for businesses associated with recreations sites that are temporarily closed because of fecal contamination, obtaining assistance from public health officials, and implementing non-lethal and lethal methods of wildlife damage management.

WS recognizes and defers to the authority and expertise of local and state health officials in determining what does or does not constitute a threat to public health. WS involvement in management of risks to human health from waterfowl may include sampling animals and the environment for the diseases/organisms including but not limited to those listed below and/or working with health officials and/or property managers to reduce existing health problems or risks. The following list provides examples of some of the types of health issues that may be associated with waterfowl.

Campylobacter infections are the leading cause of human enteritis (inflammation of the intestines). Food animals and consumption of contaminated food is the primary source of human infection, but up to 20% of *Campylobacter* cases are attributable to infections via exposure to environmental contaminants (Meade et al. 1999). Domestic and wild animals are implicated as the source of the environmental contamination. Some authors state that migratory waterfowl, especially geese, are a high risk species for *Campylobacter* contamination (Pacha et al. 1988, Aydin et al. 2001). However the prevalence of *Campylobacter* spp. found in goose feces has varied widely among studies (Clark 2003).

Campylobacter does not survive well in the environment and human health risks associated with contact with feces or contaminated turf are likely low. However, work by Clark (2003) indicates that *Campylobacter* survival is adequate to cause infection in samples up to 24 hrs post deposition.

Giardiasis (*Giardia lambia)* is an illness caused by a microscopic parasite that has become recognized as one of the most common causes of waterborne disease

in humans in the United States during the last 15 years (CDCP 1999). Giardiasis is contracted by swallowing contaminated water or putting anything in your mouth that has touched the stool of an infected animal or person, and causes diarrhea, cramps and nausea (CDCP 1999).

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.

Chlamydiosis is caused by *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).

Cercarial dermatitis ("swimmer's itch") is caused by a parasite lives in the blood of infected animals such as ducks, geese, gulls, swans, and certain aquatic mammals such as muskrats and beavers. The parasite produces eggs that are passed in the feces of infected birds or mammals. If the eggs land in the water, the water becomes contaminated. The larvae burrow into the swimmer's skin, and may cause an allergic reaction and rash (CDCP 2004).

Escherichia coli (*E. coli*) bacteria 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 a harmful *E. coli* usually associated with cattle (Gallien and Hartung 1994). This was the rationale for testing public water supplies that was developed in the United States and Europe at the turn of the century to reduce the incidence of waterborne diseases.

Regardless of whether the serological types of *E. coli* disseminated into watersheds by waterfowl are proven to be harmful to humans, 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). 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 recreational use of the site, even though they may not have been able to determine the serological type of the *E. coli.* 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 coincided with the number of Canada geese and gulls roosting at the reservoir.

Roscoe (1999) conducted a survey to estimate the prevalence of pathogenic bacteria and protozoa in resident Canada geese in NJ, and found no *Salmonella* sp., *Shigella* sp., or *Yersinia* sp. isolated from any of the 500 Canada goose samples. However, he did report finding *Cryptosporidium* sp. in 49 (10%) of the 500 geese, and *Giardia* sp. in 75 (15%) of the geese. Additionally, the USGS (U.S. Geological Survey 2000) conducted field studies in NJ, VA, and MA to determine the presence of organisms that could cause disease in humans exposed to feces of Canada geese at sites with a history of high public use and daily use by geese. *Salmonella spp.*, *Listeria spp.*, *Chlamydia sp.*, and *Giardia spp.* were isolated from goose feces in New Jersey (U.S. Geological Survey 2000).

Avian Influenza (AI) is caused by a virus in the Orthomyxovirus group. Viruses in this group vary in the intensity of illness they may cause (virulence). Wild birds, in particular waterfowl and shorebirds, are considered to be the natural reservoirs for AI (Clark 2003). Most strains of AI rarely cause severe illness or death in birds although the H5 and H7 strains tend to be highly virulent and very contagious. However, even the strains which do not cause severe illness in birds are a concern for human and animal health officials because the viruses have the potential to become virulent and transmissible to other species through mutation and reassortment (Clark 2003).

Recently, the occurrence of highly pathogenic (HP) H5N1 AI virus has raised concern regarding the potential impact on wild birds, domestic poultry, and human health should it be introduced into the U.S. It is thought that a change occurred in a low pathogenicity AI virus of wild birds, allowing the virus to infect chickens, followed by further change into the HP H5N1 AI. High Pathogenicity H5N1 AI has been circulating in Asian poultry and fowl resulting in death to these species. High Pathogenicity H5N1 AI likely underwent further change allowing infection in additional species of birds, mammals, and humans. More recently, this virus moved back into wild birds resulting in mortality of some species of waterfowl, and other birds. This is only the second time in history that highly pathogenic form of AI has been recorded in wild birds. Numerous potential routes for introduction of the virus into the US exist including: illegal movement of domestic or wild birds, contaminated products, infected travelers, and the migration of infected wild birds.

WS has been one of several agencies and organizations conducting surveillance for AI virus in migrating birds. The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds, are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the HP H5N1 virus in North America.

1.3.4.2 Risks to Human Safety from Waterfowl

Bird strikes cause an estimated seven fatalities involving civilian and military aircraft each year (Linnell et al. 1996). For the period 1991-2003, waterfowl (geese and ducks) comprise 10% of all bird-aircraft strikes to civil aviation reported to the FAA for which bird species or group was reported (Cleary et al. 2004). Of bird strikes by aircraft with reported damage, waterfowl were responsible for 32%. (Clearly et al. 2004). It is estimated that only 20-25% of all bird strikes are reported (Conover et al. 1995, Dolbeer et al. 1995, Linnell et al. 1996, Linnell et al. 1999).

The Canada goose is the most massive bird (8-15 pounds) that is commonly struck by aircraft, and nationally, this species was responsible for a disproportionately large amount of damage to civil aircraft involved in strikes with wildlife during 1991-2003 (Cleary et al. 2004). Nationally, the resident Canada goose population probably represents the single most serious bird threat to aircraft safety at this time (Alge 1999 in Cleary et al. 2000). The most serious strike involving Canada geese occurred in 1995, a Boeing 707 E38 AWACS jet taking off from Elmendorf Air Force Base in Alaska ingested at least 13 geese into the number 1 and 2 engines and crashed, killing all 24 crew members.

In Minnesota from 1990 - Sept. 30, 2005 there were 38 reported Canada goose strikes at 15 different airports. Of the 13 strikes that reported damage data, a total of $798,568 in damage was documented (FAA Website, 2006).

In Minnesota from 1990-Sept. 30, 2005 there were 3 reported mallard strikes at 2 different airports, there was no damage information recorded for any of the mallard strikes (FAA website 2006).

Waterfowl aggressively defend their nests, nesting areas, and young, and may attack or threaten pets, children, and adults (Smith et al. 1999). Additionally, slipping hazards can be created by the buildup of feces from waterfowl on docks, walkways, and other foot traffic areas, especially near nesting areas where waterfowl spend a considerable amount of time during a concentrated time period (April-May). WS records show traffic hazards result from waterfowl straying into busy streets and highways and can result in accidents as vehicles try to avoid hitting the birds (Wisconsin WS, unpubl. data).

1.3.4.3 Waterfowl damage to property

The majority of people that contact WS for assistance describe a general decline in their enjoyment of sites or recreational activities due to local overabundance of waterfowl. In many cases, people are unable to use and enjoy their own property, public parks, and other areas because of waterfowl feces. For instance, a foraging Canada goose defecates between 5.2 and 8.8 times per hour (Bedard and Gauthier 1986). Kear (1963 In Allan et al. 1995) recorded a maximum fecal deposition rate for Canada geese of 0.39 pounds per day (dry weight). Waterfowl can also damage grass (lawns, ballfields, parks) and other plants through overgrazing. Costs associated with property damage include labor and disinfectants to clean and sanitize the area, loss of property use and resale value, loss of aesthetic value of plants, gardens, aquatic vegetation, and lawns where waterfowl feed and loaf, loss of customers or visitors irritated by having to walk on feces, loss of time contacting wildlife management agencies on health and safety issues and damage management advice, and implementation of wildlife management methods. The costs of reestablishing overgrazed lawns and cleaning waterfowl feces from sidewalks have been estimated at more than $60 per bird (Allan et at. 1995).

Waterfowl collisions with aircraft are not only a risk to human safety, they can also result in expensive damage to aircraft, loss of aircraft use during repairs, and losses due to cancellation and delays of flights because of damage to aircraft. There have been 2,613 reported waterfowl strikes by civil and military aircraft in the U.S. since 1990 resulting in $79,772,580 in damage and 82,372 hours of aircraft down time. Waterfowl strikes cause damage 31% of the time when struck by aircraft. In Minnesota, there have been 25 waterfowl strikes since 2003 resulting in $220,963 in damage and 1,994 hours of aircraft down time.

1.3.4.4 Waterfowl Damage to Agriculture

The most common waterfowl damage to agriculture is crop consumption (loss of the crop and revenue), but may also include unacceptable accumulations of feces on horse pastures, trampling of wheat, and increased erosion and runoff from fields where the cover crop has been grazed. During Federal Fiscal Year 2005, WS received one request for assistance regarding waterfowl damage to agriculture in Minnesota. However, the MDNR estimates that 83% of their goose damage complaints were related to damage to agriculture (USFWS-EIS 2005).

1.3.4.5 Waterfowl Damage to Natural Resources

Mute swans can consume 8 pounds of submersed vegetation and uproot 20 pounds per day causing significant harmful impacts on lake ecosystems (Invasive Species Program. 2006). Soil erosion and sedimentation can cause damage to natural resources. Excessive numbers of waterfowl can remove bank vegetation resulting in erosion of the shoreline and soil sediments being carried by rainwater into lakes, ponds and reservoirs. Waterfowl may cause damage to natural vegetation, shorelines, parks, ponds, and lakes. Overabundant resident Canada

geese can negatively impact crops and habitats maintained as food and cover for migrant waterfowl and other wildlife.

Nutrient loading has been found to increase in wetlands in proportion to increases in the numbers of roosting geese (Kitchell et al. 1999, Manny et al. 1994). In studying the relationship between bird density and phosphorus (P) and nitrogen (N) levels in Bosque Del Apache National Wildlife Refuge in New Mexico, Kitchell et al. (1999) found an increase in the concentration of both P and N correlated with an increase in bird density. Scherer et al. (undated) stated that waterfowl metabolize food very rapidly and most of the phosphorus contributed by bird feces probably originates from sources within a lake being studied. In addition, assimilation and defecation converted the phosphorus into a more soluble form and, therefore was considered a form of internal loading. Waterfowl have contributed substantial amounts of P and N into lakes through feces creating excessive aquatic macrophyte growth and algae blooms (Scherer et al. undated) and accelerated eutrophication through nutrient loading (Harris et al. 1981, Manny et al. 1994).

Mute swans are a non-native species that can have adverse impacts on aquatic habitats and compete with native waterfowl for food and habitat. Mute swans can consume 8 pounds of submerged vegetation and uproot 20 pounds per day causing significant harmful impacts on lake ecosystems. Mute swans can out-compete trumpeter swans in nesting areas and have negatively impacted programs to recover trumpeter swans in Ohio and Michigan. Mute swans begin nesting earlier and are more aggressive than trumpeter swans. Mute swans will prevent trumpeter swans from nesting and may potentially kill pinioned trumpeters while defending their territory.

Waterfowl are considered by the American Association of Wildlife Veterinarians (AAWV) as susceptible to and carriers of disease and parasites. Because of the potential threat to free-ranging waterfowl, the AAWV put forth the following resolution (AAWV, undated): ...wild and semi-domestic ducks, geese and swans are susceptible to and carriers of disease and parasites of free-ranging wild ducks, geese, and other birds; ...the AAWV encourages local authorities and state and federal agencies to cooperate to limit the population of waterfowl on urban water areas to prevent disease outbreaks in semi-domestic as well as free ranging ducks, geese and swans and discourages the practice of relocating nuisance or excess urban ducks, geese and swans to other parks or wildlife areas as a means of local population control."

1.3.5 Waterfowl Damage and Conflicts - Minnesota

WS maintains a Management Information System (MIS) database to document assistance that the agency provides in addressing wildlife damage conflicts. MIS data is limited to information that is collected from people who have requested services or information from Wildlife Services. It does not include requests received or responded to by local, State or other Federal agencies, and it is not a complete database for all wildlife damage occurrences. The number of requests for assistance does not necessarily reflect the extent of need for action, but this data does provide an indication that needs exists.

In Minnesota, the WS program received 29 waterfowl damage-related requests for assistance in 2005 (Table 7). Requests are categorized according to resource category (agriculture, property, natural resources, and human health and safety) and location. Threats to human health and safety, primarily airports were the cause of most requests for assistance.

Table 7. Number of requests for damage management assistance regarding Canada geese, mallards, and feral waterfowl received by USDA APHIS Wildlife Services during Federal Fiscal Year 2005 (USDA MIS).

Species	Agriculture	Property	Natural Resources	Human Health & Safety	Total
Feral (ducks & geese)	0	0	0	0	0
Canada geese	1	1	0	23	25
Mallards	0	0	0	4	4
Total	0	0	0	27	29

The MDNR reports up to 400 goose complaints annually of which approximately 83% are damage to agriculture, 16% nuisance and 1% human healthy and safety (Figure 1; USFWS-EIS 2005). The majority of Canada goose damage complaints recorded by the MDNR are concentrated in the southern and western portions of Minnesota. Most nuisance complaints are associated with suburban areas where waterfowl congregate on public or private ponds and forage on lawns and mowed areas associated with parks, beaches, golf courses, schools, business campuses, and residences. The major problems are associated with the impacts of feces and grazing damage to lawns and other areas (including sidewalks, driveways, swimming pools, etc.). Agricultural losses occur primarily in the late winter and spring. The major crops damaged are corn, soybeans, winter wheat and improved pastures.

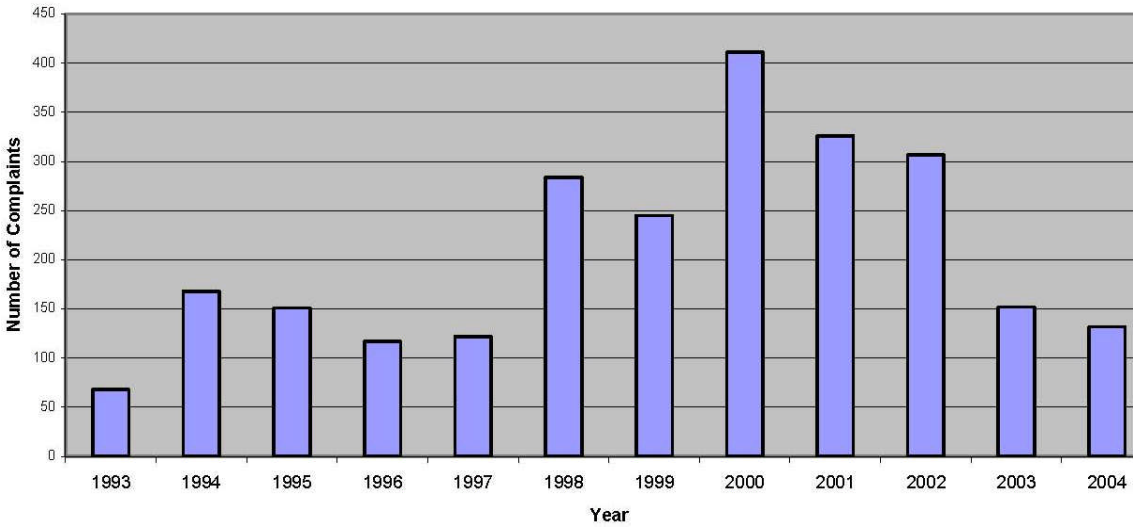

Figure 1. Goose complaints reported to the MDNR 1993-2004 (Dexter 2005).

1.4 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER ENVIRONMENTAL DOCUMENTS

ADC Programmatic Environmental Impact Statement. WS has issued a Final EIS (FEIS) on the national APHIS/WS program (USDA 1997 Revised). Pertinent and current information available in the EIS has been incorporated by reference into this EA. The FEIS may be obtained by contacting the USDA, APHIS, WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

United States Department of the Interior, Fish and Wildlife Service (USFWS) Resident Canada Goose EIS:
On August 10, 2006, the USFWS issued a Final Regulations for Managing Resident Canada Goose Populations (FR 17:154 pages 45963-45993). The new regulations were created in response to conflicts associated with high populations of resident Canada geese in the US. The rule gives State wildlife management agencies, private and public landowners, and airports additional flexibility to deal with problems, conflicts, and damages caused by resident Canada geese. The rule includes four specific control and depredation orders (Airports, Nests and Eggs, Agricultural, and Public Health) which directly relate to WS RCGDM activities conducted under this EA. Under these orders, the appropriate State wildlife agency, USFWS or other official agent (e.g., WS), or, in some cases, landowners and airport managers are authorized to conduct certain RCGDM activities without needing to apply for USFWS Migratory Bird Permits. The control and depredation orders may only be implemented between April 1 and August 31, except for the take of nests and eggs which could be implemented in March. However, under the rule,

individual states may continue to require permits for these types of activities. At this time the MDNR still requires State permits for these types of activities.

1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.5.1 Actions Analyzed

This EA evaluates waterfowl damage management by WS to protect human health, human safety, property, natural resources and agriculture on private or public land whenever or wherever such management is requested from the WS program in Minnesota.

1.5.2 American Indian Lands and Tribes

Currently WS does not have any MOUs or signed agreements for waterfowl management with any American Indian tribe in Minnesota. Other Native American tribes may chose to work with all or some of the cooperating agencies on waterfowl damage management at a later date. Any participating Tribes would need to make their own decision regarding the management alternative they wish to implement. MOUs, agreements and NEPA compliance would be conducted as appropriate before conducting WDM on any other tribal lands in Minnesota.

