

BIRDSAFE

Bringing Innovative Risk Deterrence Strategies for Aviation and Floristic Enrichment

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Let's get quantitative

Looking at the US as example, the sheer number of bird strikes has increased considerably from 1990



Number of reported bird strikes to civil aircraft

Adapted from Ekici, Filiz, et al. "An investigation of bird strike cases in the aviation sector with a novel approach within the context of the principal-agent phenomenon: Bird strikes and insurance in the USA." *Heliyon* 9.7 (2023). Figure adapted from the Federal Aviation Administration, Federal Aviation Administration National Wild Animal Impact Database, 2022. Available from, https://www.faa.gov/sites/faa.gov/files/2022-07/Wildlife-Strike-Report-1990-2021.pdf. (Accessed 6 February 2023).



Not all lead to damage, but a reported ±7% leading to actual damage potentially constitutes serious damage and risks consistently

Number of reported damage strikes to civil aircraft

Adapted from Ekici, Filiz, et al. "An investigation of bird strike cases in the aviation sector with a novel approach within the context of the principal-agent phenomenon: Bird strikes and insurance in the USA." *Heliyon* 9.7 (2023). Figure adapted from the Federal Aviation Administration Administration National Wild Animal Impact Database, 2022. Available from, https://www.faa.gov/sites/faa.gov/files/2022-07/Wildlife-Strike-Report-1990-2021.pdf. (Accessed 6 February 2023).



This artwork illustrates the main findings of the article, but does not intend to accurately represent its results (https://doi.org/10.1038/s41586-020-2705-y)

Developing a research proposal to achieve the best of both worlds

Bird collisions with aircraft pose significant risks to aviation safety. Management strategies to reduce bird presence near airports can mitigate these risks, yet they need to be effective and sustainable

Effective: they should do what they are supposed to do: minimize the risk of bird collision by lowering the prevalence of (large bodied) birds near airports

Sustainable: the proposed measures should be cost effective, safe, long-term and beneficial for multiple aspects, including minimizing impact on biodiversity

Could we aim for the best of both worlds: achieving sustainable and effective practices, while simultaneously contribute to biodiversity goals?





Summary proposal – a bird's eye view

We propose to balance aviation safety with ecological considerations using non-lethal, vegetation management as a sustainable solution

Our approach broadly consists of the following objectives

- 1) Selecting vegetation management strategies that deters (large bodied) birds while maintaining ecological diversity for the long-term, while
- 2) Determining what the most cost-effective strategy is for achieving this, and
- 3) Assessing the effectiveness of alternative vegetation strategies in real-time using state-of-the-art monitoring techniques

This translates into two distinct work packages:

WP1 Vegetation composition and bird deterrence using an experimental approach WP2 Cost-effectiveness of vegetation management and economic sustainability

The experimental approach: design

- We propose to establish experimental plots (each ~200m x 200m) in randomized block designs to account for variations in local environmental conditions (e.g., soil, infrastructure).
- Preferably in the neighborhood of an (active) airport currently employing classical management strategy or suit of mitigation measures to minimize bird collisions:
- Each plot will be assigned one of three treatments with five replicates per treatment (yielding 15 plots):

Native Flowering Shrubs: These grasses are selected based on their reduced appeal to geese for foraging and low structural suitability for nesting.

Native Flowering Shrubs and Native Low-Palatability Perennial grasses: Designed to increase plant diversity and cover, this treatment includes a mix of shrubs and grasses to reduce open space and food availability.

Conventional Turf Grass (Control): Traditional turf grass will serve as a control to compare with the new experimental vegetation compositions.

The experimental approach: design



monitor bird activity using radar systems, drone-based surveys, and field observations



quantify plant community composition and diversity by plot inventory

> track productivity and general health using multispectral sensory derived data



Work Package 1 (WP1): Vegetation Composition and Bird Deterrence

- Objective: to identify optimal vegetation compositions that deter (largebodied) birds and promotes plant biodiversity at the same time.
- Data collection:
 - Monitor bird activity using radar and drone-based surveys (where possible) combined with field observations. Data will include presence (counts and duration) of visits, foraging behavior, flock size, nesting activity, habitat usage and seasonal migration patterns (spring and fall).
 - Quantify plant community composition (incl. species richness) using plot inventory in each experimental plot, combined with an emphasis on productivity and general health using multispectral sensory derived data if possible (important for long-term sustainability of vegetation management).



Work Package 2 (WP2): Determining costeffectiveness, vegetation management practices and economic sustainability

- Objective: evaluate the cost-effectiveness of various vegetation composition and develop a dynamic bird strike risk monitoring system
- Data collection: management practice's costs (e.g., equipment, labor) will be collected from existing airport management strategies and recorded from the experimental approach:
 cost

Initial setup costs (seeding) Maintenance costs (mowing, labor hours) Long-term costs (e.g. replacement, control). Analysis: using data from WP1 for a costbenefit analysis will compare the costs of each management regime with their effectiveness in reducing bird activity

Integration and Synergy Between WPs What are the deliverables

Objective: To develop and test a dynamic monitoring system to evaluate the
effectiveness of vegetation management in reducing bird strike risks

What are the aimed deliverables:

- 1) Experimentally verified results indicating how different plant species and compositions in airport-adjacent areas influence bird presence and how these different compositions influence the ecological value the area, focusing on plant diversity and habitat suitability for non-hazardous bird species.
- 2) A cost-benefit analysis that compares the economic costs and environmental impacts of different strategies of vegetation management on airport grounds and long-term predictions of the most cost-effective methods.
- 3) Protocols for monitoring approaches including radar, UAV and bird surveys to monitor bird presence and behavior in response to vegetation changes over time and predictive models to forecast bird strike risks based on vegetation types, seasonal changes, and external factors.

