

Drone Project Report

September 26, 2018

Ormond Beach, California

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Permit #TE-181713-3



Project Objectives

Determine if a drone can be flown over nesting WSP without causing disturbance

Because we really want to do the following:

3. Collect high resolution elevation data (cm scale) of nesting habitat
4. ★ Develop better methods of censusing population numbers
5. Improve habitat management



Student Undergraduate Research Fellowship (SURF) team CSUCI



Cool things we can do

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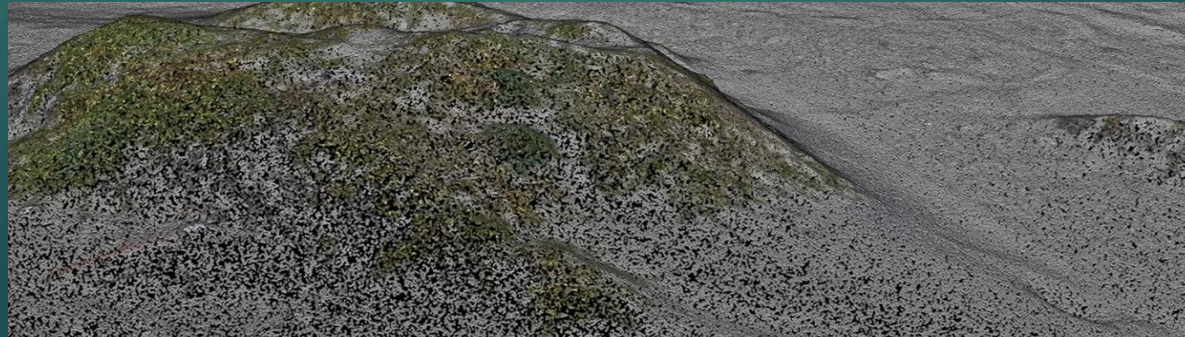
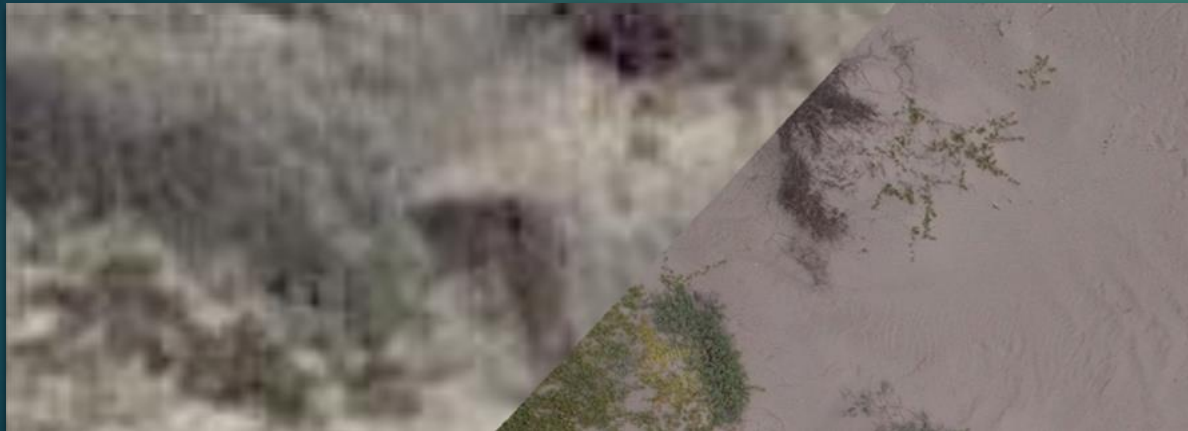
- Monitor wildlife
- Measure dynamically changing dune system
- Test new methods for finding at tracking wildlife at Ormond Beach



Mapping in High Resolution with UAV (Drone)

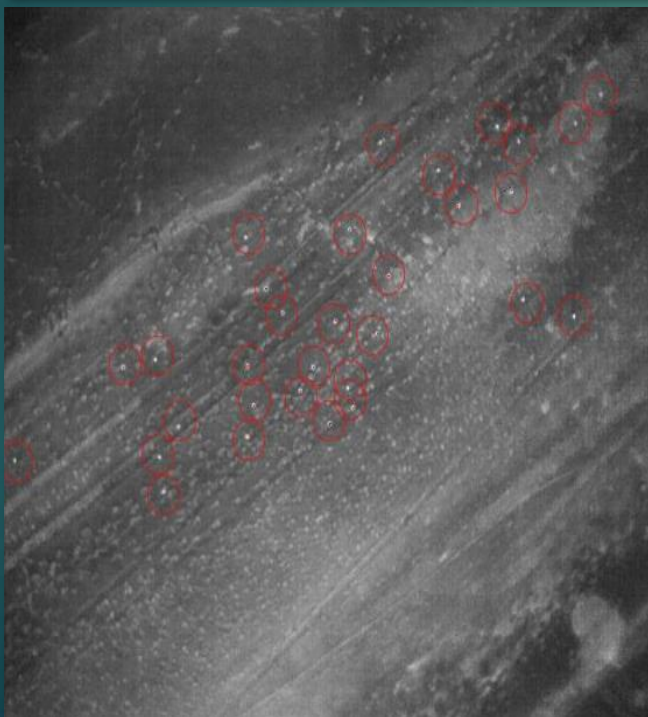
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- Using a UAV we mapped the Ormond beach to produce high resolution outputs not typically available or possible to get at a high frequency to monitor temporal changes in the dynamically changing dune system
 - Orthomosaic
 - Digital Elevation Model (DEM)
 - Point Cloud



