



## **WILDLIFE HAZARD MANAGEMENT PLAN**

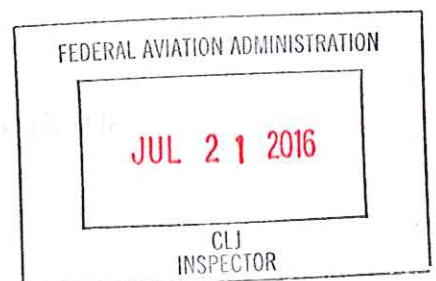
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## 1.1 Overview

Wildlife Hazard Management Plans (WHMPs) address the responsibilities, policies, and procedures necessary to reduce wildlife hazards at airports. The Federal Aviation Administration (FAA) recognizes the potential hazards posed by wildlife to aircraft and requires airports to implement a WHMP according to 14 Code of Federal Regulations (CFR) Part 139.337, Wildlife Hazard Management (see **Appendix A** for full copy of 14 CFR Part 139.337). The first WHMP for San Francisco International Airport (SFO or the Airport) was prepared in 1999 and updated in 2012 to address wildlife hazards identified on and around SFO. This revision to the plan reflects significant changes in program organization, implementation, and regulations that have occurred since the 2012 WHMP and incorporates results and recommendations from a 2014 Wildlife Hazard Assessment (WHA).

## 1.2 San Francisco International Airport

SFO is located about 13 miles south of downtown San Francisco, in unincorporated San Mateo County. **Figure 1-1** shows the location of the Airport within the San Francisco Bay Area. The Airport borders the San Francisco Bay Estuary immediately to the north, south, and east, a major refuge for migrating and overwintering waterfowl and shorebirds during the months of August through April, and breeding habitat for a few species.<sup>1</sup> The San Francisco Bay Estuary is a Western Hemisphere Shorebird Reserve Network site used by more than 1 million shorebirds during migration.<sup>1</sup> More than 30 species of waterfowl are found in San Francisco Bay. Mid-winter waterfowl surveys have counted more than 300,000 individuals in the open bays and ponds.<sup>1</sup> The Airport is also bound by densely urbanized areas to the west; U.S. Interstate 101 generally runs north/south along the western boundary of the Airport.

According to the SFO Airport Traffic Control Tower traffic count, SFO served more than 47.1 million passengers in 2014, with 431,633 aircraft operations – an increase of approximately 4.8% and 2.4% respectively compared to 2013. Of these, 334,146 were air carrier operations, 81,051 were air taxis, 12,623 were civil, and 2,813 were military operations. Patrons of the Airport are served by major air carriers that provide non-stop service and/or connecting service to international and domestic destinations. SFO is the second-busiest airport in California, after Los Angeles International Airport. As of 2013, SFO ranked 7<sup>th</sup> in enplaned passengers in the U.S.<sup>2</sup> SFO is also served by cargo carriers, including the U.S. Postal Service, to international and domestic destinations. Two helicopter operators are based at the SFO: the U.S. Coast Guard and San Francisco Helicopters.

