

CHAPTER 6

ENVIRONMENTAL IMPACTS OF ALTERNATIVES

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6.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

This chapter contains an analysis of the environmental impacts of the methods and alternatives that were considered to be feasible and effective (Chapter 4). Impacts are identified for the following categories: ecological resources (target and nontarget wildlife, vegetation and other biotic resources), water quality, parks and recreation, socioeconomic, airport operations and safety, air quality, sociological issues (humaneness and aesthetics), Coastal Zone Management Policies and impacts on NPS lands.

6.1 REGULATORY COMPLIANCE, PERMITS, REVIEWS, AUTHORIZATIONS AND LICENSES

All bird hazard management activities at JFK are and will continue to be conducted in accordance with applicable state, federal and local laws and regulations. The 1994 FEIS lists some of the major laws and regulations pertinent to bird hazard management at JFK. The following list supplements material in the 1994 FEIS.

6.1.1 Bald and Golden Eagle Protection Act (16 USC 668)

When Bald Eagles were federally listed as a threatened species, the Endangered Species Act was the primary regulation governing the management of Bald Eagles in the lower 48 states. Now that Bald Eagles have been removed from the federal list of threatened and endangered species, the Bald and Golden Eagle Protection Act is the primary regulation governing Bald Eagle management. The Act makes it a criminal offense for any person to "take" or possess any Bald Eagle or any part, egg, or nest. The Act contained several exceptions which permit take under select circumstances. If an action could potentially affect either Bald or Golden Eagles in any of these ways, the agency must consult with USFWS. Bald Eagles were observed during the 2001-2002 WHA for JFK.

6.1.2 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The Federal Insecticide Fungicide and Rodenticide Act 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 pesticides used or recommended for bird hazard management are registered with, and regulated by the EPA and the NYSDEC, Bureau of Pesticide Regulation. The lead and cooperating agencies would also comply with all New York City pesticide use regulations. The lead and cooperating agencies would use all pesticides according to label directions as required by the EPA, NYSDEC and New York City Department of Health.

6.1.3 National Historical Preservation Act (NHPA) of 1966 as amended

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR§800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the

State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. At the time the 1994 FEIS was completed, the New York State Office of Parks, Recreation and Historic Preservation determined that the gull management activities proposed in the Integrated Management Alternative of the 1994 FEIS would have no impact on those characteristics of the property which would qualify it for inclusion on the State and National Registers of Historic Places (1994 FEIS Appendix E5).

If the agencies recommend modification of structures (e.g., installation of bird exclusion devices) or habitat management practices such as grading or filling of a site to eliminate standing water, actual implementation is the responsibility of the landowner or manager. The agencies will advise the landowner or manager that the scope of this Supplemental EIS does not address these types of activities and that the landowner or manager is responsible for completing all necessary permits and planning requirements such as NEPA, SEQRA, CZMA, NHPA, etc. as appropriate.

The agencies have determined that the actions proposed in this supplement do not differ substantively from those proposed in the 1994 FEIS in terms of their impacts on Historic and Cultural Resources. The proposed alternatives will not cause major ground disturbance or any physical destruction or damage to property, wildlife habitat, or landscapes, and will not involve the sale, lease, or transfer of ownership of any property. In general, the proposed 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 the agencies under the proposed alternatives are not the types of activities that would have the potential to affect historic properties.

6.1.4 Environmental Justice and EO12898 - “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”

Environmental Justice (EJ) is a movement promoting the fair treatment of people of all races, income and culture with respect to the development, implementation and enforcement of environmental laws, regulations and policies. EJ has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status (The EJ movement is also known as Environmental Equity -- which is the equal protection of all individuals, groups or communities regardless of race, ethnicity, or economic status, from environmental hazards).

EJ is a priority for the lead and cooperating agencies. EO 12898 requires Federal agencies to make EJ part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. All bird hazard management activities would be evaluated for their impact on the human environment and compliance with EO 12898 to insure EJ. The proposed bird hazard management methods would be used in accordance with all laws and regulations for the protection of the environment. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

6.1.5 Protection of Children from Environmental Health and Safety Risks (EO 13045)

Children may suffer disproportionately from environmental health and safety risks for many reasons, including their development physical and mental status. The lead and cooperating agencies have considered the impacts that this proposal might have on children. The proposed bird hazard management activities would use only legally available and approved damage management methods where it is highly unlikely that children would be adversely affected. For these reasons, the lead and cooperating agencies conclude that there would not be an adverse environmental health or safety risk to children from implementing this proposed action. In contrast, the proposed action may reduce adverse environmental health or safety risks by reducing risks of bird/aircraft strikes to which children may potentially be exposed.

6.1.6 Protection of Migratory Birds (EO 13186)

EO 13186 directs Federal agencies to protect migratory birds and strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through enhanced collaboration between WS and the USFWS, in coordination with State, Tribal, and local governments. A National-level MOU between the USFWS and WS has been drafted to facilitate the implementation of EO 13186.

6.1.7 Investigational New Animal Drug (INAD)

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

6.1.8 The Migratory Bird Treaty Reform Act of 2004

This Act clarifies the original purpose of the Migratory Bird Treaty Act as pertaining to the conservation and protection of migratory birds native to North America and directs the USFWS to establish a list of bird species found in the United States which are non-native, human-introduced species and therefore not federally protected under the MBTA. Mute Swans and Rock Pigeons belong to families of bird species which are included in the migratory bird conventions implemented by the MBTA, but which are specifically listed as non-native species not protected by the act. House Sparrows and European Starlings are non-native species which do not belong to any of the families protected by the MBTA.

6.1.9 Executive Order Executive Order 13112 - Invasive Species

Authorized by President Clinton, EO 13112 establishes guidance to federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. The EO, in part, states that each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law; 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations, provide for restoration of native species and

habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control, and promote public education on invasive species.

6.2 ABILITY OF ALTERNATIVES TO MEET MANAGEMENT OBJECTIVES

The overall purpose of this environmental analysis is to reduce bird hazards to aircraft and human safety at JFK. Four objectives were created in Section 1.9 to measure progress towards the purpose. Six reasonable alternatives were created and evaluated against the objectives. This section reviews each alternative to determine if the alternative could be successful in meeting the project objectives. This evaluation, in context of the environmental impacts analyses in Sections 6.3-6.10, will assist the decision maker in choosing which alternative(s) best achieve the overall goal of reducing birds hazards to aircraft and human safety. The four objectives are:

- a. Reduce total bird, gull and Canada Goose strikes with aircraft on an annual basis;
- b. Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to the airport. This would equate to a reduction in risk to aviation;
- c. Reduce the local resident Canada Goose population as measured by the number of geese at Gateway NRA and NYC, state, and local government owned parks and golf courses within 7 miles of JFK. This would equate to a reduction in risk to aviation in the vicinity of the airport. Actions under consideration for Gateway NRA could involve reducing the abundance of resident Canada Geese and Mute Swans. Reduction/relocation of the Laughing Gull colony is also considered under one management alternative (Alternative 5).
- d. Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK. If level and intensity of effort remain relatively constant, then the change in the number of these bird species shot would be a measure of the change in risk to aviation safety.

6.2.1 Alternative 1: Continue Current Bird Hazard Management Activities (No-action Alternative)

The current bird hazard management program at JFK includes on-airport hazing, shooting some birds to reinforce hazing, nest and egg destruction, shooting high-risk species on airport (i.e., Canada Geese), collecting bird strike information, runway sweeps prior to opening each runway, having tenants reduce the availability of attractants (e.g. food), habitat management, insect control, management of temporary standing water on the airfield, the on-airport bird shooting program, and outreach to off-airport landowners and managers. This alternative has had some success in achieving the four objectives.

Objective a) Reduce total bird, gull and Canada Goose strikes with aircraft on an annual basis.

The total bird strike rate for JFK has shown a slight declining trend after the initial sharp drop which occurred from 1991-1993 when the gull hazard management actions were initiated (Fig. 1-2). Much of the decline is attributable to declines in gull strikes (Fig. 1-3). Strike rates by non-gull species have been highly variable among years (Fig. 4-2), but do not appear to indicate the same decreasing trend as gull strikes. Consequently, strikes by non-gull species comprise an increasing portion of total strikes (Fig. 1-5). This alternative does not address the change in the proportion of strikes involving non-gull species.

The number of gull strikes has been significantly reduced. Laughing Gull strikes with aircraft have been reduced 76-99% annually from 1992 – 2008 (Washburn et al. 2009). Aircraft strikes with Herring, Ring-billed, and Greater Black-Backed Gulls have declined 44-88% annually since 1979. The majority of the decline in gull strikes is directly attributable to the on-airport shooting program (Washburn et al. 2009). Although overall strikes with Herring Gulls have also declined since the initiation of the integrated bird strike management program, Herring Gulls have replaced Laughing Gulls as the gull species most commonly struck at JFK. Differences between Laughing Gulls and Herring Gulls in the seasonal pattern of strikes may indicate that additional refinement of the gull hazard management program may be warranted to best address conflicts with all gull species.

During this time period, the number of resident Canada Geese living in New York state increased from 80,270 in 1995 to 257,390 birds in 2010 which is a 3-fold increase over 15 years (USFWS 2010). An estimated 25,000 resident Canada Geese lived in metropolitan NYC in 2009 (B. Swift, NYS DEC, pers. comm.). The number of Canada Goose strikes with aircraft at JFK has remained stable for about 30 years while the number of geese shot on the airport has increased significantly from 1 in 2000 to 163 in 2008 (Fig. 1-7). Some of this increase is likely related to the expansion of the supplemental on-airport shooting program to include species other than gulls (i.e., gulls, Canada Geese, Mute Swans, Rock Doves, and Double-crested Cormorants; Section 6.2.3) and the extension of the duration of the supplemental on-airport shooting program in 2008. These actions would not continue if Alternative 1 is selected.

Objective b) Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to the airport.

A wildlife hazard assessment was completed at JFK in 2002. A monitoring program using a similar study design as the wildlife hazard assessment was conducted at JFK in 2009-2010. We compared the difference in number of birds observed between the 2 studies to determine if the risk to aviation had changed (Table 6-1).

The current bird hazard management activities have had mixed results among the 9 bird species of greatest management concern. For some species, management activities have had the desired effect of reducing the number of individuals for a particular species. While for other species a different approach to reducing the number of birds observed on or adjacent to the airport is needed. Species where a different approach is needed to reduce abundance observed on or adjacent to the airport are resident Canada Geese, Mute Swan, Ring-billed Gull, and Rock Dove.

Table 6-1. The abundance of birds observed on and adjacent to John F. Kennedy International Airport during a wildlife hazard assessment conducted from August 2001 to July 2002 and a monitoring program from June 2009 to May 2010 using a breeding bird survey system (Section 2.3.1-North Channel Bridge Parking Area). JFK hazard management activities in 2009/2010 included some actions that are included in Alternative 3.

Species	<u>Wildlife Hazard Assessment 2002</u>		<u>Monitoring 2010</u>	
	Total Birds Seen	Average per Survey	Total Birds Seen	Average per Survey
Atlantic Brant	1,629	31.9	636	26.5
Canada Geese	155	3.2	366	15.3
Double-crested Cormorant	523	10.9	46	1.9
Greater Black-backed Gull	180	3.8	43	1.8
Herring Gull	1,365	28.4	931	38.8
Laughing Gull	488	10.2	207	8.6
Mute Swan	0	0	4	0.2
Ring-billed Gull	173	3.6	537	22.4
Rock Dove	162	3.4	205	8.5

Objective c) Reduce the local resident Canada Goose population by measuring the number of geese on New York City, state, and local government owned parks and golf courses within 7 miles of JFK.

The current bird hazard management program only provided off-airport technical assistance to landowners and land managers. Alternative 1 was ineffective at reducing the risk to aviation from Canada Geese using public lands within 7 miles of JFK. The Canada Goose population kept increasing while Alternative 1 was implemented. A variety of hazing methods using dog harassment, egg oiling, pyrotechnics, lasers, paintball guns, foot chase and other non-lethal methods were used on public lands. Some landowners posted signs informing the public feeding the birds is prohibited. One public property (Riker's Island) did habitat alteration, which helped but did not reduce gull abundance on the island and may have played a minor or no role in changing Canada Goose abundance on the island. Several studies (Holevinski et al. 2007, Preusser et al. 2008) have shown that hazed geese move among sites but never leave the local area. Seamans et al. (2009) observed 95% of local resident Canada Geese in NYC within 5 km of the banding location 95% of the time.

Objective d) Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK.

Data on gulls, geese, and cormorants shot at JFK by WS or the JFKWMU to reduce an imminent threat to aircraft were analyzed over a 6-year period from 2004 to 2009 (Fig. 6-1). Assuming level and intensity of effort remain constant, reductions in the birds shot should be an indicator of a reduction in risk of an aircraft striking a bird. Intensity of control increased in 2003 when the JFKWMU requested assistance from the

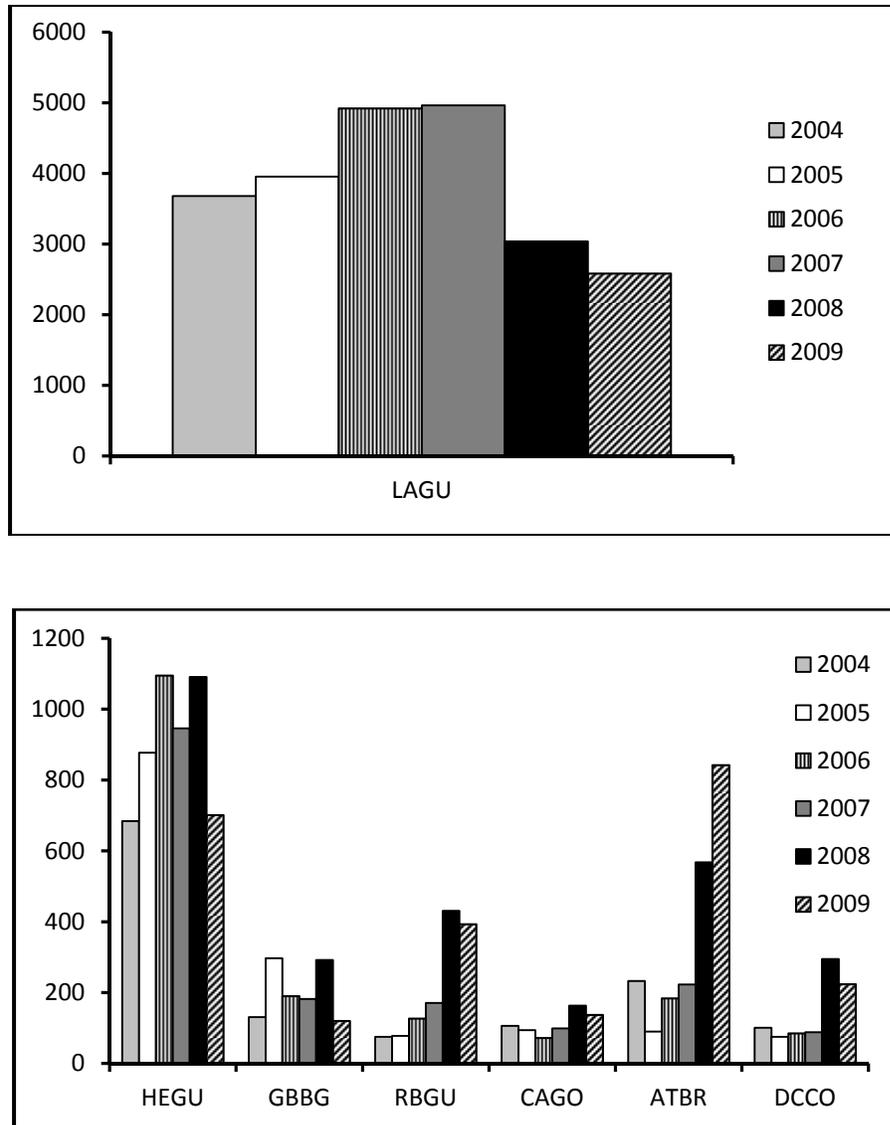


Figure 6-1. The number of Laughing Gulls (LAGU), Herring Gulls (HEGU), Greater Black-backed Gulls (GBBG), Ring-billed Gulls (RBGU), Canada Geese (CAGO), Atlantic Brant (ATBR), and Double-crested Cormorants (DCCO) shot at John F. Kennedy International Airport to protect aviation safety from 2004-2009. Figure include birds taken by WS during expanded (September-October) shooting program conducted in 2008 and 2009.

supplemental on-airport shooting program in taking Canada Geese, Brant, Mute Swans, and Cormorants which, because of their body size, are particularly hazardous to aircraft. Intensity of management effort also increased in 2008 when the duration of the on-airport shooting program was extended two months.

The effectiveness of Alternative 1, including portions of Alternative 3, appears to have varied among bird species Fig 6-1. The number of Laughing Gulls shot at JFK has declined in recent years, even with the extension of the supplemental on-airport shooting program in 2008 which may indicate that current program activities are having the desired impact. Take of Herring Gulls and Great Black-backed Gulls increased in 2008 when the supplemental on-airport shooting program was initiated, but not appreciably above levels seen previously. Take of these species decreased in 2009, but it is too early to tell if this is an indication of program efficacy or normal annual variation in take. Take of Ring-billed Gulls, Canada Geese, and Double-crested Cormorants increased over previous levels in 2008 when the shooting program was implemented, and then, for all species except brant, decreased in 2009. As with Herring Gulls and Great Black-backed Gulls, it is too early to determine if the decrease is the result of program efficacy or annual variation in take. The number of Atlantic Brant shot has increased in a stepwise manner and may indicate another strategy or method may be needed to reduce the number of these birds entering JFK airspace.

6.2.2 Alternative 2: Expand the Current Bird Hazard Management Program to include additional nonlethal methods on and off-airport

This alternative would add additional non-lethal methods by allowing government agencies to permit, recommend, and use non-lethal bird hazard management methods at off-airport sites. This alternative would include improvements in wildlife hazard monitoring on and off-airport, monitoring of the resident Canada Goose population within 7 miles of JFK and in the recording of non-lethal damage management efforts on airport. On airport, it could also include the use of lasers, capture and relocation (primarily raptors), repellents and remote controlled aircraft. Off airport methods which could be used or recommended would include habitat modification, harassment, exclusion, capture and relocation, managing human behavior, and repellents. At Gateway NRA, harassment and habitat modification could be used at Fountain Avenue and Pennsylvania Avenue landfills. Efforts to improve quality/availability of habitat for brant could also be conducted in Jamaica Bay. Repellents, exclusion and limited habitat modification could be used in developed areas of the park. Human behavior management (e.g., educating people to not feed birds) would be conducted throughout the park.

Objective a) Reduce total bird, gull and Canada Goose strikes with aircraft on an annual basis.

This alternative would support the objective of reducing total bird, gull and Canada Goose strikes. Monitoring and improved recording of nonlethal management actions would enable the JFKWMU and agencies to monitor the efficacy of current program and adjust program activities in response to changes in bird activity detected during the monitoring.

Implementation of the additional nonlethal measures on-airport is likely to help reduce total bird strikes, especially hazards associated with flocks of starlings which attempt to roost on airport property and specific raptors which could be relocated.

The permitting, recommending, or use of additional non-lethal methods at off-airport sites would probably have variable impact on reducing the risk to aviation. Impact will depend on the method and the species to be deterred. Birds must have a suitable alternative place to go for harassment to be effective. Additionally, the habitat must significantly change for birds to stop being attracted to a site. Harassment and capture and relocation without measures to impact habitat availability are unlikely to permanently deter birds from using a site because the birds will return once harassment stops or new birds will be attracted to the location.

Resident Canada Goose numbers have declined at Fountain and Pennsylvania Avenue Landfills where an enhanced non-lethal wildlife management program has been occurring for 4 years, mostly because of habitat change affected the ability of the birds to fulfill their life requirements any longer and limited population reduction of resident Canada Geese (Collins 2009). However, at locations such as playing fields, golf courses, and parks, the types of habitat management likely to result in long term changes in bird habitat use (e.g., managing for longer grass and grid systems) may be incompatible with the intended use of the location. For example, some individuals consider grid systems aesthetically unappealing at parks, and grass of sufficient length to deter waterfowl and gulls is generally too long for golf courses and playing fields.

Objective b) Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to the airport.

This alternative would permit, recommend or use non-lethal methods on off-airport sites, as well as conduct monthly monitoring of birds to measure efficacy of management actions. The additional non-lethal methods incorporated by this alternative would do little to reduce the abundance of 9 bird species over the long term. It will take the implementation of long-term habitat alteration and some population management to cause a decline in the 9 bird species above. Other nonlethal methods such as repellents and harassment are likely to result in relocation of birds, but not necessarily departure from the project area. Additional non-lethal methods may make it more difficult to implement bird removal actions since the birds would be more likely to scatter, thus making population management difficult.

Objective c) Reduce the local resident Canada Goose population by measuring the number of geese on New York City, state, and local government owned parks and golf courses within 7 miles of JFK.

Additional non-lethal methods would have little impact on the number of resident Canada Geese within 7 miles of JFK. Studies indicate that harassed geese usually remain within

1.9 miles of the treated area (Holevinski et al. 2007, Preusser et al. 2008). Consequently although most harassment methods may affect individual sites, it is regionally ineffective in reducing resident Canada Goose numbers. The level of habitat alteration that would likely be conducted within the 7 mile radius of JFK could impact goose use of specific sites (e.g., Fountain and Pennsylvania Avenue Landfills) but would likely not be of sufficient magnitude to reduce bird numbers in the metropolitan area. Numerous golf courses, playing fields, parks and similar sites would still be available and attractive to geese because the habitat management necessary to discourage bird use is either inconsistent with the intended use of the property or rejected by the landowner/manager as economically or aesthetically unacceptable. Gateway NRA, especially the Jamaica Bay Wildlife Refuge, provides important habitat for a wide range of wildlife species. The habitat changes needed to reduce resident Canada Goose use of the bay would have unacceptable consequences for nontarget species and would be inconsistent with the park mission. Implementation of a non-lethal program would be beneficial in preventing or deterring the establishment of a new goose population once the current population is reduced. Additionally, non-lethal management is often very expensive to implement and is beyond the means of most property owners or managers. The cost to harass birds at Fountain and Pennsylvania Avenue Landfills is about \$500,000 per year.

Objective d) Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK.

The monitoring of bird hazards and nonlethal damage management conducted on-airport would have a beneficial impact on the ability of managers to adjust program activities and methods to meet changing risks from birds at JFK. The new methods proposed for on-airport use would only have limited impact on geese (e.g., repellents) and are unlikely to have a substantive impact on gulls, or cormorants.

The number of gulls, geese and cormorants shot at JFK is directly related to off airport bird activity in the vicinity of JFK and birds moving through JFK airspace from Gateway NRA to locations within the city. As noted above, this alternative would likely cause relocation of some gulls and geese, but most birds are not expected to leave the 7-mile radius of the airport. There may actually be increased movement of birds and risks to aircraft by birds looking for new areas to feed where nonlethal methods are not being implemented. Ultimately, this may increase the number of birds shot at JFK.

6.2.3 Alternative 3: Increase On-Airport Lethal Bird Hazard Management Activities

This alternative would increase the duration of the supplemental on-airport shooting program from May through August to May through November. The shooting program would focus on large-bodied birds such as Canada Geese, Atlantic Brant, Mute Swans, Double-crested Cormorants, Herring Gulls, and Greater Black-backed Gulls. Program personnel would also be allowed to take Rock Doves, European Starlings, crows, and blackbirds to prevent birds from entering JFK airspace and striking aircraft. Nest and egg destruction would be used to discourage bird use of JFK property. This method would also include the use of lethal rabbit and rodent control to reduce prey for raptors on the airport.

Objective a) Reduce total bird, gull and Canada Goose strikes with aircraft on an annual basis.

Alternative 3 is similar to Alternative 1, as currently implemented, and would be expected to reduce the number of bird strikes at JFK by virtue of preventing target birds from entering JFK airspace. This would reduce the risk to aviation. This alternative may only be a partial solution for reducing the risk caused by target bird species because it doesn't address the source of birds attempting to enter JFK airspace.

Objective b) Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to the airport.

The effectiveness of this alternative would vary by species. This Alternative would be expected to reduce bird presence at the airport but would not necessarily impact bird numbers or activity near the airport. This alternative would also not address the reasons some bird species are present at or near the airport. An integrated approach may be needed to reduce abundance of most species. For example, for Atlantic Brant, an ecological approach which restores habitat quality and removes non-native Mute Swans and reduces the number of resident Canada Geese may provide additional food resources in Jamaica Bay which would allow Atlantic Brant to feed away from the airport. If brant feed away from the airport fewer would be shot. However, under current conditions, food resources for brant are limited and brant are changing feeding habits to acquire non-traditional food resources by grazing upland cultivated grasses instead of natural foods in the marsh. Similarly, given the relatively high number of resident Canada Geese in the vicinity of JFK, on-airport shooting is unlikely to substantively impact the local population.

Objective c) Reduce the local resident Canada Goose population by measuring the number of geese on New York City, state, and local government owned parks and golf courses within 7 miles of JFK.

Based on analysis in this chapter, this alternative would have little effect on this objective.

Objective d) Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK.

Portions of this alternative have already been implemented. As discussed for Alternative 1, this alternative has had the short-term impact of increasing the number of birds shot at JFK. The portion of the recent increase in take of some species which is attributable to this alternative is difficult to determine since at least some if not many of the birds taken by the shooting program would also have been taken by the JFKWMU. Long term impacts would vary by species and would depend on species activity near JFK and through JFK airspace, abundance and tendency to learn to avoid JFK airspace. Data

presented in Section 4.3.1-Supplemental On-Airport Shooting Program indicates that some gull species may be able to learn to avoid JFK airspace in response to the shooting program. This may also be possible for other species. The use of additional lethal methods would be beneficial and effective for reducing risk to aviation caused by some gulls species but, based on data in Fig. 6-1, does not appear to be having an impact on Atlantic Brant.

6.2.4 Alternative 4: Off-airport Lethal Bird Hazard Management

This alternative would enable lethal bird hazard management projects at off-airport sites, except at the Laughing Gull colony. This alternative would be used for managing resident Canada Goose populations at city, state, and local parks and golf course within 7 miles of JFK. It would also include management of Mute Swans, blackbirds, crows, Double-crested Cormorants, European Starlings and Rock Pigeons. Methods which could be used under this alternative include nest and egg destruction, egg oiling/addling/puncturing, live-capture and euthanasia, avicides, and shooting. Actions proposed for use at Gateway NRA would be limited to live-capture and euthanasia of resident Canada Geese and non-native Mute Swans at Rulers Bar Hassock, Fountain Avenue and Pennsylvania Avenue Landfills, and egg oiling/addling/puncturing of Mute Swan eggs. Oiling/addling/puncturing resident Canada Goose eggs could also occur if the number of resident Canada Geese at Gateway NRA is reduced.

Objective a) Reduce total bird, gull and Canada Goose strikes with aircraft on an annual basis.

This alternative would greatly assist JFK in decreasing Canada Goose strikes with aircraft if the airport is able to reduce local resident Canada Goose populations at all nearby sites including Rulers Bar Hassock and Pennsylvania and Fountain Avenue Landfills within Gateway NRA. The more than 775 geese at this site pose a continuing threat to aviation safety at JFK which cannot be addressed without cooperation from the NPS. This site is about one mile from the airport and geese routinely fly from the site to the airport, or through JFK airspace while on their way to other locations within the city. Collared geese from the hassock and landfill have been shot at JFK. A related project which removed geese from the entire area around LaGuardia airport seems to be reducing Canada Goose hazards at that location (Collins and Humberg 2010a).

Alternative 4 would also allow for additional management of hazards associated with Rock Pigeons, blackbirds, crows, starlings, and gulls. Off-airport actions involving these species would be limited to specific situations which are contributing to problems (e.g., a particular flock of birds). Consequently, impact on the total annual number of strikes would likely be limited.

This alternative does not include management of gulls and would have no impact on gull hazards to aircraft at JFK.

Objective b) Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to the airport.

The effectiveness of this alternative would vary by bird species. For resident Canada Geese, the benefits would be readily apparent. For other birds species limited lethal management would benefit the airport and reduce the number of birds observed on the airport but may not be readily detectible in monitoring. Brant are primarily a problem at JFK because their response to limited food in the bay has been to forage in grassy areas near JFK. By decreasing Canada Goose and Mute Swan numbers and foraging pressure at Gateway NRA, this alternative may have an indirect beneficial impact on brant strikes by providing improved foraging areas for brant farther from the airport. A reduction in Mute Swans in Jamaica Bay would decrease the number seen on the airport. Similarly, the reduction of resident Canada Geese within 7 miles of JFK would decrease the number of Canada Geese seen on the airport. The impact of egg oiling/addling/puncturing on cormorants observed on or near the airport is more uncertain. The impact of off-airport lethal bird hazard management for Rock Pigeons would only be measureable if the management action was large and broad. However a project on this scale for the protection of aircraft safety is not currently proposed.

Objective c) Reduce the local resident Canada Goose population by measuring the number of geese on New York City, state, and local government owned parks and golf courses within 7 miles of JFK.

This alternative would likely only reduce the total number of resident Canada Geese seen within the 7 mile radius if Gateway NRA allows access to their lands. If goose removals are not conducted at Gateway NRA, the overall program impact would be uneven with reductions in the number of resident Canada Geese at nearby city and state-owned parks counterbalanced by likely increases at Gateway NRA.

Objective d) Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK.

Additional off-airport lethal bird hazard management would vary depending upon the species. Data from the 2009, NYC resident Canada Goose population management project were mixed. The number of Canada Geese taken at JFK from June 2009-May 2010 was lower than the annual average from June 2004 - May 2009. However, the number of Canada Geese taken at LaGuardia from June 2009-May 2010 was slightly higher than the annual average for June 2004-May 2009. Results at LaGuardia may have been confounded by the fact that personnel at LaGuardia received new equipment in 2008 and 2009 to increase the effectiveness of bird removal operations on the AOA (Collins and Humberg 2010a). The impact on specific species is the same as that presented in Objective b above.

6.2.5 Alternative 5: Add Reduction or Relocation of the Laughing Gull Colony to Current Bird Hazard Management Program

This alternative, if implemented, would reduce the size of the Laughing Gull Colony nesting in Jamaica Bay on Gateway NRA land. A permit would be required from Gateway NRA before any management could occur. The colony would be reduced by nest and egg destruction on Gateway NRA, shooting of gulls flying into JFK airspace, shooting gulls on-colony, synthetic dead gull models, and, if registered, the use of avicides. Nest and egg destruction would occur 3 times per nesting season. This management action would most likely occur over several years and may need to occur indefinitely to maintain a reduction in nesting Laughing Gulls. It is highly unlikely the colony can be relocated exclusively through the use of existing wildlife management methods because the habitat will continue to attract nesting Laughing Gulls. However, changes in environmental conditions which lead to the loss or degradation of saltmarsh habitat or a combination of habitat change and damage management efforts may be more likely to result in Laughing Gull abandonment of the colony site.

Objective a) Reduce total bird, gull and Canada Goose strikes with aircraft on an annual basis.

The current program has been very effective in reducing the number of Laughing Gull strikes at JFK. This alternative is being reconsidered, in part, as an alternative way to achieve similar or improved results. Laughing Gull strike rates are already low, so this alternative may not have a measurable impact on Laughing Gull strike rates. This alternative would reduce the number of gulls in the colony and thus the number of adult and juvenile Laughing Gulls attempting to fly through JFK airspace. The feasibility and efficacy of this approach is challenging. With enough resources it may be feasible to locate and destroy all nests. The efficacy of reducing a Laughing Gull colony will depend in part on the gulls having an alternative place to nest and the availability of resources for what would likely be a long-term management effort. This alternative would be additive to the on-airport shooting program and not replace the shooting program although the need for the shooting program to address Laughing Gull issues is expected to decrease.

This alternative only addresses strikes by Laughing Gulls and is not expected to have any impact on strikes by any of the other species. As noted above, Laughing Gull strikes are also not expected to change substantially under this alternative, so this alternative will have no impact on total bird strikes or strikes involving geese or other gulls.

Objective b) Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to the airport.

This alternative would have no effect on other bird species of concern to aviation safety.

Objective c) Reduce the local resident Canada Goose population by measuring the number of geese on New York City, state, and local government owned parks and golf courses within 7 miles of JFK.

This alternative would have no effect on the local resident Canada Goose population.

Objective d) Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK.

This alternative is being reconsidered, in part, as an option for reducing Laughing Gull strikes without the need to shoot >2,000 Laughing Gulls per year. The intention is that relocating the colony would greatly reduce or eliminate the presence of Laughing Gulls at JFK and associated need to use shooting. Ultimately the ability to reduce the number of Laughing Gulls shot would depend on the efficacy of relocation efforts.

6.2.6 Alternative 6: Increase Integrated Bird Hazard Management – Proposed Action

This alternative would be a combination of alternatives 1-5 described above. It would allow the greatest flexibility for the agencies to use or recommend a full range of bird hazard reduction techniques.

Objective a) Reduce total bird gull and Canada Goose strikes with aircraft on an annual basis.

This alternative would have the greatest likelihood of reducing total bird, gull and Canada Goose strikes with aircraft since it uses strategies and methods from each alternative that are effective and feasible. The benefits of this objective are discussed in more detail under Alternatives 1-4.

Objective b) Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to the airport.

This alternative would have the greatest likelihood of reducing the number of gull, Canada Goose, Atlantic Brant, Double-crested Cormorants, Mute Swans, and Rock Pigeons observed on or adjacent to JFK because it uses strategies and methods from each alternative that are effective and feasible.

Objective c) Reduce the local resident Canada Goose population by measuring the number of geese on New York City, state, and local government owned parks and golf courses within 7 miles of JFK.

This alternative would have the greatest likelihood of reducing the number of resident Canada Geese within 7 miles of JFK and the efficacy of this approach can be measured through monitoring goose abundance at city, state, and local parks. The benefits of this objective are discussed in more detail under Alternative 2 and 4. Where practical and effective, nonlethal methods such as habitat management, human behavior management, exclusion or reproductive inhibitors would help keep resident Canada Goose populations at reduced levels. However, utility of some methods will be limited because habitat

alterations or exclusion systems may be incompatible with site uses and landowner/manager objectives.

Objective d) Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK.

This alternative would have the greatest likelihood of reducing the number of Canada Geese, Gulls, and Double-crested Cormorants shot on the airfield at JFK. While it may reduce the number of Atlantic Brant shot on the airfield at JFK, the need for research into alternative solutions for brant threats to aviation are needed.

6.3 IMPACT ANALYSIS FOR ALTERNATIVE 1: ORIGINAL PROGRAM/ NO-ACTION ALTERNATIVE

Impacts of the No-action proposal remain largely as identified in the 1994 FEIS Sections 5.3 (Continue the existing program), 5.4.2.4 (reducing off-airport attractants), 5.5 (Expand on-airport nonlethal program), and 5.7 (supplemental on-airport shooting program). The primary differences are impacts on target and nontarget wildlife, and the new review of sociological issues which are addressed below.

Cumulative Impacts. Cumulative impacts of each alternative to target and non-target populations are discussed and analyzed in this chapter and effects from this management plan are discussed in relationship to bird species/groups. The SEIS recognizes that the total annual removal of birds by all causes is the cumulative mortality. Cumulative impacts would be mortality caused by the proposed bird hazard management and other known causes of mortality (USDA 1997).

Quantifying all possible sources of mortality and adverse impact on a wildlife population is virtually impossible. Instead, information on population trends is used as an indicator of the consequences (i.e. cumulative impacts) of existing conditions and removals on the population. Cumulative impact of the proposed alternatives is determined by examining the proposed impact in context of existing population trends. Known substantial management programs (e.g., the NYC resident Canada Goose conflict management actions) are specifically included in the analysis. Cumulative impacts on bird populations are further monitored by the NYSDEC and USFWS on an ongoing basis through the issuance and review of migratory bird permits. Recent history of regional bird take under permits for the region is included in the analysis to facilitate understanding of cumulative impacts on bird populations.

