ENVIRONMENTAL ASSESSMENT

Reducing Rock Dove (Feral Pigeon), European Starling, and House Sparrow Damage through an Integrated Wildlife Damage Management Program in the Commonwealth of Massachusetts

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February 2007

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The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) proposes to continue the current bird damage management program that responds to rock dove (feral pigeon) (*Columbia livia*), European starling (*Sturnus vulgaris*), and house (English) sparrow (*Passer domesticus)* damage in the Commonwealth of Massachusetts. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to reduce damage activities to property, agricultural resources, livestock, natural resources and public health and safety. Damage management would be conducted on public and private property in Massachusetts when the resource owner (property owner) or manager requests assistance. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion, habitat modification or harassment would be recommended and utilized to reduce damage. In other situations, birds would be removed as humanely as possible using: shooting, trapping, egg addling/destruction, nest destruction, and registered pesticides. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy. Bird damage management activities would be conducted in the commonwealth, when requested and funded, on private or public property, including airport facilities and adjacent or nearby properties, after a *Cooperative Service Agreement* or other comparable document has been completed. All management activities would comply with appropriate federal, commonwealth, and local laws.

ACRONYMS

ADC	Animal Damage Control
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BDM	Bird Damage Management
BO	Biological Opinion
CBC	Christmas Bird Count
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DRCS	Division of Regulatory and Consumer Services
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
IWDM	Integrated Wildlife Damage Management
MBTA	Migratory Bird Treaty Act
MDAR	Massachusetts Department of Agricultural Resources
MDFG	Massachusetts Department of Fish and Game
MDFW	Massachusetts Division of Fisheries and Wildlife
MIS	Management Information System
MOU	Memorandum of Understanding
MPB	Massachusetts Pesticide Bureau
NEPA	National Environmental Policy Act
PB	Pesticide Bureau
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
TGE	Transmissible Gastroenteritis
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
WS	Wildlife Services

NOTE: On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this Environmental Assessment.

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife which increases the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The *Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (USDA 1997):

> "*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.*"

Wildlife damage management is the science of reducing damage or other problems caused by wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 1990). The USDA, APHIS, WS program (formerly known as Animal Damage Control) uses an IWDM approach, known as Integrated Pest Management (WS Directive 2.105[1]), in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1:1-7 of USDA (1997). These methods may include alteration of cultural practices and habitat and behavioral modification to prevent or reduce damage. The reduction of wildlife damage may also require that local populations be reduced through lethal means.

This environmental assessment (EA) documents the analysis of the potential environmental effects of a proposed rock dove (feral pigeon), European starling, and house (English) sparrow bird damage management (BDM) program. This analysis relies mainly on existing data contained in published documents (Appendix A), including the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997). The final environmental impact statement (USDA 1997) may be obtained by contacting the USDA, APHIS, WS Operational Support Staff at 4700 River Road Unit 87, Riverdale, MD 20737-1234.

WS is the federal agency authorized to protect American resources from damage associated with wildlife (Act of March 2, 1931, as amended (46 Stat. 1486; 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 fulfill this Congressional direction, WS activities are conducted to prevent or reduce wildlife damage caused to agricultural, industrial and natural resources; property; livestock; and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, private organizations, and individuals. Therefore, wildlife damage management is not based on punishing offending animals but as one means of reducing damage and is used as part of the WS Decision Model (Slate et al. 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to resources or the public.

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[1] WS Policy Manual - Provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions could be categorically excluded {7 CFR 372.5(c), 60 Fed. Reg. 6,000 -6,003, (1995)}. WS has decided in this case to prepare this EA to facilitate planning, interagency coordination, and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed and planned damage management program. All wildlife damage management that would take place in Massachusetts would be undertaken according to relevant laws, regulations, policies, orders and procedures, including the Endangered Species Act (ESA). Notice of the availability of this document will be consistent with the agency's NEPA procedures.

WS is a cooperatively funded, service-oriented program that receives requests for assistance from private and public entities, including other governmental agencies. Before any wildlife damage management is conducted, Cooperative Agreements, Agreements for Control or other comparable documents are in place. As requested, WS cooperates with land and wildlife management agencies to reduce wildlife damage effectively and efficiently according to applicable federal, state and local laws and Memorandums of Understanding (MOUs) between WS and other agencies.

Wildlife Service's vision is to improve the coexistence of people and wildlife. WS' mission, developed through its strategic planning process, is

1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and*

2) to safeguard public health and safety."

WS' Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- Training of wildlife damage management professionals;
- Development and improvement of strategies to reduce losses and threats to humans from wildlife;
- Collection, evaluation, and dissemination of management information;
- Informing and educating the public on how to reduce wildlife damage;
- Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989)

1.1 AUTHORITY AND COMPLIANCE

1.1.1 Wildlife Services Legislative Authority

The USDA is authorized by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services program is the Act of March 2, 1931, as amended (46 Stat. 1486; 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 provides 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."*

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. In 1988, Congress strengthened the legislative directive and authority of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

> *"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammals and birds species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."*

1.1.2 Massachusetts Department of Agricultural Resources, Division of Regulatory and Consumer Services, Pesticide Bureau (MDAR DRCS PB)

The MDAR DRCS PB, carries out the day to day responsibilities of regulating pesticides in the Commonwealth of Massachusetts. The PB also acts as support staff for the Pesticide Board and Subcommittee. The major functions of the Bureau are broken down into specific programs. The PB is responsible for enforcing all pesticide regulations and laws, both state and federal. It is responsible for carrying out provisions of the Massachusetts Pesticide Control Act. Through cooperative agreements with the Environmental Protection Agency, the department also implements provisions of the Federal Insecticide, Fungicide and Rodenticide Act.

1.1.3 Massachusetts Department of Fish and Game (MADFG)

The MADFG authority in wildlife management is given under Part I. Administration of the Government; Title XIX Agriculture and Conservation; Chapters 131. Inland Fisheries and Game and Other Natural Resources; of the Massachusetts General Laws (M.G.L). This legislation designates the Division of Fisheries and Wildlife shall be within the Department of Fisheries, Wildlife and Environmental Law Enforcement. In addition it covers general provisions; licenses, permits and stamps generally; wildlife generally; fish; and wild animals.

1.1.4 U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the Migratory Bird Treaty Act (MBTA) and those that are listed as threatened or endangered under the ESA.

The USFWS authority for action is based on the MBTA of 1918 (as amended), which implements treaties with the United States, Great Britain (for Canada), the United Mexican States, Japan, and the Soviet Union. Section 3 of this Act authorized the Secretary of Agriculture:

"From time to time, having due regard to the zones of temperature and distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the convention to allow hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President."

The authority of the Secretary of Agriculture, with respect to the Migratory Bird Treaty, was transferred to the Secretary of the Interior in 1939 pursuant to Reorganization Plan No. II. Section 4(f), 4 Fed. Reg. 2731, 53 Stat. 1433.

CFR 50 Subchapter C - The National Wildlife Refuge System - Part 30 - Feral Animals - Subpart B-30.11 - Control of feral animals states: (a) Feral animals, including horses, burros, cattle, swine, sheep, goats, reindeer, dogs, and cats, without ownership that have reverted to the wild from a domestic state may be taken by authorized federal or state personnel or by private persons operating under permit in accordance with applicable provisions of federal or state law or regulation.

1.1.5 Compliance with Federal and State Statutes

Several federal laws, state laws and state regulations regulate WS wildlife damage management. WS complies with these laws and regulations and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act. Environmental documents pursuant to NEPA must be completed before operational activities consistent with the NEPA decision can be implemented. This EA meets the NEPA requirement for the proposed action in Massachusetts. 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. WS also coordinates specific projects and programs with other agencies. The purpose of these contacts is to coordinate any wildlife damage management that may affect resources managed by these agencies or affect other areas of mutual concern.

Endangered Species Act. It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened 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.) from the USFWS describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F).

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as Amended. The MBTA provides USFWS regulatory authority to protect families of bird species that migrate outside the United States. The law prohibits the "*take*" of these species by any entity, unless permitted by USFWS; people can obtain permits to take migratory birds under this law that are causing damage to resources. A recent court case involving mute swans held that the MBTA must provide protection to individual non-native species found within the United States that belong to families of birds already protected under the Act. As a result, many other species in addition to the mute swan became eligible for protection under the MBTA that had previously been excluded. Thus, the Migratory Bird Treaty Reform Act of 2004 was passed to clarify the original intent of the MBTA, the conservation and protection of migratory birds native to North America, and directed USFWS to establish a list of non-native bird species found in the United States. Species on this list will not be afforded MBTA protection. Certain species in North America are already not protected under the MBTA because neither the species nor their family was listed in the MBTA; European starlings and house sparrows are examples. Species such as the feral pigeon are included in the list of species excluded from protections under MBTA. All actions conducted in this EA will be in compliance with the regulations of the MBTA, as amended.

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 chemical methods integrated into the WS program in Massachusetts are registered with and regulated by the EPA and the MDAR, and used by WS in compliance with labeling procedures and requirements.

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 form of capture.

Executive Order 13112 of February 3, 1999. This Order prevents the introduction of invasive species and provides for their control to minimize the economic, ecological, and human health impacts that invasive species cause. Pigeons, starlings, and house (English) sparrows are recognized as invasive species that have adverse economic, ecological, and human health impacts.

Executive Order 13186 of January 10, 2001 "Responsibilities of Federal Agencies to Protect Migratory Birds." This Order states that each federal agency, taking actions that have or are likely to have, a measurable negative effect on migratory bird populations, is directed to develop and implement, a 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 Order and is currently waiting for USFWS approval. WS will abide by the MOU once it is finalized and signed by both parties.

Occupational Safety and Health Act of 1970. The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected." This standard includes birds that may cause safety and health concerns at workplaces.

The Native American Graves and Repatriation Act of 1990. The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

National Historic Preservation Act (NHPA) of 1966 as amended. The NHPA of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that has the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the Advisory Council on Historic Preservation (i.e. State Historic Preservation Office, Tribal Historic Preservation Officers), as appropriate. WS actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties.

Each of the BDM methods described in 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, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also 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. 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.

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. 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. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." Executive Order 12898, 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 the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. 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. All chemicals used by WS are regulated by the EPA through FIFRA, MDAR, by MOUs with land managing agencies, and by WS Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used according to label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997, Appendix P). The WS operational program properly disposes of any excess solid or hazardous waste. 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. In contrast, the proposed action may benefit minority or low-income populations by reducing bird damage such as threats to public health and safety.

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 their development physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed bird damage management program would only occur by using 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.

1.2 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

1.2.1 ADC Programmatic Environmental Impact Statement.

WS, previously called Animal Damage Control (ADC), has issued a Final EIS on the national APHIS/WS program (USDA 1997). Pertinent and current information available in the EIS has been incorporated by reference into this EA.

1.2.2 WS Environmental Assessment - Statewide wildlife damage management at airports in Massachusetts.

In 2002, the WS program issued a Finding of No Significant Impact and a Final Environmental Assessment entitled, "Statewide wildlife damage management at airports in Massachusetts" which evaluated alternatives and impacts to the environment and selected an IWDM approach to manage damage associated with wildlife at airports in Massachusetts (USDA 2002). Pertinent and current information available in the EA has been incorporated by reference into this EA.

1.3 NEED FOR ACTION

Conflicts between humans and wildlife are common in Massachusetts. The need for action in Massachusetts is based on the necessity for a program to protect agriculture, livestock, property, natural resources and human health and safety from pigeon, starling, and sparrow damage. Pigeon, starling, and sparrow populations can have a negative economic impact in Massachusetts. Comprehensive surveys of pigeon, starling, and sparrow damage in Massachusetts have not been conducted. Requests for WS assistance for FY96 through FY04 are summarized (Table 1-3). These data represent only a portion of the total damage caused by pigeons, starlings, and sparrows, because not all people who experience damage request assistance from WS.

1.3.1 Need for Bird Damage Management to Protect Human Health and Safety

In Massachusetts human health and safety concerns and problems associated with birds include, but are not limited to transmission of zoonotic diseases to humans and bird-aircraft strikes.

Birds play an important role in the transmission of zoonotic diseases to humans such as Encephalitis, West Nile Virus, Psittacosis, and Histoplasmosis. Public health officials and residents at such sites express concerns for human health related to the potential for disease transmission where dropping deposits accumulate. Some bird species form large communal roosts of the kind associated with disease organisms which grow in soils enriched by bird excrement, such as *Histoplasma capsulatum* (Weeks and Stickley 1984). Sometimes, such roosts occur in urban and suburban areas.

Rock dove (feral pigeons), house sparrows, and European starlings have been suspected in the transmission of 29 different diseases to humans (Davis et al. 1971, Stickley and Weeks 1985, and Weber 1979). These include viral diseases such as meningitis and seven different forms of encephalitis; bacterial diseases such as erysipeloid, salmonellosis, paratyphoid, Pasteurellosis, and Listeriosis; mycotic (fungal) diseases such as aspergillosis, blastomycosis, candidiasis, cryptococcosis, histoplasmosis, and sarcosporidiosis; protozoal diseases such as American trypansomiasis and toxoplasmosis; and rickettsial/chlamydial diseases such as chlamydiosis and Q fever. As many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, European starlings, and house sparrows (Weber 1979). Table 1-1 shows the more typical diseases affecting humans that can be transmitted by pigeons, house sparrows, and European starlings. In most cases, in which human health concerns are a major reason for requesting BDM, no actual cases of bird transmission of disease to humans have been proven to occur. Thus, it is the risk of disease transmission that is the primary reason for requesting and conducting BDM. Situations in Massachusetts where the threat of disease associated with European starling, pigeon, or house sparrow populations might occur could be:

- exposure by residents to a European starling roost which has been in a residential area for more than three years;
- disturbance of a large deposit of droppings in an attic where a flock of feral domestic pigeons routinely roosts or nests;
- accumulated droppings from roosting European starlings, pigeons, or house sparrows on structures at an industrial site where employees must work in areas of accumulation;
- House sparrows or European starlings nesting or loafing around a food court area of a recreational facility or other site where humans eat in close proximity to concentrated numbers of these birds.

Individuals or property owners, requesting assistance with pigeon, house sparrow or European starling roost problems, are often concerned about potential disease risks, but may be unaware of the types of

diseases that can be associated with these birds. In most such situations, BDM is requested because the mess associated with droppings left by concentrations of birds is aesthetically displeasing and can result in continual clean-up costs. Under the proposed action, WS could agree to assist in resolving these types of problems.

Table 1-1. Diseases transmissible to humans and livestock associated with feral domestic pigeons, European starlings, and house sparrows. Information from Weber (1979).

Disease	Human Symptoms	Potential for Human Fatality	Effects on Domestic Animals
Bacterial:			
Erysipeloid	skin eruption with pain, itching; headaches, chills, joint pain, prostration, fever, vomiting	sometimes - particularly to young children, old or infirm people	serious hazard for the swine industry
Salmonellosis	gastroenteritis, septicaemia, persistent infection	possible, especially in individuals weakened by other disease or old age	causes abortions in mature cattle, possible mortality in calves, decrease in milk production in dairy cattle
Pasteurellosis	respiratory infection, nasal discharge, conjunctivitis, bronchitis, pneumonia, appendicitis, urinary bladder inflammation, abscessed wound infections	rarely	may fatally affect chickens, turkeys and other fowl
Listeriosis	conjunctivitis, skin infections, meningitis in newborns, abortions, premature delivery, stillbirth	sometimes - particularly with newborns	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles
Viral:			
Meningitis	inflammation of membranes covering the brain , dizziness, and nervous movements	possible — can also result as a secondary infection with listeriosis, salmonellosis, cryptococcosis	causes middle ear infection in swine, dogs, and cats
Encephalitis (7 forms)	headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	mortality rate for eastern equine encephalomyelitis may be around 60%	may cause mental retardation, convulsions and paralysis
Mycotic (fungal):			
Aspergillosis	affects lungs and broken skin, toxins poison blood, nerves, and body cells	not usually	causes abortions in cattle
Blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	rarely	affects horses, dogs and cats

Candidiasis	infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	rarely	causes mastitis, diarrhea, vaginal discharge and aborted fetuses in cattle
Cryptococcosis	lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	possible especially with meningitis	chronic mastitis in cattle, decreased milk flow and appetite loss
Histoplasmosis	pulmonary or respiratory disease. May affect vision	possible, especially in infants and young children or if disease disseminates to the blood and bone marrow	actively grows and multiplies in soil and remains active long after birds have departed
Protozoal:			
American Trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
Toxoplasmosis	inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness	possible	may cause abortion or still birth in humans, mental retardation
Rickettsial /Chlamydial:			
Chlamydiosis	pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate	occasionally, restricted to old, weak or those with concurrent diseases	in cattle, may result in abortion, arthritis, conjunctivitis, and enteritis
Q Fever	sudden pneumonitis, chills, fever, weakness, severe sweating, chest pain, severe headaches and sore eyes	possible	may cause abortions in sheep and goats

1.3.2 Need for Bird Damage Management at Airports/Airbases

The risk that birds pose to aircraft is well documented with the worst case reported in Boston in 1960 when 62 people were killed in the crash of an airliner which collided with a flock of European starlings (Terres 1980). Other examples include:

- In 1989, a F-16C "Fighting Falcon" struck a flock of European Starlings during take-off at Shaw Air Force Base, in Sumter Co., South Carolina. The plane was destroyed and damages were assessed at more than 10.3 million dollars (M. M. Bates, Pers. Comm. 2004).

- In 1999, a Boeing 757 struck a flock of European starlings at the Cincinnati/Northern Kentucky International Airport and was forced to abort the flight (NTSB 1999). Damages were assessed at more than $500,000 by airport officials (D.T. Little, WS Pers. Comm. 1999).
- On October 9, 2005, a Northwest CL-RJ100/200 struck a flock of 10 rock doves during take off from Bradley International Airport and was forced to make a precautionary landing. Damage was caused to the engine and fuselage (A. Maikshilo, WS Pers. Comm. 2006).

Flocks of starlings may intersect aircraft flight lines upon entering or exiting a roost at or near airports and present a safety threat to aviation. Starlings are a particularly dangerous bird to aircraft operations because of their high body density and tendency to travel in large flocks of hundreds to thousands of birds (Seamans et al. 1995).

Generally, bird collisions occur when aircraft are near the ground. From 1990-2002, approximately 55% of reported bird strikes occurred when the aircraft was at an altitude of 100 feet above ground level or less. Additionally, 78% occurred less than 1,000 feet above ground level and about 86% occurred less than 2,000 feet above ground level (Cleary et al. 2003). From 1990-2002, birds were involved in more than 97% of the reported wildlife strikes to civil aircraft in the USA (Cleary et al. 2003). From 1990-2002, reported losses from bird strikes totaled 211,928 hours of aircraft down time and $140.9 million in monetary losses (Cleary et al. 2003).

According to the Federal Aviation Administration's National Wildlife Strike Database, of the bird species identified in wildlife strikes, pigeons, starlings, and sparrows accounted for 4%, 5%, and 7% of the strikes, respectively from 1990-2002 (Cleary et al. 2003).

From 1990-2005, 1,013 bird strikes were reported to the FAA in Massachusetts including 21 pigeon strikes (3.06%), 15 sparrows (1.48%), and 21 European starling (2.07%). Of these reported strikes almost 40% were reported as unidentified bird species. In reality, this number is likely to be much greater since an estimated 80% of civil bird strikes go unreported (Cleary et al. 2003).

WS receives requests for assistance regarding bird damage management at airports and military airbases in Massachusetts (USDA 2002). These requests are considered serious because of the potential for loss of human life and because damage to aircraft can be extremely expensive. With the implementation of an Integrated BDM program in Massachusetts, WS could provide direct management and technical assistance at the request of any aviation facility in the commonwealth.

