

# Protecting Shorelines: Alternative Stabilization Techniques

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- Nineteen sites
- Over 100 acres
- One-third already restored
- Many w/ public shoreline access
- Mostly estuarine and marine habitat

# Developed sites

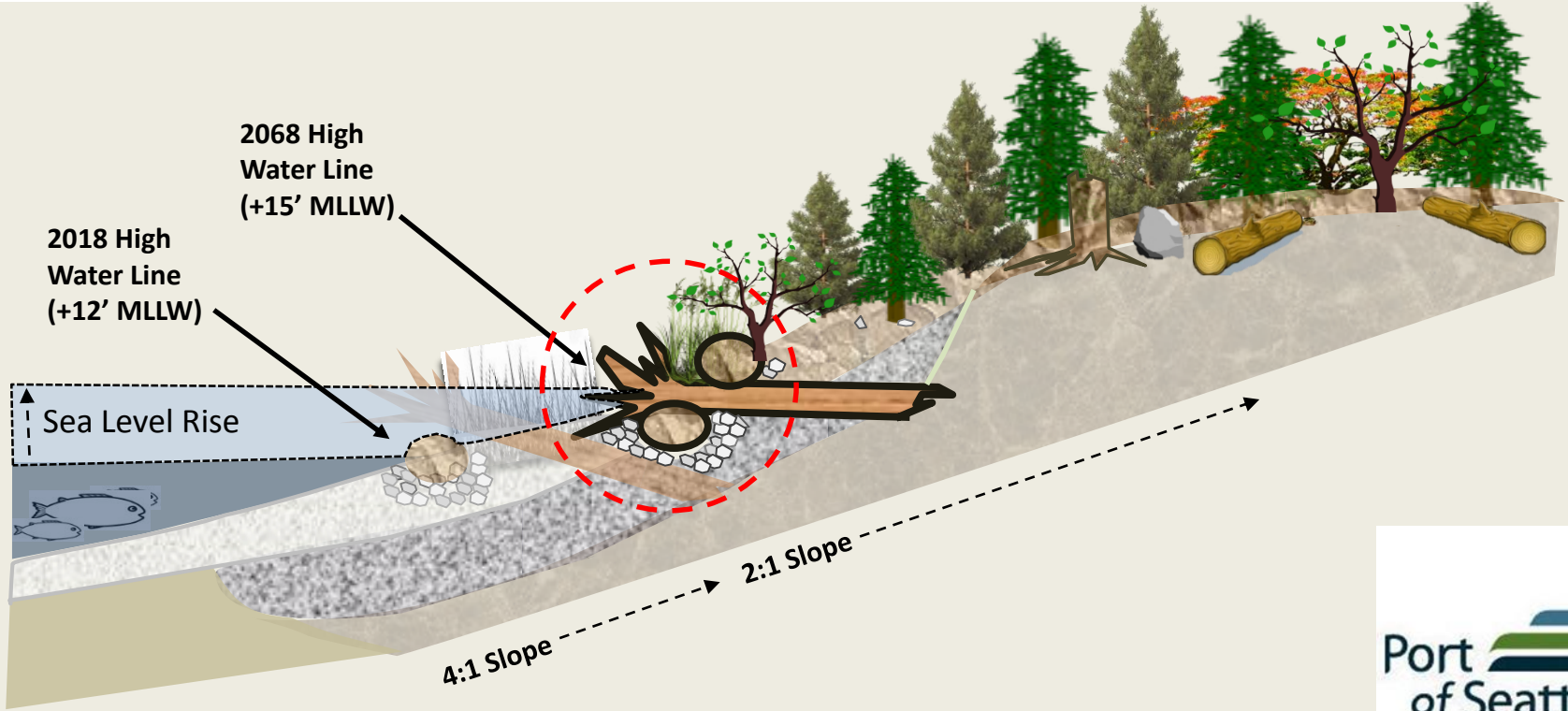


