

Are birds enhanced salt marsh resilience to drought and vegetation dieback?

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Southeastern Salt Marsh Disturbance

Drought

- > 1000 sq. km affected in southeast in last decade
- $\text{FeS}_2 + \text{O}_2 \rightarrow \text{H}_2\text{SO}_4 =$ low pH and metal toxicity
- Leads to sudden vegetation dieback
- Detritivores help remove dead biomass
- Denuded mudflat remains

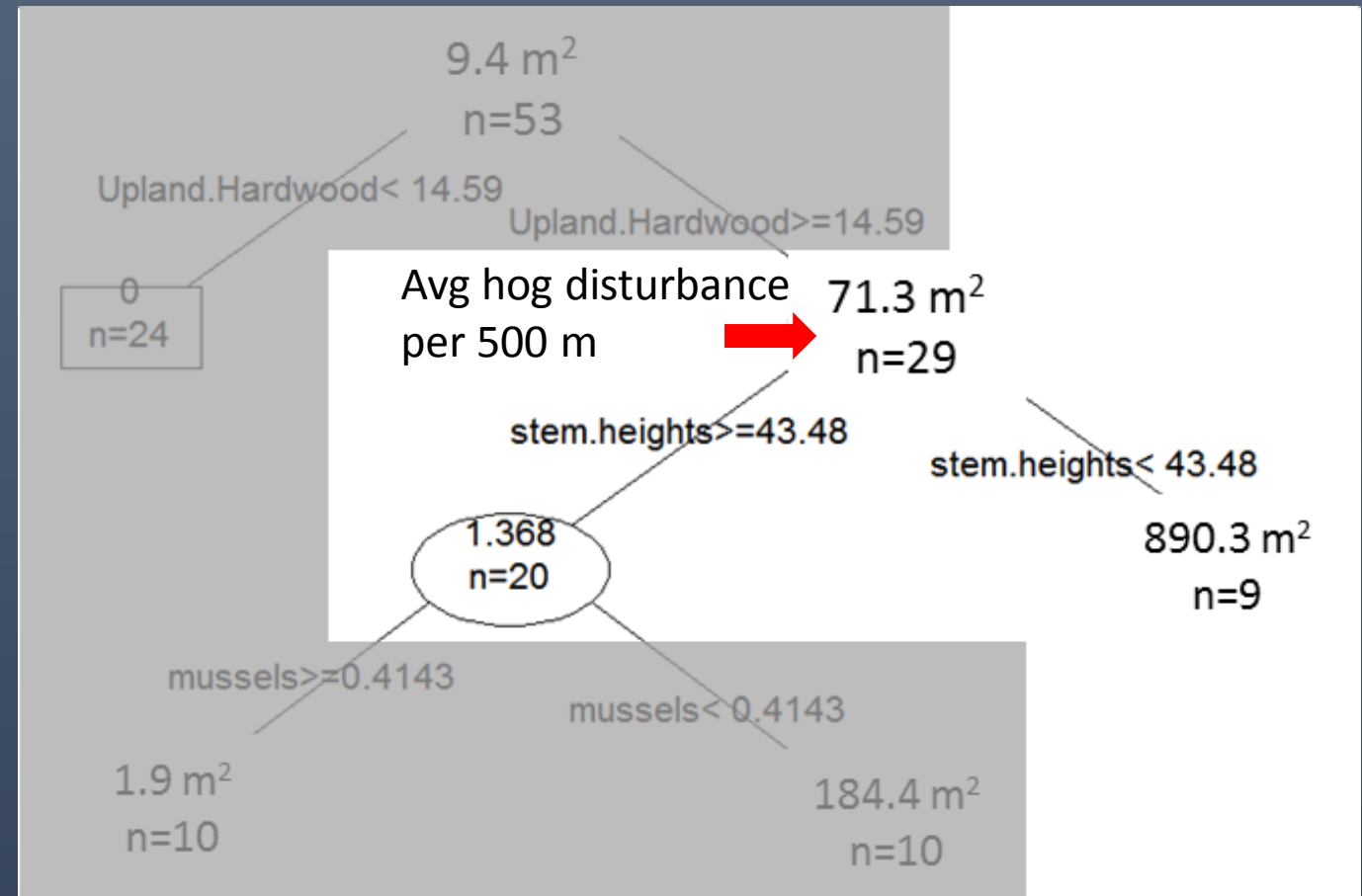


Use of mudflats by vertebrates

- Hogs prefer grass under 50 cm (Sharp and Angelini, *in prep*)



Photo credit: S. Sharp



Use of mudflats by vertebrates

- Birds often foraging in mudflat
- Ibis reported to prefer feeding in shorter *Spartina* grass

