# Non-lethal Management of American Kestrels: A Case Study at the Los Angeles International Airport

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**ABSTRACT:** Raptor-aircraft collisions (bird strikes) pose a serious safety risk to civil aircraft. Even smaller raptors, such as American kestrels, can be problematic within many airport environments. Given public interest, logistical and financial constraints, and other factors, managing raptors at airports presents some unique challenges. Although a variety of damage reduction methods are often used, non-lethal tools are typically favored by the public. Like many airports, American kestrels are commonly struck at the Los Angeles International Airport (LAX). Wildlife mitigation efforts at LAX (primarily live-capture and translocation away from the airport) were directed toward reducing the presence of kestrels. Management actions (e.g., pesticide applications) to reduce the availability of grasshoppers on the airfield at LAX were unsuccessful. On-airfield monitoring of American kestrel abundance was correlated ($r = 0.84$, $p = 0.003$) with the annual rate of kestrel-aircraft collisions at LAX, demonstrating the importance of continuing efforts to monitor populations of hazardous wildlife. Although an integrated wildlife damage management program is used at LAX, the extensive use of non-lethal methods (i.e., live-capture and translocation) to reduce the abundance of American kestrels at LAX appears to be an important part of that program.

**KEY WORDS:** airports, American kestrels, birds, bird strikes, California, *Falco sparverious*, human safety, bird management

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## INTRODUCTION

Wildlife-aircraft collisions (wildlife strikes) pose a serious safety risk to aircraft. Wildlife strikes cost civil aviation at least $708 million annually in the United States (Dolbeer et al. 2015). Over 156,100 wildlife strikes with civil aircraft were reported to the U.S. Federal Aviation Administration (FAA) during 1990-2014 (Dolbeer et al. 2015). Aircraft collisions with birds accounted for 97% of the reported strikes, whereas strikes with mammals and reptiles were 3% and <1%, respectively (Dolbeer et al. 2015). Sound management techniques that reduce the presence and abundance of wildlife hazardous to aviation in and around airports are therefore critical for safe airport operations (DeVault et al. 2013).

Los Angeles International Airport (LAX) has been reporting wildlife strikes since 1990, when the FAA began recording wildlife strikes and collecting this information into a nationwide database. In 1998, LAX partnered with the USDA APHIS Wildlife Services (WS) program to reduce the frequency and severity of wildlife strikes at the airport. Based on the reported wildlife strikes and observations of wildlife hazardous to aviation on or near the airfield at LAX, WS implemented an integrated wildlife damage management plan at the airport. A variety of hazardous wildlife have been problematic at LAX (Mendelsohn 2000, Pitlik 2006) and numerous methods have been used to manage these issues. Lethal removal (e.g., trapping and humane euthanasia) has been shown to be very effective in reducing the frequency and severity of aircraft strikes with rock pigeons (*Columba livia*) and mourning doves (*Zenaida macroura*) at LAX (Pitlik and Washburn 2012). Other species, such as raptors and gulls, require different approaches due to their behavioral patterns and/or interest from the public.

As they do at many airports within North America, American kestrels (*Falco sparverious*) pose a risk to safe aircraft operations at LAX. Recent information suggests American kestrel populations are declining across their range and concerns for their conservation have been expressed by the ornithological community and by state fish and wildlife agencies (Bird 2009, Farmer and Smith 2009). Concurrently, there is widespread public interest in issues related to the management of raptors. This is especially notable in the state of California. Effective, publicly-accepted methods to reduce the hazards posed by American kestrels to aviation safety are needed. Here, we examine historical and current patterns of American kestrel strikes at LAX and discuss a non-lethal management program to reduce the airfield presence of American kestrels and the frequency of kestrel-aircraft collisions at the airport.