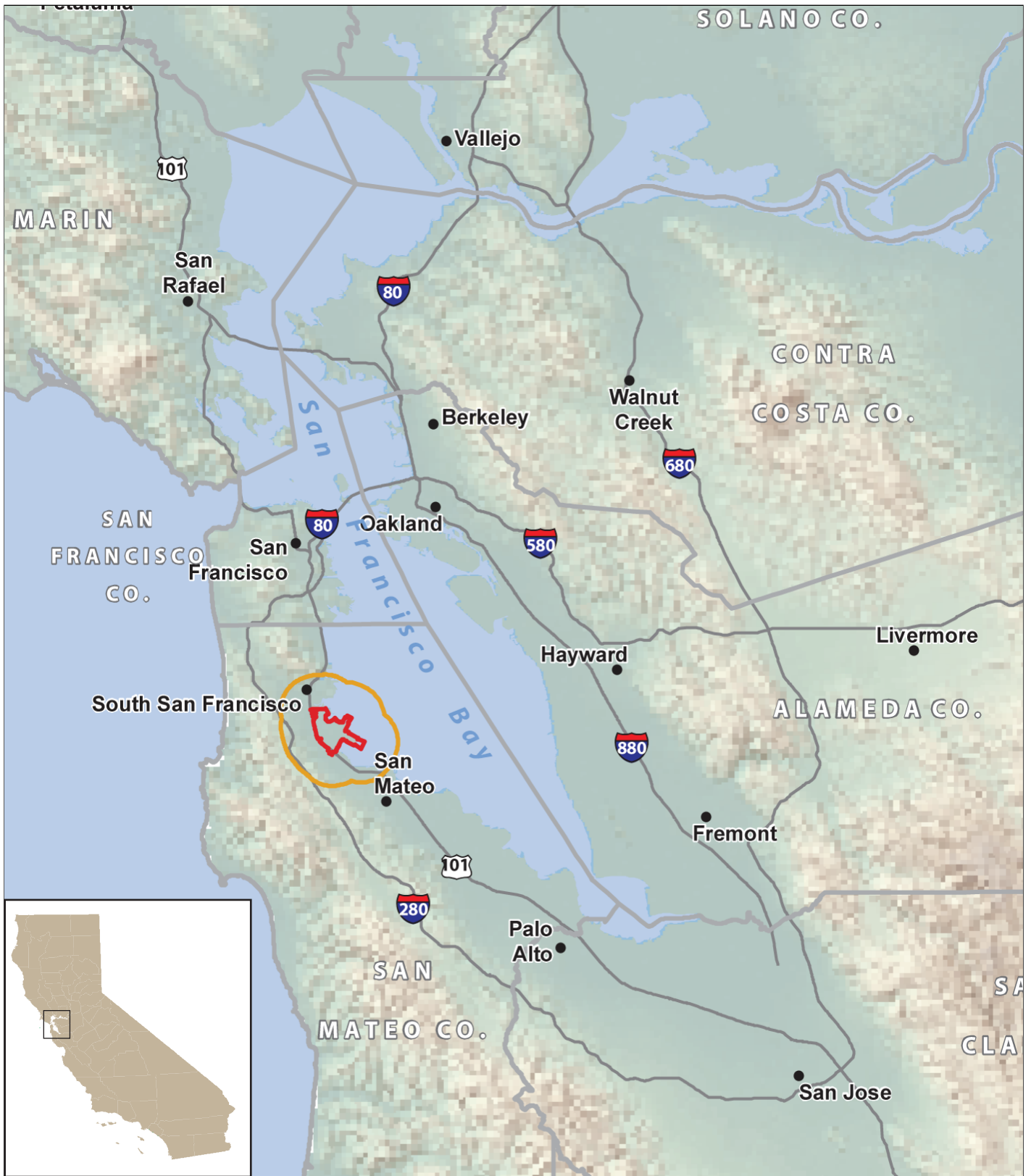
SFO occupies approximately 2,500 acres of land owned by the City and County of San Francisco (CCSF). The Airport is managed through the San Francisco Airport Commission

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<sup>1</sup> Goals Project 2000. Full citations in this Wildlife Hazard Management Plan (WHMP) are provided in Chapter 8, References Cited.

<sup>2</sup> FAA CY2008 Passenger Boarding and All-Cargo Data, published October 13, 2009.





**Legend**

- ▭ Primary Wildlife Habitat Management Zone
- ▭ Secondary Wildlife Habitat Management Zone
- County Boundary
- Freeways

**Figure 1-1**  
SFO Airport Vicinity



(Airport Commission). The Airport Commission consists of five members appointed by the Mayor of San Francisco to 4-year terms. The Airport Commission is prohibited by city charter from involving itself in the day-to-day operation of the airport; that function is vested in the Airport Director. Of the total acreage, about 180 acres is located west of U.S. 101; this property, called the West-of-Bayshore property, includes major utility alignments, power stations, and the San Francisco Bay Area Rapid Transit (BART) alignment and provides habitat for two protected species.