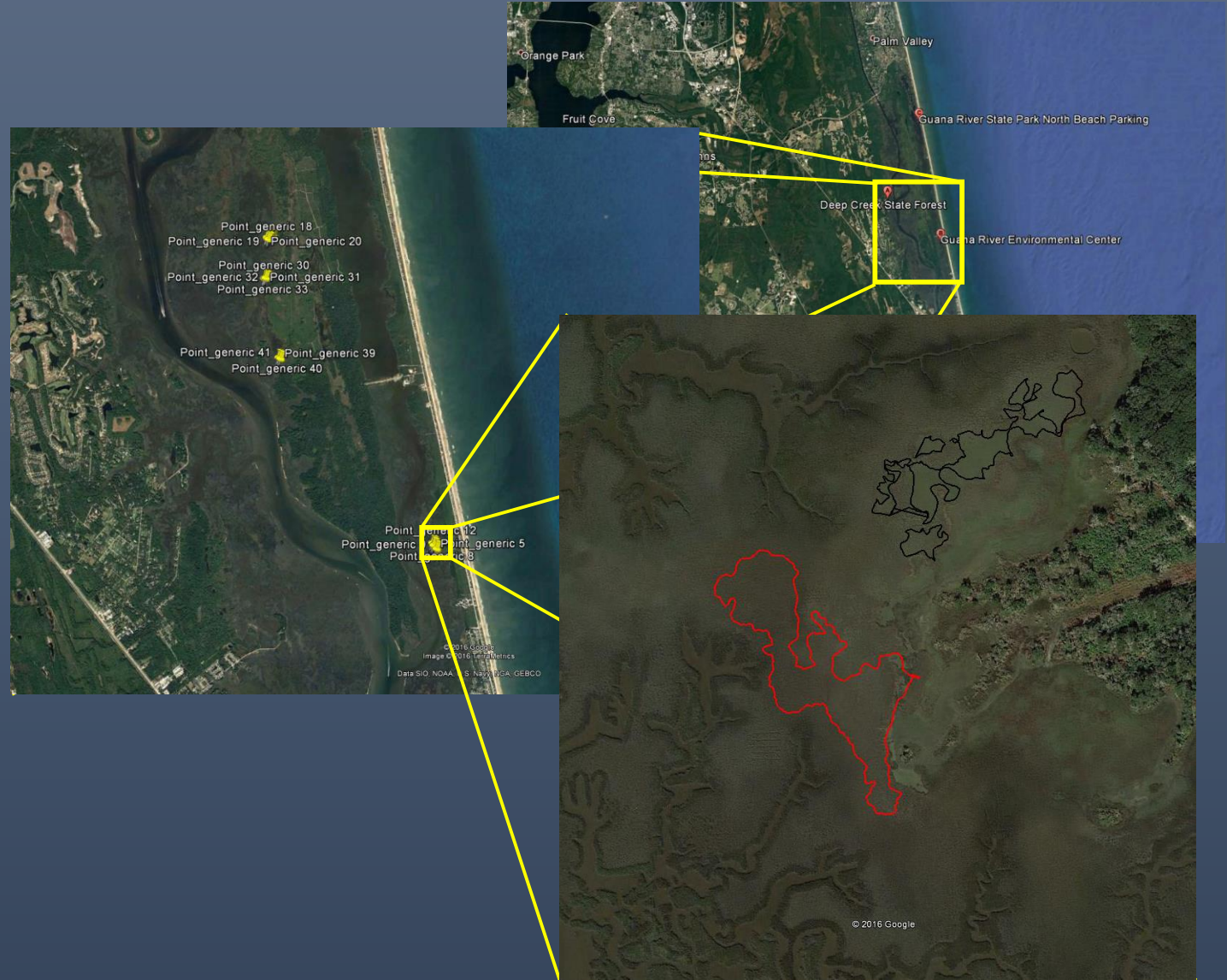


Are birds affecting recovery of cordgrass after drought?



Study area

- GTM NERR North of St Augustine
- Large dieoffs popping up in last year
- Birds often foraging in these areas



Study Questions

- What bird species are using the dieoff and how (frequency, behavior, lifestage)
 - Probing birds, like ibis, would dominate the mudflat because of their ability to dissolve chitin
- Do foraging birds affect border expansion or cordgrass recovery?
- What is the relative importance of physical probing and nutrient enrichment on border expansion or cordgrass recovery?



