

CHAPTER 2

THE INTEGRATED BIRD HAZARD MANAGEMENT PROGRAM AT JFK

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2.0 INTRODUCTION

This chapter contains information on the Integrated Bird Hazard Management Program implemented at JFK after the completion of the 1994 FEIS. The first section contains a description of the JFKWMU which is responsible for the conducting daily on-airport wildlife hazard management activities and contacting and working with off-airport entities regarding hazards to aircraft. The second section provides information on each of the IBHMP on-airport program components: vegetation, water and sanitation management; insect control; wildlife management measures (e.g., harassment, shooting, trapping); and the supplemental on-airport shooting program. Additional details on the individual program components are provided in the 1994 FEIS. The third section provides information on the JFK off-airport wildlife hazard management program and a summary of current off-airport sites which contribute to bird hazards to aircraft. The final section provides a brief description of the BHTF which advises and works with JFK on bird hazard management issues.

2.1 JFK WILDLIFE MANAGEMENT UNIT (JFKWMU)

The JFKWMU was established as required by the FAA after the 1975 crash of a DC-10 subsequent to its collision with Herring Gulls. The JFKWMU is the entity responsible for conducting daily on-airport wildlife hazard management activities at JFK. The JFKWMU has conducted bird hazard reduction programs for over 35 years. Activities conducted by the JFKWMU include monitoring and management of bird attractants, use of nonlethal and lethal wildlife control measures (e.g., harassment, shooting) to reduce bird presence, collecting data on bird strikes, and educating contractors and other personnel working at JFK in techniques needed to help reduce bird strikes (e.g., waste/debris management and eliminating animal feeding). Each day, the JFKWMU conducts wildlife patrols at the airport and responds to wildlife emergencies in the AOA including bird strikes. During wildlife patrols, Wildlife Supervisors and Agents disperse birds and other wildlife that are or may create a hazard to aircraft. Additionally, staff search for any wildlife-related problems, such as the presence of attractants (e.g., insects) and either rectify the problem or report it to the Senior Wildlife Supervisor or Wildlife Biologist for further action.

The JFKWMU, as it existed at the time the FEIS was completed, was described in 1994 FEIS Section 1.4.4). The 1994 FEIS and USFWS ROD contained the following recommendations for improving the JFKWMU:

- 1) Increase frequency of patrols and bird dispersal in non-operational areas;
- 2) conduct runway sweeps before and after every aircraft operation;
- 3) add JFKWMU-dedicated staff including permanently assigning shift agents and supervisors to the JFKWMU;
- 4) expand the JFKWMU to include a wildlife biologist (preferably with a minimum education level of Masters of Science) to coordinate bird control work and serve as a liaison to senior Port Authority management. This individual would be the direct supervisor of the bird control unit and/or responsible for coordinating all aspects of

- the airport's bird hazard control program including conducting bird hazard assessment, control and monitoring activities.
- 5) develop staff of shift supervisors and agents over time (3-6 years) to include individuals with training in entomology and wildlife management;
 - 6) retain detailed logs and records of all bird control goals, programs, results and plans. Maintain separate records of water, insect and food (habitat) management, bird hazard monitoring activities, JFKWMU operations and staffing (training, expertise), future plans, other airport bird management programs, successes and failures, effectiveness of programs and techniques, bird strike reports;
 - 7) conduct at least annual reviews of JFK's overall bird hazard control program to evaluate effectiveness and develop new/alternative approaches as necessary to respond to evolving situations;
 - 8) develop written plans for all aspects of the bird hazard control programs at JFK;
 - 9) provide sufficient equipment and vehicles to support the improved JFKWMU including equipment to disperse water following rainstorms, pyrotechnics, speaker systems capable of broadcasting laughing gull distress calls, firearms and safety equipment.
 - 10) train and authorize all JFKWMU employees to conduct all harassment methods, including the firing of firearms for lethal and non-lethal harassment. This includes development of a written training plan for all employees; and
 - 11) train and equip all JFKWMU personnel to identify bird species at JFK and apply the correct management technique for each species.

Status: The plans for wildlife hazard management have been developed by the JFKWMU and are included in the JFK WHMP which is part of the official FAA-approved JFK Airport Certification Plan (PANYNJ 2004). Details on the operations of the current JFKWMU are provided in the WHMP. The WHMP is reviewed annually. The BHTF meets biannually to review current information and data relevant to bird hazard management at JFK.

As per recommendations of the 1994 FEIS, the JFKWMU has a wildlife biologist on staff. The Wildlife Biologist directs the overall management of all wildlife hazard management measures, coordinates and tracks JFKWMU staff training, and may direct day-to-day activities or special projects. As the airport's liaison to all Federal, State and local wildlife regulatory agencies, the Wildlife Biologist is responsible for obtaining all necessary wildlife permits. The wildlife biologist evaluates the ongoing success and/ or failure of wildlife hazard management activities, prepares monitoring reports, and recommends appropriate modifications to the wildlife hazard management program. The Wildlife Biologist oversees monitoring and other data collection and analyses. The Wildlife Biologist responsibilities also include working with off-airport landowners and managers to address bird strike problems related to off-airport bird attractants (Section 2.3).

In addition to the Wildlife Biologist, the JFKWMU also has a Senior Wildlife Supervisor, two Wildlife Supervisors, and two Wildlife Agents. The Senior Wildlife Supervisor provides data for the monthly strike reports to the Wildlife Biologist and supervises day-to-day activities of Wildlife Supervisors and Wildlife Agents. The Wildlife Supervisors conduct daily runway sweeps, respond to wildlife strikes, supervise Wildlife Agents and contract employees, and

conduct wildlife patrols. The Wildlife Supervisor directs the day-to-day activities of the Wildlife Agents. The Wildlife Agents conduct daily wildlife patrols and may assist the Wildlife Supervisor, Senior Wildlife Supervisor, or Wildlife Biologist as requested. Other JFK personnel trained in wildlife hazard management include the Airport Duty Manager, Assistant Airport Duty Manager, Senior Airport Operations Agent, and Airport Operations Agent.

The JFKWMU does not have a biologist with formal entomology training, but does consult with experts and sponsor studies as needed to address insect management issues. The JFKWMU consulted with the extension entomologist from Cornell University when needed to adjust the insecticide treatment program (Section 2.2.3). The recommended protocol was successful and no insecting events have been observed since the new pesticide application protocol was implemented. In 2006, a survey of insects at JFK was conducted in conjunction with a Laughing Gull diet study to determine the types of insects available to and used by the Laughing Gulls which were attempting to forage at the airport (Bernhardt et al. 2010, Kutschbach-Brohl et al. 2010).

The JFKWMU also meets staffing needs through contracts with public and private entities. At the request of the JFKWMU, the PANYNJ obtains assistance from WS with the on-airport shooting program from approximately May through November (Washburn et al. 2009, Section 2.2.7 – Supplemental On-Airport Shooting Program). WS also provides ongoing technical assistance with wildlife hazard management and has prepared a WHA for JFK (USDA 2002). The JFKWMU works regularly with the National Wildlife Research Center on the monitoring and assessment of current wildlife hazard management activities and research to identify and develop new wildlife hazard management techniques. Additional information on agency roles and responsibilities pertaining to wildlife hazard management at JFK are provided in Section 1.10. In the summer, the PANYNJ also contracts for the assistance of a private falconry company which helps haze birds from the airport with raptors and pyrotechnics and assists with trapping and removal of European Starlings, Rock Pigeons (aka, Rock Pigeons/feral pigeons), crows and blackbirds (Section 2.2.6 – Direct Wildlife Management).

The WHMP provides a detailed description of the training requirements for all JFK personnel involved in wildlife hazard management. The JFKWMU receives annual training from a qualified airport wildlife biologist in bird identification and the safe and effective application of wildlife hazard management techniques. Additionally, selected staff members receive live ammunition training (i.e., shotgun). Training of staff involved in wildlife hazard management at JFK meets or exceeds standards for annual training as described in FAA Advisory Circular 150/5200-36.

The 1994 FEIS recommendation for runway sweeps before and after every flight was eventually determined by the PANYNJ and the BHTF to be unlikely to provide sufficient improvement in data that it justified the cost and impediment to efficient aircraft operations at JFK. Daily runway sweeps are conducted at the start of each morning shift by the Wildlife Supervisor and/or Senior Wildlife Supervisor (Fig. 2-1). Additional runway sweeps are conducted by the Wildlife Supervisor or Wildlife Agent as requested by the Air Traffic Control Tower or the Airport Duty Manager when runways change from inactive to active or when a bird strike is observed. During the morning runway sweep, the Wildlife Supervisor searches for carcasses from any unreported

wildlife strikes. When a runway opens to aircraft activity from an inactive status, the Wildlife Supervisor or Wildlife Agent must conduct a “bird sweep” to disperse any birds or other wildlife in the area and verify that there are no wildlife hazards on the runway. The increase in runway sweeps is attributable to the fact that JFK started using 3 runways for most of the day to meet needs of increased air traffic. Although January is one of the months with the least bird hazard issues, in January 2008 JFKWMU staff conducted over 300 runway sweeps, more sweeps than any month in the last eight years. This increase continued through 2008 and early 2009 although the FAA is working on a plan to reduce aircraft movements with the airport as part of a national effort by the FAA to reduce flight delays (73 FR 3510).

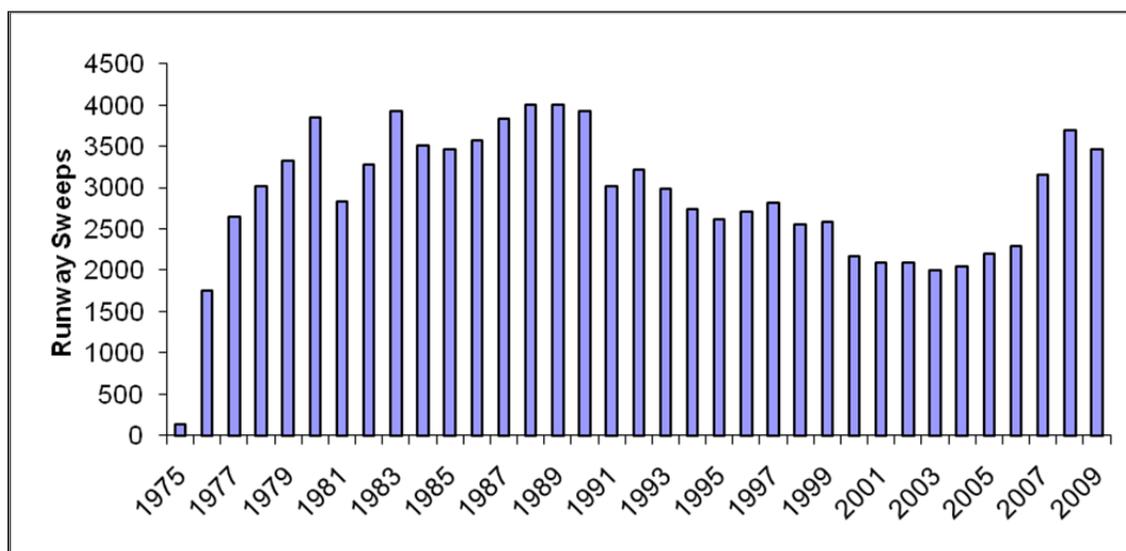


Figure 2-1. Runway sweeps conducted by JFK Wildlife Management Unit.

All patrol vehicles are equipped with radios to communicate with Airport Operations and FAA Ground Control as well as pyrotechnics, shotguns, and gull distress call tapes in order to disperse wildlife and other supplies for responding to wildlife strikes.

2.2 JFK'S ON-AIRPORT WILDIFE HAZARD MANAGEMENT PROGRAM

2.2.1 Vegetation Management

Vegetation management involves selecting and maintaining vegetation at JFK to reduce the attractiveness of the site as a feeding, resting, or nesting area for birds. The 1994 FEIS recommended intensive long-grass management on non-operational sections of the facility. In areas where long-grass management was not suitable, JFK was encouraged to use alternative groundcovers to the greatest extent possible.

Status: The current vegetation management strategy relies heavily on recommendations from WS based on the National Wildlife Research Center 1999 study at JFK (Barras et al. 2000a). Long-grass management continues to be an important component of vegetation management at JFK. Another goal has been to grow grass or other groundcover in sandy areas with poor vegetative cover. Establishing vegetation on these sites may reduce nesting by ground-nesting birds, such as American Oystercatchers, and help with erosion control. Sites targeted for vegetation establishment include areas located along the approach end of Runway 4L (Kilo Extension) and along the southern side of Runway 31L between Runways 4L and 4R. However, identification and use of alternative groundcovers has not been successful. Although the PANYNJ and National Wildlife Research Center have been able to identify groundcovers that do not provide an attraction to wildlife (e.g. seeds), none of the species or varieties tested has grown well in test plots at JFK.

