Introduction – Wildlife & Agriculture

Where does wildlife conservation and management occur?
38.4% of world’s land under agriculture
26.3% is rangeland
In Florida, rangeland is 12 million ac or 1/3 of land area
Florida’s population may double by 2060
3 million ac ag, 2.7 million ac natural habitat converted
Wildlife conservation and management in agricultural lands is critical

Introduction – Why Amphibians?

Frogs
- Important prey
- Consume lots of insects
- Energy flow from aquatic to upland habitats
Salamanders
- Sirens and amphiumas
Global amphibian declines
“Canaries in the coal mine”
Introduction - Wild Pig (*Sus scrofa*)

Objectives

1. Wild pig diet
2. Drones and rooting
3. Impacts on salamanders
4. Impacts on tadpoles

Introduction - Study Site

Buck Island Ranch
- 10,500-ac ranch in Highlands Co., FL
- Full-scale commercial operation
- Over 600 wetlands
- Hundreds of miles of ditches
- Selected thirty-six 1-3 ac. seasonal wetlands
- Data collection from June 2016 - present
1 – Wild pig diet

Past studies have used DNA metabarcoding to examine seasonal shifts in diet (Bergmann et al. 2015). Studies have also examined wild pig diet using this technique (Robeson et al. 2017). However, none have examined seasonal shifts in diet of wild pigs.

Objectives:
1. Inventory diet items
2. Compare diet shifts across an entire year
3. Evaluate impacts on wetland species with an emphasis on amphibians

March 2016 – February 2017
Ranch divided into 5 sampling areas
≥ 5 fecal samples every 2 months

Methods
• 222 total samples
• Discarded 24
• 16 non-suid, 6 too old
• 200 samples retained
• QAQC of BLAST Consensus Lineages
  1. Each OTU reviewed
  2. BLAST results compared to local species inventories and primary literature
  3. Identified to lowest taxonomic level
  4. Discarded any not identified to Family
  5. CO1 & 12S – Pig and human OTUs removed
  6. CO1 – certain taxa immediately excluded
1 – Wild pig diet

Wetland animal taxa across time
Percent of diet differs with peak in January-February
3 amphibian taxa consumed
Eastern narrow-mouthed toad
Siren (4) and dwarf siren (2)
Only in January-February

Pigs are rooting up and consuming aestivating salamanders

2 – Drones and rooting

1 - Develop rooting analysis protocol
Obtain UAV-derived imagery for study wetlands
Mosaic imagery to create a single georeferenced image
Perform spatial analyses on mosaicked image to quantify extent of rooted areas

2 - Examine the impacts of swine removal on wetland damage across a dry season

Drone – DJI Phantom 4
Map Pilot for DJI App
Open app in field
Input flight parameters
2 – Drones and rooting

- 35-140 images / wetland

W421 – January 2017

Classify Raster
Train ArcGIS by classifying a subset of pixels
Perform a Maximum Likelihood Classification analysis
2 – Drones and rooting

Delete incorrectly-classified polygons
Create fishnet to form grid
Delete incorrectly classified polygons

Correctly Classified

Incorrectly Classified

2 – Drones and rooting

Calculate Extent of Rooting Damage

WL42 – January 2017
263.35m² rooted
2.3% of wetland rooted

2 – Drones and rooting

• Fall 2016 – Removal effort for pigs south of canal
  • Removed ~ 100 pigs
• How quickly will pigs recolonize???
• Analyzed rooting across entire 2017 dry season
  • 11 (all) in the south, and 10 in the north
2 — Drones and rooting

- 2/11 wetlands in south had rooting
- 9/10 wetlands in north had rooting
- Extent of rooting varied between areas

2017

WL553
- 0 m², 0.00% rooted

WL221
- 140.77 m², 2.44% rooted

WL570
- 0 m², 0.00% rooted

WL599
- 202.31 m², 2.03% rooted

WL231
- 1703.52 m², 26.56% rooted

WL186
- 1786.69 m², 42.15% rooted

2 — Drones and rooting

Improved: mean = 16.23, sd = 17.62, min = 0.09, max = 42.15
Semi-Native North: mean = 4.83, sd = 7.10, min = 0.00, max = 17.36
Semi-Native South: mean = 0.19, sd = 0.61, min = 0.00, max = 2.03

- Conducted Kruskal-Wallis Test
- chi-squared = 13.12, df = 2, p-value = 0.0014

3 — Impacts on salamanders

Does rooting in wetlands impact aquatic salamanders?
Trapped salamanders from 2016-2018
- July-November (varied by conditions)
- 15 crayfish traps randomly placed in each study wetland, checked once a day for 5 days
- Salamanders collected and returned to lab
- Measured, marked, and released
3 – Impacts on salamanders

84 greater sirens
8 lesser sirens
and 16 two-toed amphiumas captured
Different distributions across ranch

3 – Impacts on salamanders

> 7,500 trap checks over 3 years
All taxa, not just salamanders, recorded
Large data set on fish, snakes, turtles, and invertebrates

4 – Impacts on tadpoles

Is pig rooting indirectly affecting tadpole growth, survival, and species richness?
Dip netted 36 wetlands for tadpoles from 2016-2018
For each dip, the number of tadpoles and developmental stage were recorded
For non-rooted wetlands: 25 dips
For rooted wetlands: 50 dips (half in rooted areas)
Dips in 4-16 inches of water
4 – Impacts on tadpoles

In 2018 1,968 tadpoles captured across 36 wetlands
14/36 wetlands had rooting
Significantly more tadpoles in non-rooted areas

4 – Impacts on tadpoles

Other patterns –
Squirrel Treefrogs (n = 983)
Pine Woods Treefrogs (n = 155)
Barking Treefrogs (n = 7)
Southern Cricket Frogs (n = 341)

Future analyses –
Incorporate water quality and vegetation data

Conclusions

Pig Diet
Eating amphibians, consuming salamanders in winter

Drones & Rooting
Developed efficient method to measure rooting

Impacts on Salamanders
Factors impacting occupancy and detectability TBD

Impacts on Tadpoles
Significant effect within wetland, landscape effect TBD
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