Environmental Constraints and Species Differences in Establishment and Expansion of Three Freshwater Tidal Marsh Plant Species

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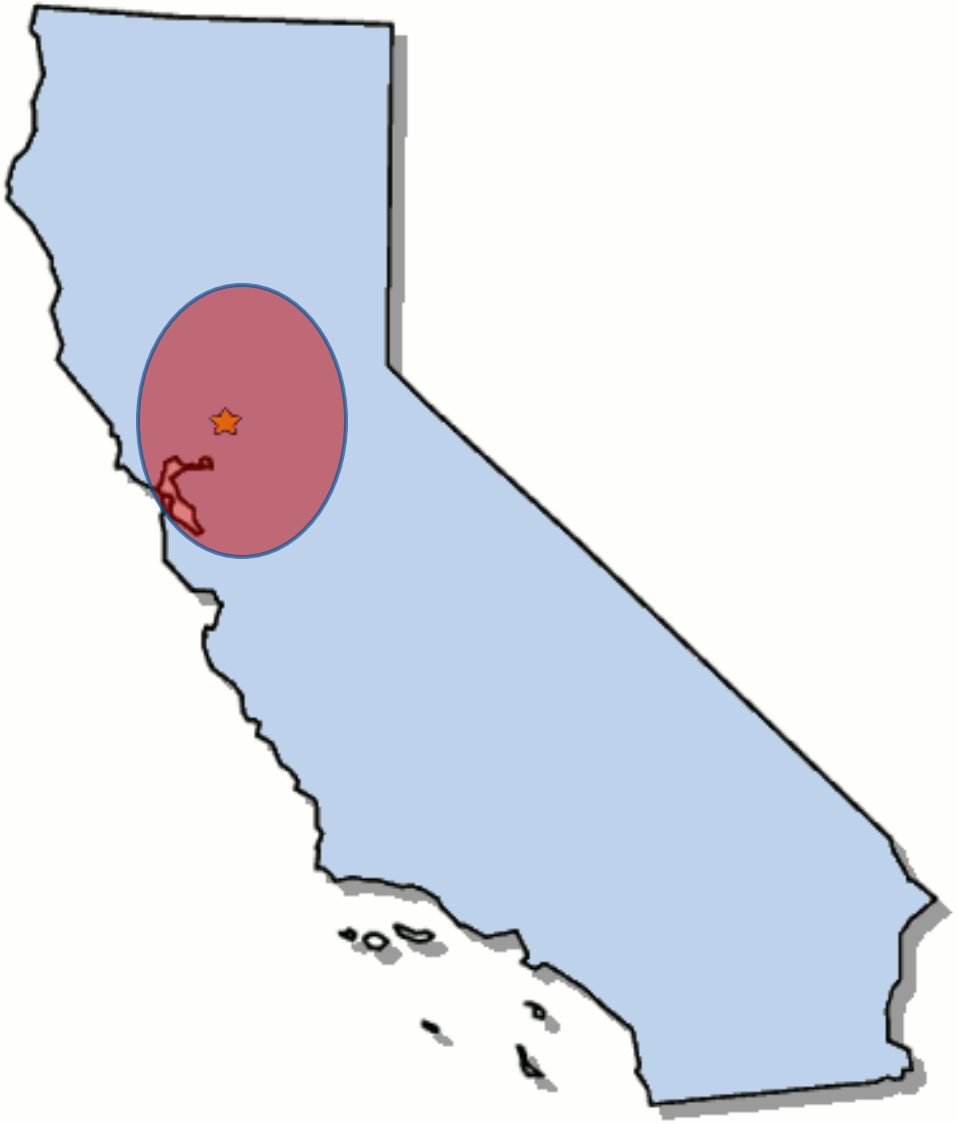
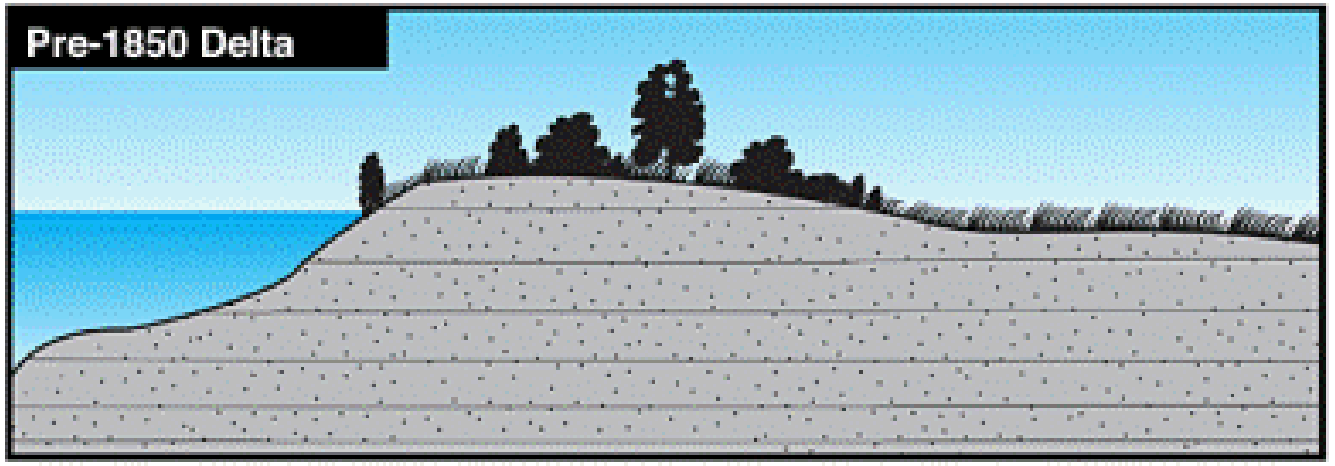
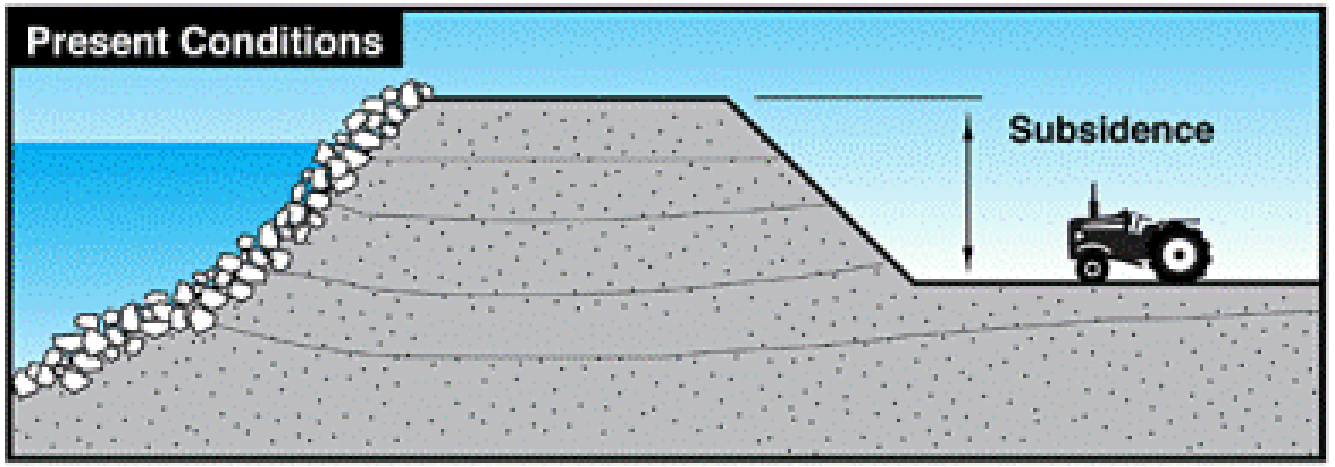
Sacramento-San Joaquin



