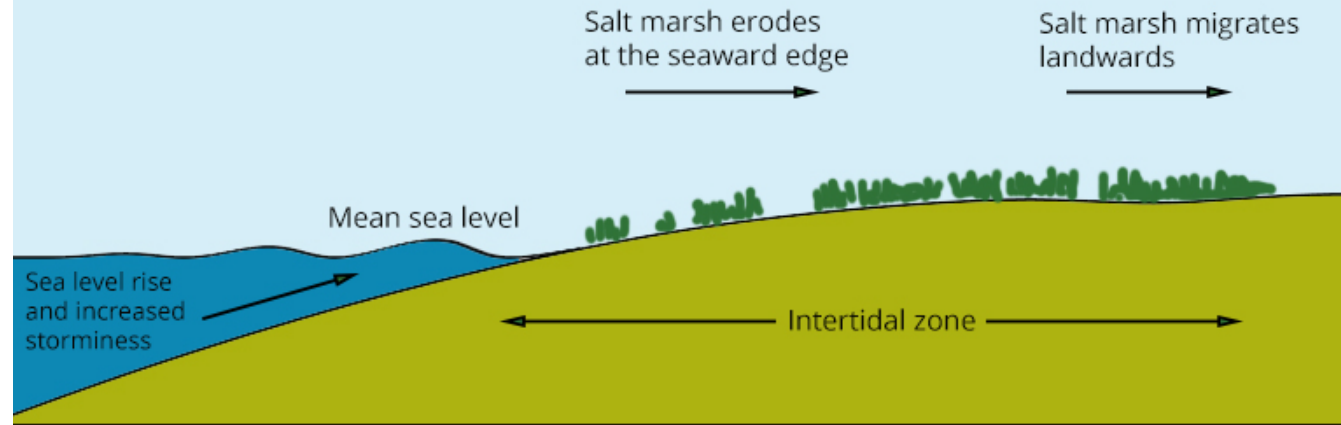


Optimizing hummock design for salt marsh restoration: managing tradeoffs between planting density and revegetation

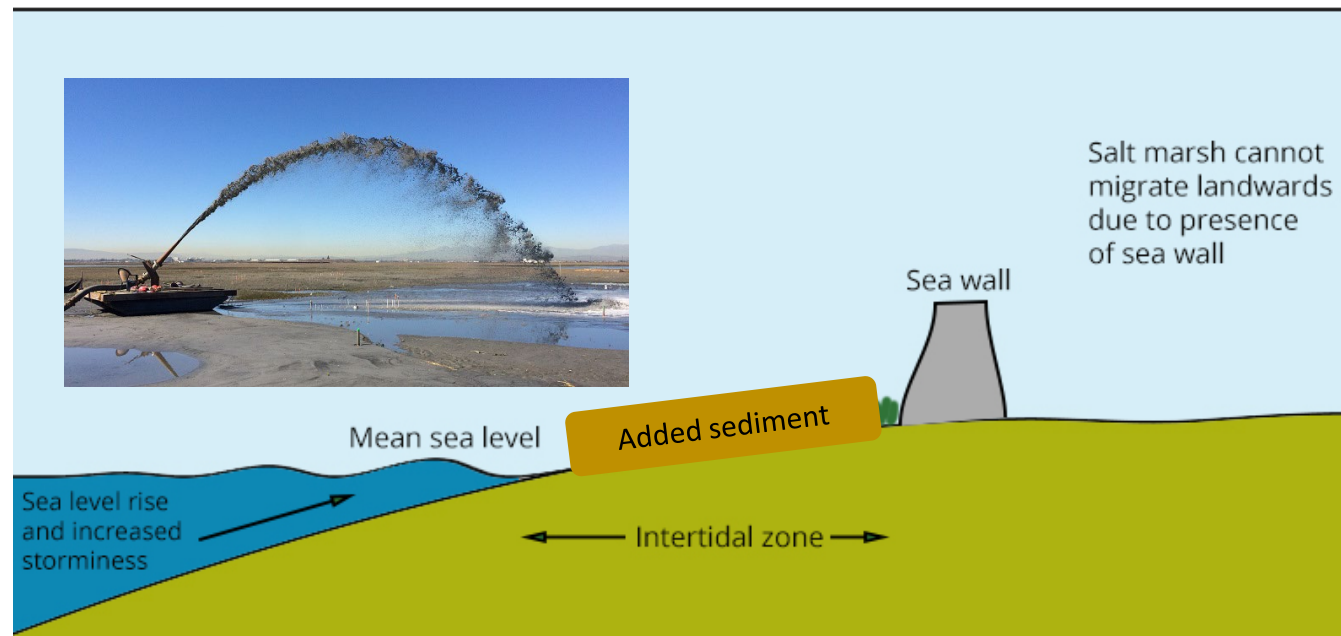
Nicolette Nelson¹, Madeline Kollegger², Olivia Lemieux², Franco Gigliotti¹, Beth Lawrence^{2,3},
Ashley Helton^{2,3}, Chris Elphick¹

1. Ecology and Evolutionary Biology, University of Connecticut; 2. Natural Resources and the Environment, University of Connecticut;
3. Center for Environmental Science and Engineering

