

# A Survey of Current sUAS Users

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# Acknowledgements



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Emma Schultz



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Dr. Morgan B. Pfeiffer

Dr. Michael Curran



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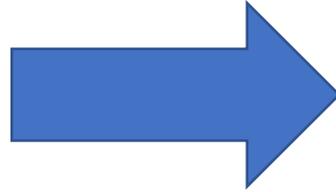
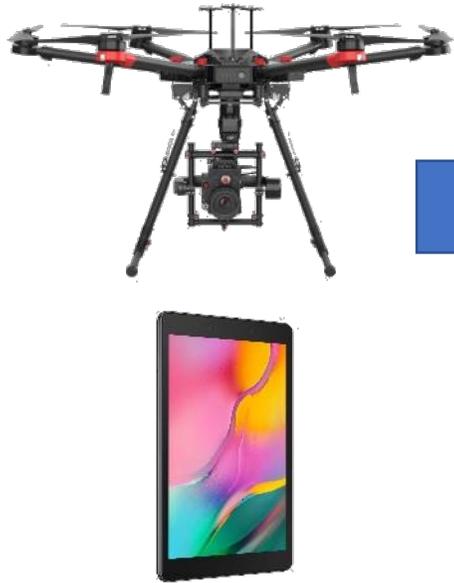


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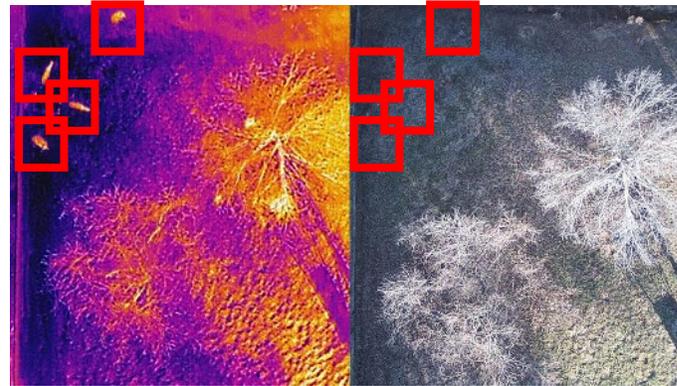


# sUAS Applications on Airports

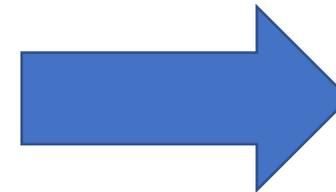
What to use and  
how to fly it?



Automating  
Image  
Classification



*"Deer, deer, deer, deer!"*



Prioritize  
Management  
Increase Efficiency



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# sUAS Applications on Airports

**Dr. Jared Elmore**

*Classifying Wildlife from Aerial Imagery Using Deep Learning Neural Networks*

Tuesday 11:00 am – 1:00 pm Technical Session 2

*Systematic Map Effort of Using Small Unmanned Aircraft Systems to Monitor Animals*