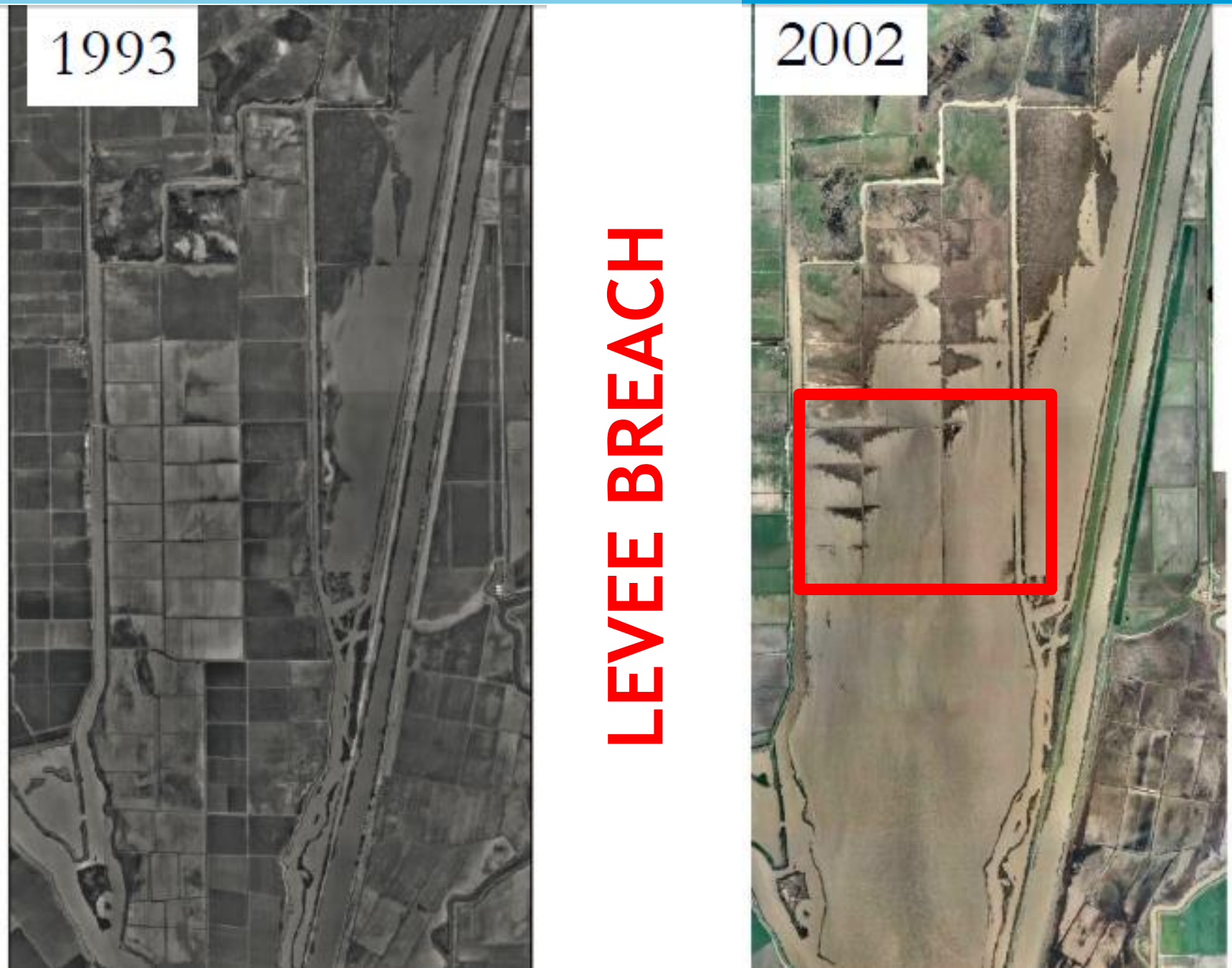
Levee Construction





Liberty Island

LEVEE BREACH


1993
2002
LEVEE BREACH

Research Questions

- How might environmental conditions impact vegetation establishment and expansion?

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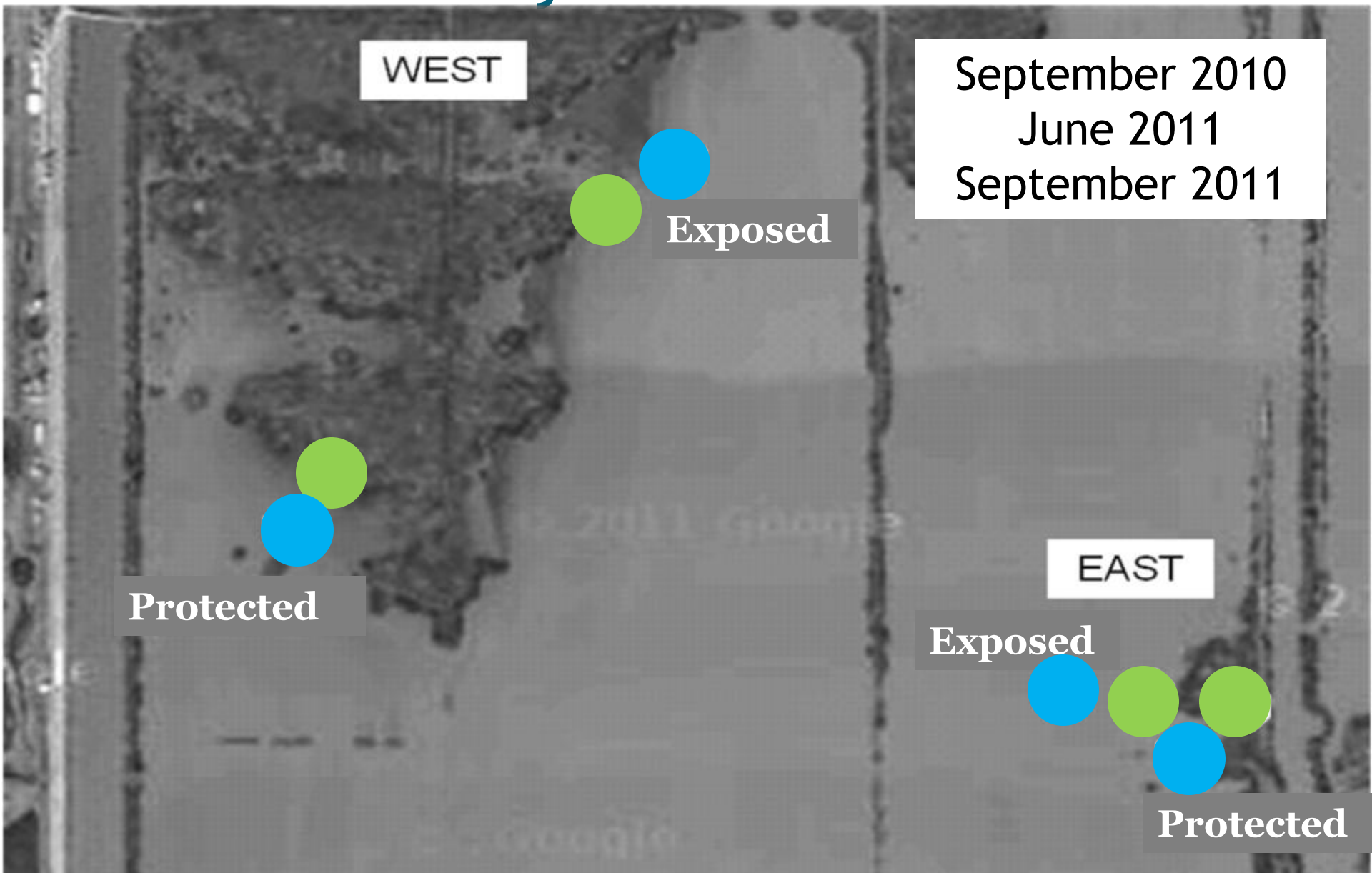
- What differences exist among species regarding establishment and expansion?

