Assessing the effectiveness of applying UAS hazing near a U.S. Part139 airport

Birdstrike 2025 – Portland, OR

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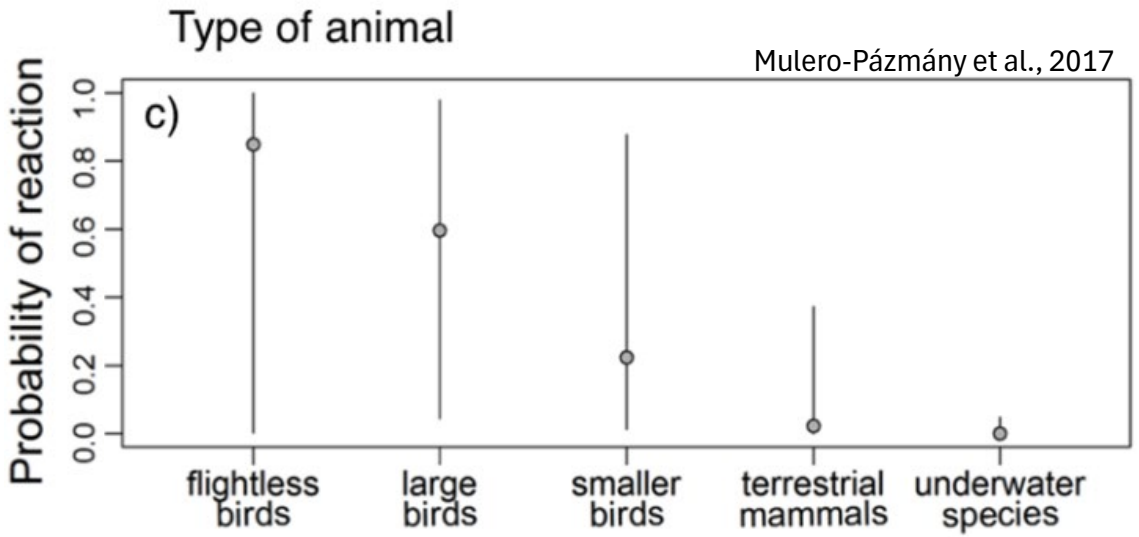
UAS hold promise as a management tool for birds

Portable and adaptable

Maneuverable in 3D-space

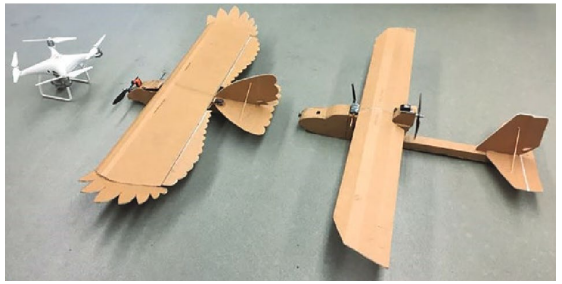
UAS seem to be more effective at eliciting responses from birds than other animals.



Mulero-Pázmány et al., 2017

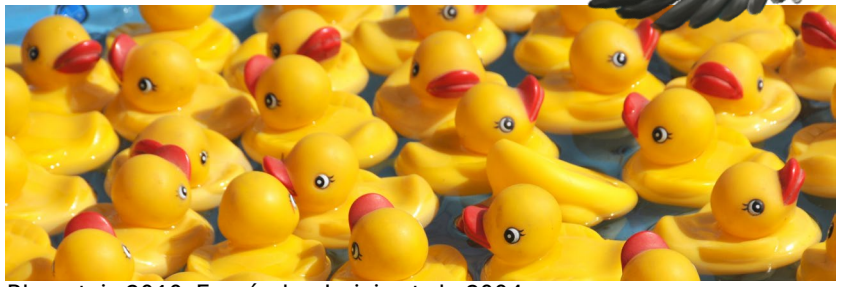
Characteristics of both the UAS and the birds themselves influence behavioral responses.

Platform



Egan et al., 2020; Storms et al., 2022

Group Size



Blumstein 2010; Fernández-Juricic et al., 2004

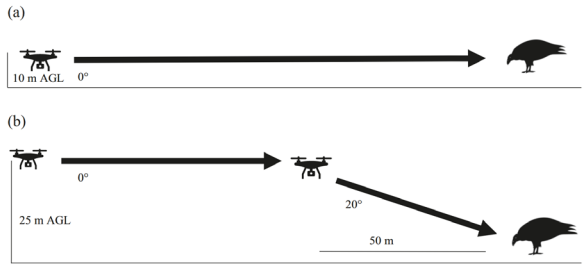
Lighting

Blackwell et al., 2012

Body Size

Kiltie 2000; e.g., Blackwell et al., 2009

Approach



Pfeiffer et al., 2021

Sensory Biases

Hart 2001

Are UAS a practical management tool in an airport context?

Some challenges unique to this operational setting may affect outcomes…

Mixed Flocks

Restricted Airspace

Multiple Stakeholders

Are UAS a practical management tool in an airport context?

