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Eelgrass (*Zostera marina*) restoration in Puget Sound: restoration tools, successes and challenges

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Speaker

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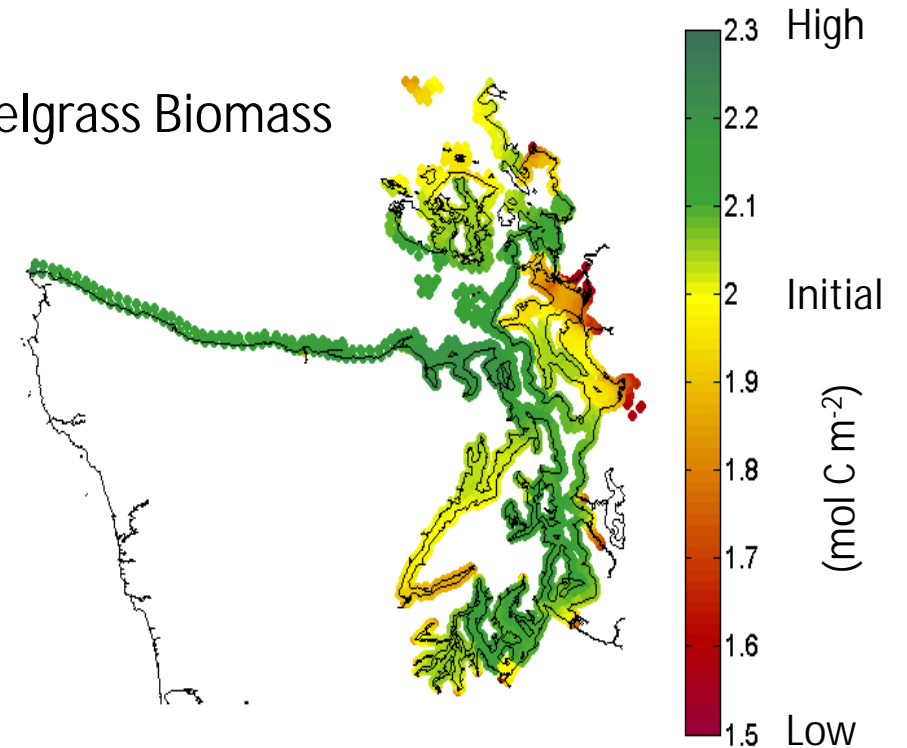


Restoration

- Eelgrass (*Zostera marina*) recovery goal established by the Puget Sound Partnership
- 20% more eelgrass by 2020
- Baseline – 22,000 ha
 - 4,400 ha
- Recovery Strategy
 - Stressor reduction
 - Restoration
- Multi-step adaptive process
 - model
 - test-transplants
 - evaluate
 - large-scale transplants



Eelgrass Biomass



Test Transplants

- 5 x 5 m plots, 500 shoots
- Subtidal (-1.5 m, MLLW)