Seed-Bank Assay

Transplant Study

Seed-Bank Assay



Transplant Study

Species Selection

Typha latifolia

Schoenoplectus acutus

Schoenoplectus californicus

Transplant Stages

Rhizome

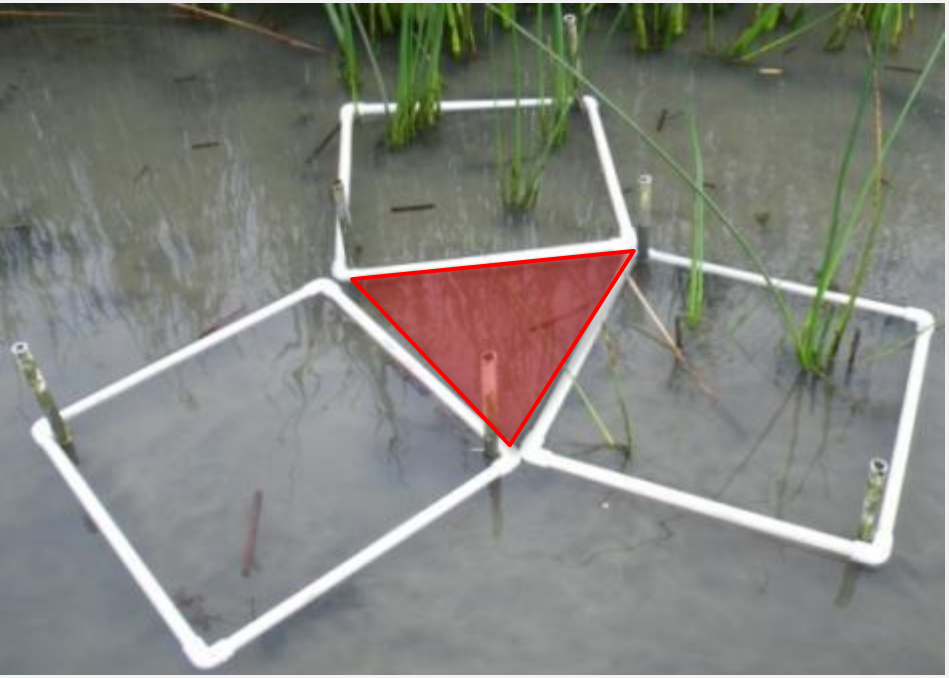
Adult Transplant

Exposed Open Water

Exposed Marsh Fringe

Protected Marsh Fringe

Protected Open Water



Monitoring

EDAPHIC

- Elevation
- Soil Bulk Density
- Soil Redox Potential
- Pore Water pH
- Soil % OM
- Soil Particle Distribution
- Depth to Compacted Soil Layer

Initial Planting: June 2010
3 Month: Sept 2010
12 Month: June 2011
24 Month: June 2012

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Monitoring

TRANSPLANT

- % Survival
- % Live Cover
- Stem Density
- Stem Height
- Area Vegetative Expansion