1.3.3 Need for Bird Damage Management at Cattle Feeding and Dairy Cattle Facilities

In 2004, Massachusetts dairy and cattle operations reported cash receipts totaling $51.275 million and $7.57 million, respectively (National Agricultural Statistic Service 2006). Pigeons, house sparrows and starlings often cause damage at cattle feeding facilities and dairies by congregating in large numbers to feed on the grain component of silage or bakery waste used as cattle feed. Such feeding strategies present disease threats to livestock at such sites. The birds also cause damage by defecating on fences, shade canopies, and other structures, which can accelerate corrosion of metal components and is generally considered an unsightly nuisance and potential health hazard for the feedlot/dairy operators and their personnel.

Scope of Livestock Feed Losses. The problem of starling damage to livestock feed has been documented in France and Great Britain (Feare 1984), and in the United States (Besser et al. 1968). The concentration of larger numbers of cattle eating huge quantities of feed in confined pens results in a tremendous attraction to European starlings, pigeons and house sparrows. Diet rations for cattle contain all of the nutrients and fiber that cattle need and are so thoroughly mixed that cattle are unable to select any single component over

others. The basic constituent of most rations is silage and the high energy portion is usually provided as corn. While cattle cannot select individual ingredients, European starlings can and do select the corn, thereby altering the energetic value of the complete diet. The removal of this high energy fraction by European starlings, is believed to reduce milk yields, weight gains, and is economically critical (Feare 1984). Glahn and Otis (1986) reported that starling damage was also associated with proximity to roosts, snow, freezing temperatures and the number of livestock on feed.

The economic significance of feed losses to European starlings has been demonstrated by Besser et al. (1968) who concluded that the value of losses in feedlots near Denver, Colorado was $84 per 1,000 birds in 1967. Forbes (1995) reported European starlings consume up to 50% of their body weight in feed each day. Glahn and Otis (1981) reported losses of 4.8 kg of pelletized feed consumed per 1,000 bird minutes. Glahn (1983) reported that 25.8% of farms in Tennessee experienced starling depredation problems of which 6.3% experienced considerable economic loss. Williams (1983) estimated seasonal feed losses to five species of blackbirds (primarily brown-headed cowbirds) at one feedlot in south Texas at nearly 140 tons valued at $18,000.

Scope of Livestock Health Problems. A number of diseases that affect livestock have been associated with feral domestic pigeons, European starlings, and house sparrows (Weber 1979). Transmission of diseases such as Transmissible Gastroenteritis Virus (TGE), Tuberculosis (TB), and Coccidiosis to livestock has been linked to migratory flocks of European starlings. Estimates of the dollar value of this type of damage are not available. A consulting veterinarian for a large cattle feeding facility in Texas indicated problems associated with coccidiosis declined following reduction of starling numbers using the facility (R. Smith, WS, Canyon District, TX, Pers. Comm.).

Table 1-2. Diseases of livestock that have been linked to feral domestic pigeons, European starlings, and/or house sparrows. Information from Weber (1979).

Disease	Livestock affected	Symptoms	Comments
Bacterial:			
Erysipeloid	cattle, swine, horses, sheep, goats, chickens, turkeys, ducks	Pigs - arthritis, skin lesions, necrosis, septicemia Sheep - lameness	serious hazard for the swine industry, rejection of swine meat at slaughter due to speticemia, also affects dogs
Salmonellosis	all domestic animals	abortions in mature cattle, mortality in calves, decrease in milk production in dairy cattle Colitis in pigs,	over 1700 serotypes □
Pasteurellosis	cattle, swine, horses, rabbits, chickens, turkeys	Chickens and turkeys die suddenly without illness pneumonia, bovine mastitis, abortions in swine, septicemia, abscesses	also affects cats and dogs
Avian Tuberculosis	chickens, turkeys, swine, cattle, horses, sheep	Emaciation, decrease in egg production, and death in poultry. Mastitis in cattle	also affects dogs and cats
Streptococcosis	cattle, swine, sheep, horses, chickens, turkeys,	Emaciation and death in poultry. Mastitis in cattle,	feral pigeons are susceptible and aid in

	geese, ducks, rabbits	abscesses and inflammation of the heart , and death in swine	transmission
Yersinosis	cattle, sheep, goats, horses, turkeys, chickens, ducks	abortion in sheep and cattle	also affects dogs and cats
Vibriosis	cattle and sheep	In cattle, often a cause of infertility or early embryonic death. In sheep, the only known cause of infectious abortion in late pregnancy	of great economic importance
Listeriosis	Chickens, ducks, geese, cattle, horses, swine, sheep, goats	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles	also affects cats and dogs
Viral:			
Meningitis	cattle, sheep, swine, poultry	inflammation of the brain, newborn calves unable to suckle	associated with listeriosis, salmonellosis, cryptococcosis
Encephalitis (7 forms)	horses, turkeys, ducks	drowsiness, inflammation of the brain	mosquitoes serve as vectors
Mycotic (fungal):			
Aspergillosis	cattle, chickens, turkeys, and ducks	abortions in cattle	common in turkey poults
Blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	Rarely	affects horses, dogs and cats
Candidiasis	cattle, swine, sheep, horses, chickens, turkeys	In cattle, mastitis, diarrhea, vaginal discharge, and aborted fetuses	causes unsatisfactory growth in chickens
Cryptococcosis	cattle, swine, horses	chronic mastitis in cattle, decreased milk flow and appetite loss	also affects dogs and cats
Histoplasmosis	horses cattle and swine	(in dogs) chronic cough, loss of appetite, weakness, depression, diarrhea, extreme weight loss	also affects dogs; actively grows and multiplies in soil and remains active long after birds have departed
Coccidiosis	poultry, cattle, and sheep	bloody diarrhea in chickens, dehydration, retardation of growth	almost always present in house sparrows; also found in pigeons and European starlings
Protozoal:			
American Trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
Toxoplasmosis	cattle, swine, horses,	In cattle, muscular	also affects dogs and

	sheep, chickens, turkeys	tremors, coughing, sneezing, nasal discharge, frothing at the mouth, prostration and abortion	cats
Rickettsial/ Chlamydial:			
Chlamydiosis	cattle, horses, swine, sheep, goats, chickens, turkeys, ducks, geese	In cattle, abortion, arthritis, conjunctivitis, enteritis	also affects dogs and cats and many wild birds and mammals
Q Fever	affects cattle, sheep, goats, and poultry	may cause abortions in sheep and goats	can be transmitted by infected ticks

1.3.4 Need for Bird Damage Management Related to Agricultural Crops

Several studies have shown that European starlings can pose a great economic threat to agricultural producers (Besser et. al. 1968, Dolbeer et al. 1978, and Feare 1984). Starlings and sparrows can also have a detrimental impact on agricultural food production by feeding in vineyards, orchards, gardens, crop fields and feedlots (Weber 1979). For example, starlings feed on numerous types of fruits such as, cherries, blueberries, apples, apricots, grapes, nectarines, peaches, plums and strawberries (Weber 1979). Starlings were also recently found to damage ripening corn (Johnson and Glahn 1994) and are known to feed on the green, milk and dough stage kernels of sorghum (Weber 1979). Additionally, starlings may pull sprouting grains, especially winter wheat, and feed on planted seed (Johnson and Glahn 1994). Sparrows damage crops by pecking seeds, seedlings, buds, flowers, vegetables and maturing fruits (Fitzwater 1994), and localized damage can be great because sparrows often feed in large flocks on a small area (Fitzwater 1994). Bird damage to crops has occasionally been identified as a problem in Massachusetts.

Massachusetts farmers produce a wide variety of cash crops throughout the commonwealth including corn, hay, potatoes, tobacco, apples, peaches, vegetables (cucumbers, snap beans, tomatoes, watermelons, cantaloupes, squash, greens, etc.) nursery crops, and floriculture.

1.3.5 Need for Bird Damage Management to Protect Property

Birds frequently damage structures on private property or public facilities with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on automobiles, can occur because of uric acid from bird droppings. Electrical utility companies frequently have problems with birds causing power outages by shorting out transformers and substations. Persons and businesses concerned about these types of damage may request WS assistance.

Pigeons, starlings, and house sparrows cause economic damage to aircraft in hangars. Accumulation of fecal droppings on planes, helicopters, maintenance equipment, and hangar floors results in unscheduled maintenance to clean planes and buildings to protect painted surfaces from acidic fecal droppings and maintain a sanitary work environment. Furthermore, birds may build nests in engines of idle aircraft which may cause engine damage or cause a fire.

1.3.6 Need for Bird Damage Management to Protect Natural Resources

Some of the species listed as threatened or endangered under the Endangered Species Act of 1973 are preyed upon or otherwise adversely affected by certain bird species. Interspecific nest competition has been well documented in European starlings. Miller (1975) and Barnes (1991) reported European starlings were responsible for a severe depletion of the eastern bluebird (*Sialis sialis*) population due to nest competition. Nest competition by European starlings has also been known to adversely impact American

kestrels (sparrow hawks) (Von Jarchow 1943, Nickell 1967, and Wilmer 1987), red-bellied woodpeckers (*Centurus carolinus*), Gila woodpeckers (*Centurus uropygialis*) (Kerpez and Smith 1990 and Ingold 1994), and wood ducks (*Aix sponsa*) (Shake 1967, McGilvery and Uhler 1971, Heusmann et.al. 1977, and Grabill 1977). Weitzel (1988) reported nine native species of birds in Nevada had been displaced by starling nest competition, and Mason et al. (1972) reported European starlings evicting bats from nest holes.

1.4 SCOPE AND PURPOSE OF THIS EA

The scope and purpose of this EA is to address and evaluate the potential impacts to the human environment from the implementation of a WS BDM program to protect agricultural resources, property, livestock, natural resources, and public health and safety in Massachusetts. Damage problems can occur throughout the commonwealth, resulting in requests for WS assistance. Under the Proposed Action, BDM could be conducted on private, federal, commonwealth, tribal, county, and municipal lands in Massachusetts upon request.

WS has completed an EA for WS program activities at airports throughout Massachusetts (USDA 2002). WS will continue to implement program activities under the Massachusetts statewide airport EA and will include potential impacts of the EA (lethal pigeon, starling and sparrow take, impacts on non-target species, etc.) in the cumulative analysis provide in this EA.

1.5 WS RECORD KEEPING REGARDING REQUESTS FOR BIRD DAMAGE MANAGEMENT ASSISTANCE

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 WS. 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.

The database includes, but is not limited to, the following information: species of wildlife involved, the number of individuals involved in a damage situation; tools and methods used or recommended to alleviate the conflict; and the resource that is in need of protection. Table 1-3 provides a summary of Technical Assistance projects completed by the Massachusetts WS program for Fiscal Year 1996-2004. A description of the WS Direct Control and Technical Assistance programs are described in Chapter 3 of this EA.

Table 1-3*. Number of incidents for technical assistance for Massachusetts Wildlife Services by Fiscal Year.

Fiscal Year	Species	Agriculture	Health & Safety	Property	Natural Resources	Total
1996	Pigeon	0	0	7	0	7
	Starling	6	0	1	0	7
	Sparrow	0	0	2	0	2
1997	Pigeon	0	0	6	0	6
	Starling	4	0	2	0	6
	Sparrow	0	0	0	0	0
1998	Pigeon	0	0	19	0	19
	Starling	1	1	9	0	11
	Sparrow	0	0	3	0	3
1999	Pigeon	0	7	2	0	9

	Starling	11	2	16	0	29
	Sparrow	0	0	1	0	1
2000	Pigeon	0	1	7	0	8
	Starling	11	2	18	0	31
	Sparrow	0	0	2	0	2
2001	Pigeon	0	1	11	0	12
	Starling	5	2	9	0	16
	Sparrow	1	0	4	0	5
2002	Pigeon	0	2	13	0	15
	Starling	7	3	5	1	16
	Sparrow	1	9	2	0	12
2003	Pigeon	0	1	5	0	6
	Starling	6	1	9	0	16
	Sparrow	0	0	2	0	2
2004	Pigeon	2	2	5	0	9
	Starling	12	1	2	0	15
	Sparrow	0	1	4	0	5
Total		67	36	166	1	270

*Data presented in this table were taken from WS-MA Annual Program Reports and represent the number of technical assistance projects conducted by the WS-MA program and do not include data from operational projects conducted during the time period covered

1.6 PROPOSED ACTION

WS proposes to continue the current bird damage management program that responds to feral pigeon, European starling, and house sparrow damage requests in the Commonwealth of Massachusetts. An IWDM approach would be implemented to reduce damage activities to property, agricultural resources, livestock, natural resources, and public health and safety. Damage management would be conducted on public and private property in Massachusetts when the resource owner (property owner) or manager requests assistance. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion, habitat modification or harassment would be recommended and utilized to reduce damage. In other situations, birds would be removed as humanely as possible using: shooting, trapping, egg addling/destruction, nest destruction, and registered pesticides. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy. Bird damage management activities would be conducted in the commonwealth, when requested and funded, on private or public property, including airport facilities and adjacent or nearby properties, after a *Cooperative Service Agreement* or other comparable document has been completed. All management activities would comply with appropriate federal, commonwealth, and local laws.

1.7 DECISION TO BE MADE

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

- Should WS implement an integrated bird damage management strategy, including technical assistance and direct control, to meet the need for starling, sparrow and pigeon damage management in Massachusetts?
- If not, should WS attempt to implement one of the alternatives to an integrated bird damage management strategy as described in the EA?
- Would the proposed action have significant impacts on the quality of the human environment, requiring preparation of an EIS?

1.8 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.8.1 Actions Analyzed

This EA evaluates bird damage management by WS to protect: 1) property, 2) agricultural resources, 3) livestock and dairies, 4) natural resources and 5) public health and safety in Massachusetts. Protection of other resources or other program activities would be addressed in other NEPA analysis, as appropriate.

1.8.2 American Indian Lands and Tribes

Currently, WS does not have any MOUs with any American Indian tribes in Massachusetts. If WS enters into an agreement with a tribe for BDM, this EA would be reviewed and supplemented, if appropriate, to insure compliance with NEPA. MOUs, agreements and NEPA documentation would be prepared as appropriate before conducting BDM on tribal lands.

1.8.3 Period for which this EA is Valid

This EA would remain valid until the WS program in Massachusetts and other appropriate agencies determine that new needs for action, changed conditions or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be supplemented pursuant to NEPA. Review of the EA would be conducted each year to ensure that the EA is sufficient.

1.8.4 Site Specificity

This EA analyzes the potential impacts of BDM and addresses activities on all public and private lands in Massachusetts under MOUs, Cooperative Agreements, and in cooperation with the appropriate public land management agencies. It also addresses the impacts of BDM in areas where additional agreements may be signed in the future. Because the proposed action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional BDM efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program.

Planning for the management of bird damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc. Although some of the sites where bird damage will occur can be predicted, all specific locations or times where such damage will occur in any

given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply wherever bird damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Massachusetts (see Chapter 3 for a description of the Decision Model and its application).

The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within the Commonwealth of Massachusetts. In this way, APHIS-WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.8.5 Summary of Public Involvement

Issues related to the proposed action were initially developed by WS. Issues were defined and preliminary alternatives were identified. 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 parties that have specifically requested to be notified. 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.

1.9 PREVIEW OF THE REMAINDER OF THIS EA

The remainder of this EA is composed of four (4) chapters and four (4) appendices. Chapter 2 discusses and analyzes the issues and affected environment. Chapter 3 contains a description of each alternative, alternatives not considered in detail, mitigation, and standard operating procedures (SOP). Chapter 4 analyzes environmental consequences and the environmental impacts associated with each alternative considered in detail. Chapter 5 contains the list of preparers of this EA. Appendix A comprises a list of the literature cited during the preparation of the EA and Appendix B is a detailed description of the methods used for BDM in Massachusetts. Appendix C and Appendix D are a comprehensive list of federally and state listed T&E species, respectively in the Commonwealth of Massachusetts.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues, including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues used to develop Standard Operating Procedures (SOPs), and issues not considered in detail, with the rationale. Pertinent portions of the affected environment are included in this chapter and in the discussion of issues used to develop SOPs. Additional affected environments are incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the proposed program in Chapter 3.

2.1 AFFECTED ENVIRONMENT

The areas of the proposed action could include areas in and around residential, commercial and industrial buildings, parks, bridges, industrial sites, urban/suburban woodlots or at any other sites where birds may roost, loaf, feed or nest. Damage management activities could be conducted at agricultural fields, vineyards, orchards, farmyards, dairies, livestock operations, grain mills, and grain handling areas (e.g., railroad yards) where birds destroy crops, feed on spilled grains, or contaminate food products for human or livestock consumption. Additionally, the area of the proposed action could include airports and surrounding property where birds represent a threat to aviation safety.

The "Environmental Status Quo" for managing damage and conflicts associated with State managed or unprotected wildlife species. As defined by NEPA implementing regulations, the "*human environment* shall be interpreted comprehensively to include the natural and physical environment *and the relationship of people with that environment.*" (40 CFR 1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "human environment," it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or will occur in the absence of the federal action. This concept is applicable to situations involving federal assistance in managing damage associated with state-resident wildlife species or unprotected wildlife species.

Unprotected wildlife species, such as most non-native invasive species, are not protected under state or federal law. Most State-resident wildlife species are managed under State authority or law without any federal oversight or protection. In some states, with the possible exception of restrictions on methods (e.g., firearms restrictions, pesticide regulations), unprotected wildlife species and certain resident wildlife species are managed with little or no restrictions allowing them to be killed or taken by anyone at any time.

When a non-federal entity (i.e. State wildlife agencies, State agriculture agencies, State health agencies, municipalities, counties, private companies, individuals, etc.) takes a management action on a State-resident wildlife species or unprotected wildlife species, the action is not subject to NEPA compliance due to the lack of federal involvement in the action. Under such circumstances, the *environmental baseline* or *status quo* must be viewed as an environment that includes those species *as they are managed or impacted by non-federal entities in the absence of the federal action being proposed.* Therefore, in those situations in which a non-federal entity has decided that a management action directed towards a state protected or unprotected wildlife species will occur and even the particular methods that will be used, WS's involvement in the action will not affect the *environmental status quo.* WS's decision-making ability is restricted to one of two alternatives - either taking the action using the specific methods as decided upon by the non-federal entity, or taking no action at all at which point the non-federal entity will take the same action anyway.

The inability to change the *environmental status quo* in the types of situations described above presents a clear question of whether there is enough federal control over the action to be taken to make direct assistance by WS a federal action requiring compliance with NEPA. This lack of federal control over the decision to be made is even clearer when the non-federal entity has committed to taking the same actions in the absence of any federal assistance from WS. Clearly, under these circumstances, by any analysis we can

envision, WS would have virtually no ability to affect the *environmental status quo* by selecting any possible alternative, even the alternative of no federal action by WS.

Therefore, based on the discussion above, it is clear that in those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, however, certain aspects of the human environment may actually benefit more from WS's involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity; WS management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

2.2 ISSUES ANALYZED IN DETAIL IN CHAPTER 4

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

- Effects on target bird species
- Effects on other wildlife species, including T&E species
- Effects on human health and safety
- Impacts to stakeholders, including aesthetics
- Humaneness and animal welfare concerns of methods used

2.2.1 Effects on Target Bird Species

A common concern among members of the public is whether wildlife damage management actions adversely affect the viability of target species populations. The target species selected for analysis in this EA are rock doves/feral pigeons, European starlings, and house sparrows.

Impacts of West Nile virus on bird populations West Nile virus (WNV) has emerged in recent years in temperate regions of North America, with the first appearance of the virus in North America occurring in New York City in 1999 (MMWR 2002, Rappole et al. 2000). Since 1999 the virus has spread across the United States and was reported to occur in 44 states and the District of Columbia in 2002 (MMWR 2002). WNV is typically transmitted between birds and mosquitoes. Mammals can become infected if bitten by an infected mosquito, but individuals of most species of mammals do not become ill from the virus. The most serious manifestation of the WNV is fatal encephalitis in humans, horses, and birds. During testing of sick and dead birds, WNV was detected in at least 138 species, including European starlings, house sparrows and pigeons (CDC 2003). In 2005, WNV was identified in 83 dead birds tested from 10 of the 14 counties in Massachusetts (USGS 2006) (Table 2-1).

