# Wildlife Hazard Management at Riverside County Airports: Background and Policy





Riverside County Airport Land Use Commission 4080 Lemon Street, 14th Floor Riverside CA 92501

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# Chapter 1. Wildlife Hazards and Aviation

Conflicts between aircraft and wildlife have occurred since the dawn of aviation. Orville Wright was the pilot associated with the first documented bird strike in 1905 during a flight over Dayton, Ohio. The first fatality associated with a wildlife strike occurred on April 3, 1912, when Calbraith Rodgers died after his aircraft struck a gull and crashed in Long Beach, California.



#### Photo 1: Calbraith Rodgers in flight. Source: Pioneers of Flight (pioneersofflight.si.edu).

FAA and others have performed research regarding wildlife strikes for approximately five decades; FAA and other federal agencies have:

- Tracked wildlife strike data since 1990 to identify the species struck most, the altitudes at which strikes occur most frequently, the type and extent of aircraft damage, and impact on flight;
- Promulgated policies, regulations and guidance to help airports perform wildlife hazard assessments, developing wildlife hazard management plans, and implement wildlife hazard management measures into project planning and construction.
- Developed an interagency Memorandum of Understanding to work together to address aviation and wildlife conflicts.

The results of federally sponsored research by FAA, USDA, and others have identified that wildlife strikes usually occur at low altitudes (i.e., at altitudes of less than 3,500 feet above ground level) and within or near airport boundaries. Agencies have developed specific guidance for airport operators to reduce wildlife strikes at their airports, including:

- Active management measures, which include non-lethal and lethal measures to disperse wildlife when it is observed on the airport.
- Passive management measures to discourage wildlife from using the airport, such removing onsite habitat or wildlife attractants (i.e., features that provide food, water shelter, or nesting opportunities).
- Administrative measures, such as staff training to identify and manage wildlife and wildlife hazards, and ongoing recordkeeping to monitor changes in wildlife presence.

Unfortunately, wildlife strikes do not always occur on airport property, and wildlife attractants can occur in nearby off-site areas to pose hazards to aircraft operations. Moreover, airport neighbors and host communities might not be aware of the risks posed by wildlife based on the presence/construction of such common features as stormwater management facilities, landscaping, or project-related mitigation sites.

Riverside County developed this report to consider wildlife strikes near Riverside County airports and to identify measures that could be implemented by the Airport Land Use Commission when reviewing proposed major land uses and other projects. The guidance presented in this report might also serve as a basis for initiating conversations with airport neighbors, their host communities, and developers when considering new projects that require discretionary approvals.

## 1.1 Background

The Federal Aviation Administration (FAA) has compiled data on wildlife strikes since 1990, and the data indicate that the number of conflicts has continued to increase. Data obtained from FAA's National Wildlife Strike Database identifies several factors that have affected the relationship between wildlife and aviation safety:

- The use of faster and quieter aircraft. Commercial air carriers have replaced their older three- or four-engine aircraft fleets with more efficient, faster, and quieter two-engine aircraft. Birds are less able to detect and avoid new aircraft using turbofan engines. Aircraft with two engines may be more vulnerable in the event of a bird strike than aircraft equipped with three or four engines (FAA and United States Department of Agriculture [USDA], 2016).
- Increased air traffic. The amount of air traffic has increased worldwide. Commercial air traffic in the U.S. increased from approximately 18 million aircraft movements in 1980 to 24.6 million in 2015 (FAA and USDA, 2016). The growth in air traffic has increased the risk of potential conflicts between aviation and wildlife.



Photo 2: Increased air traffic means an increased risk of potential conflicts. (Source: C. Boyles, 2014.)

Increased wildlife populations and adaptation to urban areas. The populations of many wildlife
species commonly involved in strikes have increased markedly in the last few decades (FAA and
USDA, 2016). As development has increased, the availability of natural or open areas that
support these species has decreased. As a result, the remaining open space provides habitat,
shelter, and feeding areas for greater populations of wildlife. Moreover, the size of the areas that
once separated airports and nearby metropolitan areas has also decreased.



Photo 3: Canada geese have adapted to urban areas throughout the U.S. (Source: Bird Strike USA Photo Gallery @www.birdstrike.org).

#### 1.2 Wildlife Strike Data and Trends

The civil and military aviation communities understand that the risk of strikes by hazardous wildlife is real and increasing.

#### 1.2.1 Increased Wildlife Strikes and Strike Reporting

The FAA National Wildlife Strike Database includes records for a total of 169,856 strikes from 1990 to 2015 (complete data for the 2016 and 2017 calendar years are not available for analysis). Although strike reporting is voluntary for airport operators and pilots, the accumulated data is sufficient to identify some trends in the frequency and severity of strikes:

- The number of strikes recorded annually increased more than sevenfold from 1990 (1,847 strikes) to 2015 (13,795 strikes).<sup>1</sup> Some speculate that the increase may be partially due to better or more diligent reporting procedures following the 2009 "Miracle on the Hudson," when a commercial aircraft departing from New York's LaGuardia airport struck a flock of Canada geese.
- Numerous avian and terrestrial species pose hazards to aircraft operations. From 1990 to 2015, 529 species of birds, 43 species of terrestrial mammals, 22 species of bats, and 18 species of reptiles were identified with wildlife strikes. Waterfowl, gulls, and raptors are the types of birds associated with the most damaging strikes; Artiodactyls (mainly deer) and carnivores (predominantly coyotes) are the mammals associated with the most damaging strikes.



Photo 4: Coyote on runway at a Riverside County airport (2016). (Source: Mead & Hunt, Inc.)

<sup>&</sup>lt;sup>1</sup> As of January 1, 2018, complete data from FAA's National Wildlife Strike Database for 2016 and 2017 are not yet available.

#### 1.2.2 Rate of Damaging Strikes

Data from the FAA National Wildlife Strike Database has been analyzed to identify the trends and differences between strikes that occur at airports holding FAA Part 139 certificates and general aviation (GA) airports.

#### **Commercial Service Airports/Certificated Airports**

Although the number of reported wildlife strikes increased 130 percent from 2000 to 2015, the number of damaging strikes declined by 19 percent at airports holding FAA Part 139 certificates.

The FAA requires all airport operators to address safety issues, including potential wildlife hazards through its regulations, guidance, and federal grant assurances. As a result, many airport operators worked to mitigate wildlife strike risks since the 1990s, and these efforts are likely responsible for the overall decline in damaging strikes. Such efforts include, but are not limited to:

- Conducting Wildlife Hazard Assessments and preparing Wildlife Hazard Management Plans;
- Ongoing research to improve wildlife management practices on and near airports;
- Performing new research to identify alternative habitat management strategies to reduce attraction to airports of hazardous wildlife species;
- Identifying new techniques to identify, discourage, or restrict hazardous wildlife species to attractive features such as stormwater ponds; and
- Identifying and reviewing technologies to harass and deter hazardous wildlife species from the aviation environment.

#### **General Aviation Airports**

The FAA increased its wildlife management efforts to address General Aviation (GA) airports in 2009 and implemented the following measures to identify reporting trends and wildlife mitigation efforts:

- Monitoring strike reporting rates;
- Monitoring the percentage of damaging strikes; and
- Tracking the number of GA airports that conduct Wildlife Hazard Assessments (WHAs) and Wildlife Hazard Site Visits.

During the five-year period from 2011 to 2015, strike reporting at GA Airports increased by 40 percent, and the number of damaging strikes increased by 37 percent. Since most GA airports do not include air traffic control towers and most operate with fewer staff members compared to certificated airports, it is likely that wildlife strikes are reported less frequently — especially if they do not result in aircraft damage.

#### 1.3 Community Efforts for Better Wildlife Hazard Management

Although the number of wildlife strikes occurring at certificated airports continues to increase, that increase is occurring at a much slower rate than in previous years, and the number of damaging strikes at commercial service airports is decreasing. The FAA's recent review of Wildlife Strikes to Aircraft in the U.S. from 1990 to 2015 recognizes the strides that certificated airports have made to reduce wildlife hazards in the airport environment. However, the report acknowledged wildlife hazards management efforts must be viewed through a broader lens that extends to the area within 5 miles of aircraft approach and departure surfaces. Since airport operators rarely own the

land within these areas, a cooperative effort must be undertaken by airport operators, their neighbors, and host communities.

The Riverside County Airport Land Use Commission (ALUC) has undertaken this study to identify the types of wildlife hazards facing its GA Airports and the results may be used to develop or consider policies that could be implemented in the Airport Influence Areas (AIAs) identified in its Airport Land Use Compatibility Plans (ALUCPs). Specific policies could be formulated to identify such items as:

- Good housekeeping practices that can be implemented by neighboring jurisdictions to discourage use by hazardous wildlife.
- ALUCP policies to promote awareness of wildlife hazards and prevent the creation of wildlife hazard attractants within the AIA.
- Recommended stormwater management technologies and Best Management Practices (BMPs) to avoid or reduce the presence of open water sources to support potentially hazardous wildlife.
- Landscaping practices to avoid or reduce the presence of materials that would serve as a food source, shelter, or roosting areas for potentially hazardous wildlife.



# Chapter 2. Regulations and Guidance

#### 2.1 Federal Regulations and Wildlife Hazard Management

The FAA is the agency responsible for prescribing and administering Federal Aviation Regulations, which are set forth in Title 14 of the Code of Federal Regulations (CFR) and govern aviation activities in the United States. The FAA also establishes policies to implement these regulations and enhance public safety at air carrier airports holding certificates under Title 14 of the CFR. Although most airports addressed by the Riverside County ALUCP do not hold certificates, the Federal regulatory framework can also apply to GA Airports that receive federal funds.

#### 2.1.1 Title 14 of the Code of Federal Regulations (CFR), Part 139

Regulations associated with wildlife management are set forth at 14 CFR Part 139.337, "Wildlife Management" (see **Appendix A**). According to 14 CFR Part 139.337, the FAA can require an airport operator to conduct a WHA when one or more of the following events occurs on or near the airport:

- 1. An air carrier aircraft experiences multiple wildlife strikes;
- 2. An air carrier aircraft experiences substantial damage from striking wildlife. As used in this paragraph, substantial damage means 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; or
- 4. Wildlife of a size, or in numbers, capable of causing an event described in paragraphs ... is observed to have access to any airport flight pattern or aircraft movement area.

A Wildlife Hazard Assessment is a specialized year-long field study performed by a qualified Airport Wildlife Biologist to identify the presence of wildlife on and in the airport vicinity that could pose hazards to aircraft operations, identify habitats and features that attract wildlife to the airport vicinity, and provide recommendations for reducing potential wildlife hazards. Based on the results of the WHA and the recommendations of the Airport Wildlife Biologist, FAA may direct an airport operator to prepare a Wildlife Hazard Management Plan (WHMP), which must be incorporated into the Airports Certification Manual and updated annually. To date, the Palm Springs International Airport and three general aviation airports in Riverside County (the Jacqueline Cochran Regional Airport, Hemet-Ryan Airport, and French Valley Airport) have undertaken Wildlife Hazard Assessments (see Section 3.2.2). PSP has completed a Wildlife Hazard Management Plan, and plans for the three GA airports are anticipated in late 2018,

#### 2.1.2 Federal Grant Assurances

Federally obligated airports are those airports that do not hold an FAA certificate pursuant to 14 CFR Part 139 but receive federal funds to support airport operations or undertake capital improvements. An airport owner that accepts FAA funds to support its operations or undertake capital improvements must agree to certain obligations known as "grant assurances." These grant assurances require the operator to maintain and operate its facilities safely, efficiently, and in accordance with specified conditions. The FAA has established 37 specific grant assurances to which airport operators must adhere if they are to receive federal funds. Grant assurance Nos. 19 through 21 apply to wildlife hazard management and land use decisions:

#### 19. Operation and Maintenance.

- a. The airport and all facilities which are necessary to serve the aeronautical users of the airport, other than facilities owned or controlled by the United States, shall be operated at all times in a safe and serviceable condition and in accordance with the minimum standards as may be required or prescribed by applicable Federal, state and local agencies for maintenance and operation. It will not cause or permit any activity or action thereon which would interfere with its use for airport purposes. It will suitably operate and maintain the airport and all facilities thereon or connected therewith, with due regard to climatic and flood conditions. Any proposal to temporarily close the airport for nonaeronautical purposes must first be approved by the Secretary. In furtherance of this assurance, the sponsor will have in effect arrangements for:
  - 1) Operating the airport's aeronautical facilities whenever required;
  - 2) Promptly marking and lighting hazards resulting from airport conditions, including temporary conditions; and
  - 3) Promptly notifying airmen of any condition affecting aeronautical use of the airport. Nothing contained herein shall be construed to require that the airport be operated for aeronautical use during temporary periods when snow, flood or other climatic conditions interfere with such operation and maintenance. Further, nothing herein shall be construed as requiring the maintenance, repair, restoration, or replacement of any structure or facility which is substantially damaged or destroyed due to an act of God or other condition or circumstance beyond the control of the sponsor.
- b. It will suitably operate and maintain noise compatibility program items that it owns or controls upon which Federal funds have been expended.

#### 20. Hazard Removal and Mitigation.

It will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards.

#### 21. Compatible Land Use.

It will take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which Federal funds have been expended.

The FAA can require operators of GA airports to address potential wildlife hazards in accordance with grant assurance Nos. 19 and 20. Although the FAA has no jurisdiction over local land use decisions, grant assurance No. 21 encourages airport operators and their jurisdictions to adopt local laws and ordinances to prevent the creation of incompatible land uses, including those that could attract hazardous wildlife. The FAA can also request airport operators to undertake a WHA or WHMP using the criteria set forth in 14 CFR Part 139.337.

#### 2.1.3 Advisory Circulars and CertAlerts

The FAA has promulgated numerous Advisory Circulars (ACs) and CertAlerts to address Wildlife Hazard Management at airports. The guidance documents provide the basis for developing wildlife management policies and procedures at airports. Although the advisory circulars are guidance documents, FAA may require federally-obligated airports to implement the guidance set forth in the ACs as a condition of their grant assurances.

Table 2-1 FAA Advisory Circulars and CertAlerts           Wildlife Hazard Management		
Advisory Circulars		
AC 150/5200-28F	Notices to Airmen (NOTAMs) for Airport Operators (for alerting pilots of wildlife hazards)	
AC 150/5200-32B	Reporting Wildlife Aircraft Strikes	
AC 150/5300-33B	Hazardous Wildlife Attractants On and Near Airports	
AC150/5200-334A	Construction or Establishment of Landfills near Public Airports	
AC 150/5200-36A Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports		
CertAlerts		
CertAlert No. 97-09	Wildlife Hazard Management Plan Outline	
CertAlert No. 98-05 Grasses Attractive to Hazardous Wildlife		
CertAlert No. 06-07 Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Lis Threatened and Endangered Species and Species of Special Concern on Airports		
CertAlert No. 13-01	Federal and State Depredation Permit Assistance	
CertAlert No. 16-03 Recommended Wildlife Exclusion Fencing		
Other Resources		
Interagency Memorandum of Agreement Between the Federal Aviation Administration, the U.S. Air For U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, U.S. Department of Agriculture to Address Aircraft-Wildlife Strikes. Available at: https://www.faa.gov/airports/environmental/media/wildlife-hazard-mou-2003.pdf		
Notes: 1. Advisory Circ 2. CertAlerts ar 3. Airport Coop	culars are available at <a href="http://www.faa.gov/regulations_policies/advisory_circulars/">http://www.faa.gov/regulations_policies/advisory_circulars/</a> e available at <a href="http://www.faa.gov/airports/airport_safety/certalerts/">http://www.faa.gov/airports/airport_safety/certalerts/</a> erative Research Program reports and syntheses are available at:	

 Airport Cooperative Research Program reports and syntheses are available at <u>http://www.trb.org/Publications/PubsACRPPublications.aspx</u>

#### 2.1.4 Advisory Circular 150/5200-33B, Wildlife Hazards On and Near Airports

Although the FAA has promulgated several ACs pertaining to wildlife management, AC 150/500-33B, "Wildlife Hazard Attractants On and Near Airports" (2007) provides specific guidance for airport operators that extends beyond airport boundaries and recognizes the synergistic relationship between wildlife hazards and nearby land uses (see **Appendix B**). Airports that have received Federal grant-in-aid assistance must use these standards.

#### **Critical Zone for Wildlife Management**

AC 150.5200-33B identifies a "critical zone" for wildlife hazard management based upon the type of aircraft operations that occur at a specific airport. The critical zone identifies a specific distance that should be maintained to separate aircraft movement areas from land.

- Perimeter A: At airports that support only piston-powered aircraft, the critical zone extends 5,000 feet beyond aircraft movement areas and five miles from approach/departure surfaces (see Error! Reference source not found.).
- Perimeter B: At airports that support turbine-powered aircraft (jet operations), the critical zone extends 10,000 feet beyond aircraft movement areas and 5 miles from approach/departure surfaces (see Error! Reference source not found.).

In addition to the critical zone, which is defined as either Perimeter A or Perimeter B, the FAA recommends maintaining a distance of 5 statute miles between the farthest edge of the airport's Air Operations Area (AOA) and any hazardous wildlife attractant that could cause hazardous wildlife movement into or across the approach or departure airspace (see **Figure 2-1**, **Perimeter C**). This 5-mile separation applies to all airports.



Figure 2-1 Separation distances within which hazardous wildlife attractants should be avoided, eliminated or mitigated (FAA, 2007).

#### Land Uses Known to Attract Potentially Hazardous Wildlife

FAA AC 150/5200-33B also identifies specific land uses that are known to attract potentially hazardous wildlife, which are described more thoroughly in Chapter 3.

- Landfills and waste management facilities
- Stormwater management facilities
- Wastewater treatment facilities
- Wetlands
- Agricultural/aquacultural operations
- Parks and golf courses
- Resource mitigation sites

#### 2.1.5 Interagency Memorandum of Agreement

The FAA has established a Memorandum of Agreement (MOA) with several federal agencies to acknowledge their respective missions in protecting aviation from wildlife hazards. Through the MOA, the agencies established procedures necessary to coordinate their missions to address existing and future environmental conditions contributing to wildlife conflicts with aviation. The MOA includes participation from the U.S. Air Force, the U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture to address aircraft-wildlife strikes. Airport operators may refer to the MOA when reviewing proposed land uses or mitigation strategies for projects within the airport vicinity or to discourage other federal agencies from developing mitigation sites or other facilities that would attract potentially hazardous wildlife.

#### 2.1.6 Other Federal Resources and Guidance

The Airport Cooperative Research Program (ACRP) is an applied research program that is funded by the FAA to develop practical solutions to problems faced by airport operators. Specific guidance documents associated with wildlife hazard management include:

- ACRP Synthesis 23: Bird Harassment, Repellent, and Deterrent Techniques for Use on and Near Airports (http://www.trb.org/Publications/Blurbs/165829.aspx)
- ACRP Synthesis 52: Habitat Management to Deter Wildlife at Airports (http://www.trb.org/Publications/Blurbs/170766.aspx)
- ACRP Report 32: Guidebook for Addressing Aircraft/Wildlife Hazards at General Aviation Airports (http://www.trb.org/Publications/Blurbs/163690.aspx)
- ACRP Report 125: Balancing Airport Stormwater and Bird Hazard Management
- Airport Stormwater Management Library (https://crp.trb.org/acrp0261/)

Although ACRP research is directed toward airport operators, many of the tools, techniques and guidance can be applied to nearby development.

#### 2.2 State of California Regulations and Guidance

The purpose statement of the California State Aeronautics Act (SAA), which appears in Division 9 of the Public Utilities Code (PUC), Section 21002 *et seq.*, identifies several items that are intended to "further and protect the public interest in aeronautics and aeronautical progress." Among these intentions are, "encouraging the development of private flying and the general use of air transportation," "fostering and promoting safety in aeronautics," and, "affecting uniformity of the laws and regulations relating to aeronautics consistent with federal aeronautics laws and regulations." Although the SAA does not address wildlife hazard management directly, its statutes govern the formation of ALUCs whose primary responsibilities include the preparation and adoption of ALUCPs.

The California Department of Transportation (Caltrans), Division of Aeronautics, provides guidance to ALUCs for the preparation and adoption of ALUCPs through its *Airport Land Use Compatibility Planning Handbook* (Handbook). The Division of Aeronautics identifies four areas or "compatibility factors" that should be considered when development land use compatibility policies for the areas near a public-use airport:

Airport Land Use Compatibility Factors		
Factor	Objective	
Noise	Minimize the number of people exposed to frequent or high levels of aircraft noise capable of disrupting noise-sensitive activities.	
Safety	Minimize the risks associated with potential aircraft accidents by providing for the safety of people and property on the ground and enhancing the likelihood of survival for aircraft occupants in the event of a mishap.	
Airspace	Avoid the development of land use conditions that can pose hazards to flight and navigation (obstructions, wildlife hazards, and visual hazards, etc.) and increase the risk of a mishap.	
Overflight	Notify people near airports of the presence of overflight to minimize or avoid annoyance with these conditions.	
Source: Caltrans, Division of Aeronautics, 2011, Airport Land Use Compatibility Handbook.		

Wildlife strikes occur when aircraft and wildlife attempt to occupy the same airspace. The Caltrans Handbook identifies wildlife hazards as "hazards to flight" that must be addressed through airspace protection policies. The Handbook summarizes the types of land uses, facilities, and structures on and near airports that can attract potentially hazardous wildlife in accordance with FAA AC 150/5200-33B.

Conflicts can arise when identifying compatibility policies pertaining to land use. In terms of safety compatibility, open space areas, such as golf courses, landfills, and stormwater management facilities sites may be desirable near airports because they are low-intensity uses that would reduce the number of people who would be present in the event of a mishap. However, these uses may be undesirable in terms of airspace protection because they have the potential to attract hazardous wildlife and increase risks to aircraft operations. To avoid potential wildlife hazards to aviation, ALUCP policies and land use decisions must consider proposed land uses within the context of both airspace and land use. For example, a golf course that is designed with alternative landscaping and without open water features might fulfill both.



# Chapter 3. Wildlife and Hazardous Wildlife Attractants in Riverside County

#### 3.1 General Environmental Setting

Riverside County includes approximately 7,400 square miles of southern California. The County extends westward from the Colorado River and the Arizona state line to within 14 miles of the Pacific Ocean.

The San Jacinto and the San Gorgonio Mountains bisect Riverside County. The area west of the mountains supports most of the County's population, with rural and suburban areas mixed with agricultural and undeveloped lands. The eastern portion of the county is dominated by desert terrain, with much of the population concentrated in the Coachella Valley and its agricultural lands (MSHCP, General Plan). A seasonal river, the Whitewater River, originates in the San Bernardino Mountains and flows southward through the Coachella Valley and into the Salton Sea. With the exception of the Coachella Valley. Valley and the Palo Verde Valley, desert wilderness dominates the areas east of the Coachella Valley.

#### 3.2 The Pacific Flyway

Migration is the regular, seasonal movement of wildlife populations from summer breeding grounds to overwintering grounds. Birds that nest in the northern hemisphere migrate northward each spring to take advantage of food sources such as insect populations and budding plants. As winter approaches, those birds move southward to escape the cold. Birds often migrate along predictable routes, or flyways, that follow coastlines, rivers, or mountain ranges.

Flyways span much of the continental U.S. as shown in **Figure 3-1**. The Pacific Flyway, which extends southward from Alaska to the southern coast of South America, is a major migratory bird route used by hundreds of bird species as they travel between nesting sites in the north and overwintering sites in the south. The Pacific Flyway encompasses Riverside County and includes a major migratory route that passes though the Coachella Valley. Several migratory routes converge at the Salton Sea (see **Figure 3-2**).