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RESULTS

ENVIRONMENTAL CONDITIONS

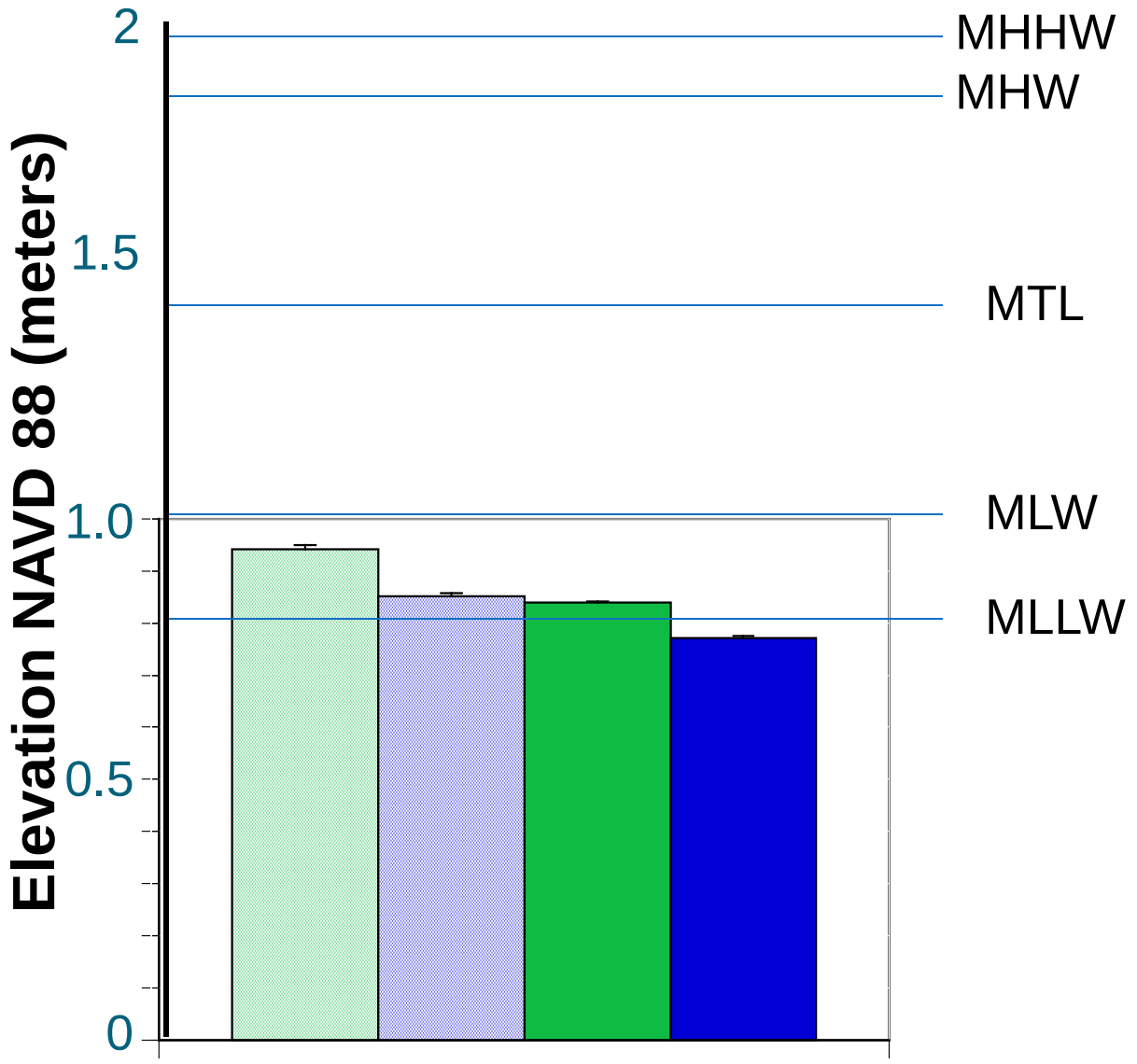
Elevation

Exposed Fringe

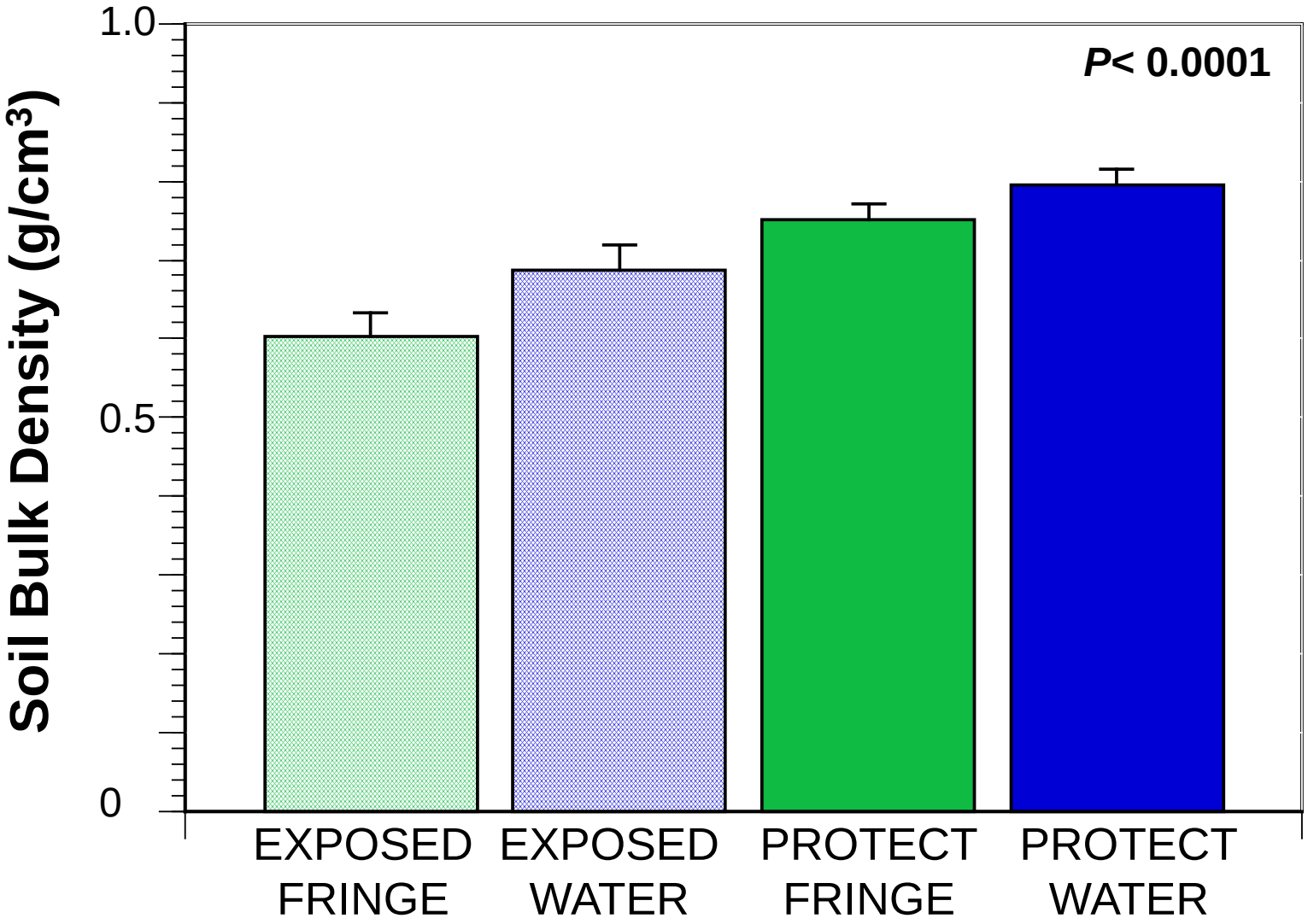
Exposed Open Water

Protected Fringe

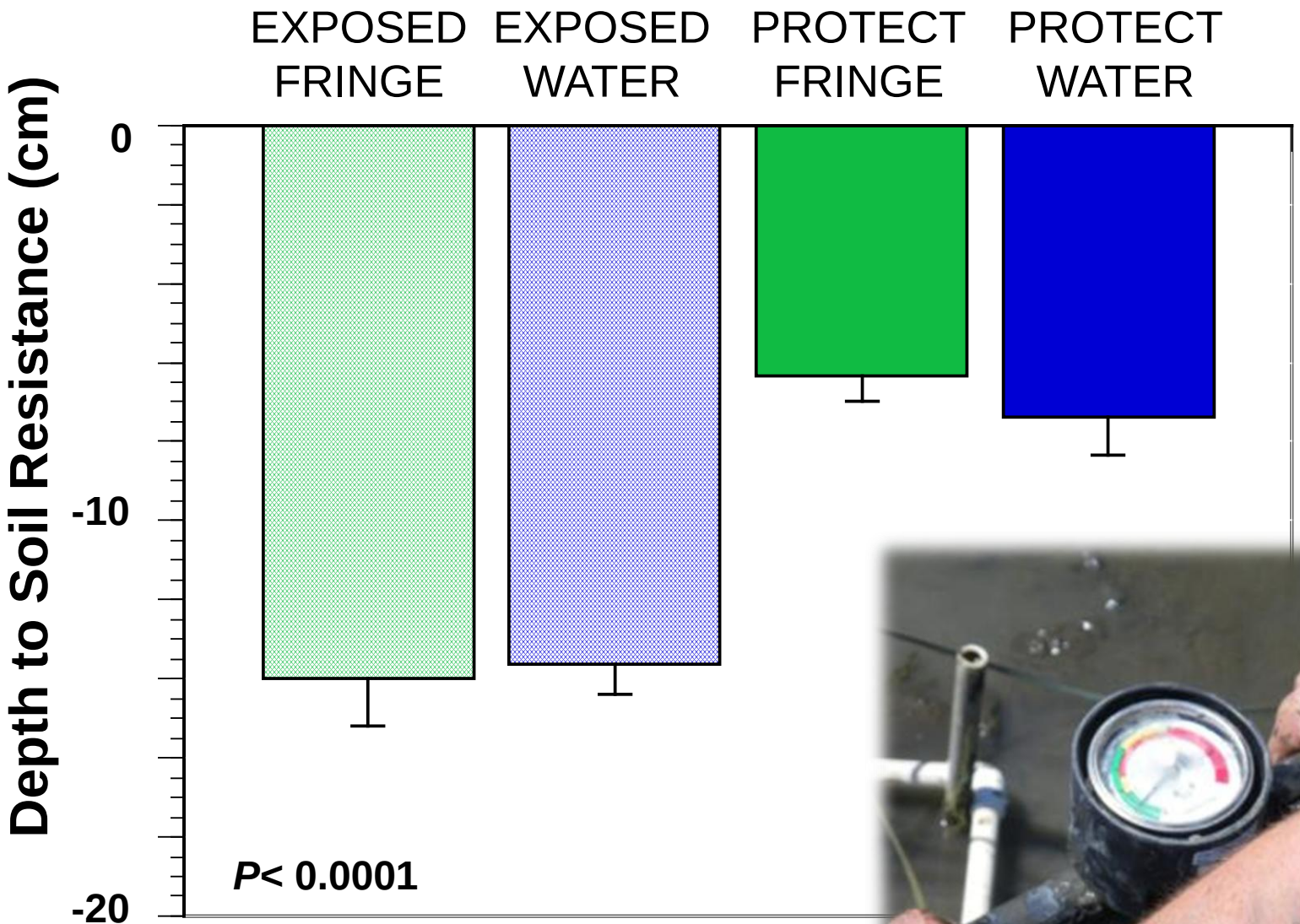
Protected Open Water



Edaphic Characteristics



Edaphic Characteristics



RESULTS

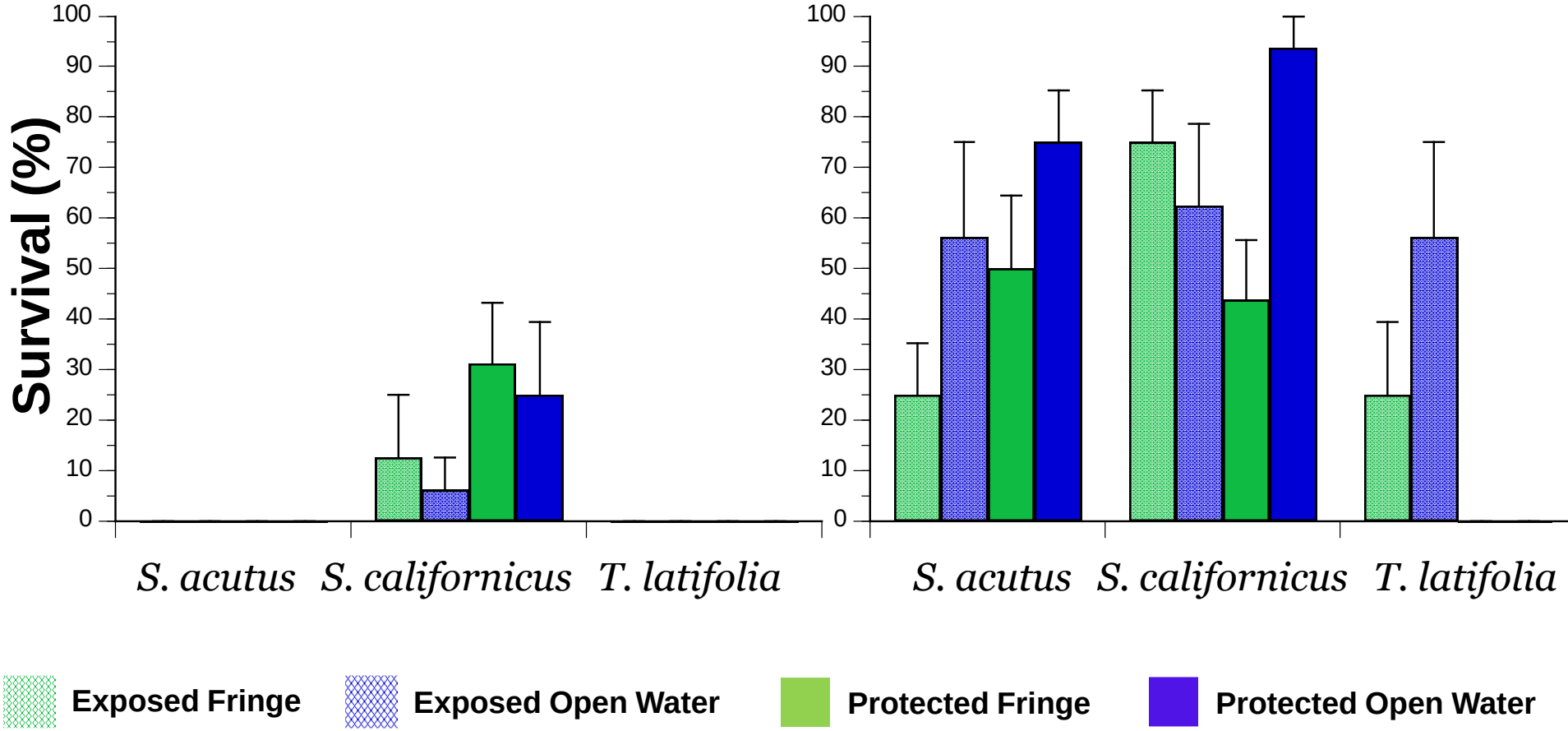
TRANSPLANT RESPONSE