Using Thermal Imaging on a Drone

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- Working with new technological applications of thermal imaging on drones
 - Identify birds
 - Find nests
 - Minimal disturbance
- Long term management implications



Ormond Beach Video

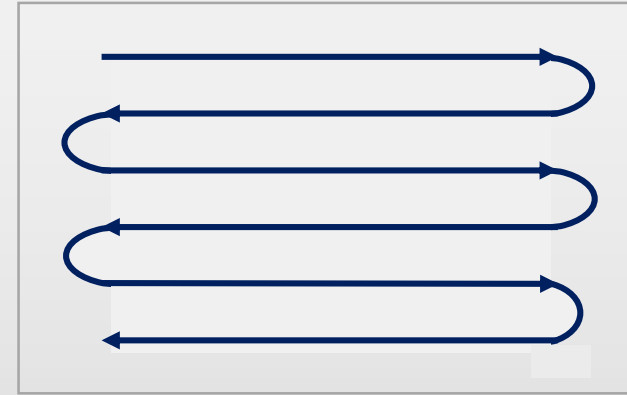
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Methods: Drone Flights

Flight details

1. Drone followed a gridded flight pattern
2. Altitude 30m (100 feet)
3. Speed = 5-8 mph
4. Flight time 12-15 minutes (battery limited)



Methods

Drone Model	Weight	Size (Diameter)	Color	Image
DJI Inspire 1	6 lbs	581mm	Black and white	
DJI Mavic Pro	2 lbs	335 mm	Black	
DJI Phantom 4 Pro	3 lbs	350 mm	White	

DJI = Dà-Jiāng Innovations

Software: Pix4d → flight control, Drone Deploy → data processing, ArcGIS Pro, Trimble Business Center

Nest Video: GoPro Hero and Hero3

Methods: Nest Observations

Field Observations

- Watched nest from a distance of 150-200' with a spotting scope/binoculars
- Practiced before 1st flight
- **In radio contact with Matt, ready to cancel flight if drone flushed a bird**



GoPro Video

- GoPro placed next to nest
- Videos reviewed later and scored, 30 sec intervals
- Allowed to run until batteries ran out (1-1.5 hours)



Methods: Behavior Reaction Score

Score	Reaction Description	Demeanor
0	Resting: Sitting still, may alternate between open & closed eyes	Normal
1	Pecking at ground while sitting, scanning, preening, yawning, stretching, foraging, shifting position on nest	Normal
2	Turning head, looking up, tracking an object, feathers relaxed looking	Intent
2.5	<i>Obviously tracking a drone</i>	<i>Intent</i>
3	Ducking in place (whole body), feathers dropped	Defensive
4	Sudden head movement tracking object, feathers may drop, neck stretched neck, head or body may be turned → This behavior seen before bird leaves nest in panic	Alarmed
5	Quickly running off nest, can be after a reaction score #4, or with no warning → Different than walking off nest to forage	Alarmed