1.5.3 Period for which this EA is Valid

This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of WS state waterfowl damage management activities.

1.5.4 Site Specificity

This EA analyzes potential impacts of WS' waterfowl damage management activities that will occur or could occur at private, public facilities, and tribal lands in all 87 counties in Minnesota. Because the proposed action is to implement an Integrated Waterfowl Damage Management program, and because Minnesota WS program goals and responsibilities are to provide service when requested within the constraints of available funding and personnel, it is conceivable that waterfowl damage management activities by WS could occur anywhere in state. WS activities are only conducted after appropriate agreements for control or similar documents outlining the type and extent of the actions to be conducted are completed with the appropriate landowner/manager. The EA emphasizes significant issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of waterfowl damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is employed for determining methods and strategies to use or recommend for individual actions conducted by WS (See USDA 1997 Revised, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application).

Decisions made using this process will be in accordance with any mitigation measures and standard operating procedures described herein and adopted or established as part of the decision.

1.5.5 Public Involvement/Notification

As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to agencies, organizations, and individuals with probable interest in the proposed program. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.6 AUTHORITY AND COMPLIANCE

1.6.1 Authority of Federal and State Agencies in Waterfowl Damage Management in Minnesota

See Chapter 1 of USDA (1997 Revised) for additional discussion of federal laws pertaining to WS.

WS Legislative Authority

The USDA is authorized by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authorities for the APHIS-WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)., which provide that:

> "*The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001.*"

The Secretary of Agriculture has delegated his authority under both the statutes listed below to the Animal and Plant Health Inspection Service (APHIS). Within that agency, the authority resides with the Wildlife Services (WS) program. Since 1931, with the changes in societal values, WS policies and its programs place greater emphasis on the part of the Act discussing "bringing (damage) under control", rather than "eradication" and "suppression" of wildlife populations.

WS is a cooperatively funded, service-oriented program. Before any operational wildlife damage management is conducted, an Agreement for Control or similar document must

be completed by WS and the landowner/administrator. WS cooperates with other federal, state, tribal, and local government entities, educational institutions, private property owners and managers, and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable Federal, State, and local laws.

WS' mission is to "provide federal 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 by:

A) training wildlife damage management professionals;
B) developing and improving strategies to reduce economic losses and threats to humans from wildlife;
C) collecting, evaluating, and disseminating management information;
D) establishing cooperative wildlife damage management programs;
E) informing and educating the public on how to reduce wildlife damage and;
F) providing data on and a source for limited use management materials and equipment, including pesticides (USDA 1989).

United States Department of the Interior, Fish and Wildlife Service (USFWS)
The primary responsibility of the USFWS is conserving fish, wildlife, plants and their habitats. While some of the USFWS' responsibilities are shared with other Federal, State, tribal, and local entities, the USFWS has special authorities in managing the National Wildlife Refuge System; conserving migratory birds, endangered species, certain marine mammals, and nationally significant fisheries; and enforcing Federal wildlife laws. The Migratory Bird Treaty Act (MBTA) gives the USFWS primary statutory authority to manage migratory bird populations in the United States. The USFWS is also charged with implementation and enforcement of the Endangered Species Act of 1973, as amended and with developing recovery plans for listed species.

Minnesota Department of Natural Resources (MDNR)
The Minnesota Department of Natural Resources is responsible for managing resident wildlife species in Minnesota. WS and the MDNR currently have a MOU that allows USDA-APHIS-WS to participate in a cooperative wildlife damage management program in Minnesota. The MOU establishes a cooperative relationship between WS, the MDNR, the Minnesota Department of Agriculture (MDA), the Minnesota Board of Animal Health (MBAH), the Minnesota Department of Health (MDH) and the University of Minnesota Extension Service (UMES) for planning, coordinating and implementing wildlife damage management policies to prevent or minimize damage caused by wild animal species (including Threatened and Endangered species) to agriculture, horticulture, aquaculture, animal husbandry, forestry, wildlife, public health/safety, property, natural resources and to facilitate the exchange of information among the cooperating agencies.

1.6.2 Compliance with Other Federal Laws

Several other federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in Minnesota. When WS direct management assistance is requested by another federal agency, NEPA compliance is the responsibility of the other federal agency. However, WS could agree to complete NEPA documentation at the request of the other federal agency.

Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)).

WS obtained a Biological Opinion (B.O.) on the National WS program from the USFWS (USDI 1992) describing potential effects of the national WS program on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997 Revised, Appendix F). WS completed an informal Section 7 consultation regarding the impacts of the waterfowl damage management methods proposed in this EA on federally-listed threatened, endangered and candidate species on May 1, 2007.

Migratory Bird Treaty Act of 1918 (U.S.C. 703711: 40 Stat. 755), as amended (MBTA)

The Migratory Bird Treaty Act provides the USFWS regulatory authority to protect families of birds that contain species which migrate outside the United States. The law prohibits any “take” of these species by any entities, except as permitted or authorized by the USFWS. The Migratory Bird Treaty Reform Act of 2004 clarifies the original purpose of the MBTA as pertaining to the conservation and protection of migratory birds native to North America and directs the USFWS to establish a list of bird species found in the United States which are non-native, human-introduced species and therefore not federally protected under the MBTA.

The USFWS issues permits to requesters for reducing migratory bird damage in certain situations. WS provides on-site assessments for persons experiencing migratory bird damage to obtain information needed to make damage management recommendations. Damage management recommendations could be in the form of technical assistance or

operational assistance. In severe cases of migratory bird damage, WS provides recommendations to the USFWS for the issuance of depredation permits to private entities or other agencies. The ultimate responsibility for issuing such permits rests with the USFWS.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The U. S. Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All pesticides used by the WS program in Minnesota are registered with and regulated by the EPA and the Minnesota Department of Agriculture, and are used by WS in compliance with label procedures and requirements. No toxicants are currently used or registered for use in managing waterfowl or reducing waterfowl damage. There are several repellents that are registered for use in reducing waterfowl damage to vegetation in Minnesota ReJeX-iT^{TM} (contains methyl anthranilate) and AG-36^{TM} and FlightControl^{TM} (contains antraquinone).

Investigational New Animal Drug (INAD)
The drug alpha chloralose (AC) has been used as a sedative for animals and is registered with the Food and Drug Administration (FDA) to capture waterfowl, coots, and pigeons. FDA approval for use under INAD (21 CFR, Part 511) authorized WS to use the drug as a non-lethal method to capture birds.

National Historic Preservation Act (NHPA) of 1966, as amended
The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR§800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings.

WS has provided copies of this EA to each of the federally recognized tribes in Minnesota and to the Great Lakes Indian Fish and Wildlife Commission. WS actions on tribal lands are only conducted at the tribes request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties.

The WDM methods described in Chapter 3 and Appendix B that might be used operationally by WS do not cause major ground disturbance, do not cause any physical destruction or damage to property, does not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. With the potential exception of noise-making devices, the proposed methods generally do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of

historic properties. There is potential for audible effects on the use and enjoyment of a historic property when methods such as propane exploders, pyrotechnics, firearms, or other noise-making methods are used at or in close proximity to such sites for purposes of hazing or removing nuisance birds or other wildlife. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use would be to benefit the historic property. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 92-583, October 27, 1972; 86 Stat. 1280).
This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to Federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for Federal approval, each state's plan was required to define boundaries of the coastal zone, to identify uses of the area to be regulated by the state, the mechanism (criteria, standards or regulations) for controlling such uses, and broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that Federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the Federal action involved a permit, license, financial assistance, or a Federally authorized activity.

WS has determined that the Preferred Alternative would be consistent with the State's Lake Superior Coastal Program. The Minnesota Lake Superior Coastal Program concurred with this determination on April 30, 2007.

Environmental Justice and Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations.
Executive Order 12898, entitled, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations" promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental Justice is a priority within APHIS and WS. Executive Order 12898 requires federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and

environmental effects of federal programs, policies and activities on minority and low income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low income persons or populations. Additionally, the donation of processed goose meat products at no cost to food programs for low-income individuals, this project could provide benefits to the economically disadvantaged and other persons in need.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

Children may suffer disproportionately from environmental health and safety risks for many reasons, including the development of their physical and mental status. WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, and has considered the impacts that this proposal might have on children. The proposed waterfowl damage management program would only use legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action. Additionally, since the proposed waterfowl damage management program may include actions to reduce accumulations of feces, waterfowl aggression, denuding of landscaped vegetation, etc., at schools, public parks, playgrounds, private properties and other locations where children are sometimes present, it should help reduce health and safety risks to children.

Executive Order 13112 of February 3, 1999.

This order directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health. To comply with Executive Order 13112, WS may cooperate with other Federal, State, or Local government agencies, or with industry or private individuals to reduce damage to the environment or threats to human health and safety.

Responsibilities of Federal Agencies to Protect Migratory Birds (Executive Order 13186)

Executive Order 13186 requires each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations, to develop and implement, a Memorandum of Understanding (MOU) with the USFWS that shall promote the conservation of migratory bird populations. WS has developed a draft MOU with the USFWS as required by this EA and is currently waiting for USFWS approval.

1.6.3 Compliance with State Laws

The MDNR designates mute swans as a regulated invasive species in Minnesota Rule 6216.0260. Mute swans may be legally kept and bred on licensed game farms in Minnesota, but must be confined and may not be released into the wild, see MN Statute 97A.105 below. Unconfined mute swans are not protected by any Minnesota Statute or Rule.

97A.105 GAME AND FUR FARMS. Subdivision 1. License requirements (In part).

(a) A person may breed and propagate fur-bearing animals, game birds, bear, or mute swans only on privately owned or leased land and after obtaining a license. Any of the permitted animals on a game farm may be sold to other licensed game farms. "Privately owned or leased land" includes waters that are shallow or marshy, are not actually navigable, and are not of substantial beneficial public use. Before an application for a license is considered, the applicant must enclose the area to sufficiently confine the animals to be raised in a manner approved by the commissioner. A license may be granted only if the commissioner finds the application is made in good faith with intention to actually carry on the business described in the application and the commissioner determines that the facilities are adequate for the business.

(b) A person may purchase live game birds or their eggs without a license if the birds or eggs, or birds hatched from the eggs, are released into the wild, consumed, or processed for consumption within one year after they were purchased or hatched. This paragraph does not apply to the purchase of migratory waterfowl or their eggs.

(c) A person may not introduce mute swans into the wild without a permit issued by the commissioner.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

2.0 INTRODUCTION

Chapter 2 contains a discussion of issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences) and issues not considered in detail, with rationale. Information on the affected environment is included in this chapter in the discussion of issues used to develop mitigation measures. Additional information on the affected environment is incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the current program in Chapter 3.

2.1 AFFECTED ENVIRONMENT

The affected environment includes any site in Minnesota where there is a conflict with the target species addressed in this EA including but not limited to property on or adjacent to airports, golf courses, athletic fields, recreational areas, swimming beaches, parks, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, wetlands, restoration sites, and cemeteries. The proposed action may be conducted on properties held in private, local, state or federal ownership. WS would not conduct waterfowl damage management at any site without the consent of the appropriate landowner/manager. At the request of the affected tribe, WS could also provide assistance with waterfowl damage management on tribal lands. Work on tribal lands would only be conducted after the completion of all appropriate agreements between WS and the tribes.

2.2 ISSUES

The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

I. Effects on Target Waterfowl Populations
II. Effectiveness of Wildlife Damage Management Methods
III. Effects on Aesthetic Values
IV. Humaneness and Animal Welfare Concerns of Methods Used by WS
V. Effects on Non-target Wildlife Species Populations, Including T&E Species

2.3 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

2.3.1 Effects on Target Waterfowl Populations

A common concern among members of the public is whether wildlife damage management actions adversely affect the viability of target wildlife species populations. The target species analyzed in this EA are Canada geese, mallards, mute swans, and domestic and feral waterfowl. For all species except mute swans, damage management efforts would only target specific offending birds or local groups of birds and are not

intended to reduce overall populations. As discussed in Section 1.4.2.3 In the future, the MDNR has their goal for the management of mute swans includes taking appropriate actions to have the birds confined under game farm licenses or removing the birds from the wild. WS could be asked to assist with this effort.

2.3.2 Effectiveness of Wildlife Damage Management Methods

Another common concern among members of the public is whether the methods of reducing waterfowl damage will be effective in reducing or alleviating the damage/conflict. The effectiveness of each alternative can be defined in terms of decreased health risks, decreased human safety hazards, reduced damage to property, agricultural and natural resources, and a reduction in nuisance complaints.

2.3.3 Affects on Aesthetic Values

Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetic values are subjective, and depend on what an observer regards as beautiful.

Generally, wildlife is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit for many people. However, wildlife may also be responsible for adverse affects to 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 waterfowl behavior sometimes results 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, sale), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and is a part of the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 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 the knowledge that the animals exist (Decker and Goff 1987). Positive values of wildlife would also include having enough wildlife to view. However, the same wildlife populations that are generally appreciated may also create conflicts with land uses and human health and safety. Certain species of wildlife can be regarded as a nuisance in certain settings. Large numbers of waterfowl can reduce the aesthetic appearance and enjoyment of some activities and locations because of excessive feces, waterfowl aggression and human injury, denuded vegetation, eroded stream banks, disruption of vehicle traffic, etc. In sum, aesthetics include those values people place on waterfowl, knowledge of their existence and occurrence in their area, ability to enjoy and use properties for their intended purpose without excessive feces present, and ability to enjoy the natural and landscaped vegetation of an area.

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. Many people directly affected by damage to property and threats to human safety caused by waterfowl desire lethal removal of the birds from the property when the WAC has been exceeded. Other people believe that waterfowl should be captured and relocated to another area to alleviate damage or threats to human safety. Some people directly affected by the damage from waterfowl oppose removal of the birds regardless of the amount of damage. Individuals who are totally opposed to bird removal want WS to teach tolerance for waterfowl damage and threats to human health and safety, and that waterfowl should never be killed. Some of the people who oppose removal of waterfowl do so because of human affectionate bonds with individual birds. These human affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

Some wildlife species readily become accustomed to people (habituate) and live in close proximity to humans. It is not uncommon for people in these situations to feed wildlife and/or otherwise derive aesthetic enjoyment from the presence of the animals. Some people consider individual wild birds as "pets," or exhibit affection toward individual animals. Examples would be people who visit a city park to feed waterfowl and homeowners who have bird feeders or bird houses.

Some property owners that have populations of waterfowl above their identified WAC are concerned about the negative aesthetic appearance of feces 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 reduced public use.

2.3.4 Humaneness and Animal Welfare Concerns of Methods used by WS

Humaneness, in part, is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently.

Research indicates that the public may be willing to accept lethal wildlife management methods if they are humane (i.e., minimize pain and suffering of the target animal) (Kellert 1993, Schwartz et al. 1997). The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important and complex concept. Wildlife 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" (Schmidt 1989).* Suffering is described as a *" . . . highly unpleasant emotional response usually associated with pain and distress"*, 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, suffering is considered to be minimized where death is immediate (CDFG 1991) such as occurs with proper shooting.

Defining pain as a component in humaneness of WS methods is a greater challenge than that of suffering. Pain occurs in animals. Altered physiology and behavior can be indicators of pain, and the causes that elicit pain responses in humans would *" . . . probably be causes for pain in other animals . . . "* (AVMA 1987). Pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991). One challenge with coping with this issue is how to achieve the least amount of animal suffering while still effectively addressing wildlife damage problems within the constraints of current technology and resources.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some waterfowl damage management methods are used.

WS personnel in Minnesota are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Mitigation measures and standard operating procedures used to maximize humaneness are listed in Chapter 3.

2.3.5 Effects on Non-target Wildlife Species Populations, Including T&E Species

WS and the public are concerned about the potential impact of damage management methods and activities on non-target species, particularly T&E species. WS' standard operating procedures include measures intended to mitigate or reduce the effects on non-target and T&E species populations and are presented in Chapter 3.

2.4 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

2.4.1 Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area

Some individuals might question whether preparing an EA for an area as large as the State of Minnesota would meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. The WS program is analogous to other agencies or entities with damage management missions such as fire and police departments, emergency cleanup organizations, insurance companies, etc. Although WS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a damage problem has become intolerable to the point that they request assistance from WS. In addition, the WS program would not be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal

populations over broad areas at a much more intensive level than would be desired by most people, including WS and state agencies. Such broad scale population management would also be impractical or impossible to achieve within WS policies and professional philosophies.

If a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire state provides a better analysis than multiple EAs covering smaller zones.

2.4.2 Effects on Human Health from Consumption of Waterfowl

There are concerns that urban waterfowl which may feed on vegetation potentially treated with pesticides and herbicides and/or swim in waters in municipal areas may contain high levels of contaminants in their tissues and may be unsafe to eat. In Illinois, only one of 44 geese from the Chicago metropolitan area had contaminant residues that exceeded USDA residue limits for food consumption. Cooking methods which reduce the amount of lipids (fats) in the meat help to reduce contaminant levels in the meat (Levengood et al. 1999). Health Canada determined that the low levels of organochlorines and mercury measured in breast muscle of ducks and geese from Canada did not pose a health hazard to human consumers and the birds were safe to eat (Braune and Malone 2006).

In Minnesota there are currently no requirements for testing of Canada geese for chemical exposure/ contamination prior to donation for human consumption. However, the MDNR, in cooperation with the Minnesota Department of Health, has been able to determine that no consumption advisory is necessary for geese removed from the twin Cities metropolitan area (B. Leuth, MDNR pers. commun.). None of the 2006 Canada goose samples submitted to the National WS contaminant study indicated contaminate levels that would make goose meat unfit for human consumption. (USDA-WS unpublished data 2006).

CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992) as described in Chapter 2 (pages 20-35), Appendix J (Methods of Control), Appendix N (Examples of WS Decision Model), and Appendix P (Risk Assessment of Wildlife Damage Control Methods Used by USDA, Wildlife Services Program) of the ADC FEIS (USDA 1997 Revised).

