

CHAPTER 1

PURPOSE AND NEED FOR ACTION

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1.0 INTRODUCTION

Bird strike hazards are a concern to civil and military airports around the world including the John F. Kennedy International Airport (JFK; Dolbeer et al. 2011, FAA 2009). Bird strikes kill birds, damage aircraft and pose a significant risk to human safety. Two strikes at JFK are particularly noteworthy; a 1975 Herring Gull strike and a 1995 Canada Goose strike (scientific names of species mentioned in text are provided in Appendix B). During the 1975 strike, Herring Gulls were ingested into an engine of a departing DC-10. The engine exploded and separated from the aircraft and the takeoff was aborted; the aircraft caught fire and was destroyed. Fortunately, no fatalities occurred. In the 1995 goose strike, an Air France Concorde ingested a pair of Canada Geese into an engine. The aircraft was able to land safely but sustained major damage. The French Aviation Authority sued the Port Authority of New York and New Jersey (PANYNJ) and the case was eventually settled out of court for over \$5 million.

In 1994, a Final Environmental Impact Statement (1994 FEIS) was completed which reviewed the environmental impacts of alternatives for managing bird hazards to aircraft at JFK. The 1994 FEIS focused on the management of Herring, Great Black-backed, Laughing, and Ring-billed Gulls which were involved in the majority of bird strikes at JFK. The location of JFK within a major bird migratory corridor (Atlantic Flyway), adjacent to a wildlife refuge (U.S. Department of the Interior [USDI], Gateway National Recreation Area [Gateway NRA], Jamaica Bay Wildlife Refuge), and the presence of a large colonial nesting bird colony (Laughing Gulls) at the end of two runways (within the wildlife refuge) combined to present JFK with unique bird-aircraft collision (bird strike) hazards. The JFK bird strike management program conducted subsequent to the completion of the 1994 FEIS has substantially reduced bird hazards to aircraft at JFK.

At the time the 1994 FEIS was prepared, the JFK Wildlife Management Unit (JFKWU) also worked to address risks to aircraft associated with other bird species, but risks caused by species other than gulls were relatively low and were not addressed in detail in the 1994 FEIS. However, land uses and bird populations have changed since the completion of the 1994 FEIS and so have bird hazards at JFK. These changes have resulted in the need to review bird strike hazards associated with species other than gulls. This supplement to the 1994 FEIS has been prepared, in part, to address these changes.

1.1 PURPOSE AND NEED

This supplement updates the information in the 1994 FEIS, provides information on the efficacy and impacts of the gull hazard reduction program and all other current bird hazard management activities, and analyzes the potential impacts of alternatives for future management of bird hazards to aircraft and human safety at JFK.

The 1994 FEIS focused on the management of Herring, Great Black-backed, Laughing, and Ring-billed Gulls which were involved in the majority (86%) of bird strikes at JFK. However, the 1994 FEIS and the USFWS Record of Decision acknowledged that the

JFKWMMU also conducted activities to reduce bird strike hazards and property damage associated with other bird species. Strikes by non-gull species comprise an increasing proportion of bird strikes at JFK. Increases in local populations of large-bodied bird species such as resident Canada Geese, Atlantic Brant, Double-crested Cormorants and non-native Mute Swans which have occurred since the completion of the 1994 FEIS are of particular concern. FAA airworthiness standards for airframes, windshields and engines use a single 4-pound bird mass as the maximum that must be tested for most components. However, individual resident Canada Geese, brant, cormorants and Mute Swans can have body mass in excess of these standards, and the geese and cormorants also commonly travel in flocks. Local flocks of non-native European Starlings and Rock Pigeons are also of particular concern because of their local abundance, flocking behavior, number of strikes at JFK and/or number of damaging strikes at JFK.

The need for action addressed in this supplement has been expanded to include the reduction of all bird strikes at JFK and resulting aircraft damage and risks to human health. The U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS), 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. Current WS actions involving non-gull species have been permitted based on separate environmental review. 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 to the public and enhances interagency coordination and communication regarding bird hazard management at JFK.

This supplement reviews bird hazard management activities which may be conducted on and off airport property including actions proposed for Gateway NRA. The U.S. Department of Transportation (USDOT), Federal Aviation Administration (FAA) has issued Advisory Circular 150/5200-33A which directs airports to consider hazardous wildlife on or near airports and adjacent land uses that cause movements of hazardous wildlife onto, into, or across an airport's approach or departure airspace or aircraft operations area (AOA). As per the guidance in the FAA Advisory Circular, this supplement considers bird hazards to aircraft which have been identified within a 5-mile radius around JFK including hazards which have been identified at Gateway NRA. Available data on movements of resident Canada Geese indicate that management of hazards associated with this species within the 5-mile radius of JFK may require work outside the 5-mile radius. Resident Canada Geese are the species of greatest concern relative to off-airport hazards to aircraft. Studies of goose movement patterns in response to harassment in Orange County, New York indicated that although harassment was effective in decreasing bird numbers at treatment sites, there were corresponding increases in geese at unmanaged areas within 1.9 miles of the treatment area (Preusser et al. 2008). A 2-year study conducted in New York City (NYC) monitored movements of Canada Geese banded within approximately 5 miles of JFK (Seamans et al. 2009). During the study, researchers monitored the area in a 7.2 mile radius around JFK for banded birds. At the conclusion of the study, approximately 45% of the birds remained within approximately 5 miles of JFK. Geese were observed within 3 miles of their banding

location 95% of the time. Geese which remained within the study area were resighted at an average straight-line distance of the original banding site of 2.2 miles. Therefore, birds which spend time within the 4-5 mile radius of JFK may also be using sites the 5-7 mile radius of the airport. Based on this information, we are proposing to conduct resident Canada Goose hazard management activities 7 mile radius around JFK. This decision is consistent with the International Bird Strike Committee Best Practice Standards for bird hazard control at airports Standard 9 which recommends airports reduce bird attractants and associated bird hazards within a 13 km (7.8 mile) bird circle around the airport (IBC 2006).

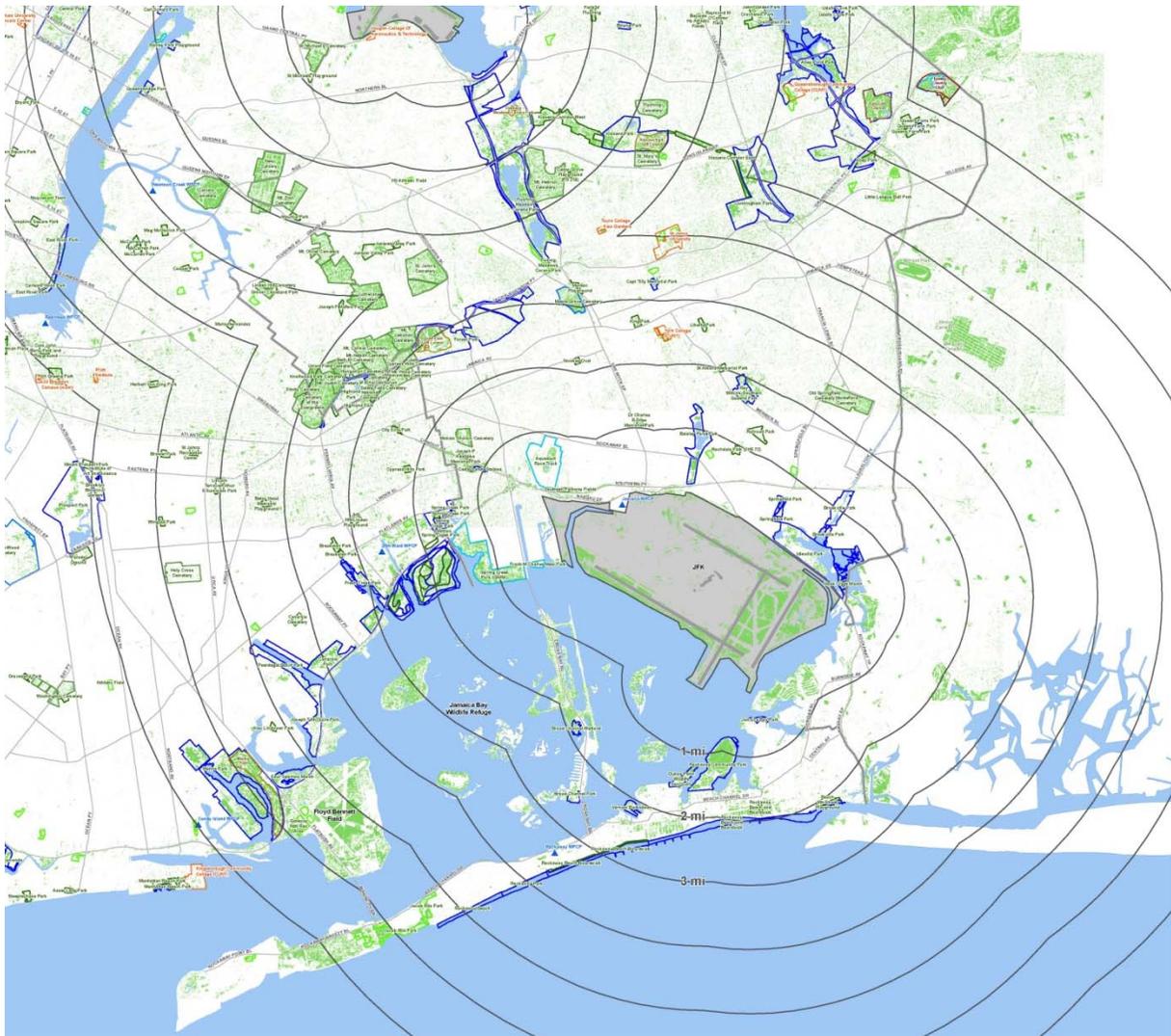


Figure 1-1. John F. Kennedy International Airport (JFK) Airport and off-airport bird hazard management areas. Each ring denotes an increase in 1 mile from the airport boundary. Map also shows intersection between off-airport bird hazard management areas for JFK and LaGuardia Airports.

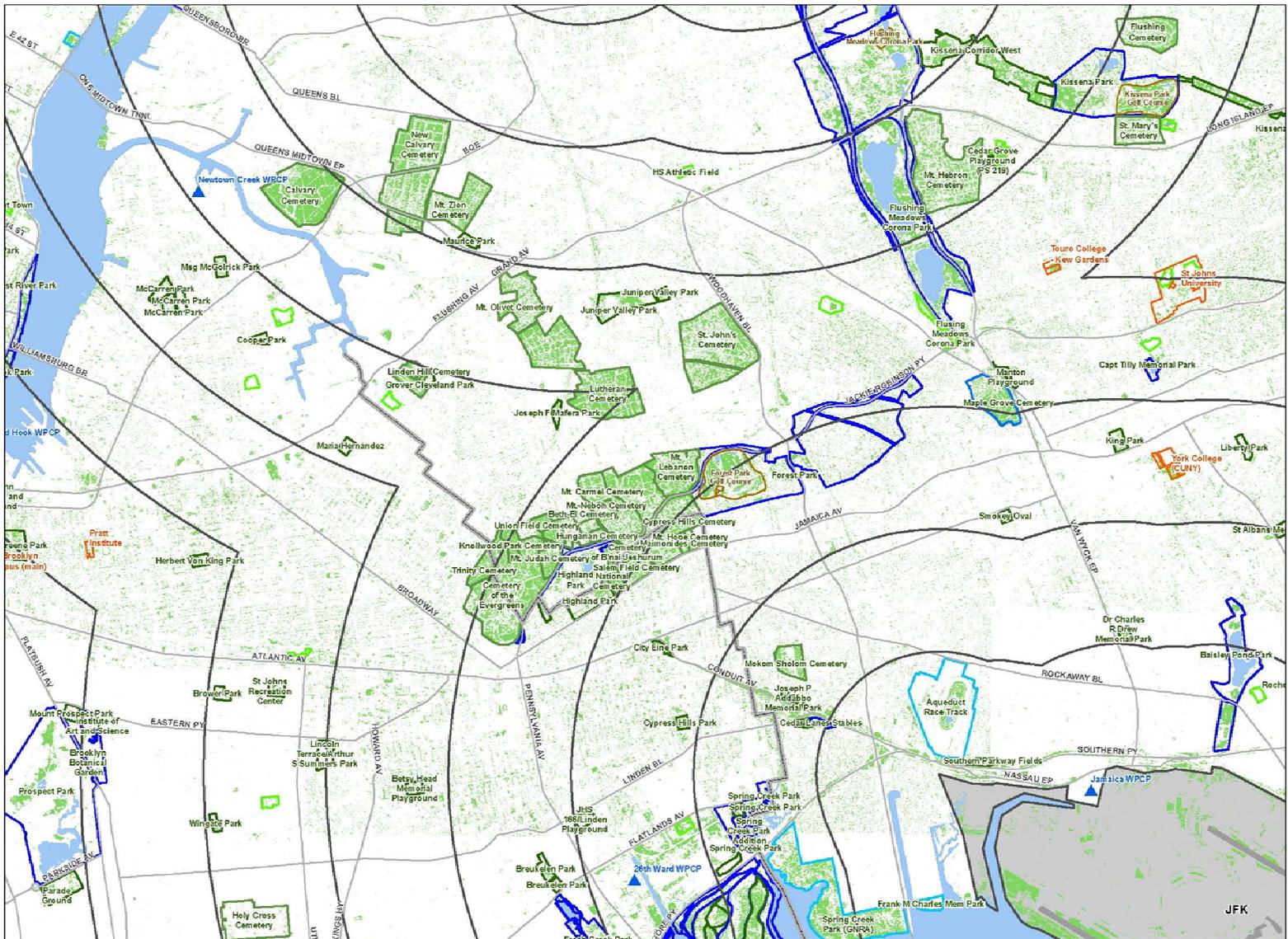


Figure 1-1a. Enlargement of northwest quarter of Figure 1-1.

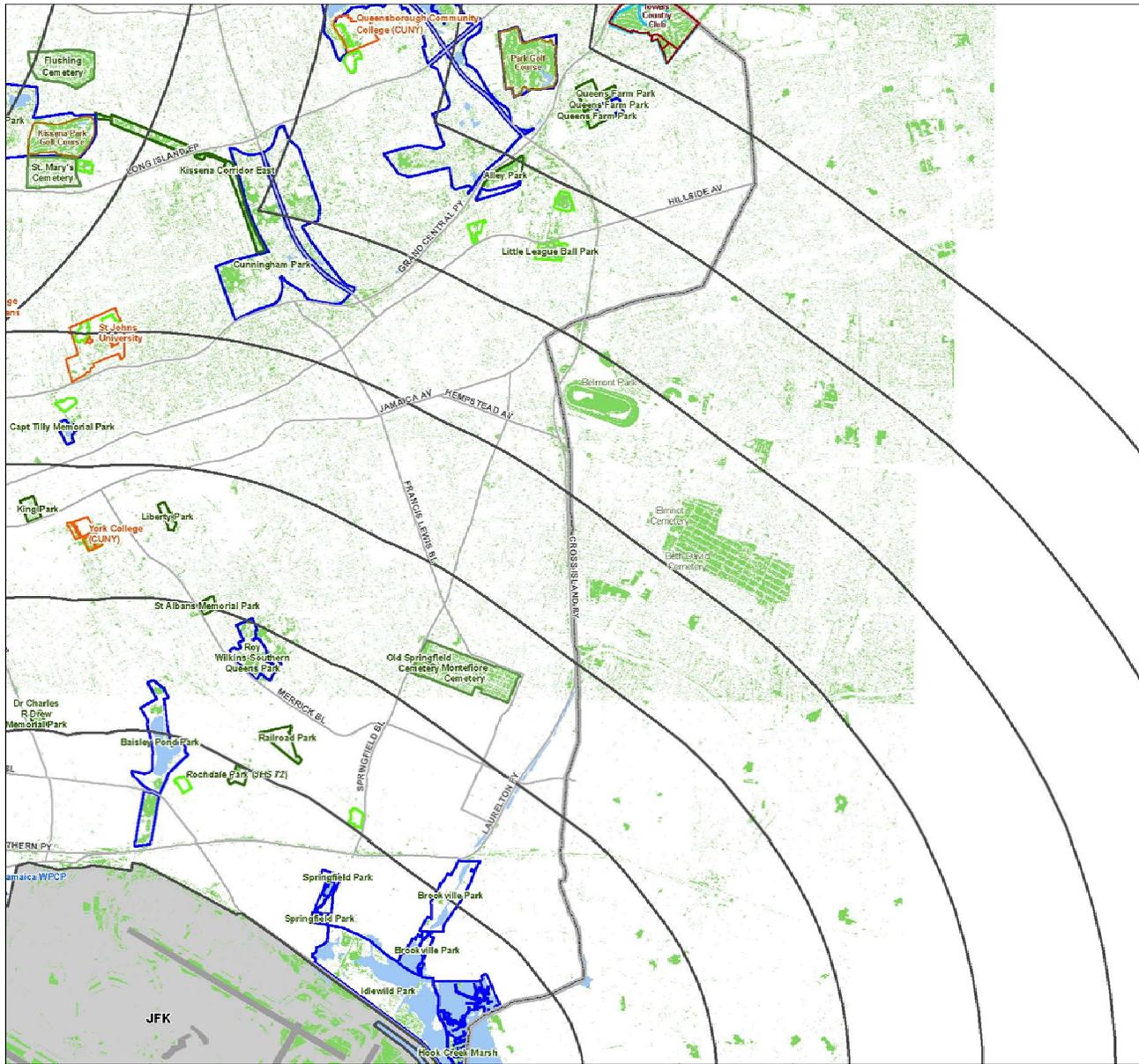


Figure 1-1b. Enlargement of northeast quarter of Figure 1-1.



Figure 1-1c. Enlargement of southwest quarter of image 1-1.

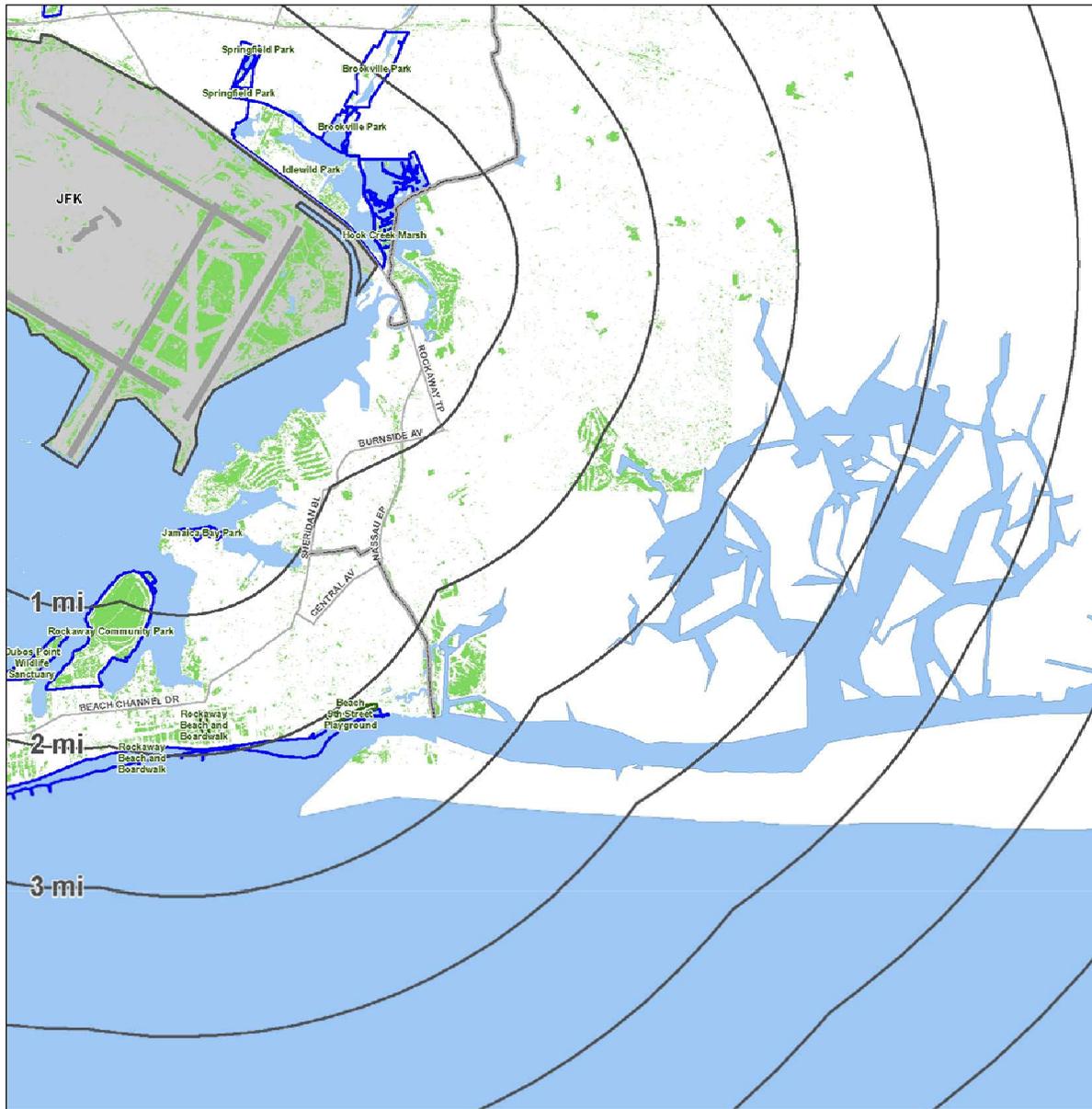


Figure 1-1d. Enlargement of southeast quarter of image 1-1.

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.

In summary, the purpose of the supplement is to:

- 1) Provide data on the efficacy and impacts of actions taken to reduce bird hazards to aircraft and human safety for JFK since the completion of the 1994 FEIS;
- 2) Identify changes in bird hazards that have occurred since the completion of the 1994 FEIS; and
- 3) Analyze potential environmental impacts of alternatives for reducing bird hazards to aircraft and human safety; and
- 4) Analyze the impact of specific management methods on land uses and management priorities for off-airport properties where management actions may be conducted, including Gateway NRA.

The 1994 FEIS established the following Purpose and Need for action. Although the actions initiated as a result of the 1994 FEIS have substantially reduced risks to aircraft from gulls, management of gull hazards continues to be a priority for JFK.

The collision of birds with aircraft at JFK has the potential to result in loss of human life. Analysis of JFK's bird strike record indicates that gulls present the greatest hazards to human safety there. In 1990, before the Interim Shooting Program went into effect, more than 70% of the bird-aircraft collisions at JFK involved gulls, especially Laughing Gulls (43% of all strikes in 1990). The majority of the Laughing Gulls originated from the nesting colony on JoCo, East High Meadow, and Silver Hole Marshes with the NPS's Gateway NRA. The close proximity of JFK and the JBWR [Jamaica Bay Wildlife Refuge] Unit of the Gateway NRA creates a hazard to human safety (Bear letter June 25, 1993, [EIS] Appendix F.1).

In order to protect human safety, and because current on-airport nonlethal measures have not successfully reduced the laughing gull-aircraft collision hazard, the alternatives evaluated here include on and off-airport actions that are nonlethal as well as lethal. The alternatives address hazards created by the four gull species present in the JFK area; with the exception of alternatives specifically related to the Jamaica Bay laughing gull nesting colony, all alternatives are directed at the four gull species that pose hazards to safe aircraft operation at the airport. The considered alternative actions involve properties that are managed by private (i.e., Aqueduct Racetrack), State of New York (Jamaica Bay Sewage Treatment Plant), bi-state (PANYNJ), and federal (USDI, NPS, and USDI, Fish and Wildlife Service (USFWS)) agencies and organizations.

The Federal cooperating agencies (United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS); USDI, USFWS and NPS) and the New York State Department of Environmental Conservation (NYSDEC),

Division of Fish, Wildlife and Marine Resources propose to develop and enact a plan to meet the need to reduce to the maximum extent possible, the potential for gull-aircraft interactions, particularly those posed by the proximity of the laughing gull nesting colony in Jamaica Bay to JFK, in order to protect human safety.

The need is to significantly reduce the number of gull aircraft interactions at JFK in order to protect human safety.

The purpose of this National Environmental Policy Act (NEPA)/New York State Environmental Quality Review (SEQR) process is to evaluate potential gull management strategies at JFK and in the Jamaica Bay that are effective, safe, environmentally sound and in compliance with applicable policies, laws and regulations.

Bird strike reduction efforts require coordination and cooperation among private, town, city, county, state and federal land managers. To help meet this need the FAA and City of New York Department of Environmental Protection (NYCDEP) have joined the team of cooperating agencies working on the supplement.

1.2 DECISION TO BE MADE

The federal management decisions addressed in this analysis include WS involvement in on- or off-airport activities to reduce bird strikes at JFK; USFWS Migratory Bird Office issuance of permits for the take of birds, their eggs, or nests in order to reduce bird strike hazards at JFK; and bird hazard management activities that may be conducted on off-airport federal lands (e.g., relocation of the Laughing Gull colony in the JBWR). The state actions considered in this analysis include issuance of NYSDEC depredation permit for the harassment and/or take of birds, their eggs, or nests in order to reduce bird strike hazards at JFK⁴ and any bird hazard management actions that may be taken on state-owned lands.

The Federal and State decisions to be made are:

1. What are the current bird strike hazards at JFK including hazards in aircraft approach and departure lanes within 7 miles of JFK?
2. What are the off-site issues contributing to bird strike hazards at JFK?
3. What are the environmental impacts of alternatives for state and federal involvement in bird strike reduction at JFK?

This analysis has been prepared in accordance with NEPA and SEQR. NEPA sets forth the requirement that Federal actions with the potential to significantly affect the human environment be evaluated for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. NEPA analyses inform decision-makers and the public of the

⁴ Except those actions covered under NYSDEC General Depredation Permits for Geese and Gulls.

need for agency action, the environmental impacts of reasonable alternatives to meet the need, provide an opportunity for public involvement in federal decision-making, and serve as a decision-aiding mechanism for federal agencies. SEQR has similar goals and requires environmental review and documentation for state agency actions.

1.3 GENERAL INFORMATION ON BIRD STRIKE HAZARDS TO AIRCRAFT

Bird strike hazards are a concern to civil and military airports around the world (Dolbeer et al. 2011, FAA 2010). Collisions between aircraft and wildlife are a concern because they threaten passenger safety (Thorpe 1996), result in lost revenue to airlines and costly repairs to aircraft (Linnell et al. 1996, Robinson 1996), and can erode public confidence in the air transport industry as a whole (Conover et al. 1995). While bird strikes that result in human fatalities are rare, the consequences can be catastrophic. The worst strike on record for loss of human lives in the U.S. was in Boston in 1960 when 62 people were killed in the crash of an airliner which collided with a flock of European Starlings (Dolbeer and Wright 2008). More recently, 24 lives were lost when an E-3B “AWACS” aircraft struck a flock of Canada Geese at Elmendorf, Alaska in 1995. Globally, wildlife strikes have killed more than 229 people and destroyed over 210 aircraft since 1988 (Dolbeer et al. 2011).

On January 15, 2009 US Airways flight 1549 out of LaGuardia Airport was forced to make an emergency landing on the Hudson River in NYC after a collision with a flock of Canada Geese severely damaged both of the aircraft’s engines. Thanks to the skill of the pilots and flight crew and the speed of the emergency response, no lives were lost in this incident. The strike served to raise public concerns regarding the risks to aircraft from birds.

It is more common for wildlife-aircraft strikes to result in expensive repairs, flight delays, or aborted aircraft movements than in injury or loss of human life. Wildlife strikes result in millions of dollars in direct and indirect damages annually. Direct costs include damage to aircraft, aircraft downtime and medical expenses of injured personnel and passengers. Indirect costs can include lost revenue from the flight, cost of housing delayed passengers, re-scheduling aircraft and flight cancellations. During the period of 1990 to 2009, FAA records indicate total reported losses from bird strikes cost the civil aviation industry over \$374.9 million in monetary losses and 424,936 hours of aircraft downtime. These figures are an underestimate of total damage (Dolbeer et al. 2011). Review of strike reports and airport data indicates that approximately 39% of all strikes at FAA certificated airport (14 CFR 139) are reported to the FAA (Dolbeer et al. 2011). Not all reports provide notation as to whether or not there was damage and some strike reports to the FAA that indicate there was an adverse impact on the aircraft from the strike do not include a monetary estimate of the damage caused. Additionally, most reports indicating damage to aircraft report direct damages and do not include indirect damage such as lost revenue, cost of putting passengers in hotels, rescheduling aircraft and flight cancellations. Dolbeer et al. (2011) estimated that the actual annual costs to the U.S. civil aviation industry from wildlife strikes (includes mammal strikes) to be over 581,400 hours of aircraft downtime, \$544 million in direct costs and \$139 million in associated costs.

