Eelgrass Preservation and Restoration in Ship Traffic Areas

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Purpose

- Review potential vessel impacts to eelgrass
- Present some examples of ways to avoid, minimize and compensate for damage

Potential Impacts from Vessels

- Direct vessel prop and hull scour
  - Jet skis, small and large vessels in Florida
- Propeller wash
  - Ferry boats in Puget Sound
- Vessel wakes
  - Fast ferries in Puget Sound
  - Large container vessels

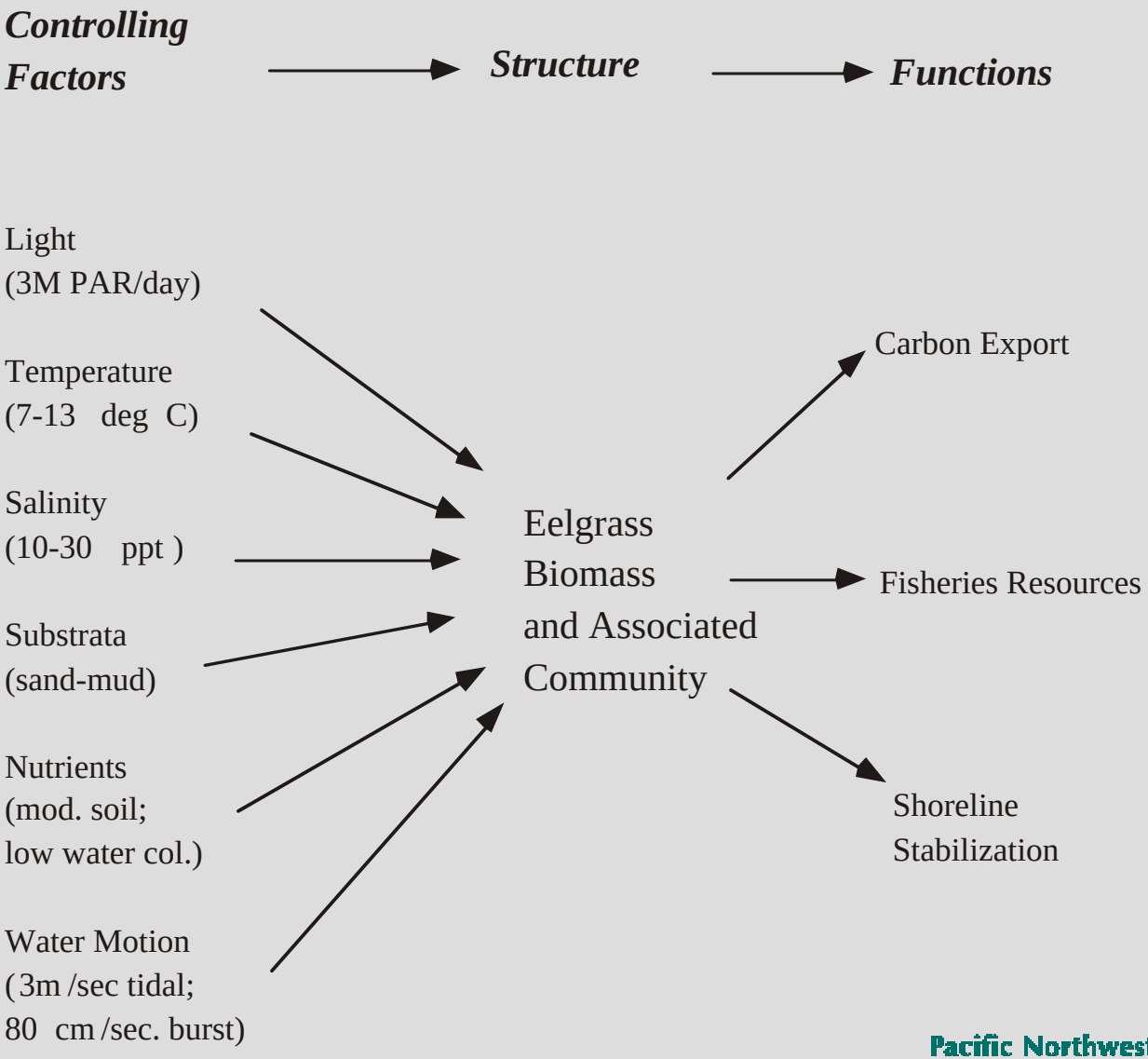
Eelgrass (*Zostera marina*) Biology and Ecology

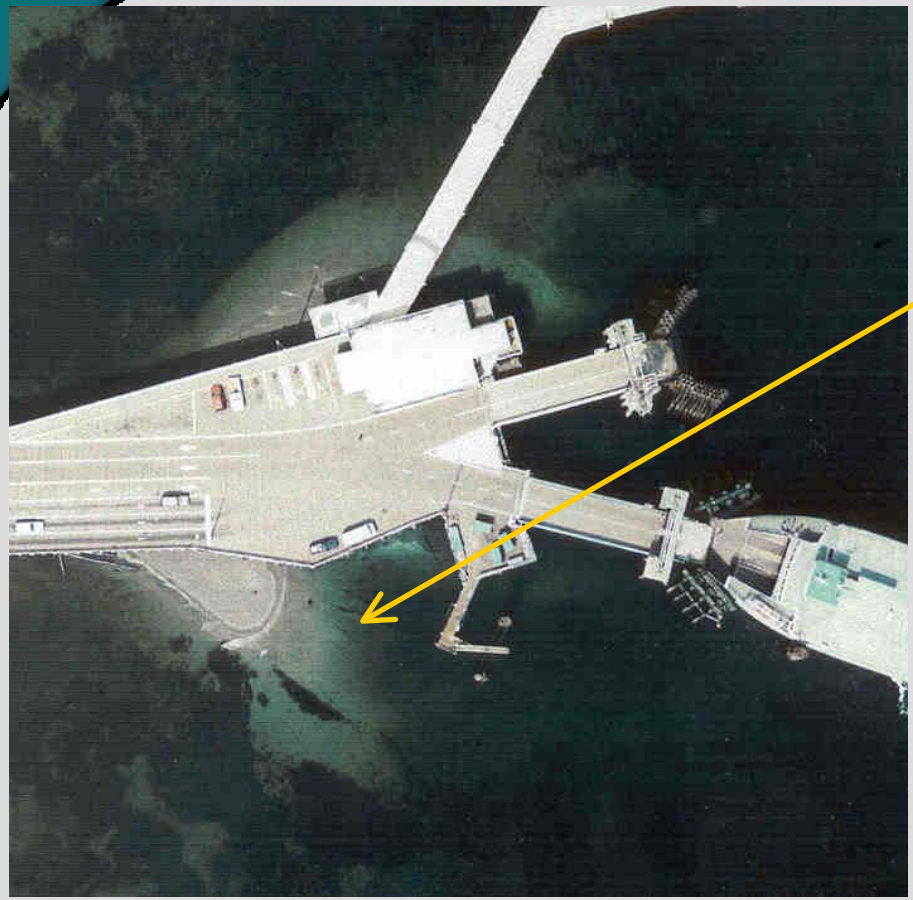
- One of about 60 species of seagrass (rooted angiosperms that grow in the sea)
- *Z. marina* is most widespread species
- Grows in dense meadows in shallow water in protected marine and estuarine areas
- Functions:
  - Primary productivity
  - Directly eaten
  - Detritus export
  - Refuge from predation
  - Reproduction habitat
  - Prey production
  - Shoreline stabilization