### American Kestrel Strikes at LAX

During 1990-1997, there was a total of 7 American kestrel strikes reported at LAX. Since the implementation of an integrated wildlife mitigation program at LAX beginning in 1998, kestrel strike reporting has increased 11-fold, from an average of 0.9 (± 0.28 SE) reported kestrel strikes per year during 1990-1997 to an average of 11.1 (± 1.45 SE) reported American kestrel strikes annually during 1998-2015 (Figure 1). Prior to the implementation of the wildlife mitigation program, strike reporting at LAX typically did not include species-level identifications (Pitlik and Washburn 2012).

A clear seasonal pattern is present in American kestrel-aircraft collisions at LAX, with 71% of these incidents

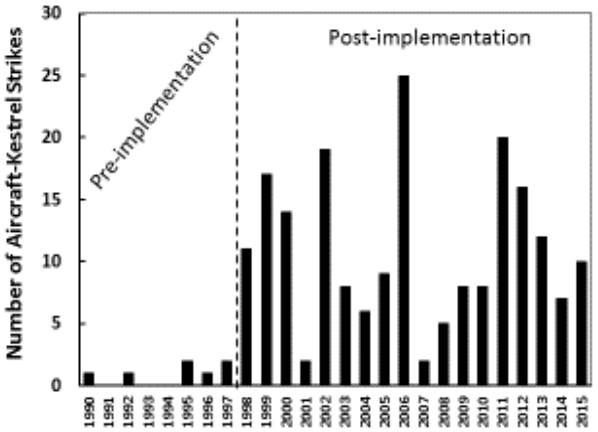


**Figure 1. Total number of reported bird strikes involving American kestrels at the Los Angeles International Airport prior to the implementation of a wildlife hazard mitigation program (1990-1997) and concurrent with an active wildlife hazard mitigation program (1998-2015).**

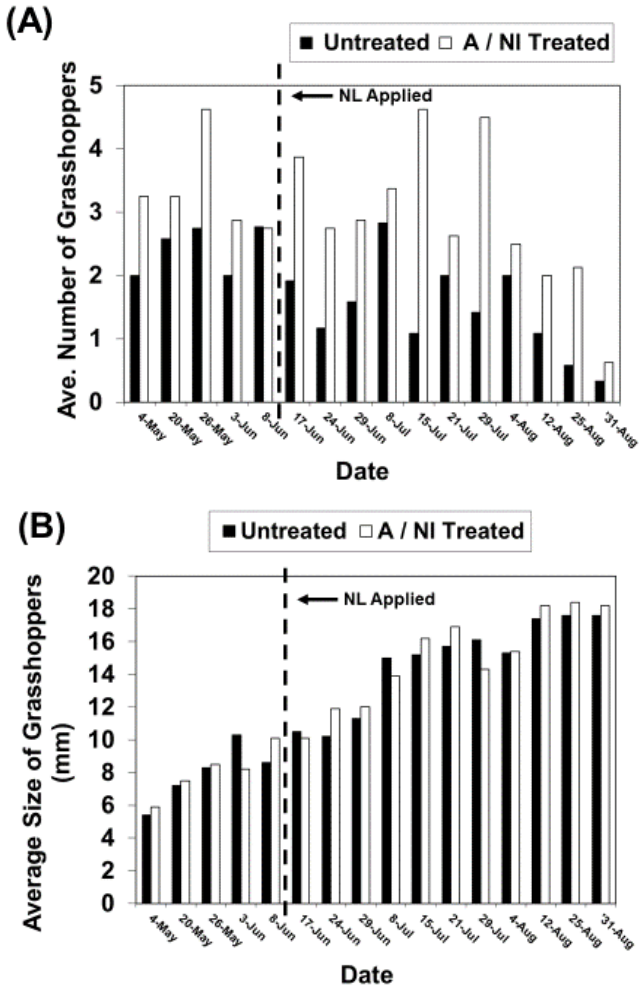


**Figure 2. (A) Abundance (average number per sweep sample) and (B) size (average length in mm) of grasshoppers collected in Azatrol® / *Nosema locustae* spore-treated and untreated (control) plots during May-August 2005 at the Los Angeles International Airport.**

