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BIRDS EYE VIEW: PRELIMINARY USE OF SMALL UNMANNED AERIAL SYSTEMS (sUAS) FOR AQUATIC TURTLE SURVEYS

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Mandi Gordon, Marc Mokrech, & Danielle DeChellis,
and all the turtle interns past & present.

Thank you!

BACKGROUND

sUAS (small unmanned aerial systems)

- Collect aerial imagery data (photos/video)
- Variety of sensors
- Increased accessibility
- Cover large areas

Benefits for surveying aquatic turtles

- Species identification
- Population assessments
- Habitat analysis
- Replayability compared to traditional BAVS (binocular aided visual surveys)

sUAS in Wildlife Conservation

Primarily marine studies & large mammals

- Green Sea Turtles (Bevan, E., et al. 2016)
- Common Hippopotamus (Linchant et al 2017)
- Galveston Shore & Wading Birds (Vallery, A. 2018)

Research growing for aquatic turtles

- Rio Grande Cooter (Davis, D. R. et al. 2020)
- Freshwater Methodology (Biserkov and Lukanov 2017)
- Rapid Turtle Assessments (Daniels et al 2018)

OBJECTIVES

Evaluating sUAS efficiency in detecting aquatic turtles

Compare & contrast different methodologies

Analyzing collected aerial imagery data

Current Focus

Future Work

PRE-FLIGHT PREPARATION

Federal Aviation Administration (FAA)

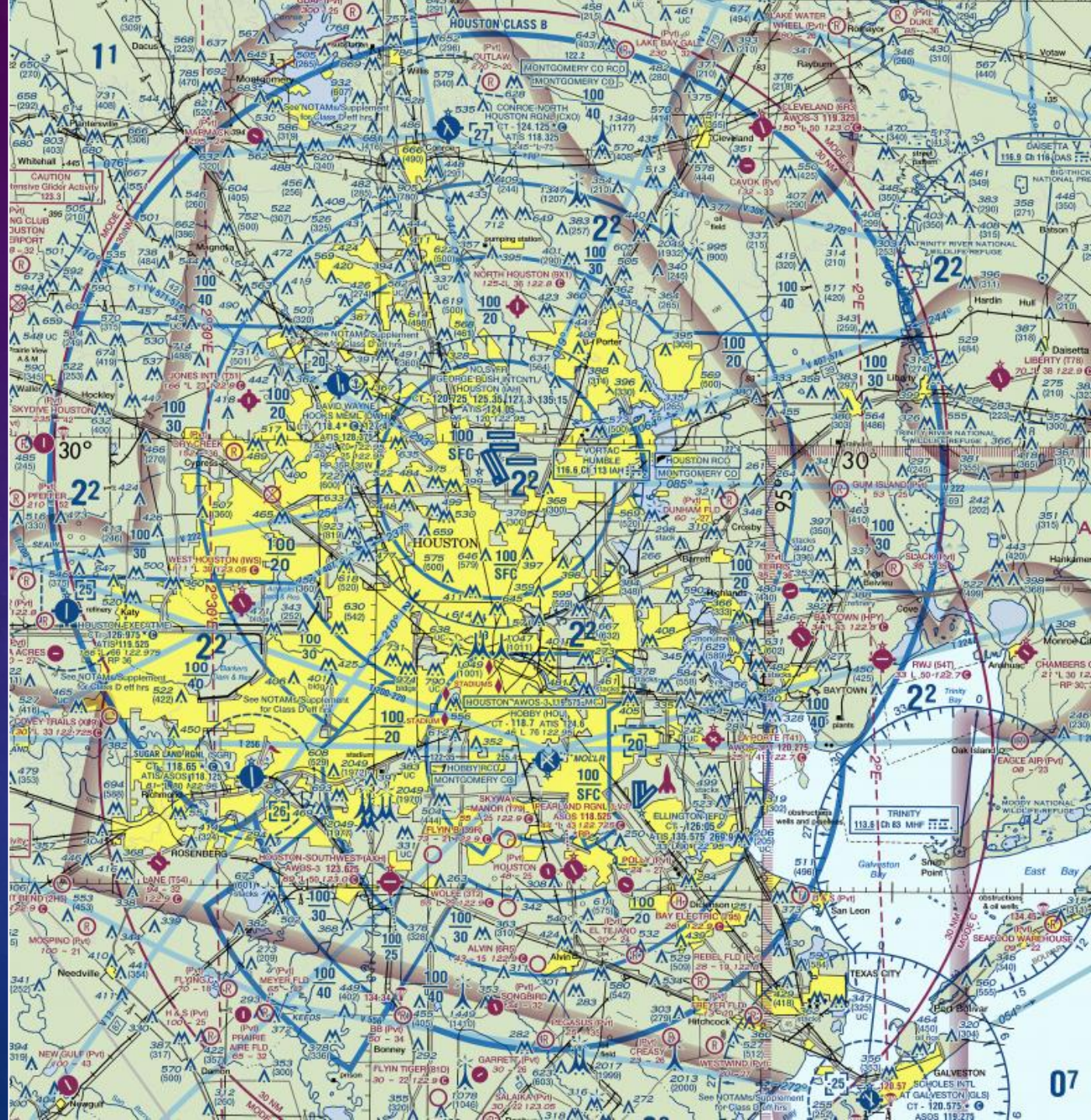
- Remote pilot license - Part 107
- Registration of sUAS
- Sectional aeronautical charts