Study hypotheses

- What bird species are using the dieoff and how (frequency, behavior, lifestage)
 - Probing birds, like ibis, would dominate the mudflat because of their ability to dissolve chitin
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Methods – Bird Survey

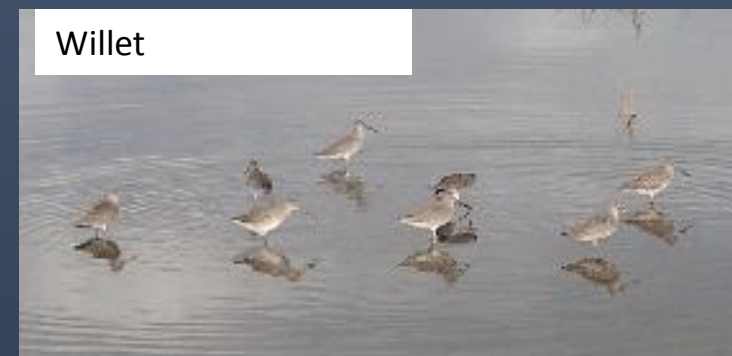
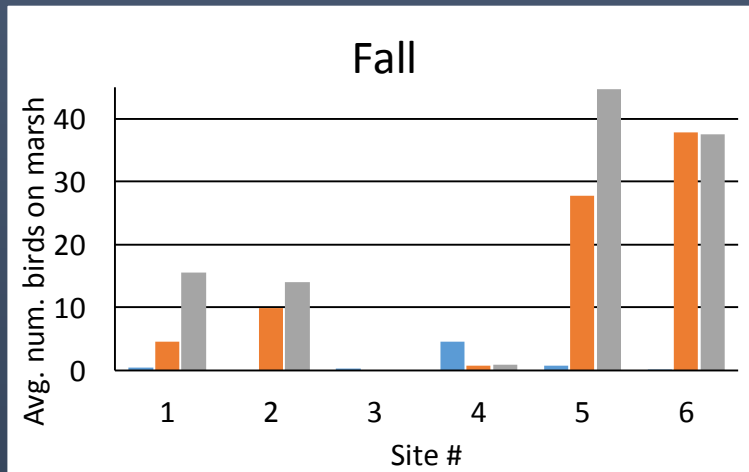
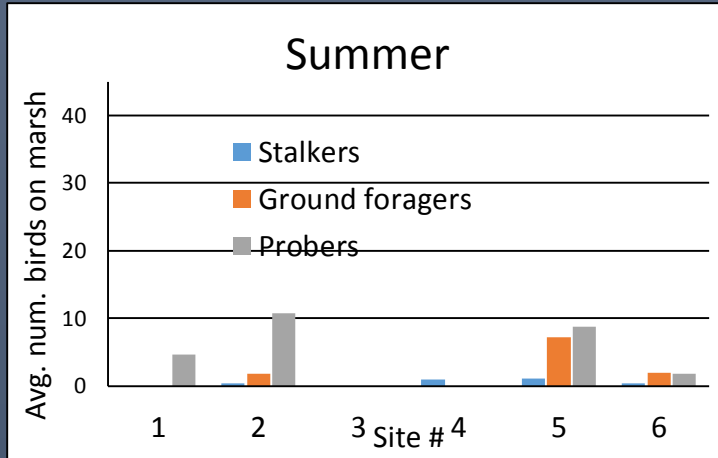
- Surveyed sites twice every season during spring and neap tide cycles
- Survey for entire low tide cycle (~6 hours)
- Counted all birds within die-off, monitored arrivals and departures
- Counted feeding birds every 15 minutes
- Noted feeding rates, prey items and catch efficiency





Bird data

- 15 different species observed
 - Split into foraging behavior
- Dominated by probers
- As many as 200 birds on a single site at one time