Chapter 3 contains a discussion of the program alternatives, including those that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), alternatives considered but not analyzed in detail, with rationale, and mitigation measures and SOP's for wildlife damage management techniques. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Evaluation of the affected environment will be addressed in more detail in Chapter 4.

3.1 WATERFOWL DAMAGE MANAGEMENT STRATEGIES AND METHODOLOGIES AVAILABLE TO WS IN MINNESOTA

This section contains a description of the general damage management strategies and individual damage management techniques that could be applied by WS to address waterfowl damage and conflicts in MN. Appendix B is a more thorough description of the methods that could be used or recommended by WS. These strategies and techniques are combined to form management alternatives discussed in Section 3.2

3.1.1 Integrated Wildlife Damage Management (IWDM).

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective[1] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (i.e., no feeding policies), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), and removal of individual offending animals (i.e., relocation), local population reduction, or any combination of these, depending on the circumstances of the specific damage problem. WS considers the biology and behavior of the damaging species and other factors using the WS Decision Model (Slate et al 1992). The recommended strategy(ies) may include any combination of preventive and corrective actions that could be implemented by the requester, WS, or other agency personnel, as appropriate. Two strategies are available:

1 The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns

Preventive Damage Management is applying wildlife damage management strategies before damage occurs, based on historical problems and data. Most preventive management techniques are non-lethal methodologies, and are most commonly applied by the resource owners/manager. When requested, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. An example would be a cooperator installing and maintaining a fence and/ or overhead wire grid system to reduce access of waterfowl to a retention pond or scaring waterfowl away from active runways.

Corrective Damage Management is applying wildlife damage management to stop or reduce current losses. Both nonlethal and lethal methods are used for corrective damage management. As requested and appropriate, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. Examples include using pyrotechnics or border collies to chase away birds, the removal of waterfowl during the summer molt using round-up techniques, and the oiling of eggs during the nesting season.

3.1.2 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model described by Slate et al. (1992) (Figure 2). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem; evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into 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

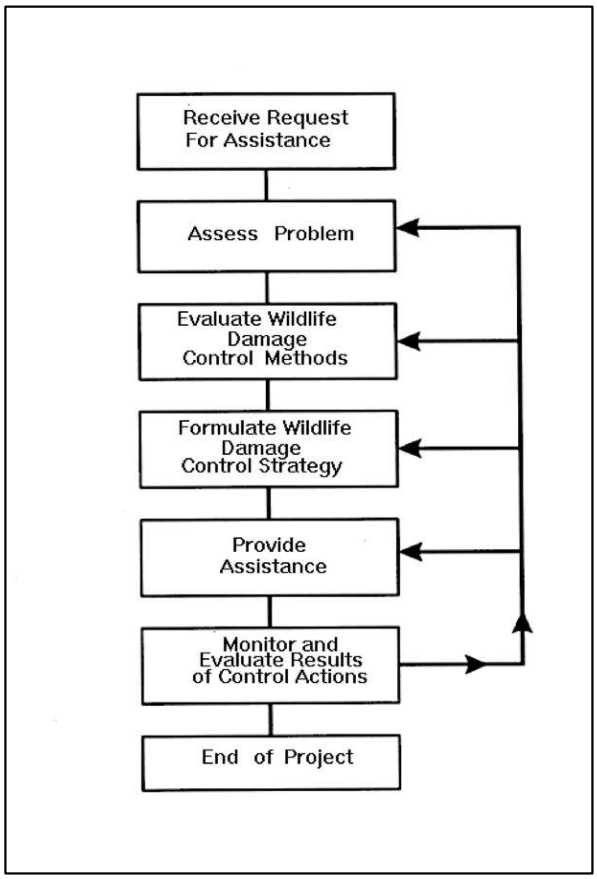

Figure 2. WS Decision Model

further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not necessarily a documented process, but is a mental problem-solving process common to most if not all professions.

3.1.3 General Types of Assistance Which May Be Provided by WS

Technical Assistance Recommendations (implementation is the responsibility of the requestor):
Technical assistance is information, demonstrations, and advice on available and appropriate wildlife damage management methods. Technical assistance may require substantial effort by WS personnel in the decision making process, but the implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems, these strategies are based on the level of risk, need, and the practicality of their application.

Under APHIS' NEPA Implementing Regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving wildlife damage problems.

Direct Damage Management Assistance (implementation is conducted or supervised by WS personnel):
Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when *Agreements for Control* or other comparable instruments provide for WS direct control damage management. The initial investigation defines the nature, history, extent of the problem, species or property directly and indirectly damaged species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problem is complex. Direct damage management provided by WS in Minnesota is provided on a cost-reimbursable basis.

Educational Efforts:
Education is an important element of WS program activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and

demonstrations are provided to producers, homeowners, state and county agents, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are periodically updated on recent developments in damage management technology, laws and regulations, and agency policies.

Research and Development:
The National Wildlife Research Center (NWRC) functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. NWRC scientists work closely with wildlife managers, researchers, field specialists and others to develop and evaluate wildlife damage management techniques. NWRC research was instrumental in the development of the repellent methyl anthranilate and the reproductive inhibitor, nicarbazin. NWRC scientists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

3.1.4 Community Based Decision Making

Technical assistance provided by Wildlife Services to resource owners for decision making.
The WS program in Minnesota follows the "co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of waterfowl and effective, practical, and reasonable methods available to the local decision maker(s) to reduce wildlife damage. This may include non-lethal and lethal methods depending upon the overall management alternative selected by WS (Section 3.2). WS and other state and federal wildlife or wildlife damage management agencies may facilitate discussions at local community meetings when resources are available. Resource owners and others directly affected by waterfowl damage or conflicts in Minnesota have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Local decision makers decide which effective methods should be used to solve wildlife-related conflicts. These decision makers include community leaders, private property owners/managers, and public property owners/managers. The process for involving local communities and local stakeholders in the decisions for waterfowl damage management assures that local concerns are considered before individual damage management actions are taken.

Community decision makers
The decision maker for the local community with a homeowner or civic association would be the President or the President's or Board's appointee. The President and Board are popularly elected residents of the local community who oversee the interests and business of the local community. This person would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision making. Identifying the decision maker for local business communities is more complex because the lease may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing Board. WS would provide technical assistance to the local community or local business community decision maker(s) and recommendations to reduce damage. Direct control would be provided by WS if requested by the local community decision maker, funding provided, and the requested direct control was compatible with WS recommendations.

Private property decision makers
The decision maker for private property owned by one person is him or herself. WS would provide technical assistance to this person and recommendations to reduce damage. Direct control would be provided by WS if requested, funding is provided, and the requested direct control was in line with WS recommendations.

If no homeowner or civic association represents the affected resource then WS will provide technical assistance to the self or locally appointed decision maker. Direct control would be provided by WS if requested, funding provided, and the requested direct control was in line with WS recommendations. Affected resource owners who disagree with the direct control action may request WS not conduct this action on their property and WS will honor this request.

Public property decision makers
The decision maker 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. WS would provide technical assistance to this person and recommendations to reduce damage. Direct control would be provided by WS if requested, funding provided, and the requested direct control was in line with WS recommendations.

3.1.5 Wildlife Damage Management Methods Available For Use or Recommendation by WS. (**Appendix B** contains more detailed descriptions of waterfowl damage management methods)

Non-lethal methods

Property owner practices consist primarily of non-lethal preventive methods such as cultural methods[2] and habitat/environmental modification. These methods may also include efforts to manage human behavior (e.g., prohibiting people from feeding waterfowl at a park). These methods are usually implemented by the property owner/manager. WS involvement consists of providing technical assistance including guidance and recommendations as to the types of practices which may help reduce the problem.

Animal behavior modification refers to tactics that alter the behavior of wildlife to reduce damages. Some but not all of these tactics include:

- Exclusion such as fencing/overhead wires
- Propane cannons (to scare waterfowl)
- Pyrotechnics (to scare waterfowl)
- Distress calls and sound producing devices (to scare waterfowl)
- Visual repellents and scaring tactics including lasers
- Harassment with dogs

Nest destruction of the target species before eggs or young are in the nest.

Habitat/environmental modification to attract or repel certain waterfowl species.

Live traps are various types of traps designed to capture waterfowl. Some examples are panel nets used for capturing waterfowl during the summer molt, rocket nets, clover traps, decoy traps, hand nets, etc.

Alpha-chloralose is used as an immobilizing agent, which is a central nervous system depressant, and used to capture waterfowl or other birds. It is generally used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as well-contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds.

2 Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife damage

Methyl Anthranilate (MA) is an artificial grape flavoring used for human consumption which has been shown to be an effective repellent for many bird species, including waterfowl. It can be applied to turf or surface water or as a fog to repel birds from small areas.

Anthraquinone is a chemical bird repellent that could be used to reduce feeding activity on airfields and other turf applications. Anthraquinone is a bio-pesticide that is non-lethal and works by causing a negative response to feeding in the treated area (Avery et al. 1997).

Rocket nets can be used to capture Canada geese. Geese are baited to a site where the net, which is launched over the geese with powder charges, keeps geese from flying away. Geese are then removed by hand from the net at which time they can be banded, relocated or euthanized.

Reproductive Inhibitors (Nicarbazin), in the form of contraceptive bait is currently available under the trade name OvoControl. When fed to Canada geese, nicarbazin resulted in decreased hatching success of eggs (Bynum et al. 2005). This product could be used to slow the growth of local Canada goose populations. Use of reproductive inhibitors for wildlife in Minnesota requires a permit from the DNR Commissioner and is pursuant to MN Rule 6212.1750.

Lethal Methods

Shooting is the selective removal of target species by shooting with an air rifle, shotgun, or rifle. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment techniques.

Cervical dislocation is sometimes used to euthanize birds that are live captured. AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and of small birds (Beaver et al. 2001).

Sport hunting is sometimes recommended when target species can be legally hunted.

Egg treatment/destruction is the practice of ceasing the development of the egg prior to hatching (egg oiling, chilling, shaking, puncturing); physically breaking eggs; or directly removing eggs from a nest and destroying them.

Carbon dioxide (CO_2) gas is an euthanasia method listed by the AVMA (Beaver et al. 2001) which is sometimes used to euthanize birds which are captured in live traps or by chemical immobilization and when relocation is not a feasible option. Live animals are placed in a container or chamber into which CO_2 gas is released. The animals quickly expire after inhaling the gas.

3.1.6 Examples of Past Waterfowl Damage Management Projects Conducted by MN WS

Nest/Egg Treatments: Geese typically lay one egg every 1-2 days for a total of 4-8 eggs/nest; the incubation period for goose eggs is approximately 28 days. Mallards typically lay between 8 and 10 eggs and the incubation period is between 26-30 days. Mute swans lay between 4-8 eggs and the incubation period is 35-38 days.

MN WS has conducted waterfowl damage management projects using nest/egg treatments in the past. The procedure has included visiting the nests every 7-10 days for the duration of the nesting season. WS treat only those eggs that are less than 14 days old. The typical egg treatment method conducted by MN WS is oiling. Oiling involves marking each egg, in the nest, and spreading a few drops of vegetable oil on the entire surface of the egg. The oiled eggs are returned to the nest until the completion of the project when they are removed and disposed of in accordance with state and federal laws. Nest/egg treatment projects are commonly used around airports, in public recreation areas, golf courses, and on other municipal and private properties. In FY 2006 Minnesota, WS removed 343 eggs Canada goose eggs from 60 nests. In FY 2005, WS removed 315 eggs Canada goose eggs from 65 nests.

Dog Harassment: MN WS has conducted waterfowl damage management projects using dog harassment treatments in the past. The procedure has included using a dog or dogs to encourage waterfowl to leave an area. Dog harassment usually occurs after the nesting season but before post-nuptual molt then again after the molt and through the fall. Sites are generally visited at least once per day. Dog harassment is only conducted in areas where egg treatment has been done or where there is no nesting of geese in order to reduce the possibility of young being present during harassment. MN WS emphasizes dog harassment activities during the resident Canada goose hunting season.

Dog harassment is most effective in areas with no water bodies or with single, small (less than 2 acres) water bodies. This technique requires an ongoing program augmented with other waterfowl control techniques. MN WS Dog harassment projects are most commonly used near airports (when in close communication with airport staff) and in sensitive public areas such as cemeteries where other non-lethal harassment methods such as pyrotechnics may be unacceptable. In FY 2006 Minnesota WS used dog harassment on 66 occasions to disperse 4,499 Canada geese. In FY 2005 Minnesota WS used dog harassment on 60 occasions to disperse 4,959 Canada geese.

Waterfowl Round-ups: When MN WS has conducted waterfowl damage management projects in the past, the procedure has included using panel nets to capture geese during post-nuptual molt when both adult geese and goslings are flightless. Once the birds are in the traps they are humanely caught and transferred to waterfowl crates and removed from the capture site. After removal from the capture site, geese can be relocated, euthanized

for human or captive wildlife consumption or held in captivity. With the current lack of relocation sites, WS plans on euthanizing all flightless Canada geese captured. They would then be donated to a charitable organization for human consumption or to a captive wildlife facility for consumption by resident carnivores. Donation of euthanized geese to a captive wildlife facility is allowed under 50 CFR 21.26(d)(3). Minnesota regulations require that any captive wildlife facility receiving donated geese must be; non-profit, open to the public, and environmentally educational. In FY 2006 WS used waterfowl roundups to capture 375 Canada geese. In FY 2005 WS used waterfowl roundups to capture 296 Canada geese.

Alpha-chloralose a waterfowl-immobilizing agent is used by MN WS personnel to capture waterfowl from areas where they are habituated to hand feeding. Typically these areas include public recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as well-contained bait in small quantities with minimal hazards to pets and humans. Single bread or corn baits are fed directly to the target birds. In FY 2006, Minnesota WS used alpha-chloralose to capture 11 Canada geese. In FY 2005, Minnesota WS used alpha-chloralose to capture 22 Canada geese.

Rocket nets. Rocket nets were used by MN WS personnel to remove 15 Canada geese in FY 2005, no rocket nets were used in FY 2006 for Canada goose capture.

Shooting is the selective removal of target species by shooting with an air rifle, shotgun, or rifle. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment techniques as well as reduce the local population of geese. In FY 2006 Minnesota WS used shooting to remove 245 Canada geese. In FY 2005 Minnesota WS used shooting to remove 215 Canada geese.

3.2 ALTERNATIVES ANALYZED IN DETAIL IN CHAPTER 4

3.2.1 Alternative 1: Integrated Wildlife Damage Management (Proposed Action/No Action)

The No Action alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable alternative that could be selected and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with guidance from the CEQ (CEQ 1981). In this guidance, the No Action alternative for situations where there is an ongoing management program may be interpreted as "no change" from current management direction or level of management intensity.

The proposed action is for the WS program to continue the current IWDM program that responds to requests for waterfowl damage management to protect property, agricultural crops, natural resources, human health, and human safety in Minnesota. Requests for

assistance may occur anywhere and anytime in Minnesota. An IWDM approach would be implemented which would allow the use of legal techniques and methods, used singly or in combination, to meet requestor needs for reducing conflicts with waterfowl. Cooperators requesting assistance would be provided with information regarding the use of effective non-lethal and lethal techniques. Non-lethal methods used by WS may include resource management, physical exclusion, and deterrents. Lethal methods used by WS may include nest and egg treatment/destruction, live capture and transportation to an approved poultry processing facility, live capture and euthanasia, and/or shooting. In many situations, the implementation of non-lethal methods such as habitat alteration, repellents, and exclusion type barriers would be the responsibility of the requestor to implement. Waterfowl damage management by WS would be allowed in Minnesota, when requested, on private property or public facilities where a need has been documented and, upon completion of an *Agreement for Control.* All management actions would comply with appropriate federal, state, and local laws.

3.2.2 Alternative 2: Technical Assistance Only by WS

This alternative would not allow for WS operational waterfowl damage management in Minnesota. WS would only provide technical assistance and make recommendations when requested. Producers, property owners, agency personnel, or others could conduct waterfowl damage management using any legal lethal or non-lethal method. Currently, alpha-chloralose is only available for use by WS employees. Therefore, this chemical would be unavailable for use by private individuals. Appendix B describes a number of methods that could be employed by private individuals or other agencies after receiving technical assistance advice under this alternative.

3.2.3 Alternative 3: Non-lethal Only by WS

This alternative would require WS to only use or recommend non-lethal methods to resolve waterfowl damage problems. Persons receiving technical assistance could still employ lethal methods that were available to them. Individuals seeking information on lethal waterfowl damage management methods would be referred to other sources such as the MDNR, USDA Agricultural Extension Service offices, universities, or pest control organizations.

Currently, alpha-chloralose is only available for use by WS employees. Therefore, use of this chemical by private individuals would be illegal. Under this alternative, WS could use alpha chloralose to capture geese, but all geese captured by WS would have to be relocated or sent to a captive animal facility. WS could not use alpha chloralose to capture geese that would be subsequently euthanized. Appendix B describes a number of non-lethal methods available for use by WS under this alternative.

3.2.4 Alternative 4: No Waterfowl Damage Management by WS

This alternative would eliminate Federal involvement in waterfowl damage management in Minnesota. WS would not provide direct operational or technical assistance and requesters of WS services would conduct WDM without WS input. Information on

waterfowl damage management methods may be available to producers and property owners through other sources such as the MDNR, USDA Agricultural Extension Service offices, universities, or pest control organizations. Alpha-chloralose is only available for use by WS employees. Therefore, this chemical would not be available for use by private individuals.