Reducing large expanses of lawn helps to deter grazing by geese. Geese have a large wingspan and require large open areas to maneuver for flight. Reducing the size or changing the shape of lawn into long, narrow rectangles or areas broken up by shrubs and trees hinders their ability to land and take flight easily. When reducing the expanse of open area is not possible, height of vegetation is managed to reduce bird use, fertilization is reduced (reduces palatability of grass), and grass varieties that are less attractive to grazers such as Canada Geese may be planted. However, as noted above, none of the alternative grass types or ground covers tested has grown well in the soils at JFK.

Shrub and tree removal or trimming has reduced cover available to birds, rabbits, and hares. Special emphasis is made to remove fruiting trees and shrubs because they provide a source of food as well as cover for birds. For example, northern bayberry has been cut along Runway 4L and Runway 31L between Runways 4L and 4R. Northern bayberry fruits are a highly attractive food source for tree swallows. In a study conducted at JFK by Bernhardt et al. (2009), all of the 65 Tree Swallows collected and examined in October 2001 had bayberry fruits in their stomachs. A review of Tree Swallow strikes before and after the initiation of the bayberry removal program in late 2001 found a 75% reduction in the number of Tree Swallow strikes after the removal of the bayberry bushes (Bernhardt et al. 2009). When removal is not feasible, trimming shrubs to eliminate the formation and/or presence of berries is recommended. Removal or trimming of trees has eliminated nesting and perching sites for raptors and other birds. Landscaping is designed to minimize bird attractants first and to be aesthetically pleasing secondarily. No fruiting trees or shrubs are used in landscaping. JFK avoids planting conifers, which are attractive roost sites for starlings. Trees with open canopies are preferred and are spaced far enough apart that the canopies do not touch each other. Trees may be pruned or removed completely to reduce canopy or stand density.

Birdhouses and nest boxes or structures are not permitted anywhere on the airport. An Osprey platform and abandoned telephone poles were removed from the southern end of Lefferts Boulevard along Bergen Basin to eliminate Osprey perching and nesting sites near the airport.

2.2.2 Water Management

With the large amount of salt water in the airport vicinity, sources of freshwater are particularly attractive to birds. Water management at JFK is particularly challenging because the airport was built on fill which is subject to continual settling. In 1991, JFK implemented measures to check for and eliminate any standing water areas on the airport. The airport's efforts appeared to be adequate at the time the 1994 FEIS was completed and no additional recommendations were made.

Status: JFK is currently moving towards eliminating freshwater wetlands within the AOA. JFK completed a project to drain and fill in the freshwater wetlands in the northeastern portion of the AOA, near Runway 4R in 2009. The WHMP recommends that no new wetlands should be created on or within 5 miles of JFK. Any new wetland generation projects required as mitigation for on-airport wetland management activities should be located outside this perimeter.

As with permanent water sources, JFK works to eliminate temporary water sources. Large puddles left after rain events are swept with a mechanical sweeper to hasten evaporation. If sweeping is not possible, repellents like methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) may be used to deter bird use of ephemeral water sources. Drainage improvements or grading and resurfacing are planned for and conducted in areas where puddles continually form.

Recent projects which helped to reduce standing water at JFK repaving taxiways Romeo and Sierra in 2009 which improved some areas where ponding was a problem and repaving Lot 9 Long Term Parking in 2002-2003 which eliminated a large pond. In 2002-2003, JFK also resurfaced runway 4R-22L to accommodate the expected arrival of the Airbus 380. The resurfacing required regarding the adjacent safety areas which resulted in ponding problems in unpaved areas. This issue was addressed in 2003 and 2004.

It is not feasible or appropriate to consider eliminating Jamaica Bay, Bergen Basin, Thurston Basin, or the nearby salt marshes. Bird hazards associated with these areas are mitigated through the use of wildlife control measures (e.g., direct management of the birds).

2.2.3 Insect Control

Insect control is an important component of airport habitat management because insects can be a significant attractant for birds. Insect control may also be conducted at the airport to reduce the chance that certain insect species (e.g., Japanese beetles) can get into cargo and be transported to new areas which do not have the species. At the time the 1994 FEIS was completed JFK had an ongoing insect control program which consisted of monitoring and tiered application of insecticides on the grassy strips along the runways and a property north of the airport. The 1994 FEIS recommended ongoing monitoring of birds feeding on the airport to determine what, if any, insects the birds were eating and then developing management plans to remove the insects from the airport.

Status: Large hatches of insects (primarily mosquito, Japanese beetle and grasshoppers) from juvenile to adult stages are a particular concern for JFK, because the abundant food source is an attractant to many birds. Insect management efforts at JFK use pesticides to reduce/eliminate these hatches. The label of the pesticide (Sevin) applied by JFK for mosquito larvae, adult Japanese beetle, and grasshopper control was modified in 2003, reducing the allowed application rate from four to two applications per season. The airport shifted the pesticide application protocol over the period of 2003-2005 to target pest species at the most vulnerable stages in their life cycle. By 2006, these efforts appeared to be successful, and no major bird insect feeding bouts have been observed since that time (L. Francoeur, PANYNJ, pers. comm.).

Studies were conducted in 2003 and 2004 which evaluated the insect population at JFK and the diets of Laughing Gulls shot at the airport (Kutschbach-Brohl et al. 2009, Bernhardt et al. 2010). Despite the impacts of mowing and periodic treatment with insecticides to prevent large hatches of insect, the different grassland habitat types at JFK supported a wide variety of insect species. In a study of Laughing Gull diets at JFK (Bernhardt et al. 2010), ants and beetles (primarily Japanese Beetles, and May Beetles) were the most common insects in Laughing Gull diets. Japanese Beetles, while found and managed at JFK, are commonly associated with areas of managed cool-season turf grasses which are commonly planted at parks and residential lawns. The presence of earthworms which are generally not found in abundance at JFK because of soil conditions, and cockroaches which are usually associated with human dwellings and refuse in diets of the gulls also provided evidence that the gulls were likely foraging in terrestrial habitats (parks, residential lawns) within the urban and suburban areas around JFK.

2.2.4 Sanitation Management

Sanitation management includes the JFK program to reduce/eliminate feeding of animals and preventing wildlife access to trash receptacles/storage containers. At the time the 1994 FEIS was completed, JFK had replaced dumpsters with enclosed trash compactors and was working to reduce bird feeding at taxi stands. The 1994 FEIS noted that these efforts had been successful, but additional and ongoing efforts to prohibit bird feeding would be beneficial to reducing bird strike hazards.

Status: Sanitation management is an ongoing effort for JFK. Management of this issue is complicated by the fact that many of the waste management problems are caused by individuals who are not employed by the PANYNJ. For example, the terminals are managed by the air carriers which use the terminals and not JFK personnel. JFK has been able to improve sanitation management by terminal operators through the issuance of “Breach of Rules” tickets. Similarly, the PANYNJ does not employ shuttle van and taxi drivers. The waiting areas used by these entities have been identified as a source of problems with sanitation. Signs and other educational methods are used, as well as speaking directly to persons involved in littering and feeding animals when observed. New PANYNJ airport operating guidelines, specifically prohibit the feeding of any

animal on airport except assistance animals, animals properly confined for transport, animals properly confined for boarding or care at the veterinary facility, law enforcement canines, and canines or raptors used for animal hazard management by authorized staff or their designated representative (PANYNJ 2009)

Debris removal helps facilitate mowing and also reduces the wildlife habitat on the airport. Debris provides cover for small mammals, which may in turn attract raptors that feed on small mammals. Debris is also aesthetically unattractive and can potentially serve as breeding grounds for mosquitoes. Contractors are required to remove all debris when they complete a project and construction areas are inspected prior to the conclusion of contracts.

JFK works to discourage feeding of birds and other wildlife by the public, contractors, and by JFK employees. Signs and other educational methods are used as well as speaking directly to persons involved in feeding wildlife when observed. Periodically, feral cat populations are discovered around the airport. Well-meaning employees leave food for strays and eventually the number of cats increases. Feral cats, because they tend to cluster near buildings, pose more of a health risk for employees than a strike hazard. However, feral cats have been observed within the AOA and may come from these feral colonies. Aircraft or vehicles may strike these cats and the cat food may attract pigeons (Rock Pigeons), European Starlings, gulls, and other birds that further complicate wildlife hazard management. Efforts are being made to discourage this behavior. As noted above, the new PANYNJ airport operating guidelines specifically prohibit the feeding of wild and feral animals. Strays are trapped and delivered to the New York Animal Care and Control which determines the fate of the animal (e.g., adoption or euthanasia).

2.2.5 Airport Buildings and Other Structures

JFK works to monitor for and eliminate puddles on flat-roofed buildings. The WHMP recommends that new buildings be designed with pitched roofs to eliminate the problem in the future (PANYNJ 2004).

Bird droppings can damage paint on vehicles and aircraft and be human health hazards. Birds may also create a mess with nesting material and the nests may create fire hazards, especially if they are located near heating and ventilation systems or high-voltage equipment. Ideally, buildings should be designed with as few flat ledges as possible to reduce potential perching and nesting sites. Efforts by the PANYNJ to discourage building features which would provide roosting and nesting areas for wildlife may be resisted by developers who wish to adhere to a specific style for reasons of consistency with an existing building (for additions) or other aesthetic reasons. Efforts are made to prevent birds from accessing buildings by filling in holes or gaps in walls and doors and keeping hangar and garage doors closed when not in use. Other building modifications that can deter use by birds may include installing netting, porcupine wire, or other materials to totally exclude birds from a location, or changing the angle of the flat surface to prevent perching or nesting. For example, shock strips, porcupine wire and netting are being employed to prevent European Starlings and Rock Pigeons (pigeons) from roosting

at monorail stations. When necessary, birds are also removed through trapping or shooting in addition to installing exclusion devices.

2.2.6 Direct Wildlife Management

The JFKWMU works under the general rule that even a single bird on or over an active runway poses a potential hazard to safe aircraft operation. The intensity of effort to reduce bird use of other locations on airport property varies depending upon the species and the risk it poses to aircraft safety. The exact action taken to rid the area of a bird depends on several factors including: wind speed and direction; bird species, status (e.g., is it threatened or endangered), activity and location; bird species historic response to harassment or lethal control; weather; runway usage and other factors. In general, a progressive approach is taken in order to rid the airport of birds. Harassment is generally the first step in controlling bird hazards. The JFKWMU and their designated agents may use pyrotechnics, gull distress calls, helikites, or other legal non-lethal methods to disperse the hazard. The method of harassment used may vary depending on the species to be controlled, time of year, and the number of birds present, and is left to the discretion of the JFKWMU. Dispersal methods are changed frequently to avoid habituation and are only used by individuals trained in the effective use of each technique. If initial harassment methods are ineffective, assistance may be obtained from the falconers or lethal control may be used. Some high-risk species, specifically geese, are shot instead of harassed when found on runways or in the runway safety areas if it is safe to take the shot.

Wildlife harassment is conducted between aircraft movements, and care is taken to disperse birds away from the active runway. Sometimes it is necessary to position additional people a short distance away from the hazing site to prevent birds from taking flight, circling, and landing at another location on the airport. This is particularly true when birds have been frequently harassed. In 2006, the JFKWMU used 3,700 pyrotechnics (2,400 “whistlers”, 1,300 “bangers”). The private contractor which assists the JFKWMU during the busiest 6 months of the year used an additional 2,000 “whistlers” and 650 “bangers”. In 2007, the JFKWMU used 5,800 pyrotechnics (3,800 “screamers” and 2,000 “bangers”). More recently in 2008, JFKWMU used 2,300 pyrotechnics (1,799 “screamers” and 501 “bangers”). Falconry has also been used to frighten birds away from the airfield with the intention that it may be more difficult for birds to habituate (become accustomed to) a natural predator than frightening devices like pyrotechnics. A raptor was flown every hour each day during the 6 month spring-fall period when need for bird hazard management at JFK is greatest. Raptor flights were initiated ½ hour before sunrises and continue until sunset. Hourly flight intervals lasted 5-20 minutes for falcons and 15-60 minutes for Harris’ Hawks (the only hawks flown). Twenty raptors (19 falcons, one Harris Hawk) were flown in 2009 for a combined total of 1,401 hours (approximately 7.8 hours per day in 2009. In 2008, 20 birds (18 falcons, 2 Harris Hawks) were flown for a combined total of 1,490 hours (approximately 8.25 hours per day).