Figure 3-2. Migratory Bird Paths at the Salton Sea. *Source: Frost, 2016.* 

#### 3.2.1 Local Conditions that Accommodate Migratory Birds

#### The Salton Sea

The Salton Sea, which lies in southern Riverside County and northern Imperial County, is California's largest lake. As part of the Colorado River delta, it is an oasis in the surrounding Sonora Desert that provides sanctuary to diverse wildlife including migratory birds that travel along the Pacific Flyway. The Salton Sea also provides habitat for abundant fish species, many of which attract avian species that are known to pose hazards to aircraft operations such as large shorebirds, gulls, and others.

Migrating birds forage for food and water as they travel, and they are attracted to vegetation and open water sources along migratory routes that provide feeding opportunities, such as lakes, ponds, drainage basins, and agricultural fields. The Salton Sea is a major nesting, wintering and stopover site on the Pacific Flyway. Migrating birds use the Salton Sea and other resources throughout the region to nest, roost, and forage. To illustrate the Salton Sea's importance to migratory birds along the Pacific Flyway, California Audubon tracked a few of the nearly 400 species that use the sea to illustrate how the migratory routes converge (see **Figure 3-2**).

#### Wetlands and Water Waterbodies

Although the Salton Sea is one known major stopover for migratory birds, other large open water features in Riverside County also support waterfowl and migratory species:

- Diamond Valley Lake;
- Lake Elsinore;
- Lake Perris;
- Lake Matthews; and
- Skinner Reservoir.

Most of these reservoirs are in the western part of Riverside County, where most of the County's airports reside. The eastern portion of the Riverside County is primarily desert habitat. However, some bird species have adapted to the desert environment and areas that include groundwater springs or that provide oases to attract both desert and coastal bird species. In desert habitats, artificial lakes or other constructed water features are highly attractive to bird species, such as ponds associated with golf courses, stormwater management/water quality treatment ponds, park areas, etc.

#### Food Sources and Foraging

Riverside County includes a variety of geographical features that can provide diverse habitats and support diverse biological resources). Natural and manmade vegetative communities documented in the County's Multi-Species Habitat Conservation Plan (MSHCP) include:

- Agriculture;
- Chaparral, shrub-dominated vegetation;
- Cismontane alkali marsh;
- Coastal sage scrub;
- Desert scrub;
- Grasslands (non-native grassland and native dominated, perennial grassland);

- Meadows and marshes;
- Montane coniferous forest;
- Playas and vernal pools;
- Riparian forest / woodland / scrub;
- Riversidean alluvial fan sage scrub;
- Woodlands and forests;
- Open water; and
- Developed or disturbed land.

These habitats help to support the diverse needs of migratory birds that pass through the County.

#### 3.2.2 Influence of Migration at Riverside County Airports

The Pacific Flyway influences the presence and extent of wildlife on and near Riverside County's 15 airports. WHAs were performed recently at four general aviation airports in Riverside County: Riverside Municipal (RAL), Hemet-Ryan Airport (HMT), French Valley Airport (F70), and the Jacqueline Cochran Regional Airport (TRM). Although the species observed at each airport varied in response to the specific habitats present, the data obtained during the 12-month wildlife monitoring effort for each airport confirms that a greater number of birds was present during the winter months (November through February), which reflects the influx of migratory birds. The types of migratory birds observed in the greatest concentrations included songbirds, blackbirds, and starlings, all of which benefit from the food sources available in nearby cultivated areas. Waterfowl were observed in relatively greater concentrations at TRM, the airport nearest airport to the Salton Sea.

#### 3.3 Hazardous Wildlife

#### 3.3.1 Hazardous Wildlife Species

Although hundreds of species have been identified in wildlife strike records, the FAA acknowledges that not all species pose the same risk to aircraft operations. As the FAA states, "aircraft collisions with birds and other wildlife are a serious economic and public safety problem. While many species of wildlife can pose a threat to aircraft safety, they are not equally hazardous" (FAA, 2007). Some species may pose a greater risk to aircraft operations based on their size, behavior, abundance, or proximity to the airport and its associated airspace.

The conventional guidelines used to assess the threat to aviation posed by a specific species considers three priorities in descending order of severity:

- Large flocking birds, such as gulls or waterfowl;
- Small flocking birds, such as starlings; and
- Large singular birds, such as hawks or vultures.

Birds that congregate in large flocks are more likely to be involved in a strike compared to solitary birds, and flocking birds have the capacity to disable more than one engine when a strike occurs. Large birds strike an aircraft with greater impact, potentially causing major damage to the aircraft and a potentially greater effect on flight.

A detailed analysis of the comparative hazards posed by various wildlife was provided in a study by Dolbeer, "Ranking the Hazard Level of Wildlife Species to Aviation." The study considered the number of strikes caused by each species, the severity of damage caused by the strike, and the resulting effect on the flight. **Table 3-1** summarizes the species and their relative ranking by Dolbeer. Nearly all species are known to occur in Riverside County. The highlighted species have been associated with documented bird strikes at Riverside County airports.

Table 3-1 Ranking of the Relative Hazards to Aviation of 25 Wildlife Species				
Rank/	Species	Hazard Value	Rank/Species	Hazard Value
1.	Deer	100	14. Owls	23
2.	Vultures	63	15. Horned lark/buntings	17
3.	Geese	55	16. Crows/ravens	16
4.	Cormorant/pelican	54	17. Coyotes	14
5.	Cranes	47	18. Mourning Dove	14
6.	Eagles	41	19. Shorebirds	10
7.	Ducks	39	20. Blackbirds-starlings	10
8.	Osprey	39	21. American kestrels	9
9.	Turkey/pheasant	33	22. Meadowlarks	7
10.	Herons	27	23. Swallows	4
11.	Hawks	25	24. Sparrows	4
12.	Gulls	24	25. Nighthawks	1
13.	Pigeons	23		
<i>Note:</i> Highlighted species have been identified in wildlife strike records for Riverside County Airports. <i>Source:</i> Ranking the Hazard Level of Wildlife Species to Civil Aviation in the USA, R.A. Dolbeer et al.,				

2000.

As shown on Table 3-1, wildlife strikes involving 17 of the 25 most hazardous species to aircraft have been documented at Riverside County Airports. Mammals (bats, rabbits, and coyotes) were also associated with strikes.

#### Wildlife Strikes at Riverside County Airports 3.3.2

Since 1990, a total of 152 wildlife strikes have been recorded in FAA's wildlife strike data base from six Riverside County airports:

- March Air Reserve Base (63 strikes); •
- Palm Springs International Airport (63 strikes); •
- Riverside Municipal Airport (12 strikes); •
- Hemet Ryan Airport (5 strikes); •
- The Bermuda Dunes Airport (4 strikes); and •
- The Jacqueline Cochran Regional Airport (4 strikes)

A complete list of wildlife strikes reported for Riverside County Airports is included in Appendix C, Table C-1.

Strike data must be considered with caution, and the absence of strike records at other County airports does not necessarily indicate that strikes have not happened. Strike reporting is voluntary for all persons except FAA tower staff. The FAA estimates that only 20 percent of all strikes were recorded in the National Wildlife Strike Database prior to 2008 and that 40 percent of all strikes have been recorded since the 2009 "Miracle on the Hudson." Nevertheless, the data provided in the FAA database indicated that strikes are ongoing at Riverside County airports. Therefore, the considerably greater number of strikes recorded at March Air Reserve Base and Palm Springs International Airport is not surprising, as the number of operations that occur at these facilities is substantially greater than the number of operations at other County airports. Both airports include staff members trained specifically in wildlife management and strike reporting.

#### Substantial Damage

Three of the 152 wildlife strikes reported in Riverside County resulted in substantial aircraft damage (i.e., >\$200,000 in damage):

- Two strikes occurred at TRM, one with Canada geese (2013) and one with a California gull (2006); and
- One strike occurred at PSP was associated with hawks (1998).

#### Minor Damage

Eight strikes resulted in minor or unknown damage, four of which were associated with unknown birds:

- One strike at HMT and one strike at PSP were associated with hawks;
- One strike at PSP was associated with a crow; and
- One strike at TRM was associated with a Canada Goose (three of the four total strikes at TRM resulted in damage to aircraft).

#### 3.3.3 Species Involved in Wildlife Strikes

Of the 152 strikes recorded in Riverside County, 147 were associated with avian species and five were associated with mammals as summarized in **Table 3-1**. Characteristics associated with the types of avian species associated with these strikes follows.

Table 3-2 Wildlife Involved in FAA Strike Records for Airports in Riverside County, CA		
Species/Species Group	No. of Strikes (Percentage of total strikes)	Damaging Strikes
Unknown Birds (Various Size) (Unidentified small, medium, and large birds)	62 strikes (41%)	4-Minor
Larks (Horned larks and western meadowlarks)	27 strikes (18%)	0
Raptors (Kestrels, owls, hawks, and falcon species)	17 strikes (11%)	1-Substantial 2-Minor
Swallows and Swifts (Cliff swallows, unidentified swallows)	11 strikes (7%)	0
Doves and Pigeons (various species)	9 strikes (6%)	0
Gulls and terns	6 strikes (4%)	1-Substantial
Waterfowl	4 strikes (3%)	1-Substantial 1-Minor
Sparrows	3 strikes (2%)	0
Other avian species (1 strike each)	7 strikes (5%)	1-Minor (Crow)
Mammals (coyotes, rabbits, bats)	6 strikes (4%)	0
Total	152 Strikes	8 Damaging Strikes

As shown on **Table 3-1**, the birds involved most frequently with wildlife strikes were unknown birds. Those associated with the greatest number of strikes were not always associated with reported damage.

#### 3.4 Hazardous Wildlife Attractants

Riverside County supports abundant and diverse wildlife based on its diverse habitat and location along the Pacific Flyway. But numerous natural and manmade resources can also attract and support hazardous wildlife species. Wildlife requires three basic needs: food, water, and shelter, and nearly all are available on and near airports. Food resources are primary determinants of bird movements and special ecology (i.e., where and how birds choose to spend their time).

Research performed by the FAA and the United States Department of Agriculture (USDA) has identified the types of natural and created land uses and wildlife attractants that should be avoided within the critical zone for hazardous wildlife (**Figure 2-1**) based on their ability to support wildlife by providing food, water or shelter., FAA AC 150/5200-33B, "Wildlife Hazard Attractants On and Near Airports" summarizes these land uses and attractants.

#### 3.4.1 Waste Collection, Transfer and Disposal Facilities

Open waste collection, transfer, and disposal facilities are known to attract various wildlife species, including birds and mammals, and should not be located within the critical zone. Uses that should be avoided include:

- Trash transfer facilities that are open on one or more sides or store uncovered quantities of municipal solid waste outside;
- Composting operations that include food or other municipal solid waste; and
- Putrescible waste disposal operations.



Photo 5: Gulls attracted to a recently closed landfill within 1 mile of a general aviation airport in California. (Source: Mead & Hunt, Inc.)

#### 3.4.2 Water Management Facilities

Water management and treatment facilities can attract potentially hazardous wildlife by providing water for drinking and by supporting the growth of adjacent vegetation. The FAA recommends that airport operators work with local and state agencies to develop policies and plans for the safe operation of public water management facilities on and near public use airports, such as:

#### Stormwater Management Facilities

Detention ponds collect storm water, protect water quality, and control runoff. Because they slowly release water after storms, they create standing bodies of water that can attract hazardous wildlife. The FAA recommends that stormwater detention located in the critical zone include the following design features:

- A maximum 48-hour detention period for the design storm and remain totally dry between rainfalls;
- Steep-sided, rip-rap lined, narrow, linearly shaped water detention basins; and
- Removing vegetation near the pond that can provide food or cover for hazardous wildlife

Whenever possible, FAA recommends the use of underground storm water infiltration systems, such as French drains or buried rock fields because these systems are less attractive to wildlife.

#### **Wastewater Treatment Facilities**

Regional or local wastewater treatment facilities frequently include the use of large open water ponds that are attractive to gulls and waterfowl species. The FAA strongly recommends against the construction of wastewater treatment facilities or associated settling ponds within the critical zone.



Photo 6: Recreational pond adjacent to a California airport. Waterfowl benefits from visitors who provide food. (Source: Mead & Hunt, Inc.)

#### Artificial Marshes

Artificial marshes are used to improve water quality through the use of submergent and emergent aquatic vegetation as natural filters. These features can be attractive to hazardous species such blackbirds and waterfowl for breeding or roosting activities. The FAA strongly recommends against establishing artificial marshes within the critical zone.

#### Wastewater Discharge and Sludge Disposal Areas

The discharge of wastewater or sludge can improve soil moisture and quality, increase the rate of vegetation growth and create an attractive food source for many species of hazardous wildlife, such as deer and geese.

#### 3.4.3 Wetlands

Wetlands are usually attractive to many types of wildlife, including many that rank high on the list of hazardous wildlife species. The FAA recommends wetland mitigation projects with the potential to attract hazardous wildlife be sited outside of the critical zone unless they provide unique functions that must remain on-site. However, wetlands also provide a variety of functions and can be regulated by various local, state, and Federal laws. The FAA's Interagency Memorandum of Agreement Between Federal Resource Agencies (see **Chapter 2**) establishes procedures necessary to coordinate their missions to address the location and type of wetland mitigation when developing projects within the critical zone.

If wetland mitigation must occur within the critical zone, a wildlife damage management biologist should be consulted to evaluate any wetland mitigation projects that are needed to protect unique wetland functions and a Wildlife Hazard Management Plan should be developed to reduce the wildlife hazards to aviation that could result from wetland construction.

#### 3.4.4 Agricultural Activities

Agricultural activities, such as cultivation, livestock production, and aquaculture, have the potential to provide abundant food sources for hazardous wildlife.

Seasonal uses of agricultural land for activities, such as hunting, can create wildlife hazards through the use of bait or calls to attract wildlife or the field dressing of harvested animals. A wildlife damage management biologist should review, in coordination with local farmers and producers, these types of seasonal land uses when they are proposed.

Outdoor aquaculture activities are inherently attractive to a wide variety of birds and the FAA warns against the development of outdoor aquaculture within the critical zone.

#### 3.4.5 Golf Courses

Golf courses are frequently viewed as a compatible land use near airports based on the availability of open space they provide and the relatively low intensity of use. However, golf courses are particularly attractive to wildlife, especially avian species, due to the presence of large open turf areas and numerous small ponds. The open, short grass/turf areas and ponds provide birds with foraging and feeding opportunities. Depending on the proximity of the golf course and the potential for birds to frequent or fly over it, the airport and its airspace can be potential attractant. Likewise, if the surrounding land uses are arid, lush greens and ponds at golf courses can attract more birds that could be potential wildlife hazards for nearby airports. The FAA recommends against construction of new golf courses within the critical zone.

Several golf courses are present immediately adjacent to Riverside County airports. These airports serve as oases in the dry airport climate and have been observed to attract numerous wildlife species. Abundant waterfowl and other hazardous species were observed on golf courses located near the Hemet-Ryan and French Valley Airports.

#### 3.4.6 Landscaping and Vegetation

Turf and ornamental landscaping can attract hazardous wildlife because it can provide food and shelter for nesting and loafing.

Plant varieties attractive to hazardous wildlife should not be planted within the critical zone to the extent practicable. The FAA recommends that airport operators and their local jurisdictions consider the development and implementation of a preferred/prohibited plant species list, reviewed by a wildlife damage management biologist and designed for the geographic location to reduce the attractiveness to hazardous wildlife for landscaping airport property.

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# Chapter 4. Wildlife Hazard Management and Land Use Compatibility Planning

#### 4.1 Location of Wildlife Strikes

#### 4.1.1 Elevation of Wildlife Strikes (above ground level)

Based on data provided by the FAA's wildlife strike database, more than 90% of all strikes occur at heights below 3,500 feet above ground level (AGL), with some variation between commercial aircraft and GA aircraft as shown in **Table 4-1**. More than one-third of all strikes occur on the ground during takeoff and landing (0 feet AGL), which includes strikes with non-avian species on aircraft movement areas and bird strikes that occur prior to takeoff or upon landing.

Table 4-1 Height of Wildlife Strikes Above Ground Level Commercial and General Aviation Aircraft (1990 to 2015)		
Height Above Ground Level         Commercial         General Aviation           (AGL)         Aircraft         Aircraft		
0 feet AGL (on the ground)	41%	37%
<500 feet AGL	71%	73%
<3,500 feet AGL	92%	97%
>3,500 feet	8 %	3%

Wildlife strike data for Riverside County airports generally coincide with the FAA data. Approximately 80 percent of the wildlife strikes in Riverside (121 of 152 strikes) occurred at less than 500 feet AGL, and 93% of the strikes (141 of 151 strikes) occurred at less than 3,500 feet AGL (refer to **Table C-1**).

Although the likelihood of a wildlife strike generally decreases with altitude, the FAA data indicate that strikes occurring at higher altitudes (i.e., above 500 feet AGL) have a greater probability of causing damage to aircraft. Since 2000, the number of wildlife strikes for commercial aircraft has declined, but that decline is associated with strikes that occur primarily in the airport environment, (i.e., at heights of <1,500 feet). The number of damaging strikes that occur at altitudes >1,500 feet have not declined. Research suggests that the decline in strikes occurring at lower heights (<1,500 feet) demonstrates the progress of wildlife hazard management programs at Part 139 airports since 1990, and less progress in mitigating strike risks that occur outside of but near to certificated airports.

At GA airports, there has been no decline in the number of damaging strikes in the airport environment (<1,500 feet AGL) since 1990, and there has been an increase in damaging strikes at heights above 1,500 feet AGL.

The implications of the strike data seem clear:

- For commercial aviation, greater attention is needed to reduce wildlife hazards outside of airport boundaries; and
- For general aviation, greater attention is needed to reduce wildlife hazards both inside and outside of airport boundaries.

As summarized in USDA's 2016 report, *Wildlife Strikes to Civil Aircraft in the United States: 1900-2015,* the aviation industry and the public must broaden their views to consider habitats and land uses within 5 miles of airports and to reduce those wildlife attractants that draw wildlife to the airspace through which aircraft fly below 3,500 feet AGL.

#### 4.1.2 Wildlife Hazard Management Within the Airport Influence Area

The FAA's critical zone for wildlife hazards includes the area within 5 miles of the approach/departure surface at any airport, and FAA guidance in AC 150/5300-33B warns against the creation of any land use or facility that would attract hazardous wildlife within these areas. However, the extent of the wildlife management policy planning area varies when considered within the context of the Airport Influence Area and guidance set forth by the *California Airport Land Use Compatibility Planning Handbook (Handbook)*.

#### Caltrans Handbook

As previously mentioned, the Caltrans *Handbook* identifies wildlife management within the context of airspace protection and the geographic area associated with the airspace compatibility policies is directly related to the imaginary surfaces identified in 14 CFR Part 77, *"Safe, Efficient Use, and Preservation of the Navigable Airspace."* The geographic area associated with the imaginary surfaces governed by Part 77 varies by airport based on the type of approach or planned approach for each runway (e.g., visual, non-precision, precision). In most cases, the imaginary surfaces extend to approximately 2 to 3 statute miles around airport runways and approximately 9.5 miles statute miles from the ends of runways having a precision instrument approach. Therefore, based on the type of runway approach, the imaginary surfaces could significantly fall short of or nearly double geographic area identified by the FAA's critical zone for wildlife hazard management.

#### **Riverside County ALUC Airspace Protection Policies**

The Riverside County ALUC addresses wildlife hazards in countywide Policy 4.3.7(d) which prohibits the creation of wildlife hazards anywhere within the Airport Influence Area:

4.3.7. Other Flight Hazards: New land uses that may cause visual, electronic, or increased bird strike hazards to aircraft in flight shall not be permitted **within any airport's influence area.** Specific characteristics to be avoided include:

- (a) Glare or distracting lights which could be mistaken for airport lights;
- (b) Sources of dust, steam, or smoke which may impair pilot visibility;
- (c) Sources of electrical interference with aircraft communications or navigation; and
- (d) Any proposed use, especially landfills and certain agricultural uses, that creates an

increased attraction for large flocks of birds. (Refer to FAA Order 5200.5A, Waste Disposal Sites on or Near Airports and Advisory Circular 150/5200-33A, "Hazardous Wildlife Attractants On or Near Airports.")

#### **Riverside County Airport Influence Area and Safety Zones**

Although the AIA associated with most airports in Riverside County does not fulfill FAA's 5-mile separation criteria, it allows the ALUC to consider the creation and application of wildlife hazard management policies to the maximum extent possible within the area and altitudes where most strikes occur.

- More than 70 percent of wildlife strikes occur within 500 feet above ground level, which is
  encompassed by Compatibility Zones A through C for each AIA. In Riverside County, 80
  percent of the wildlife strikes for which data are available occurred at altitudes of less
  than 500 feet.
- More than 90% of wildlife strikes occur within 1,000 feet above ground level, which is encompassed by compatibility Zones A through D.
- Nearly 100% of all wildlife strikes occur at elevations below 3,500 feet, which encompasses a geographical area that extends beyond AIA boundaries for most airports.

#### 4.2 Effectiveness of Wildlife Management Policies

The FAA has issued policies pertaining to wildlife hazard management for decades, but its efforts focused primarily on commercial service airports until 2009. As a federal agency, the FAA is unable to implement wildlife hazard management beyond airport boundaries because the ability to implement off-site policies resides with local jurisdictions through their police powers. Consequently, little data is available to determine the effectiveness of wildlife hazard management policies or practices implemented by local jurisdictions.

#### Case Study: Baltimore Washington International Thurgood Marshall Airport - 2002 to 2012

A recent study performed by the Maryland Aviation Administration (MAA) indicates that the implementation of rigorous wildlife hazard management policies both on and near the airport can have a dramatic and positive effect on reducing wildlife presence. Baltimore/Washington International Thurgood Marshall Airport (BWI Airport) is commercial service airport located in the Chesapeake Bay Area of Maryland and along the Atlantic Flyway. MAA conducted a Wildlife Hazard Assessment (WHA) at BWI in 2001 and developed an aggressive wildlife hazard management program. The Code of Maryland Regulations defined an Airport Zone for BWI that encompassed the area within a 4-mile radius of BWI and allowed MAA to evaluate potential obstructions and other safety hazards. MAA referred to the statute when developing wildlife hazard management policies to evaluate proposed land uses within several local jurisdictions.

MAA involved planning and zoning officials and planning staff so that potential wildlife conflicts could be considered during decision making for discretionary actions and permit authorizations. Specific measures associated with the establishment of wildlife hazard management policies and procedures included:

- Streamlining state and permit review processes to address and FAA guidance pertaining to wildlife hazard management;
- Educating staff members from local jurisdictions about wildlife hazards to aviation and wildlife management;

- Modifying the permit approval process for all subdivisions, commercial and industrial development proposed within the Airport Zone to include MAA staff review and approval;
- Developing a landscape palette for local jurisdictions to distribute to project applicants and their consultants for projects within the Airport Zone; and
- Establishing stormwater management guidance for projects within the Airport Zone and providing a third-party review process to evaluate proposed temporary and permanent stormwater management facilities within the Airport Zone. Recommendations were made to avoid the construction of open water facilities and, when necessary, to ensure that they drain within the FAA's recommended 48-hour period.

MAA conducted a second wildlife hazard assessment in 2012, approximately 10 years after it had performed its initial assessment and initiated on- and off-site wildlife management policies. The abundance of wildlife observed during the two assessments helped to evaluate the effectiveness of its wildlife hazard management policies. As summarized in **Table 4-2**, the overall abundance of wildlife observed at and near BWI Marshall decreased dramatically between 2002 and 2012.

