ENVIRONMENTAL ASSESSMENT

Reducing Gull Damage in the Commonwealth of Massachusetts

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ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

In Cooperation with:

UNITED STATED DEPARTMENT OF INTERIOR
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ACRONYMS

AI	Avian Influenza
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BCR	Bird Conservation Regions
BO	Biological Opinion
CBC	Christmas Bird Count
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
EA	Environmental Assessment
ECOFRAM	Ecological Committee on FIFRA Risk Assessment
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FY	Fiscal Year
HP	High Pathogenic
LD_{50}	Lethal Dose
MA	Methyl anthranilate
MANEM	Mid-Atlantic/New England/Maritimes
MBTA	Migratory Bird Treaty Act
MDAR	Massachusetts Department of Agricultural Resources
MDEP	Massachusetts Department of Environmental Protection
MDFG	Massachusetts Department of Fish and Game
MDFW	Massachusetts Division of Fisheries and Wildlife
MGL	Massachusetts General Law
MOU	Memorandum of Understanding
NAS	National Audubon Society
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWRC	National Wildlife Research Center
PBR	Potential Biological Removal
SOP	Standard Operating Procedures
T&E	Threatened and Endangered
US	United States
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 PURPOSE

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS)[1] program in Massachusetts continues to receive requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, and property, including threats to human safety, associated with herring gulls (*Larus argentatus*), ring-billed gulls (*Larus delawarensis*), great black-backed gulls (*Larus marinus*), and laughing gulls (*Larus atricilla*). Normally, individual wildlife damage management actions conducted by the WS program could be categorically excluded from further analysis pursuant to the National Environmental Policy Act (NEPA) and in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c), 60 FR 6000-6003).

The purpose of this Environmental Assessment (EA) is to evaluate activities conducted by WS to manage damage and threats to agricultural resources, property, natural resources, and threats to humans caused by gulls in the Commonwealth of Massachusetts where a request for assistance is received and when a depredation permit has been issued by the United States Fish and Wildlife Service (USFWS). This EA will assist in determining if the proposed management of gull damage could have a significant impact on the human environment for both humans and other organisms. The EA will also assist with identifying and addressing issues associated with gull damage management and analyzes alternative approaches to address those issues. In addition, this EA will be a planning document to coordinate efforts with other federal, Commonwealth, and local agencies. The public involvement process associated with the development of the EA will inform the public of the proposed activities and will allow for public input into the process. This EA analyzes the potential effects of gull damage management when requested, as coordinated between WS, the USFWS, and the Massachusetts Department of Fish and Game (MDFG).

WS is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of program activities; and 5) evaluate and determine if there are any potentially significant or cumulative adverse affects from the proposed program. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents (see Appendix A), interagency consultations, and public involvement.

The EA evaluates the need for action to manage damage associated with gulls in the Commonwealth, the potential issues associated with gull damage management, and the environmental consequences of conducting different alternatives to address the need for action and the identified issues. Issues relating to the reduction of wildlife damage were raised during the scoping process for WS' programmatic FEIS (USDA 1997) and were considered in the preparation of the EA. The issues and alternatives associated with gull damage management in Massachusetts were initially developed by WS in consultation with the USFWS, the MDFG, and the Massachusetts Department of Agricultural Resources (MDAR). The USFWS has regulatory authority to manage populations of migratory bird species in the Commonwealth. To assist with the identification of additional issues and alternatives to managing damage associated with gulls in Massachusetts, the pre-decisional EA will be available to the public for review and comment prior to a Decision[2].

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[1]The WS program is authorized to protect agriculture and other resources from damage caused by wildlife through the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c).

[2]After the development of the EA by WS and consulting agencies and after public involvement in identifying new issues and alternatives, WS will issue a Decision. Based on the analyses in the EA after public involvement, a decision will be made to either publish a Notice of Intent to prepare an Environmental Impact Statement or a Finding of No Significant Impact will be noticed to the public in accordance to NEPA and the Council of Environmental Quality regulations.

1.2 NEED FOR ACTION

Across the United States, human populations have expanded and land has been transformed to meet varying human needs. As the landscape has been altered to meet human needs, wildlife habitat has been substantially changed. Those human needs often compete with wildlife and have inherently increased the potential for negative interactions between wildlife and people. Negative interactions between people and wildlife occur when wildlife cause damage to resources and threaten human safety. Some species of wildlife have adapted to, and thrive in, human altered habitats. Those species, in particular, are often responsible for the majority of the negative interactions between humans and wildlife. When negative interactions occur, people often seek assistance to manage damage to resources and to reduce threats to human safety associated with wildlife. WS' Final Environmental Impact Statement (FEIS)[3] 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.*"

Both sociological and biological carrying capacities must be applied to resolving wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). Those phenomena are especially important because they define the sensitivity of a community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those directly and indirectly affected by the species and any associated damage. This damage threshold is a factor in determining the wildlife acceptance capacity. While Massachusetts may have a biological carrying capacity to support a higher population of some gull species, in many cases, the wildlife acceptance capacity is lower or has been met. Once the wildlife acceptance capacity is met or exceeded, people begin to implement population management or damage reduction methods, including lethal methods, to alleviate damage or address threats to public safety.

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (Leopold 1933, The Wildlife Society 1990, Berryman 1991). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for wildlife damage management is derived from those specific threats to resources. Those individuals of a wildlife species have no intent to do harm. They utilize habitats (*e.g.*, reproduce, walk, forage) where they can find a niche. If their activities result in actions resulting in lost economic value of resources or threaten human safety, people often characterize this as damage.

When wildlife damage and threats to human safety reaches a threshold, people often seek assistance to resolve or alleviate those damages or threats associated with wildlife. The threshold triggering a request

[3]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 document.

for assistance is often unique to the individual person requesting assistance and can be based on many factors (*e.g.*, economic, social, aesthetics).

The need for action to manage damage and threats associated with gulls in Massachusetts arises from requests for assistance[4] received by WS to reduce and prevent damage associated with gulls from occurring to four major categories: agricultural resources, natural resources, property, and threats to human safety. WS has identified those gull species most likely to be responsible for causing damage to those four categories in the Commonwealth based on previous requests for assistance. Table 1.1 lists WS' technical assistance projects involving gull damage or threats of gull damage to those four major resource types in Massachusetts from the federal fiscal year[5] (FY) 1996 through FY 2008. Technical assistance is provided by WS to those persons requesting assistance with resolving damage or the threat of damage by providing information and recommendations on gull damage management activities that can be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities will be discussed further in Chapter 3 of this EA.

The technical assistance projects conducted by WS are representative of the damage and threats that are caused by gulls in Massachusetts. As shown in Table 1.1, WS has conducted 951 technical assistance projects in Massachusetts that addressed damage and threats associated with those gull species addressed in this assessment. WS has conducted 598 technical assistance projects involving damage or threats of damage associated with herring gulls in the Commonwealth. Most requests for assistance were associated with herring gull damage to property. Overall, nearly 69% of the requests received by WS for technical assistance involved gull damage to property.

Table 1.1 - Technical assistance requests for gull damage received by WS, FY 1996 - FY 2008

Species	Agriculture	Human Safety	Property	Natural Resources	Total
Great Black-Backed Gull	5	14	125	43	**187**
Herring Gull	17	88	423	70	**598**
Laughing Gull	0	0	3	3	**6**
Ring-Billed Gull	7	24	102	27	**160**

The gull species addressed in this assessment are gregarious (*i.e.*, form large flocks) species. Although damage and threats can occur throughout the year, damage is highest during those periods when gulls are concentrated into large flocks such as migration periods and during winter months when food sources are limited. For the gull species addressed, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists for nesting.

As stated previously, the need for action arises from requests received from Commonwealth, federal, and private entities to provide assistance with resolving damage or threats of damage to four main categories of resources in Massachusetts that includes agricultural resources, natural resources, property, and human safety. More specific information regarding gull damage to those main categories is discussed in the following subsections of this EA:

Need to Resolve Threats that Gulls Pose to Human Safety

Birds can play an important role in the transmission of zoonotic diseases where humans may come into contact with fecal droppings of those birds. Few studies are available on the occurrence of zoonotic

[4] WS only conducts bird damage management after receiving a request for assistance. Before initiating bird damage activities, a Memorandum of Understanding, cooperative service agreement, or other comparable document must be signed between WS and the cooperating entity which lists all the methods the property owner or manager will allow to be used on property they own and/or manage.

[5] The federal fiscal year begins on October 1 and ends on September 30 the following year.

diseases in wild birds and the risks of transmission of those diseases to humans. Study of this issue is complicated by the fact that some disease-causing agents associated with birds may also be contracted from other sources. The risk of disease transmission from birds to humans is likely very low. However, human exposure to fecal droppings through direct contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. The gregarious behavior of gulls leads to accumulations of fecal droppings that can be considered a threat to human health and safety due to the close association of those species of gulls with human activity. Accumulations of gull droppings in public areas are aesthetically displeasing and are often in areas where humans may come in direct contact with fecal droppings. In Massachusetts, human health and safety concerns and problems associated with gulls include, but are not limited to potential for transmission of zoonotic diseases to humans, contamination of municipal drinking water sources, and bird-aircraft strikes.

Research has shown that gulls carry various species of bacteria such as *Bacillus* sp., *Clostridium* sp., *Campylobacter* spp., *Escherichia coli*, *Listeria* spp., and *Salmonella* spp. (MacDonald and Brown 1974, Fenlon 1981, Butterfield et al. 1983, Monaghan et al. 1985, Norton 1986, Vauk-Hentzelt et al. 1987, Quessey and Messier 1992). Transmission of bacteria from gulls to humans is difficult to document; however, Reilley et al. (1981) and Monaghan et al. (1985) both suggested that gulls were the source of contamination for cases of human salmonellosis. Contamination of public water supplies by gull feces has been stated as the most plausible source for disease transmission (*e.g.*, Jones et al. 1978, Hatch 1996). Gull feces has also been implicated in accelerated nutrient loading of aquatic systems (Portnoy 1990), which could have serious implications for municipal drinking water sources.

Public health concerns often arise when gulls feed and loaf near fast food restaurants, and picnic facilities; deposit waste from landfills in urban areas and drinking water reservoirs; and contaminate industrial facility ventilation systems with feathers, nesting debris, and droppings. Gulls feeding on vegetable crops and livestock feed can potentially aid in the transmission of salmonella.

Many times, individuals or property owners that request assistance with nuisance gull problems are concerned about potential disease risks but are unaware of the types of diseases that can be associated with gulls. In most situations, WS receives a request for assistance because the accumulation of droppings left by concentrations of gulls is aesthetically displeasing and can result in recurrent clean-up costs.

Threat of Aircraft Striking Gulls at Airports and Military Bases

It is widely recognized throughout the civil and military aviation communities that the threat to human safety from aircraft collisions with wildlife is increasing (Dolbeer 2000). Collisions between aircraft and wildlife are a concern throughout the world because they threaten passenger safety (Thorpe 1996), result in lost revenue, lead to costly repairs to aircraft (Linnell et al. 1996, Robinson 1996), and can erode public confidence in the air transport industry as a whole (Conover et al. 1995). From January 1990 through March 2009, 267 aircraft strikes have been reported in Massachusetts involving gulls (FAA 2009). Dolbeer et al. (2009) reported that gulls were the most commonly struck bird group from 1990 through 2008. Gull strikes represent over 18% of all reported wildlife strikes in Massachusetts. The United States Air Force (USAF) reports that herring gulls, ring-billed gulls, and laughing gulls have been identified in 593 aircraft strikes across the United States resulting in nearly $8.7 million in damages to aircraft (USAF 2009).

The threats that gulls and other wildlife pose at airports in the Commonwealth was addressed in a separate EA (USDA 2002). The EA evaluated the need for reducing those threats at airports in the

Commonwealth and the issues associated with reducing those risks by WS (USDA 2002). Information related to WS' activities to addresses threats at airports in the Commonwealth will remain as addressed in that EA (USDA 2002).

Need to Resolve Damage and Threats Posed by Gulls at Landfills

Gull attraction to landfills as a food source has been well documented (Mudge and Ferns 1982, Patton 1988, Belant et al. 1995a, Gabrey 1997, Belant et al. 1998). Large numbers of gulls are attracted to and use landfills as feeding and loafing areas throughout North America. In the northeastern United States, landfills often serve as foraging and loafing areas for gulls throughout the year, while attracting larger populations of gulls during migration periods (Bruleigh 1998). Landfills have even been suggested as contributing to the increase in gull populations (Verbeek 1977, Patton 1988, Belant and Dolbeer 1993). Regulations mandate that landfills prevent or control potential vectors, such as gulls (40 CFR 258.22). The Massachusetts Department of Environmental Protection (MDEP) Policy BWP-98-003 (see Appendix E) requires landfill operators to prevent gulls from feeding on solid waste, at any time, even for the briefest periods and to eliminate or reduce the suitability and attractiveness of the facility for other gull activities such as resting, roosting, or loafing. Failure to address gulls may result in fines and even closure of a facility. To facilitate understanding of the methods available to landfill operators, the Metropolitan District Commission, now the Massachusetts Department of Conservation and Recreation, the MDEP, the MDFG, and WS jointly developed the Manual for Gull Control at Massachusetts Landfills (see Appendix F). Gulls that visit landfills may loaf and nest on nearby drinking water supplies or rooftops, causing health concerns, aesthetic distractions, and structural damage to buildings and equipment.

Gull conflicts associated with landfills include accumulation of feces on equipment and buildings, distraction of heavy machinery operators, and the potential for gulls to transmit disease to workers on site. The tendency for gulls to carry waste off site results in accumulation of feces and deposition of garbage on surrounding industrial and residential areas. The deposition of refuse is aesthetically displeasing to surrounding residents and increases the potential for gulls to transmit disease to neighboring residents. The WS program in Massachusetts has received requests for technical assistance and consultation from landfill operators to disperse gulls that cause damage or pose a threat to human safety.

Additional Human Safety Concerns Associated with Gulls

Nesting herring and great black-backed gulls are often highly aggressive when defending their eggs and young. The WS program in Massachusetts often receives requests for assistance from property managers with concerns about potential threats of injury, particularly to workers on rooftops. Threats to safety can involve actual attacks by gulls and the risk of falls when attempting to avoid attacks. WS has documented injuries to humans from herring gull attacks requiring medical treatment.

Need to Resolve Gull Damage to Agricultural Resources

Agriculture continues to be an important sector in the Massachusetts economy with the value of agricultural production totaling nearly $490 million in 2007 (New England Agricultural Statistics 2008). Agricultural production occurs on nearly 510,000 acres of land in Massachusetts on approximately 7,700 farms (New England Agricultural Statistics 2008). Besides the production of sod, nursery, and greenhouse plants, the top farm commodities for cash receipts were generated from the production of fruit and vegetables, which together accounted for nearly 33% of the cash receipts in the Commonwealth. Cattle and calves accounted for over $12 million in cash receipts in Massachusetts during 2007 with over $50 million in cash receipts from the production of milk (New England Agricultural Statistics 2008). The

cattle and calf inventory in 2008 was estimated at nearly 43,000 with hogs estimated at 10,000 individuals (New England Agricultural Statistics 2008). Cash receipts from aquaculture totaled nearly $19 million in 2007. The aquaculture industry in Massachusetts raises a variety of freshwater and marine organisms including trout, salmon, oysters, clams, mussels, scallops, and urchins.

Damage to Aquaculture Resources

Aquaculture, the cultivation of finfish and invertebrates in captivity, has grown exponentially in the past several decades (Price and Nickum 1995). Damage to aquaculture resources occurs primarily from the economic losses associated with gulls consuming fish and other commercially raised aquatic wildlife. Damage can also result from the death of fish and other aquatic wildlife from injury associated with gull predation as well as the threat of disease transmission from one impoundment to another or from one aquaculture facility to other facilities as gulls move between sites. Also of concern to aquaculture facilities is the transmission of diseases by gulls between impoundments and from facility to facility. Given the confinement of aquatic wildlife inside impoundments at aquaculture facilities and the high densities of those organisms in the impoundments, the introduction of a disease can result in substantial economic losses since the entire impoundment is likely to become infected and result in extensive mortality. Although the actual transmission of diseases through transport by gulls is difficult to document, gulls have been documented as having the capability of spreading diseases through fecal droppings and possibly through other mechanical means such as on feathers, feet, and regurgitation.

The principal species propagated in Massachusetts are trout (NASS 2009). In 2007, there were 273 commercial aquaculture facilities in Massachusetts with nearly $18 million in sales (NASS 2009). Aquaculture products account for nearly 4% of all agricultural products sold in Massachusetts (New England Agricultural Statistics 2008). In 1984, a survey of fish producing facilities identified 43 species of birds as foraging on fish at those facilities, including gulls (Parkhurst et al. 1987).

Damage and Threats to Livestock Operations

In 2007, Massachusetts cattle and hog operations reported cash receipts totaling $12 million and $2 million, respectively (New England Agricultural Statistics 2008). Gulls often cause damage at cattle and hog feeding facilities by congregating in large numbers to consume cattle and hog feed. Such feeding strategies present disease threats to livestock at such sites. Williams et al. (1977) and Johnston et al. (1979) reported that gulls can transmit salmonella to livestock through droppings and contaminated drinking water. The gulls 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 operators and their personnel.

Damage to Agricultural Crops

Although gulls do not generally feed on agricultural crops, they do cause damage. Gulls, particularly ring-billed gulls, feed on earthworms, insects and other invertebrates in open fields. This often results in the trampling of young plants resulting in reduced yields or replanting. In addition, there may be the threat of bacterial contamination of vegetable crops due to accumulation of droppings, particularly if gulls have recently fed or loafed at landfills or sewage treatment plants. Massachusetts has a large fruit and berry industry and gulls negatively affect these farms primarily by trampling plants and to a lesser extent by eating the fruit and contaminating the ones left on the bush with fecal matter.

Massachusetts farmers produce a wide variety of cash crops throughout the Commonwealth including corn, soybeans, hay, potatoes, blueberries, vegetables (cucumbers, beans, peas, tomatoes, watermelons, cantaloupes, squash, broccoli, spinach, and other greens) nursery crops, and floriculture.

Need to Resolve Gull Damage Occurring to Property

Gull damage to property occurs through direct damage to structures, through roosting behavior, and through their nesting behavior. Gulls frequently damage structures on private property, or public facilities, with fecal contamination. Accumulated gull 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 gull droppings. This can be compounded by gulls walking in the droppings which commonly contain abrasive material such as sand passed through the digestive tract. Roof-top colonies of nesting gulls have been well documented and frequently cause damage to urban and industrial structures. Nesting gulls peck at spray on foam roofing and rubber roofing material, including caulking. This creates holes that must be repaired or roof leaks can result. Gulls transport large amounts of nest material and food remains to the rooftops which can obstruct roof drainage systems and lead to structural damage or roof failure if clogged drains result in rooftop flooding (Vermeer et al. 1988, Blokpoel and Scharf 1991, Belant 1993).

Need to Resolve Gull Damage Occurring to Natural Resources

Gulls can also negatively impact natural resources through habitat degradation, competition with other wildlife, and through direct depredation on natural resources. Habitat degradation occurs when large concentrations of gulls in a localized area negatively impact characteristics of the surrounding habitat that can adversely affect other wildlife species and can be aesthetically displeasing. Competition can occur when two species compete (usually to the detriment of one species) for available resources, such as food or nesting sites. Direct depredation occurs when predatory gull species feed on other wildlife species which can negatively influence those species' populations, especially when depredation occurs on threatened and endangered (T&E) species.

Habitat degradation in Massachusetts occurs primarily in areas where colonial waterbirds nest or where the gregarious roosting behavior of gulls occurs. The degradation of habitat occurs from the continuous accumulation of fecal droppings that occurs under nesting colonies of gulls or under areas where gulls consistently roost. Over time, the accumulation of fecal droppings where colonial waterbirds, such as gulls, nest can lead to the loss of vegetation due to the ammonium nitrogen found in the fecal droppings of gulls. Ammonium toxicity from fecal droppings may be an important factor contributing to the declining presence of vegetation on some islands in the Great Lakes (Hebert et al. 2005).

Some species listed as threatened, endangered, or of special concern under the Endangered Species Act of 1973 (ESA) and the Massachusetts Endangered Species Act (M.G.L c.131A and regulations 321 CMR 10.00) are preyed upon or otherwise adversely affected by certain gull species. Concentrations of gulls often impact the productivity and survivorship of rare or endangered colonial species such as terns (U.S. Department of the Interior 1996) and prey upon the eggs and chicks of colonial waterbirds and shorebirds such as piping plovers.

WS conducts a variety of damage management activities to protect T&E species from predation by mammalian and avian predators, including gulls. WS has been requested to manage gull predation of federally and state threatened piping plover and least terns which are a species of special concern in Massachusetts. In addition to direct predation on piping plovers, herring, great black-backed, and ring-billed gulls compete with plovers for nesting habitat and may cause piping plovers to abandon former

nesting areas. Nesting colonies of waterbirds declined at Monomoy National Wildlife Refuge in Massachusetts as a large gull colony grew rapidly during the 1960s and 1970s (USFWS 1996). Colonial nesting gull species are also known to compete with other bird species for nest sites, such as terns and plovers. In Massachusetts, herring gull, great black-backed gull, and laughing gull colonies have and continue to compete with colonial waterbirds for nest sites. In 1996, WS conducted a herring gull and great black-backed gull colony reduction project at the request of the USFWS on South Monomoy Island in Chatham, Massachusetts. WS used the avicide DRC-1339 to lethally remove nesting herring gulls and great black-backed gulls which resulted in an expansion of common and roseate tern nesting on the Island. The USFWS continues to conduct egg and nest treatment to maintain and prevent the expansion of herring gull, great black-backed gull, and laughing gull nest colonies on South Monomoy Island.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for gull damage management to reduce threats to human safety and to resolve damage to property, natural resources, and agricultural resources on federal, Commonwealth, tribal, municipal, and private land within the Commonwealth of Massachusetts wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting gull damage management in the Commonwealth to meet the need for action and evaluates different alternatives to meet that need while addressing those issues. In addition, this EA evaluates the permitting of gull take through the issuance of depredation permits by the USFWS to WS and to other entities within the Commonwealth. Activities conducted by WS to address threats associated with wildlife, including gulls, at airports in the Commonwealth will remain as addressed in the EA developed to analyze those activities (USDA 2002). Gull damage management activities conducted at airports in the Commonwealth are discussed in this assessment to ensure activities that could occur concurrently are analyzed cumulatively pursuant to the NEPA.

Issuance of Depredation Permits by the USFWS to Lethally Take Birds in the State

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, hunt, take, capture, kill, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or their parts, nests, or eggs (16 U.S.C 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13.

The MBTA does allow for the lethal take of those bird species listed in 50 CFR 10.13 when depredation occurs through the issuance of depredation permits or the establishment of depredation orders. Under authorities in the MBTA, the USFWS is the federal agency responsible for the issuance of depredation permits or the establishment of depredation orders for the take of those protected bird species when damage or threats of damage are occurring. Information regarding migratory bird permits can be found in 50 CFR 13 and 50 CFR 21.

The USFWS is a cooperating agency on this EA to analyze cumulative take of those bird species addressed in this EA from the issuance of depredation permits to entities within the Commonwealth and to ensure compliance with the NEPA. The USFWS has jurisdiction over the management of migratory birds and has specialized expertise in identifying and quantifying potential adverse affects to the human environment from bird damage management activities. The analyses in this EA will ensure the USFWS compliance with the NEPA for the issuance of depredation permits for the take of those birds species addressed.

Native American Lands and Tribes

Currently, WS does not have a Memorandum of Understanding (MOU) or signed cooperative service agreement with any Native American tribes in Massachusetts. If WS is requested by a tribe to conduct gull damage management activities, this EA would be reviewed and supplemented, if appropriate, to insure compliance with the NEPA.

Period for which this EA is Valid

If the analyses in this EA indicates an Environmental Impact Statement (EIS) is not warranted, this EA will remain valid until WS, in consultation with the USFWS and the MDFG, determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, this analysis and document will be reviewed and supplemented pursuant to the NEPA. Review of the EA will be conducted each year to ensure that the EA is sufficient. This process ensures the EA is complete and still appropriate to the scope of gull damage management activities conducted by WS in Massachusetts.

Site Specificity

This EA analyzes the potential impacts of gull damage management and addresses activities on all private and public lands in Massachusetts under MOU, cooperative service agreement, and in cooperation with the appropriate public land management agencies. It also addresses the impacts of gull damage management on 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 gull damage management efforts could occur. Thus, this EA anticipates the potential expansion and analyzes the impacts of such efforts as part of the program.

Planning for the management of gull 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, and insurance companies. Although some of the sites where gull 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 gull damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992, USDA 1997) would be the site-specific procedure for individual actions conducted by WS in Massachusetts.

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

Summary of Public Involvement

Issues related to gull damage management as conducted by WS in Massachusetts were initially developed by WS in consultation with the USFWS and the MDFG. Issues were defined and preliminary alternatives were identified through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document is being

noticed to the public through legal notices published in local print media, through direct mailings to parties that have requested to be notified or have been identified to have an interest in the reduction of threats and damage associated with gulls in the Commonwealth, and by posting the pre-decisional EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

WS will provide for a minimum of a 30-day comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final Decision or publication of a notice of intent to prepare an EIS.

1.4 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Management of migratory birds is the responsibility of the USFWS. As the authority for the management of bird populations in the Commonwealth, the USFWS was involved in the development of the EA and provided input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The MDFG is responsible for managing wildlife in the Commonwealth of Massachusetts, including gulls. WS' activities to reduce and/or prevent gull damage in the Commonwealth will be coordinated with the USFWS and the MDFG which ensure WS' actions are incorporated into population objectives established by those agencies for bird populations in the State.

Based on the scope of this EA, the decisions to be made are: 1) should WS conduct gull damage management to alleviate damage to agriculture, property, natural resources, and threats to human safety, 2) should the Migratory Bird Program in USFWS Region 5 issue a depredation permit to WS and other entities to conduct gull damage management activities, 3) should WS conduct disease surveillance and monitoring in the bird population when requested by the MDFG, the USFWS, and other agencies, 4) should WS implement an integrated wildlife damage management strategy, including technical assistance and direct operational assistance, to meet the need for gull damage management in Massachusetts, 5) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 6) would the proposed action result in adverse impacts to the environment requiring the preparation of an EIS.

1.5 RELATIONSHIP OF THIS DOCUMENT TO OTHER ENVIRONMENTAL DOCUMENTS

***WS' Programmatic Final Environmental Impact Statement*:** WS has developed a programmatic FEIS[6] that addresses the need for wildlife damage management in the United States (USDA 1997). The FEIS contains detailed discussions of potential impacts to the human environment from wildlife damage management methods used by WS. Pertinent information available in the FEIS has been incorporated by reference into this EA.

***WS' Environmental Assessment - Statewide Wildlife Damage Management at Airports in Massachusetts*:** In 2002, the WS program in the Commonwealth developed an EA to address the need to reduce threats associated with wildlife at airports (USDA 2002). The EA evaluated the issues associated with managing wildlife threats, including threats associated with gulls, at airports and developed alternatives to address those issues. Based on the analyses in the EA, a Finding of No Significant Impact

[6]Copies of WS' programmatic FEIS are available from USDA/APHIS/WS-Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

(FONSI) was issued selecting the proposed action in the EA to address the identified need. The proposed action evaluated an integrated approach using lethal and non-lethal methods to address the need for action. The analyses in the EA will remain appropriate for WS' activities conducted to reduce threats associated with wildlife, including gulls, at airports in the Commonwealth. The analyses in that EA will be discussed in this assessment to ensure WS' activities to address gull damage are evaluated cumulatively. A cumulative assessment of activities conducted by WS in the Commonwealth will ensure those activities are not sufficient to warrant the preparation of an EIS.

1.6 AUTHORITY OF FEDERAL AND COMMONWEALTH AGENCIES

WS' Legislative Authority

The primary statutory authorities for WS' program are the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c).

U.S. Fish and Wildlife Service Authority

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 former 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 MBTA, was transferred to the Secretary of the Interior in 1939 pursuant to Reorganization Plan No. II. Section 4(f), 4 FR 2731, 53 Stat. 1433. The USFWS is also responsible for the protection and management of those populations, species, and subspecies that are considered threatened or endangered under the ESA.

United States Environmental Protection Agency (EPA)

The EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) which regulates the registration and use of pesticides, including repellents to disperse birds and avicides for use to lethally take birds.

Massachusetts Department of Fish and Game

The MDFG authority to manage fish and wildlife in the Commonwealth is given under Massachusetts General Law (MGL) Part 1, Title XIX, Chapter 131. Under Chapter 131, Section 1A, the Massachusetts Division of Fisheries and Wildlife (MDFW) was created under the MDFG.

Massachusetts Department of Agricultural Resources, Division of Regulatory and Consumer Services, Pesticide Bureau

The Pesticide Bureau carries out the day to day responsibilities of regulating pesticides in the Commonwealth of Massachusetts. The Bureau also acts as support staff for the Pesticide Board and subcommittee. The major functions of the Bureau are broken down into specific programs. The Pesticide Bureau is responsible for enforcing all pesticide regulations and laws, both Commonwealth and federal. The Bureau is responsible for carrying out provisions of the Massachusetts Pesticide Control Act. Through cooperative agreements with the EPA, the department also implements provisions of the FIFRA.

1.7 COMPLIANCE WITH LAWS AND STATUTES

Several other laws or statutes authorize, regulate, or otherwise affect WS' and USFWS activities. WS and the USFWS comply with those laws and statutes and consults with other agencies as appropriate. WS will comply with all applicable federal, Commonwealth, and local laws and regulations in accordance with WS Directive 2.210.

National Environmental Policy Act

All federal actions are subject to the NEPA (Public Law 9-190, 42 U.S.C. 4321 et seq.). WS follows CEQ regulations implementing the NEPA (40 CFR 1500 et seq.), USDA (7 CFR 1b), and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. Those laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated in part by CEQ through regulations in 40 CFR, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS guidelines concerning Implementation of NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

Pursuant to the NEPA and CEQ regulations, this EA documents the analyses resulting from federal actions, informs decision-makers, and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that the policies and goals of the NEPA are infused into federal agency actions. This EA was prepared by integrating as many of the natural and social sciences as warranted, based on the potential effects of the proposed action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as amended

The MBTA provides the USFWS regulatory authority to protect families of migratory birds. The law prohibits any "*take*" of migratory bird species by any entities, except as permitted by the USFWS. Under permitting guidelines in the Act, the USFWS may issue depredation permits to requesters experiencing damage caused by bird species protected under the Act. All actions conducted in this EA will be in compliance with the regulations of the MBTA, as amended.

Endangered Species Act

Under the ESA, all federal agencies will seek to conserve T&E species and will 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 will use the best scientific and commercial data available*" (Sec.7 (a) (2)).

WS obtained a Biological Opinion (BO) on programmatic activities from the USFWS in 1992 describing potential effects on T&E species, and prescribing reasonable and prudent measures for avoiding jeopardy (see Appendix F in USDA 1997). As part of the development of this EA, WS has also consulted with the USFWS regarding T&E species in Massachusetts in regards to gull damage management activities proposed which will be discussed in Chapter 4 of this EA.

National Historic Preservation Act (NHPA) of 1966, as amended

The NHPA and its implementing regulations (36 CFR 800) require federal agencies to initiate the section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106. None of the gull damage management methods described in this EA that might be used operationally by WS causes major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves 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, the site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods, such as firearms, that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance wildlife have the potential for audible effects on the use and enjoyment of historic property. 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 problem, which means such use, would be to the benefit of the historic property. A built-in mitigating factor for this issue is that virtually all 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 the Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice - Executive Order 12898

Executive Order 12898, entitled "*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*" promotes the fair treatment of people of all races, income levels, and cultures with respect to the development, implementation and enforcement of environmental laws, regulations, and policies. Environmental justice is 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 minorities and persons or populations of low income. APHIS implements Executive Order 12898 principally through its compliance with the NEPA. All WS' activities are

evaluated for their impact on the human environment and compliance with Executive Order 12898. WS' personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income.

Protection of Children - Executive Order 13045

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their 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 gull damage management program would occur by using only 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.