SFO includes the aircraft operations area (AOA) and adjacent terminals, parking lots, and landscaped areas. **Figure 1-2** shows the entire extent of the Airport property boundary and facilities. As shown, SFO has two primary runways (Runways 10R/28L and 10L/28R) and two crosswind runways (Runways 1R/19L and 1L/19R). There are five terminal buildings at the Airport: Terminals 1, 2, and 3, International Terminal, and Signature Flight Support Executive Air Terminal. Other buildings associated with airport operations include the Mel Leong Treatment Plant, Superbay Hangar, Untied Airlines SF Maintenance Center, Airport Commission buildings and various cargo facilities, U.S. Coast Guard facilities, short- and long-term parking garages, consolidated rental car center, and BART station.

## 1.3 Background

Aircraft collisions with wildlife, also commonly referred to as wildlife strikes, cost the civil aviation industry in the United States at least \$500 million annually in direct damage and associated costs and more than 500,000 hours of aircraft down time.<sup>3</sup> Wildlife strikes can cause serious damage to aircraft and occasionally result in the loss of human life.

Large-bodied wildlife such as cormorants, cranes, deer, geese, gulls, herons, pelicans, raptors (e.g., falcons, hawks, eagles, and owls), and vultures are present in suburban and urban areas, including airports. Almost all of these species have body masses more than 4 pounds (1.8 kilograms [kg]), which exceed the airframe and engine certification standards for wildlife strikes.

Of all wildlife strikes at airports, approximately 74% generally occur at or below 500 feet above ground level (AGL). A total of 18 of the 19 civil and military large-transport aircraft were destroyed because of bird strikes crashed because of strikes that occurred on the airports. Because most strikes occur on or near airports, airports are the logical place to address the problem.

For the 14-year period between 1990 and 2003, 52,493 wildlife strikes were reported to the FAA.<sup>3</sup> Birds were involved in 97.4% of the reported strikes, mammals in 2.4%, and reptiles in less than 0.2%. As shown in **Table 1-1**, the most commonly struck bird species groups at U.S. airports were gulls, doves/pigeons, raptors, waterfowl, and blackbirds/starlings from 1990 to 2003.<sup>3</sup>

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<sup>3</sup> Cleary and Dolbeer 2005.

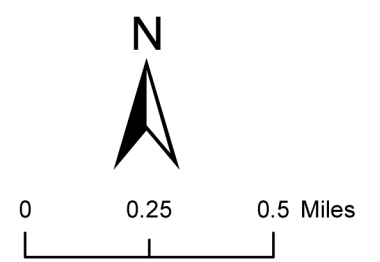




**Legend**

- SFO Property Boundary
- West-Of-Bayshore Property

**Figure 1-2**  
SFO Property and Vicinity





**Table 1-1. Percent of Most Common Wildlife Involved in Aircraft Strikes and Impacts on Airport Operations and Aircraft at U.S. Airports**

Species	Percent of Reported Strikes	Percent of Strikes with Damage	Percent of Strikes with Effect on Flight (EOF)
Gulls	25	28	11
Doves/Pigeons	14	8	11
Raptors	12	17	15
Waterfowl	10	32	20
Blackbirds/Starlings	10	4	7

<sup>1</sup> Includes aborted takeoff, engine shutdown, precautionary landing, or other.

Source: Cleary and Dolbeer 2005

To address the potential hazards that wildlife pose to aircraft and human lives, the FAA, per 14 CFR Part 139.337(b), requires the completion of a wildlife hazard assessment at airports where any of the following occur:

1. An air carrier aircraft experiences multiple wildlife strikes.
2. An air carrier aircraft experiences substantial damage from striking wildlife. Substantial damage is damage or structural failure incurred by an aircraft that adversely affects the structural strength, performance, or flight characteristics of the aircraft and that would normally require major repair or replacement of the affected component.
3. An air carrier aircraft experiences an engine ingestion of wildlife.
4. Wildlife of a size, or in numbers, capable of causing an event described in paragraphs (b)(1), (b)(2), or (b)(3) of this section are present within the AOA.

All four of these triggering events have been documented at SFO.