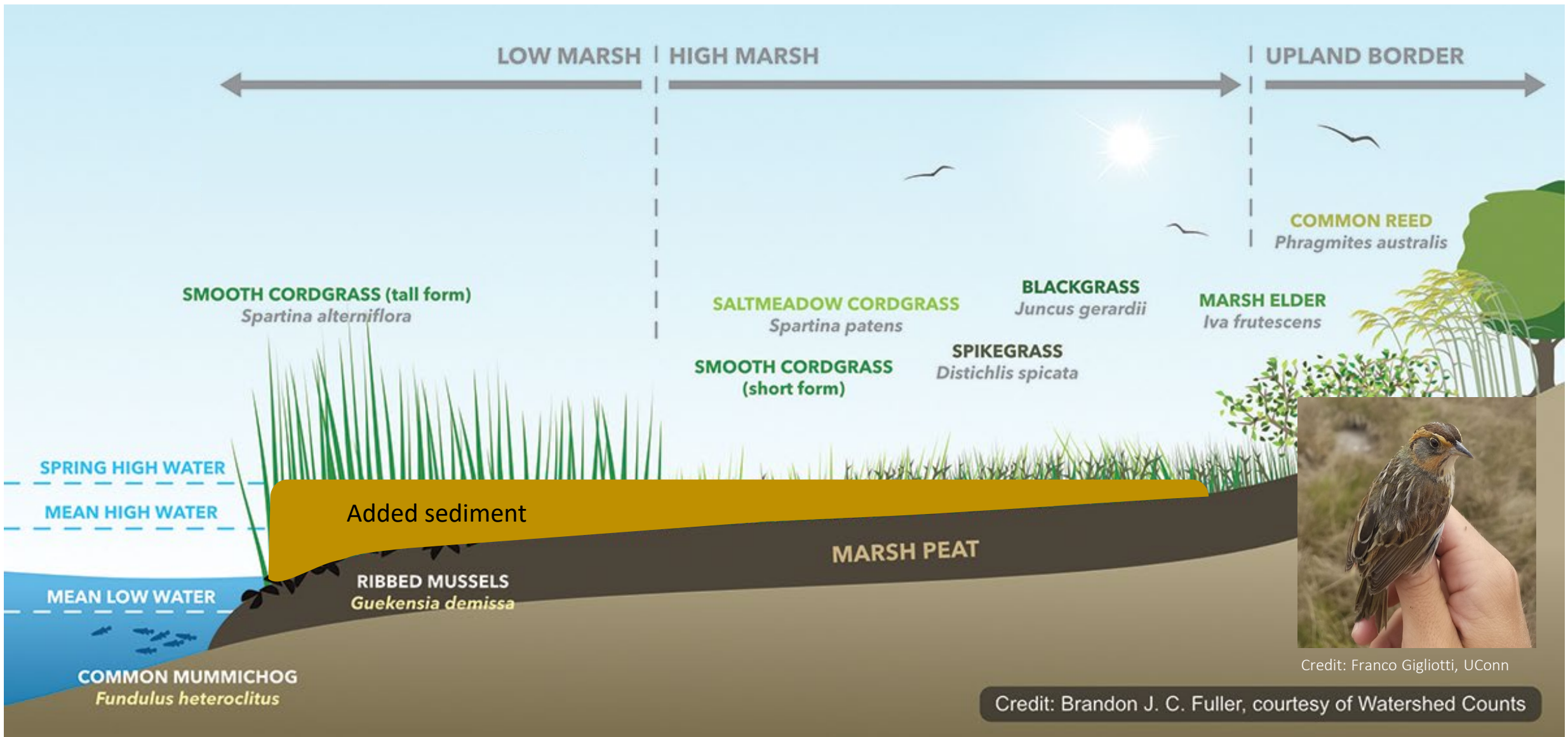
Natural habitat migration



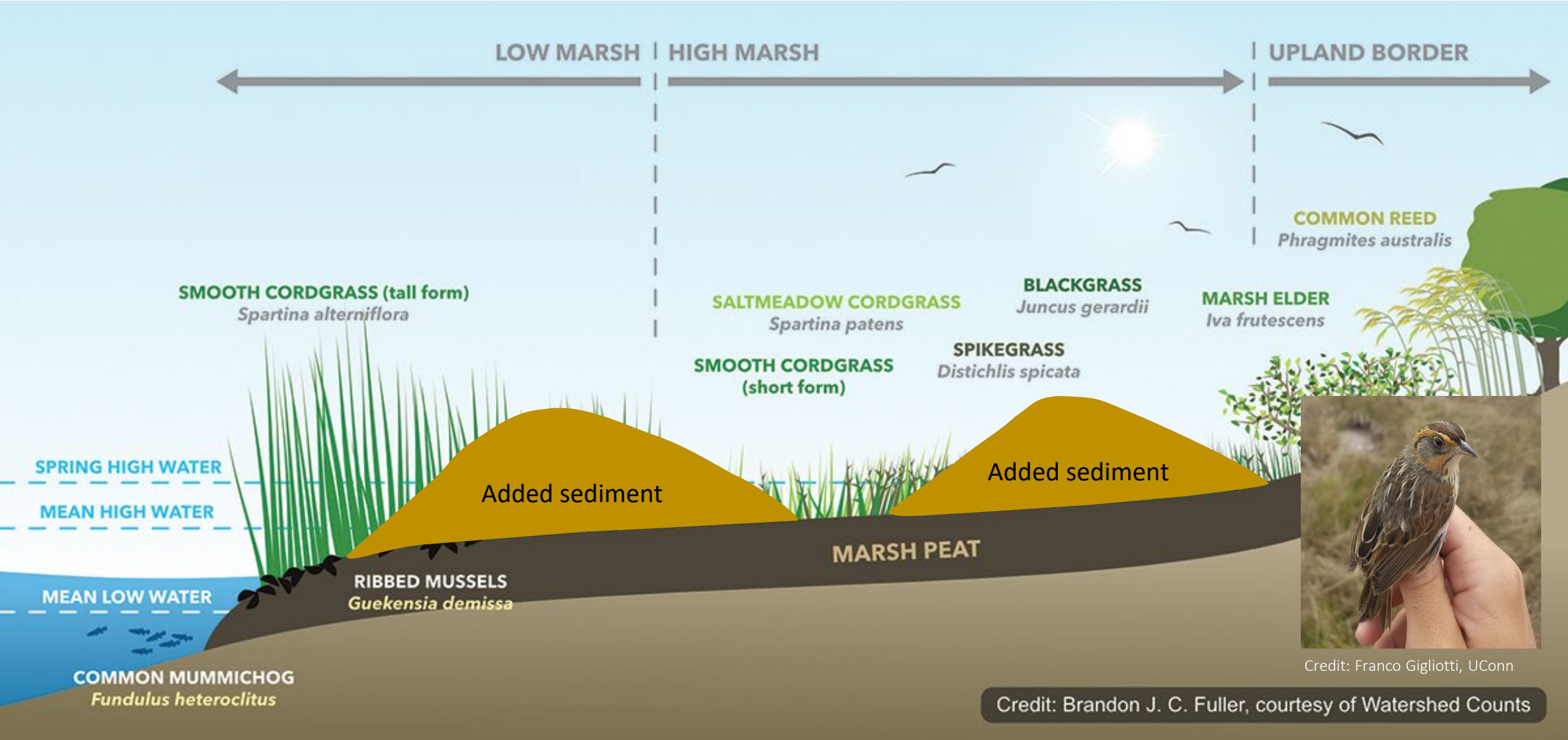
Thin layer placement



Typical thin layer placement



Variable depth sediment addition – “hummocks”





Restoration – spring 2022

- Years of planning
- 34 acres
- \$4.65 million
 - Sediment application – 14 hummocks constructed
 - 165,000 native plant plugs