A high percentage of bird strikes occur during peak migration periods, but dangerous situations can develop during any season. Aircraft are most vulnerable to bird strikes while at low altitudes, generally related to landing and taking off. Approximately 41% of strikes involving commercial aircraft and 40% of strikes involving general aviation aircraft occur when the aircraft is on the ground (e.g., taxi, take off run, landing roll; Dolbeer et al. 2011). Seventy-two percent of commercial aircraft strikes and 76% of general aviation aircraft strikes occurred at less than 500 feet above ground level (AGL; Dolbeer et al. 2011), which is why management of the area immediately surrounding taxiways, runways, and runway approaches is important.

Although the majority of bird strikes occur on airport property, there is increasing concern regarding off-airport hazards to aircraft. Dolbeer (2011) reported that the percentage of all strikes which occur off airport (defined as strikes at elevations >500 feet AGL) has increased from approximately 25% in 1990 to 30% in 2009. The rate of damaging strikes occurring at >500 feet AGL increased from 2.5 to 4 strikes per million commercial aircraft movements. Review of the same data for on-airport strikes (strikes at \leq 500 feet AGL) indicated that the damaging strike rate increased from 4.4 to 5.3 strikes per million commercial aircraft movements from 1990-1994 to 1995-1999. The rate of on-airport strikes causing substantial damage increased from 1990-1994 to 1994-1999 but decreased on-airport from 1995-1999 to 2005-2009. In contrast, there has been relatively little change in off-airport strikes causing substantial damage, fluctuating between 0.5 and 0.9 strikes per million aircraft movements. Dolbeer (2011) credited the difference to the on-airport bird hazard management programs incrementally implemented across the country over the last 20 years and called for sustained programs on-airport and increased efforts to address off-airport hazards, work to further develop bird-detecting radar and bird-migration forecasting and research into methods for increasing aircraft detection and avoidance by birds.

Experts with the civil and military aviation communities widely recognize that the threat to human health and safety from aircraft collisions with wildlife (wildlife strikes) is increasing (Dolbeer 2000, MacKinnon et al. 2001). Reasons for the increasing risk of wildlife strikes include increased air traffic, a shift from 3 to 4-engine aircraft to more efficient and quieter 2-engine aircraft, and increases in populations of wildlife species commonly involved in strikes (Dolbeer et al. 2011). U.S. Commercial air traffic increased from approximately 18 million aircraft movements per year in 1980 to over 26 million movements in 2009 and is expected to increase at a rate of approximately 1.2% per year to at least 37 million movements by 2030 (Dolbeer et al. 2011). In 1965, 90% of the approximately 2,100 U.S. passenger aircraft had three or more engines. In 1998, only 30% of the approximately 5,400 U.S. passenger aircraft had three or four engines, and by 2005, only 10% of the approximately 8,200 passenger aircraft had 3-4 engines (Cleary and Dolbeer 2005, Dolbeer et al. 2011). Studies by Burger (1983) and Kelly et al. (1999) indicate that birds are less able to detect and avoid quieter modern jet aircraft with turbofan engines (Dolbeer et al. 2011). Additionally, reducing the number of engines on an aircraft increases the risk that a multiple bird strike could affect all engines and result in a life-threatening situation. For example, the 2009 emergency landing of US Airways flight 1549 in the Hudson River resulted after a collision with a flock of Canada Geese severely damaged both of the aircraft's engines.

During the early days of aviation, when aircraft flew at slower speeds, birds had little difficulty avoiding aircraft. Bird strikes were infrequent, and when they did occur, damage was usually minimal. With the introduction of jet aircraft, bird strikes became a serious threat and more costly problem. The rapid acceleration, increased speeds, and reduced noise of jet turbine and turbo-prop aircraft give birds and other animals far less time to react to approaching aircraft. Longer runways and more complete use of runways by jet aircraft also increase the likelihood of strikes. The energy released as a result of a high-speed aircraft/bird collision is tremendous, and can be particularly damaging to technologically advanced turbine engines that use lightweight, high speed mechanical parts (Blokpoel 1976).

A new trend in the airline industry is the use of Very Light Jets (VLJs), aka microjets, intended primarily for use in point-to-point air taxi service. Very Light Jets are lighter, quieter and faster than what is commonly considered a business jet. These new jets will be even more difficult for birds to detect and avoid than current aircraft. Consequently, these aircraft are likely to be at greater risk from bird strikes than current commercial aircraft. Environmental and wildlife restoration and management efforts have been successful, and although challenges still remain for many bird species, some North American bird populations have increased markedly in the last few decades. These increases have included populations of large birds which are a particular risk to aircraft including Bald Eagles, Wild Turkeys, Turkey Vultures, Double-Crested Cormorants, Sandhill Cranes, American White Pelicans and resident (non-migratory) Canada Geese, (Sauer et al. 2008, Dolbeer et al. 2010). FAA airworthiness standards for airframes, windshields and engines use a single 4-pound bird mass as the maximum that must be tested for most components. Dolbeer and Eschenfelder (2003) determined that 36 of the approximately 650 bird species nesting in North America have average body masses greater than 4 lbs. Of the 31 species for which they could obtain population data, 24 showed population increases over the past 20-40 years. Only two species showed population declines and 5 species were stable. Thirteen of the 14 U.S. bird species weighing 8 pounds or more have increased significantly over the last 20-40 years (Dolbeer and Eschenfelder 2003).

For the period of 1990-2009, gulls were the most common bird species involved in strikes reported to the FAA (18% in which a bird species was identified (43,410 of the total 96,626 reported bird strikes had the species identified). Other frequently-struck bird groups include doves/pigeons (15%), raptors (13%), and waterfowl (8%). All bird strikes do not result in damage to the aircraft. Of the 74,855 bird strikes reported to FAA over the period of 1990-2009 which provided an indication as to the result of the strike, 86% indicated the strike did not damage the aircraft, 7% indicated there was minor damage, 3% indicated substantial aircraft damage, 3% indicated an uncertain level of damage and only 31 reports (<1%) indicated the aircraft was destroyed as a result of the strike. Gulls were involved in the greatest number of bird strikes which had a negative effect on the flight (e.g., aborted takeoff, precautionary landing). However, although gulls were involved in 2.4 times as many bird strikes as waterfowl, waterfowl were involved 1.2 times more damaging strikes. (Dolbeer et al. 2011)

1.4 BACKGROUND: BIRD STRIKES AND STRIKE MANAGEMENT AT JOHN F. KENNEDY INTERNATIONAL AIRPORT

John F. Kennedy International Airport is operated by the PANYNJ under a lease with the City of New York. The airport is located on 4,930 acres in the southeastern section of Queens County, New York City, at the edge of Jamaica Bay. In 2009, JFK handled 414,928 aircraft arrivals/departures carrying 45,915,069 passengers, 1,115,742 tons of cargo and 105,738 tons of airmail. Over 35,000 people are employed at the airport. JFK contributes approximately \$30 billion in economic activity to the NY/NJ metropolitan region generating some 230,000 jobs and \$9.8 billion in wages and salaries (PANYNJ 2010).

JFK is located next to the Gateway NRA which includes the Jamaica Bay Wildlife Refuge (JBWR; NPS undated *a*). The 9,155 acres of the refuge include salt marsh, upland fields and woods, several fresh and brackish water ponds and an open expanse of bay and islands within the boundaries of NYC. The JBWR is a nationally and internationally renowned birding area where thousands of water, land and shorebirds stop during migration and is a critical stopover area along the Eastern Flyway migration route (NPS undated *a, b*). More than 325 species of birds have been observed at the refuge over the last 25 years. The Audubon Society has classified Jamaica Bay as an Important Birding Area known to support species of global conservation concern (National Audubon Society 2009). The only known Laughing Gull breeding colony in New York State is in the JBWR (JoCo, East High Meadow, and Silver Hole Marshes) near the southeast end of runway 22R/4L of JFK (Fig. 1-1).

Bird strikes have created substantial hazards to human health and safety, as well as major financial losses due to aircraft destruction, equipment damage, runway closure, personnel costs, and passenger accommodations at JFK. During the 15-year period from 1979-93, at least 3,553 birds from 62 species were struck by 2,834 aircraft at JFK. The most severe instance occurred in November 1975, when Herring Gulls were ingested into an engine of a departing DC-10. The engine exploded and separated from the aircraft and the takeoff was aborted; the aircraft caught fire and was destroyed. Fortunately, no fatalities occurred, largely because all 139 persons aboard were airline personnel recently trained in evacuation procedures. Although there were no major injuries to passengers, the plane burned for 2 days. After this incident, JFK placed increased emphasis on management of bird strikes to aircraft. As part of their bird strike management effort, JFK began recording all bird strikes at the airport in 1975 and currently has the most extensive bird strike database of any airport in the world (PANYNJ 2004).

Following the 1975 Herring Gull-aircraft collision the PANYNJ asked USFWS's Wildlife Assistance Unit to conduct an ecological study of the airport. Since that time, the federal wildlife damage management program has worked closely with JFK to identify and reduce safety hazards associated with birds. In 1986, the USFWS Wildlife Assistance Unit was transferred to the USDA, APHIS where it was first named the Animal Damage Control

Program and later (1997) Wildlife Services⁵. Initially, the federal program's assistance consisted of preparing ecological evaluations, and providing technical assistance and training to JFK staff.

Two landfills were located near JFK and attracted thousands of gulls to the easy food source. The PANYNJ and FAA worked with the City of New York to have the landfills closed and eliminate the attractant to gulls. The Fountain Avenue Landfill was located 17,000 ft. west of JFK (within Gateway National Recreation Area) and was closed in 1985. The Edgemere Landfill was located on the Rockaway Peninsula about 7,000 feet southeast of the approach to Runway 4R, and was closed to dumping of putrescible waste in 1991 (PANYNJ 2004).

Despite the implementation of a multi-faceted bird hazard reduction program by the PANYNJ and the closure of nearby landfills, bird strikes, especially Laughing Gull strikes, continued to increase. Herring, Great Black-backed, Laughing, and Ring-billed Gulls were involved in the majority of bird strikes at JFK, and had been in the airport's bird strike record since at least the 1960's. The proportion of all bird strikes involving Laughing Gulls increased in correlation with the growth of the Jamaica Bay laughing gull colony (from 15 pairs in 1979 to 7,629 pairs in 1990). The number of aircraft struck by Laughing Gulls quickly increased from 2 to 171 in 11 years (Dolbeer and Chipman 2002). The Jamaica Bay Laughing Gull colony was located at the southeast end of runway 22R/4L, one of the 4 runways essential to the safe and effective handling of the volume of air traffic at JFK. In 1988-90, Laughing Gulls constituted 52% of the bird strikes, and the other three gull species together constituted 34% of the total bird strikes (Washburn et al. 2009).

A Bird Hazard Task Force (BHTF) was created by the PANYNJ in 1985 to serve as a clearinghouse for information relative to JFK's then-increasing bird strike hazards. The BHTF provided an opportunity for agencies and other parties to exchange ideas and discuss initiatives to address JFK's bird strike hazards. The task force included members from PANYNJ; WS; Gateway NRA; the USFWS Migratory Bird Program; the United States Department of Transportation, Federal Aviation Administration (FAA); New York State Department of Environmental Conservation (NYSDEC); Rutgers University; and the NYCDEP, including the NYC Department of Sanitation.

Bird hazards to aircraft continued to increase and a "Blue Ribbon Panel" of international experts was convened in 1989 to try to slow the trend. The panel included Hans Blokpoel, L. S. Burma, J. E. Karlsson, V. E. F. Solman, and C. S. Thomas. They created a list of recommendations, which was distributed to The Port Authority. Some of the recommendations included changes to the BHTF and the relocation of the nesting Laughing Gull colony in JBWR (PANYNJ 2004).

In 1991, PANYNJ asked WS to conduct an experimental shooting program to reduce hazards created by gulls, especially Laughing Gulls, within JFK airspace under permits issued by the USFWS and NYSDEC. Laughing Gull strikes declined 62% in 1991 compared to the 1988-1990 annual average of 261 gull strikes per year. Strikes for the other three gull species were

⁵ To minimize confusion the current name for the federal wildlife damage management program (WS) is used throughout the text.

reduced 48% from the 1988-1990 annual mean of 104 strikes per year (Washburn et al. 2009). From 1991-1993, WS biologists shot 14,191, 11,847 and 6,500 Laughing Gulls per year, respectively. By the third year of the program, the number of strikes involving Laughing Gulls was reduced by over 90% from levels observed in the late 1980s (Dolbeer et al. 2002). During this time, WS continued to provide technical advice to JFK regarding habitat management, bird harassment, insect control, elimination of food and water resources, and other activities.

Although the program was successful, concerns about the ethics and long-term cumulative impacts of shooting gulls prompted an animal rights group to sue the PANYNJ and the USFWS who issued the depredation permit to JFK (PANYNJ 2004). The lawsuit resulted in the preparation of an EIS to examine the environmental impacts of alternative strategies for reducing bird strikes at JFK. Herring, Great Black-backed, Laughing, and Ring-billed Gulls were the focus of the 1994 FEIS because they comprised more than three-quarters of the recent bird strikes and posed the greatest safety risk. The Jamaica Bay Laughing Gull colony located on the NPS's Gateway National Recreation Area was of particular concern. Non-gull bird species also occurred in JFK's bird strike record, and information on their biology, and behavior was presented in the 1994 FEIS to fully document the bird strike hazard at JFK (1994 FEIS Section 1.3).

The 1994 FEIS was completed in 1994. The USDA, APHIS Record of Decision (ROD) selected the full implementation of the Integrated Gull Hazard Control (IGHC) program developed in the 1994 FEIS which included non-lethal bird hazard management, the supplemental on-airport shooting program, relocation of the laughing gull colony, and working with off-airport property owners and managers to reduce bird strike hazards. The WS ROD supported continuing the supplemental on-airport shooting program as a short-term means of addressing bird strike hazards at JFK and the relocation of the Jamaica Bay Laughing Gull colony as a feasible and environmentally-preferred long-term solution. WS concluded that relocation of the colony would reduce the long-term mortality of gulls and would substantially reduce the potential for gull-aircraft collisions.

The USFWS also concluded that an IGHC program would be the most effective at reducing bird strikes at JFK, but it did not conclude that relocating the Jamaica Bay Laughing Gull colony was warranted at that time. The USFWS was concerned about the impacts of disrupting/ attempting to relocate the only known Laughing Gull colony in the State of New York on state and regional Laughing Gull populations. The USFWS concluded that relocating the Laughing Gull colony was unwarranted at the time since there were a number of measures that were less disruptive to the nesting gulls which should be implemented prior to attempting to relocate the colony. Details of their position are provided in 1994 FEIS Sections 6-7 to 6-9 and the USFWS ROD (FR 94-13530).

Implementation of the IGHC program began in 1994 after the completion of the FEIS. To date, management of aircraft hazards associated with the Laughing Gull colony have been restricted to the supplemental on-airport shooting program, activities to reduce on-airport gull attractants, and work with landowners and managers to reduce movement of gulls through JFK airspace, but have not included efforts to relocate the Laughing Gull colony.

In 1995, a serious incident occurred between an Air France Concorde and a pair of Canada Geese. After ingesting the geese into an engine, the aircraft was able to land safely but sustained major damage. The French Aviation Authority sued The PANYNJ and the case was eventually settled out of court for over \$5 million. More emphasis was placed on management of Canada Geese in addition to the gull management program (PANYNJ 2004).

In 1996, an experimental falconry program was added to the bird hazard management program at the airport. A contractor flies hawks and falcons for three months in the summer and assists the JFKWMU⁶ by using pyrotechnics to scare birds away from the AOA. The presence of natural predators was supposed to discourage bird presence on the airport. Although the falconry program has not resulted in a measurable decrease in bird strike rates (Dolbeer 1998*b*), the falconry program does provide JFK with additional people to conduct wildlife control (e.g., pyrotechnics) during busy nesting and migration periods (PANYNJ 2004).

Efficacy and impacts of the IGHC program and other JFK bird hazard management activities are reviewed in Performance Management Reports prepared by the PANYNJ, annual monitoring reports prepared for the PANYNJ by USDA/APHIS/WS National Wildlife Research Center (Washburn et al. 2009, Washburn and Tyson 2010), and review/issuance of permit applications by the USFWS and NYSDEC. The BHTF also meets twice per year to review the efficacy and impacts of JFK's bird hazard management efforts, exchange ideas and discuss new initiatives to address bird strike hazards. Since the completion of the 1994 FEIS, the PANYNJ has continued to fund research on wildlife hazard management at JFK to monitor and improve current programs and develop new management techniques (e.g., Seamans et al. 1995, Gabrey and Dolbeer 1996, Belant 1997, Dolbeer et al. 1997, Dolbeer 1998*b*, Dolbeer 1999, Barras et al. 2000*a*, Barras and Dolbeer 2000, Barras and Seamans 2002, Dolbeer et al. 2003, Washburn et al. 2006, Bernhardt et al. 2009, Bernhardt et al. 2010) including a wildlife hazard assessment (WHA) completed in 2002 to evaluate potential changes in wildlife hazards at the airport (USDA 2002).

1.5 COLLECTING BIRD STRIKE INFORMATION AT JFK

The definition of a bird strike that is used operationally by JFK, in the 1994 FEIS and in this supplement was developed by Bird Strike Committee Canada and has been endorsed by the International Civil Aviation Organization. A bird strike is considered to have occurred when 1) a pilot reports a bird strike, 2) aircraft maintenance personnel identify damage to an aircraft as having been caused by a bird or birds, 3) personnel on the ground report seeing an aircraft strike one or more birds, or 4) bird remains are found on active runways and taxiways (pavement) or within the safety areas around the runways or taxiways (unless another cause of death is apparent). Biologists with the JFKWMU are usually able to identify the species involved in a strike if sufficient evidence is available. However, if JFKWMU staff are uncertain or if insufficient material is available (e.g., only a feather or tissue pieces) the

⁶ The JFKWMU was formerly known as the Bird Control Unit (BCU) and is referred to as such in the EIS.

available material is shipped to the Smithsonian Institution's Feather Identification Laboratory. The laboratory uses feather matching and a DNA-based identification system to identify the remains (Heacker and Dove 2010). This is the industry standard recommended in the FAA manual on management of wildlife hazards at airports (Cleary and Dolbeer 2005). Additional information on finding evidence of bird strikes, runway sweeps (inspections), identifying bird remains and recording strikes is provided in the 1994 FEIS Section 1.1.1.

Brown et al. (2001a) raised concerns regarding the definition of bird strike used in this analysis. The authors noted that aircraft strike can only be assumed to be the cause of death for birds found active runways and taxiways (pavement) or within the safety areas around the runways or taxiways (unless another cause of death is apparent). Some of the dead birds found near runways may have been killed by the wing-tip vortices generated by aircraft and not by direct collision with aircraft. The authors also noted that proximity of the Laughing Gull colony to the JFK airfield increases the probability that some of the Laughing Gulls recovered at JFK have died from natural causes including diseases such as avian botulism and high mortality of newly fledged birds. Barras and Dolbeer (2000), in their review of reporting bias in bird strikes at JFK acknowledged that not all birds found near the runway may have died from collision with aircraft. However, they note that for the purpose of evaluating bird risks to aircraft, the exact cause of the bird death is irrelevant. The fact that the bird was in close enough proximity to the airfield and aircraft to be found dead in near the runways indicates the bird posed a strike risk to aircraft.

Some individuals have advocated only considering birds "ingestions" when assessing bird hazards to aircraft. "Ingestions" are similar to the system recommended by Brown et al. (2001a) above but only include incidents where refers to incidents were a bird is confirmed to have been ingested into an aircraft engine. Reasons for using ingestions are similar to those presented by Brown et al. (2001a). Advocates for the use of "ingestions" assert that bird ingestions into engines are the real threat to aircraft operations. They point out that the increased risks associated with changes to aircraft with fewer engines or bigger intake areas are referring to ingestions, not other types of strikes. However, as with the system recommended by Brown et al (2001a) we feel that restricting evaluations to ingestions does not allow for effective assessment and management of the *risk* of bird strikes. One of the goals of an effective hazard management program is to anticipate risks based on bird activity in the vicinity of the airfield and manage risks to prevent "ingestions". Further, not all bird strikes with detrimental impacts on the aircraft and risks to human health and safety involve engines. Ingestions are the most common kind of strike to do substantial damage to aircraft and pose risks to human safety, but they are not the only type of strike relevant to risk assessment (Section 1.6).

The JFKWMU is responsible for coordinating the collection of bird strike information for the airport. The JFKWMU database contain reports of strikes which have occurred on airport property including reports of the bird remains found on or near active runways and taxiways, strikes observed by ground personnel, and evidence found by maintenance crews as described above. The bird strike data in JFKWMU records is eventually entered into the FAA database (<http://wildlife-mitigation.tc.faa.gov/wildlife/>). Pilots and airplane mechanics may also report information directly to the FAA database. The FAA database is a combination of on and off

airport strikes. Consequently, information in the two datasets will not match. The JFKWLU strike database is the dataset used in the 1994 FEIS and, for consistency, is the primary dataset used in this analysis. The FAA database was used to obtain information on off-airport strikes.

The FAA database provided records for JFK from 1990-present. To assess off-airport strike hazards, we used data from 1994, the year the FEIS was completed, to present in this supplement. We identified strikes likely to have occurred off-airport by eliminating all records which included a notation that the strike occurred while the aircraft was on airport property (i.e., phase of flight listed as “taxi”, “take-off run” or “landing roll”) and all records where phase of flight was not specified. We also eliminated all strikes which occurred at a height of 100 feet or lower as these strikes were likely to have occurred before the aircraft left JFK property. Records which did not specify the height of the strike were also eliminated. This selection process left 267 of the 1,839 records in the FAA database for JFK during the period of 1994-2009.

1.6 HISTORY AND CURRENT STATUS OF BIRD STRIKE HAZARDS AT JFK

On-Airport Strikes

The supplemental on-airport shooting program initiated in 1991 and the implementation of the Integrated Bird Hazard Management Program developed in the 1994 FEIS have significantly reduced bird strike hazards at JFK (Fig. 1-2). Closure of the Edgemere Landfill (located approximately 7,000 feet southeast of the approach to runway 4R) in 1991 may also have contributed to declines in gull strikes. The number of aircraft striking Laughing Gulls decreased 62% in 1991 from the average strike rate of 157 strikes/year for 1988-1990 (Figs. 1-3a,b and 1-4; Washburn et al. 2009). Strikes for the period of 1992-2009 have been 76-99% lower than the 1988-1990 average. In 2008, Laughing Gull strikes (1 strike) were the lowest recorded since 1979. Strikes by the other 3 gull species were reduced 48-88% from 1988-1990 averages. Since approximately 1998, Herring Gulls have replaced Laughing Gulls as the most commonly struck gull species at JFK (Fig. 1-3).

The decrease in gull strikes has occurred despite the fact that average annual aircraft movements for 1994-2009 was higher than for 1979-1993 (351,962 movements/year 1994-2009, 300,598 movements/year 1979-1993; ANOVA $P < 0.01$). The majority of the decline is directly attributable to the initiation of the supplemental on-airport shooting program in 1991 (Washburn et al. 2009). Prior to the initiation of the supplemental on-airport shooting program, the airport had an active bird hazard management program which included many of the components of the integrated bird hazard management program developed in the 1994 FEIS, including reduction of bird attractants at the airport (vegetation management, reduction of water sources, repellents, sanitation practices, insect control), direct bird management (repellents, harassment and limited lethal removal), and work with off-airport landowners to reduce bird attractants that contributed to bird movements through JFK airspace (e.g., closure of landfills). However, these measures had done little to prevent gulls from flying over the

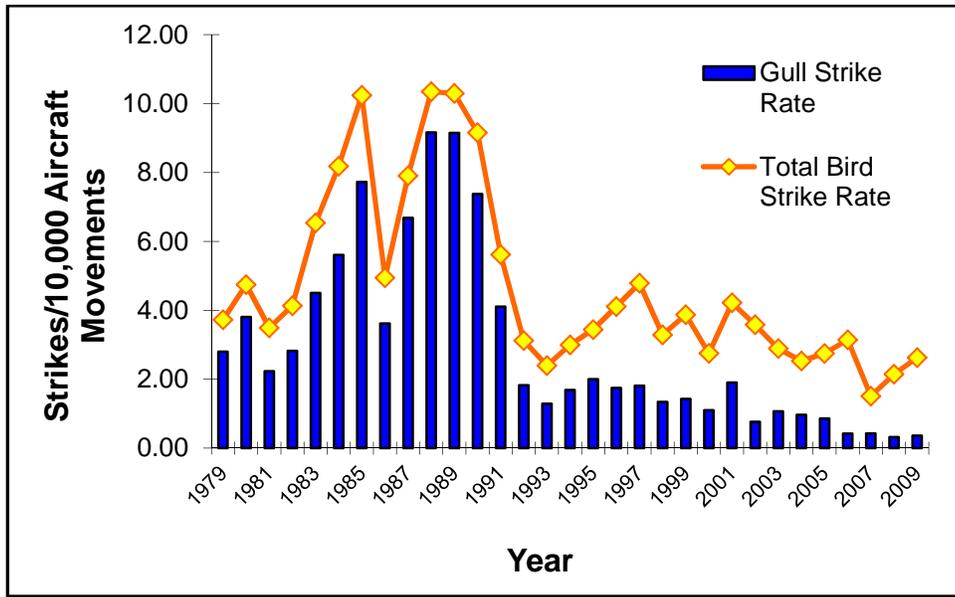


Figure 1-2. Annual on-airport bird strike rate (strikes/10,000 aircraft movements) at JFK. An on-airport gull shooting program was implemented in 1991. The Integrated Gull Hazard Management Program developed in the EIS was initiated in 1994.

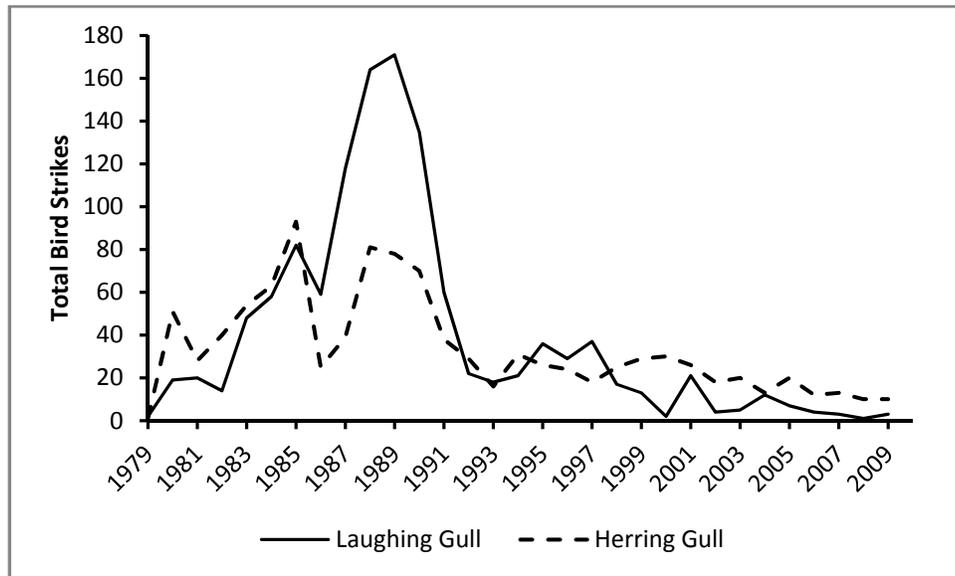


Figure 1-3a Annual on-airport Laughing Gull and Herring Gull strikes at JFK. An experimental supplemental on-airport shooting program was initiated in 1991 and an Integrated Bird Hazard Management Program, including the supplemental on-airport shooting program, started in 1994. Three nearby landfills contributed to gull hazards in the vicinity of JFK. Fountain Avenue and Pennsylvania Avenue landfills were closed in 1985. Edgemere Landfill was closed in 1991.