## 1.4 Federal Aviation Administration Requirements (14 CFR Part 139)

The FAA has established minimum requirements for WHMPs. This WHMP includes all seven elements required by the FAA under 14 CFR Part 139.337(f). These elements, along with the corresponding section of the WHMP that addresses each requirement, are listed in **Table 1-2** below:

**Table 1-2. Elements Required by FAA under 14 CFR Part 139.337(f) and Corresponding Chapters in San Francisco International Airport's Wildlife Hazard Management Plan**

Requirement Number	Requirement Description	SFO WHMP Chapter
1.	The persons who have the authority and responsibility for implementing the plan.	2
2.	Local, state, and federal regulations and copies of relevant permits.	3 and Appendix A
3.	Habitat and land use evaluations and recommended modifications.	4 and 5
4.	Identification of resources to be provided for implementation of the plan.	2 and 5
5.	Procedures to be followed during air carrier operations, including:	
5.a.	Assignment of personnel responsibilities for implementing the procedures;	2
5.b.	Physical inspections of the movement area and other areas critical to wildlife hazard management sufficiently in advance of air carrier operations to allow time for wildlife controls to be effective;	5
5.c.	Wildlife control measures; and	5
5.d.	Communication between the wildlife control personnel and airport traffic control tower (ATCT) in operation at the airport.	5
6.	Periodic evaluation and review of the WHMP for	
6.a.	Effectiveness in dealing with the wildlife hazard; and	6
6.b.	Indications that the existence of the wildlife hazard, as previously described in the wildlife hazard assessment, should be reevaluated.	6
7.	A training program to provide airport personnel with the knowledge and skills needed to carry out the WHMP.	7

Source: 14 CFR Part 139.337(f)

## 1.5 WHMP Purpose

The overall objective of the WHMP is to develop an integrated, adaptive program to effectively manage risk at SFO by reducing the probability of occurrence of wildlife/aircraft collisions. The potential for collisions with terrestrial wildlife is significantly reduced by the security fencing around the terrestrial portion of the airfield perimeter. Bird strikes, however, are a much higher risk for aircraft using SFO, especially during the critical phases of departure and landing operations. It is recognized that the risk of a bird strike at airports can never be completely eliminated; however, the underlying premise of the WHMP is that it is possible to manage that risk to an acceptable level. It is the intent of the WHMP to provide the necessary direction to do so, in a scientifically sound manner, utilizing nonlethal means wherever possible, and complying with all local, state, federal, and FAA laws and regulations. The Airport wildlife coordinator and Airport Wildlife Biologist are responsible for the implementation of the wildlife hazard management program at SFO.

The WHMP serves as strategic guidance and documentation for the program, and also demonstrates compliance with the operational requirements of the FAA as published in 14 CFR Part 139.337.

## 1.6 Annual Review and Reporting

FAA regulation 14 CFR Part 139.337(f)(6) requires annual reviews of an airport's WHMP and revisions as necessary. In accordance with this mandate, SFO's WHMP will be reviewed annually by the Airport's Wildlife Hazard Working Group. Once all of the elements of the WHMP have been evaluated, the assessment will be filed with the wildlife coordinator. The wildlife coordinator will maintain an annual log to confirm that the WHMP annual review has been completed.

In addition to the annual review process, the WHMP will be reviewed whenever an aircraft experiences a multiple-wildlife strike, a damaging collision with wildlife, or an engine ingestion of wildlife. The WHMP will be revised as necessary when the program or the hazards and issues at the Airport change significantly, but no later than once every 5 years or on request by the FAA. The intent of this review process is to maintain the WHMP as a working program that will continue to evolve to effectively meet the requirements of 14 CFR Part 139.337.

The annual review will be documented, and a WHMP assessment report will be submitted to the FAA upon request. The report will provide the FAA's Certification Safety Inspector with the status of current programs and a list of issues that can be addressed during the annual certification inspection.

## 1.7 Wildlife Hazard Overview

A Wildlife Hazard Assessment (WHA) was completed in 2010 and approved by the FAA in 2014 to support the WHMP review and revision process. The assessment is intended to fulfill the requirements of 14 CFR Part 139.337(b) and to document baseline habitat and wildlife data collected at SFO as they relate to potential aviation safety concerns. Going forward, similar data on wildlife abundance and activity will be collected continuously to provide year-round and long term data for analysis. This revision incorporates data and information collected during the WHA as well as from the 2012 WHMP, analyzes strike hazards by species, season, location, and other factors, and identifies potential attractants and special status species and habitat constraints.