Thursday 3:00-5:00 pm Technical Session 3

**Dr. Sathishkumar “Sathish” Samiappan**

*Aerial Wildlife Image Repository (AWIR)*

Thursday 1:00-2:30 pm Technical Session 3



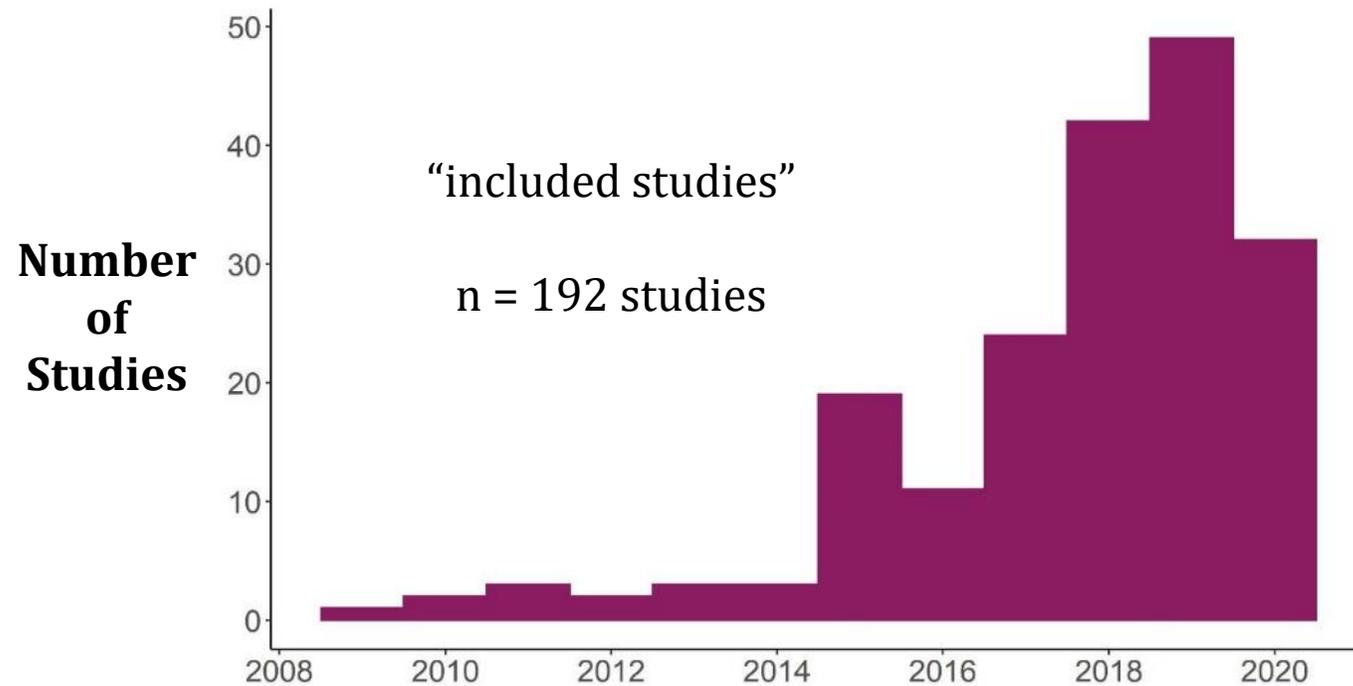
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# Increase Use of sUAS in Wildlife Monitoring



Elmore et al. *Environ Evid* (2021) 10:15  
<https://doi.org/10.1186/s13750-021-00228-w>

Environmental Evidence

SYSTEMATIC MAP PROTOCOL

Open Access

Evidence on the effectiveness of small unmanned aircraft systems (sUAS) as a survey tool for North American terrestrial, vertebrate animals: a systematic map protocol



Jared A. Elmore<sup>1\*</sup>, Michael F. Curran<sup>1</sup>, Kristine O. Evans<sup>1</sup>, Sathishkumar Samiappan<sup>2</sup>, Meilun Zhou<sup>2</sup>, Morgan B. Pfeiffer<sup>3</sup>, Bradley F. Blackwell<sup>3</sup> and Raymond B. Iglay<sup>1</sup>



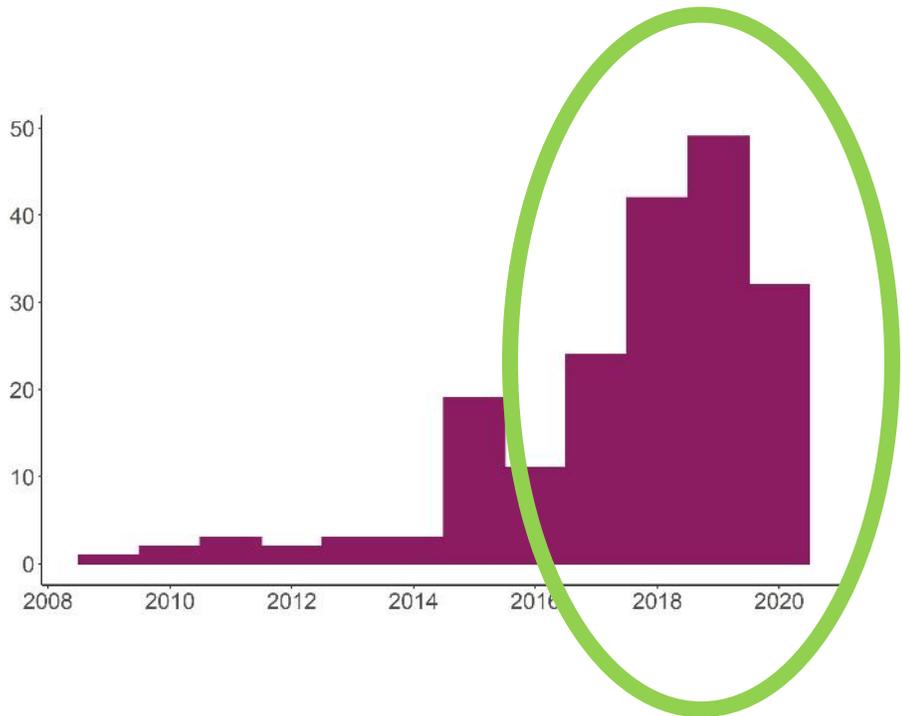
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# Changing Focus of sUAS Investigations