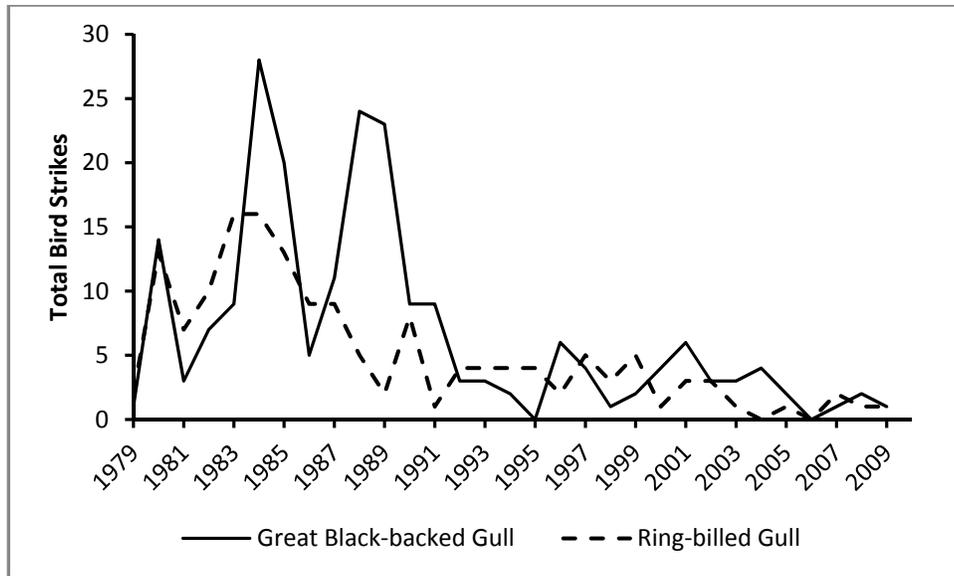


Figure 1-3b. Annual on-airport Great Black-backed Gull and Ring-billed Gull strikes at JFK. An experimental supplemental on-airport shooting program was initiated in 1991 and an Integrated Bird Hazard Management Program, including the supplemental on-airport shooting program, started in 1994. Three nearby landfills contributed to gull hazards in the vicinity of JFK. Fountain Avenue and Pennsylvania Avenue landfills were closed in 1985. Edgemere Landfill was closed in 1991.

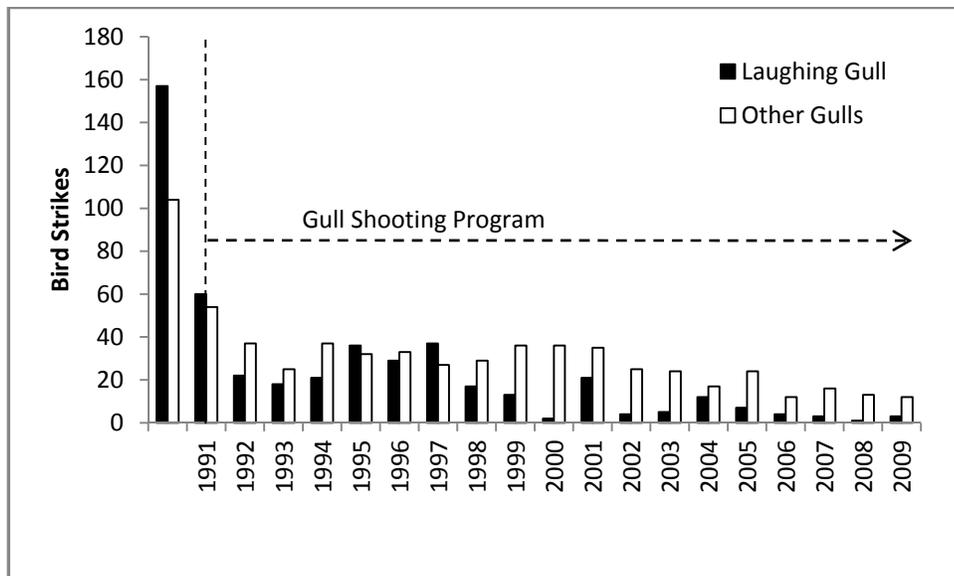


Figure 1-4. Number of aircraft striking Laughing Gulls and other Gulls (Herring, Great Black-backed, Ring-billed) on-airport at JFK 1988-2009. Figure from Washburn et al. 2009. Includes unpublished data for 2009.

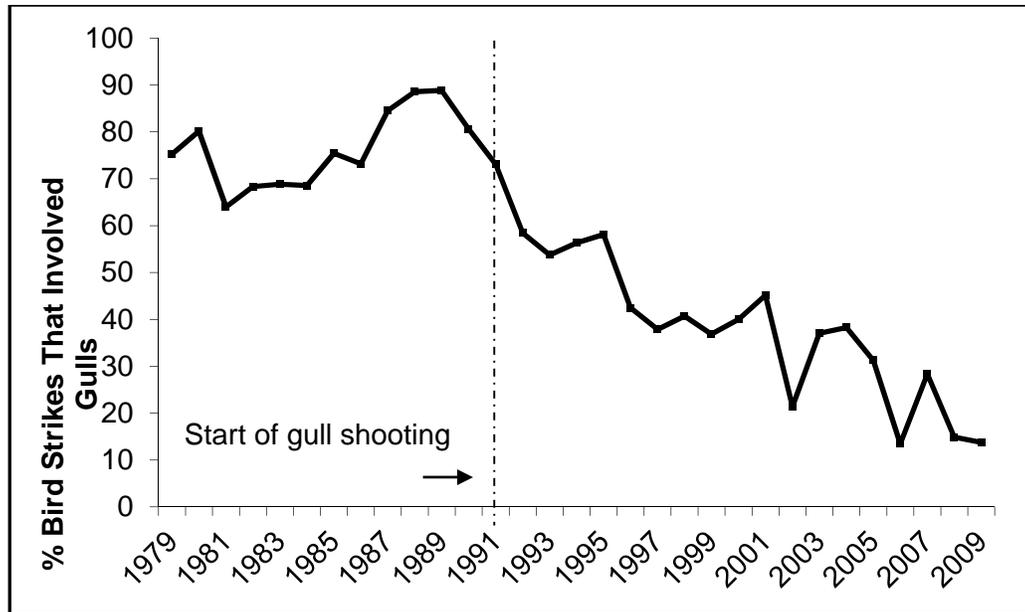


Figure 1-5. Proportion of all on-airport bird strikes at JFK caused by gulls before and after the initiation of the supplemental on-airport shooting program in 1991.

airport (Washburn et al. 2009). For example, the Pennsylvania Avenue and Fountain Avenue Landfills were closed in 1985. Although there is a dip in the gull strike rates that corresponds with this period, the decline was not long lived, and Laughing Gull, Herring Gull and Great Black-backed Gull strike rates increased rapidly after this period until 1991 when the supplemental on-airport shooting program was initiated.

When the 1994 FEIS was completed, gulls were the predominant species group, totaling 76.5% of the bird strike incidences and 69.3% of the birds struck (Table 1-1, Fig. 1-5). Gulls were involved in 74.4% of the 82 incidences in which aircraft were damaged or delayed. Laughing Gulls were the most commonly struck species, involved in 35% of all aircraft incidences, even though this species is present for only six months of each year. Of the 58 non-gull species that had been involved in bird strikes from 1979-1993, Barn Owls were the most frequently-struck (4% of all bird strikes, no aircraft damage or delayed). None of the other 57 species individually accounted for more than 2% of the strikes. The proportion of bird strikes attributable to gulls has generally been decreasing since the initiation of the supplemental on-airport shooting program and has comprised less than half of all known bird strikes since 1996 (Fig. 1-5). During the period of 1994-2009, American Kestrels became the most commonly struck non-gull species (91 strikes) followed by Barn Owls (89 strikes) and Rock Pigeons (63 strikes). A complete list of species involved in bird strikes is provided in Appendix C. Body size and tendency to move in flocks are also critical factors when determining the risk.

Detailed information on strike hazards by bird species posing greatest risks at JFK is provided in Section 1.7 below and in the 1994 FEIS Section 1.3. Despite the reductions, bird strikes continue to be a serious issue for JFK. Table 1-1 summarizes airline reports of bird strikes

and damage to aircraft at JFK. It is important to note that Table 1-1 only contains airline reports of bird strikes, not total bird strikes recorded at JFK as in Figure 1-2, and should not be used to indicate trends in total strike rates or risk to aircraft. Bird strike reporting by air-carriers is voluntary, and it can be difficult for aircraft personnel to determine if an airplane has struck a bird if the strike does not result in substantial damage. Consequently, JFK uses runway carcass searches to augment air carrier reports (Barras and Dolbeer 2000). For the period of 2000-2006, approximately 31% of bird strikes at JFK were reported by airlines. The remaining strikes are usually reported by ground personnel who observe the bird strike and/or recover bird remains on or near runways and taxiways⁷ (Section 1.5). Consequently, the lack of a decline in strikes reported in Table 1-1 is likely the result of increased JFK and nationwide efforts to encourage air-carriers to report strikes and not an indication of a failure to reduce bird strikes at JFK.

Strike data are only one indicator of the nature of bird hazards at JFK. The amount and type of effort required to reduce strikes is also an indicator of bird hazards. Since approximately 2003, there has been an increasing trend in the lethal take birds to reduce hazards to aircraft (Fig. 1-6). This increase is of particular concern because much of the increase involves large-bodied birds like Canada Geese, Atlantic Brant, and Double-crested Cormorants which are especially hazardous to aircraft (Fig. 1-7). Using take as an indicator assumes that level and intensity of effort remain the same. Some of the increases in Fig. 1-6 are likely related to changes in bird hazard management at JFK, (e.g., the extended duration of the supplemental on-airport shooting program in 2008). However, the increased take does correspond with WS and JFKWMU observations of increased difficulty in deterring some species, particularly Atlantic Brant. Even with variability in effort, trends in take are an indicator that review of management actions may be warranted.

Table 1-3 provides information on the portion of the aircraft most commonly struck by birds. Data in Table 1-3 is from information in the FAA bird strike database for JFK and includes on and off-airport strikes. Strikes involving at least one engine were the most commonly reported strike location, followed by the nose, radome, windshield and fuselage. Not all bird strikes with detrimental impacts on the aircraft and risks to human health and safety involve engines. Other areas include the windshield, nose, wing/rotor, fuselage, radome, and landing gear (Dolbeer et al. 2011, Wright 2011). Ingestions are the most common kind of strike to do substantial damage to aircraft and pose risks to human safety, but they are not the only type of strike relevant to risk assessment. Not all bird strikes with detrimental impacts on the aircraft and risks to human health and safety involve engines. Other areas include the windshield, nose, wing/rotor, fuselage, radome, and landing gear (Dolbeer et al. 2011, Wright 2011). Table 1-4 provides information on the types of aircraft struck at JFK. Although most of the aircraft struck are large passenger or cargo jets, smaller regional; aircraft such as such as the SAAB 340, EMB 135, CL RJ100/200 and business/charter aircraft (e.g., C 560, Citation X, DA 50 Falcon) have also been involved in bird strikes at JFK.

⁷ Bird remains found within safety areas of active runways and taxiways are only classified as bird strikes if another cause of death is not apparent.

Table 1-1. Summary of known damage, delays, and safety risks related to reported bird strikes at John F. Kennedy International Airport, 1979-2009 (Data provided by Port Authority of New York and New Jersey [PANYNJ])^a. Table only contains strikes reported by air carriers (See Section 1.5). Table from Washburn et al. 2009; includes unpublished data for 2009).

Year	Reported strikes	Strikes on departure	Aborted takeoffs	Total aircraft with:				No. of damaged or delayed aircraft known to involve:	
				Engine damage	Other damage	Damage	Damage or delays	Gulls ^b	Other birds ^c
1979	21	7	2	2	0	2	2	0	2
1980	17	7	1	2	0	2	2	2	0
1981	14	6	1	2	1	3	3	2	1
1982	20	2	2	2	2	4	5	3	2
1983	25	6	2	3	2	3	3	3	0
1984	27	11	3	2	1	3	3	3	0
1985	37	10	3	3	4	6	10	8	2
1986	14	6	3	2	1	3	5	4	1
1987	22	13	6	7	3	10	10	8	2
1988	26	10	2	1	0	1	3	2	1
1989	33	14	7	6	3	8	11	8	3
1990	27	16	7	5	1	6	9	8	1
1991	23	8	5	3	3	6	7	3	4
1992	18	4	2	3	1	3	3	3	0
1993	16	7	5	3	3	5	6	4	2
1994	22	9	0	0	2	2	4	0	4
1995	23	10	4	4	1	5	8	5	3
1996	26	12	5	3	1	4	7	3	4
1997	32	3	1	1	1	1	2	0	2
1998	19	8	4	4	1	4	6	1	5
1999	26	14	1	1	1	2	3	2	1
2000	37	21	6	2	3	4	11	3	8
2001	36	22	7	2	1	3	8	2	6
2002	34	17	4	1	1	2	6	2	4
2003	28	16	5	4	4	7	8	3	7
2004	33	15	2	2	1	3	6	3	3
2005	36	12	3	5	3	6	7	4	3

Year	Reported strikes	Strikes on departure	Aborted takeoffs	Total aircraft with:				No. of damaged or delayed aircraft known to involve:	
				Engine damage	Other damage	Damage	Damage or delays	Gulls ^b	Other birds ^c
2006	47	13	6	2	5	7	7	1	6
2007	25	11	3	2	2	4	4	2	2
2008	34	14	1	4	1	5	5	0	4
2009	43	10	1	2	2	4	4	0	4
Total	841	334	104	85	55	127 ^d	177	92	85

^a Information is reported to PANYNJ voluntarily by pilots and air carriers; therefore, data are incomplete and the values presented herein should be considered as minimum estimates of damage, delays and safety risks.

^b Herring Gull (33), Laughing Gull (15), Great Black-backed Gull (9), Ring-billed Gull (1), unidentified gull (34).

^c Unknown bird-28, Canada Goose-7, Atlantic Brant-4, Snow Bunting-3, European Starling-2, Osprey-6, Peregrine Falcon-2, Rock Pigeon-4, Tree Swallow-2, American Black Duck-1, Brown-headed Cowbird-1, Barn Owl-1, Double-crested Cormorant-6, Forster's Tern-1, Great Blue Heron-1, Mallard-2, Mourning Dove-1, Northern Harrier-1, Red-tailed Hawk-1, Red-winged Blackbird-1, Ring-necked Pheasant-1, Sanderling-1, Short-eared Owl-1, Snowy Owl-1, unknown duck-1, Cooper's Hawk-1, American Robin-1, Black Skimmer-1, Horned Lark-1.

^d Thirteen aircraft

Table 1-2. Point of impact of 694 bird strikes reported¹ at JFK during the period of 1994-2009.

Portion of Aircraft Involved in Bird Strike	Number of Strikes	% of Strikes
Engine	135	19.5
Engine Plus Other	43	6.2
Nose	94	13.5
Radome	91	13.1
Windshield	89	12.8
Fuselage	71	10.2
Wing or Rotor	36	5.2
Landing Gear or Tire	33	4.8
Tail	9	1.3
Lights	3	0.4
Multiple Sites – Not Engine	90	13.0
Total	995	100

¹ “Reported strikes” does not include 951 incidents unreported by air carriers in which JFK staff found dead birds on the active runways and taxiways or within safetyways of active runways and taxiways (birds not reported as strike if another cause of death is apparent). Data also does not include 301 strikes for which location of strike was not reported.

Table 1-3. Make and model of aircraft involved in 996 bird strikes reported¹ at JFK, 1994-2009. Information on the aircraft involved in the strike was not provided for 46 reports.

Company	Model	Number of Aircraft with Reported Strikes	% of Total Strikes
Airbus	A320	213	22.4
Boeing	B767	175	18.5
Boeing	B757	99	10.4
Boeing	B747	91	9.6
Airbus	A300	47	4.9
Embraer	EMB190	31	3.3
Saab	SAAB340	30	3.2
Boeing	B777	28	3.0
Boeing	B737	22	2.3
Embraer	EMB135	18	1.9
Airbus	A319	16	1.7
Canadair	CL RJ 100/200	16	1.7
Airbus	A340	15	1.6
Airbus	A330	15	1.6
Boeing	B727	14	1.5
McDonnell Douglas	DC10	14	1.5
British Aircraft	BA31 JETSTR	13	1.4
McDonnell Douglas	MD11	11	1.2
McDonnell Douglas	DC9	10	1.0
McDonnell Douglas	MD88	10	1.0
27 Other Models		60	6.3
		948	100

¹ “Reported strikes” does not include 951 incidents unreported by air carriers in which JFK staff found dead birds on the active runways and taxiways or within safetyways of active runways and taxiways (birds not reported as strike if another cause of death is apparent).

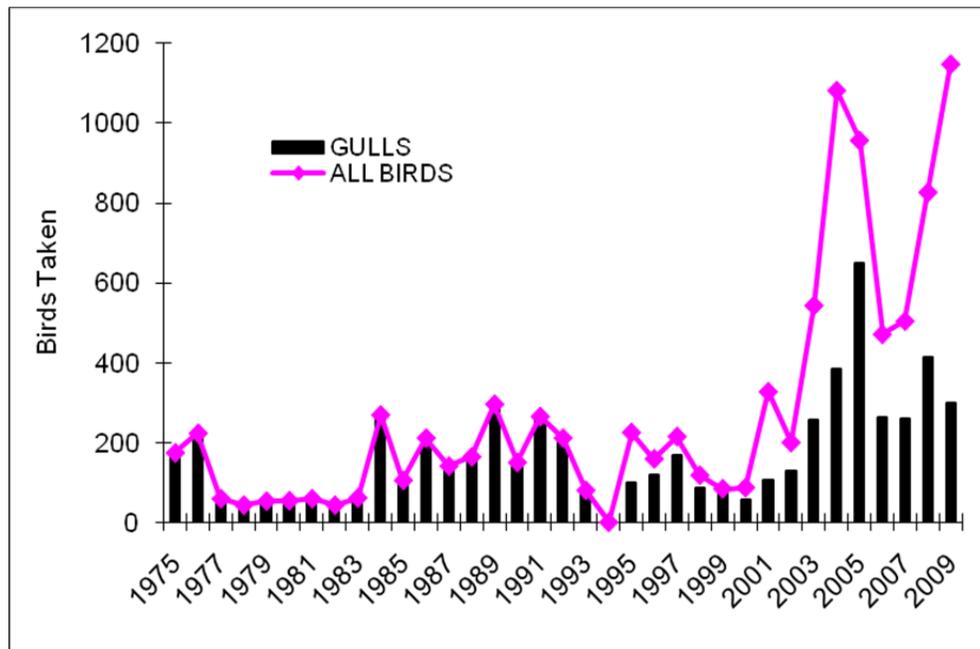


Figure 1-6. Annual take of gulls and all birds by the JFKWMU to reduce hazards to aircraft. Figure excludes birds taken by WS and private contractors.

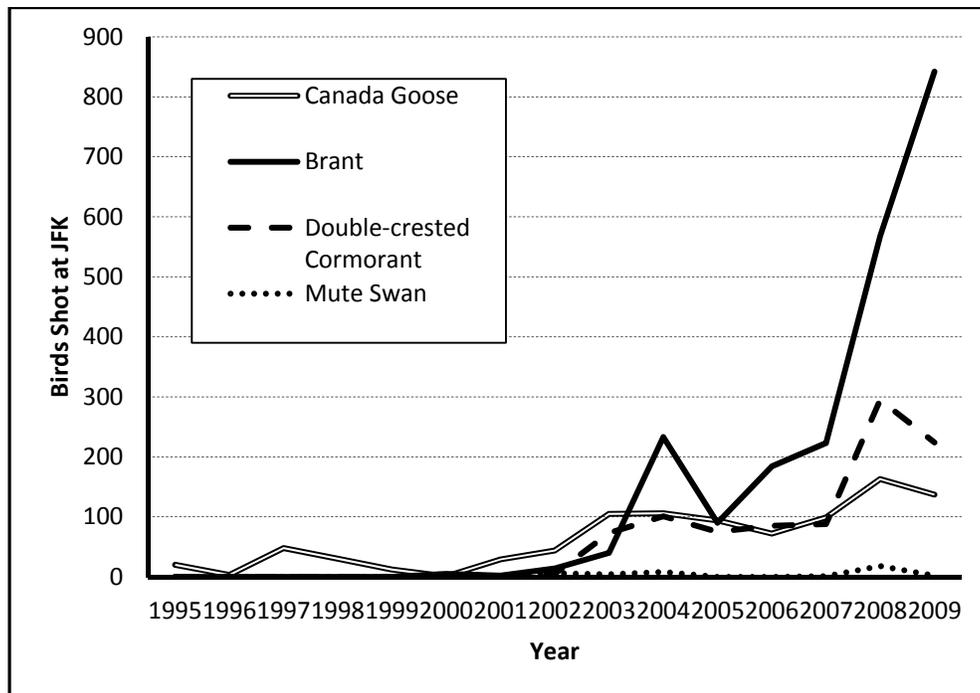


Figure 1-7. Large-bodied birds shot by the JFKWMU and WS to reduce hazards to aircraft at JFK.

Off-airport Strikes

We used reports from the FAA database to assess 267 off-airport bird strikes (Section 1.5) which occurred during the period of 1994-2009. Bird species was not determined for 63% (169) of the off-airport strikes (Appendix C, Table 2). Gulls accounted for the majority of the remaining strikes (unspecified gull - 20 strikes, Herring Gull - 12 strikes, Laughing Gull - 8 strikes, Ring-billed Gull - 2 strikes, Great Black-backed Gull - 1 strike). Aircraft damage was reported for 12 of the 43 gull strikes. Geese were the next most commonly struck species group with six Atlantic Brant strikes, five Canada Goose strikes and five Snow Goose strikes. Aircraft damage was reported for 14 of the 16 goose strikes. Ducks were involved in seven strikes (damage reported for two of the seven strikes) and Double-crested Cormorants in five strikes (damage reported for four of the five strikes). Ospreys were involved in three strikes with damage reported for one of the strikes. All other species were involved in only one or two strikes (Appendix C, Table 2). The seasonal pattern in off-airport strikes shows a peak in October and a smaller rise in the spring which corresponds with fall and spring migration (Fig. 1-8).

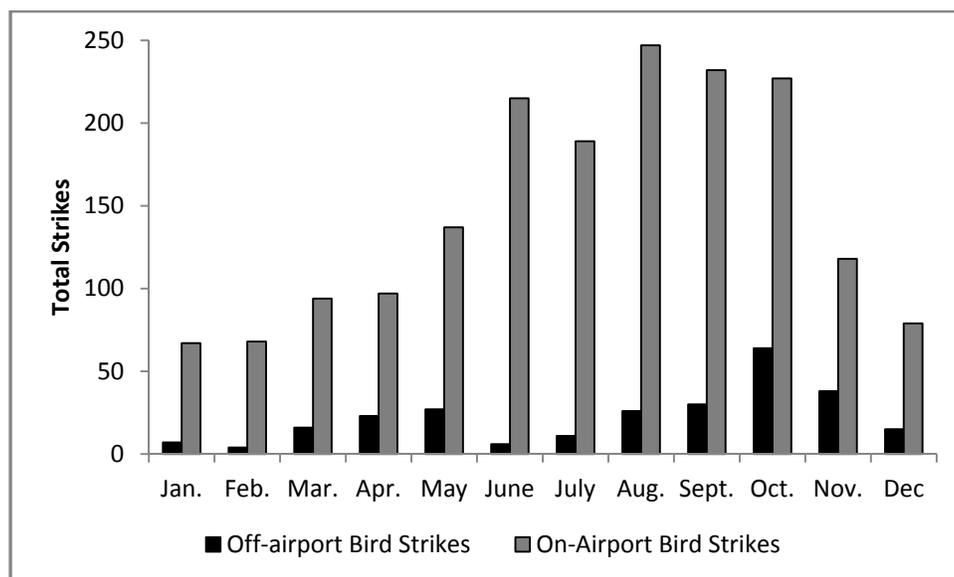


Figure 1-8. Seasonal pattern in on and off-airport bird strikes involving aircraft using JFK during 1994-2009. On-airport strike data are from JFK database. Off-airport strike data are from the FAA national wildlife strike database <http://wildlife-mitigation.tc.faa.gov/wildlife/>.

To estimate the distance of the strike from the airport, we assumed that height above ground level (AGL) increased 300 feet for every 1 mile from the airport. This figure is generally applicable for commercial aircraft on approach to an airport. Over half (68%) of the 267 off airport strikes in our analysis occurred on approach or descent. Elevation of aircraft departing the airport is more variable and depends on the speed, type and size of the aircraft. However, in general, the angle of approach to an airport is shallower than the angle of departure. For example, the strike which resulted in the emergency landing of Flight 1547 in the Hudson River occurred on departure from LaGuardia airport at approximately 2,700-2,800 ft. AGL, but the aircraft was estimated to be approximately 5 miles from the airport. Therefore, our assumption

likely underestimates the number of aircraft strikes which occurred within 7 miles of the airport. Based on our calculations, approximately 65% of off-airport strikes occurred within 5 miles of the airport and 75% of off-airport collisions occurred within 7 miles of the airport (Fig. 1-9).

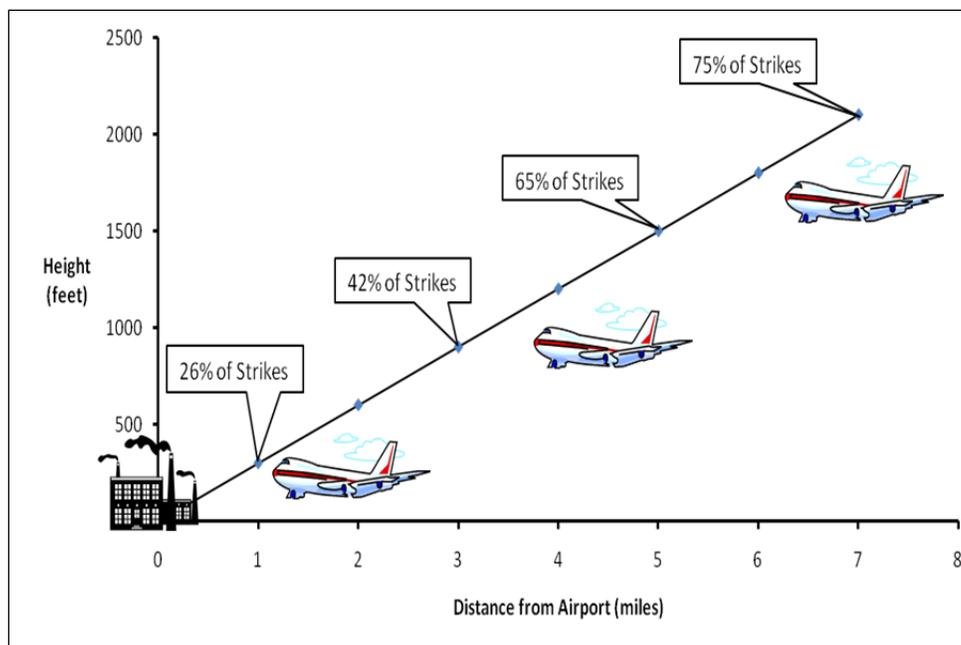


Figure 1-9. Proportion of off-airport bird strikes occurring at or within specific distances from JFK airport for 267 bird strikes reported to the FAA during 1994-2009. Distance from airport was estimated assuming 300 feet elevation for every mile of distance.

1.7 BIRD SPECIES STRUCK BY AIRCRAFT AT JFK

This section is a supplement to material presented in 1994 FEIS Section 1.3 which provides a detailed account of the biology and behavior of many of the species commonly struck by aircraft at JFK. Information below is intended to augment species descriptions in the 1994 FEIS. Species and species groups were selected for detailed discussion below because 1) they occur at JFK; 2) they were identified in FAA Advisory Circular 150/5200-33B (FAA 2007) as being among the species groups posing the greatest hazards to aircraft and/or they were listed among the species posing greater risk to aircraft because of their large body size and increasing abundance (Dolbeer and Eschenfelder 2003). Much of the information in this section is taken from the 2002 WHA conducted by WS (USDA 2002) and the 2004 FAA-approved wildlife hazard management plan (WHMP) developed by JFK (PANYNJ 2004). Additional information on bird populations and biology is provided in Chapter 6 – Environmental Impacts of Alternatives. A summary of strike rates for all species struck from 1994-2009, including species not discussed below, is provided in Appendix C.