The information presented includes WHA survey data and information gathered from the following sources:

- SFO wildlife activity reports for the WHA period between June 1, 2010 and May 31, 2011.
- SFO wildlife/bird strike reports (AIRS) from January 2, 2005 to June 27, 2011.
- FAA national strike database records from March 9, 1990 to May 29, 2011.
- SFO wildlife/bird strike reports from January 2006 to March 2009.
- Aerial photographs and a habitat survey of SFO and a 2-mile buffer conducted in July 2009.
- State and federal special status species occurrence data
- Federal designated critical habitat data.



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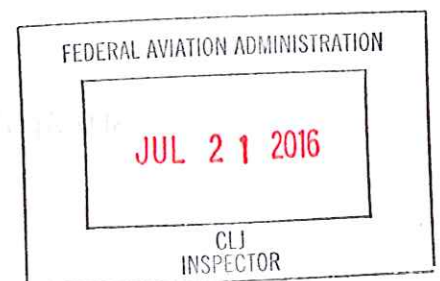
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## Acronyms and Abbreviations

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AC	Advisory Circular
AGL	above ground level
Airfield Operations	SFO Airfield Operations Department
Airport Commission	San Francisco Airport Commission
AOA	Air Operations Area
ATCT	airport traffic control tower
AVMA	American Veterinary Medical Association
BART	San Francisco Bay Area Rapid Transit District
BCDC	Bay Conservation and Development Commission
BGEPA	Bald and Golden Eagle Protection Act
BSC-USA	Bird Strike Committee USA
C/CAG	City/County Association of Governments of San Mateo County
CACs	County Agricultural Commissioners
CCR	California Code of Regulations
CCSF	City and County of San Francisco
CDFW	California Department of Fish and Wildlife
CE	categorical exclusion
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNPS	California Native Plant Society
CO <sub>2</sub>	Carbon dioxide
DPR	California Department of Pesticide Regulation
EA	environmental assessment
EIS	environmental impact statement
EOF	Effect on Flight
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FGC	California Fish and Game Code
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FOD	Foreign Object Debris
HDPE	high-density polyethylene
IPM	Integrated Pest Management
kg	kilograms
m	meter

MBTA	Migratory Bird Treaty Act
MLTP	Mel Leong Treatment Plant
mm	millimeter
MOA	memorandum of agreement
MOU	memorandum of understanding
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
PEA	Planning and Environmental Affairs
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
RPZ	Runway Protection Zone
RWQCB	Regional Water Quality Control Board
SFO	San Francisco International Airport
SFPD	San Francisco Police Department
SPCA	Society for the Prevention of Cruelty to Animals
SWRCB	State Water Resources Control Board
TSA	Transportation Security Administration
US-101	U.S. Highway 101
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WDR	waste discharge requirements
WHA	Wildlife Hazard Assessment
WHC	Wildlife Hazard Committee
WHMP	Wildlife Hazard Management Plan
WHWG	SFO Wildlife Hazard Working Group
WS	Wildlife Services



This executive summary presents an overview of the information contained in each chapter of the Wildlife Hazard Management Plan.

## Chapter 1. Introduction

Wildlife Hazard Management Plans (WHMPs) address the responsibilities, policies, and procedures necessary to manage and reduce wildlife hazards at airports. Taken together these activities comprise the Airport's wildlife hazard mitigation program. The Federal Aviation Administration (FAA) recognizes the potential hazards posed by wildlife to aircraft and requires airports to implement a WHMP according to 14 Code of Federal Regulations (CFR) Part 139.337, Wildlife Hazard Management (see **Appendix A** for full copy of 14 CFR Part 139.337). The first WHMP for San Francisco International Airport (SFO or the Airport) was prepared in 1999 and updated in 2012 to address wildlife hazards identified on and around SFO. This revision to the plan reflects significant changes in program organization, implementation, and regulations that have occurred since the 2012 WHMP and incorporates results and recommendations from a 2014 Wildlife Hazard Assessment (WHA).