## A standardized protocol for reporting methods when using drones for wildlife research

Andrew F. Barnas, Dominique Chabot, Amanda J. Hodgson, David W. Johnston, David M. Bird, and Susan N. Ellis-Felege

J. Unmanned Veh. Syst. 8:89-98 (2020)

## Application of Deep-Learning Methods to Bird Detection Using Unmanned Aerial Vehicle Imagery

Suk-Ju Hong<sup>1</sup> , Yunhyeok Han<sup>1</sup>, Sang-Yeon Kim<sup>1</sup> , Ah-Yeong Lee<sup>1,2</sup> and Ghiseok Kim<sup>1,3,\*</sup>  
Sensors 19:1651 (2019)

## Evaluating new technology for biodiversity monitoring: Are drone surveys biased?

Evangeline Corcoran<sup>1</sup>  | Simon Denman<sup>2</sup> | Grant Hamilton<sup>1</sup> 

Ecol. Evol. 11:6649-6656 (2021)



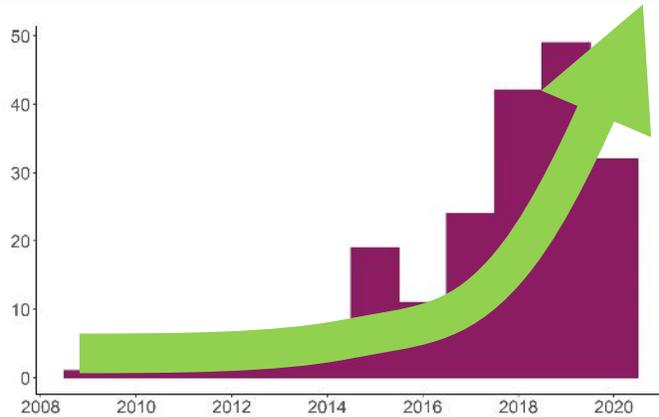
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# Survey Development and Distribution



Rapid Increase



Unpublished Lessons Learned

**Objective:** Determine current sUAS use among wildlife practitioners including **user characteristics, animals, sUAS equipment, and associated successes and failures** to complement information found in the peer-reviewed literature.



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# Survey Development and Distribution

qualtrics<sup>XM</sup>



Take the Survey!