Mechanisms of Impacts

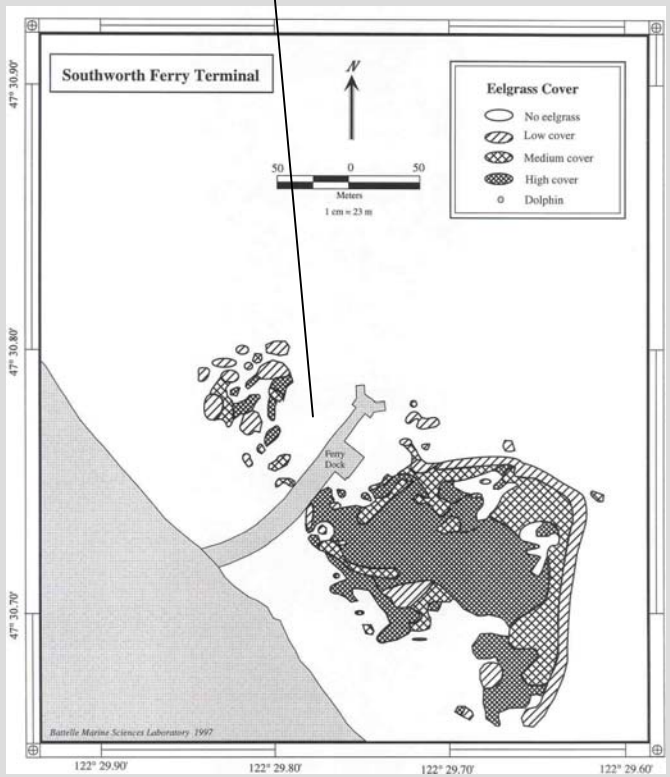
- Fragmentation of plants
- Erosion on surface fine material (organic and inorganic material on plants and on sediment)
- Erosion of sediments, and exposure of rhizomes and roots
- Erosion of plants
- Deposition and burial
- Reduction in light