Texas Parks and Wildlife Department

- Aerial Wildlife Management Permit

Requirements for…

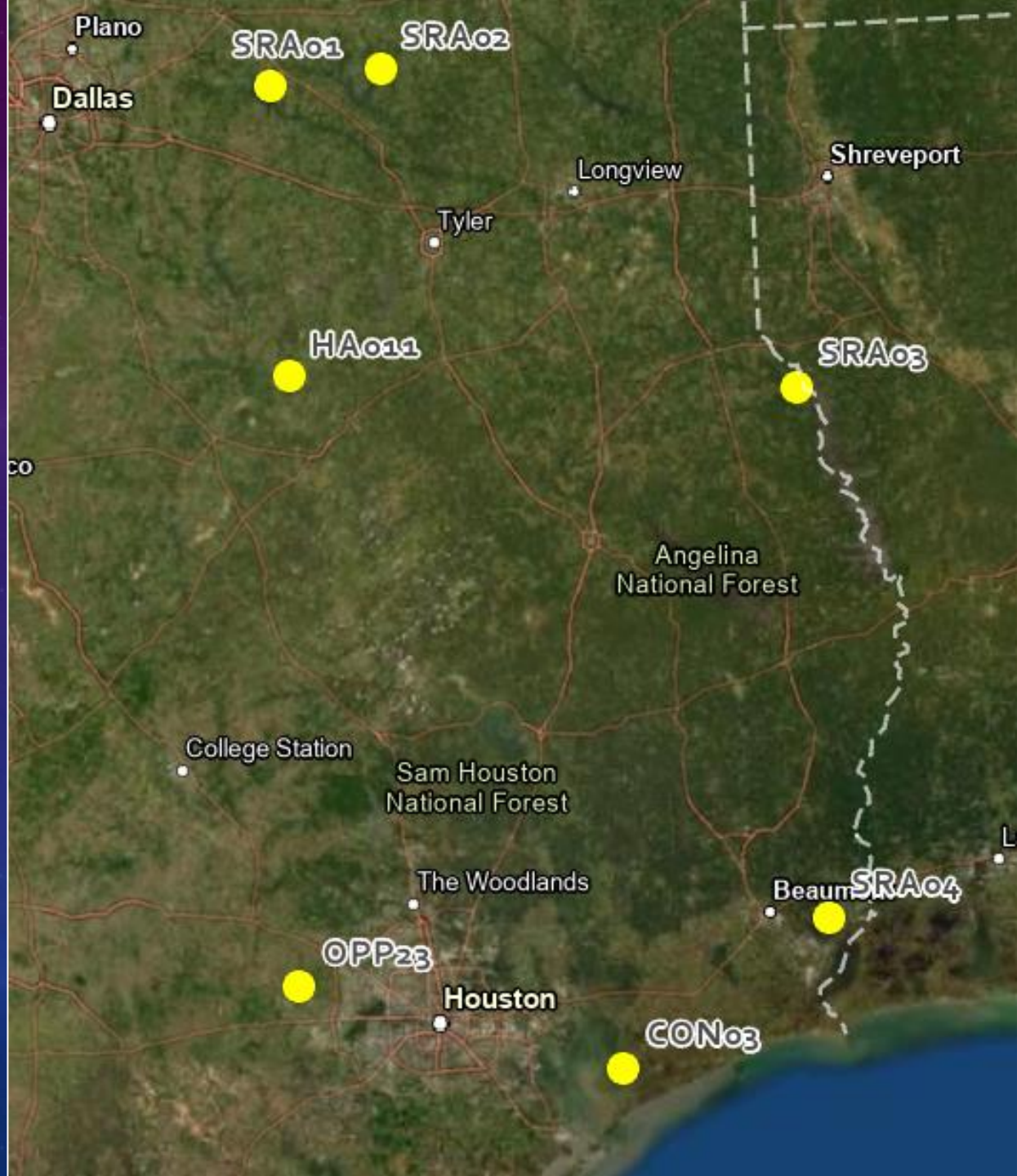
- Commercial use
- Wildlife research



SAMPLE SITES

7 Sites in East Texas

- FAA, Landowner, TPWD Permit
- Potential obstacles
- Launch Zone
- Line of Sight (LOS)



sUAS

Mavic 2 Enterprise Dual (Black)

