

# Evaluating Blackbird Response Toward Unmanned Aircraft Systems (UAS)

Conor Egan, North Dakota State University

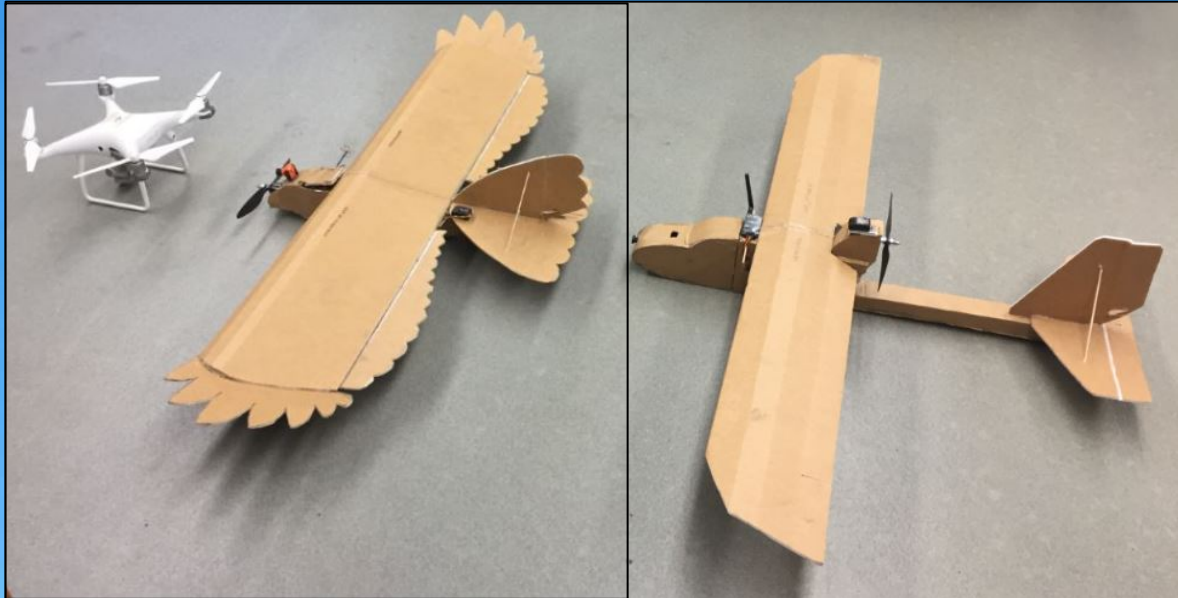
Bradley Blackwell, USDA APHIS WS NWRC Ohio Field Station

Esteban-Fernández Juricic, Purdue University

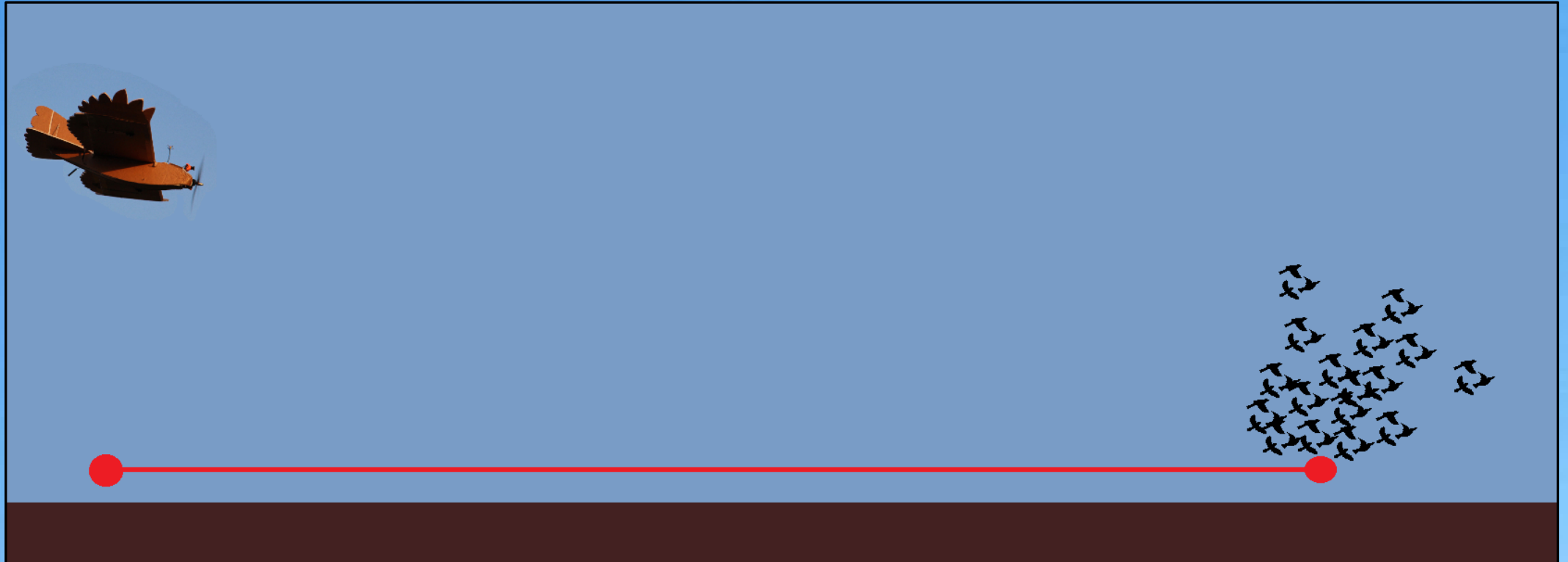
Page Klug, USDA APHIS WS NWRC North Dakota Field Station