6.3.1 Impact on Target Bird Species

The current bird hazard management program at JFK includes the use of non-lethal and lethal methods to reduce bird hazards to aircraft (Section 2.2). Bird hazard management at airports can be said to have both beneficial and negative impacts on target bird species. Prevention of bird strikes not only reduces hazards to aircraft and risks to human safety, it also prevents the death of

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

birds involved in the strike. Negative impacts on target species could potentially result from lethal bird removal, egg oiling/addling/puncturing, or nest destruction.

Most birds killed at JFK for bird hazard management are shot, however, live-capture and euthanasia may be used to remove species such as resident blackbirds, crows, starlings, and Rock Pigeons. The JFKWMMU has also used nest and egg destruction on-airport to address problems with Canada Geese, American Oystercatchers, Killdeer, Willet and Northern Harriers (Sections 1.7.2, 1.7.8 and 1.7.14). The JFKWMMU work with off-airport landowners and managers has not resulted in the elimination of any limited or critical wildlife habitat. However, the JFKWMMU has worked with some landowners and managers on site development to avoid creation of habitat for bird species which may pose hazards to aircraft (e.g., restoration of Pennsylvania Avenue and Fountain Avenue Landfills).

Bird Population Information

Current bird population estimates are unavailable for most species of birds and thus have to be estimated from the best available information. The best information currently available for monitoring most bird population trends is data from the Breeding Bird Survey (BBS). The BBS is a long-term (1966-2007¹⁵), large-scale inventory of North American birds, coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center, combines a set of over 3,500 roadside survey routes primarily covering the continental United States and southern Canada (Sauer et al. 2008). BBS routes are surveyed each May and June by experienced birders. The stated primary objective of the BBS has been to generate an estimate of population change for songbirds. Estimates of population trends from BBS data used in this report 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) for a particular geographic area and is best calculated over a number of years. *P*-values lower than 0.05 are generally considered statistically significant.

To use the BBS a few assumptions need to be accepted:

- All birds within a ¼ mile of the observer are seen at all stops on a BBS route. This assumption is faulty because observers often cannot see a ¼ mile in radius at all stops due to obstructions such as hills, trees, and brush and because some bird species are elusive. Therefore, the birds seen per route would provide a conservative estimate of the population. The detectability of birds varies depending on terrain and cover.
- The chosen survey routes are totally random and are fully representative of habitats in the area of interest. However, when BBS routes are established, survey rules allow the observers to make stops for surveys based on better quality habitat or convenient parking areas, even though the survey sites are supposed to be spaced a ½ mile apart. Therefore, if survey areas had stops with excellent food availability, such as a landfill site or waterfowl nesting habitat where birds may congregate, the count survey could be biased.

¹⁵ Survey continues, but last year analyzed at time analysis was prepared was 2007.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

This would tend to overestimate the population. However, if these sites were not on a route at all, the population could be underestimated.

- Routes were randomly selected. Routes are randomly picked throughout the State/areas, but the exact location depends on the location of the nearest available road. The starting point is picked for accessibility by vehicle. Some birds tend to congregate along roadsides and others avoid roadside areas. Additionally, most BBS routes are selected because they are “off the beaten path” so the observer can hear birds without interruption from vehicular noise.
- Birds are equally distributed throughout the survey area. Each bird species has its own specific habitat requirements. This assumption is likely to be less of a problem for habitat generalists and birds which use relatively abundant habitat types than for birds such as shorebirds and waders. The assumption that birds are equally distributed throughout the survey area is especially problematical for colonial waterbirds. Even when routes are randomly located, only a limited number of routes are likely to include areas that might be used by colonial waterbirds. BBS data on the species may under or over-represent a species depending on whether a colony area is included in the survey area. Additionally, it is not unheard of for colonial waterbirds to abandon a site in response to disturbance, habitat alteration, or other factors. This can result in a sudden decrease or increase in BBS survey numbers if the original or new site is not included in a BBS survey route.

WS recognizes the statistical variability of the data and believes that, in spite of its limitations, for many species, the BBS represents the best available commercial and scientific data available to evaluate bird populations and population trends.

The National Audubon Society conducts nationwide bird surveys in December to early January (Audubon Christmas Counts). The Christmas Bird Count (CBC) provides information on the number of birds frequenting the state during the winter months. Like the BBS data, CBC data do not provide a population estimate, but can be used as an indicator of trends in the population. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (National Audubon Society 2010).

Partners in Flight Landbird Population Estimates Database

The BBS data are intended for use in monitoring bird population trends, but it is also possible to use BBS data to develop a general estimate of the size of bird populations. Using methods adopted by Partners in Flight (PIF) (Rich et al. 2004), the relative abundance of a bird population can be used to extrapolate a population estimate. The Partners in Flight system involves extrapolating the number of birds in the 50 quarter-mile survey circles (total area/route = 10 mi²) to the area of interest. The model makes assumptions on the detectability of birds during the survey, which varies for each species. For example, some species that are large such as Canada Geese or vocalize frequently such as Mourning Doves and Northern Bobwhites are much more easily detected during bird surveys than species that are small and inconspicuous such as owls and Horned Larks, or do not vocalize that often or loudly during surveys such as Horned Larks and American Bitterns. Additionally, breeding males are often the most visible during surveys while females may be in cover or on a nest and not detected as with Red-winged Blackbirds.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Information on the detectability of a species is combined to create a detectability factor which may be used with relative abundance data from the BBS to yield a population estimate. As noted above, one of the assumptions made when using BBS data to estimate population density is that the species in question is equally distributed throughout the survey area. While this assumption may be made for many species, it is especially problematical for unevenly distributed species such as raptors, waterfowl, shorebirds, vultures and colonial-nesting species such as gulls and cormorants.

The BBS divides the country into different physiographic strata which have similar habitat/ecosystem components called Bird Conservation Regions (BCRs). The BCRs are valuable for estimates of populations because of the similarity of habitat within each region. For purposes of this analysis, we used population estimates for BCRs 14 (Atlantic Northern Forest) and 30 (New England/Mid-Atlantic Coast) which include most of the area within USFWS Region 5 except the area of the region around the eastern Great Lakes which is BCR 13 (Lower Great Lakes/St. Lawrence Plain).

The PIF population estimation system has been subject to criticism because the methodology makes assumptions regarding BBS data, including adequacy of sampling for various habitat types, visibility of bird species, detection of breeding pairs, and diurnal activity patterns which are not valid for some species (See section on Bird Population Information above; Thogmartin et al. 2006, Runge et al. 2009). A review panel assembled to assess the method identified several problems with the estimates (Thogmartin et al. 2006). The model assumes that each of the habitat types used in the model is sampled in the BBS in approximate proportion to its occurrence. However, as noted above, there are gaps in BBS coverage, especially in roadless areas, mountaintops, riparian and wetland areas, which may lead to over- or under-sampling of particular habitats. The adjustment for the detectability of breeding pairs was criticized because it failed to consider the occurrence of unpaired nonreproductive birds. Detection distances can vary among habitat types, time of day, time of year, calling rate song, volume and observer. There were also concerns related to the methodology used to establish the corrections for time of day. The model's assumptions are largely unproven and need scientific validation. Given criticism of the model and known difficulties in using BBS data to monitor unevenly distributed species, WS did not use BBS data to generate population estimates for gulls, waterfowl, raptors or shorebirds. However, population estimates derived using the PIF system were provided for other species when alternate data on population status were limited or unavailable.

Potential Biological Removal

Biological assessments for identifying the potential impact of harvest and/or removal programs on bird populations have a long history of application in the U.S. Population modeling and extensive monitoring programs form the basis of an adaptive decision-making process used to set migratory gamebird 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 on target species (Runge et al. 2008). One such tool is referred to as Potential Biological Removal (PBR; Wade 1998, Runge et al. 2004).

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

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

$$\text{PBR} = \frac{1}{2} R_{\max} N_{\min} F_R$$

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 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 ($F_R = 0.1$) or threatened species ($F_R = 0.5$; 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). To date, the PBR method has only been applied to a limited number of species (e.g., gulls, vultures, Red-tailed Hawks). When available, the PBR method has been incorporated into the population impact analysis for this supplement.

6.3.1.1 Gulls**Assessment of Authorized Take**

The PBR Method discussed above has been formulated for gull management. To estimate R_{\max} for Great Black-backed Gulls, Herring Gulls, Laughing Gulls and Ring-billed Gulls, the Slade formula (Slade et al. 1998) was used:

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

where p is adult annual survival rate, l_{α} 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 $\ln(\lambda)$. Population parameter estimates were taken from the literature for each gull species (Table 6-2), or in cases where estimates were not available, surrogate estimates from closely-related species were used (Seamans et al. 2007b). 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 6-2; Seamans et al. 2007b). Population estimates (N_{\min}) for each species were based on the number of gulls at known breeding colonies in Bird Conservation Regions (BCRs) 14 and 30 during the mid-1990's (MANEM 2006), and adjusted using a conservative estimate of 0.75 non-breeding gull per breeder to estimate the total population (Seamans et al. 2007b). Allowable take levels (± 95 CI) for each of the 4 gull species under 3 recovery factors (0.5, 1.0, 1.5) in BCRs 14 and 30 are presented in Table 6-3.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Table 6-2. Demographic parameter estimates (θ) used for estimating R_{\max} and Potential Biological Removal of gulls in BCR 14 and 30 (Seamans et al. 2007b).

Parameter	Age class	Great Black-backed Gull ¹		Herring Gull ²		Laughing Gull ³		Ring-billed Gull ⁴	
		(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

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

Table 6-3. Potential Biological Removal (\pm 95% CI) of Laughing Gulls, Herring Gulls, Great Black-backed Gulls and Ring-billed Gulls in Bird Conservation Regions 14 and 30, under 3 recovery factors (Seamans et al. 2007b).

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)

Laughing Gulls

For purposes of this EA, the Jamaica Bay Laughing Gull colony is considered to be comprised of birds nesting on JoCo Marsh and adjacent East High Meadow, and Silver Hole Marshes. This colony is the only known Laughing Gull breeding colony in the state of New York (Washburn et al. 2010). The NWRC, with assistance from the JFKWMU, Gateway NRA and cooperating agencies, has monitored the Jamaica Bay Laughing Gull colony via a combination of ground and aerial surveys conducted yearly since 1992 (Washburn and Tyson 2010, Fig. 6-2). For the period of 1992-2010¹⁶, the majority of

¹⁶ Aerial survey was not conducted in 2009 due to weather conditions.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Laughing Gulls nests have been on JoCo Marsh. For the period of 2000 – 2008, JoCo Marsh has become increasingly important for the Jamaica Bay Laughing Gull colony, with the number of nests on JoCo Marsh increasing from 64-80% of all nests counted per year for 1992-1999 to 87 -98% of all nests counted for 2000-20010 (Washburn and Tyson 2010). The shift in use of nesting area is likely related to erosion and periodic tidal flooding which has reduced the amount of available nesting habitat in Silver Hole and East High Meadow Marshes in recent years (Washburn and Tyson 2010; Fig. 6-3).

In the 1994 FEIS, Belant and Dolbeer (1993*b*) and Dolbeer (1998*a*) predicted that the supplemental on-airport shooting program would result in a decrease in the Jamaica Bay colony, but would have minimal impact on the regional and national Laughing Gull populations. As predicted, the Jamaica Bay Laughing Gull colony has decreased since the implementation of the supplemental on-airport shooting program (Fig. 6-2). However, the decline (approximately 74%) is probably not solely attributable to the number of Laughing Gulls killed to reduce bird strikes at JFK (Table 4-1), but is likely also attributable to loss of nesting habitat on Silver Hole (starting in 2000) and East High Meadow (starting in 1997, Washburn and Tyson 2011). Loss of habitat on East High Meadow and Silver Hole to tidal flooding and erosion is similar to that which has been documented for many marsh islands in Jamaica Bay (Tanacredi et al. 2002, NPS 2001; Figs 6-3 and 6-4). An alternative hypothesis is that the sharp declines in Laughing Gull use of Silver Hole and East High Meadow may be attributable to a contraction of the colony resulting from the decline in gull numbers. The gulls may have moved to JoCo marsh to gain advantages of using areas with greater nesting density (e.g., improve defense from other gull species such as Herring Gulls). No data is available documenting predation impacts on the Laughing Gull colony.

Bird bands on Laughing Gulls taken by the JFK bird hazard management program indicate that Laughing Gulls at JFK are part of a larger regional population which includes birds from New Jersey, Massachusetts, Virginia and Maine (Table 6-4). According to the USFWS (2008*b*), Laughing Gulls are categorized as a species of low conservation concern in North America and BCRs 14 and 30. Over 205,300 Laughing Gulls are believed to nest in BCRs 14 SFWS 2008*b*). Of these, over 13,500 are in Southern New England which includes New York. Despite the lethal removal of 90,592 Laughing Gulls over the period of 1991-2009 (approximately 5.5 times the number of Laughing Gulls in the Jamaica Bay Colony in 1990), population trend data from the BBS indicate that the bird hazard management program at JFK has not reduced national Laughing Gull population which has shown a mean annual increase ($P = 0.01$) of 3.3% for the period of 1966-2007 (Sauer et al. 2008, Fig. 6-5). Laughing Gulls have expanded their range southward since approximately the 1970s. However, this appears to be a return to European settlement ERA historic range (Maine to Florida) rather than an expansion into new territory (Burger 1996).

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

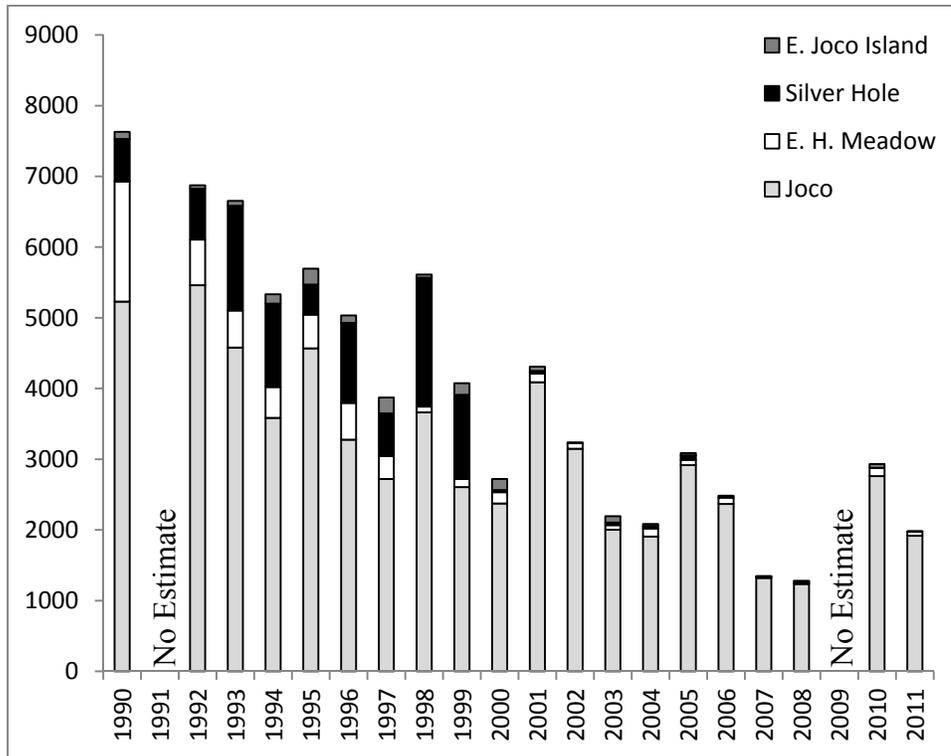


Figure 6-2. Estimated number of Laughing Gull nests in Jamaica Bay Laughing Gull colony obtained through the combined use of ground and aerial surveys (Data taken from Washburn and Tyson in 2010). Weather conditions prevented Survey in 2009.

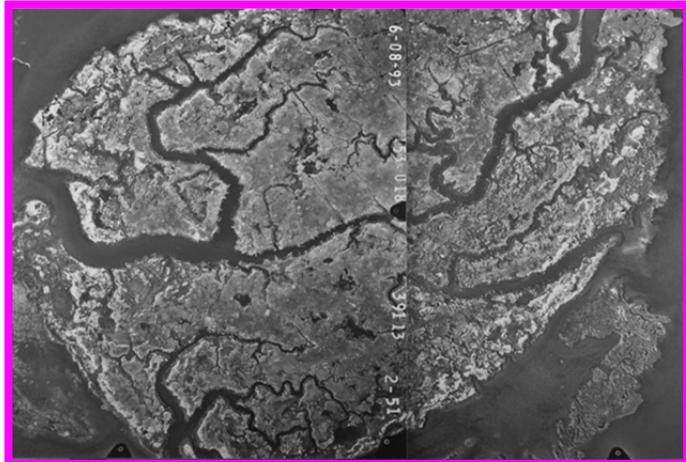


Figure 6-3. Photo of JoCo Marsh, Gateway National Recreation Area, New York, NY. Box indicates portion of East High Meadow shown in Figure 6-4. Photo courtesy of B. Wasburn, NWRC, Sandusky, OH.

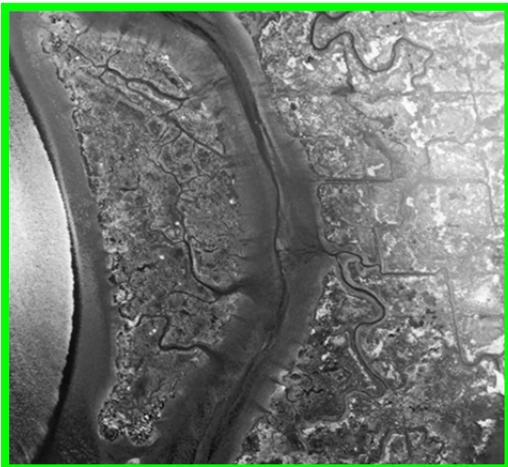
Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.



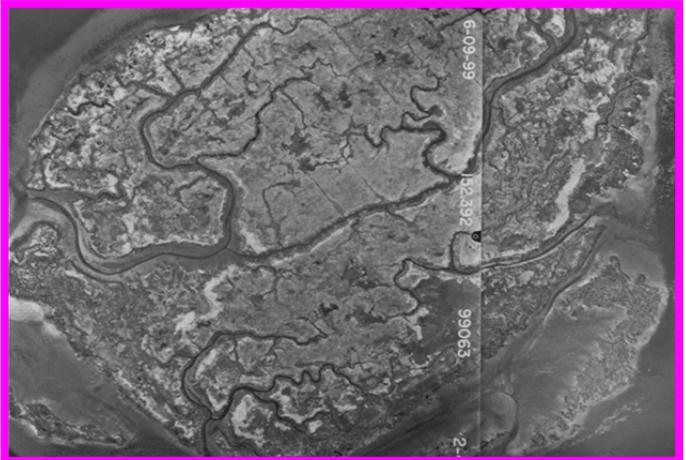
East High Meadow 1993



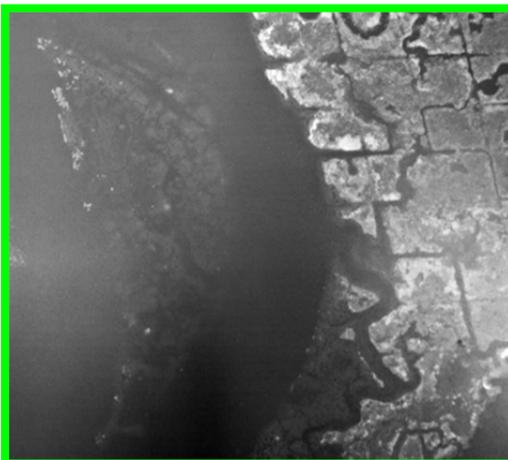
Silver Hole 1993



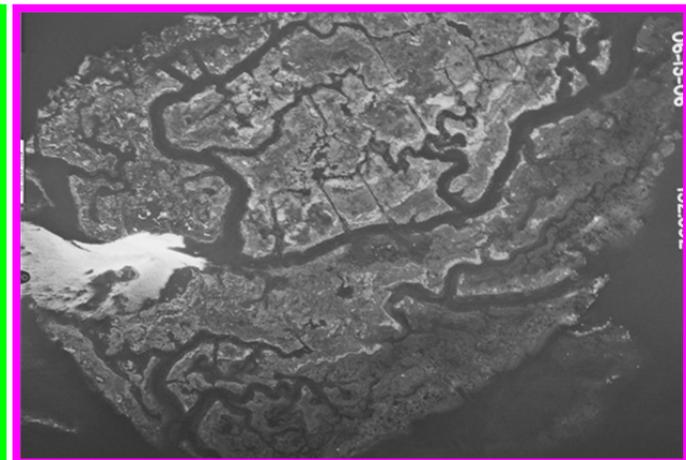
East High Meadow 1999



Silver Hole 1999



East High Meadow 2006



Silver Hole 2006

Figure 6-4. Aerial photographs of East High Meadow and Silver Hole portions of JoCo Marsh (Fig. 6-3) showing marsh erosion over time. Photos courtesy of B. Washburn, NWRC, Sandusky, OH.

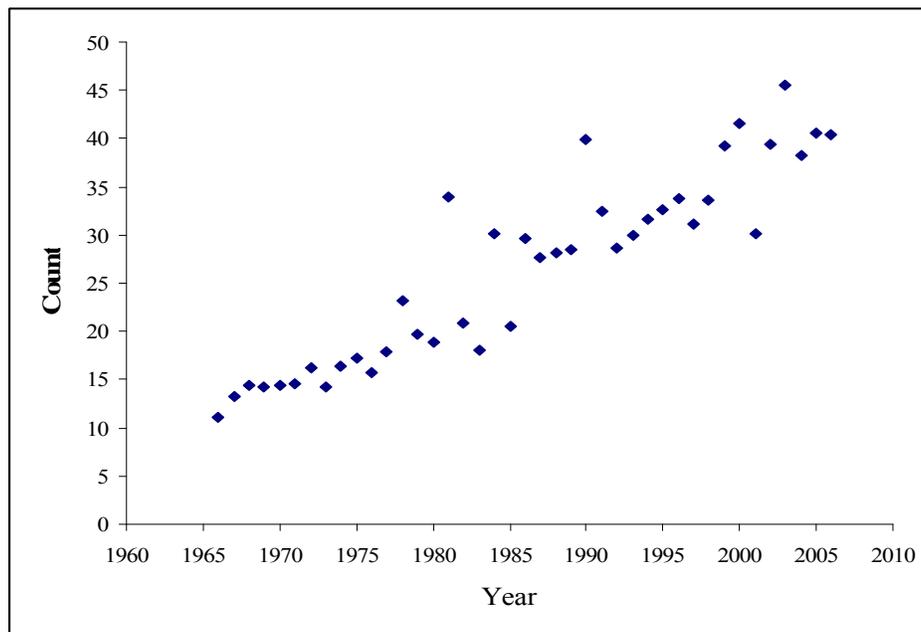
Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Figure 6-5. U.S. Department of the Interior, Geological Survey, Breeding Bird Survey data for the United States' Laughing Gull population.

The mean annual population index for Laughing Gulls from Virginia to Maine was 52% higher for the 15-year period, 1992-2006 compared to the 15-year period, 1976-1990 (Fig. 6-6, Washburn et al. 2009). The estimated Laughing Gull population north of JFK from Massachusetts to Maine increased 2.8 fold over the period of 1991 to 2007, but the New Jersey population south of JFK decreased by approximately 11% over the period of 1989 to 2007 (Table 6-5). At least some of the decline in the New Jersey Laughing Gull colony may be attributable to the reduction in the Barnegat Light, NJ colony from approximately 6,700 nests in 1989 to less than 100 nests in 1991 (Washburn et al. 2009). The decline appears to be associated with the construction of a major jetty at Barnegat Inlet, NJ which resulted in elevated spring tides that displaced nesting gulls from traditional colony sites (Washburn et al. 2009). However, a number of the gulls taken at JFK (Table 6-4) have come from New Jersey and it's possible that some of the decline may be related to bird hazard management activities at JFK (Brown et al. 2001a).

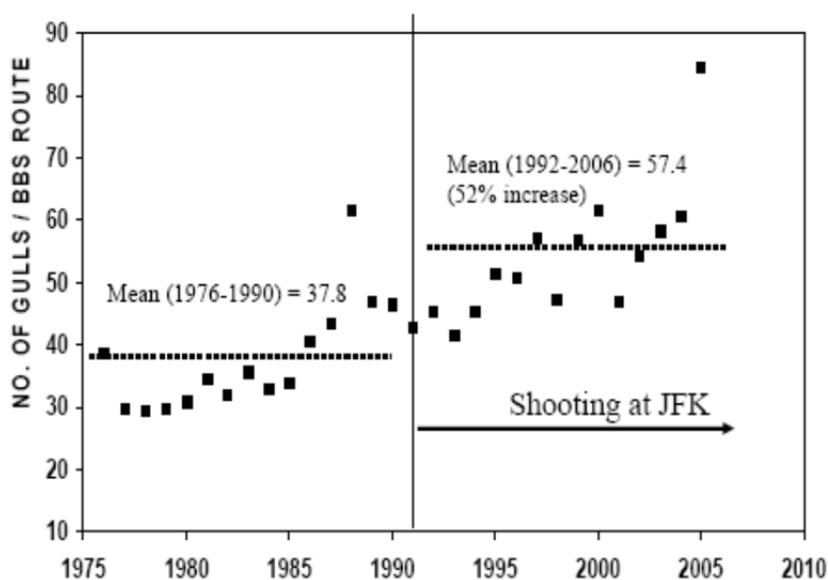
Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Figure 6-6. The mean number of Laughing Gulls recorded per Breeding Bird Survey route (Sauer et al. 2007) in the states encompassing U.S. Fish and Wildlife Service Region 5 (Virginia-Maine) during the 15 years, 1976 – 1990 (before shooting began at JFK International Airport), and in the 15 years, 1992-2006, after shooting began. Figure from Washburn et al. (2009).

During the period of 2007-2009 between 5,586 and 7,713 Laughing Gulls were killed per year in USFWS Region 5 under permits from the USFWS. This figure includes the number of Laughing Gulls that were taken for bird hazard management at JFK. The number of Laughing Gulls taken for projects other than JFK ranged from 3,003-3,980 gulls per year. To maintain current population levels, data from the PBR model indicate that a total of 15,274 Laughing Gulls may be taken annually based on $F_R = 1.0$ in BCR 14 and 30 (Table 6-3). Gulls are a long-lived species with a lifespan of approximately 10-15 years. Egg oiling for a limited period of time and at limited sites in the region may inhibit population growth in the years in which it is conducted but is not likely to adversely impact overall viability of the population.

The USFWS permit issued to JFK allows for the annual take of up to 8,100 Laughing Gulls per year. For the last 5 years, annual Laughing Gull take has been below 5,000 birds per year and is well below the level the PBR analysis indicates may be taken, even when Laughing Gull take for projects other than JFK is taken into consideration. Given this analysis, we conclude that the current bird hazard management program at JFK in combination with all other factors, does not appear to have an adverse cumulative impact regional Laughing Gull population, but has resulted in local reduction in Laughing Gull numbers in Jamaica Bay. Ongoing marsh degradation is a concern. Models of the impact of climate change on the bay indicate that the saltmarshes may not be able to keep pace with accelerated rates of sea-level risk which may occur (Kracauer Hartig et al. 2002). Even in the absence of the shooting program, if saltmarsh loss continues, Laughing Gulls may eventually abandon the JoCo site.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**Table 6-4.** Natal origin of banded gulls shot at John F. Kennedy International Airport (JFK), May-August 1991-2008. Table from Washburn et al. 2009.

Gull species	Location where gull was banded as chick ^a	Distance (km) from JFK	Number of gulls shot at JFK
Laughing Gull	Jamaica Bay, NY	1	63 ^a
	Barnegat Light, NJ	106	575
	Beach Haven, NJ	130	2 ^b
	Atlantic City, NJ	155	2
	Stone Harbor, NJ	200	10
	Monomoy Island, MA	250	1 ^c
	Chincoteague, VA	340	3
	Appledore Island, ME	365	1
	Petit Manan, ME	700	1
	Herring Gull	Point Lookout, NY	16
New Rochelle, NY		28	3
Captree State Park, NY		43	1
Fire Island Inlet, NY		70	3
Norwalk, CT		70	2 ^d
Barnegat Light, NJ		106	1
Hingham, MA		250	1
Cuttyhunk Island, MA		250	1
Great Black-backed Gull	Great Duck Island, ME	380	2
	Fire Island Inlet, NY	70	2
	Block Island, RI	190	5

a The 63 gulls shot were from a population 668 chicks (48-200/year) banded at Jamaica Bay, 1995-2000 (Port Authority of New York and New Jersey and K. Brown, unpublished data). In addition, 29 banded Laughing Gulls were shot at JFK out of 154 that had been banded as nesting adults at Jamaica Bay, 1990-2000 (22 in 1990 [Griffin and Hoopes 1991]; 7 in 1996, 73 in 1999 and 52 in 2000 [K. Brown, unpublished data]).

b In addition, a Laughing Gull banded as an adult at Beach Haven, NJ was shot at JFK.

c There is possibility that band number was misread because of extreme wear. 34

d In addition, 2 Herring Gulls shot at JFK had been banded as after-second-year birds at Stonington, CT and Massapequa Park, NY, 165 and 32 km, respectively, from JFK.

e In addition, a Laughing Gull of unknown age at banding was shot at JFK that had been banded somewhere in North Carolina, 500 to 850 km from JFK.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**Table 6-5.** Laughing Gull population status in Northeastern USA from New Jersey to Maine, 1977-2007, in relation to gull-management program at JFK from 1991-2007. No known colonies of laughing gulls are present in Canada, or coastal states Rhode Island, Connecticut, or New Hampshire. Table from Washburn et al. (2009).

State	Year	Estimated Nesting Pairs	Source of information
New Jersey ^a	1977	30,730	Erwin and Korschgen (1979)
	1985	58,192	Andrews (1990)
	1989	55,000	Jenkins et al. (1989); New Jersey DEP (2008)
	1995	39,085	New Jersey DEP (2008)
	2001	80,253	New Jersey DEP (2008)
	2004	54,481	New Jersey DEP (2008)
	2007	49,000	New Jersey DEP (2008)
New York	1977	0	Erwin and Korschgen 1979
	1979	15	Buckley and Buckley (1984)
	1990	7,629	Griffin and Hoopes (1991)
	2002	3,238	Dolbeer and Bernhardt (2002)
	2007	1,346	Washburn and Tyson (2010)
Massachusetts	1977	200	Erwin and Korschgen 1979
	1984	1,054	Andrews (1990)
	1991	1,285	Belant and Dolbeer (1993)
	1994-1995	846	I. Nisbet (Personal Communication)
	2000	1,097	S. Melvin (MA DFW, Personal Communication)
	2002	1,094	L. Welch (USFWS, Personal Communication)
	2007	1,512	L. Welch (USFWS, Personal Communication)
Maine	1977	231	Erwin and Korschgen (1979)
	1986	516	Andrews (1990)
	1991	716	Belant and Dolbeer (1993)
	1994	290	I. Nisbet (Personal Communication)
	2000	2,115	B. Allen, (ME DIFW, Personal Communication)
	2002	2,638	L. Welch (USFWS, Personal Communication) ^b
	2007	4,156	L. Welch (USFWS, Personal Communication) ^b
All 4 states	1977	31,161	
	1989-1991	64,630	
All 4 states	2007	56,014	Population was 80% higher than in 1977 and 13% lower than in 1989-1991

^a Surveys in New Jersey consisted of aerial counts of adults at colonies. Following Erwin and Korschgen (1979), we assume each adult represents a nesting pair.

^b In 2002-2007, there has been some nest destruction and limited lethal control of adult laughing gulls to enhance nesting of arctic terns and other seabirds on coastal islands.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**Herring Gulls**

Herring Gulls are the most widely distributed gull species in the Northern Hemisphere. Unlike Laughing Gulls, Herring Gulls are present year-round in the New York area (Bull 1998, Sibley 2000). BBS data indicate that there have been no statistically significant trends in Region 5 or national Herring Gull populations (-0.9 and -1.8% per year, respectively; $P \geq 0.40$) for the period of 1980-2007 (Sauer et al. 2008). Audubon CBC data indicate a decreasing trend for Herring Gulls in the New York (Appendix F). Herring Gull breeding range expanded from central Maine south along the Atlantic coast during the 1950s-1980s (Good 1998, Pierotti and Good 1994). Herring Gull range has continued to expand southward, possibly because of competition with Great Black-backed Gulls (Pierotti and Good 1994). A 2010 survey, 1,166 adult Herring Gulls, and 375 Herring Gull nests were counted in Jamaica Bay (Washburn 2011). According to the USFWS Mid Atlantic/New England/Maritimes Waterbird Conservation Plan, Herring Gulls are a species of low conservation concern in North America and BCR 30 and a species of moderate concern in BCR 14 (USFWS 2008b). Almost 91,000 Herring Gulls are believed to breed in BCR 30. Of these, over 36,000 are in Southern New England which includes New York. An additional 196,000 Herring Gulls are believed to breed in the neighboring BCR 14 (USFWS 2008b). According to Dolbeer (1998a), the number of non-breeding gulls (subadults and non-breeding adults) is estimated to equal approximately 50% of the nesting population.

From 2007-2009, USFWS records indicate a total of 4,279-6,833 Herring Gulls have been taken per year under USFWS permits in Region 5. Of the Herring Gulls taken in Region 5, 701-1,091 birds per year were shot at JFK. Annual take for projects other than JFK accounted for take of 3,578-5,887 Herring Gulls per year. To maintain current population levels, data from the PBR model indicates that a total of 16,725 Herring Gulls may be taken annually based on $F_R = 1.0$ in BCR 14 and 30 (Table 6-3). Herring Gulls are a long-lived species with a lifespan of approximately 10-15 years. Egg oiling for a limited period of time and at limited sites in the region may inhibit population growth in the years in which it is conducted but will not adversely impact overall viability of the population. The USFW permit for JFK allows for the annual take of up to 1,500 Herring Gulls at JFK. At this level, 15,225 Herring Gulls could be taken for projects unrelated to JFK and the population would still remain stable. Given that Herring Gull take in Region 5 for projects other than JFK has not exceeded 6,000 birds per year in the last 3 years, cumulative impacts of the current bird hazard management program at JFK are within parameters set by the PBR and will not adversely impact the Herring Gull population.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**Great Black-backed Gulls**

Great Black-backed Gulls are primarily a marine species which breeds in the North Atlantic Region including Jamaica Bay. Great Black-backed Gulls are present at JFK year-round. In the United States, BBS data indicate nonsignificant decreasing trends in the nationwide and USFWS Region 5 Great Black-backed Gull populations (United States -2.6% per year, $P = 0.60$; Region 5 -2.5% per year, $P = 0.69$) over the period of 1980-2007 (Sauer et al. 2008). Some of this decline may be related to a shift in activity and the range of Great Black-backed Gulls that may not be adequately represented in the BBS data. Great Black-backed Gulls have been expanding their range southward into Maryland, Virginia and South Carolina (Good 1998). Canadian Wildlife Service reports that Great Black-backed Gull populations in the Northeast have increased in the last 20 years (Canadian Wildlife Service 2002). Data from the CBC indicate a stable to slightly decreasing trend in the number of Great Black-backed Gulls overwintering in New York State (Appendix F). According to the USFWS Mid Atlantic/New England/Maritimes Waterbird Conservation Plan, Great Black-backed Gulls are a species of lowest conservation concern in North America (USFWS 2008b) and BCR 30 and of low concern in BCR 14. Over 37,300 Great Black-backed Gulls are believed to breed in BCR 30. Of these, over 25,500 are in Southern New England. There are an additional approximately 115,500 nesting Great Black-backed Gulls in BCR 14. In a 2010 survey, a total of 184 adult Great Black-backed Gulls and 130 Great Black-backed Gull nests in Jamaica Bay (Washburn 2011).