3.3 ALTERNATIVES ELIMINATED FROM FURTHER ANALYSIS WITH RATIONALE

Non-lethal Methods Implemented Before Lethal Methods
This alternative is similar to Alternative 1 except that WS personnel would be required to always recommend or use non-lethal methods prior to recommending or using lethal methods to reduce waterfowl damage. Both technical assistance and direct damage management would be provided in the context of a modified IWDM approach. Alternative 1, the Proposed Action, is similar to this alternative in that it recognizes non-lethal methods as an important dimension of IWDM, gives them first consideration in the formulation of each management strategy, and recommends or uses them when practical before recommending or using lethal methods. Additionally, in many cases, when WS is requested to provide assistance with a waterfowl damage problem, the property owner/manager(s) have already tried some nonlethal alternatives for resolving their problem. The important distinction between the Non-lethal Methods First Alternative and the Proposed Alternative is that the former alternative would require that all non-lethal methods be used before any lethal methods are recommended our used.

While the humaneness of the non-lethal management methods under this alternative would be comparable to the Proposed Program Alternative 1, the extra harassment caused by the required use of methods that may be ineffective could be considered less humane. As local waterfowl populations increase, the number of areas negatively affected by these birds would increase, and greater numbers of birds would be expected to congregate at sites where non-lethal management efforts were not effective. This may ultimately result in a greater number of waterfowl being killed to achieve the local WAC than if lethal management were immediately implemented at problem locations (Manuwal 1989). Once lethal measures were implemented, waterfowl damage would be expected to drop relative to the reduction in localized population of waterfowl causing damage.

Since in many situations this alternative would result in greater risk of relocating a damage problem instead of resolving problems, could result in greater numbers of waterfowl being killed to achieve the local WAC at a greater cost to the requester, and could result in a delay in reaching the local WAC in comparison to the Proposed Alternative, the Non-lethal Methods Implemented before Lethal Methods Alternative is removed from further discussion in this document.

3.4 STANDARD OPERATING PROCEDURES (SOPS) FOR WILDLIFE DAMAGE MANAGEMENT

The WS program, nationwide and in Minnesota has developed Standard Operating Procedures (SOPs) for its activities that reduce the potential impacts of these actions on the environment. These procedures are discussed in detail in Chapter 5 of the ADC Final EIS (USDA 1997 Revised). Some key SOPs pertinent to the proposed action and alternatives of this EA are listed below.

- The WS Decision Model would be used to identify effective wildlife damage management strategies and their impacts (Slate et al. 1992).
- Reasonable and prudent measures or alternatives would be identified through consultation with the USFWS and are implemented to avoid impacts to T&E species.
- WS uses waterfowl damage management devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1997 Revised, Appendix P). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazard to the public is even further reduced.

3.4.1 Additional SOPs Specific to the Issues

The following is a summary of additional SOPs that are specific to the issues listed in Chapter 2 of this document.

Effects on Target Species Populations

- With the exception of mute swans discussed in Section 1.3.2.3, waterfowl damage management is directed to resolve waterfowl damage problems by taking action against individual problem birds, or local populations or groups, not by attempting to eradicate or reduce waterfowl populations in the state or region.
- To ensure that methods of live-capturing waterfowl result in minimal pain and discomfort, which could be measured as factors like physical injury (e.g., bleeding, broken wing), dehydration, and over-heating, captured birds would be made as comfortable as possible by watering the birds as necessary, not overcrowding the birds if they are put in holding cages for transportation, and seeking shade for caged birds as necessary.
- WS take is monitored by comparing numbers of birds killed with overall populations or trends in populations.

Effects on Non-target Species Populations Including T&E Species

- WS personnel are trained and experienced in selecting the most appropriate method for taking problem animals and excluding non-target wildlife.
- Observations are made to determine if non-target or T&E species would be at significant risk from waterfowl damage management activities.
- WS consulted with the USFWS and MDNR regarding potential impacts of damage management methods on state and federally-listed T&E species. WS abides by reasonable and prudent alternatives (RPAs) and other agency recommendations for the protection of listed species that are established as a result of these consultations.
- If nicarbazin is registered for use in MN, WS will reinitiate Section 7 consultation with the USFWS regarding the impacts of this product on Federally-listed species.
- In the event that WS recommends habitat modification (e.g., modifying a wetland) as a damage management practice for the landowner/manager, WS will advise the landowner/manager that they are responsible for checking with state and federal authorities regarding regulations and endangered species protections that may be applicable to the proposed project. WS could recommend but will not conduct habitat management activities under any of the alternatives.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to meet the needs for action identified in Chapter 1. The chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. This section analyzes the environmental consequences of each alternative in comparison with the No Action alternative to determine if the real or potential effects would be greater, lesser, or the same.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, timber, and range. These resources will not be analyzed further.

Cumulative Effects: Discussed in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and non-target species, including threatened and endangered species.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Effects on sites or resources protected under the National Historic Preservation Act: WS waterfowl damage management actions are not undertakings that could adversely affect historic resources (See Section 1.8.2.6).

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

4.1.1 Impacts on Target Species Populations

Analysis of this issue is limited to those species intentionally killed during WS waterfowl damage management actions, specifically, Canada geese, mallards, mute swans, and domestic or feral waterfowl. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997 Revised). Magnitude is described in USDA (1997 Revised) as " . . . *a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available.

4.1.1.1 Alternative 1: Integrated Wildlife Damage Management Program (Proposed Action/No Action)

A common concern among members of the public is whether wildlife damage management actions will adversely affect the viability of target species

populations. WS maintains ongoing contact with USFWS and the MDNR and submits annual reports of WS activities to both agencies. These agencies have responsibility for maintaining healthy populations of native waterfowl. The MDNR also has responsibility for monitoring and managing free-ranging populations of nonnative and domestic waterfowl and game farms. Although local populations of waterfowl may be reduced, working cooperatively with the USFWS and MDNR and compliance with applicable state and federal laws and regulations, will ensure that the regional, national and statewide populations of native waterfowl species will not be adversely affected by WS' actions.

Canada Geese

The majority (86% in 2006) of Canada geese taken by WS are taken during the April 1 to August 31 window of time identified by the USFWS for management of resident geese in their new regulations (USFWS 2005*b*). To date, all birds taken before and after have been taken as part of efforts to reduce wildlife hazards to aircraft. Canada goose take which occurs between Sept 1 and March 31 is likely comprised of resident and migrant geese. For example, Wisconsin Department of Natural Resources goose banding data indicate that approximately 48% of the birds taken by hunters in the fall come from the migratory Mississippi Valley population (MVP) (Van Horn et al. 2006).

The 2005 spring population of resident Canada geese in Minnesota was estimated to be approximately 338,254 geese (Section 1.3). Since 2001 WS has taken (shot, captured/ euthanized or captured/relocated) a total of 1,194 Canada geese and 658 goose eggs (contained in 125 nests) in MN (Table 8). Based upon past requests for WS assistance and an anticipated increase in future requests for services, WS anticipates that no more than 1% (e.g., 3,383 birds in 2006) of the spring resident goose population would likely be killed annually by WS in Minnesota under the proposed action. During the 2005 Minnesota Canada goose hunting seasons the harvest of Canada geese (resident and migrant) in Minnesota was estimated at 207,266 (USFWS 2006). For Federal Fiscal Year (FY) 2005 (October 2004 through September 2005), the USFWS issued 116 Depredation Permits to Minnesota entities other than WS, enabling the permitted take of up to 1,466 geese and up to 2,906 goose nests. Using the 2005 hunter harvest data, USFWS permitted take, and WS anticipated kill of less than 1% of the population, the magnitude of WS impacts on the resident Canada goose population is considered to be very low. Furthermore this cumulative take would contribute positively to the USFWS resident goose population management objective of reduction from the 2005 level (338,254 geese) to approximately 182,000 geese in Minnesota (USFWS 2005*b*).

While local populations of resident Canada geese deemed above the WAC by the property owner or local community may be reduced, applicable state and federal laws and regulations authorizing take of Canada geese and their nest and eggs,

including the USFWS and MDNR permitting processes, would ensure that the statewide population would not be reduced below the USFWS population goal of 182,000 Canada geese (USFWS 2005*b*). Consequently, the potential take of resident Canada geese by WS is expected to have no negative cumulative impact on the statewide or flyway resident Canada goose population.

Table 8. Canada geese, mallards, domestic/feral waterfowl, and mute swans (individuals, nests and eggs) taken by WS in Minnesota during Federal Fiscal Years 2001-2006.

Fiscal Year	Number of Geese	Number of Mallards	Number of domestic/feral waterfowl	Number of mute swans
2001	64	56	0	0
2002	90	106	0	0
2003	91	25	0	0
2004	114	16	0	0
2005	548*	12	0	0
2006	631	26	0	0
Total	1440	241	0	0
Fiscal Year	**Number of geese eggs/nests**	**Number of mallard eggs/nests**	**Number of Domestic/feral waterfowl eggs/nests**	**Number of mute swan eggs/nests**
2001	0	0	0	0
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	315/65	0	0	0
2006	343/60	0	0	0
Total	681/125	0	0	0

* includes 198 relocated geese

Mallard Ducks

As described in section 1.3, in spring 2005, there were an estimated 238,500 mallard ducks in Minnesota (MDNR 2005). Since 2001, WS has killed a total of 241 mallards in MN (Table 8). Based upon past requests for WS assistance and an anticipated increase in future requests for services, WS anticipates that no more than 0.5% (715 birds) of the mallard population would be killed by WS annually under the proposed action. During the 2005 duck hunting season the estimated mallard harvest for Minnesota was 169,582 birds (USFWS 2006). Mallards taken during hunting season include birds that nested in the state and

birds migrating south from breeding grounds in Canada. For Federal FY 2005, the USFWS issued Depredation Permits to Minnesota entities other than WS, enabling the authorized take of up to 65 mallards by shooting, and the destruction of up to 35 mallard nests. If WS had taken the proposed 715 birds for WDM in 2005, WS' take would be only 0.4% of hunter harvest permitted by the USFWS and MDNR. As such, the proposed WS take of mallards would not contribute substantially to overall lethal take of mallards and will not have a significant impact on the state, flyway or national mallard population.

While local populations of mallard ducks deemed above the WAC by the local governing body may be reduced, applicable state and federal laws and regulations authorizing take of mallard ducks, including the USFWS and the DNR permitting processes, would ensure that the statewide and flyway populations would not be reduced below state and Mississippi Flyway population goals and objectives.

Mute Swans

In 2005, the statewide wild/feral mute swan population was estimated at 29 individuals. Because mute swans are a non-native species with the potential to have negative impacts on native birds and their habitat, the MDNR management objective for the species involves taking appropriate actions to have the birds kept for personal use/enjoyment confined in accordance with game farm licenses and removing the remaining birds from the wild. The state's management objective for mute swans is consistent with Executive Order 13112 which directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

WS has not taken any mute swans or eggs in MN. There isn't a hunting season for mute swans in MN, but in 2005, there were 12 known mute swans taken by MDNR for wildlife damage management purposes. Biologically, the optimum population size for wild/feral mute swans in Minnesota is zero as they are considered an invasive species harmful to native waterfowl and vegetation. WS could be asked to assist with the MDNR's effort to remove all wild/feral mute swans from the state. These efforts would not involve mute swans kept in accordance with the requirements of state game farm licenses and individuals would still be able to keep and enjoy these birds. The population of mute swans in Minnesota is relatively low compared to some states. For example, the mute swan population in Michigan was estimated at approximately 7,100 birds (MDNR 2006). Consequently, mute swan management efforts in Minnesota are unlikely to have substantive impacts on the regional or national mute swan population.

It is conceivable that WS could be asked to assist with the management of mute swans kept in accordance with state game farm regulations if these birds were posing a risk to human health or safety (e.g., aggressive behavior). In these

instances, WS would work with the owner/manager(s) of the swans to determine which nonlethal methods had already been tried and, where appropriate, recommend new methods and/or changes to existing methods. WS would only use lethal methods to address problems with managed mute swans at the request of or, in close coordination with, appropriate officials from the MDNR.

Domestic and Feral Waterfowl

Based upon past requests for WS assistance and an anticipated increase in future requests for services, WS anticipates that the number of domestic and feral ducks killed or removed by WS could increase substantially above the current level of take. WS has not taken any domestic or feral waterfowl in MN (Table 8). However, domestic and feral waterfowl are non-indigenous species considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction, even to the extent of complete eradication from the natural environment, could be considered a beneficial impact to native waterfowl species. Domestic and feral waterfowl are not protected by Minnesota state law or by federal law.

4.1.1.2 Alternative 2: Technical Assistance Only by WS

Under this alternative, WS would have no impact on target waterfowl populations in Minnesota because the WS program would only provide advice on the management of the target species and would not conduct any waterfowl population management activities. WS would be able to provide the site evaluations and technical assistance required to help property managers obtain permits from the USFWS for the lethal take of birds causing damage. The tranquilizer alpha-chloralose is currently only available for use by WS employees and would not be available for use under this alternative. Private efforts to reduce or prevent waterfowl damage and conflicts could increase, which could result in similar or even greater impacts on those populations than the current program alternative. It is hypothetically possible that attempts to address waterfowl damage and conflicts by inexperienced individuals could result in the inappropriate or even illegal use of damage management methods which could lead to real but unknown effects on waterfowl. Instances of this type of problem are relatively uncommon and effects on waterfowl under this alternative would probably be about the same as or slightly higher than Alternative 1 and similar to those under Alternative 3. Effects and hypothetical risks of illegal killing of waterfowl under this alternative would probably be less than Alternative 4 because individuals would have at least some access to WS assistance with waterfowl damage management.

4.1.1.3 Alternative 3: Non-Lethal Only By WS

Under this alternative, WS would not kill any target species because WS would be restricted to only using and recommending nonlethal management methods. WS would be unable to assist landowners in obtaining permits for the lethal take of

depredating birds from the USFWS. Although WS lethal take of waterfowl would not occur, it is likely that private waterfowl damage management efforts would increase, leading to potentially similar or even greater effects on target species populations than those of the current program alternative. It is hypothetically possible that attempts to address waterfowl damage and conflicts by inexperienced individuals could result in the inappropriate or even illegal use of damage management methods which could lead to real but unknown effects on waterfowl. However, for the same reasons shown in the population effects analysis in section 4.1.1.1, it is unlikely that target waterfowl populations would be adversely impacted by implementation of this alternative. Effects and hypothetical risks of illegal killing of waterfowl under this alternative would probably be less than Alternative 4 because individuals would have at least some access to WS assistance with waterfowl damage management.

4.1.1.4 Alternative 4: No Waterfowl Damage Management by WS

Under this alternative, WS would have no impact on waterfowl populations in Minnesota. The tranquilizer alpha-chloralose is currently only available for use by WS employees and would not be available for use under this alternative. Private efforts to reduce or prevent damage and conflicts would likely increase, which could lead to potentially similar or even greater effects on target species populations than those of the current program alternative. Effects on target species would depend upon the experience and level of effort expended by private persons. It is hypothetically possible that attempts to address waterfowl damage and conflicts by inexperienced individuals could result in the inappropriate or even illegal use of damage management methods which could lead to real but unknown effects on waterfowl. However, for the same reasons shown in the population effects analysis in section 4.1.1.1, it is unlikely that target waterfowl populations would be adversely impacted by implementation of this alternative. Risks associated errors in the application and use of damage management techniques would be greatest for this alternative because of the reduced availability of professional assistance with waterfowl damage management.

4.1.2 Effectiveness of Waterfowl Damage Management

4.1.2.1 Alternative 1: Integrated Wildlife Damage Management Program (ProposedAction/No Action)

Wildlife Services' extensive experience with wildlife damage management has shown that each damage management situation has its own unique challenges and needs. There aren't any waterfowl damage management techniques that are effective or appropriate for every situation. WS is best able to develop effective site-specific damage management strategies if it has access to the full range of legal damage management techniques including lethal and nonlethal methods. Consequently, this alternative would be more effective than any of the other

alternatives in reducing or minimizing damage caused by waterfowl because it allows access to the widest range of damage management techniques. Appendix B contains additional information on individual WDM methods.

Methods of frightening or discouraging waterfowl have been effective at specific sites. In most instances however, these methods have simply shifted the problem elsewhere (Conover 1984, Aguilera et al. (1991), and Swift 1998). Of the non-lethal techniques commonly used by the public to reduce conflicts with waterfowl (e.g., feeding ban, habitat modification, live swan, methyl anthranilate, fencing, harassment with dogs, people or vehicles), only fencing was reported to have been highly effective (Cooper and Keefe 1997). Habitat modifications, while potentially effective, are poorly accepted, not widely employed, and many include reducing water levels in wetlands and are not biologically sound. Long-term solutions usually require some form of local population reduction to stabilize or reduce waterfowl population size (Smith et al. 1999).

Population limiting techniques (e.g., hunting, capture and euthanize, shooting, and nest/egg destruction) may have longer-term effects than the constant effort required for hazing/harassment programs and can slow population growth or even reduce the size of a waterfowl population (Cooper and Keefe 1997). Kilpatrick and Walter (1999) reported that when an urban wildlife population above the WAC is reduced through lethal means, many residents subsequently experience reduced damage. Repopulation of sites where lethal management methods were used would undoubtedly take place as long as suitable habitat exists in that area. However, reducing the number of damaging waterfowl can facilitate the use of nonlethal methods thereby enhancing the effectiveness of non-lethal methods (Smith et al. 1999). For example, because most waterfowl are relatively long-lived, exclusive use of non-lethal methods to suppress reproduction may take years to reduce a local waterfowl population and associated damage problems. In contrast, lethal methods could be used to initially reduce the waterfowl populations and then non-lethal methods could be used to maintain the population at the reduced level.

This alternative would likely reduce the potential for bird-aircraft collisions at airports and increase human safety. Cooper (1991) reported that the removal of geese posing or likely to pose a hazard to air safety at airports considerably reduced the population of local geese, decreased the number of goose flights through airport operations airspace, and significantly reduced goose-aircraft collisions at Minneapolis-St. Paul International Airport. In addition, Dolbeer et al. (1993) demonstrated that an integrated approach (including removal of offending birds) reduced bird hazards at airports and substantially reduced bird collisions with aircraft by as much as 89%.