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### 1.2 Annual Review and Reporting

FAA regulation 14 CFR Part 139.337(f)(6) requires annual reviews of an airport's WHMP and revisions as necessary. In accordance with this mandate, SFO's WHMP will be reviewed annually by the Airport's Wildlife Hazard Working Group. Once all of the elements of the WHMP have been evaluated, the assessment will be filed with the wildlife coordinator. The wildlife coordinator will maintain an annual log to confirm that the WHMP annual review has been completed.

In addition to the annual review process, the WHMP will be reviewed whenever an aircraft experiences a multiple-wildlife strike, a damaging collision with wildlife, or an engine ingestion of wildlife. The WHMP will be revised as necessary when the program or the hazards and issues at the Airport change significantly, but no later than once every 5 years or on request by the FAA. The intent of this review process is to maintain the WHMP as a working program that will continue to evolve to effectively meet the requirements of 14 CFR Part 139.337.

The annual review will be documented, and a WHMP assessment report will be submitted to the FAA upon request. The report will provide the FAA's Certification Safety Inspector with the status of current programs and a list of issues that can be addressed during the annual certification inspection.

## **Chapter 2. Program Organization, Roles, and Responsibilities**

Chapter 2 presents the program organization, roles, and responsibilities for the implementation of the WHMP. The Airport Director maintains the primary authority over the wildlife management program at SFO. All Airport divisions and associated agencies have responsibilities outlined in the WHMP, and they must incorporate these responsibilities into their operations. Clear communication among SFO staff and divisions is essential for the WHMP to succeed. Airport staff will provide resource needs, recommendations, and progress reports or updates to SFO Planning and Environmental Affairs (PEA). The wildlife coordinator, the Airport Wildlife Biologist, and Airfield Operations staff will lead daily management of the SFO's wildlife management program. A list of all personnel responsible for direct implementation and there for requiring initial and annual Part 139 training is provided.

## **Chapter 3. Applicable Laws, Regulations and Policies Overview**

Chapter 3 discusses applicable laws, regulations, and policies associated with the requirements for and implementation of the program. Federal, state, and local governments administer laws and regulations that protect wildlife and their habitat. Most wildlife management agencies issue permits to allow the regulated and controlled harassment or take of certain wildlife species when required by extenuating circumstances and within specific parameters. Permits required to implement the program are obtained on a routine basis by the SFO Airfield Operations staff or the Airport Wildlife Biologist. For special status species and habitats, a process for coordination with the appropriate regulatory agency is described.

## **Chapter 4. Wildlife Hazard Overview**

A Wildlife Hazard Assessment (WHA) was completed in 2010 and approved by the FAA in 2014 to support the WHMP review and revision process. The assessment is intended to fulfill the requirements of 14 CFR Part 139.337(b) and to document baseline habitat and wildlife data collected at SFO as they relate to potential aviation safety concerns. Going forward, similar data on

wildlife abundance and activity will be collected continuously to provide year-round and long term data for analysis. This revision incorporates data and information collected during the WHA as well as from the 2012 WHMP, analyzes strike hazards by species, season, location, and other factors, and identifies potential attractants and special status species and habitat constraints.

The information presented includes WHA survey data and information gathered from the following sources:

- SFO wildlife activity reports for the WHA period between June 1, 2010 and May 31, 2011.
- SFO wildlife/bird strike reports (AIRS) from January 2, 2005 to June 27, 2011.
- FAA national strike database records from March 9, 1990 to May 29, 2011.
- SFO wildlife/bird strike reports from January 2006 to March 2009.
- Aerial photographs and a habitat survey of SFO and a 2-mile buffer conducted in July 2009.
- State and federal special status species occurrence data
- Federal designated critical habitat data

## Management Zones

Three management zones are delineated in the plan: the Primary, Secondary, and General Zone. Each of the management zones is described in more detail below.

### Primary Zone

The Primary Zone (**Figure 4-1**) consists of the area within the existing Airport property boundary and the runway protection zones (RPZ) located at the end of each of the four runways. The primary zone extends beyond the perimeter fence to U.S. Highway 101 (US-101) on the western side of the Airport to encompass buildings on airport property. On the southern portion of SFO, the Primary Zone extends along the property boundary to the Millbrae Gate (**Figures 4-1** and **4-2**). The area of the Primary Zone totals 2,337 acres. The RPZ, outlined by FAA AC 150/5300-13 (or current edition), establishes a protective airspace for landings and departures. This represents the area in which aircraft are most vulnerable to wildlife strike hazards. Risk to aircraft is greatest during takeoff, when aircraft are likely to be at their maximum payload and thrust, and have limited maneuverability.