# Terminal 117





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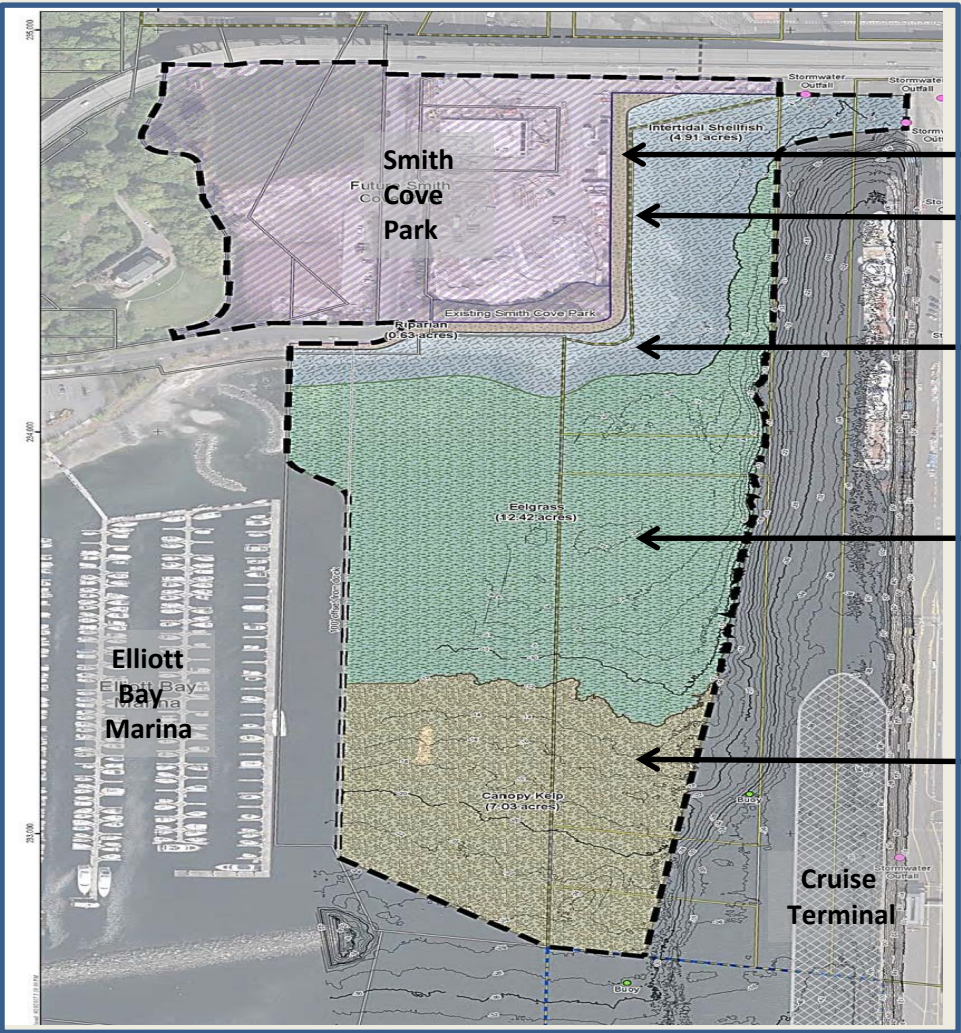




Smith Cove



# Smith Cove Blue Carbon

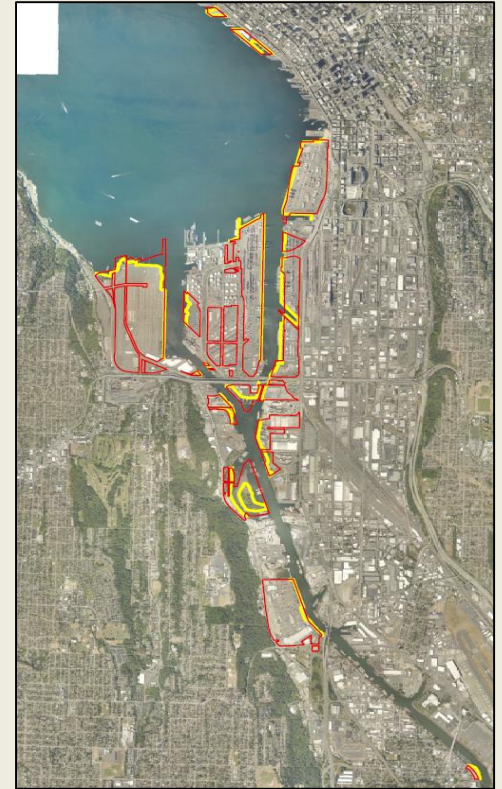


- On-Slope Riparian (> +12' MLLW)
- Shellfish & Mudflat (+8' to -2' MLLW)
- Marsh plants (+12' to +8' MLLW)
- Eelgrass (-2' to -12' MLLW)
- Kelp (-12' to -24' MLLW)