# Unmanned Aircraft Systems



# Flight-Initiation Distance



# Methods

- Estimated flock size (200 – 6000)
- Collected bearing and distance
- Approached the flock directly (~ 5-10M)
- Immediately stopped or banked once  
    > 50% of flock became airborne
- Returned the aircraft to pilot location
- Approached again and hazed birds  
    aggressively for 1-2 min

# Response

- Flight initiation distance estimate
- Time flock spent airborne
- Flock leave field? YES/NO





✕ Sport 6 96%

< NWRC1 24/10/2017 09:24:40 Medina >

Flight Distance 352.2 m Flight Time 01:29 Height 3.0 m Distance 11.2 m Horizontal Speed 10.0 m/s Vertical Speed 0.6 m/s

46.862277, -99.466455

Legal

The screenshot displays a drone flight application interface. At the top, there is a status bar with a close button (✕), the mode 'Sport', signal strength (6 bars), and battery level (96%). Below this, a header section shows the drone name 'NWRC1', the date and time '24/10/2017 09:24:40', and the location 'Medina'. A secondary header displays flight statistics: Flight Distance (352.2 m), Flight Time (01:29), Height (3.0 m), Distance (11.2 m), Horizontal Speed (10.0 m/s), and Vertical Speed (0.6 m/s). The main area is a top-down satellite-style view of a landscape, showing a dirt road on the left, a green field in the center, and a grey flight path. A red arrow indicates the drone's current position, marked with a green 'H'. A playback control bar at the bottom features a progress slider, a play button, a zoom level of 'x1', and a share icon. The word 'Legal' is visible in the bottom-left corner.