Table 4-2         Comparison of Wildlife Observed at BWI Marshall Airport         2001 v       2012			
Guild	2001	2012	Change (%)
Blackbirds/Starlings	23,792	15,966	-32.8
Columbids (Doves and Pigeons)	1,157	237	-79.5
Corvids	5,703	243	-95.7
Gulls	4,258	120	-97.1
Raptors	357	156	-56.3
Herons and Egrets	24	35	45.8
Shorebirds	191	35	-81.6
Swallows	246	119	-51.6
Waterfowl	1,049	920	-12.2
TOTAL INDIVIDUALS	37,230	18,216	-51.0
<b>Note:</b> Data pertaining to two guilds, songbirds and larks & thrushes, could not be presented for adequate comparison because the species that comprised the guilds were inconsistent between the 2001 and 2012 wildlife hazard assessments.			
<b>Source:</b> Bowie et al., 2013. <i>"Reducing Wildlife Hazards to Aviation at BWI Thurgood Marshall Airport through Agency and Community Coordination",</i> Journal of Airport Management, Vol 7, No. 3, London, England.			

To validate its data, MAA considered fluctuations in regional wildlife populations measured by others during the same general timeframe. The regional changes in avian populations measured by others during the same 10-year period varied by only slightly (by 1 to 2 percent in most cases), indicating that MAA's local results were likely the result of its increased wildlife management activities on and near the airport.



## Chapter 5. Recommended Policies and Best Management Practices

Safety is paramount, and wildlife hazard management must be considered during site planning at airports and off-site areas within the FAA's critical zones/separation distances for hazardous wildlife attractants (Figure 2-1). Policies or guidelines may be incorporated into ALUC review processes to identify, avoid, or modify proposed projects or project features that may be attractive to hazardous wildlife.

#### 5.1 Identify and Discourage Potentially Hazardous Wildlife On and Near **Riverside County Airports**

The first step in reducing wildlife hazards is to identify the presence of wildlife that is likely to occur or visit the airport vicinity and pass through its associated airspace. Based on available data for Riverside County airports, the hazardous wildlife that should be considered are summarized in Table 5-1.

Although **Table 5-1** provides a starting point for identifying and considering the presence of potentially hazardous wildlife within the AIA, it does not replace the expertise provided by an FAA-qualified airport wildlife biologist or the observations and input provided by airport staff. Table 5-1 should be revised based upon the results of additional wildlife hazard assessments performed at Riverside County airports, biological studies undertaken for projects proposed within the AIA, and input from airport operators.

**Policy/Recommendation:** Encourage applicants and airport operators to identify hazardous wildlife, their habitats, and potential attractants observed on the airport and within the AIA:

- (a) Amend Table 5-1 as new studies and data become available.
- (b) Include Table 5-1 as background data associated with subsequent ALUCP updates and, as necessary, formulate/revise ALUCP policies to reflect the additional data.
- (c) Consider the presence of hazardous wildlife in Table 5-1 during the review of proposed projects and future ALUCP updates.

Table 5-1		
Summary of Hazardous Wildlife Involved in Wildlife Strikes at Riverside County Airports		
Wildlife Species/ Species Group	Species, Risks, and Planning Considerations	
Raptors (Hawks, falcons, vultures, and owls)	<b>Species Involved.</b> Raptors involved in strikes include hawks, falcons, and owls. Their primary food sources include small mammals, birds, amphibians, and fish.	
	<b>Risk/Hazard:</b> Raptors represent a significant hazard to aircraft and may be attracted to airport environments if food sources, perching locations, and/or nesting opportunities are available. Short, manicured vegetation/ground cover is attractive to raptors and other birds of prey because rodents and other small mammals are easily observed. The presence of pigeons, starlings, or other avian prey species will also attract raptors. Damaging strikes with raptors have occurred in Riverside County.	
	<b>Planning Considerations:</b> Minimize conditions that support prey species by maintaining vegetation on and near the airport at intermediate heights of 6 to 12 inches whenever possible to disguise prey. Properly designed and maintained stormwater facilities should not incorporate features that would typically attract prey species, such as vegetation that provides food sources (seeds, fruit, nuts), shelter, or nesting opportunities. Proposed facilities should not include opportunities for raptors to perch (overhead structures, wire grids, etc.) or vegetation that is less than 6 inches. Anti-perch mechanisms should be incorporated.	
Waterfowl (geese, ducks, killdeer)	<b>Species Involved.</b> Waterfowl involved in wildlife strikes include various duck species and Canada geese. Most waterfowl species are migratory, but some populations remain year-round. Most waterfowl species have diets that consist of aquatic and wetland vegetation (e.g., seeds, stems, leaves, rhizomes, and roots), agricultural vegetation, aquatic insects, fish, mollusks, and crustaceans. Waterfowl are usually found where there is a combination of protection from predators, open water, wetland vegetation, and adjacent uplands for food, cover, and nesting. Canada geese require upland and aquatic habitat. They graze on cultivated and wild terrestrial vegetation, including turf grasses, clover, and aquatic plants (e.g., pondweed, bulrush, sedges, and cattails).	
	<b>Risk/Hazard:</b> The Canada goose is one of the most hazardous wildlife species to aircraft operations in North America, and damaging strikes with waterfowl including Canada geese have occurred in Riverside County. Canada geese tend to congregate on low vegetation adjacent to open water, which affords them an unobstructed sight line to scan for predators. When the open sight line is less than 30 feet, geese will generally move to a more suitable grazing area (WDFW 2005). (This is the basis for the 30-foot width restriction for detention ponds and infiltration ponds presented below). Various duck species were also observed.	
	<b>Planning Considerations:</b> To reduce waterfowl attraction, avoid or minimize open/standing water – such as stormwater management facilities and wetland areas – that provide food, cover, and nesting habitat. Avoid the	

Table 5-1			
Summary of Hazardous Wildlife Involved in Wildlife Strikes at Riverside County Airports			
Wildlife Species/ Species Group	Wildlife Species/ Species Group         Species, Risks, and Planning Considerations		
	creation of new open water sources near existing water sources, as waterfowl will circulate among the open water sources. Only those types of vegetation that generally are <b>not</b> favored by waterfowl for food or cover should be used in stormwater facilities and minimize detention times. Reduce ponds and open water features to sizes less than 30 feet for detention and infiltration ponds.		
Doves and Pigeons	<ul> <li>Species Involved. Various species of doves and pigeons occur in Riverside County, including mourning doves, but many were not identified to the species level. Doves and pigeons have adapted to urban areas to take advantage of human food sources and roost on buildings and bridges. Their diet consists primarily of seeds, fruits, and soft plant material.</li> <li>Risk/Hazard. Pigeons and doves pose significant hazards to aircraft operations because they often form large flocks and strikes have occurred in Riverside County.</li> </ul>		
	<b>Planning Considerations.</b> To avoid attracting pigeons and doves, stormwater facilities should not include vegetation that produces seeds or berries favored by doves and pigeons. For example, seed mixes used to revegetate disturbed areas on or near airports should not include millet or other plants that produce large seeds. Stormwater facilities should not include sand or small pebbles, which pigeons and doves ingest to aid in digestion. Opportunities for perching should be avoided, and anti-perching devices should be incorporated into project designs.		
Gulls	<b>Species Involved.</b> California gulls and other species have been involved in strikes, but many were not identified to the species level. Gulls are attracted to large, open areas such as reservoirs, lakes and rivers where they hunt for prey and scavenge for food. Gulls also have adapted to urban areas where they scavenge food from human sources, such as trash cans and uncontained debris. Various species of gulls have been observed in Riverside County,		
	<b>Risk/Hazard.</b> Gulls pose hazards to aircraft operation due to their size, abundance, and tendency to flock. They pose a serious aircraft hazard where airports are located near landfills or other major food sources, such as grasshoppers or worms on runways following heavy rains. Strikes with gulls have occurred, including one that resulted in substantial damage.		
	<b>Planning Considerations.</b> Gulls are attracted to refuse, so good housekeeping is imperative on and near airports. Good housekeeping procedures such as containing waste in enclosed containers and emptying trash cans are essential. Open water facilities should be avoided to prevent gulls from being attracted to the airport vicinity. Opportunities for perching should be avoided, and anti-perching devices should be incorporated into project designs.		

Table 5-1 Summary of Hazardous Wildlife Involved in Wildlife Strikes at Riverside County Airports	
Wildlife Species/ Species Group	Species, Risks, and Planning Considerations
Blackbirds and Starlings, and other smaller and flocking birds	<b>Species Involved.</b> Smaller birds involved in wildlife strikes include blackbirds, starlings, sparrows, swallows, and songbirds. Preferred habitat and dietary habits vary by species. Specific habitat and food availability that could result in overabundance of potential problem species should be researched and addressed on a case-by-case basis.
	<b>Risk/Hazard.</b> Smaller birds are comparatively less hazardous to aircraft because of their size, but large flocks represent a cumulative hazard to aircraft. In Riverside County, the greatest number of reported strikes was associated with larks, though none resulted in damage to aircraft. A strike with an American crow created minor damage to aircraft.
	<b>Planning Considerations.</b> Smaller birds prefer dense brush in which they can feed, nest, and seek shelter, such as in thick vegetation near open water sources or along fences, hedgerows, trees, and other structures. Stormwater facilities should not include vegetation that develops seeds (e.g., sunflower, millet) or provides shelter. Fences and structures should remain clear of dense vegetation, and vegetation should not exceed 12 inches in height. Avoid trees/structures that provide perching opportunities.
<section-header></section-header>	Coyotes hunt and feed on small animals such as rabbits, mice, grouse, and geese. Although stormwater management facilities are unlikely to attract coyotes, they are likely to attract species that coyotes prey upon. Standing water should be minimized to decrease the chance of coyotes using facilities as a watering hole.
Sources:	

Federal Aviation Administration (FAA) National Wildlife Hazard Database, accessed January 2018. Available at: <u>https://wildlife.faa.gov/database.aspx</u>

Washington Department of Transportation (WSDOT), 2008, *Aviation Stormwater Design Manual.* Available at: <u>https://www.wsdot.wa.gov/NR/rdonlyres/6F89EF1A-D31B-410A-9A7C-</u>

127D2B52D2A8/0/Chapter3StormwaterandWildlifePlanning.pdf

Photos available from the U.S. Fish and Wildlife Service (<u>www.usfws.gov</u>).
## 5.2 Identify and Avoid New Land Uses that Could Attract Hazardous Wildlife

Riverside County includes numerous lakes, rivers, and open water bodies that have the potential to attract hazardous wildlife including the Salton Sea. In addition to these natural features, many constructed facilities can attract hazardous wildlife including water quality treatment ponds, agricultural trees and fields, and golf courses.

Both the Caltrans *Handbook* and the Riverside County ALUCPs consider wildlife hazards to be airspace hazards, as conflicts occur when hazardous wildlife collide with aircraft during taxiing, takeoff, in flight, and landing. Two countywide policies address potential wildlife hazard:

- Policy 1.5.3, Major Land Use Actions, states that "The scope or character of certain major land use actions, as listed below, is such that their compatibility with airport activity is a potential concern." The policy provides a list of potential actions including "Projects having the potential to cause attraction of birds or other wildlife that can be hazardous to aircraft operations to be increased within the vicinity of an airport" (Policy 1.5.3[a][12]).
- Policy 4.3.7, Other Flight Hazards, states "New land uses that may cause visual, electronic, or increased bird strike hazards to aircraft in flight shall not be permitted within any airport's influence area." The policy identifies specific characteristics to avoid, such as "Any proposed use, especially landfills and certain agricultural uses, that creates an increased attraction for large flocks of birds" (Policy 4.3.7[d]).

Although wildlife poses hazards to aircraft in flight, the land uses that create wildlife attractants or support potentially hazardous wildlife are not usually considered during an airspace evaluation, with the exception of trees or towers that may qualify as obstructions. When considering safety, land use compatibility is evaluated on the density/intensity of the proposed use and its distance from the runway. However, many land uses that are considered compatible within the AIA may have the potential to create or support hazardous wildlife, such as:

- Agricultural uses (field crops, orchards, vineyards, dry farm, tree farms, aquaculture, dairy farms)
- Natural uses (wildlife preserves and open space, wetlands, and waterways)
- Subdivisions (amenities such as ponds, fountains, and landscaping)
- Recreational uses (Golf courses and parks)
- Industrial uses (stormwater management, amenities such as trains and landscaping)
- Commercial uses (Restaurants with outdoor seating, retail developments (amenities, such as outdoor cafes and fountains)
- Utilities (sewage treatment and disposal facilities, landfills, waste transfer and recycling stations, etc.)

Both the Caltrans Handbook and the ALUCP provide criteria related to potential airspace hazards (Policy 4.3.7[d]) and the evaluation of major land use actions (Policy 1.5.3[a][12]). In addition, Table 2A, "Basic Compatibility Criteria" and Appendix D, "Compatibility Guidelines for Specific Land Uses" include footnotes that refer to potential bird hazards. However, a direct link between land use and wildlife hazards is not provided in either the Caltrans *Handbook* or the countywide policies.

The land use Categories identified in the Riverside County ALUCP were reviewed to identify features that could attract wildlife hazards to the airport environs. Specific land uses and their potential hazards are summarized in **Table 5-2**.

Policy/Recommendation: Consider potential wildlife hazards and wildlife hazard management measures when determining the consistency of a proposed land use.

- (a) Provide guidance for ALUC staff and project applicants to consider when evaluating major new land uses or other mandatory reviews using the guidance provided in Table 5-2.
- (b) Incorporate guidance regarding wildlife hazard management into countywide and airport specific policies during subsequent ALUCP updates.

Land Use, Safety Considerations and Policy Recommendations Pertaining to Potentially Hazardous Wildlife					
In the AIA					
Land Use	Wildlife Consideration	Policy Recommendation			
Agricultural uses (Field crops, orchards, vineyards, dry farm, tree farms, aquaculture, dairy farms)	<ul> <li>Wildlife will be attracted to crops during cultivation and to scavenge following harvest.</li> <li>Confined livestock operations (i.e., feedlots, dairy operations, hog or chicken production facilities, or egg laying operations) often attract flocking birds, such as starlings, that pose a hazard to aviation. Furthermore, livestock feed, water, and manure may attract birds.</li> <li>Vines and trees will provide opportunities for roosting and perching,</li> </ul>	<ol> <li>Prohibit agriculture uses or livestock grazing on Airport property unless necessary for revenue generation and consistent with FAA criteria.</li> <li>Avoid industrial agriculture and livestock operations throughout the AIA. If such uses cannot be avoided, require the applicant to develop a program to reduce the attractiveness of the site to species that are hazardous to aviation safety following consultation with an FAA-qualified airport wildlife biologist.</li> </ol>			
	Aquaculture will attract waterfowl and raptors who feed on fish.				
Natural uses (Wildlife preserves and open space, wetlands, and waterways)	The FAA warns against the creation of mitigation sites and wildlife preservation / conservation on areas on federally obligated property (see CertAlert 06-07).	<ol> <li>Prohibit the creation of on-site mitigation areas, such as wetlands or the establishment of conservation easements on airport property (mitigation measures must be described in environmental review</li> </ol>			
	<ul> <li>Wildlife mitigation or conservation areas will create an additional wildlife attractant on or near the airport.</li> <li>Managing wildlife within designated mitigation/conservation may be prohibited by agencies, and relocating such areas will be difficult and expensive, as mitigation penalties will be applied to satisfy regulation.</li> </ul>	<ul> <li>documents pursuant to NEPA and CEQA).</li> <li>Prohibit the creation of wildlife preserves or conservation areas throughout the AIA in accordance with FAA AC 150/5200-33B and CertAlert 06-07, "Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Listed Threatened and Endangered Species and Species of Special Concern on Airports" (See Section 5.3).</li> </ul>			
Residential subdivisions (amenities such as ponds, fountains, and landscaping)	Wildlife attractants associated with subdivisions are usually associated with common areas, such as ponds, fountains and picnic areas, which may be attractive to hazardous wildlife.	<ol> <li>Prohibit picnic areas, extended detention ponds, fountains on the airport property and within Zones A through C.</li> <li>As a condition of consistency review, require applicants to submit stormwater</li> </ol>			

Land Use, Safety Considerations and Policy Recommendations Pertaining to Potentially Hazardous Wildlife				
Land Use	In the AIA Wildlife Consideration	Policy Recommendation		
	Stormwater management facilities, such as open water retention ponds, may be included as amenities. Landscaping plans may include species that are attractive to hazardous wildlife.	<ul> <li>management plans and landscaping plans for subdivisions. If plans are identified as likely to create a wildlife attractant, request that they be modified by applicant and reviewed by an FAA-qualified Airport Wildlife Hazard Biologist (landscaping plans) or engineer (stormwater management plans) to confirm that the revised plans will not create a hazardous wildlife attractant.</li> <li>Require project proponents to identify a "N Eeeding Policy."</li> </ul>		
Recreational uses (Golf courses and parks)	Golf courses and parks have the potential to attract hazardous wildlife through the creation of open water features, fountains, and landscaping materials (groundcover, trees, etc.), which may have been selected specifically to provide habitat enhancement.	<ol> <li>Prohibit new golf courses within the AIA in accordance with FAA AC 150/5200-33B.</li> <li>Prohibit parks and other recreational facilities on the airport and within Zone A.</li> <li>As a condition of consistency review for parks and outdoor recreation facilities located outside of Zone A, require applicants to submit water quality management plans and landscaping plan for subdivisions proposed in Zones D and E. If plans are identified as having the potential to create a wildlife attractant, require review by a FAA-qualified Airport Wildlife Hazard Biologist (landscaping plans) or engineer (stormwater management plans) to confirm that the revised plans will not create a hazardous wildlife attractant. If potential hazards are identified, request modifications to eliminate the potential hazard/wildlife attractant.</li> <li>Establish a formal channel/policy through which the airport operator and the operator of the recreational facility will work together to address potential wildlife management measures, the types of measures that may be necessary, and the entity responsible for implementing the management measures.</li> </ol>		

Table 5-2           Land Use, Safety Considerations and Policy Recommendations Pertaining to Potentially Hazardous Wildlife					
In the AIA					
Land Use	Wildlife Consideration	Policy Recommendation			
Industrial uses (Industrial business parks, mixed use business parks, etc.)	Industrial parks have the potential to attract hazardous wildlife through the creation of open water features (stormwater management ponds, settling ponds, etc.) and landscaped areas (groundcover, trees, etc.), which may be included in project designs specifically to provide habitat enhancement. Industry-specific operations, such as food processing, recycling, and waste-transfer operations, can attract hazardous wildlife if waste materials are not stored in enclosed areas.	<ol> <li>As a condition of consistency review, require applicants to submit water quality management plans and landscaping plans for industrial projects. If plans include features that have the potential to create a wildlife attractant, require review by a FAA- qualified Airport Wildlife Hazard Biologist (landscaping plans) or engineer (stormwater management plans) to confirm that the revised plans will not create a hazardous wildlife attractant. If potential hazards are identified, require modifications to eliminate the potential hazard/wildlife</li> </ol>			
	Worker amenities, such as outdoor picnic areas and trails, outdoor café areas, and break areas, have the potential to attract wildlife through the accumulation of trash and food wastes.	<ul> <li>attractant.</li> <li>2. As part of the consistency review, identify waste streams and storage areas to determine whether they have the potential to attract wildlife and request enclosures as necessary.</li> <li>3. Require a "No Feeding Policy" in outdoor picnic areas and outdoor seating.</li> </ul>			
<b>Commercial uses</b> (Restaurants with outdoor seating, retail developments (amenities such as outdoor cafes and fountains)	Commercial uses have the potential to attract hazardous wildlife through the creation of open water features (stormwater management ponds), fountains and water features, and landscaping. Trash in parking areas may attract scavengers such as crows and gulls. Fast food restaurants and restaurants with outdoor seating have the potential to attract flocking birds and rodents. Worker amenities, such as outdoor picnic areas and trails, outdoor café areas, and break areas, have the potential to attract wildlife through the accumulation of trash and food waste.	<ol> <li>As a condition of consistency finding, require applicants to submit water quality management plans and landscaping plans for industrial projects. If plans include features that have the potential to create a wildlife attractant, require review by an FAA-qualified Airport Wildlife Hazard Biologist (landscaping plans) or engineer (stormwater management plans) to confirm that the revised plans will not create a hazardous wildlife attractant. If potential hazards are identified, require modifications to eliminate the potential hazard/wildlife attractant.</li> <li>As part of the consistency requirements, identify waste storage areas for trash and food-related waste to ensure that waste will stored in enclosed containers and collection areas prior to removal.</li> <li>Require a "No Feeding Policy" near fast food restaurants, outdoor seating areas, and open space areas.</li> </ol>			

Land Use, Safety Considerations and Policy Recommendations Pertaining to Potentially Hazardous Wildlife In the AIA					
Land Use	Wildlife Consideration	Policy Recommendation			
Utilities (Sewage treatment and disposal facilities, landfills, waste transfer and recycling stations, etc.)	Landfills are known to attract wildlife, and FAA has strict requirements for the creation of new landfills near airports (refer to AC 150/5200- 34150/5200-34, Construction or Establishment of Landfills Near Public Airports, for a more detailed discussion of these restrictions).	<ol> <li>Prohibit new Municipal Solid Waste Landfills (MSWLs) within the AIA of any federally-obligated airport in accordance with AC 150/5200-33B and 150/5200-34.</li> <li>Prohibit water quality/sewage treatment plants throughout the AIA unless facilities are enclosed in accordance with FAA AC 150/5200-33B.</li> <li>Prohibit all waste transfer and storage facilities, recycling facilities that accept food</li> </ol>			
		<ul> <li>waste, and compositing operations within Zone A in accordance with FAA AC 150.5200-33B.</li> <li>Prohibit waste transfer, recycling (except non-food waste recycling) and storage operations within Zones B through E unless the operations and storage areas are fully enclosed in accordance with FAA AC 150.5200-33B.</li> </ul>			

### Table 5-2

### **References:**

FAA, 2007, Advisory Circular 50/5200-33B, "Wildlife Hazard Attractants on and Near Airports." Washington, D.C. Available at: https://www.faa.gov/documentLibrary/media/advisory\_circular/150-5200-33B/150\_5200\_33b.pdf

FAA, 2006, Advisory Circular 150/5200-34A, "Construction or Establishment of Landfills near Public Airports.: Available at: https://www.faa.gov/airports/resources/advisory\_circulars/index.cfm/go/document.current/documentNumber/150\_5200-34

## 5.3 Avoid Habitat Conservation for Hazardous Species On and Near Airports

Riverside County has a long tradition of environmental stewardship, and the Western Riverside County Regional Conservation Authority (RCA) was formed in 2004 to implement the Riverside County MSHCP. The comprehensive plan strives to conserve/preserve 500,000 acres to support 146 threatened, endangered, and sensitive species. Approximately 350,000 acres of existing Public/Quasi-Public Lands have been identified as part of the MSHCP Conservation Area. Coverage under the MSHCP allows the USFWS and CDFW to grant "take authorization" for projects that may incidentally take or harm individual species or their habitat outside of the MSHCP Conservation Area in exchange for providing land or an inlieu fee to support the dedication of additional target lands into the MSHCP Conservation Area.

Riverside County is a signatory to the MSHCP. Because many public use airports in Riverside are zoned as Public Facilities, airport property and adjacent properties have been designated as criteria cells within the MSHCP targeted for conservation easements pursuant to the Western Riverside County MSHCP. For example, the western half of Hemet Airport (see **Figure 5-1**) has been identified as criteria cells associated with the MSHCP, which indicates that the area meets the selection criteria for future acquisition and the establishment of conservation easements for targeted species. Several parcels adjacent to airport boundaries and within the AIA already include conservation easements (**Figure 5-1**). Similar conditions are present at the French Valley Airport other public-use airports.



Figure 5-1. Mulitple Species Habitat Conservation Plan (MSHCP) Lands



Wildlife Hazard Management Riverside County Airports

### **FAA Policy and Guidance**

The FAA warns against the establishment of conservation areas and easements on airport property, and the inclusion MSHCP or other conservation easements on airport property is contrary to FAA guidance for three reasons:

- The protection of wildlife habitat and associated habitat maintenance may attract wildlife that could pose a direct or indirect threat to aircraft operations;
- The conditions associated with conservation easements for a specific wildlife species may inhibit airport operators from performing necessary wildlife hazard management procedures required to manage other hazardous species; and
- Conservation easements can prevent an airport operator from performing orderly airport development or constructing necessary airport improvements, including those necessary for airport safety enhancement.