Shooting and falconry were used by the JFKWMU to reinforce hazing techniques. Shooting limited numbers of birds and lethal take via falconry, pursuant to state and federal permits, serves to reinforce frightening effects of nonlethal methods and removes persistent individuals who have shown no avoidance response to other techniques. Shooting is also used in instances when birds which pose a high level of risk to aircraft safety (e.g., large bodied birds or flocks of birds) attempt to enter JFK airspace.

Destruction of Canada Goose and American Oystercatcher eggs and nests on airport property has been used to reduce risks associated with these species. The JFKWMU has not destroyed Canada Goose eggs or nests since 2001 when one nest and five eggs were destroyed. American Oystercatchers are attracted to the sandy areas adjacent to runways and taxiways and regularly attempt to use these sites. The JFKWMU has destroyed limited numbers of American Oystercatcher eggs and nests every year since 2001 to discourage Oystercatchers from using the area. As stated in Section 2.2.1 above, there is ongoing research to identify vegetation that can be used in the sand/gravel areas adjacent to the runways as a long-term solution to problems with American Oystercatchers attempting to nest at JFK.

Cage-type live traps and euthanasia are used to remove European Starlings, Rock Pigeons (aka, Rock Doves, Feral Pigeons), Red-winged blackbirds, Brown-headed Cowbirds and crows to reduce aircraft hazards and problems with nesting and roosting on airport property (e.g., aesthetic and health concerns related to fecal contamination, and damage to facilities and structures). House Sparrows are a non-native invasive species and are euthanatized when incidentally captured in cage traps set for the other species (maximum 13 birds taken per year 2001-2009).

2.2.7 Supplemental On-Airport Shooting Program

The supplemental on-airport gull shooting program was started in 1991 as an experimental program to reduce the number of aircraft collisions with gulls, especially Laughing Gulls from the breeding colony in Gateway NRA near the end of runways 22R/4L. The supplemental on-airport shooting program was included in the Integrated Gull Hazard Management Program selected in the RODs for the 1994 FEIS and has been conducted by WS every year since 1991 (Washburn et al. 2009). WS biologists and specialists (2-5) stationed along the southern perimeter of the airport use shotguns with steel or non-toxic shot to shoot gulls attempting to fly over the airport (Fig. 2-2). Prior to 2008, the program was conducted from May through August each year to coincide with the presence of Laughing Gulls at the breeding colony. The efficacy of the program and impacts on the Laughing Gull colony and the regional Laughing Gull population are evaluated annually (Washburn et al. 2009, Washburn and Tyson 2010). In 2008, the end of the supplemental on-airport shooting program was extended from August to November primarily to address risk of Herring Gull strikes which are greatest in September and October (Fig. 1-10). In 2001, the JFKWMU authorized WS personnel from the on-airport shooting program to take large birds and flocking birds posing an imminent hazard to aircraft at JFK. Species other than gulls that may be shot by WS under this

authorization are Canada Geese, Mute Swans, Double-crested Cormorants, brant and Rock Pigeons.

2.2.8 Monitoring and Research

Efficacy and impacts of the JFK bird hazard management program are monitored through collection of data on bird strikes at JFK (Section 1.5), an annual report on the efficacy and impacts of the supplemental on-airport shooting program (Washburn et al. 2009), and monitoring of the Jamaica Bay Laughing Gull colony (Washburn and Tyson 2010). Additionally, a WHA was conducted at JFK by WS in 2001-2002 (USDA 2002).

The PANYNJ has supported an extensive research program to improve understanding and management of wildlife hazards at JFK (1994 FEIS Section 1.4.1, and publications such as Seamans et al. 1995, Gabrey et al. 1996, Belant 1997, Dolbeer et al. 1997, Dolbeer 1998, Dolbeer 1999, Barras et al. 2000*a,b*, Barras and Dolbeer 2000, Barras and Seamans 2002, Dolbeer et al. 2003, Washburn et al. 2006, Bernhardt et al. 2009, Bernhardt et al. 2010, Kutschbach-Brohl et al. 2010). Research conducted at JFK has not only benefited JFK but also provided information on wildlife hazard management techniques used by airports around the world.

The primary agency conducting research on bird hazard management at JFK has been the USDA, APHIS, WS, National Wildlife Research Center which has an international reputation as a leader in wildlife damage management research and a program dedicated specifically to research on the reduction of wildlife hazards to aircraft (<http://www.aphis.usda.gov/ws/nwrc/index.html>). Additional research has been conducted and/or paid for by the Gateway NRA (e.g., Tims 1999). In addition to conducting research on specific damage management techniques, the National Wildlife Research Center prepares the annual reports on the efficacy and impacts of the supplemental on-airport shooting program (Washburn et al. 2009, Washburn and Tyson 2010). The JFKWMU, WS, National Wildlife Research Center, Gateway NRA, and other BHTF members participate in an annual survey of the JBWR Laughing Gull colony coordinated by the National Wildlife Research Center. After several years comparing aerial photographs to ground counts, the Laughing Gull monitoring program has switched to the use of annual aerial surveys with ground counts conducted every 2-3 years. Reducing the number of ground counts minimizes risk of adverse impacts on soil and vegetation in the marsh and also reduces survey costs.

Cottontail rabbits and black-tailed jackrabbits are a food source for raptors such as Snowy Owls, Red-tailed Hawks, and Rough-legged Hawks which have been struck by aircraft at JFK (Section 1.7.8, Appendix C). High densities of rabbits could attract increased numbers of raptors to JFK. Additionally, although rabbit strikes pose little risk to aircraft, the resulting carcasses may attract scavengers which could be a greater threat to aircraft safety. JFKWMU, WS and National Wildlife Research Center personnel conduct semi-annual night surveys to monitor the black-tailed jackrabbit and cottontail rabbit populations at JFK.

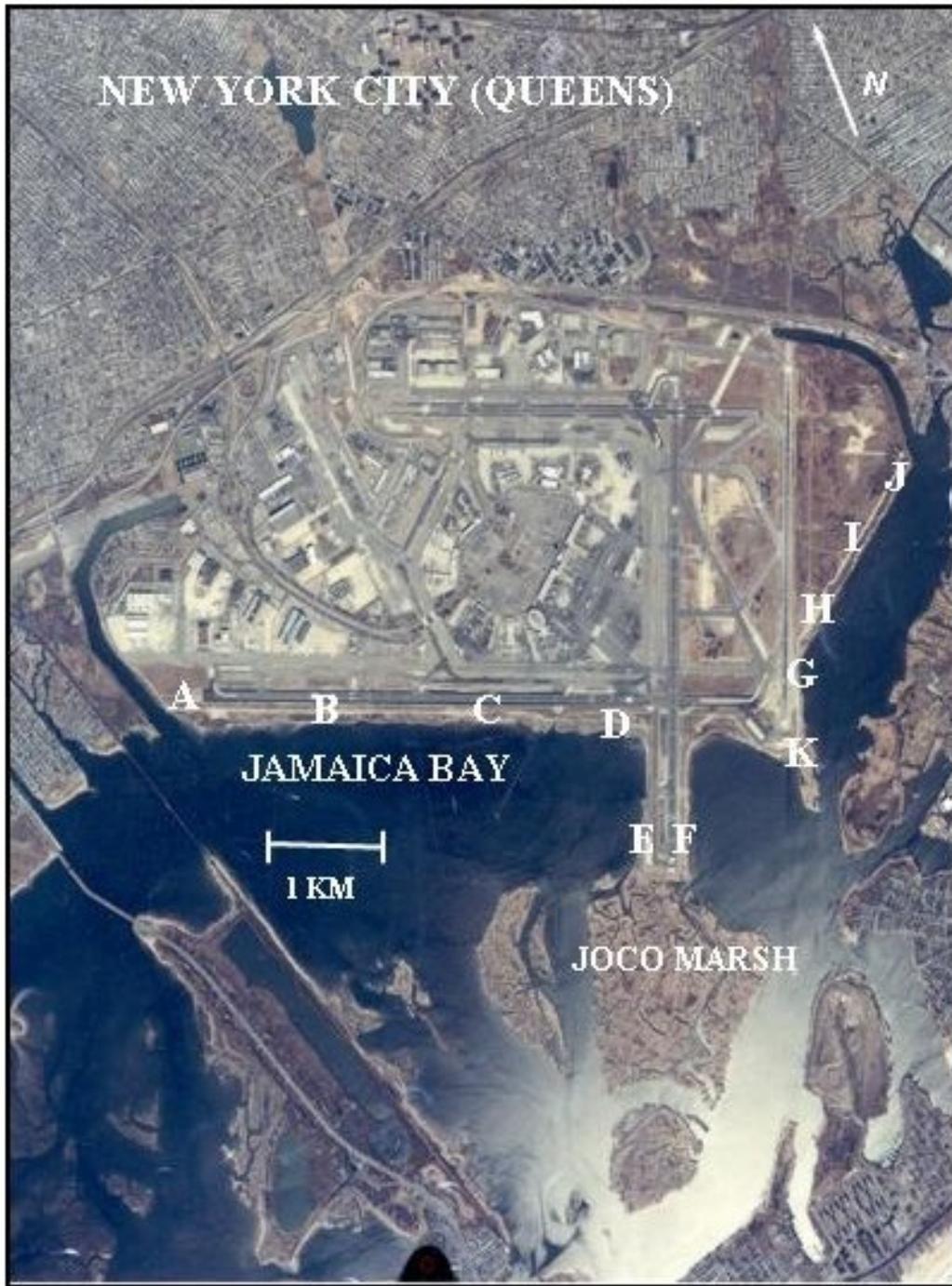


Figure 2-2. Schematic map of John F. Kennedy International Airport (JFK) showing location of nesting colony of Laughing Gulls (JoCo and adjacent marshes in Jamaica Bay) and the 11 shooting zones (lettered A to K along the southeastern and southwestern boundaries of the airport), 1991-2005. Zones G-J were used only in 1991. (Figure from Washburn et al. 2006).

2.3 JFK'S OFF-AIRPORT WILDLIFE MANAGEMENT PROGRAM PROGRAM

The area around JFK provides food and habitat for numerous bird species. The importance of off-airport wildlife hazard management is addressed in FAA Advisory Circular 150/5200-33A and has also been recently addressed by Dolbeer (2011) and Martin et al. (2011). Ponds and large expanses of grass in parks, golf courses, rights-of-way, medians and around developments provide feeding and loafing sites for many species of concern for JFK including gulls and geese. Man-made habitat and food sources including handouts from well-meaning citizens have led to populations of some bird species in excess of what can readily be tolerated in close contact with human activities. For example, the NYSDEC estimates there are approximately 20,000-25,000 Canada Geese in the NYC and Long Island area, approximately 5 times the number they believe can be tolerated by humans and human land uses in the area (i.e., cultural carrying capacity; B. Swift, NYSDEC, pers. comm.).

Removal or reduction of bird attractants can decrease the number of birds crossing JFK airspace. However, although FAA regulations impose requirements on airports for on-airport wildlife hazard management and encourage work off-airport, FAA authority does not extend to requiring off-airport landowners and managers to implement airport recommendations. However, property owners who do not respond to requests to assist in bird hazard management may be subject to litigation if a strike occurs that can be connected to their site (Dolbeer 2005).

The JFKWMU and their agents (WS) consult with off-airport landowners to coordinate wildlife management efforts and provide technical assistance on off-airport bird hazard management methods. The 1994 FEIS made no provision for the JFKWMU conducting off-airport bird hazard management or the PANYNJ providing financial assistance to off-airport landowners. However, in accordance with separate NEPA analyses (USDA 2004), WS has been working with NYC to reduce resident Canada Goose numbers for a combined project to reduce hazards to all airports in the NYC area, complaints and safety and health concerns expressed regarding high densities of geese, goose feces and aggressive geese at NYC parks, and the protection of natural resources. In some instances the PANYNJ may choose to provide financial assistance for off-airport bird hazard management.

The property owners and managers of some the primary wildlife attractants in the vicinity of JFK have been included on the BHTF, and the JFKWMU works with these landowners to coordinate wildlife management efforts. Gateway National Recreation Area, the New York City Department of Parks and Recreation, and the New York City Department of Environmental Protection manage lands near JFK and were cooperating agencies in the preparation of the SEIS. Off airport property managers may choose to implement the recommendations of the JFKWMU, implement other measures to address the issues identified by the JFKWMU or take no action. Information in this analysis will be used by the cooperating agencies in making management decisions, but each agency retains independent authority for its decisions.