Credit: Chris Elphick, UConn



Credit: Sarah Shearer, USFWS



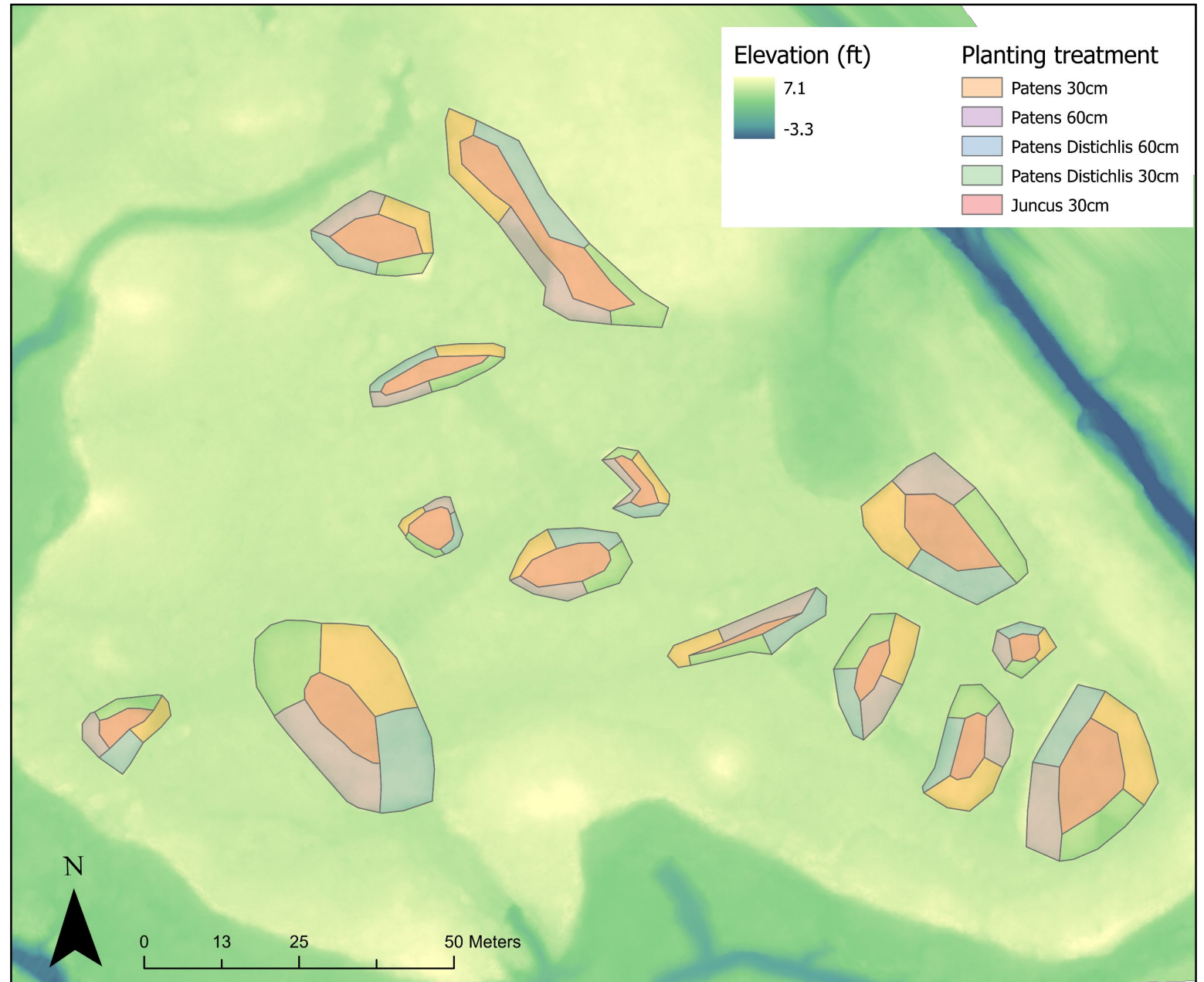
Hummocks design

Restoration targets:

- Maximum elevation – 5.5 ft (1.7 m)
 - Upland border zone
 - Infrequent inundation
- Create topographic variation
- Preserve existing salt marsh sparrow nest sites, create current/future nest sites

Experimental planting of high marsh species that varied in:

- Species composition
- Plug spacing



February 2022

August 2023

Goal – develop best practices for hummocks restoration

1. Were the targets for sediment elevation and plant species reached?
2. How many plugs should managers plant? Which species?