FAA CertAlert 06-07, "Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Listed Threatened and Endangered Species and Species of Special Concern on Airports," describes procedures for responding to requests by state wildlife agencies to facilitate and encourage habitats for state-listed threatened and endangered species or species of special concern that could occur on airports and pose a threat to aviation safety. However, the CertAlert does not apply to federally listed threatened and endangered species. The CertAlert states that:

Airport operators must decline to adopt habitat management techniques that jeopardize aviation safety. ...In particular, an airport operator that has received federal grant-in-aid assistance is obligated through its grant assurances to maintain compatible land uses. Failure to do so may lead to noncompliance with its grant obligations.

The CertAlert recommends that airport operators adhere to the habitat management practices described in other guidance and do not encourage the presence of, or attract hazardous wildlife species even if the species are state-listed or of special concern. Furthermore, it advises airport operators to "Reevaluate existing and evaluate future agreements with federal, state, or local wildlife agencies where the terms of the agreements are or may be contrary to federal obligations concerning hazardous wildlife on or near public-use airports and aviation safety."

Policy/Recommendation: Evaluate potential MSHCP-related conservation easements for land on and adjacent to airport property that have the potential to attract hazardous wildlife when reviewing a proposed project and its mitigation measures. To do so, the ALUC should:

- (a) Provide guidance for ALUC and RCA when evaluating a proposed conservation easement on or adjacent to airport property.
- Incorporate background data, maps and guidance pertaining to the (b) location of the Western Riverside County criteria cells and conservation easements subsequent updates to countywide ALUCP policies and airport specific ALUCP updates.
- Avoid the creation of new criteria cells within the AIA for Riverside (c) County airports.

# 5.4 Review and Identify Appropriate Water Quality/Stormwater Management Designs for Projects Near Airports

Water quality in Riverside County Flood Control and Water is managed by the Riverside County Conservation District, which addresses water quality in three watersheds: the Santa Ana, Margarita and the Whitewater. The District has prepared a separate *Water Quality Management Plan* and guidance document for each watershed. Each management plan and guidance document identifies the BMPs available for use in site design and water quality treatment including those associated with Low-Impact Development (LID). Project applicants seeking discretionary approvals must submit a project-specific plan that complies with the County's *Water Quality Management Plan* for the appropriate watershed.

BMPs are incorporated into project-specific water quality plans to minimize potential impacts from pollutants of concern as these can impair receiving waters, such as groundwater, streams and rivers. Treatment control BMPs are engineered systems designed to manage stormwater flows and water quality by removing pollutants from runoff. These BMPs may remove pollutants through filtration, media absorption, or other physical, biological, or chemical processes. Standard Water Quality BMPs identified in District guidance include:

- Infiltration Basins (also known as Bioinfiltration)
- Infiltration Trenches
- Permeable Pavement
- Harvest and Use (also known as Rainwater Harvesting Systems or RWH)
- Bioretention Facilities
- Extended Detention Basins
- Sand Filters

The District promotes the use of LID in association with BMPs to maximize infiltration and evapotranspiration through the use of extended detention periods and greater use of vegetation.

## FAA Policies and Guidance

Stormwater management facilities frequently rely on standing water to remove pollutants through infiltration and reduce the flow of runoff. Stormwater management facilities also rely upon the use of vegetation to reduce flows and remove pollutants from stormwater. Stormwater management facilities that provide open water and vegetation are attractive to many hazardous species as they can provide food, water, and opportunities for shelter and nesting.

The FAA "strongly recommends" that off-airport storm water management systems located within the critical zone for wildlife management, which encompasses the Air Operations Area (AOA), be designed and operated so as not to create above-ground standing water. It further recommends the following:

- Stormwater detention ponds should be designed, engineered, constructed, and maintained for a maximum 48-hour detention period after the design storm and remain completely dry between storms.
- Ponds should be designed to include the use of steep-sided, rip-rap lined, narrow, linear-shaped water detention basins.

When it is not possible to place these ponds away from an airport's AOA, the FAA recommends that airport operators use physical barriers, such as bird balls, wires grids, pillows, or netting, to prevent access of hazardous wildlife to open water and minimize aircraft-wildlife interactions. Whenever possible,

the use of underground storm water infiltration systems, such as French drains or buried rock fields, is recommended because they are less attractive to wildlife.

The Airport Cooperative Research Program (ACRP) undertook a detailed study of the relationship between stormwater management and wildlife hazards in *Report 125, Balancing Airport Stormwater and Bird Hazard Management*. The report includes a tool for evaluating the wildlife hazards associated with the implementation of stormwater management BMPs in an aviation environment. The risk management evaluation tool considered the following in relation to stormwater management:

- Exposure of water
- Pond size, area, shape and configuration,
- Hydrology
- Vegetation
- Location

**Table 5-3** summarizes the research results and identifies specific characteristics of stormwater management facilities that can affect the risk of wildlife strikes on and near airports and the specific challenges or considerations that should be addressed prior to implementation.

Table 5-3       Pisk Factors of Best Management Practice (BMP) Characteristics				
Category	Characteristic	Increases Wildlife Risk	Reduces Wildlife Risk	Implementation Challenges/Considerations
Exposure of Water	Permanent pool/dry between rain events	Permanent pool or frequently ponded	Dry between storm events	Local stormwater regulations often require a permanent pool to enhance water quality treatment. If a pool is not provided, additional quality BMPs may be required.
	Closed vessel/exposed water surface	Exposed water surface	Closed vessel / underground or limited access to water surface	Closed vessels such as tanks or underground storage tend to be more expensive per unit volume than excavated/graded features such as detention basins. They also provide reduced water quality benefits.
	Drain time	Drain time > 48 hours	Drain time < 48 hours	FAA requires maximum 48-hour drain time, but local stormwater regulations may require longer drain time to enhance water quality treatment
	Media in BMP	No media or media height< typical water elevation	Media height > typical water elevation to discourage water access by wildlife	Media can be selected to provide a water quality filtration benefit, but it will reduce BMP volume available for detention/quantity control.
	Wire/bird ball/other surface obstruction	No surface obstructions	Obstructions to block or discourage access to water by wildlife	Wildlife obstructions may be costly and may impact or increase BMP operations and maintenance.
Pond Surface Area/Size	Surface area of open water	Larger area	Smaller area / zero between storms	Surface area is the least significant factor influencing species utilization of ponds, but it should still be considered.
	Typical water depth	Intermediate depth (0.50 m to 1.0 m)	Shallow (<0.50 m) or deep (> 1.0 m)	Wildlife utilization is related to water depth indirectly. Research shows that wildlife prefers an intermediate level of emergent vegetation, which would require an intermediate depth of water: Shallow ponds can become choked with vegetation, reducing the attractiveness to wildlife, while deep ponds will not allow vegetation to grow (not enough sunlight exposure) and will also reduce the attractiveness to wildlife.

Table 5-3					
Risk Factors of Best Management Practice (BMP) Characteristics					
Category	Characteristic	Increases Wildlife Risk	Reduces Wildlife Risk	Implementation Challenges/Considerations	
	Max volume of water stored (design storm)	Increased water volume	Minimized water volume	The maximum volume of water stored is generally driven by local regulatory requirements for flood control and stream protection (reduction in peak flows and volumes), as well as extent of development. Low-impact development can help to reduce post-development runoff at the source and result in smaller BMPs.	
	Average volume of water stored (design storm)	Frequent and large volume of ponding	Dry between storm events or infrequently ponded	The average volume of water stored may be driven by design criteria (peak flow and volume restrictions, required design storms), extent of development, frequency of precipitation, and drain time.	
Perimeter Shape	Length/width ratio	Irregular	Length to width ratio is greater than 1:1 Length to width ratio is 1:1	Airports may have limited space to implement, and available space may dictate length/width ratio.	
	Side slopes (horizontal run: vertical rise)	Shallow (3:1 or flatter)	Steep recommended by FAA (assuming 2:1 or greater)	Shallow slopes recommended to facilitate maintenance.	
	Perimeter type	Irregular	Linear or circular	Linear BMPs are easier to construct and make more efficient use of available land.	
Hydrology	Soil characteristics/infiltration rate	Waterlogged/hydric or poorly draining soils	Well-draining soils	Airports may not have mitigation sites available with preferred soil characteristics. Hydric soils could be indicator of wetlands and possible permitting implications.	
	Frequency of rainfall	Frequent precipitation events	Infrequent precipitation events	Airports have no control over precipitation.	
	Magnitude of design storms	Higher-magnitude precipitation depths	Lower-magnitude precipitation depths	Airports have no control over precipitation or selected design storms.	

Table 5-3           Risk Factors of Best Management Practice (BMP) Characteristics				
Category	Characteristic	Increases Wildlife Risk	Reduces Wildlife Risk	Implementation Challenges/Considerations
Vegetation	Type of vegetation within BMP	Vegetation with high wildlife value (provides food or shelter)	Vegetation with low wildlife value	Vegetation may be a requirement of local permitting agencies to enhance water quality treatment; best to use vegetation that serves as a structural habitat and not a food source.
	Pervious or impervious bottom	Pervious bottom	Impervious (or partially impervious) bottom or well- draining pervious bottom	Impervious BMP bottoms will reduce water quality benefits from vegetation, eliminate the stormwater volume benefits offered by infiltration, and may increase stormwater management requirements or BMP sizing overall. A paved low-flow channel can reduce perviousness for most inundation conditions as well as facilitate access and sediment removal/maintenance.
	Vegetation/water ratio	Vegetation << Water	Vegetation >> Water to discourage water access by wildlife	Selected vegetation should be drought and inundation tolerant to survive variations in BMP water levels.
	Vegetation consistency/diversity index	High Diversity Index	Low Diversity Index	
Geographic Location	Distance from AOA	Inside AOA or Within FAA Separation Criteria (<10,000 ft.)	Outside FAA Separation Criteria of 10,000 ft.	Airports may have limited access/ownership of land outside of FAA separation criteria to allow for off-site mitigation. Regulatory criteria may require a mitigation ratio to increase the volume/performance of BMPs that are implemented off-site. Regulators typically also restrict mitigation to options within the same sub-watershed as the project.
	Vicinity to additional water features	< 3 km	> 3 km	Location of stormwater BMPs relative to other wildlife attractants can have a compounding effect on wildlife risk. Other wildlife risks off-property may be outside of airport's control. Increasing the distance between water bodies to 3 km or more, decreases the probability of avian usage by 50%.

Table 5-3           Risk Factors of Best Management Practice (BMP) Characteristics				
Category	Characteristic	Increases Wildlife Risk	Reduces Wildlife Risk	Implementation Challenges/Considerations
	Location relative to designated important bird area (IBA) along migration flyway	Within FAA- recommended 5-mile separation criteria	Outside FAA- recommended 5-mile separation criteria	Location of the BMP within the migration flyway can increase visibility and attractiveness of the BMP to wildlife.
	Location and elevation of BMP relative to aircraft movement pattern	< 1 km	> 1 km	Location of stormwater BMPs relative to aircraft movement patterns can significantly affect the likelihood of aircraft wildlife strikes.
Source: National Academies of Sciences, Engineering, and Medicine. 2015. <i>Balancing Airport Stormwater and Bird Hazard Management,</i> Appendix D. The National Academies Press, Washington, D.C. Available at: https://doi.org/10.17226/22216.				

**Table 5-4** summarizes the specific challenges associated with the BMPs identified in Riverside County guidance manuals, adaptive management measures, and specific recommendations for the use of the County's recommended BMPs throughout the AIA. The recommendations presented in **Table 5-4** are based on the ACRP research and FAA guidance set forth in applicable advisory circulars.

**Policy/Recommendation:** Consider proposed stormwater management facilities associated with a proposed project/land use change to determine whether it is likely to attract potentially hazardous wildlife. To do so, the ALUCP should:

- (a) Develop and provide guidance to County Water Conservation District staff and project applicants when preparing and evaluating stormwater management plans for projects located within an Airport Influence Area.
- (b) Include an evaluation of proposed stormwater management facilities for major new land uses or other mandatory revised using the guidance provided in **Table 5-4**.
- (c) Incorporate guidance regarding stormwater management facilities and wildlife hazard management into countywide and airport specific policies during subsequent ALUCP updates.

Table 5-4           Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment					
Best Management Practice (BMPs)	Description	Challenges	Recommended Adaptation for Airport Influence Area		
Stormwater Best Manag	gement Practices (BMPs)				
Infiltration Basins (also known as Bioinfiltration)	An infiltration basin is a flat earthen basin. Stormwater infiltrates through the bottom of the basin into the underlying soil over a 72- hour drawdown period. Flows exceeding storage volume must discharge to a downstream conveyance system. Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The County states that the basin surface and side slopes shall be planted with native grasses, in accordance with County of Riverside Ordinance 859 and the District's Basin Guidelines. Basin side slopes should be no steeper than 4:1. Infiltration basins are highly effective and enhance water quality through infiltration, evapotranspiration (when vegetated), evaporation, and sedimentation.	Riverside County LID requirements specify a 72-hour drawdown (exceeds FAA-48-hour drawdown period and the 48-hour period for non-LID BMPs). Cannot be used in areas with high groundwater table. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low-water-use plant species. Maintenance is required to remove trash from forebay and when percolation rates decrease. Pretreatment may also be incorporated to reduce clogging and accumulation/ponding of water. Bioinfiltration ponds are not usually suitable at airports.	<ul> <li>Prohibit infiltration basins in Zone A.</li> <li>Prohibit throughout Zones B and C without the following modifications: <ul> <li>Provide 48-hour drawdown within the Airport Influence Area (AIA). On-airport locations should provide 12-hour drawdown.</li> <li>Either modify pond design to avoid landscaping or provide appropriate landscaping that will not be attractive to hazardous wildlife and can be maintained at an intermediate height of less than 12 inches.</li> <li>Allow steep slopes of up to 1:1 in industrial areas and the use of steeper slopes (2:1 or 3:1 in other areas, provided that appropriate landscaping is included.</li> <li>Consider use of cover, such as bird balls or netting in industrial areas or other locations that are not available to the public.</li> </ul> </li> <li>Avoid in Zones D and E, and when necessary: <ul> <li>Provide 48-hour drawdown</li> <li>Provide assurance that proposed landscaping is not attractive to potentially hazardous wildlife.</li> </ul> </li> </ul>		

Table 5-4           Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment				
Best Management Practice (BMPs)	Description	Challenges	Recommended Adaptation for Airport Influence Area	
Infiltration Trenches	Infiltration trenches are shallow excavated areas that are filled with rock material to create a subsurface reservoir layer. The trench is sized to store the design capture volume in the void space between the rocks. Stormwater infiltrates through the bottom of the trench into the surrounding soil over a 72-hour period. An overflow pipe is used to bypass flows once the trench fills with stormwater. When sheet type flows approach the trench, a vegetated filter strip should be placed between the trench and the upstream drainage area. The filter strip must be a minimum of 5 feet wide and	<ul> <li>Not applicable at sites with very low soil infiltration rates, high groundwater tables, or excessively high soil infiltration rates.</li> <li>Maintenance includes: <ul> <li>Removing debris and trash from the surface of the trench and filter strip; and</li> <li>Replacing pea gravel, rock materials or soil as necessary.</li> </ul> </li> <li>If a filter strip is necessary: <ul> <li>Vegetation must be selected that will not be attractive to potentially hazardous species; and</li> <li>Vegetation must be maintained at an</li> </ul> </li> </ul>	Although a 72-hour infiltration period is required for treatment, the water accumulates below ground surface. Suitable for use on airports and within the AIA. If vegetation is required, appropriate materials must be selected and maintained to discourage the presence of potentially hazardous wildlife species.	
Permeable Pavement	planted with grasses (preferably native) or covered with mulch. Permeable pavements are composed of either a combination of pervious asphalt and concrete surfaces or permeable modular block. The permeable surface is placed on top of a reservoir aggregate layer that holds the stormwater volume until it infiltrates into the native subsoil.	<ul> <li>intermediate height of 6 to 12 inches.</li> <li>Maximum 10-acre drainage area.</li> <li>Should not be used: <ul> <li>In industrial or high vehicle traffic areas (25,000 or greater average daily traffic).</li> <li>Where soils have low infiltration rates.</li> <li>In areas where toxic materials are stored or handled.</li> <li>On airside because of potential Foreign Object Debris (FOD).</li> </ul> </li> </ul>	Appropriate for landside areas to treat parking lots and other paved surfaces that are not high-traffic areas such as airport terminal parking lots, rental car lots, Fixed- Base Operators (FBOs), and employee parking lots.	

Table 5-4           Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment				
Best Management Practice (BMPs)	Description	Challenges	Recommended Adaptation for Airport Influence Area	
Harvest and Use (also known as Rainwater Harvesting Systems or RWH)	Harvest and use BMPs include both above- ground and underground cisterns/vaults to collect and temporarily store runoff for later non-potable uses including irrigation, toilet flushing, and other non-potable uses, such as industrial processes. Dispersion within vegetated areas is preferred. Above-ground cisterns collect and store runoff from rooftops or other aboveground impervious surfaces. Underground cisterns include subsurface tanks, vaults, and pipes that temporarily store runoff for later use.	Consider seasonal variations in demand for harvested water, such as irrigation needs during the wet season. All cisterns must be equipped with/provide the following: • Mosquito prevention and abatement. • Mechanism to exclude debris and animals • Provisions for safe overflow when full. Underground cisterns / vaults must be maintained and include adequate access to remove accumulated sediment. RWH must include a mechanism to provide supplemental potable water when there is insufficient harvested water to meet facility demand. The application of harvested water should be avoided near runways and taxiways, as saturated soils force earthworms and grubs to the surface which attracts birds.	RWH contains stormwater in cistern, making it unlikely to attract hazardous wildlife. However, the application of harvested water on the airport is not recommended based on its potential to attract wildlife near aircraft movement areas. RWH would be suitable in airside locations and throughout the AIA.	

Table 5-4           Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment					
Best Management Practice (BMPs)	Description	Challenges	Recommended Adaptation for Airport Influence Area		
Bioretention Facilities (Also known as Rain Garden, Bioretention Cell, Bioretention Basin, Landscaped Filter Basin, Porous Landscape Detention)	Bioretention is integrated into a facility's landscaped areas, and landscaped areas can be designed as bioretention facilities. Bioretention facilities are shallow, vegetated basins underlain by an engineered soil media. Plants and biological activity in the root zone maintain and renew the macro- pore space in the soil, maximize plant uptake of pollutants and runoff, and allows more of the soil column to function as both a sponge to retain water). Most bioretention facilities to promote infiltration. Typical facilities range in size from less than 1 acre to a maximum of around 10 acres. Treatment mechanisms include infiltration, evapotranspiration, evaporation, and biofiltration.	Bioretention areas should be designed for at least 70 percent mature coverage. To prevent the BMP from being used as walkways, many are planted using native species that include a combination of small trees, densely planted shrubs, and natural grasses, which may provide food, shelter, nesting, roosting, or water for wildlife.	<ul> <li>Although bioretention can mask open water, it is not recommended for airports based on its potential to provide food, shelter, nesting and perching for wildlife.</li> <li>Bioretention should be prohibited in Zone A.</li> <li>Limited bioretention is permissible in Zones B and C, but only when the following criteria are achieved: <ul> <li>The BMP is used in conjunction with appropriate landscaping for such uses as:</li> <li>Adjacent to structures,</li> <li>Parking islands,</li> <li>Medians,</li> <li>Site entrances,</li> <li>Planter boxes.</li> </ul> </li> <li>Vegetation is selected carefully so as not to provide food, shelter, nesting, roosting, or water for wildlife.</li> </ul> Permissible in Zones D and E when the following criteria are achieved: <ul> <li>Basins remain less than 30 feet in length or width; and</li> <li>Vegetation is selected carefully so as not to provide food, shelter, nesting, roosting, or water for wildlife.</li> </ul>		

Table 5-4					
Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment					
Best Management Practice (BMPs)	Description	Challenges	Recommended Adaptation for Airport Influence Area		
Extended Detention Basin	The Extended Detention Basin (EDB) is designed to detain the design volume of stormwater and maximize infiltration, evaporation, evapotranspiration, and surface wetting. Additional pollutant removal is provided through sedimentation, in which pollutants can attach to sediment accumulated in the basin through the process of settling. Stormwater enters the EDB through a forebay, then enters a basin that is vegetated with native grasses interspersed with gravel-filled trenches. Water that is not infiltrated or evapotranspired is conveyed to the bottom stage of the basin and detained for an extended period. Side slopes of 4:1 are recommended in County guidance.	Water is accumulated for extended periods that exceed FAA's 48-hour limit. Ponds are generally large and have slopes that are not steep enough to comply with FAA criteria. Vegetation, and specifically native plants, are recommended to promote evapotranspiration, a key component of this when BMP.	<ul> <li>Prohibit in Zones A through D.</li> <li>Avoid in Zone E. When necessary, must be designed with caution!</li> <li>Allowable only when storage and detention can occur in underground vaults; or</li> <li>All of the following can be met: <ul> <li>Detention times are modified to percolate within 48 hours;</li> <li>Steep slopes are provided (1:1); and</li> <li>The vegetation component is removed and replaced with concrete sides. Generally not recommended for the AIA.</li> </ul> </li> </ul>		
Sand Filter Basins (also known as sand filter, pocket filter, or media filter) Though not technically a BMP, Sand filters are a highly effective treatment control.	A Sand Filter Basin (SFB) is a sand bed that is constructed above an underdrain system. Stormwater enters the SFB at its forebay or as overland sheet flow through vegetated side slopes. Flows are gradually filtered through the underlying sand bed to an underdrain. The underdrain gradually dewaters the sand bed and discharges the filtered runoff to a nearby channel, swale, or storm drain.	Sand filters are comparatively expensive and do not mitigate the peak flow from a storm event. The bottom of the sand filter should remain above the seasonal high groundwater level. Maintenance is required for the forebay and vegetation, and sand must be replaced periodically.	Sand Filter Basins are desirable near airports because standing water is not long- standing and is treated through an underdrain system. However, standing water may not drain quickly after a peak storm event. Sand filters are acceptable in landside areas of the airport and throughout the AIA.		
Other BMPS (Non-LID)					

Table 5-4           Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment				
Best Management Practice (BMPs)	Description	Challenges	Recommended Adaptation for Airport Influence Area	
Vegetated Filter Strips	Vegetated filter strips are uniformly graded areas of dense vegetation designed to treat sheet flow/urban runoff. A grass swale, sand filter, or infiltration BMP is recommended in conjunction with a filter strip.	Vegetated filter strips require frequent landscape maintenance to maintain efficiency, such as irrigation, mowing, trimming, removal of invasive species, and replanting when necessary. Plants must be selected carefully to avoid wildlife attraction and maintained at an intermediate height when in the AIA.	<ul> <li>Filter strips do not involve ponded water and are appropriate in landside areas and throughout the AIA, provided that:</li> <li>Vegetation/grasses are not attractive to hazardous wildlife; and</li> <li>Vegetation is maintained at an intermediate height of 6 to 12 inches.</li> </ul>	
Vegetated Swales	A vegetated swale is a wide, shallow, densely vegetated channel that treats urban runoff as it is slowly conveyed into a downstream system.	Recommended in combination with other BMPs. Landscape maintenance is required to maintain efficiency such as irrigation and mowing.	<ul> <li>Vegetated swales do not usually involve ponded water and are appropriate in landside areas and throughout the AIA, provided that:</li> <li>Vegetation/grasses are not attractive to hazardous wildlife; and</li> <li>Vegetation is maintained at an intermediate height of 6 to 12 inches.</li> </ul>	
Water Quality Inlets	Water quality inlets, also known as oil and grit separators, are WQI underground multi- chambered tanks designed to remove sediments and other pollutants.	Frequency of maintenance can vary due to variations in sediment and presence of hydrocarbon byproducts, and discharge may need to be treated as hazardous waste. High sediment loads can interfere with the ability of the WQI to effectively separate oil and grease from the runoff.	Appropriate on airports and throughout the AIA.	
Adaptive Management Techniques for Open Water Areas (including Regional Water Treatment Facilities)				
Waterfowl Disruption Fences	Silt fences or berms are used to disrupt lines of sight for waterfowl and to	Other wildlife may perch on berms, especially in open water.	Can be used to break up open water at large facilities near airport, such as water	

Table 5-4           Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment				
Best Management Practice (BMPs)	Best Management Practice (BMPs) Description Challenges		Recommended Adaptation for Airport Influence Area	
	discourage waterfowl from using mowed turf areas or to disrupt open water areas.	Volume of ponds is decreased.	treatment facilities. Must be used in conjunction with ongoing monitoring to prevent use by other species.	
Floating Covers	Floating covers completely cover the surface of a pond, making the water invisible from the air. The systems vary in terms of material and complexity based on size of area(s) to be covered and require assistance from a manufacturer or engineer.	<ul> <li>Should be used only in controlled areas for safety reasons and be well-signed:</li> <li>Lighter color fabric covers are preferable in hot climates/severe sunlight.</li> <li>Ponds must remain oxygenated.</li> <li>Maintenance is necessary to remove debris and plant life that accumulates on the cover.</li> </ul>	Technology must be used carefully and in controlled areas, but it is effective in reducing wildlife attraction. Can be used in airside locations.	
Floating Ball Covers	Floating ball covers/bird balls are hollow, HDPE balls that float and cover the surface of an open water facility to conceal open water. The balls rise and fall with changing water levels.	<ul> <li>Should be used only in controlled areas for safety reasons and be well-signed:</li> <li>In areas with winds, water-filled balls are recommended.</li> <li>Outfall structures must be secured to prevent loss of floating balls.</li> </ul>	Technology must be used carefully and in controlled areas, but it is effective in reducing wildlife attraction. Can be used in airside locations.	
Netting	Nets are suspended over the entire surface of a pond or open water BMP to prevent wildlife access to the water surface. The average mesh size is 2 inches and nets must be made of UV-stabilized, knotted synthetic net that can be stable despite temperature changes.	<ul> <li>Must be used in a controlled area and be well signed.</li> <li>Maintenance is necessary to make sure that nets are securely fastened.</li> <li>Although inexpensive, nets are susceptible to damage over time.</li> <li>Most effective when used with synthetic pond liners to avoid vegetative growth.</li> </ul>	Technology must be used carefully and in controlled areas, but it is effective in reducing wildlife attraction. Can be used in airside locations.	
Overhead wires	Overhead wire systems consisting of monofilament wire or Kevlar-lined stainless- steel wire can be installed to deter birds from open water areas. The grid must be	<ul> <li>Must be used in a controlled area and well signed.</li> </ul>	Technology must be used carefully and in controlled areas, but it is effective in reducing wildlife attraction. Can be used in airside locations.	