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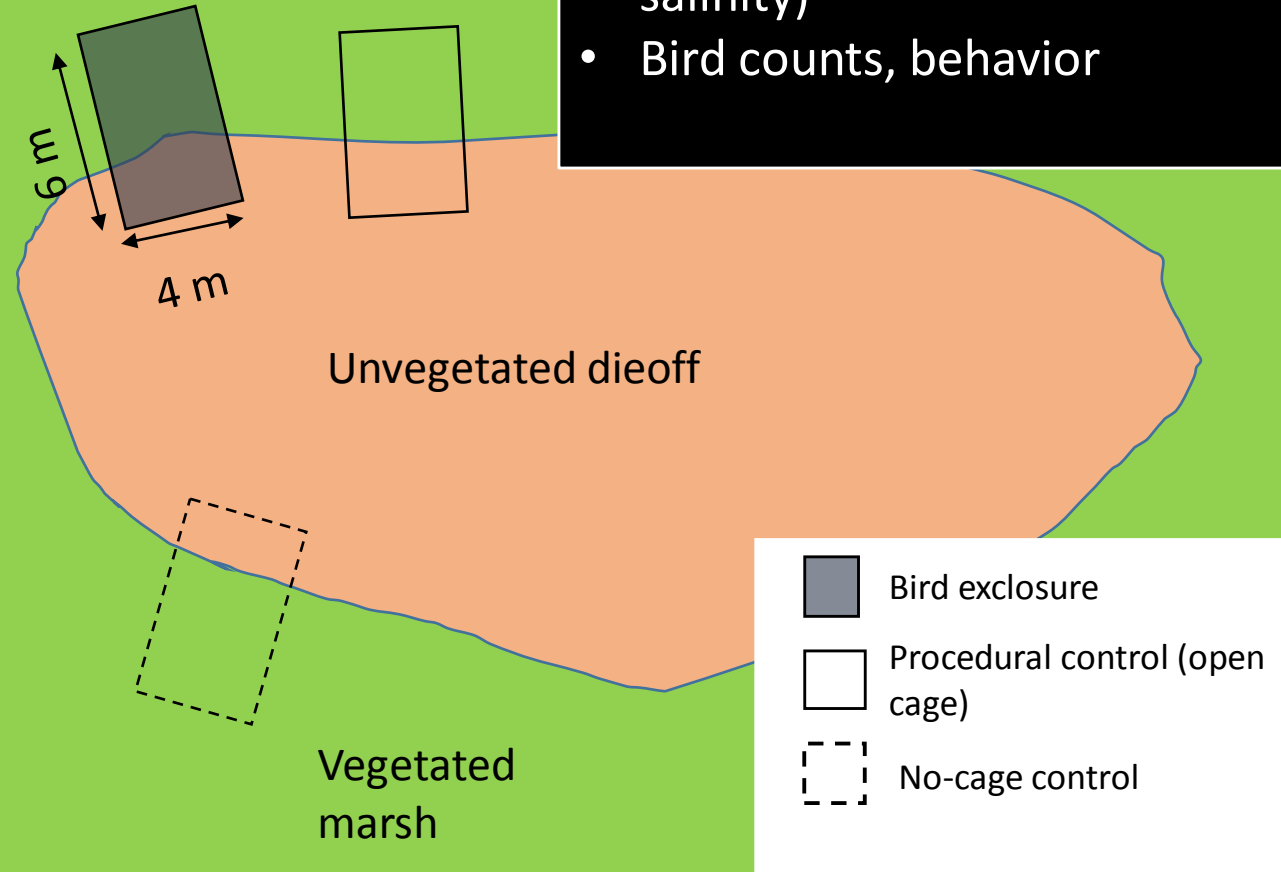


Study Design

- Do foraging birds effect border expansion or cordgrass recolonization?
 - – 6x4 plots with exclusion cages overlapping dieoff border

Variables measured

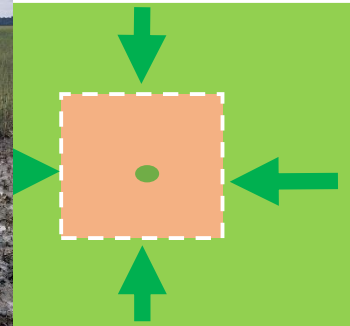
- Dieoff area/footprint
- Community surveys (vegetation, invertebrates)
- Porewater chemistry (ph, salinity)
- Bird counts, behavior



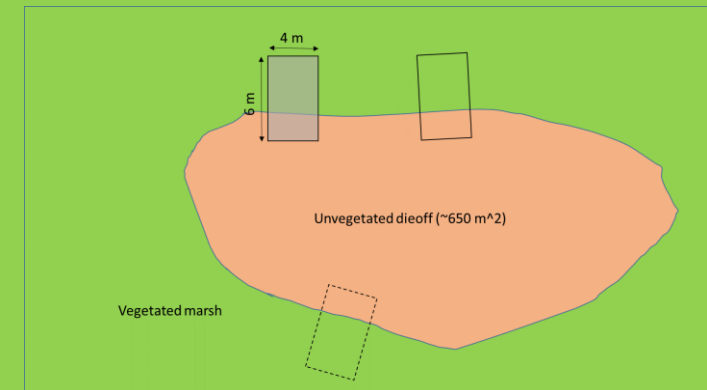
Study Design

- How do birds affect border movement and recolonization?
 - – 6x4 plots overlapping natural dieoff border
 - 3x3 m plots with vegetation removed to create disturbance baseline

- Bird exclosure
- Procedural control (open cage)
- ⋯ No-cage control
- Vegetated reference
- 25 cm dia. transplant