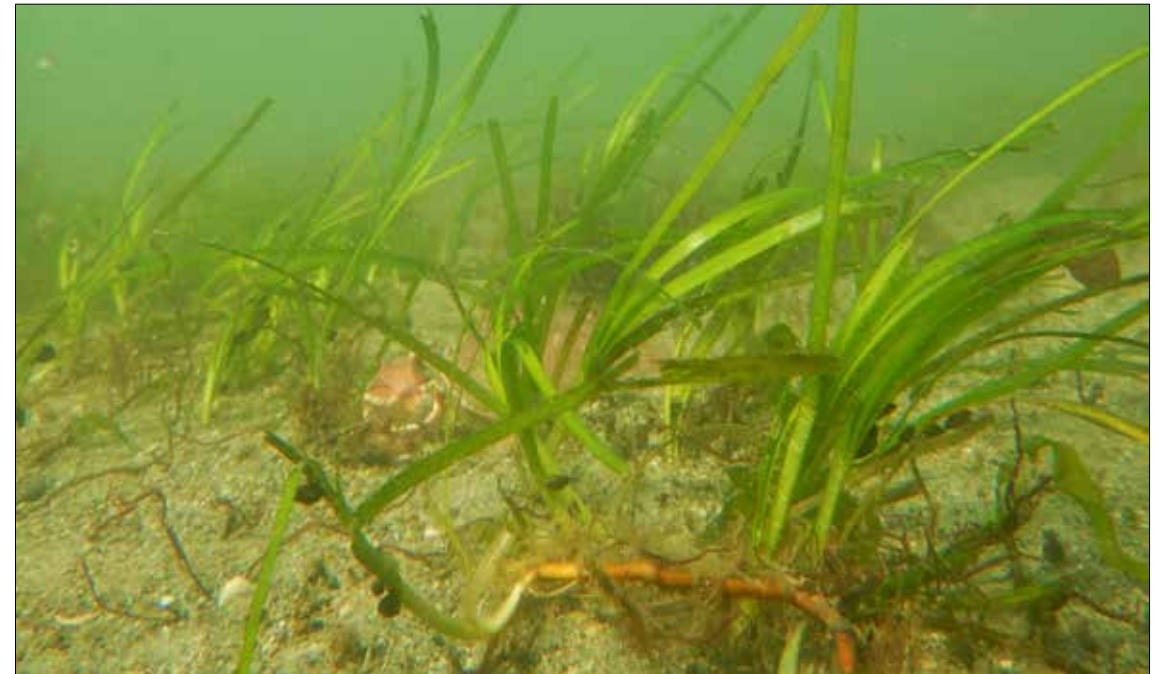


6 – 12 months

- 62% of the test sites had eelgrass
- Shoot survival ranged from 2 – 130%

After 12 months

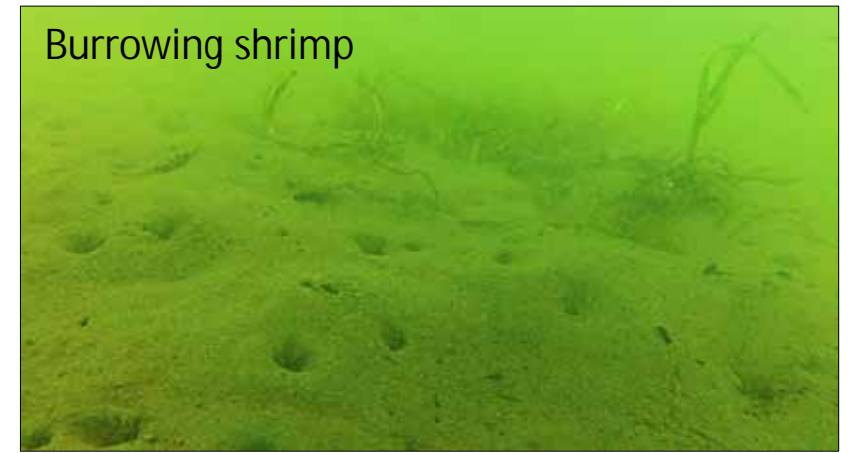
- 44% of sites had eelgrass present
- Vegetative growth observed



Challenges

- Permits
- Bioturbating organisms
 - burrowing shrimp
- Grazers
 - snails
- Competition
 - macro algae