Table 5-4           Evaluation of Stormwater Best Management Practices and Adaptive Management Techniques for an Aviation Environment				
Best Management Practice (BMPs)	Recommended Adaptation for Airport Influence Area			
	constructed above the water surface. The size of the wire grid would vary by species of concern.	<ul> <li>Overhead wires are relatively expensive (compared to nets,</li> <li>Regular maintenance is required to remove vegetation.</li> <li>Most effective when used with synthetic pond liners to avoid vegetative growth.</li> </ul>		
Pond Liners       Pond liners can be used to limit the growth of vegetation in an open water facility. Similar to concrete basins, the liners reduce wildlife attraction by preventing vegetation growth. When used, the sides of the pond should be lined, at minimum, to prevent vegetation growth. Synthetic liners can inhibit pond function.       Maintenance is required:       Technology can be used to water ponds when necess		Technology can be used to modify open water ponds when necessary in the AIA.		
<ul> <li>Notes:         <ol> <li>BMPs shaded yellow must be implemented with caution and require greater adaptation to be considered compatible within an AIA.</li> <li>BMPs shaded green identify technologies that are generally less likely to attract potentially hazardous wildlife following recommended adaptation for use in an AIA.</li> </ol> </li> </ul>				
Sources: North Carolina Department of Quality, 2018, Stormwater Design Manual, Chapter E-4, Airports. Available at:				
https://files.nc.gov/ncdeq/Energy%20Mineral%20and%20Land%20Resources/Stormwater/BMP%20Manual/E-4%20%20Airports%2001-29-2018.pdf				
Riverside County Flood Control and Water Conservation District, 2011, Design Handbook for Low Impact Development Best Management Practices. Available at:				
<u>Intp://www.noodcontrol.co.nverside.ca.us/NPDES/LIDBMP.aspx</u> Riverside County, 2006, Riverside County Water Quality Management Plan for Urban Runoff, Santa Ana River Region and Santa Margarita River Region				
Available at: http://rcflood.org/downloads/npdes/APP-O-RC-WQMP.pdf				
Washington Department of Transportation				

## 5.5 Review and Identify Appropriate Landscaping Designs and Plant Materials

Several County ordinances or guidance documents reference landscape requirements. In 2009, the County's Transportation Land Management Agency (TLMA) and Planning Department developed the *County of Riverside Guide to California Friendly Landscaping* (Landscaping Guide), which acknowledges the aesthetic importance of landscaping as well as the County's unique geographic environment and water conservation concerns. The guidelines were developed to present practical standards to help landscape architects, contractors, planners, and the public with the selection of plant materials and irrigation methods that meet the objectives of County ordinances and apply to:

- Commercial, industrial and residential development;
- Road rights-of-way;
- Parks and public lands;
- Landscaping associated with entry sign monuments;
- Fuel modification areas;
- Flood control areas; and
- Development adjacent to MSHCP and other Conservation Areas.

The Landscaping Guide recognizes that the species presented in the list may not be guaranteed for all situations, and it provides guidance for the use of species that are not included in Appendix A:

In order to incorporate plant species other than those listed, the project applicant must provide the Planning Director with the following:

- 1. Water use requirements per the Water Use Classification of Landscape Species (WUCOLSIII) or field data verifying the plant's landscape (crop coefficient).
- 2. Plant species description from Sunset Western Garden Book or other comparable source.
- 3. Comparison to a similar species included in the plant list.

### FAA Policy and Guidance

The three basic elements that attract and support wildlife are food, water, and cover; and landscape choices can offer both food and cover to potentially hazardous wildlife. For example:

- Waterfowl may be attracted to turf and grassland species, as certain grass species and their seeds provide a food source, and tall grass offers shelter for loafing and nesting.
- Doves, pigeons and starling may be attractive to short grass, which provides access to insects and to earthworms following a rain storm;
- Raptors may be attracted to short or well-maintained turf or grasslands because it provides access to prey, such as mice and voles.
- Tall grasslands can provide cover for large mammals, such as deer and coyotes.
- Hydroseeding, erosion control plantings, and revegetation seeding mixtures often include millet, rye grass, or other grains large-seed producing grasses that area attractive to waterfowl and bird species.
- Trees and forest patches can provide roosting and nesting sites.

Virtually any plant material or ground cover will provide habitat to support some wildlife. The amount and location of cover will influence wildlife use. To avoid the creation of new wildlife attractants, FAA recommends that landscape plans associated with projects on and near airports should not be developed to enhance habitat, and it recommends that landscaping plans within the critical zone be developed in

cooperation with an FAA-qualified Wildlife Hazard Damage Biologist to prevent the use of plant materials that would be attractive to the types of potentially hazardous wildlife likely to frequent the airport vicinity.

**Policy/Recommendation:** Consider potential wildlife hazards and management measures when determining evaluating the consistency of a major new land use or other mandatory review processes within Compatibility Zones A through D of the AIA as presented in the applicable Airport Land Use Compatibility Plan.

- (a) Prepare standalone design guidance for project applicants and ALUCP staff to consider when preparing landscape designs and performing project reviews. The design guidance should address the material summarized in **Table 5-5**.
- (b) Incorporate background data and the proposed landscape guidance in subsequent ALUCP updates and, as necessary, formulate/revise ALUCP policies to reflect the additional data.
- (c) Prepare and provide supplemental material to explain the relationship between landscaping and wildlife hazard management for use by TLMA and the Riverside County Planning Department. The material should be made available on the County's TLMA and incorporated into revised versions of the Landscape Guidance.

Table 5-5				
Summary of Landscape Design Guidance for Projects Near Riverside County Airports				
Landscape Design Criterion/Factor	Consideration			
Project Location	<ol> <li>Identify whether the proposed project is located within Compatibility Zones A through D.</li> <li>If a portion of the proposed project is located in a compatibility zone, the entire site will be subject to the landscape policies.</li> </ol>			
Presence of Hazardous Wildlife	1. Identify whether a Wildlife Hazard Assessment or Management Plan has been prepared for the associated airport.			
	<ul> <li>2. If neither an assessment nor management has been developed, consider whether the project has the potential to attract any of the following types hazardous wildlife observed in Riverside County: <ul> <li>Raptors (e.g., hawks, falcons, vultures, and owls)</li> <li>Waterfowl (e.g., Canada geese, ducks, killdeer)</li> <li>Doves and pigeons</li> <li>Starlings and Blackbirds and other smaller and flocking birds</li> <li>Coyotes</li> <li>Prey species (, voles, ground squirrels)</li> </ul> </li> </ul>			
Potential Food Source for Hazardous Wildlife	Identify whether proposed landscape materials will provide a potential food source for bird or mammal species such as:			
	<ul> <li>Fruit</li> <li>Nuts</li> <li>Berries</li> <li>Seeds</li> </ul> <i>Note:</i> When possible, select non-fruiting varieties or male cultivars of plants.			

Use of Tree Species and	1. Incorporate trees with columnar form.	
Installation	2. Do not provide contiguous canopy.	
	3. Avoid homogenous canopy types and heights	
	4. If site is adjacent to an airport, confirm that trees will not create obstructions at	
	maturity.	
Use of Shrubs. Accents	1. Avoid massing of cover.	
and Grasses	2. Provide a mix of deciduous, herbaceous, and evergreen species (Do not plant	
	evergreen species adjacent to each other.)	
	<ol> <li>Provide a minimum spacing between species that is equal to its mature width. (If two species are adjacent, use the lesser of the two values.)</li> </ol>	
	4. Provide at least 10 feet between trees and species that reach more than 1 foot in height at maturity.	
Use of Vines	1. Avoid massing of cover.	
	2. Use vines vertically; do not use to create canopy or to grow on the trunk or	
	branches of produces as this provides cover.	
	3. Minimize vine use to a width of 5 feet.	
Use of	1. Incorporate alternative groundcover and hardscape to the extent possible, such	
Groundcover/Turf	as:	
	Porous pavements	
	Permeable pavers	
	Artificial turf	
	2. Prevent natural succession of landscape.	
	Provide a minimum 2-foot separation between groundcover, turf, shrubs and	
	trees.	
	<ul> <li>Use masonry boarders to prevent spread of groundcover.</li> </ul>	
Provide Review by FAA-	Confirm that the landscaping plan was reviewed by an FAA-qualified Wildlife Hazard	
qualified Biologist	Damage Biologist. The biologist should provide a letter confirming that the proposed	
	project will not attract potentially hazardous wildlife or increase risks to aircraft	
	operations.	

Appendix A of the *Landscaping Guide*, "County of Riverside California Friendly Plant List", provides a general guide with recommended plant material. The plant list identifies the County's multiple sunset zones and microclimates, and suitability for specific projects or uses (rights-of-way, erosion control, MSHCP adjacent areas, and water quality features). It also identified specific plants that are prohibited in portions of the County or the County as a whole.

While the *Landscaping Guide* states that "Plant species must be selected from the plant list found in Attachment A of this Landscaping Guide" (p. 8), most of the plant materials identified in the County's Plant List could be attractive to, or provide habitat for, potentially hazardous wildlife.

**Table 5-6** identifies specific plants from the *Landscaping Guide* that are appropriate for most locations in the AIA because they are unlikely to attract hazardous wildlife. These plants are always acceptable when submitting landscape designs to the ALUC for review. Other plants may be considered on a case-by-case basis provided that they are reviewed by an FAA-qualified Wildlife Hazard Damage Biologist.

Acceptable Plants identified in the Kverside County Caliborations of the formation of the formati	Table 5-6					
Scientific NameCommon NameRegion (1,2)JansetCommentsTreesCercis occidentalisWestern RedbudVL: 1, 2 L: 3,42-24Not allowed in the Citrus/Vineyard Policy AreaOlea europaea Swan HillFruitless OliveGL: 1,2 L: 3,48,9, L: 3,411-24Pinus spp.Pine (various species)Varies by speciesSpeciesSpecies allowed on the Riverside County California Friendly Plant list include: Knobcone Pine, Calabrian Pine, Canary Island Pine, Pinyo Pine, Alepo Pine, Afghan Pine, Pinyo Pine, Alepo Pine, and Grey Pine.Rhus lanceaAfrican SumacL: 1-4 M: 5-68-9 12-24Robinia neomexicana*Desert LocustL: 1-4 M: 5-62-3, 7-11, 14, 18-24Any sterile cultivar acceptable M: 5-6Ulmus parvifoliaChinese ElmM: 1-63-243-24Aloysia triphyllaLemon VerbenaL: 1-6 12-219-10 12-2112-24Aloysia triphyllaLemon VerbenaL: 1-6 12-219-10 12-2112-24Dalea pulchraBush DaleaL: 6 12,1312-24Any sterile cultivar acceptable.	WOCOLS Sunset					
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Encelia farinosa     Brittlebush     VL: 3     8-16,	Dalea pulchra	Bush Dalea	L: 6	12.13		
	Encelia farinosa	Brittlebush	VL: 3	8-16.		
L: 3-6   18-24			L: 3-6	18-24		
Gravellia Noeli Noel's Grevellia L: 1-4, 8-9,	Gravellia Noelli	Noel's Grevellia	L: 1-4,	8-9,		
M:6 12-24			M:6	12-24		
Justicia californica Chuparosa M: 1,6 10-14,	Justicia californica	Chuparosa	M: 1,6	10-14,		
VL: 3 18-24			VL: 3	18-24		
L: 4-5			L: 4-5			
Langana camaraBusn lantanaL: 1-48-10,	Langana camara	Busn lantana	L: 1-4	8-10,		
M:6 12024			M:6	12024		
Lavendula spp.LavendarL: 1052-24;	Lavendula spp.	Lavendar	L: 105	2-24;		
M: 5-6 varies by			M: 5-6	varies by		
species				species		
Nandina domestica Heavenly Bamboo L: 1-4 3b-24	Nandina domestica	Heavenly Bamboo	L: 1-4	3b-24		
species M: 5-6	species		M: 5-6			
Rosmarinus officinalis I uscan Blue L:1-4 4-24	Rosmarinus officinalis	Tuscan Blue	L:1-4	4-24		
Tuscan Blue     Rosemary     M: 5-6       Ochic magnic     Autuma game     I.4.4	'Tuscan Blue'	Rosemary	M: 5-6	7.0		
Saivia greggia Autumn sage L: 1-4 /-9, The County permits several	Salvia greggia	Autumn sage	L: 1-4	/-9,	the County permits several	
IVI: 5-0 14-24 Other sage species that can be			0-C .IVI	14-24	considered on a seese by seese	
basis, such as: white sage					basis such as: white sage	
silver sage Mexican hush sage					silver sage Mexican hush sage	
purple sare, and black sare					purple sage, and black sage	

Accent Grasses				
Agave species	Agave	L: 1-4, 6	10, 12-24 (Varies by	
Aloe Species	Aloe	L:1-4, 6	8-9, 12-24	
Chondropetalum tectorum	Cape rush	H: 1 M:3	8-9, 14-24	
Dasylirion species	Desert Spoon	VL: 1 L: 4-6	10-24	
Deschampsia caespitosa	Tufted Hair Grass	L: 1-4	2-24	
Festuca (ovina) glauca	Blue Fescue	L: 1-2 M:3-6	1-24	
Dietes bicolor	Fortnight Lily		VL: 1 L: 3-6	
Echinocactus grusonii	Golden Barrel Cactus	VL:1-2 L: 3-4,6	12-24	
Fouquieria splendens	Octillio	L: 1, 4-6 VL: 3	10-13, 18- 20	
Hesperaloe parviflora	Red / Yellow Yucca	VL:3 L: 4-6	2b, 3, 7- 16, 18-24	
Muhlenbergia rigens	Deer Grass	L: 1,3 M: 2, 4-6	4-24	
Opuntia species	Prickly Pear, Cholla	VL: 1-3 L: 4-6	Varies by species	
Penstemon parryi	Parry's Beardtongue	L: 1-6	10-13	
Penstemon superbus	Superb Beardtongue	L: 1-6	10-13	
Tulbaghia violacea	Society Garlic	M: 1-4, 6	13-24	
Yucca species	Yucca	L: 1-6	Varies by species	Individual species should be reviewed prior to selection.
Groupdcover				Texas red yucca recommended.
Artomicio	Sandhill Saga	\/  • 1		[
pycnocephala	Sandhin Sage	VL. 1		
Oenothera caespitosa	White Evening Primrose	L: 1-2, 3-5	103, 7-14, 18-21	All primrose species acceptable for wildlife management purposes.
Oenothera stubbei	Baja Evening Primrose	L:1-6	10-13	All primrose species acceptable for wildlife management purposes
Penstemon baccharifolious	Del Rio	L;4-6	10-13	Penstemon species are generally acceptable, review on case-by-case basis.
Trachelospermum jasminoides	Star Jasmine	M: 1-6	8024	Variegated star jasmine preferred.
Zauschneria californica (Epilobium calif.)	California Fuchsia	L: 1,2,4 VL: 3 M.5-6	2011, 14- 24	

Grasses				
Cortaderia dioica [syn. C.	Pampas Grass	N/A	N/A	Not permitted by the Coachella
selloana]				Valley Multi-Species Habitat
				Conservation Plan (MSHCP).
Festuca spp.	Fescue	Varies by	Varies by	
		species	Species	
Zoysia 'Victoria'	Zoysia grass	60% of Eto	8-9, 12-24	
Notes:	-			

1. WULCOS III – Water Use Classification of Landscape Species. The WUCOLS III classification identifies water use in six regions throughout California (Regions 1-6). Riverside County Occurs in Region 4.

2. WUCOLS – Water Usage/Average Plant Factor Key:

• VL - Very low; L - Low; M - Medium; H - High

**Source**: County of Riverside California Friendly Plant List. Available at: http://rctlma.org/Portals/7/documents/landscaping\_guidelines/Guide\_to\_California\_Friendly\_Landscaping.pdf

# Chapter 6. References

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Appendix A. 14 CFR Part 139.337, "Wildlife Hazard Management"

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(1) Two-way radio communications between each pedestrian or vehicle and the tower;

(2) An escort with two-way radio communications with the tower accompanying any pedestrian or vehicle without a radio; or

(3) Measures authorized by the Administrator for controlling pedestrians and vehicles, such as signs, signals, or guards, when it is not operationally practical to have two-way radio communications between the tower and the pedestrian, vehicle, or escort;

(d) When an air traffic control tower is not in operation, or there is no air traffic control tower, provide adequate procedures to control pedestrians and ground vehicles in movement areas or safety areas through two-way radio communications or prearranged signs or signals;

(e) Ensure that each employee, tenant, or contractor is trained on procedures required under paragraph (b) of this section, including consequences of noncompliance, prior to moving on foot, or operating a ground vehicle, in movement areas or safety areas; and

(f) Maintain the following records:

(1) A description and date of training completed after June 9, 2004 by each individual in compliance with this section. A record for each individual must be maintained for 24 consecutive months after the termination of an individual's access to movement areas and safety areas.

(2) A description and date of any accidents or incidents in the movement areas and safety areas involving air carrier aircraft, a ground vehicle or a pedestrian. Records of each accident or incident occurring after the June 9, 2004 must be maintained for 12 consecutive calendar months from the date of the accident or incident.

#### §139.331 Obstructions.

In a manner authorized by the Administrator, each certificate holder must ensure that each object in each area within its authority that has been determined by the FAA to be an obstruction is removed, marked, or lighted, unless determined to be unnecessary by an FAA aeronautical study. FAA Advisory Circulars contain methods and procedures for the lighting of 14 CFR Ch. I (1–1–08 Edition)

obstructions that are acceptable to the Administrator.

#### §139.333 Protection of NAVAIDS.

In a manner authorized by the Administrator, each certificate holder must—

(a) Prevent the construction of facilities on its airport that, as determined by the Administrator, would derogate the operation of an electronic or visual NAVAID and air traffic control facilities on the airport;

(b) Protect—or if the owner is other than the certificate holder, assist in protecting—all NAVAIDS on its airport against vandalism and theft; and

(c) Prevent, insofar as it is within the airport's authority, interruption of visual and electronic signals of NAVAIDS.

#### §139.335 Public protection.

(a) In a manner authorized by the Administrator, each certificate holder must provide—

(1) Safeguards to prevent inadvertent entry to the movement area by unauthorized persons or vehicles; and

(2) Reasonable protection of persons and property from aircraft blast.

(b) Fencing that meets the requirements of applicable FAA and Transportation Security Administration security regulations in areas subject to these regulations is acceptable for meeting the requirements of paragraph (a)(1) of this section.

#### §139.337 Wildlife hazard management.

(a) In accordance with its Airport Certification Manual and the requirements of this section, each certificate holder must take immediate action to alleviate wildlife hazards whenever they are detected.

(b) In a manner authorized by the Administrator, each certificate holder must ensure that a wildlife hazard assessment is conducted when any of the following events occurs on or near the airport:

(1) An air carrier aircraft experiences multiple wildlife strikes;

(2) An air carrier aircraft experiences substantial damage from striking wildlife. As used in this paragraph, substantial damage means damage or

#### Federal Aviation Administration, DOT

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; or

(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 is observed to have access to any airport flight pattern or aircraft movement area.

(c) The wildlife hazard assessment required in paragraph (b) of this section must be conducted by a wildlife damage management biologist who has professional training and/or experience in wildlife hazard management at airports or an individual working under direct supervision of such an individual. The wildlife hazard assessment must contain at least the following:

(1) An analysis of the events or circumstances that prompted the assessment.

(2) Identification of the wildlife species observed and their numbers, locations, local movements, and daily and seasonal occurrences.

(3) Identification and location of features on and near the airport that attract wildlife.

(4) A description of wildlife hazards to air carrier operations.

(5) Recommended actions for reducing identified wildlife hazards to air carrier operations.

(d) The wildlife hazard assessment required under paragraph (b) of this section must be submitted to the Administrator for approval and determination of the need for a wildlife hazard management plan. In reaching this determination, the Administrator will consider—

(1) The wildlife hazard assessment;

(2) Actions recommended in the wildlife hazard assessment to reduce wildlife hazards;

(3) The aeronautical activity at the airport, including the frequency and size of air carrier aircraft:

(4) The views of the certificate holder;

(5) The views of the airport users; and

(6) Any other known factors relating to the wildlife hazard of which the Administrator is aware.

(e) When the Administrator determines that a wildlife hazard management plan is needed, the certificate holder must formulate and implement a plan using the wildlife hazard assessment as a basis. The plan must—

(1) Provide measures to alleviate or eliminate wildlife hazards to air carrier operations;

(2) Be submitted to, and approved by, the Administrator prior to implementation; and

(3) As authorized by the Administrator, become a part of the Airport Certification Manual.

(f) The plan must include at least the following:

(1) A list of the individuals having authority and responsibility for implementing each aspect of the plan.