Behavior Reaction Score

Resting

0 Heavy Eyes



Relaxed

1 Housekeeping



2 Observing



2.5 Looking up



Alarmed

3 Ducking



4 Intense Stare



5 Leaving Nest



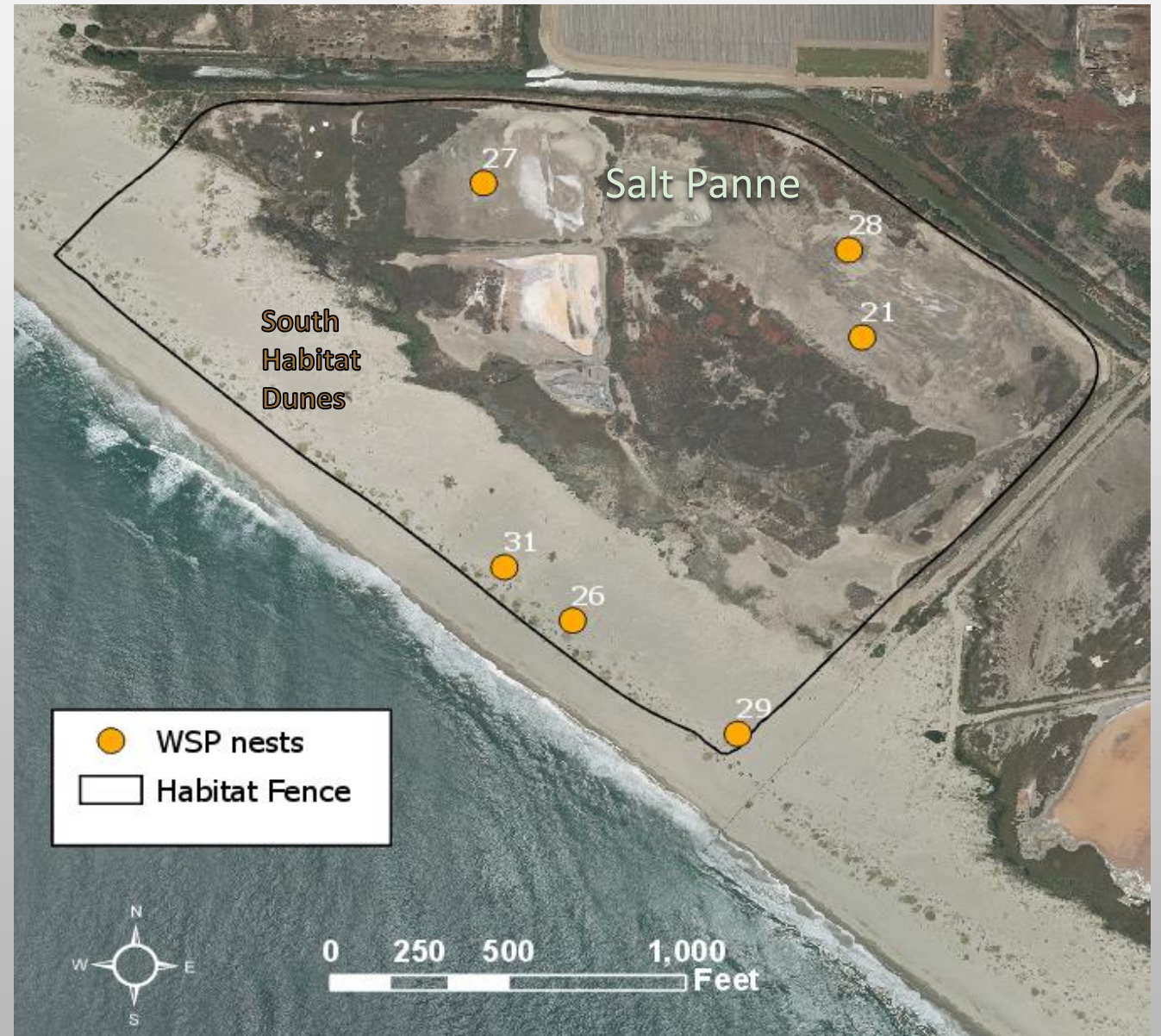
Methods: We flew Over 6 Nests

Date	Drone	Nest #
6/20/2018	Inspire (50m)	21, 27, 28
	Inspire	21, 27, 28
6/26/2018	Inspire	21*, 27, 28
6/29/2018	Inspire	21, 27, 28*
7/3/2018	Inspire	27
7/5/2018	Inspire	26* , 29
7/16/2018	Inspire	26, 29* , 31
7/17/2018	Phantom	26*, 29, 31*
	Mavic	26*, 29, 31*