From 2007-2009, a total of 754-1,118 Great Black-backed Gulls have been taken per year under USFWS permits in Region 5. Of these 120-292 gulls have been taken per year at JFK. Projects other than JFK accounted for take of 572-826 Great Black-backed Gulls per year. To maintain current population levels, data from the PBR indicate that a total of 11,234 Great Black-backed Gulls may be taken annually based on $F_R = 1.0$ in BCR 14 and 30 (Table 6-3). Great Black-backed Gulls are a long-lived species with a lifespan of approximately 10-15 years. Egg oiling for a limited period of time and at limited sites in the region may inhibit population growth in the years in which it is conducted but will not adversely impact overall viability of the population. The USFW permit for JFK allows for the annual take of up to 400 Great Black-backed Gulls at JFK. Based on the PBR model, up to 10,834 Great Black-backed Gulls could be taken for projects unrelated to JFK and the population would still remain stable. Given that Great Black-backed Gulls take in Region 5 for projects other than JFK has not exceeded 1,200 birds per year, cumulative impacts of the current bird hazard management program at JFK have not adversely impacted the Great Black-backed Gull population.

Ring-billed Gulls

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, Indiana, Michigan, Wisconsin, and Minnesota. Ring-billed Gulls tend to nest in high densities, and, in the

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Great Lakes Region, nesting colonies may be located on islands, parklands, slag yards, rooftops, breakwalls, and landfills (Blokpoel and Tessier 1986). Ring-billed Gulls breed from the southern James Bay in Canada to the Great Lakes, northeast along the St. Lawrence Valley to Newfoundland, and south to central New York (Levine 1998). Currently, there are an estimated 53,000 breeding pairs and 28 colonies in New York (McGowan and Corwin 2008). The breeding population 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).

According to the USFWS Mid Atlantic/New England/Maritimes Waterbird Conservation Plan, Ring-billed Gulls are a species of low conservation concern in North America (USFWS 2008b) and BCR 30. Breeding Bird Survey data for 1980-2007 for USFWS Region 5 indicate there have been no significant trends for the Ring-billed Gull population (-0.2% per year, $P = 0.92$), but there has been an increasing trend for the nationwide population (1.5% per year, $P = 0.01$; Sauer et al. 2008). Data from the CBC indicated an increasing trend in the number of Ring-Billed Gulls overwintering in New York State (Appendix F). Non-breeding Ring-billed Gulls are known to occur throughout BCR 14 and BCR 30 during the breeding season and birds from outside the region (e.g. Canada and the Great Lakes) also overwinter in New York. 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.

From 2007-2009, a total of 3,372-4,664 Ring-billed Gulls have been taken per year under USFWS permits in Region 5. Of these 171-431 gulls have been taken per year at JFK. Projects other than JFK accounted for take of 3,201-4,273 Ring-billed Gulls per year. To maintain current population levels, data from the PBR indicate that a total of 3,065 Ring-billed Gulls may be taken annually based on $F_R = 1.0$ in BCR 14 and 30 (Table 6-3). Ring-billed Gulls are relatively long-lived and there are records of birds living over 20 year in the wild (Ryder 1993). However, lifespan for most birds is likely much shorter (3.g., 3-10 yrs; Dewey and Pappas 2001). Egg oiling for a limited period of time and at limited sites in the region may inhibit population growth in the years in which it is conducted but will not adversely impact overall viability of the population.

The USFW permit for JFK allows for the annual take of up to 600 Ring-billed Gulls at JFK. At this level, in theory, up to 2,765 Ring-billed Gulls could be taken for projects unrelated to JFK and the population would still remain stable. Currently, take in the region has been in excess of levels estimated by the PBR system (3,065 gulls per year). However, the PBR estimates take based on a closed population of breeding birds and does not take migrants into consideration. There are no breeding Ring-billed Gulls in the vicinity of JFK, so all birds taken are likely migrants or nonbreeding birds. Given the high abundance of Ring-billed Gulls in the Lower Great Lakes, increasing population trends for wintering Ring-billed Gulls in New York State and the relatively stable trend for breeding Ring-billed Gulls in New York, current levels of take are not adversely

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impacting the state or regional Ring-billed Gull population, although local reductions may occur.

6.3.1.2 Waterfowl**Canada Geese**

There are two behaviorally distinct types of Canada Goose in New York state: resident and migratory. The USFWS defines a resident Canada Goose as one that nests or resides on a year round basis within the conterminous U.S. (Rusch et al. 1995, Ankney 1996). Migratory Canada Geese nest and raise their young in the arctic and sub-arctic regions of Canada.

Resident Canada Geese spend most of the year near their breeding areas, although many resident Canada Geese in northern latitudes make seasonal movements (Atlantic Flyway Council 1999). The New York Resident Canada Goose population is the product of individual and agency actions (Atlantic Flyway Council 1999; Section 1.7.2). Thousands of domesticated or semi-domesticated geese were released in the 1930s when the use of live decoys for hunting was prohibited. The state of New York stocked thousands of birds for hunting at state game management areas in the 1950s and 1960s (Atlantic Flyway Council 1999). Although the current resident Canada Goose population is not exactly the same subspecies as the historical population, it is still protected under the MBTA and state law.

In 1992, the breeding population of Canada Geese in New York State was estimated at 115,981 individuals. By 2003 this number had increased to 241,865 including approximately 65,000 breeding pairs. In 2007 the Atlantic Flyway Breeding Waterfowl Survey data indicated there were approximately 249,700 resident Canada Geese in New York State (USFWS 2008a, <http://mbdcapps.fws.gov/>). The current population is well over the NYSDEC management objective for the state of 85,000 resident Canada Geese (Atlantic Flyway Council 1999). Breeding Bird Survey data for the United States and USFWS Region 5 primarily address the status of resident Canada Goose populations. For the period of 1980-2007, Canada Goose populations in Region 5 and the U.S. have increased at a rate of 10.2 and 5.5% per year, respectively ($P < 0.01$, Sauer et al. 2008).

On August 20, 2007 the USFWS issued final regulations for managing resident Canada Goose populations (USFWS 2005). The new regulations were created in response to conflicts associated with high populations of resident Canada geese in the U.S. The rule gives state wildlife management agencies, private and public landowners, and airports additional flexibility to deal with problems, conflicts, and damages caused by resident Canada geese. The rule includes an Airport Control Order which authorizes managers of commercial, private and military airports and their designated agents to take Canada Geese, including nests and eggs on or within 3 miles of the airport boundaries without a federal permit. The control order may only be implemented between April 1 and September 15, except for the take of nests and eggs which could be implemented in March. Although airport managers are not required to obtain a federal permit before

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taking action covered by the order, they are required to submit an annual report of activities conducted under the order. No special authorization from the NYSDEC is required to take geese under this order, as take of geese for this purpose is authorized by the NYSDEC's General Depredation Permit. During the remainder of the year, regular Federal and state permits are required to take Canada Geese for bird hazard management at airports.

Each year, the USFWS, the Canadian Wildlife Service, the Mexican Direccion General de Conservacion Ecologica de los Recursos Naturales, state and provincial agencies and private cooperators conduct a survey of breeding waterfowl and waterfowl habitat in North America (USFWS 2009). In the Atlantic Flyway, migratory Canada Geese are primarily from the Atlantic Population, the North Atlantic Population, and the Southern James Bay Population. The 2009 population estimate for the North Atlantic Population was 53,700 breeding pairs and 179,700 total Canada Geese. Pair estimates have declined an average of 2% per year for the period of 2000-2009 but this trend was not statistically significant. The Atlantic Population increased rapidly between 1995 and 2002 (a period when hunting regulations were very restrictive to allow population growth. Since 2002, however, the population has stabilized at approximately 175,000 breeding pairs and 1,000,000 total Canada Geese. Since 1990, estimates of the Southern James Bay Population have generally fluctuated between 50,000 and 130,000 birds, averaging about 80,000, with no clear long-term trend. Very few if any SJBP geese occur in the NYC area (B. Swift, NYSDEC, pers. comm.).

According to the New York State Ornithological Union waterfowl count report, a minimum of 137,261 Canada geese were counted during winter 2008 in New York State (Swift 2008), however, the survey misses some individuals and the is based on models which tend to make conservative assumptions regarding population size, and there is annual variation in the population. Consequently, the actual population is probably closer to 250,000 in most years (Bryan Swift, NYSDEC, personal communication). Audubon Christmas Bird Count data for the period of 1980-2009 indicate an increasing trend for Canada Geese (Appendix F). These birds are a mix of resident Canada Geese that nest in NY, resident Canada Geese from neighboring states and Ontario, and migratory geese. The number of migratory Canada Geese in New York varies depending on changes in the overall population of migratory birds and weather conditions. Goose strikes at JFK have occurred during most months except July and September and likely involve both the resident and migrant goose populations (Fig. 1-12; Swift et al. 2009).

New York City is working with WS on a project to address a number of conflicts with resident Canada Geese including airport safety (JFK and LaGuardia Airports), fecal contamination and vegetation damage at NYC parks and other city-owned properties, and protection of natural resources at vegetation restoration sites (Pennsylvania Avenue and Fountain Avenue landfills; USDA 2004, Collins 2009, Collins and Humberg 2010a). In general, individual sites within the 5 mile radius with 10 or fewer birds will not have goose removals. Individual sites in the 5-7 mile radius with 20 or fewer birds will also generally not have goose removals. Although unlikely, an exception might occur if a site within the 5 mile radius is associated with specific bird movements through JFK airspace.

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The maximum number of birds taken per year for this program was 1,509 birds in 2010. When added to the estimated maximum of 500 birds per year for JFK, this could result in a reduction in the number of Canada Geese within the NYC metropolitan area. However reductions are not expected to go below NYSDEC statewide management objectives or approximately 2 geese per square mile or (0.8 geese per km²) that the NYSDEC provided for the Atlantic Flyway resident Canada Goose management plan (approximately 5,000 – 6,000 geese in the NYC metropolitan area). Given that the cumulative impacts of all known resident Canada Goose management actions are not expected to reduce the resident Canada Goose population in the NYC Metropolitan area below the NYSDEC management objectives and the general guidelines for goose numbers at individual sites that would trigger removals, the cumulative impact of the proposed action will not jeopardize the city resident Canada Goose population

Total Canada Goose take under permits from the USFWS in Region 5 for the period of 2007 to 2009 ranged from 18,957-23,624 birds per year. Take of Canada Geese at JFK during this period ranged from 99-163 birds per year. Annual Canada Goose mortality by entities other than JFK during this period ranged from 18,858-23,487 birds per year including 1,235 resident Canada Geese removed by WS for NYC in 2009. Entities other than JFK were also responsible for the destruction or oiling of 6,654-9,604 Canada Goose nests per year in Region 5 during 2007-2009. Although JFK has received permission from the USFWS to destroy Canada Goose nests and eggs on the airport property, the only such take occurred in 2000, and 2001 when 1 nest was destroyed per year. Lethal removal of Canada Geese posing a direct threat to aircraft at JFK by the supplemental on-airport shooting program was not included in the 1994 FEIS. It was added to the JFK program on an interim basis to address concerns over the risks to aircraft from large-bodied birds like geese, Double-crested Cormorants and Mute Swans, and flocking species including crows, European Starlings, blackbirds, House sparrows and Rock Pigeons. Because of the risks to aircraft, some if not all of the birds that were taken by WS at the request of the JFKWMU would have been taken by the JFKWMU if WS had not shot the birds. Instead of attempting to predict the extent to which WS' actions would have replaced JFKWMU actions, we have chosen to examine all take as part of the No-action alternative. In this way, we provide a conservative (high) estimate of impacts because it is possible that not all birds taken by WS would have been taken by the JFKWMU. If Alternative 3 is not selected as an addition to the No-action alternative, then take of geese by the supplemental on-airport shooting program will be discontinued.

Based on increasing population trend for resident Canada Geese and similar trend in the number of Canada Geese taken at JFK, we anticipate that annual take of Canada Geese at JFK under this alternative will not exceed 500 Geese per year. Under this alternative, take for other NYC programs is unlikely to exceed 2,500 birds per year. During the 2008 and 2009 hunting seasons, licensed hunters in New York took approximately 163,338 and 171,956 Canada Geese, respectively (Raftovich et al. 2010). Cumulative take for bird damage management in the NYC metropolitan area of 3,000 birds would only be approximately 1.8% of state licensed harvest and 1.2% of the 2007 estimated resident Canada Goose population. This is a conservative estimate and does not take into consideration that some of the geese taken at JFK would be from the migrant populations.

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As discussed above, the proposed take of resident Canada Geese is also within parameters addressed in the 2005 USFWS FEIS on management of resident Canada Geese. Given current increasing trends in the state resident goose population, that the state resident Canada Goose Population is well over the management objective for the species, the high number of resident Canada Geese in the NYC metropolitan area (20,000-25,000) and that take for bird hazard management at JFK is only a fraction of birds taken by licensed hunters, we conclude that the current bird hazard management program will not have a cumulative adverse impact the Canada Goose Population.

Atlantic Brant

Most Atlantic Brant in North America pass through New York during spring and fall migration and 10,000-20,000 typically remain in the vicinity of JFK airport (e.g., Jamaica Bay, West Hempstead Bay) throughout the winter. Audubon CBC data for 1980 to 2009 indicate a slightly increasing trend for brant in New York (Appendix F). Brant strikes have occurred from October through April (Fig. 1-12), consistent with their general use of the area.

Take of brant during 2007-2009 ranged from 239-845 birds per year, 223-842 of which were taken at JFK. Lethal removal of brant posing a direct threat to aircraft at JFK by the supplemental on-airport shooting program was not included in the 1994 FEIS. It was added to the JFK program on an interim basis to address concerns over the risks to aircraft from large-bodied birds like geese, cormorants and swans, and flocking species including crows, European Starlings, blackbirds, House sparrows and Rock Pigeons. Because of the risks to aircraft, some if not all of the birds that were taken by WS at the request of the JFKWMU would have been taken by the JFKWMU if WS had not shot the birds. Instead of attempting to predict the extent to which WS' actions would have replaced JFKWMU actions, we have chosen to examine all take as part of the No-action alternative. In this way, we provide a conservative (high) estimate of impacts because it is possible that not all birds taken by WS would have been taken by the JFKWMU. However, if Alternative 3 is not selected as an addition to the No-action alternative, then take of geese by the supplemental on-airport shooting program will be discontinued.

The 2009 USFWS mid-winter waterfowl survey estimated the Atlantic Brant population at approximately 151,300 birds, including approximately 57,030 that were observed in the Long Island area (Klimstra 2009). There has been no clear population trend for the Atlantic Brant Population for the period of 2000-2009, but there has been a dramatic increase in the number wintering in New York. From 1991-2005, the mean number of brant counted in the state (virtually all on Long Island) was approximately 24,000 birds (range 12,900 – 37,800), whereas since 2006, the mean count has been approximately 61,000 birds (range 56,100 – 65,700). Given current rates of brant observation and take at JFK, annual take of brant at JFK is not anticipated to exceed 1,000 birds per year. The proposed take of brant would be only 1.6% of the birds counted in New York during the last 5 years and is approximately 18% of the estimated 5,540 brant taken annually by licensed hunters in New York during 2005-2009 (USFWS 2006, 2009; 2010; Richkus et al. 2008; Raftovitch et al. 2010). Given that the proposed take is relatively low relative to

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birds counted in the waterfowl survey and birds taken by licensed hunters, we conclude that the proposed level of brant take would not have an adverse cumulative impact on the brant population.

Mute Swans

Breeding Bird Survey trend data from 1980-2007 indicate that Mute Swan populations have increased in USFWS Region 5 (13.1% per year, $P < 0.01$), and have been stable nationwide (2.5%/year, $P = 0.54$; Sauer et al. 2008). Christmas Bird Count data also indicate an increasing trend in the Mute Swan Population (Appendix F). In 1985, the Atlantic Flyway Council (AFC) initiated a Mid-Summer Mute Swan Survey (MSMSS) to document the status and more accurately track the growth rate of this non-native invasive species. This survey is conducted every 3-years during the birds' molt period in mid-July through August. The first MSMSS was completed in 1986 and the survey has usually been repeated every three years since that time¹⁷. In 2008, the MSMSS indicated there were 10,541 Mute Swans in the Atlantic Flyway, with the highest number (2,624 swans) in New York State (AFCTS 2009). The majority of Mute Swans counted in the state (2,099 swans) were in the Long Island area (NYSDEC 2008). Atlantic Flyway estimates of the Mute Swan population were highest in 2002 (14,344 swans). The 2008 estimate is 27% lower than the population estimate for 2005. The Atlantic Flyway Council Technical Section attributed the decline to several factors including, but not limited to, changes in survey effort or distribution by participating states/provinces and on-going management efforts to reduce the swan population in individual states (AFCTS 2009). Gateway NRA monitors the Mute Swans present in the bay and has, in some years, added eggs at East and West Pond (Ruler's Bar Hassock) to reduce non-native Mute Swan numbers and associated impacts on native plant and animal species. No egg addling was conducted from 2004-2008. In 2008, 342 adult Mute Swans and 46 cygnets were counted at Gateway NRA. Egg addling resumed in 2009. The number of Mute Swan decreased to 150 adults and no cygnets in 2009 and 143 adults and 6 cygnets in 2010 (Gateway NRA, unpublished data).

Mute swans are not native to North America and can have negative impacts on the environment (Atlantic Flyway Council 2003). Therefore, these birds are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in Mute Swan populations could be considered a beneficial impact to native ecosystems. The Atlantic Flyway Council has established a general goal of reducing Mute Swan populations in the flyway to levels that will minimize negative ecological impacts to wetland habitats and native migratory birds (less than 3,000 birds) and to prevent further range expansion into unoccupied habitats (Atlantic Flyway Council 2003).

Mute Swans are not protected by the Migratory Bird Treaty Act and a federal permit is not required to take Mute Swans. However, Mute Swans are protected by New York

¹⁷ There was a 4-year gap in the survey from 1989-1993. All other surveys have been conducted at three-year intervals.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

state law and a permit is required to handle or harm Mute Swans, their nests and eggs. The first Mute Swan take for the reduction of bird hazards to aircraft at JFK occurred in 2002. Since that time, the number of Mute Swans taken for bird hazard management at JFK has ranged from 0-8 birds per year. All but one of the 19 swans taken during this period were shot at the request of the JFKWMU by biologists working on the supplemental on-airport shooting program. Based on current Mute Swan population trends and increasing concerns regarding Mute Swans at JFK, the maximum annual take of Mute Swans is not expected to exceed 50 birds per year (0.5% of 2008 population estimate for Atlantic Flyway). As with Canada Geese and brant, we are including take by the supplemental on-airport shooting program in with take for the No-action alternative, because it is likely that at least some of the birds would have been taken by the JFKWMU had WS not been involved. In this way, we provide a conservative (high) estimate of impacts because it is possible that not all birds taken by WS would have been taken by the JFKWMU. However, if Alternative 3 is not selected as an addition to the No-action alternative, then take of Mute Swans by the supplemental on-airport shooting program will be discontinued. Given the low level of take relative to state and flyway Mute Swan population estimates, current levels of Mute Swan removal at JFK are not contributing substantively to cumulative impacts on regional or national Mute Swan populations and will not jeopardize the state or regional Mute Swan population.

American Black Ducks

The American Black Duck population in the Jamaica Bay area is comprised of a combination of resident and migrant birds. Population data are not available on the number of resident birds in New York or in the local area. USFWS Region 5 and National BBS Data indicate the population has been relatively stable for the period of 1980-2007 (-0.4 and 0.5% per year respectively, $P \geq 0.89$). Data from the CBC indicate a stable to slightly decreasing trend for American Black Ducks in New York (Appendix F). Black duck strikes have occurred from December through April.

Total American Black Duck take under permits from the USFWS in Region 5 for the period of 2007 to 2009 ranged from 31-58 birds per year. Take of black ducks at JFK during this period ranged from 4-7 birds per year. Annual black duck take by entities other than JFK during this period ranged from 24-52 birds per year. The mean number of black ducks counted on mid-winter waterfowl surveys during 2006-2010 was approximately 203,000 birds in the Atlantic Flyway (Klimstra 2010). The USFWS and Canadian Wildlife Service breeding waterfowl survey data from the Eastern survey area indicate the 2009 estimate of breeding black ducks (464,000 birds) was statistically similar to the 2008 level (499,000) and to the 1990-2008 average (478,000 birds; USFWS 2009a). The USFWS permit for bird hazard management at JFK allows for the take of up to 50 American Black Ducks per year. The proposed take of American Black Ducks would be only 0.03% of the birds counted during recent mid-winter waterfowl surveys, and is approximately 0.24% of the estimated 20,700 black ducks taken annually (2001-2009) by licensed hunters in New York (Klimstra 2010). Given the low number of black ducks taken relative to regional populations and harvest by licensed hunters, we conclude

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

that the current level of black duck take is not having an adverse impact on the black duck population.

Mallards

Like Black Ducks, the Mallard population in the vicinity of JFK is comprised of resident and migrant birds. Breeding season surveys by NYSDEC indicated that there were approximately 180,000-200,000 Mallards in the state during 2007-2010. Combining those estimates with results of surveys conducted in 10 other states yielded total population estimates of 620,000-700,000 Mallards in the northeastern U.S. (Klimstra 2010). In addition to surveys by the states, USFWS breeding waterfowl surveys in eastern Canada indicate that there were an additional 400,000-490,000 Mallards, for a combined total of close to 1 million Mallards in eastern North America. Most of these birds spend the winter somewhere in the Atlantic Flyway. USFWS Region 5 and National BBS data indicate the population has been increasing for the period of 1980-2007 (2.5 and 1.7% per year respectively, $P < 0.01$; Sauer et al. 2008). Data from the CBC indicate a stable to slightly increasing trend for Mallards in New York (Appendix F). Mallard strikes have occurred from most months of the year except July-September.

Total Mallard take under permits from the USFWS in Region 5 for the period of 2007 to 2009 ranged from 668-1,480 birds per year. Take of Mallards at JFK during this period ranged from 8-42 birds per year. Annual Mallard take by entities other than JFK during 2003-2007 ranged from 626-1,446 birds per year. The USFWS breeding waterfowl survey data from the Eastern survey area indicate the 2009 estimate of breeding Mallards in eastern Canada (463,000 birds) was higher than the 2008 level (451,000 birds) and the 1990-2008 average (407,000 birds; USFWS 2009). The USFWS permit for bird hazard management at JFK allows for the take of up to 100 Mallards per year. The proposed take of Mallards would be only 0.01% of the Atlantic Flyway population, and is approximately 0.11% of the estimated 95,000 Mallards taken annually by licensed hunters in New York during 2006- 2009 and 0.09% of the 114,402 Mallards taken in 2008 (Klimstra 2010, Raftovich et al. 2010). Given the low number of Mallards taken relative to regional populations and harvest by licensed hunters, and increasing population trends for mallards nesting in Region 5 and the U.S., we conclude that the current level of Mallard take is not having an adverse cumulative impact on the state or regional Mallard population.

Other Ducks

As noted in Section 1.7.7, a number of migratory waterfowl species move through the Jamaica Bay area during migration. These species are rarely struck by aircraft despite their abundance in the bay. For the most part, these species do not appear to be as attracted to sites in the city as resident birds and are not as likely to pass through JFK airspace. Nonlethal harassment is usually sufficient to disperse these species from JFK airspace. However, two Blue-winged Teal and two Gadwall were taken to reduce hazards to aircraft in 2004, one Green-winged Teal was taken in 2007, and two Bufflehead were taken in 2009. Other species involved in strikes or strike risks at JFK

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

have included Wood Duck, Greater Scaup, Lesser Scaup, and Ruddy Duck (Appendix C). Ruddy Ducks are relatively uncommon and it is highly unlikely one would be shot at JFK. At least 1,000 individuals of each of the remaining species except Blue-winged/Cinnamon Teal were taken by New York hunters in 2008 and 2009 (Raftovich et al. 2010). For each of these species, take of up to 5 individuals per year for bird hazard management at JFK will not have a significant adverse cumulative impact on the duck populations.

6.3.1.3 Double-crested Cormorants

Double-crested Cormorants are large fish-eating colonial waterbirds which are a particular hazard to aircraft because of their body size and mass (2.6-5.5 lbs with a wingspan of 45-48 inches), relatively slow flight speeds, and their natural tendency to fly in flocks (Cornell Lab of Ornithology 2010). Although cormorants are migrants, some birds appear to be wintering in the JFK area, and strikes have occurred in summer and winter months (Fig.1-15). Changes in survey methodology and timing make it difficult to determine cormorant population trends from the Harbor Herons Survey data and there is considerable variability between years (Fig. 6.5). Although the current nesting population (1,411 nests in 2010 and 1,380 nests in 2011; S. Elbin, NYC Audubon, unpub. data) is below the peak of 1,806 nests in 1995, there does appear to be a generally increasing trend for the period of 1986-2011. Of particular interest is the cormorant colony in Jamaica Bay. In 2007, 31 of the cormorant nests were observed at Elders Point West in Jamaica Bay and by 2009, there were 83 nests at Elder's Point West. In 2010, the Elders Point West site was abandoned due to initiation of a marsh restoration program at the site but 4 nests were observed at the newly restored Elders Point East. In 2011, the number of nests at Elders Point East had increased to 96 pairs. For the first time since 1986, cormorants were also recorded nesting at Canarsie Pol in 2010 (144 nests) and 2011 (34 nests). Total cormorant nests in the bay increased from 31 in 2007 to 144 in 2010 and then decreased to 130 in 2011.

Estimates of 0.6 to 4.0 subadult cormorants per breeding pair have been used for several populations (Tyson et al. 1999). Therefore, using a conservative estimate of 0.6 nonbreeding birds to breeding birds, the breeding season cormorant population in New York/New Jersey Harbor and surrounding waterways can conservatively be estimated at more than 3,785 birds. The state DCCO population has been estimated at 7,577 breeding pairs in 2005 (Weseloh et al. 2006). Using the estimate of 0.6 nonbreeding birds to breeding birds yields a state population estimate of 19,700 birds. Jamaica Bay is a major stopover point in the Atlantic Flyway. Given that many of the cormorant strikes have occurred during the spring and fall migration, it seems likely that the birds taken are part of the larger regional Double-crested Cormorant population. Tyson et al. (1999) estimated there were approximately 85,510 breeding pairs in the Atlantic Regional Double-crested Cormorant population. Breeding Bird Survey data for the period of 1980-2007 indicate that the cormorant population has been relatively stable (-0.4% per year $P = 0.74$) in USFWS Region 5 and increasing nationwide (4.4% per year, $P < 0.01$; Sauer et al. 2008). The number of breeding Double-crested Cormorants in the U.S. and Canadian portions of the lower Great Lakes peaked in approximately 2004 at 48,530

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

nests and decreased to 42,086 nests in 2007 and 41,803 nests in 2008 (Weseloh and Moore 2009). Using methods above yields a population estimate of 133,770 cormorants. Reasons for the recent decline are likely attributable to a number of factors including changes in availability of alewife in the Great Lakes, a decline in the aquaculture industry in the southern U.S. and the implementation of a Public Resource Depredation Order in the U.S. in 2003 which allowed for increased take of cormorants to protect public resources including fish, co-nesting birds and vegetation (USFWS 2003).

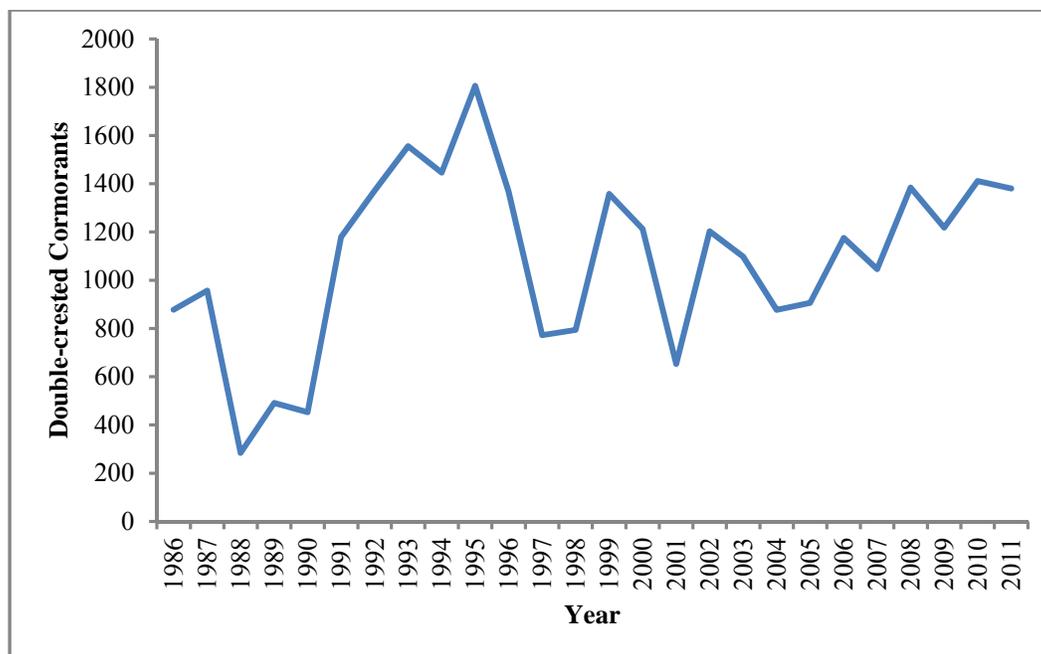


Figure 6.7. Number of cormorant nests counted during the Harbor Herons Survey. Data from S. Elbin, NYC Audubon.

For the period of 2007-2009, 2,411-2,942 Double-crested Cormorants were killed per year under USFWS Migratory Bird Permits and a Public Resource Depredation Order in Region 5. At JFK during 2007-2009, 88-295 cormorants were taken per year for the reduction of bird hazards to aircraft. Annual cormorant take by entities other than JFK during this period ranged from 2,323-2,718 birds per year. As with Canada Geese and Brant, we are including take by the supplemental on-airport shooting program in with take for the No-action alternative, because it is likely that at least some of the birds would have been taken by the JFKWMU had WS not been involved. In this way, we provide a conservative (high) estimate of impacts because it is possible that not all birds taken by WS would have been taken by the JFKWMU. However, if Alternative 3 is not selected as an addition to the No-action alternative, then take of cormorants by the supplemental on-airport shooting program will be discontinued.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Shooting cormorants at JFK during the breeding season could result in the removal of one or both members of a breeding pair, which, in turn, could adversely impact nest success. Actual impacts on the population in the New York/New Jersey Harbor area will vary depending on the timing of the removal. Birds in breeding condition shot early in the season may be on their way through to other breeding areas outside the New York/New Jersey Harbor area. Quantification of impacts on cormorants is further complicated by lack of knowledge as to whether birds removed are one or both members of a breeding pair. However, review of NYC Audubon nest count data for cormorants in the New York/New Jersey Harbor indicates a generally increasing trend over the period of time when the JFKWMU and WS personnel started shooting DCCO at JFK to reduce hazards to aircraft (2000; Fig. 6-7). Therefore, although we acknowledge that some nest failure likely results from cormorant shooting at JFK, given the recent increasing trend for nesting cormorants in the New York/New Jersey area, current levels of take at JFK are not having a cumulative adverse impact on the local cormorant population.

Based on current and anticipated future needs to address cormorant hazards to aircraft, total annual take of Double-crested Cormorants is not anticipated to exceed 400 birds per year (11% of summer population in the New York/New Jersey Area, 0.3% of the lower Great Lakes population). Current cumulative levels of cormorant take for all causes are within parameters analyzed in an USFWS FEIS on Double-crested Cormorant management (USFWS 2003) and a WS EA on cormorant damage management in New York (USDA 2009) which is tiered to the USFWS FEIS. The USFWS monitors cormorant take and populations to ensure that cumulative impacts do not exceed parameters analyzed in the FEIS. The USFWS FEIS determined that the PRDO and all other forms of take could reduce local and regional DCCO populations but would not jeopardize the viability of the regional or national DCCO population. Similarly, the WS EA concluded that the cumulative impact of cormorant damage management in New York may result in local population reductions but will not adversely affect the viability of the state cormorant population.

6.3.1.4 Raptors**American Kestrels**

American Kestrels are among the most numerous and widespread falcon in North America (Nye 2008a). Kestrels also commonly nest throughout the NYC area and there are an estimated 60-100 nesting pairs in the 5 boroughs (DeCandido and Allen 2010). They were also the most commonly struck non-gull species during the period of 1994-2009 (Appendix C). Kestrel strikes have occurred at JFK during most months of the year. Kestrels prefer fields, pastures and open areas with short grasses for foraging. Kestrel numbers in New York may have increased after European settlement in response to increased habitat made available by deforestation. In recent years, urbanization, residential development and reforestation have been limiting kestrel habitat which may explain decreasing population trends for kestrels (Nye 2008a). BBS data for 1980-2007 indicate the kestrel population has been decreasing in USFWS Region 5 and nationwide (-2.3 and -0.6% per year respectively, $P \leq 0.08$; Sauer et al. 2008). Although relatively

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

uncommon, American Kestrels have been observed during the CBC (National Audubon Society 2010). CBC data also indicate a decreasing trend for over-wintering American Kestrels in New York (Appendix F).

During the period of 2007-2009, only 66-126 American Kestrels were taken in USFWS Region 5 under permits from the USFWS. At the request of the USFWS, management of kestrels at JFK places priority on capture and relocation of problem birds if harassment is ineffective. Lethal removal is only allowed under the USFWS permit in situations where capture and relocation is not possible or there is an imminent threat to aircraft which cannot be resolved with nonlethal methods. To date, no kestrels have been killed or relocated at JFK. The USFWS permit allows for the take of up to 5 American Kestrels for bird hazard management at JFK if relocation is not possible. Given the limited number of kestrels which may be taken and that the take will be limited to only a small portion of their range in the state, the take permitted under the current bird hazard management program at JFK is not of sufficient magnitude to contribute substantively to existing Kestrel population trend and will not have an adverse cumulative impact on the regional or national kestrel population.

Osprey

Osprey is a species of special concern in New York State and the NPS keeps nesting platforms for Osprey within Gateway NRA. The 2000-2005 surveys for the New York Breeding Bird Atlas (Nye 2008b) indicate that the number of survey blocks with confirmed observations increased 163% from Breeding Bird Atlas surveys conducted in 1980-1985. As discussed in Section 1.7.6, data from Jamaica Bay banding project by the NYCDEP indicate increases in the number of Osprey nesting in the bay (Fig.1-17). USFWS Region 5 and national BBS data for the period of 1980-2006 also indicate increasing Osprey population trends (Region 5: 7.2%/year, $P = 0.02$; U.S.: 4.9% per year $P < 0.01$; Sauer et al. 2008). Osprey strikes have occurred during the period of April – October and are likely related to the presence of breeding and migratory birds. Although there has been extensive effort to band all chicks born at Gateway NRA, bands were recovered for only three of the 33 birds struck at JFK. One 5-year old bird banded as a nestling near Highlands, NJ was struck in 1997, and a 2-year old bird banded as a chick at Barnegat Light, NJ was struck in 2002. The third bird was banded in New York in 2005 and struck at JFK in 2009.

During the period of 2007-2009, 19-37 Osprey have been taken per year in USFWS Region 5 under depredation permits from the USFWS. At the request of the USFWS, NYSDEC and NYCDEP, management of Osprey at JFK places priority on capture and relocation of problem birds. Lethal removal is only allowed under the USFWS permit in situations where capture and relocation is not possible or there is an imminent threat to aircraft which cannot be resolved with nonlethal methods. From 1994-2009, the take of Osprey at JFK has been limited to 2004 when six birds were killed, 2008 when one Osprey was taken, and in 2009 when two Osprey were taken. None of the Osprey taken at JFK to reduce hazards to aircraft was banded. The USFWS permit allows for the capture and relocation of up to 10 Osprey for bird hazard management at JFK.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Alternatively, JFK is authorized to kill up to 10 Osprey if relocation is not possible. Given the increasing local (Jamaica Bay), state, regional and national Osprey populations, the limited take permitted under the current bird hazard management program at JFK will not have an adverse cumulative impact on the regional or national Osprey population.