(2) A list prioritizing the following actions identified in the wildlife hazard assessment and target dates for their initiation and completion:

(i) Wildlife population management;

(ii) Habitat modification; and

(iii) Land use changes.

(3) Requirements for and, where applicable, copies of local, State, and Federal wildlife control permits.

(4) Identification of resources that the certificate holder will provide to implement the plan.

(5) Procedures to be followed during air carrier operations that at a minimum includes—

(i) Designation of personnel responsible for implementing the procedures;

(ii) Provisions to conduct physical inspections of the aircraft movement areas and other areas critical to successfully manage known wildlife hazards before air carrier operations begin;

(iii) Wildlife hazard control measures; and

(iv) Ways to communicate effectively between personnel conducting wildlife control or observing wildlife hazards and the air traffic control tower.

(6) Procedures to review and evaluate the wildlife hazard management plan every 12 consecutive months or following an event described in paragraphs (b)(1), (b)(2), and (b)(3) of this section, including:

#### §139.339

(i) The plan's effectiveness in dealing with known wildlife hazards on and in the airport's vicinity and

(ii) Aspects of the wildlife hazards described in the wildlife hazard assessment that should be reevaluated.

(7) A training program conducted by a qualified wildlife damage management biologist to provide airport personnel with the knowledge and skills needed to successfully carry out the wildlife hazard management plan required by paragraph (d) of this section.

(g) FAA Advisory Circulars contain methods and procedures for wildlife hazard management at airports that are acceptable to the Administrator.

#### §139.339 Airport condition reporting.

In a manner authorized by the Administrator, each certificate holder must—

(a) Provide for the collection and dissemination of airport condition information to air carriers.

(b) In complying with paragraph (a) of this section, use the NOTAM system, as appropriate, and other systems and procedures authorized by the Administrator.

(c) In complying with paragraph (a) of this section, provide information on the following airport conditions that may affect the safe operations of air carriers:

(1) Construction or maintenance activity on movement areas, safety areas, or loading ramps and parking areas.

(2) Surface irregularities on movement areas, safety areas, or loading ramps and parking areas.

(3) Snow, ice, slush, or water on the movement area or loading ramps and parking areas.

(4) Snow piled or drifted on or near movement areas contrary to §139.313.

(5) Objects on the movement area or safety areas contrary to §139.309.

(6) Malfunction of any lighting system, holding position signs, or ILS critical area signs required by §139.311.

(7) Unresolved wildlife hazards as identified in accordance with §139.337.

(8) Nonavailability of any rescue and firefighting capability required in \$\$139.317 or 139.319.

(9) Any other condition as specified in the Airport Certification Manual or

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that may otherwise adversely affect the safe operations of air carriers.

(d) Each certificate holder must prepare and keep, for at least 12 consecutive calendar months, a record of each dissemination of airport condition information to air carriers prescribed by this section.

(e) FAA Advisory Circulars contain methods and procedures for using the NOTAM system and the dissemination of airport information that are acceptable to the Administrator.

#### §139.341 Identifying, marking, and lighting construction and other unserviceable areas.

(a) In a manner authorized by the Administrator, each certificate holder must—

(1) Mark and, if appropriate, light in a manner authorized by the Administrator—

(i) Each construction area and unserviceable area that is on or adjacent to any movement area or any other area of the airport on which air carrier aircraft may be operated;

(ii) Each item of construction equipment and each construction roadway, which may affect the safe movement of aircraft on the airport; and

(iii) Any area adjacent to a NAVAID that, if traversed, could cause derogation of the signal or the failure of the NAVAID; and

(2) Provide procedures, such as a review of all appropriate utility plans prior to construction, for avoiding damage to existing utilities, cables, wires, conduits, pipelines, or other underground facilities.

(b) FAA Advisory Circulars contain methods and procedures for identifying and marking construction areas that are acceptable to the Administrator.

#### §139.343 Noncomplying conditions.

Unless otherwise authorized by the Administrator, whenever the requirements of subpart D of this part cannot be met to the extent that uncorrected unsafe conditions exist on the airport, the certificate holder must limit air carrier operations to those portions of the airport not rendered unsafe by those conditions. THIS PAGE INTENTIONALLY LEFT BLANK
Appendix B. FAA AC 150, 5200-33B, "Wildlife Hazard Attractants On and Near Airports" THIS PAGE INTENTIONALLY LEFT BLANK



Federal Aviation Administration

# Advisory Circular

Subject: HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS Date: 8/28/2007 AC No: 150/5200-33B

Initiated by: AAS-300 Change:

1. **PURPOSE.** This Advisory Circular (AC) provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near public-use airports. It also discusses airport development projects (including airport construction, expansion, and renovation) affecting aircraft movement near hazardous wildlife attractants. Appendix 1 provides definitions of terms used in this AC.

2. APPLICABILITY. The Federal Aviation Administration (FAA) recommends that public-use airport operators implement the standards and practices contained in this AC. The holders of Airport Operating Certificates issued under Title 14, Code of Federal Regulations (CFR), Part 139, Certification of Airports, Subpart D (Part 139), may use the standards, practices, and recommendations contained in this AC to comply with the wildlife hazard management requirements of Part 139. Airports that have received Federal grant-in-aid assistance must use these standards. The FAA also recommends the guidance in this AC for land-use planners, operators of non-certificated airports, and developers of projects, facilities, and activities on or near airports.

**3. CANCELLATION.** This AC cancels AC 150/5200-33A, *Hazardous Wildlife Attractants on or near Airports*, dated July 27, 2004.

**4. PRINCIPAL CHANGES.** This AC contains the following major changes, which are marked with vertical bars in the margin:

- **a.** Technical changes to paragraph references.
- **b.** Wording on storm water detention ponds.
- c. Deleted paragraph 4-3.b, Additional Coordination.

5. BACKGROUND. Information about the risks posed to aircraft by certain wildlife species has increased a great deal in recent years. Improved reporting, studies, documentation, and statistics clearly show that aircraft collisions with birds and other wildlife are a serious economic and public safety problem. While many species of wildlife can pose a threat to aircraft safety, they are not equally hazardous. Table 1

ranks the wildlife groups commonly involved in damaging strikes in the United States according to their relative hazard to aircraft. The ranking is based on the 47,212 records in the FAA National Wildlife Strike Database for the years 1990 through 2003. These hazard rankings, in conjunction with site-specific Wildlife Hazards Assessments (WHA), will help airport operators determine the relative abundance and use patterns of wildlife species and help focus hazardous wildlife management efforts on those species most likely to cause problems at an airport.

Most public-use airports have large tracts of open, undeveloped land that provide added margins of safety and noise mitigation. These areas can also present potential hazards to aviation if they encourage wildlife to enter an airport's approach or departure airspace or air operations area (AOA). Constructed or natural areas—such as poorly drained locations, detention/retention ponds, roosting habitats on buildings, landscaping, odor-causing rotting organic matter (putrescible waste) disposal operations, wastewater treatment plants, agricultural or aquaculture activities, surface mining, or wetlands—can provide wildlife with ideal locations for feeding, loafing, reproduction, and escape. Even small facilities, such as fast food restaurants, taxicab staging areas, rental car facilities, aircraft viewing areas, and public parks, can produce substantial attractions for hazardous wildlife.

During the past century, wildlife-aircraft strikes have resulted in the loss of hundreds of lives worldwide, as well as billions of dollars in aircraft damage. Hazardous wildlife attractants on and near airports can jeopardize future airport expansion, making proper community land-use planning essential. This AC provides airport operators and those parties with whom they cooperate with the guidance they need to assess and address potentially hazardous wildlife attractants when locating new facilities and implementing certain land-use practices on or near public-use airports.

6. MEMORANDUM OF AGREEMENT BETWEEN FEDERAL RESOURCE AGENCIES. The FAA, the U.S. Air Force, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture - Wildlife Services signed a Memorandum of Agreement (MOA) in July 2003 to acknowledge their respective missions in protecting aviation from wildlife hazards. Through the MOA, the agencies established procedures necessary to coordinate their missions to address more effectively existing and future environmental conditions contributing to collisions between wildlife and aircraft (wildlife strikes) throughout the United States. These efforts are intended to minimize wildlife risks to aviation and human safety while protecting the Nation's valuable environmental resources.

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DAVID L. BENNETT Director, Office of Airport Safety and Standards

Table 1. Ranking of 25 species groups as to relative hazard to aircraft (1=most hazardous) based on three criteria (damage, major damage, and effect-on-flight), a composite ranking based on all three rankings, and a relative hazard score. Data were derived from the FAA National Wildlife Strike Database, January 1990–April 2003.<sup>1</sup>

	Ranking by criteria				
Species group	Damage <sup>4</sup>	Major damage⁵	Effect on flight <sup>6</sup>	Composite ranking <sup>2</sup>	Relative hazard score <sup>3</sup>
Deer	1	1	1	1	100
Vultures	2	2	2	2	64
Geese	3	3	6	3	55
Cormorants/pelicans	4	5	3	4	54
Cranes	7	6	4	5	47
Eagles	6	9	7	6	41
Ducks	5	8	10	7	39
Osprey	8	4	8	8	39
Turkey/pheasants	9	7	11	9	33
Herons	11	14	9	10	27
Hawks (buteos)	10	12	12	11	25
Gulls	12	11	13	12	24
Rock pigeon	13	10	14	13	23
Owls	14	13	20	14	23
H. lark/s. bunting	18	15	15	15	17
Crows/ravens	15	16	16	16	16
Coyote	16	19	5	17	14
Mourning dove	17	17	17	18	14
Shorebirds	19	21	18	19	10
Blackbirds/starling	20	22	19	20	10
American kestrel	21	18	21	21	9
Meadowlarks	22	20	22	22	7
Swallows	24	23	24	23	4
Sparrows	25	24	23	24	4
Nighthawks	23	25	25	25	1

<sup>&</sup>lt;sup>1</sup> Excerpted from the Special Report for the FAA, "Ranking the Hazard Level of Wildlife Species to Civil Aviation in the USA: Update #1, July 2, 2003". Refer to this report for additional explanations of criteria and method of ranking. <sup>2</sup> Relative rank of each species group was expressed with

<sup>&</sup>lt;sup>2</sup> Relative rank of each species group was compared with every other group for the three variables, placing the species group with the greatest hazard rank for  $\geq 2$  of the 3 variables above the next highest ranked group, then proceeding down the list.

<sup>&</sup>lt;sup>3</sup> Percentage values, from Tables 3 and 4 in Footnote 1 of the *Special Report*, for the three criteria were summed and scaled down from 100, with 100 as the score for the species group with the maximum summed values and the greatest potential hazard to aircraft.

<sup>&</sup>lt;sup>4</sup> Aircraft incurred at least some damage (destroyed, substantial, minor, or unknown) from strike.

<sup>&</sup>lt;sup>5</sup> Aircraft incurred damage or structural failure, which adversely affected the structure strength, performance, or flight characteristics, and which would normally require major repair or replacement of the affected component, or the damage sustained makes it inadvisable to restore aircraft to airworthy condition.

<sup>&</sup>lt;sup>6</sup> Aborted takeoff, engine shutdown, precautionary landing, or other.

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#### **SECTION 1.**

### GENERAL SEPARATION CRITERIA FOR HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS.

**1-1. INTRODUCTION.** When considering proposed land uses, airport operators, local planners, and developers must take into account whether the proposed land uses, including new development projects, will increase wildlife hazards. Land-use practices that attract or sustain hazardous wildlife populations on or near airports can significantly increase the potential for wildlife strikes.

The FAA recommends the minimum separation criteria outlined below for land-use practices that attract hazardous wildlife to the vicinity of airports. Please note that FAA criteria include land uses that cause movement of hazardous wildlife onto, into, or across the airport's approach or departure airspace or air operations area (AOA). (See the discussion of the synergistic effects of surrounding land uses in Section 2-8 of this AC.)

The basis for the separation criteria contained in this section can be found in existing FAA regulations. The separation distances are based on (1) flight patterns of piston-powered aircraft and turbine-powered aircraft, (2) the altitude at which most strikes happen (78 percent occur under 1,000 feet and 90 percent occur under 3,000 feet above ground level), and (3) National Transportation Safety Board (NTSB) recommendations.

**1-2. AIRPORTS SERVING PISTON-POWERED AIRCRAFT.** Airports that do not sell Jet-A fuel normally serve piston-powered aircraft. Notwithstanding more stringent requirements for specific land uses, the FAA recommends a separation distance of 5,000 feet at these airports for any of the hazardous wildlife attractants mentioned in Section 2 or for new airport development projects meant to accommodate aircraft movement. This distance is to be maintained between an airport's AOA and the hazardous wildlife attractant. Figure 1 depicts this separation distance measured from the nearest aircraft operations areas.

**1-3. AIRPORTS SERVING TURBINE-POWERED AIRCRAFT.** Airports selling Jet-A fuel normally serve turbine-powered aircraft. Notwithstanding more stringent requirements for specific land uses, the FAA recommends a separation distance of 10,000 feet at these airports for any of the hazardous wildlife attractants mentioned in Section 2 or for new airport development projects meant to accommodate aircraft movement. This distance is to be maintained between an airport's AOA and the hazardous wildlife attractant. Figure 1 depicts this separation distance from the nearest aircraft movement areas.

**1-4. PROTECTION OF APPROACH, DEPARTURE, AND CIRCLING AIRSPACE.** For all airports, the FAA recommends a distance of 5 statute miles between the farthest edge of the airport's AOA and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace.





PERIMETER A: For airports serving piston-powered aircraft, hazardous wildlife attractants must be 5,000 feet from the nearest air operations area.

PERIMETER B: For airports serving turbine-powered aircraft, hazardous wildlife attractants must be 10,000 feet from the nearest air operations area.

PERIMETER C: 5-mile range to protect approach, departure and circling airspace.

### **SECTION 2.**

## LAND-USE PRACTICES ON OR NEAR AIRPORTS THAT POTENTIALLY ATTRACT HAZARDOUS WILDLIFE.

**2-1. GENERAL.** The wildlife species and the size of the populations attracted to the airport environment vary considerably, depending on several factors, including land-use practices on or near the airport. This section discusses land-use practices having the potential to attract hazardous wildlife and threaten aviation safety. In addition to the specific considerations outlined below, airport operators should refer to *Wildlife Hazard Management at Airports,* prepared by FAA and U.S. Department of Agriculture (USDA) staff. (This manual is available in English, Spanish, and French. It can be viewed and downloaded free of charge from the FAA's wildlife hazard mitigation web site: <a href="http://wildlife-mitigation.tc.FAA.gov">http://wildlife-mitigation.tc.FAA.gov</a>.). And, *Prevention and Control of Wildlife Damage,* compiled by the University of Nebraska Cooperative Extension Division. (This manual is available online in a periodically updated version at: <a href="http://wildlife/solutions/handbook/">intro web site:</a>

**2-2. WASTE DISPOSAL OPERATIONS.** Municipal solid waste landfills (MSWLF) are known to attract large numbers of hazardous wildlife, particularly birds. Because of this, these operations, when located within the separations identified in the siting criteria in Sections 1-2 through 1-4, are considered incompatible with safe airport operations.

a. Siting for new municipal solid waste landfills subject to AIR 21. Section 503 of the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (Public Law 106-181) (AIR 21) prohibits the construction or establishment of a new MSWLF within 6 statute miles of certain public-use airports. Before these prohibitions apply, both the airport and the landfill must meet the very specific conditions described below. These restrictions do not apply to airports or landfills located within the state of Alaska.

The airport must (1) have received a Federal grant(s) under 49 U.S.C. § 47101, et. seq.; (2) be under control of a public agency; (3) serve some scheduled air carrier operations conducted in aircraft with less than 60 seats; and (4) have total annual enplanements consisting of at least 51 percent of scheduled air carrier enplanements conducted in aircraft with less than 60 passenger seats.

The proposed MSWLF must (1) be within 6 miles of the airport, as measured from airport property line to MSWLF property line, and (2) have started construction or establishment on or after April 5, 2001. Public Law 106-181 only limits the construction or establishment of some new MSWLF. It does not limit the expansion, either vertical or horizontal, of existing landfills.

NOTE: Consult the most recent version of AC 150/5200-34, *Construction or Establishment of Landfills Near Public Airports,* for a more detailed discussion of these restrictions.

- b. Siting for new MSWLF not subject to AIR 21. If an airport and MSWLF do not meet the restrictions of Public Law 106-181, the FAA recommends against locating MSWLF within the separation distances identified in Sections 1-2 through 1-4. The separation distances should be measured from the closest point of the airport's AOA to the closest planned MSWLF cell.
- c. Considerations for existing waste disposal facilities within the limits of separation criteria. The FAA recommends against airport development projects that would increase the number of aircraft operations or accommodate larger or faster aircraft near MSWLF operations located within the separations identified in Sections 1-2 through 1-4. In addition, in accordance with 40 CFR 258.10, owners or operators of existing MSWLF units that are located within the separations listed in Sections 1-2 through 1-4 must demonstrate that the unit is designed and operated so it does not pose a bird hazard to aircraft. (See Section 4-2(b) of this AC for a discussion of this demonstration requirement.)
- d. Enclosed trash transfer stations. Enclosed waste-handling facilities that receive garbage behind closed doors; process it via compaction, incineration, or similar manner; and remove all residue by enclosed vehicles generally are compatible with safe airport operations, provided they are not located on airport property or within the Runway Protection Zone (RPZ). These facilities should not handle or store putrescible waste outside or in a partially enclosed structure accessible to hazardous wildlife. Trash transfer facilities that are open on one or more sides; that store uncovered quantities of municipal solid waste outside, even if only for a short time; that use semi-trailers that leak or have trash clinging to the outside; or that do not control odors by ventilation and filtration systems (odor masking is not acceptable) do not meet the FAA's definition of fully enclosed trash transfer stations. The FAA considers these facilities incompatible with safe airport operations if they are located closer than the separation distances specified in Sections 1-2 through 1-4.
- e. Composting operations on or near airport property. Composting operations that accept only yard waste (e.g., leaves, lawn clippings, or branches) generally do not attract hazardous wildlife. Sewage sludge, woodchips, and similar material are not municipal solid wastes and may be used as compost bulking agents. The compost, however, must never include food or other municipal solid waste. Composting operations should not be located on airport property. Off-airport property composting operations should be located no closer than the greater of the following distances: 1,200 feet from any AOA or the distance called for by airport design requirements (see AC 150/5300-13, Airport Design). This spacing should prevent material, personnel, or equipment from penetrating any Object Free Area (OFA), Obstacle Free Zone (OFZ), Threshold Siting Surface (TSS), or Clearway. Airport operators should monitor composting operations located in proximity to the airport to ensure that steam or thermal rise does not adversely affect air traffic. On-airport disposal of compost by-products should not be conducted for the reasons stated in 2-3f.

- f. Underwater waste discharges. The FAA recommends against the underwater discharge of any food waste (e.g., fish processing offal) within the separations identified in Sections 1-2 through 1-4 because it could attract scavenging hazardous wildlife.
- **g.** Recycling centers. Recycling centers that accept previously sorted non-food items, such as glass, newspaper, cardboard, or aluminum, are, in most cases, not attractive to hazardous wildlife and are acceptable.
- h. Construction and demolition (C&D) debris facilities. C&D landfills do not generally attract hazardous wildlife and are acceptable if maintained in an orderly manner, admit no putrescible waste, and are not co-located with other waste disposal operations. However, C&D landfills have similar visual and operational characteristics to putrescible waste disposal sites. When co-located with putrescible waste disposal operations, C&D landfills are more likely to attract hazardous wildlife because of the similarities between these disposal facilities. Therefore, a C&D landfill co-located with another waste disposal operation should be located outside of the separations identified in Sections 1-2 through 1-4.
- i. Fly ash disposal. The incinerated residue from resource recovery power/heatgenerating facilities that are fired by municipal solid waste, coal, or wood is generally not a wildlife attractant because it no longer contains putrescible matter. Landfills accepting only fly ash are generally not considered to be wildlife attractants and are acceptable as long as they are maintained in an orderly manner, admit no putrescible waste of any kind, and are not co-located with other disposal operations that attract hazardous wildlife.

Since varying degrees of waste consumption are associated with general incineration (not resource recovery power/heat-generating facilities), the FAA considers the ash from general incinerators a regular waste disposal by-product and, therefore, a hazardous wildlife attractant if disposed of within the separation criteria outlined in Sections 1-2 through 1-4.

2-3. WATER MANAGEMENT FACILITIES. Drinking water intake and treatment facilities, storm water and wastewater treatment facilities, associated retention and settling ponds, ponds built for recreational use, and ponds that result from mining activities often attract large numbers of potentially hazardous wildlife. To prevent wildlife hazards, land-use developers and airport operators may need to develop management plans, in compliance with local and state regulations, to support the operation of storm water management facilities on or near all public-use airports to ensure a safe airport environment.

a. Existing storm water management facilities. On-airport storm water management facilities allow the quick removal of surface water, including discharges related to aircraft deicing, from impervious surfaces, such as pavement and terminal/hangar building roofs. Existing on-airport detention ponds collect storm water, protect water quality, and control runoff. Because they slowly release water

after storms, they create standing bodies of water that can attract hazardous wildlife. Where the airport has developed a Wildlife Hazard Management Plan (WHMP) in accordance with Part 139, the FAA requires immediate correction of any wildlife hazards arising from existing storm water facilities located on or near airports, using appropriate wildlife hazard mitigation techniques. Airport operators should develop measures to minimize hazardous wildlife attraction in consultation with a wildlife damage management biologist.

Where possible, airport operators should modify storm water detention ponds to allow a maximum 48-hour detention period for the design storm. The FAA recommends that airport operators avoid or remove retention ponds and detention ponds featuring dead storage to eliminate standing water. Detention basins should remain totally dry between rainfalls. Where constant flow of water is anticipated through the basin, or where any portion of the basin bottom may remain wet, the detention facility should include a concrete or paved pad and/or ditch/swale in the bottom to prevent vegetation that may provide nesting habitat.

When it is not possible to drain a large detention pond completely, airport operators may use physical barriers, such as bird balls, wires grids, pillows, or netting, to deter birds and other hazardous wildlife. When physical barriers are used, airport operators must evaluate their use and ensure they will not adversely affect water rescue. Before installing any physical barriers over detention ponds on Part 139 airports, airport operators must get approval from the appropriate FAA Regional Airports Division Office.

The FAA recommends that airport operators encourage off-airport storm water treatment facility operators to incorporate appropriate wildlife hazard mitigation techniques into storm water treatment facility operating practices when their facility is located within the separation criteria specified in Sections 1-2 through 1-4.

b. New storm water management facilities. The FAA strongly recommends that offairport storm water management systems located within the separations identified in Sections 1-2 through 1-4 be designed and operated so as not to create aboveground standing water. Stormwater detention ponds should be designed, engineered, constructed, and maintained for a maximum 48-hour detention period after the design storm and remain completely dry between storms. To facilitate the control of hazardous wildlife, the FAA recommends the use of steep-sided, rip-rap lined, narrow, linearly shaped water detention basins. When it is not possible to place these ponds away from an airport's AOA, airport operators should use physical barriers, such as bird balls, wires grids, pillows, or netting, to prevent access of hazardous wildlife to open water and minimize aircraft-wildlife interactions. When physical barriers are used, airport operators must evaluate their use and ensure they will not adversely affect water rescue. Before installing any physical barriers over detention ponds on Part 139 airports, airport operators must get approval from the appropriate FAA Regional Airports Division Office. All vegetation in or around detention basins that provide food or cover for hazardous wildlife should be eliminated. If soil conditions and other requirements allow, the FAA encourages

the use of underground storm water infiltration systems, such as French drains or buried rock fields, because they are less attractive to wildlife.