Eelgrass Conceptual Model





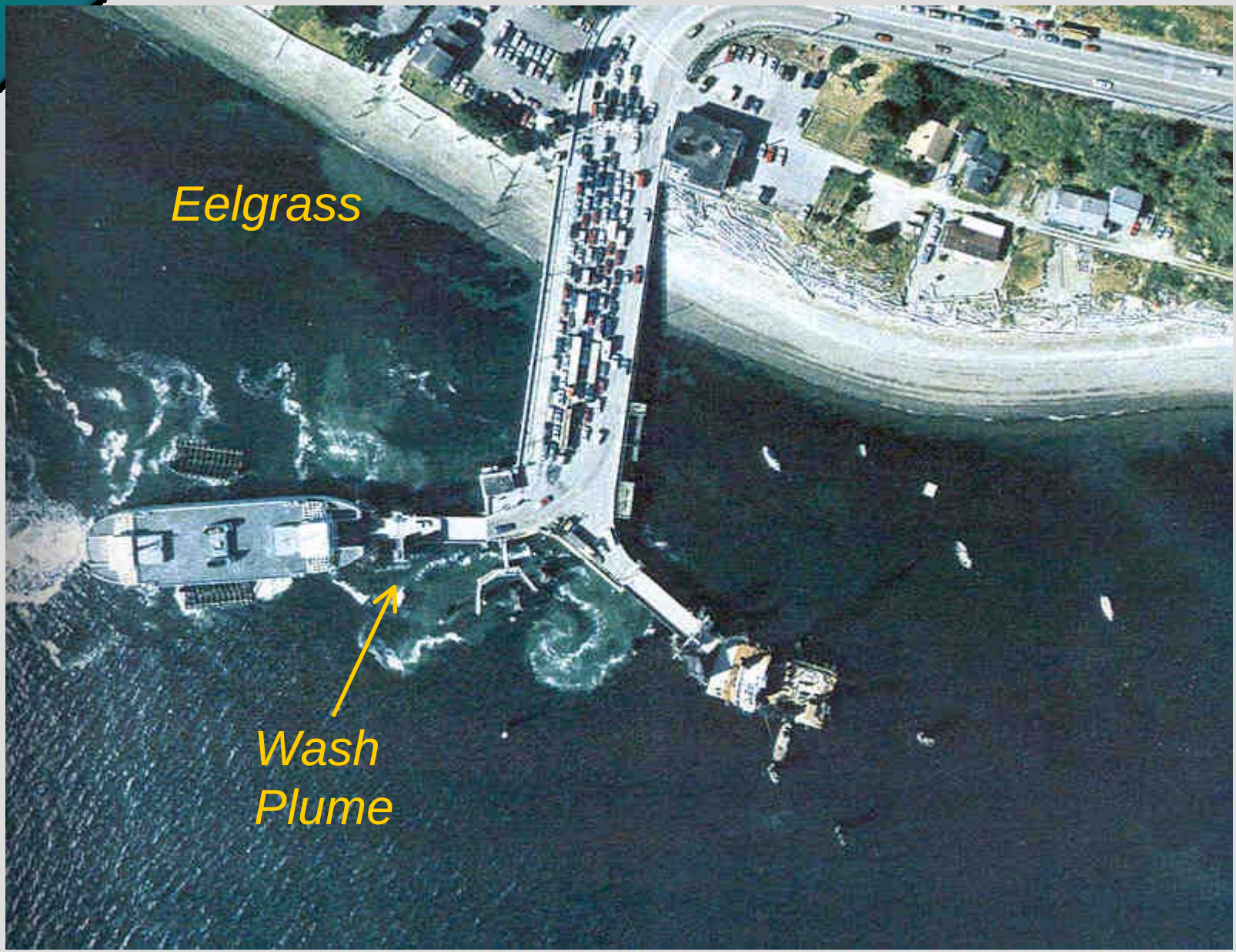
Erosion/Deposition Zone

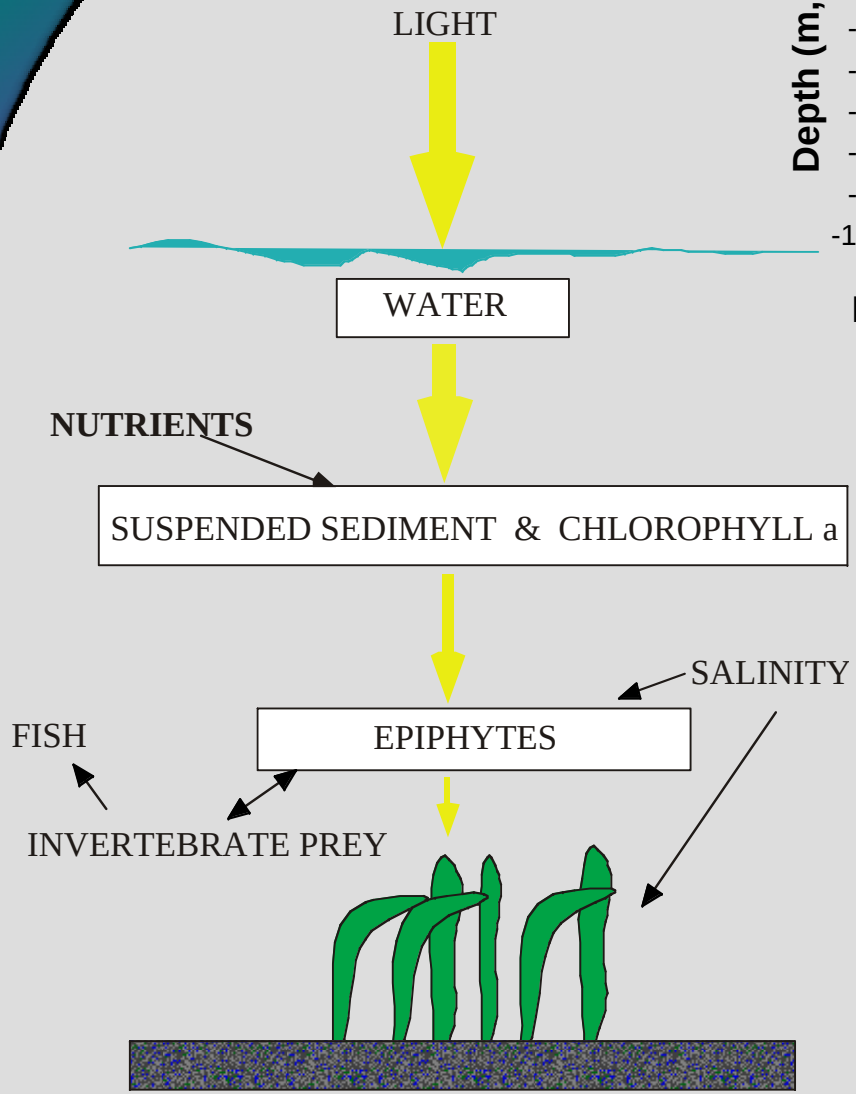


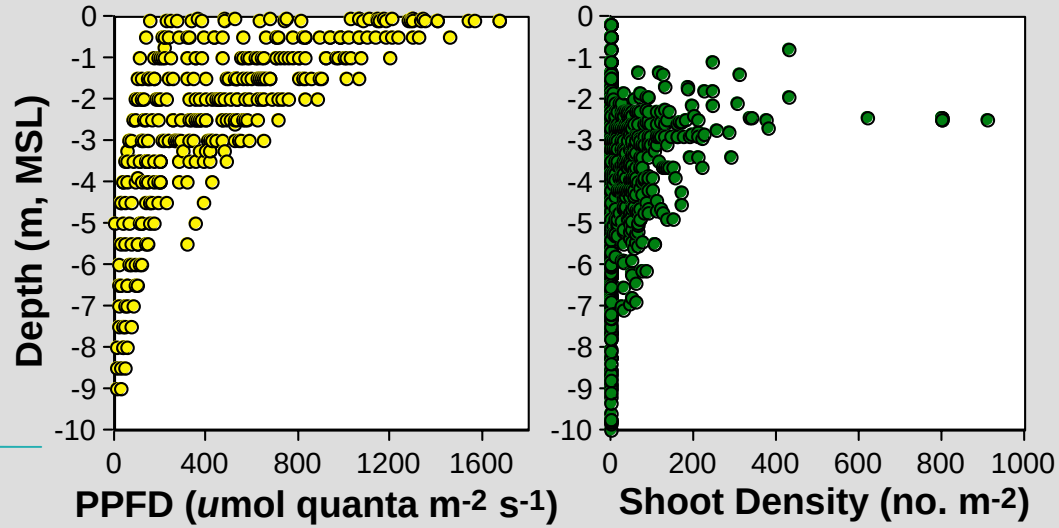