3. What about *Phragmites australis*?
4. Impacts/benefits to salt marsh birds?



Credit: Chris Elphick, UConn



Credit: Russell Beausoleil, UConn

Methods

2 elevations per treatment & unmanipulated control (1m² plots)

- Vegetation - percent cover
- Soil cores - salinity

Elevational transects (0.06m² plots)

- Vegetation - percent cover

Avian nesting and space use

Additional parameters

- Above ground biomass
- Greenhouse gases
- Soil microbes
- Soil characteristics
- Inundation frequency



Credit: Franco Gigliotti, UConn



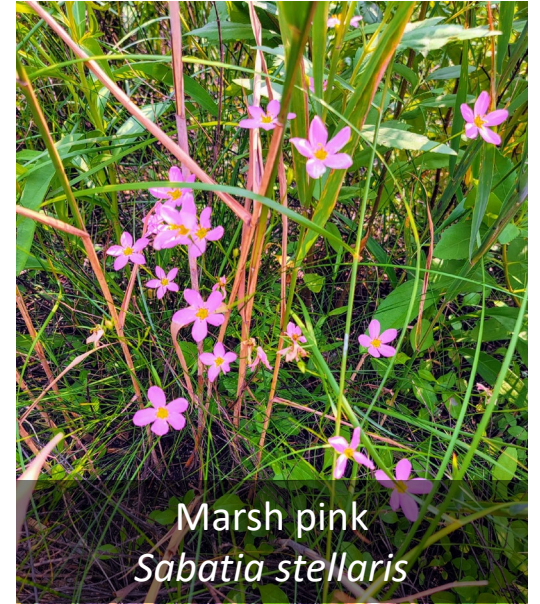
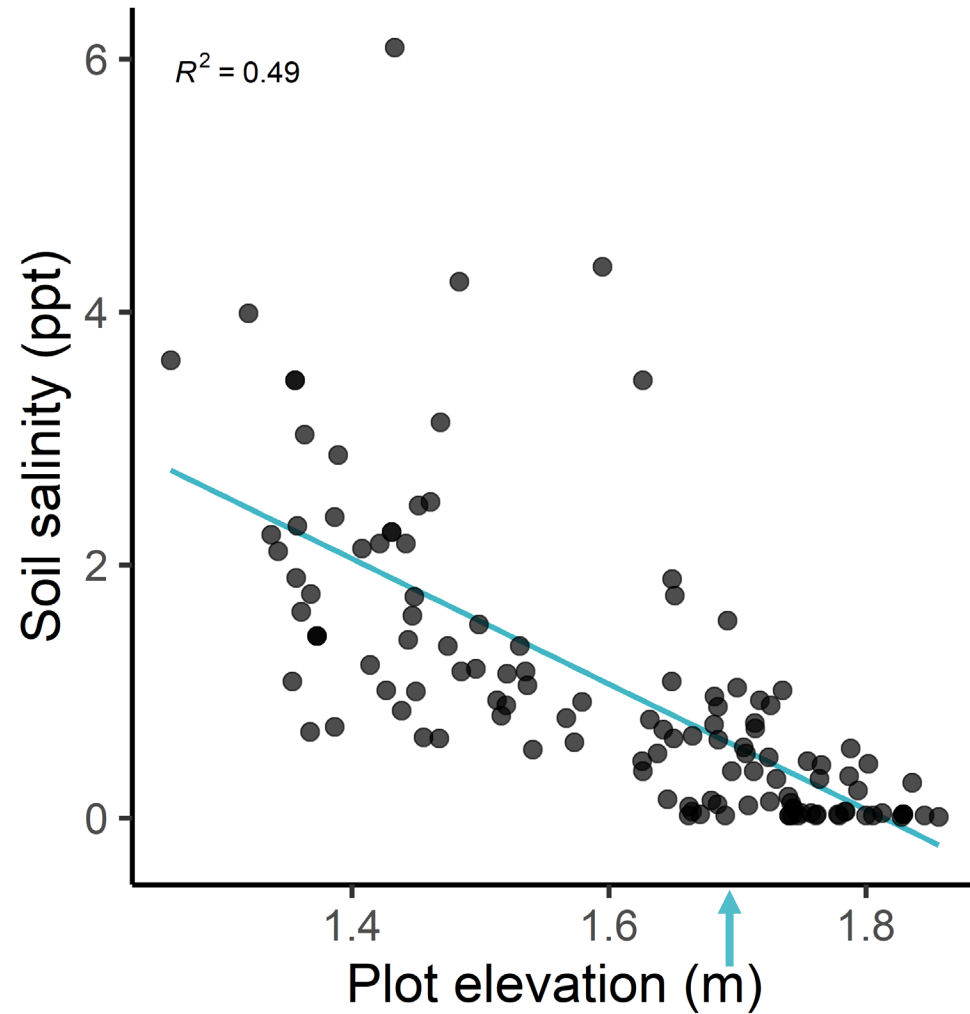
Credit: Franco Gigliotti, UConn