The following is a general description of off-airport wildlife attractants that have been identified by JFKWMU and WS (PANYNJ 2004, USDA 2002).

2.3.1 Gateway National Recreation Area

Gateway NRA contains abundant wildlife habitat and numerous recreational opportunities including birding, hiking and biking trails, beaches, fishing and boating opportunities, environmental education and sports fields as well as associated parking areas. Grassy lawns at recreational sites are attractive feeding and loafing areas for gulls and geese, and parking lots may have puddles which provide temporary fresh water sources. Gulls, pigeons and geese receive food handouts from park visitors despite the presence of signs prohibiting feeding wildlife. Gulls and pigeons scavenge food from trash left out of waste containers. Four areas within Gateway NRA of particular concern relative to bird hazards to aircraft: Jamaica Bay Wildlife Refuge, Rulers Bar Hassock, Fountain Avenue Landfill, and the Pennsylvania Avenue Landfill (Fig. 2-13).

Jamaica Bay Wildlife Refuge

The Jamaica Bay Wildlife Refuge is part of Gateway NRA and includes 650 acres of salt marsh that provides habitat for feeding, loafing, and nesting birds in addition to other wildlife including the Laughing Gull colony adjacent to JFK. Thousands of gulls and shorebirds nest on marsh islands and it is a popular stopover point for birds migrating along the Atlantic Flyway. Thousands of ducks use the Bay as a stopover point during spring and fall migrations. Jamaica Bay is also an important staging area for migration of brant between the Arctic and Delaware and Chesapeake Bays (Section 1.7.3). Thousands of brant use Jamaica Bay during the fall migration, winter holdover, and spring migration. It is not uncommon for limited numbers of brant to remain in the area during the summer (Bull 1998). Schools of fish also take refuge in Jamaica Bay, providing food for birds, other wildlife, and people. Atlantic Horseshoe crabs use shoreline areas of the bay to reproduce during May-June which attracts thousands of shorebirds and gulls to feed on eggs (NYC Parks 2010, NPS 2004).

Rulers Bar Hassock, Gateway National Recreation Area

Rulers Bar Hassock is an island located within the Jamaica Bay National Wildlife Refuge Unit of the Gateway NRA. Although the Hassock is within the Gateway NRA, there is a private inholding community, Broad Channel, of approximately 3,000 residents on the southern portion of the island. In the summer of 2009, up to 778 Canada Geese were observed at the site by personnel with WS and the NYCDEP (WS unpublished data). Resident Canada Goose numbers in the area. Rulers Bay Hassock is approximately 1.1 miles west of JFK. Resident Canada Goose use of the site has become an increasing risk to aircraft using JFK. In the summer of 2009, up to 778 Canada Geese were observed at the site by WS personnel and NYCDEP. Geese coming from this island frequently cross Runway 13R/31L near the 13R approach or fly parallel along the 13R/31L runway and cross the north-south runways 4/22 R and L before exiting the east side of the airport. Also, geese come from the island and cross the Kilo Extension.

North Channel Bridge Parking Areas

The North Channel Bridge Parking Areas located at the southern end of the North Channel Bridge at the east and west side of Cross Bay Boulevard was discussed in the 2002 Wildlife Hazard Assessment for JFK are part of Rulers Bar Hassock. The area is frequented by people picnicking, fishing, and feeding birds. In addition to those food sources, the trash cans in the parking lots are often overflowing, providing another source of food for the birds.

The North Channel Bridge Parking Area¹⁰ was one of five off-airport sites surveyed during the 2001-2002 Wildlife Hazard Assessment for JFK (USDA 2002). Each off airport site was surveyed during 45 visits conducted between August 2001 and July 2002. During each survey visit, an observer monitored 360 degrees around the observation point for 3 minutes. Observers recorded each species observed, the number of individuals per species and the behavior of each individual. Additional time was taken if needed to accurately record all species individuals and behaviors. Start times for the surveys were randomly selected to begin between dawn and dusk. Bird use of sites often varies during the course of a day, so the absence of a species during some visits may only reflect lack of use at the survey time and not complete absence from the area. A total of 21 bird species were observed at the site during the surveys including 7 waterfowl species and 4 species of gulls. Large numbers of gulls, Canada Geese, brant, and pigeons have been observed feeding and being fed by humans at these parking areas (Figs. 2-3 – 2-7). Gulls, waterfowl and pigeons were the most commonly observed species and members of these species guilds were observed at the site throughout the year. Due to the proximity to the airport, these birds are potential strike hazards and may cross into an aircraft's flight path while en route to or from the airport.

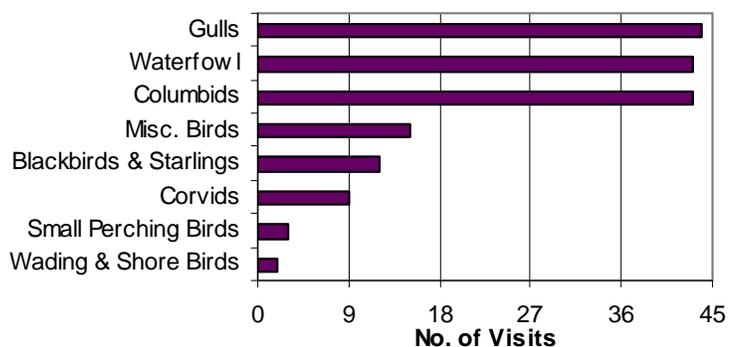


Figure 2-3. Number of visits to the North Channel Bridge Parking Area where each guild was present during 45 visits conducted for the 2001-2002 WHA for JFK (USDA 2002).

¹⁰ Referred to as “Gateway National Recreation Area Parking Area in USDA (2002).

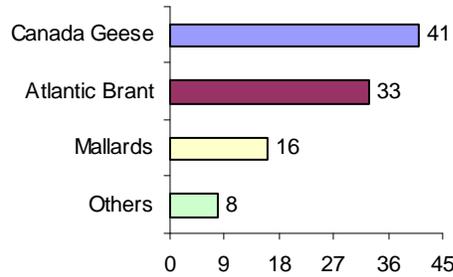


Figure 2-4. Number of surveys at the North Channel Bridge Parking Area where waterfowl species were present during 45 visits conducted for the 2001-2002 WHA for JFK (USDA 2002).

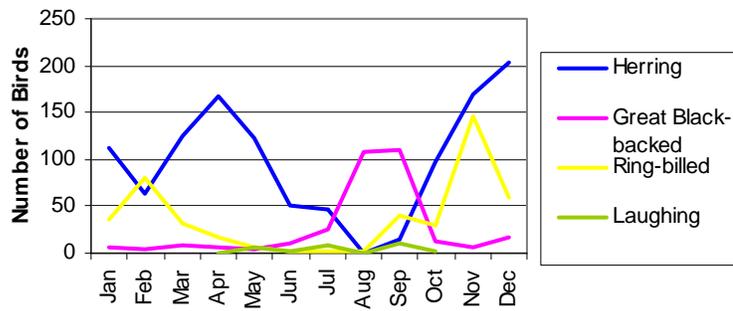


Figure 2-5. Average number of each gull species observed at the North Channel Bridge Parking Area per survey each month of the 2001-2002 WHA for JFK (USDA 2002).



Figure 2-6. Number of surveys where gull species were present during 45 visits to the North Channel Bridge Parking Area conducted for the 2001-2002 Wildlife Hazard Assessment at JFK (USDA 2002).

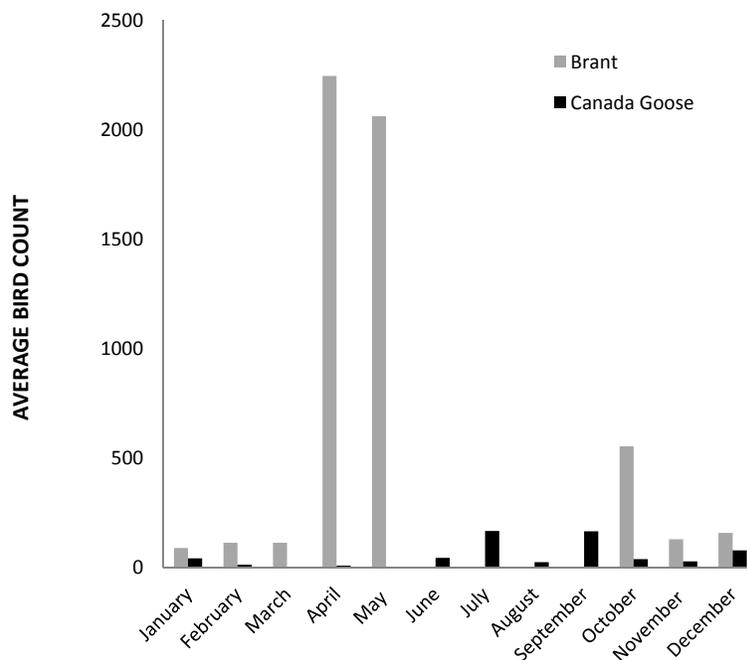


Figure 2-7. Average number of Atlantic Brant and Canada Geese observed per visit at the North Channel Bridge Parking Area during the 2001-2002 WHA for JFK (USDA 2002).

Pennsylvania Avenue Landfill and Fountain Avenue Landfill

The sites of the now-closed Pennsylvania Avenue and Fountain Avenue Landfills, are located west of the airport, and are within the approach and departure pathways for JFK. The two sites have been deeded to the National Park Service. However, NYC is responsible for environmental restoration. Issues related to bird use of the Fountain Avenue landfill were addressed in the 1994 FEIS. The Pennsylvania Avenue landfill was already closed at the time the 1994 FEIS was completed and was outside the 2-mile radius that was the FAA standard for considering off-airport hazards to aviation at the time. Both sites are currently closed to waste collection. As part of the long-term use agreements for the sites, the landfills are undergoing work to restore native plant communities and provide habitat for wildlife.

The NYCDEP is working with JFK and the BHTF to address concerns regarding the selection of vegetation for the restoration projects and is conducting a monitoring program to assess wildlife response to vegetation planted at the sites. Bird hazing programs have been conducted at these sites since 2006 to reduce bird hazards to aircraft and bird damage to vegetation during plant establishment (Collins 2009). Species targeted by the project include Canada Geese, brant, gulls, Double-crested Cormorants, Mourning Doves, ducks, blackbirds and European Starlings. The NYCDEP has established a cooperative agreement with WS to implement this project. Surveys were

conducted of birds using the landfill and well as adjacent shoreline and surrounding water. Data on the total number of birds harassed at the landfills and species of birds harasses are provided in Figs. 2-8, 2-9 and 2-10. The harassment program has helped to reduce bird numbers at the sites. However, tagged Canada Geese from the landfills have been observed or shot at JFK. Representatives from the NYCDEP have been and will continue to participate on the BHTF.

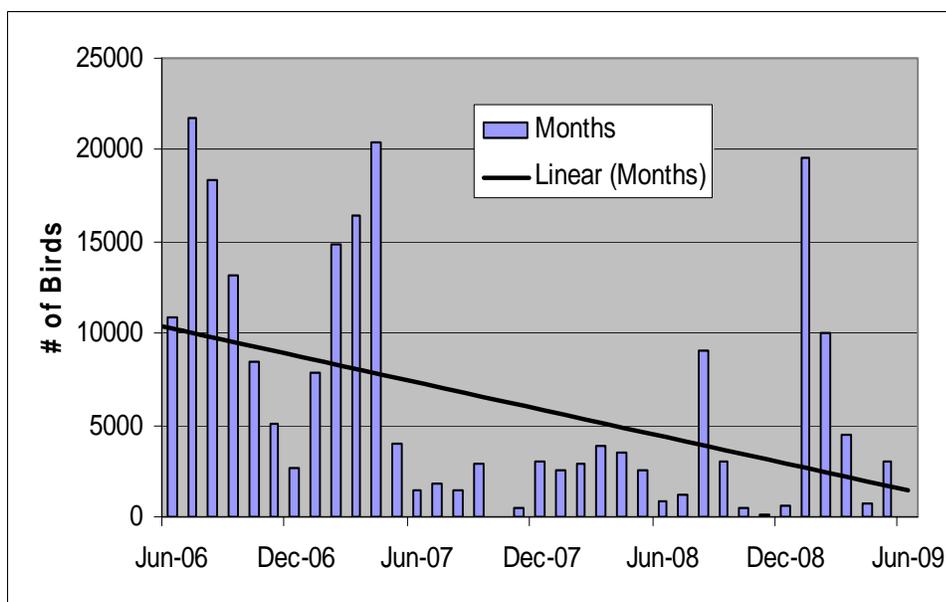


Figure 2-8. Total number of birds harassed per month at Pennsylvania Avenue Landfill 2006-2009. Figure from Collins (2009).