GPS →  
GROUND SPEED →

▼ Search

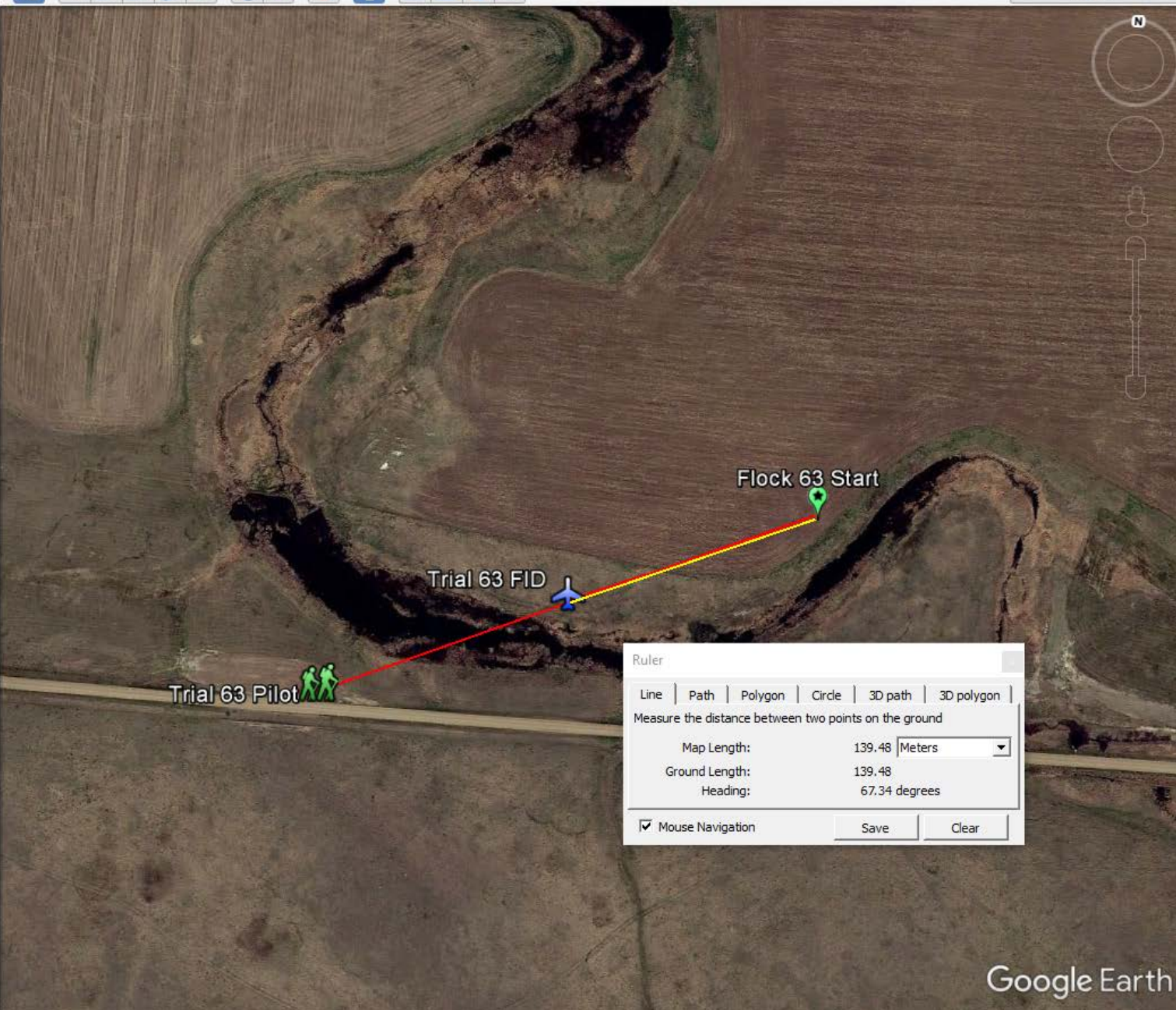
Search  
ex: 1600 Pennsylvania Ave, 20500  
Get Directions History

▼ Places

- My Places
  - Sightseeing Tour
    - Make sure 3D Buildings layer is checked
    - Start tour here
    - The Eiffel Tower
      - Located in Paris, France
    - Christ the Redeemer
      - Located in Rio, Brazil
    - The Grand Canyon
      - Located in Arizona, USA
    - Sydney
      - New South Wales, Australia
    - St Peters Basilica
      - Located in Vatican City
    - The London Eye
      - Located in London, England
    - The Titanic

▼ Layers

- Primary Database
- The new Google Earth
- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Ocean
- Weather
- Gallery
- Global Awareness
- More
- Terrain