6.3.1.5 Swallows**Tree Swallows**

Tree Swallows are migrants that are only present in New York during the summer breeding period and spring and fall migration. Tree Swallow strikes have occurred from August-October when birds migrating south for the winter, stop at the airport to feed on bayberries and other food. Data from the BBS for the period of 1980-2007 indicate the Tree Swallow population has been relatively stable in USFWS Region 5 (0.6% per year, $P = 0.27$) and slightly increasing (0.6% per year, $P = 0.04$) nationwide (Sauer et al. 2008).

During the period of 2007-2009, 0-145 Tree Swallows were taken in USFWS Region 5 under permits from the USFWS. No Tree Swallow take occurred at JFK during this period. All Tree Swallow take at JFK occurred in 2001 (184 birds) and 2005 (14 birds). The USFWS permit allows for the take of up to 150 Tree Swallows for bird hazard management at JFK. The PIF model for landbird population estimation yields a population estimate of 1,786,000 Tree Swallows in BCRs 14 and 30. Given that Tree Swallow population is stable to increasing and that total take permitted at JFK is negligible relative to the regional Tree Swallow population, the current bird hazard management program at JFK will not have a cumulative adverse impact on the regional or national Tree Swallow population.

Barn Swallows

Barn Swallows are migrants that are only present in New York during the summer breeding period. Barn Swallow strikes have only occurred during May – August with a peak in August. Data from the BBS indicate that, for the period of 1980-2007, Barn Swallow populations have been decreasing in USFWS Region 5 and nationwide (-2.2 and -1.0% per year, respectively, $P < 0.01$; Sauer et al 2008). The PIF population database provides an estimate of 1,440,000 Barn Swallows in BCRs 14 and 30.

During the period of 2007-2009, 78-248 Barn Swallows have been taken in USFWS Region 5 under permits from the USFWS. The only lethal take of Barn Swallows at JFK was in 2006 when 16 birds were taken. Maximum take of Barn Swallows is not anticipated to exceed 40 birds per year. This level of take is only 0.002% of the estimated Barn Swallow population in the region and would not have a cumulative adverse impact on the regional or national Barn Swallow population or contribute substantively to current population trends for the species.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**6.3.1.6 Mourning Doves**

Mourning Doves are a native dove species which takes advantage of the airport's available resources for cover, food, and nesting habitat, and are usually found in the undeveloped portions of the AOA. Mourning Doves are protected under state and federal law. Strikes by Mourning Doves have only occurred from July to November, a pattern which may be attributable to grass seed abundance on airport property. Increases in Mourning Dove strikes at JFK may be related to 1980-2007 population increases in USFWS Region 5 (0.7% per year, $P < 0.01$; Sauer et al. 2008). However, there has been no significant trend in call counts for the Eastern U.S. for the period of 2000-2009 (Dolton et al. 2009). Data from the BBS indicate the national Mourning Dove population for the period of 1980-2007 has also been relatively stable (-0.1% per year, $P = 0.57$, Sauer et al. 2008). Christmas Bird Count data indicate the Mourning Dove population in New York has been relatively stable (Appendix F).

During the period of 2007-2009, 1,724-3,168 Mourning Doves were taken in USFWS Region 5 under depredation permits from the USFWS. Mourning Dove take at JFK for this period ranged from 0-85 birds per year. Take of Mourning Doves for projects other than JFK has ranged from 1,722-3,083 birds per year. Mourning Dove hunting is permitted in some states in Region 5 (Delaware, Pennsylvania, Rhode Island, Maryland, Virginia, and West Virginia). Average estimated hunter harvest for these states for the period of 2007-2009 was 938,317 birds (Dolton et al. 2009, Raftovitch et al. 2010). Annual take of Mourning Doves under this alternative is not anticipated to exceed 500 birds per year. The PIF model for landbird population estimation yields a population estimate of 2,040,000 Mourning Doves in BCRs 14 and 30. Given that Mourning Dove population is stable to increasing and that total take permitted at JFK is negligible relative to the regional Mourning Dove population and hunter harvest, the current bird hazard management program at JFK will not have an adverse cumulative impact on the regional or national Mourning Dove population.

6.3.1.7 Rock Pigeons

Rock Pigeons, also known as pigeons, and Rock Doves are an introduced non-native species to North America. Non-native species are generally considered by many wildlife biologists, ornithologists and naturalists to be an undesirable component of North American native ecosystems because they compete with native species for food and other resources. Urban Rock Pigeons are prey for Peregrine Falcons. However, in contrast to common public perception, the available data indicate that peregrines are not dependent upon Rock Pigeons. For a pair in Baltimore, Maryland, pigeons comprised 46% of the prey items obtained (Barber and Barber 1988). Occurrence of pigeons in the diet varied seasonally from 51% in November – February to 24% from March – October. A total of 26 animal species were included in the diet of the pair. However, Rock Pigeons did comprised 91% of the diet of a single female peregrine observed in the same area in previous years (Barber and Barber 1983). Observations of peregrine pairs using bridge sites on the Delaware River indicated that the falcons were taking a wide variety of prey

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

items including but not limited to Horned Grebes, Lesser Golden Plover, gulls, Rock Pigeons, Mourning Doves, Northern Flickers, Blue Jays, American Robin, European Starlings and Red-winged Blackbirds (Brauning and Sheridan 1987). Cade and Bird (1990) reviewed reports on diets and nesting success of peregrines living in 16 cities. Although Rock Pigeons were a common food item reported for peregrines, they were not always the number one prey item in their diets. A 1970 – 1981 study conducted at Assateague Island in Maryland/Virginia (Ward and Leybourne 1985) indicated that migrating adult and juvenile Peregrine Falcons used a wide range of food items. Adults were primarily observed preying on shorebirds, while Northern Flickers, Brown Thrashers and Mourning Doves were the species most commonly taken by juveniles.

Rock Pigeons are present in New York and at JFK throughout the year. Rock Pigeon strikes have occurred most months of the year except December and have been highest in August – September. Using the PIF database for population estimation yields a population estimate of over 1.1 million Rock Pigeons in BCRs 14 and 30. Breeding Bird Survey Data indicate that Rock Pigeon populations have been decreasing in USFWS Region 5 (-1.3% per year; $P < 0.01$) and nationwide (-1.5% per year, $P < 0.01$; Sauer et al. 2008). CBC data indicate a relatively stable trend for Rock Pigeons in New York (Appendix F).

Federal and state permits are not required for the take of this species, so no information is available on Rock Pigeon take in the Region. For the period of 2007-2009, Rock Pigeon take at JFK has ranged from 365-591 birds per year. Lethal removal of Rock pigeons posing a threat to aircraft at JFK by the supplemental on-airport shooting program was not included in the 1994 FEIS. It was added to the JFK program on an interim basis to address concerns over the risks to aircraft from large-bodied birds like geese, cormorants and swans, and flocking species including Rock Pigeons, crows, European Starlings, and blackbirds. Because of the risks to aircraft, some if not all of the birds that were taken by WS at the request of the JFKWMU would have been taken by the JFKWMU if WS had not shot the birds. Instead of attempting to predict the extent to which WS' actions would have replaced JFKWMU actions, we have chosen to examine all take as part of the No-action alternative. In this way, we provide a conservative (high) estimate of impacts because it is possible that not all birds taken by WS would have been taken by the JFKWMU. However, if Alternative 3 is not selected as an addition to the No-action alternative, then take of Rock Pigeons by the supplemental on-airport shooting program will be discontinued.

Maximum annual take of Rock Pigeons under this alternative would be 2,500 birds per year, less than 0.2% of the Rock Pigeon population in BCRs 14 and 30. Given the relatively low level of take in comparison to the total population and the localized nature of the Rock Pigeon removals at JFK, the current bird hazard management program at JFK action will not be of sufficient scope to contribute substantively to existing cumulative impacts on the Rock Pigeon Population.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**6.3.1.8 American Oystercatchers**

The American Oystercatcher is a relatively large, conspicuous shorebird, common in coastal salt marshes and sand beaches throughout the central part of its range (Nol and Humphrey 1994). American Oystercatchers are one of the few birds to specialize on bivalve mollusks living in saltwater. Consequently, this species is completely restricted to marine habitats (Nol and Humphrey 1994). Oystercatchers have been known to adapt well to dredge spoil islands which may explain the willingness of some oystercatchers to attempt to nest in the sand/gravel areas beside the runways at JFK. American Oystercatchers also have nested on JoCo, East High Meadow and Silver Hole Marshes.

American Oystercatchers are listed on the USFWS national list of species of conservation concern. The North Atlantic Regional Shorebird Conservation Plan (USFWS undated) lists American Oystercatchers among the species of greatest conservation concern because loss of and threats to breeding grounds. The plan estimates the North American Hemisphere population at approximately 3,200 birds. As noted in Section 1.7.14, American Oystercatchers attempt to nest in the sand/gravel in safety areas for Runway 4L (Kilo Extension) and are one of the more frequently struck birds during May-July (Fig. 1-27). Oystercatchers are extremely protective of their nests, and so are difficult to disperse and more likely to be struck than Willet which also nest in this area.

During 2007-2009, 2-16 oystercatchers were killed per year to reduce hazards to aircraft at JFK. There has been no other take of American Oystercatchers in USFWS Region 3. In 2001, strikes involving Oystercatchers peaked at 11 strikes per year and JFK applied for and received its first permit to remove nests and eggs of American Oystercatchers attempting to nest near the runways on the Kilo extension. From 2001-2006 take of nests ranged from 2-7 nests per year. No nests were destroyed at JFK from 2007-2009. Strikes have dropped, and there has been only one Oystercatcher strike from 2006 to 2009 (Fig. 1-27). Establishment of suitable groundcover in the sandy areas used for nest sites will eliminate nesting habitat and reduce strikes by American Oystercatchers and Willet. Research is being conducted at JFK to identify vegetation that will grow well in the poor soils at JFK and will be a less attractive food source than the vegetation currently at the airport (Section 2.2.1).

The USFWS permit for JFK allows for the take of up to 20 American Oystercatchers and up to 20 nests per year. Success rate for birds attempting to nest next to the runways is likely to be poor because of the risk of mortality to adults and fledglings from passing aircraft. Actions to discourage birds from nesting in this area, including nest destruction, should result in the birds moving to a location where their chance of being struck by aircraft is reduced and likelihood of successfully raising young is improved. A take of 20 birds per year would be approximately 0.6% of the population and unlikely to adversely impact the population. In some instances, mortality to JFKWMU is likely compensatory to mortality that would have occurred if birds had been allowed to remain on site. Ongoing efforts to establish vegetation at the edge of the runways will also help to reduce impacts on the oystercatcher population.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**6.3.1.9 European Starlings**

Starlings were introduced into North America in 1890-91 when about 80 pairs were released into NYC's Central Park (Bump and Robbins 1966). In just 100 years, starlings have colonized the United States and expanded into Canada and Mexico and have become one of the most common birds in North America (Feare 1984).

The nationwide starling population has been estimated at 140 million (Johnson and Glahn 1994) and Meanly and Royall (1976) report that the 1974-75 winter starling population in the eastern States was estimated at about 112 million birds. The PIF model for landbird population estimation yields a population estimate 6.8 million starlings in BCRs 14 and 30. The estimated natural mortality of starlings is about 50% (USDA 1997 Revised). Using the PIF population estimate, approximately 3.4 million starlings die annually to natural mortality nationally in BCRs 14 and 30. BBS data (Sauer et al. 2008) indicate that for the period of 1980 to 2007, starling breeding populations have been decreasing in USFWS Region 5 (-1.2% per year, $P < 0.01$) and nationwide (-0.1% per year, $P = 0.05$).

Starlings are not protected by state or federal law and there are no requirements for individuals to report take of starlings. For the period of 2007-2009, annual take of starlings at JFK has ranged from 880 to 3,027 starlings per year, less than 0.06% of the starling population in BCRs 14 and 30. Maximum annual take of starlings under this alternative is not anticipated to exceed 15,000 starlings per year. The maximum number of starlings killed is negligible relative to the total number of starlings in the region (0.2%). Starling mortality at JFK is at least partially compensatory to and extremely low relative to estimated total mortality for the region. Furthermore, starlings are non-native species considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction, even to the extent of complete eradication from the natural environment, could be considered a beneficial impact to native bird species. However, given the low level of take at JFK relative to regional population, starling removal at JFK is unlikely to be of sufficient scope to substantively contribute to existing starling population trends or have a cumulative adverse impact on the regional or national starling population.

6.3.1.10 Blackbirds

The Blackbird group in North America includes about 10 species of birds (Dolbeer 1994) including some of the most prolific and abundant birds in North America (Dolbeer and Stehn 1983). Of these 10 species, Red-winged Blackbirds and Brown-headed Cowbirds are the species most commonly contributing to bird strike hazards at JFK, although Common Grackles, and Boat-tailed Grackles may also join flocks of starlings and blackbirds in fall and winter. Precise counts of blackbird populations do not exist but one estimate placed the United States summer population of the blackbird group at over 1 billion (USDA 1997 Revised) and the winter population at 500 million (Royall 1977). The majority of these birds occur in the eastern U.S. Meanley and Royall (1976) estimated 538 million blackbirds and starlings in winter roosts across the country during the winter of 1974-75. Of this total about 74% or about 400 million were in the eastern United States (Meanly and Royall 1976). Similarly, surveys in the southeastern part of

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the country estimated 350 million blackbirds and starlings in winter roosts (Bookhout and White 1981).

The PIF population model indicates there are approximately 2.97 million Red-winged Blackbirds, 6 million Common Grackles, and 650,000 Brown-headed Cowbirds in BCRs 14 and 30. There are also approximately 40,000 Boat-tailed Grackles in BCR 30. BBS population trends (Sauer et al. 2008) for these species in USFWS Region 5 for 1980-2007 are decreasing for Red-winged Blackbirds (-1.0% per year, $P < 0.01$), Common Grackles (-2.3% per year, $P < 0.01$), and Brown-headed Cowbirds (-2.7% per year, $P < 0.01$), and relatively stable for Boat-tailed Grackles (3.0% per year, $P < 0.15$). National BBS population trends show the same trends as for Region 5: Red-winged Blackbirds (-0.8% per year, $P < 0.01$), Common Grackles (-1.0% per year, $P < 0.01$), and Brown-headed Cowbirds (-0.7% per year, $P < 0.01$), and Boat-tailed Grackles (0.6% per year, $P < 0.37$). It is noteworthy that despite decreasing regional and national population trends for Red-winged Blackbirds and Common Grackles, BBS data indicate that these two species are among the five species with the highest relative abundance observed during the BBS survey in USFWS Region 5, and nationwide (Sauer et al. 2008).

Annual take at JFK for the period of 2007-2009 has ranged from 186-1,039 Brown-headed Cowbirds, and 0-95 Red-winged Blackbirds. No Common Grackles or Boat-tailed Grackles were taken during this period. Maximum anticipated annual blackbird take (all species combined) is not anticipated to exceed 1,500 birds. Natural mortality in blackbird populations is between 50 and 65% of the population each year regardless of human-caused control operations (USDA 1997 Revised). Dolbeer (1994) states that this high mortality rate is offset by a reproductive rate of 2 to 4 young fledged per female per year. Given the density-dependent relationships in a blackbird population (i.e. decreased mortality and increased fecundity of surviving birds) a high number of blackbirds would likely have to be killed in order to impact the regional breeding population. Modeling by Dolbeer et al. (1995) indicated that killing 3.6% of the wintering blackbird population had no effect on breeding populations the following spring. Dolbeer et al. (1976) constructed a population model which indicated that a reduction of 14.8% of the wintering blackbird population would reduce the spring breeding population by 20% and that a 56.2% reduction in the wintering blackbird population would reduce spring breeding populations by only 33%. In an analysis of North American blackbird populations in 1975, FWS concluded that removal of 67.5 million birds would not affect the following years post-breeding population (USFWS 1976). Total blackbird take at JFK has been negligible relative to PIF population estimates and estimated annual mortality for the blackbird and is unlikely to contribute substantively to existing population trends or adversely impact regional or national blackbird populations.

6.3.1.11 American Crows and Fish Crows

Crows are found in both urban and rural environments and in New York oftentimes form large communal roosts in city and suburban areas. They commonly use woodlots, wooded areas along streams and rivers, farmlands, orchards, parks and suburban areas (Johnson and Glahn 1994). American crows have a wide range and are extremely

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abundant, being found widely distributed over much of North America, including most of the United States (National Audubon Society 2000, Johnson 1994). Fish crows primarily inhabit the coastal areas of the eastern and southeastern U.S. (Johnson 1994).

Historically, crow populations have benefited from agricultural development because of grains available as a food supply. Winter roosting concentrations of crows occur in areas that have favorable roost sites and abundant food sources (Johnson 1994). In New York State, crow roosts consisting of tens of thousands of birds are a common occurrence throughout the fall and winter months.

American Crow populations increased drastically after receiving protection from the Migratory Bird Treaty Act in 1972. Populations tend to be densest and increasing most rapidly in urban areas of North America (Marzluff et al. 2001). However, crow populations may currently be suppressed in some areas due to West Nile Virus (LaDeau et al. 2007). A recent publication by LaDeau (2007) identifies American Crows as one of the species that have declining population trends which appear to correspond with the arrival of West Nile virus in some locations (LaDeau et al. 2007). Despite recent population declines in local areas, BBS long-term population trend data for the period of 1980-2007 indicate that the American Crow population is increasing in USFWS Region 5 and nationwide (0.5 and 0.6% per year, respectively $P \leq 0.01$; Sauer et al. 2008) and current relative abundance figures are still above 1980 levels. Breeding populations of Fish Crows have been relatively stable nationwide (-0.3% per year, $P = 0.58$), and increasing in USFWS Region 5 (1.9 $P = 0.02$; Sauer et al. 2008). Data from the CBC indicate that, for the period of 1980-2006, the over-winter American Crow population has been generally increasing, while the Fish Crow population has been relatively stable (Appendix F). The PIF database estimates that there are approximately 1,980,000 American Crows in BCRs 14 and 30. PIF data are not available for Fish Crows.

American and Fish Crow populations are healthy enough, and the problems they cause great enough, that the USFWS has established a standing depredation order for use by the public. Under this “order” (50 CFR 21.43), no federal permit is required by anyone to remove crows if they are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. The USFWS, as the agency with 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 crow populations would have no significant adverse impact on the quality of the human environment.

Crows are a bird species that may be harvested during the regulated hunting season in New York. Crow hunting seasons are determined by NYSDEC in accordance with USFWS guidelines. In New York, the season is typically open Friday through Monday (4 days a week) from early September until late March, with no daily bag limits. Crow hunters do not need to be registered in the Harvest Information Program (HIP), which provides the USFWS with a national registry of migratory bird hunters from which they can select participants for harvest surveys. Therefore no reliable hunter harvest

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information is available on the number of crows that are annually harvested by hunters in New York.

Over the period of 2007-2009, take of American Crows at JFK for bird hazard management has ranged from 0-2 birds per year. The only instance of Fish Crow take at JFK to reduce hazards to aircraft was in 2000 when 90 birds were taken. There have been no strikes involving Fish Crows at JFK since 1994 even though Fish Crows are seen at JFK. Based on current take and future needs, up to 250 crows (both species combined) may be taken per year for bird damage management at JFK. Given the low level of proposed crow take relative to the estimated population for the region, the current level of take will not have an adverse cumulative impact on crow populations.

6.3.1.12 Emergency Take

Permits issued to airports for bird hazard management by the USFWS include a provision which allows the permitted to take, trap or relocate birds on airport if the birds pose a direct threat to human safety. This provision does not include take of threatened or endangered species or eagles. Take and a description of circumstances which led to the take must be reported to the USFWS within 72 hours and must also be in accordance with state regulations. Monitoring by the USFWS and NYSDEC ensures that take does not reach levels which would have a cumulative adverse impact on state or regional bird populations. Given the comprehensive nature of the above species list, this type of take is likely to be very rare at JFK (Section 1.7.18). We anticipate that no more than 10 birds of any species not already addressed above could be taken per year under this provision. This low level of take would not have a cumulative adverse impact on bird populations which are not state or federally listed as threatened or endangered.

6.3.2 Impact on Nontarget Species

All birds on JFK grounds and in the airspace immediately above the airport are target species. Direct risks to nontarget species from the current on-airport bird hazard management program at JFK are minimal. Shooting is highly selective for target species and nontarget birds captured in live-traps can usually be released at an appropriate location. There were only 6 incidences of accidentally mortality in a nontarget species for the period of 1994-2009, even though 69,937 target gulls were taken. Unintentional take included one Common Tern in 2003, 2005, 2006, and 2008; one Caspian Tern in 2002; and one Black-crowned Night Heron in 1997. Common Terns are a state-listed threatened species. All take of state listed species is reported to the NYSDEC within 72 hours of the occurrence. No more than one Common Tern was taken in any year. This low level of take is unlikely to have a cumulative adverse effect on the state or regional Common Tern population. These incidents appear to be related to the similarity between the nontarget species and Laughing Gulls. Use of a smaller number of trained specialists has been implemented to address the issue of risks to nontarget species.

Protocols used to minimize risks that a nontarget species will be accidentally killed by the supplemental on-airport shooting program include: 1) shooting only clearly identified target species, and 2) shooting only when target bird is within range. The 1994 FEIS called for a

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prohibition on shooting over the mud flats during low tides to reduce risks of disturbing foraging birds. Based on experience working at JFK, the agencies are proposing to omit this provision. Reasons for omitting the provision include that the noise associated with shooting is negligible relative to the noise associated with aircraft arrivals and departures, and that shooting generally only results in a short-term disturbance and birds rapidly return to the feeding site. Observation of bird response to the shooting program also indicate that nontarget birds rapidly habituate to (become accustomed to) the noise from shooting and cease to respond to the disturbance.

The current bird hazard management program also likely has indirect impacts on bird behavior and movements since it seeks to reduce food, shelter and nesting resources at JFK. There is also some evidence that gulls may be learning to avoid the airport during the supplemental on-airport shooting program (Dolbeer et al. 2003, Barras et al. 2000b). Changes in bird movement patterns around the airport may result in shifts in bird numbers and activities at destination points in the city. However, given the distances involved and the mobility of birds, these shifts are likely to be relatively minor.

As noted in Chapter 5, saltmarsh habitat is a critical habitat component for many species in Jamaica Bay. Grassland habitat is also important for many species in the Jamaica Bay area. On-airport management actions will not have an adverse impact on saltmarsh habitat. Habitat management efforts at JFK favor long grass management and removal of shrubs and bushes and will result in an increase or maintenance of available grassland habitat.

Efforts to reduce off-airport factors which contribute to bird strike hazards at JFK may involve Canada Geese, Atlantic Brant, Mallards, American Black Ducks and Mute Swans. These are species which may cause problems for other wildlife if they are relocated from areas associated with bird strike hazards. Mute Swans, for example, are known to aggressively defend their nesting territory sometimes to the exclusion of native bird species (Atlantic Flyway Council 2003). If relocation efforts at one site causes increased congregations of birds at another site, it may also increase risks of disease transmission among birds and higher health risks for target and nontarget species. Actions which result in increased concentrations of birds at new sites may also have adverse impacts on vegetation (e.g., overgrazing by geese).

Gateway National Recreation Area

Biologists from the National Wildlife Research Center and the JFKWMU, NPS and other cooperators have annually conducted a survey of the Laughing Gull colony (Washburn and Tyson 2010). The survey has involved the use of both ground and aerial counts to assess colony size. The trampling of the marsh necessary to conduct any project at the site has the potential to adversely affect vegetation and reduce the physical stability of the islands (DeLaune et al. 1984). This survey also has the potential to disturb bird species nesting in the marsh with the Laughing Gulls and may pose a risk of a slight increase in bird strike risk during the survey. In theory, accidental disruption of nontarget species nests and breeding behaviors could adversely affect individual, however, the long-term impacts of the survey appear to be minimal. The survey is only conducted over a period of approximately 10 days. Recently, the survey protocol has switched from conducting annual ground surveys to conducting aerial surveys with periodic (once every several years) ground surveys to minimize risk of adverse impact on saltmarsh and

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nontarget species. Although the survey has been run every year since 1992, the same species that were originally nesting in the marshes are still recorded at the site including Common Terns which are state-listed as a threatened species and a federal species of conservation concern, seaside sparrows (state and federal species of conservation concern), American Oystercatchers (federal species of conservation concern), Saltmarsh Sparrows (federal species of conservation concern), Clapper Rails, Forster's Terns, Willet, American Black Ducks and Boat-tailed Grackles. New species nesting at the site that were not mentioned in the 1994 FEIS include Osprey (state species of conservation concern), Canada Geese, and Red-winged Blackbirds (D. Riepe, NPS, Retired, pers. comm.).

6.3.3 Water Quality

Carcasses are recovered and disposed of in accordance with state and local regulations. A limited number of carcasses cannot be reached by crews but the number is low enough that risks from on-site decomposition are nominal and no substantial impacts on the water quality of Jamaica Bay are anticipated. However, a small percentage of shot birds fall into the bay and are not recoverable.

Water management at the airport could involve the use of methyl anthranilate and other repellents to repel birds. Since these substances are approved by the EPA and applied in accordance with label directions for the safe and effective use of the products, the use of repellents would not have an adverse impact on water quality. Measures to eliminate pools of standing water through repaving and leveling of hard surfaces could result in increased discharge of pollutant-laden runoff to the bay. However, given limited occurrence of standing water as is and the presence of and future expansion of the airports storm water drainage system, any impacts are anticipated to be minimal. The increased use of insecticides for insect control could also occur. However, as is the case for repellents, all products would be applied in accordance with EPA label requirements for safe and effective product use. Although not directly related to sites where repellents would be applied, overall stormwater runoff problems at JFK were addressed in 1996 when new wastewater treatment plants were added at JFK to help reduce risks to local water supplies from first flush stormwater runoff at the bulk and satellite fuel farms.

In situations where high densities of birds are causing a decrease in water quality because of fecal contamination, reductions in the number of birds at the site may improve water quality. However, harassment activities may cause increases in the number of gulls or waterfowl using different sites, which may have adverse impacts on water quality at the new location.

Water quality may improve as a result of improved waste management practices, especially those practices which reduce the possibility that gulls will redistribute the waste to areas where it can enter storm water discharge systems and the bay.

6.3.4 Parks and Recreation

The current No-action alternative has minimal impacts on use of parks and recreational opportunities. Observation of the supplemental on-airport shooting program or interaction with

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dead or injured birds could reduce the quality of the experience of individuals visiting sections of Gateway NRA adjacent to the airport.

6.3.5 Ambient Air Quality

Minor impacts are associated with pyrotechnics, shooting for deterrence or lethal purposes, and exhaust from vehicles used for patrols of the airport. However, against background air quality conditions, these impacts are not substantial enough to warrant extensive analysis.

6.3.6 Noise

Minor impacts are associated with shooting measures, pyrotechnics and the use of alarm/distress calls. In the absence of sensitive receptors such as residential areas, schools, etc., such impacts are limited to the recreational users of Jamaica Bay. However, relative to the acoustic impacts associated with the presence of a major airport adjacent to the Gateway NRA, impacts of the bird harassment and shooting programs are likely minimal.

6.3.7 Airport Operations and Safety

The No-action alternative amounts to the continuation of bird hazard management practices already in place, exclusive of the interim expansion in the species that may be taken by the supplemental on-airport shooting program. This alternative has been effective in reducing gull strikes, especially strikes involving Laughing Gulls. However, strike risks have changed and the program needs to be adjusted to meet these changing needs. The most important potential impact of the No-action alternative is increasing risks from non-gull species, especially large-bodied birds such as Canada Geese, Atlantic Brant, Cormorants, and Mute Swans. In the absence of the interim measures instituted to reduce presence of these species at JFK, bird strikes involving these species and associated adverse impacts on property, airport operations, travel, and human safety would likely increase over current levels.

6.3.8 Socioeconomic Impacts

Failure to prevent bird strikes under any alternative, including the No-action Alternative, has the potential for detrimental socioeconomic impacts. Litigation and settlements in the event of a crash could have substantial economic impacts on the airline industry and federal, state and local agencies. For example, the 2005 strike involving Canada Geese and an Air France Concorde jet cost the PANYNJ over \$5 million in settlement costs (McKinnon et al. 2001). The total settlement associated with the 1975 starling strike at JFK which resulted in the destruction of a DC-10-30 but no loss of human life were over \$15 million (Dolbeer 2005). The replacement cost for the A320 aircraft involved in the 2009 NYC crash of flight 1549 in the Hudson River after striking Canada Geese was approximately \$60 million. Each of the 150 passengers received \$5,000-\$10,000 to compensate for lost belongings and a refund of their ticket price. Additional costs also included but were not limited to medical expenses for passengers and crew, aircraft recovery and salvage, environmental cleanup (e.g., fuel and debris in river), emergency response, and the cost of crash investigation and reporting. With bird strikes, there is also a risk that an aircraft damaged by a bird strike or aircraft parts could land in an occupied area. The

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2001 crash of flight 587 in the Belle Harbor Neighborhood on Rockaway Peninsula in NYC was due to a mechanical failure not a bird strike but does provide an example of what may happen. The crash resulted in the death of everyone on board the aircraft plus 4 individuals on the ground. It also damaged or destroyed several homes. Pieces came off the aircraft as it crashed and dropped in the surrounding neighborhood and Jamaica Bay (Kleinfield 2001).

During the period of 1994-2008, air carriers at JFK reported a total of 458 strikes, of which 83 resulted in damage or delays (Table 1-1). Thirty-seven strikes resulted in engine damage and 52 strikes resulted in an aborted takeoff. Financial losses reported for the period amounted to \$11,975,961, \$9 million of which was from the Canada Goose strike involving the Air France Concord in 1995. This figure likely underestimates total damage, because cost estimates were only provided for 18 of the strikes where damage was reported. The estimate does, however, include costs reported from 9 off-airport strikes involving aircraft arriving to or departing from JFK. As noted in Section 1.3, the reported losses generally only include the cost of damage to aircraft, additional losses to the airline industry include runway closures such as the one that resulted from the Tree Swallow strike in 1997 (Section 1.7.17), personnel costs, aircraft downtime, and costs associated with passenger accommodations. Costs incurred by passengers include increased ticket prices and auxiliary costs associated with travel delays.

The program implemented after the completion of the FEIS in 1994 has substantially decreased bird strikes at JFK. However, as discussed in Section 1.6, the bird strike threat at JFK has changed since the 1994 FEIS was completed. The program established in the 1994 FEIS is not as effective as it could be in reducing bird strike hazards at JFK.

6.3.9 Sociological Issues including Humaneness and Aesthetic Values**Humaneness**

Humaneness, in part, is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. Research indicates that the public may be willing to accept lethal wildlife management methods if they are humane (i.e., minimize pain and suffering of the target animal) (Kellert 1993, Schwartz et al. 1997). The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important and complex concept. Wildlife damage management for societal benefits could be compatible with animal welfare concerns if ". . . *the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process*" (Schmidt 1989). Suffering is described as a ". . . *highly unpleasant emotional response usually associated with pain and distress*", however, suffering ". . . *can occur without pain . . .*," and ". . . *pain can occur without suffering . . .*" (AVMA 1987). Because suffering carries with it the implication of a time frame, suffering is considered to be minimized where death is immediate (CDFG 1991) such as occurs with proper shooting. Pain occurs in animals. Altered physiology and behavior can be indicators of pain, and the causes that elicit pain responses in humans would ". . . *probably be causes for pain in other animals . . .*" (AVMA 1987). One challenge with coping with this issue is how to achieve the least amount of animal pain and suffering while still effectively addressing wildlife damage problems within the constraints of current technology and resources.

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WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new practical and effective nonlethal methods are found, a certain amount of animal suffering could occur when some bird damage management methods are used. WS and JFKWMU personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding.

Under this alternative, methods viewed by some persons as inhumane would be used. These methods would include shooting and capture and euthanasia. In a study by Loker et al. (1999) on New York State residents' perceptions of wildlife damage management methods for three different scenarios including one involving Canada Geese in a local park. Residents who were the most concerned about problems with geese tended to accept more invasive methods than those who had fewer concerns. In general nonlethal, noninvasive methods (repellents, habitat modification) were accepted by slightly more respondents (27%) than nonlethal, invasive measures (e.g., capture and relocation, 24%). However, 44% of respondents accepted lethal alternatives. The authors did not find evidence that concerns about health and safety resulted in greater tolerance of lethal methods than other types of concerns (e.g., economic, nuisance, aesthetic). However, relative to potential consequences of a goose strike with an aircraft, relative risks to human health and safety were low. In a study of central Missouri residents (Coluccy et al. 2001), support for lethal methods increased when it could be demonstrated that geese were causing serious damage, lethal methods were the only viable means of control and geese would be killed humanely and processed for human consumption. Canada Goose conflicts reported in the study by Coluccy et al. (2001) included problems with geese in agricultural and urban/suburban environments. Harassment and capture and relocation, received 23 and 29% approval and 42 and 46% disapproval ratings respectively. Anti-feeding ordinance had the highest approval rating (41%) and lowest disapproval rating (27%). Of the lethal methods considered, firearms hunting had the highest approval (51%) followed by landowner permits for lethal removal (32%) and nest manipulations (9%). Disapproval ratings were 42% for firearms hunting, 61% for landowner kill permits and 80% for nest manipulations.

In situations where birds are being live-captured and euthanized, the agencies would use euthanasia methods approved by the AVMA (Beaver et al. 2001). Most people would view AVMA-approved methods of euthanizing animals as humane. However, a minority of stakeholders would likely want no birds captured, harassed, or killed because they consider the killing of birds as inhumane regardless of the method used. On-airport bird removal does not generate a sufficient amount of geese at one time to make it cost effective to donate the geese for human consumption.

Some individuals may be concerned about the stress an animal may experience as a result of different management techniques. The National Research Council (2008) defines stress as a real or perceived perturbation to an organism's physiological base state or psychological well-being. Stress responses can include a variety of behavioral or physiological mechanisms to counter the perturbation and return to normalcy including behavioral reactions, activation of the sympathetic nervous system and adrenal medulla, secretion of stress hormones (e.g., glucocorticoids and prolactin), and mobilization of the immune system. However, the absence or presence of any of

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these responses does not necessarily include or preclude the identification of a stressful state. Stress responses such as flight from a threat serve an adaptive function and can be beneficial to the animal. Chronic or acute stress may result in distress, an aversive, negative state in which coping and adaptation processes fail to return an organism to its physiological or psychological baseline. Distress may result from a severe or prolonged stressor or multiple cumulative stressful insults with deleterious effects on the animal's welfare (National Research Council 2008).

Wildlife hazard management at airports emphasizes managing habitat to reduce the attractiveness of a site to birds, which should preclude the occurrence of stress unless a resident bird is displaced by the proposed action. Some of the methods used under this alternative (e.g., harassment, repellents) may cause short-term stress for birds. For the most part, the temporary flight response is similar to that caused by naturally occurring threats and is unlikely to be harmful. Shooting, when used by trained professionals usually results in rapid death and is unlikely to result in prolonged stress to individual birds. Use of live-capture in cage traps followed by euthanasia may be more stressful than shooting because the animal is likely to experience stress while held in the trap and when captured and either decapitated or transferred to a euthanasia chamber which may last longer than any stress associated with shooting.