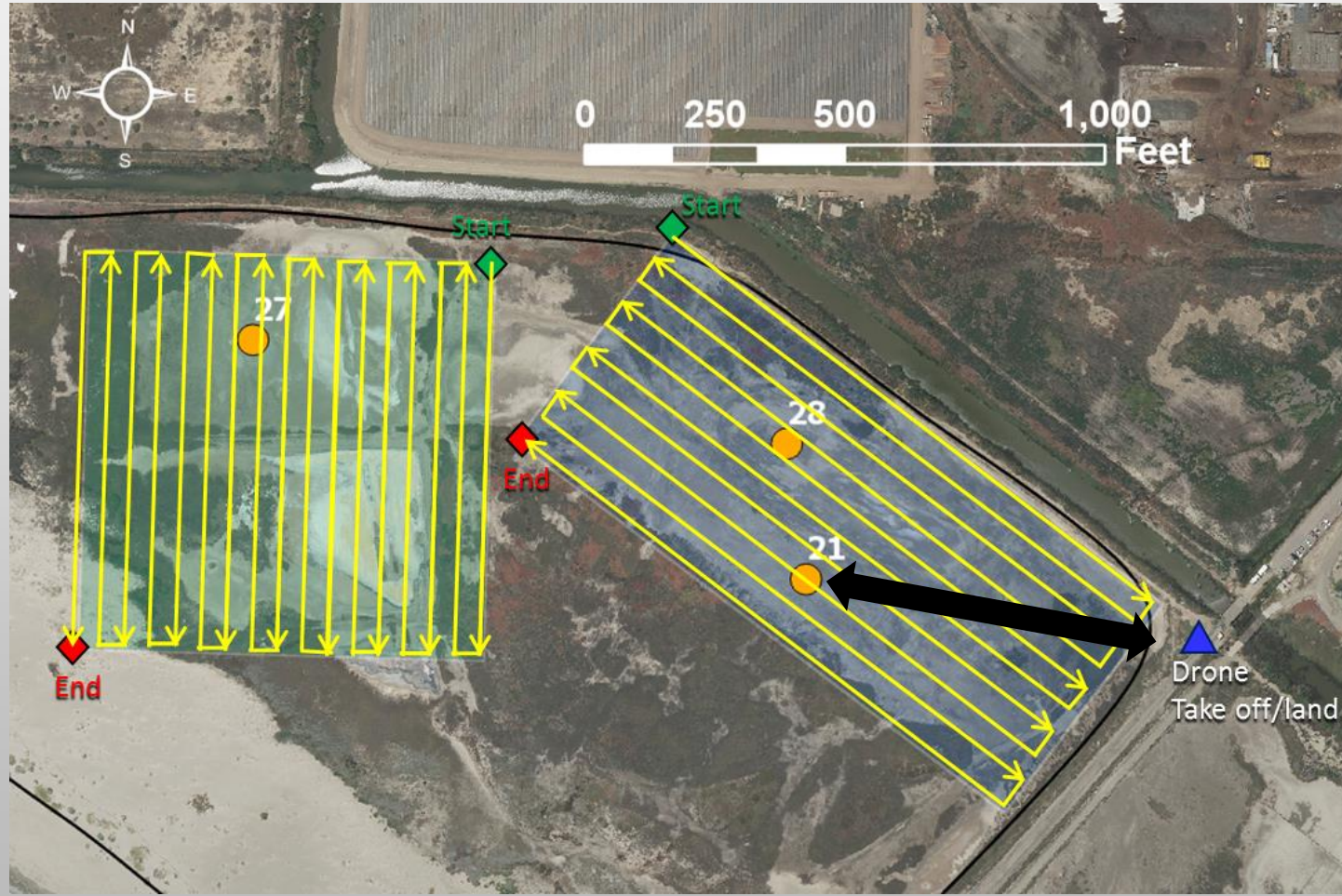
Salt Panne

South
Habitat
Dunes

*GoPro Video



Salt Panne flight path

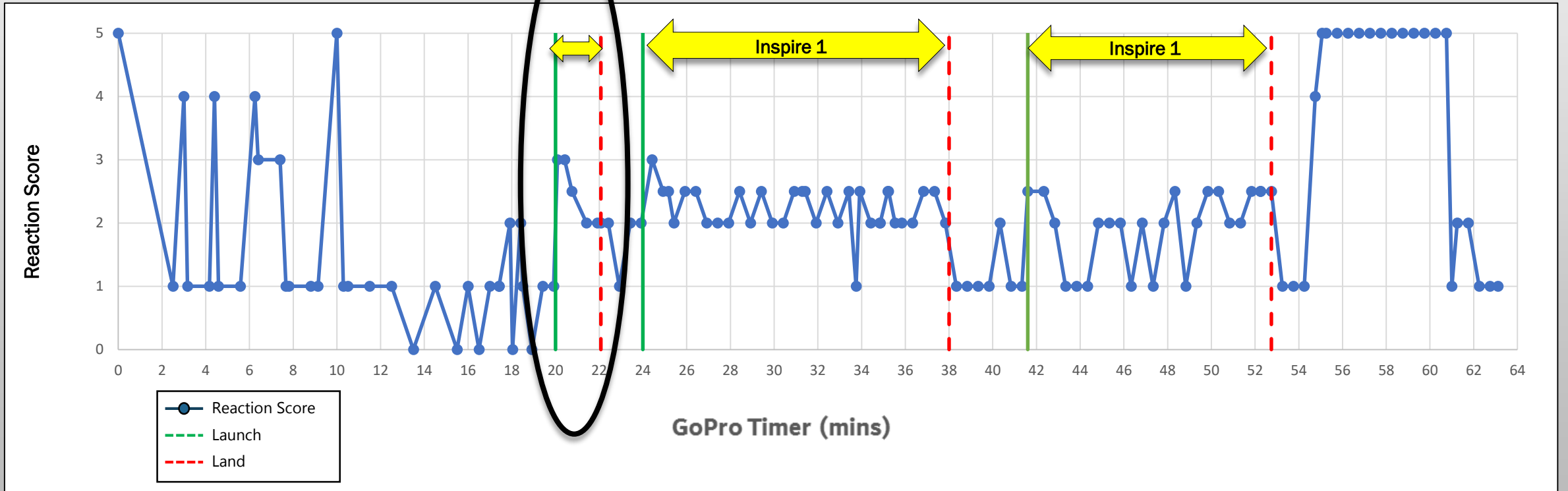


Drone launch distance to nest 21
800 ft (250m)