Responsibilities of Federal Agencies to Protect Migratory Birds - Executive Order 13186

Executive Order 13186 requires each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations, 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 EO and is currently waiting for USFWS approval. WS will abide by the MOU once it is finalized and signed by both parties.

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.

Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods integrated into the WS' program in Massachusetts, including the use of or recommendation of repellents are registered with and regulated by the EPA and the MDAR, and used or recommended by WS in compliance with labeling procedures and requirements.

Massachusetts Pesticide Control Act (MGL c.132B)

The purpose of the Massachusetts Pesticide Control Act is "*...to conform the laws of the commonwealth to the* [FIFRA], *Public Law 92-516, as amended,....and to establish a regulatory process in the commonwealth*". The Act provides "*...exclusive authority in regulating the labeling, distribution, sale, storage, transportation, use and application, and disposal of pesticides in the commonwealth...*".

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 92-583, October 27, 1972; 86 Stat. 1280).

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-

sharing grants to states to develop their programs. Subsequent to federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity. As appropriate, a consistency determination would be conducted by WS to assure management actions would be consistent with the Commonwealth's Coastal Zone Management Program.

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.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of mitigation measures and/or standard operating procedures (SOP), and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional descriptions of affected environments will be incorporated into the discussion of the environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Upon receiving a request for assistance, gull damage management activities could be conducted on federal, Commonwealth, tribal, municipal, and private properties in Massachusetts. The areas of the proposed action could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where gulls may roost, loaf, feed, nest, or otherwise occur. Examples of areas where gull damage management activities could be conducted are, but are not necessarily limited to: agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, railroad yards, waste handling facilities, industrial sites, natural areas, government properties and facilities, private properties, corporate properties, schools, hospitals, parks, woodlots, recreation areas, communally-owned homeowner/property owner association properties, wildlife refuges, wildlife management areas. The affected environment could also include areas where gulls negatively impact wildlife, including T&E species; and public property where gulls are negatively impacting historic structures, cultural landscapes, and natural resources.

Activities related to gull damage management at airports was addressed in a separate EA (USDA 2002). The evaluations of WS' activities to reduce threats associated with gulls at airports in the Commonwealth will remain as addressed in that assessment (USDA 2002).

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

Issues are concerns of the public and/or professional community raised regarding potential adverse affects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues relating to the reduction of wildlife damage were raised during the scoping process for WS' programmatic FEIS (USDA 1997) and were considered in the preparation of this EA. Those issues are fully evaluated within WS' FEIS which analyzed specific data relevant to WS' programmatic activities at the time of preparation. Issues related to managing damage associated with gulls in Massachusetts were developed by WS in consultation with the USFWS and the MDFG. The pre-decisional EA will also be made available to the public for review and comment to identify additional issues.

The issues as related to the possible implementation of the alternatives, including the proposed action, are discussed in detail in Chapter 4. The issues analyzed in detail in the EA are the following:

Issue 1 - Effects of Damage Management Activities on Gull Populations

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations of target species. Methods used to resolve damage or threats to human safety can involve altering the behavior of target species and may require the use of lethal methods when appropriate. Under the proposed action, WS would incorporate non-lethal and lethal methods described in Appendix B in an integrated approach in which all or a combination of methods may be employed to resolve a request for assistance. WS would recommend both non-lethal and lethal methods, as governed by federal, Commonwealth, and local laws and regulations.

Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage which reduces the presence of those species at the site and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove a gull or those gulls responsible for causing damage or posing threats to human safety. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods under this alternative would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

The analysis for magnitude of impact on populations from the use of lethal methods generally follows the process described in WS' programmatic FEIS (USDA 1997). Magnitude is described in WS' programmatic FEIS 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. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997). All lethal take of gulls by WS would occur at the requests of a cooperator seeking assistance.

Information on bird populations and trends are often derived from several sources including the Breeding Bird Survey (BBS), the Christmas Bird Count (CBC), and published literature. Further information on those sources of information is provided below.

Breeding Bird Survey

Bird populations can be monitored by using trend data derived from data collected during the BBS. Under established guidelines, observers count birds at established survey points along roadways for a set duration along a pre-determined route. The number and species of birds observed and heard within a quarter of a mile of the survey points are recorded. Surveys were started in 1966 and are conducted in June which is generally considered as the period of time when those birds present at a location are likely breeding in the immediate area. The BBS is conducted annually in the United States and Canada, across a large geographical area, under standardized survey guidelines. 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. 2008). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The 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 local habitat and climatic conditions. Trends can be determined using different population equations and statistically tested to determine if a trend is statistically significant.

Estimates of population trends from BBS data are derived primarily from route-regression analysis (Geissler and Sauer 1990) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is reflected in the calculated P-value (*i.e.*, the probability of obtaining the observed data or more extreme data given that a hypothesis of no change is true). The level of statistical significance (*e.g*, 0.01, 0.05, 0.10) can vary and is often set by those conducting the analysis. Often BBS or other geographically large survey data is not statistically significant at the local level because of relatively smaller sample size (*i.e.*, fewer routes surveyed), more routes with zero observations of a particular bird species which results in larger statistical variance, and low P-values set for statistical significance. The data reported from the BBS has a statistical level of significance set at $P<0.05$ (Sauer et al. 2008).

Christmas Bird Count

The CBC is conducted in December and early January annually by numerous volunteers under the guidance of the National Audubon Society (NAS). The CBC reflects the number of birds frequenting a location during the winter months and is based on birds observed within a 15 mile diameter circle around a central point (177 mi^2). The CBC data does not provide a population estimate, but can be used as an indicator of trends in the population over time. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (NAS 2002).

Assessment of Authorized Take

Biological assessments for identifying the potential impact of harvest and/or removal programs on bird populations have a long history of application in the United States. Population modeling and extensive monitoring programs form the basis of an adaptive decision-making process used each year for setting migratory game bird harvest regulations, while ensuring that levels of take are sustainable. Increasing human-wildlife conflicts caused by migratory bird species (both game and nongame), and their potential impacts on sensitive species and their habitats, has resulted in greater use of analytical tools to evaluate the effects of authorized take to achieve population objectives (Runge et al. 2009). One such tool is referred to as Potential Biological Removal (PBR; Wade 1998, Runge et al. 2004).

The USFWS recently completed PBR models for ring-billed gulls, herring gulls, great black-backed gulls, and laughing gulls in Bird Conservation Region (BCR) 14 and BCR 30. The eastern portion of Massachusetts lies within BCR 30 with portions on the central and western portion of the Commonwealth

being within BCR 14. The gulls present in the Commonwealth are those gulls likely to migrate from and have breeding colonies throughout BCR 14 and BCR 30 which covers most of the coastal and inland areas of the northeastern United States. Since population estimates and trends for gulls in the Commonwealth are limited, the PBR models developed by the USFWS for BCR 14 and BCR 30 will be used to analyze potential population impacts since the gulls present in the Commonwealth are likely those gulls migrating from and nesting in BCR 14 and BCR 30. Data used for the PBR model developed by the USFWS for those gulls addressed in this assessment and the results of the model are presented in Chapter 4.

Issue 2 - Effects on Non-target Species Populations, Including T&E Species

The issue of non-target species effects, including effects on T&E species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife. To reduce the risks of adverse affects to non-target wildlife, WS would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of capturing non-target species. Before initiating management activities, WS would select locations which are extensively used by the target species. WS will also use minimization measures and SOPs designed to reduce the effects on non-target species' populations. Minimization measures and SOPs are further discussed in Chapter 3. Methods available for use under the alternatives are described in Appendix B.

Concerns have also been raised about the potential for adverse affects to occur to non-target wildlife from the use of registered toxicants. Chemical methods being considered for use to manage damage and threats associated with gulls in Massachusetts are further discussed in Appendix B. Chemical methods considered for use to manage damage or threat associated with gulls includes the avicide DRC-1339 and repellents.

The ESA states 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. 7(a)(1)]. WS conducts Section 7 consultations with the USFWS to ensure compliance with the ESA and 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)].

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. As part of the scoping process and to facilitate interagency cooperation, WS consulted with the USFWS under Section 7 during the development of this EA which is further discussed in Chapter 4.

Issue 3 - Effects of Damage Management Methods[7] on Human Health and Safety

An additional issue often raised is the potential risks associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse affects on human safety. WS' employees use and recommend only those methods which are legally available, selective for target species, and effective to resolve the wildlife conflict. Still, some concerns exist regarding the safety of WS' methods despite their legality. As a result, WS will analyze the potential for proposed methods to pose a risk to members of the public or employees of WS.

[7]A complete list of chemical and non-chemical methods available for use under the identified alternatives, except the alternative with no damage management (Alternative 1), can be found in Appendix B. However, listing methods neither implies that all methods will be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods will be used to resolve every request for assistance.

In addition to the potential risks to the public associated with WS' methods, risks to employees are also an issue. WS' employees are potentially exposed to damage management methods as well as subject to workplace accidents. Selection of methods, as part of an integrated approach, includes consideration for public and employee safety.

Safety of Chemical Methods Employed

The issue of using chemicals methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods would include corn oil, avicides, and repellents. Egg oiling is a method for discouraging the nesting of birds in areas where damages are occurring or could occur by spraying or rubbing a small quantity of food grade corn oil on eggs in nests. The EPA has determined the use of corn oil for this purpose is exempt from registration requirements under FIFRA. Avicides are those chemical methods used to lethally take birds. DRC-1339 is the only avicide currently being considered for use to manage damage in this assessment. The most common ingredients of avian repellents are polybutene, anthraquinone, and methyl anthranilate. Chemical methods are further discussed in Appendix B. The use of chemical methods is regulated by the EPA through the FIFRA, the MDAR, and by WS Directives. WS' use of chemical methods is also discussed in WS' programmatic FEIS (USDA 1997).

Safety of Non-Chemical Methods Employed

Non-chemical methods employed to reduce damage and threats to safety caused by gulls, if misused, could potentially be hazardous to human safety. Non-chemical methods are also discussed in detail in Appendix B. The cooperator requesting assistance is made aware through a MOU, cooperative service agreement, or a similar document that those devices agreed upon could potentially be used on property owned or managed by the cooperator; thereby, making the cooperator aware of the use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods.

Effects of Not Employing Methods to Reduce Threats to Human Safety

An issue identified is the concern for human safety from not employing methods or not employing the most effective methods to reduce the threats that gulls can pose. The risks to human safety from diseases associated with gulls were addressed previously. The low risk of disease transmission from gulls does not lessen the concerns of cooperators requesting assistance to reduce threats from zoonotic diseases. Increased public awareness of zoonotic events has only heightened the concern of direct or indirect exposure to zoonoses. Not adequately addressing the threats associated with potential zoonoses could lead to an increase in incidences of injury, illness, or loss of human life. This issue will be fully evaluated in Chapter 4 in relationship to the alternatives.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

One issue is the concern that the proposed action or the other alternatives would result in the loss of aesthetic benefits of target gulls 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 the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general and in modern societies a large percentage of households have indoor or outdoor pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward those animals, especially people who enjoy viewing 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 manage conflicts/problems between humans and wildlife.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive uses, indirect benefits derived from vicarious wildlife related experiences, and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (Bishop 1987). Direct benefits are derived from a personal relationship with animals and may take the form of direct consumptive use (*i.e.*, using parts of or the entire animal) or non-consumptive use (*i.e.*, viewing the animal in nature or in a zoo, photographing) (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).

Public attitudes toward wildlife vary considerably. Some people believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to wildlife damage management want agencies to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people 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 effects on the aesthetic value of gulls from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

In contrast, property owners that have gulls roosting or nesting on their buildings are generally concerned about the negative aesthetic appearance of gull droppings and the damage to their buildings. Business owners generally are particularly concerned because negative aesthetics can result in lost business. Costs associated with property damage include labor and supplies to clean and disinfect fecal droppings, implementation of non-lethal wildlife management methods, loss of aesthetic value of flowers, gardens, and lawns which may be covered by droppings, loss of personal use, loss of customers or visitors irritated by the odor of, or of having to walk on, fecal droppings, and loss of time contacting local health departments and wildlife management agencies to resolve the health and safety issues.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

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 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."*

According to the American Veterinary Medical Association (AVMA) (1987), 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…"* 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…"* (California Department of Fish and Game 1991). Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

Defining pain as a component in humaneness 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 (California Department of Fish and Game 1991).

The AVMA states "*...euthanasia is the act of inducing humane death in an animal*" and "*... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness*" (Beaver et al. 2001). Some people would prefer AVMA accepted methods of euthanasia to be used when killing all animals, including wild animals. The AVMA states that "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible*" (Beaver et al. 2001).

Pain and suffering, as it relates to methods available for use to manage gulls 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"* (California Department of Fish and Game 1991). Research suggests that some methods can cause "*stress*" (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

The decision-making process involves trade-offs between the above aspects of pain and humaneness. 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.

The issue of humanness and animal welfare concerns will be further discussed as it relates to the methods available for use under the alternatives in Chapter 4. Minimization and SOPs to alleviate pain and suffering are discussed in Chapter 3.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were also identified by WS, the MDFG, and the USFWS during the scoping process of this EA that were considered but will not receive detailed analyses for the reasons provided. The following issues were considered but will not be analyzed in detail:

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

A concern was raised that an EA for an area as large as the Commonwealth of Massachusetts would not

meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other regulatory agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. Although WS and the USFWS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a damage problem has become intolerable to the point that they request assistance from WS. In addition, the WS program would not be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and other agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

Lead agencies have the discretion to determine the geographic scope of their analyses under the NEPA (Kleppe v Sierra Club, 427 U.S. 390, 414 (1976), CEQ 1508.25). Ordinarily, according to APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions may be categorically excluded (7 CFR 372.5(c)). The intent in developing this EA is to determine if the proposed action would potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. This EA addresses impacts for managing damage and threats to human safety associated with gulls in the Commonwealth to analyze individual and cumulative impacts and to provide a thorough analysis.

In terms of considering cumulative effects, one EA analyzing impacts for the entire Commonwealth will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination is made through this EA that the proposed action would have a significant impact on the quality of the human environment, then an EIS would be prepared. Based on previous requests for assistance, the WS program in Massachusetts will continue to conducted gull damage management in a very small area of the Commonwealth where damage is occurring or likely to occur.

WS' Impact on Biodiversity

The WS program does not attempt to eradicate any species of native wildlife in the Commonwealth. WS operates in accordance with applicable international, federal, and Commonwealth laws and regulations enacted to ensure species viability. Methods available are employed to target individual gulls or groups of gulls identified as causing damage or posing a threat of damage. Any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. WS operates on a small percentage of the land area in Massachusetts and only targets those gulls identified as causing damage or posing a threat. Therefore, impacts on biodiversity associated with gull damage management will not adversely affect biodiversity in the Commonwealth.

A Loss Threshold Should Be Established Before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss can be tolerated by cooperators until the damage reaches a threshold where damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. Establishing a threshold would be difficult or inappropriate to apply to human health and safety situations.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the

Dixie National Forest, et al., the United States District Court of Utah denied the plaintiffs' motion for a preliminary injunction. In part, the court found that a forest supervisor needs only show that damage from wildlife is threatened, to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as a percentage of loss of a particular resource to justify the need for wildlife damage management actions.

Gull Damage Management Should Not Occur at Taxpayer Expense

An issue identified through the development of WS' programmatic FEIS is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based (USDA 1997). Funding for gull damage management activities is derived from federal appropriations and through cooperative funding. Activities conducted in the Commonwealth for the management of damage and threats to human safety from gulls will be funded through cooperative service agreements with individual property owners or associations. A minimal federal appropriation is allotted for the maintenance of a WS program in Massachusetts. The remainder of the WS program is entirely fee-based. Technical assistance is provided to requesters as part of the federally-funded activities, but all direct assistance in which WS' employees perform damage management activities is funded through cooperative service agreements between the requester and WS.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by gulls and that prove to be the most cost effective will receive the greatest application. As part of an integrated approach, evaluation of methods will continually occur to allow for those methods that are most effective at resolving damage or threats to be employed under similar circumstance where gulls are causing damage or pose a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. The cost effectiveness of methods and the effectiveness of methods are linked. The issue of cost effectiveness as it relates to the effectiveness of methods is discussed in the following issue.

Effectiveness of Gull Damage Management Methods

The effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented, how accurately practitioner's diagnosis the problem, the species responsible for the damage, and how actions are implemented to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible within the limitations of current technology. The most effective approach to resolving any wildlife damage problem is to use an adaptive integrated approach which may call for the use of several management methods simultaneously or sequentially (USDA 1997, Courchamp et al. 2003).

The purpose behind integrated management is to implement methods in the most effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment[8]. Efficacy is based on the types of methods employed, the application of the method,

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

restrictions on the use of the method(s), the skill of the personnel using the method and, for WS' personnel, the guidance provided by WS Directives and policies.

The goal is to reduce damage, risks, and conflicts with wildlife as requested and not to necessarily reduce/eliminate wildlife populations. Localized population reduction could be short-term and new individuals may immigrate or be born to animals remaining at the site (Courchamp et al. 2003). The ability of an animal population to sustain a certain level of removal and to eventually return to pre-management levels does not mean individual management actions are unsuccessful, but that periodic management may be necessary. The return of wildlife to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

A common issue raised is that the use of lethal methods is ineffective because additional birds are likely to return to the area, either after removal occurs or the following year when birds return to the area which creates a financial incentive to continue the use of only lethal methods. This assumes birds only return to an area where damage was occurring if lethal methods are used. However, the use of non-lethal methods is also often temporary which could result in birds returning to an area where damage was occurring once those methods are no longer used. The common factor when employing any method is that birds will return if suitable conditions continue to exist at the location where damage was occurring and bird densities are sufficient to occupy all available habitats to the extent that damage occurs. Therefore, any reduction or prevention of damage from the use of methods addressed in Appendix B will be temporary if habitat conditions continue to exist that attract birds to an area where damage occurs.

Therefore, any method that disperses or removes birds from areas will only be temporary if habitat containing preferred habitat characteristics continues to exist the following year when birds return. Dispersing birds using non-lethal methods addressed in Appendix B often requires repeated application to discourage birds from returning to roosting locations which increases costs, moves birds to other areas where they could cause damage, and are temporary if habitat conditions at the roost remain unchanged. Dispersing and the relocating of birds could be viewed as moving a problem from one area to another which would require addressing damage caused by those birds at another location which increases costs and could be perceived as creating a financial incentive to continue the use of those methods since birds will have to be addressed annually and at multiple locations. WS' recommendation of or use of techniques to modify existing habitat or making areas unattractive to birds is discussed in Appendix B. WS' objective is to respond to request for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model to adapt methods in an integrated approach to managing gull damage that is agreed upon by the cooperator.

As part of an integrated approach to managing gull damage, WS would have the ability to adapt methods to damage situations to effectively reduce or prevent damage from occurring. Under the proposed integrated approach, all methods, individually or in combination, could be employed as deemed appropriate through WS' Decision Model to address requests for assistance. WS' objective when receiving a request for assistance under the proposed action is to reduce damage and threats to human safety or to prevent damage from occurring using an integrated approach to managing gull damage. Therefore, under the proposed action, WS would employ methods adaptively to achieve that objective.

Managing damage caused by birds can be divided into short-term redistribution approaches and long-term population and habitat management approaches (Cooper and Keefe 1997). Short-term approaches focus on redistribution and dispersal of birds to limit use of an area where damage or threats were occurring. Short-term redistribution approaches may include prohibiting feeding, the use of pyrotechnics, propane cannons, effigies, and other adverse noise, erecting access barriers such as wire grids, and taste aversion chemicals (Cooper and Keefe 1997). Population reduction by limiting survival or reproduction, removing

birds, and habitat modification are considered long-term solutions to managing damage caused by birds (Cooper and Keefe 1997).

Redistribution methods are often employed to provide immediate resolution to damage occurring until long-term approaches can be implemented or have had time to reach the desired result. Dispersing birds are often short-term solutions that move birds to other areas where damages or threats could occur (Smith et al. 1999, Gorenzel et al. 2000, Gorenzel et al. 2002, Avery et al. 2008, Chipman et al. 2008). For example, Chipman et al. (2008) found that crows could be dispersed from roost locations using non-lethal methods but crows would return to the original roost site within 2 to 8 weeks. The re-application of non-lethal methods was required every year to disperse crows from the original roost or from roosts that had formed in other areas where damages were occurring (Chipman et al. 2008). Some short-term methods may become less effective in resolving damage as a bird population increases, as birds become more acclimated to human activity, and as birds become habituated to harassment techniques (Smith et al. 1999, Chipman et al. 2008). Non-lethal methods often require a constant presence at locations when birds are present and must be repeated every day until the desired results are achieved which can increase the costs associated with those activities. For example, during a six-year project using only non-lethal methods to disperse crows in New York, the number of events required to disperse crows remained similar amongst years and at some locations, the number of events required to harass crows increased from the start of the project (Chipman et al. 2008). Long-term solutions to resolving bird damage often require management of the population (Smith et al. 1999) and identifying the habitat characteristics which attract birds to a particular location (Gorenzel and Salmon 1995).

For example, Cooper (1991) reported that the removal of geese posing or likely to pose a hazard to air safety at airports considerably reduced the population of local geese, decreased the number of goose flights through airport operations airspace, and significantly reduced goose-aircraft collisions at Minneapolis-St. Paul International Airport. In addition, Dolbeer et al. (1993) demonstrated that an integrated approach (including removal of offending birds) reduced bird hazards at airports and substantially reduced bird collisions with aircraft by as much as 89%. Jensen (1996) also reported that an integrated approach that incorporated the removal of geese, reduced goose-aircraft collisions by 80% during a two year period. Boyd and Hall (1987) showed that a 25% reduction in a local crow roost resulted in reduced hazards to a nearby airport.

Based on the evaluation of the damage situation, the most effective methods will be employed individually or in combination based on the prior evaluations of methods or combinations of methods in other damage management situations. Once employed, methods will be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods is considered as part of the decision making-process under WS' use of the Decision Model described in Chapter 3 for each damage management request based on continual evaluation of methods and results.

Impacts of Avian Influenza (AI) on Bird Populations

AI is caused by a virus in the Orthomyxovirus group. Viruses in this group vary in the intensity of illness they may cause (virulence). Wild birds, in particular waterfowl and shorebirds, are considered to be the natural reservoirs for AI (Clark and Hall 2006). Most strains of AI rarely cause severe illness or death in birds although the H5 and H7 strains tend to be highly virulent and very contagious. However, even the strains which do not cause severe illness in birds are a concern for human and animal health officials because the viruses have the potential to become virulent and transmissible to other species through mutation and reassortment (Clark and Hall 2006).

Recently, the occurrence of highly pathogenic (HP) H5N1 AI virus has raised concern regarding the potential impact on wild birds, domestic poultry, and human health should it be introduced into the United States. It is thought that a change occurred in a low pathogenicity AI virus of wild birds, allowing the virus to infect chickens, followed by further change into the HP H5N1 AI. HP H5N1 AI has been circulating in Asian poultry and fowl resulting in death to these species. HP H5N1 AI likely underwent further change allowing infection in additional species of birds, mammals, and humans. More recently, this virus moved back into wild birds resulting in mortality of some species of waterfowl, and other birds. This is only the second time in history that highly pathogenic form of AI has been recorded in wild birds. Numerous potential routes for introduction of the virus into the United States exist including: illegal movement of domestic or wild birds, contaminated products, infected travelers, and the migration of infected wild birds. WS has been one of several agencies and organizations conducting surveillance for AI virus in migrating birds. The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the HP H5N1 virus in North America. To date, evidence does not exist that AI is negatively affecting migratory bird populations in the United States.

Gull Damage Should Be Managed By Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce gull damage for property owners or when deemed appropriate by the resource owner. 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.

Effects from the Use of Lead Ammunition in Firearms

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally take birds. As described in Appendix B, the lethal removal of gulls with firearms by WS to alleviate damage or threats would occur using a rifle or shotgun. In an ecological risk assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996). To address lead exposure from the use of shotguns, the standard conditions of depredation permits issued by the USFWS pursuant to the MBTA for the lethal take of birds requires the use of non-toxic shot. To alleviate concerns associated with lead exposure in wildlife, WS will only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns to take all birds pursuant to depredation permits issued by the USFWS.

The take of birds by WS in the Commonwealth occurs primarily from the use of shotguns. However, the use of rifles could be employed to lethally take some gull species. To reduce risks to human safety and property damage from bullets passing through birds, the use of rifles is applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through birds. Birds that are removed using rifles will occur within areas where retrieval of all bird carcasses for proper disposal is highly likely (*e.g.*, at roost sites). With risks of lead exposure occurring primarily from ingestion of shot and bullet fragments, the retrieval and proper disposal of bird carcasses will greatly reduce the risk of scavengers ingesting or being exposed to lead.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through

a bird, if misses occur, or if the bird carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of water, either ground water or surface water, from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "transport" readily in surface water when soils were neutral or slightly alkaline in pH (*i.e*., not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "fall zones" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot where it was believed the lead contamination was due to runoff from the parking lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the "action level" of 15 parts per billion as defined by the EPA (*i.e.*, requiring action to treat the water to remove lead). The study found that the dissolution (*i.e*., capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape is reduced once the bullets and shot form crusty lead oxide deposits on their surfaces, which serves to naturally further reduce the potential for ground or surface water contamination (Craig et al. 1999). These studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS' activities to reduce gull damage using rifles, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent.

WS' assistance with removing birds would not be additive to the environmental status quo since those birds removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement if a depredation permit is issued. The amount of lead deposited into the environment may be lowered by WS' involvement in bird damage management activities due to efforts by WS to ensure projectiles do no pass through but are contained within the bird carcass which limits the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that birds are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement ensures bird carcasses lethally removed using firearms will be retrieved and disposed of properly to limit the availability of lead in the environment and ensures bird carcass are removed from the environment to prevent the ingestion of lead in carcasses by scavengers. Based on current information, the risks associated with lead bullets that are deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from bird carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water. As stated previously, when using shotguns, only non-toxic shot would be used by WS.

Impacts of Dispersing Gulls on People in Urban/Suburban Areas

Another issue often raised is that the dispersal of gulls from a location to alleviate damage or conflicts at one site can result in new damage or conflicts at a new site. While the original complainant may see resolution to the gull problem when the gulls are dispersed, the recipient of the gulls may see the gull problem as imposed on them. Thus, on the whole, there is no resolution to the original gull problem (Mott and Timbrook 1988). Gulls usually are dispersed using a combination of harassment methods including pyrotechnics, propane cannons, effigies, and electronic distress calls (Booth 1994, Avery et al. 2008, Chipman et al. 2008). A similar continuing conflict can develop when habitat alteration is used to disperse gulls. This concern is heightened in large metropolitan areas where the likelihood of gulls dispersed from a location finding a new location and not coming into conflict is very low. WS has minimized the impact of dispersing gull roosts in urban/suburban areas by creating a management option to depopulate the gulls creating the conflict problem.

In urban areas, WS often works with the community or municipal leaders to address gull damage involving large concentrations of gulls that are likely affecting several people. Therefore, WS often consults not only with the property owner where gulls are located but with community leaders to allow for community-based decision-making on the best management approach. In addition, when seeking funding for gull damage management activities involving urban gulls, funding is often provided by the municipality where the gulls are located which allows for gull damage management activities to occur within city limits where gulls occur. This allows for gulls that have been dispersed and begin to cause damage or pose threats to be addressed effectively and often times, before gulls become well-established. The community-based decision-making approach to gull damage management in urban areas is further discussed under the proposed action alternative in Chapter 3. Therefore, this issue was not analyzed further.

A Site Specific Analysis Should be Made for Every Location Where Gull Damage Management Could Occur

The underlying intent for preparing an EA is to determine if a proposed action might have a significant impact on the human environment. WS' EA development process is issue driven, meaning issues that were raised during the interdisciplinary process and through public involvement that were substantive, were used to drive the analysis and determine the significance of the environmental impacts of the proposed action and the alternatives. Therefore, the level of site specificity must be appropriate to the issues listed.

The analysis in this EA was driven by the issues raised during the scoping process during the development of the EA. In addition to the analysis contained in this EA, WS' personnel use the WS Decision Model (Slate et al. 1992, USDA 1997) described in Chapter 3 as a site specific tool to develop the most appropriate strategy at each location. The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to wildlife damage management requests.

As discussed previously, one EA analyzing impacts for the entire Commonwealth will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas and allows for a better cumulative impact analysis. If a determination is made through this EA that the proposed action would have a significant impact on the quality of the human environment, then an EIS would be prepared.

CHAPTER 3: ALTERNATIVES

Chapter 3 contains a discussion of the alternatives which were developed to address the identified issues

discussed in Chapter 2. Alternatives were developed for consideration based on the issues using the WS Decision model (Slate et al. 1992, USDA 1997). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Chapter 3 also discusses alternatives considered but not analyzed in detail, with rationale. Minimization measures and SOPs for gull damage management in Massachusetts are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

The alternatives developed to address the issues identified in Chapter 2 include:

Alternative 1 - Continuing the Current Integrated Approach to Managing Gull Damage (Proposed Action/No Action)

The proposed action/no action alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by gulls in Massachusetts. A major goal of the program would be to resolve and prevent gull damages and to reduce threats to human safety. To meet this goal, WS, in consultation the USFWS, the MDFG, and the MDAR, would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding is available, operational damage management. Funding could occur through federal appropriations or from cooperative funding. The adaptive approach to managing damage associated with gulls would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by site-specific evaluation to reduce damage or threats to human safety for each request. City/town managers, agricultural producers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. The USFWS could continue to issue depredation permits to WS and to those entities experiencing gull damage when requested by the entity and when deemed appropriate by the USFWS.

Under this alternative, WS could respond to requests for assistance by: 1) taking no action if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by gulls, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. The take of gulls can only legally occur through the issuance of a depredation permit issued by the USFWS and only at levels specified in the permit. When applying for a depredation permit, the requesting entity submits with the application the number of gulls requested to be taken to alleviate the damage. Therefore, under this alternative, the USFWS could: 1) deny an application for a depredation permit when requested to alleviate gull damage, 2) could issue a depredation permit at the take levels requested, or 3) could issue permits at levels below those take levels requested.

Property owners or managers requesting assistance would be provided with information regarding the use of effective and practical non-lethal and lethal techniques. Property owners or managers may choose to implement WS recommendations on their own (*i.e.*, technical assistance), use contractual services of private businesses, use volunteer services of private organizations, use contractual services of WS (*i.e.*, direct operational assistance) or take no action.

The property owner or manager may choose to apply for their own depredation permit from the USFWS to lethally take gulls, as required by the implementing regulations of the MBTA for depredation control (50 CFR 21.41). The USFWS requires non-lethal methods be used and shown ineffective or impractical before the USFWS will issue a depredation permit. In this situation, WS would evaluate the damage and complete a Migratory Bird Damage Report which would include information on the extent of the

damages, the number of gulls present, and a recommendation for the number of gulls that should be taken to best alleviate the damages.

Following USFWS review of a complete application for a depredation permit from a property owner or manager and the Migratory Bird Damage Report, a depredation permit could be issued to authorize the lethal take of a specified number of gulls as part of an integrated approach. Upon receipt of a depredation permit, the property owner or manager or appropriate subpermittee may commence the authorized activities and must submit a written report of their activities upon expiration of their permit. Permits may be renewed annually as needed to resolve damages. Property owners or managers could conduct management using those methods legally available. Most methods discussed in Appendix B that are available for use to manage gull damage would be available to all entities. The only method currently available that would not be available for use by those persons experience gull damage is the avicide DRC-1339 which can only be used by WS.

In anticipation of damage management activities, WS would annually submit an application for a depredation permit to the USFWS estimating the maximum number of gulls that could be lethally taken to alleviate damage in the State through direct operational assistance projects. The number of gulls anticipated to be lethally taken by WS would be based on previous requests for assistance received to manage damage associated with gulls. Therefore, the USFWS could: 1) deny WS' application for a depredation permit, 2) issue a depredation permit for the take of gulls at a level below the number requested by WS, or 3) issue a depredation permit for the number of gulls requested by WS.