4.1.2.2 Alternative 2: Technical Assistance Only by WS

With WS technical advice but no direct management assistance, entities requesting waterfowl damage management would either take no action, implement WS recommendations for non-lethal and lethal control methods, or seek other sources of assistance with waterfowl damage management. If the individual/organization with the damage problem decides to not take action, conflicts and damage would likely continue or increase as bird numbers are maintained or increased. The efficacy of the alternative sources for assistance with waterfowl damage management will vary depending upon the training and skills of the individual(s) involved, The tranquilizer drug alpha-chloralose is only available to WS and would not be available under this alternative. In general, this alternative is likely to be less effective than Alternative 1 and similar to Alternative 3.

4.1.2.3 Alternative 3: Non-Lethal Only By WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods in providing assistance with waterfowl damage problems. The success or failure of the use of non-lethal methods can be quite variable. Methods of frightening or discouraging waterfowl have been effective at specific sites. In most instances however, these methods have simply shifted the problem elsewhere (Conover 1984, Aguilera et al. 1991, and Swift 1998). However, if WS is providing direct operational assistance in dispersing waterfowl, coordination with local authorities, who may assist in monitoring the birds' movements, is generally conducted to assure they do not reestablish in other undesirable locations. Of the non-lethal techniques commonly used by the public to reduce conflicts with waterfowl (e.g., feeding ban, habitat modification, live swan, methyl anthranilate, fencing, harassment with dogs, people or vehicles), only fencing was reported to have been highly effective (Cooper and Keefe 1997). For optimal efficacy, some frightening strategies require long-term commitment of staff and/or financial resources that many not be available to everyone with a waterfowl damage problem. Habitat modifications, while potentially effective, are poorly accepted, not widely employed, and many include reducing water levels in wetlands and are not biologically sound. Long-term solutions usually require some form of local population reduction to stabilize or reduce waterfowl population size (Smith et al. 1999). Capture and relocation is an option for local population reduction under this alternative, however, with time, it often becomes increasingly difficult to find relocation sites. Additional difficulties with relocation are discussed in Chapter 3 and Appendix B. In general, this alternative is likely to be less effective than alternative one and similar to Alternative 2.

4.1.2.4 Alternative 4: No Waterfowl Damage Management by WS

With no WS assistance, private individuals and community government officials would either take no action, which means the waterfowl damage and conflicts

would likely continue or increase in each situation as waterfowl numbers are maintained or increased, or implement their own non-lethal and lethal control methods. The efficacy of the alternative sources for assistance with waterfowl damage management will vary depending upon the training and skills of the individual(s) involved, the tranquilizer drug alpha-chloralose is only available to WS and would not be available under this alternative. Completely eliminating WS involvement in waterfowl damage management would eliminate a source of readily available professional assistance with waterfowl damage management which is likely to make this alternative the least effective of the 4 alternatives.

4.1.3 Impacts on Aesthetic Values

4.1.3.1 Effects on Human Affectionate-Bonds with Individual Birds and on Aesthetic Enjoyment of Waterfowl.

Alternative 1: Integrated Wildlife Damage Management Program (Proposed Action/No Action)

Some people who routinely view or feed individual geese, ducks, swans or domestic waterfowl would likely be disturbed by removal of such birds under the proposed program. People who have developed affectionate bonds with individual birds may feel sadness and anger if those particular birds were removed, especially if the birds are removed using lethal methods. WS is aware of such concerns and works to mitigate these impacts. Often the management goals at a particular site are to reduce the local population, not eliminate all birds. In these situations, WS may sometimes be able to mitigate such concerns by working to leave birds which have particular importance to individuals.

Some people derive aesthetic enjoyment from watching waterfowl. For these individuals, watching waterfowl can provide an opportunity for peace, relaxation and entertainment. Like individuals with attachment to particular birds, these individuals' aesthetic enjoyment of a site could be adversely impacted by the removal of the waterfowl. However, as noted above, WS works with property owners/managers to try and address these concerns. As stated above, it is often possible to resolve damage problems at a site without removing all birds, so opportunities for aesthetic enjoyment of birds would remain. Additionally, except for mute swans, bird removal actions would generally be restricted to local sites and to small percentages of overall waterfowl populations. Canada geese, mallards, and feral/domestic ducks would remain common and abundant and would therefore continue to remain available for viewing by persons with that interest.

It is the MDNR's goal to eliminate/ prevent the establishment of free-ranging mute swans in the state and WS could assist the state with that effort. The MDNR will work to achieve this goal with or without the assistance of WS. If successful,

the only opportunity to observe mute swans in the state would be in captivity. Removal of these birds would likely be distressing to any individuals with attachments to the few remaining mute swans in the state. However, given that there was estimated to be less than 20 free-ranging mute swans in the state in fall 2006 opportunities to interact with this non-native species are already very limited. In context of the ample opportunities to view and enjoy native Canada geese, mallards, and an increasing population of native trumpeter swans (currently at over 2,000 birds), the impact of removing mute swans on overall aesthetic opportunities to enjoy waterfowl will be relatively low.

Lethal removal of waterfowl from airports should not affect the public's enjoyment of the aesthetics of the environment since airport properties are closed to the public. The ability to view and interact with waterfowl at these sites is usually either restricted to viewing from a location outside boundary fences, or is forbidden.

Alternative 2: Technical Assistance Only by WS
Under this alternative, WS would not conduct any damage management activities, but could provide advice on damage management alternatives. Consequently, WS would not have a direct impact on stakeholder aesthetic enjoyment of waterfowl. Some people who oppose direct management assistance in wildlife damage management by the government but favor government technical assistance would favor this alternative. Persons who have developed affectionate bonds with individual birds would not be affected by WS' activities under this alternative because the individual birds would not be killed by WS. However, the MDNR or other private entities would likely conduct direct management assistance activities similar to those that would no longer be conducted by WS, and the effects would then be similar to the proposed alternative.

Alternative 3: Non-Lethal Only By WS
Under this alternative, WS would not conduct any lethal wildlife damage management but would still use nonlethal methods to reduce waterfowl damage. Some people who oppose lethal control of wildlife but are tolerant or supportive of government involvement in non-lethal wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual birds would not be affected by the death of individual birds under this alternative, but might oppose dispersal or translocation of certain birds. As discussed in this Subsection under Alternative 1, with the exception of mute swans, WS might sometimes be able to mitigate such concerns by leaving certain waterfowl which might be identified by interested individuals.

Although WS would not use lethal methods to resolve waterfowl damage conflicts under this alternative, property owners/managers would still have legal access to lethal damage management techniques. If the MDNR and/or property

owners and managers chose to use lethal WDM methods without assistance from WS, the impacts would be similar to the proposed action alternative.

Alternative 4: No Waterfowl Damage Management by WS
Under this alternative, WS would not conduct any lethal removal of waterfowl nor would the program conduct any harassment of birds. Some people who oppose any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual birds would not be affected by WS' activities under this alternative. However, the MDNR or other private entities would likely conduct waterfowl damage management activities similar to those that would have been provided by WS under the preferred alternative, and the effects would be similar to the proposed action alternative.

4.1.3.2 Impacts on Aesthetic Values of Property Damaged by Birds

Alternative 1: Integrated Wildlife Damage Management Program (Proposed Action/No Action)
As noted in Section 4.1.2.1, this alternative would give WS the greatest ability to effectively resolve waterfowl damage. Consequently, this alternative would be most effective in reducing the adverse aesthetic impacts of waterfowl and their feces on property. Individuals whose aesthetic enjoyment of other birds and the environment is diminished by the presence of waterfowl and waterfowl feces will be positively affected by programs which result in reductions in the presence of waterfowl.

The dispersal of waterfowl by harassment and barriers can sometimes result in the birds causing the same or similar problems at the new location. If WS is providing direct operational assistance in dispersing such birds, coordination with local authorities, who may assist in monitoring the birds' movements, may be conducted to assure they do not reestablish in other undesirable locations.

Alternative 2: Technical Assistance Only by WS
Under this alternative, WS would not conduct any operational waterfowl damage management activities. However, similar activities could be conduced by entities other than WS. As noted in Section 4.1.2.2, overall efficacy of this alternative in reducing adverse impacts by waterfowl will vary depending upon the training, experience and methods available to the individuals conducting the damage management activities. The tranquilizer drug alpha-chloralose would not be available as a management option under this alternative. In general, this alternative is likely to be similar to or have slightly less beneficial impacts on the aesthetic value of property damaged by waterfowl. However, potential impacts on aesthetic value of property damaged by waterfowl would likely be greater than for Alternative 4, since WS would be providing technical assistance.

The dispersal of waterfowl by harassment and barriers can sometimes result in the birds causing the same or similar problems at the new location. If WS has only provided technical assistance, coordination with local authorities to monitor the birds' movements to determine if birds become established in other undesirable locations may not be conducted. This could increase the risk of moving the adverse aesthetic impacts to nearby property owners.

Alternative 3: Non-Lethal Only By WS
Under this alternative, WS would be restricted to non-lethal methods only. As noted in Section 4.1.2, restricting WS access to some damage management techniques may make it harder for WS to effectively resolve damage problems. Consequently, WS would be less able to effectively reduce adverse impacts on property from waterfowl than under Alternative 1.

Additionally, exclusive use of nonlethal methods has greater potential to result in waterfowl relocating to other sites where they would likely create or worsen similar problems for other property owners. If WS is providing direct operational assistance in dispersing such birds, WS may coordinate damage management activities with local officials in order to minimize incidence of waterfowl relocating to other undesirable locations.

In some cases, exclusive use of nonlethal methods like hazing/frightening may require a long-term commitment of resources that may be difficult for some property owners/managers. Property owners could still use lethal waterfowl damage management methods without assistance from WS. Ability of these alternative sources to reduce adverse aesthetic impacts on property from waterfowl will vary depending upon the training, skills and equipment available to the entity conducting the WDM.

Alternative 4: No Waterfowl Damage Management by WS
Under this alternative, the lack of any operational or technical assistance in reducing waterfowl problems would mean aesthetic values of some affected properties would continue to be adversely affected if the property owners were not able to reduce waterfowl damage in some other way. Ability of these alternative sources to reduce adverse aesthetic impacts on property from waterfowl will vary depending upon the training, skills and equipment available to the entity conducting the WDM.

The dispersal of waterfowl by harassment and barriers can sometimes result in the birds causing the same or similar problems at the new location. Coordination with local authorities to monitor waterfowl movements, to determine if birds become established in other undesirable locations, might not be conducted, therefore increasing the potential of adverse effects to nearby property owners.

4.1.4 Humaneness and Animal Welfare Concerns of Lethal Methods Used by WS

4.1.4.1 Alternative 1: Integrated Wildlife Damage Management Program (Proposed Action/No Action)

Under this alternative, methods viewed by some persons as inhumane would be used by WS. These methods would include capture and euthanasia, capture and processing for human consumption, immobilization with the use of alpha-chloralose, and shooting.

Many stakeholders would want waterfowl captured in a way that results in no pain or a minimization of pain, which they could measure as physical injury (e.g., bleeding, broken wing). Captured birds would be made as comfortable as possible by watering the birds as necessary, not overcrowding the birds if they are put in holding crates for transportation, and seeking shade for caged birds as necessary.

There would likely be concern among stakeholders, in situations where waterfowl are captured and processed for human consumption, that the birds should be killed quickly. Birds would be processed for human consumption in state licensed poultry processing facilities in accordance with all pertinent regulations.

There may be concern among stakeholders that birds sedated with alpha-chloralose should not be allowed to drown, even if the birds are to be euthanized. If waterfowl are shot, stakeholders would likely want quick clean kills of shot birds. Some persons would view shooting as inhumane.

In situations where waterfowl are being captured alive by use of nets or by hand, the birds would be euthanized by methods approved by the AVMA (Beaver et al. 2001). Most people would view AVMA-approved methods of euthanizing animals as humane.

Some people could also be concerned about eggs being oiled, punctured, chilled, or addled. A minority of stakeholders would likely want no waterfowl captured, harassed, or killed because they consider putting birds in crates as inhumane, and the killing of birds as inhumane regardless of the method used.

Some people have concerns over the potential for separation of waterfowl family groups through management actions. This could occur through harassment (e.g., pyrotechnics, dogs) and lethal control methods. However, it is not uncommon for waterfowl family units to experience change. Bellrose (1980) cites several sources which list annual mortality rates of juvenile waterfowl ranging from 7 to 19% during the hatching to fledgling stage. Biologists believe that juvenile birds have a good likelihood of survival without adult birds once the juvenile reaches

fledgling stage, which occurs by July for most juvenile birds. Therefore, molting juvenile waterfowl that escape capture would most likely survive to adulthood (Mississippi Flyway Council Technical Section 1996). Separated adults form new pair bonds and readily breed with new mates (Moser et al. 1991).

Alternative 2: Technical Assistance Only by WS
Under this alternative, WS would not conduct any lethal or non-lethal management actions, and would only provide advice on waterfowl damage management. Thus, lethal methods viewed as inhumane by some persons would not be used by WS. However, individuals could use most damage management techniques on their own or contract for the assistance of entities other than WS. If the individual(s) conducting the damage management actions are inexperienced and/or use the methods improperly, risk of injury, pain and distress for the birds would be higher than with a WS program. Risks of these types of problems would be lower for this alternative than for Alternative 4 because WS would be able to provide technical assistance, including training, on the safe and effective use of damage management techniques. Use of the tranquilizer drug alpha chloralose, which may facilitate calm capture of waterfowl, is available only to WS personnel and would not be available under this alternative. Overall, impacts on humaneness and animal welfare concerns associated with waterfowl damage management under this alternative would likely be similar to or, potentially, less humane than Alternative 1.

Alternative 3: Non-Lethal Only By WS
Under this alternative, lethal methods viewed as inhumane by some persons would not be used by WS. However, it is expected that some requesters of waterfowl damage management assistance would reject non-lethal methods recommended by WS and/or would not be willing or able to pay the extra cost of implementing and maintaining them. These individuals could still use most lethal damage management techniques on their own or contract for the assistance of entities other than WS. If the individual(s) conducting the damage management actions are inexperienced and/or use the methods improperly, risk of injury, pain and distress for the birds would be higher than with a WS program. Overall, impacts on humaneness and animal welfare concerns associated with waterfowl damage management under this alternative would likely be similar to or, potentially, less humane than Alternative 1.

Alternative 4: No Waterfowl Damage Management by WS
Under this alternative, methods viewed as inhumane by some persons would not be used by WS. However, individuals could use most damage management techniques, including lethal methods, on their own or contract for the assistance of entities other than WS. If the individual(s) conducting the damage management actions are inexperienced and/or use the methods improperly, risk of injury, pain and distress for the birds would be higher than with a WS program. Risks of

these types of problems would be lower for this alternative than for Alternative 4 because WS would be able to provide technical assistance, including training, on the safe and effective use of damage management techniques. Use of the tranquilizer drug alpha chloralose, which may facilitate calm capture of waterfowl, is available only to WS personnel and would not be available under this alternative. Overall, waterfowl damage management under this alternative would likely be similar to the proposed action alternative.

4.1.5 Effects on Non-target Wildlife Species Populations, Including Threatened and Endangered Species

4.1.5.1 Alternative 1: Integrated Wildlife Damage Management Program (Proposed Action/No Action)

WS, other wildlife professionals, and the public are concerned with the impact of damage management methods and activities on non-target species, especially threatened and endangered (T&E) species. WS' standard operating procedures include measures intended to mitigate or reduce the effects on non-target species populations and are presented in Chapter 3. WS has not killed any non-target wildlife species while conducting waterfowl damage management activities in Minnesota and does not anticipate this number to substantially increase.

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. Lists of State and Federal T&E species were obtained from the MDNR and the USFWS (Appendices C & D). The Minnesota WS program has completed an informal Section 7 consultation with the USFWS regarding potential risks to federally-listed species (Appendix C) from the actions proposed in this EA. WS has determined that the proposed action may affect but is unlikely to adversely affect bald eagles and will have no effect on all other federally listed species in the state. The USFWS concurred with WS' determination of may effect, not likely to adversely effect bald eagles on May 1, 2007. The consultation did not include an assessment of the potential impacts of nicarbazin on federally-listed T&E species. WS has agreed to reinitiate Section 7 consultation with the USFWS in the event that nicarbazin is registered for use in MN. WS has also consulted with the MDNR regarding potential impacts of the methods proposed in this EA on state-listed threatened and endangered species (Appendix D). WS has determined that the proposed action will have no effect on populations of state-listed mammals, reptiles, amphibians, mollusks, insects, vascular plants, lichens, mosses, or fungi. The proposed action will either have no affect on or may affect but is unlikely to adversely affect state-listed bird populations. One June 6, 2007, WS received notice that the MDNR concurred with this determination.

WS abides by laws and regulations of the MBTA regarding migratory birds (50 CFR§21). Non-target migratory bird species and other wildlife species are

usually not affected by the waterfowl damage management methods proposed in this EA, except for the occasional scaring from harassment devices, capture in a cage-type live trap, or capture in nets. Scaring and harassment devices may cause migratory birds and other affected wildlife to temporarily leave the immediate vicinity of scaring, but they would most likely return after conclusion of the action. Birds caught in live traps and nets can usually be released on site although it is theoretically possible that the proposed action could result in the unintended death of a limited number of individuals (< 6 per species/year). Given that WS does not anticipate taking any state or federally-listed threatened or endangered species, the limited level of lethal take will not result in adverse impacts on non-target species populations.

Non-lethal chemical products that might be used or recommended by WS would include repellents such as methyl or di-methyl anthranilate (artificial grape flavoring used in foods and soft drinks sold for human consumption), which has been used as an area repellent, anthraquinone, and the tranquilizer drug alpha-chloralose. Such chemicals have undergone rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or FDA. Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and State pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on wildlife populations.