Large Vessel Wake

Scalloped edge

Exposed Rhizomes


Eelgrass
Wash
Plume

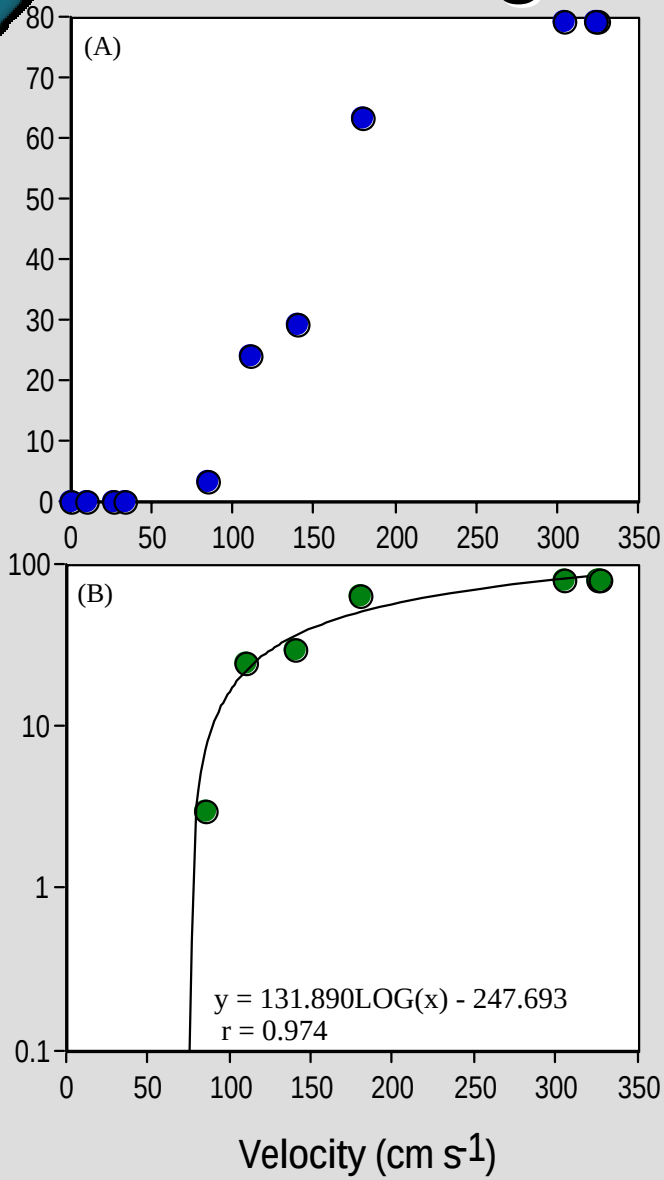


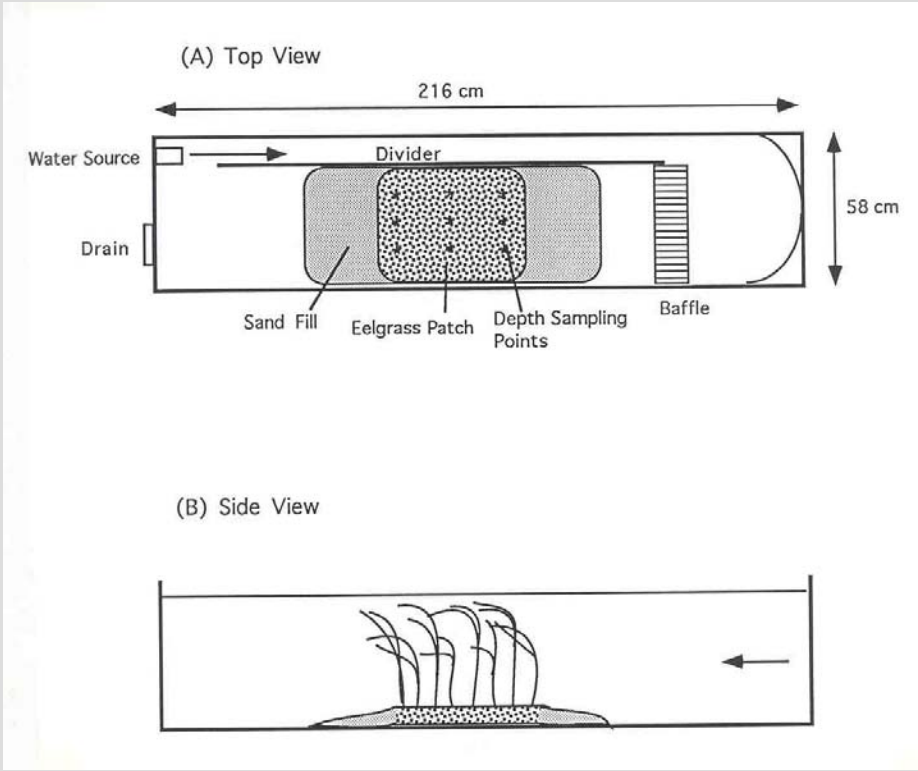