WS will work with those persons experiencing gull damage in addressing those gulls responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as gulls begin to cause damage. Gull damage that has been ongoing can be difficult to resolve using available methods since gulls are conditioned to feed, roost, loaf, and are familiar with a particular location. Subsequently, making that area unattractive through the use of available methods can be difficult to achieve once damage has been ongoing. WS will work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

Non-lethal methods include, but are not limited to: habitat/behavior modification, nest destruction, visual deterrents, live traps, exclusionary devices, frightening devices, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS include: live-capture followed by euthanasia, DRC-1339 avicide, and shooting. Euthanasia of live-captured gulls would occur through the use of cervical dislocation or carbon dioxide once gulls are live-captured using other methods. Carbon dioxide is an acceptable form of euthanasia for gulls while cervical dislocation is a conditionally acceptable[9] method of euthanasia (AVMA 2007).

Lethal and non-lethal methods are intended to be short-term attempts at reducing damage occurring at the time those methods are employed. Long-term solutions to managing gull damage would include limited habitat manipulations and changes in cultural practices which are addressed further below and in Appendix B.

Non-lethal methods can disperse or otherwise make an area unattractive to gulls causing damage thereby, reducing the presence of gulls at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for

[9]The AVMA (2007) defines conditional acceptable as "...[methods] *that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature".*

assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model, primarily if non-lethal methods have been employed by the cooperator and have proven to be ineffective in resolving damage or threats to a level acceptable to the cooperator. Non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse gulls from the area resulting in a reduction in the presence of those gulls at the site where those methods were employed. The use of non-lethal methods in an integrated approach can be effective in dispersing bird species. For example, Avery et al. (2002) and Seamans (2004) found that the use vulture effigies were an effective non-lethal method to disperse roosting vultures. Chipman et al. (2008) found the use of only non-lethal methods to disperse urban crow roosts often requires a long-term commitment of affected parties, including financial commitments, to achieve and maintain the desired result of reducing damage. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since those species are unharmed. The continued use of non-lethal methods often leads to the habituation of bird species to those methods which can decrease the effectiveness of those methods (Avery et al. 2008, Chipman et al. 2008). For any management methods employed, the proper timing is essential in effectively dispersing those gulls causing damage. Employing methods soon after damage begins or soon after threats are identified increases the likelihood that those damage management activities will achieve success. Therefore, coordination and timing of methods is necessary to be effective in achieving expedient resolution of gull damage.

Lethal methods would be employed to resolve damage associated with those gulls identified by WS as responsible for causing damage or threats to human safety only after receiving a request for the use of those methods. The use of lethal methods would result in local population reductions in the area where damage or threats were occurring since gulls would be removed from the population. Lethal methods are often employed to reinforce non-lethal methods and to remove gulls that have been identified as causing damage or posing a threat to human safety. The use of lethal methods would result in local reductions of gulls in the area where damage or threats were occurring. The number of gulls removed from the population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of gulls involved with the associated damage or threat, and the efficacy of methods employed. Under the proposed action, the lethal methods being considered are shooting with firearms, the live-capture of gulls that are subsequently euthanized, and the avicide DRC-1339.

Very little information is available on the effectiveness of using lethal methods to achieve a reduction in gull damage in the area where those methods are employed. Despite the lack of documented success in using lethal methods, the use of lethal methods has been successful in reducing damage associated with other bird species (Boyd and Hall 1987, Gorenzel et al. 2000). Most lethal methods are intended to reduce the number of gulls present at a location since a reduction in the number of gulls at a location leads to a reduction in damage which is applicable whether using lethal or non-lethal methods. The intent of non-lethal methods is to harass, exclude, or otherwise make an area unattractive to gulls which disperses those gulls to other areas which leads to a reduction in damage at the location where those gulls were dispersed. The intent of using lethal methods is similar to the objective trying to be achieved when using non-lethal methods which is to reduce the number of gulls in the area where damage is occurring which can lead to a reduction in the damage occurring at that location.

Although the use of firearms can reduce the number of gulls using a location (similar to dispersing gulls), the use of a firearm is most often used to supplement and reinforce the noise associated with non-lethal methods. The capture of gulls using live-traps and subsequently euthanizing those gulls and the use of DRC-1339 is employed to target those gulls causing damage or posing a threat since the use of those

methods occurs at the site where damage or threats are occurring or at locations where gulls causing damage or threats are feeding.

Often of concern with the use of lethal methods is that gulls that are lethally taken will only be replaced by other gulls either during the application of those methods (either from other gulls that immigrate or emigrate into the area) or by gulls the following year (increase in reproduction that could result from less competition). As stated previously, the use of lethal methods are not intended to be used as population management tools over broad areas. The use of lethal methods are intended to reduce the number of gulls present at a location where damage is occurring by targeting those gulls causing damage or posing threats which is similar to the use of non-lethal methods where the intent is to disperse birds from an area. Since the intent of lethal methods is to manage those gulls causing damage and not to manage entire gull populations, those methods are not ineffective because gulls return the following year.

Chipman et al. (2008) found that crows returned to roosts previously dispersed using non-lethal methods within 2 to 8 weeks. In addition, Chipman et al. (2008) found that the use of non-lethal methods had to be re-applied every year during a six-year project evaluating the use of only non-lethal methods. At some roost locations, Chipman et al. (2008) found the number of crows that returned each year to roosts over a six-year period actually increased despite the use of non-lethal methods each year. Despite the need to re-apply non-lethal methods yearly, the return of crows to roost locations previously dispersed, and the number of crows using roost locations increasing annually at some roost locations, Chipman et al. (2008) determined the use of non-lethal methods could be effective at dispersing urban crow roosts in New York. Similar results were found by Avery et al. (2008) during the use of crow effigies and other non-lethal methods to disperse urban crow roosts in Pennsylvania. Crows returned to roost locations in Pennsylvania annually despite the use of non-lethal methods and effigies (Avery et al. 2008). Gorenzel et al. (2002) found that crows returned to roost locations after the use of lasers. Therefore, the use of both lethal and non-lethal methods may require repeated use of those methods. The return of gulls to areas where damage management methods were previously employed does not indicated previous use of those methods were ineffective since the intent of those methods are to reduce the number of gulls present at a site where damage is occurring at the time those methods are employed.

Although crows are not specifically addressed in this EA, the discussion of those examples of management methods employed to address crow damage are likely representative of the results achieved by those methods when applied to any gull species that exhibit similar roosting behaviors such as those species addressed in this assessment.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing gull damage. Those methods are intended to reduce damage occurring at the time those methods are employed but do not necessarily ensure gulls will not return once those methods are discontinued or the following year when gulls return. Long-term solutions to resolving gull damage are often difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as wire grids, or other practices such as closing garbage cans. When addressing gull damage, long-term solutions generally involve modifying existing habitat or making conditions to be less attractive to gulls. To ensure complete success, alternative sites in areas where damage is not likely to occur are often times required to achieve complete success in reducing damage and avoid moving the problem from one area to another. Modifying a site to be less attractive to gulls will likely result in the dispersal of those gulls to other areas where damage could occur or could result in multiple occurrences of damage situations.

Appendix B contains a thorough discussion of the methods available for use in an integrated wildlife damage management approach to address requests for assistance to manage damage or reduce threats to human safety. WS' programmatic FEIS contains additional discussion on adaptive management using an

integrated approach to address damage to resources and threats to human safety (USDA 1997). As part of an integrated approach, WS may provide technical assistance and direct operational assistance to those persons experiencing damage associated with gulls.

Technical Assistance Recommendations

Under the proposed action, WS would provide technical assistance to those persons requesting gull damage management as part of an integrated approach to managing damage. Technical assistance would occur as described in Alternative 2 of this EA. Technical assistance is also further discussed in WS' programmatic FEIS (USDA 1997).

The WS program in the Commonwealth regularly provides technical assistance to individuals, organizations, and other federal, Commonwealth, and local government agencies for managing gull damage. Technical assistance includes collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator has attempted to resolve the problem. WS then provides information on appropriate methods that the cooperator may consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues. Technical assistance could also be provided as part of the application process for issuing a depredation permit by the USFWS under this alternative when deemed appropriate.

Since FY 1996, WS has conducted 951 technical assistance projects that involved gull damage to agricultural resources, property, natural resources, and threats to human safety.

Operational Damage Management Assistance

Operational damage management assistance includes damage management activities that are directly conducted by or supervised by personnel of WS. Operational damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and there is a written agreement between WS and the entity requesting assistance. 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 chemicals are necessary or if the problems are complex.

Educational Efforts

Education is an important element of 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, WS provides lectures, courses, and demonstrations to producers, homeowners, Commonwealth and county agents, colleges and universities, and other interested groups. Cooperating agencies frequently cooperate with other entities in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that other wildlife professionals and the public are periodically updated on recent developments in damage management technology, programs, 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 research biologists work closely with wildlife managers, researchers, and others to develop and evaluate wildlife damage management techniques. NWRC biologists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

WS' Decision Making Procedures

WS' personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model (WS Directive 2.201) and described by Slate et al. (1992). WS' programmatic FEIS also provides further discussion and examples of how the Decision Model is used to address damage and threats associated with wildlife (USDA 1997). 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 and 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 damage 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 is ended. In terms of the WS Decision Model, 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, including WS.

Community-based Decision Making

The WS program in Massachusetts follows the "co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of gulls and effective, practical, and reasonable methods available to the local decision-maker(s) to reduce damage or threats. This includes non-lethal and lethal methods. WS, in coordination with Commonwealth and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available. Resource owners and others directly affected by gull damage or conflicts in the Commonwealth have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Under a community based decision-making process, WS would provide information, demonstration, and discussion on all available methods to the appropriate representatives of the community for which services were requested to ensure a community-based decision is made. By involving decision-makers in the process, damage management actions can be presented to allow for decisions on damage management to involve those individuals that the decision maker(s) represents. As addressed in the EA, WS would provide technical assistance to the appropriate decision-maker(s) to allow for information on damage management activities to be presented to those persons represented by the decision-maker(s), including demonstrations and presentation by WS at public meetings to allow for involvement of the community. Requests for assistance to manage gulls often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives, the decision-maker(s) are able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentation by WS on gull damage management activities. This process allows decisions on gull damage management activities to be made based on local input.

Community Decision-Makers

The decision-maker for the local community with a homeowner or civic association would be the President or the Board's appointee. The President and Board are popularly elected residents of the local community who oversee the interests and business of the local community. This person would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision-making. If no homeowner or civic association represents the affected resource then WS will provide technical assistance to the self- or locally-appointed decision-maker. Identifying the decision-maker for local business communities is more complex because the arrangements made between the businesses and building owner(s) may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing Board. WS would provide technical assistance and make recommendations for damage reduction to the local community or local business community decision-maker(s). Direct control would be provided by WS only if requested by the local community decision-maker, funding is provided, and if the requested direct control was compatible with WS' recommendations.

Private Property Decision-Makers

In the case of private property owners, the decision-maker is the individual that owns or manages the affected property. The decision-maker has the discretion to involve others as to what occurs or does not occur on property they own or manage. Due to privacy issues, WS can not disclose cooperator information to others. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others are involved in the decision-making process is a decision made by that individual. Direct control would be provided by WS if requested, funding is provided, and the requested management was according to WS' recommendations.

Public Property Decision-Makers

The decision-maker for local, Commonwealth, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals, and legal mandates for the property. WS would provide technical assistance to this person and recommendations to reduce damage. Direct control would be provided by WS if requested, funding provided, and the requested actions were within the recommendations made by WS.

Examples of WS' Direct Operational and Technical Assistance in Massachusetts

Examples of direct operational assistance and technical assistance projects conducted by WS in Massachusetts to address gull damage include:

Management of Damage Caused by Gulls Landfills

WS currently provides technical assistance and consultation, upon request, to landfills in Massachusetts. WS also may assist landfill operators in obtaining USFWS depredation permits for managing migratory birds, particularly gulls. WS uses and recommends damage management strategies for those facilities.

WS may receive requests for assistance in resolving wildlife hazards in the future from landfill operators previously discussed, or any other landfill or trash transfer station in Massachusetts. WS may provide technical assistance and/or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate for use at landfills.

Management of Competition and Predation of T&E Species by Gulls

WS currently provides technical assistance and consultation, upon request, to natural resource managers attempting to enhance or protect T&E species in Massachusetts. WS assists managers in obtaining USFWS depredation permits for managing gull predation and competition. WS uses and recommends management strategies to reduce predation and competition between gulls and T&E species.

WS may receive requests for assistance in reducing gull predation and competition with T&E species in the future from private, municipal, Commonwealth, and federal resource managers in Massachusetts. WS may provide technical assistance and/or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate and not likely to adversely affect the T&E species they are intended to support.

Urban Nesting Gull Colonies

WS provides information or services, upon request, to property owners in Massachusetts to reduce the number of nesting ring-bill, herring gulls, and great black-backed gulls, in urban environments. WS may assist property owners with obtaining a USFWS depredation permit for managing these urban nesting colonies. Integrated damage management strategies are recommended and used for these situations.

The main direct control activity used to manage these urban nesting colonies, particularly those located on rooftops, is nest and egg removal. As part of an integrated damage management strategy, WS also recommends harassment with distress tapes and scare tactics prior to the nesting season or construction of a rooftop grid wire system to exclude gulls from the roof.

WS may receive requests for assistance in resolving conflicts with gulls in the future from properties previously discussed, or any other property owners in Massachusetts. WS may provide technical assistance and/or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate for use in urban environments.

Alternative 2 - Gull Damage Management by WS through Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with managing damage and threats associated with gulls with technical assistance only. Technical assistance would provide those cooperators experiencing damage or threats associated with gulls with information, demonstrations, and recommendations on available and appropriate methods available. The implementation of methods and techniques to resolve or prevent damage is the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that are of limited availability for use by private 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. In some instances, wildlife-related information provided to the requestor results in tolerance/acceptance of the situation. In other instances, management options are discussed and recommended. Only those methods legally available for use by the appropriate individual would be recommend or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those experiencing damage or threats associated with gulls in the Commonwealth except for the avicide DRC-1339 which is only available to WS.

This alternative would place the immediate burden of operational damage management work on the

resource owner, other governmental agencies, and/or private businesses. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent gull damage as permitted by federal, Commonwealth, and local laws and regulations or those persons could take no action.

Similar to Alternative 1, under this alternative, the USFWS issue permits at the levels requested by those entities experiencing damage, could issue permits at levels below the level requested on permit applications, or could deny the issuance of permits. WS could provide technical assistance to those persons applying for permits under this alternative by assisting with filling out forms, making recommendations on take levels to achieve damage or threat reduction, provide information on damage management activities that could be employed, or by the loaning of equipment. Under the technical assistance only alternative, WS would not be directly involved with the take of gulls in the Commonwealth and therefore, would not apply for a depredation permit from the USFWS annually. If a person experiencing gull damage receives technical assistance from WS, the property owner or manager experiencing gull damage or threats could: 1) take no action, 2) use non-lethal methods only, 3) apply for a depredation permit that would allow for the lethal take of gulls, or 4) take illegal action and lethally take gulls without a depredation permit despite WS recommendations.

Alternative 3 – No Gull Damage Management Conducted by WS

This alternative precludes any and all activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of gull damage management in the Commonwealth. All requests for assistance received by WS to resolve damage caused by gulls would be referred to the USFWS, the MDFW and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with gulls in the Commonwealth, those persons experiencing damage caused by gulls could continue to resolve damage by employing those methods legally available since the take of gulls can occur through the issuance of depredation permits by the USFWS. All methods described in Appendix B would be available for use by those experiencing damage or threats except for the use of the avicide DRC-1339 which can only be used by WS.

The USFWS could continue to issue depredation permits under this alternative. However, the USFWS does not have the mandate or the resources to verify wildlife damage and to assess each request for a permit to ensure prior use of non-lethal methods before the issuance of permits. A State agency with responsibilities for migratory birds would likely have to provide this information if depredation permits would be issued since WS would have no involvement is damage management activities. If the information was verified and provided for on the application to the USFWS, following the agency's review of a complete application package for a depredation permit from a property owner or manager to lethally take gulls, the permit issuance procedures would follow that described in Alternative 1.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Non-lethal Methods Implemented Before Lethal Methods

This alternative would require that all non-lethal methods or techniques described in Appendix B be applied to all requests for assistance to reduce damage and threats to safety from gulls in the Commonwealth. If the use of all non-lethal methods fails to resolve the damage situation or reduce threats to human safety at each damage situation, lethal methods would be employed to resolve the

request. Non-lethal methods would be applied to every request for assistance regardless of severity or intensity of the damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by those persons experiencing gull damage.

Those experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting WS. Verification of the methods used would be the responsibility of WS. No standard exists to determine requester diligence in applying those methods, nor are there any standards to determine how many non-lethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of non-lethal methods can be evaluated. The proposed action described (Alternative 1) is similar to a non-lethal before lethal alternative because the use of non-lethal methods is considered before lethal methods by WS (WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not add additional information to the analyses in the EA.

Use of Non-lethal Methods Only by WS

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by gulls in the Commonwealth. Only those methods discussed in Appendix B that are considered non-lethal would be employed by WS. No lethal take of gulls would occur by WS. The use of lethal methods could continue to be used under this alternative by those experiencing damage by gulls when permitted by the USFWS. Exclusionary devices can be effective in preventing access to resources in certain circumstances. The primary exclusionary methods are netting and over-head lines. Exclusion is most effective when applied to small areas to protect high value resources. However, exclusionary methods are neither feasible nor effective for protecting human safety, agriculture, or native wildlife species from gulls across large areas. The non-lethal methods used or recommended by WS under this alternative would be identical to those identified in any of the alternatives. Non-lethal methods would be employed by WS in an integrated approach under this alternative.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS would refer requests for information regarding lethal information to the MDFG, USFWS, local animal control agencies, or private businesses or organizations. Under this alternative; however, property owners/managers might be limited to using non-lethal methods only as they may have difficulty obtaining permits for lethal methods, especially in urban areas.

Property owners or managers could conduct management using shooting or any non-lethal method that is legal. Property owners or managers might choose to implement WS' non-lethal recommendations, implement lethal methods, or request assistance from some private or public entity other than WS. Property owners/managers frustrated by lack of WS' assistance with the full range of gull damage management techniques may try methods not recommended by WS (*e.g.*, poisons). In some cases, property owners or managers may misuse some methods or use some methods in excess of what is necessary.

The proposed action, using an integrated damage management approach, incorporates the use of non-lethal methods when addressing requests for assistance. In those instances where non-lethal methods would effectively resolve damage from gulls those methods would be used or recommended under the proposed action. For those requests that can be resolved using non-lethal methods as determined by WS through the use of the WS Decision Model, WS would employ or recommend only non-lethal methods under the proposed action. Since non-lethal methods would be available for use under the alternatives analyzed in detail, this alternative would not add to the analyses.

Use of Lethal Methods Only by WS

This alternative would require the use of lethal methods only to reduce threats and damage associated with gulls. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. Non-lethal methods have been effective in alleviating gull damage. In those situations where damage could be alleviated using non-lethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. Therefore, this alternative was not considered in detail.

Trap and Translocate Gulls Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Gulls would be live-captured using live-traps, cannon nets, rocket nets, bow nets, or mist nests. All gulls live-captured through direct operational assistance by WS would be translocated. Translocation sites would be identified and have to be approved by the USFWS, the MDFG, and/or the property owner where the translocated gulls would be placed prior to live-capture and translocation. Live-capture and translocation could be conducted as part of the alternatives analyzed in detail. However, the translocation of wildlife could only occur under the authority of the USFWS and/or MDFG. Therefore, the translocation of gulls by WS would only occur as directed by those agencies. When requested by the USFWS and/or the MDFG, WS could translocate gulls under any of the alternatives analyzed in detail, except for the no involvement by WS alternative. Since WS does not have the authority to translocate gulls in the Commonwealth unless permitted by the USFWS and/or the MDFG, this alternative was not considered in detail since translocation of gulls could occur under any of the alternatives analyzed in detail.

Translocation of gulls causing damage to other areas following live-capture generally would not be effective or cost-effective. Translocation of birds is generally ineffective 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 translocation would most likely result in bird damage problems at the new location. Also, hundreds or thousands of gulls would need to be captured and translocated to solve some damage problems; therefore, relocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats (Nielsen 1988).

Reducing Damage by Managing Gull Populations through the Use of Reproductive Inhibitors

Under this alternative, the only method available to resolve requests for assistance would be the recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in gulls responsible for causing damage. Reproductive inhibitors are often considered for use where wildlife populations are overabundant and where lethal control programs are not publicly acceptable (Muller et. al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors.

Reproductive control for wildlife could be accomplished either through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through: 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) through gene therapy. Contraception could be accomplished through: 1) hormone implantation (synthetic steroids such as

progestins), 2) immunocontraception (contraceptive vaccines), and 3) oral contraception (progestin administered daily).

Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species. Currently, no reproductive inhibitors are available for use to manage most bird populations. Given the costs associated with live-capturing and performing sterilization procedures on birds and the lack of availability of chemical reproductive inhibitors for the management of most bird populations, this alternative was not evaluated in detail. If a reproductive inhibits becomes available to manage gull populations and has proven effective in reducing localized gull populations, the use of the inhibitor could be evaluated under the proposed action as a method available that could be used in an integrated approach to managing damage. This EA would be reviewed and supplemented to the degree necessary to evaluate the use of the reproductive inhibitor as part of an integrated approach described under the proposed action.

Compensation for Gull Damage

The compensation alternative would require WS to establish a system to reimburse persons impacted by gull damage. Under such an alternative, WS would continue to provide technical assistance to those persons seeking assistance with managing damage. In addition, WS would conduct site visits to verify damage. Analysis of this alternative in WS' programmatic FEIS indicated that a compensation only alternative had many drawbacks. Compensation would: 1) require large expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation, 2) most likely be below full market value, 3) give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies, and 4) not be practical for reducing threats to human health and safety.

3.3 MINIMIZATION AND SOPs FOR GULL DAMAGE MANAGEMENT TECHNIQUES

Minimization measures are any features of an action that serves to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in the Commonwealth of Massachusetts, uses many such minimization measures which are discussed in detail in Chapter 5 of WS' programmatic FEIS (USDA 1997). Those minimization measures will be incorporated into activities conducted by WS when addressing gull damage and threats in the Commonwealth.

Some key minimizing measures pertinent to the proposed action and alternatives include the following:

- The WS Decision Model, which is designed to identify effective wildlife damage management strategies and their impacts, is consistently used and applied when addressing gull damage.

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

- Non-target animals captured in traps are released unless it is determined that the animal will not survive and/or that the animal cannot be released safely.

- The presence of non-target species is monitored before using DRC-1339 to reduce the risk of mortality of non-target species' populations.

- WS has consulted with the USFWS to ensure program activities will not likely adversely affect T&E species.

- All personnel who use chemicals are trained and certified to use such substances or are supervised by trained or certified personnel.

- All personnel who use firearms are trained according to WS' Directives.

- The use of non-lethal methods is considered prior to the use of lethal methods when managing gull damage.

- WS employs methods and conducts activities for which the risk of hazards to public safety and hazards to the environment have been determined to be low according to a formal risk assessment (USDA 1997). 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.

3.4 ADDITIONAL MINIMIZATION MEASURES SPECIFIC TO THE ISSUES

Issue 1 - Effects of Damage Management Activities on Gull Populations

- Lethal take of gulls by WS would be reported and monitored by WS and by the USFWS annually to evaluate population trends and the magnitude of WS' take of gulls in the Commonwealth.

- WS will only target those individuals or groups of target species identified as causing damage or posing a threat to human safety.

- The WS' Decision Model, designed to identify the most appropriate damage management strategies and their impacts, will be used to determine gull damage management strategies.

- WS will annually monitor gull damage management activities to ensure activities do not adversely affect gull populations in the Commonwealth.

- Preference is given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

- When conducting removal operations via shooting, identification of the target will occur prior to application.

- As appropriate, suppressed firearms will be used to minimize noise impacts.

- Personnel will use lures, trap placements, and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.

- Any non-target animals captured in cage traps, nets, or any other restraining device will be released whenever it is possible and safe to do so.

- Personnel will be present during the use of all live-capture methods to ensure non-target species are released immediately or are prevented from being captured.

- WS will consult with the USFWS and the MDFG to evaluate activities to resolve gull damage and threats to ensure the protection of T&E species.

- WS will annually monitor activities conducted under the selected alternative, if activities are determined to have no significant impact on the environment and an EIS is not required, to ensure those activities do not negatively impact non-target species

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

- Damage management activities would be conducted professionally and in the safest manner possible. Most activities will be conducted away from areas of high human activity. If this is not possible, then activities will be conducted during periods when human activity is low (*e.g.*, early morning).

- Damage management via shooting would be conducted professionally and in the safest manner possible. Shooting would be conducted during time periods when public activity and access to the control areas are restricted. Personnel involved in shooting operations will be fully trained in the proper and safe application of this method.

- All personnel employing chemical methods would be properly trained and certified in the use of those chemicals. All chemicals used by WS would be securely stored and properly monitored to ensure the safety of the public. WS' use of chemicals and training requirements to use those chemicals are outlined in WS Directive 2.430.

- All chemical methods used by WS or recommended by WS would be registered with the EPA and the MDAR.

- Carcasses of birds retrieved after damage management activities would be disposed of in accordance with WS Directive 2.505.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

- Management actions to reduce or prevent damage caused by gulls would be directed toward specific individuals identified as responsible for the damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- All methods or techniques applied to resolve damage or threats to human safety would be agreed upon by entering into a cooperative service agreement, MOU, or comparable document prior to the implementation of those methods.

- Preference is given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

- Personnel would be well trained in the latest and most humane devices/methods for removing problem gulls.
- WS' use of euthanasia methods will follow those recommended by WS Directive 2.430.
- The NWRC is continually conducting research to improve the selectivity and humaneness of wildlife damage management devices used by personnel in the field.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified. The following resource values in the Commonwealth are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, critical habitats (areas listed in T&E species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further. The activities proposed in the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. Therefore, the proposed action/no action alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS, the MDFG, the USFWS, and the MDAR.

Issue 1 - Effects of Damage Management Activities on Gull Populations

A common issue is whether damage management actions will adversely affect the populations of target gull species, especially when lethal methods are employed. WS maintains ongoing contact with USFWS and the MDFG to ensure activities are within management objectives for those species. Under the alternatives, WS would submit annual bird damage management activity reports to the USFWS and the MDFW.

Alternative 1 - Continuing the Current Integrated Approach to Managing Gull Damage (Proposed Action/No Action)

Under the proposed action, WS would employ lethal and non-lethal methods in an integrated approach using the WS Decision Model to address gull damage when requested in the Commonwealth. The use of non-lethal methods are generally regarded as having minimal adverse affects on targeted species since those methods are intended to disperse wildlife from an area. The use of non-lethal methods under the proposed action would not reach a magnitude where dispersal would cause adverse affects by limiting

access of entire wildlife populations or large portions of populations to habitat or food sources. Requests for assistance and the subsequent activities conducted by WS would only occur on a small portion of the total land area of Massachusetts. Therefore, the use of non-lethal methods under the proposed action would not adversely affect gull populations in the Commonwealth.

Of concern is the use of lethal methods that results in the take of gulls in areas where damage is occurring and a request for such activities is received by WS. The lethal take of gulls by WS or any other entity can only occur pursuant to the MBTA when a depredation permit has been issued by the USFWS. In Massachusetts, a depredation permit is also required from the MDFG to lethally take birds to alleviate damage and threats. Lethal take would result in the removal of those gulls identified as causing damage or posing threats. Therefore, localized reductions in the number of gulls would occur from the use of lethal methods.

The USFWS monitors the total take of birds from all sources and factors in survival rates from predation, disease, and other mortality data. Ongoing contact with USFWS and the MDFG assures local, Commonwealth, and regional knowledge of wildlife population trends are considered. While local populations of gulls may be reduced, compliance with applicable Commonwealth and federal laws and regulations authorizing take of gulls and their nest and eggs will ensure that the regional and statewide population will not be adversely affected.

As discussed previously, the analysis for magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual take data. Qualitative determinations are based on population trends. Information on bird populations and trends are often derived from several sources including the BBS, the CBC, and published literature.

As was discussed in Chapter 2, allowable harvest models for bird species have had a long history of use in the United States, primarily with waterfowl species to determine allowable harvest during annual hunting seasons. Although no hunting season exists for gulls, the take of gulls under depredation permits issued by the USFWS and the MDFW can occur in the Commonwealth. The USFWS recently prepared PBR models using population parameters for each gull species to estimate the allowable take level for gulls in BCR 14 and BCR 30.

Population parameter estimates were taken from available literature for each gull species (Table 4.1), or in cases where estimates were not available, surrogate estimates from closely-related species were used (Seamans et al. 2007). Because there was uncertainty associated with demographic parameter estimates, allowable take levels were calculated using a simulation approach to estimate a range of R_{max} values with parameter estimates randomly drawn from normal distributions based on reported standard errors (Table 4.1; Seamans et al. 2007).

To use the PBR method to determine levels of allowable take, or cumulative impacts over a large geographic area, the information required includes a minimum estimate of the population size using science-based monitoring programs (*e.g.*, BBS, CBC, coordinated colony surveys), and the intrinsic rate of population growth. The formula for PBR is:

$$\text{PBR} = \tfrac{1}{2}\, R_{max} N_{min} \mathrm{F_R}$$

where R_{max} is the maximum population growth rate at low densities, and in the absence of removal (Runge et al. 2004), N_{min} is the minimum population size, and $\mathrm{F_R}$ is a recovery factor ranging from 0.1 to 2.0. The recovery factor is a qualitative assessment that is typically set at low levels for endangered ($\mathrm{F_R}$ = 0.1) or threatened species ($\mathrm{F_R}$ = 0.5; Taylor et al. 2000), or if the status of the population is poorly known

(Runge et al. 2004). However, using a recovery factor above 1.0 has been discussed for species in which the management objective is to hold the population at a smaller fraction of its carrying capacity (Runge et al. 2009).

Table 4.1 - Demographic parameter estimates (θ) used for estimating R_{max} and Potential Biological Removal of gulls in BCR 14 and BCR 30 (Seamans et al. 2007).

		Great black-backed gull[1]		Herring gull[2]		Laughing gull[3]		Ring-billed gull[4]	
Parameter	**Age class**	**(θ)**	**SE (θ)**	**(θ)**	**SE (θ)**	**(θ)**	**SE (θ)**	**(θ)**	**SE (θ)**
p	Adult	0.87	0.03	0.87	0.03	0.87	0.03	0.87	0.03
$l\alpha$	Adult	0.42		0.42		0.56		0.56	
	Hatch Year	0.729	0.035	0.729	0.035	0.729	0.035	0.729	0.035
	Second Year	0.886	0.024	0.886	0.024	0.886	0.024	0.886	0.024
b		0.784	0.018	0.752	0.022	0.752	0.022	0.752	0.022
α		5		5		3		3	
ω		19		20		19		19	
N_{min}		250,000		390,000		270,000		54,000	
R_{max}		0.09	0.027	0.086	0.027	0.113	0.036	0.113	0.036

[1]Good 1998
[2]Pierotti and Good 1994
[3]Burger 1996, Dinsmore and Schreiber 1974
[4]Ryder 1993, Seamans et al. 2007

To estimate R_{max} for gulls, the Slade formula (Slade et al. 1998) was used:

$$1 = p\lambda^{-1} + 1_{\alpha}\, b\lambda^{-\alpha} - l_{\alpha} bp^{(\omega-\alpha+1)}\, \lambda^{-(\omega+1)}$$

where p is adult annual survival rate, $l\alpha$ is the survival rate from birth to age at first reproduction, b is the number of female offspring per female of reproductive age per year, α is the age at first reproduction, ω is the age at last reproduction, and λ is the intrinsic rate of population change. After solving the above equation for λ, R_{max} was estimated as ln(λ).

Population estimates (N_{min}) for each species were based on the number of gulls at known breeding colonies in BCR 14 and BCR 30 during the mid-1990s (MANEM Regional Waterbird Plan 2006), and adjusted using a conservative estimate of 0.75 non-breeding gull per breeder to estimate the total population (Seamans et al. 2007). Allowable take levels (± 95 CI) for each of the four gull species addressed in this assessment under three recovery factors (0.5, 1.0, 1.5) in BCR 14 and BCR 30 are presented in Table 4.2.