In developing a bird hazard management plan for JFK, the agencies are trying to achieve a "balance" between the needs of people, recognizing that people are part of the environment, and animals while keeping issues like protection of the environment, economics, humaneness, etc. in perspective. Questions like, "Is it more humane to allow birds to fly across runways, or to remove the birds and the hazards that exist?" need to be asked and answered. The agencies recognize that animal welfare organizations are concerned that some methods used to manage wildlife damage may expose animals to pain and suffering. However, the agencies also recognize another side to this issue, as perceived by traveling publics, airport managers, and others. The humaneness of an action or management plan must not only consider the effects of the action on the wildlife but also on the people or other species that may be affected by the wildlife. Ideally, such protection would be achieved through non-lethal means, but when non-lethal means are not practical or effective as was determined in the 1994 FEIS, lethal means may be the only way to accomplish such protection.

As noted above, since the start of the supplemental on-airport shooting program in 1991, the program has resulted in the death of 85,098 Laughing Gulls. One of the difficult questions to be answered through this analysis and the public involvement process is whether the agencies should continue to allow the only Laughing Gull colony in the state of New York to remain in its current location at the cost of thousands of Laughing Gulls per year or to risk the uncertainty of success and potential impacts on target and nontarget species and try and relocate the Laughing Gull colony.

Aesthetic Values

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

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Generally, wildlife is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit for many people. However, wildlife may also be responsible for adverse effects to people. Human safety is jeopardized by wildlife collisions with aircraft and automobiles, aggressive waterfowl behavior sometimes results in human injury, and wild animals may harbor diseases transmissible to humans.

The range of social and economic benefits associated with wildlife include direct benefits related to consumptive and non-consumptive use (e.g., wildlife related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and is a part of the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987, 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 the knowledge that the animals exist (Decker and Goff 1987). Positive values of wildlife would also include having enough wildlife to view. However, the same wildlife populations that are generally appreciated may also create conflicts with land uses and human health and safety and adverse aesthetic impacts. Certain species of wildlife can be regarded as a nuisance in certain settings. Large numbers of waterfowl can reduce the aesthetic appearance and enjoyment of some activities and locations because of excessive feces, waterfowl aggression and human injury, denuded vegetation, eroded stream banks, disruption of vehicle traffic, etc.

Public reaction to bird hazard management is variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife. Many people directly affected by threats to human safety caused by birds may desire immediate lethal removal of the birds. Other people believe that birds should be captured and relocated to another area to alleviate threats to human safety. Some people directly affected by the risk of bird strikes oppose removal of the birds regardless of the nature of the risk. Individuals who are totally opposed to bird removal want agencies to teach tolerance for birds and threats to human health and safety, and that birds should never be killed. Some of the people who oppose removal of waterfowl do so because of human affectionate bonds with individual birds. These human affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

Some individuals opposed to the use of lethal methods may feel that the observation or knowledge of the supplemental on-airport shooting program or interaction with dead or injured birds would have an adverse impact on their aesthetic enjoyment of the bay. Others may feel that their enjoyment and sense of security in the area is compromised by the knowledge that all possible actions are not being implemented to reduce the risk of a significant bird strike at JFK.

Actions to reduce bird hazards at JFK have resulted in a reduction in the size of the Jamaica Bay Laughing Gull Colony which might be considered an adverse impact on recreational (bird watching) uses of coastal areas. However, a substantial Laughing Gull colony remains at the site, so impacts on the value of the Jamaica Bay Laughing Gull colony as a bird watching opportunity are low.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**6.3.10 Coastal Zone Management Programs**

In general, bird strike reduction at JFK will have a beneficial impact on coastal resources by reducing the risk of serious damage to an aircraft which could result in the need to dump fuel prior to an emergency landing or the environmental damage, disturbance, and contamination that would result from a crash and associated firefighting and recovery efforts. A review of the state coastal zone management policies identified the following issues:

Policy 2. Facilitate siting of water-dependent uses and facilities on or adjacent to coastal waters

Certain development and site restoration activities may result in increased hazards of bird strikes at JFK. Review of compatibility of coastal area developments should take into consideration, potential impacts on bird hazards at JFK. This may affect which new developments are established near JFK and landscaping and land management practices.

Policy 7. Preservation, protection and restoration of significant coastal fish and wildlife habitats

This alternative does not propose alteration of significant coastal fish and wildlife habitat. The current program has resulted in recommendations for site restoration projects which have impacted the type of plants which are used for site restoration (i.e., Fresh Kills and Fountain Avenue Landfills). Bird hazard management recommendations may restrict the type of restoration activities that may be conducted. However these recommendations may also benefit fish and wildlife habitat because they reduce the risk of adverse impacts on fish and wildlife habitats from a plane crash.

Policy 9. Protect, maintain and increase the level and types of access to public water-related recreational resources

Actions to reduce bird hazards at JFK have resulted in a reduction in the size of the Jamaica Bay Laughing Gull Colony which might be considered an adverse impact on recreational (bird watching) uses of coastal areas. However, a substantial Laughing Gull colony remains at the site, so impacts on the value of the Jamaica Bay Laughing Gull colony as a bird watching opportunity are low. Observation of the supplemental on-airport shooting program or interaction with dead or injured birds could reduce the quality of the experience of individuals visiting Jamaica Bay.

Policy 23. Protect, enhance, and restore structures, districts, areas or sites that are of historic, cultural or archaeological significance

Some bird exclusion devices (e.g., porcupine wire, Nixilite, etc.) that might be recommended to reduce bird activity off airport property are affixed to structures in order to deter bird use of ledges and other surfaces. Wire grid systems may also be perceived as having a detrimental impact on the character of a site. These methods would not be used at sites of historic, cultural or archaeological significance without appropriate prior consultation with the New York State

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

Office of Office of Parks, Recreation and Historic Preservation. Projects implemented with the consent of this office will not adversely affect these resources.

Policy 33. Best Management Practices to Control Stormwater Runoff

Bird hazard management activities may include the use of methyl anthranilate and other repellents to repel birds. Since these substances are approved by the EPA and applied in accordance with label directions for the safe and effective use of the products, the use of repellents would not have an adverse impact on water quality. Measures to eliminate pools of standing water through repaving and leveling of hard surfaces could result in increased discharge of runoff to the bay. However, this type of activity is likely to be limited and any impacts are anticipated to be minimal. The increased use of insecticides for insect control may reduce water quality to some degree. However, as is the case for repellents, all products would be applied in accordance with EPA label requirements for safe and effective product use.

Policy 38. Quality and Quantity of Surface Water

Bird hazard management activities may include the use of bird repellents and insecticides. Since these substances are approved by the EPA and applied in accordance with label directions for the safe and effective use of the products, the use of repellents would not have an adverse impact on water quality.

Policy 39. Transport, Storage, Treatment and Disposal of Solid Wastes

All pesticides (bird repellents, insecticides) used for bird hazard management would be applied in accordance with EPA and state requirements for safe transport, storage, application, and disposal. Risks associated with the use of these products will be minimal. Water quality and solid waste issues may improve as a result of efforts to get JFK and off-airport landowners to improve waste management practices as part of their bird hazard management programs.

The transport, storage and disposal of bird carcasses is conducted in a manner which minimizes the effects on groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

Policy 40. Air Quality

The only aspect of the bird hazard management program with the potential to adversely affect air quality is the use of motor vehicles to go to and from off-airport locations and to patrol the airport during daily bird hazard management activities. However, the consumption of fossil fuels for bird damage management is insignificant relative to ambient levels in the New York area.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.**Policy 41. Preserve and protect tidal and freshwater wetlands**

Except for the relatively minor disturbance associated with the Laughing Gull colony counts, the current bird hazard management program is not having an adverse impact on tidal and freshwater wetlands.

6.3.11 Identifying and Avoiding Impairments and Unacceptable Impacts on National Park Service lands.

The National Park Service has policy to avoid impairments of park resources and values. Additionally, since the threshold at which impairment occurs is not always apparent, the National Park Service avoids impacts that fall short of impairment. These impacts that fall short of impairment are unacceptable impacts. A review of the impacts from actions in Alternative 1 on National Park Service park resources and values was undertaken. Unacceptable impacts or impairments would impede the ability of the park to maintain bio-diversity; diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources; or interfere with an atmosphere of peace and tranquility or the natural soundscape in natural locations within the park.

The No Action alternative continues the current bird hazard management program at JFK, including non-lethal and lethal programs to reduce bird hazards to aviation safety on the airport, providing technical assistance on methods to reduce bird attractants to landowners off the airport. The non-lethal program includes hazing birds with pyrotechnics, lasers, distress calls, and chasing birds with vehicles and on foot. Some birds would be shot on JFK to reinforce hazing actions. Also, gulls would be shot upon entering JFK airspace. There are no off-airport bird hazard management operations in this alternative.

The only potential risk of unacceptable impact or impairment would be if the current on-airport shooting program resulted in the extirpation of the Laughing Gull colony. The Laughing Gull nesting colony in Gateway NRA is the only nesting colony in New York (Washburn et al. 2010). Belant and Dolbeer (1993b) and Dolbeer (1998a) predicted there would be no population impacts on the national or regional Laughing Gull population from the shooting of the gulls at JFK. However, the number of nests in the colony have declined approximately 74% from 7,629 nests in 1990 to 1,979 nests in 2011 (Washburn and Tyson 2011). As discussed in Section 6.3.1.1, the decline is likely attributable to a combination of the shooting program and degradation and erosion of East High Meadow and Silver Hole Marshes caused by tidal flooding (Tanacredi et al. 2002, NPS 2001, Washburn and Tyson 2010). Despite these factors, the population has been relatively stable over the period of 2000-2011, although there has been high variability in colony size in recent years (Washburn and Tyson 2011). As noted above, ongoing loss of saltmarsh habitat in the bay is a concern. Ongoing marsh degradation is a concern. Models of the impact of climate change on the bay indicate that the saltmarshes may not be able to keep pace with accelerated rates of sea-level risk which may occur (Kracauer Hartig et al. 2002). Even in the absence of the shooting program, if saltmarsh loss continues, Laughing Gulls may eventually abandon the JoCo site.

Impact Analysis: Alternative 1: Original Program/No Action Alternative cont.

During the period when this alternative was implemented, the national Laughing Gull population has increased in abundance and range (Sauer et al. 2008). There has been no impact on the regional Laughing Gull population even though more than 69,000 gulls have been shot upon entering JFK airspace between 1991 and 2009.

In summary, there were management actions occurring adjacent to Gateway NRA that resulted in the large take of gulls since 1991. While the take of such a large number of gulls may cause concern, there was no population impact regionally or nationally. Local natural resource conditions and the shooting program are contributing to the decline of nesting Laughing Gulls in Gateway NRA. Although the Laughing Gull Colony at Gateway NRA is greatly reduced from levels observed in 1991, a substantial colony (>3,000 birds) and associated bird viewing opportunities remain. If, cumulatively, all factors impacting the Laughing Gull colony cause a further decline, it is possible that the colony could eventually abandon the site and relocate to another area which may or may not be within Gateway NRA. Loss of the Laughing Gull colony would qualify as an impairment.

Gateway NRA still has a diverse bird community, there are still thousands of gulls and other bird species for citizens to enjoy or be inspired by, and the hazing and shooting program at JFK has probably less impact on the soundscape at Gateway NRA than the hundreds of daily jet aircraft movements nearby.

6.4 IMPACT ANALYSIS FOR ALTERNATIVE 2: ADD ADDITIONAL NONLETHAL METHODS ON AND OFF-AIRPORT TO CURRENT BIRD HAZARD MANAGEMENT PROGRAM

6.4.1 Impacts on Target Species

Incorporation of this alternative into the bird hazard management program is not expected to result in additional mortality in target or nontarget species. However, any time an animal is live-captured, there is a slight risk of significant injury or mortality. Individuals conducting live-trapping will be trained and experienced in the use of these methods which should minimize any risks. There is also a slight risk of unintentional mortality from the use of paintballs. More than 42,000 birds have been hazed with paintballs at the Fountain and Pennsylvania Avenue Landfills over 3 years from October 2007 to September 2010 (USDA, unpub. data). Canada Geese, Atlantic Brant, and Herring Gulls comprised 95% of the birds hazed. Only 3 Herring Gulls have been killed by paintballs while hazing. At JFK, about 500 Canada Geese and Atlantic Brant were harassed in 2009 (L. Francoeur, JFK Airport, pers. comm.). No birds were killed with paintballs at JFK. Total mortality or serious injury of all species from this alternative should be less than 4 birds per year, and in most years there is likely to be no mortality or serious injury. This low level of take would fall within totals predicted under Alternative 1 and would not adversely impact target species populations.

On-airport, the implementation of improved monitoring and data collection procedures should result in more targeted bird hazard management efforts and a more effective and efficient bird

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

hazard management program. Improved bird hazard management should result in fewer bird losses to strikes with aircraft. Identification of off-airport factors contributing to on-airport risks may allow for effective non-lethal management of off-airport hazards and reduce the number of birds that are shot at JFK. For example, if nonlethal methods reduce bird use of an off-airport attractant, there may be fewer movements through JFK airspace and less need for lethal or nonlethal management on-airport.

Off-airport, the standardized bird hazard monitoring program would help to ensure that the sites targeted for bird hazard management are associated with problems at JFK. Species that could be targeted for off-airport bird hazard management are geese, ducks, Mute Swans, Double-crested Cormorants, gulls, blackbirds, crows, Rock Doves and ducks. The goal of off-airport nonlethal bird hazard management projects is generally to get the target species to discontinue use of a particular site. These efforts generally do not result in the mortality of the target species, but they can result in disruption or loss of a season's reproductive effort through egg-oiling, nest destruction, or harassment and habitat modifications which cause birds to leave a site. All species that might be targeted by the use of off-airport nonlethal bird hazard management are generally abundant and the loss of a season's reproductive effort is unlikely to adversely affect their population. Additionally, many of the species likely to be targeted under this alternative readily adapt to human-altered environments. Habitat for these species, especially waterfowl, is not limited in the JFK area and encouraging birds to discontinue use of some sites is highly unlikely to cause hardship for these species.

Gateway National Recreation Area

Nonlethal methods proposed for Gateway NRA include harassment and habitat management at Pennsylvania Avenue and Fountain Avenue Landfills. Specifically, it may include use of bird dispersal methods (e.g., pyrotechnics, electronic harassment devices, pursuit on foot or with dogs, lasers, vehicle presence, and paintballs). As discussed above, there has been some limited unintentional mortality (3 Herring Gulls) in the course of the 3 years paintballs have been used at Pennsylvania Avenue and Fountain Avenue Landfills. No mortality is expected from any of the remaining methods. The low level of unintentional mortality associated with the use of paintballs will not adversely impact target species populations.

As upland areas predominated by grass and forbs mature toward a shrubland habitat, Canada Goose and other target species use of the area would be expected to decrease because the site no longer provides suitable food or habitat.

Use of methods such as exclusion, repellents, and human behavior management in developed areas of the park are expected to decrease the number of target species in these locations. However, the methods will not kill the birds, just redistribute the birds, so they are unlikely to adversely impact target species populations. Enforcement of no-feeding policies is likely to be beneficial to target species because it would cause birds to make greater use of natural food sources and discourage high concentrations of birds in feeding areas which may contribute to disease transmission among birds.

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.**Reproductive Inhibitors**

Nicarbazin is a reproductive inhibitor which can be used to maintain or reduce local populations of Canada Geese and Rock Pigeons. Nicarbazin will not result in death of any birds. Used exclusively, the time required to achieve population reduction in a bird population will depend on the mortality rate (i.e., lifespan) of adult birds, the proportion of the population that eats the correct dose of bait, and immigration of birds from the surrounding area once the local population starts to decline. The manufacturer predicts that under ideal conditions, with all pigeons in the area consuming the appropriate dose of bait during the entire breeding season, it may be possible to see reductions of up to 50% within the first year of product use (Innolytics 2009).

In situations where there is need for a more rapid response to ongoing damage it may be necessary to first reduce the number of birds present at the site using other methods and then use nicarbazin to keep the local population at the reduced level. In areas where the population is currently low and conflicts are tolerable, nicarbazin may be used to maintain the local population at current levels.

Although nicarbazin may be suitable for reducing or maintaining local bird populations, the cost of bait and labor involved in product application, will limit the scope of nicarbazin use. Use of nicarbazin is not anticipated to be of sufficient scope to result in substantial reductions in the state Canada Goose or Rock Pigeon populations. However, it should be noted that the NYSDEC is working to reduce the resident Canada Goose population in the state. Additionally, because Rock Pigeons are a non-native invasive species with negative impacts on native species, any level of population reduction including complete eradication would be considered by many biologists to be a beneficial impact on native ecosystems.

Gateway National Recreation Area

Nicarbazin is not proposed for use at Gateway NRA

6.4.2 Impacts on Nontarget Species

Relocation of target birds may disrupt or displace other bird species. The waterfowl, blackbirds, gulls and crows that would be targeted by this effort may cause problems for vegetation and other wildlife species at their new location. Mute Swans, for example, are known to aggressively defend their nesting territory sometimes to the exclusion of native bird species (Atlantic Flyway Council 2003). If relocation efforts at one site cause increased congregations of birds at another site, it may also increase risks of disease transmission among target and nontarget birds.

Some nonlethal management methods such as harassment may have an adverse impact on nearby nesting bird species, especially if a prolonged effort is required (Preusser et al. 2008). Review of available data indicate that state-listed threatened Northern Harriers, and state-listed endangered Peregrine Falcons nest within the 5-mile radius of JFK. However, harassment and habitat modification would not be conducted in areas used for nesting by Northern Harriers or Peregrine Falcons and are unlikely to have inadvertent impacts on these species. Northern Harriers have

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

been observed at Pennsylvania Avenue and Fountain Avenue Landfills and do not appear to be deterred by bird management activities at this location (see Gateway NRA below). Urban-nesting wildlife species that are not targeted by the harassment effort are likely to quickly habituate to the harassment activities.

Off airport habitat management recommendations would include recommendations of modifications that would exclude target birds or reduce the utility of the site for target bird species (e.g., exclusion devices on ponds, long grass management, changing vegetation used for landscaping, pruning or removal of roost trees). These activities will likely have adverse impacts on species with similar habitat requirements, but, as in the case of planting shrubs to break up large grassy areas, long-grass management, and the habitat restoration at Pennsylvania Avenue and Fountain Avenue Landfills, these alterations may have beneficial impacts on other wildlife species. Habitat alterations that would substantially impact nontarget species would not be proposed for areas of unique or limited availability habitat. Consequently, nontarget birds indirectly impacted by habitat changes to discourage target species should be able to find suitable habitat in other locations.

Gateway National Recreation Area

Use of harassment and habitat modification can impact nontarget species with similar habitat requirements as the target species. However, in the case of the landfills, Gateway NRA management objectives for the area were to create a tall grass/shrub/tree habitat which would not be attractive to waterfowl or gulls. Some of the target species, including Canada Geese, blackbirds and starlings, pigeons and doves, have been impeding habitat development at the site by foraging on seed and or newly sprouting vegetation. The combination of harassment and habitat management in this area serves the dual purpose of reducing risks to aircraft and accomplishing the original management goals for the site. As the plant community develops, WS is working with NYCDEP and Gateway NRA on alternatives to minimize and refine the use of harassment to meet decreasing need to manage species of aviation concern (Collins 2009).

Relocated birds may aggravate problems in other sections of the park. Multiple habitat restoration projects are in process in Gateway NRA. Goose and Mute Swan foraging has caused substantial problems for some vegetation restoration projects (Sections 5.1.2 and 5.1.3). In particular, resident Canada Geese relocated within Gateway NRA and from other sites in the city under this alternative may cause additional problems at these locations.

Despite the ongoing harassment program, several threatened and endangered species have been observed using the landfills including state-listed threatened Northern Harrier, Pied-billed Grebe, Upland Sandpiper, Common Tern and Least Tern, state-listed endangered Peregrine Falcon, and short-eared owl, and state and federally-listed endangered Piping Plovers. These species have been observed feeding or loafing on or in the water near the landfill. Their presence at the sites has been concurrent with the year-round harassment program, so current bird hazard management activities appear to have negligible impact on these species. One factor which likely contributes to the low impact of the program is that harassment activities have become increasingly target-specific. When the program was initiated, target birds were accustomed to using the location and intensive effort was needed to harass them from the site including use of

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

general harassment methods such as pyrotechnics. Now, birds are easier to harass and usually, just the presence of a vehicle or a person exiting the vehicle and approaching birds is often sufficient to discourage site use. Use of pyrotechnics which may also temporarily disperse nontarget birds has greatly decreased.

Use of exclusion, habitat modification, and repellents in developed areas of the park are unlikely to adversely impact nontarget species as noted for Alternative 1. Human behavior management may have a beneficial impact on nontarget species by preventing congregations of target birds which can damage habitat in the feeding area and increase risk of disease transmission among birds.

Reproductive Inhibitors

Nicarbazin baits for geese are to be used at office complexes, golf courses, residential communities, and municipalities. Although it is possible that other egg-laying species such as birds, reptiles, amphibians, fish, and invertebrates, could feed on the baits, which could reduce their egg-laying potential, the sites where the bait would be used are not as conducive to attracting many species of egg-laying animals. These areas are also places where T&E species are typically not found. Birds in urban and suburban habitats are typically common species that have adapted to the presence of man. Only a few other species are expected to consume the baits, primarily Mallards, domestic waterfowl, and possibly gulls, crows, and Rock Pigeons. In an Oregon field study, the primary nontarget avian species to consume the bait were American Crows, Common Ravens and Mallards. However, because most bait consumption by non-target species is expected to be occasional or intermittent and the bait must be consumed regularly throughout the breeding season to inhibit reproduction, nicarbazin is not expected to have any significant impact on these species. Additionally, the size of the baits will prevent small birds and songbirds from eating the baits; small pieces of bait will be removed during the manufacturing process by sifting through screens. Studies on waterfowl in the Fort Collins, Colorado area have shown that most mallards will not eat the bait; they pick up the bait, manipulate it with their bill and then spit it out. However, Mallards that are used to being fed by people could eventually eat the bait after the Canada Geese on site began eating the bait. Since Canada Geese will typically aggressively protect their food sources, they are expected to chase away any other birds attempting to eat the bait offered. Treatment sites would be monitored prior to and during bait application to ensure that non-target species access to the site is limited to nonexistent and that there is no state or federally listed species that could consume the bait present at the site. Unconsumed bait will be picked up after the bait application period.

Risk of nontarget species access to nicarbazin when used for Rock Pigeons is likely to be lower due to differences in the application strategy. As with the goose formulation, nicarbazin for pigeons is only registered for use in urban areas, applicators must ensure that children and pets do not come into contact with the product, the product cannot be used within 20 feet of any body of water, and the product may only be applied on rooftops or other flat paved or concrete surfaces. Applicators must confirm by visual observation that Rock Pigeons are eating the bait and nontargets are not feeding on the bait. The label stipulates that the bait application must be discontinued at sites if nontargets are observed feeding on the bait. As with the goose formulation, no excess bait may remain after feeding. The chemistry of the active ingredient

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

assures that there is a low risk of any effect on a raptor. To have an effect, the bird must consume the bait. Once Nicarbazin is digested and absorbed, it is no longer biologically available to another bird. There is effectively no risk of secondary toxicity (http://www.innolyticsllc.com/new%20pigeon%20pages/pigeon_FAQ.html).

Studies of the effects of nicarbazin on animals other than birds that lay eggs have been limited to snakes. When Brown Tree Snakes were treated with nicarbazin, the number of eggs laid, the hatchability of the eggs, and the health of the offspring were not affected by treatment. It is possible, but not probable, that other egg-laying species could feed on the bait such as turtles. However, WS will monitor the site prior to and during bait application and will remove the bait and/or change the bait application system to avoid exposure to nontarget species.

Toxicity studies in birds and mammals given short and long-term doses of nicarbazin show minimal effects. The volume of Nicarbazin bait that would have to be consumed by nontarget birds and mammals precludes them from being killed by exposure to the bait. For example, a rat would have to consume over 2.2 pounds of the Nicarbazin bait in a single feeding to reach the lethal dose required to kill 50% of the rats to consume that level of bait (LD50). Extrapolations from data on chickens indicate that Crows would have to eat 1.4 lbs of bait each day for 84 days before they would reach the LD50 (Binam et al. 2005). Mammalian predators of geese that have eaten bait could also be exposed to the bait. However, calculations of a worst case scenario by Bynum et al. (2005) indicate that a Coyote would have to eat over 40 geese in a single day in order to reach the acute (one dose) LD50 for Nicarbazin determined for dogs weighing 25 lbs., or over 13 geese per day for 163 days to reach the chronic (repeated dose) LD50.

Gateway National Recreation Area

Reproductive inhibitors are not proposed for use at Gateway NRA.

6.4.3 Water Quality

Impacts of this alternative are similar to the No-action alternative with the primary difference being one of scale of action. More nonlethal bird hazard management activities are likely to be conducted off-airport under this alternative than under the No-action Alternative. If bird relocation efforts at one site cause increased congregations of birds at a different site, there may be adverse impacts on local water quality from fecal contamination. Over-grazing by high densities of geese could lead to increases in runoff and associated impacts on water quality as discussed for the No-action alternative. Conversely, reducing waterfowl use of areas associated with bird strike hazards may have beneficial impacts on water quality at the site. Impacts at Gateway NRA are similar to those for other sites.

6.4.4 Parks and Recreation

Parks and recreational areas can be major off-airport attractants for target species. This alternative would increase efforts to reduce target bird species use of these locations. Some individuals will consider a reduction in the presence of birds at these sites to be an adverse impact on their enjoyment and use of the sites. Others would be pleased with the reduction in some over-abundant species that make it difficult to enjoy the intended use of the park (e.g.,

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

though fecal accumulations). Bird feeding in one of the activities which individuals may enjoy at parks and similar locations, although Nassau County has established a waterfowl feeding ban. Even with feeding bans, it can be extremely difficult to convince individuals to cease bird feeding.

Use of nonlethal methods to resolve problems with waterfowl will result in the birds moving to a new location. It is possible that this may lead to unacceptably high concentrations of birds at the new site which may have an adverse impact on recreational use of the site because of fecal contamination. Additionally, nesting waterfowl, particularly geese and swans can be aggressive toward humans when defending their nests or chicks.

Some people may perceive nonlethal methods such as the use of repellents on grass as offensive and an impediment to their enjoyment of these areas. Methyl anthranilate, one of the primary active ingredients in repellents used for birds, is an artificial grape flavoring food additive and does not pose any risk to human health and safety. The second active ingredient commonly used in bird repellents is anthraquinone which is a naturally occurring chemical found in many plant species. Use in accordance with label directions, this product should also pose no risks to human health and safety. However, it may be necessary to close parks during periods when repellents are being applied and for a period after application while the products dry. Other individuals may perceive the noise and activity associated with bird harassment as detrimental to their recreational enjoyment of a site. To the maximum extent practical, these types of activities would be scheduled for times when they would have the least impact on recreational activities. This may be easier for methods like repellent application than for harassment methods which have to be conducted when the birds are at the park.

Recreational use of sites can be one of the major factors complicating the implementation of nonlethal management techniques. For example the need for short grass and large open areas of grass in playing fields and other park sites preclude use of most habitat management and exclusion methods to reduce use by geese and gulls. Overhead or over-water wire and grid systems intended to exclude gulls and waterfowl may be considered unsightly and to have a detrimental impact on recreational use of sites. However, the intended use of recreational sites generally has priority, and the primary impact of these types of constraints is on the efficacy of the bird hazard management recommendations.

Gateway National Recreation Area

Pennsylvania Avenue and Fountain Avenue Landfills are not open for recreational use. Nonlethal bird damage management activities are unlikely to have substantial direct impact on recreational use of the sites except for possible minor noise disturbance to adjacent properties. These methods may be considered disruptive to the park experience by some individuals, but to date, there have been no complaints regarding the nonlethal components of the program on Pennsylvania Avenue and Fountain Avenue Landfills.

Relocation of birds can lead to problems with the relocated birds at new locations as discussed above. This is especially likely for resident Canada Geese. Ultimately, establishment of the intended vegetation community and reduction of damage management efforts should lead to

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

greater use by native wildlife populations at Gateway NRA and enhance the overall park experience.

Impacts of enforcing “No-feeding” policies on individuals’ enjoyment of the park will be as described above for other locations. However, increased efforts for proper sanitation and adequate waste disposal may result in cleaner, more pleasant conditions for park visitors. One of the food attractants at the park for gulls, pigeons, starlings and crows are prayer offerings left by individuals of some of the many faiths practiced in NYC (USDA 2002). It may be necessary to work with these groups to develop accommodations which meet their needs while also reducing conflicts with birds. Limitations and concerns regarding the use of repellents exclusion devices will also be as noted above.

6.4.5 Ambient Air Quality

Minor impacts are associated with pyrotechnics, shooting for deterrence or lethal purposes, and exhaust from vehicles used for patrols of on and off-airport sites. However, against background air quality conditions, these impacts are not substantial enough to warrant extensive analysis. Levels of vehicle use would likely be higher for this alternative than for the No-action alternative because of travel to off-airport locations. However, this increase is not likely to be appreciable in light of background air quality impacts. Impacts at Gateway NRA would be similar to those for other locations.

6.4.6 Noise

Minor impacts are associated with shooting measures (for harassment), pyrotechnics and the use of alarm/distress calls. Use of these devices may have an undesirable impact on residential areas and uses of the treatment site and surrounding property. In areas where these types of impacts are possible, preference will be given to the use of quieter harassment methods such as trained dogs, remote-controlled boats, and individuals in canoes and kayaks. Use of pyrotechnics in the city is not anticipated due to the strict code enforcement by the Fire Department of New York City.

Gateway National Recreation Area

Noise-making devices are only proposed for use at Fountain Avenue and Pennsylvania Avenue landfills at Gateway NRA. These sites are not currently open for recreational use and are separated from the main recreational areas of the park. There may be some slight noise disturbance from the harassment program. However, to date, there have been no complaints regarding noise associated with the harassment project. Once the sites have been adequately reclaimed, the intention is to open these locations to public use. Habitat alterations and the implementation of a consistent harassment program have already reduced the need to use harassment, including pyrotechnics. If harassment is still needed at the time the sites are opened for public use, the agencies will work to select nonlethal bird dispersal methods which will minimize noise impacts on recreational use.

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.**6.4.7 Airport Operations and Safety**

Where exclusion and habitat modification are able to render a site inaccessible or unattractive to birds, these methods can be a preferred and effective long-term solution to bird hazard problems. However, there are concerns regarding the use of harassment as a means of deterring birds from using off-airport sites. The initial response of birds to frightening stimuli is usually to fly into the air which may actually increase risks to aircraft in the short term. This may be especially true for species like gulls which may engage in towering in response to frightening devices. Although harassment can be effectively used to deter birds from using a specific site, in studies with geese, harassed birds did not move far from their original site (Preusser et al. 2008, Holeveinski et al. 2007). Geese may be just as much of a hazard to aircraft at their new location as at the original site. Effective use of this alternative will require monitoring and, if needed, additional management efforts to prevent problems at their new location. It may be necessary to have a simultaneous effort at multiple sites to make sure birds do not relocate to other inappropriate locations.

6.4.8 Socioeconomic Impacts

Adding this alternative to the No-action alternative would help reduce bird strike hazards to aircraft at JFK. As such, it would likely result in a reduction in direct and indirect costs associated with bird strikes discussed for Alternative 1.

The waterfowl, blackbirds, gulls and crows that would be targeted by this effort are abundant species known for causing other types of damage problems when they congregate in areas used by humans (e.g., issues associated with fecal contamination, damage to plants and landscaping, overgrazing in wildland areas, etc. (USDA2004, USDA 2005, USDA 2009). If relocation efforts at one site cause increased congregations of birds and damage problems a different site, there may be expenses to repair the damage, costs associated with lost use of the damaged site, and costs to manage the new damage problem. One of the primary challenges associated with the use of nonlethal methods to address this type of problem is that it is difficult to control where the relocated birds go. Displaced birds may move to a new location which also poses hazards to aircraft or, as noted above, they may move to a location which results in different problems and conflicts. Individuals who may not have had a damage problem may find themselves having to act to address problems created by efforts to reduce risks and conflicts at JFK.

6.4.9 Sociological Issues including Humaneness and Aesthetic Values**Humaneness**

Adding the proposed monitoring and reporting programs will improve the efficacy and specificity of bird hazard management at JFK. As such, it should be perceived as improving the overall humaneness and accountability of the current bird hazard management program. Use of nonlethal methods is general perceived as the humane solution to most wildlife conflicts and is likely to be well received by most members of the public as an addition to the existing on-airport bird hazard management program. However, some members of the public may consider

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

nonlethal methods to be cruel because these methods may be implemented daily over a period of months to achieve the desired results.

Effective implementation of this alternative would likely require regular use of harassment methods at some sites. In general, harassment is likely to only result in minor short-term impacts as discussed for Alternative 1. However, off-airport, target species (e.g., resident Canada Geese) which may not leave the 5-mile radius of JFK in response to harassment could be subject to periods of prolonged harassment and stress. Harassment programs would need to be discontinued during molt when adults are flightless and while chicks are flightless to avoid stress and distress to birds which cannot effectively respond to harassment. Capture and relocation would cause short-term stress to the animals during the relocation process and longer-duration impacts to the animal as it adjusts to the relocation site or attempts to return to the original capture location. The remaining methods under this alternative are not anticipated to result in appreciable stress to affected animals.

Aesthetics

Viewing and feeding waterfowl at parks and other locations in the city is perceived by many individuals as a pleasurable and aesthetically appealing activity. Off-airport damage management actions which greatly reduce or eliminate birds from a particular site will be perceived by some as a significant loss in aesthetic values. This may be especially true for individuals who may have formed an attachment to a particular bird or birds a specific site that they enjoy.

For some people, in situations where high numbers of birds are having an adverse impact on a site because of fecal contamination or aggressive behavior, the proposed action may have a beneficial aesthetic impact.

There may be concerns that risks to aircraft at JFK may be misused as justification for bird removal to address nuisance/aesthetic problems. Off-airport bird hazard management for JFK would only be conducted after informing the members of the BHTF of the proposed action. The BHTF includes representatives from federal, state and city agencies with management authority for bird management and agencies with management authority for lands around JFK. All off-airport bird hazard management activities would be conducted in accordance with public notification policies of the landowner or land manager.

Some individuals may feel that their enjoyment of sites used by waterfowl or the surrounding areas may be adversely affected by noise and commotion associated with harassment efforts. Exclusion devices such as wire grid systems and other bird barriers and visual frightening techniques may also be perceived as being aesthetically unappealing and adversely affecting the appearance of the location where they are applied. In a study by Loker et al. (1999) on New York State residents' perceptions of Canada Goose damage management methods. Residents who were the most concerned about problems with geese tended to accept more invasive methods than those who had fewer concerns. However, residents who were highly concerned about goose damage considered non-lethal noninvasive methods which affected a pond's

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

appearance (e.g., flags, floating boards, and fencing over the ponds) unacceptable as exclusive management actions, but were supportive of invasive nonlethal methods.

Aesthetic values are based on and influenced by an individual's perceptions and beliefs. In the case of bird hazard management at airports, the extent to which an individual perceives an action as having an unacceptable aesthetic impact will depend, in part, on the degree of urgency the individual feels regarding the management of bird strike hazards (Loker et al. 1999). Individuals who place a high priority on doing everything possible to reduce bird strike hazards may not be as distressed by the aesthetic impacts of a bird hazard management technique used to address problems at JFK as they might be if the same method was proposed to resolve a nuisance problem (e.g., feces at parks).

6.4.10 Coastal Zone Management Programs

For most issues, consistency with Coastal Zone Management Programs will not differ from the No-action Alternative. The only difference in impacts on coastal issues between this alternative and the No-action alternative is in the extent to which the methods will be applied at off-airport sites. However, the use of nonlethal methods to reduce bird use of off-airport attractants associated with bird strike hazards at JFK may affect water-related recreational use of some sites.