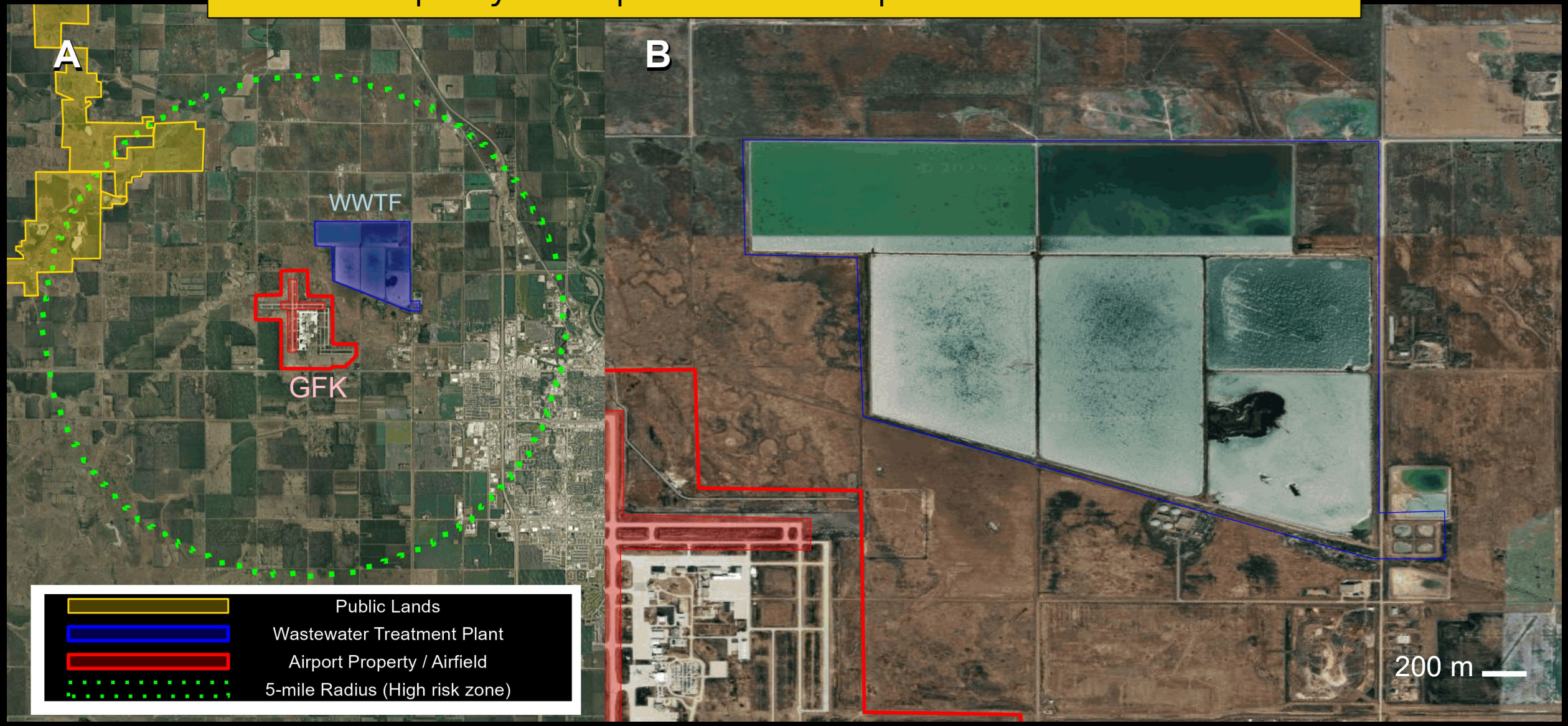
— We aimed to…

Identify challenges to applying UAS in this context

Determine effects of UAS hazing on mixed flocks

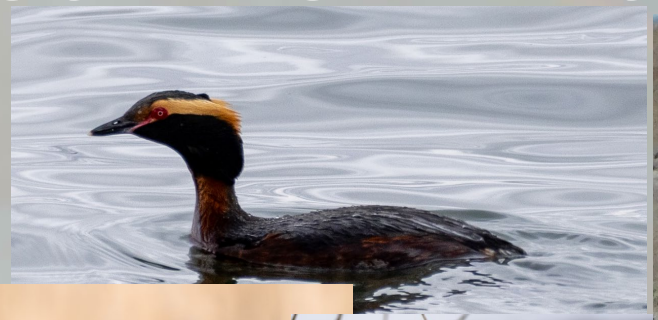
Evaluate factors that influence dispersal

Our field site is an active operational setting nestled in a uniquely complex landscape of stakeholders.



The Wastewater Treatment Plant...











...stinkin' perfect for this.

Photo credits: @nicholasrush & Levin Brandt

UAS System and Flight Operations

Autel Evo II

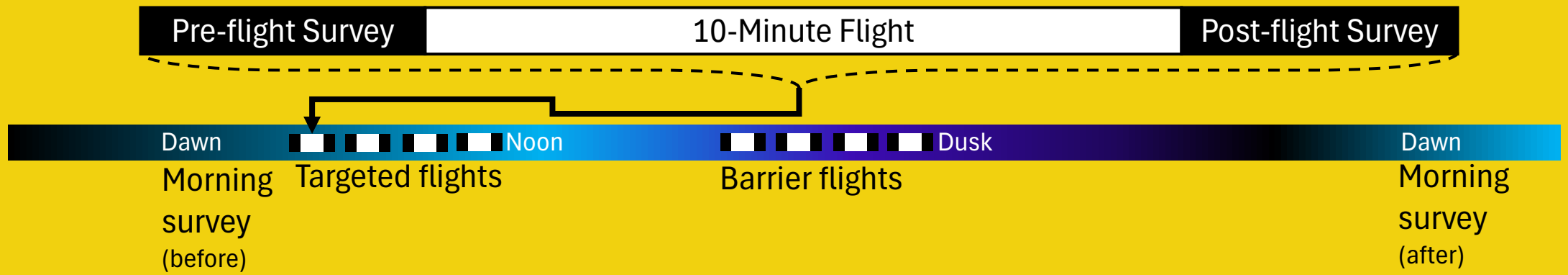
EVO II Pro Enterprise

2.45 lbs (1110 g)