- c. Existing wastewater treatment facilities. The FAA strongly recommends that airport operators immediately correct any wildlife hazards arising from existing wastewater treatment facilities located on or near the airport. Where required, a WHMP developed in accordance with Part 139 will outline appropriate wildlife hazard mitigation techniques. Accordingly, airport operators should encourage wastewater treatment facility operators to incorporate measures, developed in consultation with a wildlife damage management biologist, to minimize hazardous wildlife attractants. Airport operators should also encourage those wastewater treatment facility operators to incorporate these mitigation techniques into their standard operating practices. In addition, airport operators should consider the existence of wastewater treatment facilities when evaluating proposed sites for new airport development projects and avoid such sites when practicable.
- d. New wastewater treatment facilities. The FAA strongly recommends against the construction of new wastewater treatment facilities or associated settling ponds within the separations identified in Sections 1-2 through 1-4. Appendix 1 defines wastewater treatment facility as "any devices and/or systems used to store, treat, recycle, or reclaim municipal sewage or liquid industrial wastes." The definition includes any pretreatment involving the reduction of the amount of pollutants or the elimination of pollutants prior to introducing such pollutants into a publicly owned treatment works (wastewater treatment facility). During the site-location analysis for wastewater treatment facilities, developers should consider the potential to attract hazardous wildlife if an airport is in the vicinity of the proposed site, and airport operators should voice their opposition to such facilities if they are in proximity to the airport.
- e. Artificial marshes. In warmer climates, wastewater treatment facilities sometimes employ artificial marshes and use submergent and emergent aquatic vegetation as natural filters. These artificial marshes may be used by some species of flocking birds, such as blackbirds and waterfowl, for breeding or roosting activities. The FAA strongly recommends against establishing artificial marshes within the separations identified in Sections 1-2 through 1-4.
- f. Wastewater discharge and sludge disposal. The FAA recommends against the discharge of wastewater or sludge on airport property because it may improve soil moisture and quality on unpaved areas and lead to improved turf growth that can be an attractive food source for many species of animals. Also, the turf requires more frequent mowing, which in turn may mutilate or flush insects or small animals and produce straw, both of which can attract hazardous wildlife. In addition, the improved turf may attract grazing wildlife, such as deer and geese. Problems may also occur when discharges saturate unpaved airport areas. The resultant soft, muddy conditions can severely restrict or prevent emergency vehicles from reaching accident sites in a timely manner.

**2-4. WETLANDS.** Wetlands provide a variety of functions and can be regulated by local, state, and Federal laws. Normally, wetlands are attractive to many types of wildlife, including many which rank high on the list of hazardous wildlife species (Table 1).

**NOTE:** If questions exist as to whether an area qualifies as a wetland, contact the local division of the U.S. Army Corps of Engineers, the Natural Resources Conservation Service, or a wetland consultant qualified to delineate wetlands.

- a. Existing wetlands on or near airport property. If wetlands are located on or near airport property, airport operators should be alert to any wildlife use or habitat changes in these areas that could affect safe aircraft operations. At public-use airports, the FAA recommends immediately correcting, in cooperation with local, state, and Federal regulatory agencies, any wildlife hazards arising from existing wetlands located on or near airports. Where required, a WHMP will outline appropriate wildlife hazard mitigation techniques. Accordingly, airport operators should develop measures to minimize hazardous wildlife attraction in consultation with a wildlife damage management biologist.
- **b.** New airport development. Whenever possible, the FAA recommends locating new airports using the separations from wetlands identified in Sections 1-2 through 1-4. Where alternative sites are not practicable, or when airport operators are expanding an existing airport into or near wetlands, a wildlife damage management biologist, in consultation with the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, and the state wildlife management agency should evaluate the wildlife hazards and prepare a WHMP that indicates methods of minimizing the hazards.
- **c. Mitigation for wetland impacts from airport projects.** Wetland mitigation may be necessary when unavoidable wetland disturbances result from new airport development projects or projects required to correct wildlife hazards from wetlands. Wetland mitigation must be designed so it does not create a wildlife hazard. The FAA recommends that wetland mitigation projects that may attract hazardous wildlife be sited outside of the separations identified in Sections 1-2 through 1-4.

(1) Onsite mitigation of wetland functions. The FAA may consider exceptions to locating mitigation activities outside the separations identified in Sections 1-2 through 1-4 if the affected wetlands provide unique ecological functions, such as critical habitat for threatened or endangered species or ground water recharge, which cannot be replicated when moved to a different location. Using existing airport property is sometimes the only feasible way to achieve the mitigation ratios mandated in regulatory orders and/or settlement agreements with the resource agencies. Conservation easements are an additional means of providing mitigation for project impacts. Typically the airport operator continues to own the property, and an easement is created stipulating that the property will be maintained as habitat for state or Federally listed species.

Mitigation must not inhibit the airport operator's ability to effectively control hazardous wildlife on or near the mitigation site or effectively maintain other aspects of safe airport operations. Enhancing such mitigation areas to attract hazardous wildlife must be avoided. The FAA will review any onsite mitigation proposals to determine compatibility with safe airport operations. A wildlife damage management biologist should evaluate any wetland mitigation projects that are needed to protect unique wetland functions and that must be located in the separation criteria in Sections 1-2 through 1-4 before the mitigation is implemented. A WHMP should be developed to reduce the wildlife hazards.

(2) Offsite mitigation of wetland functions. The FAA recommends that wetland mitigation projects that may attract hazardous wildlife be sited outside of the separations identified in Sections 1-2 through 1-4 unless they provide unique functions that must remain onsite (see 2-4c(1)). Agencies that regulate impacts to or around wetlands recognize that it may be necessary to split wetland functions in mitigation schemes. Therefore, regulatory agencies may, under certain circumstances, allow portions of mitigation to take place in different locations.

(3) Mitigation banking. Wetland mitigation banking is the creation or restoration of wetlands in order to provide mitigation credits that can be used to offset permitted wetland losses. Mitigation banking benefits wetland resources by providing advance replacement for permitted wetland losses; consolidating small projects into larger, better-designed and managed units; and encouraging integration of wetland mitigation projects with watershed planning. This last benefit is most helpful for airport projects, as wetland impacts mitigated outside of the separations identified in Sections 1-2 through 1-4 can still be located within the same watershed. Wetland mitigation banks meeting the separation criteria offer an ecologically sound approach to mitigation in these situations. Airport operators should work with local watershed management agencies or organizations to develop mitigation banking for wetland impacts on airport property.

**2-5. DREDGE SPOIL CONTAINMENT AREAS.** The FAA recommends against locating dredge spoil containment areas (also known as Confined Disposal Facilities) within the separations identified in Sections 1-2 through 1-4 if the containment area or the spoils contain material that would attract hazardous wildlife.

**2-6. AGRICULTURAL ACTIVITIES.** Because most, if not all, agricultural crops can attract hazardous wildlife during some phase of production, the FAA recommends against the used of airport property for agricultural production, including hay crops, within the separations identified in Sections 1-2 through 1-4. If the airport has no financial alternative to agricultural crops to produce income necessary to maintain the viability of the airport, then the airport shall follow the crop distance guidelines listed in the table titled "Minimum Distances between Certain Airport Features and Any On-Airport Agricultural Crops" found in AC 150/5300-13, *Airport Design*, Appendix 17. The cost of wildlife control and potential accidents should be weighed against the income produced by the on-airport crops when deciding whether to allow crops on the airport.

- a. Livestock production. Confined livestock operations (i.e., feedlots, dairy operations, hog or chicken production facilities, or egg laying operations) often attract flocking birds, such as starlings, that pose a hazard to aviation. Therefore, The FAA recommends against such facilities within the separations identified in Sections 1-2 through 1-4. Any livestock operation within these separations should have a program developed to reduce the attractiveness of the site to species that are hazardous to aviation safety. Free-ranging livestock must not be grazed on airport property because the animals may wander onto the AOA. Furthermore, livestock feed, water, and manure may attract birds.
- **b.** Aquaculture. Aquaculture activities (i.e. catfish or trout production) conducted outside of fully enclosed buildings are inherently attractive to a wide variety of birds. Existing aquaculture facilities/activities within the separations listed in Sections 1-2 through 1-4 must have a program developed to reduce the attractiveness of the sites to species that are hazardous to aviation safety. Airport operators should also oppose the establishment of new aquaculture facilities/activities within the separations listed in Sections 1-2 through 1-4.
- c. Alternative uses of agricultural land. Some airports are surrounded by vast areas of farmed land within the distances specified in Sections 1-2 through 1-4. Seasonal uses of agricultural land for activities such as hunting can create a hazardous wildlife situation. In some areas, farmers will rent their land for hunting purposes. Rice farmers, for example, flood their land during waterfowl hunting season and obtain additional revenue by renting out duck blinds. The duck hunters then use decoys and call in hundreds, if not thousands, of birds, creating a tremendous threat to aircraft safety. A wildlife damage management biologist should review, in coordination with local farmers and producers, these types of seasonal land uses and incorporate them into the WHMP.

### 2-7. GOLF COURSES, LANDSCAPING AND OTHER LAND-USE CONSIDERATIONS.

- a. Golf courses. The large grassy areas and open water found on most golf courses are attractive to hazardous wildlife, particularly Canada geese and some species of gulls. These species can pose a threat to aviation safety. The FAA recommends against construction of new golf courses within the separations identified in Sections 1-2 through 1-4. Existing golf courses located within these separations must develop a program to reduce the attractiveness of the sites to species that are hazardous to aviation safety. Airport operators should ensure these golf courses are monitored on a continuing basis for the presence of hazardous wildlife. If hazardous wildlife is detected, corrective actions should be immediately implemented.
- b. Landscaping and landscape maintenance. Depending on its geographic location, landscaping can attract hazardous wildlife. The FAA recommends that airport operators approach landscaping with caution and confine it to airport areas not associated with aircraft movements. A wildlife damage management biologist should review all landscaping plans. Airport operators should also monitor all landscaped areas on a continuing basis for the presence of hazardous wildlife. If

hazardous wildlife is detected, corrective actions should be immediately implemented.

Turf grass areas can be highly attractive to a variety of hazardous wildlife species. Research conducted by the USDA Wildlife Services' National Wildlife Research Center has shown that no one grass management regime will deter all species of hazardous wildlife in all situations. In cooperation with wildlife damage management biologist, airport operators should develop airport turf grass management plans on a prescription basis, depending on the airport's geographic locations and the type of hazardous wildlife likely to frequent the airport

Airport operators should ensure that plant varieties attractive to hazardous wildlife are not used on the airport. Disturbed areas or areas in need of re-vegetating should not be planted with seed mixtures containing millet or any other large-seed producing grass. For airport property already planted with seed mixtures containing millet, rye grass, or other large-seed producing grasses, the FAA recommends disking, plowing, or another suitable agricultural practice to prevent plant maturation and seed head production. Plantings should follow the specific recommendations for grass management and seed and plant selection made by the State University Cooperative Extension Service, the local office of Wildlife Services, or a qualified wildlife damage management biologist. Airport operators should also consider developing and implementing a preferred/prohibited plant species list, reviewed by a wildlife damage management biologist, which has been designed for the geographic location to reduce the attractiveness to hazardous wildlife for landscaping airport property.

- **c.** Airports surrounded by wildlife habitat. The FAA recommends that operators of airports surrounded by woodlands, water, or wetlands refer to Section 2.4 of this AC. Operators of such airports should provide for a Wildlife Hazard Assessment (WHA) conducted by a wildlife damage management biologist. This WHA is the first step in preparing a WHMP, where required.
- **d.** Other hazardous wildlife attractants. Other specific land uses or activities (e.g., sport or commercial fishing, shellfish harvesting, etc.), perhaps unique to certain regions of the country, have the potential to attract hazardous wildlife. Regardless of the source of the attraction, when hazardous wildlife is noted on a public-use airport, airport operators must take prompt remedial action(s) to protect aviation safety.

**2-8.** SYNERGISTIC EFFECTS OF SURROUNDING LAND USES. There may be circumstances where two (or more) different land uses that would not, by themselves, be considered hazardous wildlife attractants or that are located outside of the separations identified in Sections 1-2 through 1-4 that are in such an alignment with the airport as to create a wildlife corridor directly through the airport and/or surrounding airspace. An example of this situation may involve a lake located outside of the separation criteria on the east side of an airport and a large hayfield on the west side of an airport, land uses that together could create a flyway for Canada geese directly across the airspace of the airport. There are numerous examples of such situations;

therefore, airport operators and the wildlife damage management biologist must consider the entire surrounding landscape and community when developing the WHMP.

### **SECTION 3.**

## PROCEDURES FOR WILDLIFE HAZARD MANAGEMENT BY OPERATORS OF PUBLIC-USE AIRPORTS.

**3.1. INTRODUCTION.** In recognition of the increased risk of serious aircraft damage or the loss of human life that can result from a wildlife strike, the FAA may require the development of a Wildlife Hazard Management Plan (WHMP) when specific triggering events occur on or near the airport. Part 139.337 discusses the specific events that trigger a Wildlife Hazard Assessment (WHA) and the specific issues that a WHMP must address for FAA approval and inclusion in an Airport Certification Manual.

**3.2.** COORDINATION WITH USDA WILDLIFE SERVICES OR OTHER QUALIFIED WILDLIFE DAMAGE MANAGEMENT BIOLOGISTS. The FAA will use the Wildlife Hazard Assessment (WHA) conducted in accordance with Part 139 to determine if the airport needs a WHMP. Therefore, persons having the education, training, and expertise necessary to assess wildlife hazards must conduct the WHA. The airport operator may look to Wildlife Services or to qualified private consultants to conduct the WHA. When the services of a wildlife damage management biologist are required, the FAA recommends that land-use developers or airport operators contact a consultant specializing in wildlife damage management or the appropriate state director of Wildlife Services.

**NOTE:** Telephone numbers for the respective USDA Wildlife Services state offices can be obtained by contacting USDA Wildlife Services Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD, 20737-1234, Telephone (301) 734-7921, Fax (301) 734-5157 (<u>http://www.aphis.usda.gov/ws/</u>).

**3-3. WILDLIFE HAZARD MANAGEMENT AT AIRPORTS: A MANUAL FOR AIRPORT PERSONNEL.** This manual, prepared by FAA and USDA Wildlife Services staff, contains a compilation of information to assist airport personnel in the development, implementation, and evaluation of WHMPs at airports. The manual includes specific information on the nature of wildlife strikes, legal authority, regulations, wildlife management techniques, WHAs, WHMPs, and sources of help and information. The manual is available in three languages: English, Spanish, and French. It can be viewed and downloaded free of charge from the FAA's wildlife hazard mitigation web site: <u>http://wildlife-mitigation.tc.FAA.gov/</u>. This manual only provides a starting point for addressing wildlife hazard issues at airports. Hazardous wildlife management is a complex discipline and conditions vary widely across the United States. Therefore, qualified wildlife damage management biologists must direct the development of a WHMP and the implementation of management actions by airport personnel.

There are many other resources complementary to this manual for use in developing and implementing WHMPs. Several are listed in the manual's bibliography.

**3-4.** WILDLIFE HAZARD ASSESSMENTS, TITLE 14, CODE OF FEDERAL REGULATIONS, PART 139. Part 139.337(b) requires airport operators to conduct a Wildlife Hazard Assessment (WHA) when certain events occur on or near the airport.

Part 139.337 (c) provides specific guidance as to what facts must be addressed in a WHA.

**3-5. WILDLIFE HAZARD MANAGEMENT PLAN (WHMP).** The FAA will consider the results of the WHA, along with the aeronautical activity at the airport and the views of the airport operator and airport users, in determining whether a formal WHMP is needed, in accordance with Part 139.337. If the FAA determines that a WHMP is needed, the airport operator must formulate and implement a WHMP, using the WHA as the basis for the plan.

The goal of an airport's Wildlife Hazard Management Plan is to minimize the risk to aviation safety, airport structures or equipment, or human health posed by populations of hazardous wildlife on and around the airport.

The WHMP must identify hazardous wildlife attractants on or near the airport and the appropriate wildlife damage management techniques to minimize the wildlife hazard. It must also prioritize the management measures.

**3-6. LOCAL COORDINATION.** The establishment of a Wildlife Hazards Working Group (WHWG) will facilitate the communication, cooperation, and coordination of the airport and its surrounding community necessary to ensure the effectiveness of the WHMP. The cooperation of the airport community is also necessary when new projects are considered. Whether on or off the airport, the input from all involved parties must be considered when a potentially hazardous wildlife attractant is being proposed. Airport operators should also incorporate public education activities with the local coordination efforts because some activities in the vicinity of your airport, while harmless under normal leisure conditions, can attract wildlife and present a danger to aircraft. For example, if public trails are planned near wetlands or in parks adjoining airport property, the public should know that feeding birds and other wildlife in the area may pose a risk to aircraft.

Airport operators should work with local and regional planning and zoning boards so as to be aware of proposed land-use changes, or modification of existing land uses, that could create hazardous wildlife attractants within the separations identified in Sections 1-2 through 1-4. Pay particular attention to proposed land uses involving creation or expansion of waste water treatment facilities, development of wetland mitigation sites, or development or expansion of dredge spoil containment areas. At the very least, airport operators must ensure they are on the notification list of the local planning board or equivalent review entity for all communities located within 5 miles of the airport, so they will receive notification of any proposed project and have the opportunity to review it for attractiveness to hazardous wildlife.

**3-7 COORDINATION/NOTIFICATION OF AIRMEN OF WILDLIFE HAZARDS.** If an existing land-use practice creates a wildlife hazard and the land-use practice or wildlife hazard cannot be immediately eliminated, airport operators must issue a Notice to Airmen (NOTAM) and encourage the land-owner or manager to take steps to control the wildlife hazard and minimize further attraction.

#### **SECTION 4.**

### FAA NOTIFICATION AND REVIEW OF PROPOSED LAND-USE PRACTICE CHANGES IN THE VICINITY OF PUBLIC-USE AIRPORTS

### 4-1. FAA REVIEW OF PROPOSED LAND-USE PRACTICE CHANGES IN THE VICINITY OF PUBLIC-USE AIRPORTS.

- **a.** The FAA discourages the development of waste disposal and other facilities, discussed in Section 2, located within the 5,000/10,000-foot criteria specified in Sections 1-2 through 1-4.
- b. For projects that are located outside the 5,000/10,000-foot criteria but within 5 statute miles of the airport's AOA, the FAA may review development plans, proposed land-use changes, operational changes, or wetland mitigation plans to determine if such changes present potential wildlife hazards to aircraft operations. The FAA considers sensitive airport areas as those that lie under or next to approach or departure airspace. This brief examination should indicate if further investigation is warranted.
- **c.** Where a wildlife damage management biologist has conducted a further study to evaluate a site's compatibility with airport operations, the FAA may use the study results to make a determination.

#### 4-2. WASTE MANAGEMENT FACILITIES.

a. Notification of new/expanded project proposal. Section 503 of the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (Public Law 106-181) limits the construction or establishment of new MSWLF within 6 statute miles of certain public-use airports, when both the airport and the landfill meet very specific conditions. See Section 2-2 of this AC and AC 150/5200-34 for a more detailed discussion of these restrictions.

The Environmental Protection Agency (EPA) requires any MSWLF operator proposing a new or expanded waste disposal operation within 5 statute miles of a runway end to notify the appropriate FAA Regional Airports Division Office and the airport operator of the proposal (40 CFR 258, *Criteria for Municipal Solid Waste Landfills*, Section 258.10, *Airport Safety*). The EPA also requires owners or operators of new MSWLF units, or lateral expansions of existing MSWLF units, that are located within 10,000 feet of any airport runway end used by turbojet aircraft, or within 5,000 feet of any airport runway end used only by piston-type aircraft, to demonstrate successfully that such units are not hazards to aircraft. (See 4-2.b below.)

When new or expanded MSWLF are being proposed near airports, MSWLF operators must notify the airport operator and the FAA of the proposal as early as possible pursuant to 40 CFR 258.

- b. Waste handling facilities within separations identified in Sections 1-2 through 1-4. To claim successfully that a waste-handling facility sited within the separations identified in Sections 1-2 through 1-4 does not attract hazardous wildlife and does not threaten aviation, the developer must establish convincingly that the facility will not handle putrescible material other than that as outlined in 2-2.d. The FAA strongly recommends against any facility other than that as outlined in 2-2.d (enclosed transfer stations). The FAA will use this information to determine if the facility will be a hazard to aviation.
- **c.** Putrescible-Waste Facilities. In their effort to satisfy the EPA requirement, some putrescible-waste facility proponents may offer to undertake experimental measures to demonstrate that their proposed facility will not be a hazard to aircraft. To date, no such facility has been able to demonstrate an ability to reduce and sustain hazardous wildlife to levels that existed before the putrescible-waste landfill began operating. For this reason, demonstrations of experimental wildlife control measures may not be conducted within the separation identified in Sections 1-2 through 1-4.

**4-3. OTHER LAND-USE PRACTICE CHANGES.** As a matter of policy, the FAA encourages operators of public-use airports who become aware of proposed land use practice changes that may attract hazardous wildlife within 5 statute miles of their airports to promptly notify the FAA. The FAA also encourages proponents of such land use changes to notify the FAA as early in the planning process as possible. Advanced notice affords the FAA an opportunity (1) to evaluate the effect of a particular land-use change on aviation safety and (2) to support efforts by the airport sponsor to restrict the use of land next to or near the airport to uses that are compatible with the airport.

The airport operator, project proponent, or land-use operator may use FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, or other suitable documents similar to FAA Form 7460-1 to notify the appropriate FAA Regional Airports Division Office. Project proponents can contact the appropriate FAA Regional Airports Division Office for assistance with the notification process.

It is helpful if the notification includes a 15-minute quadrangle map of the area identifying the location of the proposed activity. The land-use operator or project proponent should also forward specific details of the proposed land-use change or operational change or expansion. In the case of solid waste landfills, the information should include the type of waste to be handled, how the waste will be processed, and final disposal methods.

a. Airports that have received Federal grant-in-aid assistance. Airports that have received Federal grant-in-aid assistance are required by their grant assurances to take appropriate actions to restrict the use of land next to or near the airport to uses that are compatible with normal airport operations. The FAA recommends that airport operators to the extent practicable oppose off-airport land-use changes or practices within the separations identified in Sections 1-2 through 1-4 that may attract hazardous wildlife. Failure to do so may lead to noncompliance with applicable grant assurances. The FAA will not approve the placement of airport

development projects pertaining to aircraft movement in the vicinity of hazardous wildlife attractants without appropriate mitigating measures. Increasing the intensity of wildlife control efforts is not a substitute for eliminating or reducing a proposed wildlife hazard. Airport operators should identify hazardous wildlife attractants and any associated wildlife hazards during any planning process for new airport development projects.

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#### APPENDIX 1. DEFINITIONS OF TERMS USED IN THIS ADVISORY CIRCULAR.

- **1. GENERAL.** This appendix provides definitions of terms used throughout this AC.
  - 1. Air operations area. Any area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft. An air operations area includes such paved areas or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiways, or apron.
  - **2. Airport operator.** The operator (private or public) or sponsor of a public-use airport.
  - **3. Approach or departure airspace.** The airspace, within 5 statute miles of an airport, through which aircraft move during landing or takeoff.
  - **4. Bird balls.** High-density plastic floating balls that can be used to cover ponds and prevent birds from using the sites.
  - 5. Certificate holder. The holder of an Airport Operating Certificate issued under Title 14, Code of Federal Regulations, Part 139.
  - 6. Construct a new MSWLF. To begin to excavate, grade land, or raise structures to prepare a municipal solid waste landfill as permitted by the appropriate regulatory or permitting agency.
  - 7. Detention ponds. Storm water management ponds that hold storm water for short periods of time, a few hours to a few days.
  - 8. Establish a new MSWLF. When the first load of putrescible waste is received on-site for placement in a prepared municipal solid waste landfill.
  - **9.** Fly ash. The fine, sand-like residue resulting from the complete incineration of an organic fuel source. Fly ash typically results from the combustion of coal or waste used to operate a power generating plant.
  - **10. General aviation aircraft.** Any civil aviation aircraft not operating under 14 CFR Part 119, Certification: Air Carriers and Commercial Operators.
  - **11. Hazardous wildlife.** Species of wildlife (birds, mammals, reptiles), including feral animals and domesticated animals not under control, that are associated with aircraft strike problems, are capable of causing structural damage to airport facilities, or act as attractants to other wildlife that pose a strike hazard
  - 12. Municipal Solid Waste Landfill (MSWLF). A publicly or privately owned discrete area of land or an excavation that receives household waste and that is not a land application unit, surface impoundment, injection well, or waste pile, as those terms are defined under 40 CFR § 257.2. An MSWLF may receive

other types wastes, such as commercial solid waste, non-hazardous sludge, small-quantity generator waste, and industrial solid waste, as defined under 40 CFR § 258.2. An MSWLF can consist of either a stand alone unit or several cells that receive household waste.