# Port Shorelines

- Port of Seattle owns 16 miles of shoreline
- Over 90% armored (rip-rap, bulkhead, etc)
- Habitat for listed species
- Increasing pressure due to sea-level rise and climate change
- Maintenance and repair actions subject to challenging regulations





# Bankline Stabilization Programmatic Permit

- Framework of pre-approved solutions
- Solutions ladder from a fully restored bankline solution through maintenance of existing infrastructure
- Characterize existing bankline conditions
- Evaluate feasibility of enhancement

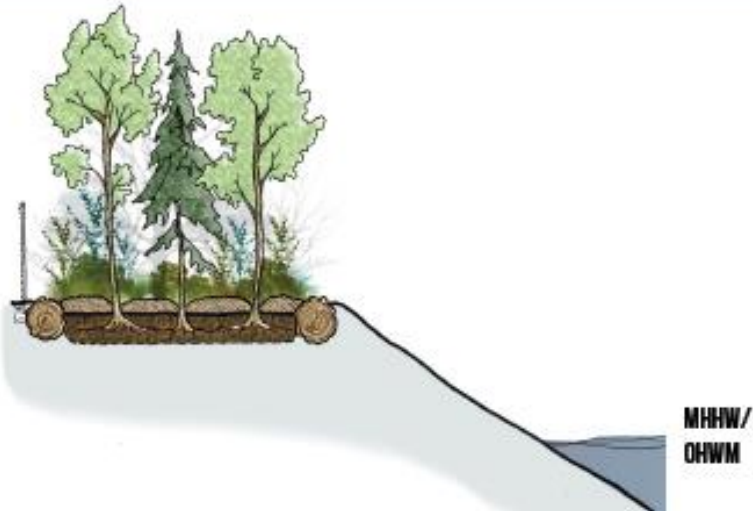


# Decision Tree

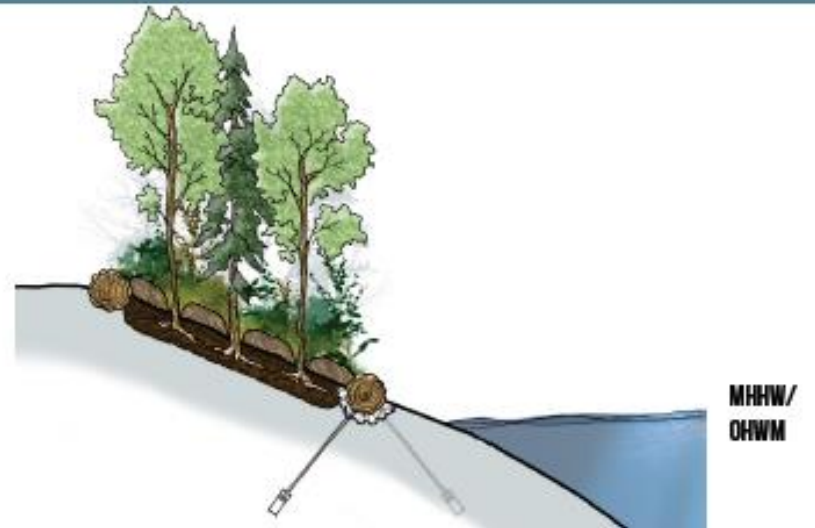
- **Environmental enhancement** through alternative and/or in-kind repairs where feasible
- Allow **in-kind repair/replacement** where enhancement infeasible
- **No expansion of hard structural stabilization** allowed through programmatic permits
- Align with regulatory framework