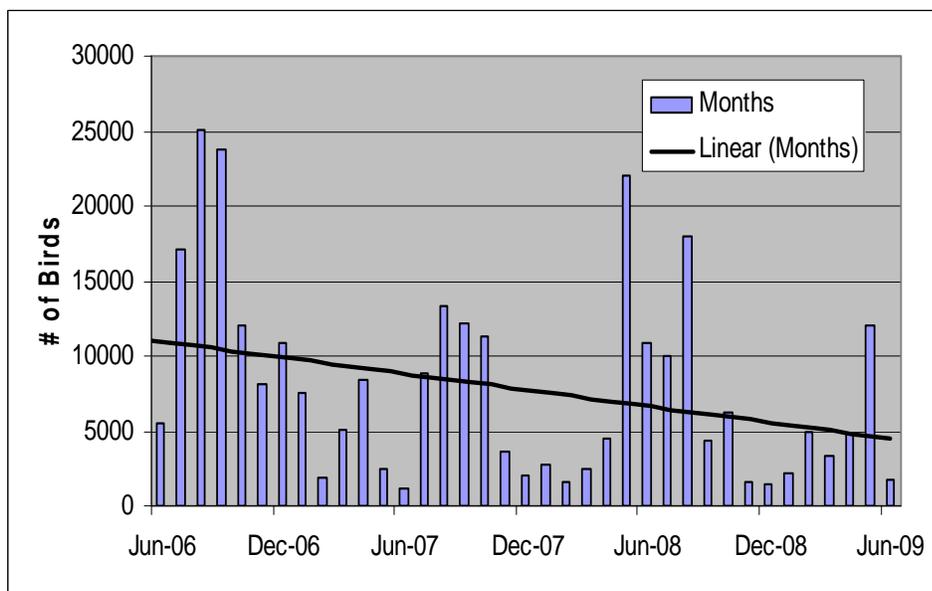


Figure 2-9. Total number of birds harassed per month at Fountain Avenue Landfill 2006-2009. Figure from Collins (2009).

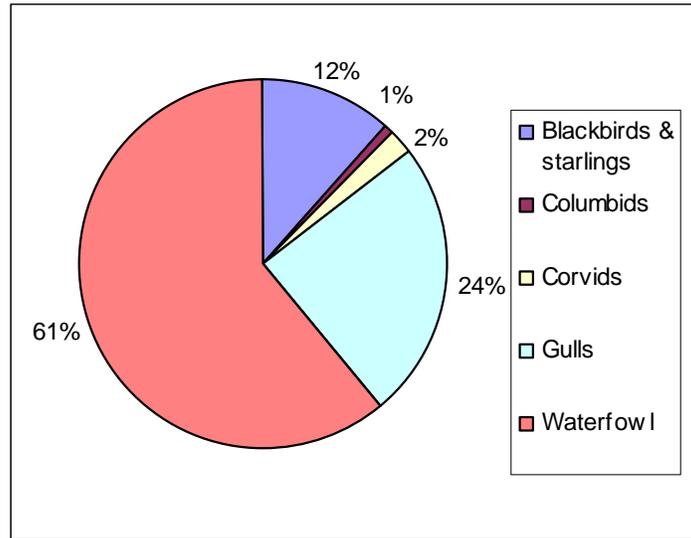


Figure 2-10. Species guild of birds harassed at Pennsylvania Avenue and Fountain Avenue Landfills 2006-2009. Figure from Collins (2009).

2.3.2 Baisley Pond Park

Baisley Pond Park, a NYC park located approximately 0.8 mile from the airport between Baisley Boulevard and Rockaway Boulevard, attracts large numbers of waterfowl and gulls (Figs 2-11, 2-12). During 12 months in 2008-2009, an average of 101 Canada Geese and 41 Atlantic Brant were observed per visit to the park (range – geese per visit; citation). Birds feed on aquatic vegetation in the pond, vegetation in the surrounding park and food from park visitors. During the airport WHA conducted by WS (USDA 2002), gull and larger waterfowl species (Canada Geese, Atlantic Brant, Mute Swans) which are particularly hazardous to aircraft were observed flying over and adjacent to the airport when moving between Jamaica Bay and Baisley Pond Park (USDA 2002).

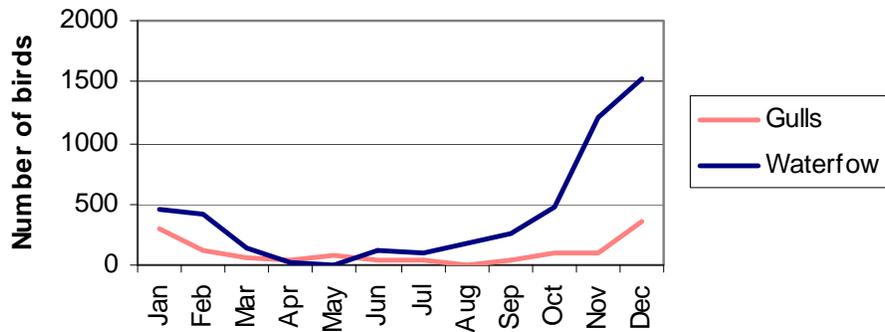


Figure 2-11. Average number of gulls and waterfowl observed at Baisley Park per survey conducted each month of the 2001-2002 WHA for JFK (USDA 2002).

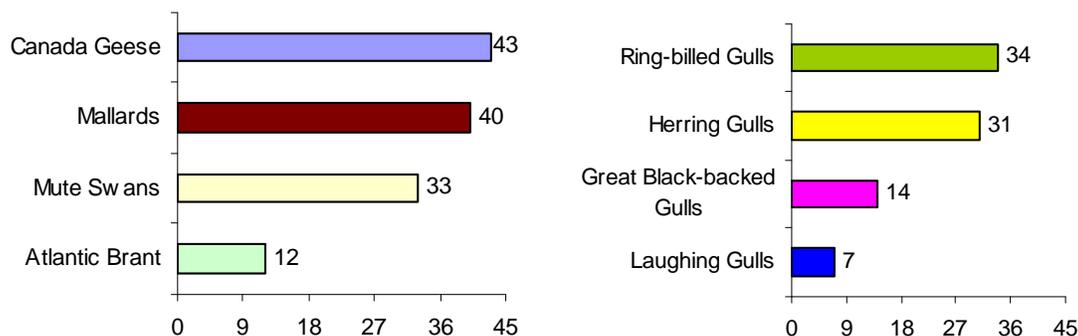


Figure 2-12. Number of times the four most common waterfowl and gull species present during surveys (45) conducted at Baisley Pond Park during a Wildlife Hazard Assessment for JFK (USDA 2002)

2.3.3 Aqueduct Racetrack

Aqueduct Racetrack is a large dirt horse track with a grass infield and is approximately one mile northwest of the airport. Aqueduct Racetrack was identified in the 1994 FEIS as an off-airport attractant for gulls. The 1994 FEIS recommended encouraging Aqueduct Racetrack to adopt site management practices to reduce the use of the site by gulls including long grass management, prohibiting bird feeding, and excluding birds from the infield ponds with a wire barrier. Currently, Canada Geese and brant are also attracted to the grass and may graze there in large numbers. During periods of heavy snowfall, the importance of this food source increases since the racetrack operates during the winter and early spring providing grass to the geese at a time when many other areas would be covered with snow or ice. Aqueduct currently employs a nuisance wildlife control contractor to eliminate the geese from the racetrack. The airport coordinates with the contractor on a seasonal basis.

2.3.4 Gateway Shopping Center

The Gateway Shopping Center was built in 2003 and is approximately three miles west of the airport. The shopping center consists of several stores and restaurants, parking lots, and a narrow park. Although the park is a long rectangular strip between the parking lots and the Belt Parkway, the grass has attracted Canada Geese and brant during the spring and summer. The airport has contacted the management of the shopping center to alert them to the hazard posed by the attractant and to work together on a solution.

2.3.5 Tidal Wetlands & Bodies of Water

There are many tidal wetlands within 5 miles of the airport. The shorelines and open water of Dead Horse Bay, Raritan Bay, Jamaica Bay, Brosewre Bay, and South Oyster Bay are attractants to many species of birds, fish, and other wildlife. Little can be done to

eliminate these attractants, however, the BHTF through its members, monitor these areas and share information on development and restoration projects that may impact the airport.

2.3.6 Golf Courses

Bird species like Canada Geese and brant are attracted to golf courses to feed on the grass and loaf on the ponds (water hazards). The airport contacts golf courses to educate them on the hazard to aircraft posed by wildlife and to discuss best management practices (BMP). Despite the urban location of the airport, there are many golf courses located within five miles of the airport including: Marine Park Golf Course (Brooklyn), Breezy Point Executive Golf Course (Breezy Point), Inwood Country Club (Inwood), North Woodmere Park Golf Course (North Woodmere), Woodmere Country Club (Woodmere), Rockaway Hunting Club (Cedarhurst), Lawrence Village Country Club (Lawrence), Seawane Country Club (Hewlett Harbor), Bay County Park Golf Course (East Rockaway), Forest Park Golf Course (Woodhaven).

2.3.7 Belmont Park (Elmont)

Belmont Park is another racetrack located approximately 4.5 miles northeast of the airport. The racetrack has a grassy infield area that attracts foraging geese.

2.3.8 Flushing Meadows - Corona Park

Flushing Meadows is a large public park that contains two freshwater ponds, grass fields, sporting fields, and park concessions. Canada Geese and brant can be seen on a seasonal basis grazing on the grass or loafing on the ponds with gulls. During June 2009, there were 192 Canada Geese living at the park. Even though the park attracts hazardous wildlife, it is at the edge of the 5-mile radius of the airport, and the movement patterns of these birds have not been documented.

2.3.9 Jamaica Bay Sewage Treatment Plant

The Jamaica Bay Sewage Treatment Plant is located approximately 3 miles northwest of the laughing gull colony. Birds from the JBWR Laughing Gull colony reach the plant by crossing JFK over runway 13R/31L. The plant was identified in the 1994 FEIS as a major attractant for gulls. The 1994 FEIS recommended installation of a wire grid system over the plant to reduce gull use of the site. The grid system was never installed. However, bird activity at the site is currently so low, that it wasn't identified as a specific hazard to aviation in the 2002 WHA (USDA 2002).

2.3.10 Public Parks

There are several state, county, and local parks within the 7-mile radius of the airport that may attract hazardous wildlife. Many of these parks have water sources near or within the park which make them particularly attractive to waterfowl and gulls. Some parks

offer fishing or crabbing which may also attract birds. Parks identified as having features which make them likely to contribute to bird hazards include but are not limited to: Baisley Pond Park, Brooklyn Marine Park, Brookville Park, Canarsie Beach Park, Cunningham Park, Flushing Meadow-Corona Park, Fresh Creek Park, Kissena Park, Rockaway Community Park, Roy Wilkins Park, Spring Creek Park, Springfield Park, and Valley Stream State Park managed by the NYC Department of Parks and Recreation; and Bayswater State Park, Hempstead Lake State Park and Valley Stream State Park managed by the New York State Parks and Recreation Department. Nassau County Parks within the 7-mile radius of JFK that also have water sources near or within the park include Bay Park, Doxy Creek Fishing Park, Grant Park, Halls Pond Park, Inwood Park, Lister Park, Lofts Pond Park, Mill Pond Park, North Woodmere Park, Silver Lake Park, Silver Point County Park and Tanglewood Preserve. Town of Hempstead Parks and Recreation parks with similar attractants include Baldwin Harbor Park, Brook Road Park, Hewlett Point Park, Lido Beach West Town Park, Oceanside Park, Rath Park, and Shell Creek Park. The JFKWMU and WS work to contact the parks to educate them on the danger of hazardous wildlife near the airport and to discuss Best Management Practices for reducing bird hazards.

2.3.11 Highway Median Strips

Like public parks, the short-cut grass in highway median strips can also be an attractant for nesting and foraging geese. If these sites are located so that there is increased bird movement through JFK airspace or aircraft approach/departure lanes, it can result in increased hazards to aircraft. Although median strips were not identified in the WHA or WHMP as contributing significantly to current bird hazards, some off-airport bird management activities proposed in this supplement (e.g., harassment) could result in increased bird use of these types of areas and the need to work with the City of New York to monitor and manage these locations more closely.