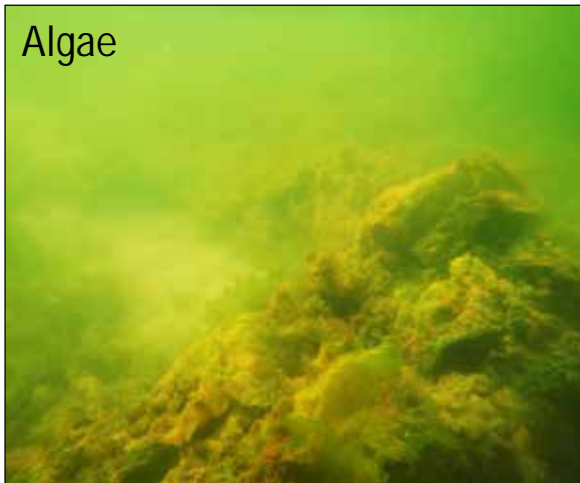
Burrowing shrimp



Snails

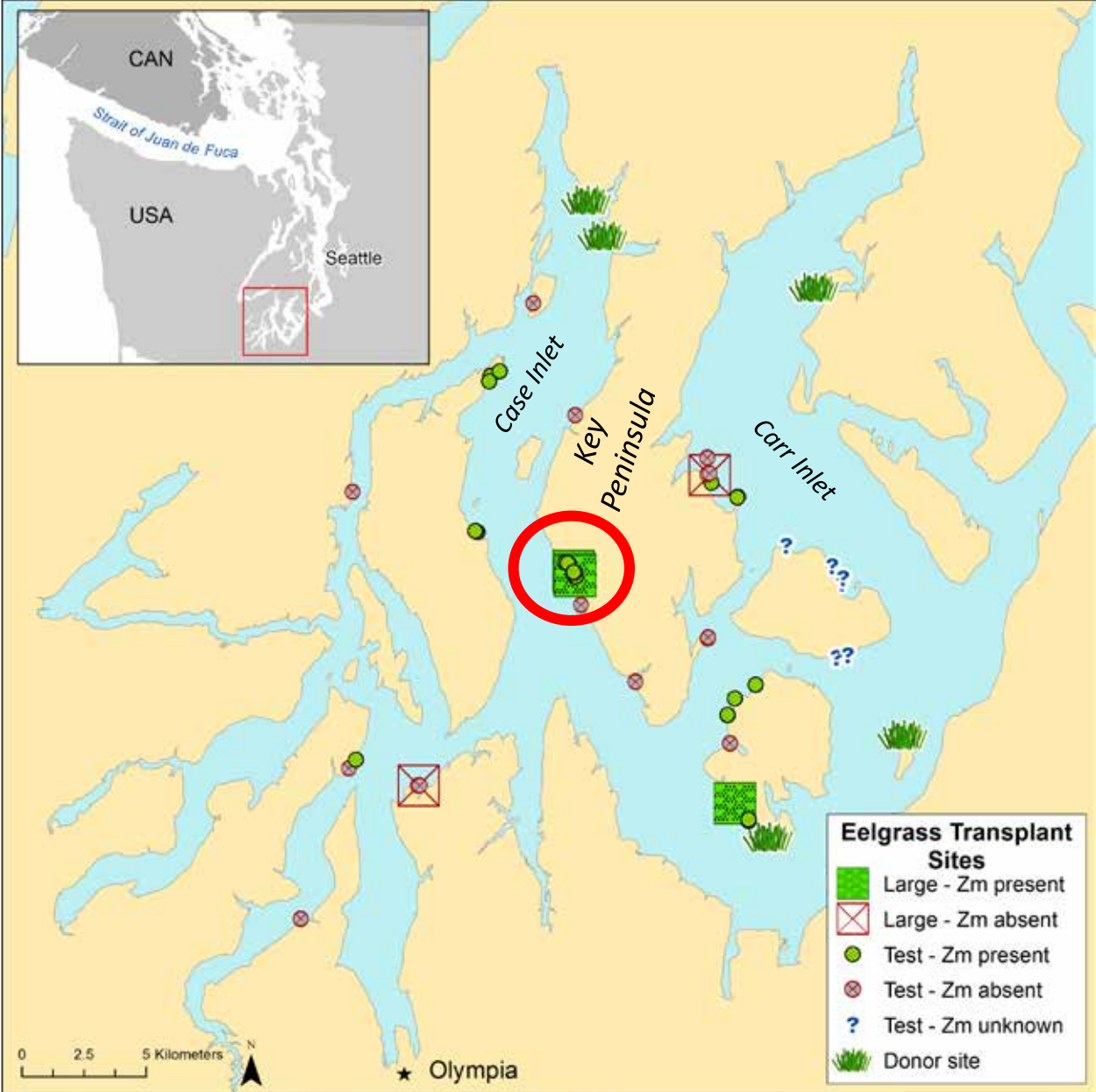


Algae

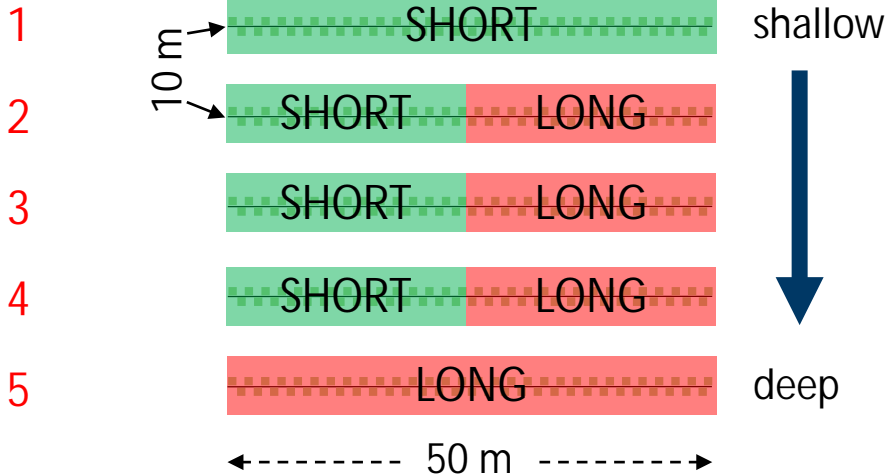


(A. Barna 2016)