The PBR models were developed by the USFWS for BCR 14 and BCR 30 to evaluate harvest levels for gulls in the northeastern United States to ensure take occurs within levels to achieve desired population objectives for those species. The four gull species addressed in this assessment are known to breed along coastal areas and inland sites that are contained within BCR 14 and BCR 30. Since population estimates and trends for gulls are limited, the PBR models were developed by the USFWS for BCR 14 and BCR 30 to analyze potential population impacts from lethal take since the gulls present in the northeastern United States are likely those gulls migrating from and nesting in BCR 14 and BCR 30. Given the close geographical proximity of States in the northeastern United States and given the mobility of gulls, assessing allowable take for each State in the northeast would be difficult. Some concerns arise regarding

the use of regional gull population estimates for assessing allowable take in BCR 14 and BCR 30 as opposed to the more specific breeding population estimates in the Commonwealth. To address those concerns the analyses for each species will include the evaluation of proposed take levels as those take levels relate to the statewide breeding population and how the proposed take relates to the PBR model for gulls in BCR 14 and BCR 30.

Table 4.2 - Potential Biological Removal (± 95% CI) of gulls in BCR 14 and BCR 30 under 3 recovery factors (Seamans et al. 2007).

Species	$F_R = 0.5$	$F_R = 1.0$	$F_R = 1.5$
Laughing Gull	7,685 (3,927 – 12,685)	15,274 (7,188 – 23,042)	26,044 (10,798 – 34,818)
Herring Gull	8,360 (3,892 – 12,656)	16,725 (7,788 – 25,397)	25,048 (11,716 – 37,875)
Great Black-backed Gull	5,614 (2,764 – 8,358)	11,234 (5,561 – 16,670)	16,853 (8,364 – 25,086)
Ring-billed Gull	1,532 (713 – 2,318)	3,065 (1,455 – 4,634)	4,588 (2,161 – 6,951)

Most States in the northeastern United States conduct colonial waterbird surveys to determine breeding population trends for many colonial waterbirds, including gulls. Most State-level population estimates are provided as the number of breeding pairs of gulls surveyed. Therefore, one breeding pair equals two gulls. Gulls are migratory bird species and the breeding population of gulls estimated at the State-level is only representative of the number of gulls present in a State during a short period of time (breeding season) and does not account for migratory gulls present during the winter nor do breeding colony surveys account for the population of non-breeding gulls present during the breeding season in the Commonwealth. Therefore, to better account for the mobility of gulls and the fact that gulls present in the northeastern United States are likely gulls that nest and migrate through BCR 14 and BCR 30, the USFWS developed models based on the geographical scope of the nesting populations of gulls. In addition, the PBR models developed by the USFWS are based on breeding and non-breeding gulls which are often not included in surveys conducted at colonial nesting sites. Since the take of gulls to alleviate damage can occur throughout the year and not just during the breeding season, a comprehensive model like the PBR that includes non-breeding populations of gulls allows for a more systemic analysis of allowable take on gull populations.

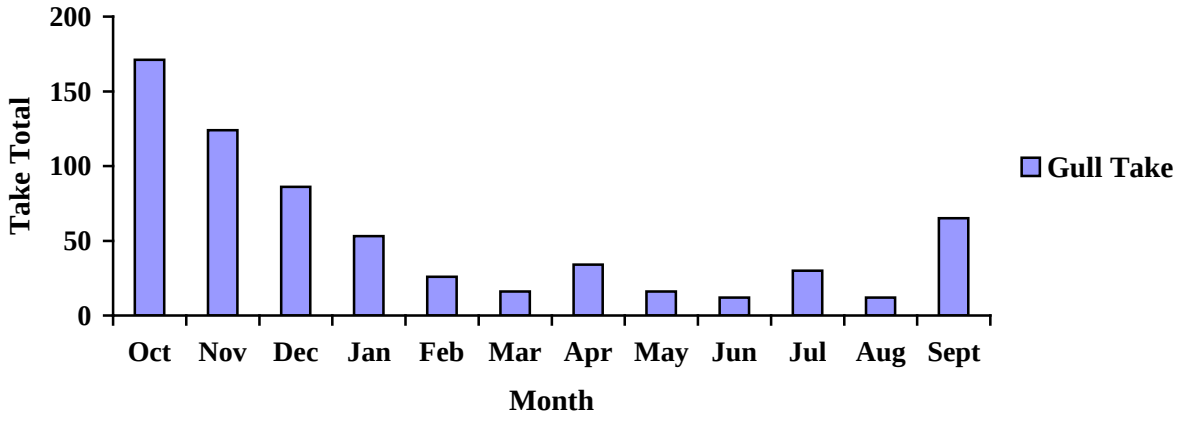
The level of annual take evaluated for each gull species under the proposed action was based on the number of gulls lethally taken during requests received by WS in the Commonwealth from FY 2003 through FY 2008. As the number of requests for assistance received by WS increases, the number of gulls that are addressed to alleviate damage is also likely to increase. When lethal methods are deemed appropriate using the WS Decision Model for each request for assistance, the number of gulls address using lethal methods to achieve the desired results of alleviating damage or threats is also likely to increase. Therefore, the annual take levels analyzed for each of the gull species account for likely increasing number of requests for assistance and the subsequent need to address a higher number of gulls annually to alleviate damage and threats. Based on prior requests for assistance, WS anticipates requests to alleviate damage associated with gulls to increase at landfills, at power substations, from rooftop nesting gulls, and to alleviate predation and nest site competition with other colonial nesting waterbirds. Based on the number of requests for assistance and based on personal observations of WS' employees, the number of gulls nesting atop the roofs of buildings is increasing in the Commonwealth along with the number of gulls utilizing the enclosed environment of electrical substations. Gulls nesting on rooftops cause damage to drainage systems from the building up of nesting material as well as by pulling on and

tear roofing material which can lead to leaks. Concerns have been raised that gulls nesting at electrical substations may cause electrical power outages as they enter and exit the facility. Requests for assistance with managing damage and threats associated with gull predation, habitat degradation, and nest site competition with other colonial nesting waterbirds have been received by WS in the Commonwealth previously. In FY 1996, WS was requested to assist with the removal of herring gulls and black-backed gulls to alleviate nest site competition with common terns and roseate terns. The removal of the gulls allowed for the successful recolonization of the island by the terns. As was discussed previously, the annual take levels analyzed in the proposed action alternative also includes gulls that could be lethally taken at airports in the Commonwealth which were addressed in a separate EA but are included in the take of gulls in this assessment to assure activities conducted by WS are analyzed cumulatively.

Concerns have also been raised regarding the potential for the proposed take of gulls under the proposed action alternative to have adverse affects on breeding colonies in the Commonwealth, which have shown recent declining trends. Of those gull species addressed in this assessment, only ring-billed gulls do not have breeding colonies in the Commonwealth. Although nesting start dates vary among the three gull species in the Commonwealth, nesting generally occurs from April to June with young present in the nests from May through August. The peak nesting period occurs in May for those gull species nesting in the Commonwealth with June through July being the peak time for young to be present in nests.

WS' total take of those gull species addressed in this assessment by month from FY 2006 through FY 2009 are shown in Figure 4.1. Although requests for assistance to manage damage or threats associated with gulls can occur throughout the year, nearly 84% of the gulls lethally taken by WS from FY 2006 through FY 2009 have occurred from September through March. With gull nesting generally occurring from April to June and young present in nests from May through August, most of WS' lethal take of gulls has occurred outside of the nesting season. However, the take of gulls has occurred by WS during those months when nesting is occurring to alleviate damage or threats associated with the nesting behavior.

Figure 4.1 - WS' gull take in the Commonwealth by Month from FY 2006 to FY 2009



The current surveys conducted to assess trends in the number of breeding pairs of gulls nesting at historical sites does not include a count of the number of non-breeding (sub-adults and non-breeding adults) gulls present within the Commonwealth nor provides trend data for non-breeding gull populations. Dolbeer (1998) estimated the number of non-breeding laughing gulls was equal to about 50% of the nesting population. The PBR model developed by the USFWS to estimate allowable take calculated a

total population for each gull species using 0.75 non-breeding gulls for every breeding adult. The proportion of non-breeding gulls that have been taken by WS or that will likely be taken by WS under the proposed action alternative in unknown. As stated previously, nearly 84% of the gulls lethally taken by WS from FY 2006 through FY 2009 were taken outside those months when nesting would be occurring. Gulls lethally taken during those months when nesting is not occurring could represent gulls that nest in Massachusetts, gulls that nest elsewhere but are present in the Commonwealth during the migration period, or were non-breeding gulls the previous year. Since distinguishing gulls that breed at different sites is not possible (unless banding has occurred), the proportion of WS' estimated take under the proposed action alternative that would represent gulls that nest in the Commonwealth, that nest outside of the Commonwealth, or are non-breeding gulls is unknown. Similarly, gulls taken by WS during the nesting season could represent gulls that are nesting in the Commonwealth, are nesting in colonies outside of the Commonwealth but are foraging within the Commonwealth, or are non-breeding gulls.

The annual take levels analyzed in this assessment include an anticipated increase in the number of requests received by WS to address gulls during the nesting season, primarily from gulls nesting on rooftops and nesting at electrical substations. In addition, WS could receive requests to address predation issues and nest site competition with other colonial waterbirds. Although the number of breeding pairs of gulls nesting at historical gull nesting colonies in the Commonwealth appears to be decreasing based on periodic surveys, the number of gulls nesting on rooftops and other man-made structures appears to be increasing in the State based on anecdotal information. If a shift in the nesting behavior of gulls to rooftops and other man-made structures is occurring, that shift would likely cause a decline in historical breeding gull colonies unless the gull population is expanding to a level where breeding pairs are being forced to nest outside of historical locations.

If gull populations were expanding, the number of gulls using historical colonies would likely remain stable or increase (occupying all available space at historical nesting locations) causing the remaining breeding pairs of gulls to find nesting locations elsewhere. Surveys continue to indicate the number of breeding pairs of gulls using historical nesting sites in the Commonwealth are declining which could indicate an overall declining breeding population or could indicate a shift in nesting locations due to the loss of habitat at those locations, disturbances or nest failures that have resulted in abandonment of part of the colony, or a shift to more productive nesting locations such as rooftops and other man-made structures. Nesting on rooftops and other man-made structures does provide benefits to nesting gulls by providing additional protection from predators and human disturbance compared to ground nesting on islands. No information is currently available linking the decline in known breeding colonies to an increase in the number of breeding pairs on rooftops in the Commonwealth. However, current surveys are only conducted at historical gull breeding sites and have not attempted to determine the number of breeding pairs nesting on rooftops or other structures outside of those historical locations. Therefore, information is currently not available to adequately predict whether the anecdotal information of an increasing trend in rooftop nesting colonies can account for the decline in the number of gull breeding pairs nesting at historical nesting colonies.

The issue of the potential impacts of conducting the alternatives on the populations of those gull species addressed in this assessment is analyzed for each alternative below.

Ring-billed Gull Population Impact Analysis

Ring-billed gulls are migratory birds which prefer to nest on islands with sparse vegetation. The breeding population of ring-billed gulls is divided into two populations; the western population and the eastern population. The eastern breeding population of the United States includes New York, Vermont, Ohio, Illinois, Michigan, Wisconsin, and Minnesota (Blokpoel and Tessier 1986). Breeding populations of

ring-billed gulls in New York can be found on Lake Champlain, the St. Lawrence River, the lower Great Lakes, and Oneida Lake (Bull 1974, Peterson 1985). Ring-billed gulls nest in high densities and, in the Great Lakes region, nesting colonies may be located on islands, parklands, slag yards, rooftops, breakwalls, and landfills (Blokpoel and Tessier 1986).

Regional populations of ring-billed gulls have increased at a rate of 8%-11% per year since 1976, with a regional breeding population of 40,844 gulls in 13 colonies reported in the 1990s (MANEM Regional Waterbird Plan 2006). The overall regional population of ring-billed gulls in BCR 14 and BCR 30 is estimated at 54,000 (see Table 4.1). No breeding population estimates are currently available for Massachusetts. Ring-billed gulls do have a year round presence and can be observed throughout much of the Commonwealth. In 1984, the population of ring-billed gulls in the Great Lakes region was estimated at approximately 648,000 pairs (Blokpoel and Tessier 1986). Blokpoel and Tessier (1992) found that the nesting population of ring-billed gulls in the Canadian portion of the lower Great Lakes system increased from 56,000 pairs to 283,000 pairs from 1976-1990.

Ring-billed gulls are considered a species of lowest concern in BCR 14 and BCR 30 which encompass most of the Commonwealth (MANEM Regional Waterbird Plan 2006). Almost 41,000 ring-billed gulls are believed to breed in BCR 14. There are no known breeding colonies in BCR 30. CBC data from 1966-2008 shows a general increasing population trend for wintering populations of ring-billed gulls throughout the Commonwealth (NAS 2002). A similar increase has also been documented on BBS routes in the United States (Sauer et al. 2008). In the eastern BBS region, the ring-billed gull population is also showing an increasing annual trend estimated at 1.8% since 1966 with the trend across all routes in the United States estimated to be increasing at 2.6% annually which is statistically significant (Sauer et al. 2008).

Ring-billed gulls are protected from take under the MBTA. However, take can occur pursuant to the MBTA through depredation permits issued by the USFWS and the MDFG. WS' take of gulls occurs under permits issued to WS or under permits issued to cooperators where WS is acting as an agent on the permit. The take of ring-billed gulls authorized by the USFWS issued to all entities is shown in Table 4.3. The number of permits issued by the USFWS has increased nearly 81% since 2003. The reported number of ring-billed gulls taken increased from 158 in 2003 to 420 in 2006. In 2008, the USFWS authorized the take of up to 4,550 ring-billed gulls for damage management purposes to entities which would comprise 8.4% of the population estimated at 54,000 if take had occurred at the authorized levels.

Table 4.3 – USFWS authorized take of ring-billed gulls in Massachusetts, 2003-2008

Ring-billed Gulls	Adults			Nests		
	Authorized	Take	% Take	Authorized	Take	% Take
2003	2,720	160	5.9%	100	0	0%
2004	2,455	305	12.4%	125	2	1.6%
2005	3,460	211	6.1%	120	0	0%
2006	4,270	425	10.0%	200	0	0%
2007	4,330	354	8.2%	0	0	0%
2008	4,550	174	3.8%	1,420	0	0%

The USFWS also authorized ring-billed gull nests to be destroyed as part of depredation permits to prevent and alleviate damage. The number of permits to destroy ring-billed gull nests and the reported take are shown in Table 4.3. Since 2003, only two ring-billed gull nests have been reported as destroyed. The USFWS, as the agency with migratory bird management responsibility, could impose restrictions on depredation take as needed to assure cumulative take does not adversely affect the continued viability of

populations. This should assure that cumulative impacts on ring-billed gull populations have no significant adverse impact on regional gull populations.

A total of 11 ring-billed gulls were lethally taken by WS in Massachusetts from FY 2003 to FY 2008 to manage damage and threats to human safety. During this period, WS also dispersed 464 ring-billed gulls using non-lethal methods as part of an integrated approach to resolving gull damage in the Commonwealth. Primarily due to an increase in requests for assistance at landfills in FY 2009, a total of 23 ring-billed gulls were lethally taken and 1,194 were non-lethally dispersed by WS in Massachusetts. Based on the number of ring-billed gulls lethally taken from FY 2003 through FY 2009 and a reasonable anticipation of an increase in the number of requests for assistance, WS could lethally take up to 500 ring-billed gulls and 50 nests in Massachusetts as part of an integrated damage management program. WS anticipates an increase in the need to address damage and threats associated with ring-billed gulls at airports, landfills, and from gulls nesting on rooftops. To ensure the cumulative take of ring-billed gulls is evaluated in this EA, the lethal take of up to 500 ring-billed gulls and up to 50 nests analyzed in this assessment will include those gulls and nests that could be taken at airports which were analyzed in a separate EA (USDA 2002).

WS may employ nest removal, including eggs, as a method to address damage by ring-billed gulls and the other gull species being analyzed. Nest removal is not used by WS as a population control method. This method is used by WS to inhibit nesting in an area where damage or threats are occurring due to nesting activity and is intended to relocate a nesting pair or colony of gulls to an area where there are no conflicts. There may be occasions when nest treatment, addling, or oiling the eggs and allowing the nesting pair to return to the nest for continued incubation, may be preferable to nest removal. Total nest take at a site is determined by the highest number of active nests with eggs removed and destroyed or treated on a single day during the nesting season. All nests re-built up to the peak and all nests re-built after the peak are considered re-nests for purposes of reporting the number of nests destroyed to the USFWS.

From 2003 through 2007, the number of ring-billed gulls taken annually in the northeastern United States (USFWS Region 5)[10] has ranged from 678 to 1,289 ring-billed gulls with an average annual take of 980 ring-billed gulls. The PBR model developed by the USFWS currently predicts that 3,065 ring-billed gulls could be taken annually to maintain the current breeding population levels in BCR 14 and BCR 30 which encompasses the northeastern United States (MANEM Regional Waterbird Plan 2006). Non-breeding ring-billed gulls are also known to occur throughout BCR 14 and BCR 30 during the breeding season. Based on the known take of ring-billed gulls occurring annually in BCR 14 and BCR 30, the take level from all known sources has been below the estimated level that would result in a breeding population decline.

If WS lethally takes 500 ring-billed gulls and if the take of ring-billed gulls under depredation permits from 2003 through 2007 is indicative of future lethal take in the northeastern United States, the total take of gulls in BCR 14 and BCR 30 would have ranged from 1,178 gulls to 1,789 gulls with an average take of 1,480 gulls. As stated previously, based on the PBR model developed for ring-billed gulls by the USFWS, up to 3,065 ring-billed gulls could be taken in BCR 14 and BCR 30 annually to maintain current population levels. The proposed total take of ring-billed gulls by WS evaluated in this assessment when included with the known take of ring-billed gulls under depredation permits would not exceed the level necessary to cause a decline in ring-billed gull populations based on the PBR model.

No exact population estimates are available in Massachusetts for ring-billed gulls. Thus, based on the best available information for the regional gull populations, WS' annual removal of up to 500 gulls would

[10] The USFWS is divided into nine regions in the United States. USFWS Region 5 includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia.

reduce the estimated regional population of 54,000 gulls by less than 1.0% annually. Since population trends continue to indicate an increasing ring-billed gull population, the population of ring-billed gulls in the region and in Massachusetts is likely greater than 54,000 gulls since the population estimated in Table 4.1 is considered a minimum population (N_{min}).

Based on the best available information described above, WS' potential impacts to populations of ring-billed gulls has been and is expected to continue to be insignificant to the overall viability and reproductive success of ring-billed gull populations on a local, regional, and nationwide scale. This determination is based on the increasing regional trends of ring-billed gull populations as derived from BBS data and PBR data for BCR 14 and BCR 30. The PBR model predicts ring-billed gulls in BCR 14 and BCR 30 could sustain a harvest of 3,065 individuals and maintain current population levels. The proposed take of up to 500 ring-billed gulls annually by WS when combined with the average take of ring-billed gulls in the northeastern United States would total 1,480 gulls which is below the take level predicted by the PBR model that would cause a decline in the population. Even if the proposed take of up to 500 ring-billed gulls is combined with the highest level of take of ring-billed gulls in the northeastern United States, the overall take would be below the level where a population decline would occur from the proposed take of up to 500 gulls based on the model. WS' take and all known take in the northeastern United States since 2003 has not reached a level that indicates an adverse impact to ring-billed gull populations is occurring. With management authority over migratory birds, the USFWS could impose stricter take limits if warranted based on population data. The USFWS, as the agency with migratory bird management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on ring-billed gull populations would have no significant adverse impact on the quality of the human environment.

Herring Gull Population Impact Analysis

Herring gulls are the most widely distributed gull species in the Northern Hemisphere. Herring gulls breed in colonies near oceans, lakes, or rivers (Bent 1921). Herring gulls nest along the Atlantic coast and will nest on natural or man-made sites, such as rooftops and breakwalls. In Massachusetts, herring gulls nest along the coast and on islands from the Merrimac River along the border with New Hampshire south to Cape Cod, Martha's Vineyard, and Nantucket Islands and along the South Shore to the border with Rhode Island. Herring gulls are also increasingly nesting on man-made structures, particularly on rooftops or in areas with complete perimeter fencing such as electrical substations.

The population of herring gulls in the southern New England and Mid-Atlantic Regions was estimated at approximately 66,000 breeding pairs (MANEM Regional Waterbird Plan 2006). Herring gulls have decreased approximately 38% in the same area between 1970 and into the 1990s (MANEM Regional Waterbird Plan 2006). In 1990, the statewide population of herring gulls was estimated at 35,000 breeding pairs (Pierotti and Good 1994). The MDFW estimated the number of breeding herring gulls in Massachusetts in 1994-1995 at approximately 17,669 pairs at 62 nesting sites (S. Melvin, MDFW, pers. comm. 2009). In 2006-2007, the number of herring gulls nesting in the Commonwealth was estimated to be at least 9,144 with no census being conducted at Nomans Land Island where nesting is known to have occurred. Although total counts from all sites surveyed during the two survey periods are not directly comparable because of disparities in survey methods between some sites, most sites were surveyed using comparable methods during 2006-2007. For those sites, the results of nesting counts can be compared. For herring gulls, counts from sites that were surveyed using similar methods declined by 42% between the 1994-1995 counts and the 2006-2007 counts (S. Melvin, MDFW, pers. comm. 2009).

According to the MANEM Waterbird Conservation Plan, herring gulls are considered a species of low

concern in North America (MANEM Regional Waterbird Plan 2006). Almost 91,000 herring gulls are believed to breed in BCR 30. Of those herring gulls, over 36,000 gulls occur in Southern New England, which includes all of coastal Massachusetts where herring gull nesting is known to occur. In addition, over 196,000 herring gulls are believed to breed in the neighboring BCR 14 which includes north central and western Massachusetts (MANEM Regional Waterbird Plan 2006).

CBC data gathered in Massachusetts from 1966-2008 indicates the number of herring gulls observed during the survey has shown a declining trend in the Commonwealth (NAS 2002). Data available from the BBS indicates the number of herring gulls observed during the survey are showing a downward trend in Massachusetts estimated at -3.6% since 1966 (Sauer et al. 2008). A similar downward trend is occurring across BBS routes in the United States estimated at -2.1% annually since 1966. BBS data currently indicates a declining population in the northeastern United States (USFWS Region 5) estimated at -0.5% annually since 1966 (Sauer et al. 2008). Existing BBS survey routes and coastal counts of nesting herring gulls conducted by the MDFW may not sufficiently take into account the change in nesting behavior from islands to rooftops exhibited by numerous nesting herring gull pairs.

Herring gulls are also protected from take under the MBTA but can be taken pursuant to the Act through the issuance of a depredation permit by the USFWS when gulls are causing or about to cause damage. As previously discussed, the USFWS has developed a PBR model to estimate the allowable take of herring gulls in BCR 14 and BCR 30 which includes Massachusetts. Based on the model, an allowable harvest of up to 16,725 herring gulls in BCR 14 and BCR 30 would maintain current population levels in those two regions. The take of herring gulls also occurs by other entities (*e.g.*, airports, landfills) through depredation permits issued by the USFWS and the MDFW. All of WS' activities conducted to manage damage caused by herring gulls and to reduce threats to human safety have occurred under a depredation permit from the USFWS pursuant to the MBTA and under permits issued by the MDFW.

A total of 227 gulls have been lethally taken by WS in Massachusetts from FY 2003 to FY 2008 to manage damage and threats to human safety. During this period, WS has also dispersed 3,069 herring gulls using non-lethal methods as part of an integrated approach to resolving gull damage in the Commonwealth. Primarily due to an increase in requests for assistance at landfills in FY 2009, a total of 414 herring gulls were lethally taken and 26,734 herring gulls were non-lethally dispersed by WS in Massachusetts to alleviate damage and threats. Based on the level of take since FY 2003, WS reasonably expects the need to lethally take herring gulls to increase but will not exceed 1,500 herring gulls annually.

The increase in the estimated annual take level by WS in the Commonwealth when compared to take by WS previously arises primarily from the increased requests to address damage associated with herring gulls at landfills and from damages occurring from nesting activities. In addition, WS could be requested to participate with other natural resources agencies or groups in the Commonwealth to assist with reducing the number of herring gulls nesting at locations to reduce nest site competition between herring gulls and other species, such as roseate terns. For example, in FY 1996 WS was requested to participate in the removal of 1,165 herring gulls to reduce nest site competition between herring gulls and common terns. The removal of herring gulls to reduce nest site competition has allowed for successful common tern and roseate tern nesting at the site for the last 13 nesting seasons. In FY 2009, WS addressed over 27,000 herring gulls during damage management activities in the Commonwealth which was an increase of over 719% when compared to the number of herring gulls addressed by WS from FY 2003 through FY 2008. Similar to ring-billed gulls, the proposed take level of herring gulls analyzed in this EA would also include the take of herring gulls to reduce threats at airports in the Commonwealth which was analyzed in a separate EA (USDA 2002). Therefore, the combined take from activities addressed in this EA and those activities addressed in the airport EA (USDA 2002) would not exceed 1,500 herring gulls annually. The take of 1,500 herring gulls would represent 4.2% of the MANEM Regional Waterbird Plan estimated

herring gull breeding population in Southern New England and 8.2% of the estimated 2006-2007 breeding population in Massachusetts. In addition to the lethal take of herring gulls, up to 650 nests could be destroyed annually to reduce and prevent damage to property, agricultural resources, natural resources, and to reduce threats to human safety.

Herring gulls have also been lethally taken by other entities in the Commonwealth to alleviate damage as permitted by the USFWS and the MDFW through the issuance of depredation permits. The number of herring gulls authorized to be lethally taken in the Commonwealth by the USFWS and the MDFW are shown in Table 4.4. The number of herring gulls authorized to be taken by the USFWS and the MDFW has increased annually since 2003. In 2008, the USFWS and the MDFW authorized the take of up to 4,671 herring gulls in Massachusetts to reduce damage and threats associated with herring gulls. If 4,671 herring gulls had been lethally taken in the Commonwealth as permitted by the USFWS and the MDFW, the authorized take would have represent 25.5% of the 9,144 herring gull breeding pairs estimated in the Commonwealth during the 2006-2007 count.

The highest level of herring gull take occurred in 2005 when 782 gulls were taken in Massachusetts. Based on a stable population of herring gulls, take of herring gulls in 2005 (782 the highest level of take) would represent 4.3% of the 2006-2007 herring gull breeding population estimate without accounting for the non-breeding and wintering populations. Herring gull nests were also authorized to be destroyed by the USFWS through the issuance of depredation permits. The number of herring gull nests destroyed annually has ranged from 117 nests in 2004 to a high of 1,179 nests in 2007.

Table 4.4 - USFWS authorized take of herring gulls in Massachusetts, 2003-2008

Herring Gulls	Adults			Nests		
	Authorized	Take	% Take	Authorized	Take	% Take
2003	2,815	438	15.6%	1,555	171	11.0%
2004	3,641	489	13.4%	3,375	117	3.5%
2005	4,039	782	19.4%	3,110	967	31.1%
2006	4,355	723	16.6%	3,005	226	7.5%
2007	4,460	574	12.9%	2,470	1,179	47.7%
2008	4,671	699	15.0%	2,575	174	6.8%

Impacts due to nest removal and destruction should have little adverse impact on the herring gull population regionally and in Massachusetts. Nest destruction methods are considered non-lethal when conducted before the development of an embryo. Additionally, herring gulls are a long lived species and have the ability to identify areas with regular human disturbance and low reproductive success which causes them to relocate and nest elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected, this activity has no long term effect on breeding adult herring gulls. Nest removal is not used by WS as a population management method. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is intended to relocate a nesting pair or colony of herring gulls to an area where there are no conflicts. From FY 2003 to FY 2008, 196 nests were removed by WS to alleviate damage and reduce threats. The destruction of up to 650 herring gulls nests annually by WS would occur in localized areas where nesting occurs and would not reach a level where adverse affects on herring gull populations would occur. As with the lethal take of gulls, the take of nests must also be authorized by the USFWS and the MDFW. Therefore, the number of nests taken by WS annually would occur at the discretion of the USFWS and the MDFW. Take would only occur at levels authorized by those agencies.

To maintain current population levels, the PBR model developed by the USFWS predicts that 16,725

herring gulls can be taken in BCR 14 and BCR 30 annually based on $F_R = 1.0$ (see Table 4.2). In the northeastern United States (USFWS Region 5), the average annual reported take of herring gulls from 2003 through 2007 has been 3,171 herring gulls by all entities issued depredation permits by the USFWS. Herring gull take by all entities in the northeastern United States has ranged from 2,117 gulls to a high of 3,911 gulls taken under depredation permits issued by the USFWS between 2003 and 2007. Based upon the PBR model, the average annual take of herring gulls in USFWS Region 5 has been below the level of take that would lead to a population decline. To maintain current herring gull populations, the PBR model estimated the allowable harvest of herring gulls in BCR 14 and BCR 30 was over 16,000 gulls annually. With $F_R = 0.5$ (recovery factor), the PBR predicted 8,360 herring gulls could be harvested annually in BCR 14 and BCR 30 which would likely lead to a population increase. The average annual take of herring gulls in the northeastern United States by all entities has been below the level where a population decline would occur based on the model.

The average annual take of herring gulls by all entities in the northeastern United States has averaged 3,171 gulls from 2003 through 2007. If up to 1,500 herring gulls were lethally taken by WS and the average take by all entities in the northeastern United States remains stable, the combined take would be 4,671 herring gulls which is below the level predicted by the PBR that would cause a decline in the herring gull population in the northeastern United States. The take of herring gulls by all entities to alleviate damage or threats has ranged from 2,117 gulls to a high of 3,911 herring gulls from 2003 through 2007. If the range of gulls taken remains stable in the northeastern United States and if 1,500 gulls were taken by WS in Massachusetts, the overall take by all entities would range from 3,617 to a high of 5,411 herring gulls which is below the level that would cause a decline in the breeding population of herring gulls based on the PBR model.

WS' proposed take of up to 1,500 herring gulls annually and 650 nests along with take by other entities is expected to continue to be insignificant to the overall viability and reproductive success of herring gull populations on a local, regional, and nationwide scale. Known take of herring gulls is below the level that the PBR model predicts will cause a decline in the population in the northeastern United States from take permitted by the USFWS. The permitting of take by the USFWS and the MDFW provides outside evaluation to ensure WS' take occurs within the allowed limits to achieve desired population management objectives for herring gulls in Massachusetts and the northeastern United States.

Great Black-backed Population Impact Analysis

The great black-backed gull is essentially a marine species, which breeds in the North Atlantic region. In the United States, the great black-backed gull breeds south to Long Island, New York (Bull 1974). During the winter, great black-backed gulls can also be found along the Great Lakes and larger rivers, such as the St. Lawrence River (Bull 1974, Angehrn et al. 1979). In Massachusetts, great black-backed gulls nest along the coastal areas of the Commonwealth. The over-wintering population of great black-backed gulls has been increasing along the Great Lakes, along with the expansion of their breeding range (Angehrn et al. 1979). During the winter, great black-backed gulls can also be found at inland feeding areas such as landfills and restaurants.