1. Were the targets for elevation and plant species reached?

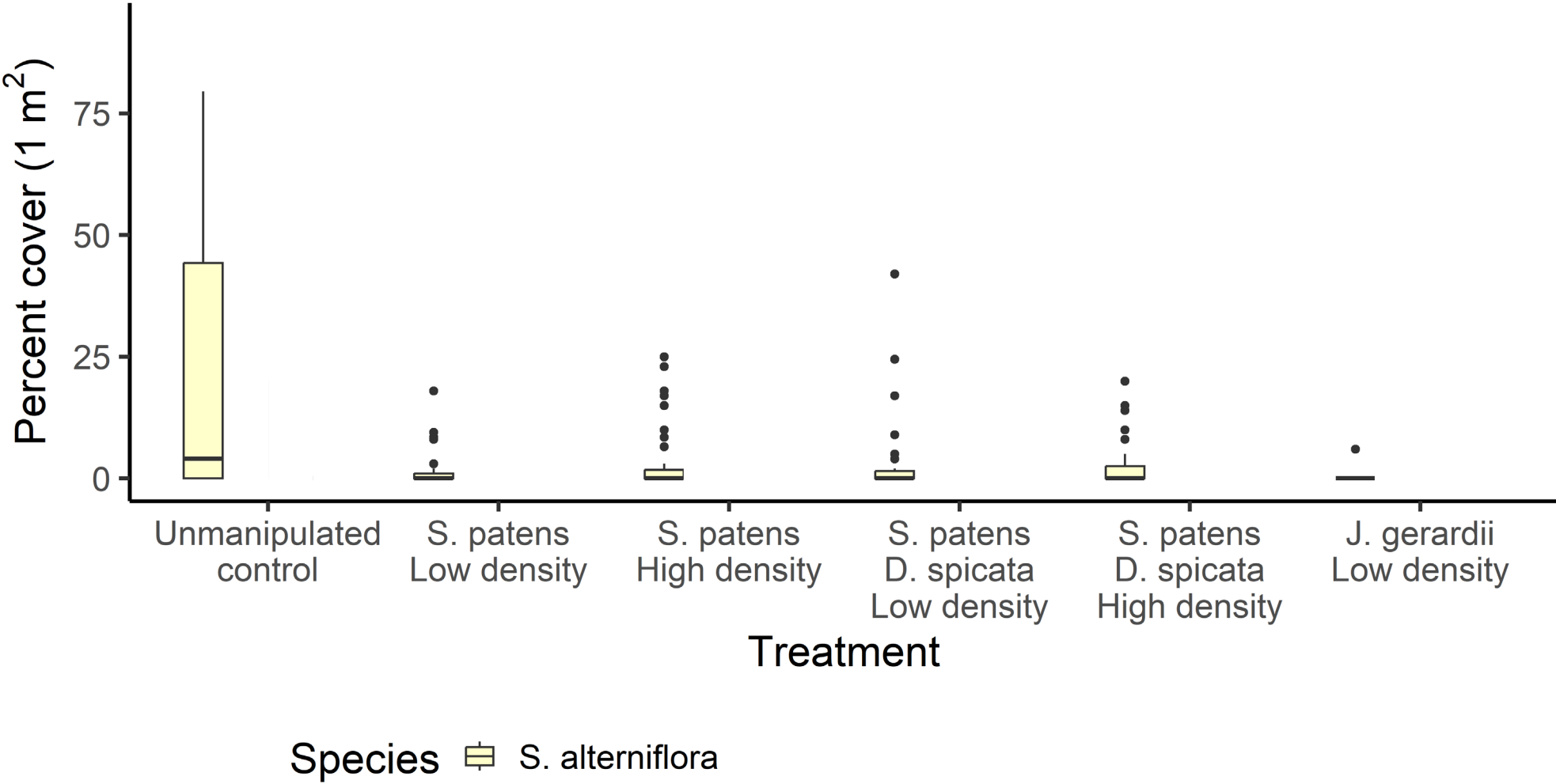


1. Were the targets for elevation and plant species reached?