Although birds infected with WNV can die or become ill, most infected birds do survive and may subsequently develop immunity to the virus (CDC 2003, Cornell University 2003). In some bird species, particularly Corvids (crows, blue jays, ravens, magpies), the virus causes disease (often fatal) in a large percentage of infected birds (Audubon 2003, CDC 2003, Cornell University 2003, MMWR 2002). In 2002, WNV surveillance/monitoring programs revealed that Corvids accounted for 90% of the dead birds reported with crows representing the highest rate of infection (MMWR 2002). Large birds that live and die near humans (i.e. crows) have a greater likelihood of being discovered, therefore the reporting rates tend to be higher for these bird species and are a "good indicator" species for the presence of WNV in a specific area (Cornell University 2003, Audubon 2003). According to US Geological Survey (USGS), National Wildlife Health Center, information is not currently available to know whether or not WNV is having an impact on bird populations in North America. USGS states that it is not unusual for a new disease to cause

high rates of infection or death because birds do not have the natural immunity to the infection. Furthermore, it is not known how long it will take for specific bird population to develop sufficient immunity to the virus. Surveys of wild birds completed in the last three years have shown that some birds have already acquired antibodies to the virus (USGS-NWHC 2003). Based upon available Christmas Bird Counts and Breeding Bird Surveys, USGS-NWHC (2003) states that there have been declines in observations of many local bird populations, however they do not know if the decline can be attributed to WNV or to some other cause. A review of available crow population data by Audubon (2003) reveals that at least some local crow populations are suffering high WNV related mortality, but crow numbers do not appear to be declining drastically across broad geographic areas. USGS does not anticipate that the commonly seen species, such as crows and blue jays, will be adversely affected by the virus to the point that these bird species will disappear from the U.S. (USGS-NWHC 2003).

Table 2-1 Massachusetts 2005 West Nile Virus Cumulative Dead Bird Infections by County (USGS 2006).
USGS Cumulative 2005 Data as of February 14, 2006

Barnstable County	3
Bristol County	11
Dukes County	2
Essex County	8
Hampden County	2
Middlesex County	25
Norfolk County	11
Plymouth County	6
Suffolk County	9
Worcester County	6
Cumulative Total in Massachusetts	**83**

2.2.2 Effects on Other Wildlife Species, including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is whether the proposed action or any of the alternatives might result in adverse impacts to populations of other wildlife, particularly T&E species. WS' SOPs are designed to reduce the effects on non-target species' populations and are presented in Chapter 3. To reduce the risks of adverse affects to non-target species, WS would select damage management methods that are target-selective or apply such methods in ways to reduce the likelihood of capturing or killing non-target species.

Threatened and Endangered species lists from the USFWS and Commonwealth of Massachusetts were reviewed to identify potential effects on federal and state listed T&E species. 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. WS has consulted with the USFWS under Section 7 of the ESA concerning potential effects of BDM methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997). WS is also in the process of reinitiating Section 7 consultation at the state program level to assure that potential effects on T&E species have been adequately addressed.

Some members of the public are concerned that the use of registered toxicants to reduce bird damage would have adverse impacts on other wildlife species, including T&E species. Under the alternatives proposed in this EA, the primary toxicant proposed for use by WS is DRC-1339 which would be used to remove feral domestic pigeons or European starlings in damage situations. A similar product to DRC-1339 is Starlicide® and can be used to control pigeons and starlings in specific areas of the United States. However, Starlicide® is not registered in the Commonwealth of Massachusetts and will not be discussed in any further detail. Another chemical method that could be used is Avitrol. Avitrol is classified as an avian distressing agent and is normally used to deter target bird species from using certain areas where they are causing conflicts. Other chemicals available for use include the tranquilizer Alpha-chloralose (for live-capturing pigeons), anthraquinone (Flight Control®), and methyl and di-methyl anthranilate (artificial grape flavoring, which also has bird repellent capabilities). See Appendix B for detailed description of these chemicals and their potential effects.

2.2.3 Effects on Human Health and Safety

Safety and efficacy of chemical control methods

Some individuals may have concerns that chemicals used for animal control should not be used because of potential adverse effects on people from being exposed to the chemicals directly or to the animals that have died as a result of the chemical use. Under the alternatives proposed in this EA, one of the toxicants proposed for use by WS is DRC-1339, which would be primarily used to remove European starlings and feral pigeons in damage situations. The EPA through FIFRA regulates DRC-1339 use. DRC-1339 use is also regulated by the Massachusetts Pesticide Bureau through the Massachusetts Pesticide Control Act as well as by WS Directives. The chemical bird repellents methyl anthranilate (Rejex-it®) or anthraquinone (Flight Control®) could be used to reduce feeding activity on airfields. Both methyl anthranilate and anthraquinone are non-lethal and work by causing a negative response to feeding in the treated area. Another chemical method that could be used is Avitrol, which is classified as a chemical frightening agent and is normally used to avert certain bird species from using certain problem areas. The avian tranquilizer Alpha-Chloralose could be used for live-capturing pigeons.

The use of registered chemical toxicants and repellants for bird damage management poses no risk to public health and safety. WS personnel who apply pesticides are certified restricted use pesticide applicators and apply pesticides according to label instructions. Certification is obtained after passing written tests administered by the Massachusetts Pesticide Bureau. See Appendix B for a detailed description of these chemicals and their potential effects.

Impacts on human safety of non-chemical BDM methods

Some people may be concerned that WS' use of firearms, traps, and pyrotechnic scaring devices could cause injuries to people. WS personnel occasionally use traps, rifles, air rifles and shotguns to remove birds that are causing damage. There is some potential fire hazard to agricultural sites and private property from pyrotechnic use.

Firearm use is a very sensitive public concern because of safety relating to the public and the threat of misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. In addition, WS employees residing in Massachusetts are required to obtain and maintain a Commonwealth of Massachusetts Class A Large Capacity License to Carry Firearms (M.G.L. c. 140, § 131).

Impacts on human health and safety from birds

The concern stated here is that the absence of adequate BDM would result in adverse effects on human health and safety, because bird damage would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased incidence of injuries, illness, or loss of human lives.

2.2.4 Impacts to Stakeholders, including Aesthetics

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception and today a large percentage of households have pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife.

There may be some concern that the proposed action or alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is a philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature and is dependent on what an observer regards as beautiful.

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

Many people, directly affected by problems and threats to public health or safety caused by birds, insist upon their removal from the property or public location when they cause damage. Some members of the public have an idealistic view and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to public health or safety. Others, directly affected by the problems caused by wildlife, strongly support removal. Individuals not directly affected by the harm or damage caused by

wildlife may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Those totally opposed to bird damage management want WS to teach tolerance for damage and threats to public health or safety, and that wildlife should never be killed. Some people would strongly oppose removal of birds regardless of the amount of damage. Some members of the public who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

The WS program in Massachusetts only conducts wildlife damage management at the request of the affected property owner or resource manager. If WS received requests from an individual or official for BDM, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions have been determined to be the most efficient, effective, practical and necessary. Management actions would be carried out in a caring, humane, and professional manner.

2.2.5 Humaneness and Animal Welfare Concerns of Methods Used

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if *". . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

Suffering is described as a *". . . highly unpleasant emotional response usually associated with pain and distress."* However, suffering *". . . can occur without pain . . . ,"* and *". . . pain can occur without suffering . . . "* (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for *". . . little or no suffering where death comes immediately . . . "* (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would *". . . probably be causes for pain in other animals . . . "* (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (CDFG 1991).

Pain and suffering, as it relates to WS damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *". . . neither medical nor veterinary curricula explicitly address suffering or its relief"* (CDFG 1991).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

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 BDM methods are used in situations where non-lethal damage management methods are not practical or effective.

Massachusetts WS personnel 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. Standard Operating Procedures used to maximize humaneness are listed in Chapter 3.

2.3 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.3.1 No Wildlife Damage Management at Taxpayer Expense; Wildlife Damage Management should be Fee Based

Funding for WS comes from a variety of sources in addition to federal appropriations. Massachusetts agency funds, county funds, municipal funds, private funds, and other federal agency funds are applied to the program under Cooperative Service Agreements. Federal, state, and local officials have decided that wildlife damage management should be conducted by appropriating funds. WS was established by Congress as the agency responsible for providing wildlife damage management to the people of the United States. Wildlife damage management is an appropriate sphere of activity for government programs, since aspects of wildlife damage management are a government responsibility and authorized and directed by law.

2.3.2 Bird Damage should be Managed by Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce bird damage for property owners or property owners could attempt to reduce their own damage problems. Some property owners would prefer to use a private nuisance wildlife control agent because the nuisance wildlife agent is located in closer proximity and thus could provide the service at less expense, or because they prefer to use a private business rather than a government agency. However, some property owners would prefer to contract with a government agency. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues and reduced administrative burden. Additionally, use of the pesticide DRC-1339 may be the most effective damage management method in some situations, either used alone or as part of an IWDM program. This avicide is registered only for use by WS and is not available to private nuisance wildlife control agents or property owners.

2.3.3 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 Commonwealth of Massachusetts would meet the NEPA requirements for site specificity. If in fact 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 commonwealth may provide a better analysis than multiple EAs covering smaller zones. In addition, the WS program in Massachusetts only conducts BDM in a very small area of the commonwealth where damage is occurring or likely to occur.

2.3.4 Effectiveness of Bird Damage Management Methods

A concern among members of the public is whether the methods of reducing bird damage will be effective in reducing or alleviating bird damage and conflicts. The effectiveness of each method or methods can be defined in terms of decreased potential for health risks, decreased human safety hazards, reduced property damage, and reduced agricultural damage. In terms of the effectiveness of a specific method or group of methods, this would not only be based on the specific method used, but more importantly upon the skills and abilities of the person implementing the control methods and the ability of that person to determine the appropriate course of action to take. It would be expected that the more experience a person has in addressing bird damage conflicts and implementing control methods the more likely they would be successful reducing damage to acceptable levels. WS technical assistance program provides information to assist persons in implementing their own BDM program, but at times the person receiving WS technical assistance may not have the skill or ability to implement the BDM methods recommended by WS. Therefore, it is more likely that a specific BDM method or group of methods would be effective in reducing damage to acceptable levels when WS professional bird damage assistance is provided than that would occur when the inexperienced person attempts to conduct BDM activities.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

The No Action alternative is a procedural NEPA requirement (40 CFR 1502), 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 the Council on Environmental Quality's (CEQ's) definition (CEQ 1981).

Alternatives analyzed in detail are:

- Alternative 1: Technical Assistance Only.
- Alternative 2: Integrated Bird Damage Management Program. (Proposed Action/No Action)
- Alternative 3: Non-lethal Bird Damage Management Only By WS
- Alternative 4: No federal WS Bird Damage Management.

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 Alternative 1: Technical Assistance Only

This alternative would not allow for WS operational BDM in Massachusetts. WS would only provide technical assistance and make recommendations when requested. Producers, property owners, agency personnel, or others could conduct BDM using any legal lethal or non-lethal method available to them. Currently, DRC-1339 and AC are only available for use by WS employees. Therefore, use of these chemicals by others would be illegal. Avitrol could also be used by commonwealth certified restricted-use pesticide applicators.

3.1.2 Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

Wildlife Services proposes to continue the current bird damage management program that responds to feral pigeon, European starling, and house (English) sparrow damage requests in the Commonwealth of Massachusetts. An IWDM approach would be implemented to reduce damage activities to property, agricultural resources, natural resources, livestock, and public health and safety. Damage management would be considered and may be conducted on public and private property in Massachusetts when the resource owner (property owner) or manager requests assistance. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion, habitat modification or harassment would be recommended and utilized to reduce damage. In other situations, birds would be removed as humanely as possible using: shooting, trapping, egg addling/destruction, nest destruction, and registered pesticides. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy. Bird damage management activities would be conducted in the commonwealth, when requested and funded, on private or public property, including airport facilities and adjacent or nearby properties, after an *Agreement for Control* or other comparable document has been completed. All management activities would comply with appropriate federal, commonwealth, and local laws.

3.1.3 Alternative 3: Non-lethal Bird Damage Management Only by WS

This alternative would require WS to use non-lethal methods only to resolve bird damage problems. Requests for information regarding lethal management approaches would be referred to MDFW, FWS, USDA Agricultural Extension Service offices, local animal control agencies or private businesses or organizations. Individuals might choose to implement WS non-lethal recommendations, implement lethal methods or other methods not recommended by WS, contract for WS direct control services, use contractual services of private businesses, or take no action. Persons receiving WS' non-lethal technical and direct control assistance could still resort to lethal methods that were available to them. DRC-1339 and AC are only available for use by WS employees. Avitrol could also be used by commonwealth certified restricted-use pesticide applicators.

3.1.4 Alternative 4: No Federal WS Bird Damage Management

This alternative would eliminate WS involvement in BDM in Massachusetts. WS would not provide direct operational or technical assistance and requesters of WS' assistance would have to conduct their own BDM without WS input. Requests for information would be referred to MDFW, FWS, USDA Agricultural Extension Service offices, local animal control agencies, or private businesses or organizations. Individuals might choose to conduct BDM themselves, use contractual services of private businesses, or take no action. DRC-1339 and AC are only available for use by WS employees. Therefore, use of these chemicals by private individuals would be illegal. Avitrol could also be used by commonwealth certified restricted-use pesticide applicators.

3.2 BDM STRATEGIES AND METHODOLOGIES AVAILABLE TO WS IN MASSACHUSETTS

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2 and 3 described above. Alternative 4 would terminate both WS technical assistance and operational BDM by WS. Appendix B is a more thorough description of the methods that could be used or recommended by WS.

3.2.1 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 the most cost-effective[2] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2 The IWDM Strategies Employed by WS

Technical Assistance Recommendations
"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. 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 use by non-WS entities. Technical assistance may be provided through 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.

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

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 bird damage problems.

Direct Damage Management Assistance (Direct Control)
Direct damage management assistance includes damage management activities that are directly 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 are provided for direct damage management by WS. The initial investigation defines the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary or if the problems are complex.

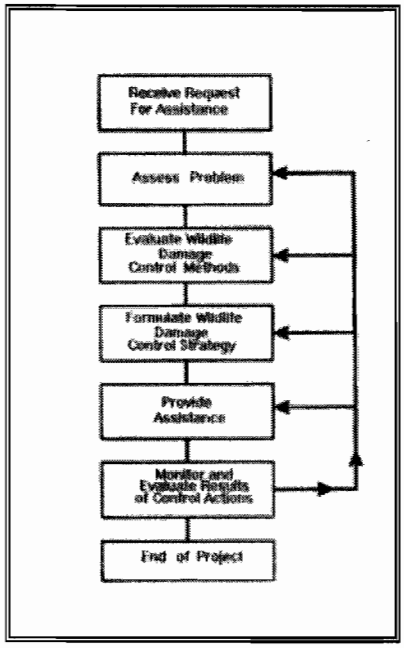
Educational Efforts
Education is an important element of WS program activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to producers, homeowners, commonwealth 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 Methyl Anthranilate, an avian repellent. In addition, NWRC is currently testing new experimental drugs that inhibit bird reproduction. NWRC scientists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

3.2.3 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model and described by Slate et al. (1992) (Figure 3-1). 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 effectively reducing damage. WS personnel assess the problem then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this 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 further management declines. 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 a written documented process, but a mental problem-solving process common to most, if not all, professions.

Figure 3-1
WS Decision Model



3.2.4 Bird Damage Management Methods Available for Use

3.2.4.1 Non-chemical, Non-lethal Methods

Agricultural producer and property owner practices consist primarily of non-lethal preventive methods such as cultural methods[3] and habitat modification.

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

- Exclusions, such as netting
- Propane exploders (to scare birds)
- Pyrotechnics (to scare birds)
- Distress calls and sound producing devices (to scare birds)
- Visual repellents and other scaring tactics
- Lasers (to scare birds)

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

Egg addling/oiling/destruction is the practice of destroying the embryo in the egg prior to hatching; physically breaking eggs; or directly removing eggs from a nest and destroying them.

Habitat/environmental modification intended to attract or repel certain bird species.

[3] Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife damage.

Live traps are various types of traps designed to capture birds alive. Some examples are clover traps, decoy traps, nest box traps, mist nets, cannon nets, etc. Captured target birds can then be euthanized or released on site, such as birds captured after accidentally entering a building.

Lure crops/alternate foods are crops planted or other food resources provided to mitigate the potential loss of higher value crops.

3.2.4.2 Chemical, Non-lethal Methods

Avitrol is a chemical frightening agent registered for use on feral pigeons, European starlings, and house (English) sparrows in various situations. This chemical works by causing distress behavior in the birds that consume treated baits from a mixture of treated and untreated bait. These distress calls then generally frighten the other birds from the site. In most cases, those birds that consume the treated bait will die (Johnson and Glahn 1994).

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

Tactile repellents reportedly deter birds from roosting, perching, or nesting on certain structural surfaces by creating a tacky or sticky surface that the birds avoid.

Methyl Anthranilate (MA) and **Di-methyl Anthranilate** (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species. It can be applied to turf or surface water or as a fog to repel birds from small areas. It may also become available for use as a livestock feed additive that has bird repellent value.

Other repellents: Other available bird repellents include anthraquinone (Avery et al. 1997) and particulate feed additives, such as charcoal particles (e.g., adhered to livestock feed).

3.2.4.3 Mechanical, Lethal Methods

Snap traps are considered quick-kill traps. They are modified rat traps that are used to remove individual birds causing damage to buildings.

Shooting is more effective as a dispersal technique than as a way to reduce bird numbers. The number that can be killed by shooting is generally very small in relation to the number involved in damage situations. Usually only a few dozen birds can be shot from individual flocks that can number anywhere from a few hundred to many thousands or hundreds of thousands of birds before the rest of the birds become gun shy. Shooting, however, can be helpful in some situations to supplement and reinforce other dispersal techniques. It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with rifles, shotguns, or pellet guns (rifles or pistols) is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible.

Cervical dislocation is approved by the American Veterinary Medical Association (AVMA) and may be used to euthanize birds which are captured in live traps.

3.2.4.4 Chemical, Lethal Methods

DRC-1339 is a slow-acting avicide for reducing damage from several species of birds, including European starlings and pigeons. DRC-1339 is highly toxic to sensitive species, but only slightly toxic to non-sensitive to birds, predatory birds and mammals. This chemical would be the primary lethal chemical method used for European starling damage management under the proposed program.

Carbon dioxide (CO_2) gas is an AVMA-approved euthanasia method which is sometimes used to euthanize certain birds that have been chemically immobilized or captured in live traps. Live birds are placed in a container or chamber into which CO_2 gas is released. The birds quickly expire after inhaling the gas.

3.2.5 Examples of Past Technical Assistance and Direct Control Projects in Massachusetts

The following examples serve as illustrations of WS BDM projects. They are intended to present realistic examples of past and on-going BDM projects only and are not a conclusive or all encompassing list of all BDM projects conducted by WS in Massachusetts.

- The Massachusetts WS program entered into a Cooperative Service Agreement in 2002 with CSX Transportation (CSXT) Worcester to manage a pigeon and starling problem under a rail bridge and surrounding areas. Concerns were high over damage to property and possible disease threats to the public as the bridge crosses a highly traveled road and is adjacent to a small restaurant. The open design of the bridge allows access to pigeons and starlings. CSXT was required to conduct a major clean up of the bridge to comply with city health concerns. WS has implemented an IWDM approach utilizing shooting, live trapping and CSXT installed electronic distress callers to help manage the pigeon and starling problem at this facility since 2002 to maintain low numbers of birds and associated damage.

- In 2003, the University of Massachusetts (UMass) Hadley Farm facility in Hadley, Massachusetts requested assistance from WS to reduce health and safety hazards, property damage, and maintenance problems caused by feral pigeons, European starlings and house sparrows. To resolve the problem an integrated approach utilizing live trapping (decoy trapping, mist nets and hand capture), air rifles, nest/egg destruction and avicides are performed as needed to manage the bird population. In 2006, the current agreement was expanded to include the Tilson Farm Recycling Facility where house sparrows and European starling are causing damage to ceiling material by creating holes and depositing excess nesting material and health and safety hazards to workers.

