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Impact of Nutrient Resorption on the Fitness and Growth in *Iva Frutescens*, Salt Marsh Elder

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Impact of Nutrient Resorption on the Fitness and Growth of *Iva frutescens*, Salt Marsh Elder

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JOHNSON & WALES
U N I V E R S I T Y

Nutrient Resorption

- Process of moving nutrients from annual to perennial plant tissues performed by deciduous plant species during leaf senescence
- Acts as a nutrient conservation mechanism for perennial deciduous plants
- Reclaimed nutrients provide reservoir of nutrients for subsequent growing seasons

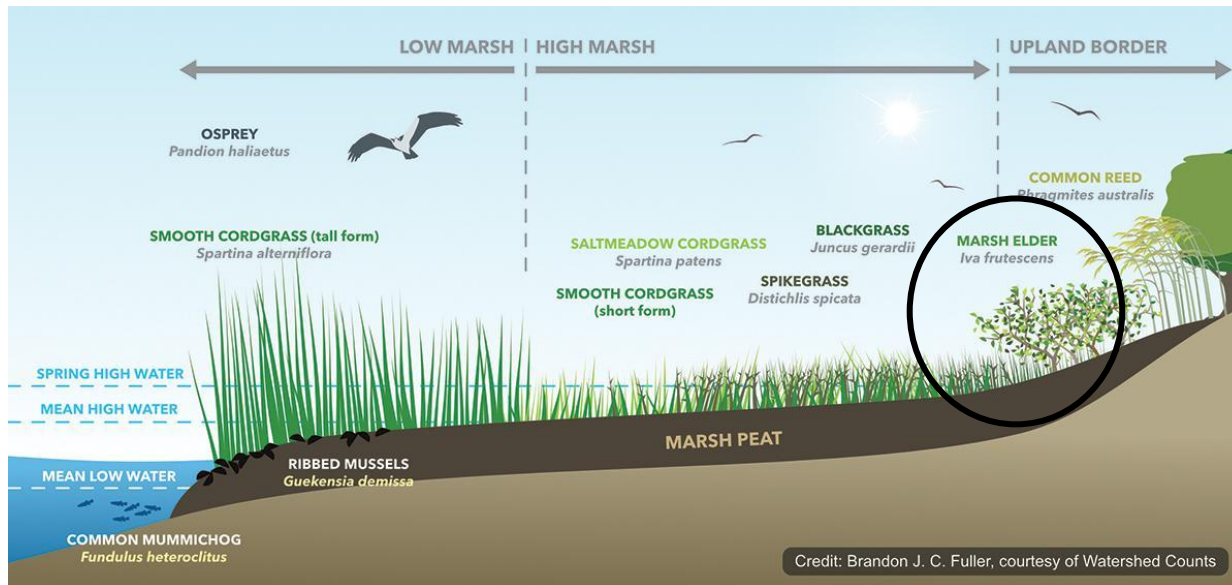


Nutrient Removal to Perennial Tissues



Iva frutescens – Model Organism

- Common name – Salt Marsh Elder
- Frequents lower end of upland border in New England salt marshes
- Perennial woody shrub with thick leaf lamina and mild serrations



Research Questions

RQ#1: Does nutrient resorption impact the fitness of *Iva frutescens*?

RQ#2: Does nutrient resorption impact the growth of *Iva frutescens*?

RQ#3: Are seeds of *Iva frutescens* plants of consistent mass?

RQ#4: What is baseline N and P resorption proficiency of *Iva frutescens*?

Field Work

Determined field sites

- Four salt marshes in west passage of Narragansett Bay

Determined sample individuals

- 10 randomly selected individuals at each site
- 5 individuals were defoliated prior senescence/nutrient resorption (treatment)
- 5 individuals were unmolested (control)