Survival : Sept 2010

Rhizomes

Adult Transplants

Life Stage: P<0.0001
Species: P<0.0001

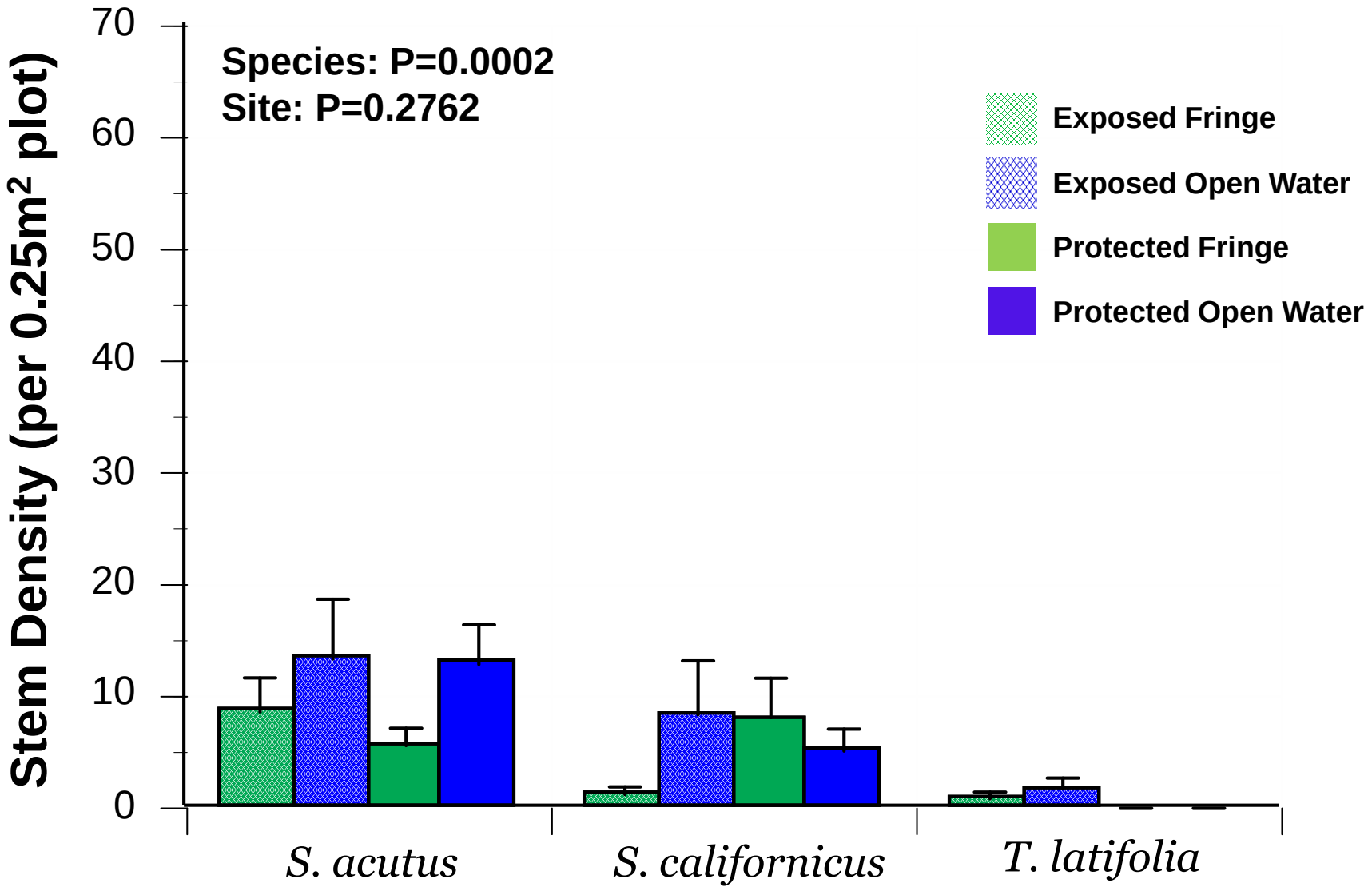


June 2011

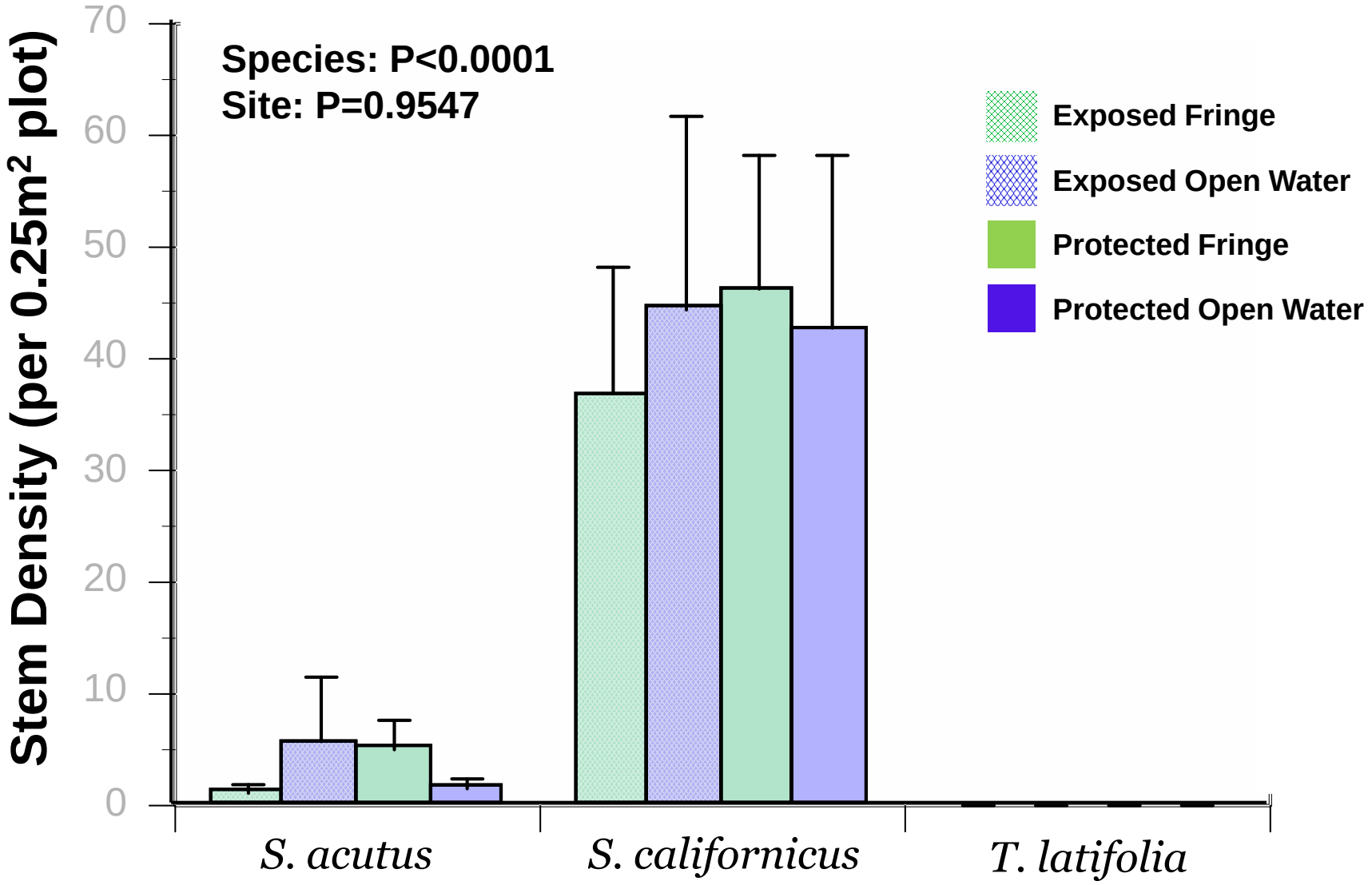
Adult Transplants

Rhizome Transplants

Stem Density : Sept 2010



Stem Density : June 2011

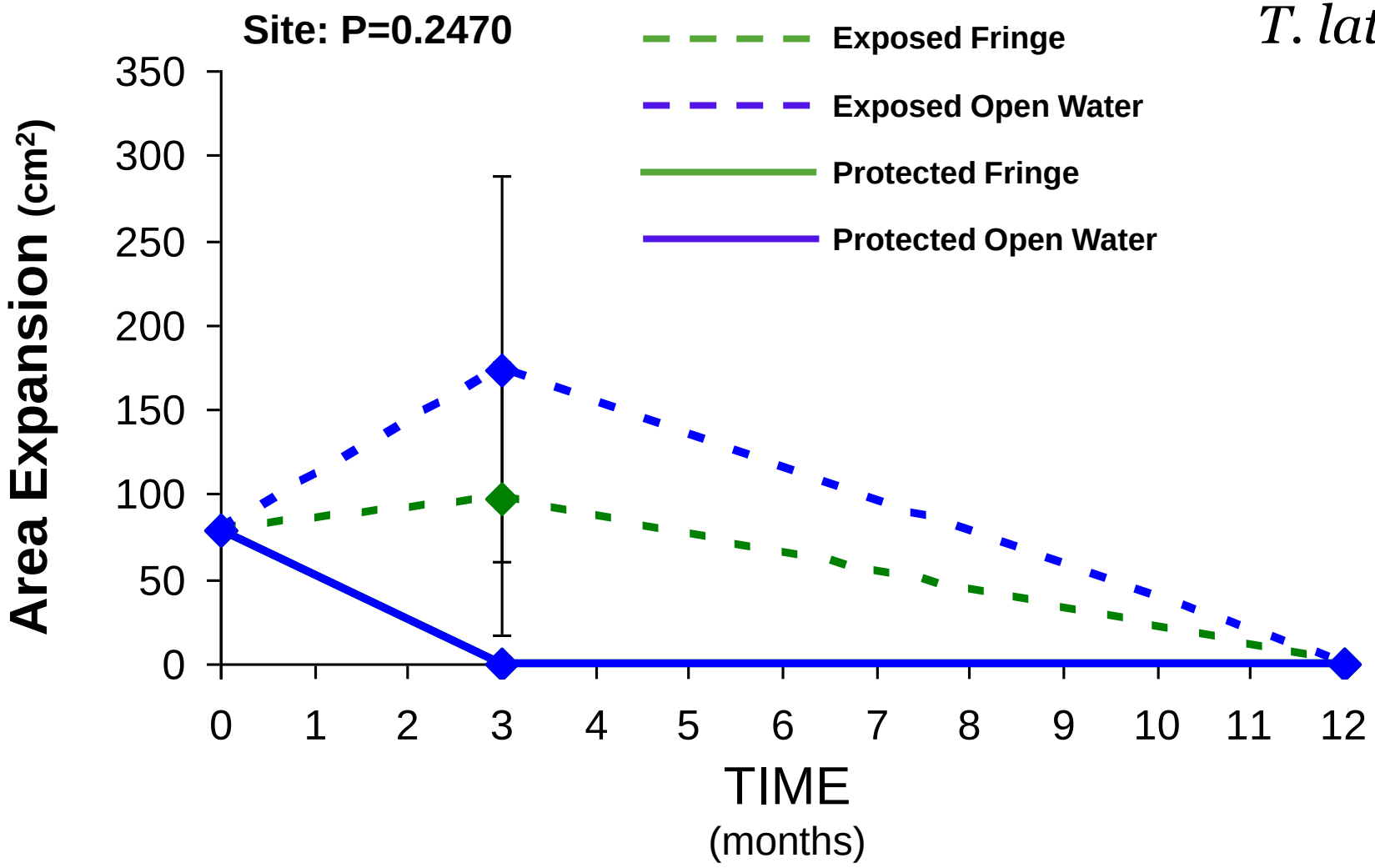


Dead *Typha* on the West side of Liberty Island in June 2011

Photo: Hester 2011

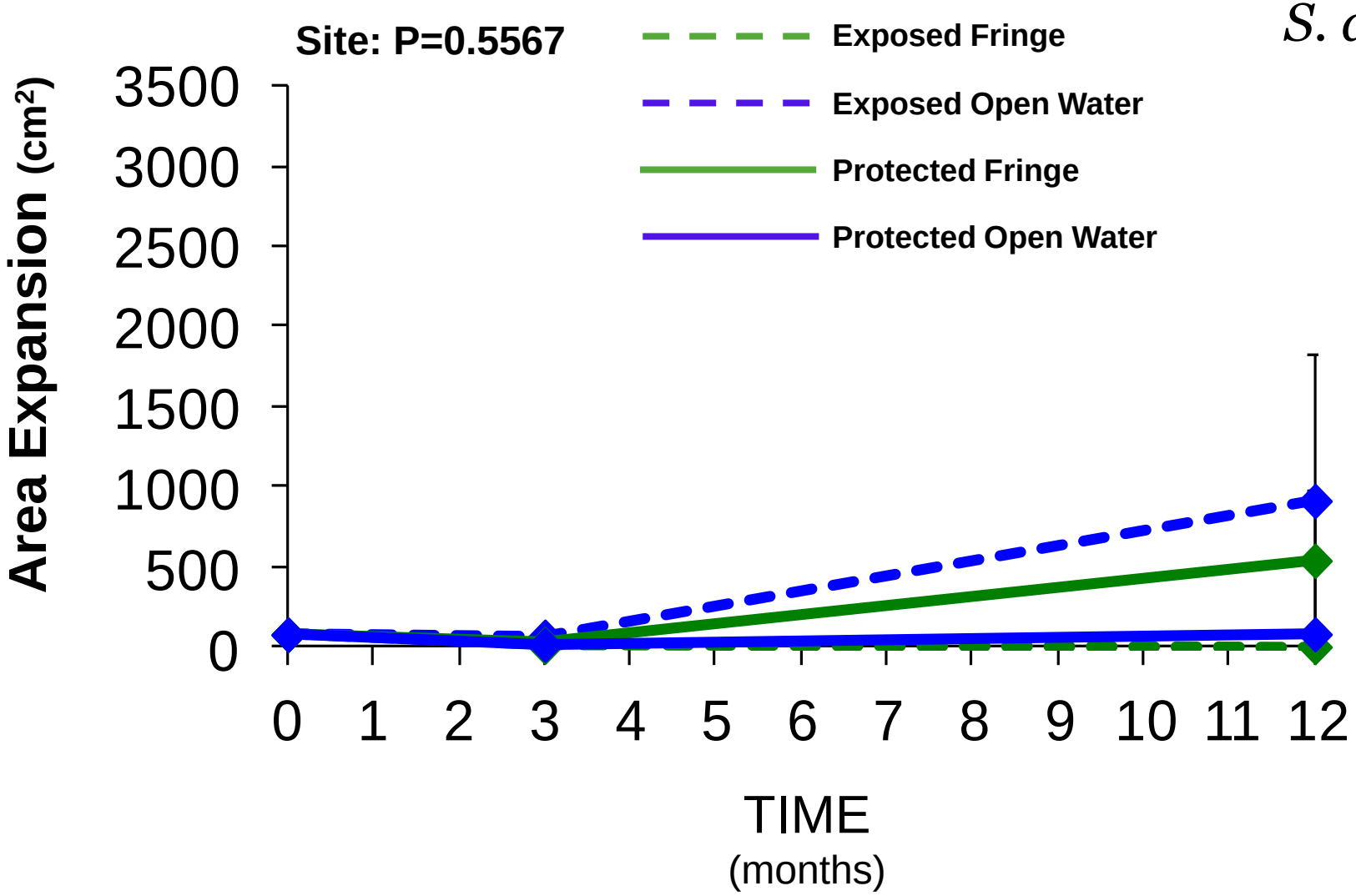