Ruler

Line | Path | Polygon | Circle | 3D path | 3D polygon

Measure the distance between two points on the ground

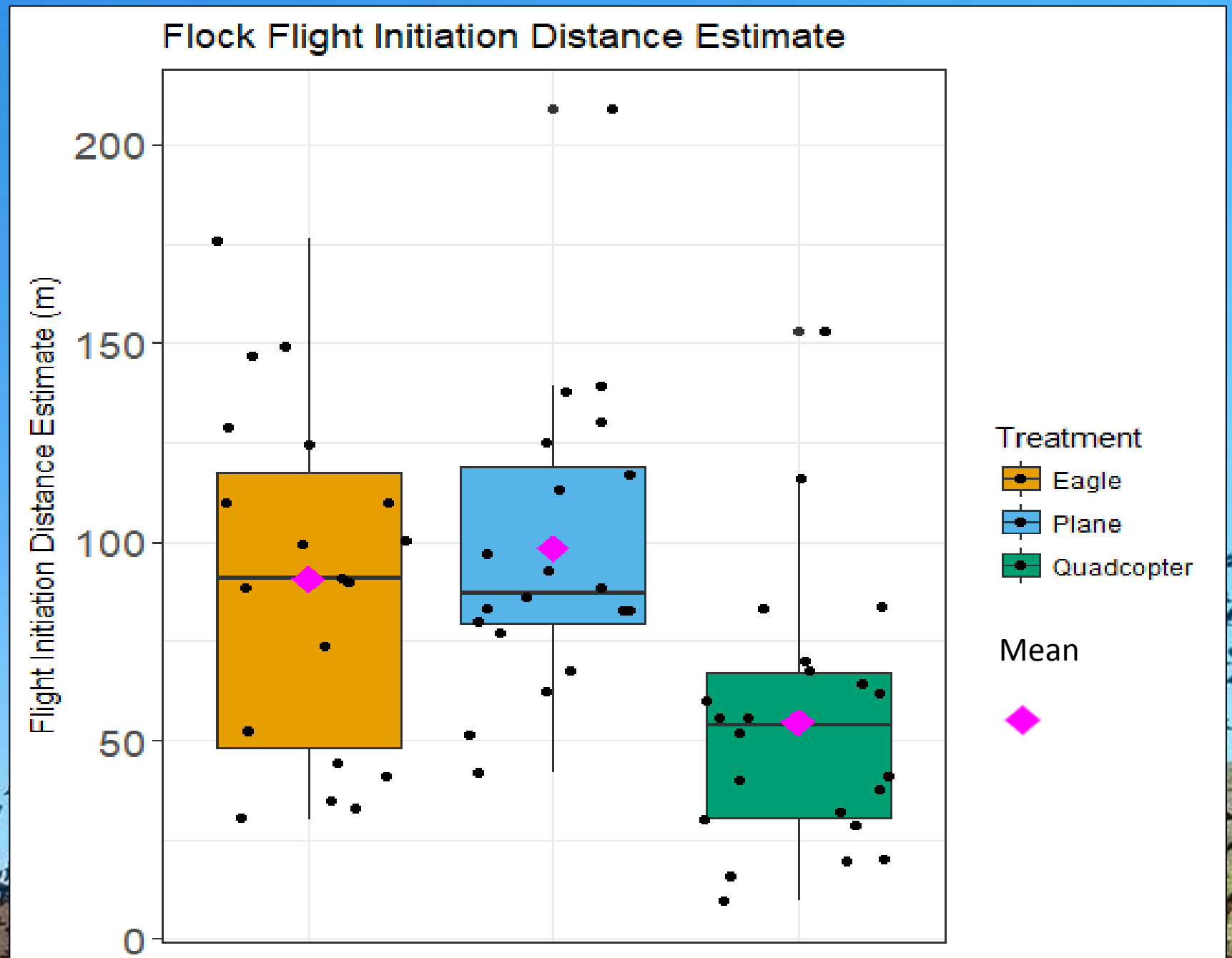
Map Length:	139.48	Meters
Ground Length:	139.48	
Heading:	67.34	degrees