Policy 9. Protect, maintain and increase the level and types of access to public water-related recreational resources

Actions to reduce bird hazards at JFK would result in the reduction or complete removal of waterfowl from some parks and recreational areas. Some individuals will perceive the reduction in bird numbers as having an adverse impact on their recreational use of the site. However, the proposed action will not removal all birds at recreational areas within the 7 mile radius of JFK. Opportunities to view and enjoy waterfowl and other target species would still be available but individuals may have to go elsewhere for these opportunities.

6.4.11 Identifying and Avoiding Impairments and Unacceptable Impacts on National Park Service lands.

No unacceptable impacts or impairments were identified for actions proposed under Alternative 2. Alternative 2 would augment on-airport bird hazard management efforts by establishing a regular bird hazard monitoring program; and enable the agencies to recommend and use non-lethal bird hazard management off-airport, including Gateway NRA and Fountain and Pennsylvania Avenue Landfills. This alternative excludes the Laughing Gull colony on Gateway NRA. The non-lethal hazing program would include harassment, habitat alteration, exclusion, capture and relocation, posting "feeding the birds is prohibited" signage and modification of human behavior.

The implementation of non-lethal bird hazard management efforts can only be done with permission of the landowner. The National Park Service requires the issuance of a permit before wildlife management actions can be undertaken on lands under its management. Wildlife Services' procedures require obtaining written permission of the landowner before actions are

Impact Analysis: Alternative 2: Add Additional Nonlethal Alternative cont.

implemented. The landowner can allow or disallow the use of select methods on their property. This safeguard is an added layer of review to ensure appropriate methods are implemented. An example of non-lethal bird hazard management methods in current use at Rulers Bar Hassock is posting of signs instructing patrons that feeding of birds is prohibited. At Fountain and Pennsylvania Avenue Landfills a wider range of non-lethal bird hazard management activities, including 15mm pyrotechnics, chasing birds with vehicles and on foot, lasers, and distress calls are implemented since the sites are closed to the public.

In summary, the implementation of non-lethal bird hazard management off-airport would have no acceptable impacts or impairments to park resources or values. The non-lethal methods implemented would need a permit from the National Park Service before implementation on Gateway NRA. Recommended methods would be appropriate for the site, thus methods would be different among sites were non-lethal bird hazard management methods are used. The implementation of a bird hazard monitoring program is benign and resembles much of the bird watching currently ongoing throughout Gateway NRA.

6.5 IMPACT ANALYSIS FOR ALTERNATIVE 3: ADD ADDITIONAL ON-AIRPORT LETHAL HAZARD MANAGEMENT ACTIVITIES TO CURRENT BIRD HAZARD MANAGEMENT PROGRAM

6.5.1 Impact on Target Species

Adverse impacts of this alternative on target species populations include take of nests and eggs of Canada Geese and American Oystercatchers, increased mortality in gulls associated with extending the duration of the supplemental on-airport shooting program to address problems with Herring Gulls; and potential increases in mortality of new species that might be taken by the supplemental on-airport shooting program. New Species that might be taken by the supplemental on-airport shooting program include Canada Geese, Atlantic Brant, Double-crested Cormorants, Mute Swans, ducks, Rock Pigeons, Crows, Blackbirds and European Starlings.

Nest and Egg Destruction

Impacts of on-airport nest and egg destruction on target species populations are addressed in Section 6.3.1. The USFWS permit allows for the destruction of up to 50 Canada Goose nests and 20 American Oystercatcher nests per year to reduce bird hazards to aircraft at JFK. Nest destruction generally causes adults to leave the site. Depending on the time of year, adults may attempt to renest in another location.

The number of Canada Goose nests that might be impacted is insignificant relative to the number of birds present in the state (Section 6.3.1), and will not adversely impact the increasing resident Canada Goose population. The annual rate of increase for Canada Geese in New York State from the BBS was 10.3% per year ($P < 0.01$; Sauer et al. 2008). Actual impacts are likely to be negligible as there have been no Canada Geese nests destroyed except for in 2001 and 2002, and

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

even then, only 1 nest was destroyed per year. On-airport take of nests is not anticipated to increase over current levels.

For American Oystercatchers, the number of nests that may be destroyed has ranged from 0-4 nests per year. The number of nests taken represents the maximum number of pairs that could be affected. The number of nests removed could represent more than one nest removal for the same pair. Depending on the timing of the nest removal, it is possible that birds that have their nest destroyed at JFK may move elsewhere and successfully re-nest although subsequent nests generally have 2 eggs instead of the three eggs in initial nests (Ehrlich et al. 1988). In either instance, the total number of pairs affected would be lower than the number of nests destroyed.

Although American Oystercatcher populations are declining, the take of American Oystercatchers in the Region is sufficiently limited in scope (the only authorized take has occurred at JFK) and in number that it is unlikely to contribute to the current population trend for the species. As noted for Alternative 1, nest success of birds attempting to nest next to the runways is likely to be poor because of the numerous risks of mortality to adults and fledglings from aircraft. Actions to discourage birds from nesting in this area, including nest destruction, should result in the birds moving to a location where their chance of being struck by aircraft is reduced and likelihood of successfully raising young is improved.

In 2007, under special permit from the USFWS and NYSDEC, the JFKWMU removed a Northern Harrier nest and 4 eggs to reduce a persistent threat to aircraft from a pair of birds that had chosen to nest on the airport property. Because of the intensive efforts to deter all bird activity at JFK, the need to remove nests and eggs of birds is relatively rare. However, as in the case of the Northern Harrier, one or two nest from other species may be removed during a given year, but only after advance consultation with the USFWS and NYSDEC as appropriate. Given USFWS and NYSDEC oversight, the removal of one or two nests would not adversely impact target species populations.

Extending the Duration of the Supplemental On-airport Shooting Program

Under this alternative, the duration of the supplemental on-airport shooting program would be extended from May – August to May – October. This time extension is primarily intended to help address problems with Herring Gulls which, unlike Laughing Gulls, remain in the NYC area year-round although Laughing Gulls may also be taken for the same reason they are taken during the summer shooting program. Herring Gull strikes are now more common than Laughing Gull strikes. The supplemental on-airport shooting program has been effective in reducing strikes by all gull species. Continuing the supplemental on-airport shooting program into October would mean that the program would be in effect during the months when Herring Gull strikes have been the highest (Fig. 1-10).

Continuing the shooting program an additional month would be a 25% increase in the duration of the shooting program. For purposes of analysis, we are assumed the increase in the program would equate to a maximum 25% increase in take of Herring Gulls, Ring-billed Gulls and Great Black-backed Gulls as these species are present year-round. Increasing the permitted take of

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

Herring Gulls, Ring-billed Gulls and Great Black-backed Gulls 25% would result in maximum permitted take of approximately 1,500 Herring Gulls, 400 Ring-billed Gulls, and 400 Great Black-backed Gulls. For all species except Ring-billed Gulls, this level of take is consistent with the level of take which occurred during experimental implementation of this method in 2008 and 2009 (Table 6-6). Ring-billed Gull activity in the vicinity of the airport was higher than expected. Therefore, we anticipate that up to 600 Ring-billed Gulls may be taken per year if the length of the supplemental on-airport shooting program is extended. Using the analysis and methods from Alternative 1, this increase would not have an adverse impact on the regional populations of these species.

Most Laughing Gulls have left the colony by this time although there may be annual variation in Laughing Gull presence at Gateway NRA. Adverse weather conditions could lead to early nest failures and subsequent renesting which could extend the period when Laughing Gulls are present. Similarly, mild weather conditions could result in Laughing Gulls remaining in the area longer than usual. In general, impacts on total take of Laughing Gulls are anticipated to be lower than for the other gull species. However, even if Laughing Gull removals were conducted at the same level as for the other gull species (e.g., approximately 1,100 birds per year) it would not increase current annual Laughing Gull take to the level allowed under the USFWS permit (8,100 Laughing Gulls per year). Average take of Laughing Gulls by the supplemental on-airport shooting program for the last 5 years was 4,252 birds per year (range 3,699-4,879 birds per year). Using the analysis and methods from Alternative 1, this increase would not have an adverse impact on the regional populations of Laughing Gulls although it would likely contribute to local population decreases.

As noted for Alternative 1, the number of nests in the colony have declined approximately 74% from 7,629 nests in 1990 to 1,979 nests in 2011 (Washburn and Tyson 2011). As discussed in Section 6.3.1.1, the decline is likely attributable to a combination of the shooting program and degradation and erosion of East High Meadow and Silver Hole Marshes caused by tidal flooding. Despite these factors, the population has been relatively stable over the period of 2000-2011, although there has been high variability in colony size in recent years (Washburn and Tyson 2011). If, cumulatively, all factors impacting the Laughing Gull colony cause a further decline, it is possible that the colony could eventually abandon the site and relocate to another area which may or may not be within Gateway NRA. Marsh degradation is of particular concern. Even in the absence of the shooting program, if saltmarsh loss continues, Laughing Gulls may eventually abandon the JoCo site.

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.**Table 6-6.** Birds taken at JFK airport during a Sept-Oct. extension of the supplemental on-airport shooting program.

Species	2008	2009
Laughing Gull	114	764
Herring Gull	297	121
Great Black-backed Gull	78	13
Ring-billed Gull	217	322
Canada Goose	53	21
Atlantic Brant	171	114
Double-crested Cormorant	80	114

Increase Species Taken by Supplemental On-airport Shooting Program

This method would authorize the supplemental on-airport shooting program to take Canada Geese, Atlantic Brant, Mute Swans, Double-crested Cormorants, European Starlings, Rock Pigeons, blackbirds and crows that attempt to fly into JFK airspace in the same manner as they currently take gulls. This program is currently being implemented at JFK on an interim basis to address risks from these species. The JFKWMU and WS have been particularly concerned about risks from large-bodied birds and most efforts have focused on these species. Some, if not all, of the birds which could be taken by an increased supplemental on-airport shooting program would likely be taken by the JFKWMU as part of the original on-airport wildlife hazard management program (Alternative 1) if they were not taken by the supplemental shooting program. All of the species listed above are present in the Jamaica Bay and NYC area most of the year. Based on current population trends, and ongoing bird hazard management activities at JFK, maximum estimated annual take under this Alternative (Includes Alternative 1) would be 500 Canada Geese, 1,000 Atlantic Brant, 50 Mute Swans, 400 Double-crested Cormorants, 100 Mallards, 50 Black Ducks, 5 Gadwall, 5 Green-winged Teal, 5 Wood Ducks, 5 Greater Scaup, 5 Lesser Scaup, 5 Bufflehead, 2 Cinnamon/Blue-winged Teal, 2,500 Rock Pigeons, 15,000 European Starlings, 1,000 blackbirds (all species combined) and 250 crows (American Crows and Fish Crows combined). Because it is likely that some or all of these birds would be taken by the JFKWMU in the absence of an expanded supplemental on-airport shooting program, this level of take was analyzed as a worst-case (maximum take) scenario under Alternative 1. Based on the data and analyses provided for Alternative 1, increasing take to these levels will not adversely impact populations of these species.

Cottontail Rabbit and Black-tailed Jackrabbit Removal

A shooting program could significantly reduce the cottontail rabbit and black-tailed jackrabbit populations at JFK. The non-native black-tailed jackrabbit population primarily occurs on JFK property and it is theoretically possible that implementation of this alternative could result in the elimination of the black-tailed jackrabbit population. Given that black-tailed jackrabbits are a non-native species, removal of the population would be considered by some biologists and ecologists to be a beneficial impact on the native ecosystem. However, time and labor required

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

to remove each animal increases substantially as populations become very low. Consequently, it's unlikely that all individuals from the black-tailed jackrabbit population will be removed.

Cottontail rabbits are a common and abundant species in New York State. Removal of cottontail rabbits at JFK would result in a reduction in the cottontail rabbit population on JFK property. However, given the occurrence of cottontail rabbits on surrounding property and the reproductive capacity of cottontail rabbits, any impact is likely to be short term. Ongoing efforts will likely be needed to keep the population at desirable levels.

Rodent Removal

Three rodent species were identified during a study of the impacts of vegetation management on bird and rodent activity at JFK, house mouse, meadow vole and white-footed mouse (Barras et al. 2000a). House mice are a non-native species. House mice produce multiple litters per year with 3 – 11 young per litter (Burt and Grossenheider 1980). Meadow voles and white footed mice are highly prolific native species (meadow voles - up to 17 litters annually, typically 4-5 young per litter; white-footed mice - multiple litters per year, five young each) (Godin 1977). All three species are relatively common and are not restricted to JFK property.

Most biologists and ecologists would consider any level of removal of non-native rodents including complete eradication to be a beneficial impact on native ecosystems. However, given the reproductive capacity of house mice and that source populations will remain outside the boundaries of JFK, any reductions in the house mouse population are likely to be short term. Ecological impacts of removing native rodents depends on the scope and magnitude of the removal. Given that meadow voles and white-footed mice are relatively common, the high reproductive capacity of both species and that source populations would remain outside the boundaries of JFK, population reductions resulting from this action would be short-term and of low overall impact. Ongoing efforts would likely be needed to keep the rodent populations at JFK at desirable levels.

6.5.2 Impact on Nontarget Species

Most methods used to implement this alternative (shooting, live-capture and euthanasia, nest destruction) are highly selective for target species. The increase in shooting by the supplemental on-airport shooting program is not likely to substantially increase the impact nontarget species on or adjacent to the airport beyond that anticipated under Alternative 1. This alternative is not expected to have any impact on airport habitat. The primary risk to nontarget species from implementation of this alternative would be associated with the use of rodenticides. Efforts to prevent bird and other animal use of JFK property will help minimize the risk that a nontarget species would inadvertently access the bait or that a predator or scavenger would access a poisoned rodent.

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

Zinc Phosphide

Zinc phosphide is 2 to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Brock 1965, Evans et al. 1970, Schitoskey 1975, Bell and Dimmick 1975, Hill and Carpenter 1983, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Matscke et al. 1983, Marsh 1987, Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume prairie dog tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (i.e., causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Tkadlec and Rychnovsky 1990, Johnson and Fagerstone 1994).

Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siefried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from zinc phosphide grain bait consumption or, for scavenging bird species, from eating poisoned rodents (USDA 1997 Revised). Use of rolled oats instead of whole grain also appears to reduce bird acceptance of bait.

Uresk et al. (1988) reported on the effects of zinc phosphide on six non-target rodent populations. They determined that no differences were observed from pretreatment until after treatment in populations of eastern cottontail rabbits (*Sylvilagus floridanus*) and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by non-target wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (*Peromyscus maniculatus*) populations in areas treated with zinc phosphide, however the effect was not statistically significant because of high variability in densities and the reduction was not long-term (Deisch et al. 1990).

Ramey et al. (2000) reported that 5 weeks after treatment, no Ring-necked Pheasants (*Phasianus colchicus*) had been killed as a result of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect non-target populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poison grain remaining for their consumption was low (*i.e.*, bait was accepted by prairie dogs before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide. Reduced impacts on birds have also been reported by Tietjen and Matschke (1982) and Matschke et al. (1983).

Deisch et al. (1989) reported on the effect zinc phosphide has on invertebrates. They determined that zinc phosphide bait reduced ant densities, however, spider mites, crickets, wolf spiders, ground beetles, darkling beetles and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Deisch 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect populations sampled (Deisch et al. 1989). Long-term effects were not directly related to rodenticides, but more to habitat changes (Deisch 1986) as vegetative cover and prey diversity increased without prairie dogs grazing and clipping the vegetation (Deisch et al. 1989).

Chlorophacinone and Diphacinone

Chlorophacinone and Diphacinone are first-generation anticoagulant rodenticides which require multiple feedings over a period of approximately 3-5 days to kill target animals (Timm 1994). Chlorophacinone and diphacinone are highly toxic to rodents and other mammals, slightly toxic to humans, and minimally toxic to granivorous birds. It is a secondary hazard to predators and scavengers. The need for multiple feedings over a period of several days helps to minimize risks to nontarget species. To reduce risks of nontarget poisoning, bait would be placed in 2 inch diameter, 30 inch long PVC pipe bait stations. Bait stations would be placed out of reach of children and pets. Broadcast applications of bait are prohibited. Applicators must collect and properly dispose of dead animals to reduce risks of secondary poisoning. Ongoing programs to harass and otherwise deter birds and other animals from using JFK will also reduce secondary poisoning hazards to raptors and avian scavengers. Given the combination of measures to reduce direct consumption of bait by nontarget species and fencing and harassment to reduce risks to nontarget species, the proposed action is expected to have no effect on state or federally-listed T&E species. Fencing and access restrictions to JFK also help minimize risks to humans and pets. Given the above protective measures risks to nontarget species from on-airport use of chlorophacinone and diphacinone are likely to be very low.

6.5.3 Water Quality

Carcasses of birds shot at JFK will be collected and disposed of in accordance with state and federal regulations. A limited number of birds may die in locations where their carcasses cannot be recovered. The natural decay of these carcasses would introduce low levels of decomposition products to the biogeochemical cycle of the marsh and ultimately to the water column.

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

Hik and Jefferies (1990) showed that waterfowl feces play an important role in nutrient cycling in salt marshes. The lethal removal of birds under this alternative might result in a reduction in the amount of fecal material contributed directly into the bay. However, the number of birds removed at JFK is low relative to total bird use in the bay. The primary species targeted by this alternative that would use the bay would be geese. Given the increase in the New York State population of resident Canada Geese, reductions in fecal material from birds shot at JFK is insignificant relative to total contributions to the system by all water using the bay. Additionally, as indicated in Section 5.2, dissolved inorganic nitrogen and total nitrogen levels in the water of the bay are already very high and in excess of limiting concentrations for algal growth.

6.5.4 Parks and Recreation, Air Quality, Noise

Impacts of this alternative on these factors will be similar to the supplemental on-airport shooting program in the No-action Alternative. The primary difference is that there will be a slight increase in the amount of shooting and the bird species which may be targeted and associated impacts.

6.5.5 Airport Operations and Safety

The supplemental on-airport shooting program has operated safely in conjunction with airport operations since 1991. Preventing large-bodied birds from entering JFK airspace will serve to effectively reduce bird strike hazards at JFK. The current limited implementation of this alternative seems to have kept bird strike hazards from these species at a low level in spite of increasing populations of some species and what appears to be increasing attempts by these species to enter JFK airspace (Sections 1.7). Use of the supplemental on-airport shooting program to take members of flocking species such as blackbirds and rock pigeons can serve to frighten the remainder of the flock away from JFK airspace and reduce strike hazards to aircraft.

6.5.6 Socioeconomic Impacts

Adding this alternative to the No-action alternative would help reduce bird strike hazards to aircraft at JFK. As such, it would likely result in a reduction in direct and indirect costs associated with bird strikes discussed for Alternative 1.

6.5.7 Sociological Issues including Humaneness and Aesthetic Values**Humaneness**

The proposed action involves increasing the use of lethal methods to reduce bird hazards to aircraft at JFK. As with the No-action Alternative, the agencies recognize that some individuals will be concerned that the shooting and toxicants used to manage wildlife damage may expose animals to pain, stress and suffering. With shooting, death is often instantaneous or occurs very quickly and is not expected to result in substantial stress to the species. Production of a clutch of eggs requires substantial physiological investment from the adult birds. Nest and egg destruction would result in stress on the adult birds. Depending upon the species and the timing of the event,

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

the birds may attempt to renege in another location. However, given that nest and egg destruction is not commonly used at JFK because of effective habitat management and harassment programs, overall stress to birds from this method will be limited to only a few individuals. In general, public perceptions of the humaneness and the stress and distress to animals from the use of toxicants is less favorable than for other methods because of the time the products take to kill the target animal and the potential for risks to nontarget species. Some individuals will perceive the use of any lethal method as inhumane, unnecessary, and morally unacceptable.

Some members of the traveling public, airport managers, and others will be more sensitive to another side of the issue, specifically, whether or not it is humane to not do everything reasonably possible to reduce risks to humans from bird strikes. These individuals will be more likely to perceive the proposed action as being a humane means of reducing risks to people and the environment from bird strikes.

Aesthetic Impacts

JFK property is not open to the public for wildlife observation, so actions which limit the number of birds on-airport are likely to have a little impact on bird watching opportunities. Additionally, as noted above, the lethal methods proposed for use under this alternative are not expected to adversely impact target species populations. Some individuals opposed to the use of lethal methods may feel that the observation or knowledge of the supplemental on-airport shooting program or interaction with dead or injured birds would have an adverse impact on their aesthetic enjoyment of the bay.

6.5.8 Coastal Zone Management Programs

Consistency with Coastal Zone Management Programs will not differ from the No-action Alternative. The only difference in impacts on coastal issues between this alternative and the No-action alternative is in the extent to which the methods will be applied.

6.5.9 Identifying and Avoiding Impairments and Unacceptable Impacts on National Park Service lands.

Alternative 3 would add additional on-airport lethal bird hazard management activities to the current bird hazard management program (Alternative 1). The duration of the on-airport bird shooting program would be increased from May to November from May to August; personnel in the shooting program would assist the on-airport JFK WMU by shooting Canada Geese, Mute Swans, cormorants, brant, ducks, crows, starlings, and blackbirds entering JFK airspace. This alternative would include the implementation of lethal rabbit and rodent management methods. The on-airport shooting program would continue in the background of jet noise routinely occurring at JFK. Visitors to Gateway NRA would unlikely notice bird damage management activities at JFK unless that took a boat to the perimeter of the airport. Even then, jet noise would smother some shooting reports. Since planes fly daily year round an extension of the shooting period would be little noticed. Some of the birds being shot are non-native invasive species (e.g. European Starlings, Mute Swans). Federal policy encourages their removal from

Impact Analysis: Alternative 3: Add Additional On-Airport Use of Lethal Methods Alternative cont.

the environment. Other species are overabundant and conflict with human values and resources in which other Final Environmental Impact Statements call for population management of resident Canada Geese and Double-crested Cormorants (USFWS 2005 and USFWS 2003). Furthermore, Gateway NRA has documented some of these non-native or overabundant species are damaging natural resources in the park (G. Frame, Gateway NRA, unpub. rep., 2011). The other species (i.e. blackbirds, crows) are abundant and their take on JFK is minimal. Brant are seasonally abundant before migrating to the arctic to breed before returning each fall.

In summary, the implementation of an extended period of on-airport lethal bird hazard management is unlikely to have unacceptable impacts or impairments to park resources or values. However, if, cumulatively, all factors impacting the Laughing Gull colony cause a further decline, it is possible that the colony could eventually abandon the site and relocate to another area which may or may not be within Gateway NRA. Loss of the Laughing Gull colony would qualify as an impairment. The additional on-airport lethal bird hazard management activities would have small beneficial impacts to the bio-diversity in Gateway NRA. The management of invasive or overabundant bird species, while environmentally beneficial will be understood by some Gateway NRA patrons as beneficial, while other patrons may be saddened at first until those environmental impacts can be explained. A few patrons at Gateway NRA will be distraught over any lethal management actions regardless of any justification. However the net impact to enjoying or learning about park resources would be positive. Also, the lethal management actions would be confined to JFK. Impacts to the soundscape would be unnoticeable.

6.6 IMPACT ANALYSIS FOR ALTERNATIVE 4: ADD OFF-AIRPORT LETHAL BIRD HAZARD MANAGEMENT ACTIVITIES TO CURRENT BIRD HAZARD MANAGEMENT PROGRAM**6.6.1 Impact on Target Species**

Lethal methods would only be proposed to address off-airport issues with Canada Geese, Mute Swans, Double-crested Cormorants, Rock Pigeons, blackbirds, crows, and European Starlings. This alternative does not include efforts to remove/relocate the Laughing Gull colony. This alternative does include implementation of a wildlife hazard monitoring program as discussed in Section 4.4.1. This wildlife hazard monitoring program would improve the ability of the JFKWMU to accurately identify off-airport bird attractants near JFK.

6.6.1.1 Canada Geese

Adding this alternative to the current program would increase cumulative take of Canada Geese from 500 geese per year to 4,000 Canada Geese. Off-airport lethal take of Canada Geese would focus on resident birds within 5 miles of JFK. Additional removals may occur at locations up to 7 miles to help address problems with bird numbers within 5 miles of the airport. In general, individual sites within the 5 mile radius with 10 or fewer

Impact Analysis: Alternative 4: Off-Airport Use of Lethal Alternative cont.

birds will not have goose removals. Individual sites in the 5-7 mile radius with 20 or fewer birds will also generally not have goose removals. Although unlikely, an exception might occur if a site within the 5 mile radius is associated with specific bird movements through JFK airspace. As discussed in the impacts analysis for Alternative 1, the 2009 Atlantic Flyway Breeding Waterfowl Survey data indicated there were approximately 249,700 resident Canada Geese in the state of New York. The current population is well over the NYSDEC management objective of 85,000 resident Canada Geese (Atlantic Flyway Council 1999). Adding this alternative to the No-action Alternative would increase maximum annual take to 4,000 geese per year, or 1.6% of the state resident Canada Goose population. This level of take is much less than the current annual rate of increase for Canada Geese in New York state from the BBS (10.3% per year, $P < 0.01$; Sauer et al. 2008) and will not adversely impact the state resident Canada Goose population. However, local population reductions will occur in the areas where the geese are removed. Given that the proposed action is unlikely to impact the productivity or viability of the regional resident Canada Goose population and the mobility of birds, the impacts of removals would be temporary unless maintained. Populations would be expected to recover within a few years if management efforts were discontinued.

At present, NYC is working with WS on a project to address a number of conflicts with resident Canada Geese including airport safety (JFK and LaGuardia Airports), fecal contamination and vegetation damage at NYC parks and other city-owned properties, and protection of natural resources at vegetation restoration sites (Pennsylvania Avenue and Fountain Avenue landfills; USDA 2004, Collins 2009, Collins and Humberg 2010a). Cumulatively, this could result in a substantial reduction in the number of Canada Geese within the NYC metropolitan area. However reductions are not expected to go below NYSDEC statewide management objectives, approximately 2 geese per square mile ($0.8/\text{km}^2$) that were provided for the Atlantic Flyway resident Canada Goose management plan. Given that the cumulative impacts of all known resident Canada Goose management actions are not expected to reduce the resident Canada Goose population below the NYSDEC management objectives and the general guidelines for goose numbers at individual sites that would trigger removals, the proposed action will not jeopardize the city, state or regional Canada Goose population .

Gateway National Recreation Area

Under this Alternative, resident Canada Goose removals could be conducted at Rulers Bar Hassock and at Pennsylvania and Fountain Avenue Landfills. Up to 1,000 of the total resident Canada Geese which might be taken per year under this alternative could be taken at Gateway NRA. Removals would be highest the first two years of the program and decrease substantially after that point. These actions will result in a substantial reduction in the number of geese at these locations and in the park in general. However, goose removals will not be conducted in most areas of the park. Consequently, opportunities to view Canada Geese will remain, albeit at a reduced level. Actions proposed under this alternative will have no impact on the number of migrant Canada Geese using Gateway NRA.

Impact Analysis: Alternative 4: Off-Airport Use of Lethal Alternative cont.**6.6.1.2 Mute Swans**

As with Canada Geese, off-airport removal of Mute Swans would likely target resident birds which had been identified as having movement patterns through JFK airspace. The maximum annual take of Mute Swans that would occur under this alternative would be 50 birds per year which, when added to the No-action Alternative would increase maximum annual take to 100 birds per year. In 2008, the MSMSS indicated there were 10,541 Mute Swans in the Atlantic Flyway, 2,624 of which were in New York. The proposed take of Mute Swans would be 3.8% of the 2008 estimate of Mute Swans in New York and 0.9% of the 2008 Mute Swan population in the Atlantic Flyway. Given the low level of take relative to state and flyway Mute Swan population estimates, current levels of Mute Swan removal at JFK are not having an adverse impact on regional or national Mute Swan populations. However, some local population reductions will occur in the areas where the swans are removed.

Gateway National Recreation Area

The only Mute Swan management which would occur on Gateway NRA would be egg oiling. Gateway NRA already treats eggs in Mute Swan nests as part of the Wildlife Refuge Management Plan to prevent further degradation of water quality and aquatic vegetation in East Pond. Up to 35 nests and associated eggs could be oiled per year at Gateway NRA under this alternative. This action will not result in the death of adult birds but will eventually help to reduce the local population of non-native Mute Swans.

6.6.1.3 Double-crested Cormorants

Take of Double Crested Cormorants under this alternative will be limited to egg oiling/addling and nest and egg destruction. Based on current DCCO activity in the JFK area, WS does not anticipate oiling/addling more than 100 nests per year. Egg oiling and addling will not result in mortality of the adults and may improve survivorship of adults by discouraging activity near JFK where adult birds may be shot to reduce risks to aircraft or die in a bird strike. The Harbor Herons project estimates that there were approximately 1,183 cormorant nests in the New York/New Jersey Harbor area. The proposed action could impact up to 10% of the nests in the area. This level of work could cause local reductions in nesting cormorants, but is not anticipated to jeopardize local cormorant populations. However, cumulative impacts from all known causes are within parameters analyzed in an USFWS FEIS on Double-crested Cormorant management (USFWS 2003) and a WS EA on cormorant damage management in New York (USDA 2009) which is tiered to the USFWS FEIS. The WS EA concluded that the cumulative impact of cormorant damage management in New York may result in local population reductions but will not adversely affect the viability of the state or regional cormorant population.

Impact Analysis: Alternative 4: Off-Airport Use of Lethal Alternative cont.Gateway National Recreation Area

No egg oiling/addling/puncturing or lethal removal of adult cormorants is proposed for Gateway NRA.

6.6.1.4 Blackbirds, European Starlings, Rock Pigeons and Crows

Lethal methods would only be used to reinforce harassment of roosting groups of blackbirds and crows. The maximum number of birds that would be taken per year under this alternative would be 100 blackbirds (all species combined), 100 crows (all species combined) and 100 starlings and 500 Rock Pigeons. Adding this take to the maximum annual take proposed in the No-action Alternative would increase total annual take of these species to 1,100 blackbirds, 350 crows, 3,000 Rock Pigeons and 15,100 starlings. Using the analyses methods for Alternative 1, this level of take will not adversely affect populations of these species.

Gateway National Recreation Area

Lethal removal of blackbirds, starlings, pigeons and crows is not proposed for Gateway NRA.

6.6.2 Impact on Nontarget Species Populations

The lethal bird removal techniques, shooting and live-trapping followed by euthanasia, are highly selective for target species. Shooting is virtually 100% selective for target species and nontarget birds captured in live-traps can be released at an appropriate location. Shooting will have impacts on nontarget species similar to those described for Alternatives 1 and 2.

Live-capture and euthanasia of resident Canada Geese would be conducted from approximately June 15-July 15 during the molt (flightless) period of the geese. Live-capture is not conducted under high heat to minimize stress and adverse impacts on target and nontarget species. Birds are quietly gathered by staff members on foot or in watercraft (canoe/kayak) to minimize stress on geese and nontarget wildlife and the action is expected to cause little disturbance to nontarget species. The brief disturbance as individual pass while collecting geese is unlikely to have a substantive impact on nontarget birds with nests or fledglings. Staff will work to minimize travel through natural vegetated areas to reduce impacts on wildlife and native vegetation. At urban/suburban sites capture pens are generally placed in locations where impact on vegetation is minimal (e.g., areas with cut grass or sand/gravel). Impacts on native vegetation from these actions will be low.

Cormorants are colonial waterbirds and nest in groups with other species of waterbird. Care must be taken when conducting egg oiling and nest destruction projects to minimize impacts on co-nesting birds. If adults are startled from the nest for too long or at the wrong time of day, there is potential for increased mortality rates for eggs and chicks. However, in most instances, migratory birds and other affected non-target wildlife may temporarily leave the immediate vicinity of scaring, but usually return after conclusion of the action. At colonies which support a

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high number of co-nesting gulls, predation by gulls has become an increasing concern. Human activities including research, population surveys and CDM actions which result in adult birds leaving their nests create opportunities for gulls to prey on eggs and chicks of other gulls and co-nesting species. Efforts to reduce gull predation include working at the colonies at night to reduce likelihood that adults will move off nests, minimizing the number of site visits, conducting egg oiling later in the season when gulls have eggs and chicks and are less likely to leave their own young in order to prey on other nests, and maintaining a sufficient distance from non-target birds to prevent or reduce incidence of adults flushing from nests. While this type of disturbance does result in the loss of eggs and chicks, many of the species including gulls and DCCOs may re-nest and can successfully fledge young (LLBO 2007).

DRC-1339

This alternative could also include the use of the toxicant DRC-1339 to remove European Starlings, blackbirds, crows and gulls (except Laughing Gulls). 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. For more than 30 years, DRC-1339 has proven to be an effective method of Starling, Blackbird, Gull, and Rock Pigeon damage management at feedlots, dairies, airports, and in urban areas (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Potential risks from the use of any toxicant include risk that a nontarget species would consume treated bait (primary toxicity) and risks that a predator could receive a lethal dose of toxin by consuming a bird which had eaten the treated bait. To minimize primary toxicity hazards to nontarget species from the use of DRC-1339, WS uses prebaiting observations and prior history information to determine likelihood of non-target bird presence. In addition any bait site would be monitored by WS or the cooperator to ensure that non-target birds do not utilize the bait site. Bait placement and the use of structures or feeding station can also be used to reduce access by the nontarget species. Baiting would not be conducted if nontarget species are accessing the bait application site.

Secondary poisoning has not been observed with DRC-1339 treated baits. DRC-1339 was developed as an avicide because it is much less toxic to mammals than birds, which minimizes risks to mammals from its use. DRC-1339 is highly toxic to sensitive species such as starlings, blackbirds, pigeons, crows, magpies, and ravens, but only slightly toxic to nonsensitive 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). Many other bird species, such as raptors, sparrows, and eagles, are classified as nonsensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to nontarget and T/E species (USDA 1997 Revised). During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and European starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent. DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. 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

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chemicals) have low toxicity. Appendix P of USDA (1997 Revised) 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.

Gateway National Recreation Area

All actions conducted at Gateway NRA would only be conducted with the consent of the park supervisor and in coordination with park staff.

Live-capture and removal of resident Canada Geese could be conducted at Ruler's Bar Hassock, and Pennsylvania Avenue and Fountain Avenue Landfills. Actions at each of the three sites would only be conducted on one or two days per year during the period of June 15-July 15. Individual actions, from set up of pens to departure from site are only expected to last less than 2 hours. Actions would be conducted early in the day to minimize impact on recreational use of the sites. Live-capture would not be conducted during periods of high heat. Birds are quietly gathered by staff members on foot or in watercraft (canoe/kayak) to minimize stress on geese and nontarget wildlife and the action is expected to cause little disturbance to nontarget species. The brief disturbance as individual pass while collecting geese is unlikely to have a substantive impact on nontarget birds with nests or fledglings. Most migrant birds are not expected to be in the area during the period when round ups are conducted. However, some nonbreeding birds and early-migrating shorebirds could be present. Sites will be monitored prior to conducting work and locations selected that will minimize impacts on migrants. Conducting actions earlier in the June 15-July 15 range will also help minimize impacts on migrants. Given the short duration of the action and that it will be confined to only a limited number of locations at the park, any disturbance on early arriving migrants would be negligible. Birds may temporarily move away from project to nearby locations and could readily return at the conclusion of the project.

Staff will work to minimize travel through natural vegetated areas to minimize impacts on wildlife and native vegetation. At Pennsylvania Avenue and Fountain Avenue Landfills and West Pond of Rulers Bar Hassock, it should be possible to find short grass or sand/gravel areas for the capture pens. Use of these locations is not expected to have any substantive impact on nontarget species or sensitive vegetation. At East Pond at Rulers Bar Hassock and other areas with established native vegetation, WS will consult with Gateway NRA staff to find areas where pens will not impact rare or sensitive plants and animals. WS will also observe the site prior to conducting the action to identify areas where pens may be placed that will minimize impact on breeding birds. Given the proposed protective measures, the proposed action is likely have a low risk of adverse impact on nontarget species.