USDA



ECOLOGICAL SOCIETY OF AMERICA  
**esa**  
ECOLOG-L



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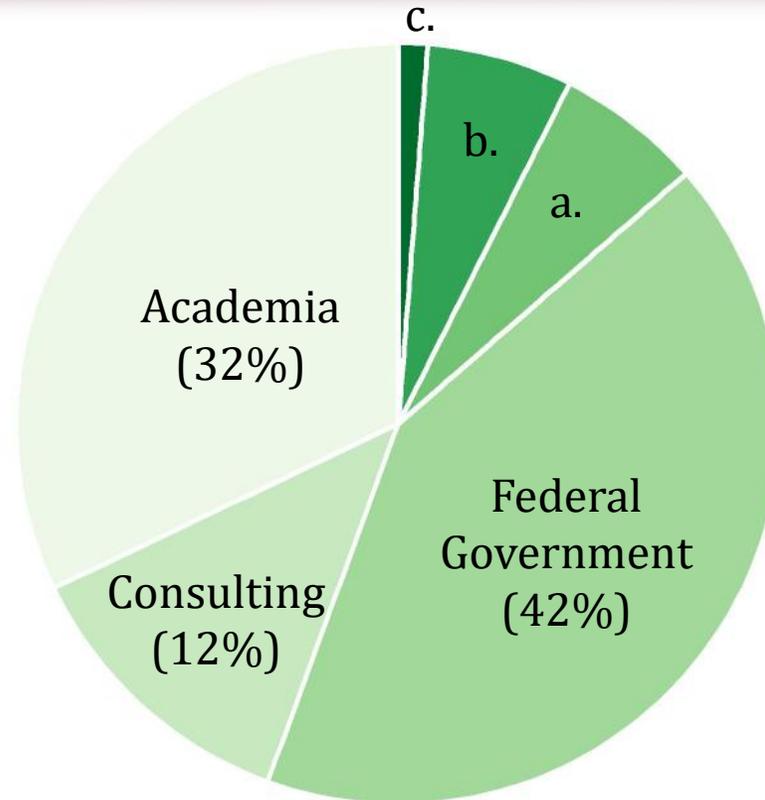


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# Who Are the Current sUAS Users?

## sUAS Work Affiliation



- a. Local/State Government (6%)
- b. Non-Profit (6%)
- c. Other NGO (1%)

*Rounding Error ~1%*



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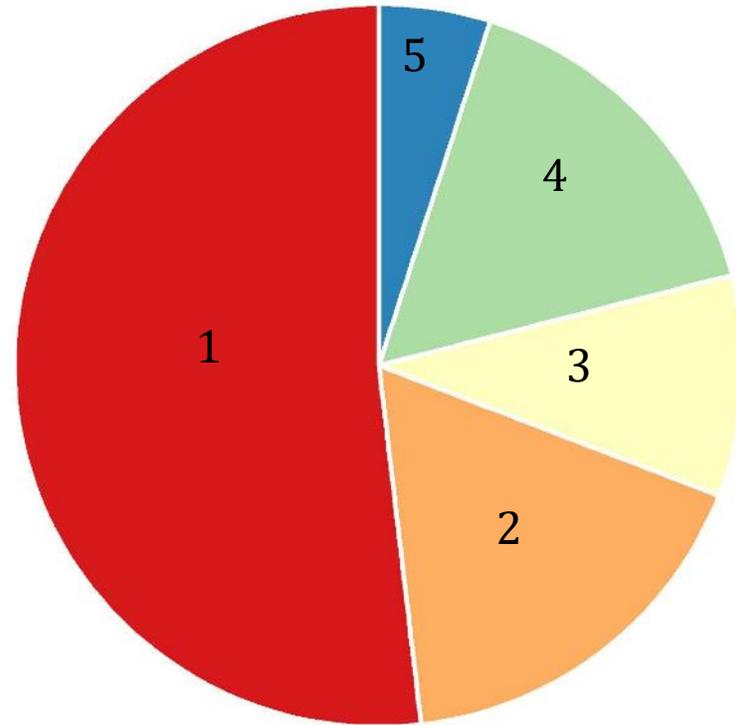


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# Who Are the Current sUAS Users?

## sUAS Experience



### YES

- 1. Data analysis and pilot (52%)
- 2. Pilot only (17%)
- 3. Data analysis only (10%)

} 79%

### NO

- 4. Planning to use sUAS (16%)
- 5. Why Am I Here? (5%)



# Who Are the Current sUAS Users?

## EXPERIENCE

### United States (84%)

- Australia
- Canada
- Colombia
- Denmark
- Finland
- South Africa

### 1-3 years (54%)

- <1 year (17%)
- >5 years (17%)
- 3-5 years (12%)

- <5 hours (22%)
- 10-20 hours (20%)
- >100 hours (18%)