2.3.12 Feeding Migratory Waterfowl

Some people enjoy feeding migratory waterfowl (e.g., geese, ducks, and swans) and view the practice as a relaxing, pleasant way to interact with nature. Unfortunately, this practice often leads to conditions that are unhealthy for birds and people. Bird feeding can lead to high concentrations of waterfowl in excess of what can be ecologically sustained by the site (i.e., the ecological carrying capacity of the site). These high concentrations of waterfowl increase the risk of disease transmission among birds, can lead to conflicts and concerns pertaining to the aesthetic impacts and health risks to humans from fecal contamination, and increases the probability of problems with aggressive behavior by food-conditioned birds. Waterfowl feeding is a problem for JFK because it contributes to the number of waterfowl moving daily from Jamaica Bay through JFK airspace and aircraft approach and departure lanes to feeding and loafing sites in parks and similar locations in the city. Because of their large body size and the tendency of some species to move in groups, waterfowl, especially geese and swans, are particularly hazardous to aircraft. Unless feeding is prohibited, efforts to limit local waterfowl populations and change bird movement patterns are undermined because the

birds continue to receive positive reinforcement (food) for using the problem site. In 2007, Nassau County established a waterfowl feeding ban on County lands to reduce the risks of negative impacts from bird feeding on waterfowl, the environment and human health and safety.

2.4 BIRD HAZARD TASK FORCE

At the time the 1994 FEIS was prepared the BHTF had a limited advisory role. The BHTF was chaired by the Manager of JFK's Aeronautical Services Division who set the agenda and led the meetings. Changes to the BHTF recommended in the 1994 FEIS included:

- 1) actively soliciting agenda items and meeting times from Task Force Members at least 4-6 weeks prior to meeting;
- 2) providing task force members with reports and summaries of agenda items prior to meeting to permit active informed participation in the meeting;
- 3) permitting a regular review of the JFK WHMP by task force members;
- 4) recording and circulating meeting notes; and
- 5) considering the appropriateness of requiring all airlines that use JFK to report bird strikes to the JFKWMU or FAA.

Additionally, the USFWS ROD stated that the BHTF should be reorganized to act as an independent review body and that chairmanship of the BHTF should rotate annually among member organizations prior to future issuance of permits for the lethal take of birds at JFK.

Status: The BHTF has been reorganized so that it is chaired by the member organizations. The task force chairman works with members to set meeting dates and actively solicits agenda items from task force members at least 4-6 weeks prior to the meeting. Task force members are given a copy of the agenda prior to the meeting date. Meeting notes are recorded and distributed to task force members for review and approval. The BHTF meets twice annually to discuss the wildlife hazard management program and provides recommendations on current programs and research to the airport.

2.5 New York City Canada Goose Hazard Management Program

The 2009 emergency landing of US Airways flight 1549 out of LaGuardia Airport after a collision with a flock of Canada Geese raised public awareness regarding hazards to aircraft from Canada Geese. The January 15, 2009 bird strike is a reminder that Canada Goose collisions with aircraft occur in New York and can cause aircraft to crash. For the period of January 2007 – December 31, 2010, 16 Canada Goose strikes were reported in New York State. After reviewing information on the hazards to aircraft from resident Canada Geese, and the size of the resident Canada Goose population living within 7 miles of JFK and LaGuardia Airport, the City of New York and the PANYNJ chose to initiate a Canada Goose hazard management program. Geese were also removed to address problems with fecal contamination of water supplies, damage to turf and ornamental plantings, and loss of site use due to excessive fecal contamination (Collins and Humberg 2010a).

The program was initiated in 2009, when 1,235 Canada Geese were removed from 17 sites within 5 miles of JFK and LaGuardia Airport. Data from the first year of the project indicate that the removals have helped to reduce bird strike hazards for JFK and LaGuardia airports (Section 4.6.5, Collins and Humberg 2010*a*). There was a 51% reduction in the number of geese observed in 2010 from 2009 at sites evaluated both years (Collins and Humberg 2010*a*). During the second year of the program a total of 1,676 resident Canada Geese were captured from 19 sites out of 63 sites evaluated within 7-miles of the two airports (Collins and Humberg 2010*b*).



Figure 2-13. Map of Jamaica Bay including habitat restoration areas. Map provided by National Park Service, Gateway National Recreation Area.

CHAPTER 3

ALTERNATIVES DEVELOPMENT AND ANALYSIS

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3.0 EIS METHODOLOGY – ALTERNATIVES DEVELOPMENT AND ANALYSIS

This section describes the range of general bird hazard management approaches that were considered in determining reasonable alternatives to reduce wildlife hazards at JFK. It also provides general information on the evaluation process used in selecting specific management methods for inclusion in the management alternatives. The evaluation process is applied to the potential wildlife hazard management methods in Chapter 4.

3.1 RANGE OF APPROACHES CONSIDERED TO REDUCE BIRD HAZARDS TO AIRCRAFT

The 1994 FEIS identified two main strategies for reducing gull strike hazards which are also applicable to the management of hazards associated with other bird species addressed in this supplement: 1) reducing the probability of bird/aircraft interaction; and 2) reducing the hazardous effects of a strike by improving aircraft tolerance of bird strikes. The strategy of reducing the probability of a bird/aircraft interaction was divided into a series of more specific approaches discussed below including reducing bird presence in JFK airspace and aircraft avoidance of birds (Fig. 3-2). For each management approach, the agencies have identified types of management techniques that could be used to achieve the goals of the management approach. Figure 3-2 shows the relationship between management strategies and management techniques. These management techniques were combined to form the overall management alternatives subjected to assessments of feasibility and efficacy (1994 FEIS Chapter 3 and SEIS Chapter 4) and detailed environmental impact analysis (1994 FEIS Chapter 5 and SEIS Chapter 6).

3.1.1 Reducing Bird Presence in JFK Airspace

Bird presence in JFK active airspace can be minimized by reducing the utility of JFK airspace for birds on and off-airport, and by reducing off-airport bird activity.

Reducing the Utility of JFK Airspace for Birds

Reducing Destination Utility: Destination Utility refers to wildlife use of resources available on airport property such as food, water, shelter and nesting habitat. Destination Utility is managed by reducing or eliminating on-airport wildlife attractants and making it difficult or impossible for wildlife to use attractants which cannot be eliminated (e.g., via harassment, barriers, etc.).

Reducing Transgression Utility: Transgression Utility refers to wildlife travel through JFK airspace and approach and departure pathways on their way to and from attractants (feeding, nesting and loafing sites) located in Gateway NRA and the NYC area. Transgression Utility may be managed by reducing off-airport attractants which result in bird movements through JFK airspace and the approach/departure lanes for aircraft using JFK (within 7 miles of JFK for resident Canada Geese and within 5 miles of JFK for all other species; Section 1.1). Off-airport attractants which result in increased risks to

aircraft safety at JFK are identified through observations of bird movement patterns on and near JFK like those conducted in the WHA prepared by WS (USDA 2002) and the observations and recommendations of the JFKWMU and members of the BHTF. In addition to identifying and responding to existing wildlife hazards, these entities may also provide input in the planning stages for projects to prevent or minimize the development of new bird attractants.

Although on-airport wildlife attractions can be managed by JFK, JFK has no authority to require cooperation on the part of off-airport property owners and managers. The airport may request off-airport land manager assistance with bird hazard management, and can provide technical assistance on bird hazard management methods, but cannot require any land manager to conduct these activities. Any bird hazard management activities conducted off-site must be acceptable to the landowner or property manager and consistent with management directives and objectives for the site.

Landowners who choose not to respond to a request to manage a wildlife hazard to aircraft may be subject to litigation if there is an accident or damage that can be directly related to a failure to respond to a request for off-airport wildlife hazard management. For example, a complex legal battle ensued after the 1975 collision of a DC-10-30 with gulls at JFK that resulted in injuries to 30 passengers and the complete destruction of the aircraft (Section 1.4). The airline and the aircraft owner sued the FAA, the PANYNJ, several aerospace companies, and NYC (because of two landfills near the airport) in Federal or State courts.

Because of the wide variety of off airport bird attractants, the dynamic nature of bird use at off-airport sites (e.g., birds moving from one site to another because of harassment or varying availability of resources), and differing public and private needs and values regarding off-airport sites, management of off-site attractants requires an ongoing process of site evaluation, communication and management, and, where appropriate, additional public involvement processes.

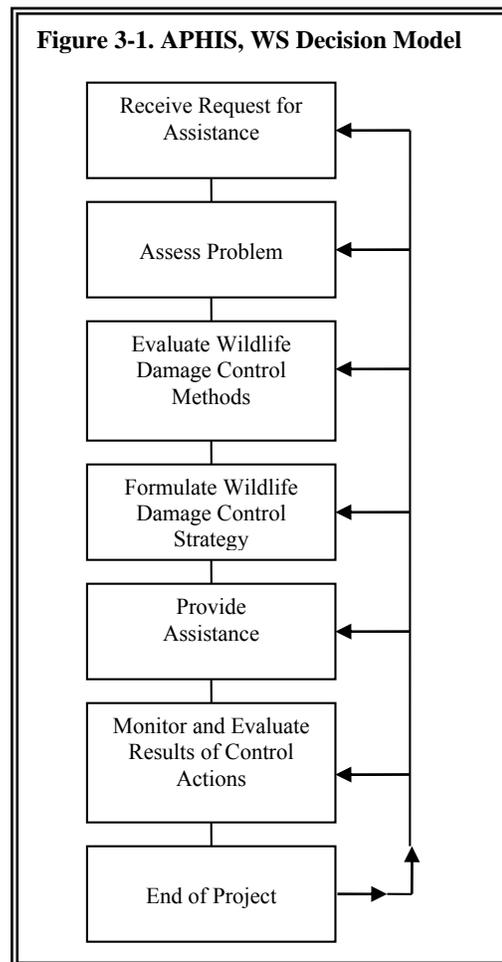
To address the wide variety of off-airport management scenarios, and the need to promptly respond to shifts in the location of off-airport bird activity that impact bird strike risks at JFK, the agencies have considered the full range of wildlife damage management techniques known to reduce bird use of and access to attractants likely to be in the area around JFK. Depending on the alternatives selected by the agencies, all or a subset of these methods may be available for use in addressing off-airport attractants. Site-specific bird hazard management strategies will be developed for each off-airport site in cooperation with the landowner or property manager using a process similar to the Decision Model developed by the WS Program (USDA 1997 Revised, Slate et al. 1992). The WS decision model is an undocumented thought process used for evaluating and responding to damage complaints that is common to most if not all professions (Slate et al. 1992). Gateway NRA is managed by the NPS, and resource management decisions made by the NPS are subject to review and analysis pursuant to the NEPA. This document provides site specific analysis and management proposals for the Gateway NRA to facilitate decision-making by the NPS.

Personnel from JFK or their designated agents would work with the off-airport landowner or property manager to assess the problem, evaluate the appropriateness and availability (legal and administrative) of available strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods the landowner/managers considers practical to implement are developed into a management strategy. After the management strategy has been implemented, monitoring is conducted by the landowner/manager the JFKWMU or their designated agent. Evaluation continues to assess the effectiveness of the strategy. If the strategy meets the landowner/manager objectives for the site, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy.

Reducing Bird Activity Near JFK

One strategy for reducing bird strikes is to reduce local bird activity near JFK by reducing the local population of birds living in the vicinity of the airport. Local population reduction, specifically removal or reduction of the Laughing Gull nesting colony in Gateway NRA, was proposed and analyzed in detail in the 1994 FEIS. Use of local population reduction as a damage management technique was developed as a viable option for gull hazard reduction because, in part, a high proportion of strikes were related to a single species (Laughing Gulls), and because bird strike hazards from Laughing Gulls appeared to be directly related to the number of birds using of a specific site.

A similar approach could be used as part of an integrated program to address issues with resident Canada Geese (York et al. 2001, Baxter and Robinson 2007). The most recent WHA (USDA 2002) recommended reducing populations of Canada Geese at offsite locations. However, the abundance of feeding, loafing, and nesting areas around JFK and the high abundance of geese in the greater NYC area which can move into treatment areas will necessitate a continual process of monitoring and addressing attractants at multiple off-airport locations. The abundance of suitable habitat and tendency for birds to move among locations within a relatively limited area (Section 1.1, 1.7.2) also factored



into the proposal to reduce the local resident Canada Goose population within a specific region (e.g., the 5 mile radius around JFK with additional work conducted in a 7-mile radius as needed) instead of targeting a limited number of specific sites near the airport.