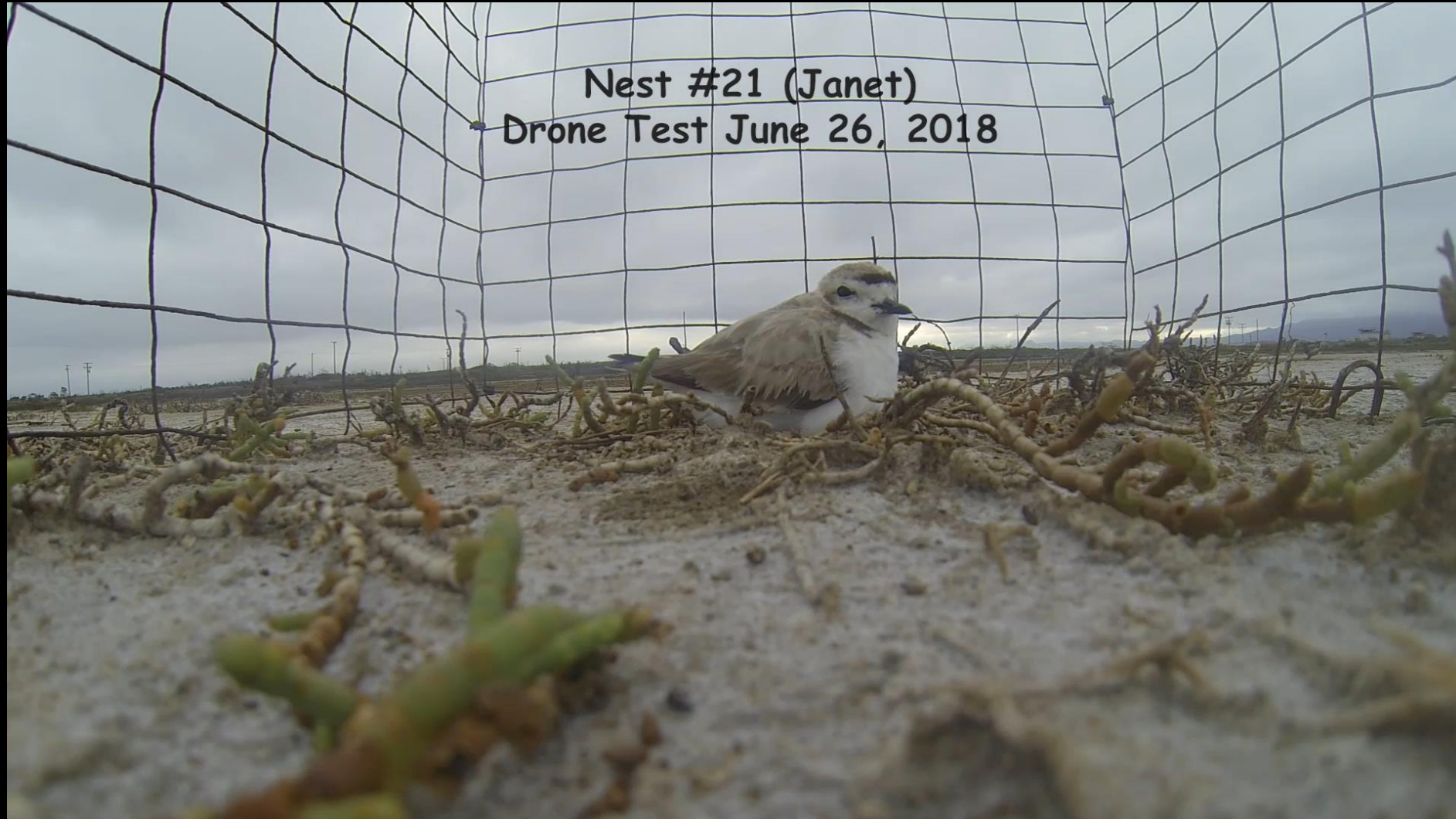
Nest 21 Reaction Scores

1. Drone can be seen launching and landing
2. Could see bird's reaction to drone