EVO II Pro RTK V3

2.73 lbs (1237 g)

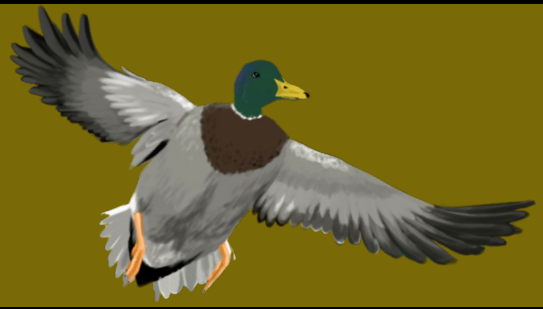
Typical Daily Schedule



Are UAS a practical management tool in an airport context?

— We aimed to…

Identify challenges to applying UAS in this context

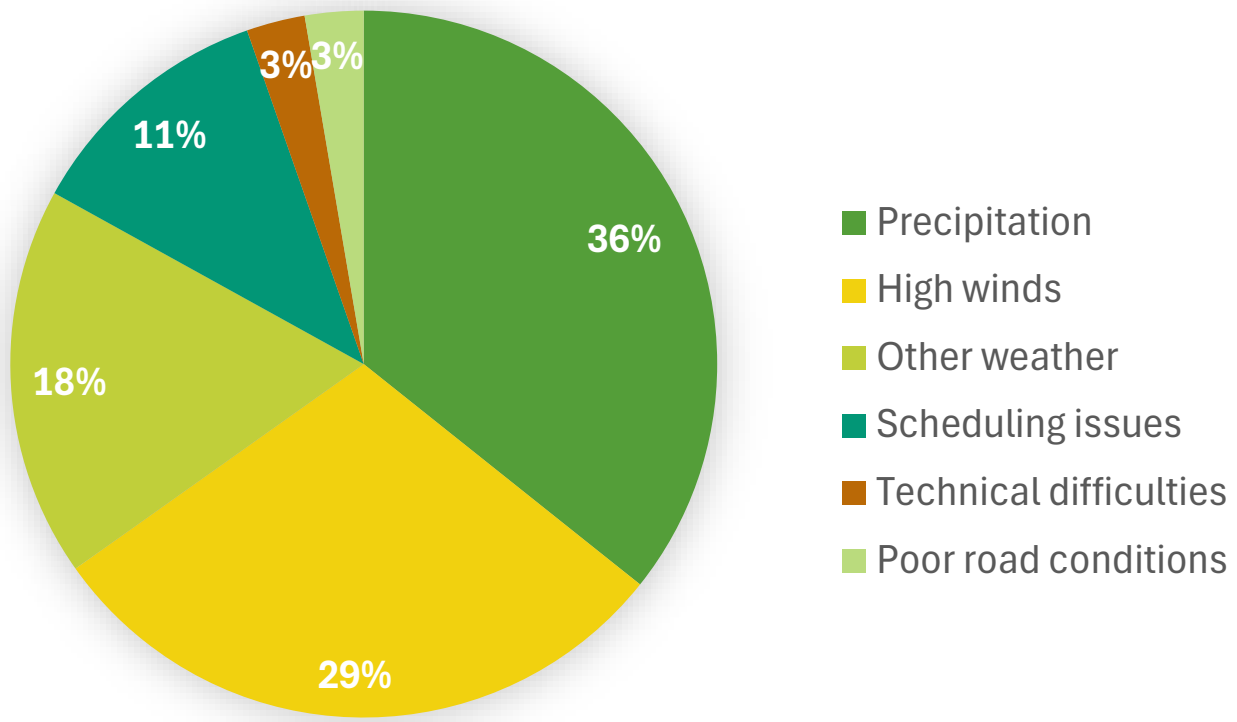


Determine effects of UAS hazing on mixed flocks

Evaluate factors that influence dispersal

UAS Operations: Challenges & Limitations

We cancelled 26% of our planned daily operations, usually due to **weather**.



We saw an average of **2.4 aircraft overhead** during our UAS flights.

Are UAS a practical management tool in an airport context?

Key Takeaways

Weather and safety precautions were the most notable challenges

Are UAS a practical management tool in an airport context?