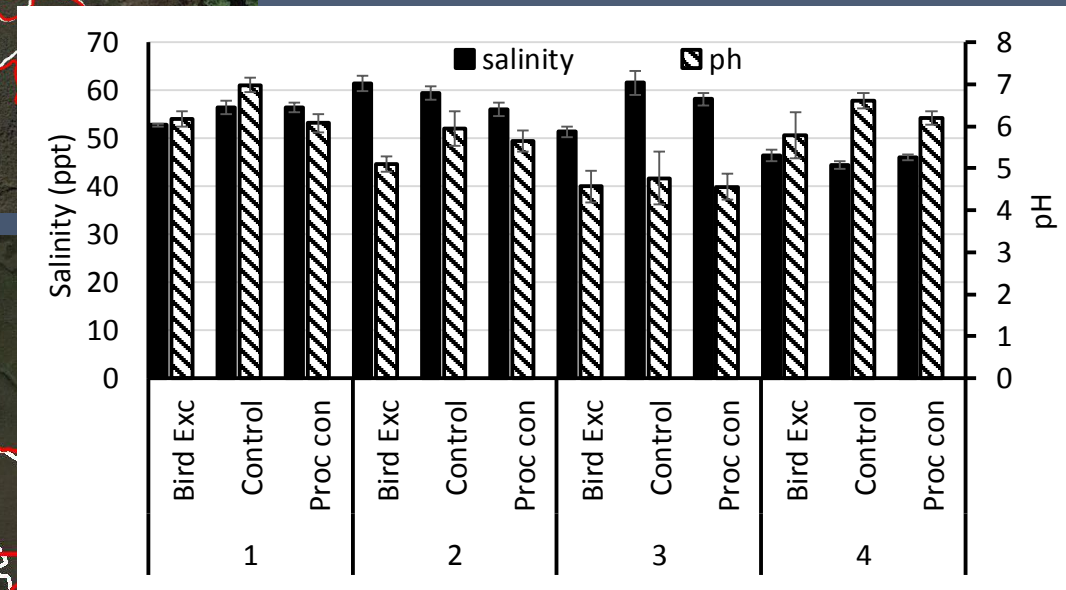
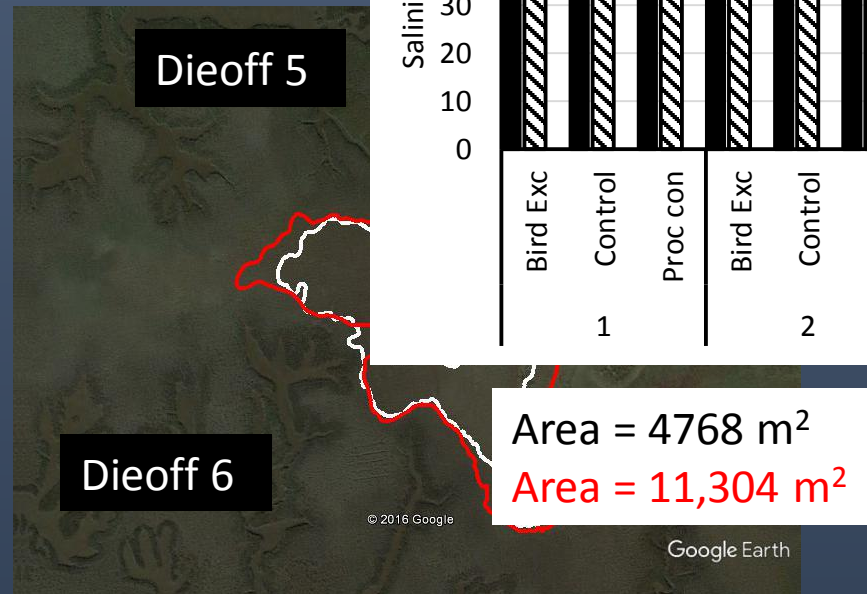
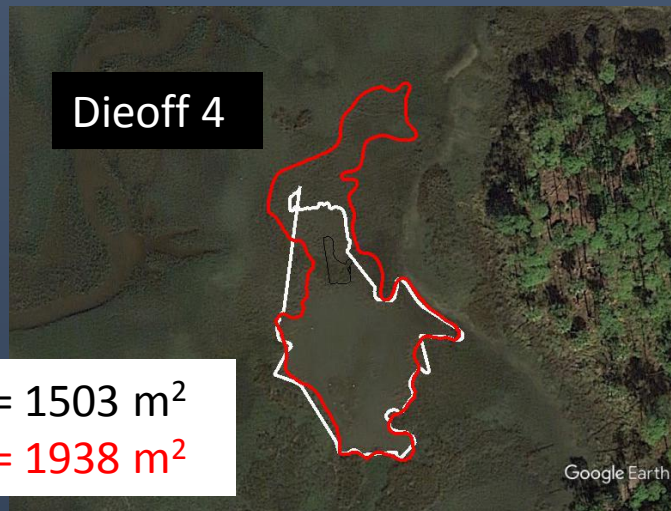