- 5-10 hours (10%)
- 20-30 hours (10%)
- 30-50 hours (14%)
- 50-100 hours (6%)



# Who Are the Current sUAS Users?

**Applications and Interest  
Still Emerging**

**1 study (40%)**

**2-5 studies (40%)**

6-10 studies (10%)

10-20 studies (8%)

> 20 studies (2%)

**Not Presented Work (33%)**

**Conference/Proceedings (23%)**

**Technical Report (20%)**

**Peer-reviewed Publications (14%)**

Other (7%)

Expert Witness (2%)



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# Animals of Interest and Collisions



## Collisions with Wildlife

4% of Participants ( $n = 2$ )



20 Wildlife Strikes with “Drones”



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# Platforms Used



**dji**

(54%)

**AUTEL**

ROBOTICS

(15%)

**SDR**

(11%)

**Parrot**<sup>®</sup>

(4%)

**AV**

AeroVironment<sup>™</sup>

(3%)



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# Platform Issues



(n = 8)

vs.

# Everyone

(n = 12)

*Based on Participants Who Experienced Issues*

*A Difference to Consider*

*Close Call*

Low Battery Platform/Controller (38% vs. 65%)

Loss of GPS Link (63% vs. 69%)

Flyaway (13% vs. 7%)

Inability to Connect to Sensor (63% vs. 64%)

Loss of Communication Link (88% vs. 69%)

Programming Malfunction (38% vs. 39%)

Lost Signal to Sensor (50% vs. 64%)

Failed to Record Data (38% vs. 44%)

File Corruption (25% vs. 41%)



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# Sensors Used

**RGB (39%) Thermal (27%)**

**Multispectral or Infrared (13% each)**

**LiDAR (3%)**

**Hyperspectral (2%)**

**Other (3%; bioacoustics, animal behavior focus)**



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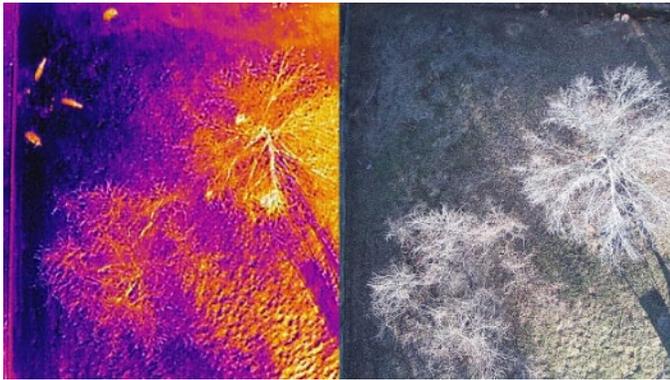
# Sensors Issues

*Based on Participants Who Experienced Issues*

## Thermal vs. RGB

(*n*=6)

(*n*=12)



Poor Resolution (100% vs. 75%)

Image Blur (Even)

Unable to Stitch/Mosaic (33% vs. 42%)

Uncalibrated Sensor (33% vs. 25%)



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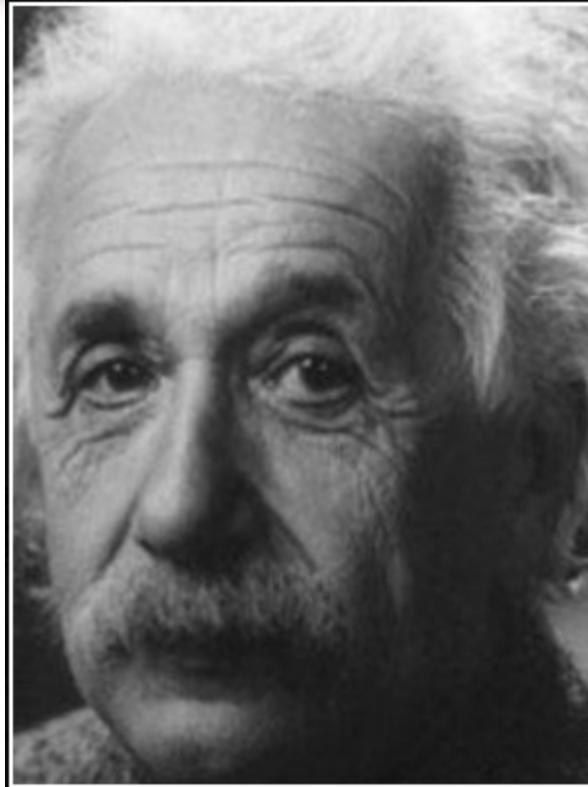