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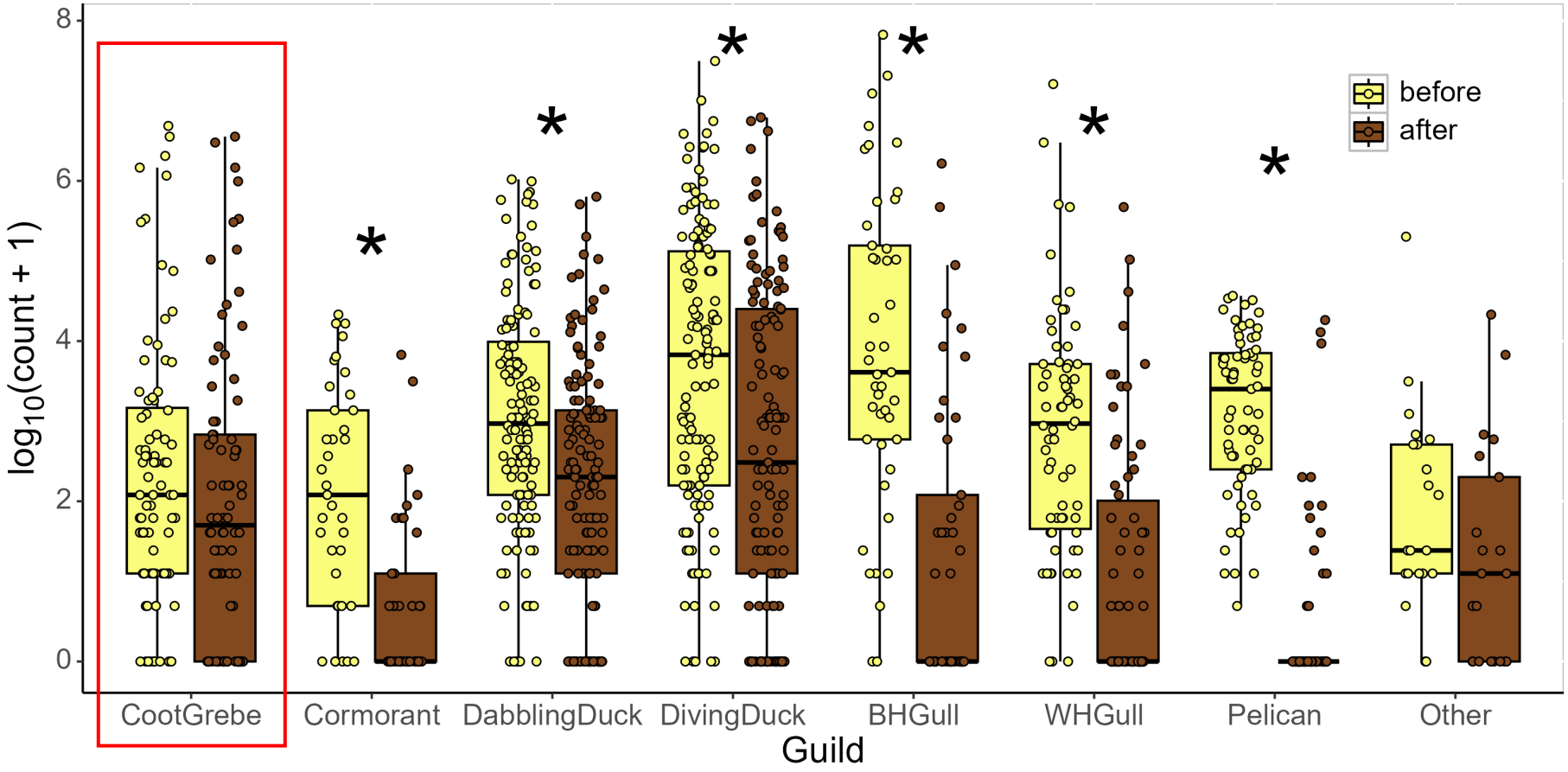
Identify challenges to applying UAS in this context