Field Sites -Four Salt Marshes

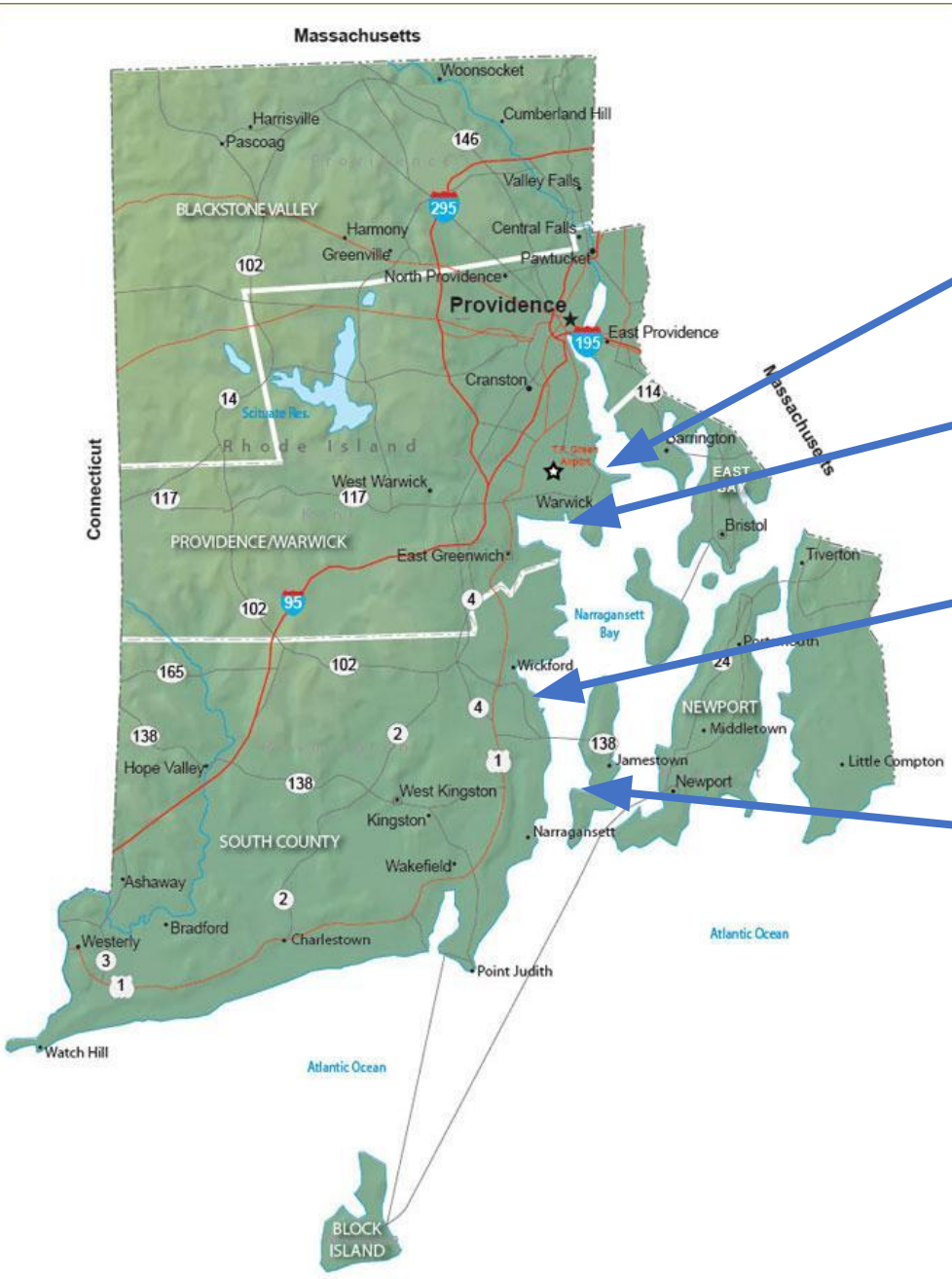
Passenonkquis
Marsh (Warwick)

Buttonwoods
Marsh (Warwick)

Bissel Marsh
(S. Kingstown)

Fox Marsh
(Jamestown)

- Three along western edge of Narragansett Bay
- One on Conanicut Island (Jamestown)
- Marshes exhibit typical species diversity
- Normal tidal influences present at all sites



Field Work

Fitness measurement

- All mature seeds were collected from each control and treatment individual

Growth measurement

- For each individual, 5 largest stems were measured for diameter (cm)



Lab Work

Each sample (unsorted seeds) was dried to constant weight

Each sample was sorted to isolate seeds from debris

- Debris consisted of inflorescence material and leaves



Lab Work

Sorted and dried seed samples were weighed

- Total plant individual seed mass (all seeds for each sample individual)
- Subset seed mass measurement
 - 100 seeds from 13 randomly selected individuals

Data analysis

- ANOVA performed to determine whether seed mass was consistent among sample individuals across sample sites



Lab Work

Leaf Tissue was separated and prepared

- Dried and prepared for nutrient analysis

Leaf nutrient data analyzed

- Nitrogen and Phosphorus leaf concentration
- % N / dry leaf mass
- % P / dry leaf mass



Results and Conclusions

***RQ#1 & RQ#2:* The impact of nutrient resorption on *I. frutescens* will be assessed after this growing season by comparing 2021 and 2022 fitness and growth data between control and treatment groups.**

- During this academic year, samples were processed in laboratory to manually isolate seeds from other plant material, such as leaves and inflorescence
- These processed samples will be used to determine seed number (fitness) and used to address RQ#1 and #2. Analysis will be conducted during the summer and fall of 2023

***RQ#3: Iva frutescens* seeds were of consistent mass across all sample sites (no significant difference)**

- Consistent seed mass will allow total individual seed mass measurements to be compared across all sample sites when determining the impact of nutrient resorption on the fitness of *Iva frutescens*
- ANOVA – ($F[3,16] = 1.37, p > 0.05$)

Results and Conclusions

RQ#4: What is baseline N and P resorption proficiency of *Iva frutescens*?

DATA ADDRESSING RQ#4 WILL BE ENTERED HERE PRIOR TO PRESENTATION DATE

NUTRIENT ANALYSIS CURRENTLY BE CONDUCTED

Future Directions....

- **This is an ongoing project - during 2023 growing season, sample individuals will be allowed to proceed normally**
- **Fitness**
 - Seed production from 2021 and 2022 will be compared to that of 2023 for all sample individuals at all sites
 - Total seed mass and count will be compared between treatment (defoliated) and control (unmolested) plants to determine whether the prevention of nutrient resorption resulted in diminished reproductive fitness.
- **Growth**
 - Stem diameter from 2021 and 2022 will be compared to that of 2023 for all sample individuals at all sites
 - Stem diameter will be compared between treatment (defoliated) and control (unmolested) plants to determine whether the prevention of nutrient resorption resulted in diminished growth capacity

Future Directions....

- **Nutrient Resorption Proficiency**

- Nutrient resorption proficiency (NRP) is the final nutrient concentration of senesced leaves as they are shed by deciduous plants
- NRP is measured as % of nutrient by dry leaf mass
- Nutrient concentrations (N & P) will be measured in a number (TBD) of *Iva frutscens* individuals
- NRP of N & P will be:
 - Among sample sites
 - Analyzed for correlation to individual plant fitness
 - Analyzed for correlation to individual plant growth