- The Massachusetts WS program entered into Cooperative Service Agreements with four Massachusetts dairy farms in 2004, seven in 2005 and five in 2006 to control European starling consuming and contaminating livestock feed and creating a health hazard for dairy cattle. WS used applications of DRC-1339 to alleviate these problems.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered, but not analyzed in detail. These were:

3.3.1 Lethal Bird Damage Management Only By WS

Under this alternative, WS would not conduct any non-lethal control of birds for BDM purposes in the commonwealth, but would only conduct lethal BDM. This alternative was eliminated from further analysis

because some bird damage problems can be resolved effectively through non-lethal means. Additionally, lethal methods may not always be available for use due to safety concerns or local ordinances prohibiting the use of some lethal methods, such as the discharge of firearms. For example, a number of damage problems involving the encroachment of injurious birds into buildings can be resolved by installing barriers or repairing of structural damage to the buildings, thus excluding the birds. Further, damage situations such as large flocks of injurious birds on/near airport runways could not be removed immediately by lethal means, while scaring them away through various harassment devices might resolve the threat to passenger safety at once.

3.3.2 Compensation for Bird Damage Losses

The compensation alternative would require the establishment of a system to reimburse persons impacted by bird damage. This alternative was eliminated from further analysis because no federal or commonwealth laws currently exist to authorize such action. Under such an alternative, WS would not provide any direct control or technical assistance. Aside from lack of legal authority, analysis of this alternative in the ADC Final EIS indicated that the concept has many drawbacks (USDA 1997):

- It would require larger expenditures of money and labor to investigate and validate all damage claims to determine and administer appropriate compensation.

- Compensation would most likely be less than full market value. Responding in a timely fashion to all requests to assess and confirm damage would be difficult and certain types of damage could not be conclusively verified. For example, proving conclusively in individual situations that birds were responsible for disease outbreaks would be impossible, even though they may actually have been responsible. Thus, a compensation program that requires verification would not meet its objective for mitigating such losses.

- Compensation would give little incentive to resource owners to limit damage through improved cultural, husbandry, or other practices and management strategies.

- Not all resource owners would rely completely on a compensation program and unregulated lethal control of these specific birds would most likely continue as permitted by commonwealth law.

- Compensation would not be practical for reducing threats to human health and safety.

3.3.3 Use of Bird-proof Feeders in Lieu of Lethal Control at Dairies and Cattle Feeding Facilities

Bird-proof feeders were proposed by Animal Protection of New Mexico (APNM), Inc. as a method for excluding birds at dairies and cattle feeding facilities in that State. This method would involve the installation of 1/8" thick steel panel feed troughs, covered by parallel 4-6 inch spaced steel cables or wires running from the outer top edge of the trough up at a 30-45 degree angle to the top of the head chutes that cattle use to access the feed. Vertical canvas strips would be hung from the cables. The feeder was reportedly designed for use with horses. A copy of a diagram of this system was sent to Mr. Jim Glahn, Bird Control Research Biologist at the WS-National Wildlife Research Center (NWRC), who has nearly 12 years of experience researching problems caused by European starlings at livestock feeding operations. He found the following:

- A major flaw in the design is the spacing of the cables at 4-6" which would allow European starlings to drop through. Reducing the spacing to 2" as recommended by Johnson and Glahn (1994) would likely interfere with the delivery of feed to the troughs. Interference would occur because the feed mixture currently used by most dairies is a mixture of chopped alfalfa hay and corn silage with a grain component. The alfalfa/corn silage portion would likely hang up on the

cable or wire strands of the troughs and much would fall outside the troughs, with increased feed waste a result (Twedt and Glahn 1982).

- The spacing of the canvas strips is not specified, and canvas would deteriorate quickly from cattle licking and weather (Twedt and Glahn 1982).

Mr. Glahn expressed the opinion, based on Twedt and Glahn (1982) and Feare (1984), that exclusion methods to reduce starling depredations at livestock feeding operations are usually the least cost-effective solution. Despite the above concerns about the bird-proof feeder system recommended by APNM, Inc., similar types of systems could be recommended by WS under the current program should any become available that are effective, practical, and economically feasible for producers to implement.

3.4 STANDARD OPERATING PROCEDURES FOR BIRD DAMAGE MANAGEMENT TECHNIQUES

3.4.1 Standard Operating Procedures (SOPs)

The current WS program, nationwide and in Massachusetts, uses SOPs and these are discussed in detail in Chapter 5 of the ADC Final EIS (USDA 1997). Some key SOPs pertinent to the proposed action and alternatives of this EA include:

- The WS Decision Model thought process which is used to identify effective wildlife damage management strategies and their effects.

- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid effects to T&E species.

- EPA-approved label directions are followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse effects to the environment when chemicals are used in accordance with label directions.

- All WS employee in the commonwealth using restricted chemicals are trained and certified by, or operate under the direct supervision of, program personnel or others who are experts in the safe and effective use of chemical BDM materials.

- The presence of non-target species is monitored before using DRC-1339 to control European starlings and pigeons at feedlots to reduce the risk of mortality of non-target species populations.

- Research is being conducted to improve BDM methods and strategies so as to increase selectivity for target species, to develop effective non-lethal control methods, and to evaluate non-target hazards and environmental effects.

- Management actions would be directed toward localized populations or groups of target species and/or individual offending members of those species. Generalized population suppression across the commonwealth, or even across major portions of the commonwealth, would not be conducted.

- WS uses BDM 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, Appendix P). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.

- To facilitate and address potential public inquiries, WS will contact both the MDFG; MDFW and the MDAR; PB before conducting outdoor use of toxicants.

3.4.2 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 Non-target Species Populations, including T&E Species

- WS personnel are trained and experienced to select the most appropriate method for taking problem animals and excluding non-target take.
- Observations of birds feeding at feedlots, dairies, or European starling staging areas or observations of birds that are associated with feral domestic pigeon concentrations are made to determine if non-target or T&E species would be at risk from BDM activities.
- WS has consulted with the USFWS regarding potential effects of control methods on T&E species and abides by reasonable and prudent alternatives (RPAs) and/or reasonable and prudent measures (RPMs) established as a result of that consultation. For the full context of the Biological Opinion, see the ADC Final EIS, Appendix F (USDA 1997).
- WS uses chemical methods for BDM that have undergone rigorous research to prove their safety and lack of serious effects on non-target animals and the environment.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. This 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 commonwealth are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, 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 T&E 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 BDM actions are not undertakings that could adversely affect historic resources (See Section 1.1.5).

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

As described in section 2.1, in those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, however, certain aspects of the human environment may actually benefit more from WS's involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity; WS management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

4.1.1 Effects on Target Bird Species Populations

4.1.1.1 Alternative 1: Technical Assistance Only

Under this alternative, WS would have no impact on house sparrow, feral pigeon, and European starling populations in the commonwealth because the program would not provide any operational BDM activities. The program would be limited to providing advice only. Private efforts to reduce or prevent bird damage and perceived disease transmission risks could increase, which could result in similar or even greater effects on those populations than the Proposed Action. However, for the same reasons shown below in the population effects analysis in section 4.1.1.2, it is unlikely that target bird populations would be adversely impacted by implementation of this alternative. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of other chemicals which could lead to real but unknown effects on target bird populations (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). DRC-1339

and the immobilizing drug AC are currently only available for use by WS employees and would not be available for use under this alternative.

4.1.1.2 Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

Analysis of this issue is limited to those species killed during WS BDM. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997). Magnitude is described in USDA (1997) 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. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*.

Table 4-1 Number of feral pigeons, European starlings and house sparrows lethally removed by USDA APHIS Wildlife Services in Massachusetts during Federal Fiscal Years 1996 to 2004.

Fiscal Year	Number of Feral Pigeons	Number of European Starling	Number of House Sparrow
1996	20	0	0
1997	7	0	0
1998	130	0	0
1999	20	409	0
2000	20	409	0
2001	168	0	12
2002	256	314	8
2003	110	52	0
2004	8	2513	0
Total	739	3697	20

Breeding Bird Surveys. Bird populations can be monitored by using data from the Breeding Bird Surveys (BBS). The BBS is a large-scale inventory of North American birds coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center (Sauer et al 2003). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The BBS was started in 1966, and routes are surveyed in June by experienced birders. The stated primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, as a result of variable annual local habitat and climatic conditions. Trends can be determined using different population equations, and statistically tested to determine if a trend is significant. The significance of a trend's "change" is reflected in the calculated P-value (probability) for that species.

The BBS data is best used to monitor population trends. However, the average number of birds per route (relative abundance) can be used to theoretically estimate the population size (relative

abundance/10 mi^2 x 10,554.57 mi^2 (total land/water area in Massachusetts)). To use these population estimates the following assumptions would need to be accepted.

1. All birds within a quarter mile of the observer are seen at all stops on a BBS route; this assumption is faulty because observers often cannot see a quarter mile in radius at all stops due to obstructions such as hills, trees, and brush and because some bird species can be very elusive. Therefore, the number of birds seen per route would provide a conservative estimate of the population.
2. The chosen survey routes are totally random and are fully representative of available habitats. When BBS routes are established, survey rules allow the observers to make stops for surveys based on better quality habitat or convenient parking areas, even though the survey sites are supposed to be spaced a half-mile apart. Therefore, if survey areas had stops with excellent food availability, the count survey could be biased. This would tend to overestimate the population. However, if these sites were not on a route at all, the population could be underestimated.
3. Birds are equally distributed throughout the survey area and routes were randomly selected. Routes are randomly picked throughout the state, but are placed on the nearest available road. Therefore, the starting point is picked for accessibility by vehicle. However a variety of habitat types are typically covered since most BBS routes are selected because they are "off the beaten path" to allow observers to hear birds without interruption from vehicular noise.

Christmas Bird Counts. The National Audubon Society (NAS) conducts nationwide bird surveys in December to early January (the NAS Christmas Counts). The Christmas Bird Counts (CBC) reflect the number of birds frequenting the state during the winter months. The CBC data does not provide a population estimate, but can be used as an indicator of trends in the population. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (National Audubon Society 2002).

European Starling Population Effects

Colonization of North America by the European Starling began on March 6, 1890 when a Mr. Eugene Scheifflin, a member of the Acclimatization Society, released 80 starlings into New York's Central Park. The birds thrived and exploited their new habitat. By 1918, the advance line of migrant juveniles extended from Ohio to Alabama; by 1926 from Illinois to Texas; by 1941 from Idaho to New Mexico; and by 1946 to California and Canadian coasts (Miller 1975). In just 50 short years the starling had colonized the United States and expanded into Canada and Mexico and 80 years after the initial introduction had become one of the most common birds in North America (Feare 1984).

Precise counts of starling populations do not exist but one estimate placed the nationwide starling population at an estimated at 140 million birds (Johnson and Glahn 1994). Natural mortality in starling populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997). Therefore the estimated natural mortality of starlings in the eastern U.S should be between 70 and 91 million birds annually. Based upon an anticipated increase in requests for services, WS' lethal management of starlings in Massachusetts would be expected to be no more than approximately 20,000 starlings in any one year under the Proposed Action.

According to Breeding Bird Survey trend data provided by Sauer et al. (2005) starling populations have decreased at an annual rate of -4.1%, -0.9% and -0.6% from 1966-2004 in Massachusetts, the Eastern Region and the United States, respectively. With a relative abundance of 64.19, a total Massachusetts summer starling population could be estimated at approximately 60,000 birds. Massachusetts Christmas Bird Count data from 1966-2004 shows a declining population trend for

wintering populations of starlings throughout the commonwealth (National Audubon Society 2005).

Starlings are non-indigenous and often have negative impacts on the environment and compete with native birds. Therefore, starlings are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in starling populations in North America, even to the extent of complete eradication, could be considered a beneficial impact to native bird species. Neither federal nor commonwealth laws protect this species except that under Massachusetts law, a farmer is required to apply for and receive a permit from the commissioner of fisheries, wildlife and environmental law enforcement to trap and kill birds (M.G.L. Part 1, Title XIX, Ch. 131, Sec. 38). Any BDM involving lethal control actions by WS for this species would be restricted to isolated, individual sites, or communities. In those cases where starlings are causing damage or are a nuisance, complete removal of the local population could be achieved. This would be considered to be a beneficial impact on the human environment since the affected property owner or administrator would request it. Although regional population impacts would be minor, even if significant regional or nationwide reductions could be achieved, this would not be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, some individuals who experience aesthetic enjoyment of starlings may consider major population reduction in some localities a negative impact.

Based on the above information and WS limited lethal take of starlings in Massachusetts, WS should have minimal effects on local, statewide, regional or continental starling populations.

Feral Domestic Pigeon Population Effects

Feral domestic pigeons, or rock doves, are a non-indigenous species that were first introduced into the United States by European settlers as a domestic bird to be used for sport, carrying messages, and as a source of food (USFWS 1981). Many of these birds escaped and eventually formed the feral pigeon populations that are now found throughout the United States, southern Canada, and Mexico (Williams and Corrigan 1994). However, because pigeons are an introduced rather than a native species, they are not protected by federal law or Massachusetts law.

Pigeons are highly dependent on humans to provide them with food and sites for roosting, loafing, and nesting (Williams and Corrigan 1994). Thus, they are commonly found around city buildings, bridges, parks, farm yards, grain elevators, feed mills, and other manmade structures (Williams and Corrigan 1994). Additionally, although pigeons are primarily grain and seed eaters, they will readily feed on garbage, livestock manure, spilled grains, insects, and any other available bits of food (Williams and Corrigan 1994).

According to Breeding Bird Survey trend data provided by Sauer et al. (2005) from 1966-2004 rock dove populations have increased at an annual rate of 0.8% in Massachusetts and have decreased at an annual rate of -0.1% and -0.4% in the Eastern Region and the United States, respectively. With a relative abundance of 6.87, a total Massachusetts summer rock dove population could be estimated at approximately 6,300 birds. Massachusetts Christmas Bird Count data from 1966-2004 shows an increasing population trend for wintering populations of rock doves throughout the commonwealth (National Audubon Society 2005).

As with starling, neither federal nor Massachusetts laws protect this species. Rock doves are non-indigenous and often have negative impacts on the environment. Therefore, these birds are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in rock dove populations could be considered a beneficial impact to the environment. Any BDM involving lethal control actions by WS for this species would be restricted to isolated, individual sites, or communities. In those

cases where feral domestic pigeons are causing damage or are a nuisance, complete removal of the local population could be achieved. This would be considered to be a beneficial impact on the human environment since the affected property owner or administrator would request it. Although regional population impacts would be minor, even if significant regional or nationwide reductions could be achieved, this would not be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, some individuals who experience aesthetic enjoyment of pigeons may consider major population reduction in some localities a negative impact.

Based upon an anticipated increase in requests for services, WS' lethal management of pigeons in Massachusetts would be expected to be no more than approximately 1,000 pigeons in any one year under the Proposed Action. Based on the above information and WS limited lethal take of pigeons in Massachusetts, WS should have minimal effects on local, statewide, regional or continental pigeon populations.

House sparrow Population Effects

House sparrows were introduced to North America from England in 1850 and have spread throughout the continent (Fitzwater 1994). House sparrows are found in nearly every habitat except dense forest, alpine, and desert environments. They prefer human-altered habitats, and are abundant on farms and in cities and suburbs (Robbins 1973).

According to Breeding Bird Survey trend data provided by Sauer et al. (2005) house sparrow populations have decreased at an annual rate of -1.1%, -2.8% and -2.6% from 1966-2004 in Massachusetts, the Eastern Region and the United States, respectively. With a relative abundance of 27.09, a total Massachusetts summer house sparrow population could be estimated at approximately 25,000 birds. Massachusetts Christmas Bird Count data from 1966-2004 shows an increasing population trend for wintering populations of house sparrows throughout the commonwealth (National Audubon Society 2005).

The change in farming practices may have been a factor for their recent population decrease. The considerable decline in small farms and associated disappearance of a multitude of small feed lots, stables and barns, may have reduced house sparrow populations, as these sites were a primary source of food in the early part of the 20th century. Ehrlich et al. (1988) suggested that house sparrow population declines might be linked to the dramatic decrease during the 20th century in the presence of horses as transport animals. Grain rich horse droppings were apparently a major food source for this species.

House sparrows are non-indigenous and often have negative impacts on and competition with native birds. Therefore, house sparrows are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in house sparrow populations in North America, even to the extent of complete eradication, could be considered a beneficial impact to native bird species. Neither federal nor Massachusetts laws protect this species. Any BDM involving lethal control actions by WS for this species would be restricted to isolated, individual sites, or communities. In those cases where sparrows are causing damage or are a nuisance, complete removal of the local population could be achieved. This would be considered to be a beneficial impact on the human environment since the affected property owner or administrator would request it. Although regional population impacts would be minor, even if significant regional or nationwide reductions could be achieved, this would not be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, some individuals who experience aesthetic enjoyment of house sparrows may consider major population reduction in some localities a negative impact.

Based upon an anticipated increase in requests for services, WS' lethal management of house sparrows in Massachusetts would be expected to be no more than approximately 1,000 house sparrows in any one year under the Proposed Action. Based on the above information and WS limited lethal take of house sparrows in Massachusetts, WS should have minimal effects on local, statewide, regional or continental house sparrow populations.

4.1.1.3 Alternative 3: Non-lethal Bird Damage Management Only by WS

Under this alternative, WS would not take any target species because no lethal methods would be used. Although WS lethal take of house sparrows, feral domestic pigeons, and European starlings would not occur, it is likely that without WS conducting some level of lethal BDM activities for these species; private BDM efforts would increase, leading to potentially similar or even greater effects on target species populations than those of the current program alternative. For the same reasons shown in the population effects analysis in section 4.1.1.2, however, it is unlikely that target bird populations would be adversely impacted by implementation of this alternative. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of other chemicals which could lead to real but unknown effects on target bird populations (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). Effects and hypothetical risks of illegal chemical toxicant use under this alternative would probably be about the same as those under Alternative 1, but less than Alternative 4.

4.1.1.4 Alternative 4: No Federal WS Bird Damage Management

Under this alternative, WS would have no impact on house sparrow, feral domestic pigeon, and European starling populations in the commonwealth. WS would conduct no bird damage management activities under this alternative. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Private efforts to reduce or prevent depredations could increase which could result in effects on target species populations to an unknown degree. Effects on target species under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by private persons. For the same reasons shown in the population effects analysis in section 4.1.1.2, it is unlikely that target bird populations would be adversely impacted by implementation of this alternative. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of other chemicals which could lead to real but unknown effects on target bird populations (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003).

4.1.2 Effects on Other Wildlife Species, including T&E Species

4.1.2.1 Alternative 1: Technical Assistance Only

Alternative 1 would not allow any WS direct operational BDM in Massachusetts. Non-target or T&E species would not be impacted by WS activities from this alternative. Technical assistance or self-help information would be provided at the request of producers and others. Although technical support might lead to more selective use of control methods by private parties 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, leading to greater take of non-target wildlife than under the proposed action. It is hypothetically possible that, similar to Alternative 3 and 4, frustration caused by the inability to reduce damage and associated losses could lead to illegal use of chemical toxicants which could lead to unknown effects on local non-target species populations, including some T&E species (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). Hazards to raptors, including bald eagles, could therefore be greater under

this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

4.1.2.2 Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

Adverse Effects on Non-target (non-T&E) Species Direct impacts on non-target species occur when WS program personnel inadvertently kill, injure, or harass animals that are not target species. In general, these impacts result from the use of methods that are not completely selective for target species. Non-target migratory bird species and other non-target wildlife species are usually not affected by WS's management methods, except for the occasional scaring from harassment devices. In these cases, migratory birds and other affected non-target wildlife may temporarily leave the immediate vicinity of scaring, but would most likely return after conclusion of the action.