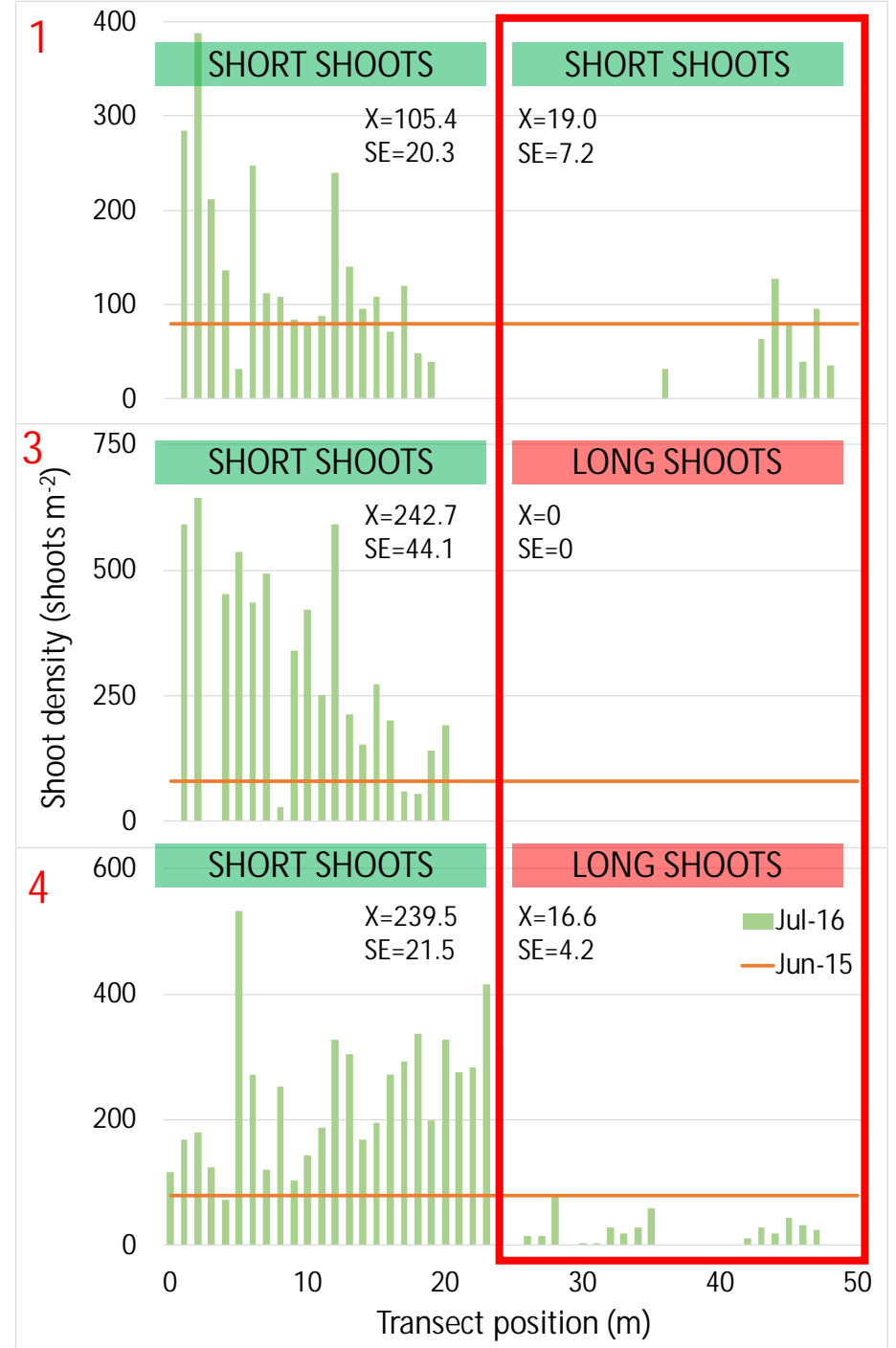
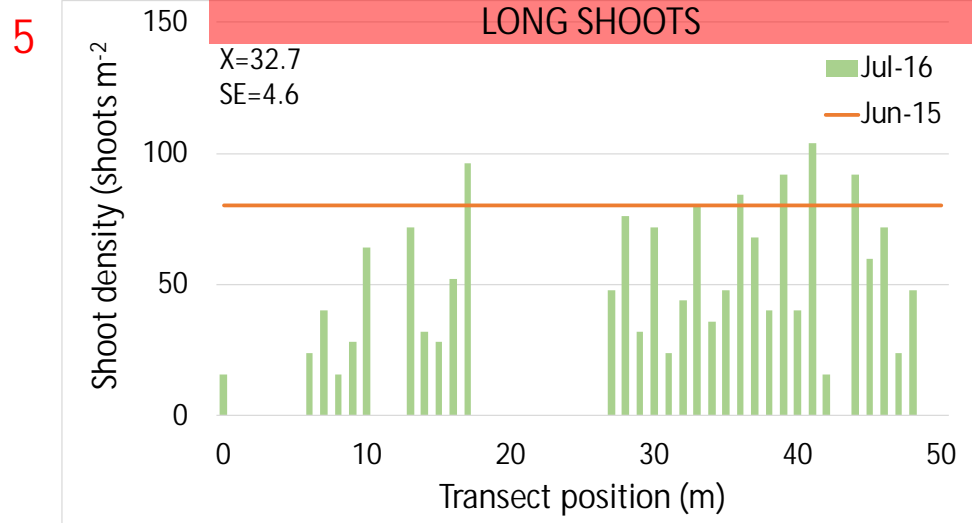
