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

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**Speaker**
Jeff Gaeckle, John Vavrinec, Kate Buenau, Amy Borde, Lara Aston, Ron Thom, and Jim Shannon

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

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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
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
Restoration Sites 2013 - 2017

Large-scale Transplants

1. SHORT
2. SHORT - LONG
3. SHORT - LONG
4. SHORT - LONG
5. LONG

Shallow
Deep

Eelgrass Transplant Sites
- Large - Zm present
- Large - Zm absent
- Test - Zm present
- Test - Zm absent
- Test - Zm unknown
- Donor site
Shoot Density: Year 1

Shoot density (shoots m\(^{-2}\))

- **LONG SHOOTS**
  - 1: X=32.7, SE=4.6
  - 3: X=242.7, SE=44.1
  - 4: X=239.5, SE=21.5

- **SHORT SHOOTS**
  - 1: X=105.4, SE=20.3
  - 2: X=19.0, SE=7.2
  - 3: X=0, SE=0
  - 4: X=16.6, SE=4.2

Transect position (m)

- 10 m to 50 m
- Shallow: 0 m to 20 m
- Deep: 20 m to 50 m

 Shoot density (shoots m\(^{-2}\))

- **LONG SHOOTS**
  - 5: X=32.7, SE=4.6

- **SHORT SHOOTS**
  - 5: X=16.6, SE=4.2
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 ± 31,500 shoots
- 270 ± 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
Performance: Year 1

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

- Method study
  - burlap
  - re-bar
  - washers
  - staples

- Evaluate efficiency of transplanting

- Evaluate success of each method
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
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