Determine effects of UAS hazing on mixed flocks

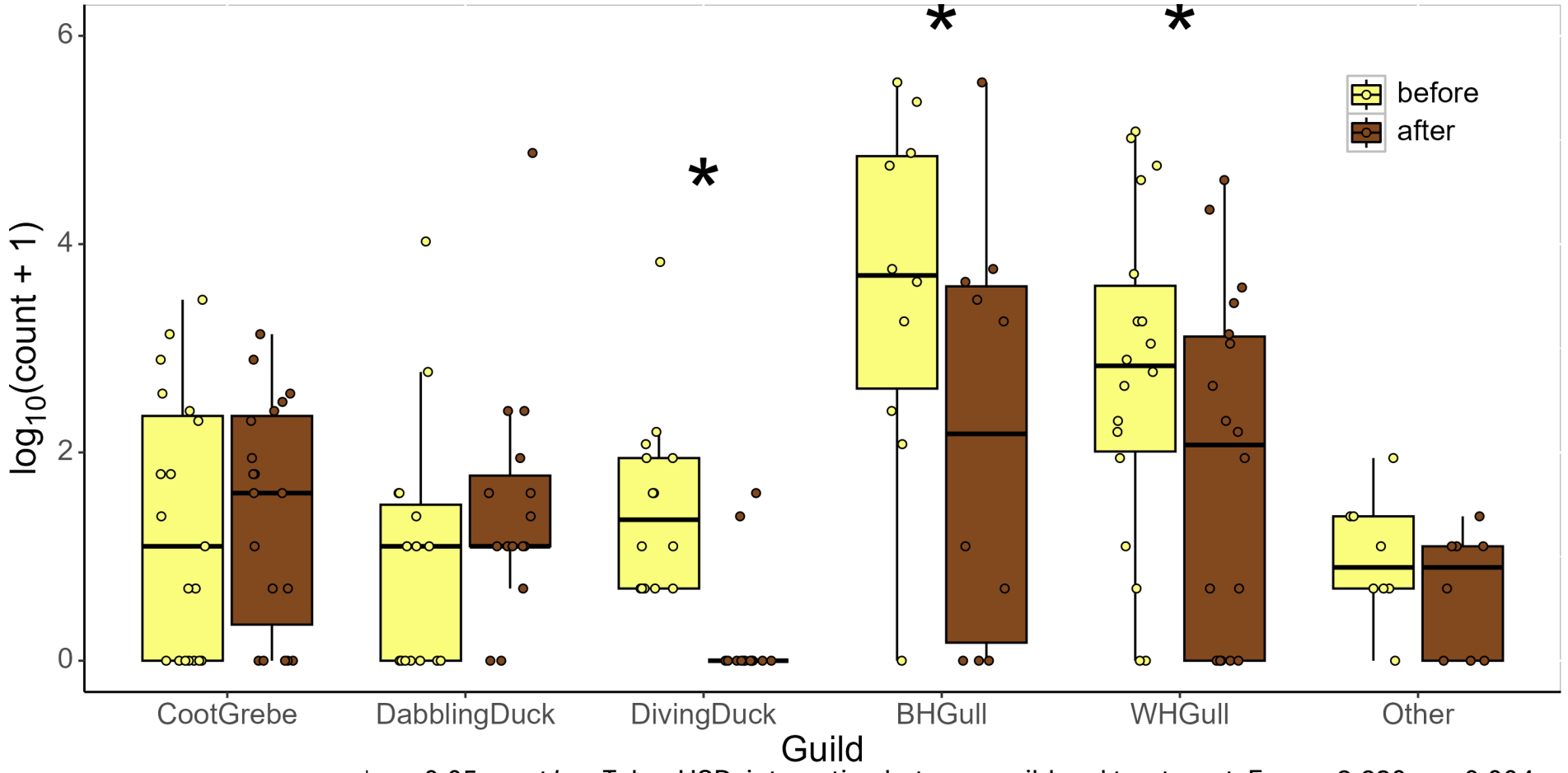
Evaluate factors that influence dispersal

Targeted flights reduced the presence of birds for all guilds except for coots and grebes.



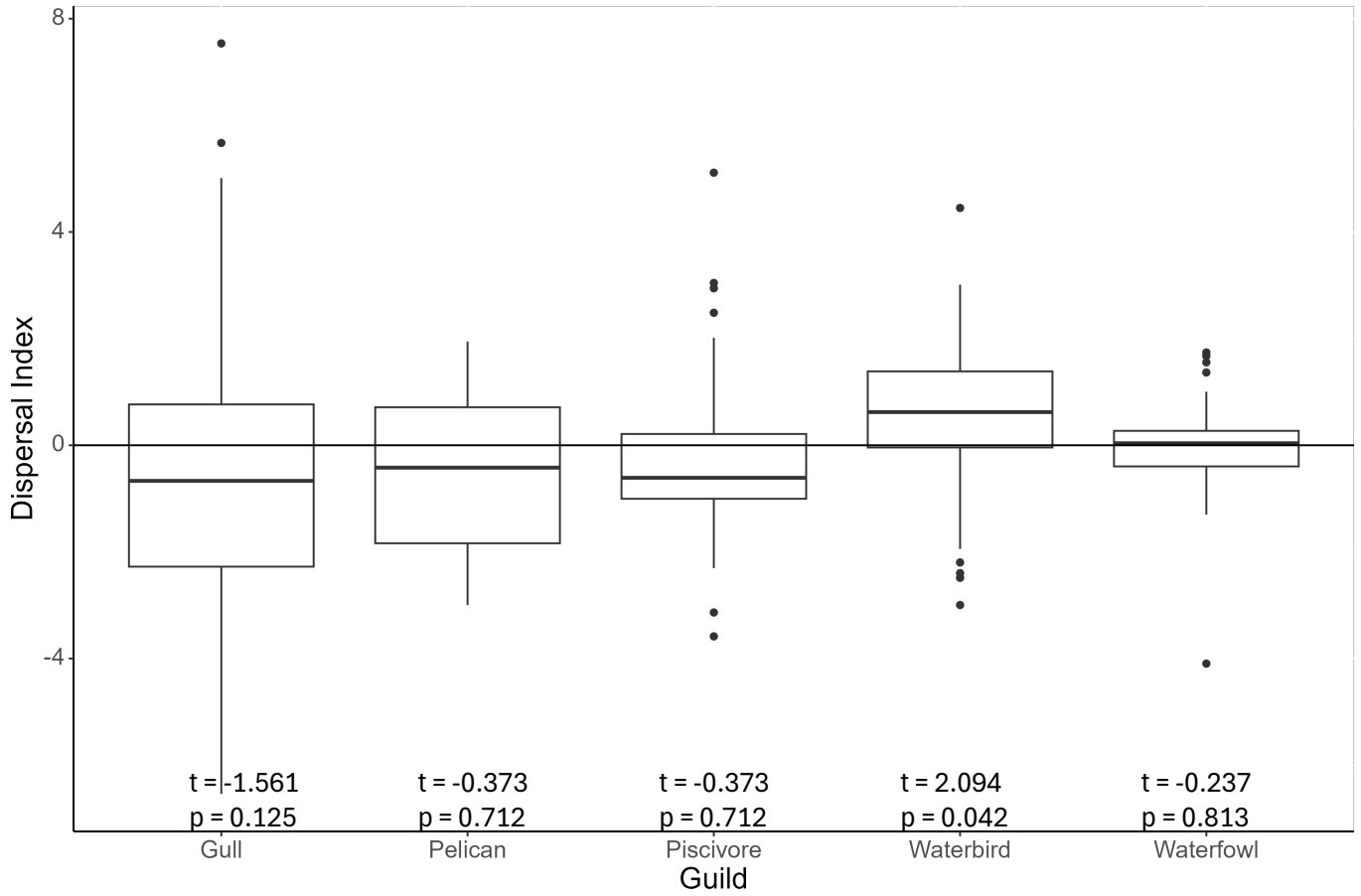
* $p < 0.05$; *post hoc* Tukey HSD; interaction between guild and treatment: $F_{7,1117} = 14.31$, $p < 0.0001$