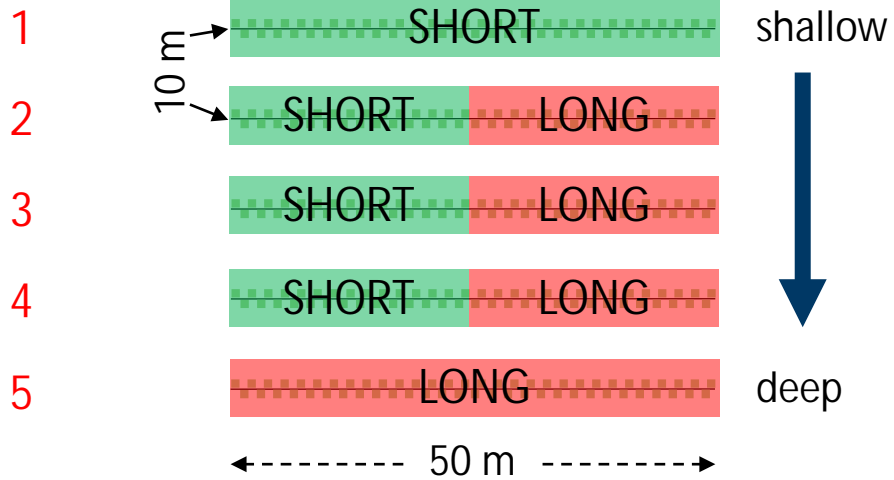
Restoration Sites 2013 - 2017