65 species observed



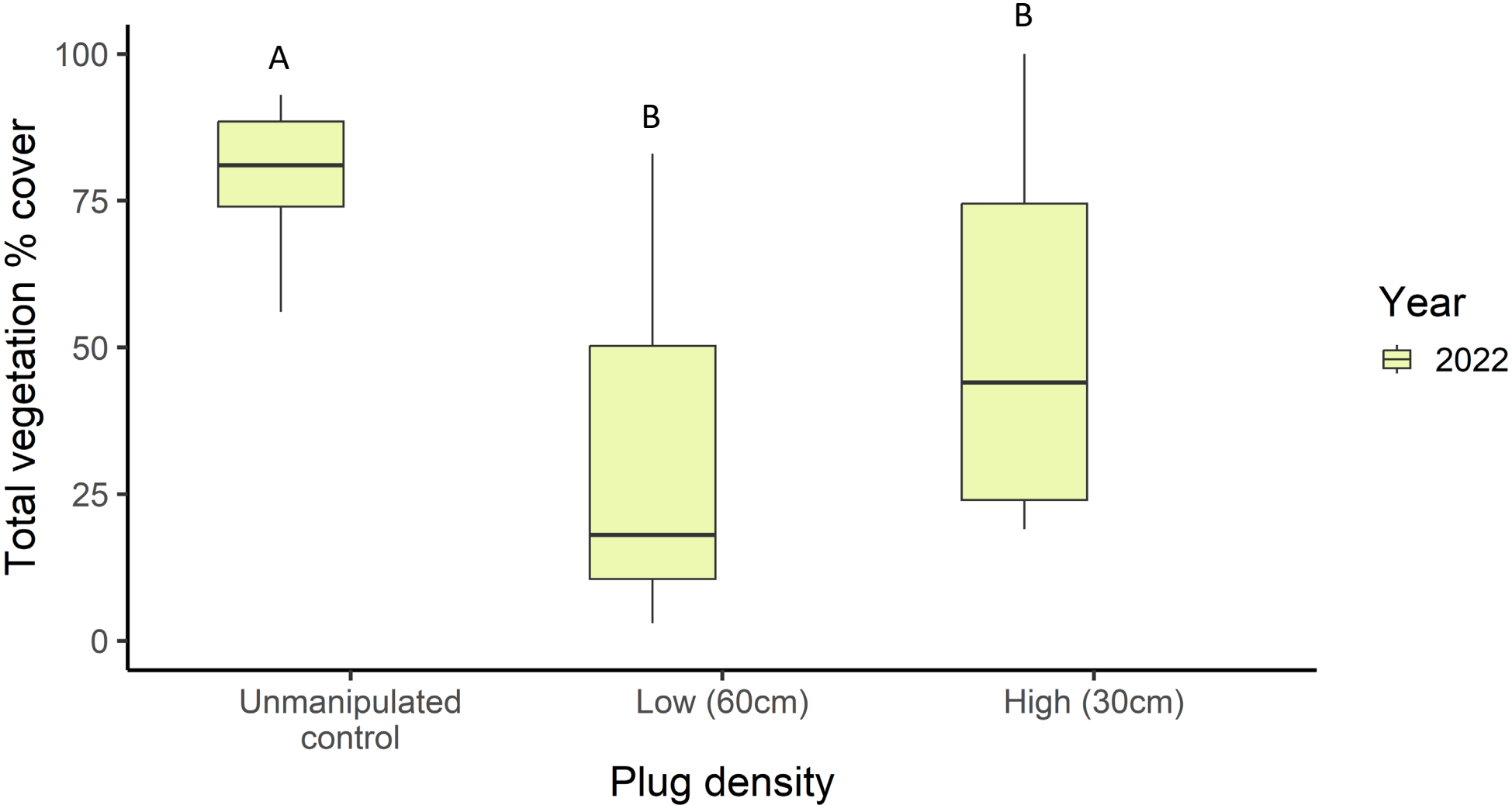
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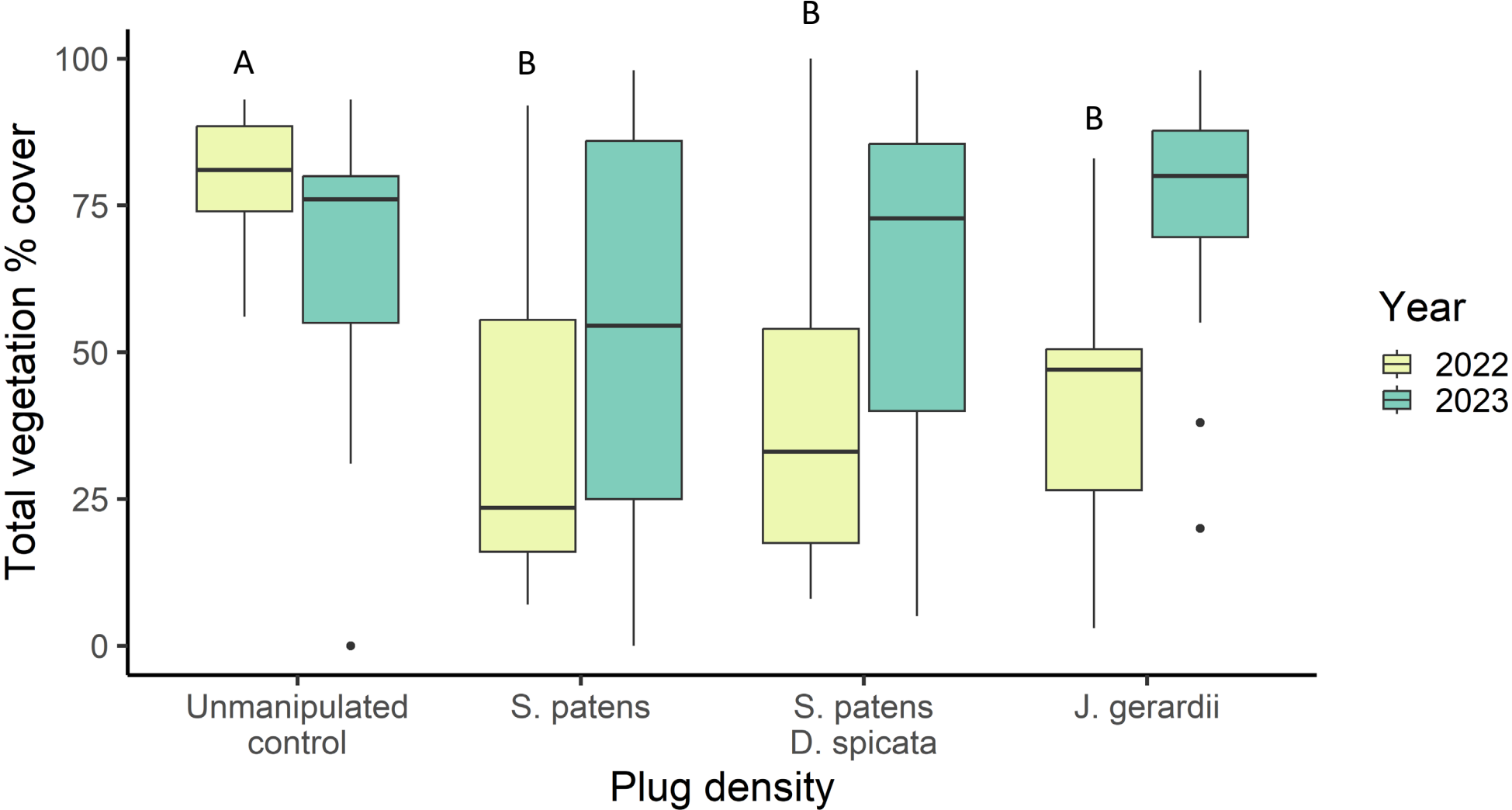