# Alternative Stabilization w/ Natural Elements

**B1. TOP OF SLOPE RIPARIAN BUFFER**



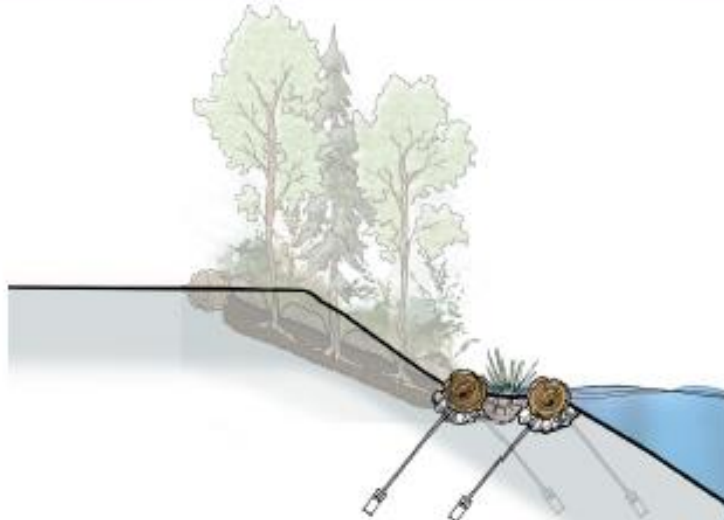
**B2. ON-SLOPE RIPARIAN BUFFER**



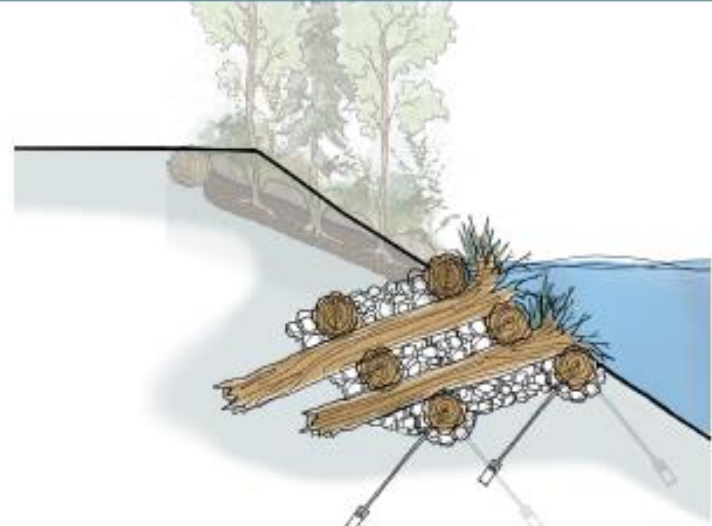


# Alternative Stabilization w/ Natural Elements

## B3. TRANSITION ANCHOR SYSTEM



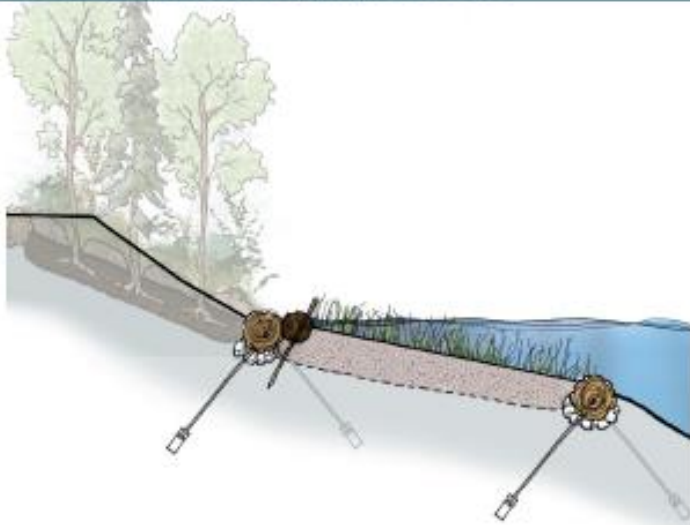
MHHW/  
OHWM



MHHW/  
OHWM

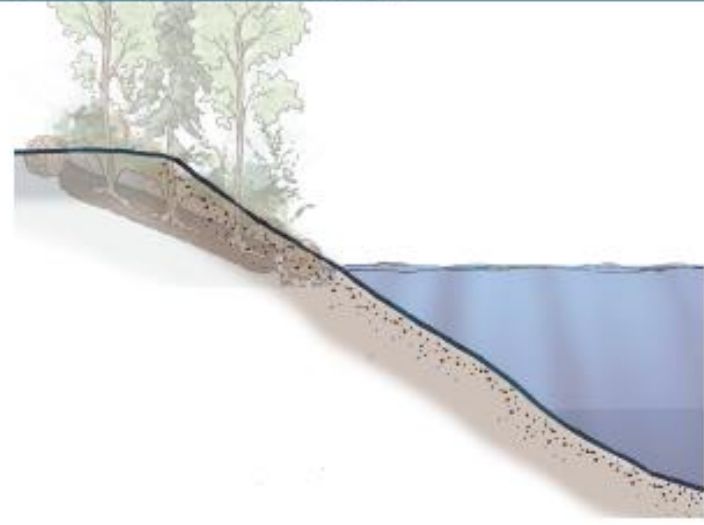
# Alternative Stabilization w/ Natural Elements