Transplant Expansion

T. latifolia



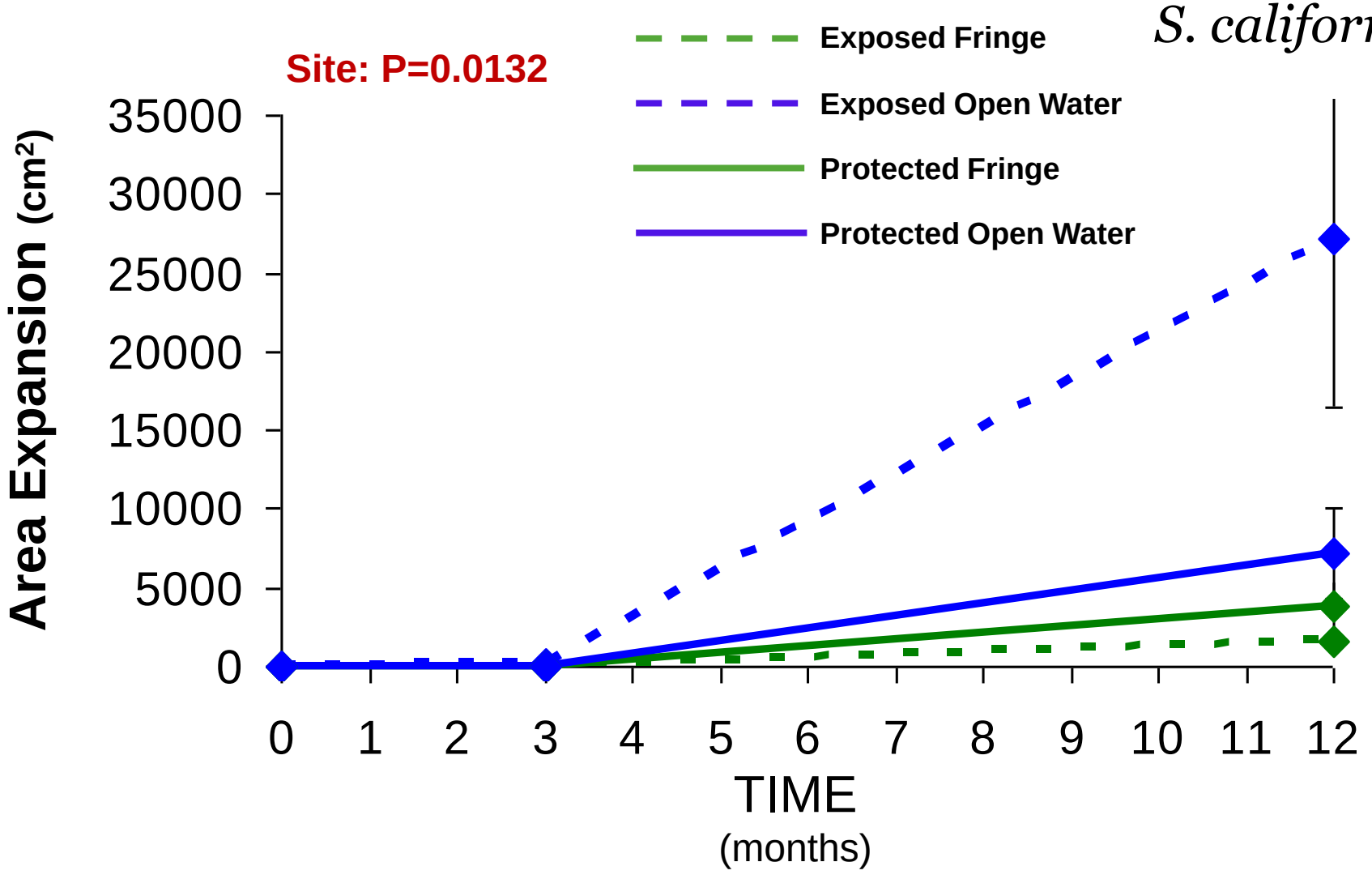
Transplant Expansion

S. acutus



Transplant Expansion

S. californicus



Protected Open Water

Exposed Open Water

Conclusions

- **Environmental Characteristics**

  Degree of soil compaction greater on protected side

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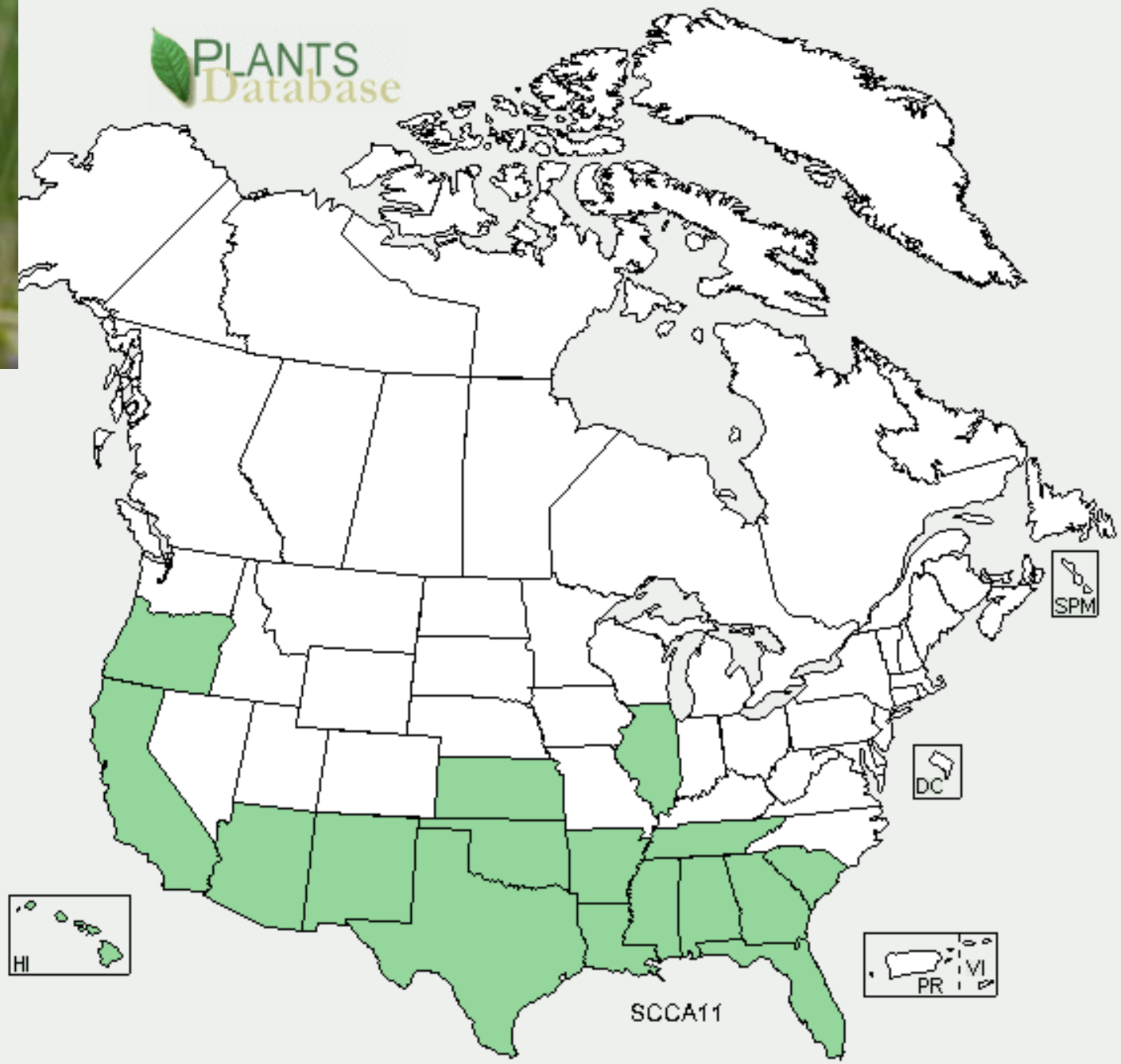