occuring during the months of June, July, and August. Increased strike reporting associated with other species occurred as well, providing a much more accurate assessment of the frequency and severity of wildlife strikes at LAX (Pitlik and Washburn 2012). This information is critical for understanding the current situation at an airport and essential for the development of effective and species-specific management plans (Cleary and Dolbeer 2005). Evaluations of the historical and current annual strike rate of American kestrels at LAX, in addition to recommendations provided during Wildlife Hazard Assessements at the airport (Mendelsohn 2000, Pitlik 2006), demonstrate that this species presents a risk to safe aircraft operations at LAX and consequently management actions are needed to reduce this risk.

**Manipulation of Food Resources**

Removal of food sources on airfields that is attractive to or used by hazardous wildlife is one method of reducing the presence of wildlife on airfields (DeVault and Washburn 2013). At LAX (and numerous other airports and military bases), American kestrels are attracted to grasshoppers (Washburn et al. 2011) that inhabit the areas between the runways in the summer months. We conducted an experimental mitigation program to reduce the attractiveness of grasshoppers on the airfield at LAX during summer 2005. We applied Azatrol® insecticide and *Nosema locustae* spores to selected areas of the LAX airfield in June, July, or August 2005. We sampled the grasshopper communities present in treated and control plots each month (May to August) using a sweep-net sampling regimen (Kutschbach-Brohl et al. 2010). All captured grasshoppers in each sample were counted and measured (length to the nearest mm). We compared the abundance and size of grasshoppers in the treated and control plots using repeated measures analysis of variance (Zar 1996). Grasshoppers (primarily clear-winged grasshoppers *Camnula pellucida*, and wallula grasshoppers *Conozoa wallula*) were more ($F_{1, 319} = 27.5$, $p < 0.0001$) abundant in the treated plots, whereas the size of grasshoppers was similar ($F_{1, 228} = 0.85$, $p = 0.37$) between treated and untreated (control) areas (Figure 2 A&B). Although the reduction / removal of grasshoppers from airfield habitats might be achieved using other insecticides, the Azatrol® and *Nosema locustae* spore treatments we used were ineffective at LAX.

**Live-capture and Translocation**

Live-capture and translocation of problematic animals is a common practice used in the management of human-wildlife conflict situations (Fisher and Lindenmayer 2000, Sullivan et al. 2015). Translocation of raptors from airport environments is a non-lethal method with the goal of reducing raptor abundance within airport environments (Schafer et al. 2002, Guerrant et al. 2013). Live-capture and translocation of American kestrels, to reduce the airfield presence and frequency of bird strikes involving this species, has been conducted as part of the integrated wildlife damage management program at LAX since 1999. During 1999-2015, a total of 762 American kestrels (average of 45 per year ±9.1 SE) was live-captured on the LAX airfield and translocated to release sites approximately 25

miles (range of 17-125 miles) away from the airport (Figure 3). Most of the translocations (90%) occurred from May to September.

To determine if translocated birds return to the LAX airfield, 108 kestrels that were translocated during 2013-2015 were marked with a unique color-coded plastic leg band used exclusively by the WS airport wildlife hazards program (Schafer and Washburn 2016). Of these birds, only 4 (2%) of them were later recaptured at LAX, one of them twice (this bird was translocated 3 times).

**Monitoring of American Kestrel Airfield Presence**

Monitoring the airfield environment for the presence and abundance of wildlife hazardous to aviation is an essential component of any integrated wildlife mitigation program (Cleary and Dolbeer 2005). During 2006-2015, we conducted bi-monthly avian point count surveys at LAX to evaluate the relative abundance of American kestrels at the airport. Overall, an average of 3.3 (± 0.4 SE) American kestrels was observed per survey during this time period. Similar to American kestrel strikes with aircraft and the number of American kestrels translocated from LAX, there was a strong seasonal pattern of American kestrel abundance on the airfield, with the highest numbers observed during the summer (Figure 4). The high abundance of kestrels during this time of year coincides with the fledging and post-natal movements of hatching-year American kestrels. Not surpringly, a large percentage of the kestrels present at LAX during summer and early fall are hatching-year birds.