Reductions in the number of non-native Mute Swans and resident Canada Geese could have beneficial impacts on nontarget species. Non-native species compete with native species for food and space. Mute Swans aggressively defend their nesting territories from other species including native birds. Mute Swans also forage on submerged aquatic vegetation which is use for a variety of other species including migrant waterfowl. Canada Goose grazing can also pull up root systems of newly established plants and has caused problems for native ecosystem recovery projects in the bay (e.g., Pennsylvania Avenue and Fountain Avenue Landfills. Atlantic

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Brant, Snow Geese and migrant Canada Geese also forage on these plants during migration and while over-wintering in the bay. Collectively, this foraging causes substantial damage to many acres of saltmarsh each year (Frame et al. 2005, G. Frame Gateway NRA, pers. comm.). Presence of non-native Mute Swans and resident Canada Geese results in ongoing foraging pressure during the summer growing season. Reductions in the number of these species will likely have beneficial impacts on native wildlife and plant communities and would be consistent with Gateway NRA objectives to restore and maintain native species and ecosystems.

6.6.3 Water Quality

Carcasses of birds will be collected and disposed of in accordance with state and federal regulations. A limited number of birds may die in locations in the bay where their carcasses cannot be recovered. The natural decay of these carcasses would introduce low levels of decomposition products to the biogeochemical cycle of the marsh and ultimately to the water column.

This alternative is expected to result in reductions in the number of resident Canada Geese at specific locations where removals are conducted. These removals may result in a reduction in the amount of fecal material deposited in and/or running off the grass into nearby ponds and other bodies of water. In these instances, this alternative may result in an improvement in water quality.

The toxicant, DRC-1339, would be applied in accordance with EPA regulations for the protection of the environment, including preventing bait material from entering waterways. (Bait stations will be used to facilitate clean up of unconsumed material. 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 Revised).

Gateway Natural Recreation Area

Methods which could be used at Gateway NRA include egg oiling/addling/puncturing and live-capture and euthanasia. Live-capture and euthanasia is not expected to have any impact on water quality except that it will reduce fecal deposition by high densities of resident Canada Geese. This may have a positive impact on water quality in East and West ponds on Rulers Bar Hassock.

6.6.4 Parks and Recreation

Parks and recreational areas can be major off-airport attractants for Mute Swans and Canada Geese. This alternative would involve removal of geese and swans from these locations. Some individuals will consider a reduction in the presence of birds at these sites to be distressing and a substantial adverse impact on their enjoyment and use of the sites. Other individuals would be pleased with the reduction of some overabundant species which they believe are degrading the intended use of the park (e.g., through fecal accumulations). Bird feeding in one of the activities

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which individuals may enjoy at parks and similar locations, although Nassau County has established a waterfowl feeding ban. Even with feeding bans, the popularity of this activity is such that it can be extremely difficult to convince individuals to cease bird feeding.

Some birds are likely to continue almost all parks where the public is accustomed to seeing geese. In general, individual sites within the 5 mile radius with 10 or fewer birds will not have goose removals. Individual sites in the 5-7 mile radius with 20 or fewer birds will also generally not have goose removals. Although unlikely, an exception might occur if a site within the 5 mile radius is associated with specific bird movements through JFK airspace. When goose removals are conducted, all geese may be removed from the area for a brief period. However, the complete absence of resident Canada Geese is not expected to be long-term and limited numbers of geese are anticipated to recolonize the sites within a few days to a few weeks.

Public response to the NYC resident Canada Goose population reduction project at Prospect Park in 2010 provided insight into the nature of public interaction with the resident Canada Geese at the parks. Prospect Park is one of only a limited number of parks in the city which can be readily accessed using the subway system. In addition to aesthetic enjoyment of the birds, some teachers had developed educational programs focusing on the geese which included student participation in public outreach to discourage goose feeding. There were also many individuals who had developed emotional attachments to specific birds. All of these groups were dismayed by the removal of the geese, especially given that they felt they had no warning of the removal or opportunity for input prior to goose removal.

In areas where high concentrations of waterfowl and associated fecal material is perceived as having a negative impact on use of the site, removal of waterfowl using the area may have a positive impact on recreational use of the site.

At present, NYC is working with WS on a project to reduce conflicts with resident Canada Geese the New York City Metropolitan area, including risks to airport safety (JFK and LaGuardia Airports), fecal contamination and vegetation damage at NYC parks and other city-owned properties, and natural resource protection at vegetation restoration sites (Pennsylvania Avenue and Fountain Avenue landfills. This area includes the 7-mile radius around JFK and Laguardia Airports (Figure 1-1). Cumulatively, this could result in a substantial reduction in the number of Canada Geese within the project area. Recolonization rates will be fastest at the perimeters of the project area because of the proximity to unmanaged resident Canada Goose populations. Given that the cumulative impact of the proposed action is not anticipated to reduce the resident Canada Goose population below 5,000-6,000 birds and the thresholds for triggering management action discussed above, there should always be sites available where individuals can view and enjoy geese.

Gateway National Recreation Area

Gateway NRA is enjoyed by visitors from NYC, elsewhere in the U.S. and from around the world. As with other off-airport locations, feeding geese and swans is a popular activity despite rules prohibiting feeding wildlife. This alternative will substantially reduce opportunities to view and enjoy resident Canada Geese and non-native Mute Swans. However, given the

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regional population of these species and that management actions will be limited to only a portion of the park, some birds will remain for people to view, especially at locations other than Rulers Bar Hassock and the landfills. This alternative will not adversely impact opportunities to view and enjoy migrant Canada Geese.

6.6.5 Air Quality, Noise

Levels of vehicle use would likely be higher for this alternative than for the no-action alternative because of travel to off-airport locations. However, this increase is not likely to be appreciable in light of background air quality impacts.

Minor impacts are associated with shooting measures. Use of shooting off-airport would be extremely limited and usually only involve reinforcement of harassment for blackbirds, starlings and crows. The preferred methods for removing geese and swans involve either hand capturing birds sedated using alpha chloralose, or hand capture of birds that are herded into corrals during the period of summer when they cannot fly because they have molted their flight feathers. Firearms are unlikely to be used to remove geese and swans from off-airport sites. Shooting would not be used at off-airport sites unless the activity had been approved by local government. Use of live-capture and euthanasia and egg oiling/addling/puncturing will have no substantive impact on air quality or noise at Gateway NRA.

6.6.6 Airport Operations and Safety

Adding this alternative to the No-action Alternative should help reduce bird strike hazards at JFK. A Canada Goose removal program similar to those which would be conducted for JFK successfully reduced Canada Goose strikes at LaGuardia airport (Section 4.6.5). Use of limited shooting to reinforce harassment efforts can help frighten the remainder of the flock away from JFK airspace and reduce strike hazards to aircraft.

6.6.7 Socioeconomic Impacts

Adding this alternative to the No-action alternative would help reduce bird strike hazards to aircraft at JFK. As such, it would likely result in a reduction in direct and indirect costs associated with bird strikes discussed for Alternative 1.

Unlike on-airport bird hazard management actions, off-airport management actions conducted under this alternative may be paid for by the landowner or manager. In some instances, the PANYNJ has helped to share the costs of management actions which have reduced risks at JFK. The gulls, waterfowl, blackbirds, crows and starlings that would be targeted by this effort are abundant species known for causing other types of damage problems when they congregate in areas used by humans (e.g., issues associated with fecal contamination, damage to plants and landscaping and structures, etc.; USDA 2005). Not all birds at treatment sites are likely to be lethally removed. Some birds are likely to leave the site in response to lethal bird hazard management activities. One of the primary challenges associated with this type of bird response is that it is difficult to control where the relocated birds go. Individuals who may not have had a damage problem may find themselves having to act to address problems created by efforts to

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reduce risks and conflicts at JFK. If damage management efforts at one site cause increased congregations of birds and damage problems a different site, there may be expenses to repair the damage, costs associated with lost use of the damaged site, and costs to manage the new damage problem.

6.6.8 Sociological Issues including Humaneness and Aesthetic Values**Humaneness**

Lethal removal of any bird species, especially resident Canada Geese and Mute Swans is considered to be inhumane by some individuals. Newspaper articles, public comments, and demonstrations on resident goose management actions conducted in 2009 and 2010 are indicative of the passion and compassion people feel for these birds. Issue expressed also include concerns about the impact of bird removal on the remaining member of a pair bond in instances where only one member of the pair is removed and the fate of juvenile birds. Staff members conducting removals of flightless birds strive to keep birds as calm as possible and to keep family groups together. Nonetheless, removal of juvenile birds and potential stress to adults and juveniles who may be separated in the capture process is perceived by some individuals as being inhumane. As noted for Alternative 1, there are also situations where individuals have formed attachments to particular birds. For these people, loss of these birds is particularly distressing. This alternative includes lethal removal of birds at Gateway NRA. Some individuals may feel that it is particularly inappropriate to lethally remove birds from a national park established, in part, as a preserve for wildlife, even if the species targeted are non-native or having an adverse impact on park resources. There have also been concerns expressed regarding the fate of the euthanized birds with donation to the needy for food preferred over other forms of disposal authorized under the MBTA (e.g., burial or incineration). Wildlife Services, the NYSDEC, NYDEP, New York State Department of Health and other cooperators are working to develop a safe and acceptable method for donating birds for food.

DRC-1339 is a slow acting toxicant. While some individuals may perceive any lethal method as being inhumane, toxicants, especially slow acting products, are often considered more objectionable than other faster methods such as shooting.

Shooting may also be used under this alternative, and like other lethal management options, will be perceived as inhumane by some individuals. In situations where birds are being live-captured and euthanized, the agencies would use euthanasia methods approved by the AVMA (Beaver et al. 2001). Most people would view AVMA-approved methods of euthanizing animals as humane. However, a minority of stakeholders would likely want no birds captured, harassed, or killed because they consider the killing of birds as inhumane regardless of the method used.

Opinions of egg oiling/addling/puncturing and nest and egg destruction will vary among those individuals opposed to the use of lethal bird hazard management methods. Some individuals may perceive these methods, if used before the chick gets too far along in its development, as being humane and acceptable. Others will perceive these methods as being no more humane than killing of adults or they may perceive egg oiling and nest destruction as an unethical interference with the birds' right to reproduce and conduct their lives in peace.

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Methods proposed under this alternative may result in stress to the birds. Shooting is not anticipated to result in substantial stress to the birds. As noted for Alternative 3, nest and egg destruction results in stress to the adult birds. Egg oiling/addling and puncturing may result in lower levels of stress to the adults because the animals may retain their nests and are expected to continue incubating treated eggs. The extended incubation period associated with egg oiling/addling/puncturing may reduce the likelihood that birds will renest and associated physiological stress. The period of stress associated with live capture and euthanasia would be longer than with harassment supplemented by lethal and shooting. However, as noted above, WS strives to keep the birds calm and comfortable and keep family groups together. The period of physiological stress associated with avicides would be longer than that proposed for other methods under this alternative. Data are not available to compare stress associated with the use of DRC-1339 to the use of capture in live traps and subsequent euthanasia which might also be used for the species which may be treated with DRC-1339. Capture in live traps may result in more brief but acute periods of stress as the animal is initially captured and handled for euthanasia.

Aesthetic Impacts

Viewing and feeding birds at parks and other locations in the city is perceived by many individuals as a pleasurable and aesthetically appealing activity by many individuals. Off-airport damage management actions which greatly reduce or eliminate birds from a particular site may be perceived as a significant loss in aesthetic values. This may be especially true for individuals who may have formed an attachment to a particular bird or birds a specific site that they enjoy.

Many of the bird species that may be taken under this alternative may also be associated with adverse aesthetic impacts associated with fecal deposition and vegetation damage associated with high concentrations of birds. In instances where these types of impacts are also happening, removal of birds to reduce hazards to aircraft at JFK may have a beneficial aesthetic impact. However, there may also be concerns that risks to aircraft at JFK may be misused as justification for bird removal to address nuisance/aesthetic problems. To address these concerns, off-airport bird hazard management for JFK would only be conducted at sites known from the standardized hazard assessments and additional research (if available) as being associated with hazards at JFK. Additionally, off-airport bird hazard management for JFK would only be conducted after informing the members of the BHTF of the proposed action. The BHTF includes representatives from federal, state and city agencies with management authority for bird management and agencies with management authority for lands around JFK. All off-airport bird hazard management activities would be conducted in accordance with public notification policies of the landowner or land manager.

Some individuals may feel that their enjoyment of sites used by waterfowl or the surrounding areas may be adversely affected by noise and commotion associated with bird removal efforts. However, these activities are conducted quietly, are short in duration and are generally conducted during times of the day when recreational use of site is at a minimum.

Aesthetic values are based on and influenced by an individual's perceptions and beliefs. In the case of bird hazard management at airports, the extent to which an individual perceives an action

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as having an unacceptable aesthetic impact will depend, in part, on the degree of urgency the individual feels regarding the management of bird strike hazards. Individuals who place a high priority on doing everything possible to reduce bird strike hazards may not be as distressed by the aesthetic impacts of a bird hazard management technique used to address problems at JFK as they might be if the same method was proposed to resolve a nuisance problem (e.g., feces at parks).

Gateway National Recreation Area

The resident Canada Goose and Mute Swan management actions proposed under this alternative will reduce the number of these species at Gateway NRA. However, actions will be limited to specific locations within the park and are unlikely to eliminate these species. Opportunities to observe resident Canada Geese will remain, albeit at reduced numbers. Impacts will be greatest at Rulers Bar Hassock. Pennsylvania Avenue and Fountain Avenue Landfills are not as subject to access by the public. This alternative will not adversely impact the number of migrant Canada Geese which use Gateway NRA. Individual perceptions of the aesthetic impacts of the action at Gateway NRA will be largely as described for elsewhere in the study area. However, as noted above, some individuals will find the use of lethal methods particularly objectionable in a National Park. Conversely, some individual who perceive their use of the site, especially playing fields and similar sites with cut grass, may perceive a reduction in resident Canada Geese and associated fecal material and vegetation impacts to increase their ability to enjoy the sites.

6.6.9 Coastal Zone Management Programs

For most issues, consistency with Coastal Zone Management Programs will not differ from the No-action Alternative. For these issues, the only difference in impacts on coastal issues between this alternative and the No-action alternative is in the extent to which the methods will be applied at off airport sites. However, this alternative may have an impact on waterfowl use of recreational sites and does involve the use of a toxicant (DRC-1339) which is not part of the current bird hazard management program at JFK.

Policy 9. Protect, maintain and increase the level and types of access to public water-related recreational resources

Actions to reduce bird hazards at JFK would result in the reduction or complete removal of waterfowl from some parks and recreational areas. Some individuals will perceive the reduction in bird numbers as having an adverse impact on their recreational use of the site. However, the proposed action will not removal all birds at recreational areas within the 5 mile radius of JFK, nor, in many cases will it result in total elimination of birds from a site. Opportunities to view and enjoy waterfowl and other target species would still be available but individuals may have to go elsewhere for these opportunities.

Policy 38. Quality and Quantity of Surface Water

Bird hazard management activities may include the use of the toxicant DRC-1339. This substance has been approved by the EPA and would be applied in accordance with label

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directions for the safe and effective use of the product, including all measures for the protection of water. Additionally, 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 Revised).

Policy 39. Transport, Storage, Treatment and Disposal of Solid Wastes

DRC-1339 would be applied in accordance with EPA and state requirements for safe transport, storage, application, and disposal. Risks associated with the use of this product will be minimal.

6.6.10 Identifying and Avoiding Impairments and Unacceptable Impacts on National Park Service lands.

No unacceptable impacts or impairments were identified for actions proposed under Alternative 4. Alternative 4 would add additional off-airport lethal bird hazard management activities to the current bird hazard management program (Alternative 1). Most off-airport bird hazard management activities would be within 5 miles of JFK, except for programs managing resident Canada Geese. Bird species which would be targeted off-airport includes Canada Geese, Mute Swans, cormorants, blackbirds, crows, Rock Pigeons, and starlings. Only resident Canada Geese and Mute Swans are proposed for management at Gateway NRA. Canada Geese may be reduced in abundance by capture and euthanasia. Mute Swans may be managed by egg oiling/addling and nest destruction.

Resident Canada Geese are an overabundant bird species that originated from stocking by the state for hunting programs and release by bird collectors and hunting clubs during the 1930's (USFWS 2005). As noted in Section 5.3, in 2010 1,240 molted resident Canada Geese in the East and West Ponds and the bay shoreline of Rulers Bar Hassock (Gateway NRA, unpub. rep., 2011). The Gateway NRA mission of protecting and preserving native wildlife, and natural plant and animal communities would be furthered by reducing interspecies competition from resident Canada Geese. Abundant resident Canada Geese dig out roots and rhizomes of Smooth Cordgrass in Gateway NRA marsh resulting in under-mining and subsequent washing away of the grass tussocks. The herbivory by geese also results in lost plants and sand which anchors the plants. The resident Canada Geese are the only goose species at Gateway NRA year round and with brant eat sea lettuce daily until it becomes scared in early winter. Some of the birds being shot are invasive species (e.g. European Starlings, Mute Swans). Federal policy (Executive Order 13112 - Invasive Species) encourages the removal of non-native invasive species from the environment. Finally, the National Park Service would need to issue a permit for the removal of resident Canada Geese or Mute Swan nest and egg destruction on Gateway NRA.

In summary, the implementation of additional off-airport lethal management activities would be substantially beneficial for Gateway NRA. The reduction of resident Canada Geese and Mute Swans would improve aviation safety and have collateral benefits to improve bio-diversity to the park. Future generations would be able to enjoy a healthier ecosystem and learn from the benefits of balancing the abundance of multiple species in harmony with its habitat. The

Impact Analysis: Alternative 4: Off-Airport Use of Lethal Alternative cont.

soundscape would be unaffected by management actions since the management actions are relatively quiet. While patrons observing the capture and removal of Canada Geese will have a mix of emotions from approval to disappointment, many would approve of the environmental benefits and know resident Canada Geese will still occur in the marsh in smaller numbers. In the fall the marsh would welcome migratory Canada Geese, Brant, and Snow Geese with more native plants to nourish their bodies. This alternative would be beneficial for the ecosystem and aviation safety.

6.7 IMPACTS ANALYSIS FOR ALTERNATIVE 5: ADD REDUCTION OR RELOCATION OF THE LAUGHING GULL COLONY TO CURRENT BIRD HAZARD MANAGEMENT PROGRAM

In the 1994 FEIS Section 5.8.1, gull hazard management proposals were divided into two categories. The first category of methods included continued development of JFKs on-airport program, working with off-airport landowners to minimize attractants, and the supplemental on-airport shooting program. The second category of methods involved all methods intended for use in relocating the Jamaica Bay Laughing Gull colony. Category 1 components were to be implemented first and Category 2 elements would only be implemented if Category 1 elements failed to reduce risks to an acceptable level. This alternative is comprised of the Category 2 elements that were forwarded for inclusion in the final analysis. Although the current program is effective in reducing Laughing Gull strikes at JFK, concerns about the humaneness of killing thousands of Laughing Gulls per year and concerns about the long-term sustainability of current mortality levels (Brown et al. 2001a) warrant re-evaluation of these methods. In the 1994 FEIS, the USFWS Decision noted that if relocation of the Laughing Gull colony is warranted, the NPS would define appropriate actions, analyze environmental impacts and environments and document its decision within the context of its legal authorities and management policies.

6.7.1 Impacts on Laughing Gulls

Impacts of efforts to relocate the Laughing Gull Colony are discussed in the 1994 FEIS in Sections 5.4 and 5.6. In Chapter 5 of the 1994 FEIS, several alternatives for eliminating the Laughing Gull colony were eliminated from consideration because they were perceived as having unacceptably high environmental impacts. These methods are still not considered for utilization under this alternative. The only methods under consideration for use in relocating the Laughing Gull colony at this time are use of dead gull effigies, nest and egg destruction, egg oiling, toxicant application and shooting adult birds at the colony site. Impacts associated with these methods remain as analyzed in the 1994 FEIS. The exceptions are the new issues of humaneness and aesthetic impacts that have been added to this supplement.

Since the completion of the 1994 FEIS, Brown et al. (2001a) have provided a review of the feasibility of relocating the Laughing Gull colony on Long Island. Although the authors were not convinced that relocation of the colony was necessary to reduce bird strike hazards at JFK, they did note that ethical considerations and concerns about the long-term impacts on the regional gull colony may warrant the attempt. A survey of Long Island conducted by Washburn

Impact Analysis: Alternative 5: Relocation of Laughing Gull Colony - cont.

et al. (2010) indicated that, although there appears to be suitable habitat, there is no evidence of another Laughing Gull colony on Long Island. Brown et al. (2001) proposed using nesting colonies of Forster's Terns and Common Terns as indicators of areas which may be suitable for Laughing Gulls based on a high frequency of Laughing Gulls occurring at nest locations with one or the other species at other sites. Selection of suitable sites would also require consideration of human uses of the location for recreation and other purposes, plans for development and land ownership, the distance of the site from JFK and other airports, etc. Once a suitable site is located the authors proposed attracting Laughing Gulls to the site using decoys of courting birds, broadcasting vocalizations and placement of physical stimuli (wrack), based on the use of similar devices to relocate Arctic Terns (Kress 1983) and Common Terns (Blokpoel et al. 1997). The authors recommended attempting to relocate some birds prior to attempts to relocate the Jamaica Bay colony to obtain a better idea of the feasibility and logistical requirements of colony relocation.

6.7.2 Impacts on Nontarget Species

Brown et al. (2001a) noted that Common Terns, Forster's Terns Clapper Rails and Black Ducks nest near the Laughing Gull colony and might be adversely impacted by disturbance and potential structural damage to habitat resulting from frequent visits to deter Laughing Gull activity at the site. A study on Common Tern response to disturbance conducted at Lake Oneida, NY (Mattison 2006), documented that the greatest levels of disturbance in the colony were from human activity within the colony including researchers monitoring tern reproduction and banding birds and a WS crew that visited the island to install mylar tape on one end of the island to deter nesting double-crested cormorants. Noise disturbance from other locations on the lake including that from the use of pyrotechnics ("screamers" and "bangers") was less disruptive than visits to the colony, and birds appeared to quickly acclimate to the use of the devices. Terns did not leave nests during the 13 instances of "banger" use within observable distance of the colony, but did lift off nests in three of the seven instances when "screamers" were used from similar distances.

6.7.3 Humaneness

This alternative involves killing adult birds via shooting or toxicants, egg destruction and egg oiling. All of these methods are likely to be perceived as being inhumane by some individuals worried about the welfare of individual birds. Opinions of egg oiling and destruction will vary among those individuals opposed to the use of lethal bird hazard management methods. Some individuals may perceive these methods, if used before the chick gets too far along in its development, as being humane and acceptable. Others will argue that the gulls have a right to peaceful reproduction and to conduct their lives free of harm and molestation.

Individuals who place a high level of priority on human welfare may consider the methods used to relocate the gull colony to be more humane than not taking every reasonably feasible action to reduce risks to humans and the environment from a crash caused by a bird strike.

As noted in Section 6.3.1, since the start of the supplemental on-airport shooting program in 1991, 90,592 Laughing Gulls have been killed for bird hazard management at JFK. One of the

Impact Analysis: Alternative 5: Relocation of Laughing Gull Colony - cont.

difficult questions to be answered through the public involvement process for this supplement is whether the agencies should continue to allow the only Laughing Gull colony in the state of New York to remain in its current location at the cost of thousands of Laughing Gulls per year, or to risk the uncertainty of success and potential impacts on target and nontarget species and try to relocate the Laughing Gull colony. Individuals who place a high priority on the fate of individual gulls may consider attempting to relocate the colony with all its associated potential risks to nontarget species and the gulls to be a more humane solution to the problem than the ongoing shooting of thousands of birds per year.

It should be noted that relocating the Laughing Gull Colony may result in increased bird mortality during the first years of the project as shooting on-colony and, possibly, toxicants would be used to reduce Laughing Gull use of the site. Ongoing efforts may be needed after the colony is relocated to prevent new Laughing Gulls from recolonizing the site. However, the effort and potential bird mortality needed to prevent gulls from recolonizing a site is anticipated to be lower than that required to get Laughing Gulls to discontinue use of a traditional nesting site. It is also possible that some risk of strikes from Laughing Gulls will remain from non-breeding birds which use Jamaica Bay, similar to risks from the other gull species.

Shooting is not anticipated to result in substantial stress to individual birds. Use of dead gull effigies is not anticipated to result in only short-term stress similar to that associated with harassment. Stress associated with nest and egg destruction and egg oiling/addling and toxicants would be as described for Alternative 4. However, given site fidelity of Laughing Gulls, the agencies anticipate persistent attempts by the birds to use the site which would likely result in the stress of multiple renesting attempts. Attempts to renest within a given year would likely be lower for egg oiling/addling, but it may take more years of egg oiling/addling and subsequent nest failure for birds to abandon a site than with nest and egg destruction.

6.7.4 Aesthetic Impacts

Gateway NRA protects the Laughing Gull colony because it is unique to Jamaica Bay and the state. The colony is also of interest and value to birding enthusiasts. These individuals would perceive the loss of the Laughing Gull colony an adverse impact on their aesthetic enjoyment of the area. As noted in Section 5.1.1, a number of other bird species also nest on JoCo, East High Meadow and Silver Hole marshes. These species would probably be disturbed by the on-colony management activities with possible adverse effects on reproductive success. Nests of secretive species such as Saltmarsh Sparrows may be trampled inadvertently. This disturbance may affect the abundance of these species at the marsh.

In the long term, removal of Laughing Gulls may provide more habitat for other marsh-nesting birds (e.g., state-threatened Common Tern) in the JoCo, East High Meadow and Silver Hole marshes, thus providing their populations an opportunity to increase. Increases in nontarget species, especially in state-threatened Common Terns and other state and federal species of concern would have a positive aesthetic impact. The availability of additional nesting space on JoCo marsh might be especially important in light of current flooding and marsh loss in Silver Hole and East High Meadow marshes. Although such increases might, in turn, represent hazards to aircraft, they would be of much less concern because the terns are smaller than the Laughing

Impact Analysis: Alternative 5: Relocation of Laughing Gull Colony - cont.

Gulls and seldom overfly the airport. Conversely, increases in existing Laughing Gull colonies or the establishment of a new Laughing Gull colony may result in new or increased conflicts with other bird species at the relocation site. The criterion for selecting potential relocation sites discussed in the 1994 FEIS includes measures to minimize risks to sensitive species.

6.7.5 Identifying and Avoiding Impairments and Unacceptable Impacts on National Park Service lands.

Laws and policies direct the National Park Service to avoid impairments of park resources and values. Additionally, since the threshold at which impairment occurs is not always apparent, the National Park Service avoids impacts that fall short of impairment. These impacts that fall short of impairment are unacceptable impacts. Unacceptable impacts or impairments would impede the ability of the park to maintain bio-diversity; diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources; or interfere with an atmosphere of peace and tranquility or the natural soundscape in natural locations within the park (Public Law 92-592-Oct. 27, 1972, 86 Stat., pages 1308-1311). A review of the impacts from actions in Alternative 5 on National Park Service park resources and values was undertaken. There was a risk of an unacceptable impact identified with this alternative that may meet the threshold for an impairment. As noted in the 1994 FEIS, there is risk that, despite efforts to find other suitable locations within Gateway or elsewhere in New York State, the Laughing Gulls would abandon the current colony site and move to some other location outside the park or state.

The implementation of Alternative 5 would still require the on-airport shooting program (Alternatives 1 and 3) to reduce risk to aviation safety because gulls and other birds would still fly daily over or across JFK airspace. Furthermore, the gull colony would be expected to diminish in size but, based on site fidelity of Laughing Gulls in other areas where CDM has been conducted (See Chapter 4 analysis of feasibility and effectiveness), may not abandon the marsh nesting site solely from a combination of lethal and non-lethal methods. The ongoing hazing and exclusion may impact other nesting bird species in the marsh on Gateway NRA. Some wetland plants would be trampled but most or all would recover in the latter part of the summer growing season after Laughing Gull nesting attempts cease in early July.

In summary, Alternative 5 would have a risk of impacting park resources and values including impairment depending on the cumulative impact on the Laughing Gull colony. The impacts on nesting other nesting birds would be minimal to moderate, depending on bird species and the degree of on-colony effort required to reduce/relocate Laughing Gulls. Some bird species may move away from hazing activities to avoid disturbance. The ability of current or future Gateway NRA patrons to enjoy or learn about park resources would be reduced for about 3 months of the year on this portion of the 9,000 acre Gateway NRA. The peace and tranquility would be affected in the Jamaica Bay marsh (about 650 acres) but unaffected in the remainder of Gateway NRA.

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.**6.8 IMPACTS ANALYSIS FOR ALTERNATIVE 6: INCREASED INTEGRATED BIRD HAZARD MANAGEMENT – PROPOSED ACTION**

This alternative would involve the integrated use of Alternatives 1-4 for bird hazard management at JFK. The environmental impacts of the 4 proposed IMP methods are provided here and discussed in greater detail for each of the alternatives in the preceding analyses. In general, the methods proposed are those which were expected to have the least environmental impacts while still serving to effectively reduce bird hazards at JFK. Used together, the effectiveness of one component may reduce the need to use another component. For example, effective use of nonlethal methods to reduce off-airport bird attractants would likely reduce the need for on and off-airport lethal methods. Consequently, the environmental impacts of the integrated program could be less than the sum of its constituting elements.

6.8.1 Impacts on Target Bird Species

Data from surveys of the Jamaica Bay Laughing Gull Colony indicate that implementation of the supplemental on-airport shooting program component of this alternative has contributed to the reduction of the colony from a high of 7,629 nesting pairs in 1990 to a low of 1,280 nesting pairs in 2008 (Washburn and Tyson 2010). Exclusive of the sharp decline from 2006-2008, the overall size of the colony was relatively stable for 2000-2009 at approximately 33% of the level recorded in 1990. However, loss of nesting habitat to marsh erosion, particularly on East High Meadow and Silver Hole Marshes is likely also contributing to current local population declines (Washburn and Tyson 2010). However, regional Laughing Gull population appears to be stable or increasing despite current levels of take at JFK (Washburn et al. 2009).

Canada Geese, brant, Mute Swans, Double-crested Cormorants, ducks, blackbirds, starlings, Rock Pigeons and crows could be taken under Alternative 1 and 3. Off-airport Double-crested Cormorant take would be limited to egg oiling/addling. While the analyses for Alternatives 3 and 4 address the impacts of each alternative in combination with Alternative 1, they do not address the combined impact of all three alternatives. Maximum annual take under this alternative would be 4,000 Canada Geese, 1,000 Atlantic Brant, 100 Mute Swans, 15,100 starlings, 3,000 Rock Pigeons, 1,100 blackbirds, 350 crows, 8100 Laughing Gulls, 1,500 Herring Gulls, 400 Great Black-backed Gulls, 600 Ring-billed Gulls, 100 Mallards, 50 Black Ducks, 400 cormorants, 5 kestrels, 10 osprey, 150 Tree Swallows, 40 Barn Swallows, 500 Mourning Doves, 20 American Oystercatchers, and 5 each of Blue-winged Teal, Green-winged Teal, bufflehead, wood ducks, Greater Scaup, Lesser Scaup and Gadwall. Based on analyses provided for Alternatives 1, 3, and 4, the proposed level of cumulative take will not adversely impact target species populations. Take of Mute Swans, blackbirds, starlings and crows under this alternative will not differ substantially relative to the estimated populations of these species and will not have an adverse impact on these species populations.

The current resident Canada Goose population, which is likely to make up the majority of Canada Geese taken, is well over the NYSDEC management objective of 85,000 resident Canada Geese (Atlantic Flyway Council 1999). Take of 4,000 Canada Geese would only be 1.6% of the state resident Canada Goose population. This level of take is much less than the

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.

current annual rate of increase for Canada Geese in New York state from the BBS (10.3% per year, $P < 0.01$; Sauer et al. 2008) and will not adversely impact the state resident Canada Goose population. However, some local population reductions will occur in the areas where the geese are removed.

Take of Atlantic Brant would only be 0.6% of the 2009 midwinter count for the Atlantic Flyway and unlikely to adversely affect the Atlantic Brant population (USFWS 2009). The proposed take of brant would be only 1.6% of the birds counted in New York during the last 5 years and is approximately 18% of the estimated 5,540 brant taken annually by licensed hunters in New York during 2005-2009 (USFWS 2006, 2009; 2010; Richkus et al. 2008; Raftovitch et al. 2010). However, hunting is not permitted in the Gateway NRA and the impact of take on and around JFK on Atlantic Brant hunting opportunities is unclear. Given that the proposed level of take is not anticipated to reduce the brant population, impact of shooting brant to reduce hazards at JFK on overall hunting opportunities in New York State is likely to be low to moderate.

Ducks, Rock Doves and Double-crested Cormorants, Blackbirds and Crows could be taken by the JFKWMU or by the supplemental on-airport shooting program (Alternatives 1 and 3). Analysis for Alternative 3 indicates the combined take for both alternatives will not adversely affect populations of these species. All other bird species which may be targeted for lethal removal would only be taken on-airport under the standard operations of the JFKWMU (Alternative 1). Analysis for Alternative 1 indicates that regional populations of these species would not be adversely affected by the proposed levels of lethal removal.

6.8.2 Impacts on Nontarget Species Impacts

Direct risks to nontarget species from the current on-airport bird hazard management program at JFK are minimal. The lethal bird removal techniques, shooting and live-trapping followed by euthanasia, are highly selective for target species. Shooting is virtually 100% selective for target species and nontarget birds captured in live-traps can be released at an appropriate location. The supplemental on-airport shooting program and harassment efforts that include waterfowl in the bays adjacent to the airport have the potential to disturb nontarget birds nesting and feeding in the areas of the bay around JFK. Protocols used to minimize risks that a nontarget species would be accidentally killed or that nontarget birds will be disturbed by noise include: 1) shooting only clearly identified target species, and 2) shooting only when target birds are within range.

The current bird hazard management program has impacts on bird behavior and movements since it seeks to reduce food, shelter and nesting resources at JFK. It also seeks to modify bird flight patterns around JFK. There is some evidence that gulls may be learning to avoid the airport during the supplemental on-airport shooting program (Dolbeer et al. 2003). Changes in bird movement patterns around the airport may result in shifts in bird numbers and activities at destination points in the city. However, given the distances involved and the mobility of birds, these shifts are likely to be relatively minor.

Use of nonlethal methods to reduce off-airport attractants may cause increased congregations of birds at another site, which can increase risks of disease transmission among target and nontarget

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.

species. Actions which result in increased concentrations of birds at new sites may also have adverse impacts on vegetation (e.g., overgrazing by geese).

Activities that require visits to the Laughing Gull colony such as the Laughing Gull survey, and egg oiling have the potential to adversely affect vegetation and reduce the physical stability of the islands (DeLaune et al. 1984). However, available information on the impacts of the Laughing Gull colony survey (Section 6.3.1.1) indicates that the disturbance is unlikely to affect the Long Island populations of these species. Description of alternative 4 includes provisions for minimizing impacts on vegetation from goose removals and egg-oiling and addling.

Some off-airport management methods such as harassment, egg oiling/addling, nest and egg destruction and shooting may have an adverse impact on nearby nesting bird species, especially if a prolonged effort is required (Preusser et al. 2008). Provisions for the protection of nontarget species and reduction of impacts are as described for each of the individual alternatives which make up this alternative. Given the protective measures in place, overall impacts should be low.

Off airport habitat management recommendations would include recommendations of modifications that would exclude target birds or reduce the utility of the site for target bird species. These activities will likely have adverse impacts on species with similar habitat requirements, but, as in the case of planting shrubs to break up large grassy areas and long-grass management, these alterations may have beneficial impacts on other wildlife species.

Because of bait application procedures and the formulation of DRC-1339 and the proposed rodenticides, risks to non-target species from the use of DRC-1339 should be extremely low.