The avian tranquilizer, alpha-chloralose, is typically administered as single bread or corn baits which are fed directly to the target birds with minimal hazards to pets, human and non-target species. WS specialists are always at the site while alpha-chloralose is being administered and would be able to prevent nontarget birds from accessing the bait. Sedated birds are immediately removed from the treatment area, thereby minimizing secondary hazards to predators.

Based on a thorough Risk Assessment, APHIS concluded that, when chemical methods are used by WS in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible effects on the environment (USDA 1997 Revised).

4.1.5.2 Alternative 2: Technical Assistance Only by WS

Alternative 2 would not allow any WS direct operational waterfowl damage management in Minnesota. There would be no impact on non-target or T&E species from WS activities under this alternative. Technical assistance or self-help information would be provided upon request. Although technical support might lead to more selective use of control methods by private individuals than that which might occur under Alternative 4, private efforts to reduce or prevent

depredations could still result in less experienced persons implementing control methods. These individuals may make errors in the application of damage management methods which may lead to greater take of non-target wildlife than under the Proposed Action. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of waterfowl, which could lead to unknown effects on local non-target species populations, including some T&E species. In conclusion, hazards to nontarget species would be similar to or slightly higher than under the proposed alternative.

4.1.5.3 Alternative 3: Non-Lethal Only By WS
Under this alternative, WS take of non-target animals would be less than that of the proposed action because no lethal damage management methods would be used by WS. The availability of assistance with nonlethal damage management methods from WS may result in increased trial/use of nonlethal methods than with alternatives 2 and 4. However, individuals would still have the ability to use lethal methods on their own or contract with non-WS entities for assistance with lethal waterfowl damage management methods. As with Alternative 2, impacts on the environment would vary depending upon the extent to which landowners/managers seek assistance with lethal damage management form sources other than WS and the experience/training of the individual(s) using the lethal WDM methods. These individuals may make errors in the application of damage management methods which may lead to greater take of non-target wildlife than under the Proposed Action. For example, shooting by persons not proficient at bird identification could lead to killing of non-target birds. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of waterfowl which could lead to unknown effects on local non-target species populations, including T&E species. In conclusion, hazards to nontarget species would be similar to or slightly higher than under the proposed alternative.

4.1.5.4 Alternative 4: No Waterfowl Damage Management by WS
Alternative 4 would not allow any WS waterfowl damage management in Minnesota. There would be no impact on non-target or threatened and endangered species by WS activities from this alternative. However, private efforts to reduce or prevent depredations would likely increase, which could result in less experienced persons implementing control methods. These individuals may make errors in the application of damage management methods which may lead to greater take of non-target wildlife than under the Proposed Action. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of waterfowl which could lead to unknown effects on local non-target species populations, including T&E species. In conclusion, hazards to nontarget species would be similar to or slightly higher

than under the proposed alternative. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of waterfowl which could impact local non-target species populations, including some T&E species. Because of the lack of readily available assistance from WS, including technical assistance, risks of adverse impacts on nontarget species are greatest for this alternative.

4.2 CUMULATIVE IMPACTS

Cumulative impacts are impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts of public actions to reduce waterfowl damage in the absence of WS assistance (Alternative 4) can only be speculated. Similarly, cumulative impacts of public actions to reduce waterfowl damage in the absence of WS direct damage management assistance (Alternative 2) can only be speculated. However, it is reasonable to expect that as governmental assistance in resolving wildlife conflicts decreases, independent actions increase. The environmental desirability of these actions would be dependent upon the individuals who implement them. Many such actions would be poorly monitored, and public accountability would likely be low. For these reasons, cumulative impacts to the environment may be expected to increase as the extent of WS assistance decreases.

No significant cumulative environmental impacts are expected from any of the 4 alternatives. All take of native waterfowl would be coordinated through the appropriate state and federal agencies. These agencies are charged with maintaining healthy populations of native waterfowl. In addition to the cumulative impact analyses provided in this document, these agencies also consider current status of target species populations and anticipated take by all sources when setting limits for hunter harvest and issuing permits for the take of these species. Working closely with these agencies and in accordance with all applicable regulations and permits, helps WS ensure that the proposed action will not have adverse cumulative impacts on the environment.

Although some persons will likely be opposed to WS participation in waterfowl damage management activities, the analysis in this EA indicates that the proposed WS Integrated waterfowl damage management program will not result in substantial cumulative adverse impacts on the quality of the human environment. Table 9 summarizes the expected impacts of the alternatives on each of the issues.

Table 9. Summary of the expected impacts of each of the alternatives on each of the issues related to waterfowl damage management by WS in Minnesota.

Issues	***Alternative 1 Current Program/No Action- Integrated Wildlife Damage Management Program***	***Alternative 2 Technical Assistance Only by WS***	***Alternative 3 Nonlethal Only by WS***	***Alternative 4 No Federal WS Waterfowl Damage Management Program***
Target Species Effects	*Low effect - reductions in local waterfowl numbers; would not adversely affect state and flyway populations of native birds.*	*No effect on waterfowl populations by WS. Reductions in local waterfowl numbers by non-WS personnel likely. Alternative would not adversely affect state and flyway populations of native birds.*	*Low effect - reductions in local waterfowl numbers by WS would result only from bird relocation and would not affect state numbers of target species. Use of lethal by Non-WS personnel likely. Alternative would not adversely affect state and flyway populations of native birds.*	*No impact by WS. Reductions in local waterfowl numbers by non-WS personnel likely. Alternative would not adversely affect state and flyway populations of native birds.*
Effectiveness of WDM	*The proposed action has the greatest potential of successfully reducing waterfowl conflicts and damage.*	*WS actions likely to be less effective than under Alternative 1. Overall effectiveness would be similar to or less than the proposed action dependent upon action taken by non-WS personnel.*	*WS actions likely to be less effective than under Alternative 1. Overall effectiveness would be similar or less than the proposed action dependent upon action taken by non-WS personnel.*	*WS would have no impact on waterfowl damage. Overall efficacy would be similar to or less than the proposed action dependent upon action taken by non-WS personnel.*

Aesthetic Enjoyment of waterfowl	*Low to moderate effect at local levels; Some local populations may be reduced; WS waterfowl damage management activities do not adversely affect overall regional or state waterfowl populations.*	*Low to moderate effect. Local waterfowl numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement local population reduction methods. No adverse affect on overall regional and state waterfowl populations.*	*Low effect. Local waterfowl numbers in damage situations would remain high or possibly increase when non-lethal methods are ineffective unless non-lethal WS local population reduction efforts or the local population reduction efforts of non-WS personnel are successful. No adverse affect on overall regional and state waterfowl populations.*	*No effect by WS. Low to moderate effect. Local waterfowl numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement local population reduction method. No adverse affect on overall regional and state waterfowl populations.*
Aesthetic Damage Caused by Waterfowl	*Best impacts - waterfowl damage problems most likely to be resolved without creating or moving problems elsewhere.*	*Moderate impact by WS. Overall impact variable depending upon efficacy of damage management efforts by non-WS entities.*	*Moderate effect – Alternative has highest risks of moving waterfowl and associated damage problems to other sites. Overall impact depends on efficacy of damage management efforts by non-WS entities.*	*Effect depends upon actions of non-WS entities. Waterfowl may move to other sites which can create aesthetic damage problems at new sites.*
Humaneness Concerns of Methods Used by WS	*Low to moderate effect - methods viewed by some people as inhumane would be used by WS.*	*No effect by WS. Non-WS personnel could still use methods viewed as inhumane by some individuals.*	*WS actions would be perceived as more humane than in Alternatives 1 and 2. Non-WS personnel could still use methods viewed as inhumane by some individuals.*	*No effect by WS. Non-WS personnel could still use methods viewed as inhumane by some individuals*
Effects on Other Wildlife Species, Including T&E Species	*Low effect - methods used by WS would be highly selective with very little risk to non-target species.*	*No effect by WS.* *Impacts by non-WS personnel would be variable.*	*Low effect - methods used by WS would be highly selective with very little risk to non-target species.*	*No effect by WS.* *Impacts by non-WS personnel would be variable.*

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED

5.1 List of Preparers

John Hart, Wildlife Biologist, USDA APHIS Wildlife Services, Grand Rapids, Minnesota

Jason Suckow, State Director, WI/MN, USDA/APHIS/Wildlife Services, Sun Prairie, Wisconsin

Kim Wagner, Environmental Coordinator, USDA APHIS Wildlife Services, Sun Prairie, Wisconsin

5.2 List of Persons Consulted

Steve Cordts, Waterfowl Staff Specialist, MDNR, Bemidji, Minnesota

Robyn Flahrety, USFWS Migratory Bird Permit Office, Minneapolis, Minnesota

Bryan Leuth, Urban Wildlife Specialist, MDNR, Forest Lake, Minnesota

Nick Reindl, Depredation Specialist, MDNR, Brainerd, MN

APPENDIX A

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APPENDIX B

Waterfowl Damage Management Methods Available for Use or Recommended by the Minnesota Wildlife Services Program

The most effective approach to resolving wildlife damage problems is to integrate the use of several methods, either simultaneously or sequentially. Integrated Wildlife Damage Management (IWDM) would integrate and apply practical methods of prevention and reduce damage by wildlife while minimizing harmful effects of damage reduction measures on humans, other species, and the environment. IWDM may incorporate resource management, physical exclusion and deterrents, and local population management, or any combination of these, depending on the characteristics of specific damage problems.

In selecting damage management techniques for specific damage situations, consideration is given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of wildlife damage. Consideration is also given to the status of target and potential non-target species, local environmental conditions and impacts, social and legal aspects, and relative costs of damage reduction options. The cost of damage reduction may sometimes be a secondary concern because of the overriding environmental, legal, and animal welfare considerations. These factors are evaluated in formulating damage management strategies that incorporate the application of one or more techniques.

A variety of methods are potentially available to the WS program in Minnesota relative to the management or reduction of damage from waterfowl. WS develops and recommends or implements IWDM strategies based on resource management, physical exclusion and wildlife management approaches. Within each approach there may be available a number of specific methods or tactics.

Various federal, state, and local statutes and regulations and WS directives govern WS use of damage management tools and substances. The following methods and materials are recommended or used in technical assistance and direct damage management efforts of the WS program in Minnesota. The effectiveness of the program can be defined in terms of reduced economic losses, decreased health hazards, and minimized property damage.

RESOURCE MANAGEMENT

Resource management includes a variety of practices that may be used by resource owners to reduce the potential for wildlife damage. Implementation of these practices is appropriate when the potential for damage can be reduced without significantly increasing a resource owner's costs or diminishing his/her ability to manage resources pursuant to goals. Resource management recommendations are made through WS technical assistance efforts.

Habitat Alteration: Habitat alteration can be the planting of vegetation unpalatable to wildlife or altering the physical habitat (Conover and Kania 1991, Conover 1992). Conover (1991[a], 1991[b]) found that even hungry Canada geese refused to eat some ground covers such as common periwinkle (*Vinca minor*), English ivy (*Hedera helix*) and Japanese pachysandra (*Pachysandra terminalis*). These findings are consistent with observations by Bashburn et al. (2005) that captive Canada geese avoided established patches of endophyte-infected tall fescue in favor of patches. Planting less preferred plants or grasses to discourage geese from a specific area could work more effectively if good alternative feeding sites are nearby (Conover 1985). However, the manipulation of turf grass varieties in urban/suburban, heavy use situations such as parks, athletic fields and golf courses is often not feasible. Varieties of turf grass that grow well and can withstand regular mowing and regular/heavy human use include: Kentucky blue grass, red fescue, perennial bent grass, perennial rye grass and white clover. All of these grasses are appealing to most waterfowl. The turf grass varieties that are not appealing to some waterfowl such as, tall fescue, orchard grass and timothy, do not withstand regular mowing and/or regular/heavy human use.

Fences, hedges, shrubs, boulders, etc. can be placed at shorelines to impede waterfowl movements. Restricting a bird's ability to move between water and land will deter them from an area, especially during molts (Gosser et al. 1997). However, people are often reluctant to make appropriate landscape modifications to discourage waterfowl activity (Breault and McKelvey 1991, Conover and Kania 1991). Unfortunately, both humans and waterfowl appear to find lawn areas near water attractive (Addison and Amernic 1983, Cooper[a] In Press), and conflicts between humans and waterfowl will likely continue wherever this interface occurs. Cooper (1998) reported that 93% of current shoreline turf, in the Twin Cities metropolitan area, would be needed to be modified to limit the goose population to established goals, and this approach may be unacceptable to the human residents. To limit the resident goose population size in the Twin Cities region of Minnesota, Cooper (1998) estimated costs of modifying habitat at $33.9 million for tall grass prairie and $1.8 billion for ground juniper (*Juniperus spp.*). Therefore, he concluded that shoreline habitat modification as a population management tool would be prohibitively expensive.

Removal of water bodies would likely reduce the attractiveness of an area to waterfowl. Urban/suburban waterfowl tend to feed near bodies of water with a distant view over short grass (Conover and Kania 1991). Draining/removal of water bodies are often considered unreasonable and aesthetically unacceptable. These types of activities would be conducted by the landowner/manager who would be responsible for compliance with all applicable state and federal regulations. The draining of wetlands is strictly regulated and must be permitted by the U.S. Army Corps of Engineers and the MDNR.

Lure Crops: Lure crops are food resources planted to attract wildlife away from more valuable resources (e.g., crops). This method is largely ineffective for urban waterfowl since food (turf) resources are readily available. For lure crops to be effective, the ability to keep birds from surrounding fields would be necessary, and the number of alternative feeding sites must be minimal (Fairaizl and Pfeifer 1988). Additionally, lure crops

reduce damage for only a short time (Fairaizl and Pfeifer 1988) and damage by resident waterfowl is generally continuous. The resource owner is limited in implementing this method contingent upon ownership of, or otherwise ability to manage the property. Unless the original waterfowl-human conflict is resolved, creation of additional waterfowl habitat could increase future conflicts.

Lure crops may be planted on some land held in private ownership, such as conservation clubs, throughout Minnesota. These plantings may provide some additional food or act as an attractant for waterfowl. However, it is highly unlikely they contribute to conflicts with waterfowl or act as significant waterfowl attractants.

Modify Human Behavior: Artificial feeding of waterfowl by people attracts and sustains more birds in an area than could be supported by natural food supplies. This unnatural food source exacerbates damage by waterfowl. The elimination of feeding of waterfowl is a primary recommendation made by WS, and many local municipalities and homeowners associations have adopted policies and ordinances prohibiting it. Some parks have posted signs, and there have been efforts made to educate the public on the negative aspects of feeding waterfowl. However, sometimes people do not comply, and the policies are poorly enforced in some areas.

Alternatively, some entities do not prohibit the feeding of waterfowl because the waterfowl population in the location has not exceeded the WAC. It is unlikely that the feeding of waterfowl in these locations would significantly contribute to conflicts with waterfowl in other communities or locations.

Alter Aircraft Flight Patterns: In cases where the presence of waterfowl at airports results in threats to human safety, and when such problems cannot be resolved by other means, the alteration of aircraft flight patterns or schedules may be recommended. However, altering operations at airports to decrease the potential for hazards is not feasible unless an emergency situation exists. Otherwise, the expense of interrupted flights and the limitations of existing facilities make this practice prohibitive.

Removal of Domestic Waterfowl: Flocks of urban waterfowl are known to act as decoys and attract migrating waterfowl (Crisley et al. 1968, Woronecki 1992, AAWV undated). Rabenold (1987) and Avery (1994) reported that birds learn to locate food resources by watching the behavior of other birds. The removal of domestic waterfowl from ponds removes birds that act as decoys in attracting other waterfowl. Domestic and feral waterfowl could also carry diseases which threaten wild populations. Property or resource owners may be reluctant to remove some or all decoy birds because of emotional attachments to the birds and/or the aesthetic enjoyment of their presence.

PHYSICAL EXCLUSION AND DETERRENTS

Physical exclusion and deterrents restrict the access of wildlife to resources and/or alter behavior of target animals to reduce damage. These methods provide a means of appropriate and effective prevention of waterfowl damage in many situations.

Electric Fence: The application of electrified fencing is generally limited to rural settings, due to the possibility/likelihood of electricity interacting with people and pets. Limits of this application arise where there are multiple landowners along the wetland, pond, or lake, and the size of the field and its proximity to bodies of water used by waterfowl. Perceptions from Minnesota on the effectiveness of electric fences were high (Cooper and Keefe 1997). While electric fencing may be effective in repelling waterfowl in some urban settings, its use is often prohibited in many municipalities for human safety reasons. Problems that typically reduce the effectiveness of electric fences include; vegetation on fence, flight capable waterfowl, fencing knocked down by other animals (e.g., white-tailed deer and dogs), and poor power.

Barrier Fence: The construction or placement of physical barriers has limited application for waterfowl. Barriers can be temporary or permanent structures. Lawn furniture/ornaments, vehicles, boats, snow fencing, plastic hazard fencing, metal wire fencing, and multiple strand fencing have all been used to limit the movement of waterfowl. Perceptions from Minnesota indicate that permanent barriers were highly effective, while temporary barriers were moderately effective (Cooper and Keefe 1997). The application of this method is limited to areas that can be completely enclosed and do not allow waterfowl to land inside enclosures. Similar to most abatement techniques, this method has been most effective when dealing with small numbers of breeding waterfowl and their flightless young along wetlands and/or waterways. Unfortunately, there have been situations where barrier fencing designed to inhibit waterfowl nesting has entrapped young and resulted in starvation (Cooper 1998).

The preference for waterfowl to walk or swim, rather than fly, during this time period contributes to the success of barrier fences. Waterfowl that are capable of full or partial flight render this method useless, except for enclosed areas small enough to prevent landing. However, site specific habitat alterations have merit, provided that landscape designs are based on biological diversity and human safety objectives (Cooper[b] In Press). To limit the goose population size in the Twin Cities region of Minnesota with wire fences, Cooper (1998) estimated it would cost $12.3 million for 25 years.