WS personnel are experienced and trained in wildlife identification, and to select the most appropriate methods for taking targeted animals and excluding non-target species. Shooting is virtually 100% selective for the target species; therefore no adverse impacts are anticipated from use of this method. Any non-target species captured in a live trap would be released unharmed on site. No adverse impacts from the use of registered pesticides and repellents are anticipated. Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used 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).

Although it is possible that some non-target birds may be unknowingly killed by use of DRC-1339 for starling or pigeon control, the method of application is designed to minimize or eliminate that risk. For example, DRC-1339 treated bait is only applied after a period of pre-baiting with untreated bait material and when non-target birds are not observed coming to feed at the site. The primary bait material for use with DRC-1339 for control of starlings in Massachusetts is CU Bird Carrier.

While every precaution is taken to safeguard against taking non-target birds, changes in local flight patterns and other unanticipated events can result in the incidental take of unintended species. These occurrences are rare and should not affect the overall populations of any species under the current program. WS take of non-target species during BDM activities is expected to be extremely low to non-existent.

Beneficial Effects on Non-target Species Interspecific nest competition has been well documented in European starlings. Miller (1975) and Barnes (1991) reported European starlings were responsible for a severe depletion of the eastern bluebird (*Sialis sialis*) population due to nest competition. Nest competition by European starlings has also been known to adversely impact American kestrels (sparrow hawks) (Von Jarchow 1943, Nickell 1967, and Wilmer 1987), red-bellied woodpeckers (*Centurus carolinus*), Gila woodpeckers (*Centurus uropygialis*) (Kerpez and Smith 1990 and Ingold 1994), and wood ducks (*Aix sponsa*) (Shake 1967, McGilvery and Uhler 971, Heusmann et. al. 1977, and Grabill 1977). Weitzel (1988) reported nine native species of birds in Nevada had been displaced by starling nest competition, and Mason et al. (1972) reported European starlings evicting bats from nest holes. Control operations as proposed in this alternative could reduce starling populations on a local level. Reduction in nest site competition would be a beneficial impact on the species listed above.

T&E Species Effects 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.

Federally Listed Species WS has obtained and reviewed the list of federally listed T&E species for the Commonwealth of Massachusetts (see Appendix C). WS has consulted with the USFWS under Section 7 of the ESA concerning potential impacts of BDM methods on T&E species and has obtained a Biological Opinion. For the full context of the Biological Opinion, see Appendix F of the ADC Final EIS (USDA 1997, Appendix F).

WS BDM activities in Massachusetts would not adversely affect the gray wolf, Eastern puma, bald eagle, piping plover, Eskimo curlew, green sea turtle, hawksbill sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, shortnose sturgeon, roseate tern or small whorled pogonia. This determination is based on the conclusions made by the USFWS during their 1992 programmatic consultation of WS activities and subsequent Biological Opinion (USDA 1997, Appendix F). In addition, WS has determined that the use of BDM methods will have no effect on those T&E species not included in the 1992 BO or their critical habitats. Furthermore, WS has determined that the use of AC and lasers will have no effect on any listed T&E species. Therefore, WS has determined that the proposed WS BDM program will not likely adversely affect any federally listed T&E species. The USFWS concurs with the WS determination (A. Tur, USFWS; 20 Oct. 2006).

Additionally, as stated in the 1992 BO, the USFWS has determined that the only BDM method that might adversely affect the bald eagle was above ground use of strychnine treated bait for "nuisance birds." Strychnine is no longer registered for above ground use and would not be used by WS for BDM in the commonwealth. DRC-1339 poses no primary hazard to eagles because eagles do not eat grain or other bait materials on which this chemical might be applied during BDM, and further, because eagles are highly resistant to DRC-1339 - up to 100 mg doses were force fed to captive golden eagles with no mortality or adverse effects noted other than regurgitation and head-shaking (Larsen and Dietrich 1970). Secondary hazards to raptors from DRC-1339 and Avitrol are low to nonexistent (see Appendix B). Therefore, WS BDM in Massachusetts is not likely to adversely affect bald eagles.

Commonwealth Listed Species. WS has obtained and reviewed the list of Massachusetts listed T&E species and species of special concern and has determined that the proposed WS BDM program will not adversely affect any of the species listed in Massachusetts (see Appendix D).

Mitigation measures and SOPs to avoid T&E effects are described in Chapter 3 (Subsection 3.4.2) and are also described in Subsection 4.1.2 of this chapter. The inherent safety features of DRC-1339 and Avitrol use that preclude or minimize hazards to mammals and plants are described in Appendix B and in a formal risk assessment in the ADC Final EIS (USDA 1997, Appendix P). Those measures and characteristics should assure there would be no jeopardy to T&E species or adverse effects on mammalian or non-T&E bird scavengers from the proposed action.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS management activities may have less of an impact on non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

4.1.2.3 Alternative 3: Non-lethal Bird Damage Management Only by WS

Under this alternative, WS take of non-target animals would hypothetically be less than that of the proposed action because no lethal control actions would be taken by WS. However, if bird damage problems were not effectively resolved by non-lethal control methods, members of the

public may resort to other means of lethal control such as the use of shooting or even illegal use of chemical toxicants (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than 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 use of chemical toxicants which could lead to unknown effects on local non-target species populations, including T&E species (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). Hazards to raptors, including bald eagles and falcons, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

4.1.2.4 Alternative 4: No Federal WS Bird Damage Management

Alternative 4 would not allow any WS BDM in the commonwealth. There would be no impact on non-target or T&E species by WS BDM activities from this alternative. Management actions taken by non-federal entities would be considered the *environmental status quo.*

Private efforts to reduce or prevent depredations could increase which could result in less experienced persons implementing control methods and could 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 use of chemical toxicants which could impact local non-target species populations, including some T&E species (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). Hazards to raptors, including bald eagles, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals.

4.1.3 Effects on Human Health and Safety

4.1.3.1 Effects of Chemical BDM Methods on Human Health

Alternative 1: Technical Assistance Only

Alternative 1 would not allow any direct operational BDM assistance by WS in the commonwealth. Concerns about human health risks from WS' use of chemical BDM methods would be alleviated because no such use would occur. DRC-1339 and AC are only registered for use by WS personnel and would not be available for use by private individuals. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and leading to a greater risk than the Proposed Action alternative. However, because some of these private parties would be receiving advice and instruction from WS, concerns about human health risks from chemical BDM methods use should be less than under Alternative 4. Commercial pest control services would be able to use Avitrol and such use would likely occur to a greater extent in the absence of WS' assistance. Use of Avitrol in accordance with label requirements should preclude any hazard to members of the public. Hazards to humans and pets could be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the Proposed Action alternative.

Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

DRC-1339 is the primary lethal chemical BDM method that would be used under the proposed program alternative. Some concern has been generated by a few members of the public that unknown, but significant, risks to human health may exist from DRC-1339 used for BDM.

This chemical is one of the most extensively researched and evaluated pesticides ever developed. Over 30 years of studies have demonstrated the safety and efficacy of this compound. Appendix B provides more detailed information on this chemical and its use in BDM. Factors that virtually eliminate any risk of public health problems from use of this chemical are:

- Its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops.

- DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means that treated bait material generally is nearly 100% broken down within a week.

- It is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people.

- Application rates are extremely low (less than 0.1 lb. of active ingredient per acre) (EPA 1995).

- A human would need to ingest the internal organs of birds found dead from DRC-1339 to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur.

- The EPA has concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995). Notwithstanding, the extremely controlled and limited circumstances in which DRC-1339 is used would prevent any exposure of the public to this chemical.

The above analysis indicates that human health risks from DRC-1339 use would be virtually nonexistent under any alternative.

Avitrol (4-Aminopyridine) is another chemical method that might be used by WS in BDM. Appendix B provides more detailed information on this chemical.

Avitrol is available as a prepared grain bait mixture or as a powder. It is formulated in such a way that ratios of treated baits to untreated baits are no greater than 1:9. Factors that virtually eliminate health risks to members of the public from use of this product as an avicide are:

- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (ETOXNET 1996). Therefore, little of the chemical remains in killed birds to present a hazard to humans.

- A human would need to ingest the internal organs of birds found dead from Avitrol ingestion to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur. Furthermore, secondary

hazard studies with mammals and birds have shown that there is virtually no hazard of secondary poisoning.

- Although Avitrol has not been specifically tested as a cancer-causing agent, the chemical was found not to be mutagenic in bacterial organisms (EPA 1997). The best scientific information currently available does not indicate it is or is not a carcinogen. Notwithstanding, the extremely controlled and limited circumstances in which Avitrol is used would prevent exposure of members of the public to this chemical.

The above analysis indicates that human health risks from Avitrol use would be virtually nonexistent under any alternative.

Other BDM Chemicals. Other non-lethal BDM chemicals 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 which is presently marketed as Flight Control®; and the immobilizing drug AC. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by the EPA or Food and Drug Administration (FDA). Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and commonwealth 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 human health.

Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used 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).

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Alternative 3: Non-lethal Bird Damage Management Only by WS

Alternative 3 would not allow for any lethal methods use by WS in the commonwealth. WS could only implement non-lethal methods such as harassment and exclusion devices and materials. Non-lethal methods could, however, include Avitrol, the immobilizing drug AC, and chemical repellents such as anthraquinone and methyl anthranilate which, although already considered safe for human consumption because it is artificial grape flavoring, which might nonetheless raise concerns about human health risks. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by the EPA or FDA. Any operational use of chemical repellents and immobilizing drugs would be in accordance with labeling requirements under FIFRA and commonwealth pesticide laws and regulations and FDA rules 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 human health.

Excessive cost or ineffectiveness of non-lethal techniques could result in some entities rejecting WS' assistance and resorting to other means of BDM. Such means could include illegal pesticide

uses. Hazards to humans and pets could be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the proposed alternative.

Alternative 4: No Federal WS Bird Damage Management

Alternative 4 would not allow any WS BDM in the commonwealth. WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo.*

Concerns about human health risks from WS' use of chemical BDM methods would be alleviated because no such use would occur. DRC- 1339 and AC are only registered for use by WS personnel and would not be available for use by private individuals. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and potentially leading to greater risk to human health and safety than the proposed action alternative. Commercial pest control services would be able to use Avitrol and such use would likely occur to a greater extent in the absence of WS' assistance. Use of in accordance with label requirements should preclude any hazard to members of the public. However, hazards to humans and pets could be greater under this alternative if other chemicals that are less selective or that cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets (USDA 1997, White et al. 1989, USFWS 2001, USFDA 2003). Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the current program alternative.

4.1.3.2 Effects of Non-chemical BDM Methods on Human Safety

Alternative 1: Technical Assistance Only

Under this alternative, WS would not engage in direct operational use of any non-chemical BDM methods. Risks to human safety from WS' use of firearms, traps and pyrotechnics would hypothetically be lower than the Proposed Action alternative, since WS would not be conducting direct control activities. Hazards to humans and property could be greater under this alternative if personnel conducting BDM activities using non-chemical methods are poorly or improperly trained.

Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

Non-chemical BDM methods that might raise safety concerns include shooting with firearms, traps and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The Massachusetts WS program has had no accidents involving the use of firearms, traps or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS' operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse affects on human safety from WS' use of these methods is expected.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo.* In some situations, dependent upon the skills and abilities of the

non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Alternative 3: Non-lethal Bird Damage Management Only by WS

Under this alternative, non-chemical BDM methods that might raise safety concerns include shooting with firearms when used as a harassment technique, traps and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The Massachusetts WS program has had no accidents involving the use of firearms, traps or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS' operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse affects on human safety from WS' use of these methods is expected.

Alternative 4: No Federal WS Bird Damage Management

Alternative 4 would not allow any WS BDM in the commonwealth. WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo.*

Concerns about human health risks from WS' use of non-chemical BDM methods would be alleviated because no such use would occur. The use of firearms, traps or pyrotechnics by WS would not occur in BDM activities in the commonwealth. However, private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and potentially leading to greater risk to human health and safety than the proposed action alternative. Commercial pest control services would be able to use pyrotechnics, traps or firearms in BDM programs and this activity would likely occur to a greater extent in the absence of WS' assistance. Hazards to humans and property could be greater under this alternative if personnel conducting BDM activities using non-chemical methods are poorly or improperly trained.

4.1.3.3 Effects on Human Health and Safety from Birds

Alternative 1: Technical Assistance Only

With WS technical assistance but no direct management, entities requesting BDM assistance for human health concerns would either take no action, which means the risk of human health problems would likely continue or increase in each situation as bird numbers are maintained or increased; or implement WS recommendations for non-lethal and lethal control methods. Potential impacts would be variable. Individuals or entities that implement management actions may or may not have the experience necessary to efficiently and effectively conduct an effective BDM program. In some situations the implementation of non-lethal controls such as electric or porcupine wires, netting barriers, and harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other urban roosting sites not previously affected. This potential risk would be less likely under this alternative than Alternative 4 when people requesting assistance receive and accept WS technical assistance recommendations.

Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

People are concerned with potential injury, illness, and loss of human life as a result of the potential impacts of injurious bird species. An Integrated BDM strategy, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing this risk. All BDM methods could possibly be implemented and recommended by WS.

An IWDM approach reduces damage or threats to public health or safety for people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. As discussed in Chapter 1, birds are a threat to aviation safety and can also carry or transmit diseases to humans. In most cases, it is difficult to conclusively prove that birds were responsible for transmission of individual human cases or outbreaks of bird-borne diseases. Nonetheless, certain requesters of BDM service may consider this risk to be unacceptable and may request such service primarily for that reason. In such cases, BDM, either by lethal or non-lethal means, would, if successful, reduce the risk of bird-borne disease transmission at the site for which BDM is requested.

In some situations the implementation of non-lethal controls such as electric or porcupine wires, netting barriers, and harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other urban roosting sites not previously affected. In such cases, lethal removal of the birds may actually be the best alternative from the standpoint of overall human health concerns in the local area. If WS is providing direct operational assistance in relocating birds, coordination with local authorities may be conducted to assure they do not reestablish in other undesirable locations.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Alternative 3: Non-lethal Bird Damage Management Only by WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods in providing assistance with bird damage problems. The success or failure of the use of non-lethal methods can be quite variable. In some situations the implementation of non-lethal controls such as electric or porcupine wires, netting barriers, and harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other urban roosting sites not previously affected. Some requesting entities, such as city government officials, would reject WS assistance for this reason and would likely seek to achieve bird damage management by other means. However, if WS is providing direct operational assistance in relocating birds, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

Alternative 4: No Federal WS Bird Damage Management

WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo.*

With no WS assistance, cooperators would be responsible for developing and implementing their own BDM program. Cooperator efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods, therefore leading to a greater potential of not reducing bird hazards, than under the proposed action. In some situations the implementation of non-lethal controls such as electric or porcupine wires, netting barriers, and harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other urban roosting sites not previously affected. Under this alternative, human health problems could increase if private individuals were unable to find and implement effective means of controlling birds that cause damage problems.

4.1.4 Impacts to Stakeholders, including Aesthetics

4.1.4.1 Effects on Human Affectionate Bonds with Individual Birds and on Aesthetic Values of Wild Bird Species

Alternative 1: Technical Assistance Only

Under this alternative, WS would not conduct any direct operational BDM, but would still provide technical assistance or self-help advice to persons requesting assistance with bird damage. Additionally, WS would not conduct any harassment of birds that were causing damage. Those who oppose direct operational 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 wild birds would most likely not be affected by WS' activities under this alternative because the individual birds would not be killed by WS. However, other private entities would likely conduct BDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the Proposed Action alternative.

Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

Those who routinely view or feed individual birds, such as feral domestic pigeons, would likely be disturbed by removal of such birds under the current program. WS is aware of such concerns and takes these concerns into consideration to mitigate effects. WS may be able to mitigate such concerns by leaving certain birds that have been identified by interested individuals.

Some members of the public have expressed opposition to the killing of any birds during BDM activities. Under this Proposed Action alternative, some lethal control of birds would occur and these persons would be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular birds that would be killed by WS' lethal control activities. Lethal control actions would generally be restricted to local sites and to small, unsubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would, therefore, continue to remain available for viewing by persons with that interest.

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

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Alternative 3: Non-lethal Bird Damage Management Only by WS

Under this alternative, WS would not conduct any lethal BDM, but may conduct harassment of birds that are causing damage. Some people who oppose lethal control of wildlife by the government, but are tolerant of government involvement in non-lethal wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would most likely not be affected by the death of individual birds under this alternative, but might oppose dispersal or translocation of certain birds. WS may be able to

mitigate such concerns by leaving certain birds that have been identified by interested individuals. In addition, the abundant populations of target bird species in urban environments would enable people to continue to view them and to establish affectionate bonds with individual wild birds. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct BDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the proposed action alternative.

Alternative 4: No Federal WS Bird Damage Management

Under this alternative, WS would not conduct any lethal removal of birds nor would the program conduct any harassment of birds. WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo.*

Those in opposition of any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would not be affected by WS' activities under this alternative. However, other private entities would likely conduct BDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the proposed action alternative.

4.1.4.2 Effects on Aesthetic Values of Property Damaged by Birds

Alternative 1: Technical Assistance Only

Under this alternative, the lack of operational assistance in reducing bird problems could result in an increase of potential adverse affects on aesthetic values of affected properties. However, potential adverse affects would likely be less than as those under Alternative 4, since WS would be providing technical assistance.

Relocation of nuisance roosting or nesting populations of birds (e.g., starling roosts) through harassment, barriers, or habitat alteration can sometimes result in the birds causing the same problems at the new location. If WS has only provided technical assistance, coordination with local authorities to monitor the birds' movements to assure the birds do not reestablish in other undesirable locations might not be conducted, thereby increasing the potential of adverse effects to nearby property owners.

Alternative 2: Integrated Bird Damage Management Program (Proposed Action/No Action)

Under this alternative, operational assistance in reducing bird problems, in which droppings from the birds cause an intolerable mess, would improve aesthetic values of affected properties. In addition, individuals objecting to the presence of invasive non-native species, such as European starlings, feral pigeons, and house sparrows, and whose aesthetic enjoyment of other birds is diminished by the presence of such species, will be positively affected by programs which result in reductions in the presence of such birds.

Relocation or dispersal of nuisance roosting or nesting populations of birds (e.g., starling roosts) by harassment can sometimes result in the birds causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo.* In some situations, dependent upon the skills and abilities of the

non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Alternative 3: Non-lethal Bird Damage Management Only by WS

Under this alternative, WS would be restricted to non-lethal methods only. WS would not be able to implement lethal management actions in those situations where non-lethal methods are not effective at reducing damage to acceptable levels. In these situations bird damage would likely remain the same or possibly increase unless cooperators implemented their own damage management program. The success or failure of the use of non-lethal methods can be quite variable. If non-lethal methods alone are effective at reducing damage and conflicts, this alternative would improve aesthetic values of affected properties. Assuming property owners would choose to allow and pay for the implementation of these non-lethal methods, this alternative could result in birds relocating to other sites where they would likely cause or aggravate similar problems for other property owners. Thus, this alternative would likely result in more property owners experiencing adverse effects on the aesthetic values of their properties than the Proposed Action alternative.

Relocation or dispersal of nuisance roosting or nesting populations of birds (e.g., starling roosts) by harassment can sometimes result in the birds causing the same or similar problems at the new location. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

Alternative 4: No Federal WS Bird Damage Management

WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo.*

Under this alternative, the lack of any operational or technical assistance in reducing bird problems would mean aesthetic values of some properties would continue to be adversely affected if the property owners were not able to achieve BDM some other way. In many cases, this type of aesthetic damage would worsen because property owners would not be able to resolve their problems.

Relocation of nuisance roosting or nesting population of birds (e.g., starling roosts) through harassment, barriers, or habitat alteration can sometimes result in the birds causing the same problems at the new location. Coordination of dispersal activities with local authorities to monitor the birds' movements to assure the birds do not re-establish in other undesirable locations might not be conducted, thereby increasing the potential of adverse effects to nearby property owners.