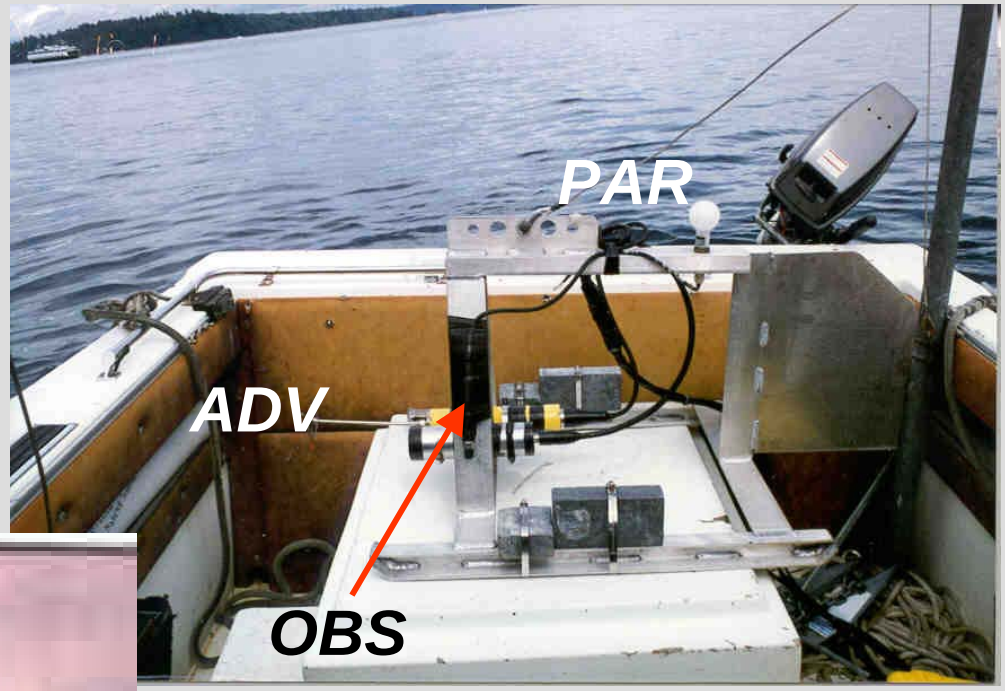
Role of Light

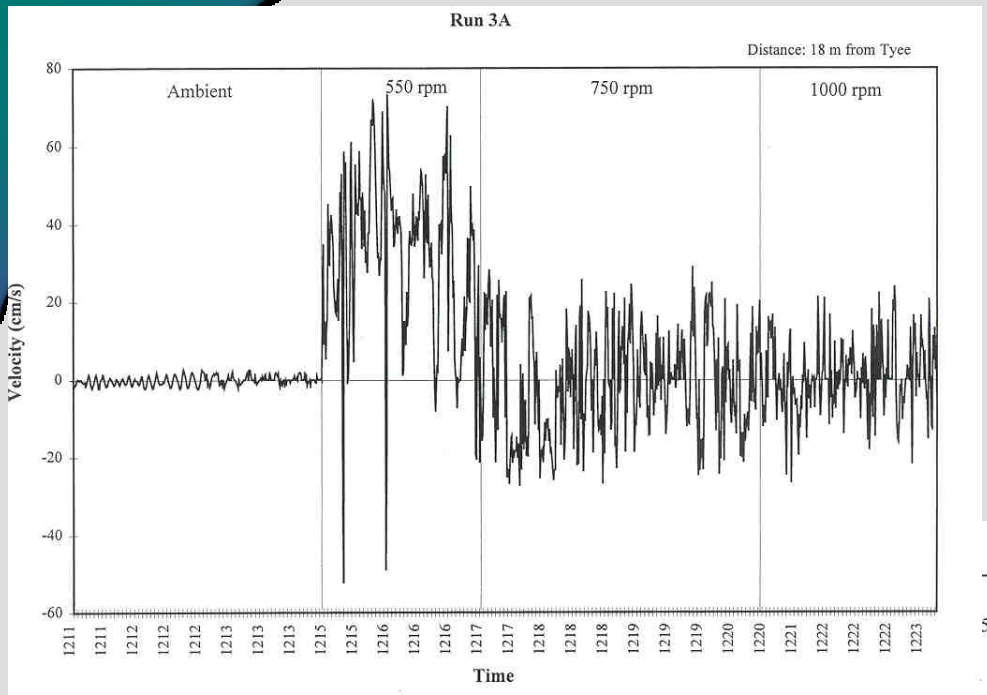
- ***Controls growth***
- ***Controls distribution***
- ***Frequent reduction can affect eelgrass***