1.7.1 Gulls

There are four species of gull found at JFK: Laughing Gulls, Herring Gulls, Great Black-backed Gulls, and Ring-billed Gulls. All the species can be found in the Western Long Island Sound area throughout the year except Laughing Gulls which migrate south during the winter months. Laughing Gulls, Greater Black-backed Gulls and Herring Gulls are known to nest in the Long Island Sound area including in Jamaica Bay (Craig 2009, Tims 1999). Ring-billed Gulls rarely nest in Long Island Sound area. Details on gull behavior and gull attractants at and near JFK are provided in the 1994 FEIS.

All four gull species are protected under the federal Migratory Bird Treaty Act (MBTA) and state law. Permits from the USFWS and NYSDEC are required to take these species.

Sections 1.6 and 1.7.1 above contains details on the on-airport gull strikes since the completion of the 1994 FEIS. At the time the supplemental on-airport shooting program was initiated (1991), gulls were the predominant species group struck by aircraft at JFK and Laughing Gulls comprised the largest percentage of the gull strikes. After the implementation of the WS experimental shooting program in 1991 and subsequent integrated gull hazard management program in 1994, the number of strikes attributable to all gull species has declined (Fig. 1-5). Closure of the Edgemere Landfill, located within approximately 1 mile of JFK, to dumping of putrescible waste in 1991 may have also contributed to the decline in gull strikes. However, gulls continue to be the most frequently observed species guild at JFK (USDA 2002). Herring Gulls are the most frequently struck gull species, replacing Laughing Gulls in 1998 (Fig. 1-3, Washburn et al. 2009). Seasonal patterns in gull strikes and gull activity at JFK remain as described in the 1994 FEIS (Fig. 1-10).

There were 43 off-airport gull strikes reported for the period of 1994-2009, 20 of which were attributed to unspecified gulls, 12 caused by Herring Gulls, 8 by Laughing Gulls, two by Ring-billed Gulls and one by a Great Black-backed Gull. Twelve of the strikes resulted in damage to the aircraft. Thirty six of the off-airport strikes occurred at elevation of 2,000 feet or less and likely occurred within the 5-mile radius of JFK. On additional strike occurred at an elevation of 2,000 feet and may have occurred within 7 miles of JFK. Six strikes occurred at elevations of 2,500 - 4,500 feet.

Gulls were rated 11th among the top wildlife species/species guilds posing hazards to aircraft by (FAA 2007). Rankings were based on percentage of strikes causing damage, major damage (aircraft destroyed or substantial damage occurred), and percentage of strikes having an effect on flight (e.g., aborted takeoff, engine shut down, precautionary landing). Gulls were the most frequently struck bird species group in North America for the period of 1990-2009 and were involved in the greatest number of strikes involving multiple birds (21%; Dolbeer et al. 2011). Three Herring Gull strikes to civil aircraft reported during the period of 1990-2008 resulted in injuries (three people) and two strikes involving Ring-billed Gulls resulted in injuries (eight people; Dolbeer et al. 2009)). An additional eight reported unspecified gull strikes to civil aircraft during this period resulted in injuries to 9 people.

The supplemental on-airport shooting program has contributed to a reduction in the JBWR Laughing Gull colony. Erosion and flooding of the marshes is also a factor in the decline (Section 6.2.1). However, the decline does not appear to have come at the cost of the regional Laughing Gull population. The Laughing Gull populations in Maine and Massachusetts have been relatively stable or increasing since the initiation of the JFK program. The New Jersey population has been variable (Washburn et al. 2009). The regional number of nesting pairs dropped from approximately 55,000 pairs in 1989 to 39,085 pairs in 1995 and then peaked in 2001 at approximately 80,253 pairs. In 2004, there were an estimated 54,481 breeding pairs and 49,000 breeding pairs reported in 2007. At least some of the fluctuation in the New Jersey colonies appears to be related to habitat shifts (Washburn et al. 2009). The Mid Atlantic/New England/Maritimes Region Waterbird Conservation Plan which includes Long Island reports an increasing trend for the Laughing Gull population (MANEM 2006).

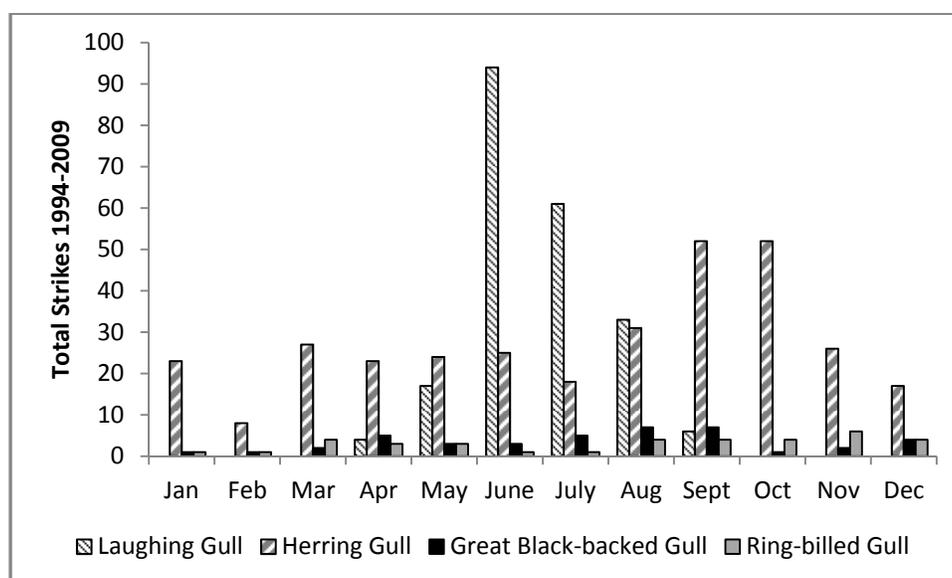


Figure 1-10. Seasonal patterns in on-airport gull strikes at JFK for the period of 1994-2008.

Herring Gulls breeding range expanded from central Maine south along the Atlantic coast during the 1950s-1980s (Good 1998, Pierotti and Good 1994). Herring Gull range has continued to expand southward, possibly because of competition with Great Black-backed Gulls (Pierotti and Good 1994). The Mid Atlantic/New England/Maritimes Region Waterbird Conservation Plan which includes Long Island reports a decreasing population trend for Herring Gulls in the U.S. and Canada (MANEM 2006). Audubon Christmas Bird Count data also show a decreasing trend for Herring Gulls during the period of 1980-2009 (National Audubon Society 2010). Review of data from the U.S. Geological Survey, Breeding Bird Survey (BBS) data for the period of 1980-2007 indicates that Herring Gull populations have been relatively stable to slightly decreasing in New York and USFWS Region 5⁸ and nationwide (-2.5 - -0.9% per year, $P \geq 0.40$).

⁸ USFWS Region 5 includes the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New Hampshire, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia.

Like Herring Gulls, Great Black-backed Gulls have been expanding their range southward into Maryland, Virginia and South Carolina (Good 1998). North American populations may currently exceed historic levels because of the abundance of new anthropogenic (human generated) food sources. Ring-billed Gulls are one of the most common gull species. In 1990, the North American Ring-billed Gull population was estimated at 3-4 million birds (Ryder 1993). The Mid Atlantic/New England/Maritimes Region Waterbird Conservation Plan reports increasing regional population trends for Ring-billed Gulls and Great Black-backed Gulls (MANEM 2006). Audubon Christmas Bird count and BBS data also show slightly increasing trends for Ring-billed Gulls, but a stable or slightly decreasing trend for Great Black-backed Gulls (Sauer et al. 2008, National Audubon Society 2010).

1.7.2 Canada Geese

Although Canada Geese are not one of the most frequently struck species at JFK (Figure 1-11), they do pose one of the greatest risks to aircraft because of their size and tendency to fly in flocks. Aircraft engines are designed to withstand the ingestion of a 4-lb. bird into the engine without resulting in an uncontained fire or engine failure. With a body mass of 9-11 lbs. (Madge and Burn 1988) and flocking behavior, Canada Geese pose a serious risk to aircraft safety.

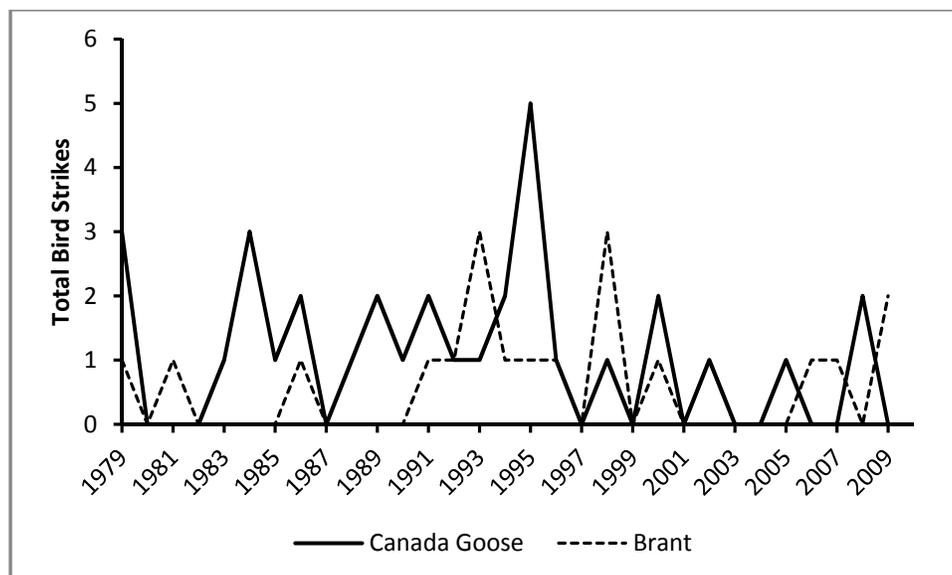


Figure 1-11. Total on-airport Canada Goose and Atlantic Brant strikes at JFK.

The Canada Goose population can be divided into resident and migratory populations for management purposes. Migratory Canada Geese pass through the Long Island area, and some birds winter on Long Island. However, relatively few of these geese occur in Western Long Island (B. Swift, NYDEC, pers. comm.). Resident Canada Geese live year-round in Metropolitan New York. The resident Canada Goose population in New York is different from the population that historically nested in the area (USFWS 2005). The original pre-Colonial population likely was primarily the subspecies *Branta canadensis canadensis*, but these birds

were eventually extirpated from the state. The current population was introduced in the early 20th century and came from a variety of sources including state agency release programs started in 1919 using imported game farm stock (USFWS 2005). Additional domestic and semi-domestic birds were released by private individuals and hunt clubs in 1935 when the use of live decoys was banned. Consequently, the current resident Canada Goose population in the Long Island area is a mix of various subspecies including *B. c. maxima*, *B. c. moffitti*, *B. c. interior*, *B. c. canadensis* (USFWS 2005).

An estimated 20,000-25,000 resident Canada Geese live year-round in metropolitan New York region (including Long Island and Rockland/Westchester counties). Some resident geese from New England also winter in the NYC area, especially during more severe winters. Canada Geese have been seen at JFK during all times of the year, and are often seen crossing the airport from Gateway NRA to feeding and loafing sites in the city (USDA 2002). Canada Geese make extensive use of fields, lawns and other grassy areas for feeding and loafing. Resident Canada Geese have also learned to accept food provided by people. Although the resident Canada Geese may show a preference for a particular site, they do make use of multiple locations. In a study of banded resident Canada Geese in the NYC area (Seamans et al. 2009), the proportion of observations which occurred at each of 9 the original banding location ranged from 7 - 58% (median 32%). Depending upon the original banding location, the number of additional locations where banded geese were observed ranged from 5-14 (median 10 locations).

Canada Geese are protected under the MBTA and state law. However, both the USFWS and NYSDEC have special regulations in place to facilitate management of conflicts with Canada Geese. The federal rule (FR 17:154 pages 45963-45993) gives state wildlife management agencies, private and public landowners, and airports additional flexibility to deal with problems, conflicts, and damages caused by resident Canada Geese. The rule includes Airport and Nests and Eggs Depredation Orders. Under these orders, the appropriate State wildlife agency, U.S. Fish and Wildlife Service, other official agent (e.g., WS), or, in some cases, landowners and airport managers are authorized to conduct certain resident Canada Goose damage management activities without needing to apply for USFWS Migratory Bird Permits. The control and depredation orders may only be implemented between April 1 and August 31, except for the take of nests and eggs which could be implemented in March. Individuals and agencies are required to report actions taken under the depredation order to the USFWS. Similarly, the NYSDEC has established a General Depredation Order for the take of Canada Geese. The depredation order authorizes any person to take any number of Canada Geese between April 1 and September 15, and any number of goose nests or eggs in accordance with the federal airport control order, or any other federal permit or authorization. Permits from the USFWS and NYSDEC are required for all other goose take.

During the period of 1994-2009 there were 15 on-airport strikes involving 24 Canada Geese at JFK (Fig. 1-11). Five of the seven air-carrier reported Canada Goose strikes included information on damage to the aircraft. The average annual number of on-airport Canada Goose strikes for JFK during the period of 1994-2009 (Canada Goose - 0.9 strike/year, range 0-5 strikes/year) is similar to that reported in the 1994 FEIS for 1979-1993 (Canada Goose - 1.2 strikes/year, range 0-3 strikes/year). However, the number of Canada Geese taken on-airport to reduce wildlife hazards to aircraft has increased substantially in recent years (Fig. 1-7), which

may be indicative of a general rise in problems with geese. Five off-airport Canada Goose strikes were reported by air-carriers using JFK during the period of 1994-2009. Three of the strikes resulted in damage to the aircraft. Four of the strikes occurred at 2,000 feet elevation or less and likely occurred within the 7 mile radius of JFK. The remaining strike occurred at 4,000 feet.

Nationally, geese were ranked second out of the 23 bird species/species groups determined to be most hazardous to aircraft (FAA 2007). Nationwide, for the period of 1990-2009, there were 1,238 reported strikes involving Canada Geese (630 involving multiple birds; Dolbeer et al. 2011). Fifty-one percent of the strikes resulted in damage to the aircraft. Reported damage from the strikes was \$88,904,019. During the period of 1990-2008, a Canada Goose strike resulted in the death of two individuals in a civil aircraft and 15 strikes resulted in the injury of 18 people (Dolbeer et al. 2009). An additional seven people were injured in strikes involving an unspecified goose species. In 1995, 25 lives were lost when an E-3B "AWACS" military aircraft struck a flock of Canada Geese at Elmendorf, Alaska. A January 15, 2009 Canada Goose strike involving multiple birds caused both engines of flight 1549 out of LaGuardia Airport to fail and resulted in the emergency landing of the aircraft in the Hudson River (Marra et al. 2010). Thanks to the skill of the flight crew and emergency responders, all 155 people on board the aircraft survived the incident. The aircraft was completely destroyed.

As noted in Section 1.3, nationwide, the proportion of all bird strikes involving commercial aircraft which occurs off-airport has increased over the period of 1990-2009 as has the proportion of damaging strikes (Dolbeer 2011). A separate review of Canada Goose strikes conducted by Dolbeer (2011) showed patterns similar to but more pronounced than those for all birds combined. The proportion of all Canada Goose strikes which occurred off-airport (> 500 feet AGL) increased from approximately 25% in the early 1990s to approximately 40% during 2005-2009. The proportion of strikes causing damage to aircraft also increased during this period from approximately 25% in the early 1990s to about 50% during 2005-2009. Canada Goose strike rates (strikes per 1 million aircraft movements) on and off-airport generally increased from 1990-1994 and 2000-2004, but decreased from 2005 to 2009. However, the decline was greater for on-airport strikes (0.83 to 0.53) than for off-airport strikes (0.48-0.39). Canada Goose strikes resulting in substantial damage increased off airport for entire study period. However, on-airport strikes resulting in substantial damage increased from 1990-1994 through 2000-2004, but decreased from 2005-2009. The decrease in on-airport strikes may be attributable to increasing implementation of bird hazard management programs at airports.

Both resident and migrant Canada Geese have been involved in strikes at JFK. Isotope analyses indicate that the strike which resulted in the emergency landing of flight 1549 was likely caused by geese which had spent time in the Labrador Region of Canada (i.e., migrant geese), but the majority of the strikes at JFK appear to be attributable to resident geese. The USFWS has determined that most if not all Canada Geese in New York from April 1 through September 15 are members of the resident goose population, so strikes during this period can be attributed to resident birds. Of the 15 Canada Goose strikes reported at JFK for the period of 1994-2009, seven (47%) occurred during the period of April - September and involved resident birds (Fig. 1-12). Strikes during the rest of the year could involve either resident or migrant birds. We do not know what proportion of the strikes which occur from January - March and October - December,

however we can make an informed estimate based on the relative proportion of resident and migrant geese in the overall goose population (Dolbeer 2010). From 1990-2009, the USFWS estimated that resident birds made up approximately 64.4% of the total Canada Goose population (USFWS 2009; Dolbeer and Steubert 2010). Assuming that geese are involved in strikes in proportion to their abundance, then five of the Canada Geese struck from October - March were also resident birds. Using these estimates, 80% of the Canada Goose strikes reported at JFK for the period of 1994-2009 involved resident birds. Bird banding data also indicate that resident birds contribute to the goose strike hazard at JFK. Three hundred resident Canada Geese in the NYC area were banded and their movements monitored in order to assess goose movements relative to JFK and LaGuardia airports (Seamans et al. 2009). Birds were monitored from August 2006 until July 2008. During this period, three of the 327 Canada Geese shot during wildlife hazard management operations at JFK were birds banded for the study at Brookville Park, Baisley Pond Park and Woodmere Park. An additional Canada Goose which was banded at Pennsylvania Avenue Landfill for a different project was also shot at JFK during this period (Seamans et al. 2009).

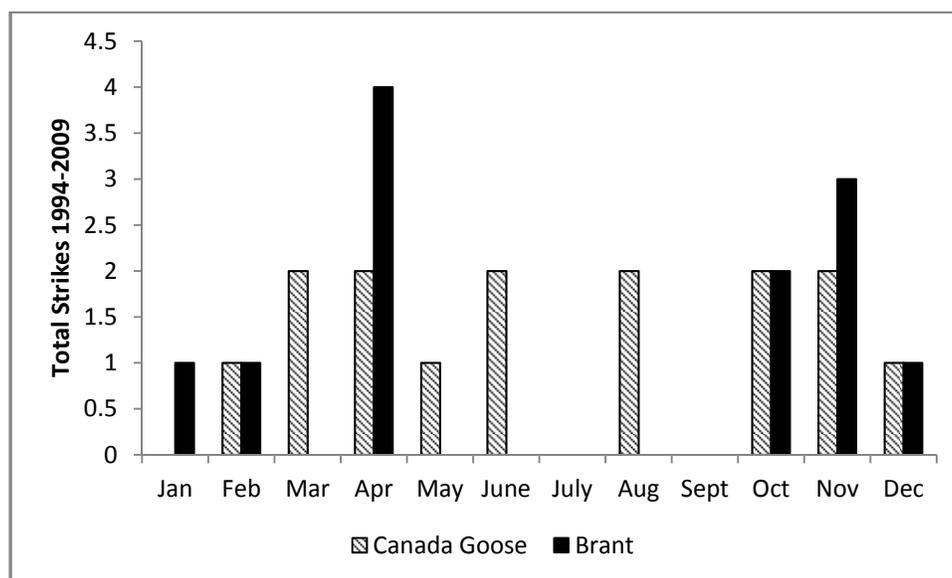


Figure 1-12. Seasonal patterns in on-airport goose strikes at JFK for the period of 1994-2009.

The 2009 Canada Goose strike which resulted in the emergency landing on the Hudson River occurred when the plane was at 2,700-2,800 ft. elevation. However, goose strikes usually occur at much lower elevations and are likely associated with local movements and not long distance migrations. We reviewed 1,084 Canada Goose strike reports for U.S. airports in the FAA national wildlife strike database which provided information on the height of the strike for the period of 1990-2009. Thirty-six percent of the strikes occurred while the aircraft was on the ground (e.g., taxi, landing roll, takeoff run) and 68% of strikes at or below 300 feet above ground level (AGL). Eighty percent of strikes occurred at or below 1,500 feet AGL. Distance of strikes from the airports was more difficult to determine because only 472 (43%) of the reports with information on height of strike provided any information on distance from the airport and 423 of

the strikes (39%) reported distance as 0 (strike occurred on-airport). The relationship between height above ground and distance from airport tends to be more consistent for aircraft on approach than for aircraft on departure and an estimate of 1 mile of distance per 300 ft. can be used as a general rule of thumb (L. Francoeur, PANYNJ, pers. comm.). On departure, the relationship between height and distance will be more variable depending on factors such as the size of the aircraft, type of engine, and local rules established to minimize noise impacts on local communities. Data for landing aircraft (i.e., aircraft on descent, approach or landing roll phase of flight) indicates that approximately 89% of goose strikes involving landing aircraft occur within 7 miles of the airport (Figure 1-13). For reasons noted in section 1-5, this is likely a conservative estimate of the number of goose strikes which occurred within 7 miles of the airports

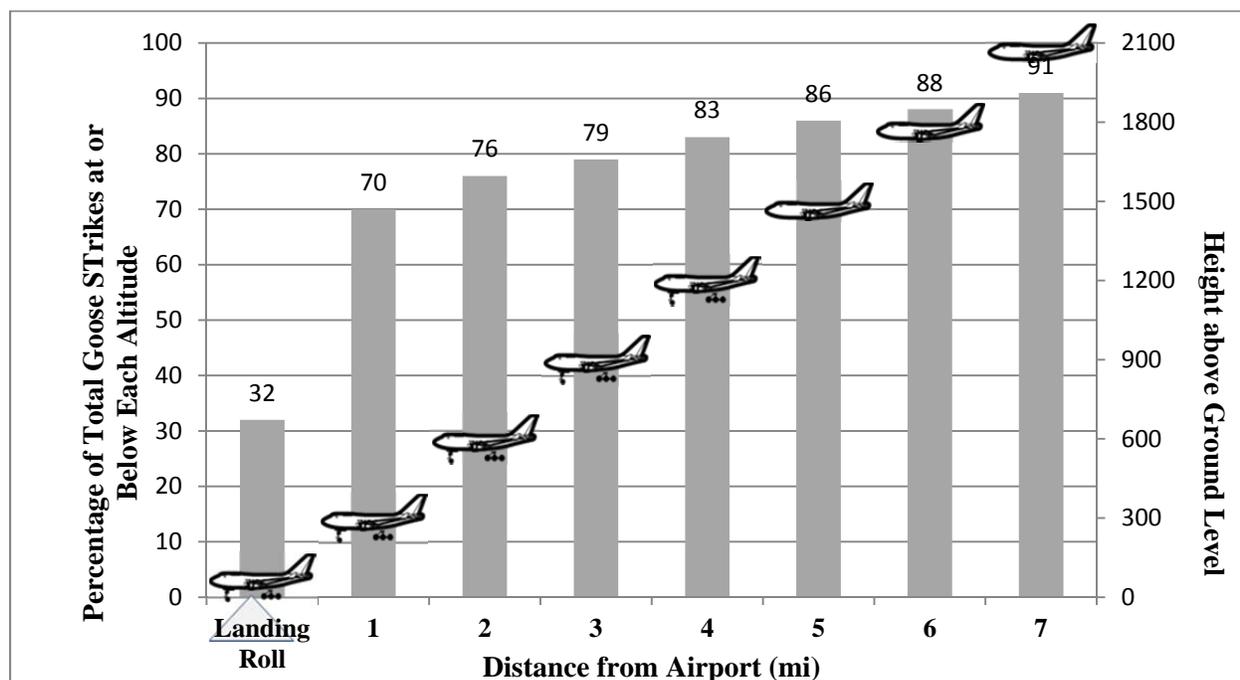


Figure 1-13. Elevation of strike and estimated distance from airport for 662 Canada Goose strikes involving aircraft landing at U.S. civil airports 1990-2009 (FAA Bird Strike Database). Distance from airport assumes 1 mile distance per 300ft above ground level. Approximately 61% of all bird strikes reported by commercial aircraft in the U.S. for the period of 1990-2009 occurred during landing (descent, approach or landing roll; Dolbeer et al. 2011).

The increase in goose hazards at JFK may be attributable, in part, to the increasing population of resident Canada Geese which poses a year-round threat to aircraft safety at JFK (Fig. 1-12; Sauer et al. 2008, USFWS 2005). In 1992, the breeding population of Canada Geese in New York State was estimated at 115,981 birds. By 2000 there were 153,593 resident Canada Geese and numbers peaked in 2007 with an estimated 249,700 Canada Geese in New York State (USFWS 2008a, <http://mbdcapps.fws.gov/>). The estimated number of breeding Canada Geese in New York has declined to 200,000 birds in 2009 but increased to 228,670 in 2010 (USFWS 2010). As noted above, the resident Canada Goose population in Long Island and NYC has been roughly estimated at approximately 20,000-25,000 birds (B. Swift, NYSDEC, pers. comm.).

1.7.3 Atlantic Brant and Snow Geese

Atlantic Brant and Snow Geese are the two other goose species which may pose risks to aircraft at JFK. Both species are protected under the MBTA and state law. Of the two, brant pose the greatest risk because they are more abundant and use portions of Jamaica Bay adjacent to the airport to feed and rest. Brant are considerably smaller than Canada Geese weighing approximately 3.5 lbs. (Madge and Burn 1988), but are found throughout Jamaica Bay and surrounding areas in large numbers during the winter, and during spring and fall migration. A few individuals may remain in the area throughout the year. Western Long Island, including Jamaica Bay and the Hempstead Bays adjacent to JFK, is a primary spring staging area for most of the 150,000 Atlantic Brant that typically winter on the Atlantic coast (Reed et al. 1998, <http://www.state.nj.us/dep/fgw/brant03/html/report.htm>), with about 60,000 Atlantic Brant spending the full winter in this area (Paul Castelli, New Jersey Fish and Wildlife, personal communication; Bryan Swift, NYSDEC, pers. comm.; and www.hoola.info/map/4s3W1n2FJ2Lm2G2O3gz3D1xf). Atlantic Brant generally prefer submerged aquatic vegetation and spend most of their time in relatively close proximity to water. However, due in part to declines in preferred foods, the brant overwintering along the Atlantic coast have been including cultivated grasses in their diet and are increasingly found foraging at sites similar to those used by Canada Geese (Ward et al. 2005). The use of upland sites means that there is more movement of brant from natural areas in Gateway NRA and the Hempstead bays to feeding and loafing sites in the city (e.g., parklands, golf courses, highway medians, etc.) and a corresponding increase in brant movements through JFK airspace.

The average annual number of on-airport brant strikes for JFK during the period of 1994-2009 (0.7 strikes/year, range 0-3 strikes/year) is similar to that reported in the 1994 FEIS for 1979-1993 (0.5 strikes/year, range 0-3 strikes/year; Fig. 1-11, 1-12). However, the number of brant taken on-airport to reduce wildlife hazards to aircraft has increased substantially in recent years (Fig. 1-7), which may be indicative of a general rise in problems with these species. Off-airport, there were 4 reported strikes involving brant, 3 of which caused damage to the aircraft. Two strikes occurred at 300 feet elevation or less and the two remaining strikes occurred at 3,000 feet.

Nationally, geese were ranked second out of the 23 bird species/species groups determined to be most hazardous to aircraft (FAA 2007). When an aircraft strikes a goose, it often results in damage to the aircraft and expensive repair costs. During the period of 1994-2008, there were 10 strikes involving 20 brant. One of the two air-carrier reported brant strikes included information on damage to the aircraft. Nationwide, for the period of 1990-2009 there were 20 strikes involving brant (9 with multiple birds; Dolbeer et al. 2011). Reported damage from the strikes was \$51,271. During the period of 1990-2008, there were no reports of injuries associated with Atlantic Brant strikes, but seven strikes involving unspecified goose species resulted in injuries to seven people were reported (Dolbeer et al. 2009).

Atlantic Brant are strongly dependent upon a relatively narrow range of natural food sources which makes the population vulnerable to starvation during severe winters when coastal waters freeze. Cultivated grasses and agricultural crops do provide an alternate food source when preferred foods are limited (Ward et al. 2005). Breeding season for brant is also very short and severe weather on the Arctic breeding grounds can result in production failures. Consequently

Atlantic Brant populations are subject to considerable annual fluctuations (Arctic Goose Joint Venture 2008). However, in general, the Atlantic Brant population has been increasing (Arctic Goose Joint Venture 2008, Ward et al. 2005, Atlantic Flyway Council 2002). Since 1990, the number of Atlantic Brant counted in the Midwinter Waterfowl Survey has fluctuated between 100,000 and 180,000, averaging about 147,000 birds. This is above the North American Waterfowl Management Plan population goal of 124,000 birds (Atlantic Flyway Council 2002).