Surface Coverings: Waterfowl may be excluded from ponds using overhead wire grids (Fairaizl 1992, Lowney 1993). Overhead wire grids have been demonstrated to be most applicable on ponds $\leq$ two acres, but wire grids may be considered aesthetically unappealing to some people. Wire grids render a pond unusable for boating, swimming, fishing, and other recreational activities. Installation costs are about $1,000 per surface acre for materials. The expense of maintaining wire grids may be burdensome for some people.

Balls approximately five inches in diameter can be used to cover the surface of a pond. A "ball blanket" renders a pond unusable for boating, swimming, fishing, and other recreational activities. This method is very expensive, costing about $131,000 per surface acre of water.

Visual Deterrents: Reflective tape has been used successfully to repel some birds from crops when spaced at three to five meter intervals (Bruggers et al. 1986, Dolbeer et al. 1986). Mylar flagging has been reported effective at reducing migrant Canada goose damage to crops (Heinrich and Craven 1990). Flagging is impractical in many locations and has met with some local resistance due to the negative aesthetic appearance presented on the properties where it is used. Other studies have shown reflective tape ineffective (Tobin et al. 1988, Bruggers et al. 1986, Dolbeer et al. 1986, Conover and Dolbeer 1989). While sometimes effective for short periods of time, reflective tape has proven mostly ineffective in deterring resident geese.

Mute Swans: Mute swans are ineffective at preventing Canada geese from using or nesting on ponds (Conover and Kania 1994). Additionally, swans can be aggressive towards humans (Conover and Kania 1994, Chasko 1986) and may have undesirable effects on native aquatic vegetation (Allin et al. 1987, Chasko 1986). Executive Order 11987 May 24, 1977, states that federal agencies shall encourage states, local governments, and private citizens to prevent the introduction of exotic species into the environment. Until recently, mute swans were classified as an exotic species by the Federal government. A recent court case as the U.S. Court of Appeals for the District of Columbia ruled that mute swans are covered by protective/management authorities contained in the Migratory Bird Treaty Act. The use of mute swans as a Canada goose damage management technique is ineffective, and not recommended.

Dogs: Dogs can be effective at harassing waterfowl and keeping them off turf and beaches (Conover and Chasko 1985, Castelli and Sleggs 2000). Around water, this technique appears most effective when the body of water to be patrolled is less than two acres in size (Swift 1998). Although dogs can be effective in keeping waterfowl off individual properties, they do not contribute to a solution for the larger problem of overabundant waterfowl populations (Castelli and Sleggs 2000). This is one of the damage management techniques that requires an ongoing financial and/or personnel commitment in order to be effective. Swift (1998) reported that when harassment with dogs ceases, the number of geese return to pre-treatment numbers. WS has recommended and encouraged the use of dogs where appropriate.

Repellents: Methyl Anthranilate (MA) is a registered repellent for waterfowl and is marketed under the trade names ReJeX-iT and Bird Shield. Results with MA appear to be mixed. Cummings et al. (1995) reported that MA repelled Canada geese from grazing turf for four days. However, Belant et al. (1996) found it ineffective as a grazing repellent when applied at 22.6 and 67.8 kg/ha which is the label rate and triple the label rate, respectively. MA is water soluble therefore, moderate to heavy rain or daily watering and/or mowing render MA ineffective. To use chemical repellents for waterfowl damage management in Minnesota, State regulations governing use of restricted chemicals must be followed. Testing in numerous locations throughout Wisconsin during the 1990s indicated that in many situations MA is cost prohibitive, is only marginally effective in repelling geese, and commonly just causes geese to move to nearby untreated areas. (P. Vagnini, West Bend Parks, Recr. and For. Dept., April, 2000,

D. Keuler, Rock River Hills Golf Course, April, 2000, and G. Youngs, Milwaukee County Dept. Parks, Recr. and Culture, March, 2000, pers. comm.).

Research continues on other avian feeding repellents. A 50% anthraquinone product (FlightControl), shows promise for waterfowl (Dolbeer et al. 1998). Like MA, anthraquinone has low toxicity to birds and mammals. Activated charcoal has also been evaluated for use in deterring waterfowl damage, but it requires frequent re-application to effectively reduce waterfowl damage (Mason and Clark 1995). Further, laboratory and field trials are needed to refine minimum repellent levels and to enhance retention of treated vegetation (Sinnott 1998).

Hazing: Hazing reduces losses in those instances when the affected waterfowl move to a more acceptable area. Achieving that end has become more difficult as the local waterfowl population has increased. Birds hazed from one area where they are causing damage, frequently move to another area where they cause damage (Brough 1969, Conover 1984, Summers 1985, Swift 1998). Smith et al. (1999) noted that others have reported similar results, stating: "..biologists are finding that some techniques (e.g., habitat modifications or scare devices) that were effective for low to moderate population levels tend to fail as flock sizes increase and waterfowl become more accustomed to human activity . Generally speaking, birds tend to habituate to hazing techniques (Zucchi and Bergman 1975, Blokpoel 1976, Summers 1985, Aubin 1990). In some locations and circumstances, hazing waterfowl is a useful component of a waterfowl damage management program.

Scarecrows: The use of scarecrows has had mixed results. Effigies depicting alligators, humans, floating swans and dead geese have been employed, with limited success for short time periods in small areas. An integrated approach (swan and predator effigies, distress calls and non-lethal chemical repellents) was found to be ineffective at scaring or repelling nuisance waterfowl (Conover and Chasko 1985). While Heinrich and Craven (1990) reported that using scarecrows reduced migrant Canada goose use of agricultural fields in rural areas, their effectiveness in scaring geese from suburban/urban areas is severely limited because geese are not afraid of humans as a result of nearly constant contact with people. In general, scarecrows are most effective when they are moved frequently, alternated with other methods, and are well maintained. However, scarecrows tend to lose effectiveness over time and become less effective as waterfowl populations increase (Smith et al. 1999). Like most frightening devices, the efficacy of scarecrows may be improved/extended through the occasional use of lethal methods (e.g., shooting, real dogs) to reinforce the 'threat' associated with the frightening stimulus. Reinforcement with lethal methods like shooting is often not an available alternative for urban/suburban waterfowl problems.

Seamans and Bernhardt (2004) evaluated the efficacy of a dead goose effigy in repelling Canada geese. They did observe a significant reduction in goose activity in areas with the effigy. However, when only the goose effigy was used, the repellent effect only lasted approximately 5 days. This technique may have greater potential when used as part of as integrated damage management program.

Distress Calls: Aguilera et al. (1991) found distress calls ineffective in causing migratory and resident geese to abandon a pond. Although, Mott and Timbrook (1988) reported distress calls as effective at repelling resident geese 100 meters from the distress unit, the birds would return shortly after the calls stopped. The repellency effect was enhanced when pyrotechnics were used with the distress calls. In some situations, the level of volume required for this method to be effective in urban/suburban areas would be prohibited by local noise ordinances. A similar device, which electronically generates sound, has proven ineffective at repelling migrant waterfowl (Heinrich and Craven 1990).

Lasers: The use of lasers a non-lethal avian damage control method, has recently been evaluated for a number of species (Blackwell et al. 2002). In experimental situations, waterfowl have exhibited avoidance reactions to lasers under low light conditions (Blackwell et al. 2002), and a field test of lasers at a Pennsylvania site demonstrated effectiveness of lasers in dispersing large flocks of waterfowl off of a lake, with nearly no habituation to the technique (Cepek et al. 2001). A 650 nm, 50 mW diode laser effectively reduced goose numbers at night during a controlled field study at urban sites in Ohio (Sherman and Barras 2004). Motion-activated laser hazing systems have effectively repelled captive Canada geese (Werner and Clark 2006). Wide scale public use of lasers is not typically recommended at this time, pending additional research (on effectiveness and impacts) on its use as a waterfowl damage management tool. In some situations (neighborhoods, schools, hospitals), use of lasers may enhance integrated control programs since they are silent and do not fire a projectile.

Pyrotechnics: Pyrotechnics (screamer shells, bird bombs, and 12-gauge cracker shells) have been used to repel many species of birds (Booth 1994). Aguilera et al. (1991) found 15mm screamer shells effective at reducing resident and migrant Canada geese use of areas of Colorado. However, Mott and Timbrook (1988) and Aguilera et al. (1991) doubted the efficacy of harassment and believed that moving the geese simply redistributed the problem to other locations.

Fairaizl (1992) and Conomy et al. (1998) found the effectiveness of pyrotechnics highly variable among different flocks of waterfowl. Some flocks in urban areas required continuous harassment throughout the day with frequent discharges of pyrotechnics. The waterfowl usually returned within hours. A minority of resident Canada goose flocks in Virginia showed no response to pyrotechnics (Fairaizl 1992). Some flocks of Canada geese in Virginia have shown quick response to pyrotechnics during winter months suggesting migrant geese made up some or all of the flock (Fairaizl 1992). Shultz et al. (1988) reported fidelity of resident Canada geese to feeding and loafing areas is strong, even when heavy hunting pressure is ongoing. Mott and Timbrook (1988) concluded that the efficacy of harassment with pyrotechnics is partially dependent on availability of alternative loafing and feeding areas. Although one of the more effective methods of frightening waterfowl away, more often than not they simply move waterfowl to other areas. There are also safety and legal implications regarding their use. Discharge of pyrotechnics is inappropriate and prohibited in some urban/suburban areas. Pyrotechnic

projectiles can start fires, ricochet off buildings, pose traffic hazards, and trigger dogs to bark incessantly, annoy and possibly injure people.

In Minnesota, pyrotechnic launchers may be considered as firearms by some local law enforcement departments. In those cases, possession and use of pyrotechnic equipment would require acquisition of appropriate permits and licenses as directed by the local Police Department. Additionally, use of pyrotechnics in certain municipalities would be constrained by local firearm discharge and noise ordinances.

Propane Cannons: Propane cannons are generally inappropriate for urban/suburban areas due to the repeated loud explosions, which many people would consider a serious and unacceptable nuisance and potential health threat (hearing damage). Although a propane cannon can be an effective dispersal tool for migrant waterfowl in agricultural settings, resident waterfowl in urban areas are more tolerant of noise and habituate to propane cannons relatively quickly.

LOCAL POPULATION MANAGEMENT

Potential methods of managing the local waterfowl population include relocation, contraception, egg destruction, capture with AC, toxicants, hunting and depredation permits, capture and euthanize.

Capture and Relocation: Smith (1996) reported that groups of juvenile geese relocated from urban to rural settings can effectively eliminate these geese from urban areas, retain them at the release site, include them in the sport harvest, and expose them to higher natural mortality. Smith (1996) also reported that multiple survival models indicated that survival estimates of relocated juveniles were half of those of urban captured and released birds. Woytek and Hestbeck (1997) reported that relocated goslings had higher recovery rates, lower survival and high fidelity to relocation areas in Minnesota than normal wild goslings. If this method in used to reduce damage in Minnesota, only juvenile waterfowl would be relocated away from problem areas to new/separate properties.

For purposes of relocation, resident waterfowl are usually captured with panel nets, rocket nets, drive traps, net guns, dip nets, and/or by hand. Panel nets as described by Costanzo et al. (1995) are lightweight, portable panels (approximate size 4' x 10') that are used to herd and surround waterfowl into a moveable catch pen. This method is equally efficient on hard (pavement) and soft (field) surfaces, and can be employed in such a way as to reduce stress on captured birds (place the catch pen in a shaded area) and control other impacts (place far from roadways). Rocket netting involves the setting of bait in an area that would be completely contained within the dimensions of a manually propelled net. The launching of the rocket net occurs too quickly for the birds to escape. Rocket netting may take place anytime during the year. Using a net gun to capture waterfowl can be conducted anytime during the year by firing a net from a shoulder mounted gun.

Ultimately, the relocation of resident waterfowl from metropolitan communities can assist in the reduction of overabundant populations (Cooper and Keefe 1997), and has been accepted by the general public as a method of reducing waterfowl populations to socially acceptable levels (Fairaizl 1992). In addition, the removal of waterfowl posing or likely to pose a hazard to air safety at airports has been demonstrated to reduce the population of local waterfowl and decrease the number of waterfowl flights through the airport operations airspace; and resulted in increased air safety at the Minneapolis-St. Paul International Airport (Cooper 1991).

Relocation of resident waterfowl has the potential to spread disease into populations of other and/or migrating waterfowl. The American Association of Wildlife Veterinarians "..discourages the practice of relocating nuisance or excess urban ducks, geese and swans to other parks or wildlife areas as a means of local population control." (AAWV undated).

Although the MDNR has provisions for relocating Canada geese, and has done so in the past, there are currently no other states or tribal authorities willing to allow them to be relocated to their property.

Contraception: Inhibiting reproduction is one way of reducing waterfowl populations, but, given that most waterfowl are relatively long-lived (Cramp and Simmons 1977, Allan et al. 1995) exclusive use of contraceptive methods may take a period of years to reduce local bird populations. Contraceptive methods are likely to be most valuable as a means of maintaining waterfowl populations at desired levels.

Canada geese have been successfully vasectomized to prevent production of young, this method is only effective if the female does not form a bond with a different male. In addition, vasectomies can only prevent the production of the mated pair. The ability to identify breeding pairs for isolation and to capture a male bird for vasectomizing becomes increasingly difficult as the number of birds increase (Converse and Kennelly 1994). Keefe (1996) estimated mechanical sterilization of a Canada goose to cost over $100 per bird.

The NWRC has been instrumental in the development and registration of a new product, nicarbazin (OvoControl-GTM; CAS 330-95-0/4,4=-dinitrocarbanilide (DNC, CAS 587-90-6)/ 2-hydroxy-4,6-dimethylpyrimidine (HDP, CAS 108-79-2) (1:1)), which is an infertility agent for Canada geese in urban areas. Nicarbazin is available to certified pesticide applicators and is not restricted to use by WS. Use of baits containing nicarbazin would allow the numbers of small to moderate sized groups of Canada geese to be controlled by reducing the hatchability of eggs laid by treated geese without requiring the location of each individual nest to be determined (as is the case for egg oiling/addling/destruction). In a field study conducted in Oregon (Bynum et al. 2005), use of nicarbazin reduced hatchability of eggs 35.6% ($P = 0.062$). When considering the success of individual nests at sites rather than flocks as a whole, percent hatchability was significantly reduced 50.7% ($P < 0.001$). The high degree of variability among Canada geese in their movement patterns, nesting and habitat use complicates use of this product

(Vercauteren and Marks 2004). The variability in goose behavior can make it difficult to get the required doses to the geese (see below). Under current label guidelines, the cost for nicarbazin (Ovocontrol®) applications exceeds the cost of other control methods (Tim Julien, President, Nuisance Wildlife Control Operators Association, pers. comm. 2006, Cooper and Keefe 1997) until the goose population reaches a critical threshold of approximately > 80 birds (Caudell and Shwiff 2006).

Nicarbazin is thought to induce infertility in birds by two main mechanisms. Nicarbazin may disrupt the membrane surrounding the egg yolk, resulting in intermixing of egg yolk and white (albumin) components, creating conditions in which the embryo cannot develop. Nicarbazin may also inhibit incorporation of cholesterol into the yolk, a step that is necessary for yolk formation, thereby limiting energy for the developing embryo. If the yolk does not provide enough energy, the embryo will not completely form and the egg will never hatch. Nicarbazin bait must be consumed for several days to achieve blood levels that affect the hatchability of eggs that are forming. Nicarbazin is undetectable in the plasma of Canada geese, mallards, and chickens by 4-6 days after consumption of nicarbazin bait has stopped. The levels of active ingredient in the blood are reduced by half within one day after bait consumption stops. If the level of active ingredient falls by approximately one half its peak levels, no effects on egg formation can be seen. By two days after bait consumption has stopped, no effects on the egg being formed are seen. Consequently, the bait must be offered to the geese each day of the nesting period for best impact on reproduction.

Nicarbazin is not currently registered and available for use in Minnesota.

Egg Destruction/Reproduction Control: Egg addling, oiling, freezing, egg replacement, or puncturing can be effective in reducing recruitment into the local population (Christens et al. 1995, Cummings et al. 1997). While egg removal/destruction can reduce production of young, merely destroying an egg does not reduce a population as quickly as removing immature or breeding adults (Cooper and Keefe 1997). As with other species of long-lived waterfowl, which require high adult mortality to reduce populations (Rockwell et. al 1997), it is likely that adult resident waterfowl must be removed to reduce the population to a level deemed acceptable to communities. Approximately five eggs must be removed to have the effect of stopping one adult from joining the breeding population (Rockwell et al. 1997, Schmutz et al. 1997). Keefe (1996) estimated egg destruction to cost $40 for the equivalent of removing one adult goose from the population. To equal the effect of removing an adult bird from a population, all eggs produced by that bird during its entire lifetime must be removed (Smith et al. 1999). Furthermore, egg removal efforts must be nearly complete in order to prevent recruitment from a small number of surviving nests that would offset control efforts (Smith et al. 1999). Cooper and Keefe (1997), Rockwell et al. (1997), and Schmutz et al. (1997) reported that waterfowl egg destruction is only fractionally effective in attaining population reduction objectives, and that nest/egg destruction is not an efficient or cost-effective damage management or population reduction approach. The Atlantic Flyway Resident Canada Goose Management Plan (Atlantic Flyway Council 1999), states that to effectively reduce resident goose populations, an increase in adult

and immature mortality rates, combined with reproductive control, is necessary. Reproductive control alone can not reduce the population in an acceptable time; treatment of 95% of all eggs each year would result in only a 25% reduction over 10 years (Allan et al. 1995). In contrast, reducing annual survival of resident Canada geese by just 10% would reduce a predicted growth rate of more than 15%/year to a stable population, assuming moderate recruitment (Atlantic Flyway Council 1999). In addition, nest destruction is estimated to cost significantly more than other forms of population management (Cooper and Keefe 1997). Egg destruction, while a valuable tool, has fallen short as a single method for reducing local waterfowl populations. Many nests cannot be found by resource managers in typical urban-suburban settings due to the difficulties in gaining access to search the hundreds of private properties where nests may occur. In addition, waterfowl which have eggs oiled in successive years may learn to nest away from the water making it more difficult to find nests. Throughout the waterfowl nesting season, WS treat or destroys waterfowl eggs to eliminate reproduction on the site, which may slow the growth of the local population and increase the impact of waterfowl harassment activities.