Eelgrass Flume Studies

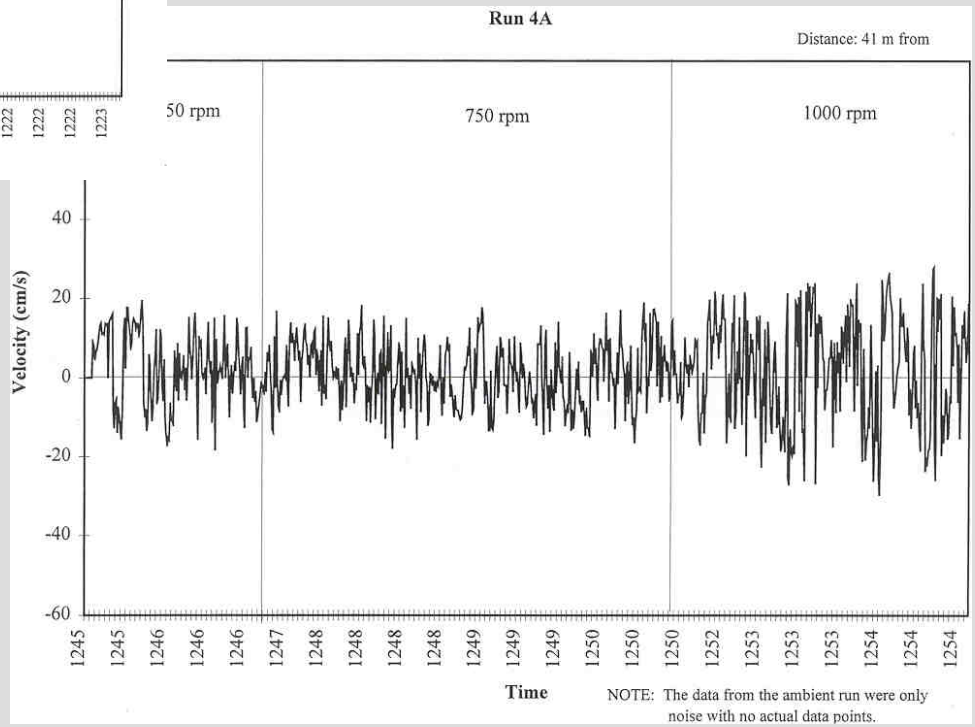





PAR
ADV
OBS

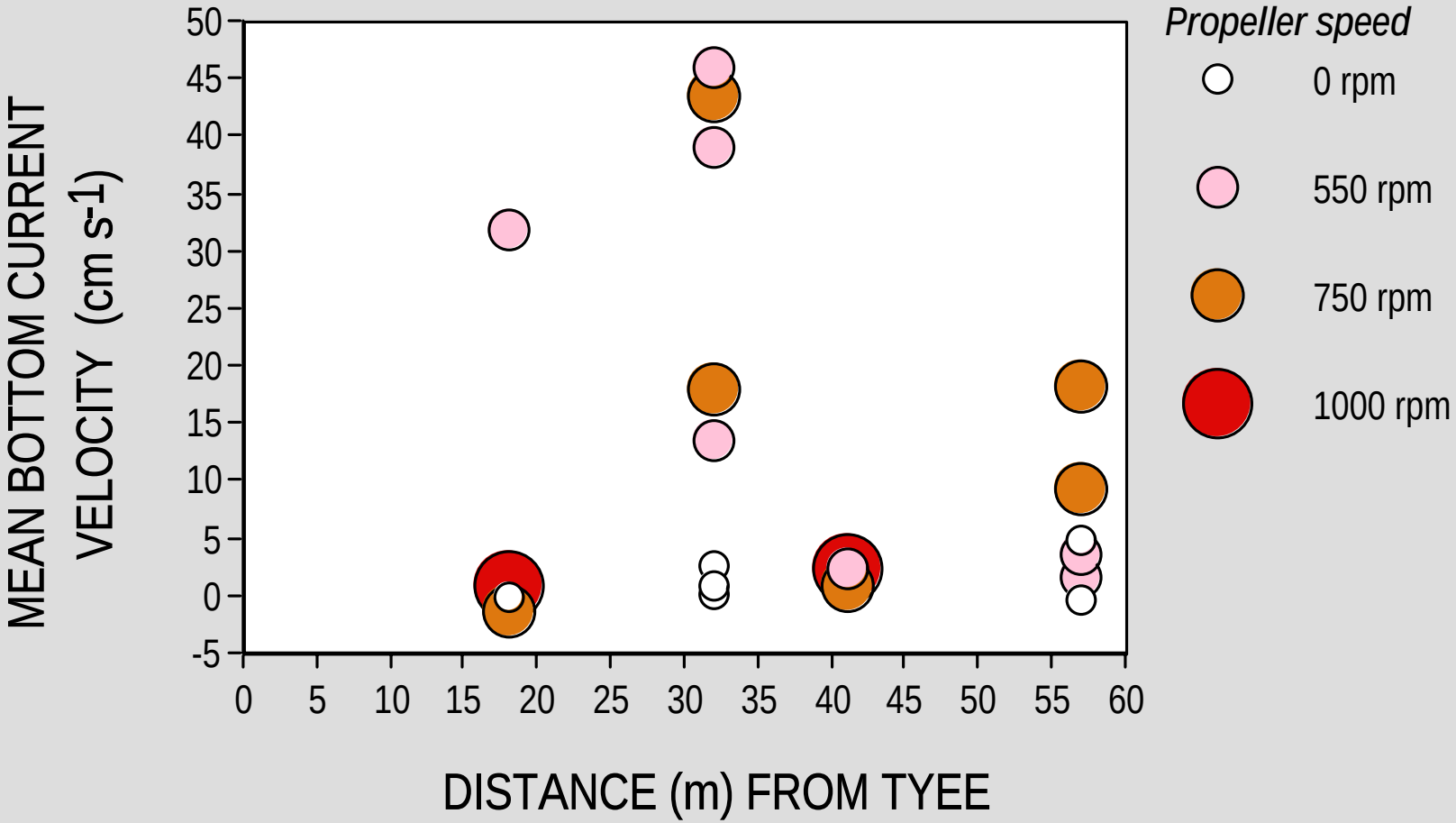


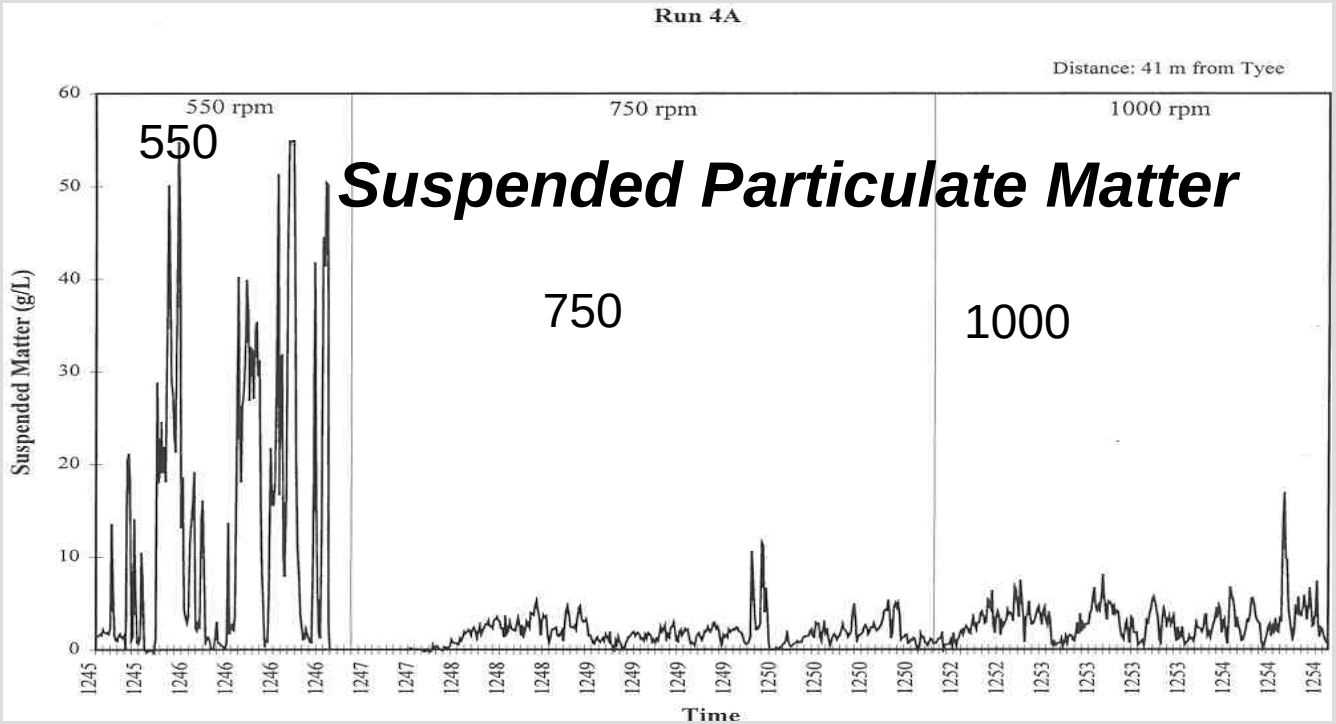
18m from propellers

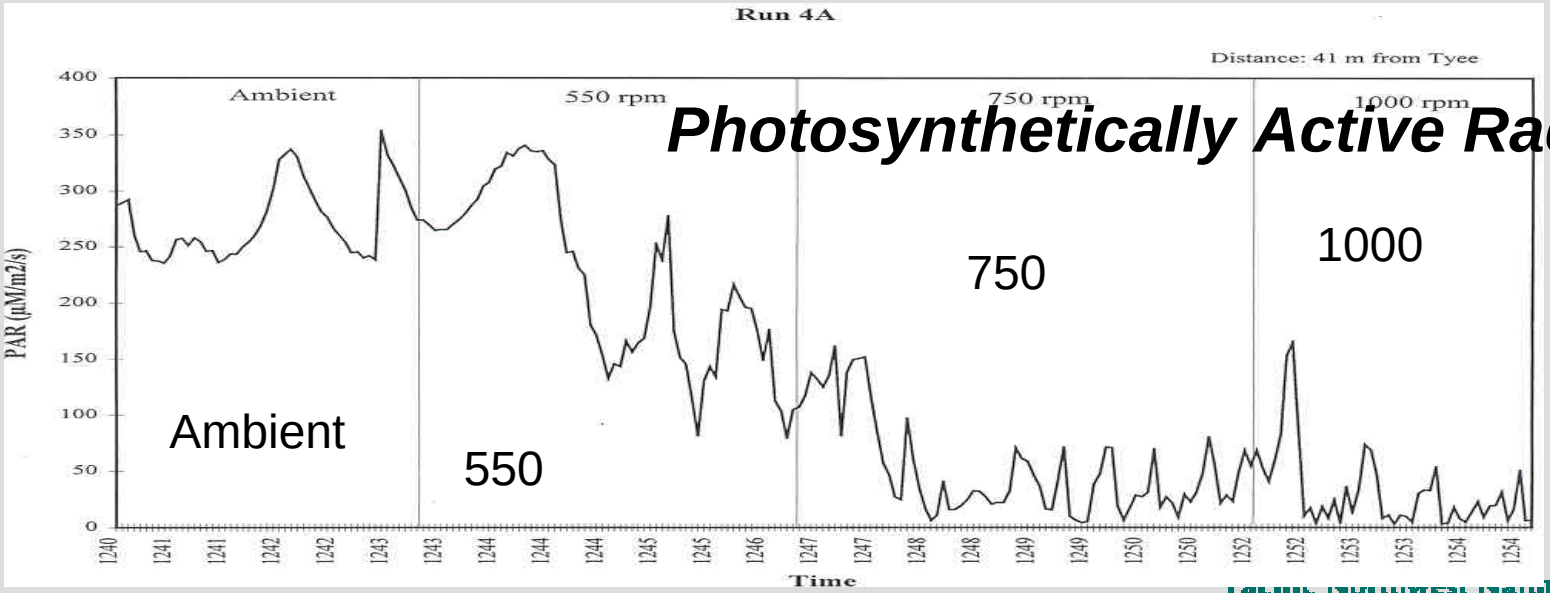


41m from propellers

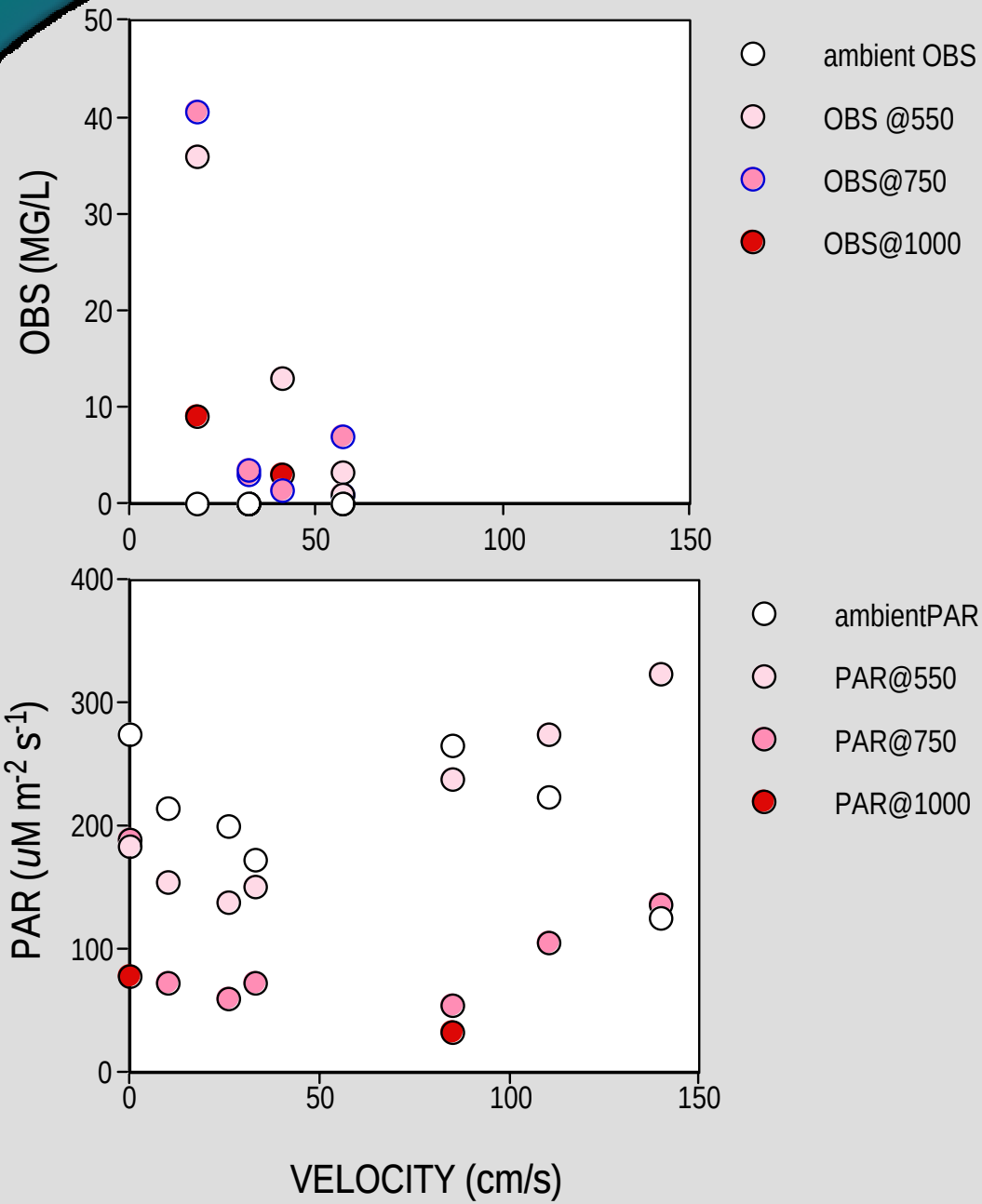
Field Studies of Propeller Wash




Run 4A
Distance: 41 m from Tyee
550 rpm
750 rpm
1000 rpm
550
750
1000
Suspended Particulate Matter
Suspended Matter (g/L)
Time


Run 4A
Distance: 41 m from Tyee
Ambient
550 rpm
750 rpm
1000 rpm
Photosynthetically Active Radiation
Ambient
550
750
1000
PAR (µM/m2/s)
Time

Bottom Velocity, Turbidity and PAR

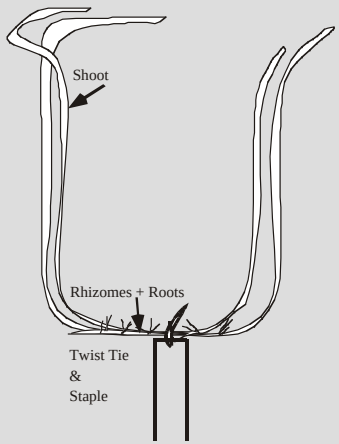


Mechanisms for Minimization and Recovery

- Remove or reduce source of disturbance below a threshold expected to cause problem
  - Set back zone
  - Reorient slips
  - Reroute ships
  - Establish and enforce best management practices

- Natural Recovery Processes
  - Flowering and seed deposition
  - Rhizome spread
  - Drift fragments