- 12 MP camera w/ zoom
- Thermal sensor

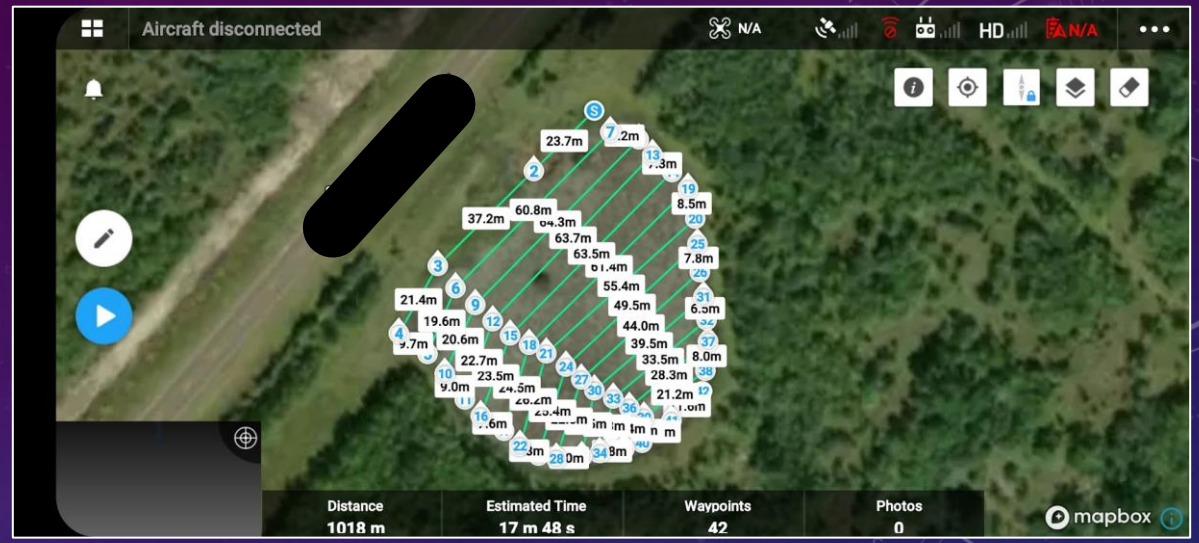
Phantom P4 Multispectral (White)

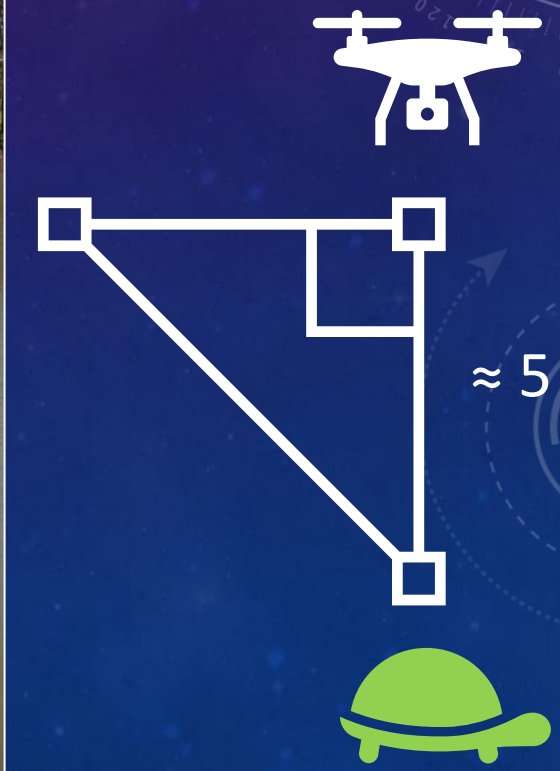
- 2 MP camera
- 5 monochrome sensors for multispectral images
  - (Blue, Green, Red, Red Edge, Near-Infrared)

FIELD METHODOLOGY

sUAS

- Pre-planned flights
- ≈ 20 min per battery
- -90° gimble (angle of camera)
- Target altitude of 5 meters
- Slow speed 1 m/s
- Stop and zoom during mission
- Conducted simultaneously with BAVS





BAVS (Binocular Aided Visual Surveys)

- Scanning from a distance
- Min. of 20 min @ each site
- Skill required

DATA PROCESSING METHODOLOGY

Manual Processing

- Video/photos replayed using VLC media player
  - (playback, zoom, slow)
- Database compiled of aquatic turtles
  - Species
  - Count
- Time consuming process