Based on field observations and strike data, limited numbers of Snow Geese routinely winter in remote areas of Jamaica Bay. Mid-winter counts from 1973-2008 for the entire NYC-Long Island region averaged 223 birds, with peak counts of less than 1,100 (http://nybirds.org/Articles/wfc73-08_r10.pdf). During winter and migration Snow Geese forage primarily on underground rhizomes tubers and roots. They also graze on new shoots of aquatic and agricultural plants and will forage in agricultural fields for waste grain (Mowbray et al. 2000). Snow Geese do not appear to be attracted to sites in the city like Canada Geese and Atlantic Brant which may explain why Snow Goose observations and on-airport Snow Goose Strikes are rare. For the period of 1994-2009 there has only been 1 on-airport reported Snow Goose strike with no reported damage to aircraft. Five off-airport snow-geese strikes have been reported for JFK, all of which resulted in either moderate or severe damage to the aircraft. However, four of the five off-airport strikes occurred at elevations of 3,000 feet or more and likely occurred outside the 7-mile radius of JFK. No Snow Geese have been taken by the JFKWMMU or WS to reduce hazards to aircraft at JFK. Consequently, Snow Geese are not currently considered a priority threat to aviation at JFK and are not addressed further in this section.

1.7.4 Mute Swans

Mute Swans were not discussed in the 1994 FEIS. Like Canada Geese, Mute Swans are observed moving between the Gateway NRA and feeding sites in freshwater ponds and rivers in the city. Mute Swans are not native to the United States. The first introductions of Mute Swans to the wild from captive populations are believed to have occurred along the Hudson River in 1910 and in Long Island, New York in 1912 (Atlantic Flyway Council 2003). Mute Swans are present in the Long Island/NYC area throughout the year. Like Canada Geese, Mute Swans also accept food handouts from people.

Mute Swans are not protected under the MBTA and no state or federal permits are required to take Mute Swans. However, Mute Swans are protected by New York State law (as are all wild waterfowl), so permits from NYSDEC are required to take Mute Swans or to disturb their nests or eggs. The NYCDEP prohibits capture and relocation of Mute Swans.

Although there has been only one on-airport Mute Swan strike at JFK (1999) during the period of 1994-2009, no off-airport strikes, and no air-carrier reports of damage, Mute Swans are addressed here because their size (approximately 20-24 lbs., Madge and Burn 1988) makes them particularly hazardous to aircraft (Dolbeer and Eschenfelder 2003) and because they are present all times of the year. The fact that Mute Swans have been taken on-airport (Fig. 1-7) is also an indication that Mute Swans are passing through JFK airspace. Nationwide, there have been 5 reported strikes involving Mute Swans for the period of 1990-2009, one of which involved

multiple birds (Dolbeier et al. 2011). Damage was not reported for any of the strikes. Mute Swans have been taken to reduce on-airport hazards to aircraft at JFK (Fig. 1-7).

Data from the Atlantic Flyway Mid-summer Mute Swan Survey indicated there were an estimated 2,624 Mute Swans in New York state during the 2008 breeding season, 1,843 of which were in the Long Island area and 307 were in the Hudson River Valley/Eastern New York (Atlantic Flyway Council 2009, <http://www.dec.ny.gov/animals/47734.html>). Winter counts, which do not cover the entire NYC and Long Island region, typically vary from 1,000-1,500 Mute swans. Gateway NRA monitors the Mute Swans present in the bay and has, in some years, added eggs at East and West Pond (Ruler's Bar Hassock) to reduce non-native Mute Swan numbers and associated impacts on native plant and animal species. No egg addling was conducted from 2004-2008. In 2008, 342 adult Mute Swans and 46 cygnets were counted at Gateway NRA. Egg addling resumed in 2009. The number of Mute Swan decreased to 150 adults and no cygnets in 2009 and 143 adults and 6 cygnets in 2010 (Gateway NRA, unpublished data). For the period of 1980-2007, BBS data indicate Mute Swan populations have been increasing in New York State (8.4% per year, $P = 0.06$), USFWS Region 5 (13.1% per year, $P < 0.01$; Sauer et al. 2008). During the 16-year period from 1986-2002, the annual mean growth rate for the Mute Swan population in the Atlantic Flyway was approximately 6%. The population appeared to reach a peak of approximately 14,300 birds in 2002 and has subsequently declined to approximately 10,541 swans in 2008 (Atlantic Flyway Council 2009). Factors contributing to the decline include changes in survey effort, density dependence factors and on-going population reduction efforts conducted by states in the flyway (Atlantic Flyway Council 2009).

1.7.5 Double-crested Cormorants

Double-crested Cormorants are large fish-eating birds which nest and feed in New York/New Jersey Harbor, the Long Island Sound and associated waterways. Cormorants are colonial waterbirds which nest and feed in groups. Like geese and Mute Swans, cormorants are a particular hazard to aircraft because of their body size (wingspan of 45-48 inches (114-123 cm)) and mass (2.8-5.5 lbs. (1,200-2,500 g), slow flight speeds, and their natural tendency to fly in flocks (Cornell Lab of Ornithology 2009; Dolbeier and Eschenfelder 2003). Cormorants frequently fly over the airport in flocks from 4-50 birds, but appear to be struck less frequently than they are seen (Fig. 1-14). Cormorants are harassed or shot when crossing over the airport at low altitude, but are frequently flying too high to be in range of pyrotechnics or shotguns. Although cormorants are migrants, some birds appear over-winter in the area, and strikes have occurred in summer and winter months (Fig. 1-15).

Since the completion of the 1994 FEIS (1994-2009), there have been 16 on-airport cormorant strikes at JFK involving 17 birds. Six of the 10 air-carrier reported strikes for 1994-2009 resulted in damage to the aircraft (Appendix C). There isn't a significant difference between cormorant strike rates before and after the completion of the EIS (1979-1993 0.6 strikes/year, range 0-2 strikes/year; 1994-2009 1 strike/year, range 0-4 strikes/year; ANOVA $P = 0.35$). However, the number of birds that WS and the JFKWMU have lethally taken per year has increased in recent years (Fig. 1-7). The JFKWMU added shooting to the integrated program to reduce risks caused by cormorants in 2000 with only a few (1-5) birds taken per year for the first

few years. The number of cormorants killed to reduce hazards to aircraft increased substantially in 2003 and has ranged from 73 to 295 birds per year since that time (Fig. 1-7). Increases in 2008 and 2009 may be partially attributable to the 2 month extension of the supplemental on-airport shooting program started in 2008. There have been five reports of off-airport cormorant strikes for JFK during the period of 1994-2009, four of which resulted in damage to the aircraft (Appendix C, Table 2). Four of the off-airport strikes occurred at 400 ft. AGL and one occurred at 1,500 AGL.

Cormorants were rated third among the 23 top bird species/species groups evaluated for hazards to aircraft (FAA 2007). Nationwide, for the period of 1990-2009 there were 79 reported strikes involving Double-crested Cormorants, and 9 of which involved multiple birds (Dolbeer et al. 2011). There was \$2,804,722 in damage reported for the strikes (Dolbeer et al. 2011). One of the strikes which occurred between 1990 and 2008 resulted in the injury of a person in the aircraft (Dolbeer et al. 2009).

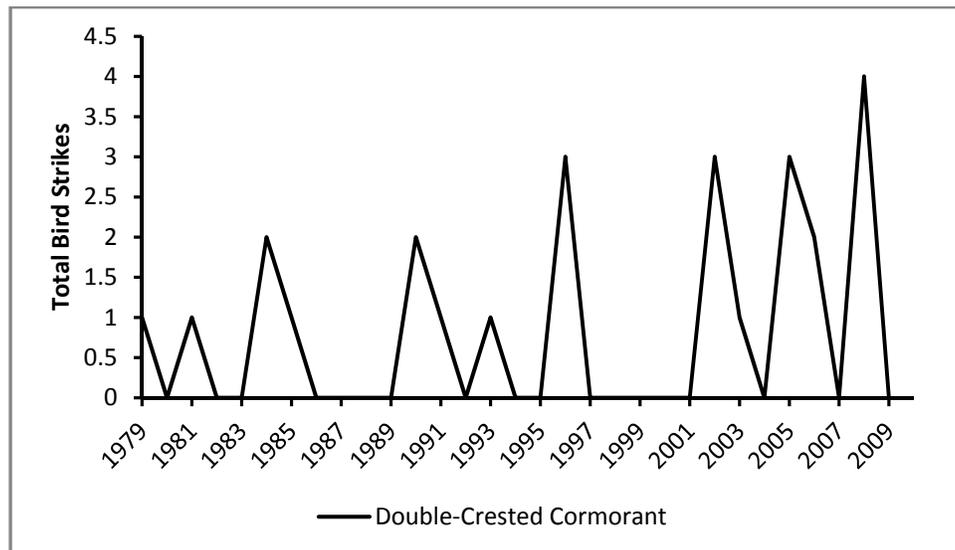


Figure 1-14. Annual on-airport Double-crested Cormorant strikes at JFK. Cormorants are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take cormorants to reduce hazards at airports.

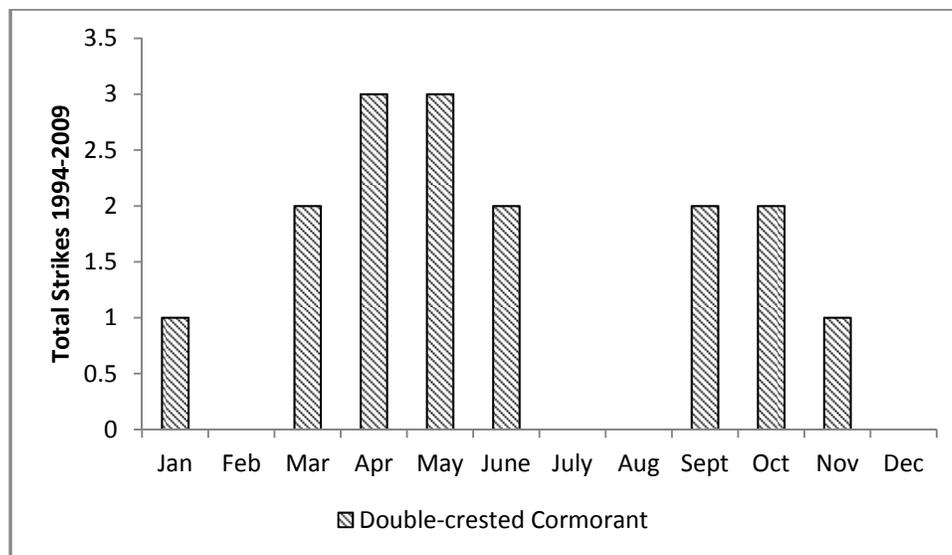


Figure 1-15. Seasonal patterns in on-airport Double-crested Cormorant strikes at JFK for the period of 1994-2009.

Increases in conflicts with cormorants may be related to increasing cormorant populations in the Eastern U.S (USFWS 2003). The NYC Audubon Society Harbor Herons Project (S. Elbin, NYC Audubon, unpublished data) indicates that the number of cormorant nests in the New York/New Jersey Harbor area has varied substantially over time (Section 6.3.1.3). Although the current nesting population (1,411 nests in 2010 and 1,380 nests in 2011) is below the peak of 1,806 nests in 1995, there does appear to be a generally increasing trend for the period of 1986-2011. Of particular interest is the cormorant colony in Jamaica Bay. In 2007, 31 of the cormorant nests were observed at Elders Point West in Jamaica Bay and by 2009, there were 83 nests at Elder's Point West. In 2010, the Elders Point West site was abandoned due to initiation of a marsh restoration program at the site but 4 nests were observed at the newly restored Elders Point East. In 2011, the number of nests at Elders Point East had increased to 96 pairs. For the first time since 1986, cormorants were also recorded nesting at Canarsie Pol in 2010 (144 nests) and 2011 (34 nests). Total cormorant nests in the bay increased from 31 in 2007 to 144 in 2010 and then decreased to 130 in 2011.

1.7.6 Osprey

The Osprey is a large fish-eating raptor (wingspan 59-71 in. (150-180 cm), weight 3.1 - 4.4 lbs. (1,400-2,000 g); Cornell Lab of Ornithology 2010). Osprey frequently take their catch to FAA radio towers or even to the runways to feed. Because of their large size and slow speed when taking off, Osprey present a substantial hazard to aircraft. Osprey were the second most commonly observed raptor species (29 observations, 22% of all raptor observations) during the 2001-2002 WHA (USDA 2002). Osprey are a species of special concern in New York State and the NPS keeps nesting platforms for Osprey within Gateway NRA. The NPS and PANYNJ consult regarding the location of osprey nesting platforms within Gateway NRA to minimize Osprey activity at or near JFK. The PANYNJ has removed abandoned telephone poles and other potential nesting and perching sites to reduce the presence of osprey at the airport.

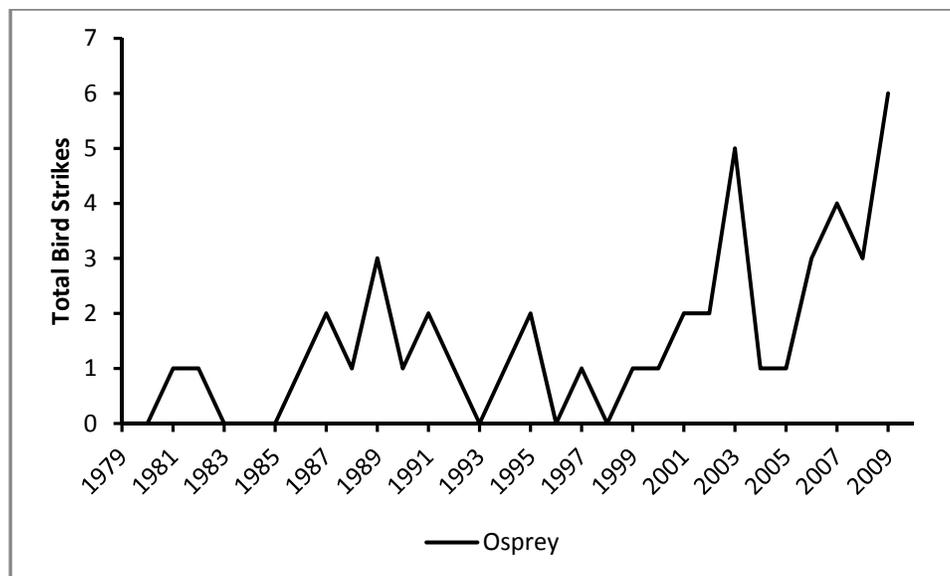


Figure 1-16. Annual on-airport Osprey strikes at JFK.

Osprey are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take or relocate Osprey to reduce hazards at airports.

The average Osprey strike rate for the period of 1994-2009 (2.1 Osprey strikes/year; range 0-6 strikes/year) at JFK, was significantly greater than the average of 0.9 strikes/year (range 0-3 strikes/year) reported in the 1994 FEIS (ANOVA, $P = 0.02$, Fig. 1-16). The JFKWMMU reports increasing incidents of Osprey attempting to use airport property. Osprey have been particularly resistant to harassment and may not respond at all, especially if they are eating a fish. One Osprey was shot in 2008 to reduce hazards to aircraft and two birds were shot in 2009. Birds were only shot if they were on the runway or in the runway safety area and had failed to respond to harassment. Osprey strikes have occurred at JFK from April to October. There have been three off-airport strikes reported for JFK during the period of 1994-2009, one of which resulted in damage to the aircraft (Appendix C, Table 2).

Osprey were rated number 7 among the 23 top bird species/species groups evaluated for hazards to aircraft (FAA 2007). Nationwide, for the period of 1990-2009, there were 168 reported Osprey strikes, three of which involved multiple birds (Dolbeer et al. 2011). There was a reported \$292,923 in damage associated with the strikes (Dolbeer et al. 2011). Two of the Osprey strikes which occurred from 1990-2008 caused injuries to people (2) on the aircraft (Dolbeer et al. 2009). All of the strikes have occurred at 1,100 ft. AGL or lower.

The apparent increase in Osprey activity on and near JFK may be related to increasing 1980-2007 Osprey population trends for USFWS Region 5 and the Eastern BBS Region (7.2%/year, $P < 0.01$; and 3.9%/year, $P < 0.01$ respectively; Sauer et al. 2008). Data from Jamaica Bay banding project by the NYCDEP also indicate increases in the number of Osprey young hatched in the bay (Fig. 1-17). Three of the nine air-carrier reported strikes for 1994-2008 resulted in damage to the aircraft (Appendix C). All of the Osprey strikes that occurred from 1993-2008

involved only 1 bird. The seasonal distribution of Osprey strikes has changed slightly from that reported in the 1994 FEIS and includes the period of April – October and not just the July – October window reported in the 1994 FEIS.

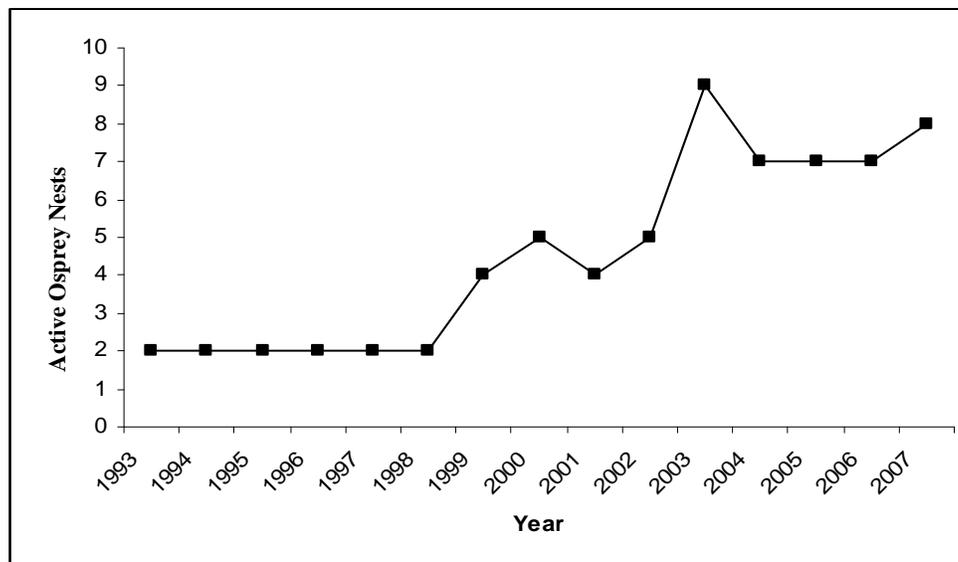


Figure 1-17. New York City Department of Environmental Protection data on Osprey nests in Jamaica Bay.

1.7.7 Ducks

Most of the duck species seen at and adjacent to JFK in Jamaica Bay are migrants and usually only present during late fall and winter months. However, Mallards and American Black Ducks are resident in New York and have been seen at JFK throughout the year (USDA 2002).

Mallards and American Black Ducks accounted for 71% of duck observations during the 2001-2002 WHA (USDA 2002). Other duck species such as American Widgeon, Gadwall, Green-winged Teal, Bufflehead, scaup, and Ruddy Ducks are rarely struck by aircraft, despite the large numbers of them at Jamaica Bay during migration (Appendix C). The 2008 New York State Ornithological Association January waterfowl count recorded 11,023 scaup, 1,028 Goldeneye, 3,209 Bufflehead, 3,341 Ruddy Ducks, 87 Northern Pintail, 1,003 wigeon, and 1,235 Gadwall in Region 10 - Long Island (<http://www.nybirds.org/Articles/WFC2008.pdf>).

Ducks are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take ducks to reduce hazards at airports.

For the period of 1994-2009, the number of Mallards struck on-airport has ranged between 0 and 5 strikes/year and has averaged 1.4 strikes/year (Fig. 1-18), down from an average of 3.1 strikes/year (range 0-10 strikes/year for 1997-1993; ANOVA, $P = 0.02$). During the same period, on-airport Black Duck strikes ranged from 0-3 strikes/year with an average of 0.7 strikes/year, down from 2.1 strikes/year (range 0-5 strikes/year) reported in the 1994 FEIS (ANOVA, $P = 0.01$). There were 24 Mallards and 23 Black ducks involved in the 22 Mallard and 12 American Black Duck strikes. Two of the three air-carrier reported on-airport Mallard strikes and one of the five air-carrier reported on-airport American Black Duck strikes resulted in

damage to aircraft. American Black Duck strikes have been recorded in October and from December – April whereas Mallard strikes have been more evenly distributed throughout the year (October – June; Fig. 1-19). The lack of Mallard strikes in July-August coincides with the flightless period during molt. There have also been three off airport Mallard strikes during this period, one of which resulted in damage to the aircraft (Appendix C, Table 2). Two of the off-airport Mallard strikes occurred at 300 ft. AGL or lower and one occurred at 1,300 ft. AGL. Mallards have been shot at JFK each year since 2001 (Total = 216 birds) when nonlethal methods failed to resolve hazards caused by Mallards. Black Ducks have only been lethally taken to reduce hazards to aircraft since 2004 (Total = 72 birds).

For the period of 1994-2009 there have been 13 on-airport strikes involving ducks other than American Black Ducks and Mallards. No one species was responsible for more than three of the on-airport strikes, and all strikes involved only one bird except for one strike involving two Green-winged Teal. None of the strikes resulted in air-carrier reports of damage (Appendix C). Off-airport duck strikes during 1994-2009 included 2 Lesser Scaup strikes, one Long-tailed Duck strike, and one unspecified duck strike. Only the Long-tailed Duck strike resulted in damage to the aircraft (Appendix C, Table 2). The other ducks lethally taken since 1999 other than Mallards and American Black Ducks were two Blue-winged Teal, two Gadwall, one Green-winged Teal, and two Bufflehead.

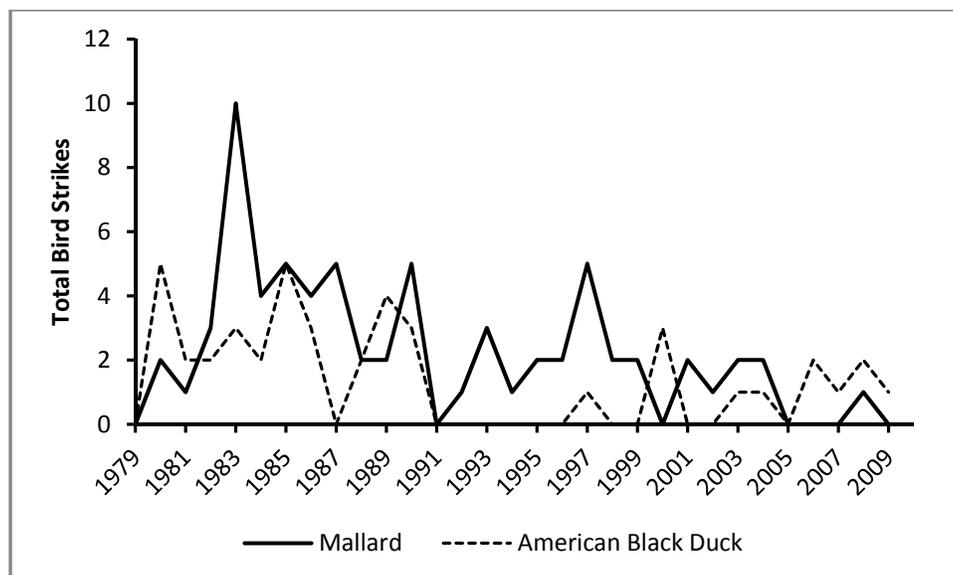


Figure 1-18. Annual on-airport Mallard and American Black Duck strikes at JFK.

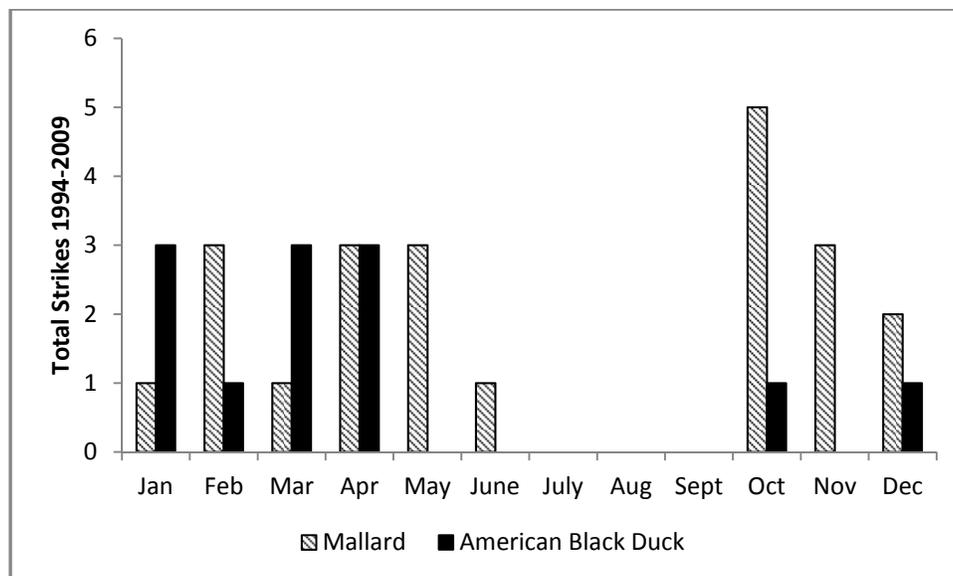


Figure 19. Seasonal patterns in on-airport duck strikes at JFK for the period of 1994-2009.

Ducks were ranked 6th among the 23 bird species/species groups evaluated for hazardous to aircraft (FAA 2007). Nationwide, there were 521 Mallard strikes and 31 American Black Duck strikes to civil aircraft during the period of 1990 - 2009 (Dolbeer et al. 2011). Multiple birds were involved in 117 of the Mallard strikes and 11 of the Black Duck Strikes. Reported cost of damage for Mallards and American Black Ducks was \$5,399,639 and \$1,500 respectively (Dolbeer et al. 2011). Two people were injured in two of the Mallard strikes to civil aircraft during 1990-2008 (Dolbeer et al. 2009). Fifteen people were injured in 13 strikes involving unspecified ducks during this period.

The reduction in Mallard strikes has occurred despite the fact that BBS data indicate Mallard numbers in New York State and USFWS Region 5 increased over the period of 1980-2006 (New York 3.5% per year, $P = 0.03$; Region 5 2.5% per year, $P < 0.01$; Sauer et al. 2008). Audubon Christmas Bird Count (CBC) data for New York and New Jersey indicate a relatively stable to increasing population trend for Mallards 1980 – 2009 (National Audubon Society 2010). The reduction in strikes may be largely attributable to the Integrated Bird Hazard Control (IBHC) program including habitat management and efforts to eliminate temporary and permanent water sources on airport property. Population trend data from the BBS indicate relatively stable American Black Duck population trends for New York and USFWS Region 5 (Sauer et al. 2008). The decrease in black duck strikes is likely attributable, in part, to the same factors which contributed to the decrease in Mallard strikes. However, CBC data for the period of 1980-2009 indicate a slight decreasing trend in Black Ducks (National Audubon Society 2010). During the 2008 New York State Ornithological Association January waterfowl count, 7,566 Black Ducks and 8,567 Mallards were counted in Region 10-Long Island (<http://www.nybirds.org/Articles/WFC2008.pdf>).

1.7.8 Hawks

In this supplement, the term “hawk” refers to buteos and harriers. Buteos have broad-wings and chunky bodies. Harriers are slim, narrow-winged hawks. Hawks (buteos) were ranked as number 10 among 23 bird species/species groups hazardous to aircraft. Buteos (Red-tailed Hawk, Rough-legged Hawk) are rarely struck by aircraft at JFK with only four on-airport Red-tailed Hawk strikes, one off-airport Red-tailed Hawk strike (2,300 feet AGL) and two on-airport Rough-legged Hawk strikes reported during the period of 1994-2009. Aircraft damage was reported for the off-airport Red-tailed Hawk strike and the only air-carrier report of an on-airport Red-tailed Hawk strike. There were no reports of damage for the Rough-legged Hawk strikes.

Northern Harriers were more frequently struck than the other two hawk species with 31 harriers involved in 30 strikes during 1994-2009 (Fig. 1-20). Of the nine harrier strikes reported by air-carriers only one report noted damage to the aircraft. The following section focuses on Northern Harriers because of the greater frequency of Northern Harrier strikes.