Barrier flights immediately reduced the presence of gulls and diving ducks.



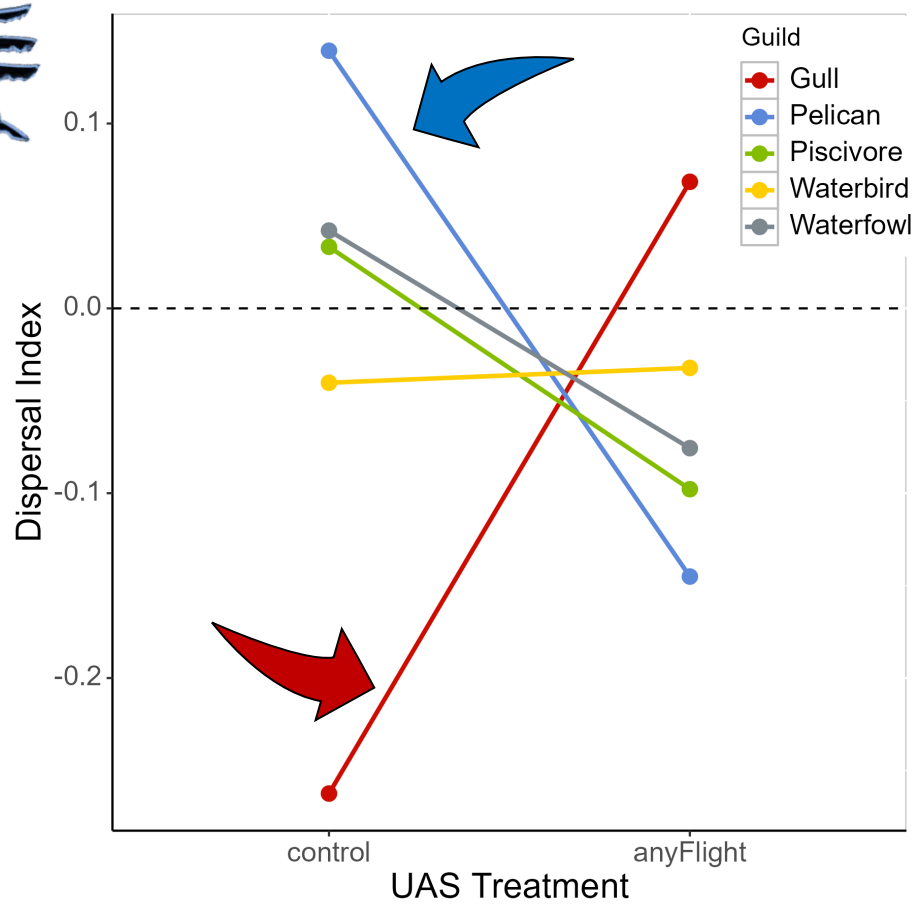
* $p < 0.05$; *post hoc* Tukey HSD; interaction between guild and treatment: $F_{5,137} = 3.620$, $p = 0.004$

We did not find evidence of an effect of barrier flights on overnight roosting.



Even across 24-hours, the effects of UAS hazing on avian presence depends on species.

Pelican numbers went **up** when there was no UAS hazing & **down** after UAS hazing



interaction between guild and treatment: $F_{4,820} = 3.752$, $p = 0.005$

Gull numbers went **down** when there was no UAS hazing & **up** after UAS hazing