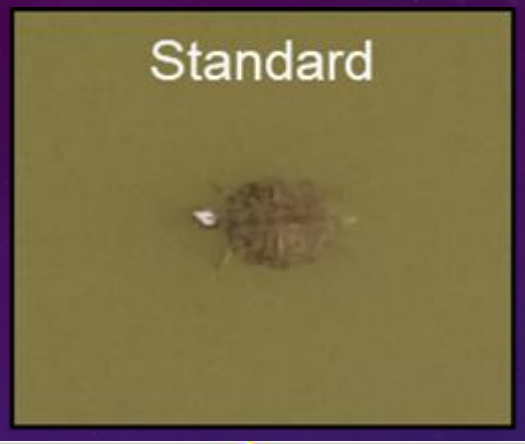
MULTISPECTRAL SENSORS

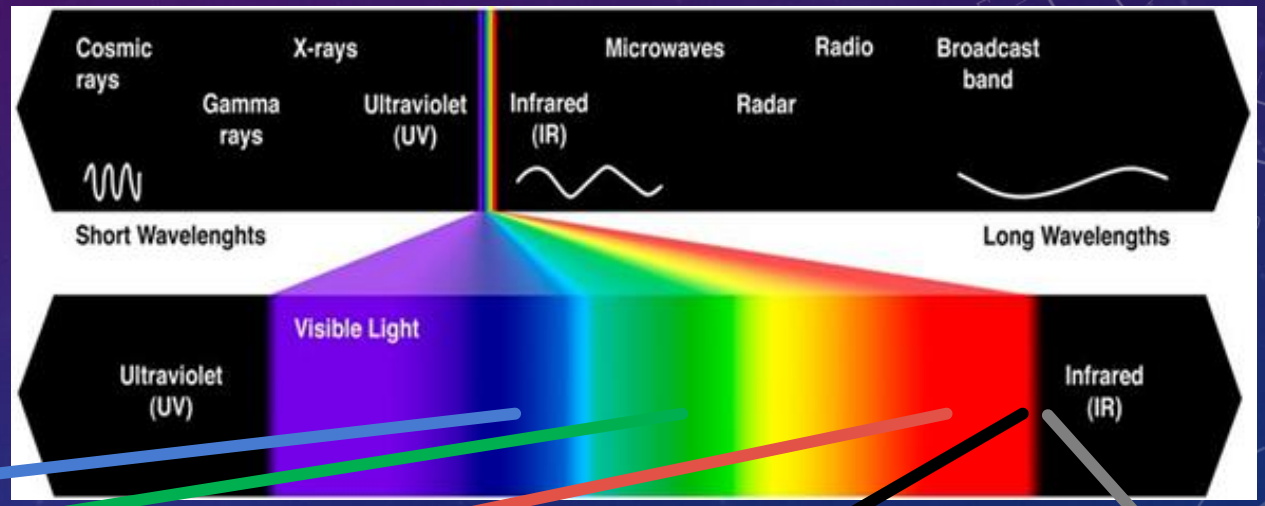
Electromagnetic Spectrum

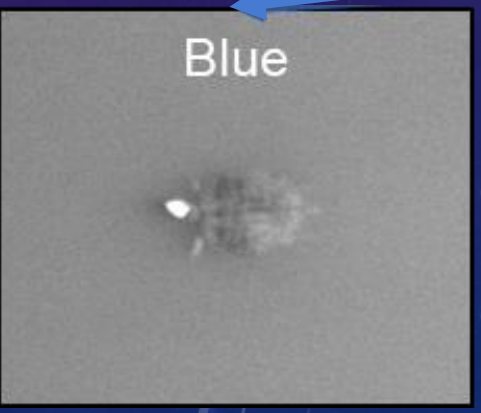
- (B, G, R) Blue, Green, Red
- (RE, NIF) Red Edge, Near-Infrared

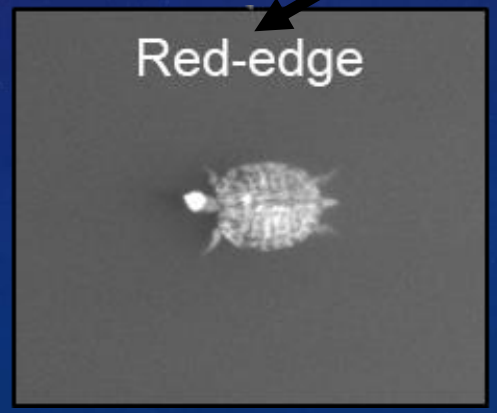
Why use them?