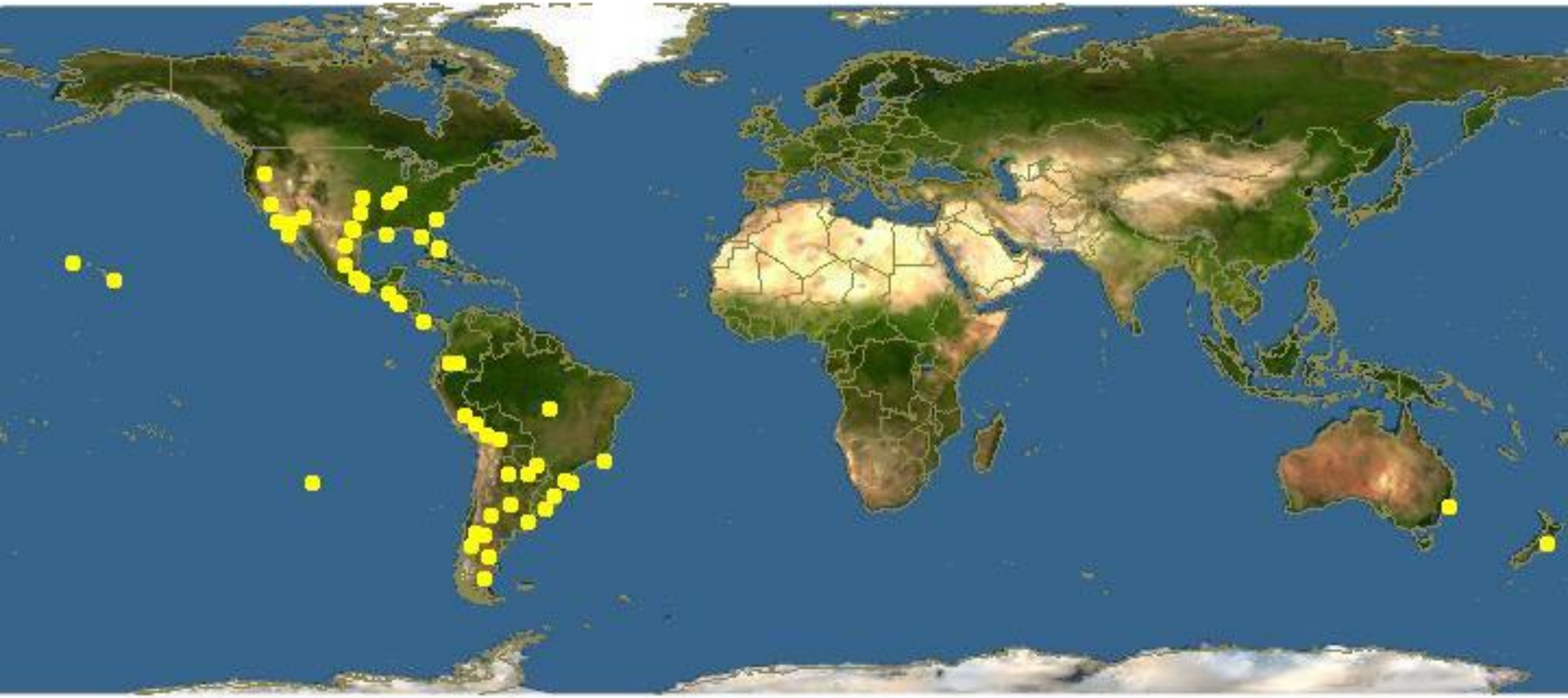
  - Degree of soil compaction greater on protected side
- **Species Performance**
  - *S. californicus* best suited to establish and expand

S. californicus



S. californicus



Encyclopedia of Life

Conclusions

- **Environmental Characteristics**
  - Degree of soil compaction greater on protected side
- **Species Performance**
  - *S. californicus* best suited to establish and expand
- **Area Expansion**
  - Soil compaction may be a limiting factor

Restoration Concerns:

1) Successful sexual reproduction

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2) Ensure amiable edaphic conditions

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1) Successful sexual reproduction
2) Ensure amiable edaphic conditions
3) Species selection

Acknowledgements…

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