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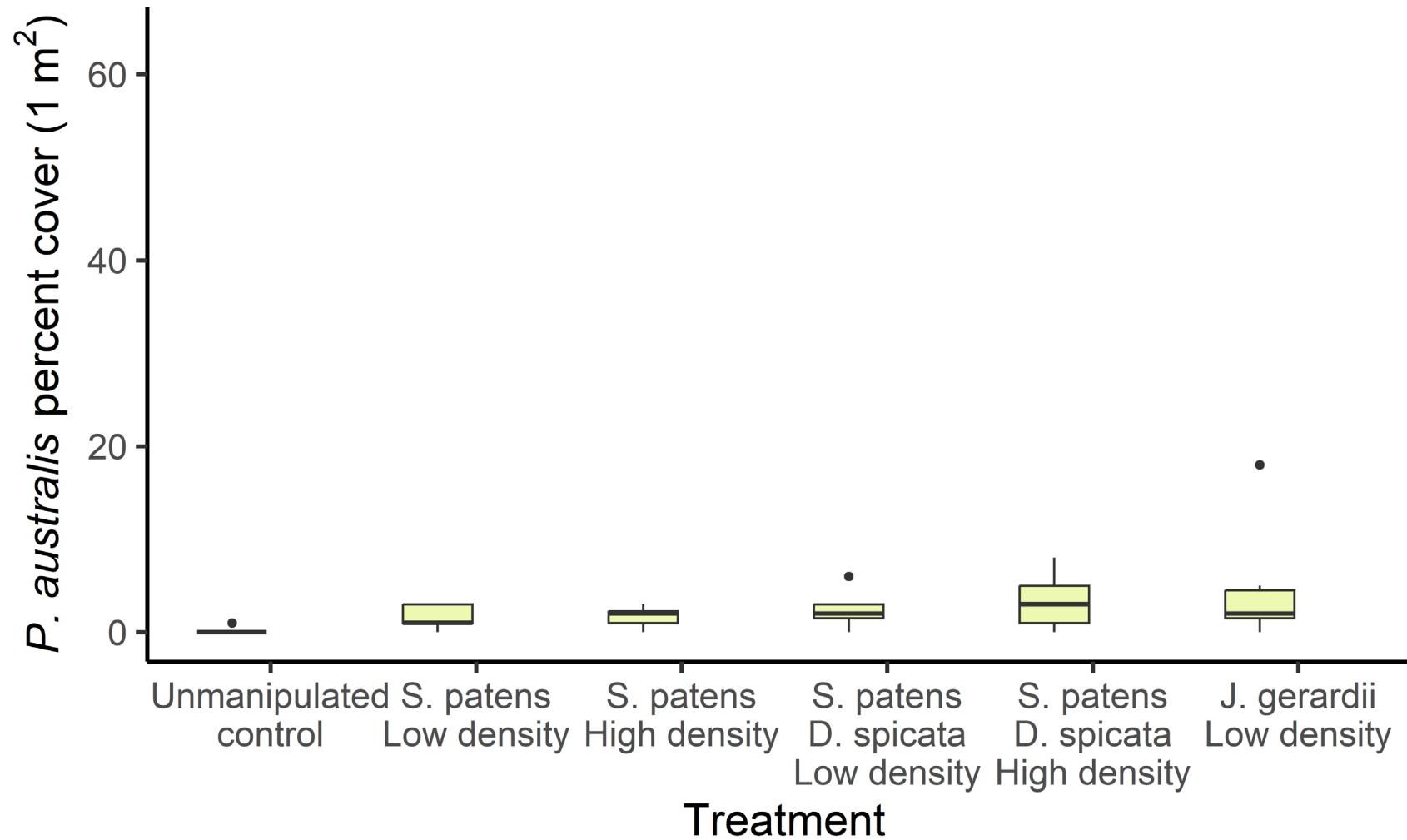
2. How many plugs should managers plant?