Mouse Navigation

Save Clear

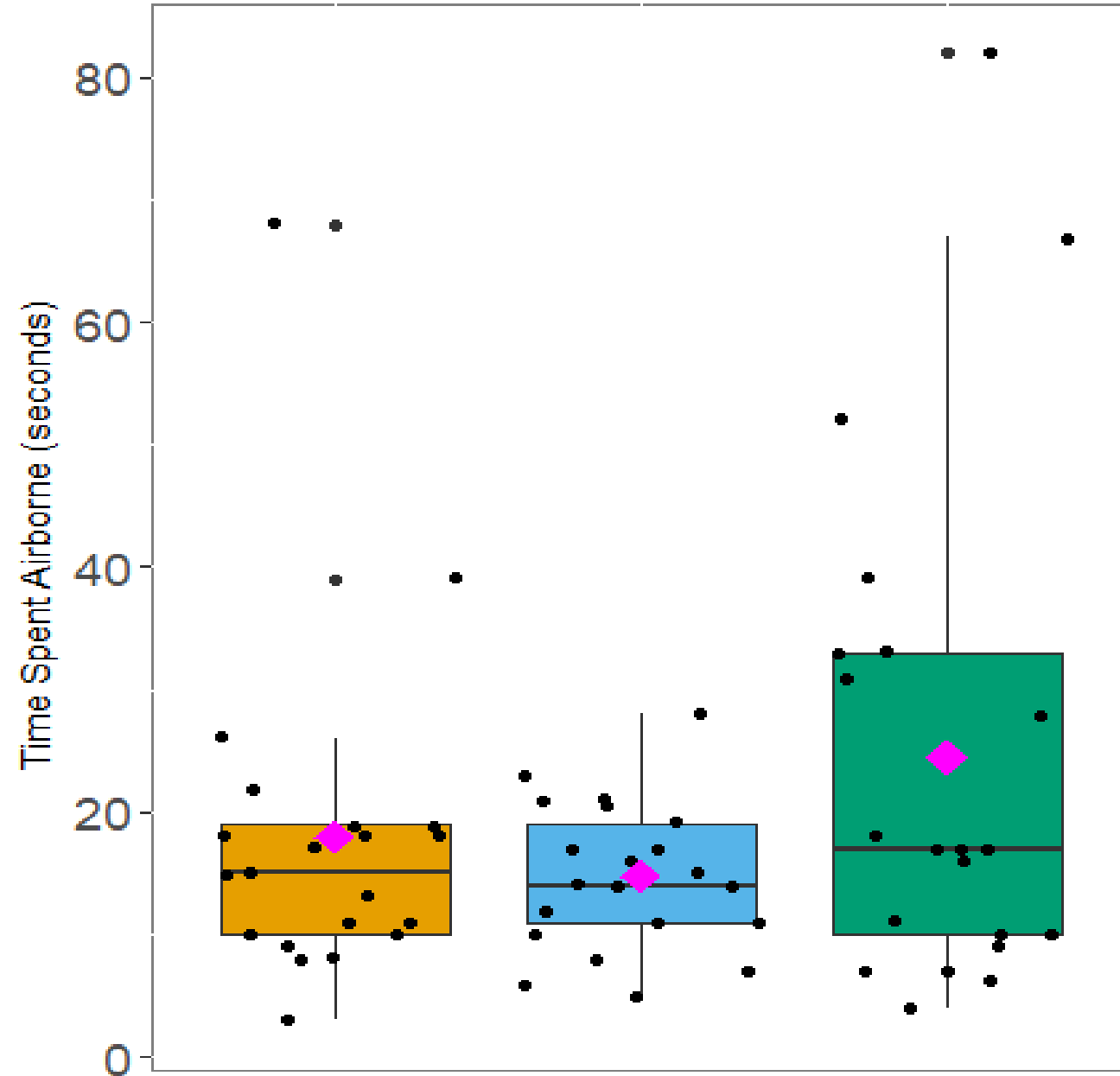


# Results



# Results

Time Flock Spent Airborne in Response to UAS



Treatment

Eagle

Plane

Quadcopter

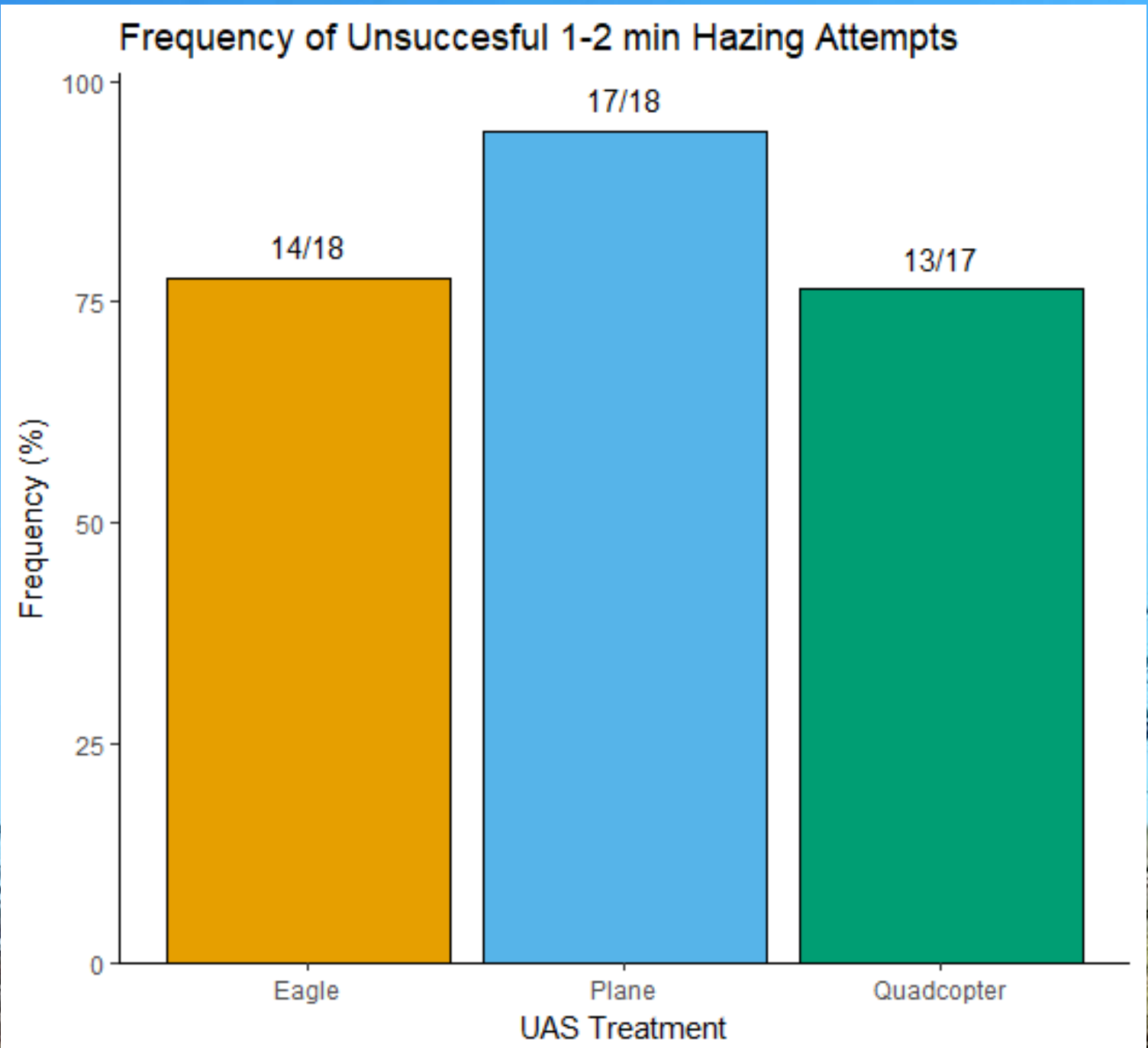
Mean



# Results

Average Flock Size Successfully Hazed  
**690**

Average Flock Size Unsuccessfully Hazed  