**Effectiveness of American Kestrel Strike Mitigation Efforts**

We used Pearson correlation analyses to determine if relationships existed among the annual number of kestrel strikes, the total number of kestrels translocated each year, and the annual average number of American kestrels observed per survey at LAX (Zar 1996). Although the annual strike rate for American kestrels at LAX was highly correlated ($r = 0.84$, $p = 0.003$) with the average number of kestrels observed per survey, no relationship between the strike rate and observations per survey or the number of annual relocations and observations per survey was found ($r = 0.15$, $p = 0.58$ and $r = 0.06$, $p = 0.88$, respectively). A strong relationship between the number of birds observed on the airfield and the annual strike rate demonstrates the need for continual monitoring (e.g., surveys) of the abundance of wildlife hazardous to aviation.

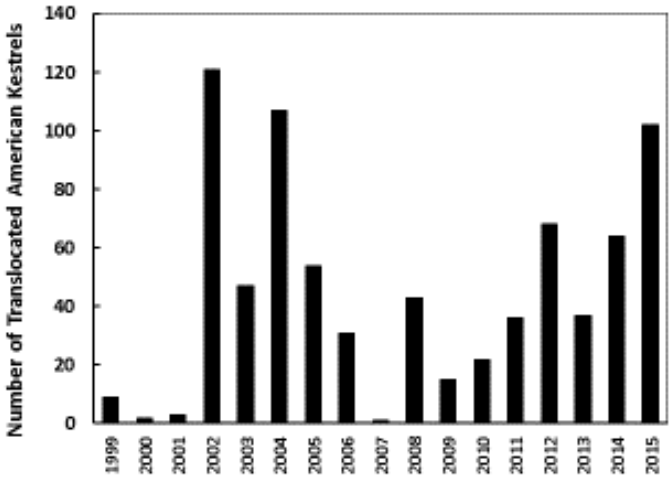


**Figure 3. Total number of American kestrels live-captured and translocated from the Los Angeles International Airport during the implementation of a wildlife hazard mitigation program (1998-2015).**

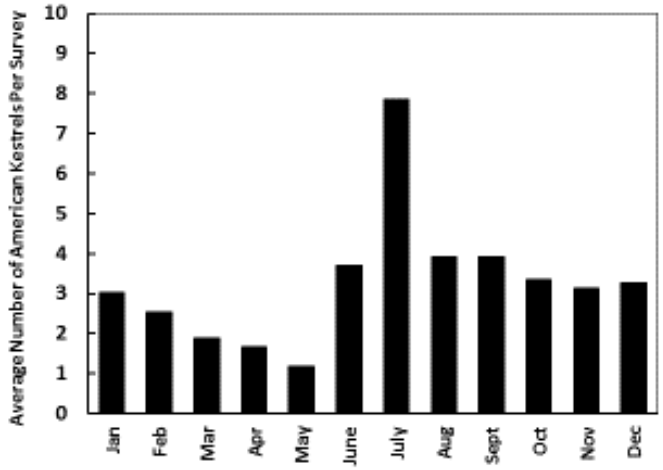


**Figure 4. Average number of American kestrels observed per survey each month at the Los Angeles International Airport during 2006-2015.**

## SUMMARY

American kestrels have posed a long-term risk to aviation safety at LAX. Consistent reporting of wildlife strikes, monitoring of the airfield for the presence/abundance of American kestrels and other hazardous wildlife, and the use of primarily non-lethal methods are essential components of the integrated wildlife mitigation program conducted by WS at LAX. Unique color-marking of American kestrels (and other raptors) should be continued into the future to allow for the evaluation of this non-lethal program and to help increase our understanding of this method to reduce the presence of American kestrels on the airfield at LAX as well as at other airports. Additional management actions to reduce the availability of food resources (e.g., insects) for American kestrels at LAX should be investigated and evaluated.

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