Wildlife Services has consulted with the USFWS and NYSDEC regarding risks to state and federally-listed species from the proposed action. The USFWS concurred with WS' determination that the proposed action may affect but is unlikely to adversely affect Piping Plovers, Roseate Terns and seabeach amaranth and would have no effect on any other federally-listed species in the project area. The NYSDEC concurred with WS' determination that, although the proposed actions may result in some risk to state-listed species, overall risk is low and, given the proposed protective measures, would not jeopardize state threatened and endangered species populations. The state concurred with this determination with the provision that additional case-by-case consultation be conducted for any proposals to relocate Northern Harriers and Peregrine Falcons.

6.8.3 Water Quality

All pesticides (insecticides, repellents, DRC-1339) would be applied in accordance with EPA label regulations for the protection of the environment including water quality. Consequently these methods are not anticipated to have a substantive adverse affect on water quality.

Measures to repave or level hard surfaces to prevent accumulation of standing water may result in increased water runoff and associated pollutant loads into the bay. However given that this recommendation is not likely to be made often for off-airport sites and the limited number of standing water issues on airport, and ongoing efforts by the NYCDEP to improve handling of

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.

stormwater and pollutant impacts into the bay (NYCDEP 2007), any impacts are anticipated to be minimal.

Improved waste management may improve water quality because it reduces the possibility that gulls will redistribute refuse and the likelihood that refuse will enter the storm water discharge system and ultimately into the bay.

While biologists using shooting programs on and off airport would strive to recover carcasses of birds taken for bird strike reduction at JFK, some birds may land in areas where they cannot be recovered. The natural decay of carcasses introduced decomposition products to the biogeochemical cycle of the marsh and, ultimately, the water column.

This alternative is expected to result in reductions in the number of resident Canada Geese at specific locations where removals are conducted. These removals may result in a reduction in the amount of fecal material deposited directly into and running off the grass into nearby ponds and other bodies of water. In these instances, this alternative may result in an improvement in water quality. Conversely, if bird relocation efforts at one site cause increased congregations of birds at a different site, there may be adverse impacts on local water quality from fecal contamination. Over-grazing by high densities of geese could lead to increases in runoff and associated impacts on water quality as discussed for the No-action alternative. Conversely, reducing waterfowl use of areas associated with bird strike hazards may have beneficial impacts on water quality at the site.

6.8.4 Parks and Recreation

Off-airport reductions in the number of waterfowl at parks will have an adverse impact on some individuals' enjoyment of the parks. Conversely, in areas where high concentrations of waterfowl and associated fecal material is perceived as having a negative impact on use of the site, removal of waterfowl using the area may have a positive impact on recreational use of the site.

Use of nonlethal methods to resolve problems with waterfowl will result in the birds moving to a new location. It is possible that this may lead to unacceptably high concentrations of birds at the new site which may have an adverse impact on recreational use of the site because of fecal contamination or because nesting waterfowl, particularly geese and swans can be aggressive toward humans when defending their nests or chicks.

Some people may perceive nonlethal methods such as the use of repellents on grass as offensive and an impediment to their enjoyment of these areas. It may be necessary to close parks during periods when repellents are being applied and for a period after application while the products dry. Other individuals may perceive the noise and activity associated with bird harassment as detrimental to their recreational enjoyment of a site. To the maximum extent practical, these types of activities would be scheduled for times when they would have the least impact on recreational activities. This may be easier for methods like repellent application than for harassment methods which have to be conducted when the birds are at the park.

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.**6.8.5 Air Quality**

Minor impacts associated with shooting measures, pyrotechnics and vehicle use to patrol airport and travel to and from off-airport sites. However, against background air quality conditions these impacts are not substantial enough to warrant additional analysis.

6.8.6 Noise

This alternative will result in minor impacts from shooting, pyrotechnics, and distress calls on the airport or in Jamaica Bay. Overall on-airport impacts insignificant relative to noise levels associated with the airport.

Off-airport impacts from shooting, use of pyrotechnics and distress calls. Use of these devices may have an undesirable impact on residential areas and uses of the treatment site and surrounding property. In areas where these types of impacts are possible, preference will be given to the use of quieter harassment methods such as lasers, trained dogs, remote-control boats, and individuals in canoes and kayaks.

Use of pyrotechnics in the city is not anticipated due to the strict code enforcement by the Fire Department of NYC.

6.8.7 Airport Operations and Safety

In general, the integrated use of the bird hazard management methods in Alternatives 1-4 would have the greatest success in reducing bird strike hazards at JFK. Access to a wide range of damage management alternatives would better enable biologists to work with off-airport landowners to develop effective bird hazard reduction programs that accommodate the existing uses and values of off-airport sites. Inclusion of Alternative 5 would not have resulted in a substantial reduction in Laughing Gull strikes over current methods.

6.8.8 Socioeconomic Impacts

In general, the integrated use of the bird hazard management methods in Alternatives 1-4 would have the greatest success in reducing bird strike hazards at JFK. Costs from bird strikes would be lowest for this alternative.

This alternative may include costs for off-airport landowners or managers. Landowners or managers could be responsible for costs of reducing bird attractants on their property. In some instances, the PANYNJ may choose provide financial assistance for off-airport bird hazard management programs. Additionally, it is possible that harassment activities conducted at one site may cause birds to move to a new site where they may cause conflicts and damage problems. In these situations, landowners or managers would also have to address cost of damage and cost of damage management methods.

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.**6.8.9 Sociological Impacts****Humaneness**

This alternative would involve the use of lethal methods including shooting, capture and euthanasia, egg destruction, egg oiling and the toxicant DRC-1339. This alternative combines the use of lethal methods with practical and effective nonlethal methods which may help with long-term resolution of bird hazards. The integrated use of nonlethal and lethal methods may ultimately lead to less use of lethal methods than if only Alternatives 3 or 4 are added to the current program. Consequently, the integrated use of nonlethal and lethal methods is likely to be perceived as less objectionable than the exclusive use of lethal methods.

Some individuals will perceive the use of any lethal method as inhumane. Use of the toxicant DRC-1339 and rodenticides is likely to be perceived as the least humane and most stressful because of the time between treatment and death of the animal. Some individuals may find the use of egg oiling and egg destruction less offensive if conducted early in the development of the embryo. In general, egg oiling/addling/puncturing is likely to be less stressful to the birds than nest and egg destruction.

Removal and euthanasia of resident Canada Geese and Mute Swans is considered to be inhumane by some individuals. These people may be concerned about the impact of bird removal on the remaining member of a goose pair, in instances where only one member of the pair is removed. Removal of juvenile birds and potential stress to adults and juveniles who may be separated in the capture process is also perceived by some individuals as being particularly inhumane and stressful. In situations where birds are being live-captured and euthanized, the agencies would use euthanasia methods approved by the AVMA (Beaver et al. 2001). Most people would view AVMA-approved methods of euthanizing animals as humane. However, a minority of stakeholders would likely want no birds captured, harassed, or killed because they consider the killing of birds as inhumane regardless of the method used.

People who place a high level of priority on human welfare may consider the methods used to relocate the gull colony to be more humane than not taking every reasonably feasible action to reduce risks to humans and the environment from a crash caused by a bird strike.

Aesthetic Impacts

Some individuals opposed to the use of lethal methods may feel that the observation or knowledge of the supplemental on-airport shooting program or interaction with dead or injured birds would have an adverse impact on their aesthetic enjoyment of the bay.

Actions to reduce bird hazards at JFK have resulted in a reduction in the size of the Jamaica Bay Laughing Gull Colony which might be considered an adverse impact on recreational (bird watching) uses of coastal areas by some people. However, a substantial Laughing Gull colony remains at the site, so impacts on the value of the Jamaica Bay Laughing Gull colony as a bird watching opportunity are low.

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.

Viewing and feeding waterfowl at parks and other locations in the city is perceived by many individuals as a pleasurable and aesthetically appealing activity by many individuals. Off-airport damage management actions which greatly reduce or eliminate birds from a particular site may be perceived as a significant loss in aesthetic values. This may be especially true for individuals who may have formed an attachment to a particular bird or birds a specific site that they enjoy. Conversely, in situations where high numbers of waterfowl have resulted in adverse impacts on a site because of fecal contamination or aggressive behavior, removal of the birds or reduction of the local population may be perceived as having a beneficial aesthetic impact.

Some individuals may feel that their enjoyment of sites used by waterfowl or the surrounding areas may be adversely affected by noise and commotion associated with harassment efforts. These types of activities need to be conducted as soon as reasonably possible after birds arrive at the site and it may not be possible to time these actions so that they are conducted when recreational use of the site is at a minimum. Exclusion devices such as wire grid systems and other bird barriers and visual frightening techniques may also be perceived as being aesthetically unappealing and adversely affecting the appearance of the location where they are applied.

Some individuals may feel that their enjoyment of sites used by waterfowl may be adversely affected by bird removal efforts. However, unlike bird harassment programs it is easier to conduct these activities during times of the day when recreational use of site is at a minimum.

Aesthetic values are based on and influenced by an individual's perceptions and beliefs. In the case of bird hazard management at airports, the extent to which an individual perceives an action as having an unacceptable aesthetic impact will depend, in part, on the degree of urgency the individual feels regarding the management of bird strike hazards. Individuals who place a high priority on doing everything possible to reduce bird strike hazards may not be as distressed by the aesthetic impacts of a bird hazard management technique used to address problems at JFK as they might be if the same method was proposed to resolve a nuisance problem (e.g., feces at parks).

6.8.10 Coastal Zone Management Programs**Policy 2. Facilitate siting of water-dependent uses and facilities on or adjacent to coastal waters**

Certain development and site restoration activities may result in increased hazards of bird strikes at JFK. Review of compatibility of coastal area developments should take into consideration, potential impacts on bird hazards at JFK. This may affect which new developments are established near JFK and landscaping and land management practices.

Policy 7. Preservation, protection and restoration of significant coastal fish and wildlife habitats

This alternative does not propose alteration of significant coastal fish and wildlife habitat. The current program has resulted in recommendations for site restoration projects which have impacted the type of plants which are used for site restoration (i.e., Fresh Kills and Fountain

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.

Avenue Landfills). Bird hazard management recommendations may restrict the type of restoration activities that may be conducted. However these recommendations may also benefit fish and wildlife habitat because they reduce the risk of adverse impacts on fish and wildlife habitats from a plane crash.

Policy 9. Protect, maintain and increase the level and types of access to public water-related recreational resources

This alternative would result in the removal of the Jamaica Bay Laughing Gull Colony which could be considered an adverse impact on recreational (bird watching) uses of coastal areas. It also has the risk of adversely affecting other bird species nesting on JoCo, East High Meadow and Silver Hole marshes and associated birding opportunities.

Observation of the supplemental on-airport shooting program or interaction with dead or injured birds could reduce the quality of the experience of individuals visiting Jamaica Bay.

Actions to reduce bird hazards at JFK would result in the reduction or complete removal of waterfowl from some parks and recreational areas. Some individuals will perceive the reduction in bird numbers as having an adverse impact on their recreational use of the site. However, the proposed action will not remove all birds at recreational areas within the 7-mile radius of JFK. Opportunities to view and enjoy waterfowl and other target species would still be available but individuals may have to go elsewhere for these opportunities.

Policy 23. Protect, enhance, and restore structures, districts, areas or sites that are of historic, cultural or archaeological significance

Some bird exclusion devices (e.g., porcupine wire, nixilite, etc.) that might be recommended to reduce bird activity off airport property are affixed to structures in order to deter bird use of ledges and other surfaces. Wire grid systems may also be perceived as having a detrimental impact on the character of a site. These methods would not be used at sites of historic, cultural or archaeological significance without appropriate prior consultation with the New York State Office of Parks, Recreation and Historic Preservation. Projects implemented with the consent of this office will not adversely affect these resources.

Policy 33. Best Management Practices to Control Stormwater Runoff

Bird hazard management activities may include the use of methyl anthranilate and other repellents to repel birds. Since these substances are approved by the EPA and applied in accordance with label directions for the safe and effective use of the products, the use of repellents would not have an adverse impact on water quality. Measures to eliminate pools of standing water through repaving and leveling of hard surfaces could result in increased discharge of runoff to the bay. However, incidences of this type of activity are likely to be limited and any impacts are anticipated to be minimal. The increased use of insecticides for insect control may reduce water quality to some degree. However, as is the case for repellents, all products would be applied in accordance with EPA label requirements for safe and effective product use.

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.**Policy 38. Quality and Quantity of Surface Water**

Bird hazard management activities may include the use of bird repellents and insecticides. Since these substances are approved by the EPA and applied in accordance with label directions for the safe and effective use of the products, the use of repellents would not have an adverse impact on water quality.

Bird hazard management activities may include the use of the toxicant DRC-1339 and rodenticides. As with repellents and insecticides, these substances have been approved by the EPA and would be applied in accordance with label directions for the safe and effective use of the product, including all measures for the protection of water. Additionally, 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 Revised).

Policy 39. Transport, Storage, Treatment and Disposal of Solid Wastes

All pesticides (bird repellents, insecticides, DRC-1339, rodenticides) used for bird hazard management would be applied in accordance with EPA and state requirements for safe transport, storage, application, and disposal. Risks associated with the use of these products will be minimal. Water quality and solid waste issues may improve as a result of efforts to get JFK and off-airport landowners to improve waste management practices as part of their bird hazard management programs.

The transport, storage and disposal of bird carcasses is conducted in a manner which minimizes the effects on groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

Policy 40. Air Quality

The only aspect of the bird hazard management program with the potential to adversely affect air quality is the use of motor vehicles to go to and from off-airport locations and to patrol the airport during daily bird hazard management activities. However, the consumption of fossil fuels for bird damage management is insignificant relative to ambient levels in the New York area.

Policy 41. Preserve and protect tidal and freshwater wetlands

Movements through saltmarsh for the Laughing Gull survey and off-airport egg oiling/addling and nest destruction have the potential to adversely impact saltmarsh habitat. However, given the protective measures discussed for each of the alternatives, these risks are low. To date, there is little evidence that the Laughing Gull monitoring program has adversely impacted the saltmarsh. However, the agencies have adopted methods for population surveillance (fewer trips and increased use of aerial surveillance) which should further reduce potential impacts on saltmarsh.

Impact Analysis: Alternative 6: Increase Integrated Bird Hazard Management - cont.**6.8.11 Identifying and Avoiding Impairments and Unacceptable Impacts on National Park Service lands.**

As discussed for Alternatives 1 and 3, if cumulative impacts on the Laughing Gull colony result in further reductions in the number of birds in the colony and associated site abandonment, this Alternative could result in impairment. Independent of the on-airport shooting program, loss and/or degradation of saltmarsh habitat could result in colony abandonment. No other unacceptable impacts or impairments were identified for actions proposed under Alternative 6. Alternative 6 would be the implementation of an integrated wildlife damage management program utilizing activities in Alternatives 1, 2, 3, and 4. There would be no reduction or relocation of the Laughing Gull colony on Gateway NRA (Alternative 5).

The implementation of an integrated program offers the most effective and practical methods for reducing threats to aviation while minimizing negative environmental impacts. Alternative 6 would be efficient at resolving threats to aviation, flexible to allow different methods to be used for different properties, species, or situation; and minimize environmental impacts to target and non-target wildlife. The greatest range of wildlife damage management methods would be available and could be balanced against the different missions of each property to reduce damage while minimizing impacts to the human environment. The public wants natural resource management agencies to minimize harmful effects to wildlife and the environment while protecting public safety at airports.

6.9 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTNEANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

During implementation of the Increased Integrated Bird Hazard Management Program, portions of the marsh complex consisting of JoCo, East High Meadow and Silver Hole marshes in the Jamaica Bay National Wildlife Refuge would be subject to varying types of disturbance,. Similarly, habitat modifications and varying degrees of disturbance may occur at a limited number of sites within the 7 mile radius of JFK which have been identified as being attractants to birds with flight patterns that pose risks to aircraft at JFK. None of the modifications or disturbance would be permanent or irreversible.

The productivity of land and water, in terms of ecological productivity as a wildlife habitat would be affected for the period of implementation. Nest and egg destruction, egg oiling, capture and removal projects, and shooting would result in some lethal impacts and disturbance of nontarget species which could affect their reproductive capability. Although the local Laughing Gull population in Jamaica Bay, and possibly some colonies in New Jersey, has declined as a result of the current supplemental on-airport shooting program, the regional Laughing Gull population has increased since the initiation of the shooting program.

Successful implementation of the Increased Integrated Bird Hazard Management Program would result in a lower frequency of aircraft accidents and would reduce economic costs associated with these incidents. It would also reduce potential risks of a serious bird strike which could result in a seriously damaged aircraft needing to release fuel prior to an emergency landing or a plane crash and associated adverse impacts on people and the environment.

6.10 IRREVERSABLE AND IRRETRIVABLE COMMITMENTS OF RESOURCES

Irreversible and Irretrievable Commitments of resources are the materials and costs associated with conduct of the proposed alternative (Increased Integrated Bird Hazard Management). The materials and costs listed here are estimated expenditures of resources for each activity; real costs and materials will vary. Cost to conduct activities beyond 2009 would essentially be similar, but would vary depending on inflation, cost of living and salary increases, the exact nature of the program, developing technologies and other factors. Agencies, organizations, landowners, and land managers with authority to implement each activity will determine the exact nature of bird hazard management programs that would be conducted.

6.10.1 Alternative 1: Materials and Costs of the Current Bird Hazard Management Program

Currently, annual expenditures for the conduct of JFK's on-airport bird hazard control program are approximately 5,841,841. General cost breakdowns are provided below.

1. JFKWMU

- a. Salaries and benefits, including Wildlife Biologist and Supervisory staff (\$985,557)¹⁸.
- b. Training & Certifications (\$1,282)
- c. Equipment (\$1,924).
- d. Vehicle costs (\$81,793).
- e. Supplies (\$4,374).
- f. Permits and authorizations including USFWS Migratory Bird Permit, New York State Division of Fish, Wildlife and Marine Resources License \$0.

SUBTOTAL – WMU = \$1,074,930

2. Insect Control

- a. Salaries and benefits and training including costs of record-keeping and preparing plans (\$2,000).
- b. Contract with insecticide applicator \$85,000.

SUBTOTAL – Insect Control = \$87,000/yr.

¹⁸ This estimate does not include the costs for overtime or for midnight wildlife control duties assumed as part of the duties of the midnight Assistant Airport Duty Supervisor. This also does not include the salaries of additional airport staff who are trained and may occasionally assist with wildlife hazard management.

3. Vegetation Management

- a. Salaries and benefits including costs of record-keeping and preparing plans (\$1,500,000).
- b. Equipment and supplies (machinery maintenance, gasoline, turf, seed, plants, etc.) (\$122,832).

SUBTOTAL – Vegetation Management = \$1,622,832.

4. Cost of Water Management

Costs vary by year depending upon need. Some years, little to no new water management projects may be needed. In 2009, the airport completed a project to drain and fill in the on-airport freshwater wetlands in the northeastern portion of the AOA, near Runway 4R. (\$2,244,000).

SUBTOTAL – Water Management = \$2,244,000

5. Cost of Private Contractor(s) – falconry program and bird hazard management assistance in 2009.

- a. Falconry program (\$582,125).
- b. Contractors in addition to USDA, WS (\$6,350).

SUBTOTAL – Private Contractor(s) = \$588,475

6. Cost of Supplemental On-airport Shooting Program

- a. Salaries and benefits (\$149,000).
- b. Travel (\$46,000).
- c. Equipment (\$3,000).
- d. Vehicle costs (\$6,606).
- e. Supplies (\$20,000).

SUBTOTAL – On-Airport Shooting Program= \$224,606.

7. Research

JFK has a long history as a leader in bird strike monitoring research and management. Research evaluating existing and new methods for reducing bird strikes has been an ongoing component of the JFK bird hazard management program (Section 2.2.8). Some projects like monitoring the On-airport Shooting Program, the survey of the Jamaica Bay Laughing Gull colony and the on-airport rabbit survey are conducted every year (Washburn et al. 2005*b*, 2009, Washburn and Tyson 2010). Annual costs for research conducted by USDA, WS averages \$21,000 per year.

Other research projects are established as needed to address specific questions regarding bird hazard management at JFK (e.g., Barras and Dolbeer 2000*a,b*, Dolbeer et al. 2002, Dolbeer et al. 2003, Washburn et al. 2006). Costs for these projects vary depending upon the complexity of the project.

6.20.2 Alternative 2: Add Additional Nonlethal Bird Hazard Management to Current Program

On-Airport Methods

1. Implement Standardized, Monthly Bird Hazard Monitoring

- a. Salaries and benefits (\$66,000).
- b. Travel (\$0)
- c. Vehicle costs (\$7,000).
- d. Equipment and supplies (\$6,500).

SUBTOTAL – Standardized Bird Hazard Assessment = \$79,500

2. Improve Recording of Nonlethal Hazard Management Activities

- a. Salaries and benefits (\$60,000). (Approximate cost to have contractor perform changes to current system at JFK).
- b. Computer, programs and supplies for data entry (\$27,000).

SUBTOTAL – Improved Recording of Nonlethal Hazard Management Activities = \$87,000.

3. Lasers – The WMU has already purchased a laser for use in bird hazard management. Cost in 2007 was \$4,000.

Off-airport Methods

The landowner or land manager would fund any off-airport bird hazard management programs and would have the final authority to determine the nature and scope of measures that would occur. Landowners or land managers could conduct the projects on their own with technical assistance from WS or the JFKWMU staff, could hire a private contractor to conduct the desired program or could contract for the services of WS. Depending upon circumstances, the PANYNJ may provide financial assistance for some off-airport bird hazard management. Volunteers and animal welfare organizations may be willing to provide assistance needed to implement education programs on the importance of not feeding wildlife and proper waste disposal which could help decrease the need for more aggressive management techniques such as bird harassment or lethal bird removal.

Costs will vary widely depending on the size and nature of the site(s), the species involved and the types of management actions to be implemented. Because of the nature and use of many off-airport sites, it may not be possible to alter the habitat sufficiently to effectively deter bird use. In these instances, repeated visits to the site within and among years may be needed for optimal efficacy. The 1994 FEIS Section 9.1.3.2 provided estimates of the cost of projects to address problems at Aqueduct Racetrack and Jamaica Bay Sewage Treatment Plant including costs to install grid wire exclusion systems.

Only limited data is available comparing the cost and efficacy of bird damage management

techniques. A feasibility study by Keef (1996) was prepared on the cost effectiveness of alternatives for removing nuisance Canada Geese in the Twin Cities, MN. Costs per bird removed of the management strategies considered included: relocation - \$10 per goose; capture, euthanasia and donation for human consumption - \$20 per goose; egg destruction \$40 per goose, surgical sterilization \$100 per goose, and habitat modification (extremely high – no cost provided). A more recent evaluation of a community based integrated nonlethal program to reduce Canada goose numbers at specific sites in New York (Preusser et al. 2008) demonstrated that the integrated use of multiple nonlethal techniques was successful in reducing goose numbers and fecal counts at treatment sites. However, geese hazed from treatment sites did not appear to travel far and were often observed at an unmanaged site within 1-2 miles of the treated site.

Although it's possible that the geese may relocate to a site where they won't cause problems, it is also possible that the harassed geese may cause similar or even worse problems at the new site(s). Consequently, the exclusive use of nonlethal WDM methods would usually require coordination with other nearby landowners in order to resolve and not just relocate the problem. When this occurs, the problem involves more than the original landowner. Harassment programs require a community based approach because like many waterfowl damage management methods, this strategy would require ongoing annual efforts. Data indicate the total annual effort required declined over the period of the study, but at least some level of effort would be required each year. NY WS personnel estimate that the cost of harassment programs, excluding the costs of research data collection and monitoring, would be approximately \$10,000 per site annually, with some variation depending upon the size and nature of the site and number of birds present. A similar program using goose removal would cost approximately \$1,800-2,700 per site excluding the cost of meat processing that is paid by the cooperator if the geese are donated for human consumption (A. Gosser, NY WS, pers. comm.). Goose removal programs would also likely require an additional commitment to future work, but would likely require fewer resources than harassment programs. Combining goose removal in an integrated approach with egg/oiling and harassment increases overall efficacy and efficiency of the program.

An example of a nonlethal bird removal project conducted by WS in New York that is similar to the ones which may be conducted is an upstate non-lethal Canada Goose management program. This program uses a Border collie, remote control boats, and other scaring methods to haze geese from designated sites. From May through October each year an employee visits each site 5 days per week, several times each day. The program cost was about \$130,000 annually and a population of approximately 2,500 geese were harassed each year from 2004 to 2006. After 3 years of harassment we learned, the population of resident Canada Geese was stable and harassment must be constant each week or the geese returned to the sites within 2 weeks (Preusser et al. 2008). Work conducted at Pennsylvania Avenue and Fountain Avenue Landfills has cost approximately \$500,000 per year.

6.10.3 Alternative 3: Add Additional On-Airport Lethal Bird Hazard Management to Current Program

If this alternative is selected for addition to Alternative 1, but Alternative 2 is not, cost of implementing the Standardized Bird Hazard Assessment and the increased reporting of on-

airport harassment activities would be included in this Alternative. Nest and egg destruction could be and has been readily incorporated into the existing JFKWMU program without appreciable increases in operational costs.

Increasing the number of targeted species that and the length of time by the On-airport Shooting Program would require additional field staff. There would be an increase in the amount of supplies used and a decrease in the amount of time between equipment purchases.

We divided the cost of the shooting program (including the cost of increasing the species which may be targeted from above) by the number of months the program was in effect to estimate monthly cost of the shooting program. Each additional month of the shooting program would cost.

1. Salaries and benefits (\$18,500).
2. Travel (\$5,700)
3. Equipment (\$300).
4. Vehicle costs (\$850).
5. Supplies (\$2,400).

TOTAL – Cost of increasing Shooting program by one month = \$27,750.

6.10.4 Alternative 4: Add Off-Airport Lethal Bird Hazard Management to Current Program

If this alternative is selected for addition to Alternative 1, but Alternative 2 is not, cost of implementing the Standardized Bird Hazard Assessment and the increased reporting of on-airport harassment activities would be included in this Alternative.

As with Alternative 2, the landowner or land manager may fund any off-airport bird hazard management programs and would have the final authority to determine the nature and scope of measures that would occur. In some circumstances, financial assistance may be available from the PANYNJ. Landowners or land managers could conduct the projects on their own with technical assistance from WS or the JFKWMU staff, could hire a private contractor to conduct the desired program or could arrange for the services of WS.

Costs will vary widely depending on the size and nature of the site(s), the species involved and the types of management actions to be implemented. As with nonlethal methods, if habitat alterations and exclusion methods cannot be applied so that birds are deterred from using the site, it may be necessary to repeat treatments within and among years. However, WS experience with lethal removal techniques indicates that, generally, fewer trips to a site are likely to be needed per year with lethal removal than with the use of nonlethal techniques. However the need to repeat site treatments is similar to Alternative 2.

An example of a lethal bird removal project conducted by WS in New York that is similar to the one that may be conducted is a broad-scale Canada Goose removal program. This program included 17 sites, at which 1,235 geese were removed and euthanized. The total cost for the

project was \$35,777 and required 15 days to complete. It is estimated that annual removal will be necessary at some of the sites.

6.10.5 Alternative 5: Add Reduction/Relocation of Jamaica Bay Laughing Gull Colony to Current Program

If this alternative is selected for addition to Alternative 1, but Alternative 2 is not, cost of implementing the Bird Hazard Monitoring program and the increased reporting of on-airport harassment activities would be included in this Alternative. Costs for one year of implementing this alternative include:

1. Salary and Benefits (\$415,683)
2. Travel (\$273,000)
3. Equipment (\$78,850)
4. Vehicle Costs (\$11,600)
5. Supplies (\$18,150)

TOTAL = \$797,283

The salary, travel, vehicle costs, and supplies would be re-occurring for years 2, 3, and 4. The total project cost for 4 years would be

1. Salary and Benefits (\$1,662,732)
2. Travel (\$1,092,000)
3. Equipment (\$78,850)
4. Vehicle Costs (\$46,400)
5. Supplies (\$72,600)

TOTAL (for 4 year project) = \$2,952,582

6.10.6 Alternative 6: Increased Integrated Bird Hazard Management – Proposed Action

At its simplest, the cost of this alternative should be the sum of the cost of implementing Alternatives 1-4. However, integrated bird hazard management programs are generally more effective than the sum of their relative parts. Used together, the effectiveness of one component may reduce the need to use another component. For example, effective use of nonlethal methods to reduce off-airport bird attractants would likely reduce the need for on and off-airport lethal methods. Consequently, the costs and commitment of resources of the integrated program could be less than the sum of its constituting elements.

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CHAPTER 7

MITIGATION AND MONITORING

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7.0 INTRODUCTION

As defined in Section 1508.20 of the Regulations for Implementing Procedural Provisions of the National Environmental Policy Act (40CFR 1500-1508), mitigation includes: a) avoiding the impact altogether by not taking a certain action or parts of any action; b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and e) compensating for the impact by replacing or providing substitute resources or environments. Standard Operating Procedures (SOPs) can be incorporated into project proposals to reduce or avoid the likelihood that an action will result in adverse impacts that would require mitigation. This section contains information on the SOPs and mitigation measures intended for use in implementing the proposed action (Alternative 6).

7.1 STANDARD OPERATING PROCEDURES

This section contains a description of the SOPs already incorporated in JFKWMU and WS use of bird hazard management methods that would reduce the potential of adverse environmental impacts.

7.1.1 Impacts on Target Species Populations

- Management actions would be directed toward localized populations or groups and/or individual offending birds.
- Data on the number of birds taken would be provided to the USFWS and NYSDEC, as appropriate, for monitoring the potential impacts to bird 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 bird populations.

7.1.2 Impacts on Nontarget Species and Vegetation

- Personnel assisting off-airport landowners would be trained and experienced in selecting the most appropriate methods for removing targeted birds and excluding non-target species.
- All bird hazard management activities will be conducted in accordance with USFWS and NYSDEC requirements to ensure protection of T/E species.
- All pesticides including insecticides, avicides, rodenticides and repellents would be stored, applied and disposed of in accordance with label directions and state and federal regulations to minimize risk of adverse impacts from pesticide use.
- DRC-1339 treatment sites would be monitored for the presence of nontarget species before using avicides to reduce the risk of mortality to non-target species. Baiting

strategies would be adjusted as needed to minimize or eliminate access by nontarget species.

- The JFKWMU and WS, if appropriate, would initiate consultation with the USFWS or NYSDEC as applicable following any incidental take of T/E species.
- All shooting would be conducted by trained personnel to minimize risk of accidental shooting of a nontarget species.
- Non-toxic shot would be used when shooting birds to eliminate risks of lead contamination in wetlands.
- Carcasses of all birds killed for bird hazard management would be recovered whenever possible. However, a small percentage of shot birds fall into the bay and are not recoverable.

7.1.3 Impacts on Recreation

- Whenever possible, bird hazard management activities including harassment, bird removal, on-colony gull shooting (if alternative 5 is implemented), and pesticide application would be conducted at times that allow for effective use of the product but also minimize adverse impacts on recreational use of sites.
- Carcasses of all birds killed for bird hazard management would be recovered whenever possible. However, a small percentage of shot birds fall into the bay and are not recoverable.
- With the exception of bird feeding which is not recommend at any recreational site, and reductions in the number of birds (waterfowl in particular) that may be seen at some sites, bird hazard management recommendations would be designed to accommodate and retain the recreational purposes of the site where they are conducted.

7.1.4 Impacts on Water Quality

- All pesticides will be transported, used, stored and applied in accordance with label requirements and state and federal regulations.
- Non-toxic shot will be used when shooting birds to eliminate risks of lead contamination in wetlands.
- Carcasses of all birds killed for bird hazard management would be recovered whenever possible and disposed of in accordance with Federal, State and local regulations. However, a small percentage of shot birds fall into the bay and are not recoverable.

7.1.5 Impacts on Noise

- When conducting off-airport bird hazard management activities in recreational areas, preference would be given to methods which minimize noise impacts (e.g., use of dogs, remote control boats instead of pyrotechnics).
- Pyrotechnics would not be used in residential areas unless the activity had been approved by local government. However, use of pyrotechnics in the city is not anticipated due to strict code enforcement by the Fire Department of New York City.

7.1.6 Humaneness

- Where practical and effective options are available, preference would be given to the use of nonlethal techniques.
- The use of newly developed, proven non-lethal methods would be encouraged when appropriate.
- The agencies would continue to support research improving the selectivity efficacy and humaneness of bird hazard management practices.
- WS will follow recommendations of the AVMA wildlife veterinarians association and American Ornithological Society when euthanizing birds.

7.2 MITIGATION

The 1994 FEIS provides mitigation measures to address the impact of the loss of the Jamaica Bay Laughing Gull breeding colony (1994 FEIS Section 7.1.1), including setting criteria for selecting potential relocation sites, establishing a plan of action for relocation actions. The 1994 FEIS also provides mitigation measures for the supplemental on-airport shooting program (1994 FEIS Section 7.1.2) and daily activities of the JFKWMU (1994 FEIS Section 7.1.3). These mitigation measures remain as discussed in the 1994 FEIS with the exceptions discussed below.

7.2.1 Selection of Relocation Sites for Laughing Gulls

Criteria used in the selection of likely alternative nesting sites in New York State for the gull colony include that the site must not have terns, Piping Plovers or other gulls. This provision was established in part to avoid disruption of and competition with state and federally-listed species and species of conservation concern (terns, Piping Plovers; e.g., 1994 FEIS Section 5.4.1) and also to reduce the likelihood of problems with predation by larger gull species (i.e., Herring Gulls, Great Black-backed Gulls). This is in contrast to the recommendation of Brown et al. (2001a) who suggested that sites with Forster's and Common Terns may be suitable areas for relocation efforts. However, after consideration of the issue, the agencies have determined that the reasons for avoiding sites with terns remain valid and this criterion for likely relocation sites will be retained. The agencies have reviewed the list of potential relocation sites provided

in the 1994 FEIS. The NWRC completed surveys of Long Island to identify other Laughing Gull colonies in 2009 (Washburn et al. 2010). While other habitat suitable for Laughing Gull nesting was identified, no nesting Laughing Gull colonies were found on Long Island in 2009.

7.2.2 Mitigation for the Supplemental On-airport Shooting Program

All shooting be conducted in adherence with all Federal and NYSDEC permit requirements. An annual report will be provided on the impacts of the supplemental on-airport shooting program.

Carcasses of birds will be recovered whenever possible and disposed of daily in accordance with applicable state, federal and local regulations.

The lead and cooperating agencies would continue to monitor the Laughing Gull colony. However, annual on-colony surveys will not be conducted. Conducting the surveys every other year will minimize potential disturbance to the marsh and nontarget species and will make best use of limited agency resources. Information from 18 years of colony surveys, data not including the 2011 nest census currently being undertaken indicate the colony is relatively stable in regard to the size of the nesting colony (at least during the past 10 years or so). Although there is year-to-year variability, but overall the colony has remained fairly consistent in size and is certainly productive (in regard to reproduction)(B. Washburn, NWRC, pers. comm.). The agencies will also make increased use of aerial surveys. Review of aerial survey and ground data from several years of Laughing Gull colony surveys indicates that aerial surveys checked with periodic ground surveys can be used as a reliable means of monitoring the Laughing Gull colony.

7.2.3 Mitigation for Off-airport Bird Hazard Management Activities

Mitigation measures discussed here are in addition to SOPs discussed in Section 6.1 above.

Where practical and effective alternatives are available and do not conflict with the original use of the site, preference will be given to habitat management, exclusion and similar measures which provide nonlethal long-term reductions in the utility of the site for target species.

Management actions conducted at Gateway NRA will only be conducted with the consent of the Park supervisor.

Gateway NRA staff will be consulted prior to conducting capture and removal and egg oiling to arrange for locations and times which allow for management action but also minimize impacts on nontarget species an vegetation.

Sites at Gateway NRA will be monitored prior to conducting egg oiling/addling/puncturing and live-capture and removal to identify locations which may be actively used by sensitive species and should be avoided while conducting management actions.