In BCR 14, the breeding population of great black-backed gulls has been estimated at 115,546 gulls (MANEM Regional Waterbird Plan 2006). In BCR 30, which includes Massachusetts, the breeding population of great black-backed gulls has been estimated at 37,372 gulls (MANEM Regional Waterbird Plan 2006). The population of great black-backed gulls in the southern New England and Mid-Atlantic Regions is approximately 28,000 breeding pairs (MANEM Regional Waterbird Plan 2006). Great black-backed gulls have increased about 39% across the entire 13 northeast state region from the 1970s through the 1990s (MANEM Regional Waterbird Plan 2006). In the United States, great black-backed gulls

breeding populations have increased 109% from the 1970s to 1990s (MANEM Regional Waterbird Plan 2006). Canadian Wildlife Service reports that the population figures for the great black-backed gull populations in the Northeast (*i.e.*, along the St. Lawrence River) have increased in the last twenty years (Canadian Wildlife Service 2002). In 1994-1995, the statewide population of great black-backed gulls was estimated at 15,000 breeding pairs (Good 1998) at 62 nesting sites (S. Melvin, MDFW pers. comm. 2009). During surveys conducted in 2006 and 2007, the breeding population of great black-backed gulls in the Commonwealth was estimated at 9,054 breeding pairs (S. Melvin, MDFW pers. comm. 2009). Methods used to survey gull colonies varied from the 1994-1995 surveys and the 2006-2007 surveys for some of the colonies surveyed which makes comparing the results of the surveys difficult for some colonies. For those colonies in which survey methods used in 1994-1995 are comparable to survey methods used in 2006-2007 indicated the number of nesting great black-backed gulls declined by 40% between the two surveys (S. Melvin, MDFW pers. comm. 2009).

CBC data gathered in Massachusetts from 1966 through 2008 shows the number of great black-backed gulls observed during the survey to be stable to slightly increasing (NAS 2002). BBS data indicates a declining population trend for great black-backed gulls in Massachusetts estimated at -1.3% annually since 1966 (Sauer et al. 2008). Across all routes in the United States, BBS data indicates populations are declining at an estimated rate of -2.5% annually since 1966 with similar declining estimates for the northeastern United States estimated at -2.7% (Sauer et al. 2008). However, BBS data compiled for the New England/Mid Atlantic BCRs show an increasing trend in the number of nesting great black-backed gulls estimated at 7.9% annually since 1966 (Sauer et al. 2008). From 1980 to 2007, data compiled from the BBS indicates the number of great black-backed gulls in the New England/Mid Atlantic BCRs has increased 8.7% annually (Sauer et al. 2008).

The data quality rating assigned to the trend estimates for great black-backed gulls surveyed in Massachusetts and across the United States indicates that the trend data is poor due to low abundance, is based on very small sample sizes, the results are so imprecise that a 3% per year change would not be detected, or there is inconsistencies in the trend over time (Sauer et al. 2008). BBS trend data is derived from surveyors identifying bird species based on visual and auditory cues at stationary points along established routes that are surveyed annually. All birds are counted within a quarter of mile of fixed points along the survey route. Since gulls nest along coastal areas and on islands away from established roads, the survey parameters of the BBS are not likely to accurately reflect changes in the number of gulls breeding at nesting colonies.

Similar to the other gull species discussed, the USFWS has issued depredation permits allowing take of black-backed gulls to entities other than WS for damage management purposes. Table 4.5 shows the authorized take of great black-backed gulls permitted by the USFWS and the reported take for all entities receiving depredation permits. Except for take authorized in 2004 and 2008, the number of black-back gulls authorized for take has increased annually since 2003. In 2008, the USFWS authorized the take of 4,446 great black-back gulls in Massachusetts to all entities for damage management purposes. The highest level of take since 2003 occurred in 2005 and was reported at 611 gulls.

WS' take of great black-back gulls from FY 2003 through FY 2008 has ranged from six gulls taken in FY 2007 to nine gulls taken in FY 2008 with a total of 15 gulls taken by WS from FY 2003 through FY 2008. No take of great black-backed gulls occurred by WS from FY 2003 through FY 2006. In FY 2006, one great black-backed gull nest was destroyed by WS with four nests destroyed in FY 2007 by WS. WS has also employed non-lethal methods to disperse great black-backed gulls from areas where damage was occurring. From FY 2003 to FY 2008, WS dispersed 175 great black-backed gulls using non-lethal methods. Similar to activities conducted by WS involving damage caused by ring-billed gulls and herring gulls, requests for assistance associated with damage caused by or posed by great black-backed gulls in

the Commonwealth increased in FY 2009 when compared to the previous six year period. During FY 2009, 77 great black-backed gulls were lethally taken by WS to alleviate damage and 4,474 great black-backed gulls were non-lethally dispersed.

Table 4.5 - USFWS authorized take of great black-backed gulls in Massachusetts, 2003-2008

Great Black-backed Gulls	Adults			Nests		
	Authorized	Take	%Take	Authorized	Take	% Take
2003	2,475	362	14.6%	1,105	283	25.6%
2004	3,270	141	4.3%	2,110	274	13.0%
2005	3,782	611	16.2%	1,530	302	19.7%
2006	4,105	392	9.5%	1,387	47	3.4%
2007	4,193	386	9.2%	1,133	281	24.8%
2008	4,446	292	6.6%	1,552	7	0.5%

As was stated previously, WS anticipates an increase in the number of requests to assist with managing damage associated with great black-backed gulls in the Commonwealth. In association with an increase in the number of requests for assistance is the need to address a higher number of gulls to alleviate damage and threats. As part of the proposed action alternative, WS would employ an integrated approach to managing damage that could involve the use of lethal methods. If the number of gulls addressed by WS increases, the number of gulls lethally taken will also likely increase along with the number of gulls addressed using non-lethal methods. Increases in the number of requests for assistance to manage damage are likely to involve gull damage at landfills, on rooftops, and involve reducing threats to natural resources. In addition, the take of great black-backed gulls analyzed in this EA includes those black-backed gulls that could be lethally taken at airports that were analyzed in a separate analysis (USDA 2002). Based on those anticipated increases in requests for assistance, WS could lethally take up to 750 great black-backed gulls annually under the proposed action alternative and up to 100 nests annually in the Commonwealth.

Although WS' total take of great black-backed gulls from FY 2003 through FY 2008 has not reached the annual take level analyzed in this assessment, previous requests for WS' assistance has involved the lethal take of black-backed gulls at levels that would warrant analysis of higher take levels. For example, in FY 1996, WS was requested to assistance with reducing nest site competition between great black-backed gulls and terns. During that project, at the request of the resource manager, a total of 692 great black-backed gulls were lethally taken to alleviate competition which successfully allowed common terns and roseate terns to nest at the location where activities occurred. Therefore, if a similar request is made of WS in the future, the take of up to 750 black-backed gulls could occur.

Impacts due to nest removal and destruction should have little adverse impact on the great black-backed gull population regionally and in Massachusetts. Nest destruction methods are considered non-lethal when conducted before the development of an embryo. Additionally, black-backed gulls are a long lived species and have the ability to identify areas with regular human disturbance and low reproductive success which causes them to relocate and nest elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected, this activity has no long term effect on breeding adult great black-backed gulls. Nest removal is not used by WS as a population management method. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is intended to relocate a nesting pair or colony of gulls to an area where there are no conflicts. The destruction of up to 100 great black-backed gull nests annually by WS would occur in localized areas where nesting occurs and would not reach a level where adverse affects on gull populations would occur. As with the lethal take of gulls, the take of nests must also be authorized by the USFWS and the MDFW.

Therefore, the number of nests taken by WS annually would occur at the discretion of the USFWS and the MDFW. Take of nests would only occur at levels authorized by those agencies.

Great black-backed gulls are considered a species of lowest concern in BCR 30 and of low concern in BCR 14 (MANEM Regional Waterbird Plan 2006). Over 37,000 great black-backed gulls are believed to breed in BCR 30 with over 115,000 great black-backed gulls nesting in BCR 14. Of those, over 43,500 occur in the Gulf of Maine, which includes Massachusetts. The breeding population goal for great black-backed gulls is between 137,626 to 168,210 gulls in BCR 14 and BCR 30 which is below the maximum (MANEM Regional Waterbird Plan 2006). To maintain the current population levels in BCR 14 and BCR 30, the PBR model developed by the USFWS predicts take of 11,234 great black-backed gulls would not cause a decline in gull populations in BCR 14 or BCR 30. With $F_R = 0.5$ (recovery factor), the PBR predicted 5,614 great black-backed gulls could be harvested annually in BCR 14 and BCR 30 which would still allow those populations to increase.

From 2003 through 2007, the number of great black-backed gulls taken in the northeastern United States (USFWS Region 5) has ranged from 404 to 1,203 gulls with an average of 814 great black-backed gulls taken annually by all entities. The average annual take of great black-backed gulls in USFWS Region 5 by all entities authorized to take gulls through depredation permits is below the level of annual take required to maintain current population levels predicted by the PBR model. To cause a population decline, the PBR model estimates that nearly 17,000 great black-backed gulls would have to be taken annually in the region. According to the PBR model, the average annual take by all entities in USFWS Region 5 of 814 gulls is below the allowable harvest for great black-backed gull populations to increase. If WS' annual take reached 750 great black-backed gulls and if the take of great black-backed gulls remains similar to the take that has occur from FY 2003 through 2007 in the northeastern United States, the combined take would not reach a magnitude that the PBR model predicts would result in a decline in the population of black-backed gulls in BCR 14 and BCR 30. The average annual take of great black-backed gulls in the northeastern United States has been 814 gulls taken. When combined with the annually level of take analyzed under the proposed action alternative, the combined take would represent nearly 1,600 gulls taken annually if the average take remains similar in the future. A combined take of 1,600 gulls would not reach the level of take that the PBR models estimates will cause a declining population in BCR 14 and BCR 30.

Based on the best available information, WS' take of great black-backed gulls in Massachusetts has not adversely affected the statewide population nor will WS' proposed take of up to 750 great black-backed gulls and up to 100 nests annually in the Commonwealth. The permitting of take by the USFWS and the MDFW provides outside evaluation to ensure WS' take occurs within the allowed limits to desired population objectives.

Laughing Gull Population Impact Analysis

The laughing gull uses coastal habitats such as salt marsh islands, sandy islands with scattered patches of long grass (breeding), seacoasts, bays, and estuaries (non-breeding). Non-breeding summer birds can be found 30-60 km inland from coastal breeding sites. Breeders may fly 40 km for food. Inland habitat includes meadows, plowed fields, lakes, marshes, impoundments, and pools (MANEM Regional Waterbird Plan 2006).

In 2007, laughing gull numbers remained stable at 1,512 pairs and the species added two new sites in Massachusetts. In previous years, nesting only occurred on South Monomoy Island in Chatham (1,498 breeding pairs). Laughing gulls had averaged 1,056 nesting pairs on South Monomoy Island from 1985 to 2007; however, the USFWS has initiated a nest control program for laughing gulls to reduce

competition with nearby common tern and federally endangered roseate tern colonies (MDFW 2008).

In 2007, Minimoy Island, near South Monomoy Island, was colonized by 14 pairs of laughing gulls and Plymouth Long Beach in Plymouth was colonized by 59 pairs of gulls. Nesting at the Plymouth site occurred after initiation of a predator damage management project to protect nesting terns and piping plovers during the 2006 nesting season.

Laughing gulls can be found nesting along the coastal areas of BCR 14 and BCR 30 with most breeding colonies occurring in BCR 30 (MANEM Regional Waterbird Plan 2006). Over 200,000 laughing gulls nest along the coastal areas in BCR 30 and have been given a conservation rank of lowest concern (MANEM Regional Waterbird Plan 2006). In BCR 14, nesting laughing gulls are estimated at 2,704 gulls and have also been given a conservation rank of lowest concern (MANEM Regional Waterbird Plan 2006). The breeding population of laughing gulls in the 1970s was estimated at 129,768 laughing gulls in 63 colonies. In the 1990s, the breeding population had increased to 205,348 laughing gulls in 275 colonies which represented a 58% increase in regional abundance (MANEM Regional Waterbird Plan 2006). BBS trend data for laughing gulls in the Eastern BBS Region shows a statistically significant increasing trend estimated at 3.4% annually since 1966 (Sauer et al. 2008). In the northeastern United States (USFWS Region 5), BBS trend data shows an increasing trend estimated at 3.2% annually since 1966 (Sauer et al. 2008). In the New England/Mid Atlantic BCRs, the number of laughing gulls observed along BBS routes has shown an increasing trend estimated at 3.2% annually since 1966 with a relative abundance (*i.e.*, birds/route) of 51.18 gulls (Sauer et al. 2008). No BBS data in currently available for Massachusetts (Sauer et al. 2008). CBC data for laughing gulls observed overwintering in the Commonwealth has shown a cyclical trend since 1966 (NAS 2002).

From 2003 through 2007, the lethal annual take of laughing gulls by all entities in the northeastern United States (USFWS Region 5) has ranged from 4,559 to 6,007 gulls with an average annual take of 5,341 laughing gulls. The PBR model for laughing gulls in BCR 14 and BCR 30 estimates that nearly 15,000 laughing gulls can be taken annually with no adverse affect on the current population. Current take levels from all known entities in the breeding range of laughing gulls has not exceeded the level of annual take that would cause a decline in the breeding laughing gull population based on the PBR model. As shown in Table 4.6, the USFWS has issued depredation permits to entities in Massachusetts for the take of laughing gull nests since 2005. In 2003, permits were issued for the take of up to 15 adult laughing gulls but none were taken and no new permits have been issued to entities in Massachusetts for the take of adult laughing gulls since.

WS has conducted no operational damage management activities to minimize or prevent damage caused by laughing gulls in Massachusetts. However, based on the increasing population trend observed in the region, WS reasonably anticipates take not to exceed 500 laughing gulls and 50 nests annually. Based on the predicted allowable take for laughing gulls in BCR 14 and BCR 30, WS' take of up to 500 laughing gulls and up to 50 nests will not reach a magnitude that would cause a decline in regional laughing gull populations.

As stated previously, the PBR model predicts that up to 15,000 laughing gulls could be lethally taken annually in BCR 14 and BCR 30 to maintain populations. The PBR model is based on a minimal population estimate for laughing gulls in the northeastern United States. If WS' takes up to 500 laughing gulls annually in the Commonwealth and the number of gulls take from 2003 through 2007 is indicative of the number of gulls that could be taken in the future in the northeastern United States, then the total take of laughing gulls would range from 5,059 gulls to 6,507 gulls with an average annual take of 5,841 gulls. The highest level of take of laughing gulls estimated at 6,507 would represent 43.4% of the estimated take that could occur and still maintain gull populations in the northeastern United States.

Table 4.6 - Number of nests authorized by USFWS permit and reported taken for laughing gulls in Massachusetts by all entities, 2005-2008.

Laughing Gulls	Nests		
	Authorized	Taken	Percent
2005	900	799	88.8%
2006	1,600	434	27.1%
2007	2,000	1,084	54.2%
2008	2,000	1,579	79.0%

Like other gull species, the take of laughing gull nests by WS is not expected to reach a magnitude where adverse affects to the population of laughing gulls will occur. The USFWS authorized the take of up to 2,000 nests in the Commonwealth in 2007 and 2008. If up to 50 nests were taken by WS annually and if the number of nests authorized to be taken by the USFWS remains stable, WS' take of up to 50 nests would increase the total nests taken by 2.5%. If the take of 50 nests had occurred by WS in 2008, the total take of nests would not reach the number of nests authorized to be taken by the USFWS.

The USFWS, as the agency with migratory bird management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on laughing gull populations would have no significant adverse impact on the quality of the human environment.

Alternative 2 - Gull Damage Management by WS through Technical Assistance Only

Gull populations in the Commonwealth would not be directly impacted by WS from a program implementing technical assistance only. However, persons experiencing damage or threats from gulls may implement methods based on WS' recommendations. Under a technical assistance only alternative, WS would recommend and demonstrate for use both non-lethal and lethal methods legally available for use to resolve gull damage. Methods and techniques recommended would be based on WS' Decision Model using information provided from the requestor or from a site visit. Requestors may implement WS' recommendations, implement other actions, or take no action. However, those persons requesting assistance are likely those that would implement damage abatement methods in the absence of WS' recommendations.

Under a technical assistance only alternative, those persons experiencing threats or damage associated with gulls in the Commonwealth could lethally take gulls despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of gulls lethally taken would likely be similar to the other alternatives since take could occur through the issuance of a depredation permit by the USFWS and the MDFW. WS' participation in a management action would not be additive to an action that could occur in the absence of WS' participation.

With the oversight of the USFWS and the MDFW, it is unlikely that gull populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and therefore, direct operational assistance could be provided by other entities, such as the MDFW, the USFWS, private entities, and/or municipal authorities. If direct operational assistance is not available from WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (White et al. 1989, USDA 1997, USFWS 2001, Food and Drug Administration 2003).

Alternative 3 – No Gull Damage Management Conducted by WS

Under this alternative, WS would not conduct gull damage management activities in the Commonwealth. WS would have no direct involvement with any aspect of addressing damage caused by gulls and would provide no technical assistance. No take of gulls by WS would occur in the Commonwealth. Gulls could continue to be lethally taken to resolve damage and/or threats occurring through depredation permits issued by the USFWS and the MDFW.

Local gull populations could decline, stay the same, or increase depending on actions taken by those persons experiencing gull damage. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of gulls out of frustration or ignorance. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the proposed action.

Since gulls could still be taken under this alternative, the potential effects on the populations of gulls in the Commonwealth would be similar among all the alternatives for this issue. WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct gull damage management activities without WS' direct involvement. Therefore, any actions to resolve damage or reduce threats associated with gulls could occur by other entities despite WS' lack of involvement under this alternative.

Issue 2 - Effects on Non-target Species Populations, Including T&E Species

As discussed previously, a concern is often raised about the potential impacts to non-target species, including T&E species, from the use of methods to resolve damage caused by gulls. The potential effects on the populations of non-target wildlife species, including T&E species, are analyzed below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Gull Damage (Proposed Action/No Action)

The potential adverse affects to non-targets occurs from the employment of methods to address gull damage. Under the proposed action, WS could provide both technical assistance and direct operational assistance to those requesting assistance. The use of non-lethal methods as part of an integrated direct operational assistance program would be similar to those risks to non-targets discussed in the other alternatives. Personnel from WS are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target wildlife, WS would employ the most selective methods for the target species, would employ the use of attractants that are as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. Minimization methods and SOPs to prevent and reduce any potential adverse impacts on non-targets are discussed in Chapter 3 of this EA. Despite the best efforts to minimize non-target take during program activities, the potential for adverse impacts to non-target exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Non-lethal methods have the potential to cause adverse affects to non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected; therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by gulls are also likely to disperse non-targets in the immediate area the methods are employed. Therefore,

non-targets may be permanently dispersed from an area while employing non-lethal dispersal techniques. However, like target species, the potential impacts on non-target species from the use of non-lethal methods are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods.

Other non-lethal methods available for use under this alternative include live-traps, nets, and repellents. Though the use of nets and live-traps are virtually selective for target individuals and live-capture does occur from those methods, the potential for death of a target or non-target animal while being restrained or released does exists. Trap and net placement in areas where target species are active and the use of target-specific attractants will likely minimize the capture of non-targets. If traps and nets are attended to appropriately, any non-targets captured can be released on site unharmed. The lethal take of non-targets from using those methods is unlikely with take never reaching a magnitude that a negative impact on populations would occur. Any potential non-targets captured using non-lethal methods would be handled in such a manner as to ensure the survivability of the animal if released. The potential adverse affects associated with non-lethal methods are negligible and, in the case of exclusion and harassment methods, often temporary.

Only those repellents registered with the EPA pursuant to the FIFRA and registered for use in the Commonwealth would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for gulls are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested.

Overall, impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal take would occur. Non-lethal methods would be available under all the alternatives analyzed. WS' involvement in the use of or recommendation of non-lethal methods would ensure non-target impacts are considered under WS' Decision Model. Impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by gulls under this alternative would include shooting and the avicide DRC-1339. In addition, gulls could also be euthanized once live-captured by other methods. Lethal take of live-captured gulls would occur pursuant to WS Directive 2.505. Available methods and the application of those methods to resolve gull damage is further discussed in Appendix B.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of those methods. A common concern with the use of DRC-1339 is the potential non-target risks. All label requirements of DRC-1339 will be followed to minimize non-target hazards. As required by the label, all potential bait sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets are observed feeding on the pre-bait, the plots are abandoned and no baiting would occur at those locations. Treated bait is mixed with untreated bait per label requirements when applied to bait sites to minimize the likelihood of non-targets finding and consuming bait that has been treated. The bait type selected can also limited the likelihood that non-target species will consume treated bait since some bait types are not preferred by non-target species.

Once sites are baited, sites are monitored daily to further observe for non-target feeding activity. If non-

targets are observed feeding on bait, those sites are abandoned. By acclimating target gull species to a feeding schedule, baiting can occur at specific times to ensure bait placed is quickly consumed by target gull species, especially when large flocks of target species are present. The acclimation period allows for treated bait to be present only when gulls are conditioned to be present at the site and provides a higher likelihood that treated bait is consumed by the target species which makes it unavailable to non-targets. In addition, when present in large numbers gull species tend to exclude non-targets from a feeding area due to their aggressive behavior and by the large number of conspecifics present at the location. Therefore, risks to non-target species from consuming treated bait only occurs when treated bait is present at a bait location. WS will retrieve all dead gulls to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on gull carcasses.

DRC-1339 Primary Hazard Profile - DRC-1339 was original selected for reducing bird damage because of its high toxicity to blackbirds (DeCino et al. 1966, West et al. 1967, Schafer 1972) and low toxicity to most mammals, sparrows, and finches (Schafer and Cunningham 1966, Apostolou 1969, Schafer 1972, Schafer et al. 1977, Matteson 1978, Cunningham et al. 1979, Cummings et al. 1992, Sterner et al. 1992). The likelihood of a non-target bird obtaining a lethal dose is dependent on: (1) frequency of encountering the bait, (2) length of feeding bout, (3) the bait dilution rate, (4) the bird's propensity to select against the treated bait, and (5) the susceptibility of the non-target species to the toxicant. Birds that ingest DRC-1339 probably die because of irreversible necrosis of the kidney and subsequent inability to excrete uric acid (*i.e.*, uremic poisoning) (DeCino et al. 1966, Felsenstein et al. 1974, Knittle et al. 1990). Birds ingesting a lethal dose of DRC-1339 usually die in one to three days.

The acute oral toxicity (LD_{50}) of DRC-1339 has been estimated for over 55 species of birds (Eisemann et al. 2003). There have been concerns expressed about the study designs used to derive acute lethal doses of DRC-1339 for some bird species (Gamble et al. 2003). The appropriateness of study designs used to determine acute toxicity to pesticides has many views (Lipnick et al. 1995). The use of small sample sizes was the preferred method of screening for toxicity beginning as early as 1948 to minimize the number of animals involved (Dixon and Mood 1948). In 1982, the EPA established standardized methods for testing for acute toxicity that favored larger sample sizes (EPA 1982). More recently, regulatory agencies have again begun to debate the appropriate level of sample sizes in determining acute toxicity based on a growing public concern for the number of animals used for scientific purposes.

Based on those concerns, the Ecological Committee on FIFRA Risk Assessment (ECOFRAM) was established by EPA to provide guidance on ecological risk assessment methods (EPA 1999). The committee report recommended to the EPA that only one definitive LD_{50} be used in toxicity screening either on the mallard or northern bobwhite and recommended further testing be conducted using the up-and-down method (EPA 1999). Many of the screening methods used for DRC-1339 prior to the establishment of EPA guidelines in 1982 used the up-and-down method of screening (Eisemann et al. 2003).

A review of the literature shows that LD_{50} research using smaller sample sizes conducted prior to EPA established guidelines are good indicators of LD_{50} derived from more rigorous designs (Bruce 1985, Bruce 1987, Lipnick et al. 1995). Therefore, acute and chronic toxicity data gathered prior to EPA guidance remain valid and to ignore the data would be inappropriate and wasteful of animal life (Eisemann et al. 2003).

DRC-1339 Secondary Hazards -Secondary poisoning has not been observed with DRC-1339 treated baits. 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. 1979). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds

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 non-existent.

DRC-1339 is rapidly metabolized and excreted and does not bio-cumulate which probably accounts for its low secondary hazard profile (Schafer 1991, USDA 1997). For example, cats, owls and magpies would be at risk only after exclusively eating DRC-1339-poisoned starlings for 30 continuous days (Cunningham et al. 1979). Studies using the American kestrel (*Falco sparverius*) as a surrogate species showed that secondary hazards to raptors are small and are not put at risk by DRC-1339 baiting (USDA 1997). The risk to mammalian predators from feeding on birds killed with DRC-1339 appears to be low (Johnston et al. 1999).

The risks associated with non-target animal exposure to DRC-1339 baits have been evaluated in rice fields in Louisiana (Glahn et al. 1990, Cummings et al. 1992, Glahn and Wilson 1992), poultry and cattle feedlots in several western states (Besser 1964, Ford 1967, Royall et al. 1967), ripening sunflower fields in North Dakota (Linz et al. 2000), and around blackbird staging areas in east-central South Dakota (Knutsen 1998, Linz et al.1999, Smith 1999). Smith (1999) used field personnel and pointing and retrieving dogs to search for dead non-target animals around baited sites and found no non-target carcasses that exhibited histological signs consistent with DRC-1339 poisoning. The other studies also failed to detect any non-target birds that had succumbed to DRC-1339. However, DRC-1339 is a slow-acting avicide and thus, some birds could move to areas not searched by the study participants before dying. Avian reproduction does not appear to be affected from ingestion of DRC-1339 treated baits until levels are ingested where toxicity is expressed (USDA 2001).

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

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by gulls, the use of such methods can result in the incidental take of unintended species. Those occurrences are rare and should not affect the overall populations of any species under the proposed action. WS' take of non-target species during activities to reduce damage or threats to human safety associated with gulls is expected to be extremely low to non-existent. No non-targets have been taken by WS during prior gull damage management activities in the Commonwealth. WS will monitor annually the take of non-target species to ensure program activities or methodologies used in gull damage management do not adversely impact non-targets. Methods available to resolve and prevent gull damage or threats when employed by trained, knowledgeable personnel are selective for target species. WS will annually report to the USFWS and the MDFW any non-target take to ensure take by WS is considered as part of management objectives established. The potential impacts to non-targets are similar to the other alternatives and are considered to be minimal to non-existent.

The proposed gull damage management could benefit many other wildlife species that are impacted by their predation or competition for habitat. For example, gulls are generally very aggressive nesting area

colonizers and will force other species from preferred nesting areas. Gulls often feed on the eggs, nestlings, and fledglings of other bird species. Greater black-backed gulls are especially aggressive and will kill young terns and other birds. This alternative has the greatest possibility of successfully reducing gull damage and conflicts to wildlife species since all available methods could possibly be implemented or recommended by WS.

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. Mitigation measures and SOPs to avoid T&E effects are described in Chapter 3 of this EA.

Federally Listed Species **-** The current list of species designated as threatened and endangered in Massachusetts as determined by the USFWS and the National Marine Fisheries Services was obtained and reviewed during the development of this EA. Appendix C contains the list of species currently listed in the Commonwealth along with common and scientific names.

Based on a review of those T&E species listed in the Commonwealth during the development of this EA, WS determined that activities conducted pursuant to the proposed action will not likely adversely affect those species listed in the State by the USFWS and the National Marine Fisheries Services nor their critical habitats. As part of the development of the EA, WS consulted with the USFWS under Section 7 of the ESA. The USFWS concurred with WS' determination that activities conducted pursuant to the proposed action would not likely adversely affect those species currently listed in the State or their critical habitats (S. von Oettingen, USFWS, pers. comm. 2010).

WS may be requested to participate in activities that may have a beneficial impact on T&E species, either intentionally or unintentionally. Examples of beneficial impacts include reductions in predation, nest site competition, habitat degradation, and the spread of wildlife diseases such as avian influenza and West Nile virus. WS does not currently conduct activities to reduce predation on or competition with any T&E species associated with gulls in Massachusetts but has done so previously. If such activities are requested of WS, consultation with the USFWS prior to the start of those actions would occur to ensure those activities would not adversely affect T&E species.

Commonwealth Listed Species **–** WS has obtained and reviewed the list of T&E or species of special concern (see Appendix D) designated by the Commonwealth of Massachusetts and has determined that the proposed WS' activities will have no effect on any species listed as vulnerable or threatened and endangered. If WS' activities are requested that may be beneficial to species listed by the Commonwealth as vulnerable, threatened, or endangered by enhancing reproduction or survival of individuals through reduction of harassment, competition, or predation associated with gulls, WS will initiate consultation with the Commonwealth prior to start of any action.

Alternative 2 - Gull Damage Management by WS through Technical Assistance Only

Under a technical assistance alternative, WS would have no direct impact on non-target species, including T&E species. Methods recommended or provided through loaning of equipment could be employed by those requesting assistance. Recommendations would be based on WS' Decision Model using information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize non-target impacts associated with the methods being recommended or loaned. Methods recommended could include non-lethal and lethal methods as deemed appropriate by WS' Decision Model and as permitted by laws and regulations.

The potential impacts to non-targets under this alternative would be variable and based on several factors. If methods are employed, as recommended by WS and cooperating agencies, the potential impacts to non-targets are likely similar to the proposed action. If recommended methods and techniques are not followed or if other methods are employed that were not recommended, the potential impacts on non-target species, including T&E species is likely higher compared to the proposed action.

The potential impacts of harassment and exclusion methods to non-target species would be similar to those described under the proposed action. Harassment and exclusion methods are easily obtainable and simple to employ. Since identification of targets occurs when employing shooting as a method, the potential impacts to non-target species are likely low under this alternative.

Those experiencing damage from gulls may implement methods and techniques based on the recommendations of WS. The potential for impacts would be based on the knowledge and skill of those persons implementing recommended methods. Potential impacts from providing only technical assistance could be greater than those described in the proposed action if those experiencing damage do not implement methods or techniques correctly. Incorrectly implemented methods or techniques recommended by WS could lead to an increase in non-target take.

If requestors are provided technical assistance but do not implement any of the recommended actions, the potential impacts to non-targets would be lower compared to the proposed action. If those requesting assistance implement recommended methods appropriately and as instructed or demonstrated, the potential impacts to non-targets would be similar to the proposed action. Methods or techniques not implemented as recommended or used inappropriately would likely increase potential impacts to non-targets. Therefore, the potential impacts to non-targets, including T&E species would be variable under a technical assistance only alternative.

The ability to reduce negative impacts caused by gulls to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions.

Alternative 3 – No Gull Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with gull damage management activities in the Commonwealth. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Gulls could continue to be taken through the issuance of depredation permits by the USFWS and the MDFW. Risks to non-targets and T&E species would continue to occur from those who implement gull damage management activities on their own or through recommendations by the other federal, Commonwealth, and private entities. Although some risks occur from those that implement gull damage management in the absence of any involvement by WS, those risks are likely low and are similar to those under the other alternatives.

The ability to reduce negative impacts caused by gulls to other wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

A common concern is the potential adverse affects methods available could have on human health and safety. The threats to human safety of methods available under the alternatives are evaluated below by

each of the alternatives.

Alternative 1 - Continuing the Current Integrated Approach to Managing Gull Damage (Proposed Action/No Action)

Under the proposed action, those methods discussed in Appendix B, would be integrated to resolve and prevent damage associated with gulls in the Commonwealth. WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under the proposed action. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from gulls. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS would be similar to those risks addressed by the other alternatives. Lethal methods available under the proposed action would include the use of firearms, DRC-1339, and live-capture followed by euthanasia.

WS' employees who conducted gull damage management activities are knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' directives. That knowledge is incorporated into the decision-making process inherent with the WS' Decision Model that is applied when addressing threats and damage caused by gulls. When employing lethal methods, WS' employees considered risks to human safety when employing those methods based on location and method. Risks to human safety from the use of methods is likely greater in urban areas when compared to rural areas that are less densely populated. Consideration is also give to the location where damage management activities will be conducted based on property ownership. If locations where methods will be employed occur on private property in rural areas where access to the property is controlled and monitored, the risks to human safety from the use of methods is likely less. If damage management activities occur at parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety increases.

The use of live-capture traps have also been identified as a potential issue. Live-capture traps are typically set in situations where human activity is minimal to ensure public safety. Traps rarely cause serious injury and are triggered through direct activation of the device. Live-capture traps available for gulls are typically walk-in style traps where gulls enter but are unable to exit. Therefore, human safety concerns associated with live traps used to capture gulls require direct contact to cause bodily harm.

Other live-capture devices, such as cannon nets, pose minor safety hazards to the public since activation of the device occurs by trained personnel after target species are observed in the capture area of the net. Lasers also pose minimal risks to the public since application occurs directly to target species by trained personnel which limits the exposure of the public to misuse of the method.