 - Launch
 - Flyover
 - Landing

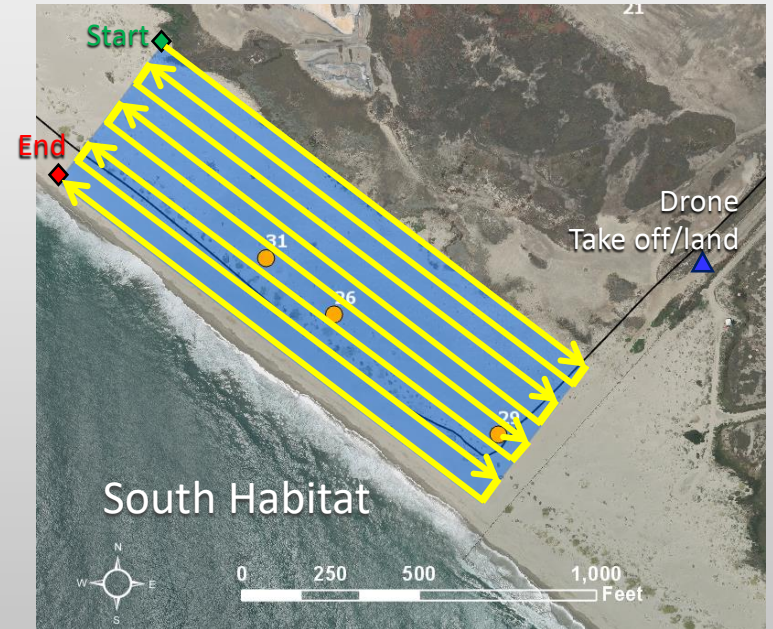
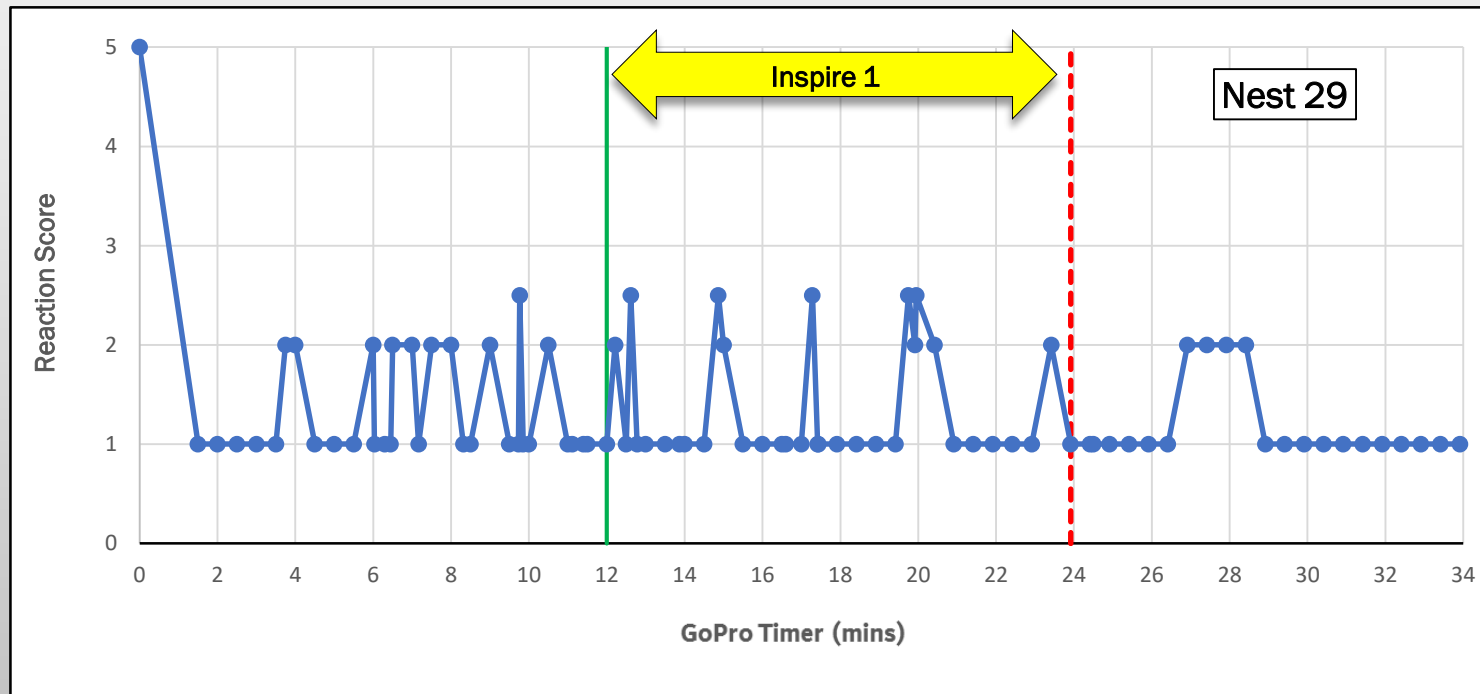
Drone
Video