3.1.2 Aircraft Avoidance of Birds

An alternative to keeping birds away from the areas used by aircraft is to avoid flying aircraft at times and into locations where bird hazards are present. Scheduling flights to minimize aircraft activity during peak bird activity periods is one way to enable aircraft to avoid bird hazards. The feasibility of this approach is dependent on a variety of conditions, including wind, weather, maintenance and noise abatement requirements, and the level of air traffic. Consequently, the applicability of this approach is infrequent, unpredictable and generally not viable for busy commercial airports such as JFK.

Hazards to aircraft could also be reduced through detection and avoidance of birds by aircraft. This would be achieved through the use of bird tracking (i.e., radar) and warning systems. The feasibility of this type of strategy depends on the ability of technology to identify threats and notify pilots in time to avoid hazards, and the ability (e.g., availability of airspace) of aircraft to safely engage in avoidance maneuvers.

3.2 EVALUATION OF MANAGEMENT ALTERNATIVES

3.2.1 Tier 1: Initial Range of Alternatives considered

Because of the broad range of potential solutions to the gull hazard at JFK, the 1994 FEIS used a tiered selective method to address all reasonable alternatives consistent with 40 CFR Part 1502.14¹¹, and then focused on those techniques which combined the highest effectiveness and feasibility with the lowest adverse environmental impacts. The approach used in the 1994 FEIS to select methods for gull hazard management (1994 FEIS Section 2.2) has been adapted to the management of all bird strike hazards at JFK.

Identification of Management Methods

Through an extensive literature review, an initial inventory was made of all methods available for use in reducing wildlife hazards to aircraft. The literature review was augmented by discussions and meetings with parties involved in the problem at JFK and data from research conducted at JFK. Alternatives suggested in public comments on the 1994 FEIS were also included. Individual methods were combined into groups based on general management approaches discussed above (on- and off-airport management) and agency experience regarding public perceptions and desires for wildlife hazard management (e.g., nonlethal or lethal methods; Table 4-2).

¹¹ Rigorously explore and objectively evaluate all reasonable alternatives and, for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.

Feasibility and Effectiveness Analysis

All methods identified using procedures in Section 3.2.1 were subjected to an assessment of the technical feasibility of their implementation, as well as their applicability and effectiveness in reducing the bird-aircraft strike hazard at JFK. This determined the range of feasible and effective methods that would be advanced for further assessment of environmental impacts. Feasibility and effectiveness were determined through review and analysis of data in the literature, case studies at other locations, data from research conducted at JFK, information from professionals in the field of wildlife hazard management at airports, and analysis of the specific conditions under which the methods would have to be implemented. In the 1994 FEIS, effectiveness of methods intended to reduce the Laughing Gull colony was assessed using a computer model which simulated the population characteristics and the probable size the Jamaica Bay Laughing Gull population. Details of model development and its application are provided in the 1994 FEIS Chapter 3.

There is a wide variety of methods for reducing bird strike hazards and considerable variation in the methods used to assess efficacy of bird management strategies. Additionally, much of the available information in the scientific literature has only limited applicability to the specific situation at JFK. Consequently, development of uniform and/or quantitative criteria for quantitative ranking of methods was considered neither feasible nor desirable. The purpose of this stage in the analysis was to eliminate rather than to rank alternatives. Consequently, the absence of detailed and uniform evaluation criteria was not considered an impediment to an adequate treatment of alternatives.

3.2.2 Tier 2: Environmental Impacts of Feasible and Effective Alternatives

The methods within each alternative that were determined to be feasible and effective were subsequently assessed regarding their potential environmental impacts. This evaluation considered the methods' impacts on the following:

- Ecological Resources:
 - Target Wildlife Species Populations
 - Nontarget Wildlife Species Populations
 - Threatened and Endangered Species
 - Wildlife Habitat
- Water Quality
- Parks and Recreation
- Socioeconomics
- Air Quality
- Ambient Noise
- Airport Operations and Safety
- Coastal Zone Management
- Historic and Cultural Resources

This analysis is provided in Chapter 5 of the 1994 FEIS and Chapter 6 of this supplement. Methods that were determined to have especially adverse environmental impacts were not advanced for consideration in the alternatives.

Humaneness and Animal Welfare Concerns

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the relative humaneness of actions differently. Kellert and Berry (1980) in a survey of American attitudes toward animals related that 58% of their respondents, "*... care more about the suffering of individual animals . . . than they do about species population levels.*" Schmidt (1989) indicated that vertebrate pest control 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.*"

Individual perceptions of pain, suffering and the relative humaneness of an action as it relates to comparisons of wildlife damage management methods, has both professional and lay points of arbitration (USDA 1997 revised). Measures of injury can be used as indications that a damage management method causes pain, but individual perception of the humaneness of an issue is also subject to complex, subjective, individual value-based review of the consequences of alternative actions including taking no action. For example, in the case of resident urban waterfowl management, alternatives may include the use of capture and euthanasia or capture and relocation to a captive animal facility. Depending on individual values, some people may perceive any method which results in the death of the animal as inhumane while others may see methods which result in subjecting a free-living creature to spending the remainder of its life in captivity as being less humane than immediate euthanasia, even if the care provided is exceptional.

The issue of individual perceptions of the humaneness of individual bird strike hazard management methods is not precisely an environmental impact and was not addressed in the 1994 FEIS on bird hazard management at JFK. However, the lead and cooperating agencies acknowledge that humaneness of individual methods is an important issue to the public and have added this factor to the evaluation of alternatives conducted in Chapter 6.

3.3 DEVELOPOMENT OF MANAGEMENT ALTERNATIVES

The agencies used information on gull hazard management in the 1994 FEIS, an extensive review of the literature, input from wildlife professionals, public comments received on the 1994 FEIS, data from reports and research prepared and conducted specifically for JFK as well as the recommendations of the BHTF to identify all reasonable methods that could be used to reduce all bird strike hazards at JFK. The management techniques were combined to form the management alternatives listed below which are designed to represent the range of possible management actions that could be taken to reduce hazards at JFK.

Alternative 1 is a continuation of the current bird hazard management program. Alternatives 2-5 are management strategies which may be added, singly or in combination with other Alternatives, to the existing bird hazard management program. Alternative 6 is a combination of Alternatives 1-5. Alternative 7 involves a reduction in the intensity of current bird hazard management activities.

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

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

The 1994 FEIS limited its analysis to evaluating options for managing gull hazards to aircraft because, during the period of 1988-90, gull strikes comprised approximately 86% of all bird strikes at JFK. Wildlife Services, the lead agency in the preparation of the 1994 FEIS, only anticipated being actively involved in conducting gull hazard management activities (e.g., supplemental on-airport shooting program and/or efforts to reduce the Laughing Gull Colony) and limited the scope of the analysis to the impacts of activities that would be conducted by WS. However, the 1994 FEIS and the USFWS Record of Decision acknowledged that the JFKWMU also conducted activities to reduce bird strike hazards and property damage associated with other bird species. These actions have been permitted based on separate environmental review. For purposes of this analysis, it is the combined multi-species bird hazard management program, including the gull hazard management program selected in the 1994 FEIS that is the No-action Alternative. As explained in Section 1.1, combining the analyses of all bird hazard management activities in one document enables the agencies to more clearly communicate the nature of the bird hazard and bird hazard management activities at JFK to the public and enhances interagency coordination and communication regarding bird hazard management at JFK. Including all bird hazard management activities in the Supplemental EIS would also enable WS, at the request of the JFKWMU, to participate in all facets of bird hazard management allowed under this alternative. Consequently, the No-action alternative consists of all gull hazard management methods described in the Integrated Gull Hazard Management Alternative described in the 1994 FEIS (except off-airport activities to reduce the Laughing Gull colony); JFKWMU and WS on-airport use of nonlethal and lethal methods to reduce hazards to aircraft by all bird species, and JFKWMU and WS technical advice and outreach to off-airport landowners and property managers regarding ways to reduce bird attractants (Table 4-2). It does allow for the PANYNJ to provide financial assistance for off-airport bird hazard management, but off-airport bird hazard management for JFK would not be conducted by WS.

3.3.2 Alternative 2: Add Additional Nonlethal Methods On and Off-Airport to Current Bird Hazard Management Program

Under this alternative, existing on-airport bird hazard management efforts would be augmented by establishing a regular bird hazard monitoring program, and by enabling the agencies to permit, recommend and use nonlethal bird hazard management methods at off-airport sites to reduce bird hazards at JFK. This alternative does not include the use of nonlethal methods to reduce or relocate the Laughing Gull colony. However, it does include efforts to reduce the resident Canada Goose population within 7 miles of the airport via nonlethal methods (e.g., capture and relocation, reproductive inhibitors, etc.). This alternative also includes the use of nonlethal methods to reduce hazards to aircraft from birds at Gateway NRA, particularly at Rulers Bar Hassock, and Pennsylvania and Fountain Avenue Landfills¹². Species which may be targeted for off-airport management actions under this alternative include gulls (except the Laughing Gull colony), geese, ducks, Mute Swans, Double-crested Cormorants, blackbirds, crows, Rock Pigeons, and European Starlings. These species have been selected because they tend to move from Jamaica Bay through JFK airspace to locations within the city and/or because they form large flocks which move in the approach and departure lanes for JFK.

This alternative could include use of nonlethal bird hazard management methods within Gateway NRA. Specifically, it may include use of bird dispersal methods (e.g., pyrotechnics, electronic harassment devices, trained pursuit on foot or with dogs, lasers, vehicle presence, paintballs), at Pennsylvania Avenue and Fountain Avenue Landfills. There may also be times Gateway NRA may choose to alter habitat to achieve specific wildlife management goals consistent with its plans and policies. For example, as upland areas predominated by grass and forbs mature toward a shrubland habitat, Canada Goose use of the habitat would be expected to decrease because the site no longer provides suitable food or habitat. Enforcement of “Do Not Feed the Birds”, and trash disposal policies at the park may also be increased (human behavior management).

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

This alternative would increase the duration of the annual supplemental on-airport shooting program from May through August to May through November which would allow the program to augment JFKWMU actions during more of the peak period for hazards from large-bodied gulls (e.g., Herring Gulls; Fig. 1-10). The current supplemental on-airport shooting program was developed primarily to address hazards from Laughing Gulls. As discussed in Section 1.7.1, Herring Gull strikes are now the most common gull strike at JFK.

Under this alternative, staff at the gull shooting stations could be authorized to assist the JFKWMU efforts by using lethal methods to keep large-bodied birds which pose particular risks to aircraft (i.e., Canada Geese, Atlantic Brant, Mute Swans, Double-crested Cormorants, ducks) from entering JFK airspace in the same manner as the four gull species are taken. Supplemental on-airport shooting program personnel would also be authorized to take individuals from flocks of Rock Pigeons, European Starlings, crows and blackbirds to prevent birds from entering JFK airspace and to frighten remaining flock members from the site.

¹² Any action proposed for Gateway NRA would not be conducted without authorization/approval from the NPS.

Black-tailed jackrabbits, Eastern cottontail rabbits and small rodents (mice, rats, voles) are a food source for raptors and can attract these species to JFK. This alternative could also include use of lethal rabbit and rodent control measures to reduce attractants for raptors. Reducing populations of small rodents, jackrabbits and rabbits on-airport also minimizes the likelihood that larger predatory mammals will be attracted to the site and become an additional aircraft strike hazard.

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

This alternative would enable WS to recommend and conduct lethal bird hazard management projects at off-airport sites. It does not include activities to reduce or relocate the Laughing Gull colony. Most management actions would be restricted to the 5-mile radius around JFK. However, as discussed in Section 1.1, this alternative also includes actions to manage the resident Canada Goose population within 7 miles of the airport (e.g., live-capture and euthanasia, egg oiling/addling, nest and egg destruction, shooting). Work in the 5-7 mile radius area would be conducted as needed to augment the population reduction efforts in the 5-mile radius around JFK and is not proposed as a uniform reduction of all resident Canada goose populations in the 5-7 mile radius.

Species which may be targeted for off-airport management actions under this alternative include resident Canada Geese, Mute Swans, Double-crested Cormorants, blackbirds, crows, Rock Pigeons, and European Starlings. This alternative could also include the use of lethal methods to reduce hazards to aircraft from resident Canada Geese and Mute Swans at Gateway NRA, particularly at Rulers Bar Hassock, and Pennsylvania and Fountain Avenue Landfills⁹. Lethal bird hazard management proposed for Gateway NRA includes the use of capture and euthanasia to reduce the number of resident Canada Geese at Ruler's Bar Hassock, Pennsylvania Avenue Landfill and Fountain Avenue Landfill; and egg oiling/addling and nest and egg destruction to reduce the number of Mute Swans. If the number of resident Canada Geese at Rulers Bar Hassock is reduced, egg oiling may be used at Rulers Bar Hassock to help maintain goose numbers at the reduced level.