Safety issues due arise related to misusing firearms and the potential human hazards associated with firearm use when employed to reduce damage and threats. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearm safety training course and to remain certified for firearm use, WS' employees must attend a re-certification safety training course in accordance with WS Directive 2.615. WS' employees who carry and use firearms as a condition of employment, are required to sign a form certifying that they have not been convicted of a misdemeanor crime of domestic violence. A thorough safety assessment will be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when

conducting activities. WS will work closely with cooperators requesting assistance to ensure all safety issues are considered before the use of firearms are deemed appropriate for use. All methods, including firearms, must be agreed upon with the cooperator to ensure the safe use of methods. A risk assessment conducted during the development of WS' programmatic FEIS, determined the risks to human safety from the use of firearms was low based on the use profile of the method (USDA 1997).

All WS' personnel who handle and administer chemical methods will be properly trained in the use of those methods. Training and adherence to agency directives will ensure the safety of employees applying chemical methods. All lethally taken gulls that can be retrieved will be disposed of in accordance with WS Directive 2.515. All euthanasia will occur in the absence of the public to further minimize risks. Minimization measures and SOPs to reduce threats to human safety are further described in Chapter 3 of this EA.

The recommendation of repellents or the use of those repellents registered for use to disperse gulls in the Commonwealth could occur under the proposed action as part of an integrated approach to managing gull damage. Those chemical repellents that would be available to recommend for use or be directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. Risks to human safety associated with the use or recommendation of repellents are addressed under the technical assistance only alternative (Alternative 2) and would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents are discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

Risks to human safety from the use of avicides could occur either through direct exposure of the chemical or exposure to the chemical from gulls that have been lethally taken. The only avicide currently registered for use in Massachusetts is DRC-1339 (3-chloro-p-toluidine hydrochloride) that could be used for gull damage management. DRC-1339 is currently registered with the EPA to manage damage associated with several bird species, including gulls, and can be formulated on a variety of bait types depending on the label. For gulls, technical DRC-1339 (powder) must be mixed with melted stick margarine and spread between slices of bread. The bread is then sliced into cubes for transportation and use. The mixing, drying, and storage of DRC-1339 treated bait occurs in controlled areas that are not accessible by the public. Therefore, risks to public safety from the preparation of DRC-1339 are minimal. Some risks do occur to the handlers during the mixing process from inhalation and direct exposure on the skin and eyes. Adherence to label requirements during the mixing and handling of DRC-1339 treated bait for use of personal protective equipment ensures the safety of WS' personnel handling and mixing treated bait. Therefore, risks to handlers and mixers that adhere to the personal protective equipment requirements of the label are low.

Locations where treated bait may be placed are determined based on product label requirements (*e.g.*, distance from water, specific location restrictions), the target bird species use of the site (determined through pre-baiting and an acclimation period), on non-target use of the area (areas with non-target activity are not used or abandon), and based on human safety (*e.g.*, in areas restricted or inaccessible by the public or where warning signs have been placed). Once appropriate locations are determined, treated baits are placed by manual broadcast (distributed by hand) per label requirements. Once baited, locations are monitored for non-target activity and to ensure the safety of the public. After each baiting session, all uneaten bait is retrieved. Through pre-baiting, target birds can be acclimated to feed at certain locations at certain periods of time. By acclimating birds to a feeding schedule, baiting can occur at specific times

to ensure bait placed is quickly consumed by target bird species, especially when large flocks of target species are present. The acclimation period allows for treated bait to be placed at a location only when target birds are conditioned to be present at the site and provides a higher likelihood that treated bait is consumed by the target species which makes it unavailable for potential exposure to humans. To be exposed to the bait, someone would have to approach a bait site and handle treated bait. If the bait has been consumed by target species or is removed by WS, then treated bait is no longer available and human exposure to the bait could not occur. Therefore, direct exposure to treated bait during the baiting process would only occur if someone approached a bait site that contained bait and if treated bait was present, would have to handle treated bait.

Factors that minimize any risk of public health problems from the use of DRC-1339 are: 1) its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops (contrary to some misconceptions, DRC-1339 is not applied to feed materials that livestock can feed upon), 2) DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours; in general, DRC-1339 on treated bait material is almost completely broken down within a week if not consumed or retrieved, 3) the chemical 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, 4) application rates are extremely low (EPA 1995), 5) a human would need to ingest the internal organs of birds found dead from DRC-1339 to be exposed, and 6) the EPA has concluded that, based on mutagenicity (*i.e.*, 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). Under the proposed action, the controlled and limited circumstances in which DRC-1339 would be used would prevent any exposure of the public to this chemical. Based on current information, the human health risks from the use of DRC-1339 would be virtually nonexistent under this alternative.

No adverse affects to human safety have occurred from WS' use of methods to alleviate gull damage in the Commonwealth from FY 2004 through FY 2009. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low.

Alternative 2 - Gull Damage Management by WS through Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations of methods and the demonstration of methods only to resolve damage. WS would only provide technical assistance to those requesting assistance with gull damage and threats. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use. Risks to human safety from the use of non-lethal methods were considered low when evaluated in a formal risk assessment in WS' programmatic FEIS (USDA 1997). Risks to human safety associated with non-chemical methods such as resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, and cage traps were considered low based on their use profile for alleviating damage associated with wildlife (USDA 1997). Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration of those risks, they can be used with a high degree of safety.

Under a technical assistance only alternative, the use of DRC-1339 would not be available to the general public. Personnel employing nets are present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with rocket nets during ignition and storage of the explosive charges, safety precautions associated with the use of the method, when adhered to, pose minimal risks to human safety and primarily occur to the handler. Nets would not be employed

in areas where public activity is high which further reduces the risks to the general public. Nets would be employed in areas where public access is restricted whenever possible to reduce risks to human safety. Overall, nets would pose minimal risks to the public.

The use of chemical methods that are considered non-lethal would also be available under this alternative. Chemical methods available would include repellents. There are few chemical repellents registered for use to manage gulls in the Commonwealth. Most repellents require ingestion of the chemical to achieve the desired affects on target species. Repellents that require ingestion are intended to discourage foraging on vulnerable resources and to disperse birds from areas where the repellents are applied. The active ingredients of repellents that are currently registered for use to disperse gulls in Massachusetts include methyl anthranilate and polybutene. Another common active ingredient in repellents intended to disperse other bird species contain the active ingredient anthraquinone. Currently, no repellents are currently registered for use to disperse birds in the Commonwealth that contain the active ingredient anthraquinone. Methyl anthranilate (grape derivative) and anthraquinone (plant extract) are naturally occurring chemicals. Repellents, when used according to label directions, are generally regarded as safe especially when the ingredients are considered naturally occurring. Some risk of exposure to the chemical occurs to the applicator and to others from the potential drift as the product is applied. Some repellents also have restrictions on whether application can occur on edible plants with some restricting harvest for a designated period after application. All restriction on harvest and required personal protective equipment would be included on the label and if followed, would minimize risks to human safety associated with the use of those products.

The recommendation of shooting with firearms as a method of direct lethal take could occur under this alternative when lethal take has been authorized through the issuance of a depredation permit by the USFWS and the MDFW. Safety issues due arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. When used appropriately and with consideration for human safety, risks associated with firearms are minimal. If firearms are employed inappropriately or without regard to human safety, serious injuries could occur. Under this alternative, recommendations of the use of firearms by WS would include human safety considerations. Since the use of firearms to alleviate gull damage would be available under any of the alternatives and the use of firearms by those persons experiencing gull damage could occur whether WS was consulted or contacted, the risks to human safety from the use of firearms would be similar among all the alternatives.

If non-chemical methods are employed according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to the proposed action. If methods are employed without guidance from WS or applied inappropriately, the risks to human safety could increase. The extent of the increased risk would be unknown and variable. Non-chemical methods inherently pose minimal risks to human safety given the design and the extent of the use of those methods.

Given the use profile of many methods to manage damage and threats associated with gulls, the risks to human safety from the use of those methods are low when employed by WS (USDA 1997). The cooperator requesting assistance is also made aware of threats to human safety associated with the use of those methods. Minimization measures and SOPs for methods are discussed in Chapter 3 of this EA. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the methods available to alleviate gull damage could threaten human safety. However, when used appropriately methods available to alleviate damage would not threaten human safety.

Alternative 3 – No Gull Damage Management Conducted by WS

Under the no gull damage management alternative, WS would not be involved with any aspect of managing damage associated with gulls in the Commonwealth, including technical assistance. Due to the lack of involvement in managing damage caused by gulls, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from gulls from conducting damage management activities in the absence of WS' assistance. The direct burden of implementing permitted methods would be placed on those experiencing damage.

Similar to the technical assistance only alternative, the avicide DRC-1339 would not be available under this alternative to those experiencing damage or threats from gulls. Since most methods available to resolve or prevent gull damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. However, methods employed by those not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

Another concern often raised is the potential impact the proposed action will have on the aesthetic value that people often regard for gulls. The effects of the alternatives on this issue are analyzed below by alternative.

Alternative 1 - Continuing the Current Integrated Approach to Managing Gull Damage (Proposed Action/No Action)

Under the proposed action, methods would be employed that would result in the dispersal, exclusion, or removal of individuals or small groups of gulls to resolve damage and threats. In some instances where gulls are dispersed or removed, the ability of interested persons to observe and enjoy those gulls will likely temporarily decline.

Even the use of exclusionary devices can lead to the dispersal of wildlife if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, the wildlife will likely disperse to other areas where resources are more vulnerable. The use of lethal methods would result in temporary declines in local populations resulting from the removal of gulls to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those gulls responsible for the resulting damage. Therefore, the ability to view and enjoy gulls will still remain if a reasonable effort is made to locate gulls outside the area in which damage management activities occurred. Those gulls removed by WS are those that could be removed by the person experiencing damage when permitted by the USFWS and the MDFW.

All activities are conducted where a request for assistance has been received and only after an agreement for such services have been signed by the cooperator. Some aesthetic value would be gained by the removal of gulls and the return of a more natural environment, including the return of other native wildlife and plant species that may be suppressed or displaced by high gull densities.

Since those gulls removed by WS under this alternative could be removed with a depredation permit issued by the USFWS and the MDFW, WS' involvement in taking those gulls would not likely be additive to the number of gulls that could be taken in the absence of WS' involvement.

WS' take of gulls from FY 2004 through FY 2009 has been of low magnitude compared to the total mortality. WS' activities are not likely additive to the gulls that would be taken in the absence of WS' involvement. Although gulls removed by WS are no longer present for viewing or enjoying, those gulls would likely be taken by the property owner or manager through the issuance of depredation permit. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of gulls and the allowable take of gulls predicted by the PBR model, WS' gull damage management activities conducted pursuant to the proposed action would not adversely affect the aesthetic value of gulls. The impact on the aesthetic value of gulls and the ability of the public to view and enjoy gulls under the proposed action would be similar to the other alternatives and is likely low.

Alternative 2 - Gull Damage Management by WS through Technical Assistance Only

If those persons seeking assistance from WS were those persons likely to conduct gull damage management activities in the absence of WS' involvement, then technical assistance provided by WS would not adversely affect the aesthetic value of gulls in the Commonwealth similar to Alternative 1. Gulls could be lethally taken under this alternative by those entities experiencing gull damage or threats which would result in localized reductions in the presence of gulls at the location where damage was occurring. The presence of gulls where damage was occurring would be reduced where damage management activities are conducted under any of the alternatives. Even the recommendation of non-lethal methods is likely to result in the dispersal of gulls from the area if those non-lethal methods recommended by WS are employed by those receiving technical assistance. Therefore, technical assistance provided by WS would not prevent the aesthetic enjoyment of gulls since any activities conducted to alleviate gull damage could occur in the absence of WS' participation in the action, either directly or indirectly.

Alternative 3 – No Gull Damage Management Conducted by WS

Under the no gull damage management by WS alternative, the actions of WS would have no impact on the aesthetic value of gulls in the Commonwealth. Those experiencing damage or threats from gulls would be responsible for researching, obtaining, and using all methods as permitted by federal, Commonwealth, and local laws and regulations. Gulls would continue to be dispersed and lethally taken under this alternative in the Commonwealth. Lethal take could continue to occur through the issuance of depredation permits by the USFWS and the MDFW.

Since gulls will continue to be taken under this alternative, despite WS' lack of involvement, the ability to view and enjoy gulls would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of gulls dispersed or taken since WS' has no authority to regulate take or the harassment of gulls in the Commonwealth. The USFWS and the MDFW with management authority over gulls could continue to adjust all take levels based on population objectives for gulls in the Commonwealth. Therefore, the number of gulls lethally taken annually under depredation permits are regulated and adjusted by the USFWS and the MDFW.

Those persons experiencing damage or threats could continue to use those methods they feel appropriate to resolve gull damage or threats, including lethal take. WS' involvement in gull damage management is therefore, not additive to the gulls that could be taken in the Commonwealth. The impacts to the aesthetic value of gulls would be similar to the other alternatives.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

As discussed previously, a common issue often raised is concerns about the humaneness of methods available under the alternatives for resolving gull damage and threats. The issues of method humaneness relating to the alternatives are discussed below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Gull Damage (Proposed Action/No Action)

Under the proposed action, WS would integrate methods using WS' Decision Model as part of technical assistance and direct operational assistance. Methods available under the proposed action could include non-lethal and lethal methods integrated into direct operational assistance conducted by WS. Under this alternative, non-lethal methods would be used by WS which are generally regarded as humane. Non-lethal methods would include resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), nest destruction, exclusion devices, frightening devices, cage traps, nets, and repellents.

As discussed previously, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. 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.

Some individuals believe any use of lethal methods to resolve damage associated with wildlife is inhumane because the resulting fate is the death of the animal. Others believe that certain lethal methods can lead to a humane death. Others believe most non-lethal methods of capturing wildlife to be humane because the animal is generally unharmed and alive. Still others believe that any disruption in the behavior of wildlife is inhumane. With the multitude of attitudes on the meaning of humaneness and the varying perspectives on the most effective way to address damage and threats in a humane manner, agencies are challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS is to use methods as humanely as possible to effectively resolve requests for assistance to reduce damage and threats to human safety. WS will continue to evaluate methods and activities to minimize the pain and suffering of methods addressed when attempting to resolve requests for assistance.

Some methods have been stereotyped as "humane" or "inhumane". However, many "humane" methods can be inhumane if not used appropriately. For instance, a live trap is generally considered by most members of the public as "humane". Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately.

Therefore, the goal is to effectively address requests for assistance using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of resource management methods, harassment methods, and exclusion devices are regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary.

Although some issues of humaneness could occur from the use of cage traps, nets, and repellents, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods are from injuries to animals while restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

If gulls are to be live-captured by WS, WS' personnel would be present on-site during capture events or methods would be checked frequently to ensure gulls captured are addressed timely and to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Under the proposed action, lethal methods could also be employed to resolve requests for assistance to resolve or prevent gull damage and threats. Lethal methods would include shooting, DRC-1339, and euthanasia after gulls are live-captured. WS' use of euthanasia methods under the proposed action would follow those required by WS' directives (WS Directive 2.430) and recommended by the AVMA for use on free-ranging wildlife under field conditions (AVMA 2007).

The euthanasia methods being considered for use under the proposed action for live-captured gulls are cervical dislocation and carbon dioxide. The AVMA guideline on euthanasia lists cervical dislocation and carbon dioxide as an acceptable method of euthanasia for free-ranging gulls which can lead to a humane death (AVMA 2007). The use of cervical dislocation or carbon dioxide for euthanasia would occur after the animal has been live-captured and away from public view. Although the AVMA guideline also lists gunshot as a conditionally acceptable method of euthanasia for free-ranging wildlife, there is greater potential the method may not consistently produce a humane death (AVMA 2007). WS' personnel that employ firearms to address gull damage or threats to human safety will be trained in the proper placement of shots to ensure a timely and quick death.

Although the mode of action of DRC-1339 is not well understood, it appears to cause death primarily by nephrotoxicity in susceptible species and by central nervous system depression in less-susceptible species (Decino et al. 1966, Westberg 1969, Schafer 1984). DRC-1339 causes irreversible necrosis of the kidney and the affected bird is subsequently unable to excrete uric acid with death occurring from uremic poisoning and congestion of major organs (Decino et al. 1966, Knittle et al. 1990). The external appearances and behavior of starlings that ingested DRC-1339 slightly higher than the LD_{50} for starlings appeared normal for 20 to 30 hours, but water consumption doubled after 4 to 8 hours and decreased thereafter. Food consumption remained fairly constant until about 4 hours before death, at which time starlings refused food and water and became listless and inactive. The birds perched with feathers fluffed as in cold weather and appeared to doze, but were responsive to external stimuli. As death neared, breathing increased slightly in rate and became more difficult; the birds no longer responded to external stimuli and became comatose. Death followed shortly thereafter without convulsions or spasms (DeCino et al. 1966). Birds ingesting a lethal dose of DRC-1339 become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. This method appears to result in a less stressful death than which probably occurs by most natural causes, which are primarily disease, starvation, and predation. In non-sensitive birds and mammals, central nervous system depression and the attendant cardiac or pulmonary arrest is the cause of death (Felsenstein et al. 1974). DRC-1339 is the only lethal method that would not be available to other entities under the other alternatives. DRC-1339 to manage damage caused by gulls is only available to WS' personnel for use.

Research and development by WS has improved the selectivity and humaneness of management techniques. 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 methods are used in situations where non-lethal damage management methods are not practical or effective. Personnel from WS are experienced and professional in their use of management methods. Consequently, management methods are implemented in the most humane manner possible under the constraints of current technology. Those methods discussed in Appendix B to alleviate gull damage and/or threats in the Commonwealth, except for DRC-1339, could be used under any of the alternatives

by those persons experiencing damage regardless of WS' direct involvement. Therefore, the issue of humanness associated with methods would be similar across any of the alternatives since those methods could be employed. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. Minimization measures and SOPs that would be incorporated into WS' activities to ensure methods are used by WS as humanely as possible are listed in Chapter 3.

Alternative 2 - Gull Damage Management by WS through Technical Assistance Only

The issues of humaneness of methods under this alternative are likely to be perceived to be similar to humaneness issues discussed under the proposed action. This perceived similarity is derived from WS' recommendation of methods that some consider inhumane. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requestor employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to the proposed action.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target gull species and to ensure methods are used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of gulls or improperly identifying the damage caused by gulls along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of being perceived as inhumane. In those situations, the pain and suffering are likely to be regarded as greater than those discussed in the proposed action.

Alternative 3 – No Gull Damage Management Conducted by WS

Under this alternative, WS would have no involvement in any aspect of gull damage management in the Commonwealth. Those experiencing damage or threats associated with gulls could continue to use those methods legally available. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the general public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the general public to use to resolve damage and threats caused by gulls. Similar to Alternative 2, the lack of understanding of gull behavior or proper method use could lead to situations where methods are employed that could be perceived as inhumane.

4.2 CUMULATIVE IMPACTS OF THE PROPOSED ACTION BY ISSUE

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.

WS will continue to coordinate gull damage management activities and will report all take of gulls to the USFWS and the MDFW annually. WS will also annually monitor program activities to ensure those activities are within the scope analyzed in this EA.

Issue 1 - Effects of Damage Management Activities on Gull Populations

Evaluation of activities relative to target species indicated that program activities will likely have no cumulative adverse affects on gull populations when targeting those species responsible for damage. WS' actions would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place. Those activities include, but are not limited to:

- Natural mortality of gulls
- Human-induced mortality of gulls through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in wildlife population densities

All those factors play a role in the dynamics of gull populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. The actions taken to minimize or eliminate damage are constrained as to scope, duration, and intensity for the purpose of minimizing or avoiding impacts to the environment. WS uses the Decision Model to evaluate damage occurring, including other affected elements and the dynamics of the damaging species; to determine appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

With management authority over gull populations, the USFWS and the MDFW can adjust take levels, including the take of WS, to ensure population objectives for gulls are achieved. Consultation and reporting of take by WS will ensure the USFWS and the MDFW considers any activities conducted by WS.

WS' take of gulls in Massachusetts from FY 2004 through FY 2009 was of a low magnitude when compared to the total known take. The USFWS and the MDFW considers all known take when determining population objectives for gulls and can adjust the number of gulls that can taken for damage management purposes to achieve the population objectives. Any take by WS will occur at the discretion of the USWFS and the MDFW. Any gull population declines or increases that are associated with damage management activities will be the collective objective for gull populations established by the USFWS and the MDFW through the regulation of take. Therefore, the cumulative take of gulls annually or over time by WS will occur at the desire of the USFWS and the MDFW as part of management objectives for gulls in the Commonwealth.

No cumulative adverse impacts are expected from WS' gull damage management actions based on the following considerations:

1. Historical outcomes of WS' damage management activities on wildlife

Gull damage management activities are conducted by WS only at the request of a cooperator to reduce

damage that is occurring or prevent damage from occurring and only after methods to be used are agreed upon by all parties involved. WS' annually monitors activities to ensure any potential impacts are identified and addressed. WS works closely with Commonwealth and federal resource agencies to ensure damage management activities are not adversely impacting gull populations and that WS' activities are considered as part of management goals established by those agencies. Historically, WS' activities to manage gulls in Massachusetts have not reached a magnitude that would cause adverse impacts to gull populations in the Commonwealth.

2. SOP and mitigation strategies built into the WS program

SOPs and mitigation measures are designed to reduce the potential negative effects of WS' actions on gulls, and are tailored to respond to changes in wildlife populations which could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in programs are defined through SOPs and mitigation measures, and implementation is insured through monitoring, in accordance with the WS' Decision Model (Slate et al. 1992).

3. Current status of potentially affected wildlife species

Natural and human-induced mortality patterns for gulls are expected to remain essentially unchanged in Massachusetts. This is true of elements outside WS' programs and the programs themselves. As a result, no cumulative adverse affects are expected from repetitive programs over time in the fairly static set of conditions currently affecting wildlife in Massachusetts.

Issue 2 - Effects on Non-target Species Populations, Including T&E Species

Potential effects on non-target species from conducting gull damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages. The use of non-lethal methods during activities to reduce or prevent damage caused by gulls has the potential to exclude, disperse, or capture non-target wildlife. However, the effects of non-lethal methods are often temporary and often do not involve the take (killing) of non-target wildlife species. When using exclusion devices and/or chemical repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion and repellents do not involve lethal take, cumulative impacts on non-target species from the use of exclusionary methods will not occur but would likely disperse those individuals to other areas. Exclusionary methods and repellents are often expensive and require constant maintenance to ensure effectiveness. Therefore, the use of exclusionary devices and repellents will be somewhat limited to small, high-value areas and not used to the extent that non-targets are excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources or nesting sites. The use of visual and auditory harassment and dispersion methods are generally temporary with non-target species returning after the cessation of those activities. Dispersal and harassment do not involve the take (killing) of non-target species and similar to exclusionary methods are not used to the extent or at a constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species followed by euthanasia have the potential to impact non-target wildlife through the take (killing) or capture of non-target species. Capture methods used are often methods that are set to confine or restrain target wildlife after being triggered by a target individual. Capture methods are employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B are methods that are employed to confine

or restrain wildlife that are subsequently euthanized using humane methods since relocation is currently not considered. With all live-capture devices, non-target wildlife captured can be released on site if determined to be able to survive following release. Minimization and SOPs are intended to ensure take of non-target wildlife is minimal during the use of methods to capture target wildlife. The use of firearms and euthanasia methods are essentially selective for target species since identification of an individual is made prior to the application of the method. Euthanasia methods are applied through direct application to target wildlife. Therefore, the use of those methods will not impact non-target species.

Chemical methods available for use under the proposed action are repellents and DRC-1339 which are described in Appendix B. Except for repellents that are applied directly to the affected resource, all chemical methods are employed using baits that are highly attractive to target species and used in areas where exposure to non-targets are minimal. The use of those methods requires an acclimation period and monitoring of potential bait sites for non-target activity. All chemicals will be used according to product label which ensure that proper use will minimize non-target threats. WS' adherence to Directives, SOPs, and mitigation measures governing the use of chemicals also ensures non-target hazards are minimal.

All chemical methods will be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals will be stored and transported according to WS and Department of Transportation regulations. The amount of chemicals used or stored by WS will be minimal to ensure human safety. Based on this information, WS' use of chemical methods, as part of the proposed action, will not have cumulative impacts on non-targets.

All label requirements of DRC-1339 will be followed to minimize non-target hazards. As required by the label, all potential bait sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets are observed feeding on the pre-bait, the plots are abandoned and no baiting would occur at those locations. Once sites are baited, sites are monitored daily to further observe for non-target feeding activity. If birds are observed feeding on bait, those sites are abandoned. WS will retrieve all dead gulls to the extent possible following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on gull carcasses.

Repellents may also be used or recommended by the WS program in Massachusetts to manage gull damage. The active ingredient in numerous commercial repellents is methyl anthranilate which has been categorized by the EPA as "generally recognized as safe". Methyl anthranilate is a derivative of grapes and used as a flavoring in food and as a fragrance in cosmetics. Other repellents available contain the active ingredient polybutene, which when applied, creates a sticky surface which is intended to prevent perching. Although not registered for use to disperse gulls in the Commonwealth, other bird repellents registered contain the active ingredient anthraquinone, which is a naturally occurring plant extract. Characteristics of these chemicals and potential use patterns indicate that no significant cumulative impacts related to environmental fate are expected from their use in WS' programs in Massachusetts when used according to label requirements.

The methods described in Appendix B all have a high level of selectivity and can be employed using SOPs and minimization measures to ensure minimal impacts to non-targets species. No non-targets were taken by WS during gull damage management activities from FY 2004 through FY 2009. Based on the methods available to resolve gull damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those species' populations would occur. Therefore, take under the proposed action of non-targets will not cumulatively impact non-target species. WS' has reviewed the T&E species listed by the USFWS and the National Marine Fisheries Services and has determined that gull damage management activities proposed by WS will not likely adversely affect those federally-listed T&E species in Massachusetts or their critical habitats. The USFWS has concurred with

WS' determination (see Chapter 4). If a request is received by WS to conducted gull damage management activities to reduce predation on or nest site completion with T&E species, WS will initiate consultation for those activities. WS has also reviewed the list of State-listed T&E species and species of special concern listed by the MDFW. Based on a review of the proposed activities, WS has determined those activities will have no effect on State-listed species. Cumulative impacts will be minimal on non-targets from any of the alternatives discussed**.**

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

All non-chemical methods described in Appendix B are used within a limited time frame, are not residual, and do not possess properties capable of inducing cumulative adverse impacts on human health and safety. All non-chemical methods are used after careful consideration of the safety of those employing methods and to the public. All capture methods are employed where human activity is minimal to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed will have no effect on human safety. All methods are agreed upon by the requesting entities which are made aware of the safety issues of those methods when entering into a MOU, cooperative service agreement, or other comparable document between WS and the cooperating entity. SOPs and minimization measures also ensure the safety of the public from those methods used to capture or take wildlife. A formal risk assessment conducted by APHIS determined that WS' non-chemical methods, when used as intended, pose a low risk to human safety (USDA 1997). Firearms used to alleviate or prevent damage, though hazards do exist, are employed to ensure the safety of employees and the public.

Personnel employing non-chemical methods will continue to be trained to be proficient in the use of those methods to ensure safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods will not cumulatively impact human safety.

Repellents for use to disperse gulls from areas of application are available. All repellents must be registered with the EPA according to the FIFRA along with being registered for use in the Commonwealth. Many of the repellents currently available for use have active ingredients that are naturally occurring and are generally recognized as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents are applied according to label requirements, no adverse affects to human safety are expected.

Gull damage management programs which include the use of pesticides as a lethal damage management component may have the greatest potential for cumulative impacts on the environment as such impacts relate to the deposit of chemical residues in the physical environment with potential for environmental toxicosis.

DRC-1339 may be used by WS or recommended by WS for use to manage damage or threats associated with gulls in the Commonwealth. DRC-1339 has been evaluated for possible residual effects which might occur from buildup of the chemical in soil, water, or other environmental sites. DRC-1339 is formulated on baits and placed in areas only after pre-baiting has occurred and in only those areas where non-targets are not present or would not be exposed to treated baits. All uneaten bait is recovered and disposed of according to EPA label requirements.

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 could potentially be used in gull damage management programs in Massachusetts, the chemical's instability which results in degradation of the product, and application protocols used in WS' programs further reduces the likelihood

of any environmental accumulation. The use of DRC-1339 under the proposed action and in other bird damage management activities is not expected to increase to a level that adverse affects would occur from the cumulative use of the chemical. Based on potential use patterns, the chemical and physical characteristics of DRC-1339, and factors related to the environmental fate, no cumulative impacts are expected from the lethal chemical components used or recommended by the WS program in Massachusetts.

WS has received no reports or documented any adverse affects to human safety from WS' gull damage management activities conducted from FY 2004 through FY 2009. No cumulative adverse affects from the use of those methods discussed in Appendix B are expected given the use patterns of those methods for resolving gull damage in the Commonwealth.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

The activities of WS would result in the removal of gulls from those areas where damage or threats were occurring. Therefore, the aesthetic value of gulls in those areas where damage management activities were being conducted would be reduced. However, for some people, the aesthetic value of a more natural environment would be gained by reducing gull densities.

Some people experience a decrease in aesthetic enjoyment of wildlife because they feel that overabundant species are objectionable and interfere with their enjoyment of wildlife in general. Continued increases in numbers of individuals or the continued presence of gulls may lead to further degradation of some people's enjoyment of any wildlife or the natural environment. The actions of WS could positively affect the aesthetic enjoyment of wildlife for those people that are being adversely affected by the target species identified in this EA.

Gull population objectives are established and enforced by the USFWS and the MDFW. Therefore, WS has no direct impact on the status of the gull population since all take by WS occurs at the discretion of the USFWS and the MDFW. Since those persons seeking assistance could remove gulls from areas where damage is occurring with a permit from the USFWS or the MDFW, WS' involvement would have no effect of the aesthetic value of gulls in the area where damage was occurring if those gulls are removed by the resource owner. When damage caused by gulls has occurred, any removal of gulls by the property or resource owner would likely occur whether WS was involved with taking the gulls or not.

Therefore, the activities of WS are not expected to have any cumulative adverse affects on this element of the human environment if occurring at the request of a property owner and/or manager.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

WS continues to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by wildlife. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing humane methods.

All methods not requiring direct supervision during employment (*e.g.*, live traps) will be checked and monitored to ensure any wildlife confined or restrained are addressed in a timely manner to minimize distress of the animal. All euthanasia methods used for live-captured gulls will be applied according to AVMA guidelines for free-ranging wildlife. Shooting will occur in limited situations and personnel will be trained in the proper use of firearms to minimize pain and suffering of gulls taken by this method.

WS employs methods as humanely as possible by applying measures to minimize pain and that allow wildlife captured to be addressed in a timely manner to minimize distress. Through the establishment of minimization measures and SOPs that guide WS in the use of methods to address damage and threats associated with gulls in the Commonwealth, the cumulative impacts on the issue of method humaneness are minimal. All methods will be evaluated annually to ensure measures and SOPs are adequate to ensure those methods continue to be used to minimize suffering and that wildlife captured are addressed in a timely manner to minimize distress.

CHAPTER 5: LIST OF PREPARERS, CONSULTANTS, AND REVIEWERS

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APPENDIX A
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APPENDIX B
GULL DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE MASSACHUSETTS WS PROGRAM

NON-LETHAL METHODS - NON-CHEMICAL

Agricultural producer and property owner practices- These consist primarily of non-lethal preventive methods such as changing cultural methods and implementing 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-** These may include altering planting dates so that crops are not young and more vulnerable to damage when the damage-causing species is present, or the planting of crops that are less attractive or less vulnerable to such species. Cultural methods also include locating resources damaged by birds away from roosting, nesting, feeding or loafing areas. 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, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994).
>
> **Environmental/Habitat modification-** Environmental or habitat modification can be an integral part of GDM. Wildlife production, and/or presence, is 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 GDM strategies at or near airports to reduce bird aircraft strike problems by eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport or other properties can be minimized through management of vegetation and water from areas adjacent to aircraft runways or the resource to be protected.