First Video Recorded Drone Flight – 2:23 minutes



Nest #29 south dunes : *Drone turns over nest 4 times



Nest 29 drone test flight video: 3:50 minutes



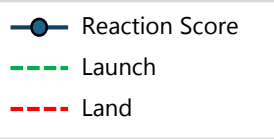
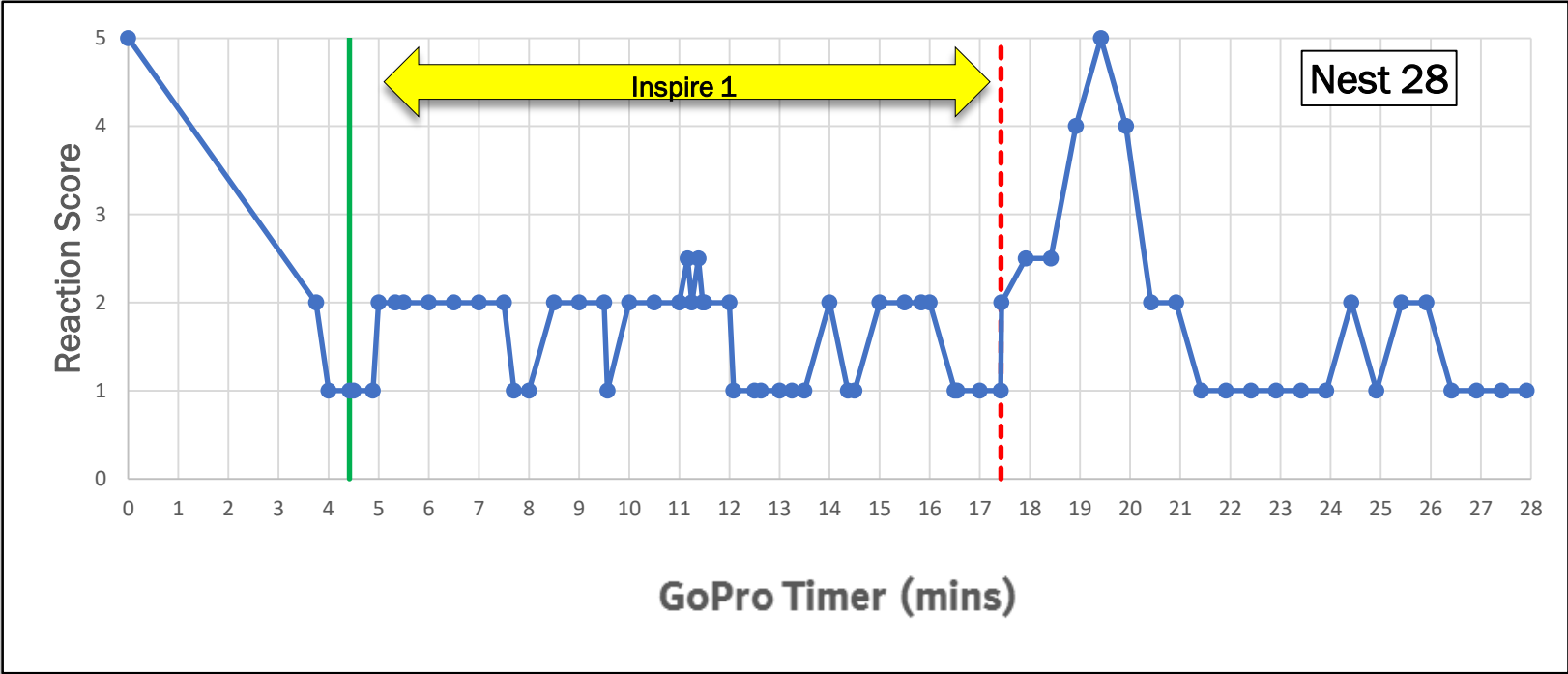
Loud Plane and Helicopter Flyover: 40 seconds