Hawks are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take or relocate hawks to reduce hazards at airports.

Northern Harriers are present at the airport year-round and while common locally, they are listed as a threatened species in New York State. Diet for Northern Harriers includes small mammals such as mice, voles, shrews and small rabbits; birds (primarily song birds and small waterbirds), amphibians; reptiles and frogs (Macwhirter and Bildstein 1996). With a wingspan of 3-4 feet (102-118 cm) and weight of 0.7- 1.7 lbs. (300-750 g), Northern Harriers are a large raptor capable of significantly damaging an aircraft in a strike and have been struck by aircraft since 1982 (Fig. 1-20; Cornell Lab of Ornithology 2010). Northern Harriers were the most commonly observed raptor (55 observations, 42% of all raptor observations) during the 2002 WHA (USDA 2002)⁹. Harriers are ground-nesters and are known to nest in the undeveloped area east of Runway 4R. When hunting, harriers fly low (less than 17 feet above ground) in undeveloped open habitats like those found at JFK (Macwhirter and Bildstein 1996).

For the period of 1994-2009, there was an average of 1.9 on-airport strikes per year (range 0-6 strikes/year). One of the nine air-carrier reported strikes for 1994-2009 resulted in damage to the aircraft (Appendix C). In only one instance, was more than one bird involved in a strike (2 birds involved in the strike). The average annual on-airport Northern Harrier strike rate for the period after the completion of the EA is an increase from 0.9 strikes/year (range 0-3 strikes/year) for the period of 1979-1993 (ANOVA, $P = 0.07$). There were no off-airport reports of Northern Harrier strikes for this period. No Harriers have been shot to reduce hazards to aircraft at JFK, but in 2007 one nest with eggs was destroyed to discourage Harrier use of airport property. Nationally, there have been 70 reported Northern Harrier strikes for the period of 1990-2009, two of which involved multiple birds (Dolbeer et al. 2011). There was \$200,000 of aircraft damage reported for the strikes. There were no specific records of injuries to individuals involved in Northern Harrier strikes to civil aircraft for the period of 1990-2008 although five people were injured in three strikes involving unspecified hawks (Dolbeer et. al. 2009).

⁹ Observation periods for the WHA ran from dawn to dusk and would not accurately reflect presence of predominantly nocturnal species like Barn Owls and Short-eared Owls.

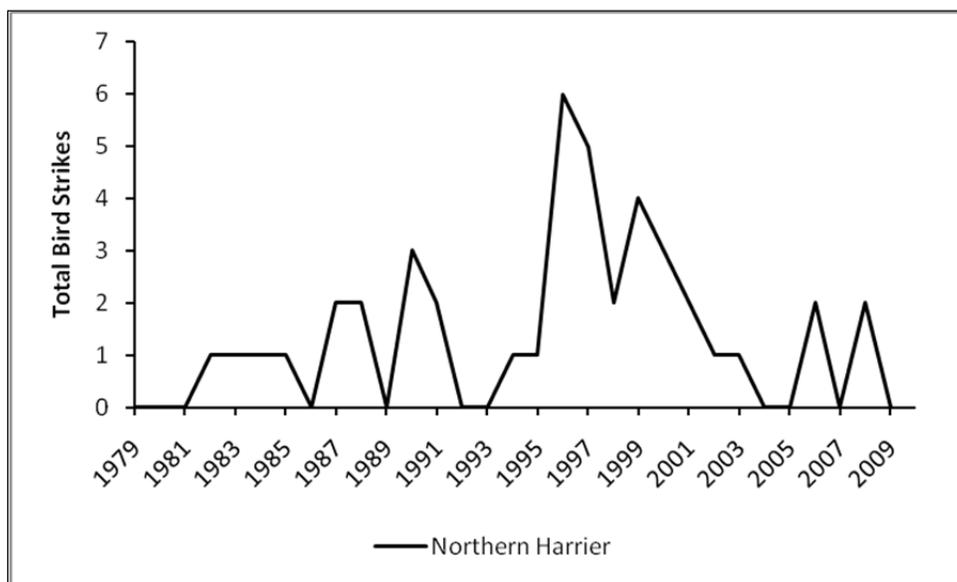


Figure 1-20. Annual on-airport Northern Harrier aircraft strikes at JFK.

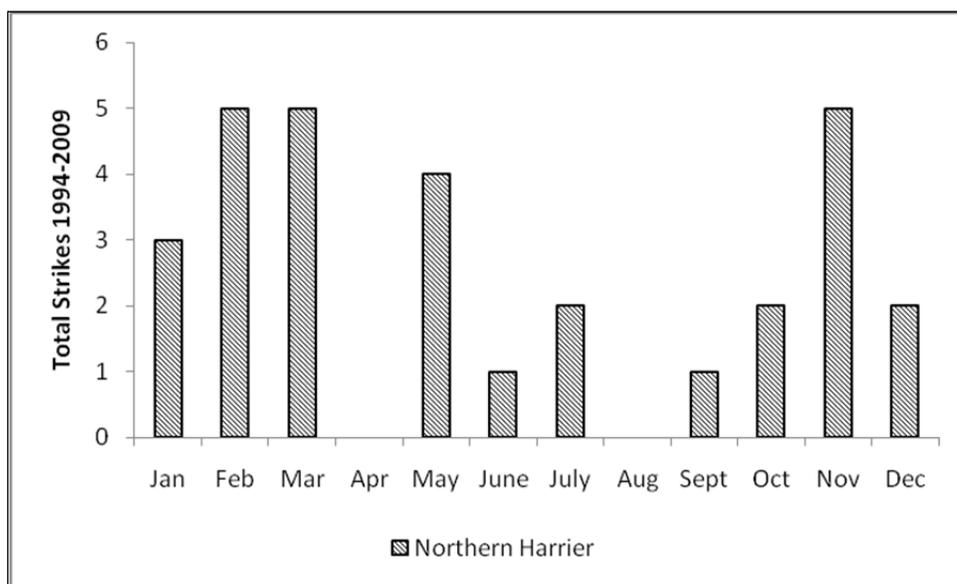


Figure 1-21. Seasonal patterns in on-airport Northern Harrier strikes at JFK for the period of 1994-2009.

The increase in Northern Harrier strikes does not appear related to state or regional Northern Harrier breeding population trends, as BBS data indicate a stable to declining trend for the period of 1980-2007 in New York (-2.9% per year, $P = 0.25$) and relatively stable trend in USFWS Region 5 (2.4%/year, $P = 0.24$; Sauer et al. 2008). However, Northern Harrier strikes are generally highest from November-March (Fig. 1-21). Data from the CBC indicate that

observations of Harriers have been generally higher for the period of 1994-2009 than for 1979-2003 (Fig. 1-22; National Audubon Society 2010).

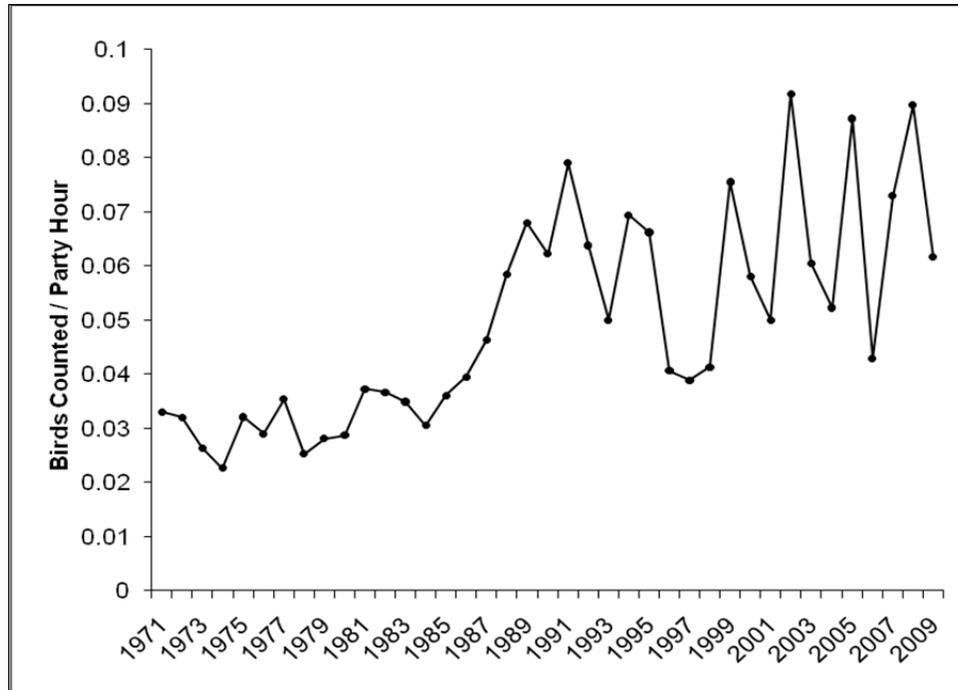


Figure 1-22. Audubon Christmas Bird Count data for Northern Harriers in New York State.

1.7.9 Rock Pigeons

Rock Pigeons, also known as Rock Doves or feral pigeons, are an introduced species. Rock Pigeons are found at JFK throughout the year in both the airport operations and public areas of the airport. Rock Pigeons are one of the species which have learned to use as spilled food and handouts from people. They are attracted to trash bins and the taxi-hold area of the airport where these food sources are available and also make use of similar food sources at parks, parking lots and other areas outside the airport. Rock pigeons also readily use buildings, aircraft hangers and other structures for roosting and nesting. The JFKWMU works to educate employees and visitors regarding the importance of not feeding wildlife (Section 2.2.4). They also use habitat modification and exclusion to reduce pigeon use of structures on airport property (Section 2.2.5). When necessary, lethal removal (live capture and euthanasia, shooting) is also used as part of the integrated program to reduce risks from Rock Pigeons.

Rock pigeons are not protected under federal law and may be taken without a permit from the USFWS. They are not protected under state law, and the environmental conservation law of New York (11-0513) authorizes the local legislative body of any city, town or village, or in the City of New York, the Department of Health to issue permits to take pigeons if the agency/administrative body has determined that the pigeons pose a menace to public health or are a

public nuisance. New York state law (33-1301) also prohibits the use of the toxicant, avitrol, in cities of 1 million or more.

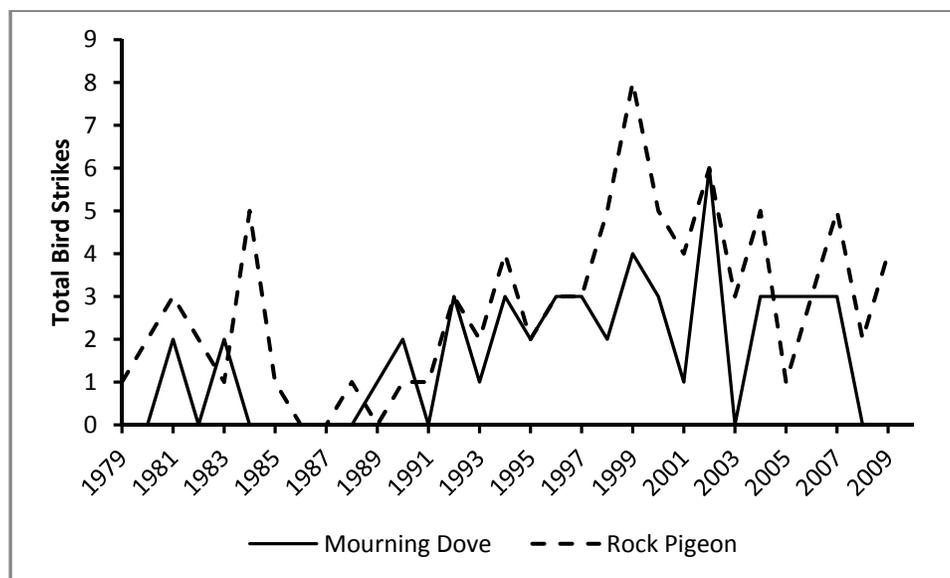


Figure 1-23. Annual on-airport aircraft strikes of Rock Pigeons and Mourning Doves at JFK.

Rock Pigeons have been struck by aircraft at JFK, but usually have not caused much damage. Since the completion of the 1994 FEIS (1994-2009), there have been 63 on-airport strikes involving 111 birds. Average strike rate for the period of 1994-2009 was 3.9 strikes per year (range 1-8 strikes/year; Fig. 1-23) which is higher than the 1.5 strikes/year (range of 0-5 strikes/year) for 1979-1993 (ANOVA $P < 0.01$). Three of the 13 air-carrier reported strikes for 1994-2009 resulted in damage to the aircraft (Appendix C). Rock Pigeon strikes have occurred during most months of the year, but are highest for April and the period of August through October. There have been two off-airport Rock Pigeon strikes, one of which resulted in damage to the aircraft (Appendix C, Table 2). The strikes occurred at 400 feet AGL or less. Starting in 2000, Rock Pigeons have been killed each year by the JFKWMU to reduce risks to aircraft. They are also taken by a private contractor to reduce risks to aircraft and property damage. Average annual take of Rock Pigeons for the period of 2000-2009 was 343 Rock Pigeons per year. Rock Pigeons were rated number 12 among the 23 bird species/species groups ranked for hazards to aircraft (FAA 2007). Nationwide, for the period of 1990-2009, there were 1,782 reported Rock Pigeon strikes, 622 of which involved multiple birds (Dolbeer et al. 2011). Reported cost of strikes was \$5,208,449. Two of the Rock Pigeon strikes reported during 1990-2008 resulted in injuries to individuals on the aircraft (1 person per strike; Dolbeer et al. 2009). The 1994 FEIS reported that regional and national populations of Rock Pigeons were increasing, but BBS data for New York and USFWS Region 5 indicate that the Rock Pigeon population has been decreasing over the period of 1980-2007 (New York -1.7% per year; USFWS Region 5 - 1.3% per year; $P \leq 0.01$; Sauer et al. 2008).

1.7.10 Herons, Bitterns and Egrets

Herons and egrets are hazardous to aircraft because of their relatively large body mass (Cattle Egret 0.79 – 0.82 lb. (360 – 372 g); Glossy Ibis 1.1 - 1.8 lbs. (500 - 800 g); Great Blue Heron 4.6 - 5.5 lb. (2,100-2,500 g); Black-crowned Night-Herons 1.8 – 2.0 lb. (827 - 913 g); Yellow-crowned Night Herons 1.4 - 1.6 lb. (649 - 716 g), Great Egrets 1.8 – 2.3 lb. (812 – 1048 g)) and or because they are known to forage in flocks (e.g., Glossy Ibis, Great Egrets and Cattle Egrets)(Poole 2005). Most herons and egrets generally forage in wetland areas. Diet varies among species but may include insects, crustaceans and other invertebrates, fish, frogs and other small vertebrates (Mccrimmon et al. 2001, Davis and Kricher 2000, Watts 1995, Davis 1993, Butler 1992). Herons are commonly found in Bergen and Thurston Basin and occasionally found in the freshwater wetlands at JFK. Unlike the majority of herons and egrets, Cattle Egrets are commonly found foraging in lawns fields and pastures for insects, frogs and other small vertebrates (Telfair 2006). Elimination of the on-airport freshwater wetlands that was completed in 2009 should eliminate the on the airport attraction for most herons and egrets. Pyrotechnics can be used to disperse herons and egrets from the two small bays. Cattle Egrets were frequently struck during the 1980's and were discussed in the 1994 FEIS, but have not been struck since 1991. The decline in Cattle Egret strikes is believed to be due to the closure of landfills in the area where the egrets foraged and an overall decline in the number of Cattle Egrets in the area (PANYNJ 2004, Craig 2009).

Herons and egrets are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take herons and egrets to reduce hazards at airports.

During the period of 1994-2009, there were 8 on-airport strikes involving Great Blue Herons, 7 strikes involving Great Egrets, 2 strikes involving Glossy Ibis, 23 strikes involving Black-crowned Night-Herons, and one strike with a Yellow-crowned Night-Heron. Damage to aircraft was recorded for only one of the 3 air-carrier reported strikes with a Great Blue Heron. No damage was reported for the air-carrier reported strikes involving Great Egret and a Yellow-crowned Night Heron. During the same period there was one off-airport Great Blue Heron strike. The strike occurred at 1,000 feet AGL and resulted in damage to the aircraft. The only birds in this group shot to reduce hazards to aircraft at JFK have been Glossy Ibis. Eight ibis were shot in 2004 and 1 ibis was shot in 2005.

Herons were rated number 10 among the 23 bird species/species groups ranked for hazards to aircraft (FAA 2007). Nationwide, for the period of 1990-2009, there have been 235 strikes involving Great Blue Herons (6 involving multiple birds), 37 strikes involving Black-crowned Night Herons (2 involving multiple birds), and 12 strikes involving Yellow-crowned Night Herons (1 involving multiple birds; Dolbeer et al. 2011). There was \$5,128,010 in damage reported for these strikes. There were also 44 strikes involving Great Egrets (7 involving multiple birds) and 2 Glossy Ibis strikes (1 involving multiple birds; Dolbeer et al. 2011). There was \$1,851,782 in reported damage for the strikes. One of the strikes involving egrets resulted in injury to an individual on the aircraft (Dolbeer et al. 2009).

The 2009 Harbor Herons survey reported 308 Great Egret nests in the New York/New Jersey Harbor. This was greater than the average observed in surveys conducted from 2002-2008.(267

nests), but less than the 347 nests observed in 2008 (Craig 2009, Craig and Bernick 2008, Bernick 2007). Ninety two of the nests observed in 2009 were on islands in Jamaica Bay. Data from the BBS for the period of 1966-2007 do not indicate a significant population trend for New York State ($P = 0.67$), but increasing trends are reported for USFWS Region 5 and nationwide (2.3 – 5.9% per year, $P < 0.01$; Sauer et al. 2008).

Two hundred and five Glossy Ibis nests were observed during the 2009 Harbor Herons survey, which was less than the average for 2002-2008 (250 nests), but more than the 175 nests counted in 2008 (Craig 2009, Craig and Bernick 2008, Bernick 2007). Similarly, the 750 Black-crowned Night Heron nests observed in 2009 was less than the average for 2004-2007 (846 nests), but more than the 551 nests observed in 2008. However, Black-crowned Night-Herons continue to be the most abundant Heron species counted in the survey (Craig 2009, Craig and Bernick 2008, Bernick 2007). Yellow-crowned Night Heron nests have increased substantially from 6-15 nests from 2002-2007 to 62 nests in 2008 and 87 nests in 2009. Glossy Ibis data for the period of 1966-2007 was not available from the BBS for New York State, and there wasn't a significant population trend for USFWS Region 5 or nationwide ($P \geq 0.46$; Sauer et al. 2008). BBS data for the same interval also did not show significant trends for Black-crowned Night Herons for New York State, USFWS Region 5 and nationwide ($P \geq 0.11$). Despite local increases, there was not a significant nationwide trend in the BBS for the national Yellow-crowned Night Heron Population ($P = 0.37$; State and Regional data were not available; Sauer et al. 2008).

The decrease in Cattle Egret strikes at JFK may be related to a pronounced decrease in the species locally and regionally in populations north of the Carolinas (Bernick 2007, Telfair 2006). Only one Cattle Egret nest was found during the 2009 Harbor Herons survey and there has been a general decreasing trend for the species in the Harbor since 1985 when 266 pairs were counted (Craig 2009, Bernick 2007). The BBS does not have Cattle Egret data for New York State. There are no significant population trends for USFWS Region 5 or nationwide for the period of 1966-2007 ($P \geq 0.65$, Sauer et al. 2008). However, there does appear to have been a significant decline in both regions since 1980 (1.7-7.2% per year, $P \leq 0.05$) which is consistent with observations from the Harbor Herons survey (Sauer et al. 2008, Bernick 2007).

The Harbor Herons survey provided no data on Great Blue Herons. The New York State population of Great Blue Herons has been reported as increasing (Butler 1992). BBS data for the period of 1966 -2007 also indicate increasing Great Blue Heron population trends for New York, USFWS Region 5, and nationwide (1.4-2.5% per year, $P < 0.04$; Sauer et al. 2008).

1.7.11 Mourning Doves

Mourning Doves are a native dove species which takes advantage of the airport's available resources for cover, food, and nesting habitat, and are usually found in the undeveloped portions of the AOA, particularly near fences. Mourning Dove hazards to aircraft were not specifically addressed in the 1994 FEIS. Like Rock Pigeons, Mourning Doves move in flocks which increase the risk of an adverse impact on aircraft from a strike.

Mourning Doves are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take Mourning Doves to reduce hazards at airports.

Since the completion of the 1994 FEIS (1994-2009), there have been 41 strikes involving 46 birds. The average strike rate for the period of 1994-2009 was 2.4 strikes/year (range 1-6 strikes/year; Fig. 1-19) which is higher than the 0.7 strikes/year (range of 0-3 strikes/year) for 1979-1993 (ANOVA $P < 0.01$). One of the 10 air-carrier reported strikes for 1994-2009 resulted in damage to the aircraft (Appendix C). Mourning Dove strikes occur at JFK from July - November. Mourning Doves have been killed at JFK to reduce risks to aircraft starting in 1999. Average annual take of Mourning Doves for the period of 2000-2009 was 55 doves per year. Mourning Doves were ranked sixteenth among the 23 bird species ranked for hazards to aircraft by (FAA 2007). Nationally, for the period of 1990-2009, there have been 3,408 reported strikes involving Mourning Doves including 666 strikes which involved multiple birds (Dolbeer et al. 2011). Reported costs of damage were \$5,503,214 (Dolbeer et al. 2011). One of the Mourning Dove strikes that occurred between 1990 and 2008 and one strike involving an unspecified dove resulted in injuries to an individual on the aircraft (Dolbeer et al. 2009).

It is possible that the increase in Mourning Dove strikes at JFK is related to 1980-2007 population increases in New York and USFWS Region 5 (0.7 - 1.7% per year, $P < 0.01$; Sauer et al. 2008). Christmas Bird Count data indicate the Mourning Dove population in New York state has been relatively stable (Appendix F). However, there was no significant trend in call count surveys over the 10 year and 44 year intervals (Dolton et al. 2009).

1.7.12 Owls

Owls enter JFK airspace while searching for food. Small rodents, cottontail rabbits and black-tailed jackrabbits may be found on airport property and can be a food source for owls. Barn Owls and Short-eared Owls are the species most commonly struck at JFK (Appendix C, Fig. 1-24). Barn Owl strikes have been recorded throughout the year (Appendix C, Fig. 1-25). Short-eared Owls are a state-listed endangered species which, based on strike rates, appear to be most common in the JFK area during the winter and early spring (Fig. 1-25). Other owl species involved in strikes at JFK include Snowy Owls, Long-eared Owls, and Barred Owls (Appendix C). Reducing owl hazards to aircraft is difficult because they are not easily seen at night or early morning prior to sunrise when they are present at the airport. The only exceptions are Snowy Owls and Short-eared Owls which are also present during the day.

Owls are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take owls to reduce hazards at airports. A state permit is also required to use nonlethal harassment methods on state-listed threatened and endangered species.

With an average on-airport strike rate of 5.6 strikes per year (range 1-11 strikes/year) for the period of 1994-2009, Barn Owls were the second most frequently struck raptor species at JFK. The average annual Barn Owl strike rate after the completion of the 1994 FEIS was lower but not statistically different from the period prior to the completion of the 1994 FEIS (ANOVA, $P = 0.18$; Fig. 1-24). From 1979-1993, there was an average of 7.2 Barn Owl strikes per year (range 2-17 strikes/year) with peaks during the 1980's prior to the closure of the two neighborhood landfills. Aircraft damage was reported for two of the eight air-carrier reported Barn Owl strikes. Barn Owl strikes have occurred during all months of the year, but have been highest

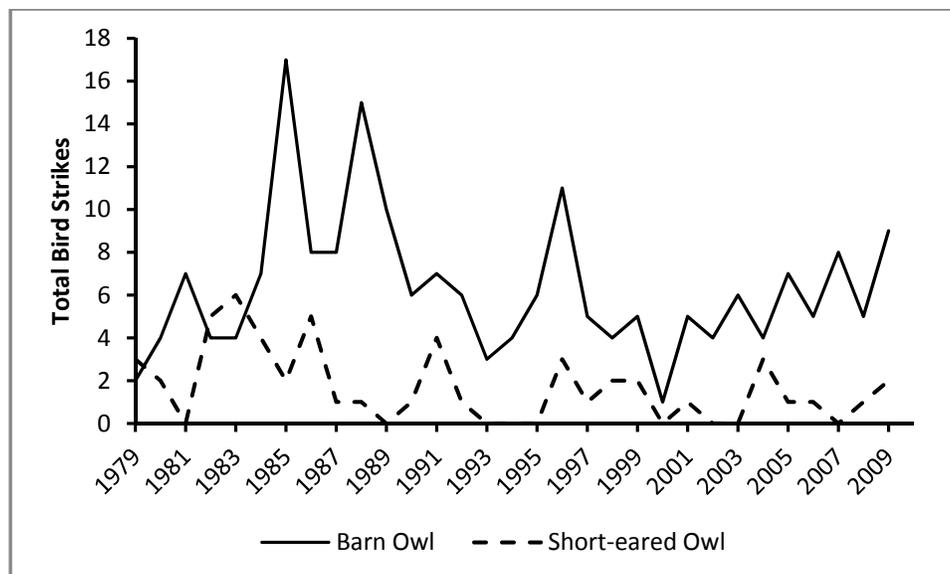


Figure 1-24. Annual on-airport Barn Owl and Short-eared Owl strikes at JFK.

from June through November (Fig. 1-25). Short-eared Owls have been struck an average of 1.1 times per year since 1994 (range 0-3 strikes/year, Fig. 1-24). The number of strikes has declined from an average of 2.3 strikes/per year (range 0-6 strikes/year; ANOVA, $P = 0.04$) prior to the completion of the 1994 FEIS. Short-eared Owl strikes appear to be associated with overwintering birds as they have only been recorded from November through May (Fig. 1-21). There were no reports of damage to aircraft from the four air-carrier reported strikes with Short-eared Owls during 1994-2009. There were no off-airport owl strikes reported for JFK during 1994-2009. On-airport strikes involving other owl species during 1994-2009 include 10 Snowy Owl strikes, three Long-eared Owl strikes and one Barred Owl strike. Damage to aircraft was reported for the only air-carrier reported Snowy Owl strike. There were no air-carrier reports of damage for the other owl species. Three Snowy Owls were shot in 2008 and one was shot in 2009 to reduce threats to aircraft safety.

Owls were ranked thirteenth among the 23 bird species/species groups posing greatest hazards to aircraft (FAA 2007). Nationwide, for the period of 1980-2009, there were 558 Barn Owl strikes and 213 Short-eared Owl strikes (Dolbeer et al. 2011). Four of the Barn Owl strikes and none of the Short-eared Owl strikes involved multiple birds. Damage was reported for 26 of the Barn Owl strikes and seven of the Short-eared Owl strikes. Reported cost of damage from Short-eared Owl and Barn Owl strikes was \$3,168,481 (Dolbeer et al. 2011). One strike to civil aircraft involving an unspecified owl resulted in injury to a person on the aircraft during the period of 1990-2008 (Dolbeer et al. 2009).

Population data for Barn Owls and Short-eared Owls are limited. Breeding Bird Survey data are not available for Short-eared Owls or Barn Owls in New York or USFWS Region 5. Nationwide, there is no significant population trend for Barn Owls ($P = 0.15$), but there appears to be a slight decreasing trend for Short-eared Owls (-3.3% per year, $P = 0.09$; Sauer et al. 2008). Audubon Christmas Bird Count data indicate that, for the period of 1980-2009, the number of

overwintering Short-eared Owls has been relatively stable and Barn Owls have been stable to slightly decreasing (National Audubon Society 2010). The American Littoral Society has worked with the Gateway NRA on the erection and maintenance of Barn Owl nest boxes throughout the Bay. Their data indicate a decrease in active Barn Owl nests in Jamaica Bay since approximately 1999 (C. Nadareski, NYCDEP, pers. comm., Fig. 1-26). Some of the decrease is believed to be attributable to raccoons which have accessed the islands with Barn Owl nest boxes.