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 but not all methods that are included by this category are:

- Bird-proof barriers
- Electronic guards
- Propane exploders
- Pyrotechnics
- Distress Calls and sound producing devices
- Chemical frightening agents
- Taste or odor repellents
- Scare crows
- Mylar tape
- Eye-spot balloons

- Lasers

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 Misake 1983, Conover 1982, Arhart 1972). Mylar tape and flagging has produced mixed results in its effectiveness to frighten birds (Belant and Ickes 1997, Dolbeer et al. 1986, Tobin et al. 1988). Generally, scaring devices that affect more than one of the birds' senses are more effective. Mylar tape and flagging have both visual and auditory components that have better repellency.

Bird proof barriers- Barriers can be effective but are often cost-prohibitive, particularly because of the aerial mobility of birds which requires overhead barriers as well as peripheral fencing or netting. Exclusion adequate to stop bird movements can also restrict movements of livestock, people and other wildlife (Fuller-Perrine and Tobin 1993). Overhead wire grids can deter gulls from nesting, loafing, and feeding areas (Blokpoel and Tessier 1984, Belant and Ickes 1996, Dolbeer et al. 1988). The birds apparently fear colliding with the wires and thus avoid flying into areas where the method has been employed.

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 some 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). 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. A few people would find exclusionary devices such as netting unsightly, trashy, and a lowering of the aesthetic value of the neighborhood when used over personal gardens.

Auditory scaring devices- Devices such as propane exploders, pyrotechnics, electronic guards, scare crows, 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, 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, they 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.

Visual scaring techniques- Techniques such as 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, effigies (scarecrows), sometimes are 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, Belant and Ickes 1997). Pochop et al. (2001) tested a visual barrier made of woven black polypropylene fabric in parallel rows 5 m apart to discourage gull nesting to protect salmon smolt along the Columbia River in Washington State. The zone with fencing had 84% fewer nests than the control zone. Silt fencing showed potential as a non lethal bird management technique. Generally, 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- Lasers are a non-lethal technique recently evaluated by the NWRC (Glahn et al. 2000a, Blackwell et al. 2002). The low-powered laser has proven to be effective in dispersing a variety of bird

species in a number of different environments. The low-powered laser is most effective before dawn or after dusk when the red beam of the laser is clearly visible. Bright sunlight will "wash out" the laser light rendering it ineffective. Although researchers are not sure if birds see the same red spot as people, it is clear that certain bird species elicit an avoidance response in reaction to the laser. The birds view the light as a physical object or predator coming toward them and generally fly away to escape. Research, however, has shown that the effectiveness of low-powered lasers varies depending on the bird species and the context of the application.

Waterfowl, such as ducks and geese, have been successfully relocated using low-powered lasers (Blackwell et al. 2002). Long-legged wading birds, like great blue herons, have also been successfully dispersed using low-powered laser light. This discovery is especially important to aquaculture producers because it gives them another non-lethal tool for combating the heron, the double-crested cormorant, and other fish-eating birds (Glahn et al. 2000a).

In addition to these successes, low-powered lasers have proven effective against crows and gulls at landfills, and vultures. In Hawaii they have been tested as a potential means for moving endangered species out of industrial areas and airports where their foraging activities put the birds themselves at risk and pose a safety threat to air traffic.

It has been found that blackbirds, starlings, and pigeons generally don't readily respond to low-powered lasers (Blackwell et al. 2002). The reason for this distinction in response is likely due to the very different eye structure of bird species active at night or in low-light situations. Because these species are active during the day, traditional means of dispersal are still most effective with these species.
The low-powered lasers that have been developed safely and effectively disperse birds without harming them or people. At higher levels, lasers can burn tissue, causing injury to people and animals. Although low-powered lasers can be effective when used in combination with other non-lethal methods, they should not be considered a cure-all. As with any non-lethal measure, once enforcement stops, problem birds can return to cause conflict again. In certain situations, non-lethal management efforts must be continuous to have the desired impact.

Nest destruction- 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 highly mobile and can easily return to damage sites from long distances, or because of high populations. Nest destruction can be very time consuming because most birds will repeatedly rebuild nests. This method poses no imminent danger to pets or to the public.

Egg addling/destruction- Egg addling or destruction is a method 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 which causes 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). WS regularly uses egg addling or destruction; 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 METHODS - CHEMICAL

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. MA (artificial grape flavoring food additive) has been shown to be a promising repellent for many bird species, including gulls and waterfowl (Dolbeer et al. 1993, Belant et al. 1995b). Cummings et al. (1995) found effectiveness of MA declined significantly after 7 days. 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[11]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[12]), and of relatively low toxicity to fish and other invertebrates. MA 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). It has been listed as "Generally Recognized as Safe" by the U.S. Food and Drug Administration (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. 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 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 nonirritating 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. Applied at a rate of about 0.25 lb/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.

Anthraquinone- A 50% anthraquinone product (FlightControl®, Avipel®) is another registered repellent for Canada geese. Like MA, anthraquinone has low toxicity to birds and mammals (Dolbeer et al. 1998) and is a restricted use chemical. FlightControl® is authorized for use on turf at or near airports; grassy areas at commercial, industrial and municipal sites or developed urban areas; golf courses and landfills or dumpsites.

Other chemical repellents- A number of other chemicals have shown bird repellent capabilities. 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).

Tactile repellents- A number of tactile repellent products are on the market which reportedly deter birds

[11]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.
[12]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.

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 and temperature extremes reduce their tackiness. They sometimes cause aesthetic problems and expensive clean-up by running down the sides of buildings in hot weather.

Egg oiling- Egg oiling is a method for suppressing reproduction of nuisance birds by spraying or rubbing a small quantity of food grade vegetable oil or mineral oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and 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. Blackwell et al. (2000) found that gull eggs oiled later (7-15 days before expected hatch date) in the incubation period were less likely to produce chicks (1% hatch versus 20% hatch) than eggs oiled early (21-27 days before expected hatch date) in the incubation period. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under the FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

LETHAL METHODS - MECHANICAL

Shooting- Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. In a comparison between the use of pyrotechnics and shooting as a method to disperse cormorants from their night roosts in Mississippi, shooting was found to be at least equally as effective as pyrotechnics for dispersing cormorants from their night roosts. It was also found to be unlikely to result in a large number of birds being killed (Glahn 2000, Glahn et al. 2000b). Normally, shooting is conducted with shotguns, rifles or air rifles. Shooting is a very individual 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. All firearm safety precautions are followed by WS when conducting GDM activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Firearm use is a very sensitive public concern because of safety and misuse issues. 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-trap and euthanasia- Live trapping followed by euthanasia can be used to reduce local populations of birds. Birds captured in live traps are subsequently euthanized by American Veterinary Medical Association approved methods of cervical dislocation or CO_2.

Live traps include:

Decoy traps- 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 traps are used to capture birds attracted to an area where nesting is occurring. The most common nest trap is a starling nest box trap. This consists of a box with a small opening for the bird to enter and a trigger on the inside that blocks the entrance opening when the bird rests on the bottom of the box (DeHaven and Guarino 1969). Nest traps for gulls are made of a wire mesh box with a funnel opening. The wire mesh box is placed over the nest. When the bird returns and enters the funnel to sit on the nest, it is trapped inside (Weaver and Kadlec 1970). Nest 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.

Mist nets are more commonly used for capturing small-sized birds such as English sparrows, finches, etc. but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced into the United States in the 1950s 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 due to molting and other birds which are typically shy to other types of capture.

Cervical dislocation is sometimes used to euthanize birds which are captured by hand or 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 American Veterinary Medical Association 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).

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the FIFRA (administered by the EPA and the Massachusetts Pesticide Bureau). WS personnel that use restricted-use chemical methods are certified as pesticide applicators by the Commonwealth of Massachusetts 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 American Veterinary Medical Association (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 has been proven to be an effective method of bird 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 bird damage problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban bird population reduction.

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 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. 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 are highly sensitive to DRC-1339. Many other bird species, such as raptors, 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. 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 birds 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. 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 LISTED THREATENED AND ENDANGERED SPECIES IN MASSACHUSETTS

Animal species listed in this state and that occur in this state

Status	Species
E	Beetle, American burying (*Nicrophorus americanus*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Plymouth Red-Bellied Turtle (*Pseudemys rubriventris bangsi*)
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*)

Animal species listed in this state that do not occur in this state

Status	Species
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
E	Curlew, Eskimo (*Numenius borealis*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Wolf, gray Lower 48 States, except where delisted and where EXPN. Mexico. (*Canis lupus*)

Animal listed species occurring in this state that are not listed in this state

Status	Species
T	Sea turtle, green except where endangered (*Chelonia mydas*)

Plant species listed in this state and that occur in this state

Status	Species
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
E	Gerardia, sandplain (*Agalinis acuta*)
T	Pogonia, small whorled (*Isotria medeoloides*)

Plant species listed in this state that do not occur in this state

Status	Species
T	Amaranth, seabeach (*Amaranthus pumilus*)
E	Chaffseed, American (*Schwalbea americana*)

APPENDIX D
SPECIES THAT ARE STATE LISTED AS THREATENED, ENDANGERED, OR OF SPECIAL CONCERN IN THE COMMONWEALTH OF MASSACHUSETTS

Common Name	Scientific Name	MA Status	Fed Status	Notes
VERTEBRATES:				
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		
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	
Wood Turtle	*Glyptemys insculpta*	SC		
Bog Turtle	*Glyptemys muhlenbergii*	E	T	
Blanding's Turtle	*Emydoidea blandingii*	T		
Diamond-backed 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	*Pantherophis alleghaniensis*	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		
Northern Harrier	*Circus cyaneus*	T		
Sharp-Shinned Hawk	*Accipiter striatus*	SC		
Peregrine Falcon	*Falco peregrinus*	E		

King Rail	*Rallus elegans*	T		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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	*Sternula 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:

Sponges				
Smooth Branched Sponge	*Spongilla aspinosa*	SC		
Flatworms				
Sunderland Spring Planarian	*Polycelis remota*	E		
Segmented Worms				
New England Medicinal Leech	*Macrobdella sestertia*	SC		
Snails				
New England Siltsnail	*Floridobia winkleyi*	SC		
Walker's Limpet	*Ferrissia walkeri*	SC		
Coastal Marsh Snail	*Littoridinops tenuipes*	SC		
Slender Walker	*Pomatiopsis lapidaria*	E		
Boreal Marstonia	*Marstonia lustrica*	E		
Boreal Turret Snail	*Valvata sincera*	E		

Mussels				
Dwarf Wedgemussel	*Alasmidonta heterodon*	E	E	
Triangle Floater	*Alasmidonta undulata*	SC		
Swollen Wedgemussel	*Alasmidonta varicosa*	E		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Yellow Lampmussel	*Lampsilis cariosa*	E		
Tidewater Mucket	*Leptodea ochracea*	SC		
Eastern Pondmussel	*Ligumia nasuta*	SC		
Creeper	*Strophitus undulatus*	SC		
Crustaceans				
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		
Insects				
Dragonflies				
Spatterdock Darner	*Rhionaeschna mutata*	SC		
Subarctic Darner	*Aeshna subarctica*	T		
Comet Darner	*Anax longipes*	SC		
Ocellated Darner	*Boyeria grafiana*	SC		
Spine-Crowned Clubtail	*Gomphus abbreviatus*	E		
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-tipped 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*	SC		
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		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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		
American Burying Beetle	*Nicrophorus americanus*	E	E	
Butterflies and Moths				
Coastal Heathland Cutworm	*Abagrotis nefascia*	SC		
Barrens Daggermoth	*Acronicta albarufa*	T		
Drunk Apamea Moth	*Apamea inebriata*	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		
Mustard White	*Pieris oleracea*	T		
Pink Sallow Moth	*Psectraglaea carnosa*	SC		
Southern Ptichodis	*Ptichodis bistrigata*	T		
Orange Sallow Moth	*Rhodoecia aurantiago*	T		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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:

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*	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		
Eaton's Beggar-ticks	*Bidens eatonii*	E		
Estuary Beggar-ticks	*Bidens hyperborea*	E		
Cornel-leaved Aster	*Doellingeria infirma*	E		
New England Boneset	*Eupatorium 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		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Rand's Goldenrod	*Solidago simplex* ssp. *randii* v. *monticola*	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	*Boechera laevigata*	T		
Green Rock-cress	*Boechera 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		
Chenopodiaceae (Saltworts)				

Fogg's Goosefoot	*Chenopodium foggii*	E		
American Sea-blite	*Suaeda calceoliformis*	SC		
Cistaceae (Rockroses, Pinweeds)				
Bushy Rockrose	*Crocanthemum dumosum*	SC		
Beaded Pinweed	*Lechea pulchella* var. *moniliformis*	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	*Tillaea aquatica*	T		
Cupressaceae (Cedars, Junipers)				
Arborvitae	*Thuja occidentalis*	E		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Cyperaceae (Sedges)				
River Bulrush	*Bolboschoenus fluviatilis*	SC		
Foxtail Sedge	*Carex alopecoidea*	T		
Back's Sedge	*Carex backii*	E		
Bailey's Sedge	*Carex baileyi*	T		
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*	E		
False Hop Sedge	*Carex lupuliformis*	E		
Midland Sedge	*Carex mesochorea*	E		
Michaux's Sedge	*Carex michauxiana*	E		
Mitchell's Sedge	*Carex mitchelliana*	T		
Few-fruited Sedge	*Carex oligosperma*	E		
Few-flowered Sedge	*Carex pauciflora*	E		
Variable Sedge	*Carex polymorpha*	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-rush/Spike-sedge	*Eleocharis microcarpa* var. *filiculmis*	E		
Ovate Spike-rush or 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-rush or 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		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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		
Wild Senna	*Senna hebecarpa*	E		
Fagaceae (Oaks, Beeches)				
Bur Oak	*Quercus macrocarpa*	SC		
Yellow Oak	*Quercus muehlenbergii*	T		
Fumariaceae (Fumitories)				
Climbing Fumitory	*Adlumia fungosa*	SC		

Gentianaceae (Gentians)				
Andrew's Bottle Gentian	*Gentiana andrewsii*	E		
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		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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		
False Pennyroyal	*Trichostema brachiatum*	E		
Lentibulariaceae (Bladderworts)				
Resupinate Bladderwort	*Utricularia resupinata*	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	*Corallorhiza 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		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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		
Three Bird Orchid (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		
New England Northern Reedgrass	*Calamagrostis stricta* ssp. *inexpansa*	E		
Tufted Hairgrass	*Deschampsia cespitosa* ssp. *glauca*	E		
Commons's Panic-grass	*Dichanthelium ovale* ssp. *pseudopubescens*	SC		
Mattamuskeet Panic-grass	*Dichanthelium dichotomum 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* ssp. *pubescens*	T		
Philadelphia Panic-grass	*Panicum philadelphicum ssp. philadelphicum*	SC		
Drooping Speargrass	*Poa saltuensis* ssp. *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 spicatum*	E		
Podostemaceae (Threadfeet)				
Threadfoot	*Podostemum ceratophyllum*	SC		
Polygonaceae (Docks, Knotweeds)				
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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		
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* ssp. *asarifolia*	E		
Ranunculaceae (Buttercups)				
Black Cohosh	*Actaea racemosa*	E		
Purple Clematis	*Clematis occidentalis*	SC		
Golden Seal	*Hydrastis canadensis*	E		
Tiny-flowered Buttercup	*Ranunculus micranthus*	E		
Bristly Buttercup	*Ranunculus pensylvanicus*	SC		
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* ssp. *sayi*	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 ssp. interior*	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		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
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*	SC		
Britton's Violet	*Viola brittoniana*	T		
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.

APPENDIX E

Policy BWP-98-003: Gull Control at Landfills & Other Solid Waste Management Facilities

This policy provides guidance to the regulated community on the Department's requirements for controlling gulls at landfills and at other solid waste management facilities.

_____	_____
Date	James C. Colman Assistant Commissioner Bureau of Waste Prevention

1.0 Policy Statement

The dramatic increase in gull populations in the northeast during the latter half of this century has resulted in a number of environmental challenges. For example, gulls roosting on water bodies have caused bacterial and viral contamination of public water supplies and recreational waters, which is of particular concern to the ten (10) surface water supplies across the state that do not rely on filtration systems. Gulls have also created a bird hazard to aircraft when they frequent areas close to airports. In addition, gulls have contributed to the decline of some endangered species such as the Piping Plover and Roseate Tern by increasing predation and competition for nesting space. Lastly, gulls have caused nuisance conditions at residences, parks and recreational areas by fouling yards, picnic tables, beaches and park benches with their droppings.

Landfills have been identified as a primary food source used by some species of gulls throughout the year, but primarily during the fall and winter months. The Department, accordingly, regards gulls as a vector and has established operational requirements to prevent gulls from feeding at landfills or other solid waste management facilities. This policy is expected to significantly reduce, over time, gull populations. As a result this policy will help protect public health by: (a) reducing the quantity of pollutants entering water supplies and recreational water bodies; (b) reducing the threat of bird hazards to aircraft; (c) reducing the threat to some endangered species caused by the current overpopulation of gulls; and (d) reducing nuisance conditions at residences, parks and other recreational areas.

This policy provides guidance on how to comply with the existing regulatory requirement to control gulls, a type of vector, at solid waste management facilities (SWMFs). It does so by defining the applicability, objectives, and requirements for implementing a gull control program at SWMFs.

For most facilities this policy is self-implementing as long as the facility complies with the performance requirements of the policy within 90 days of notice by the Department. If a facility fails to comply within 90 days the facility may be subject to enforcement action which may include the issuance of a notice of non-compliance, penalties or license action.

2.0 Regulatory Authority

The Department of Environmental Protection (DEP), pursuant to the authority granted by St. 1987, c. 584, and M.G.L. c. 111, s. 150A, has promulgated regulations at 310 CMR 19.000 titled "Solid Waste Management Facility Regulations". 310 CMR 19.000 is intended to protect public health, safety and the environment by comprehensively regulating the storage, transfer, processing, treatment, disposal, use and reuse of solid waste in Massachusetts.

Section 19.038: General Criteria for the Review of Applications for a Permit or Permit Modification. Part 19.038(2)(a)4 states that the design, construction, operation and maintenance of the facility shall not constitute a threat to public health, safety or the environment. Part 19.038(2)(a)(8) states that the construction, operation and maintenance of the facility shall not represent a bird hazard. Part 19.038(2)(a)10 states that the construction, operation or maintenance of the facility will not cause or contribute to the taking of any endangered or threatened species of plants, fish or wildlife as identified in 50 CFR Part 17. (Please note: revisions to the regulations that address endangered species are expected to be promulgated in the near future. The proposed revisions will change

the wording of section 19.038(2)(a)10 to be consistent with section 16.40(4)(c) of 310 CMR 16.00, the "Site Assignment Regulations for Solid Waste Facilities").

Section 19.040: Department's Modification, Suspension or Revocation of a Permit states at 19.040(1) that the Department may rescind, suspend or modify a permit when it determines that the operation or maintenance of a facility results in a threat to public health, safety or the environment.

Section 19.130(16) Vector, Dust and Odor Control requires that landfills prevent vectors, dust, odors and other nuisance conditions from developing at the landfill and any other areas related to the general facility operations. (Vectors include birds by definition.)

The Department adopts the following definitions for the purposes of this guidance.

The Department, in conjunction with the Metropolitan District Commission and the Division of Fisheries and Wildlife, has determined that landfills should not be a food source for gulls because gulls:

1. create a threat to the public health by contaminating water supplies and recreational waters;
2. create a threat to the public safety by contributing to or creating a bird hazard for aircraft;
3. contribute to the taking of certain endangered species of wildlife; and
4. create nuisance conditions at residences, parks and other recreational facilities.

Therefore, in accordance with its regulatory authority to protect public health, safety and the environment the Department is providing this guidance for solid waste management facilities to facilitate compliance with the requirements for vector, specifically gull, control as required by the regulations.

3.0 Applicability

This policy is applicable to all solid waste management facilities (SWMFs). The primary focus of this policy is municipal solid waste (MSW) landfills. Other types of SWMFs where food wastes are available, such as transfer stations, are also required to comply with this policy. It is generally not expected that gulls or other birds will be a problem at construction and demolition (C+D) waste landfills or similar types of SWMFs where food wastes are not part of the waste stream managed, but such facilities shall comply with this policy as necessary.

4.0 Definitions

All terms used in this policy shall have the meanings set forth in 310 CMR 19.000 unless the context clearly implies or indicates another meaning.

The following definitions have been taken verbatim from the solid waste regulations and are repeated here for clarity in understanding this policy.

Bird Hazard means a hazard to aircraft created by an increase in the likelihood of bird/aircraft collisions.

Facility means an established site or works and other appurtenances thereto, which is, has been or will be used for the handling, storage, transfer, processing, treatment or disposal of solid waste including all land, structures and improvements which are directly related to solid waste activities.

Vector means an organism that is capable of transmitting a pathogen from one organism to another including, but not limited to, flies and other insects, rodents, birds and vermin.

Solid Waste Management Facility (See "Facility")

The following new definitions are needed to clarify the meaning of this policy.

Gulls means Herring Gulls (*Larus argentatus*), Great Black-backed Gulls (*L. marinus*), Ring-billed Gulls (*L. delawarensis*) and other birds of the genus *Larus*. These birds are commonly and collectively referred to as "gulls" or "seagulls".

Gull control methods means all measures used to prevent gulls from feeding at a facility and other measures intended to prevent or discourage gulls from frequenting a facility for other activities such as resting, roosting or loafing.

5.0 Gull Control

5.1 General
Requirements- Gulls are highly resourceful and aggressive. By feeding at landfills, gulls are able to satisfy their total daily nutritional requirements even with a brief (less than 15 minutes) feeding period. Consequently, successful gull control programs must be continuous and unrelenting.

Gull control programs should address the particular needs and situations at each landfill. Landfills vary in characteristics that make them suitable or attractive to gulls, such as location, size and operational methods. Consequently, some sites may only need to implement minimal control methods to successfully control gulls, whereas other sites may need to develop a comprehensive gull control plan to achieve effective gull control. Gull control programs should be developed by a professional experienced and knowledgeable about gull control methods.

A discussion of general gull control methods and possible components of a generic gull control plan can be found in the document "A Manual for Gull Control at Massachusetts Landfills" which is referenced in section 10.0 of this policy.

5.2 Performance Standard
A successful gull control program will:

1. prevent gulls from feeding on solid waste, at any time, even for the briefest periods, at the facility; and

2. eliminate or reduce the suitability and attractiveness of the facility for other gull activities such as resting, roosting or loafing.

5.3 Gull Control Hierarchy
A gull control program should be designed around a hierarchy that begins with the least intrusive or destructive control measures and then progresses to more aggressive methods. An effective control program based on this hierarchy is one that first focuses on removing the availability of food at landfills followed by habitat management controls and then lastly relies on harassment or lethal methods to control gulls. This hierarchy is defined in terms of highest to lowest priority as follows:

1. Landfill Operational Controls. Methods of unloading, spreading, compacting and covering refuse need to be critically examined and evaluated. Possible methods to reduce the likelihood of gulls feeding include minimizing the size of the daily active area (active face), maintaining human presence at all times and cover material placement (type, depth and frequency).

2. Habitat Controls. These focus on altering the landfill environment to make it less attractive to gull resting, loafing or roosting activity. Such control methods include eliminating or reducing surface water bodies (retention ponds, etc.) and short grass areas.

3. Harassment Methods. These include the use of pyrotechnics, propane cannons, recorded distress calls and trained dogs with the objective of actively trying to scare gulls away.

4. Lethal Methods. This primarily means the use of shooting to kill gulls. Reliance on killing gulls can never be the primary means for gull control. Shooting or any lethal method can only be used to reinforce other control methods. The implementation of lethal methods will require a permit issued by the United States

Fish and Wildlife Service (USFWS), which generally limits the taking of gulls to between 50 and 200 a year at any given facility.

5.4 Gull Control Plan Components

A gull control plan should include the following:

1. a **locational map**, encompassing a fifty (50) mile radius around the site, that identifies, at a minimum, major water bodies, especially drinking water reservoirs;

2. a **regional map**, such as a USGS 1/25,000 scale topographical map, that identifies all surface water supply reservoirs, recreational waters and airports within five (5) miles of the facility;

3. a **narrative description of the history and extent of gull activity** at the facility including gull control methods used in the past and their effectiveness;

4. a discussion of the **goals and objectives** of the gull control program. This should include a description of the criteria that will be used to identify and quantify gull activity at the facility including, at a minimum, the number and type of gulls and frequency and duration of gull activity. It should also define how the program's effectiveness will be evaluated and the threshold level of gull activity that will initiate new or additional gull control measures;

5. a provision providing for **notification to the Department**, within 48 hours, when gull activity at the facility has resulted in a complaint by an abutter or public officials on any three (3) consecutive days or any five (5) days within a one month period;

6. an **alternatives analysis** that evaluates, at a minimum, the anticipated effectiveness of the gull control methods as outlined in section 5.3 Gull Control Hierarchy. Also, provide explanations why each method was or was not chosen;

7. a **description of the selected (proposed) gull control methods** including equipment, construction activities, personnel requirements (including training), permits required (including federal and state fish and wildlife permits), and other operation and maintenance requirements related to gull control;

8. **references** and other sources used to substantiate the proposed control plan and the criteria used for selection of the chosen methods;

9. **contingency measures** that could be implemented if additional control measures are needed;

10. an **evaluation of the staff and other resources** needed to implement the control plan thoroughly and completely and the degree of variability and unpredictability needed in the selected control measures to ensure an effective control plan. In particular, provide specifics and acknowledge the need to be relentless and continuous in implementing an effective control plan;

11. a provision for, at a minimum, **daily inspection** to monitor and record gull use at the site, including methods of harassment (if any) used that day. A draft gull inspection log should also be included;

12. a plan for **notifying**, before the implementation of a new or significantly modified gull control program, abutters and other nearby individuals, including commercial establishments, likely to be impacted by the gull control program because of noise, displacement of gulls, or other impacts. The discussion shall also include how complaints/problems resulting from the gull control program will be recorded and resolved;

13. identification of the **contact person** and all other personnel who will be responsible for implementing the gull control program along with an outline of their responsibilities; and

14. a **schedule for implementing the control measures** including a critical path for obtaining all necessary permits, equipment and training.

Nothing in this policy is intended to limit the applicant from evaluating and proposing other types of gull control measures that have not been mentioned herein.

6.0 Implementation

6.1 New or Expanded Municipal Solid Waste (MSW) Landfills

All permit applications for a new or expanded MSW landfill shall include a plan for gull control in compliance with the solid waste regulations and this policy.

6.2 New or Expanded Non-MSW Landfills or Other Solid Waste Management Facilities

Permit applications for these facilities do not have to include specific gull control plans unless the Department determines, and notifies the applicant, that site specific concerns require the submission of a gull control plan in accordance with the solid waste regulations and this policy.

6.3 Existing MSW Landfills, Non-MSW Landfills or Other Solid Waste Management Facilities

Copies of this policy shall be provided to all existing landfills. In addition, the Department will identify and provide notification to existing landfills and other solid waste management facilities that have a gull control problem. That notification will provide the reasons used to determine the facility has a gull control problem.

In general, facilities receiving notice will have one or more of the following characteristics:

1. historic use of the facility by gulls;
2. located near or within commuting distance of surface water supplies or recreational waters used as roosting loafing or staging areas;
3. history of gull complaints by abutters or other nearby receptors;
4. located near habitat of endangered, threatened or special concern state-listed wildlife species;
5. operating at greater than 99 tons per day; or
6. located near an airport.

The Department shall make its determination based on information in the record, inspections and observations by the Department or other public officials and by other means.

Landfills or other SWMFs that receive notice that they have a gull control problem are expected to implement a gull control program that will result in the facility meeting the performance standard of this policy (see section 5.2). Gull control measures should be started as soon as possible and within 90 days of receiving notice from the Department a gull control program should be fully implemented and effective. Compliance with the notice to provide gull control at the facility is self-implementing at this time, unless specifically noted otherwise by the Department.

A successful control program will consist of site specific methods that will effectively control gulls at the facility. It is not necessary, initially, for a gull control program to comprehensively address all the components of a gull control plan as listed in section 5.3 to comply with this policy. The facility does not have to submit its gull control program to the Department for review and approval.

However, please note that all MSW landfills have a continuing obligation to control gulls as provided by 310 CMR 19.000. If a facility fails to control gulls at its facility it may be subject to enforcement action as provided for by 310 CMR 19.081(see section 8.0). Enforcement actions may include the requirement to develop, for review and approval by the Department, a comprehensive gull control plan as discussed in section 5.4.

Other facilities not notified by the DEP as stated above may be subject to provisions of this policy in accordance with the Department's regulatory authority as outlined in section 8.0.

7.0 Reporting
If the facility is required to conduct regular inspections in accordance with 19.130(35) or another permit requirement, the status of gull control shall be provided in the inspection report. Please see the Appendix for an example of the information to report.

8.0 Compliance and Enforcement

8.1 Compliance
In general, the following criteria shall be used to determine if a facility has a gull control problem:

1. gulls observed or otherwise known to be feeding at the site;
2. the number of gulls frequenting the site;
3. availability of a food source for the gulls;
4. compliance with good operational practices such as use of daily cover material;
5. location relative to:
    a. surface water supplies;
    b. airports;
    c. abutters or other nearby receptors;
    d. recreational waters;
    e. endangered species habitat;
    f. parks or other recreational facilities;
6. the frequency of use by gulls;
7. suitability of the site for resting, loafing or roosting; and
8. complaints by abutters or others affected by the gulls.

8.2 Enforcement
Solid waste landfills which fail to prevent gulls from using their facility may be in non-compliance with either or both 19.130(9) - Bird Hazards or 19.130(16) - Vector Control. Landfills that are determined to be in non-compliance with the regulations may be subject to enforcement actions as provided for by 19.081 - Enforcement Provisions, including notices of non-compliance, enforcement orders, or penalties.

Landfills that are found to be in noncompliance will be required, by a deadline determined by the Department, to implement the level of gull control methods necessary to bring the facility into compliance with the regulations and this policy. Landfills may be required to develop and submit to the Department for review and approval a gull control plan that complies with section 5.4.

Other types of SWMFs may also be subject to enforcement actions if they create a nuisance condition or threat to public health, safety or the environment by failing to control gulls at their facility.

9.0 Qualifier
This policy focuses on gulls because they are the birds that have been the most documented to be a threat to public health, safety or the environment. However, if other bird species are identified as being problematic at a

specific SWMF then the requirements for control measures identified in this policy shall be inclusive for all bird species.

Implementation of this policy cannot violate any applicable federal, state or local laws or regulations. Under no circumstances shall gull control measures implemented to comply with this policy create or exacerbate a bird hazard problem or other public health, safety or environmental problem at the facility or in the proximity to the facility.

10.0 Background

The Metropolitan District Commission has developed a manual that describes the history of the gull problem at Quabbin and Wachusett Reservoirs and contains generic information about gull control measures that can be used as reference for developing a gull control plan or program. This manual should not, however, be considered the sole source of information when developing a comprehensive gull control plan. The manual is titled: A Manual for Gull Control at Massachusetts Landfills

11.0 Background

The number of herring and great black-backed gulls ("large gulls") in the Commonwealth, subsidized by abundant man-provided food supplies, has dramatically increased during this century. While only a handful of "large gulls" nested in the Commonwealth in 1920, an estimated 32,661 nesting pairs were recorded in 1995. The actual total number of gulls in the Commonwealth would also include sub-adults and, at times, birds from other areas that visit the state. The general increase in the "large gull" population has been linked to the gulls' successful utilization of manmade food sources associated with landfills and the fishing industry. The expanded gull population has created significant public health, safety and environmental concerns. These concerns include water quality at surface water reservoirs, water quality at recreational water bodies, creating aircraft bird hazards, impact on endangered species and creating nuisance conditions at parks and recreational areas.

One of the highest priority environmental concerns for the Commonwealth of Massachusetts is providing and maintaining high quality drinking water for its citizens. The Department of Environmental Protection (DEP) is the state agency responsible for developing and implementing regulatory requirements for ensuring the quality of drinking water. The DEP has identified watershed protection as one of the most important factors in protecting water quality. One component of an effective watershed protection plan is to prevent gulls from roosting on surface water reservoirs because gulls have been identified as a significant source of fecal coliform contamination.