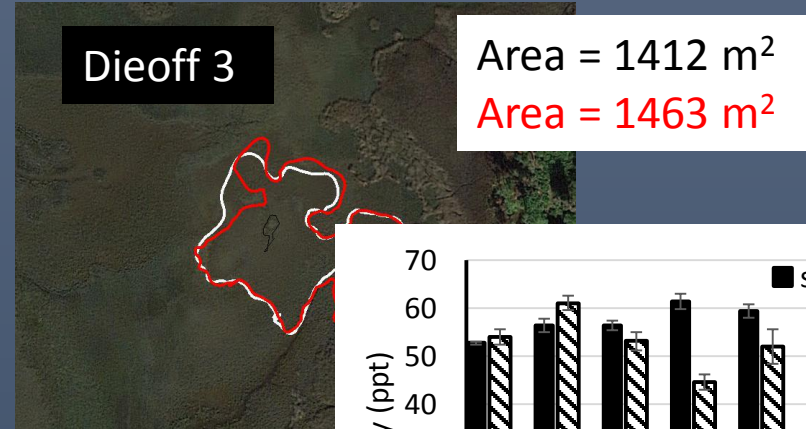
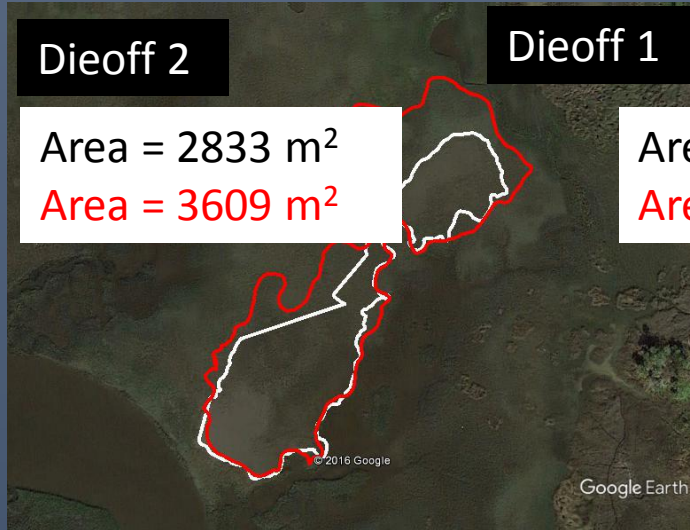
Vegetated marsh