- Aid visibility into water









THERMAL SENSOR

23 April 2021
14:48

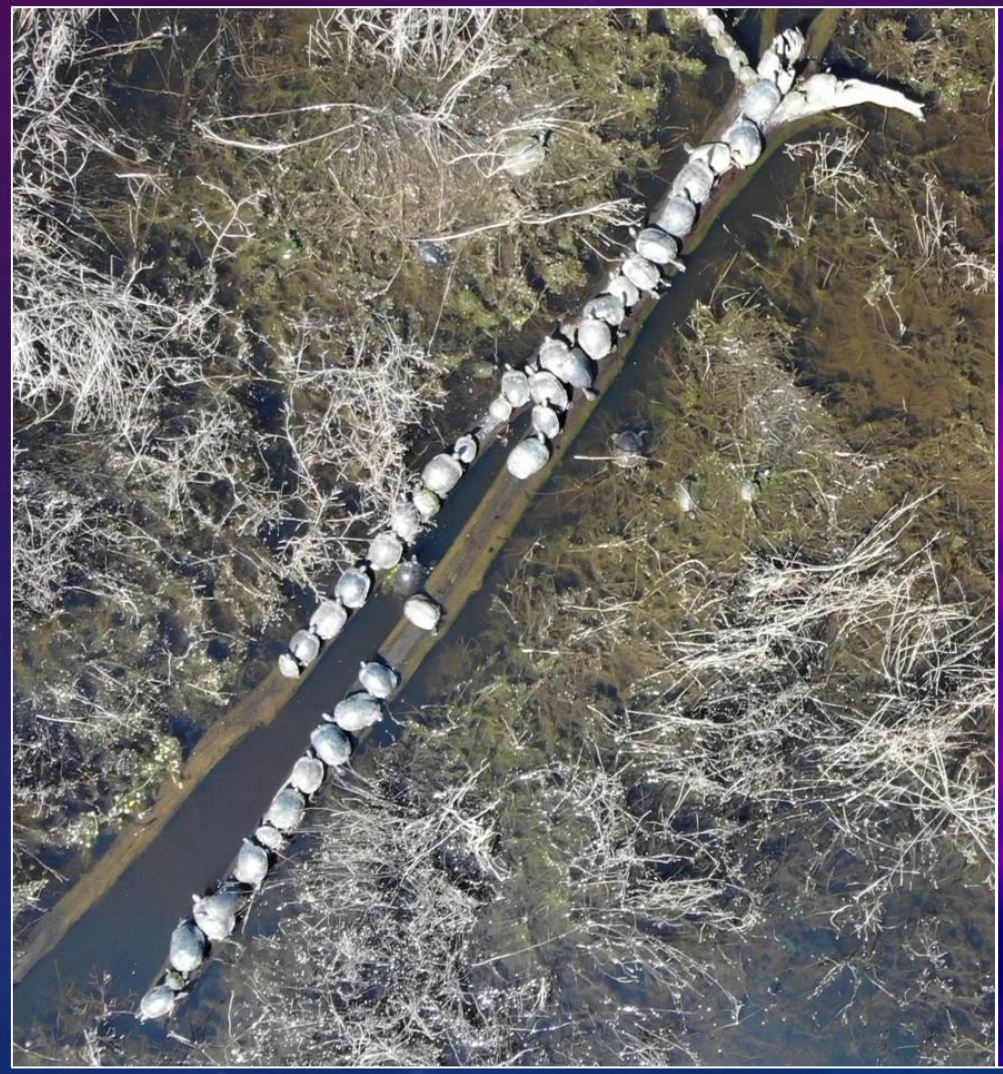
Air Temp. = 21.1 °C
Water Temp. = 19.1 °C
Δ Temp. = 2.0 °C