As the result of research done at the Quabbin and Wachusett Reservoirs, the Metropolitan District Commission (MDC), with the assistance of the Division of Fisheries and Wildlife (DFW), has determined that the number of roosting gulls should substantially decline if their food sources within the vicinity were eliminated. Further research has documented that landfills within a radius up to 50 miles away are the primary food sources for many of these gulls.

Surface water supplies that have documented significant numbers of roosting gulls include the Quabbin, Wachusett, Norumbega and Crystal Lake reservoirs. Preventing gulls from roosting on any surface water supply is an important pollution prevention practice because it reduces the opportunity for bacterial contamination. This is especially a public health concern for the ten (10) unfiltered surface water supplies in the state.

Other surface water bodies that are not water supplies but are used for recreational purposes, such as swimming, are also being impacted by gulls. Gulls and their droppings are not only physically bothersome but are suspected of increasing coliform levels in recreational water bodies.

Gulls are also the primary bird species responsible for creating bird hazards for aircraft when landfills are located near airports.

The Massachusetts Division of Fisheries and Wildlife, in conjunction with the United States Fish and Wildlife Service has determined that gulls are a serious threat to some endangered species, such as the Piping Plover and Roseate Tern. The artificially large population of gulls that is being maintained by their ability to feed on garbage

at landfills and, to a lesser extent, other manmade food sources has resulted in gulls both preying on the young of other species as well as displacing other species from nesting sites.

Lastly, gulls create or contribute to nuisance conditions by fouling yards and picnic areas with their droppings at residences, parks and other recreational areas.

Gull behavior is such that a coordinated regional approach requiring controls at all landfills in affected areas is needed to achieve the goal of preventing gulls from using landfills as a food source. In the absence of such a regional approach, gulls merely shift from landfill to landfill and continue to frequent the same reservoirs, airports and other areas with associated problems.

Wildlife biologists believe that if gulls are denied access to landfills for feeding, their numbers will substantially decrease over time. Elimination of the landfill food subsidies will eventually translate into reductions in gull populations. Eventually many of these gulls will likely disappear from most inland locations and be confined to their historical and more natural range on the coast.

Appendix

FIELD DATA FORM - GULL CONTROL PROGRAM

FACILITY NAME:_____

DATA RECORDER:_____ DATE:_____

CONDITIONS:

SKY:_____

TEMPERATURE:_____

WIND:_____

PRECIPITATION:_____

IME	# GULLS PRESENT	LOCATION OF GULLS	GULL CONTROL METHODS USED	RESULTS

GULL OBSERVATIONS AND CONTROL ACTIVITIES:

COMMENTS:

APPENDIX F

MANUAL FOR GULL CONTROL AT MASSACHUSETTS LANDFILLS JOINTLY DEVELOPED BY:

Metropolitan District Commission,
Division of Watershed Management
Massachusetts Department of Environmental Protection,
Bureau of Waste Prevention
Massachusetts Division of Fisheries & Wildlife
USDA APHIS Wildlife Services

May 1998

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MANUAL FOR GULL CONTROL AT MASSACHUSETTS LANDFILLS

I. INTRODUCTION

In recent years, large numbers of gulls leave coastal zones and use inland portions of Massachusetts during fall and winter months. The combination of large inland water bodies for night roosting, plus abundant and concentrated food supplies at local landfills, have created very favorable conditions for the survival of these species.

The resulting high concentrations of gulls at inland sites have resulted in a number of public health, safety or nuisance problems. These include risks of bird strikes around airports, contamination of public water supplies and possible disease transmission. A wide variety of methods have been used in an attempt to control the impacts of gulls, and some efforts have successfully reduced localized problems. For example, gull harassment programs at several area landfills have reduced the threat of bird strikes at Westover Airbase in Chicopee; daily harassment efforts at Quabbin and Wachusett reservoirs have substantially reduced water quality problems associated with night roosting gulls.

However, the long-term solution to gull problems will require a coordinated effort on the part of various governmental agencies and private parties to control not only roosting behavior, but also gull access to major food supplies at landfills and other locations. Otherwise, individual gull control efforts will only have the effect of moving the gulls, and the problems, to other locations.

This manual discusses the problems associated with fall and winter concentrations of gulls in Massachusetts, and outlines a program and methods to control gull feeding at municipal solid waste landfills. Much of the information used in this manual came from the scientific literature, the experiences and observations of staff from the Metropolitan District Commission/Division of Watershed Management (MDC/DWM), the Massachusetts Division of Fisheries & Wildlife (MDFW), and the USDA/APHIS/Wildlife
Services office in Amherst. Additional information was taken from a Fugro-McClelland report prepared for Resource Control, Inc. (Fugro-McClelland (East). 1993 (draft). "An Appraisal of Potential Gull Problems Associated with a Proposed Landfill in Clinton, Massachusetts And Practical Solutions"). Paul Lyons (MDC) was the primary author of this manual. In addition, Paul Emond (DEP), Brad Blodget (MDFW), Laura Henze (USDA APHIS), John Scannell (MDC), Pat Austin (MDC) and Dan Clark (MDC) played significant roles in its development.

II. BACKGROUND

A. Gull Species of Concern

Two species of gulls are typically associated with landfills and water supply reservoirs in this region: Herring Gulls (*Larus argentatus*) and Great Black-backed Gulls (*Larus marinus*). Ring-billed Gulls (*Larus delawarensis*) also use landfills, but not to the extent that the other two species do. The herring gull is the common gull of the Northeast - a large bird with a white head and under parts, and gray wings with black tips when in adult plumage. Herring gull young of the year have a generally brown appearance, acquiring progressively more white plumage with each successive molt as they mature.

Herring gulls breed in the northern latitudes of both the New and Old Worlds. In New England, breeding colonies are found from Maine to Connecticut. Herring gulls nest almost exclusively on coastal islands. The only known inland colony of herring gulls in Massachusetts was located on an island in the Wachusett Reservoir in central Massachusetts. The herring gull is migratory and nests from April through

September. The main food items of herring gulls have been reported as garbage, sewage, fishery wastes and various mussels and crabs.

Great black-backed gulls have a similar natural history to herring gulls, and are also similar in appearance, except for their larger size and the characteristic black back in adults. Relatively uncommon in Massachusetts until the 1960's, the black-back population has increased dramatically in the past few decades. Although they tend to be less associated with human activities than herring gulls, black-backs are still commonly observed at landfills and readily intermix with herring gulls.

Ring-billed gulls look similar to herring gulls, but are smaller with yellowish rather than pinkish feet and a black stripe around the bill. These gulls are found more extensively in the interior United States than in New England. Although they are sometimes observed at landfills, ring-billed gulls are more frequently found at shopping malls, near fast-food restaurants, or feeding on worms and insects in open fields or agricultural areas.

Gulls have caused or exacerbated a number of different ecological problems, which seem to stem primarily from the tremendous recovery and expansion of the gull population in this century. This has been a world-wide phenomenon, which began in the late 19th century after the gull populations had been decimated by those who took the eggs and chicks for consumption, and killed adults for their plumage. Bird protection laws were passed, and between 1900 and 1960, herring gulls expanded from a few birds nesting in Maine to thousands nesting as far south as North Carolina.
At the present time, herring gull and ring-billed gull populations appear to have stabilized, or are declining, but great black-backed gull populations continue to increase and expand their range.

B. Gulls and Water Supplies

Gull roosting and loafing on water supply reservoirs can lead to contamination of those water supplies, and such problems have been experienced by water supply managers in various parts of the state. These impacts can be particularly problematic at smaller reservoirs that do not have the dilution potential to deal with the contamination associated with hundreds or thousands of roosting gulls, which often use these smaller reservoirs as loafing areas during daylight hours. Larger reservoirs in Massachusetts (e.g., Quabbin and Wachusett) are also affected however, since these water bodies (along with the Connecticut River) appear to be the primary night roost locations for gulls in the state.

With new federal and state drinking water regulations currently in effect, increased concern and attention have been focused on gull impacts and control in recent years. These efforts have mainly involved gull harassment, with the goal of eliminating gulls altogether from smaller water bodies, or moving the roosting birds far enough away from water intakes to allow natural settling and dilution of the contaminants on larger reservoirs. On Quabbin and Wachusett reservoirs, intensive gull control efforts have been underway for several years, and have produced very positive results.

The most common problem associated with gull roosting on water supply reservoirs has been contamination with fecal bacteria. However, another concern is the transmission of human pathogens such as *Salmonella*, which gulls have been known to carry. Further, gulls may also serve as mechanical vectors of disease organisms that are picked up on their feet and/or feathers at landfills or sewage treatment plants. Even in the absence of such disease transmission however, fecal coliform contamination alone can render reservoir water legally unfit to drink and mandate costly water treatment measures.

The greatest use of inland reservoirs by gulls generally occurs in fall and winter with populations increasing steadily from the end of the breeding season through ice-up. However, midwinter use is highly

variable; inclement weather generally increases gull use of inland reservoirs, and ice-up restricts their use. In Massachusetts, the Quabbin and Wachusett reservoirs, along with the Connecticut River, represent the largest inland fresh water sources, and all three are used by roosting gulls.

Diurnal activity patterns of gulls using night roost reservoirs are regular and predictable. Most birds leave the reservoirs shortly after dawn and disperse widely in search of food. Landfills, shopping centers, fish processing plants, and sewage outfalls are primary feeding areas. Although not well-documented, it is likely that gulls will travel up to 50 miles from roosting sites to some food sources.

During the day, gulls use various sites as "loafing areas" when they are not feeding. These areas often include roofs of buildings, water towers, open fields, ponds, lakes and reservoirs, usually in close proximity to feeding areas. For water supply managers with reservoirs close to landfills, this behavior can be of particular concern, since the gulls generally spend most of the day at the reservoir - loafing, washing and defecating - leaving only occasionally and for relatively short periods of time to feed at the landfill.

In general, few gulls remain on roosting reservoirs during the day, unless landfills are operating in close proximity. When flying to and from the reservoirs, the gulls use established flight paths, which generally correspond to the most direct routes to local landfills. Upon returning to the reservoirs, small groups often land in staging areas and then coalesce into a single larger flock in the main roosting area at dusk. The roosting areas are in the same general location of the reservoir on most nights.

C. Gulls and Landfills

Gulls are attracted to landfills and other refuse disposal sites due to the abundance of edible waste they supply. In fact, many authors attribute the dramatic worldwide increase in gulls - and in particular herring gulls, great black-backed gulls, and ring-billed gulls in North America - to the abundant year round supply of high quality food which became available at landfills during the past century.

Once they arrive at a landfill (usually close to daybreak); gulls may land nearby or continue to soar above the site, as high as 3,000 feet. This behavior creates additional concerns when airfields are located nearby. Accordingly, many commercial and military airports conduct active gull harassment or control to minimize risks of bird strikes with their planes.

Although they usually spend most of the daylight hours in the vicinity of landfills or other feeding areas, gulls may spend relatively little time actually feeding. When pressed, gulls can consume their whole daily food intake in only 15 minutes. This is a very important factor to consider when planning gull control activities - i.e., there can be no lapses in the harassment program that would allow the gulls to feed even for a short time.

The number of gulls utilizing a given landfill depends on a number of factors including the weather, season, landfill size, location and management (including gull harassment) practices, and type of refuse present. Gull use is generally highest from September to March, during the period not devoted to nesting. However, within these general trends, daily gull use is still highly variable.

III. OVERVIEW OF GULL CONTROL METHODS

Gull control methods can be categorized into one of two groups: 1) direct or active methods, which either decrease the population through the destruction of eggs or killing of birds, or which actively disperse birds from an area; and 2) indirect or passive methods which alter habitat to make it less attractive to the birds.

Population reduction methods are usually impractical at landfills or roosting sites, due to the inherent difficulty in killing enough birds to substantially reduce their numbers. This method has been used successfully at nesting sites however, where the gulls' strong attachment to the nest helps overcome their otherwise wary nature.

Numerous methods have been developed to harass or disperse gulls from areas where they are not wanted. These include human presence, pyrotechnics, recorded distress calls, propane cannons, visual frightening devices, and trained dogs. In general, methods utilizing human presence tend to be more effective but also more expensive.

Mechanical or stationary devices may work initially, but they generally lose effectiveness as the birds become accustomed to their presence and/or operation. The use of trained dogs has been very effective in reducing Canada goose numbers at golf courses and other problem areas, and may hold some promise for some landfill operations.

Indirect/passive methods (habitat management) are aimed at eliminating or making unavailable one or more of the five basic gull survival requirements: nesting areas, secure night-time roosting areas, feeding areas, loafing areas, and drinking water sources.

Nesting areas and night-time roosts are seldom if ever present at landfills. Access to feeding areas may be controlled by minimizing the area of the active cell surface area, covering the landfill food source, and denying access to the working face by overhead lines or other methods. Night time dumping is another option, since gulls do not feed at night. Loafing areas may be eliminated by removing surface waters at landfills. Seeding, planting or letting all grassy areas grow may also help since gulls avoid tall grass or shrubby areas that prevent them from seeing their surroundings.

Gulls are wary and adaptable animals, and an effective control program generally needs to be both varied and unpredictable. Thus, a combination of options is often used, along with a degree of irregularity in when, where and how they're applied.

IV. GULL CONTROL PROGRAM FOR LANDFILLS

A. General

This section provides a blueprint for implementing an effective gull control program at landfills. However, inherent in this proposal is the recognition that gull problems are regional concerns, not local ones, and that gull control operations at an individual landfill must be part of a larger regional effort to be truly successful. Thus, a concerted and coordinated effort by various state, federal and private agencies and parties is needed.

The goal of this coordinated effort should be to disrupt the daily patterns of gull feeding and roosting so as to bring about a major change in their behavior patterns in the region. On an individual landfill level, this will require that gulls are completely prevented from feeding at that site. It's crucial to understand that nothing but 100% effectiveness is acceptable. If gulls are precluded from feeding for most of the day, except during a brief period during the machine operator's lunch break or for 20 minutes after the landfill closes, then the whole effort was for naught. Remember, when pressured, gulls can meet their total daily food intake requirements in less than 15 minutes, even though they may spend the whole day at or near the landfill.

It's also important to understand that intensive gull control may only be necessary for a short time period, just until the birds get the message that they cannot feed at that site. Experiences at other landfills suggest that this learning occurs in as little as two days. Thus, although continued vigilance and control measures are still periodically needed afterwards, the intensive gull control period may be very short. Again, this all hinges on the initial effort being close to 100% effective.

B. Program Components

Effective gull control programs usually employ a variety of methods to prevent acclimation by the birds. Thus, the following techniques should be viewed as a "pool" of potential options for dealing with gulls. At any one time, only one or a couple of the harassment methods might be needed, although the others should be readily available if and when needed.

In general, a landfill gull control program should include: 1) habitat alterations (indirect methods) to make the area less desirable to gulls; 2) a variety of harassment and lethal control methods (direct methods) designed to make it unsafe or undesirable for gulls to feed at the site; and 3) accurate monitoring and record-keeping of control measures used and gull responses. Each of these components will be discussed further in the following sections. Local animal damage control professionals (see resource list at the end of this manual) can assist landfill operators in selecting the methods that best fit the specific characteristics of a site. In addition, proper permits should be obtained so that the landfill operators can legally implement the full range of gull control options.

1. *Habitat Alteration*

As described earlier, habitat alteration involves eliminating or restricting access to any of the basic survival requirements of gulls. At landfills, this can often be accomplished by minimizing the surface area of the active landfill face, providing good daily coverage of refuse, managing nearby vegetation, eliminating local surface water sources. In some cases, it may be necessary to restrict access to refuse with overhead wires or other physical barriers.

a.) Minimize Surface Area of Active Face - The landfill should be designed and operated so as to minimize the surface area where refuse is deposited. This will decrease the site's attractiveness to gulls, and facilitate the spatial concentration of active gull control efforts, making them easier to perform and more cost-effective.

b.) Daily Coverage - Conventionally, landfill coverage is accomplished with soil materials. State regulations mandate complete coverage of the refuse at least once per day (at the end of the day), and when soil materials are used, the coverage must be at least six inches deep. Regular coverage of refuse throughout the day is desirable since it minimizes the availability of food for the gulls. In most cases, good coverage of refuse is the only means of preventing gull feeding during times when the landfill is closed. In practice however, complete coverage of refuse is difficult to achieve, although it should still be a goal of landfill operations. In situations where it is determined that conventional coverage methods are not preventing gulls from gaining access to refuse after hours, alternative coverage methods (e.g., tightly-woven plastic mesh) that can be pulled or rolled out over the active cell should be considered.

c.) Vegetation Management - Gulls prefer, and are attracted to large open areas that are either devoid of vegetation (e.g., paved areas, gravel areas, exposed soil areas, open water areas), or have closely mown vegetation (lawns, agricultural fields). These areas provide ideal gull loafing habitat, and any that exist on the site should be eliminated or minimized. Grassy areas should not

be mowed. All areas of exposed soil (except active cells, roads, and other necessary openings) on the landfill property which are presently devoid of vegetation (less than 25 percent plant cover) should be hydro-seeded or cultivated with an appropriate mixture of seed, fertilizer and mulch. The particular species of plant is not important, however, it should be a fast-growing species which grows rank (dense) and tall (>10 in.), grows on sterile soils with little cultivation, and has stout stems that resist lodging (laying down under rain, snow, wind). Cinquefoil (*Potentilla* spp.) has been suggested in the literature as suitable, however, quackgrass (*Agropyron repens*), reed canary grass (*Phalaris arundinacea*), or other species recommended by the Natural Resource Conservation Service for this purpose and in these soils can be used. The resultant vegetation should be allowed to grow, and be maintained at a height of at least ten inches where possible. The goal is to have the site's vegetation tall and dense. One cutting per year will usually be adequate to prevent the growth of woody vegetation. This cutting should be done in late April or early May (i.e., prior to grassland bird nesting seasons) so that the vegetation is rank and at least ten inches tall for the fall and winter months.

As the landfill operations progress, all areas that are recently filled and covered, and expected to remain inactive for a least one month, should be planted and treated as described above. Efforts should be made to maintain as much of the landfill property as possible with vegetation at least ten inches tall and preferably twenty or more inches.

d.) Surface Water Elimination - Every attempt should be made to avoid, minimize and/or eliminate non-jurisdictional and non-required surface waters on the landfill site, including ponds, borrow pits and puddle areas. Most such surface waters are attractive to gulls as drinking and loafing sites. Grading activities conducted during landfill operations should be done in a manner to avoid the creation of surface water bodies.

e.) Physical Barriers - Several means of physically excluding gulls from refuse areas have been used, including wire grids and metal buildings constructed over the dumping area. These tend to be expensive and/or labor intensive however. Wire grids, consisting of a single series of parallel lines, but more commonly two series of parallel lines erected at right angles to each other to form a mesh or grid pattern, can be erected above the active cell of the landfill. This method has been effectively used to exclude larger gull species from landfills, reservoirs and fish hatcheries. Grid spacing of 20 feet or less is generally effective on the three problem gull species found in this region. Either monofilament plastic line, or stainless steel wires can be used.

2. *Harassment Methods*

The above habitat modification methods can substantially reduce the attractiveness of a landfill to gulls. However, since the primary value of most landfills to gulls is as a food supply, it is likely that some gulls will still be present, even after habitat modification methods have been employed. The combination of habitat modification with active and diligent harassment of gulls can effectively eliminate gulls from landfills however. Following are some of the more effective harassment methods.

a.) Human Presence - Although various artificial or mechanical methods have been developed to influence gull behavior, the tendency for gulls to acclimate to them precludes their use as the main means of landfill gull control. Thus, human presence, at least on a periodic basis, is very important in this program. Once a control program is underway, human presence alone is often enough to move gulls from an area. When combined with other methods, such as pyrotechnics, human presence is even more effective. The goal of this phase of the program is for the gulls to associate the sight of landfill staff with danger. To achieve this, it's important to make each

encounter with landfill staff unpleasant, or better yet dangerous, for the gulls. This can be accomplished with the use of pyrotechnics, firearms, or other methods described below.

b) Pyrotechnics - A mainstay of most gull harassment programs is some form of pyrotechnic use. Shell crackers, "screamers" and "bangers" are most commonly used. These devices are essentially fire-crackers that are projected into the middle of a flock of gulls. Shell crackers are fired from 12 gauge shotguns, which for safety purposes should be single-barreled, breech-loading guns with an open choke (modified or improved cylinder). Screamers and bangers are smaller diameter projectiles which are fired from commercially available .22 caliber starter or blank pistols. It has been found that screamers are particularly effective on gulls. Judicious and varied use of several different kinds of pyrotechnics is important, to prevent acclimation by the gulls. A list of suppliers of pyrotechnic devices appears at the end of this document. [Note that the use of certain pyrotechnic devices in Massachusetts requires the possession of a Firearms Identification (FID) Card or a License to Carry Firearms.] In most situations, the combination of human presence and pyrotechnics will be enough to prevent gulls from landing and feeding. These two methods should form the foundation of the gull harassment program. However, various other methods are also available to supplement these methods.

c) Gull Distress Calls - Cassette tapes of recorded gull distress calls are sometimes used to elicit a sense of alarm or a flight response in gulls. The effectiveness of distress or alarm calls can be further enhanced by displaying a dead or decoy gull in a dying or distressed posture while playing the tape. Reactions to distress calls tend to be species-specific (i.e., to elicit the desired response in herring gulls, you need to use herring gull distress calls, etc.), and sometimes result in curiosity instead of flight responses in the target birds. In the latter case, shell crackers or screamers can be used to achieve the desired effect.

d.) Propane Cannons - These devices, which produce loud explosions at regular, pre-set intervals are often used in bird control, although their regularity often leads to acclimation, and thus reduced effectiveness. Again, they can be useful in combination with other methods.

e.) Visual Frightening Devices - These objects, including balloons with painted "eyes", flags and human or raptor effigies, are meant to provide gull control during times of no human presence. They may be effective in some situations, but seldom when used alone.

f.) Trained Dogs - While no information was found in the literature on the use of trained dogs to deter gull use of landfills, the technique still holds promise. Dogs have been used on occasion to scare problem birds from agricultural areas and airfields, and are currently used at a number of golf courses and corporate headquarters for controlling Canada geese. While still unproven as a control method for gulls at landfills, this method could prove to be very effective and inexpensive, and is worth pursuing if opportunities present themselves.

3. *Lethal Methods*

It is occasionally necessary to reinforce harassment with the actual killing or poisoning of one or more birds. Such activities do require a federal depredation permit, co-signed by the state Division of Fisheries & Wildlife. Depredation permits are issued by the U.S. Fish & Wildlife Service (USFWS); applications are available from the USDA Wildlife Services office (413 253-2403) or the USFWS Hadley office (413 253-8643). Permit applications should be submitted well in advance of the anticipated start date of the gull control program. Two to three months lead time should be adequate.

a.) Shooting - While pyrotechnics are often effective in dispersing gulls, the birds sometimes

acclimate to their use if no harm ever befalls them. Thus, it is sometimes necessary to supplement or reinforce pyrotechnic use with live shells that kill one or more gulls. For maximum effect and impact, shooting should be done when and where other gulls can witness the action. Considerable care should obviously be taken to avoid shooting of non-target species, and in residential areas. To avoid such problems, lethal methods should only be considered or used when other methods are becoming ineffective.

b.) Toxicants - Aversive conditioning of gulls has sometimes been achieved with the use of chemical frightening agents such as Avitrol. In Massachusetts, this is the only toxicant registered by both the USEPA and the MPB for use at landfills. When applied correctly, only a small percentage of the target population is affected (usually less than 1%), but the rest of the birds are frightened away from the site. The chemical is completely metabolized in the birds that ingest it, thus there is no risk of secondary poisoning of nontarget species. Where gull activity is heavy, Avitrol may have to be re-applied several times a year to maintain adequate control. As with other bird control methods, Avitrol is most effective when used as part of an integrated program with other bird control methods. Avitrol is a restricted-use pesticide and may only be applied by licensed applicators. Both state and federal wildlife control permits are required. Further, since some members of the public may be opposed to the use of toxicants, discretion should be used with this product.

C. Program Monitoring and Modification

A monitoring program is essential for documenting the effectiveness of the gull control program, as well as for determining if and when modifications in the program are needed. Further, some record-keeping is required as a condition of the issuance of depredation permits. At a minimum, daily records should be kept on gull numbers, harassment activities (methods used, number of shots fired, etc.), responses of gulls to control activities, and number of gulls shot. Field data forms (an example of one is attached) should be used for recording this information, and completed forms should be collected and filed on a daily basis. Such records represent very important information that allows for continuous evaluation of the effectiveness of various control methods, as well as the overall success of the gull control program.

V. SUMMARY

Inland concentration of herring, great black-backed and ring-billed gulls in Massachusetts constitutes a serious threat to drinking water supplies, air traffic safety, and public health and welfare in general. Effective control of gulls requires a concerted effort on the part of state and federal agencies, water supply managers and landfill owners and operators.

Control of gulls at landfills should involve a combination of habitat modification and active harassment, with the goal of achieving 100% effectiveness in preventing gull feeding and loafing on site. Specific gull control programs should be developed for each landfill operation, and be geared specifically to the particular situation and layout of that landfill. Assistance in developing these plans is readily available through several state and/or federal agencies. All landfill staff should be familiar with the goals and methods of the plan, which should include both habitat modification and active harassment techniques.

Habitat modification options include minimizing the surface area of the active landfill face, complete daily coverage of refuse, managing vegetation to create an inhospitable environment for gulls, eliminating water sources, and using physical barriers such as overhead wires to restrict gull access to food supplies. Harassment methods include human presence, use of pyrotechnics, gull distress call tapes, propane cannons, visual frightening devices and trained dogs. Lethal measures such as shooting or toxicants may

occasionally be needed to reinforce harassment methods.

Habitat modification works in conjunction with harassment techniques, and is intended to make the general area less attractive to gulls. Eliminating large open areas with no or low vegetation, along with good coverage of refuse and eliminating on-site water sources should accomplish this.

Gulls are very adaptable, and can acclimate quickly to any harassment method that poses no obvious threat of physical harm to them. Thus, it's important that gull control programs use a variety of methods and have the ability to switch quickly among them. In general, a diligent human presence, combined with the use of several pyrotechnic options and an occasional reinforcement with lethal methods (such as shooting) should be very effective. The use of trained dogs also holds potential.

In many cases, dramatic changes in gull behavior patterns can be brought about in only a few days if the harassment effort is diligent. In such cases, the gulls often leave the area altogether, at least temporarily, thus greatly reducing the amount of effort needed on subsequent days. However, as long as putrescible waste is available at the landfill, gulls will periodically visit the site and attempt to feed; thus, constant vigilance is required indefinitely to assure long-term success.

It is important that the gull control program remain adaptable and responsive to changes in gull populations, landfill operations, and concerns of the public and public agencies. This requires good record- keeping and communication. A close working relationship and open dialogue should be maintained with DEP, USDA APHIS Wildlife Services program and the MDFW. Private consultants are also available to train personnel, implement control programs, and/or conduct monitoring. MDC Division of Watershed Management staff is also available to share their knowledge and experiences with landfill gull control. These agencies, companies and individuals represent a wealth of information and experience on gull control methods and programs, and are ready and willing to consult with landfill operators on the development of effective programs.

RESOURCE LIST

I. TECHNICAL ASSISTANCE

Assistance with setting up and conducting gull control programs is available through several sources. For assistance with:

...control techniques, sources of supplies, permit applications, contact:

USDA APHIS
Wildlife Services office
463 West Street
Amherst, MA 01002
(413) 253-2403
(contacts: Laura Henze; Jennifer Lynch; Don Wilda)

...gull behavior, control program design, contact:

Brad Blodget, State Ornithologist
Massachusetts Division of Fisheries & Wildlife
One Rabbit Hill Rd.
Westborough, MA 01081
(508) 792-7270

In addition, staff from the Metropolitan District Commission, Division of Watershed Management have been conducting gull control operations at MDC reservoirs and local landfills for several years. The following people can provide information and suggestions based on those experiences:

Dan Clark
Wildlife Biologist
(508) 792-7423 ext. 215

John Scannell
Environmental Engineer
(508) 365-5292

Paul Lyons
Wildlife Biologist
(413) 323-8998

II. EQUIPMENT SUPPLIERS

A. Pyrotechnic devices:

The Bullseye Gunshop
1081 Huntindon Ave.
Waterbury, CT 06704
(203) 755-1055

Colonial Fireworks
5956 Ivanhoe
Ipsilanti, MI 48197
(313) 482-3272

Pyrotechnic devices (cont.)

Margo Supplies Ltd.
Site 20, Box 11, RR #6
Calgary, Alberta, Canada
T2M 4L5
(403) 285-9731

New Jersey Fireworks Co.
Box 118
Vineland NJ 08360
(609) 692-8030
[rope firecrackers]

O.C. Ag. Supply
1328 Allec St.
Anaheim, CA 92805
(714) 991-0960

Reed-Joseph Internat'l Co.
P.O. Box 894
Greenville, MS 38702
(800) 647-5554
[carry bombs, screamers, bangers]

Stoneco Inc.
P.O. Box 187
Dacono, CO 80514
(303) 833-2376

Sutton Ag Ent.
1081 Harkins Rd.
Salinas CA 93901
(408) 422-9693
[shellcrackers, whistlers]

Wald & Co.
208 Broadway
Kansas City, MO 64105
(816) 842-9299
[rope firecrackers]

Western Fireworks Co.
2542 SE 13th Ave.
Canby, OR 97013
(503) 266-7770

JPF Distributors
9 Union Square - Suite 184
Southbury, CT 06488
1-800-582-8843

TAPCO Inc.
P.O. Box 818
Smyrna, GA 30081
(800) 359-6195
[12-gauge bombs, mini-grenades]

B. Visual Bird Repellents:

The Huge Co.
7625 Page Blvd.
St. Louis, MO 63133
(800) 325-3371

Pete Konzak
Box 20
Minnewaukan, ND 58351
(701)473-5646
[jump-up scarecrow]

Orchard Equipt. & Supply
P.O. Box 540
Conway, MA 01341
(413) 369-4335
[balloons, flash tape]

Tri Lite Inc.
1335 West Randolph
Chicago, IL 60610
(312) 226-7778
[flashing lights]

Kite City
1201 Front St.
Old Sacramento, CA 95814
[hawk kite]

Mellingers
2310 W. South Range Rd.
N. Lima, OH 44452
(800) 321-7444
[scarecrow]

Sutton Ag. Ent.
746 Vertin Ave.
Salinas, CA 93901
(408) 422-9693
[kites]

Wildlife Mngmnt. Supplies
640 Starkweather
Plymouth, MI 48170
(800) 451-6544
[balloons]

C. Electronic or Recorded Sound Repellents:

Weitech, Inc.
P.O. Box 1659
310 Barclay Way
Sisters, OR 97759
(800) 343-2659

Johny Stewart
Box 7594
Waco, TX 76710
(800) 537-0652

Reed-Joseph Internat'l
232 Main Street
P.O. Box 894
Greenville, MS 38702
(800) 647-5554

Wildlife Control
Margo Supplies Ltd.
Site 20, Box 11 RR #6
Calgary, Alberta, Canada T2M 4L5
(403) 285-9731

Bird Busters
1083 Thomas Jefferson St., N.W.
Washington, D.C. 20007
(800) NO-BIRDS

Sutton Ag. Enterprises, Inc.
746 Vertin Ave.
Salinas, CA 93901
(408) 422-9693

Signal Education Aids
2314 Broadway
Denver, CO 80205
(303) 295-0479

III. SAMPLE FIELD DATA FORM

The form on the following page can be used to record daily gull observations, and to document the use and effectiveness of gull control activities.

FIELD DATA FORM - GULL CONTROL PROGRAM

FACILITY NAME: _____

DATA RECORDER: _____ DATE: _____

CONDITIONS:

SKY: _____

TEMPERATURE: _____

WIND: _____

PRECIPITATION: _____

GULL OBSERVATIONS AND CONTROL ACTIVITIES:

TIME	# GULLS PRESENT	LOCATION OF GULLS	GULL CONTROL METHODS USED	RESULTS

COMMENTS: _____
_____
_____
_____