2. Which species?



3. What about *Phragmites*?



Year

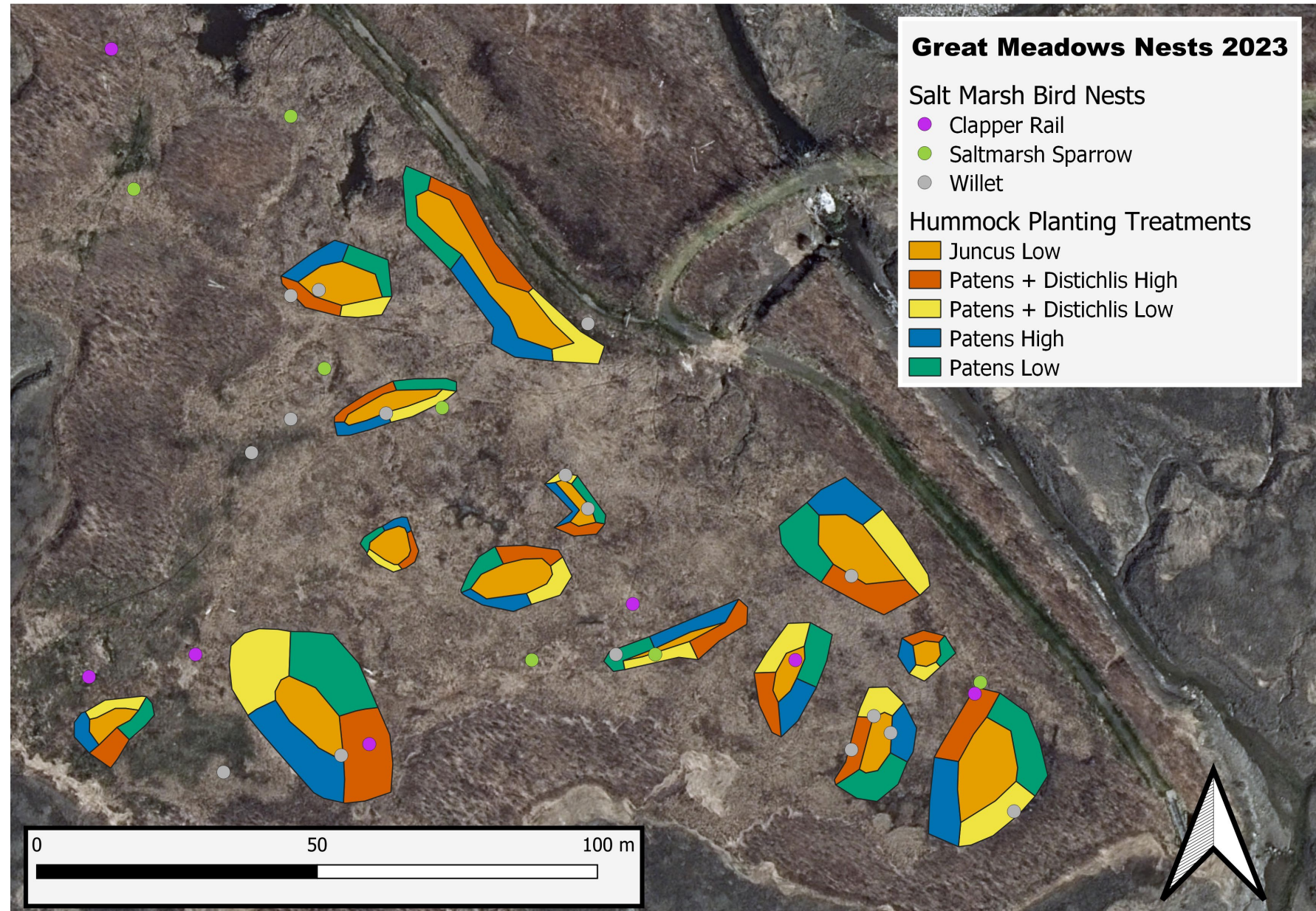
2022

3. What about *Phragmites*?



4. Impacts/benefits to salt marsh birds

- Total # of nests found: 33
 - Includes a wild turkey nest and a duck nest (either mallard or black duck)
 - 9 SALS fledged (43% nest success rate)
 - 2024: telemetry, space use



Best practices for hummocks restoration – what have we learned?

1. The target elevation was reached, and plugs established successfully
2. Fewer plugs (60cm spacing) may be sufficient; no species differences
3. Managers should expect *Phragmites australis* in the upland border zone
 - Potential for greater colonization rates with fewer plugs
 - Adaptive management is needed
4. Salt marsh birds benefited



Short-term trends can be misleading

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- CT DEEP
- Town of Stratford

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- Avalon Park and Conservancy
- Connecticut's Beardsley Zoo
- Norwalk Maritime Aquarium
- Sacred Heart University
- Southern Connecticut State University
- NOAA, Northeast Fisheries Science Center
- Salt Marsh Stewards
- Hundreds of community members