4.1.5 Humaneness and Animal Welfare Concerns of Methods Used

4.1.5.1 Alternative 1: Technical Assistance Only

Under this alternative, WS would provide self-help advice only. Thus, lethal methods, viewed as inhumane by some persons, would not be used by WS. Without WS direct operational assistance, it is expected that many requesters of BDM would reject non-lethal recommendations or would not be willing to pay the extra cost of implementing and maintaining them and would seek alternative means that might include lethal methods. Similar to Alternative 3, DRC-1339 would no longer be available as it is only registered for use by or under the direct supervision of WS personnel. Thus, the only chemical BDM methods legally available would be Avitrol. The use of Avitrol may be viewed by many persons as less humane than DRC-1339. Similar to the proposed

action shooting; and live trapping/capture and euthanization by decapitation, cervical dislocation, or CO_2 gas could be used by these entities.

4.1.5.2 Alternative 2: Implement an Integrated Bird Damage Management Program (Proposed Action/No Action)

Under this alternative, methods viewed by some persons as inhumane would be used in BDM by WS. These methods would include shooting, live capture and euthanasia, and toxicants/chemicals such as DRC-1339 and Avitrol.

Shooting, when performed by experienced professionals, usually results in a quick death for target birds. Occasionally, however, some birds are initially wounded and must be shot a second time or must be caught by hand and then euthanized. Some persons would view shooting as inhumane.

The primary lethal chemical BDM method that would be used by WS under this alternative would be DRC-1339. This chemical causes a quiet and apparently painless death resulting from uremic poisoning and congestion of major organs (Decino et al. 1966). The birds become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. However, the method appears to result in a less stressful death than that which probably occurs by most natural causes, such as by disease, starvation, or predation. For these reasons, WS considers DRC-1339 use to be a relatively humane method of lethal BDM. However, despite the apparent painlessness of the effects of this chemical, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable.

The chemical Avitrol repels birds by poisoning a few members of a flock, causing them to become hyperactive. Their distress calls generally alarm the other birds and cause them to leave the site. Only a small number of birds need to be affected to cause alarm in the rest of the flock. The affected birds generally die. In most cases where Avitrol is used, only a small percentage of the birds are affected and killed by the chemical with the rest being merely dispersed. In experiments to determine suffering, stress, or pain in affected animals, Rowsell, et. al. (1979) tested Avitrol on pigeons and observed subjects for clinical, pathological, or neural changes indicative of pain or distress. None were observed. Conclusions of the study were that the chemical met the criteria for a humane pesticide. Notwithstanding, some persons would view Avitrol as inhumane treatment of the birds that are affected by it based on the birds' distress-like behavior.

Occasionally, birds captured alive by use of the immobilizing drug AC, cage traps, by hand, or with nets would be euthanized. The most common method of euthanization would be by decapitation, cervical dislocation, or CO_2 gas which are described and approved by AVMA as humane euthanasia methods (Beaver et al. 2001). Most people would view AVMA-approved euthanization methods as humane.

In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

4.1.5.3 Alternative 3: Non-lethal Bird Damage Management 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 many requesters of BDM assistance would reject non-lethal methods recommended by WS and/or would not be willing to pay the extra cost of implementing and maintaining them and would seek alternative means that may include lethal methods. DRC-

1339 would not be available to non-WS entities; however, Avitrol could be used by WS and would also be legal for use by certified pest control operators. Avitrol would most likely be viewed as less humane than DRC-1339 because of the distress behaviors that it causes. Similar to the proposed action shooting; and live trapping/capture and euthanization by decapitation, cervical dislocation, or CO_2 gas could be used by these entities.

4.1.5.4 Alternative 4: No Federal WS Bird Damage Management

Under this alternative, methods viewed as inhumane by some persons would not be used by WS. WS would have no impact on this issue. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Similar to Alternatives 1 and 3, DRC-1339 would no longer be available for use since it is only registered for use by or under the direct supervision of WS personnel. However, Avitrol would be legal for use by certified pest control operators. Avitrol would most likely be viewed as less humane than DRC-1339 because of the distress behaviors that it causes. Similar to the proposed action shooting; and live trapping/capture and euthanization by decapitation, cervical dislocation, or CO_2 gas could be used by these entities.

4.2 CUMULATIVE IMPACTS

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

Under Alternatives 1, 2 and 3, WS would address damage associated with birds in a number of situations throughout the commonwealth. The WS BDM program would be the primary federal program with BDM responsibilities; however, some Massachusetts and local government agencies may conduct BDM activities in Massachusetts as well. Through ongoing coordination with these agencies, WS is aware of such BDM activities and may provide technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with such agencies in the same area, but may conduct BDM activities at adjacent sites within the same timeframe. In addition, commercial pest control companies may conduct BDM activities in the same area. The potential cumulative impacts analyzed below could occur either as a result of WS BDM program activities over time, or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

Cumulative Impacts on Wildlife Populations

Bird Damage Management methods used or recommended by the WS program in Massachusetts will likely have no cumulative adverse effects on target and non-target wildlife populations. WS limited lethal take of target bird species is anticipated to have minimal impacts on target bird populations in Massachusetts, the region and the U.S. When control actions are implemented by WS the potential lethal take of non-target wildlife species is expected to be minimal to non-existent.

Cumulative Impact Potential from Chemical Components

BDM programs which include the use of pesticides as a lethal population management component may have the greatest potential for cumulative impacts on the environment as such impacts relate to deposit of chemical residues in the physical environment and environmental toxicosis. The avicides, DRC-1339 and the frightening agent, Avitrol, are the only chemicals used or recommended by the Massachusetts WS BDM program for the purpose of obtaining lethal effects on birds. These chemicals have been evaluated

for possible residual effects which might occur from buildup of the chemicals in soil, water, or other environmental sites.

> ***DRC-1339*** exhibits a low persistence in soil or water, and bioaccumulation of the chemical is unlikely (USDA 1997). Additionally, the relatively small quantity of DRC-1339 that will be used in BDM programs in Massachusetts, the chemical's instability which results in speedy degradation of the product, and application protocol used in WS programs further reduces the likelihood of any environmental accumulation. DRC-1339 is not used by any other entities in Massachusetts.
>
> ***Avitrol*** may be used or recommended by the Massachusetts WS program. Most applications would not be in contact with soil, applications would not be in contact with surface or ground water, and uneaten baits will be recovered and disposed of according to EPA label specifications. Avitrol exhibits a high persistence in soil and water but, according to literature, does not bioaccumulate (USDA 1997 and EXTOXNET 2000). Because of Avitrol's characteristic of binding to soils, it is not expected to be present in surface or ground water as a result of its use on land (EPA 1980). A combination of chemical characteristics and baiting procedures used by WS would reduce the likelihood of environmental accumulation of Avitrol. The EPA has not required studies on the fate of Avitrol in the soil because, based on use patterns of the avicide, soil residues are expected to be low (EPA 1980).

Based on use patterns, the chemical and physical characteristics of DRC-1339 and Avitrol, and factors related to the environmental fate of these pesticides, no cumulative impacts are expected from the lethal chemical components used or recommended by the WS BDM program in Massachusetts.

Non-lethal chemicals may also be used or recommended by the WS BDM program in Massachusetts. Characteristics of these chemicals and use patterns indicate that no significant cumulative impacts related to environmental fate are expected from their use in WS BDM programs in Massachusetts.

Cumulative Impact Potential from Non-chemical Components

Non-chemical methods used or recommended by WS BDM program in Massachusetts may include exclusion through use of various barriers, habitat modification of structures or vegetation, live trapping and euthanasia of birds, harassment of birds or bird flocks, and shooting.

Because shooting may be considered as a component of the non-chemical, the deposition of lead shot in the environment is a factor considered in this EA.

> ***Lead Shot.*** Threats of lead toxicosis to waterfowl from the deposition of lead shot in waters where such species fed were observed more than one hundred years ago (Sanderson and Belrose 1986). As a result of discoveries made regarding impacts to several species of ducks and geese, federal restrictions were placed on the use of lead shot for waterfowl hunting in 1991. "Beginning September 1, 1991, the contiguous 48 United States, and the States of Alaska and Hawaii, the Territories of Puerto Rico and the Virgin Islands, and the territorial waters of the United States, are designated for the purpose of Sec. 20.21 (j) as nontoxic shot zones for hunting waterfowl, coots, and certain other species. 'Certain other species' refers to those species, other than waterfowl or coots, affected by reason of being included in aggregate bags and concurrent seasons."
>
> All WS BDM shooting activities conform to federal, commonwealth and local laws. If activities are conducted near or over water, WS uses steel shot during activities. Consequently, no deposition of lead in non-toxic shot zones is likely to occur as a result of WS BDM actions in Massachusetts. Therefore, cumulative impacts are not likely to occur if toxic shot is used. Additionally, WS will evaluate other BDM actions which entail the use of shot on a case by case

basis to determine if deposition of lead shot poses any risk to non-target animals, such as domestic livestock. If such risk exists, WS will use non-toxic shot in those situations.

Roost Harassment/Relocation. Some potential exists for cumulative impacts to human health and safety related to the harassment of roosting bird flocks such as European starlings in urban environments. If birds are dispersed from one site and relocate to another where human exposure to concentrations of bird droppings over time occurs, human health and safety could be threatened. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

SUMMARY

No significant cumulative environmental impacts are expected from any of the 4 alternatives.

Under the Proposed Action, the lethal removal of birds by WS would not have a significant impact on overall starling, pigeon, and house sparrow populations in Massachusetts, but some local reductions may occur. No risk to public safety is expected when WS' services are provided and accepted by requesting individuals in Alternatives 1, 2, and 3, since only trained and experienced wildlife biologists/specialists would conduct and recommend BDM activities. There is a slight increased risk to public safety when persons who reject WS assistance and recommendations in Alternatives 1, 2 and 3 and conduct their own BDM activities, and when no WS assistance is provided in Alternative 4. In all 4 Alternatives, however, it would not be to the point that the impacts would be significant.

Under Alternative 4, management actions taken by non-federal entities would be considered the *environmental status quo.* In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage rock doves/feral pigeons, European starlings, and house sparrows to stop damage with or without WS assistance in Alternatives 1, 2, and 3, WS participation in carrying out the action will not affect the *environmental status quo.* In some situations, dependent upon the skills and abilities of the non-federal entity, WS involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

Although some persons will likely be opposed to WS' participation in BDM activities on public and private lands within the Commonwealth of Massachusetts, the analysis in this EA indicates that WS Integrated BDM program will not result in significant cumulative adverse impacts on the quality of the human environment. Table 4-2 summarizes the expected impact of each of the alternatives on each of the issues.

Table 4-2. Summary of Potential Impacts.

Issues	*Alternative 1 Technical Assistance Only*	*Alternative 2 Integrated Bird Damage Management Program (Proposed Action/No Action)*	*Alternative 3 Nonlethal BDM Only by WS*	*Alternative 4 No Federal WS BDM Program*
Target Species Effects	No effect by WS. Low effect - reductions in local starling, pigeon, and sparrow numbers by non-WS personnel likely; would not significantly affect state and regional populations.	Low effect - reductions in local starling, pigeon, and sparrow numbers; would not significantly affect state and regional populations	Low effect - reductions in local starling, pigeon, and sparrow numbers by non-WS personnel likely; would not significantly affect state and regional populations.	No effect by WS. Low effect - reductions in local starling, pigeon, sparrow numbers by non-WS personnel likely; would not significantly affect state and regional populations
Effects on Other Wildlife Species, Including T&E 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.	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.
Human Health and Safety Risks	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater potential of not reducing bird damage than under the proposed action.	The proposed action has the greatest potential of successfully reducing this risk. Low risk from methods used by WS.	Impacts could be greater under this alternative than the proposed action. Low risk from methods used by WS.	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater potential of not reducing bird damage than under the proposed action.
Aesthetic Enjoyment of Birds	Low to moderate effect. Local bird numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse affect on overall regional and state starling, pigeon and sparrow populations.	Low to moderate effect at local levels; Some local populations may be reduced; WS bird damage management activities do not adversely affect overall regional or state starling, pigeon, and sparrow populations.	Low to moderate effect. Local bird numbers in damage situations would remain high or possibly increase when non-lethal methods are ineffective unless non-WS personnel successfully implement lethal methods; no adverse affect on overall regional and state starling, pigeon, and sparrow populations.	Low to moderate effect. Local bird numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse affect on overall regional and state starling, pigeon, and sparrow populations.
Aesthetic Damage Caused by Birds	Moderate to High effect - birds may move to other sites which can create aesthetic damage problems at new sites.	Low effect - bird damage problems most likely to be resolved without creating or moving problems elsewhere.	Moderate to High effect - birds may move to other sites which can create aesthetic damage problems at new sites. Less likely than Alt. 1 and 4.	High effect - bird problems less likely to be resolved without WS involvement. Birds may move to other sites which can create aesthetic damage problems at new sites
Humaneness Concerns of Methods Used	No effect by WS. Impacts by non-WS personnel would be variable.	Low to moderate effect - methods viewed by some people as inhumane would be used by WS.	Lower effect than Alt. 2 since only non-lethal methods would be used by WS	No effect by WS. Impacts by non-WS personnel would be variable.

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED

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APPENDIX A
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APPENDIX B

BIRD DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE MASSACHUSETTS WILDLIFE SERVICES PROGRAM

NON-LETHAL, NON-CHEMICAL METHODS

Agricultural producer and property owner practices These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Cultural methods and other management techniques are implemented by the agricultural producer or property owners/managers. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. These methods include:

> **Cultural methods** may include altering planting dates so that crops are not young and vulnerable to damage when the damage-causing species are present, or the planting of crops that are less attractive or less vulnerable to such species. At feedlots or dairies, cultural methods generally involve modifications to the level of care or attention given to livestock, which may vary depending on the age and size of the livestock. Animal husbandry practices include, but are not limited to, techniques such as night feeding, indoor feeding, closed barns or corrals, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994).
>
> **Environmental/Habitat modification** can be an integral part of BDM. Wildlife production and/or presence are directly related to the type, quality, and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain bird species or to repel certain birds. In most cases, the resource or property owner is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of BDM strategies at or near airports to reduce bird-aircraft strike hazards by eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport properties can be minimized through management of vegetation and water from areas adjacent to aircraft runways. Habitat management is often necessary to minimize damage caused by starlings that form large roosts during late autumn and winter. Bird activity can be greatly reduced at roost sites by removing all the trees or selectively thinning the stand.

Animal behavior modification This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve use of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some of the methods included in this category are:

- Bird-proof barriers
- Electronic guards
- Propane exploders (cannons)
- Pyrotechnics (bangers, screamers, etc.)
- Distress calls and sound producing devices
- Chemical frightening agents
- Repellents
- Scare crows/effigies
- Mylar tape
- Lasers
- Eye-spot balloons

These techniques are generally only practical for small areas. Scaring devices such as distress calls, helium-filled eye-spot balloons, raptor effigies and silhouettes, mirrors, and moving disks can be effective, but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott 1985, Shirota and Masake 1983, Conover 1982, Arhart 1972). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, Tobin et al. 1988).

Bird proof barriers can be effective, but are often cost-prohibitive as the aerial mobility of birds usually requires overhead barriers as well as peripheral fencing or netting. Exclusionary devices, adequate to stop bird movements, can also restrict movements of livestock, people and other wildlife (Fuller-Perrine and Tobin 1993). Netting can be used to exclude birds from a specific area by the placement of bird-proof netting over and around the specific resource to be protected. Exclusion may be impractical in most settings (e.g., commercial agriculture); however, it can be practical in small areas (e.g., personal gardens) or for high-value crops (e.g., grapes) (Johnson 1994). Although this alternative would provide short-term relief from damage, it may not completely deter birds from feeding, loafing, staging, or roosting at that site. The public often finds exclusionary devices, such as netting, unsightly and fear the devices will lower the aesthetic value of the neighborhood when used over personal gardens.

Auditory scaring devices such as propane exploders, pyrotechnics, electronic guards, scarecrows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective, but usually only for a short period of time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Mott 1985, Shirota and Masake 1983, and Arhart 1972). Williams (1983) reported an approximate 50% reduction in blackbirds at two south Texas feedlots as a result of pyrotechnics and propane cannon use. However, these devices are often not practical in dairy or feedlot situations because of the disturbance to livestock, although livestock can generally be expected to habituate to the noise. Birds, too, quickly learn to ignore scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics. In Massachusetts, these methods may also be impractical due to proximity to nearby residences.

Visual scaring techniques such as the use of Mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly give birds a visual cue that a large predator is present), flags, lasers, and effigies (scarecrows), are occasionally effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et. al. 1986, Tobin et. al. 1988). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Lasers are a non-lethal technique recently evaluated by the USDA, APHIS, WS, National Wildlife Research Center (NWRC) (Blackwell et al. 2002, Glahn et al. 2000). For best results and to disperse numerous birds from a roost, the laser is most effectively used in periods of low light, such as after sunset and before sunrise. In the daytime, the laser can also be used during overcast conditions or in shaded areas to move individual and small numbers of birds, although the effective range of the laser is much diminished. Blackwell et al. (2002) tested lasers on several bird species and observed varied results among species. Lasers were ineffective at dispersing pigeons and mallard with birds habituating in approximately 5 minutes and 20 minutes, respectively (Blackwell et al. 2002). As with other BDM tools; lasers are most effective when used as part of an integrated management program.

Nest destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas which may create nuisances for home and business owners. Heusmann and Bellville (1978) reported that nest removal was an effective, but time-consuming method because problem bird species are generally abundant and highly mobile and can easily return to damage sites from long distances. This method poses no imminent danger to pets or the public.

Egg addling/destruction are methods of suppressing reproduction in local nuisance bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times, causing

detachment of the embryo from the egg sac. Egg destruction can be accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen (see *Egg oiling* below). Although WS does not commonly use egg addling or destruction for control of pigeons, starlings and house sparrows, it is a valuable damage management tool and has proven effective in some applications.

Lure crops/alternate foods. When depredations cannot be avoided by careful crop selection or modified planting schedules, lure crops can sometimes be used to mitigate the loss potential. Lure crops are planted or left for consumption by wildlife as an alternative food source. This approach provides relief for critical crops by sacrificing less important or specifically planted fields. Establishing lure crops is sometimes expensive, requires considerable time and planning to implement, and may attract other unwanted species to the area.

NON-LETHAL, CHEMICAL METHODS

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a ratio of 1:9. Avitrol, however, is not completely non-lethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Pre-baiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, gulls, blackbirds, starlings, and house sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding. Usually, a few birds will consume the treated bait and become affected by the chemical. The affected birds then broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies have demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water. It is non-accumulative in tissues and is rapidly metabolized by many species (Schafer 1991).

Avitrol is acutely toxic to avian and mammalian species; however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. Some hazards may occur to predatory species consuming unabsorbed chemical in the GI tract of affected or dead birds (Holler and Shafer 1982, Schafer 1981). A formal Risk Assessment found no probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound (USDA 1997, Appendix P).

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be a promising repellent for many bird species (Dolbeer et al. 1993). Cummings et al. (1995) found effectiveness of MA declined significantly after 7 days. Belant (1996) found MA ineffective as a bird grazing repellent, even when applied at triple the recommended label rate. MA is also under investigation as a potential bird taste repellent. MA may become available for use as a livestock feed additive (Mason et al. 1984; Mason et al. 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[4]), nontoxic to rats in an inhalation study (LC_{50} > 2.8

[4] An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or, in this case in micrograms per individual bee, required to cause death in 50% of a test population of a species.

mg/L[5]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992; RJ Advantage, Inc. 1997). It has been listed as "Generally Recognized as Safe" (GRAS) by the FDA (Dolbeer et al. 1992).

Water surface and turf applications of MA are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about $64/lb., with retreating required every 3-4 weeks (RJ Advantage, Inc. 1997). The cost of treating turf areas would be similar on a per acre basis. Also, MA completely degrades in about 3 days when applied to water (RJ Advantage, Inc. 1997), which indicates the repellent effect is short-lived.