Large-scale Transplants



Shoot Density: Year 1





Rebound: Year 2

2015

- 22,000 shoots
- 80 shoots m^{-2}
- 275 m^2

2016

- 13,500 shoots
- 96 shoots m^{-2}
- 140 m^2

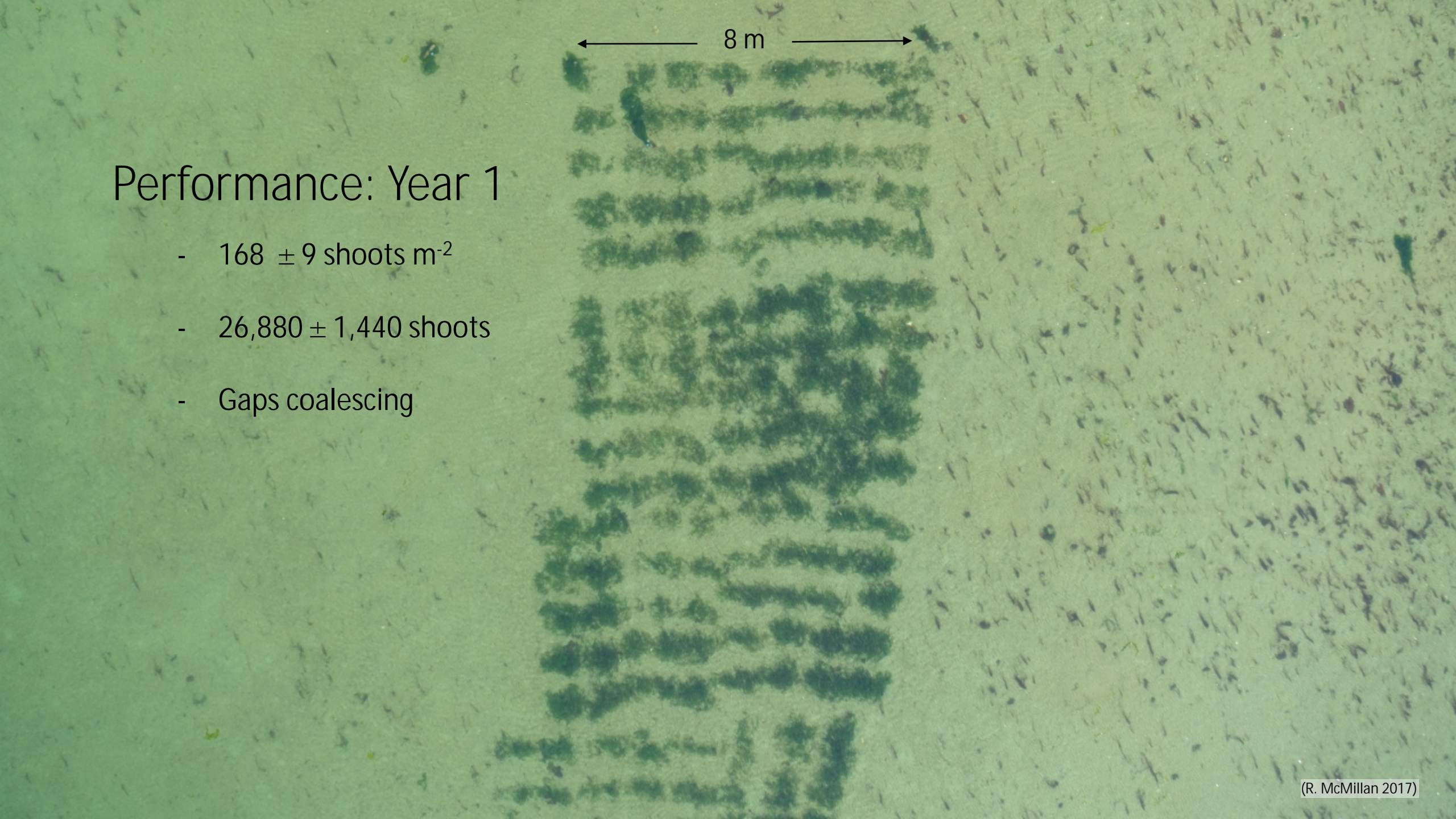
2017

- 105,000 \pm 31,500 shoots
- 270 \pm 90 shoots m^{-2}
- 350 m^2

Disturbance Control: Burlap Strips

- Tortilla Method (Pickerell et al. 2012)
- 160 m² area
- 126 shoots m⁻²
- 20,160 shoots



An aerial photograph showing a field with a grid-like pattern of dark green vegetation. A scale bar at the top center indicates a distance of 8 meters. The field is divided into several rows of vegetation, with gaps between them. The overall appearance is that of a managed agricultural or experimental field.