**1430**



# Natural Predation



# Thank you!

## USDA-APHIS-WS NWRC

Travis DeVault, June Weisbeck, William Kennerly

## USDA-APHIS-WS ATOC

Kyle Hunsaker

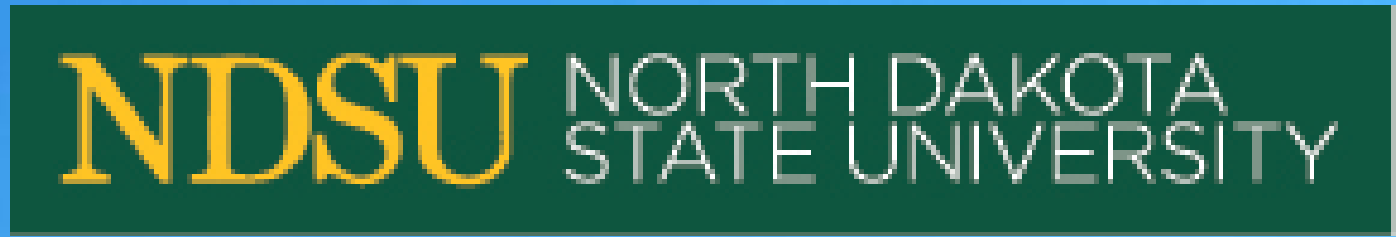
## USDA-APHIS-WS North Dakota

John Paulson, Andrew Wiseman, Rod O'Claire

## SUNFLOWER PRODUCERS

## NORTH DAKOTA STATE UNIVERSITY

Jennifer Preuss, Tim Greives, Devan McGranahan



QUESTIONS?

