A Bird's Eye View: Blackbird Flock Response to Unmanned Aircraft **System Approaches in Sunflower Fields**

Mallory Gyovai White¹ and Page E. Klug² ¹North Dakota State University, Biological sciences Department, Fargo ND, ²USDA-APHIS-Wildlife Services National Wildlife Research Center, North Dakota Field Station, Fargo ND

Background

- Mixed blackbird flocks cause (US \$) millions of dollars worth of damage to commercial sunflowers fields [1]
- In the Prairie Pothole Region, damage can exceed the industry standard of 5%, and reach total field losses [2]
- Red-winged Blackbirds (Agelaius phoeniceus) are experiencing an overall population decline, while regional trends show an increase based on breeding bird surveys [3]
- A dynamic tool is needed to reduce blackbird damage to sunflowers as the damage is actively occurring [4]
- Research using Unmanned Aircraft System (UAS) platforms to haze blackbirds in sunflower fields found that an increased negative stimulus is needed to promote flock abandonment of sunflower fields [5]





Figure 1. Blackbird damage to sunflower crop in North Dakota (left), and a regional trend map of Red-winged Blackbird breeding populations from 1966-2015 (Sauer et al. 2017; right).

Objectives

- Establish the flight initiation distance (FID) of free-ranging blackbird flocks in commercial sunflower fields and cattails when approached by the DJI Agras MG-1P FID is used to measure the risk perception that a bird has toward an approaching object
- Measure variables that may impact FID
 - Field size, flock size, presence of cannons, flock distance from launch site and field edge, and vegetation type





Figure 2. A) The DJI Mavic Air II was flown above B) the DJI Agras MG-1P to record the flock response to the Agras approach and measure the distance at which the flock took flight.

Methods

- Trials began with 5-15 min. of pre-observation (5 minutes in 2019). Data recorded included: number of times the flock lifted off, time the flock spent in flight, and presence of raptors.
- The flock location and vegetation type was identified visually by the remote pilot-in-command.
- The eye-in-the-sky UAS was launched to 60-80 m (60 m in 2019) above ground level (AGL) for video recording.
- Once the eye-in-the-sky UAS reached altitude, the Agras was launched to 5 m AGL.
- At a speed of 4 m/s the Agras approached the flock, with the eye-in-the-sky UAS overhead.
- When the majority of the flock flushed due to the approach of the Agras, we halted the platforms and recorded data. Trials concluded with 5-15 min. of post-observation (5 minutes in 2019), in the same manner as the pre-observation.

- in sunflower = 13; viable trials in corn = 1; viable trials in cattails = 4).
- counties (viable trials in sunflower = 16; viable trials in cattail = 22)
- and there was no precipitation
- The average FID in 2019 was 38 meters ± 9.6, and in 2020 was 39 meters ± 16.6.



Figure 3. The correlation between the flight initiation distance (FID) and log-transformed variables for A) flock size and B) flock distance from launch site of Agras in 2019.

Effect	Mean	SD	Estimate	SE	t	Р
Flight Initiation Distance (m)						
Log ₁₀ Flock Size (estimated # birds)	6.19	1.40	-7.940	1.174	-6.671	< 0.001
Log ₁₀ Flock Dist.to UAS Launch (m)	5.32	0.384	26.191	4.443	5.895	<0.001

Table 1. A multiple linear regression was calculated to predict flight initiation distance (FID) based on flock size and flock distance from launch site of the spraying drone (Agras).



variables for A) flock size and B) flock distance from launch site of Agras in 2020.

Effect	Mean	SD	Estimate	SE	t	Р
Flight Initiation Distance (m)						
Log ₁₀ Flock Size (estimated # birds)	5.86	1.31	6.777	2.072	3.271	<0.002
Log ₁₀ Flock Dist.to UAS Launch (m)	5.37	0.455	-14.120	5.827	-2.423	<0.02

Table 2. A multiple linear regression was calculated to predict flight initiation distance (FID) based

 on flock size and flock distance from launch site of the spraying drone (Agras).





Preliminary Results

In 2019, we conducted 35 trials in Emmons, Burleigh, Kidder and Logan counties. (viable trials

In 2020, we conducted 60 trials in Emmons, Burleigh, Kidder, Logan, McHenry and Bottineau

Trials were conducted during daylight hours when winds did not exceed 17 mph (sustained)

Figure 4. The correlation between the flight initiation distance (FID) and log-transformed



Figure 5. A) The view from the Mavic (80 m above ground level) as the Agras approaches a flock, and B) a low-flying view of a flock. Both flocks are foraging in commercial sunflower fields.

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2020 data will be further broker
Extended hazing (time = 10 min
Evaluate changes in flock behav

- The 'Bird Damage to Sunflower Crops' survey investigates:

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n down between vegetation types (cattail and sunflower).

n.) will be evaluated for impact on flock behavior.

vior after exposure to UAS hazing.

Results from this study will inform the use of UAS platforms for precision agriculture and spot treatment of an avian repellent to reduce bird damage to crops.

> The perception of UAS devices to mitigate blackbird damage The willingness to adopt new management techniques The factors that influence the perceived efficacy of current management tools

Acknowledgements & Literature Cited