← 8 m →

Performance: Year 1

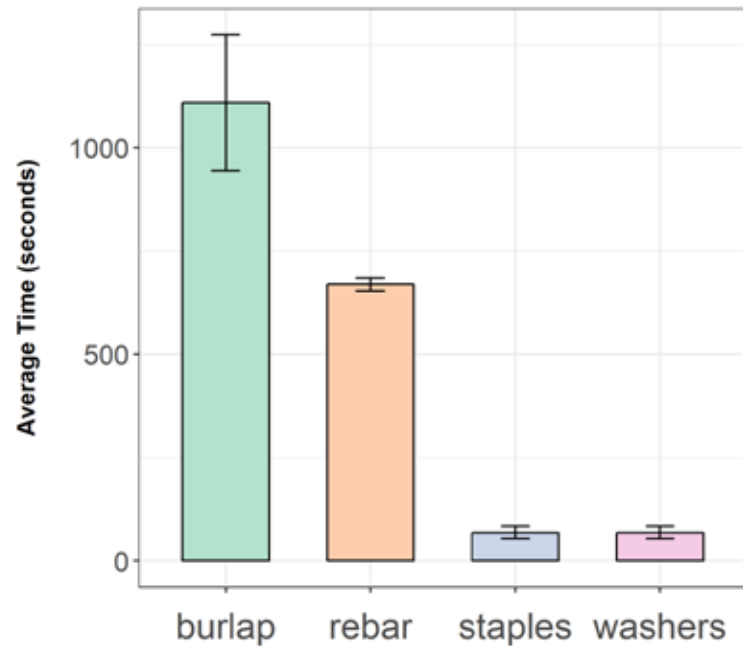
- 168 ± 9 shoots m^{-2}
- $26,880 \pm 1,440$ shoots
- Gaps coalescing

Modifications

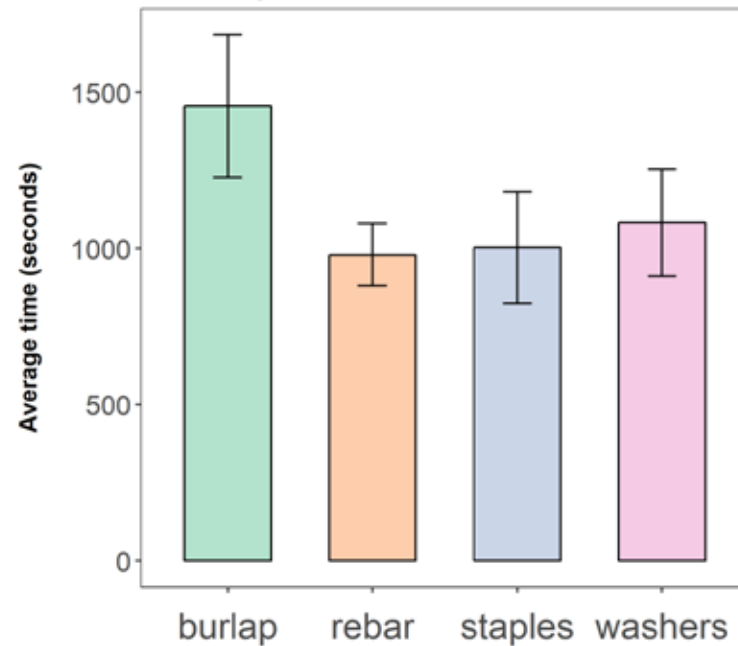
- Method study
 - burlap
 - re-bar
 - washers
 - staples
- Evaluate efficiency of transplanting
- Evaluate success of each method