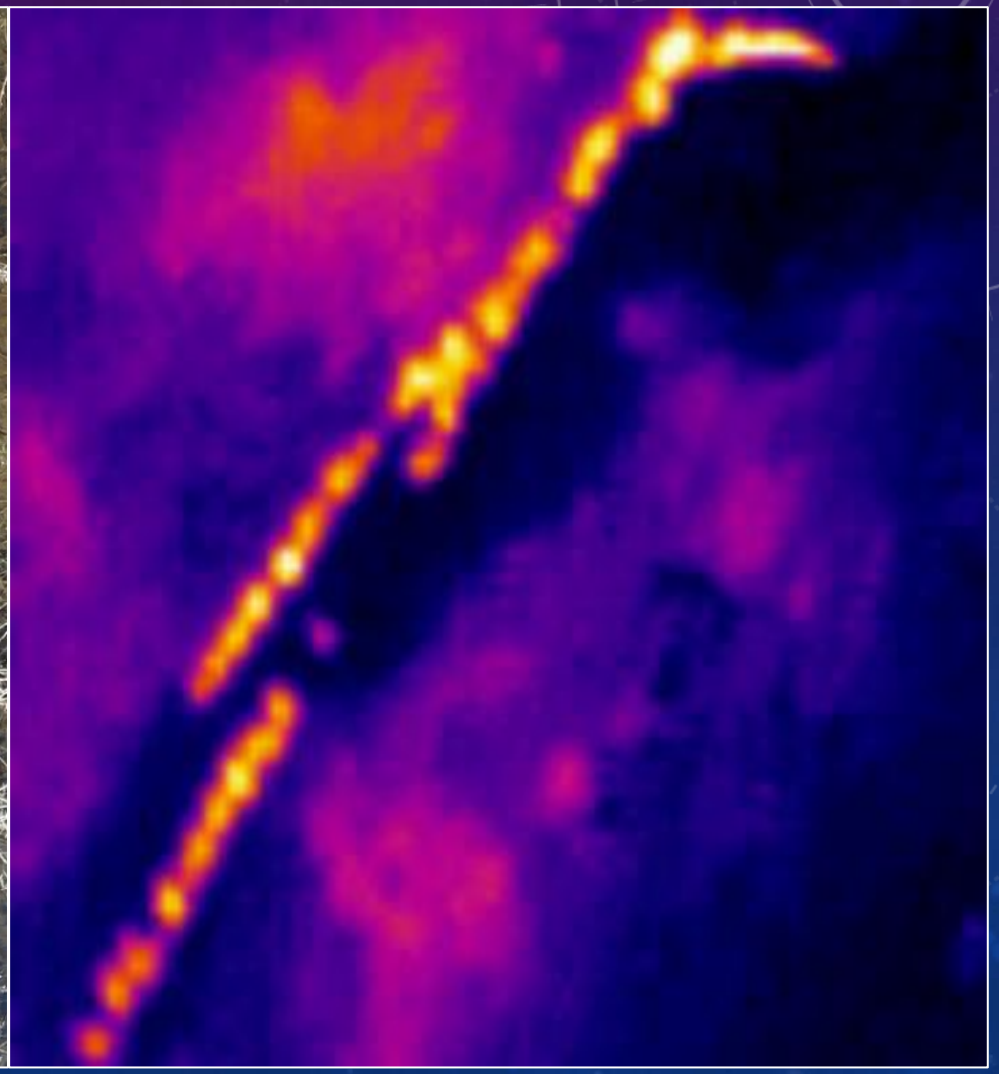
Uncooled VOx Microbolometer

- Simultaneous with video/photo

Why use it?

- Viable for ectotherms?
- Identify basking hotspots





PRELIMINARY RESULTS

March – July 2021
23/28 Missions completed

Video (Mavic 2 Enterprise Dual)
- 09:06:43 (hr:min:sec)
- Estimated aquatic turtles = 1222
- Species identified = 8

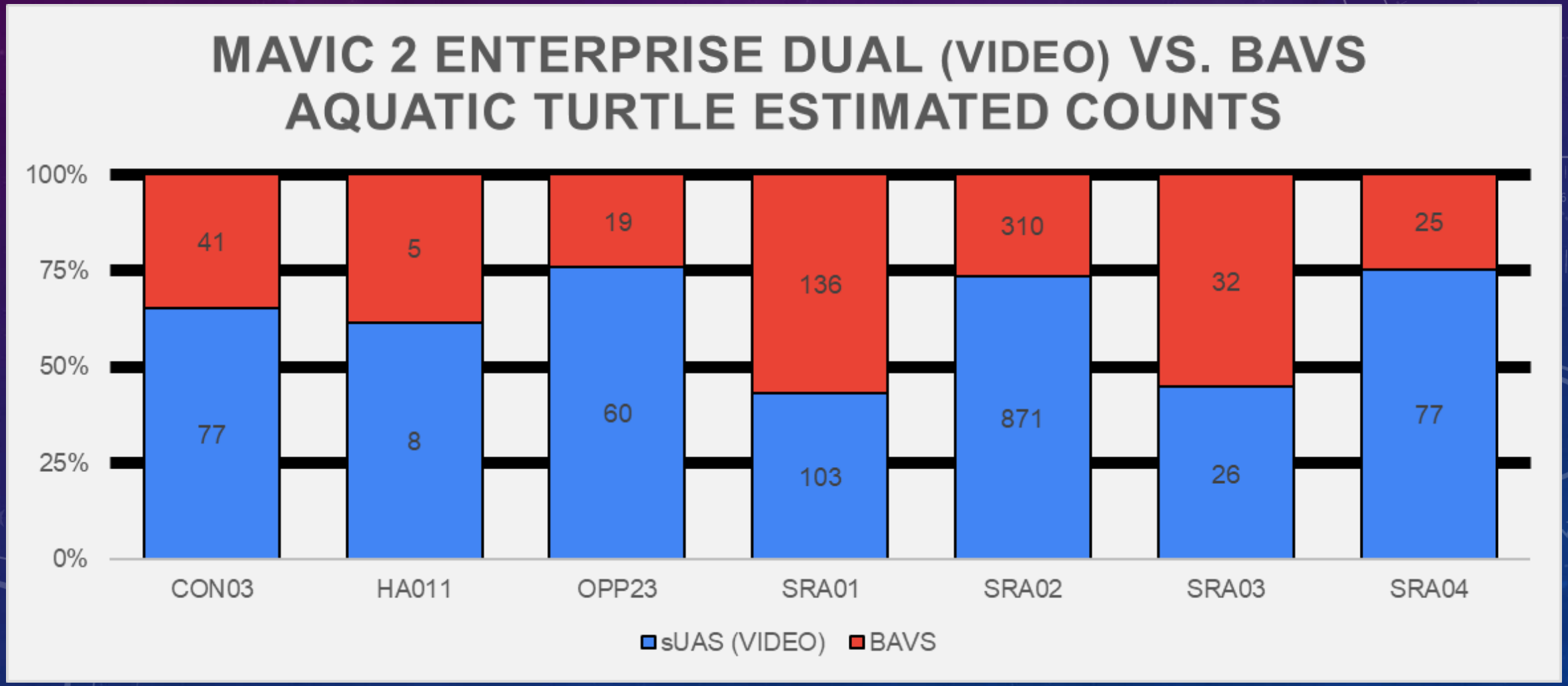
Images with bands (Phantom P4 Multispectral)
- 4,250 (25,500 total)
- Estimated aquatic turtles = 1423
- Species identified = 5