Capture with Alpha-Chloralose: Alpha-chloralose (AC) may be used only by AC-certified WS personnel to capture waterfowl. Pursuant to FDA restrictions, waterfowl captured with alpha-chloralose for subsequent euthanasia must be killed and buried or incinerated, or be held alive for at least 30 days, at which time the birds may be killed and processed for human consumption.

Toxicants: All pesticides are regulated by the EPA. There are currently no toxicants registered with the EPA for use on waterfowl and therefore none would be used by WS.

Hunting: WS sometimes recommends that resource owners consider legal hunting as an option for reducing waterfowl damage. Although legal hunting is impractical and/or prohibited in many urban-suburban areas, it may be suitable for agricultural damage and may be used to reduce some populations of resident waterfowl. Legal hunting also reinforces harassment programs (Kadlec 1968). Zielske et al. (1993) believed legal hunting would not reduce resident Canada geese populations where there is limited interest in legally hunting resident geese. However, hunting has had a major impact on the distribution of geese in the Minneapolis-St. Paul Metro Area of Minnesota (Cooper and Keefe 1997). They reported goose densities during the summer in hunted areas of the Metro Area (which comprised only 23% of the area) were significantly lower (three times lower) than densities in unhunted areas. Similarly, Conover and Kania (1991) reported that Canada geese were more likely to cause damage in areas that waterfowl hunting was prohibited. Even in urban/suburban areas (e.g., golf courses and green spaces) there may be locations where controlled hunting would be effective in reducing waterfowl damage. In Minnesota, geese are legally harvested during 3 seasons: regular season, early September season, and late January season and mallard ducks are legally harvested according to the different duck zones. These seasons are described, and annual harvests are described in Section 1.3.2.3.

Shooting. Shooting waterfowl can be highly effective in removing birds from specific areas and in supplementing harassment. Currently, depredation permits are issued by the USFWS to requesters or property owners for the purpose of reducing conflicts caused by certain waterfowl and migratory birds for a $50.00 fee. When appropriate, WS recommends to the USFWS that depredation permits be issued to property owners to enable them to more effectively reduce damage associated with waterfowl. Shooting is the practice of selectively removing target birds. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment techniques. Shooting is used to reduce waterfowl problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. In Minnesota, shooting waterfowl pursuant to a Depredation Permit from the Minnesota Game Commission is conducted primarily by farmers, airport personnel, municipal and county park personnel, and others.

Capture and Euthanize: The most efficient way to reduce the size of resident waterfowl population is to increase mortality among adult waterfowl. Nationwide, hunting is the major cause of waterfowl mortality, but waterfowl using urban/suburban environments may seldom be exposed to hunters (Conover and Chasko 1985, Smith et al. 1999). For purposes of lethal control, resident waterfowl are usually captured with panel nets, rocket nets, drive traps, net guns, dip nets, and/or by hand. Panel nets as described by Costanzo et al. (1995) are lightweight, portable panels (approximate size 4' x 10') that are used to herd and surround waterfowl into a moveable catch pen. This method is equally efficient on hard (pavement) and soft (field) surfaces, and can be employed in such a way as to reduce stress on captured birds (place the catch pen in a shaded area) and control other impacts (place far from roadways). Rocket netting involves the setting of bait in an area that would be completely contained within the dimensions of a manually propelled net. The launching of the rocket net occurs too quickly for the birds to escape. Rocket netting may take place anytime during the year. Using a net gun to capture waterfowl can be conducted anytime during the year by firing a net from a shoulder mounted gun. Waterfowl that are captured and euthanized would be buried, incinerated, or processed for charitable donation.

The molt process, when resident waterfowl are flightless, typically occurs from early-June through mid-July. Migrant waterfowl are present in Minnesota from October through March and do not cause the majority of the conflicts in urban/suburban locations. Therefore, capture and euthanizing resident waterfowl would primarily occur from May through August 30th, although WS may conduct activities at any time, as appropriate. Resident waterfowl captured during this period may be processed for human consumption and donated to charitable organizations.

Waterfowl captured and processed for donation to food programs would only be processed by facilities licensed by the state governing authority. Typically, costs of processing and donation are paid by the requestor, and processing would usually occur at poultry processing facilities. Waterfowl determined to be unsuitable for human consumption would be disposed of pursuant to permitted authorities.

The advantages of lethal damage management by WS are that it would be applied directly to the problem population, its effects are obvious and immediate, and it carries no risk that the birds will return or move and create conflicts elsewhere. The use of lethal methods to reduce waterfowl damage can be very effective at alleviating damage and the most economical approach to reducing damage when compared to non-lethal methods (Cooper and Keefe 1997, Smith et al. 1999). Additionally, capture and removal of waterfowl is the most cost efficient lethal method to reduce damage, except for hunting (Cooper and Keefe 1997). It is estimated to cost $18-25 per bird for capture and processing for human consumption (Keefe 1996, Cooper and Keefe 1997). To limit the resident goose population in the Twin Cities region of Minnesota with capture and processing, it was estimated to cost $325,000 per year (Cooper 1998). This method is at least 50% less expensive than egg/nest destruction, sterilization, or habitat modification (Keefe 1996). The use of lethal methods may provide a longer period of effectiveness than some non-lethal methods because it would likely take months to years before the original local population level of waterfowl returned. Some nonlethal methods have to be frequently applied and/or continually maintained (e.g., repellents, frightening/hazing programs).

The primary disadvantage is that lethal removal of birds is considered a morally and socially unacceptable method by some individuals. Additionally, like some nonlethal alternatives, lethal methods are not a permanent solution and do not address the factors which attract waterfowl to the site.

APPENDIX C

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES IN MINNESOTA

MAMMALS

Lynx canadensis ..... Canada lynx (T)

BIRDS

Charadrius melodus ..... piping plover (E, T)
Haliaeetus leucocephalus ..... bald eagle (T)
Grus americanus ..... whooping crane (X)

REPTILES

Sistrurus catenatus ..... Eastern massasauga (C)

FISH

Notropis topekae ..... Topeka shiner (E)

MOLLUSKS

Lampsilis higginsi ..... Higgins eye pearlymussel (E)
Quadrula fragosa ..... winged mapleleaf (E)
Cumberlandia monodonta ..... spectaclecase (C)
Plethobasus cyphyus ..... sheepnose (C)

BUTTERFLIES AND MOTHS

Lycaeides melissa samuelis ..... Karner blue butterfly (E)
Hysperia dacotae ..... Dakota skipper (C)

VASCULAR PLANTS

Erythronium propullans ..... Minnesota dwarf trout lily (E)
Platanthera praeclara ..... Western prairie fringed orchid (T)
Sedum integrifolium ssp. *Leedyi* ..... Leedy's roseroot (T)
Botrychium lineare ..... slender moonwort (C)
Lespedeza leptostachya ..... prairie bush-clover (T)

E = endangered T = threatened C = candidate X = non-essential experimental

APPENDIX D

STATE LISTED THREATENED AND ENDANGERED SPECIES IN MINNESOTA

MAMMALS

Threatened

Spilogale putorius..... eastern spotted skunk

BIRDS

Endangered

Ammodramus bairdii.....Baird's sparrow
Ammodramus henslowii.....Henslow's Sparrow
Anthus spragueii.....Sprague's Pipit
Calcarius ornatus.....chestnut-collared longspur
Charadrius melodus.....piping plover (Fed. Status: T)
Rallus elegans.....king rail
Speotyto cunicularia .....burrowing owl

Threatened

Cygnus buccinator.....trumpeter swan
Falco peregrinus .....peregrine falcon (Fed. Status: E)
Lanius ludovicianus.....loggerhead shrike
Phalaropus tricolor .....Wilson's phalarope
Podiceps auritus.....horned grebe
Sterna hirundo.....common tern

AMPHIBIANS AND REPTILES

Endangered

Acris crepitans.....northern cricket frog
Sistrurus catenatus .....massasauga

Threatened

Clemmys insculpta.....wood turtle
Crotalus horridus .....timber rattlesnake
Emydoidea blandingii.....Blanding's turtle

FISH

Threatened

Polyodon spathula.....paddlefish

MOLLUSKS

Endangered

Arcidens confragosus .....rock pocketbook
Elliptio crassidens.....elephant-ear
Fusconaia ebena.....ebonyshell
Lampsilis higginsi.....Higgins eye (Fed. Status: E)

Lampsilis teres.....yellow sandshell
Novasuccinea n. sp. Minnesota B.....Iowa pleistocene ambersnail
Plethobasus cyphyus.....sheepnose
Quadrula fragosa.....winged mapleleaf (Fed. Status: E)
Quadrula nodulata.....wartyback
Vertigo hubrichti hubrichti.....Midwest pleistocene vertigo

Threatened

Actinonaias ligamentina.....mucket
Alasmidonta marginata.....elktoe
Cumberlandia monodonta.....spectaclecase
Cyclonaias tuberculata.....purple wartyback
Ellipsaria lineolata.....butterfly
Epioblasma triquetra.....snuffbox
Megalonaias nervosa.....washboard
Novasuccinea n. sp. Minnesota A.....Minnesota pleistocene ambersnail
Pleurobema coccineum.....round pigtoe
Quadrula metanevra.....monkeyface
Simpsonaias ambigua.....salamander mussel
Tritogonia verrucosa.....pistolgrip
Venustaconcha ellipsiformis.....ellipse
Vertigo hubrichti variabilis n. subsp.....variable pleistocene vertigo
Vertigo meramecensis.....bluff vertigo

BUTTERFLIES AND MOTHS

Endangered

Erynnis persius.....persius dusky wing
Hesperia comma assiniboia.....assiniboia skipper
Hesperia uncas.....uncas skipper
Lycaeides melissa samuelis.....Karner blue (Fed. Status: E)
Oeneis uhleri varuna.....Uhler's arctic

Threatened

Hesperia dacotae.....dakota skipper
Hesperia ottoe.....ottoe skipper
Oarisma garita.....garita skipper

CADDISFLIES

Endangered

Chilostigma itascae.....headwaters chilostigman

TIGER BEETLES

Endangered

Cicindela fulgida fulgida.....a species of tiger beetle
Cicindela limbata nympha.....a species of tiger beetle

Threatened

Cicindela denikei..... a species of tiger beetle
Cicindela fulgida westbournei..... a species of tiger beetle
Cicindela lepida..... a species of tiger beetle

VASCULAR PLANTS

Endangered

Agalinis auriculata..... eared false foxglove
Agalinis gattingeri..... round-stemmed false foxglove
Asclepias stenophylla..... narrow-leaved milkweed
Astragalus alpinus..... alpine milk-vetch
Bartonia virginica..... Virginia bartonia
Botrychium gallicomontanum..... frenchman's bluff moonwort
Botrychium oneidense..... blunt-lobed grapefern
Botrychium pallidum..... pale moonwort
Cacalia suaveolens..... sweet-smelling Indian-plantain
Caltha natans..... floating marsh-marigold
Carex Formosa..... handsome sedge
Carex pallescens..... pale sedge
Carex plantaginea..... plantain-leaved sedge
Castilleja septentrionalis..... northern paintbrush
Cheilanthes lanosa..... hairy lip-fern
Chrysosplenium iowense..... Iowa golden saxifrage
Cristatella jamesii..... James' polanisia
Dodecatheon meadia..... prairie shooting star
Draba norvegica..... Norwegian whitlow-grass
Eleocharis wolfii..... Wolf's spike-rush
Empetrum eamesii..... purple crowberry
Empetrum nigrum..... black crowberry
Erythronium propullans..... dwarf trout lily (Fed. Status: E)
Escobaria vivipara..... ball cactus
Fimbristylis puberula var. *interior*..... hairy fimbristylis
Glaux maritime..... sea milkwort
Hydrastis Canadensis..... golden-seal
Iodanthus pinnatifidus..... purple rocket
Isoetes melanopoda..... blackfoot quillwort
Lechea tenuifolia..... narrow-leaved pinweed
Lesquerella ludoviciana..... bladder pod
Listera auriculata..... auricled twayblade
Malaxis paludosa..... bog adder's-mouth
Marsilea vestita..... hairy water clover
Montia chamissoi..... montia
Oryzopsis hymenoides..... Indian ricegrass
Osmorhiza berteroi..... Chilean sweet cicely
Oxytropis viscida..... sticky locoweed
Paronychia fastigiata..... forked chickweed
Parthenium integrifolium..... wild quinine
Platanthera flava var. *herbiola*..... tubercled rein-orchid
Platanthera praeclara..... western prairie fringed orchid (Fed. Status: T)
Polemonium occidentale ssp. *lacustre*..... western Jacob's-ladder
Polygala cruciata..... cross-leaved milkwort

Polystichum braunii..... Braun's holly fern
Potamogeton bicupulatus ..... snailseed pondweed
Potamogeton diversifolius ..... diverse-leaved pondweed
Psoralidium tenuiflora..... slender-leaved scurf pea
Sagina nodosa ssp. *borealis* ..... knotty pearlwort
Saxifraga cernua..... nodding saxifrage
Scleria triglomerata..... tall nut-rush
Sedum integrifolium ssp. *leedyi* ..... Leedy's roseroot (Fed. Status: T)
Selaginella selaginoides ..... northern spikemoss
Senecio canus ..... gray ragwort
Talinum rugospermum..... rough-seeded fameflower
Tofieldia pusilla..... small false asphodel
Xyris torta..... twisted yellow-eyed grass

VASCULAR PLANTS

Threatened

Achillea sibirica..... Siberian yarrow
Allium cernuum ..... nodding wild onion
Allium schoenoprasum var. *sibiricum* ..... wild chives
Ammophila breviligulata ..... beachgrass
Arabis holboellii var. *retrofracta*..... Holboell's rockcress
Arnica lonchophylla ..... long-leaved arnica
Arnoglossum plantagineum ..... tuberous Indian-plantain
Asclepias hirtella..... prairie milkweed
Asclepias sullivantii..... Sullivant's milkweed
Asplenium trichomanes..... maidenhair spleenwort
Aster shortii ..... Short's aster
Aureolaria pedicularia ..... fernleaf false foxglove
Besseya bullii..... kitten-tails
Botrychium lanceolatum..... triangle moonwort
Botrychium lunaria..... common moonwort
Botrychium rugulosum ..... St. Lawrence grapefern
Carex careyana ..... Carey's sedge
Carex conjuncta..... jointed sedge
Carex davisii..... Davis' sedge
Carex festucacea..... fescue sedge
Carex garberi ..... Garber's sedge
Carex jamesii..... James' sedge
Carex katahdinensis ..... Katahdin sedge
Carex laevivaginata..... smooth-sheathed sedge
Carex laxiculmis..... spreading sedge
Carex sterilis ..... sterile sedge
Crassula aquatica..... pigmyweed
Crataegus douglasii..... black hawthorn
Cyperus acuminatus ..... short-pointed umbrella-sedge
Cypripedium arietinum..... ram's-head lady's-slipper
Diplazium pycnocarpon..... narrow-leaved spleenwort
Dryopteris marginalis..... marginal shield-fern
Eleocharis nitida..... neat spike-rush
Eleocharis olivacea ..... olivaceous spike-rush
Eleocharis rostellata..... beaked spike-rush

Eupatorium sessilifolium ..... upland boneset
Floerkea proserpinacoides ..... false mermaid
Heteranthera limosa ..... mud plantain
Huperzia porophila ..... rock clubmoss
Lespedeza leptostachya ..... prairie bush clover (Fed. Status: T)
Melica nitens ..... three-flowered melic
Moehringia macrophylla ..... large-leaved sandwort
Napaea dioica ..... glade mallow
Nymphaea leibergii ..... small white waterlily
Paronychia Canadensis ..... Canadian forked chickweed
Phegopteris hexagonoptera ..... broad beech-fern
Plantago elongate ..... slender plantain
Poa paludigena ..... bog bluegrass
Polystichum acrostichoides ..... Christmas fern
Rhynchospora capillacea ..... hair-like beak-rush
Rotala ramosior ..... tooth-cup
Rubus chamaemorus ..... cloudberry
Salicornia rubra ..... red saltwort
Saxifraga paniculata ..... encrusted saxifrage
Scleria verticillata ..... whorled nut-rush
Scutellaria ovata ..... ovate-leaved skullcap
Shinnersoseris rostrata ..... annual skeletonweed
Silene nivea ..... snowy campion
Subularia aquatica ..... awlwort
Sullivantia sullivantii ..... reniform sullivantia
Vaccinium uliginosum ..... alpine bilberry
Valeriana edulis var. *ciliate* ..... valerian
Viola lanceolata ..... lance-leaved violet
Viola nuttallii ..... yellow prairie violet
Woodsia glabella ..... smooth woodsia
Woodsia scopulina ..... Rocky Mountain woodsia

LICHENS

Endangered

Buellia nigra ..... a species of lichen
Caloplaca parvula ..... a species of lichen
Dermatocarpon moulinsii ..... a species of lichen
Leptogium apalachense ..... a species of lichen
Lobaria scrobiculata ..... a species of lichen
Parmelia stictica ..... a species of lichen
Pseudocyphellaria crocata ..... a species of lichen
Umbilicaria torrefacta ..... a species of lichen

Threatened

Cetraria oakesiana ..... a species of lichen
Coccocarpia palmicola ..... a species of lichen
Parmelia stuppea ..... a species of lichen

MOSSES

Endangered

Schistostegia pennata..... luminous moss

FUNGI

Endangered

Fuscoboletinus weaverae..... a species of fungus
Psathyrella cystidiosa..... a species of fungus
Psathyrella rhodospora..... a species of fungus