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# Applications to current research

## Avoiding pitfalls



I don't need to know everything, I  
just need to know where to find it,  
when I need it

— *Albert Einstein* —

AZ QUOTES



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# Applications to current research

*What's Currently Being Used?*

**What Issues Have Occurred That  
Do Not Need to Happen Again?**

*Why Start at 0 AGL?*



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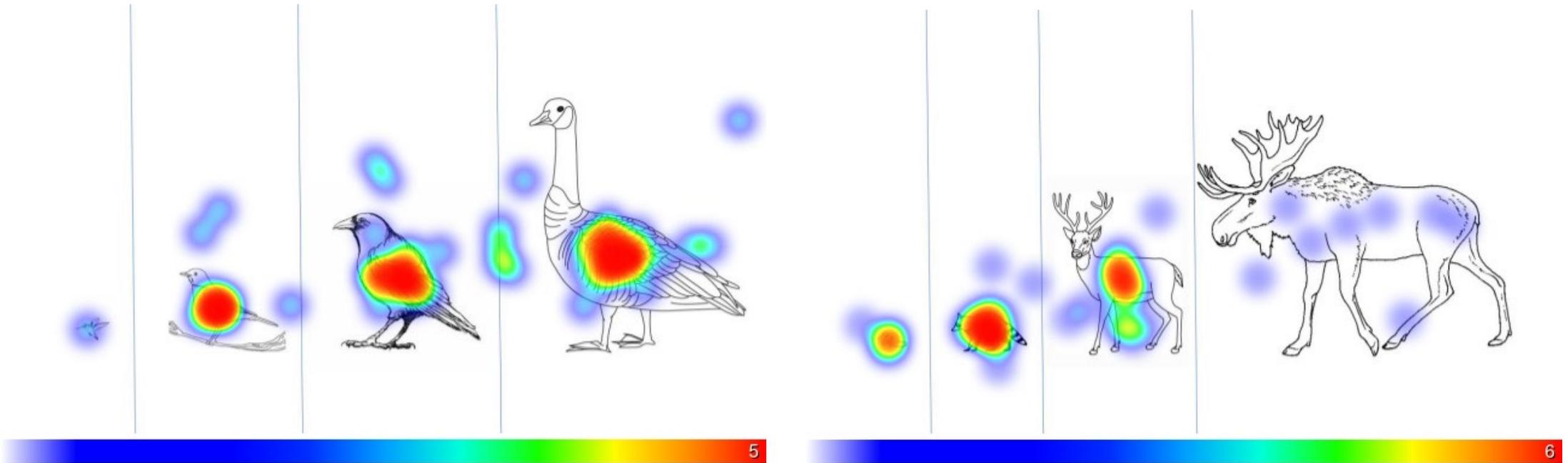


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# Applications to current research