BAVS (Binocular aided visual surveys)
- 28:43:33 (hr:min:sec)
- Estimated aquatic turtles = 568
- Species identified = 5

PRELIMINARY RESULTS

Mavic 2 Enterprise Dual sUAS (Video) vs BAVS (Binocular aided visual surveys)

- Higher observations for 5 out of 7 sites (71.4%)



PRELIMINARY RESULTS

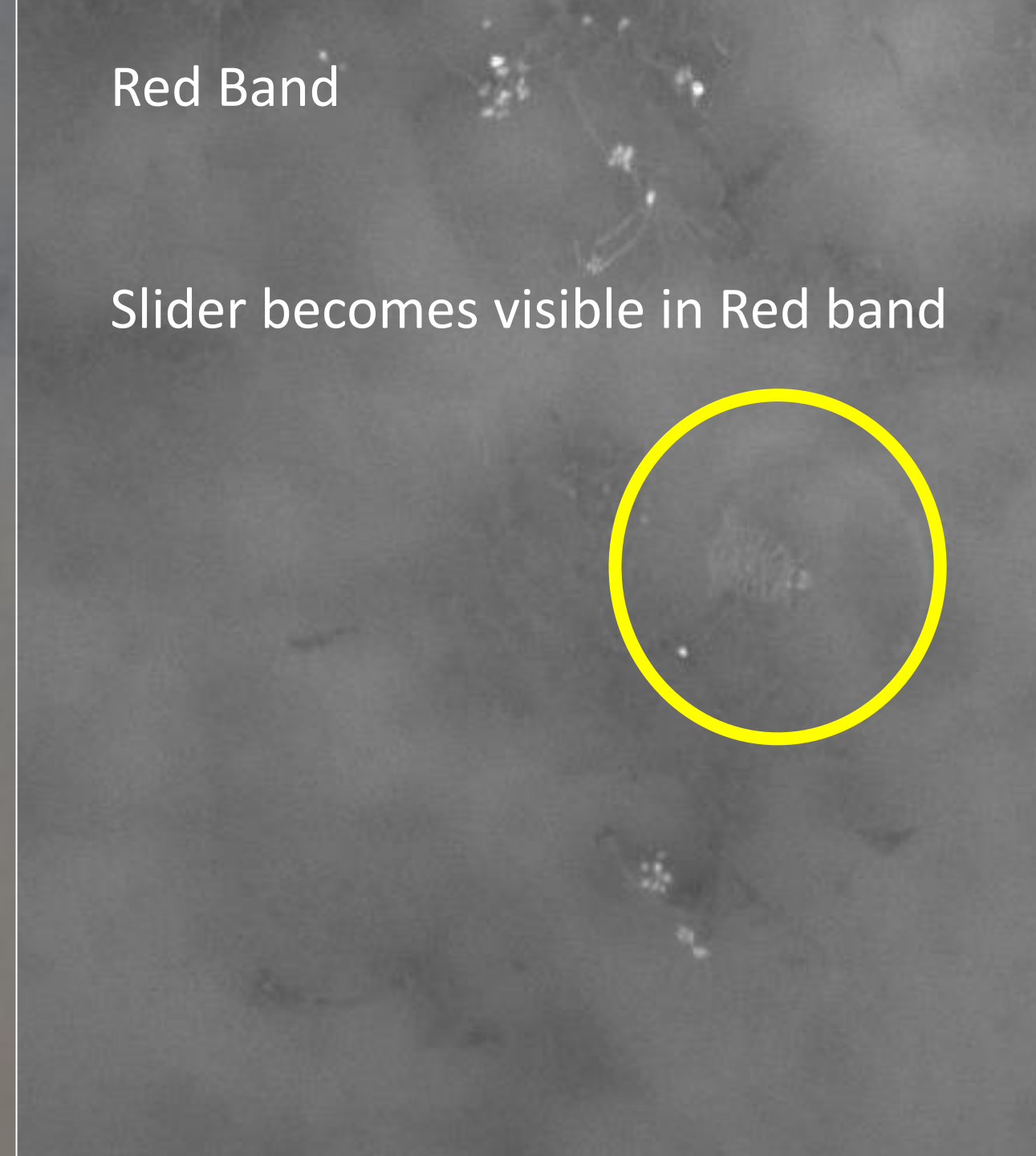
Turtle species (Common name)	Method		
	Video	Photos w/ bands	BAVS
Slider Turtle	877	1110	261
Unknown Turtle	297	292	182
North-American Softshell Turtle	19	12	1
Red-eared Slider	17	3	112
Spiny Softshell	3	4	0
Map Turtle	3	0	0
Snapping Turtle	3	2	1
Western Chicken Turtle	2	0	0
Musk Turtle	1	0	0
River Cooter	0	0	1