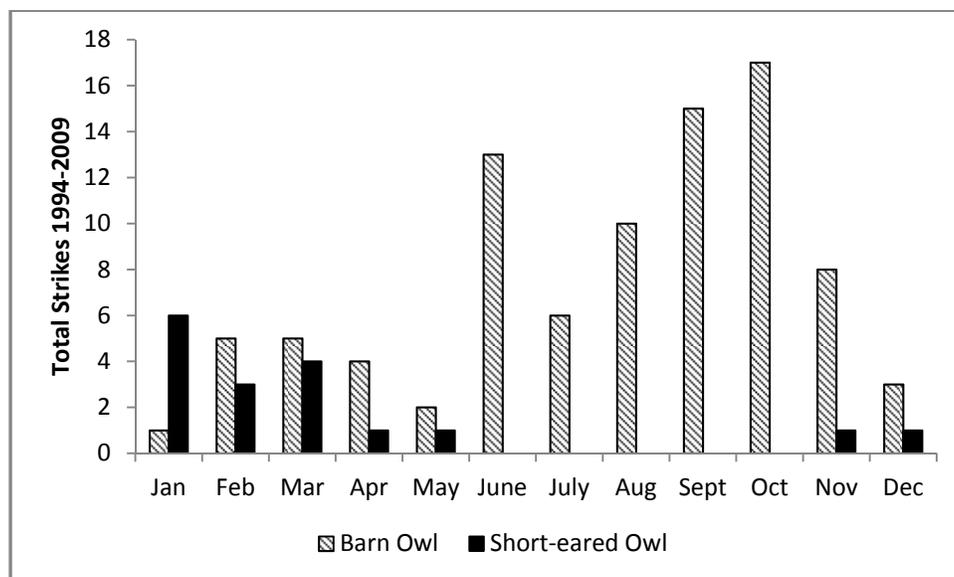


Figure 1-25. Seasonal patterns in on-airport Barn Owl and Short-eared Owl strikes at JFK for the period of 1994-2009.

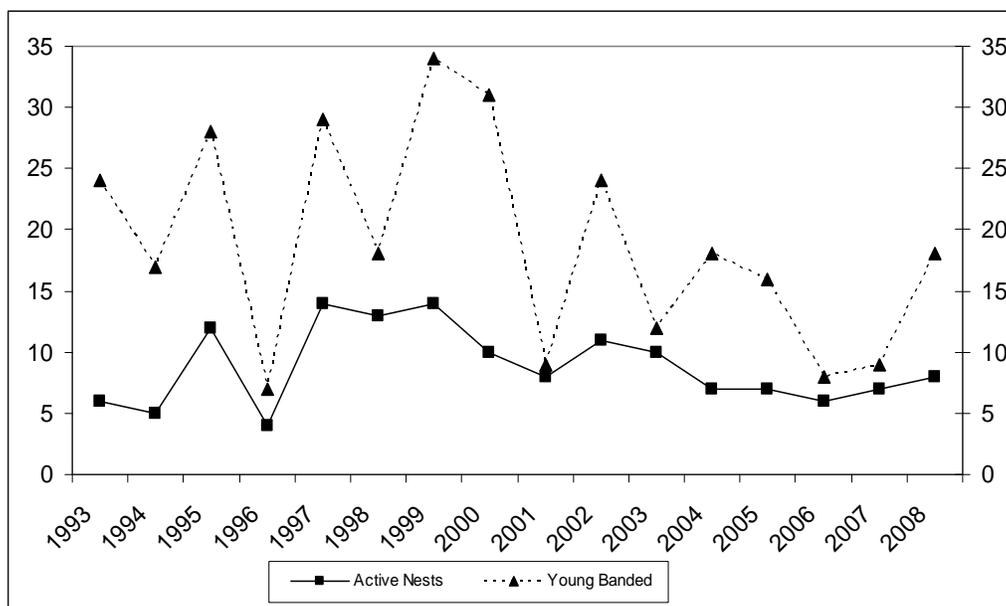


Figure 1-26. Barn owl nests and young banded in Jamaica Bay (C. Nadareski, NYCDEP 2010)

1.7.13 Falcons

The American Kestrel is one of the few raptors present at the airport that is not a state-listed threatened or endangered species. Kestrels were the most commonly struck non-gull species during the period of 1994-2009 (Appendix C) and the third most commonly observed raptor species in the 2001-2002 WHA (USDA 2002). Kestrels are attracted to the airport property when feeding, primarily on insects and small rodents. Because of their small size, American Kestrels have a lower risk rating (19th of 23 bird species/species groups; FAA 2007) than the hawks and owls discussed above. Peregrine Falcons are slightly larger than kestrels, but are much less abundant. Peregrine Falcon populations in the United States have been increasing and peregrines were removed from the federal list of threatened and endangered species in 1999 (64 FR 46542-46558). They are currently federally classified as a Species of Conservation Concern (USFWS 2008c) and are still classified as a state endangered species in New York. Peregrines are known to nest nearby in Jamaica Bay and, in 2009 and 2010, in an abandoned aircraft hangar on JFK property. Peregrines have been observed on the airport throughout the year.

Falcons are protected under the MBTA and state law. Permits from the USFWS and NYSDEC would be required to take falcons to reduce hazards at airports. A state permit is also required to use nonlethal harassment methods on state-listed threatened and endangered species.

From 1994-2009, on-airport kestrel strikes ranged from 0-16 strikes/year and averaged 5.7 strikes/year (Fig. 1-22). This is higher but not statistically different (ANOVA, $P = 0.08$) from the 3.1 strikes/year (range 0-9 strikes) reported in the 1994 FEIS. The higher average strike rate may be attributable to spikes in kestrel strikes that occurred in 1996/97 and 1999 (Fig. 1-26). In three instances, more than one bird involved in a strike (two birds involved in the strikes). None of the thirteen air-carrier reported strikes that occurred during 1994-2009 resulted in damage to the aircraft (Appendix C). Seasonal patterns in kestrel strikes remain as described in the 1994 FEIS. Over the period of 1994-2009, peregrine strikes have averaged 1.8 strikes per year with a range of 0-6 strikes per year (Fig. 1-26). This is higher than the 0.7 strikes/year reported in the 1994 FEIS (ANOVA, $P = 0.05$) and is likely attributable to the increasing peregrine population. Only one peregrine strike involved more than one bird (two birds involved in strike). One of the eight air-carrier reported strikes for 1994-2009 resulted in damage to the aircraft (Appendix C). Peregrines have been struck from April through November, with a peak in August which may be attributable to the presence of young of the year. There were no reports of off-airport kestrel or peregrine strikes during 1994-2009. It has not been necessary to use lethal methods to reduce risks from American Kestrels and Peregrine Falcons. The PANYNJ is working with local regulatory authorities regarding options for demolition of the old aircraft hangar which has been used by Peregrines.

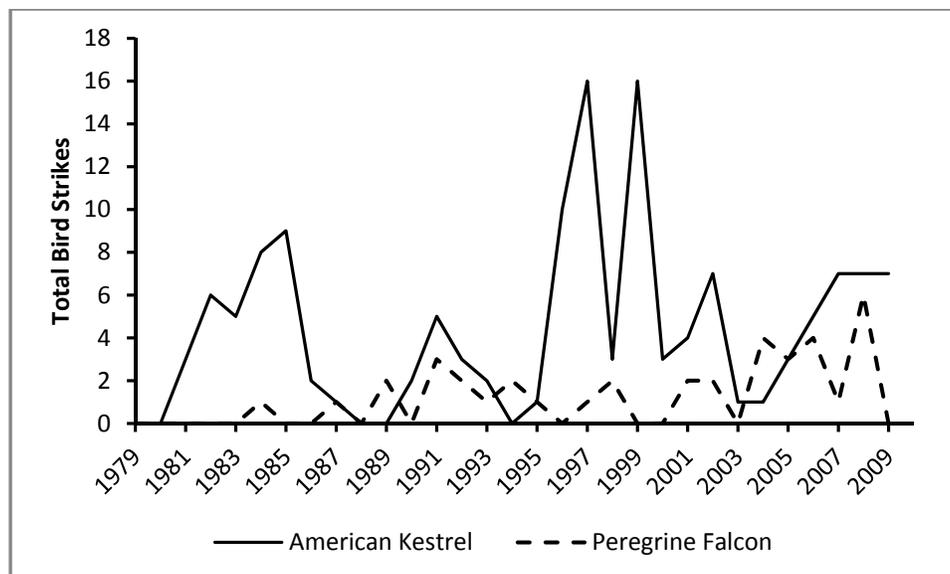


Figure 1-26. Annual on-airport aircraft strikes of American Kestrels and Peregrine Falcons at JFK.

Nationwide, there were 2,019 reported kestrel strikes for the period of 1990-2009, 88 of which involved multiple birds (Dolbeer et al. 2011). Cost of the 19 kestrel strikes with reported damage was \$1,428,813. One of the kestrel strikes which occurred from 1994-2008 resulted in injuries to 2 of the individuals onboard the aircraft (Dolbeer et al. 2009). Reported cost damage for kestrel strikes was \$1,428,813. For the period of 1990-2009, there were 149 reported strikes involving Peregrine Falcons, six of which involved multiple birds. Cost of the ten peregrine strikes with reported damage was \$235,500.

BBS data for 1980-2007 indicate the kestrel population has been decreasing in New York State and USFWS Region 5 (-3.2 and -2.3%/year respectively, $P \leq 0.04$; Sauer et al. 2008). Peregrine Falcons in New York have been reproducing successfully during the last 25 years. The number of successful pairs in 2009 (55) was over 6 times the number in 1990 (9). The average number of young/successful pair from 2005-2009 was 2.4 (Loucks 2010).

1.7.14 Shorebirds

Several shorebird species have become increasing hazards to aircraft at JFK since the completion of the 1994 FEIS, particularly during the nesting season. Jamaica Bay provides attractive feeding and nesting habitat for shorebirds including the shoreline areas around the Kilo extension. Aircraft strikes are greatest for American Oystercatchers which nest in the sand/gravel in safety areas for Runway 4L (Kilo Extension; Appendix C). With an average weight of 22 ounces (623 g) and length of 17-21 inches (43-53 cm) American Oystercatchers are a relatively large shorebird (Cornell Lab of Ornithology 2010). American Oystercatchers prefer sandy beaches, mudflats, and, occasionally, rocky shores where mollusk prey can be found. They are listed as a federal species of conservation concern. Oystercatchers are extremely

protective of their nests, and so are more difficult to disperse and more likely to be struck than Willet which also occasionally attempt to nest in this area.

Shorebirds are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take shorebirds to reduce hazards at airports. Several shorebird species are listed as threatened or endangered by the NYSDEC. A state permit is also required to use nonlethal harassment methods on state-listed threatened and endangered species.

For the period of 1994-2009, there were 101 on-airport shorebird strikes involving 122 birds. Thirty-six of the strikes involved American Oystercatchers (Fig. 1-27). American Oystercatcher strikes occur from April through September. Other shorebird species which have been struck by aircraft at JFK during the same period include Willet (5 strikes), American Golden Plover (9 strikes), Black-bellied Plover (7 strikes), Semipalmated Plover (8 strikes), Killdeer (15 strikes), American Woodcock (11 strikes), Semipalmated Sandpiper (3 strikes), Upland Sandpiper (2 strikes), Sanderling (2 strikes), Least Sandpiper (2 strikes) and Dunlin (1 strike; Appendix C). Air-carriers reported damage for two on-airport Sanderling strikes (Appendix C). One off-airport Short-billed Dowitcher strike (1,200 feet AGL) and one off-airport Killdeer strike (4,000 feet AGL) were reported for aircraft using JFK during 1994-2009. The strike involving the dowitcher resulted in damage to the aircraft (Appendix C, Table 2).

Shorebirds were ranked seventeenth among the 23 categories of birds/bird species evaluated for hazards to aircraft (FAA 2007). Nationally, there were 3,158 strikes involving shorebirds reported for the period of 1990-2009 including 514 which involved multiple birds (Dolbeer et al. 2011). Reported damage for shorebird strikes was \$3,420,818.

Harassment is the primary method used to reduce shorebird hazards. However, during 2000-2009, an average of 12 oystercatchers has been killed per year to reduce hazards to aircraft from birds attempting to nest near the runway on the Kilo extension. In 2001 the PANYNJ applied for and received its first permit to remove nests and eggs of American Oystercatchers attempting to nest near the runways on the Kilo extension. From 2001-2006, the JFKWMU destroyed between 2-7 nests with eggs per year (Total = 22 nests with 61 eggs). However, it has not been necessary to take oystercatcher nests or eggs from 2007-2009. In 2008, 1 Killdeer nest with 3 eggs and 2 Willet nests with a total of 5 eggs were destroyed to discourage nesting at JFK and associated hazards to aircraft. Eight Killdeer were taken in 2009, seven Willet were taken in 2005 and 2 Semipalmated Plovers were taken in 2002 to reduce risks to aircraft. Establishment of groundcover in the sandy areas used for nest sites will eliminate nesting habitat and reduce strikes by American Oystercatchers and Willet. Research is being conducted at JFK to identify vegetation that will grow well in the poor soils at JFK and will not be an attractive food source for wildlife (Section 2.2.1).

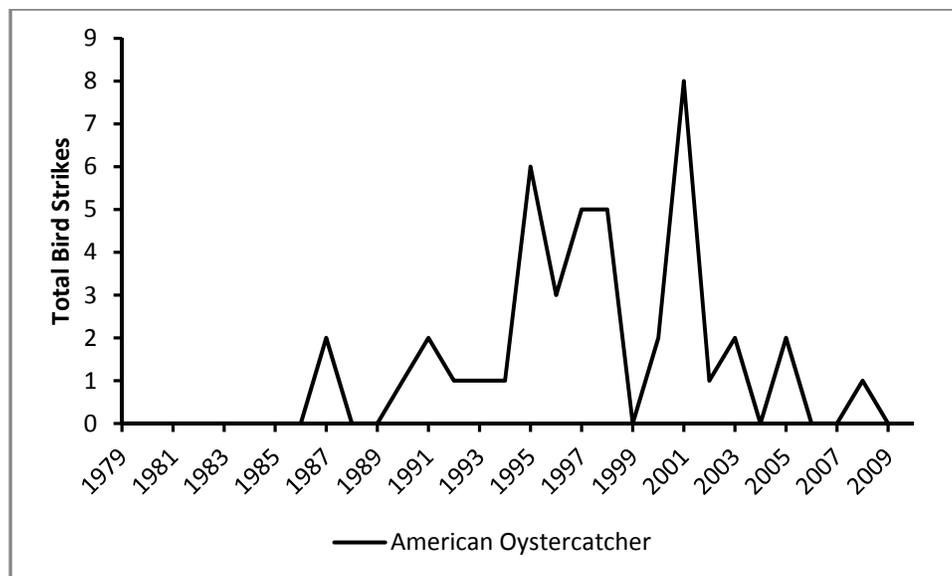


Figure 1-27. Annual on-airport American Oystercatcher strikes at JFK.

Population information on shorebirds is limited. The U.S. Shorebird Conservation Plan (Brown et al. 2000) lists population declines for American Golden Plover, Black-bellied Plover, Semipalmated Sandpiper, Dunlin, Least Sandpiper and American Woodcock. Populations of Willet, Killdeer, Upland Sandpipers and Sanderling are believed to be stable or increasing. Insufficient information was available to make a determination regarding population trends for American Oystercatchers, Killdeer, and Semipalmated Plovers. Data from the BBS for the period of 1980-2007 indicate decreasing trends for American Woodcock in New York (-9.2% per year, $P = 0.02$) and nationwide (-8.2% per year, $P = 0.04$), and no significant trend for USFWS Region 5 (-5.0% per year, $P = 0.24$; Sauer et al. 2008). Killdeer populations appear to be decreasing in New York, USFWS Region 5, and nationwide (-2.8 - -0.5% per year, $P \leq 0.01$). There were no significant population trends for Willet (-7.3 - 0.3% per year, $P \geq 0.51$) or Upland Sandpipers (-2.9 - -0.7% per year, $P \geq 0.16$) in New York, USGS Region 5, or nationwide (Sauer et al. 2008).

1.7.15 Crows

Crows, primarily American Crows, are frequent visitors to the airport, however, aircraft rarely strike crows (PANYNJ 2004). American Crows weigh 11-22 ounces (316-620 g) and have a wingspan of 33-39 inches (85-100 cm). Fish Crows are smaller, weighing 7-11 ounces (36-40 g) with a wingspan of 14-16 inches (36-40 cm; Cornell Lab of Ornithology 2010).

Crows are protected under the MBTA and state law. However, because of the damage and conflicts caused by blackbirds, the USFWS has established a depredation order to facilitate management of damage caused by blackbirds. For purpose of the Order “blackbird” is defined as Yellow-headed Blackbirds, Red-winged Blackbirds, Brewer’s Blackbirds, cowbirds, crows, (except Tamaulipas Crows), grackles, and magpies (50 CFR 21.43). A Federal permit is not required to remove blackbirds if they are committing or about to commit depredations upon

ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. Similarly, no license or permit from NYSDEC is required for any taking of destructive wildlife authorized by ECL Section 11-0523. Included under this authorized taking are starlings, American Crows, pigeons and, during certain months of the year, blackbirds (i.e., red-winged blackbirds, common grackles and cowbirds.).

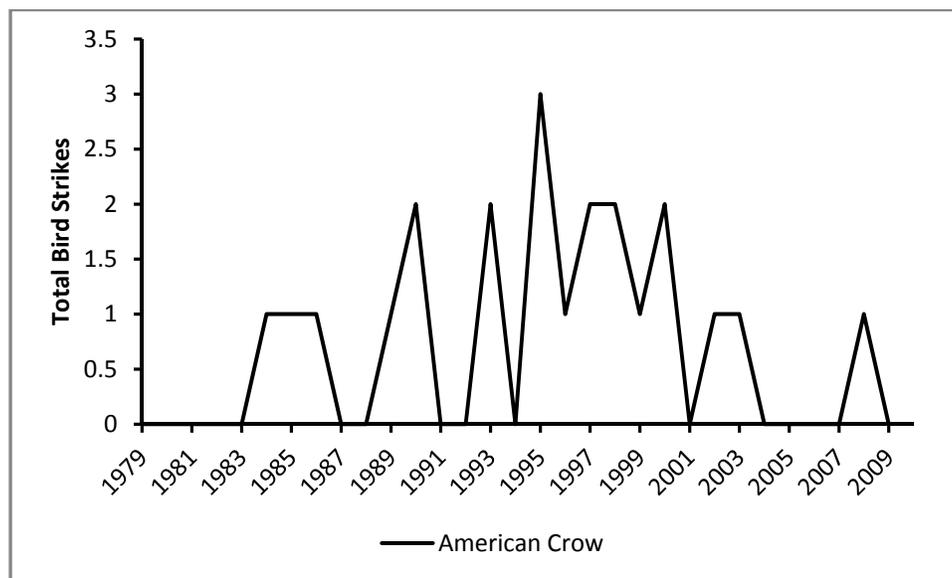


Figure 1-28. Annual on-airport American Crow strikes at JFK.

Since the completion of the 1994 FEIS (1994-2009), there have been 14 on-airport strikes involving 18 American Crows (Appendix C). There has been an average of 0.9 strikes per year (range 0-3 strikes/year) for the period of 1994-2009 which is not significantly different from the average of 0.5 strikes per year for the period of 1979-1993 (ANOVA $P = 0.28$; Fig. 1-28). The one air carrier report of an American Crow strike during 1994-2009 did not result in damage to the aircraft. American Crow strikes at JFK occur from April – October. There were no off-airport crow strikes reported for aircraft using JFK from 1994-2009. Nationally, for the period of 1990-2009, there were 248 strikes involving American Crows, 36 of which involved multiple animals (Dolbeer et al. 2011). Reported damage by American Crows was \$1,265,113.

During the period of 2000 to 2009, 159 American crows have been killed in order to reduce hazards to aircraft at JFK. This includes the maximum take of 151 birds in 2000. Crows have been trapped in the area east of Runway 4R, however, they are extremely wary and difficult to trap or shoot. Since crows are seen disproportionately more often than they are struck, crows are not much of a hazard to aircraft at JFK. Although Fish Crows are seen on-airport and have been taken by the JFKWMU and a private contractor to reduce hazards to aircraft (90 birds in 2000), there are no records of fish crow strikes at JFK since the completion of the 1994 FEIS.

Data from the BBS indicate that for the period of 1980-2007, American Crow populations have been increasing in New York (1% per year), the Eastern BBS Region (0.7% per year) and Nationwide (0.6% per year, $P \leq 0.001$; Sauer et al. 2008). Fish Crow populations for the same interval appear to be relatively stable (-0.6 – 4.7% per year; $P > 0.15$).

1.7.16 Blackbirds and Starlings

European Starlings are a non-native species which are present throughout the year at the airport and surrounding areas. While small in size, starlings are extremely dense birds and travel in large flocks and thus pose a serious risk of damage to aircraft when struck. The worst bird strike on record for loss of human lives in the U.S. was in Boston in 1960 when 62 people were killed in the crash of an airliner which collided with a flock of European Starlings (Dolbeer and Wright 2008). Starlings are common throughout the year at the airport and surrounding areas. In late summer and fall, large flocks of starlings attempt to roost in trees at Buildings 208 and 111. Starlings also feed and loaf within the AOA, and are often found in the strike records. Starlings can also create problems when they nest or roost in hangars or buildings on the airport. The droppings can damage paint on vehicles and aircraft and create health hazards. Brown-headed Cowbirds, Red-winged Blackbirds, Common Grackles, and Boat-tailed Grackles also form flocks of migratory and over-wintering birds, and may join flocks of starlings in fall and winter. These mixed blackbird flocks can number in the thousands of birds.

As a non-native species, starlings are not protected by state or federal law. The remaining blackbird species are protected under the MBTA and state law. As noted for crows, both the USFWS and NYSDEC have established regulations which facilitate the take of blackbirds to reduce bird damage and conflicts and risks to human health and safety. New York state law (33-1301) also prohibits the use of the toxicant, avitrol, in cities of 1 million or more.

Since the completion of the 1994 FEIS (1994-2009), there have been 39 on-airport starling strikes involving 149 birds, 16 cowbird strikes involving 71 birds and four Red-winged Blackbird strikes involving five birds. There have been no grackle strikes since the completion of the 1994 FEIS. The average annual starling strike rate for 1994-2009 was 2.5 strikes per year (range 0-6 strikes; Fig. 1-29). This is higher than the average of 1 strike/year (range 0-4 strikes) for 1976-1993 reported in the 1994 FEIS (ANOVA, $P = 0.01$). Only one of the 12 starling strikes reported by air-carriers during 1994-2009 resulted in damage to the aircraft. Annual cowbird strikes since the completion of the 1994 FEIS averaged 1 strike/year (range 0-4 strikes/year), with the majority of strikes (13) occurring from 2002-2007 (Fig. 1-29). There were no Brown-headed Cowbird strikes from 1979-1995. Red-winged blackbird strikes are less common than cowbird strikes with only one blackbird strike prior to the completion of the 1994 FEIS and four blackbird strikes (no more than 1 strike/year) since the completion of the 1994 FEIS. One of the four cowbird strikes and none of the three Red-winged Blackbird strikes reported by air-carriers during 1994-2009 resulted in damage to the aircraft (Appendix C). Although starling strikes have occurred during most months of the year, strike rates are highest from August – November during formation of fall flocks and migration (Fig. 1-30). Cowbird and blackbird strikes have occurred from June-November. From 1994-2009, there also was an off-airport starling strike (300 feet AGL) and an unspecified blackbird strike (500 feet AGL; Appendix C, Table 2). The starling strike caused damage to the aircraft.

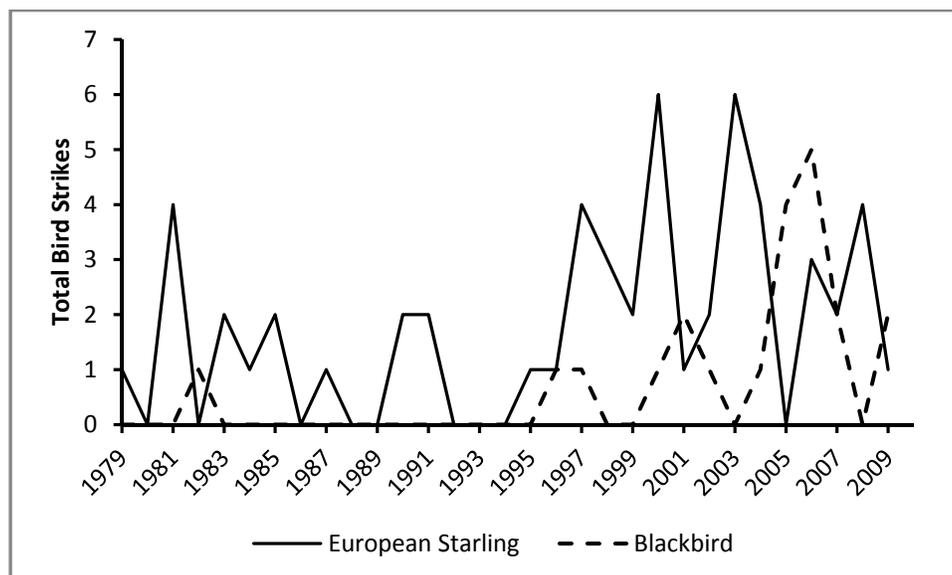


Figure 1-29. Annual on-airport European Starling and Blackbird (Red-winged Blackbirds, Brown-headed Cowbird) strikes at JFK.

Blackbirds and starlings ranked 18th among the 23 bird species/and species groups evaluated for hazards to aircraft (FAA 2007). For the period of 1990-2009, there were 2,330 starling strikes reported in the U.S., 896 of which involved multiple birds (Dolbeer et al. 2011). Damage from starling strikes for this period was \$4,345,705. During the same interval, there were also 101 Red-winged Blackbird strikes and 86 Brown-headed Cowbird strikes. Thirteen of the Red-winged blackbird strikes and 29 of the cowbird strikes involved multiple birds. Total cost of damage caused by Red-winged Blackbirds and Brown-headed Cowbirds was \$869,052.

Starlings have been killed at JFK to reduce risks to aircraft and are also trapped and euthanized by a private contractor to reduce risks to aircraft and property damage. Bird feces are highly acidic and can be corrosive to paint and metal surfaces. Bird feces can also have corrosive effects on monuments and decorative stonework on buildings (Gómez-Heras et al. 2004). Microbes within bird excrement also can cause damage to materials for buildings and monuments (Channon 2004, Bassi and Chiatante 1976). Average annual take of starlings for the period of 2000-2009 was 1,032 starlings per year. Blackbirds have also been killed at JFK to reduce risks to aircraft. Total take for the period of 2000-2009 has been 1,900 Brown-headed Cowbirds, 164 Red-winged Blackbirds, 3 Common Grackles and 1 Boat-tailed Grackle.

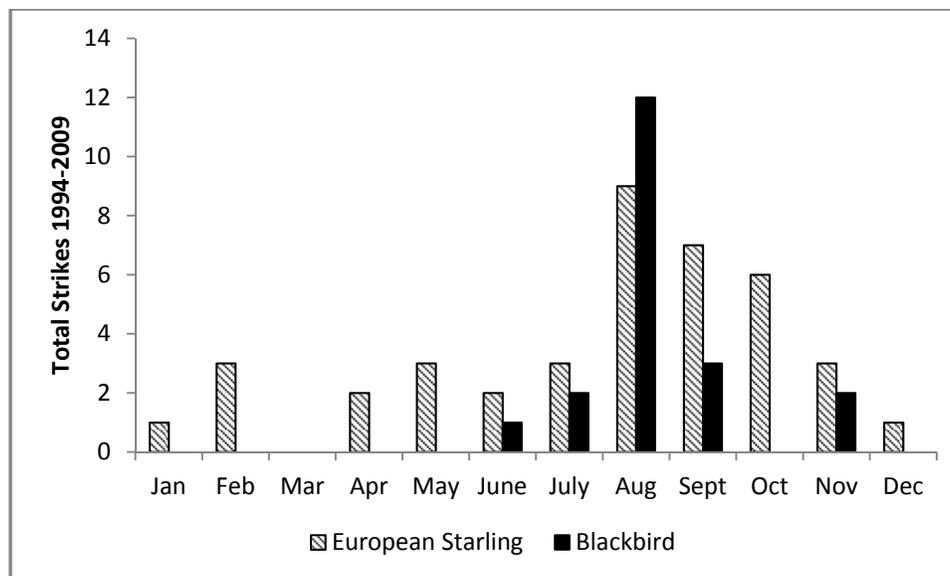


Figure 1-30. Seasonal patterns in on-airport European Starling and Blackbird (Red-winged Blackbird, Brown-headed Cowbird) strikes at JFK for the period of 1994-2009.