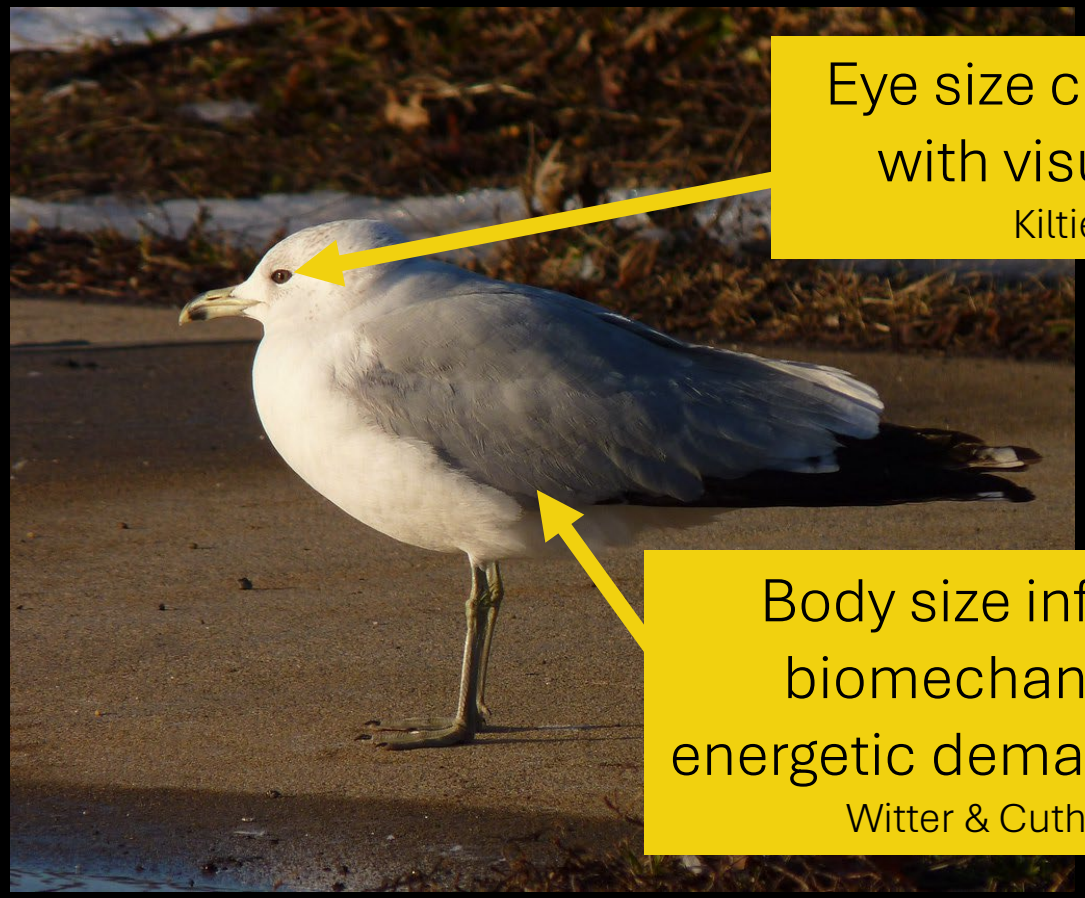
Are UAS a practical management tool in an airport context?

Key Takeaways

Weather and safety precautions were the most notable challenges

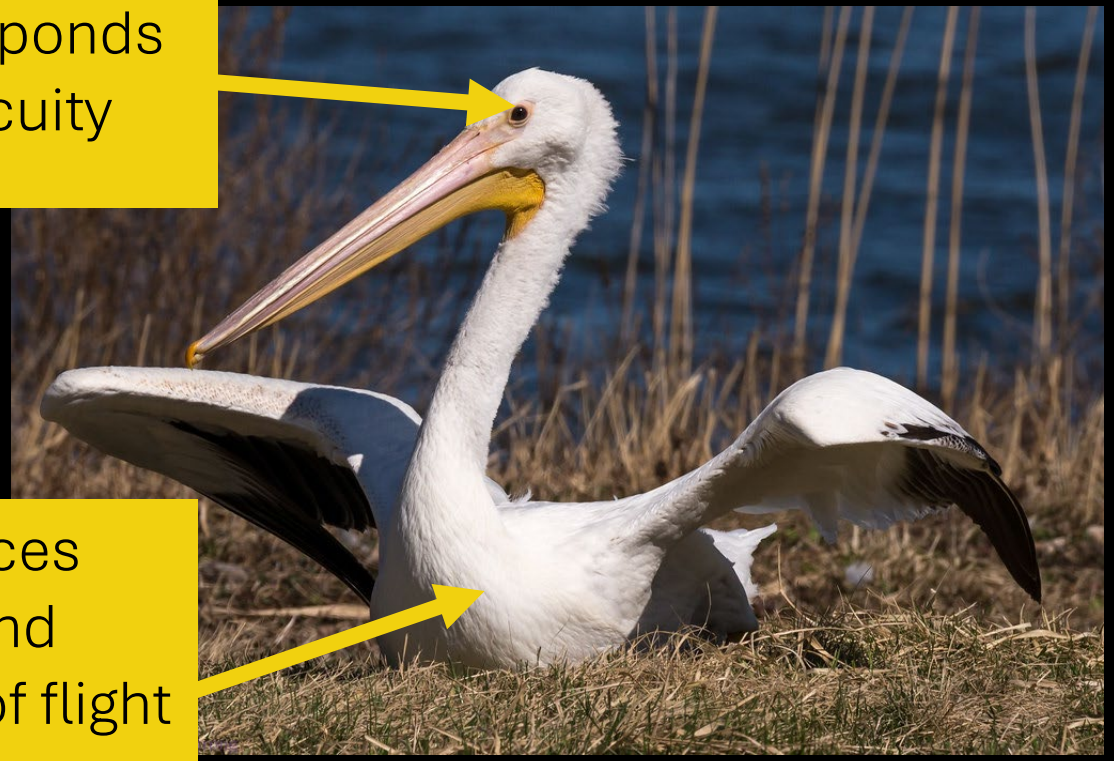
UAS hazing is most effective in the short-term and in small areas, but it depends on species.

A Closer Look at Species Differences: Gulls vs. Pelicans



Eye size corresponds with visual acuity

Kiltie 2000



Body size influences biomechanics and energetic demands of flight

Witter & Cuthill 1993

Dilution effect on likelihood of predation in large groups

Blumstein 2010; Fernández-Juricic et al., 2004

Are UAS a practical management tool in an airport context?