## Example - Imagery and Animal Size



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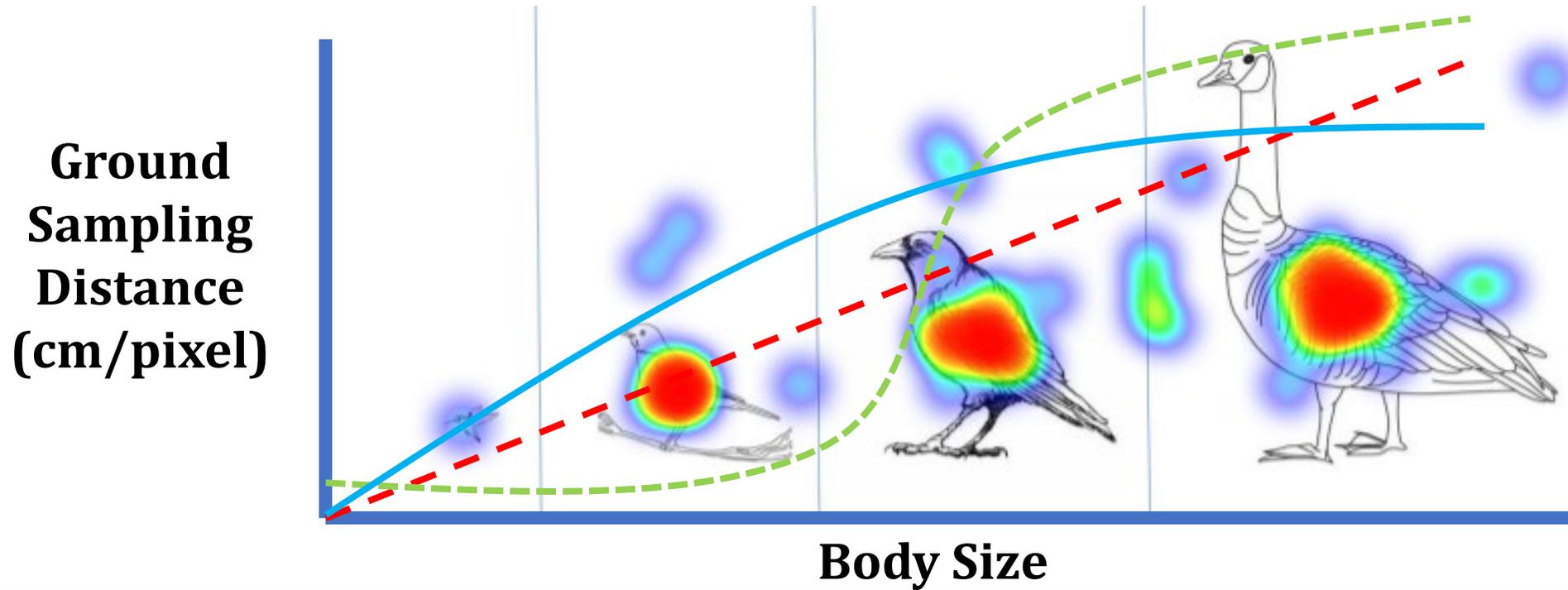


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# Applications to current research

## Examples - Imagery and Animal Size



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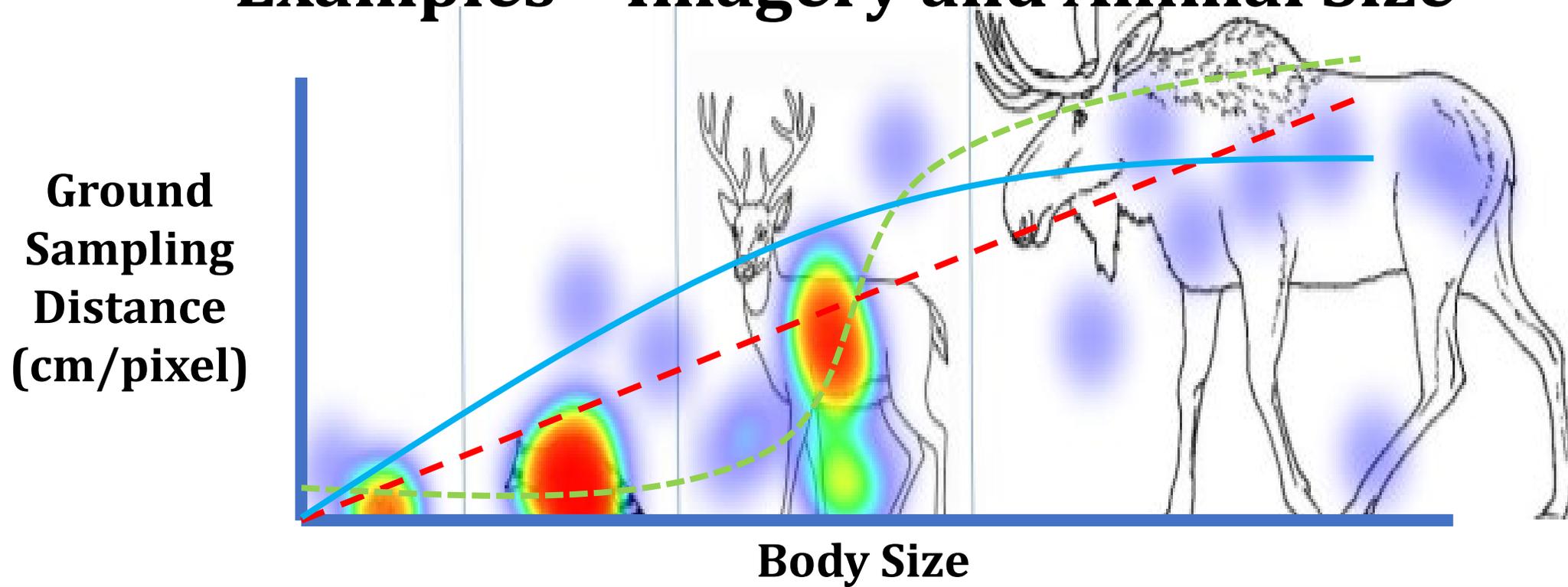