SFO's WHMP objective for the Primary Zone is to eliminate or reduce, to the extent practicable, all attractants for potentially hazardous wildlife species that occur within the zone, and to not allow for the construction of any new attractants within this zone. All lands in the Primary Zone are owned and managed by the City and County of San Francisco. The Primary Zone is the area in which SFO staff implements wildlife management operations on a daily basis. This includes wildlife control operations, related activities, and management to reduce wildlife, habitat, and attractants.

### Secondary Zone

The Secondary Zone, as shown in **Figure 4-1**, encompasses all remaining lands within the 10,000-foot radius area established in FAA AC 150/5200-33B (or current edition) that are not included in the Primary Zone. Most lands in the Secondary Zone are privately owned and not under direct SFO management. Land uses within the Secondary Zone should be compatible with safe

aircraft operations, should not create new attractants for potentially hazardous wildlife species, and should not enhance existing attractants such that they become an unacceptable risk to the safe operation of aircraft.

Airport staff should work with adjacent landowners and the regulatory agencies to discourage or modify actions on non-Airport property that are documented or predicted to result in unacceptable risks to aviation safety. Whenever possible, SFO staff should coordinate and consult with local jurisdictions to reduce risks to aviation safety before implementation of any major management decision.

## General Zone

The General Zone at SFO is defined as the area within a 5-mile radius of the Airport Operations Area (AOA). FAA AC 150/5200-33B provides guidance on areas to be included in a WHMP, as well as guidance on the siting of land uses that have the potential to attract hazardous wildlife to or near airports. The FAA recommends a distance of five (5) miles between the farthest edge of the AOA and any hazardous wildlife attractant, if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. Wildlife attractants within the General Zone, particularly attractants that lie within the approach and departure patterns, could degrade air traffic safety at SFO. Potential attractants in the General Zone include San Francisco Bay, tidal marsh and mudflats, wastewater treatment facilities, marinas, golf courses, San Andreas and Crystal Springs Reservoirs, and open space (e.g., the San Francisco Bay Trail, San Bruno Mountain, parks). SFO staff will review and work to reduce potential hazardous wildlife attractants and development within the General Zone. Airport staff will also work cooperatively with property owners in the General Zone to discourage land use practices that may increase the potential to attract wildlife to the proximity of the Airport.

## 4.3 Observed Wildlife

Point count surveys were conducted twice per month for one year from 2010 to 2011 to collect data for analysis in the WHA. Abundance, seasonality, and natural history characteristics were used to assign hazard ranks to wildlife species present at SFO. The most hazardous species or species groups were identified as geese (specifically Canada geese), cormorants and pelicans, ducks, herons, hawks, gulls, owls (specifically barn owls), shorebirds, and blackbirds and starlings. The characteristics and hazard presented by each species or species group is discussed.

## 4.4 Threatened and Endangered Species and Habitats

Critical habitat for one species (steelhead) has been designated within the 10,000ft Secondary Zone. Critical Habitat for three additional species (bay checkerspot butterfly, marbled murrelet, and California red-legged frog) is designated within the 5 mile General Zone (**Figure 4-4**).

Nineteen threatened, endangered, and/or fully protected species have recorded occurrences within 10,000ft of SFO (**Figure 4-5**). These include: 9 plants, 2 butterflies, 1 fish, 1 amphibian, 1 reptile, 4 birds, and 2 bats. See **Appendix H** for a table detailing each species, their habitat requirements, and their likelihood to occur. Of the 19 species with recorded occurrences within 10,000ft of the airport, only 7 may occur or are known to occur on SFO property where the WHMP actions may have

potential impacts. The 7 species that may or are known to occur at SFO are the longfin smelt, California red-legged frog, San Francisco garter snake, American peregrine falcon, Ridgway's rail, brown pelican, and white-tailed kite.