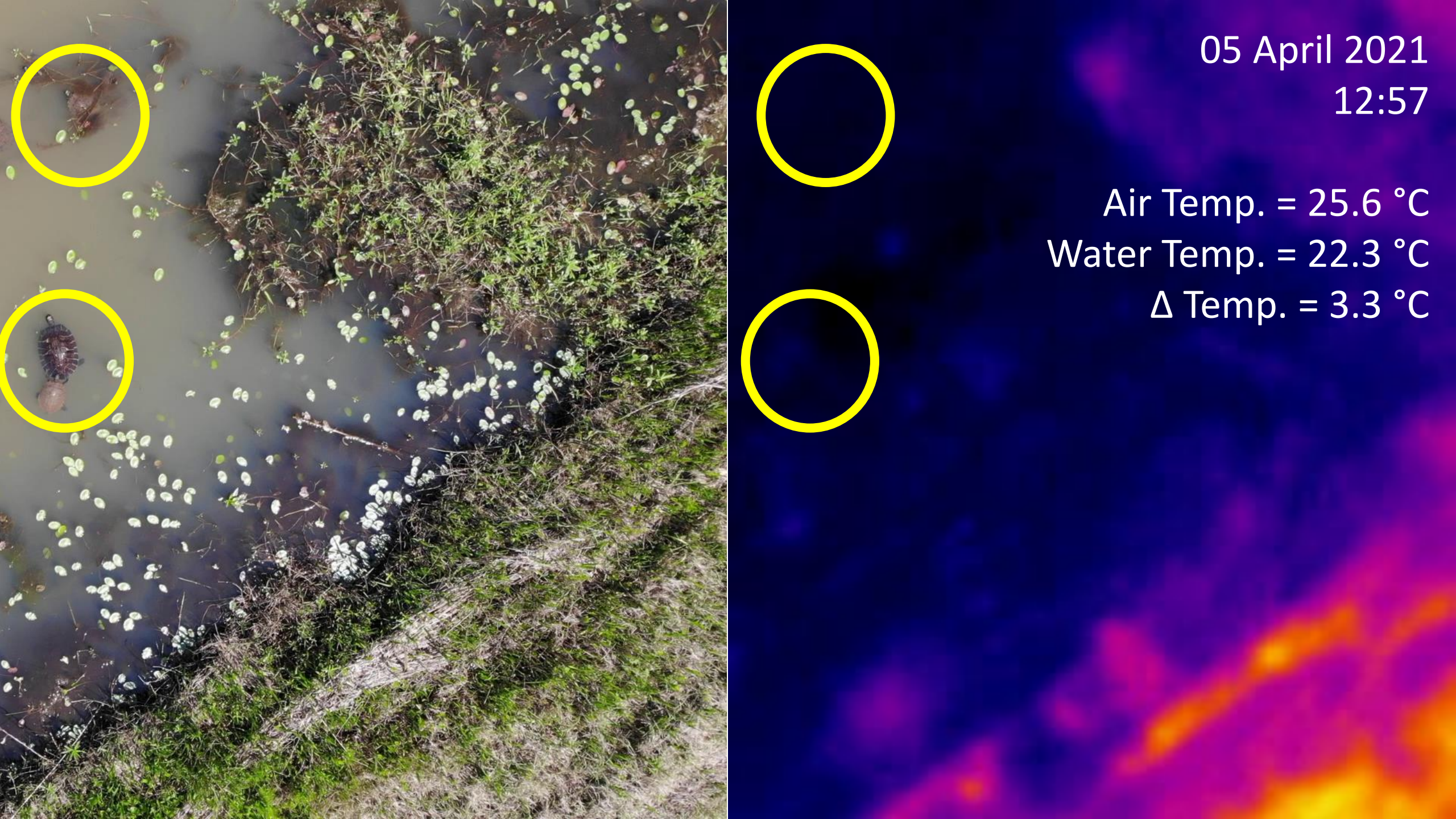
Crother, B. I. (ed.). 2017. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding pp. 1–102. SSAR Herpetological Circular 43.

Standard Image

Red Band

Slider becomes visible in Red band




05 April 2021
12:57
Air Temp. = 25.6 °C
Water Temp. = 22.3 °C
Δ Temp. = 3.3 °C

DISCUSSION

sUAS for aquatic turtle surveys

- Quality of sensor
- Environmental conditions
- Turtle size & carapace features

sUAS (video) vs BAVS (Binocular aided visual surveys)

- Generally, sUAS > BAVS at detection
- Consider site area & allotted survey time

Multispectral Bands

- Aid in aquatic turtle detection
- Increased visibility into water

Thermal

- Identify basking hotspots
- Further investigation

CONCLUSION

- sUAS effective for aquatic turtle surveys
- As sensor capabilities increase, so will sUAS application
- Requirements…
  - Training, permitting, FAA regulations
  - Favorable weather & habitat conditions
  - Large data sets = long processing time

NEXT STEPS

- Continued flights in 2022
- Updating turtle database
- Investigating thermal sensor
- Analyzing aerial imagery

THANK YOU!
QUESTIONS?
Contact: Nagro@uhcl.edu