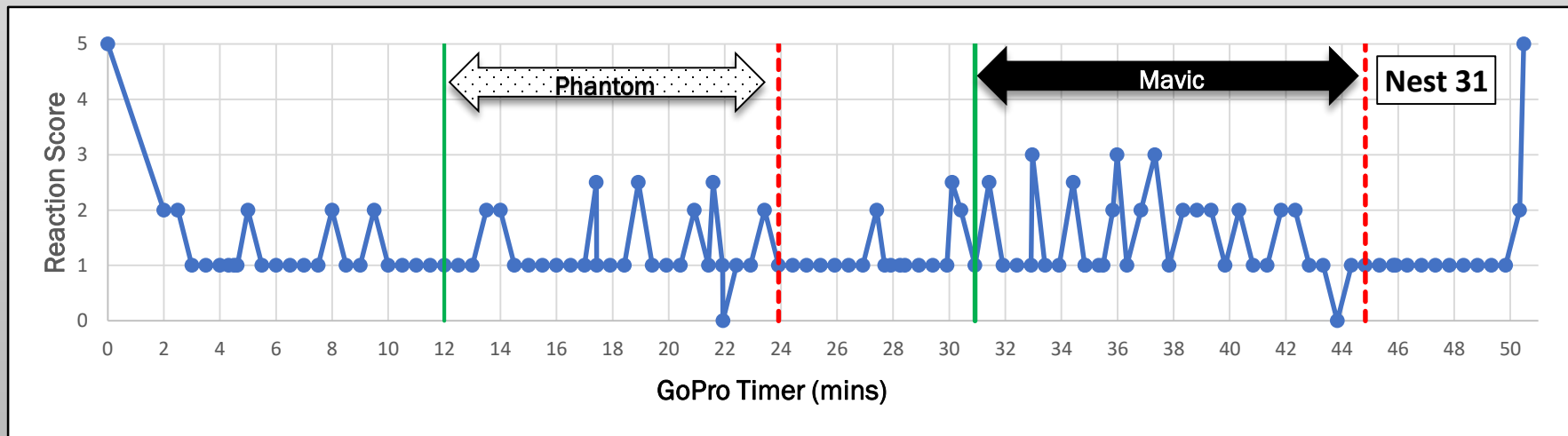
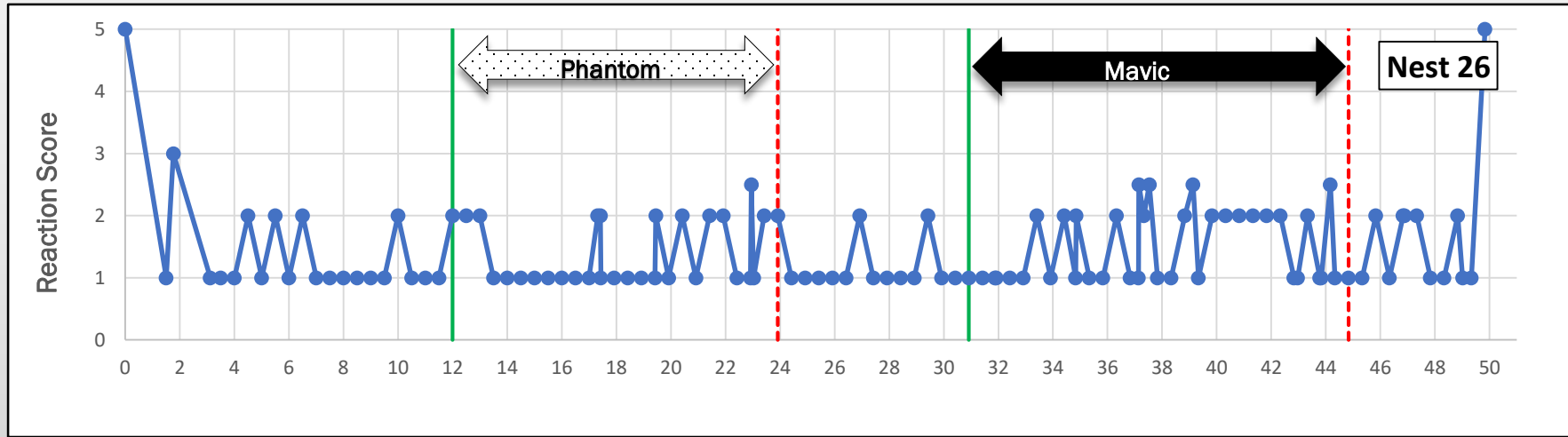
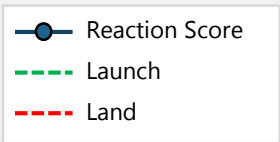
Additional flight reaction scores (no video)

Individual birds had varying reactions to drones

Salt Panne



July 17: Different drones



Summary of Nest Flight Findings

1. Brooding snowy plovers did not flush in response to drone flyover
2. However, they were aware of drone presence ...although responses were often subtle:
 - Turned head to look up at drone
 - In a few cases they ducked in place
 - Other times they appeared to stop activity and became still
3. Individual birds had varying responses
4. Birds appear to pick up on sight, more than sound of drone
5. One plover reacted to drone launch 800 feet away (250 m)

Questions?