Results - dieoff change over time

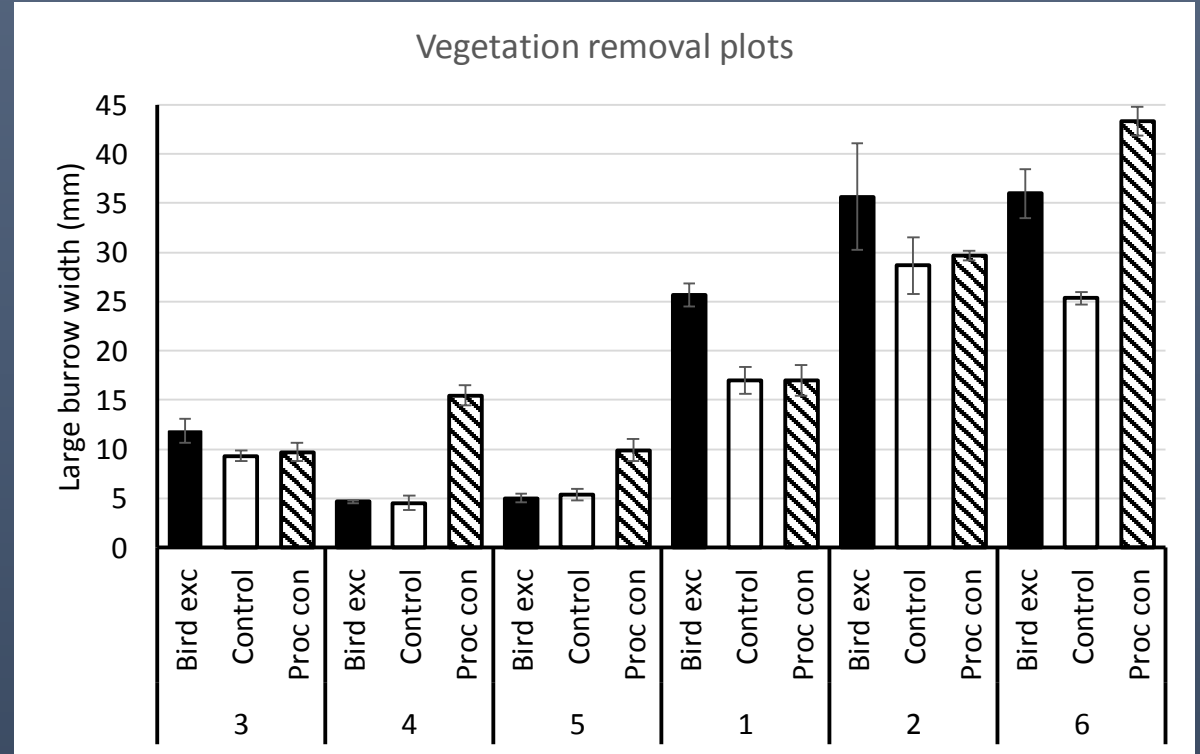
White = June 2016

Red = Januray 2017



Results – vegetation removed

- Burrows larger in exclusion
 - Burrows are important for aerating soil and flushing porewater!
- Transplants hit hard by expanding dieoff






Study Questions

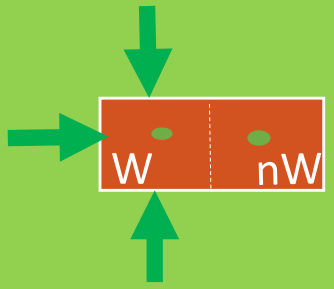
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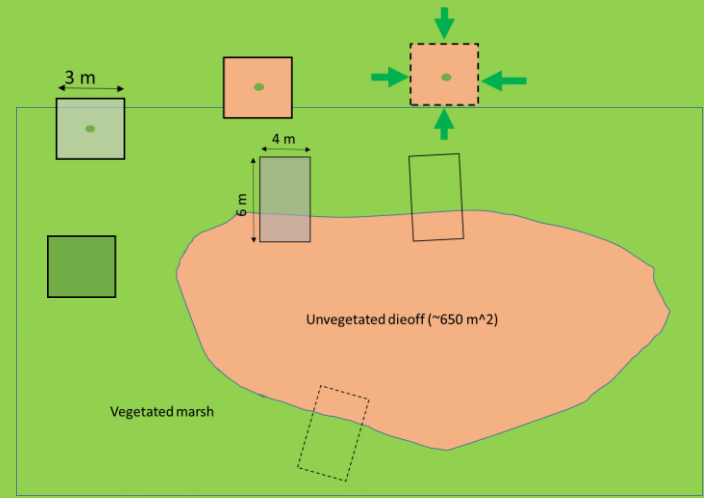
Study Design

- What is the relative importance of probing and nutrient deposition on border movement and cordgrass recovery
 - Fertilizer applied to reflect density of birds

	Fertilized caged plot
	Unfertilized caged plot
W	Widened crab burrow plot
nW	Non-Widened crab burrow plot
	25 cm dia. transplant