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

Reduction or relocation of the Laughing Gull colony in Gateway NRA was included as a damage management alternative in the 1994 FEIS. However, as discussed in Section 1.4 above, there was agency disagreement as to the need for direct action to reduce the Laughing Gull colony. None of the methods proposed to directly manage the Laughing Gull colony have been implemented. The combination of the supplemental on-airport shooting program and erosion of gull nesting habitat in Gateway NRA do appear to have caused an overall decline in the size of the Laughing Gull colony to 1,280 nests in 2008, down from the 7,629 nesting pairs in counted in 1990 (Washburn and Tyson 2010, Hartig et al. 2002). The integrated gull hazard management program at JFK has been effective in reducing Laughing Gull strikes (Sections 1.6, 1.7.1), but WS biologists and researchers with the National Wildlife Research Center involved in monitoring the supplemental on-airport shooting program continue to recommend reduction or

relocation of the Laughing Gull colony. Relocation is still being recommended for consideration as preferable long-term management alternative because the current program continues to result in the lethal removal of over 2,000 Laughing Gulls annually in 2008 and 2009 and over 4,000 Laughing Gulls annually in 2006 and 2007 (Washburn et al. 2009). Relocation of the Laughing Gull colony may substantially reduce the number of Laughing Gulls which are shot each year at JFK. Brown et al. (2001a) also noted that removal of the Laughing Gull colony was not needed to reduce the current rate of Laughing Gull strikes, but they also indicated that relocation of the colony should be re-evaluated to address animal welfare concerns and concerns regarding long-term impacts on the regional Laughing Gull population.

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

This alternative would be a combination of Alternatives 1-4 above. When presented in the draft SEIS, this alternative also included management actions discussed in Alternative 5. However, after review of material in the SEIS and public comments, the agencies have decided to omit attempts to relocate/reduce the Laughing Gull colony. This decision was made based on available information on the difficulty in reducing/relocating established Laughing Gull colonies, concerns that the level of activity and effort required to relocate the colony could lead to adverse impacts on nesting nontarget species and saltmarsh habitat, and public comments which indicated that the current level of Laughing Gull mortality is preferable to the possibility that New York State would lose its only breeding colony of Laughing Gulls. Gateway NRA also noted that actions which could jeopardize the existence of a native species on lands under their management when a viable alternative is available would also be contrary to NPS policy.

This alternative would enable the agencies to use and recommend the full range of bird hazard reduction techniques. An Integrated Wildlife Damage Management approach would be implemented which would allow use of nonlethal and lethal methods, used singly or in combination, to resolve conflicts with wildlife affecting the use of the airfield and safe airport operations. When making recommendations for off-airport bird hazard management preference would be given to practical and effective non-lethal methods, but non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy.

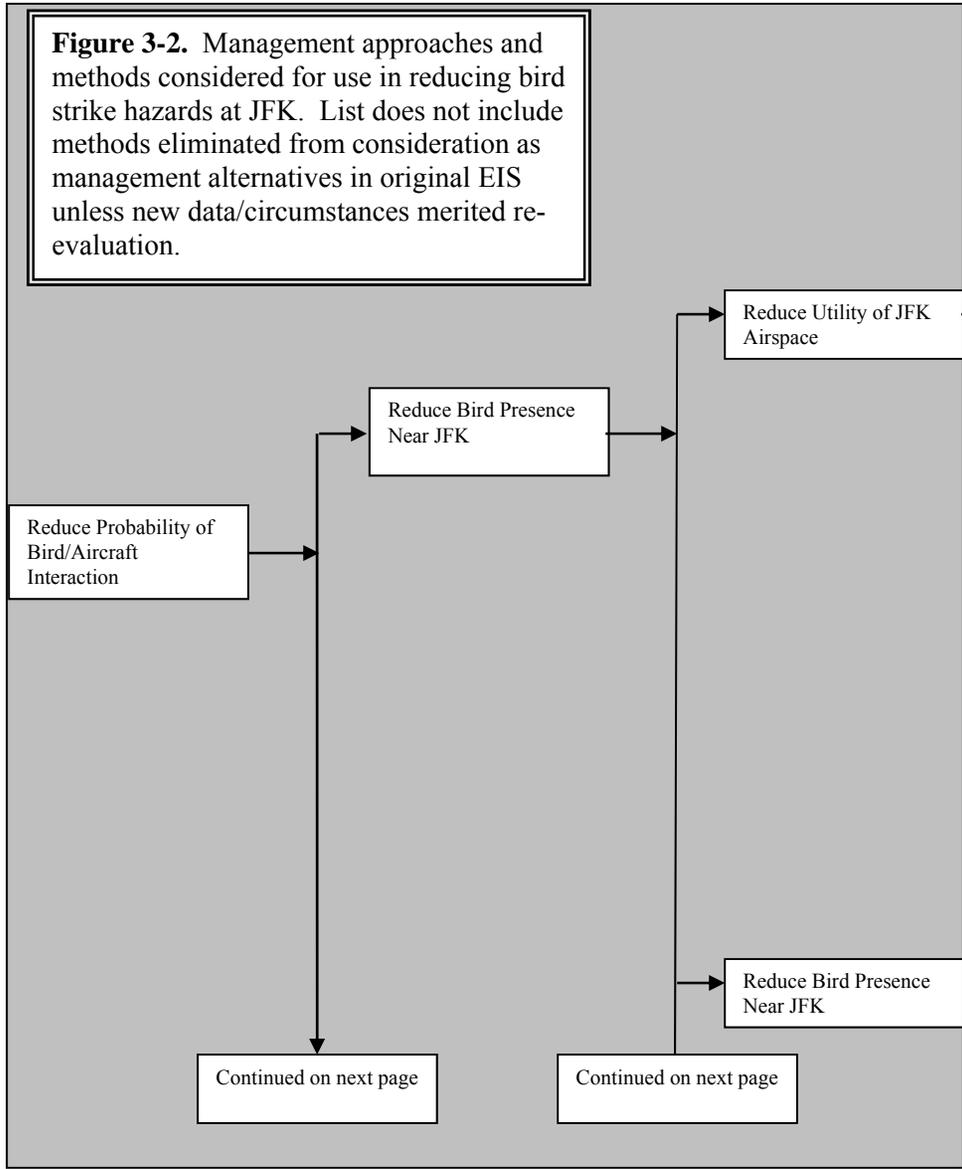
3.3.7 Alternative 7: Only Use Nonlethal Methods for Bird Hazard Management On- and Off-Airport

The exclusive use of nonlethal bird hazard management activities at JFK was considered in the 1994 FEIS. It would actually involve a decrease in the intensity of current on-airport bird hazard management because it would not include the supplemental on-airport shooting program and the limited use of lethal methods when birds fail to respond to harassment by the JFKWMU. In Records of Decision for the 1994 FEIS, the NPS, USFWS and USDA concurred that integrated use of nonlethal and lethal methods was needed to adequately reduce gull strike hazards at JFK. Current data and experience of biologists working at JFK supports the belief that exclusive use of nonlethal methods would still not be sufficient to reduce bird hazards at JFK. For example, the JFKWMU primarily uses shooting to remove birds that fail to respond to harassment and

birds which pose an immediate threat to aircraft safety (i.e., when nonlethal methods have failed or are inadequate to address the situation). If exclusive use of nonlethal methods was adequate to resolve the problem, there would be no need for this type of action. However, recent increases in take of species like the large-bodied birds in Figure 1-7 may indicate that this is not the case. Additionally, the high number of gulls that are still taken each year when they attempt to enter JFK airspace (4,866 Laughing Gulls and 914 Herring Gulls taken in 2006) would appear to indicate that the supplemental on-airport shooting program is still needed to augment JFKWMU efforts. Consequently, the nonlethal-only alternative will not receive further analysis.

APPROACH

Figure 3-2. Management approaches and methods considered for use in reducing bird strike hazards at JFK. List does not include methods eliminated from consideration as management alternatives in original EIS unless new data/circumstances merited re-evaluation.

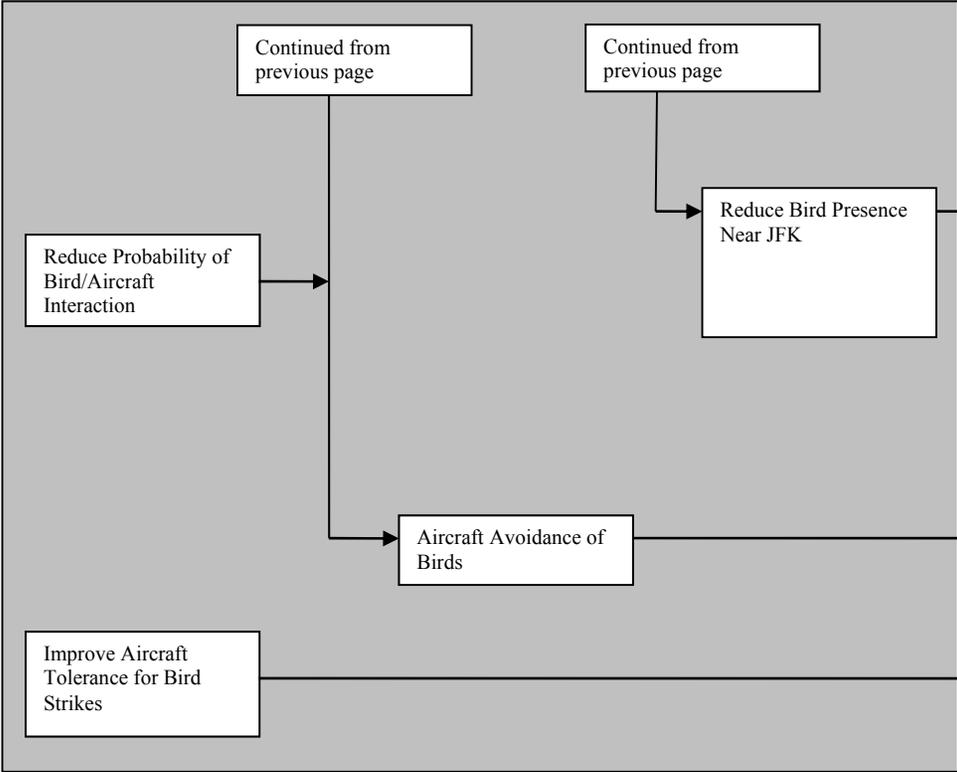


METHODS FOR USE IN ALTERNATIVES

NONLETHAL	LETHAL
<p>On-Airport</p> <ul style="list-style-type: none"> •Vegetation Management •Insect Control •Water Management •Waste Management •People Management •Harassment •Repellents •Exclusion •Frightening Devices 	<p>On-Airport</p> <ul style="list-style-type: none"> •Harassment with lethal bird removal •Intensive Shooting Program •Trapping •Toxicants •Nest/Egg Destruction •Rabbit Removal •Rodent Removal
<p>Reduce Off Airport Attractants</p> <ul style="list-style-type: none"> •Vegetation/Habitat Management •Exclusion •Waste Management •Harassment •Frightening Devices •People Management •Repellents •Reproductive Inhibitors •Capture and Relocation 	<p>Reduce Off Airport Attractants</p> <ul style="list-style-type: none"> •Harassment with lethal bird removal •Shooting •Toxicants •Nest/Egg Destruction •Egg Oiling/Addling •Capture and Euthanasia
<p>Reduce Laughing Gull Colony*</p> <p>Dead Gull Models</p>	<p>Reduce Laughing Gull Colony</p> <ul style="list-style-type: none"> •Egg/Nest Destruction •Egg Oiling •Shooting Gulls at Colony •Toxicant

APPROACH

METHODS FOR USE IN ALTERNATIVES



NONLETHAL	LETHAL
-----------	--------

- Reduce Resident Waterfowl Population Near JFK**
- Vegetation/Habitat Management
 - Exclusion
 - Harassment
 - Frightening Devices
 - People Management
 - Repellents
 - Reproductive Inhibitors
 - Capture and Relocation

- Reduce Resident Waterfowl Population Near JFK**
- Egg/Nest Destruction
 - Egg Oiling
 - Capture and Euthanasia
 - Shooting

- Flight Scheduling
- Radar Warning Systems

- Aircraft Technology**
- Engine Design