Another potentially more cost-effective method of MA application is by use of a fog-producing machine (Vogt 1997). The fog drifts over the area to be treated and is irritating to the birds while being non-irritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial treatment before the birds abandon a treatment site (Dr. P. Vogt, RJ Advantage, Inc., Pers. Comm. 1997). Applied at a rate of about .25 l./acre of water surface, the cost is considerably less than when using the turf or water treatment methods.

MA is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or the FDA.

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, European starlings rejected grain to which charcoal particles were adhered (L. Clark, NWRC, Pers. Comm. 1999). If further research finds this method to be effective and economical in field application, it may become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products (L. Clark, NWRC, Pers. Comm. 1999).

Other chemical repellents A number of other chemicals have shown bird repellent capabilities. Anthraquinone, a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and boat-tailed grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998). Compounds extracted from common spices used in cooking and applied to perches in cage tests have been shown repellent characteristics against roosting European starlings (Clark 1997). Naphthalene (moth balls) was found to be ineffective in repelling European starlings (Dolbeer et al. 1988).

Tactile repellents A number of tactile repellent products are on the market which reportedly deters birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason and Clark 1992). The repellency of tactile products is generally short-lived because dust tends to stick to the product. Additionally, tactile repellents may not be aesthetically pleasing and may require expensive clean-up costs as the material may run down the sides of buildings in hot weather.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove pigeons, waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981). AC is typically delivered as a 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. WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. AC was eliminated from more detailed analysis in USDA (1997) based on critical element

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[5] An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

screening; therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. AC is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990), but the compound is generally not soluble in water and, therefore, should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, non-target species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

Egg oiling is a method for suppressing reproduction of nuisance birds by spraying a small quantity of food grade vegetable oil or mineral oil on eggs in nests. The oil prevents exchange of 75 gases and causes asphyxiation of developing embryos. It has been found to be 96-100% effective in reducing hatchability. (Pochop 1998; Pochop et al.1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not re-nest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. This method is extremely target specific and is less labor intensive than egg addling.

LETHAL, MECHANICAL METHODS

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. Normally, shooting is conducted with shotguns, rifles, or air rifles. Shooting is a very target-specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce non-lethal methods. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1997). It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire rifles is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. WS complies with all firearm safety precautions when conducting BDM activities and all laws and regulations governing the lawful use of firearms are strictly followed.

Firearm use is a very sensitive public concern because of issues relating to public safety and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Live traps include (although live traps are non-lethal, birds will be euthanized upon capture): These consist of traps used to capture animals alive. Captured birds will be subsequently killed by other legal methods. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances; habitats in other areas are generally already occupied; and relocation would most likely result in bird damage problems at the new location. Relocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, difficulties in adapting to new locations or habitats, and the likelihood that relocated birds will become involved in damage situations at or near the release site.

> **Decoy traps** are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds

which enter and become trapped themselves. Active decoy traps are monitored daily, every other day, or as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Nest box traps may be used by WS for corrective damage management and are effective in capturing local breeding and post breeding European starlings and other targeted secondary cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976).

Mist nets are more commonly used for capturing small-sized birds such as house sparrows and finches, but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. This method was introduced into the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net, usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping "pockets" in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds such as pigeons, feral ducks, and waterfowl and use mortar projectiles to propel a net up and over birds which have been baited to a particular site. This type of net is especially effective for waterfowl that are flightless during the molt and other birds which are typically shy to other types of capture.

Cervical dislocation is sometimes used to euthanize birds which are captured in live traps. The bird is stretched and the neck is hyper extended and dorsally twisted to separate the first cervical vertebrae from the skull. The 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 other small birds (Beaver et al. 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Beaver et al. 2001).

Snap traps are modified rat snap traps used to remove individual woodpeckers, European starlings, and other cavity nesting birds. The trap treadle is baited with peanut butter or other food attractants and attached near the damage area. These traps pose no imminent danger to pets or the public and are usually located in positions inaccessible to people and most non-avian animals. They are very selective because they are usually set in the defended territory of the target birds.

LETHAL, CHEMICAL METHODS

All chemicals used by WS are registered as required by the FIFRA (administered by the EPA). WS personnel who use restricted-use chemical methods are certified as pesticide applicators by the Massachusetts Department of Agricultural Resources, Pesticide Bureau and are required to adhere to all certification requirements set forth in FIFRA and Massachusetts pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

CO_2 is sometimes used to euthanize birds which are captured in live traps. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO_2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the AVMA (Beaver et al. 2001). CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

DRC-1339 (3-chloro-p-toluidine hydrochloride) is the principal chemical method that would be used for bird damage management under the Proposed Action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (West et al.

1967, Besser et al. 1967, Decino et al. 1966). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird/starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), dispersing crow roosts in urban/suburban areas (Boyd and Hall 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 has several EPA Registration Labels (56228-10, 56228-17, 56228-28, 56228-29, and 56228-30) depending on the application or species involved in the bird damage management project. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species, but only slightly toxic to non-sensitive birds, predatory birds, and mammals (Johnson et al. 1999, Schafer 1981, Schafer 1991). For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens, are highly sensitive to DRC-1339. Many other bird species such as raptors (Schafer 1981), sparrows, and eagles are classified as non-sensitive. Numerous studies show that DRC- 1339 poses minimal risk of primary poisoning to non-target and T&E species (USDA 1997). Secondary poisoning has not been observed with DRC-1339 treated baits, except crows eating gut contents of pigeons (Kreps 1974). During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent (Johnson et al. 1999, Schafer 1984, Schafer 1991). DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997). Appendix P of USDA (1997) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339.

Appendix C

Federally Threatened and Endangered Species Found in Massachusetts

28 listings

Animals -- 23

Status	Listing
E	Beetle, American burying (*Nicrophorus americanus*)
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
E	Curlew, Eskimo (*Numenius borealis*)
T	Eagle, bald lower 48 States (*Haliaeetus leucocephalus*)
E	Northern (Plymouth) red bellied cooter (turtle) (*Pseudemys rubriventris bangsi*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, blue (*Balaenoptera musculus*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Whale, Sei (*Balaenoptera borealis*)
E	Wolf, gray lower 48 States, except MN and where XN; Mexico (*Canis lupus*)

Plants -- 5

Status	Listing
T	Amaranth, seabeach (*Amaranthus pumilus*)
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
E	Chaffseed, American (*Schwalbea americana*)
E	Gerardia, sandplain (*Agalinis acuta*)
T	Pogonia, small whorled (*Isotria medeoloides*)

T = Threatened
E = Endangered

Appendix D

The Massachusetts List of Endangered, Threatened, and Special Concern species

VERTEBRATES:

Common Name	Scientific Name	MA Status	Fed Status	Notes
Fish				
American Brook Lamprey	*Lampetra appendix*	T		
Shortnose Sturgeon	*Acipenser brevirostrum*	E	E	
Atlantic Sturgeon	*Acipenser oxyrinchus*	E		
Lake Chub	*Couesius plumbeus*	E		
Eastern Silvery Minnow	*Hybognathus regius*	SC		
Bridle Shiner	*Notropis bifrenatus*	SC		
Northern Redbelly Dace	*Phoxinus eos*	E		
Longnose Sucker	*Catostomus catostomus*	SC		
Burbot	*Lota lota*	SC		
Threespine Stickleback	*Gasterosteus aculeatus*	T		1
Amphibians				
Jefferson Salamander	*Ambystoma jeffersonianum*	SC		2
Blue-Spotted Salamander	*Ambystoma laterale*	SC		3
Marbled Salamander	*Ambystoma opacum*	T		
Spring Salamander	*Gyrinophilus porphyriticus*	SC		
Four-Toed Salamander	*Hemidactylium scutatum*	SC		
Eastern Spadefoot	*Scaphiopus holbrookii*	T		
Reptiles				
Loggerhead Seaturtle	*Caretta caretta*	T	T	
Green Seaturtle	*Chelonia mydas*	T	T	
Hawksbill Seaturtle	*Eretmochelys imbricata*	E	E	
Kemp's Ridley Seaturtle	*Lepidochelys kempii*	E	E	
Leatherback Seaturtle	*Dermochelys coriacea*	E	E	
Spotted Turtle	*Clemmys guttata*	SC		
Wood Turtle	*Clemmys insculpta*	SC		
Bog Turtle	*Clemmys muhlenbergii*	E		
Blanding's Turtle	*Emydoidea blandingii*	T		
Diamondback Terrapin	*Malaclemys terrapin*	T		
Northern Red-bellied Cooter	*Pseudemys rubriventris*	E	E	4
Eastern Box Turtle	*Terrapene carolina*	SC		
Eastern Wormsnake	*Carphophis amoenus*	T		
Eastern Ratsnake	*Elaphe obsoleta*	E		
Copperhead	*Agkistrodon contortrix*	E		
Timber Rattlesnake	*Crotalus horridus*	E		
Birds				
Common Loon	*Gavia immer*	SC		
Pied-Billed Grebe	*Podilymbus podiceps*	E		
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	E		
American Bittern	*Botaurus lentiginosus*	E		
Least Bittern	*Ixobrychus exilis*	E		
Bald Eagle	*Haliaeetus leucocephalus*	E	T	

Northern Harrier	*Circus cyaneus*	T	
Sharp-Shinned Hawk	*Accipiter striatus*	SC	
Peregrine Falcon	*Falco peregrinus*	E	
King Rail	*Rallus elegans*	T	
Common Moorhen	*Gallinula chloropus*	SC	
Piping Plover	*Charadrius melodus*	T	T
Upland Sandpiper	*Bartramia longicauda*	E	
Roseate Tern	*Sterna dougallii*	E	E
Common Tern	*Sterna hirundo*	SC	
Arctic Tern	*Sterna paradisaea*	SC	
Least Tern	*Sterna antillarum*	SC	
Barn Owl	*Tyto alba*	SC	
Long-Eared Owl	*Asio otus*	SC	
Short-Eared Owl	*Asio flammeus*	E	
Sedge Wren	*Cistothorus platensis*	E	
Golden-Winged Warbler	*Vermivora chrysoptera*	E	
Northern Parula	*Parula americana*	T	
Blackpoll Warbler	*Dendroica striata*	SC	
Mourning Warbler	*Oporornis philadelphia*	SC	
Vesper Sparrow	*Pooecetes gramineus*	T	
Grasshopper Sparrow	*Ammodramus savannarum*	T	
Henslow's Sparrow	*Ammodramus henslowii*	E	
Mammals			
Water Shrew	*Sorex palustris*	SC	
Rock Shrew	*Sorex dispar*	SC	
Indiana Myotis	*Myotis sodalis*	E	E
Small-Footed Myotis	*Myotis leibii*	SC	
Southern Bog Lemming	*Synaptomys cooperi*	SC	
Sperm Whale	*Physeter catodon*	E	E
Fin Whale	*Balaenoptera physalus*	E	E
Sei Whale	*Balaenoptera borealis*	E	E
Blue Whale	*Balaenoptera musculus*	E	E
Humpback Whale	*Megaptera novaeangliae*	E	E
Northern Right Whale	*Eubalaena glacialis*	E	E

INVERTEBRATES:

Common Name	Scientific Name	MA Status	Fed Status	Notes
Sponges				
Smooth Branched Sponge	*Spongilla aspinosa*	SC		
Flatworms				
Sunderland Spring Planarian	*Polycelis remota*	E		
Moss Animals				
Carter's Moss Animal	*Lophopodella carteri*	SC		
Segmented Worms				
New England Medicinal Leech	*Macrobdella sestertia*	SC		
Snails				
New England Siltsnail	*Cincinnatia winkleyi*	SC		
Walker's Limpet	*Ferrissia walkeri*	SC		
Coastal Marsh Snail	*Littoridinops tenuipes*	SC		

Slender Walker	*Pomatiopsis lapidaria*	E	
Pilsbry's Spire Snail	*Pyrgulopsis lustrica*	E	
Boreal Turret Snail	*Valvata sincera*	E	
Olive Vertigo	*Vertigo perryi*	SC	
Mussels			
Dwarf Wedgemussel	*Alasmidonta heterodon*	E	E
Triangle Floater	*Alasmidonta undulata*	SC	
Swollen Wedgemussel	*Alasmidonta varicosa*	E	
Yellow Lampmussel	*Lampsilis cariosa*	E	
Tidewater Mucket	*Leptodea ochracea*	SC	
Eastern Pondmussel	*Ligumia nasuta*	SC	
Creeper	*Strophitus undulatus*	SC	
Crustaceans			
Appalachian Brook Crayfish	*Cambarus bartonii*	SC	
Intricate Fairy Shrimp	*Eubranchipus intricatus*	SC	
Agassiz's Clam Shrimp	*Eulimnadia agassizii*	E	
Northern Spring Amphipod	*Gammarus pseudolimnaeus*	SC	
American Clam Shrimp	*Limnadia lenticularis*	SC	
Taconic Cave Amphipod	*Stygobromus borealis*	E	
Piedmont Groundwater Amphipod	*Stygobromus tenuis tenuis*	SC	
Coastal Swamp Amphipod	*Synurella chamberlaini*	SC	
Dragonflies			
Spatterdock Darner	*Aeshna mutata*	SC	
Subarctic Darner	*Aeshna subarctica*	T	
Comet Darner	*Anax longipes*	SC	
Ocellated Darner	*Boyeria grafiana*	SC	
Spine-Crowned Clubtail	*Gomphus abbreviatus*	E	
Beaver Pond Clubtail	*Gomphus borealis*	SC	
Harpoon Clubtail	*Gomphus descriptus*	E	
Midland Clubtail	*Gomphus fraternus*	E	
Rapids Clubtail	*Gomphus quadricolor*	T	
Cobra Clubtail	*Gomphus vastus*	SC	
Skillet Clubtail	*Gomphus ventricosus*	SC	
Umber Shadowdragon	*Neurocordulia obsoleta*	SC	
Stygian Shadowdragon	*Neurocordulia yamaskanensis*	SC	
Brook Snaketail	*Ophiogomphus aspersus*	SC	
Riffle Snaketail	*Ophiogomphus carolus*	T	
Ski-tailed Emerald	*Somatochlora elongata*	SC	
Forcipate Emerald	*Somatochlora forcipata*	SC	
Coppery Emerald	*Somatochlora georgiana*	E	
Incurvate Emerald	*Somatochlora incurvata*	T	
Kennedy's Emerald	*Somatochlora kennedyi*	E	
Mocha Emerald	*Somatochlora linearis*	SC	
Riverine Clubtail	*Stylurus amnicola*	E	
Zebra Clubtail	*Stylurus scudderi*	E	
Arrow Clubtail	*Stylurus spiniceps*	T	
Ebony Boghaunter	*Williamsonia fletcheri*	E	
Ringed Boghaunter	*Williamsonia lintneri*	E	
Damselflies			
Tule Bluet	*Enallagma carunculatum*	SC	
Attenuated Bluet	*Enallagma daeckii*	SC	

New England Bluet	*Enallagma laterale*	SC		
Scarlet Bluet	*Enallagma pictum*	T		
Pine Barrens Bluet	*Enallagma recurvatum*	T		
Beetles				
Twelve-Spotted Tiger Beetle	*Cicindela duodecimguttata*	SC		
Hentz's Redbelly Tiger Beetle	*Cicindela rufiventris hentzii*	T		
Northeastern Beach Tiger Beetle	*Cicindela dorsalis dorsalis*	E	T	
Bank Tiger Beetle	*Cicindela limbalis*	SC		
Cobblestone Tiger Beetle	*Cicindela marginipennis*	E		
Barrens Tiger Beetle	*Cicindela patruela*	E		
Puritan Tiger Beetle	*Cicindela puritana*	E	T	
Purple Tiger Beetle	*Cicindela purpurea*	SC		
Elderberry Long-Horned Beetle	*Desmocerus palliatus*	SC		
American Burying Beetle	*Nicrophorus americanus*	E	E	
Butterflies and Moths				
Coastal Heathland Cutworm	*Abagrotis nefascia*	SC		
Barrens Daggermoth	*Acronicta albarufa*	T		
Spiny Oakworm	*Anisota stigma*	SC		
Drunk Apamea Moth	*Apamea inebriata*	SC		
Coastal Plain Apamea Moth	*Apamea mixta*	SC		
New Jersey Tea Inchworm	*Apodrepanulatrix liberaria*	E		
Straight Lined Mallow Moth	*Bagisara rectifascia*	SC		
Hessel's Hairstreak	*Callophrys hesseli*	SC		
Frosted Elfin	*Callophrys irus*	SC		
Bog Elfin	*Callophrys lanoraieensis*	T		
Gerhard's Underwing	*Catocala herodias gerhardi*	SC		
Precious Underwing Moth	*Catocala pretiosa pretiosa*	E		
Waxed Sallow Moth	*Chaetaglaea cerata*	SC		
Melsheimer's Sack Bearer	*Cicinnus melsheimeri*	T		
Chain Dot Geometer	*Cingilia catenaria*	SC		
Unexpected Cycnia	*Cycnia inopinatus*	T		
Three-Lined Angle Moth	*Digrammia eremiata*	T		
Imperial Moth	*Eacles imperialis*	T		
Early Hairstreak	*Erora laeta*	T		
Persius Duskywing	*Erynnis persius persius*	E		
Sandplain Euchlaena	*Euchlaena madusaria*	SC		
Dion Skipper	*Euphyes dion*	T		
The Pink Streak	*Faronta rubripennis*	T		
Phyllira Tiger Moth	*Grammia phyllira*	E		
Slender Clearwing Sphinx Moth	*Hemaris gracilis*	SC		
Barrens Buckmoth	*Hemileuca maia*	SC		
Buchholz's Gray	*Hypomecis buchholzaria*	E		
Pine Barrens Itame	*Itame* sp. 1	SC		5
Pale Green Pinion Moth	*Lithophane viridipallens*	SC		
Twilight Moth	*Lycia rachelae*	E		
Pine Barrens Lycia	*Lycia ypsilon*	T		
Barrens Metarranthis	*Metarranthis apiciaria*	E		
Coastal Swamp Metarranthis	*Metarranthis pilosaria*	SC		
Northern Brocade Moth	*Neoligia semicana*	SC		
Dune Noctuid Moth	*Oncocnemis riparia*	SC		
Pitcher Plant Borer	*Papaipema appassionata*	T		

Ostrich Fern Borer	*Papaipema* sp. 2	.SC	6
Chain Fern Borer	*Papaipema stenocelis*	T	
Water-willow Stem Borer	*Papaipema sulphurata*	T	
Eastern Veined White	*Pieris oleracea*	T	
Pink Sallow Moth	*Psectraglaea carnosa*	SC	
Southern Ptichodis	*Ptichodis bistrigata*	T	
Orange Sallow Moth	*Rhodoecia aurantiago*	T	
Oak Hairstreak	*Satyrium favonius*	SC	
Spartina Borer	*Spartiniphaga inops*	SC	
Faded Gray Geometer	*Stenoporpia polygrammaria*	T	
Pine Barrens Zale	*Zale* sp. 1	SC	7
Pine Barrens Zanclognatha	*Zanclognatha martha*	T	

PLANTS:

Common Name	Scientific Name	MA Status	Fed Status	Notes
Aceraceae (Maples)				
Black Maple	*Acer nigrum*	SC		
Adiantaceae (Cliff Ferns)				
Fragile Rock-Brake	*Cryptogramma stelleri*	E		
Alismataceae (Arrowheads)				
Estuary Arrowhead	*Sagittaria montevidensis* ssp. *spongiosa*	E		
Wapato	*Sagittaria cuneata*	T		
River Arrowhead	*Sagittaria subulata* var. *subulata*	E		
Terete Arrowhead	*Sagittaria teres*	SC		
Apiaceae (Parsleys, Angelicas)				
Hemlock Parsley	*Conioselinum chinense*	SC		
Saltpond Pennywort	*Hydrocotyle verticillata*	T		
Canadian Sanicle	*Sanicula canadensis*	T		
Long-Styled Sanicle	*Sanicula odorata*	T		
Aquifoliaceae (Hollies)				
Mountain Winterberry	*Ilex montana*	E		
Araceae (Arums)				
Green Dragon	*Arisaema dracontium*	T		
Golden Club	*Orontium aquaticum*	E		
Araliaceae (Ginsengs)				
Ginseng	*Panax quinquefolius*	SC		
Asclepiadaceae (Milkweeds)				
Purple Milkweed	*Asclepias purpurascens*	E		
Linear-Leaved Milkweed	*Asclepias verticillata*	T		
Aspleniaceae (Spleenworts)				
Mountain Spleenwort	*Asplenium montanum*	E		
Wall-Rue Spleenwort	*Asplenium ruta-muraria*	T		
Asteraceae (Asters, Composites)				
Lesser Snakeroot	*Ageratina aromatica*	E		
Boreal Wormwood	*Artemisia campestris* ssp. *borealis*	E		
Eaton's Beggar-ticks	*Bidens eatonii*	E		
Estuary Beggar-ticks	*Bidens hyperborea* var. *colpophila*	E		
Cornel-Leaved Aster	*Doellingeria infirma*	E		
New England Boneset	*Eupatorium leucolepis* var. *novae-angliae*	E		

