Regional patterns in seagrass distribution, and their implications for management in greater Puget Sound

Bart Christiaen  
*Washington State Dept. of Natural Resources, United States, bart.christiaen@dnr.wa.gov*

Pete Dowty  
*Washington State Dept. of Natural Resources, United States, Peter.Dowty@dnr.wa.gov*

Lisa Ferrier  
*Washington State Dept. of Natural Resources, United States, lisa.ferrier@dnr.wa.gov*

Jeff Gaeckle  
*Washington State Dept. of Natural Resources, United States, jeffrey.gaeckle@dnr.wa.gov*

Helen Berry  
*Washington State Dept. of Natural Resources, United States, helen.berry@dnr.wa.gov*

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Bart Christiaen, Pete Dowty, Lisa Ferrier, Jeff Gaecke, Helen Berry
Seagrass in greater Puget Sound

INTRODUCTION

Zostera marina

Zostera japonica

Phyllospadix sp.
**Indicator: soundwide eelgrass area**

Management target defined on a **soundwide scale**: 20% increase relative to 2000-2008 baseline by 2020

**Advantages**

- Intuitive – easy to communicate
- Good for detecting long-term / large area change

**Disadvantage**

- Oversimplifies complexity on smaller spatial scales
Beyond the indicator ...

Greater Puget Sound has regional differences in
- geomorphology
- impervious cover
- tidal range
- available substrate
- water clarity
- ...

Are there regional differences in characteristics of eelgrass beds?
Submerged Vegetation Monitoring Program

2005
- Eelgrass
- Zm and Zj mixed
- Zj mono
- Absent
Regions in greater Puget Sound

- SJS: Strait and San Juan Islands
- NPS: Northern Puget Sound
- SWH: Saratoga Whidbey Basin
- CPS: Central Puget Sound
- HDC: Hood Canal
Where does eelgrass grow in Puget Sound?

- Approximately 22,000 ha of eelgrass in greater Puget Sound
- ~50% of eelgrass on tidal flats (74 sites total)
- Distribution different in each region
Spatial patterns in eelgrass area in part determined by the amount of available substrate.
What is the depth distribution?

- Eelgrass grows between +1.4 and -12 m (MLLW)
- Optimal depth range appears to be between 0 and -4 m (MLLW)
- Different depth distribution regions / flats vs fringe
Spatial patterns

- Spatial gradients in eelgrass depth range throughout the entire greater Puget Sound
- Spatial patterns caused by natural or anthropogenic drivers?
- Can spatial patterns help identify vulnerable areas in Puget Sound?
Environmental parameters

Turbidity (kd490)

Tidal range (MHHW – MLLW)

Exposure (Fetch)

Satellite data by Brandon Sackmann, Integral Consulting

VDATUM (NOAA)

FetchR
PCA analysis of environmental parameters

Eelgrass depth range becomes narrower with increasing turbidity and tidal range
Implications for management

1. **Soundwide eelgrass area**: important regional performance measure
   - Intuitive, easy to communicate
   - Large scale / long term trends

2. **Eelgrass area** not evenly distributed
   - Size of eelgrass beds vs. available habitat
   - Different distribution (flats/fringe) in depending on region
   - Different function (blue carbon vs. migratory corridors for salmon)?
Implications for management

3. Approximately 60% of eelgrass grows in the subtidal:
   • Large fraction on State Owned Aquatic Lands

4. Patterns in eelgrass depth range:
   • Smallest depth range: Saratoga Whidbey, South Puget Sound and lower Hood Canal
   • Longer residence times / high turbidity / high tidal range

5. Areas of concern: narrower depth range = more vulnerable to disturbance, as eelgrass is more limited in available habitat.
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