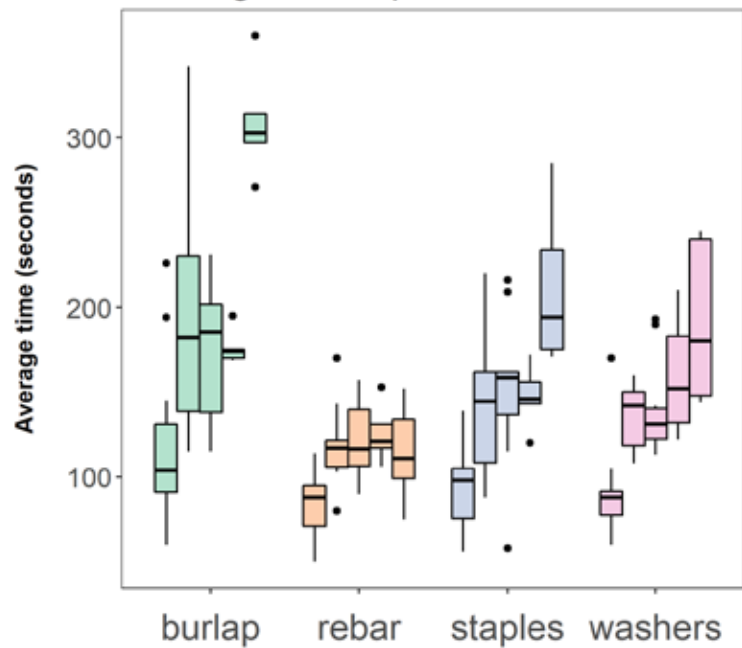
Material Prep



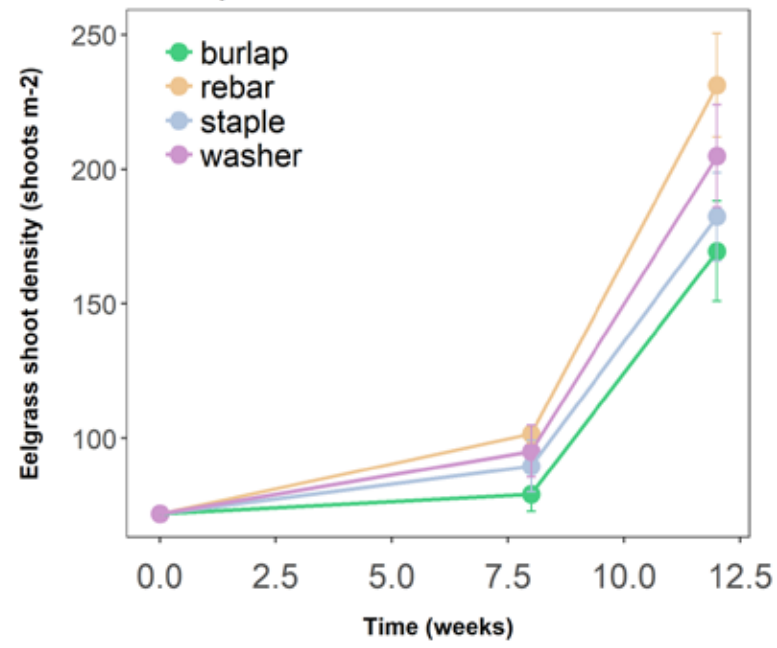
Planting



Planting Unit Prep

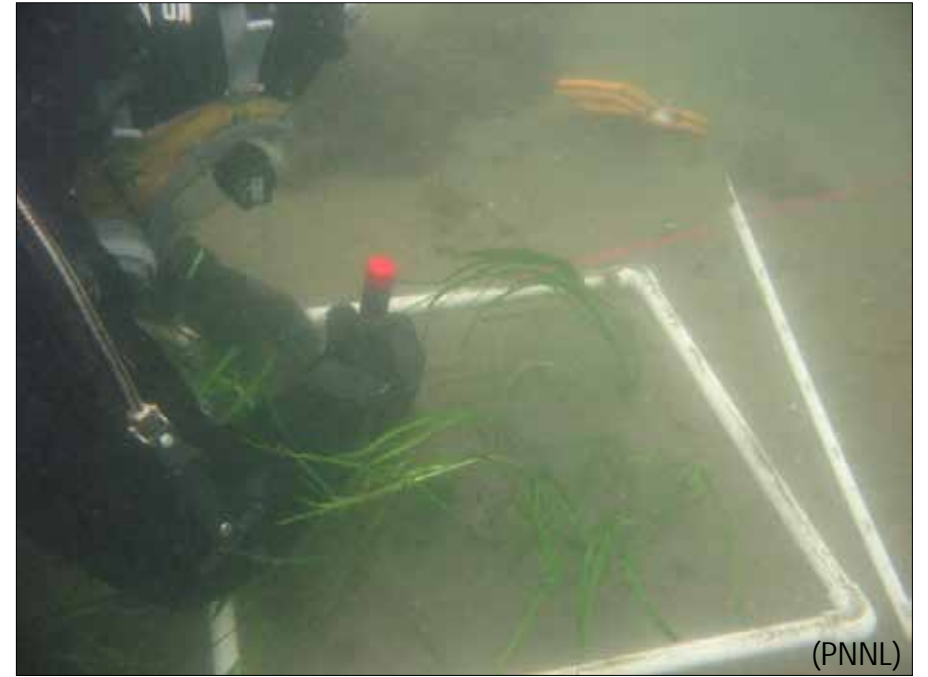


Transplant Success - South



Future restoration work

- Monitor
 - test- & large-scale transplants
 - methods study
- Research
 - track transplants and environmental variables across a gradient of observed loss
 - assess genetically robust donor sources
 - improve model performance
- Data distribution
 - interactive restoration map



Acknowledgements

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(A. Barna 2016)