Purple Cudweed	*Gamochaeta purpurea*	E
New England Blazing Star	*Liatris scariosa* var. *novae-angliae*	SC
Lion's Foot	*Nabalus serpentarius*	E
Sweet Coltsfoot	*Petasites frigidus* var. *palmatus*	E
Sclerolepis	*Sclerolepis uniflora*	E
Large-Leaved Goldenrod	*Solidago macrophylla*	T
Upland White Aster	*Solidago ptarmicoides*	E
Rand's Goldenrod	*Solidago simplex* ssp. *randii*	E
Eastern Silvery Aster	*Symphyotrichum concolor*	E
Crooked-Stem Aster	*Symphyotrichum prenanthoides*	T
Tradescant's Aster	*Symphyotrichum tradescantii*	T
Betulaceae (Birches, Alders)		
Mountain Alder	*Alnus viridis* ssp. *crispa*	T
Swamp Birch	*Betula pumila*	E
Boraginaceae (Borages)		
Oysterleaf	*Mertensia maritima*	E
Brassicaceae (Mustards)		
Lyre-Leaved Rock-cress	*Arabidopsis lyrata*	E
Smooth Rock-cress	*Arabis laevigata*	T
Green Rock-cress	*Arabis missouriensis*	T
Purple Cress	*Cardamine douglassii*	E
Long's Bitter-cress	*Cardamine longii*	E
Fen Cuckoo Flower	*Cardamine pratensis* var. *palustris*	T
Cactaceae (Cacti)		
Prickly Pear	*Opuntia humifusa*	E
Campanulaceae (Bluebells, Lobelias)		
Great Blue Lobelia	*Lobelia siphilitica*	E
Caprifoliaceae (Honeysuckles)		
Hairy Honeysuckle	*Lonicera hirsuta*	E
Snowberry	*Symphoricarpos albus* var. *albus*	E
Broad Tinker's-weed	*Triosteum perfoliatum*	E
Downy Arrowwood	*Viburnum rafinesquianum*	E
Caryophyllaceae (Pinks, Sandworts)		
Nodding Chickweed	*Cerastium nutans*	E
Michaux's Sandwort	*Minuartia michauxii*	T
Large-leaved Sandwort	*Moehringia macrophylla*	E
Silverling	*Paronychia argyrocoma*	E
Knotted Pearlwort	*Sagina nodosa* ssp. *nodosa*	T
Chenopodiaceae (Saltworts)		
Fogg's Goosefoot	*Chenopodium foggii*	E
American Sea-blite	*Suaeda americana*	SC
Cistaceae (Rockroses, Pinweeds)		
Bushy Rockrose	*Helianthemum dumosum*	SC
Beaded Pinweed	*Lechea pulchella* var. *monoliformis*	E
Clusiaceae (St. John's-worts)		
Creeping St. John's-wort	*Hypericum adpressum*	T
Giant St. John's-wort	*Hypericum ascyron*	E
St. Andrew's Cross	*Hypericum hypericoides* ssp. *multicaule*	E
Convolvulaceae (Morning Glories)		
Low Bindweed	*Calystegia spithamaea*	E
Crassulaceae (Sedums)		

Pygmyweed	*Crassula aquatica*	T	
Cupressaceae (Cedars, Junipers)			
Arborvitae	*Thuja occidentalis*	E	
Cyperaceae (Sedges)			
River Bulrush	*Bolboschoenus fluviatilis*	SC	
Foxtail Sedge	*Carex alopecoidea*	T	
Back's Sedge	*Carex backii*	E	
Bailey's Sedge	*Carex baileyi*	E	
Bush's Sedge	*Carex bushii*	E	
Chestnut-colored Sedge	*Carex castanea*	E	
Creeping Sedge	*Carex chordorrhiza*	E	
Davis's Sedge	*Carex davisii*	E	
Glaucescent Sedge	*Carex glaucodea*	E	
Handsome Sedge	*Carex formosa*	T	
Slender Woodland Sedge	*Carex gracilescens*	E	
Gray's Sedge	*Carex grayi*	T	
Hitchcock's Sedge	*Carex hitchcockiana*	SC	
Shore Sedge	*Carex lenticularis*	T	
Glaucous Sedge	*Carex livida* var. *radicaulis*	E	
False Hop-sedge	*Carex lupuliformis*	E	
Midland Sedge	*Carex mesochorea*	E	
Michaux's Sedge	*Carex michauxiana*	E	
Few-fruited Sedge	*Carex oligosperma*	E	
Few-flowered Sedge	*Carex pauciflora*	E	
Variable Sedge	*Carex polymorpha*	E	
Eastern Saline Sedge	*Carex recta*	E	
Schweinitz's Sedge	*Carex schweinitzii*	E	
Dioecious Sedge	*Carex sterilis*	T	
Walter's Sedge	*Carex striata*	E	
Fen Sedge	*Carex tetanica*	SC	
Hairy-fruited Sedge	*Carex trichocarpa*	T	
Tuckerman's Sedge	*Carex tuckermanii*	E	
Cat-tail Sedge	*Carex typhina*	T	
Wiegand's Sedge	*Carex wiegandii*	E	
Engelmann's Umbrella-sedge	*Cyperus engelmannii*	T	
Houghton's Flatsedge	*Cyperus houghtonii*	E	
Wright's Spike-rush	*Eleocharis diandra*	E	
Intermediate Spike-sedge	*Eleocharis intermedia*	T	
Tiny-fruited Spike-sedge	*Eleocharis microcarpa* var. *filiculmis*	E	
Ovate Spike-sedge	*Eleocharis ovata*	E	
Few-flowered Spike-sedge	*Eleocharis quinqueflora*	E	
Three-angled Spike-sedge	*Eleocharis tricostata*	E	
Slender Cottongrass	*Eriophorum gracile*	T	
Dwarf Bulrush	*Lipocarpha micrantha*	T	
Capillary Beak-sedge	*Rhynchospora capillacea*	E	
Inundated Horned-sedge	*Rhynchospora inundata*	T	
Short-beaked Bald-sedge	*Rhynchospora nitens*	T	
Long-beaked Bald-sedge	*Rhynchospora scirpoides*	SC	
Torrey's Beak-sedge	*Rhynchospora torreyana*	E	
Northeastern Bulrush	*Scirpus ancistrochaetus*	E	E
Long's Bulrush	*Scirpus longii*	T	

Papillose Nut-sedge	*Scleria pauciflora*	E	8
Tall Nut-sedge	*Scleria triglomerata*	E	
Dryopteridaceae (Wood Ferns)			
Braun's Holly-fern	*Polystichum braunii*	E	
Smooth Woodsia	*Woodsia glabella*	E	
Elatinaceae (Waterworts)			
American Waterwort	*Elatine americana*	E	
Empetraceae (Crowberries)			
Broom Crowberry	*Corema conradii*	SC	
Equisetaceae (Horsetails)			
Dwarf Scouring-rush	*Equisetum scirpoides*	SC	
Ericaceae (Laurels, Blueberries)			
Great Laurel	*Rhododendron maximum*	T	
Mountain Cranberry	*Vaccinium vitis-idaea* ssp. *minus*	E	
Eriocaulaceae (Pipeworts)			
Parker's Pipewort	*Eriocaulon parkeri*	E	
Fabaceae (Beans, Peas, Clovers)			
Large-bracted Tick-trefoil	*Desmodium cuspidatum*	T	
Spreading Tick-trefoil	*Desmodium humifusum*	E	
Wild Senna	*Senna hebecarpa*	E	
Fagaceae (Oaks, Beeches)			
Bur Oak	*Quercus macrocarpa*	SC	
Yellow Oak	*Quercus muehlenbergii*	T	
Fumariaceae (Fumitories)			
Climbing Fumitory	*Adlumia fungosa*	T	
Gentianaceae (Gentians)			
Andrew's Bottle Gentian	*Gentiana andrewsii*	T	
Spurred Gentian	*Halenia deflexa*	E	
Slender Marsh Pink	*Sabatia campanulata*	E	
Plymouth Gentian	*Sabatia kennedyana*	SC	
Sea Pink	*Sabatia stellaris*	E	
Grossulariaceae (Currants)			
Bristly Black Currant	*Ribes lacustre*	SC	
Haemodoraceae (Redroots)			
Redroot	*Lachnanthes caroliana*	SC	
Haloragaceae (Water-milfoils)			
Alternate-flowered Water-milfoil	*Myriophyllum alterniflorum*	E	
Farwell's Water-milfoil	*Myriophyllum farwellii*	E	
Pinnate Water-milfoil	*Myriophyllum pinnatum*	SC	
Comb Water-milfoil	*Myriophyllum verticillatum*	E	
Hydrophyllaceae (Waterleaves)			
Broad Waterleaf	*Hydrophyllum canadense*	E	
Hymenophyllaceae (Filmy-ferns)			
Weft Bristle-fern	*Trichomanes intricatum*	E	
Iridaceae (Irises)			
Sandplain Blue-eyed Grass	*Sisyrinchium fuscatum*	SC	
Slender Blue-eyed Grass	*Sisyrinchium mucronatum*	E	
Isoetaceae (Quillworts)			
Acadian Quillwort	*Isoetes acadiensis*	E	
Lake Quillwort	*Isoetes lacustris*	E	

Juncaceae (Rushes)			
Weak Rush	*Juncus debilis*	E	
Thread Rush	*Juncus filiformis*	E	
Black-fruited Woodrush	*Luzula parviflora* ssp. *melanocarpa*	E	
Lamiaceae (Mints)			
Purple Giant-hyssop	*Agastache scrophulariifolia*	E	
Downy Wood-mint	*Blephilia ciliata*	E	
Hairy Wood-mint	*Blephilia hirsuta*	E	
Gypsywort	*Lycopus rubellus*	E	
Basil Mountain-mint	*Pycnanthemum clinopodioides*	E	
False Pennyroyal	*Trichostema brachiatum*	E	
Lentibulariaceae (Bladderworts)			
Resupinate Bladderwort	*Utricularia resupinata*	T	
Fibrous Bladderwort	*Utricularia striata*	T	
Subulate Bladderwort	*Utricularia subulata*	SC	
Liliaceae (Lilies)			
Devil's-bit	*Chamaelirium luteum*	E	
Linaceae (Flaxes)			
Sandplain Flax	*Linum intercursum*	SC	
Rigid Flax	*Linum medium* var. *texanum*	T	
Lycopodiaceae (Clubmosses)			
Foxtail Clubmoss	*Lycopodiella alopecuroides*	E	
Mountain Firmoss	*Huperzia selago*	E	
Lythraceae (Loosestrifes)			
Toothcup	*Rotala ramosior*	E	
Magnoliaceae (Magnolias)			
Sweetbay Magnolia	*Magnolia virginiana*	E	
Melastomataceae (Meadow Beauties)			
Maryland Meadow Beauty	*Rhexia mariana*	E	
Moraceae (Mulberries)			
Red Mulberry	*Morus rubra*	E	
Nymphaeaceae (Water Lilies)			
Tiny Cow-lily	*Nuphar microphylla*	E	
Onagraceae (Evening Primroses)			
Many-fruited False-loosestrife	*Ludwigia polycarpa*	E	
Round-fruited False-loosestrife	*Ludwigia sphaerocarpa*	E	
Ophioglossaceae (Grape Ferns)			
Adder's-tongue Fern	*Ophioglossum pusillum*	T	
Orchidaceae (Orchids)			
Putty-root	*Aplectrum hyemale*	E	
Arethusa	*Arethusa bulbosa*	T	
Autumn Coralroot	*Corallorrhiza odontorhiza*	SC	
Ram's-head Lady's-slipper	*Cypripedium arietinum*	E	
Small Yellow Lady's-slipper	*Cypripedium parviflorum* var. *makasin*	E	
Showy Lady's-slipper	*Cypripedium reginae*	SC	
Dwarf Rattlesnake-plantain	*Goodyera repens*	E	
Small Whorled Pogonia	*Isotria medeoloides*	E	T
Lily-leaf Twayblade	*Liparis liliifolia*	T	
Heartleaf Twayblade	*Listera cordata*	E	
Bayard's Green Adder's-mouth	*Malaxis bayardii*	E	
White Adder's-mouth	*Malaxis monophyllos* var. *brachypoda*	E	

Crested Fringed Orchis	*Platanthera cristata*	E
Leafy White Orchis	*Platanthera dilatata*	T
Pale Green Orchis	*Platanthera flava* var. *herbiola*	T
Hooded Ladies'-tresses	*Spiranthes romanzoffiana*	E
Grass-leaved Ladies'-tresses	*Spiranthes vernalis*	T
Cranefly Orchid	*Tipularia discolor*	E
Nodding Pogonia	*Triphora trianthophora*	E
Oxalidaceae (Wood-sorrels)		
Violet Wood-sorrel	*Oxalis violacea*	E
Poaceae (Grasses)		
Annual Peanutgrass	*Amphicarpum amphicarpon*	E
Purple Needlegrass	*Aristida purpurascens*	T
Seabeach Needlegrass	*Aristida tuberculosa*	T
Reed Bentgrass	*Calamagrostis pickeringii*	E
Tufted Hairgrass	*Deschampsia cespitosa* ssp. *glauca*	E
Commons's Panic-grass	*Dichanthelium ovale* ssp. *pseudopubescens*	SC
Mattamuskeet Panic-grass	*Dichanthelium dichotum* ssp. *mattamuskeetense*	E
Rough Panic-grass	*Dichanthelium scabriusculum*	T
Wright's Panic-grass	*Dichanthelium wrightianum*	SC
Hairy Wild Rye	*Elymus villosus*	E
Frank's Lovegrass	*Eragrostis frankii*	SC
Saltpond Grass	*Leptochloa fusca* ssp. *fascicularis*	T
Sea Lyme-grass	*Leymus mollis*	E
Woodland Millet	*Milium effusum*	T
Gattinger's Panic-grass	*Panicum philadelphicum* ssp. *gattingeri*	SC
Long-Leaved Panic-grass	*Panicum rigidulum* var. *pubescens*	T
Philadelphia Panic-grass	*Panicum philadelphicum*	SC
Drooping Speargrass	*Poa languida*	E
Bristly Foxtail	*Setaria parviflora*	SC
Salt Reedgrass	*Spartina cynosuroides*	T
Shining Wedgegrass	*Sphenopholis nitida*	T
Swamp Oats	*Sphenopholis pensylvanica*	T
Small Dropseed	*Sporobolus neglectus*	E
Northern Gama-grass	*Tripsacum dactyloides*	E
Spiked False-oats	*Trisetum triflorum* ssp. *molle*	E
Podostemaceae (Threadfeet)		
Threadfoot	*Podostemum ceratophyllum*	SC
Polygonaceae (Docks, Knotweeds)		
Strigose Knotweed	*Persicaria setacea*	T
Sea-beach Knotweed	*Polygonum glaucum*	SC
Pondshore Knotweed	*Polygonum puritanorum*	SC
Seabeach Dock	*Rumex pallidus*	T
Swamp Dock	*Rumex verticillatus*	T
Portulacaceae (Spring Beauties)		
Narrow-leaved Spring Beauty	*Claytonia virginica*	E
Potamogetonaceae (Pondweeds)		
Algae-like Pondweed	*Potamogeton confervoides*	T
Variable Pondweed	*Potamogeton diversifolius*	E

Frie's Pondweed	*Potamogeton friesii*	E	
Hill's Pondweed	*Potamogeton hillii*	SC	
Ogden's Pondweed	*Potamogeton ogdenii*	E	
Straight-leaved Pondweed	*Potamogeton strictifolius*	E	
Vasey's Pondweed	*Potamogeton vaseyi*	E	
Pyrolaceae (Shinleaf)			
Pink Pyrola	*Pyrola asarifolia* var. *purpurea*	E	
Ranunculaceae (Buttercups)			
Black Cohosh	*Cimicifuga racemosa*	E	
Purple Clematis	*Clematis occidentalis*	SC	
Golden Seal	*Hydrastis canadensis*	E	
Tiny-flowered Buttercup	*Ranunculus micranthus*	E	
Bristly Buttercup	*Ranunculus pensylvanicus*	T	
Rosaceae (Roses, Shadbushes)			
Small-flowered Agrimony	*Agrimonia parviflora*	E	
Hairy Agrimony	*Agrimonia pubescens*	T	
Bartram's Shadbush	*Amelanchier bartramiana*	T	
Nantucket Shadbush	*Amelanchier nantucketensis*	SC	
Roundleaf Shadbush	*Amelanchier sanguinea*	SC	
Bicknell's Hawthorn	*Crataegus bicknellii*	E	
Sandbar Cherry	*Prunus pumila* var. *depressa*	T	
Northern Prickly Rose	*Rosa acicularis*	E	
Northern Mountain-ash	*Sorbus decora*	E	
Barren Strawberry	*Waldsteinia fragarioides*	SC	
Rubiaceae (Bedstraws, Bluets)			
Northern Bedstraw	*Galium boreale*	E	
Labrador Bedstraw	*Galium labradoricum*	T	
Long-leaved Bluet	*Houstonia longifolia*	E	
Salicaceae (Willows)			
Swamp Cottonwood	*Populus heterophylla*	E	
Sandbar Willow	*Salix exigua*	T	
Scheuchzeriaceae	**(Pod-grasses)**		
Pod-grass	*Scheuchzeria palustris*	E	
Schizaeaceae (Climbing Ferns)			
Climbing Fern	*Lygodium palmatum*	SC	
Scrophulariaceae (Figworts)			
Sandplain Gerardia	*Agalinis acuta*	E	E
Winged Monkey-flower	*Mimulus alatus*	E	
Muskflower	*Mimulus moschatus*	E	
Swamp Lousewort	*Pedicularis lanceolata*	E	
Hairy Beardtongue	*Penstemon hirsutus*	E	
Sessile Water-speedwell	*Veronica catenata*	E	
Culver's-root	*Veronicastrum virginicum*	T	
Sparganiaceae (Bur-reeds)			
Small Bur-reed	*Sparganium natans*	E	
Verbenaceae (Vervains)			
Narrow-leaved Vervain	*Verbena simplex*	E	
Violaceae (Violets)			
Sand Violet	*Viola adunca*	E	
Britton's Violet	*Viola brittoniana*	T	
Northern Bog Violet	*Viola nephrophylla*	E	

Viscaceae (Christmas-mistletoes)

Dwarf Mistletoe	*Arceuthobium pusillum*	SC

1. Trimorphic freshwater population only.

2. Including triploid and other polyploid forms within the *Ambystoma jeffersonianum/Ambystoma laterale* complex.

3. Ditto

4. This species is listed by the U. S. Fish and Wildlife Service as *P. r. bangsi* (Plymouth Redbelly Turtle) in 50 CFR 17.11.

5. Undescribed species near *I. inextricata*

6. Undescribed species near *P. pterisii*

7. Undescribed species near *Z. lunifera*

8. Includes the two varieties of this species that occur in Massachusetts: *s.p.* var. *pauciflora* and *s.p.* var. *caroliniana.*

Last Revised 6/18/2004

E - Endangered
T - Threatened
SC –Special Concern, State