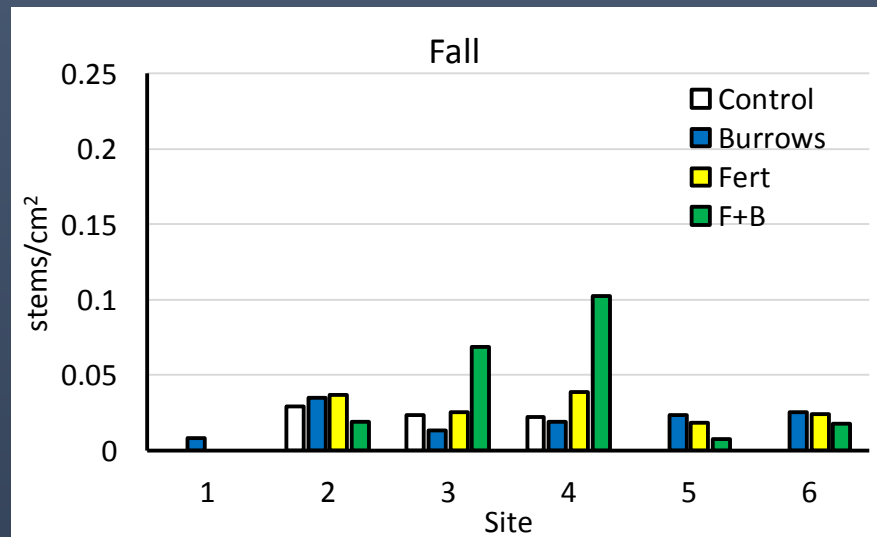
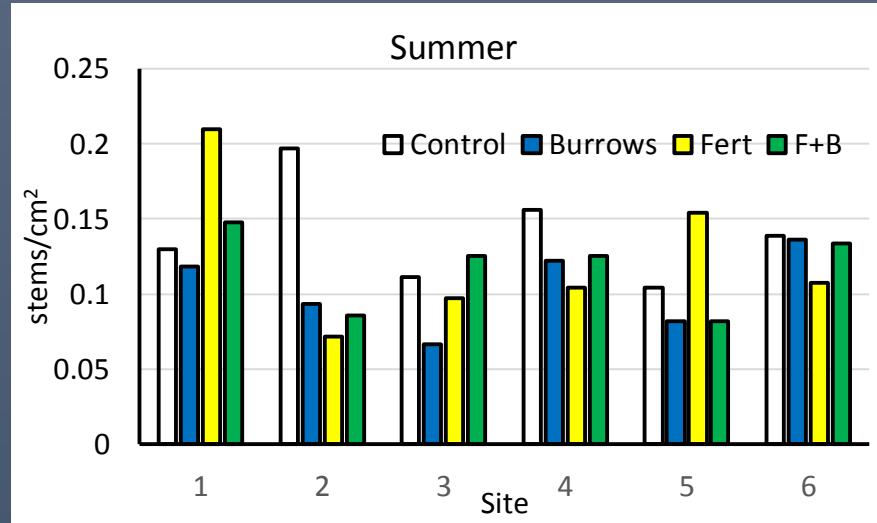


Vegetated marsh



Results –controlled experiment

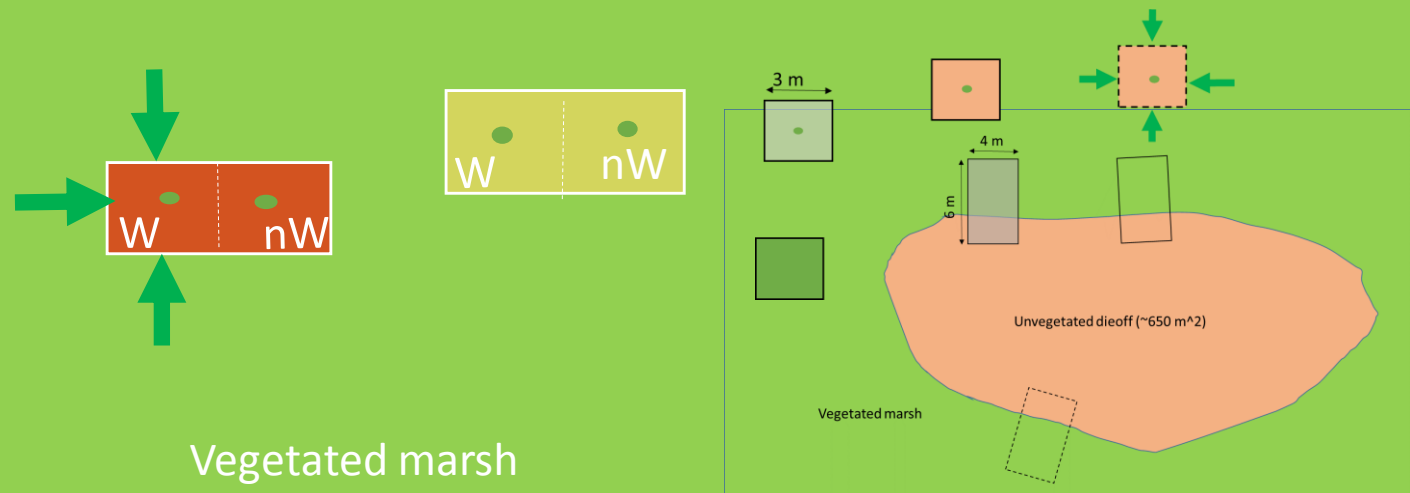
- Plots in path of expanding dieoff, transplants hit hard
- often did not survive dieoff
- F+B seem to indicate antagonistic interaction in more stressed environments



Trends so far...



- Lots of bird, mostly probers, using marsh
- Die-off is expanding, partly due to salinity and pH stress
- Birds possibly affecting crab burrow size
- Probing and fertilizing mechanisms increased resilience during dieoff



Thanks to...



Questions?

-E. Johnson, A. Berssoza, S. Crotty, K. Prince, K. Glodzik
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-Brandon Noel for bird help
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