The change in starling strikes is not related to state or regional population trends. European Starling populations have been decreasing in New York and the USFWS Region 5 for the period of 1980-2007 (New York -1.5% per year, USFWS Region 5 1.2%/year, $P < 0.01$; Sauer et al. 2008). The Partners in Flight Landbird Population Database indicates there are approximately 170,000 European Starlings in the New York State portion of BCR 30 which includes Long Island (Blancher et al. 2007). BBS population trends for Red-winged Blackbirds and Cowbirds in New York and USFWS Region 5 during 1980-2007 are decreasing (Red-winged Blackbirds: -1.4 – -1.0% per year, $P < 0.01$; Brown-headed Cowbirds -2.7 - -2.5% per year, $P < 0.01$; Sauer et al. 2008),

1.7.17 Swallows

Individually, swallows would not appear to present a substantial hazard to aircraft because of their small size (Tree Swallows: weight 0.6-0.9 ounces (16-25g); Barn Swallows: weight 0.6-0.9 ounces (17-20 g); Cornell Lab of Ornithology 2010). Although the speed of the aircraft can give strikes with small birds considerable force, the primary risk associated with these species is that they are found in flocks which can result in damage to multiple sections of the aircraft. The two swallow species most commonly involved in strikes at JFK are Tree Swallows and Barn Swallows. Tree Swallow strikes occur from August-October when birds migrating south for the winter, stop at the airport to feed on bayberries and other food. Barn Swallows are known to cluster around abundant food sources (e.g., areas where there has been an insect hatch) (Cornell Lab of Ornithology 2010). Small groups (5-6 birds) of Barn Swallows have been observed foraging for insects at JFK and have been struck by aircraft from May through August with a peak in August.

Swallows are protected under the MBTA and state law. Permits from the USFWS and NYSDEC are required to take swallows to reduce hazards at airports.

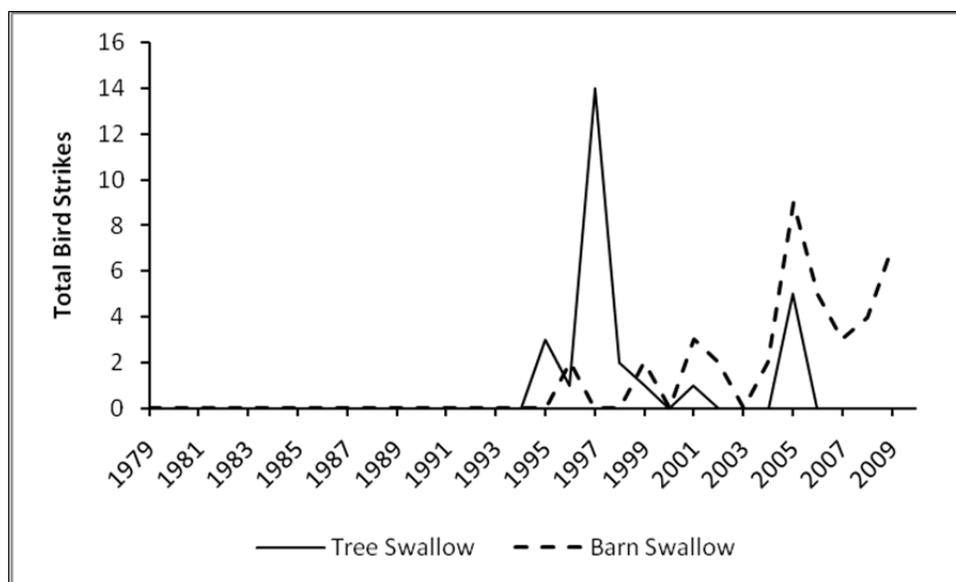


Figure 1-31. Annual on-airport Tree Swallow and Barn Swallow strikes at JFK.

The first Tree Swallow strike was recorded in 1995 and the highest number of strikes (14) was recorded in 1997. Since the completion of the 1994 FEIS (1994-2009), there have been 27 strikes involving 380 birds (Fig. 1-31). One aircraft struck 197 Tree Swallows in 1997 and a section of Runway 31L was closed in October 2001 due to a flock of Tree Swallows that were undeterred by the dispersal methods used on them. Two of the thirteen strikes reported by air-carriers for 1994-2009 resulted in damage to the aircraft. The first Barn Swallow strike was recorded in 1996. Over the period of 1996-2009, there have been 39 strikes involving 68 birds (Fig. 1-31). Barn Swallow strikes have been reported each year starting in 2004. None of the 13 strikes reported by air-carriers for 1994-2009 resulted in damage to the aircraft. Swallows ranked 21st among the 23 bird species/species groups evaluated for risks to aircraft (FAA 2007). Nationwide, for the period of 1990-2009, there have been 192 Tree Swallow strikes, 63 of which involved multiple birds (Dolbeer et al. 2011). There have also been 1,070 Barn Swallow strikes, 190 of which involved multiple birds. Reported cost of strikes by Tree Swallows and Barn Swallows was \$65, and \$23,907 respectively. There were two off-airport Tree Swallow strikes (200 and 400 feet AGL) and one off-airport Barn Swallow strike (300 feet AGL) during 1994-2009. There was no reported damage for any of the strikes.

Tree swallows have been killed by the JFKWMU to reduce hazards to aircraft in 2001 (184 birds) and 2005 (14 birds). The only lethal take of Barn Swallows to address damage problems at JFK occurred in 2006 when 16 birds were taken. On-going efforts to manage insect populations and remove bayberries should help reduce Barn Swallow and Tree Swallow strikes (Bernhardt et al. 2009).

Data from the BBS for the period of 1980-2007 indicate the Tree Swallow population has been increasing in New York (2.2% per year, $P = 0.03$) and relatively stable in USFWS Region 5 (0.6% per year, $P = 0.27$; Sauer et al. 2008). Data from the BBS indicate that, for the period of 1980-2007, Barn Swallow populations have been decreasing in New York and USFWS Region 5 (-2.0 and -2.2% per year, respectively, $P < 0.01$).

1.7.18 Other Bird Strikes

The list of bird species struck at JFK is not limited to the species noted above. Other species include American Robins, Blue Jays, Veery, Dark-eyed Juncos, and sparrows. Appendix C contains a detailed list of all bird species struck by aircraft at JFK. Bird strikes involving these species are relatively rare, but have, on occasion, resulted in reports of damage to aircraft (Appendix C). As with the bird species noted above, the JFKWMU and their designated agents work to prevent these species from using JFK and JFK airspace. To date, nonlethal methods have generally been adequate to address problems with these species. However, the USFWS permit for JFK does allow for emergency take of birds not specifically listed under the airport's permit if needed to address a threat to aircraft that cannot be adequately addressed using nonlethal measures. The airport is required to submit a written report to the USFWS each instance of emergency take within 72 hours of the incident which includes information on the reason why it was necessary to use lethal methods to reduce the hazard. The only take of birds for wildlife hazard management at JFK that has not been reviewed above was the take of two Ring-necked Pheasants in 2002, four Snow Buntings in 2003, and 1 Northern Flicker in 2008.

House Sparrows are occasionally (0-13 birds per year) captured in traps set for blackbirds and pigeons. House sparrows tend to stay near the buildings and are not generally a strike hazard to aircraft although their nests and droppings can cause problems. Over the period of 1994-2009, there were only two strikes involving 4 birds with no reports of damage. House sparrows are also a non-native species and, consequently, are euthanized instead of released when captured in the traps.

1.7.19 Summary

The species of primary interest for the bird strike reduction program are Herring Gulls, Ring-billed Gulls, Great Black-backed Gulls, Laughing Gulls, Canada Geese, Double-crested Cormorants, Atlantic Brant, Mute Swans, European Starlings and Rock Pigeons. This list is based on criteria that include local abundance (based on survey data), body weight, flocking behavior, number of strikes at JFK, and number of damaging strikes at JFK. Gulls are important due to local abundance, and the number of wildlife-aircraft strikes over the years. Canada Geese are the second most damaging species, with 15 strikes at JFK during 1994-2009 for a total of \$10,500,200 million in damage. Cormorants are less abundant than Canada Geese, but their large body size and tendency to fly low make them particularly hazardous to aircraft approaching and leaving JFK. Atlantic Brant are of concern due to their high seasonal abundance, flocking behavior, body size, low flying altitude, and poor response to hazing. Mute Swans, the largest bird at nearly 25 pounds, would cause significant and possibly catastrophic damage during a wildlife-aircraft strike. Lastly, pigeons and starlings are flocking species and locally abundant. European Starlings also have a high body density (Seamans et al. 1995) which makes individual

birds a greater risk to aircraft than might be otherwise anticipated given their size. While other species may have caused damaging strikes, or incurred more strikes these bird species are of secondary management concern because of lower risks of damaging strikes. The JFKWMU also works extensively to manage hazards associated with these species. Many of the actions proposed in this supplement for species of primary concern will also help with species of secondary concern. Several of the alternatives proposed also include actions to address risks from species other than those of primary management concern (e.g., ducks, crows, blackbirds, raptors).

1.8 OTHER WILDLIFE STRIKES AT JFK

The grounds of JFK provide habitat for a variety of mammals, reptiles and amphibians including Eastern cottontail rabbits, black-tailed jackrabbits, domestic dogs and feral cats, small rodents (Norway rats, house mice, meadow voles and white-footed mice; Barras et al. 2000a), Eastern diamondback terrapins, snakes, frogs and toads. Most of these species are rarely if ever struck by aircraft and in no instance has a strike by any of these species resulted in an air-carrier report of damage to an aircraft, so none of these species is considered to pose much of a direct hazard to aircraft. Although these species do not pose a direct hazard to aircraft, smaller species such as rodents (rats, mice, voles), cottontail rabbits and black-tailed jackrabbits are a food source for medium to large size raptors such as Snowy Owls, Red-tailed Hawks, and Rough-legged Hawks which pose a much greater risk to aircraft and have been struck by aircraft at JFK (Section 1.7.8, 1.7.12, Appendix C). Carcasses of animals struck at the airfield may also be an attractant to scavengers. However, risks from carcasses are likely already minimized by JFKWMU efforts to quickly remove all animal carcasses. JFK did not start counting wildlife strikes with non-avian species until 2000. Black-tailed jackrabbits and Eastern diamondback terrapins are the species most commonly reported as struck (Fig. 1-32).

Black-tailed jackrabbits are the more common of the two lagomorph species found at the airport. However, they are not native to New York and the population was likely introduced to the state for hunting purposes (Wilson and Ruff 1999). Cottontail rabbits are native to the area, but are generally less abundant than the jackrabbits. In 1999, the PANYNJ and the National Wildlife Research Center initiated a spring and fall survey system for black-tailed jackrabbits and cottontail rabbits (Washburn et al. 2005b). Abundance of jackrabbits from December 1999 to March averaged 43.8 jackrabbits per survey (Standard Error (SE) = 1.62) in Fall and 37.8 jackrabbits per survey (SE 5.93) in Spring (Washburn et al. 2005b). Cottontail rabbit abundance has been more variable, with lows from Fall 1999 to Spring 2002 (average rabbits per survey = 10.7, SE = 2.85), highs from Spring 2002 to Spring 2005 (average = 45.3, SE = 1.37) and declines again in Fall 2004 and Spring 2005 (average = 8.5, SE = 0.61; Washburn et al. 2005b).

Eastern diamondback terrapins are attracted to the sand/gravel in safety areas for Runway 4L (Kilo Extension) for nesting. As with bird species like Oystercatchers that are attracted to this habitat type, identification and cultivation of ground cover suitable to this site that will not aggravate other wildlife hazard problems should greatly reduce terrapin strikes.

Dogs are observed infrequently at the airport and originate from nearby areas or are escapees from cargo shipments. On occasion, JFK personnel have chased dogs across the runway, which has caused the Air Traffic Control Tower to temporarily close sections of the runway to reduce hazards to people, animals and aircraft.

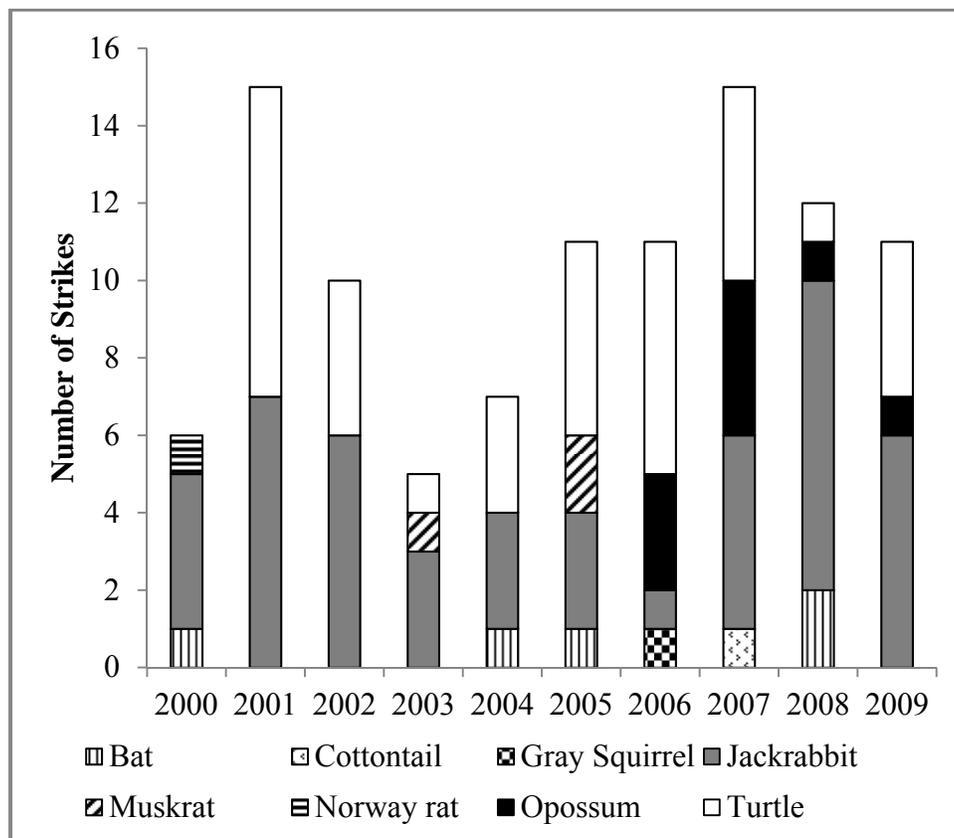


Figure 1-32. Aircraft strikes at JFK involving species other than birds which were involved in more than one strike. Species involved in only one strike include a garter snake, Norway rat, cottontail rabbit, gray squirrel and feral cat.

1.9 OBJECTIVES

Four primary objectives were established to measure progress towards reducing threats to aviation at JFK. Objectives will be evaluated annually by the Port Authority of New York and New Jersey Task Force. Results will be used to adjust control measures on and off the airport to improve efficacy of management actions. The four objects are:

- a) Reduce total bird, gull and Canada Goose strikes with aircraft on an annual basis. The change in the number of bird-aircraft strikes will be measured using the Federal Aviation Administration aircraft strike data base.

- b) Reduce the abundance of gulls, Canada Geese, Atlantic Brant, and Double-crested Cormorants, Mute Swans and Rock Pigeons observed on or adjacent to the airport. The abundance of these bird species will be measured through routine monthly monitoring conducted using standardized bird surveys. Actions under consideration for Gateway NRA could involve reducing the abundance of resident Canada Geese and Mute Swans. Reduction/relocation of the Laughing Gull population is also considered under one management alternative (Alternative 5).
- c) Reduce the local resident Canada Goose population by measuring the number of geese on NYC, state, and local government owned parks and golf courses within 7 miles of JFK. The reduction in the local goose population would equate to a reduction in the risk of a goose –aircraft strike. The local goose population will be measured during late May through early June.
- d) Reduce the number of Canada Geese, Gulls, Double-crested Cormorants, and Atlantic Brant shot on the airfield at JFK. If level and intensity of effort remain relatively constant, then the change in the number of these bird species shot would be a measure of the change in risk to aviation safety.

1.10 AGENCY ROLES AND RESPONSIBILITIES

Over the past thirty years, a number of studies, management programs, and environmental analyses have been conducted regarding the bird strike hazard problems at JFK. The documentation and control of bird strike hazards at JFK requires cooperation among State, Federal, and local agencies and the PANYNJ. The problems and potential solutions are complex, and require ongoing analysis and management effort. The roles and responsibilities of the agencies involved in this effort are outlined below.

1.10.1 U.S. Department of Transportation, Federal Aviation Administration (FAA)

The FAA is responsible for certifying airports and insuring their compliance with federal laws pertaining to safe operation, as well as establishing airworthiness criteria for aircraft engines and components. Federal Aviation Regulation 14 CFR part 139, “Certification and Operations: Land Airports Serving Certain Air Carriers,” as per Section 139.337, “Wildlife Hazard Management,” requires certificated airports such as JFK to develop and implement a WHMP (1994 FEIS Appendix E.1). Section 139.337(d) (2) states that the Plan shall provide measures to alleviate or eliminate wildlife hazards to air carrier operations. The Plan must provide a description of the proposed actions and include target dates for implementation.

FAA Regulation 14 CFR 33.77 enumerates criteria for airworthiness standards that newly-certificated aircraft engines must satisfy regarding ability to withstand bird strikes (Appendix E.1).

The FAA has been an active member of the BHTF at JFK since the group's inception. On May 14, 1993, the FAA determined that an "urgent situation" existed at JFK that required immediate action, and requested the NYSDEC to issue the state permit necessary for WS to conduct the operational gull hazard reduction program (1994 FEIS Appendix C.5.7). The FAA has provided technical information, document review, and guidance relative to aircraft safety and risk management at JFK (1994 FEIS Appendix F.2).

1.10.2 U.S. Department of the Interior, Fish and Wildlife Service (USFWS)

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

The FWS issues permits for the capture and handling or take of migratory birds for scientific purposes or to address depredation issues. The USFWS works cooperatively with WS, state natural resource management agencies, the FAA, and airport operators when dealing with bird hazards at airports. Where warranted, the USFWS issues permits that allow the take of migratory birds as part of integrated management programs that also include non-lethal techniques such as harassment, habitat modification, and control of food and water resources on and near airports.

The FWS has been an active member of the BHTF at JFK since the 1970s, has provided ongoing assistance in the development of bird hazard control programs, and has conducted site visits to JFK to review program operations and purposes (1994 FEIS Appendix C.5.1). The FWS has been issuing permits to JFK personnel to conduct ongoing bird control work, and to WS to conduct operational gull control activities. The FWS is a Federal Cooperating Agency because of its technical expertise, permitting authority and its legal responsibilities under the NEPA.

1.10.3 U.S. Department of the Interior, National Park Service (NPS)

The U.S. Department of the Interior's National Park Service (NPS) administers the Gateway National Recreation Area (Gateway NRA), which is immediately south of JFK, and which extends westward to include most of Jamaica Bay and adjacent uplands. The Gateway NRA was established by Congress in 1972 to, "preserve and protect for the use and enjoyment of present and future generations, an area possessing outstanding natural and recreational features" (Public Law 92-592).

Wildlife Services the PANYNJ and the City of New York have studied the threats that gulls and other birds pose to air craft and human safety in the vicinity of the JFK International Airport. National Park Service management policy requires protecting and preserving natural and cultural

resources in perpetuity for the benefit of future generations (NPS 2006). Any actions conducted at Gateway NRA would require the approval of the Superintendent of Gateway NRA and must be consistent with the mission and management policies of the NPS (NPS 2006) and Gateway NRA. Authorization of individual actions conducted within the context of the NPS decision on this supplement will be handled through the issuance of Special Use Permits and Scientific Research and Collecting Permits. Permit requests for each management action must include a detailed description of the project and justification for the action. The Superintendent has the authority to add site-specific or event-specific conditions in the Special Use Permit.

It is the policy of the NPS (section 4.4.2 in NPS 2006) that, whenever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species. NPS may intervene to manage native species only when such intervention will not cause unacceptable impacts to the populations of the species or to other components and processes of the ecosystems that support them. Special conditions must exist to justify management intervention. In the case for managing the resident Canada Goose population in Gateway NRA, Gateway NRA has concluded that the resident Canada Goose population in the park occurs at an unnaturally high concentration as a result of human activities in the urban landscape (e.g., maintenance of extensive lawns, golf courses, etc.) and it is not possible to mitigate the effects of the human influences;

In addition, NPS may control native species if they threaten natural communities or prohibit the implementation of other park management objectives. The park has undertaken a major, multi-decade, multimillion dollar saltmarsh restoration program in Jamaica Bay. Extensive goose foraging on roots and rhizomes of mature plants and plucking entire young plants out of the mud has greatly diminished the park's restoration efforts. This has been greatly exacerbated by the large numbers of geese who have taken up residence in Jamaica Bay. The NPS has been an active member of the Bird Hazard Task Force since the 1970s, and has an interest in bird management plans developed and conducted by JFK because they have the potential to affect bird species associated with Gateway NRA and recognize that a joint partnership with WS, NYC and the PANYNJ to control goose populations in the vicinity of the JFK Airport should accomplish the dual goals of native ecosystem protection and protection of aircraft and human safety at JFK.

1.10.4 United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS)

WS is the Federal program authorized by law to help reduce damage caused by wildlife. The primary statutory authorities for the APHIS-WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). The mission of the USDA/APHIS/WS program is to provide federal leadership in managing conflicts with wildlife. Wildlife Services' mission, developed through its strategic planning process (USDA 1989), is: 1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety."* WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can cause damage to agriculture and property, pose risks to human health

and safety, and affect industrial and natural resources. WS conducts programs of research, technical assistance and applied management to resolve problems that occur when human activity and wildlife conflict.

Memoranda of Understanding among WS and other governmental agencies also define WS responsibilities in wildlife damage management. A Memorandum of Understanding between the FAA and WS recognizes WS role and expertise in providing wildlife hazard management assistance to the aviation community. It states, that the “FAA or the certificated airport may request technical and operational assistance from WS to reduce wildlife hazards.” The FAA recognizes WS expertise in wildlife hazard management at airports and a Memorandum of Understanding (MOU) between the FAA and WS (No. 12-4-71-0003-MOU) establishes a cooperative relationship between these agencies for resolving wildlife hazards to aviation.

WS, including the National Wildlife Research Center, has been involved in wildlife hazard management at JFK since the gull-aircraft collision in 1975 when the PANYNJ requested an ecological study of the airport. Since that time, WS has worked cooperatively with the PANYNJ to identify and reduce safety hazards associated with birds. Prior to 1991, WS’ involvement was limited to conducting research and providing technical assistance, including training, on bird hazard management at JFK. In 1991, the PANYNJ requested WS operational assistance with the experimental gull shooting program conducted under permits issued by the USFWS and NYSDEC. WS has continued to provide research, technical assistance with gull hazard management, and operational assistance with the supplemental on-airport shooting program since that time. WS could act as an agent of the PANYNJ or assist other landowners in implementing bird hazard management plans as allowed under the alternative(s) selected based on the analysis in this supplement. WS has been requested by the NYC Department of Environmental Protection to assist with hazing programs to reduce/prevent bird use of Pennsylvania and Fountain Ave. landfill sites.

1.10.5 New York State Department of Environmental Conservation (NYSDEC)

The NYSDEC exists to conserve, improve, and protect New York State's natural resources and environment, and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social wellbeing. The NYSDEC requires the airport to obtain a permit to take or harass most birds, except geese, gulls, blackbirds and non-native species, called a depredation license and a state permit to collect or possess dead wildlife for educational or training purposes. The depredation license and collection permit must be renewed annually and are only valid in conjunction with applicable federal migratory bird permits. The state permit may be more restrictive than the federal depredation permit and also lists what bird species and which methods the airport is authorized to use. Additionally, the airport must have a permit from NYSDEC to collect or possess for exhibition any raptors being used for the falconry program at the airport. This permit is required for any photographs or interviews to be taken regardless of whether the birds are working.

New York’s State Environmental Quality Review (SEQR) Act Article 8 of the Environmental Conservation Law (ECL) and the statewide SEQR regulations (6NYCRR Part 617) require

completion of environmental review documentation, and permit coordination documentation of state requirements with the federal NEPA process.

The NYSDEC has been an active member of the BHTF since the 1970s, pursuant to its interest in conserving wildlife populations in New York State, and its role in evaluating applications from the Port Authority and WS for permits to conduct bird hazard control to protect human safety at JFK. NYSDEC has issued permits to JFK pursuant to ECL 11-0521 and 6NYCRR Part 175.

1.10.6 New York City Department of Environmental Protection (NYCDEP)

The New York City Department of Environmental Protection (DEP) is a City agency of nearly 6,000 employees that manages and conserves the City's water supply; distributes more than one billion gallons of clean drinking water each day to nine million New Yorkers and collects wastewater through a vast underground network of pipes, regulators, and pumping stations; and treats the 1.3 billion gallons of wastewater that New Yorkers produce each day in a way that protects the quality of New York Harbor. To achieve these mandates, DEP oversees one of the largest capital construction programs in the region. As the City agency responsible for NYC's environment, DEP also regulates air quality, hazardous waste, and critical quality of life issues, including noise.

The NYCDEP has been a member of the JFK BHTF since 1992. The NYCDEP, along with the PANYNJ, is also responsible for the initiation of the program to reduce resident Canada Goose population in portions of NYC and associated strike hazards to aircraft using airports in the NYC area. The program was developed in response to the January 15, emergency landing of Flight 1549 in the Hudson River after a strike involving multiple Canada Geese and a subsequent evaluation of recent Canada Goose strikes in the NYC area.

Pursuant to a Record of Decision with the New York State Department of Environmental Conservation, NYCDEP is responsible for remediation activities following landfill closure at the Pennsylvania and Fountain Avenue Landfills, located in Brooklyn and Queens, New York, within close proximity to JFK. As part of this remediation, NYCDEP developed an end-use plan to convert these landfills into a natural area restoration park with the installation of several coastal plant communities. Due to the proximity of the landfills to JFK, concerns were raised that the seeding and planting of these landfills would increase of these sites for several birds of concern (e.g. geese, ducks, gulls, etc.). To avoid potential problems, NYCDEP agreed to engage in an active program of wildlife damage management to reduce and minimize feeding, nesting, and loafing habitat and has developed a contract to monitor and manage bird populations at the two landfill sites.

1.10.7 New York City Department of Parks and Recreation

The NYC Department of Parks and Recreation is the agency responsible for the management of the city's parks and recreational spaces. The Department of Parks and Recreation is the steward of approximately 29,000 acres of land including more than 800 athletic fields, 1,000 playgrounds, 550 tennis courts, 66 public pools, 48 recreational facilities, 17 nature centers, 13

golf courses and 14 miles of beaches. Areas such as parks with ponds, golf courses and athletic fields can be particularly attractive to feeding, loafing and nesting resident Canada Geese, gulls, swans and ducks. The NYC Department of Parks and Recreation is a member of the BHTF and works with the PANYNJ to help reduce bird attractants at lands under the department's management.

1.10.8 Port Authority of New York and New Jersey (PANYNJ)

The PANYNJ administers JFK, and leases the facilities from the City of New York. As an air carrier, JFK is administered by the PANYNJ pursuant to federal FAA guidelines that include Federal Aviation Regulation 14 CFR Part 139.337 ("Wildlife Hazard Management"). Part 139 mandates that airport authorities assess wildlife hazards at their airports and develop and conduct plans to reduce or eliminate these hazards in the interest of human safety. Since the 1960s, the PANYNJ has evaluated and conducted management plans to reduce hazards from wildlife and it has created the BHTF in 1985 to monitor, improve, and guide PANYNJ actions regarding the wildlife hazards at JFK. JFK's most recent wildlife hazard plan was developed and accepted by the FAA in 2004. The PANYNJ is the managing agency for all on-airport hazard reduction actions that have occurred to date, with the exception of the on-airport shooting program, which is conducted at the PANYNJ's request by WS. The PANYNJ also contracts with a private falconry company for assistance with bird hazard management at the airport during the busy migration and nesting periods. Programs that are conducted by the PANYNJ include, but are not limited to: insect control, water management, sanitation, JFKWMU, grass management, and other non-lethal habitat management activities. The PANYNJ has and will continue to conduct these activities pursuant to NYC, State of New York, and federal permits regarding migratory birds, wetlands, disposal of carcasses, use of materials, noise, and other concerns.

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