## B4. EMERGENT MARSH BED



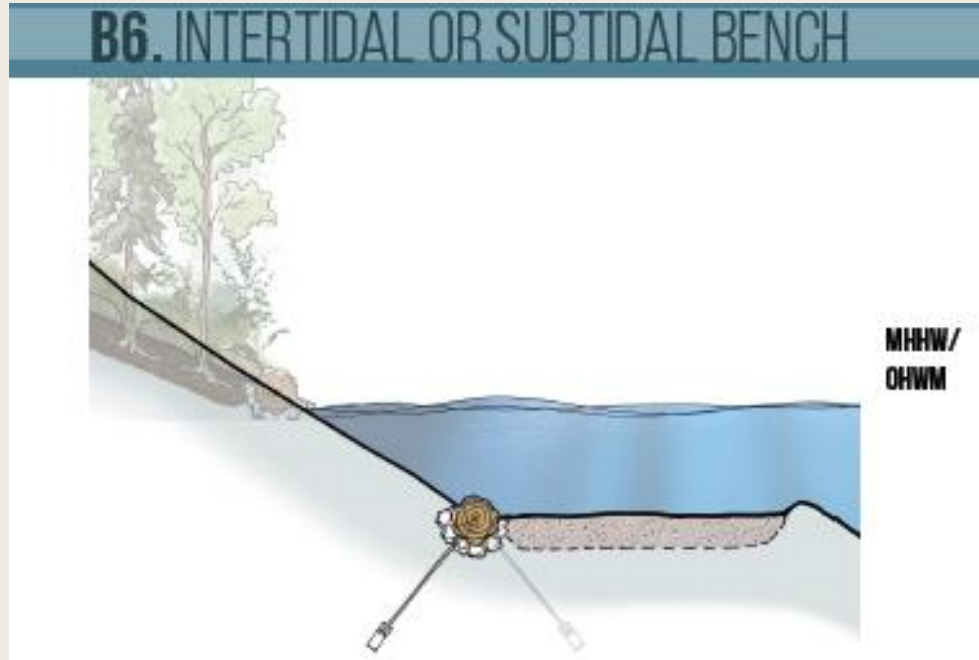
MHHW/  
OHWM

## B5. NATURAL BEACH



MHHW/  
OHWM

# Alternative Stabilization w/ Natural Elements





# Programmatic Governance

Facility/Project Name	Project Completion Date	Pre-treatment Condition	Post-treatment Condition	HEA value (dSAYs)	Zone
T91 Cruise Repair	TBD	Conventional Armored Slope	Sloped Bulkhead	<b>-0.12</b>	Marine
T104 Intertidal Bench	1992	Conventional Armored Slope	Conventional Armored Slope, Intertidal Bench	<b>+0.30</b>	Estuarine
South Park 8 <sup>th</sup> Ave S Public Access and South Riverside Drive (2 projects)	2015	Conventional Armored Slope	Transitional Anchor System, Emergent Marsh Bed, Top of Slope Riparian, On-slope Riparian	<b>+2.67</b>	Estuarine
<i>Project 4</i>	<i>2019</i>	<i>Vertical Bulkhead</i>	<i>Conventional Armored Slope and Top of Bank Riparian</i>	<i>+1.50</i>	<i>Marine</i>
<i>Project 5</i>	<i>2020</i>	<i>Conventional Armored Slope</i>	<i>Conventional Armored Slope, On-Slope Riparian, and Transitional Anchor System</i>	<i>+2.17</i>	<i>Marine</i>
			<b>Running Total (dSAYs)</b>	<b>6.52</b>	

# Results

- Continue to protect Port assets from bankline failure and vessel wake, wind and current erosion
- Employ best management techniques from agency perspective,
- Self mitigate for construction by improvement or at least not increasing size or making worse .
- Track improvements over time
- Work permitted for 10 years



# T108 Before





# Transition Anchor System



# West Yard Top of Slope Riparian System



# South Riverside Before





# Transition Anchor System







questions