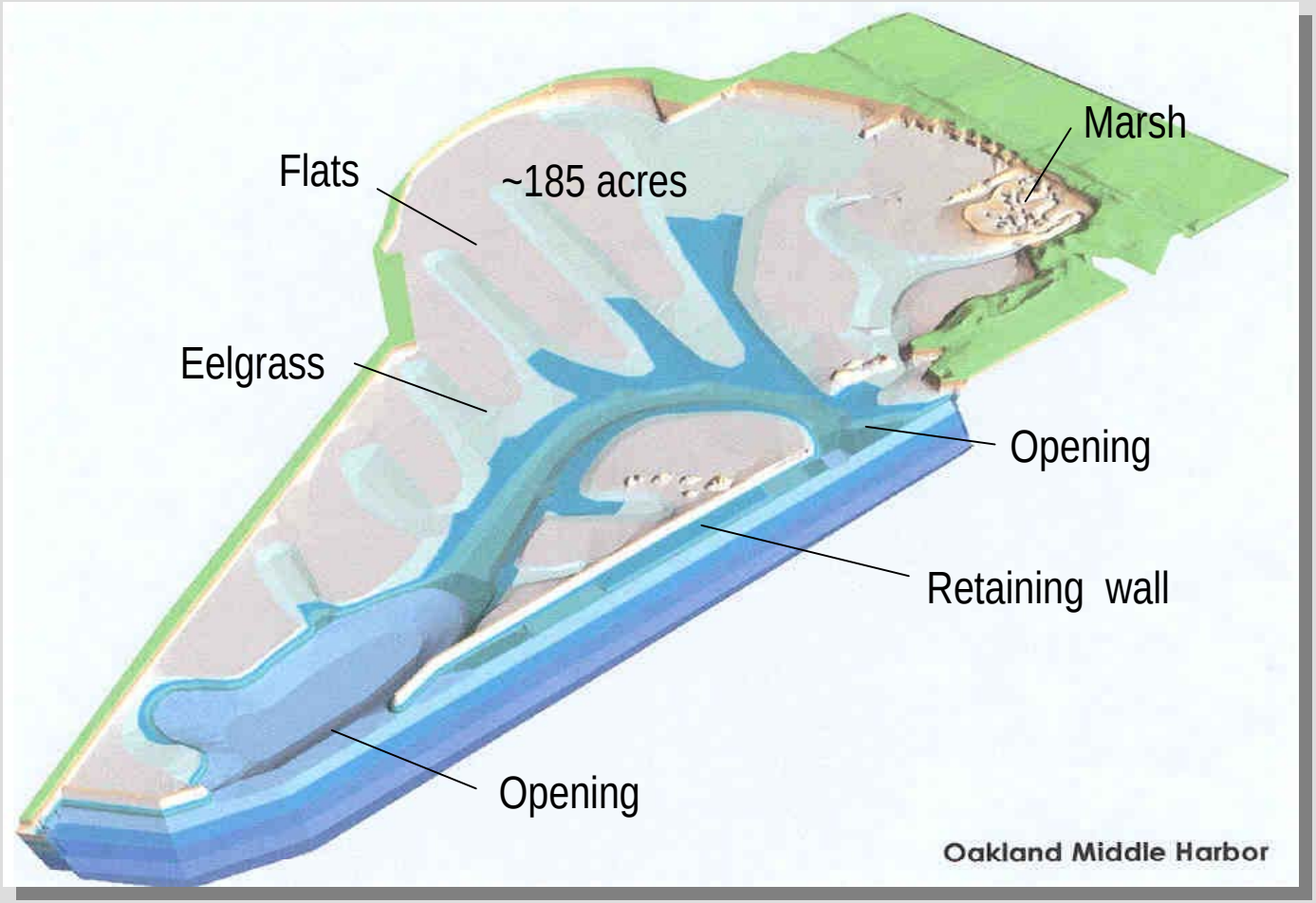
- Restoration
  - Adult plantings
  - Seed plantings



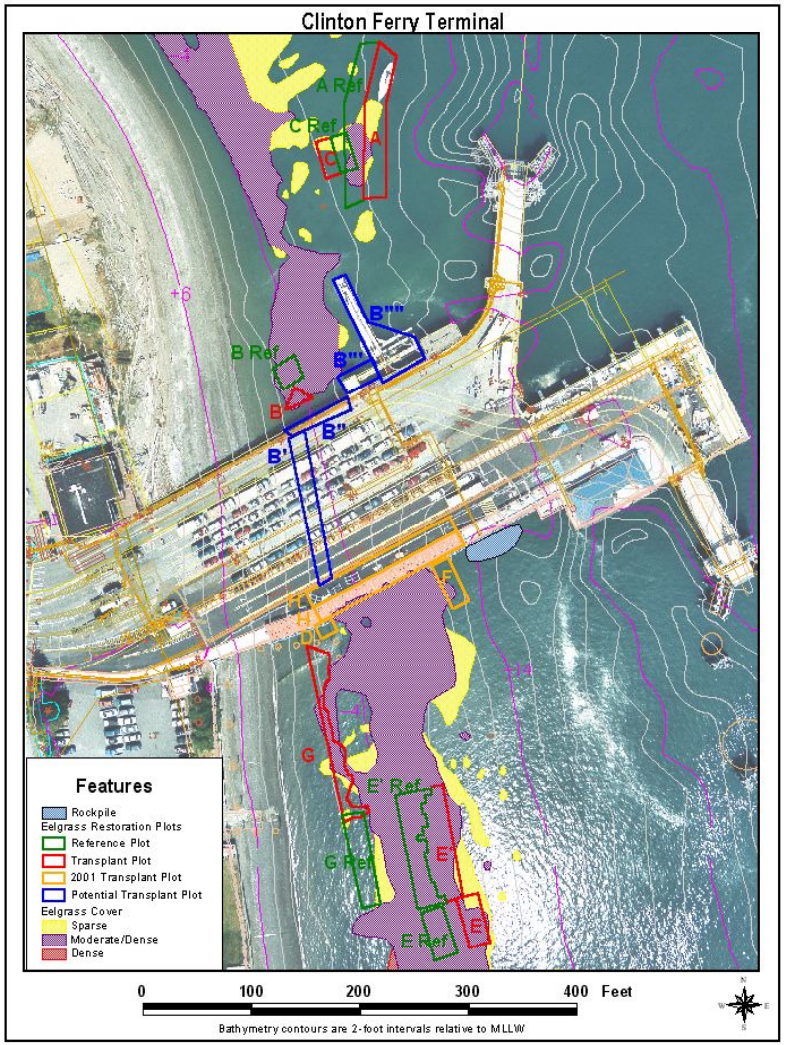
Oakland Middle Harbor Mudflat/Eelgrass Restoration

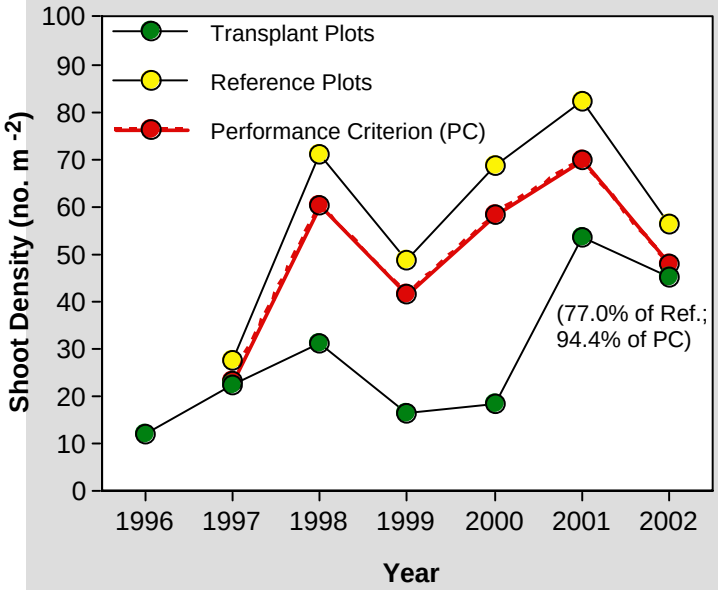
Adaptive Measures

- Incremental fill-settlement cycle
- Test planting of eelgrass
- Adjustable openings to maintain water quality



Eelgrass Restoration





- Mean shoot density over all plots close to performance criterion by 2002
- Highly variable reference density tracked generally by planting plot density
- Large increase over time in reference density an issue

Contact Information

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