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# Applications to current research

## Examples - Imagery and Animal Size



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# Where do we go from here?

## Follow-up Survey



© People Pulse



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# Where do we go from here?

## Image Sharing

**Dr. Sathishkumar “Sathish” Samiappan**  
*Aerial Wildlife Image Repository (AWIR)*  
Thursday 1:00-2:30 pm Technical Session 3



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# Where do we go from here?

## Selection Criteria



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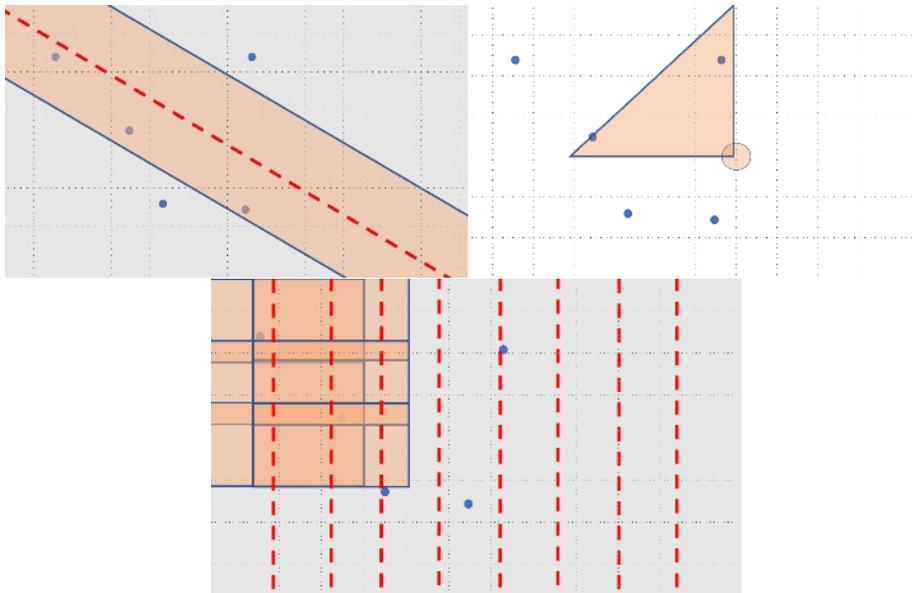


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# Where do we go from here?

## Flight Guidelines and Considerations



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# Where do we go from here?

## Collaboration



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# Take the Survey!



## sUAS Wildlife Survey

[https://msstate.co1.qualtrics.com/jfe/form/SV\\_d9WaZb5QHUSa0K](https://msstate.co1.qualtrics.com/jfe/form/SV_d9WaZb5QHUSa0K)



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# Thank you and please stay in touch!



**Take the Survey!**

## MSU sUAS Wildlife Research Team

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Co-PIs: Dr. Ray Iglay, Dr. Sathish Samiappan, & Dr. Kristine Evans

Postdocs: Dr. Jared Elmore & Dr. Landon Jones

Ph.D. Student: Ms. Emma Schultz



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