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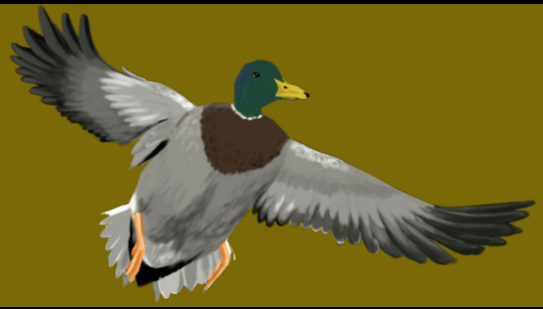
Identify challenges to applying UAS in this context



Determine effects of UAS hazing on mixed flocks

Evaluate factors that influence dispersal

We compared the performance of four models for estimating the dispersal of all birds within a defended area during targeted flights.

	Predominant guild	Biomass	Starting Distance	Ratio of Predominant Guild	# UAS Maneuvers	Group Size	# of Guilds	Ambient Light	Ambient Temperature	Wind Speed
Null										
Full	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Base	✓									
Entire Group	✓		✓		✓		✓		✓	

The predominant guild within a mixed-species flock is the most important factor influencing the response of the entire, mixed-species group to UAS approach.

	Predominant guild	Biomass	Starting Distance	Ratio of Predominant Guild	# UAS Maneuvers	Group Size	# of Guilds	Ambient Light	Ambient Temperature	Wind Speed
Null										
Full	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Base	✓									
Entire Group	✓		✓		✓		✓		✓	
Black-Headed Gulls		✓		✓		✓	✓			
Coots & Grebes		✓								✓
Cormorants		✓		✓						
Dabbling Ducks		✓		✓	✓	✓				
Diving Ducks		✓	✓	✓			✓			
Pelicans		✓		✓						
White-Headed Gulls		✓		✓			✓		✓	

Factors that were important for within-guild dispersal related to group size, body size, and group composition.

Are UAS a practical management tool in an airport context?

Key Takeaways

Weather and safety precautions were the most notable challenges

UAS hazing is most effective in the short-term and in small areas, but it depends on species.

Body size, group size, and guild were important factors influencing dispersal.

Management Implications

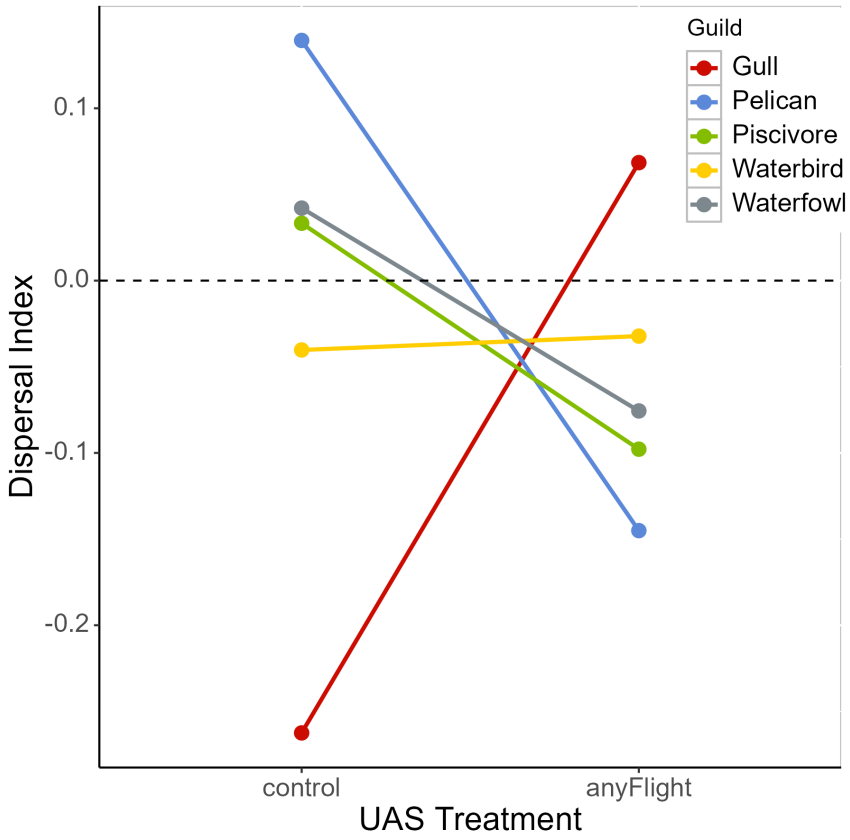
Weather is likely to present a formidable obstacle to UAS hazing and there may be constraints related to safety when operating in an unpredictable environment.

We must understand species differences in avian response to UAS interventions to not only improve efficacy, but also to reduce the potential for enhancing strike risk.

A “one-size-fits-all strategy” might be less effective than a strategy tailored to individual target species.

What the gull?

Are gulls attracted to the UAS?



We must consider species-specific behaviors to achieve predictable outcomes.

We observed some other potentially concerning behavioral responses.

However, we might be able to use this knowledge to our advantage in management contexts.

Control <u>when</u> large groups of birds pick up

Develop species-specific management strategies

— Next steps...

Characterize the species-specific behavioral responses to UAS approach.

Explore how Motus compatible technology may be useful in the context of aviation wildlife management.

Thank you! Questions?

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Get in touch!