- **13. New MSWLF.** A municipal solid waste landfill that was established or constructed after April 5, 2001.
- 14. Piston-powered aircraft. Fixed-wing aircraft powered by piston engines.
- **15. Piston-use airport.** Any airport that does not sell Jet-A fuel for fixed-wing turbine-powered aircraft, and primarily serves fixed-wing, piston-powered aircraft. Incidental use of the airport by turbine-powered, fixed-wing aircraft would not affect this designation. However, such aircraft should not be based at the airport.
- **16. Public agency.** A State or political subdivision of a State, a tax-supported organization, or an Indian tribe or pueblo (49 U.S.C. § 47102(19)).
- **17. Public airport.** An airport used or intended to be used for public purposes that is under the control of a public agency; and of which the area used or intended to be used for landing, taking off, or surface maneuvering of aircraft is publicly owned (49 U.S.C. § 47102(20)).
- 18. Public-use airport. An airport used or intended to be used for public purposes, and of which the area used or intended to be used for landing, taking off, or surface maneuvering of aircraft may be under the control of a public agency or privately owned and used for public purposes (49 U.S.C. § 47102(21)).
- **19. Putrescible waste.** Solid waste that contains organic matter capable of being decomposed by micro-organisms and of such a character and proportion as to be capable of attracting or providing food for birds (40 CFR §257.3-8).
- **20.** Putrescible-waste disposal operation. Landfills, garbage dumps, underwater waste discharges, or similar facilities where activities include processing, burying, storing, or otherwise disposing of putrescible material, trash, and refuse.
- **21. Retention ponds.** Storm water management ponds that hold water for several months.
- 22. Runway protection zone (RPZ). An area off the runway end to enhance the protection of people and property on the ground (see AC 150/5300-13). The dimensions of this zone vary with the airport design, aircraft, type of operation, and visibility minimum.
- 23. Scheduled air carrier operation. Any common carriage passenger-carrying operation for compensation or hire conducted by an air carrier or commercial

operator for which the air carrier, commercial operator, or their representative offers in advance the departure location, departure time, and arrival location. It does not include any operation that is conducted as a supplemental operation under 14 CFR Part 119 or as a public charter operation under 14 CFR Part 380 (14 CFR § 119.3).

- 24. Sewage sludge. Any solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and a material derived from sewage sludge. Sewage does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works. (40 CFR 257.2)
- **25. Sludge.** Any solid, semi-solid, or liquid waste generated form a municipal, commercial or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility or any other such waste having similar characteristics and effect. (40 CFR 257.2)
- 26. Solid waste. Any garbage, refuse, sludge, from a waste treatment plant, water supply treatment plant or air pollution control facility and other discarded material, including, solid liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or source, special nuclear, or by product material as defined by the Atomic Energy Act of 1954, as amended, (68 Stat. 923). (40 CFR 257.2)
- **27. Turbine-powered aircraft.** Aircraft powered by turbine engines including turbojets and turboprops but excluding turbo-shaft rotary-wing aircraft.
- **28. Turbine-use airport.** Any airport that sells Jet-A fuel for fixed-wing turbine-powered aircraft.
- **29. Wastewater treatment facility.** Any devices and/or systems used to store, treat, recycle, or reclaim municipal sewage or liquid industrial wastes, including Publicly Owned Treatment Works (POTW), as defined by Section 212 of the Federal Water Pollution Control Act (P.L. 92-500) as amended by the Clean Water Act of 1977 (P.L. 95-576) and the Water Quality Act of 1987 (P.L. 100-4). This definition includes any pretreatment involving the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW. (See 40 CFR Section 403.3 (q), (r), & (s)).

- 30. Wildlife. Any wild animal, including without limitation any wild mammal, bird, reptile, fish, amphibian, mollusk, crustacean, arthropod, coelenterate, or other invertebrate, including any part, product, egg, or offspring thereof (50 CFR 10.12, *Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants*). As used in this AC, wildlife includes feral animals and domestic animals out of the control of their owners (14 CFR Part 139, Certification of Airports).
- **31. Wildlife attractants.** Any human-made structure, land-use practice, or humanmade or natural geographic feature that can attract or sustain hazardous wildlife within the landing or departure airspace or the airport's AOA. These attractants can include architectural features, landscaping, waste disposal sites, wastewater treatment facilities, agricultural or aquaculture activities, surface mining, or wetlands.
- **32.** Wildlife hazard. A potential for a damaging aircraft collision with wildlife on or near an airport.
- **33.** Wildlife strike. A wildlife strike is deemed to have occurred when:
  - a. A pilot reports striking 1 or more birds or other wildlife;
  - **b.** Aircraft maintenance personnel identify aircraft damage as having been caused by a wildlife strike;
  - **c.** Personnel on the ground report seeing an aircraft strike 1 or more birds or other wildlife;
  - **d.** Bird or other wildlife remains, whether in whole or in part, are found within 200 feet of a runway centerline, unless another reason for the animal's death is identified;
  - e. The animal's presence on the airport had a significant negative effect on a flight (i.e., aborted takeoff, aborted landing, high-speed emergency stop, aircraft left pavement area to avoid collision with animal) (Transport Canada, Airports Group, *Wildlife Control Procedures Manual*, Technical Publication 11500E, 1994).

#### 2. RESERVED.

Appendix C.Wildlife Strikes at Riverside County Airports (1990 to2016)

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FAA Wildlife Strike Records for Riverside County Airports (1990 to 2016)					
Incident	Species	Damage	Height	Distance from	Phase of
Date	Involved	Damage	(Feet AGL)	Airport (Miles)	Flight
March Air Res	erve Base (RIV)				
7/9/2015	American kestrel	N	0	0	Landing
5/20/2015	Horned lark	N	0	0	Take-off run
5/8/2015	Cliff swallow	N	0	0	Landing
4/30/2015	Barn owl	Ν	200	0	Landing
4/13/2015	Western meadowlark	Ν	0	0	Take-off run
4/13/2015	Sparrows	Ν		10	Approach
3/31/2015	Horned lark	N			Approach
12/10/2014	Coyote	Ν	0	0	Landing
11/2/2014	Perching birds	Ν	0	0	Landing
9/29/2014	Fox sparrow	Ν			Approach
9/4/2014	Cliff swallow	Ν	200	0	Approach
8/6/2014	Horned lark	N	100	0	Approach
7/29/2014	Unknown bird - small	Ν	1000		Climb
6/18/2014	Horned lark	Ν	5	0	Take-off run
4/10/2014	Cliff swallow	Ν	100	0	Approach
4/3/2014	Unknown bird	N	600	2	Approach
3/18/2014	Unknown bird	N	7000	20	Approach
2/13/2014	Savannah sparrow	Ν	100	0	Take-off run
1/16/2014	Perching birds (y)	Ν	500	0	Approach
1/11/2014	Horned lark	Ν	0	0	Take-off run
1/8/2014	Peregrine falcon	Ν	50	0	Take-off run
11/6/2013	Northern pintail	N	500	0	Take-off run
10/27/2013	Horned lark	Ν	10	0	Take-off run
10/21/2013	Horned lark	Ν	50	0	Take-off run
8/28/2013	Unknown bird	Ν	500	2	Approach
6/27/2013	Horned lark	Ν	25	0	Take-off run
6/17/2013	Cliff swallow	Ν	25	0	Take-off run
6/14/2013	Cliff swallow	Ν	75	0	Take-off run
4/21/2013	Horned lark	N	50	0	Landing
3/28/2013	Cliff swallow	Ν	100		Approach
3/26/2013	Cliff swallow	Ν	200		Take-off run

Table O 4

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Table C-1   FAA Wildlife Strike Records for   Riverside County Airports (1990 to 2016)					
Incident Date	Species Involved	Damage	Height (Feet AGL)	Distance from Airport (Miles)	Phase of Flight
3/12/2013	White-throated swift	Ν	0		Take-off run
2/24/2013	Horned lark	Ν			Landing
2/6/2013	Red-tailed hawk	Ν	50		Take-off run
11/20/2012	White-throated swift	Ν	50	0	Landing
11/7/2012	Perching birds (y)	Ν	100	0	Climb
10/30/2012	Horned lark	N	10	0	Take-off run
10/16/2012	Horned lark	Ν	0	0	Take-off run
10/11/2012	Horned lark	Ν	0	0	Take-off run
10/11/2012	Horned lark	N	0	0	Take-off run
8/28/2012	Horned lark	N	0	0	Take-off run
6/4/2012	Cliff swallow	N		5	Landing
1/17/2012	Unknown bird	N	0	0	Take-off run
12/6/2011	Horned lark	N	100		Take-off run
11/27/2011	Horned lark	N	0	0	Take-off run
9/23/2011	Unknown bird	N		0	Take-off run
9/11/2011	Horned lark	Ν	40		Landing
7/27/2011	Swallows	Ν	0	0	Take-off run
12/8/2009	Horned lark	Ν			Landing
12/8/2009	Horned lark	Ν			Approach
12/1/2009	Horned lark	Ν			Landing
11/12/2009	Unknown bird – medium	Ν			Take-off run
10/16/2009	bat	Ν			Approach
10/13/2009	Horned lark	Ν			Take-off run
10/8/2009	Horned lark	Ν			Take-off run
8/14/2009	Unknown bird – medium	N			Take-off run
6/11/2009	Horned lark	Ν			Take-off run
6/10/2009	Unknown bird – medium	N			Take-off run
5/4/2009	Horned lark	N			Approach
3/4/2009	Western meadowlark	Ν			Landing
10/6/2008	Unknown bird – medium	Ν			Approach

Table C-1   FAA Wildlife Strike Records for   Riverside County Airports (1990 to 2016)						
Incident Date	Species Involved	Damage	Height (Feet AGL)	Distance from Airport (Miles)	Phase of Flight	
8/29/2008	Unknown bird – medium	N			Landing	
9/26/2007	medium	N			Approach	
6/1/2007	Unknown bird - small	М	100		Approach	
Riverside Mur	nicipal (RAL)					
2/6/2016	Unknown bird	М		0	Approach	
7/21/2015	Rock pigeon	N	1800	10	APPROACH	
12/4/2012	Hawks	N	0	0	Take-off run	
11/7/2011	European starling	Ν	10	0	Approach	
8/5/2006	Unknown bird – medium	Ν	1500		Descent	
6/27/2006	Unknown bird – medium	N			Approach	
7/21/2005	Mourning dove	N	0	0	Take-off run	
9/17/2004	Peregrine falcon	Unknown		0		
12/21/2003	Unknown bird – medium	N	600		Approach	
2/6/2002	Hawks	Ν	100		Approach	
7/1/2001	Unknown bird - small	N	1500		Descent	
2/9/1999	Doves	Ν			Approach	
Hemet-Ryan A	irport					
4/27/2015	Unknown bird - small	Ν	500		Climb	
2/28/2011	Unknown bird - small	Ν	250		Approach	
10/12/2005	Unknown bird - small	Ν	1200		Approach	
7/31/2000	Red-tailed hawk	М	0	0	Take-off run	
1/14/1992	Unknown bird - small	Ν	500		Approach	
Palm Springs International Airport						
4/27/2016	Unknown bird Unknown birds – small (11 to 100	N	100		Approach	
4/25/2015	struck))	N	25	0	Approach	
1/25/2015	Doves	Ν	300		Approach	
11/30/2014	Unknown bird	N	1200		Climb	
11/18/2014	Prairie falcon	Ν	0	0	Take-off run	

Table C-1   FAA Wildlife Strike Records for   Riverside County Airports (1990 to 2016)								
Incident Date	Species Involved	Damage	Height (Feet AGL)	Distance from Airport (Miles)	Phase of Flight			
10/16/2014	Unknown bird - small	Ν	1400		Approach			
7/2/2014	Gulls	N		0	Departure			
4/2/2014	Unknown bird	Ν	1300	1.5	Approach			
3/26/2014	Unknown bird	Ν	200		Approach			
3/3/2014	Unknown bird	Ν	400		Approach			
9/13/2013	Unknown bird	Ν	300		Approach			
2/17/2013	Unknown bird - small	Ν	800	3	Approach			
1/30/2013	Burrowing owl	Ν	50	0	Climb			
11/6/2012	Unknown bird	Ν			Approach			
9/11/2012	Unknown bird	Ν		0	Approach			
2/26/2012	Unknown bird	Ν	0	0	Landing Roll			
2/6/2012	Coyote	Ν	0	0	Landing Roll			
12/4/2011	Unknown bird - small	N	300	1	Approach			
8/19/2011	Coyote	Ν	0	0	Take-off run			
12/23/2010	Unknown bird	N	0	0	Take-off run			
9/5/2010	Unknown bird	Unknown			Approach			
9/1/2010	Microbats	Ν	0	0	Landing Roll			
7/13/2010	Mourning dove	N	0	0	Take-off run			
7/13/2010	Unknown bird	Ν	0	0	Take-off run			
7/2/2010	Tyrant flycatchers (2-10 struck)	Unknown		0				
10/17/2009	medium	Ν	7000	15	Climb			
7/8/2009	American kestrel	Unknown	0	0	Take-off run			
3/21/2009	Unknown birds – small (2 to 10 struck)	N	1400	5	Approach			
2/10/2009	Unknown bird - small	Ν			Approach			
12/9/2008	Unknown bird – medium	Ν	0	0	Take-off run			
8/2/2008	Unknown bird – medium	Ν	200		Climb			
9/26/2007	Unknown bird - small	N	1500		Approach			
5/24/2007	Unknown bird – medium	Ν			Approach			
Table C-1   FAA Wildlife Strike Records for   Riverside County Airports (1990 to 2016)								
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Incident Date	Species Involved	Damage	Height (Feet AGL)	Distance from Airport (Miles)	Phase of Flight			
3/23/2007	Unknown bird – medium	N	0	0	Take-off run			
7/12/2006	Unknown bird – medium	Ν	6500		Descent			
5/7/2006	medium (2 to 10 struck)	N			Climb			
3/14/2006	Unknown bird - small	N	0	0	Take-off run			
2/20/2006	Unknown bird – medium	N	200		Approach			
10/22/2005	Prairie falcon	Ν	0	0	Take-off run			
10/11/2005	American kestrel	Unknown		0				
2/12/2005	California gull	Unknown		0				
7/1/2004	American kestrel	Unknown		0				
11/18/2003	Mourning doves (2 to 10 struck)	Unknown		0				
11/12/2003	Western grebe	Unknown		0				
5/19/2002	Unknown bird - small	Ν						
3/9/2002	Rabbits	Ν	0	0	Take-off run			
4/27/2001	Terns	N	50		Approach			
8/19/2000	Unknown bird – medium	N	2600		Approach			
5/16/2000	Common nighthawk	N	3		Approach			
3/22/2000	Unknown bird - small	Ν	1000		Approach			
3/29/1999	Unknown bird – medium	Unknown			Approach			
12/11/1998	Hawks (2 to 10 struck)	S	8		Approach			
4/11/1998	Gulls	Ν	0	0	Take-off run			
2/11/1998	Unknown bird - small	Ν	2000		Approach			
2/24/1007	American crows	M	500		Approach			
3/14/1997	Unknown bird – medium	M	500		Арргоасн			
4/26/1994	Killdeer (11 to 100 struck)	N	0	0	Take-off run			
2/7/1994	Gulls (2 to 10 Struck)	N	0	0	Take-off run			
1/12/1994	Doves	Ν	200		Climb			

Table C-1									
Riverside County Airports (1990 to 2016)									
Incident Date	Species Involved	Damage	Height (Feet AGL)	Distance from Airport (Miles)	Phase of Flight				
	(2 to 10 struck)		(						
5/15/1993	Doves	N	200		Climb				
2/6/1992	Unknown bird - small	N	1000		Approach				
9/25/1991	Unknown bird – medium	N	500	1.5	Approach				
5/15/1991	Unknown bird - small	Ν	800		Climb				
Bermuda Dunes Airport									
10/25/2006	Red-tailed hawk	Ν	25		Approach				
5/29/2006	Rock pigeon	N	0	0	Take-off run				
12/8/2002	Unknown bird – medium	N	0	0	Take-off run				
1/5/1999	Unknown bird – medium	M?			Climb				
Jacqueline Cochran Regional Airport									
10/17/2013	Geese	S	400	0.2	Climb				
3/27/2006	California gull	S	3000		Climb				
2/22/2004	Canada geese (11 to 100 struck)	M?	200		Climb				
4/16/2002	Unknown bird – medium	N	1000		Approach				
Key:   AGL = above ground level   M = Minor damage   M? = Minor/unknown damage   S = Substantial damage   Source:   EAA National Mildlife Outline Database Merchington D.O. Accessed lang 0017									
FAA, National Wildlife Strike Database, Washington, D.C. Accessed June 2017.									

Appendix D. CertAlert 06-07, "Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Listed Threatened and Endangered Species and Species of Special Concern on Airports THIS PAGE INTENTIONALLY LEFT BLANK



# ADVISORY CAUTIONARY NON-DIRECTIVE AIRPORT SAFETY AND OPERATIONS DIVISION AAS-300

FOR INFORMATION, CONTACT Ed Cleary, AAS-300, (202) 267-3389

## Date: 11/21/2006

No. 06-07

To: Airport Operators, FAA Airport Certification Safety Inspectors

## Topic: Requests by State Wildlife Agencies to Facilitate and Encourage Habitat for State-Listed Threatened and Endangered Species and Species of Special Concern on Airports

#### PURPOSE:

This Certalert describes procedures for responding to requests by state wildlife agencies to facilitate and encourage habitats for state-listed threatened and endangered species or species of special concern that occur on airports and may pose a threat to aviation safety. This Certalert does not apply to federally listed threatened and endangered species. Federal Aviation Administration (FAA) guidance on dealing with federally listed threatened and endangered species - Policies and Procedures, Appendix A, Section 8.

## BACKGROUND:

An airport's air operations area (AOA) is an artificial environment that has been created and maintained for aircraft operations. Because an AOA can be markedly different from the surrounding native landscapes, it may attract wildlife species that do not normally occur, or that occur only in low numbers in the area. Some of the grassland species attracted to an airport's AOA are at the edge of their natural ranges, but are attracted to habitat features found in the airport environment. Also, some wildlife species may occur on the airport in higher numbers than occur naturally in the region because the airport offers habitat features the species prefer. Some of these wildlife species are state-listed threatened and endangered species or have been designated by state resource agencies as species of special concern.

Many state wildlife agencies have requested that airport operators facilitate and encourage habitat on airports for state-listed threatened and endangered species or species of special concern. Airport operators should exercise great caution in adopting new management techniques; new techniques may increase wildlife hazards and be inconsistent with safe airport operations. Managing the on-airport environment to facilitate or encourage the presence of hazardous wildlife species can create conditions that are incompatible with, or pose a threat to, aviation safety.

## **DISCUSSION:**

Hazardous wildlife are those species of wildlife (50 CFR 10.12), including feral animals and domesticated animals not under control (14 CFR 139.5, Definitions), that are associated with aircraft strike problems, are capable of causing structural damage to airport facilities, or act as attractants to other wildlife that pose a strike hazard. (FAA Advisory Circular 150/5200-33A, Hazardous Wildlife Attractants on or Near Airports, July 27, 2004.) Not all state-listed threatened and endangered species or species of concern pose a direct threat to aviation safety. However, these species may pose an indirect threat and be hazardous because they attract other wildlife species or support prev species attractive to other species that are directly hazardous. Also, the habitat management practices that benefit these state-listed threatened and endangered species and species of special concern may attract other hazardous wildlife species. For example, the grassland habitat preferred by grasshopper sparrows, which are listed as threatened in New York<sup>1</sup>, also supports a wide variety of insects and small mammals. These insects and small mammals are an indirect threat to aviation safety because they are very attractive to hawks, owls, gulls and other birds. It is these large birds that can pose a direct threat to aviation safety. On-airport habitat and wildlife management practices designed to benefit wildlife that directly or indirectly create safety hazard where none existed before are incompatible with safe airport operations.

Airport operators must decline to adopt habitat management techniques that jeopardize aviation safety. Adopting such techniques could place them in violation of their obligations and subject to an FAA enforcement action and possible civil penalties under 49 U.S.C. §44706, as implemented by 14 CFR § 139.337. In particular, an airport operator that has received federal grant-in-aid assistance is obligated through its grant assurances to maintain compatible land uses. Failure to do so may lead to noncompliance with its grant obligations. Further, airports that serve commercial air carriers are required to be certificated under 49 U.S.C. §44706, as implemented by 14 CFR Part 139. Title 14 CFR § 139.337(a) requires airport operators holding a Part 139 certificate to "take immediate action to alleviate wildlife hazards whenever they are detected." Accordingly, Part 139-certificated airport operators should make state wildlife agencies aware of the airport's FAA-approved Wildlife Hazard Management Plan (WHMP), AC 150/5200-33A, and the joint FAA-Wildlife Services manual. Wildlife Hazard Management at Airports (6/05) (joint FAA/WS manual). Before making any changes in land management practices, the airport operator should carefully review the above documents to assure that any changes are consistent with its obligations under federal law to control wildlife hazards and attractants in the AOA. For ease of reference, the key land management practices bearing upon aviation safety are summarized and highlighted below:

#### **RECOMMENDATIONS:**

- 1. Adhere to the turf, landscaping, and habitat management practices described in the airport's WHMP, AC 150/5200-33A, and the joint FAA/WS manual. Do not change these practices specifically to encourage the presence of, or to attract hazardous wildlife species even if the species are state-listed or of special concern.
  - a. Do not deliberately preserve or develop on-airport wildlife habitats such as wetlands, forest, brush, or native grasslands having characteristics that attract

<sup>&</sup>lt;sup>1</sup> Those species listed by states as threatened, endangered, or species of special concern vary from state to state. For information on state listed species, contact the appropriate state wildlife management Agency.

hazardous wildlife (See the airport's WHMP, AC 150/5200-33A, and the joint FAA/WS Manual.)

- b. Manage the airport's AOA vegetation as recommended in the airport's WHMP, AC 150/5200-33A, and the joint FAA/WS manual.
- 2. Adhere to the wildlife harassment and repellant techniques described in the airport's WHMP, AC 150/5200-33A, and the joint FAA/WS manual to prevent hazardous wildlife species from becoming established and complicating the ability to adhere to prescribed habitat management practices.
- 3. Do not allow hazardous state-listed threatened and endangered species or species of special concern to remain on the airport if it requires managing the airport environment contrary to FAA recommendations.
- 4. Reevaluate existing and evaluate future agreements with federal, state, or local wildlife agencies where the terms of the agreements are or may be contrary to federal obligations concerning hazardous wildlife on or near public-use airports and aviation safety.
- 5. Whenever practicable, wetland mitigation for state-listed threatened and endangered species or species of special concern should be sited off-airport (see AC 150/5200-33A, §2-4.c (1)).

OSB

11/21/2006

Ben Castellano, Manager Airport Safety & Operations Division

Date

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