## 4.5 Wildlife Strikes at SFO

A total of 70 wildlife-aircraft strikes were recorded during the WHA period and 1,186 were recorded by the FAA from 1990 to 2011 (**Table 4-3**). Wildlife groups that were most identified in strikes included gulls, large waterbirds, passerines, diurnal raptors, owls, shorebirds, and mammals (**Table 4-3**).

A large percentage of strikes at SFO were not identified because of a lack of identifiable remains, failure to collect and send remains for identification, or lack of availability of genetic identification at the time of the strike (**Table 4-3**). SFO currently collects any remains of an unidentified wildlife strike and sends the feathers to the Feather Identification Lab at the Smithsonian Institution for identification.

## 4.6 Habitat Occurrence

The geographical location of SFO along the San Francisco Bay and nearby refuges and salt ponds leads to high potential use by birds, particularly shorebirds, waterfowl, seabirds, and gulls. San Francisco Bay is an important migratory stopover in spring and fall, and is important habitat for overwintering and breeding birds. All undeveloped land cover types on SFO property (Primary Zone) and within a 2-mile radius of SFO property (Secondary Zone) were mapped for vegetative cover types.

In addition to vegetation, wetlands within the 10,000 foot Secondary Zone were analyzed. Within the secondary and primary zones, there are approximately 7,657 acres of wetlands including estuarine and marine deepwater and wetlands, freshwater emergent wetland, freshwater ponds, and riverine systems.

## Chapter 5. Wildlife Management Techniques

The wildlife management strategies chapter of the WHMP outlines the range of measures employed to ensure public safety at SFO by reducing the incidence of wildlife-aircraft collisions. These measures are grouped according to four general categories:

1. Wildlife control procedures to discourage, disperse, and remove potentially hazardous wildlife from the airfield vicinity.
2. Habitat modification practices to reduce the attractiveness of lands on and around the airport to potentially hazardous wildlife.
3. Research and development projects to gather data and field-test new equipment and techniques, and to gain understanding of wildlife dynamics as they relate to SFO.
4. Information and education programs to articulate the hazards that wildlife can pose to safe aircraft operation.

Wildlife control procedures and habitat management actions undertaken at SFO are subject to regular field-testing and evaluation by the Airport Wildlife Biologist and Airport Operations staff. It is expected that these measures will evolve over time as more effective applications and new techniques are identified and adopted by SFO. Any recommended changes to the management techniques and protocols presented in this chapter will be incorporated into future updates of the WHMP.

A detailed presentation of the various techniques, approaches, and strategies currently available for wildlife hazard management at SFO is provided. Much of this chapter is devoted to methods to control birds on the airfield, the primary wildlife-aviation hazard identified. Most mammals at SFO do not represent a significant strike hazard, but they can attract avian predators such as hawks and owls. No large mammals such as deer and coyotes are observed at SFO. Small mammals at SFO will be managed by manipulating habitat.

## Chapter 6. Evaluation and Implementation

This chapter outlines the procedures for evaluating the WHMP and its implementation. Wildlife populations on and in the vicinity of airports are constantly changing in response to changes in land use and environmental factors. In addition, wildlife may adapt or habituate to wildlife hazard management control strategies that were once effective, or develop new behavioral or feeding patterns on or near the airport. New wildlife control technologies might become available, or established products or techniques could be withdrawn or banned. Finally, there may be changes in wildlife control and management personnel at an airport. Any of these factors could materially alter the effectiveness of the wildlife hazard program and its implementation.

## Chapter 7. Training

All personnel identified in Chapter 2 as having responsibility for direct implementation of the WHMP should receive initial and annual training in the following areas as identified in FAA AC 150/5200-36A:

- Wildlife hazards at airports.
- Laws associated with wildlife control.
- Techniques (e.g., traps, poisons) used for prey-base reduction (only personnel involved in direct control).
- Firearm and pyrotechnic safety, including hands-on training.
- Wildlife identification and dispersal techniques.
- Airport communications and driving safety to operate safely in the AOA.

## Chapter 8. References Cited

Chapter 8 lists the literature citations in the text of the WHMP.