

Elliott Bay  Seawall
Project

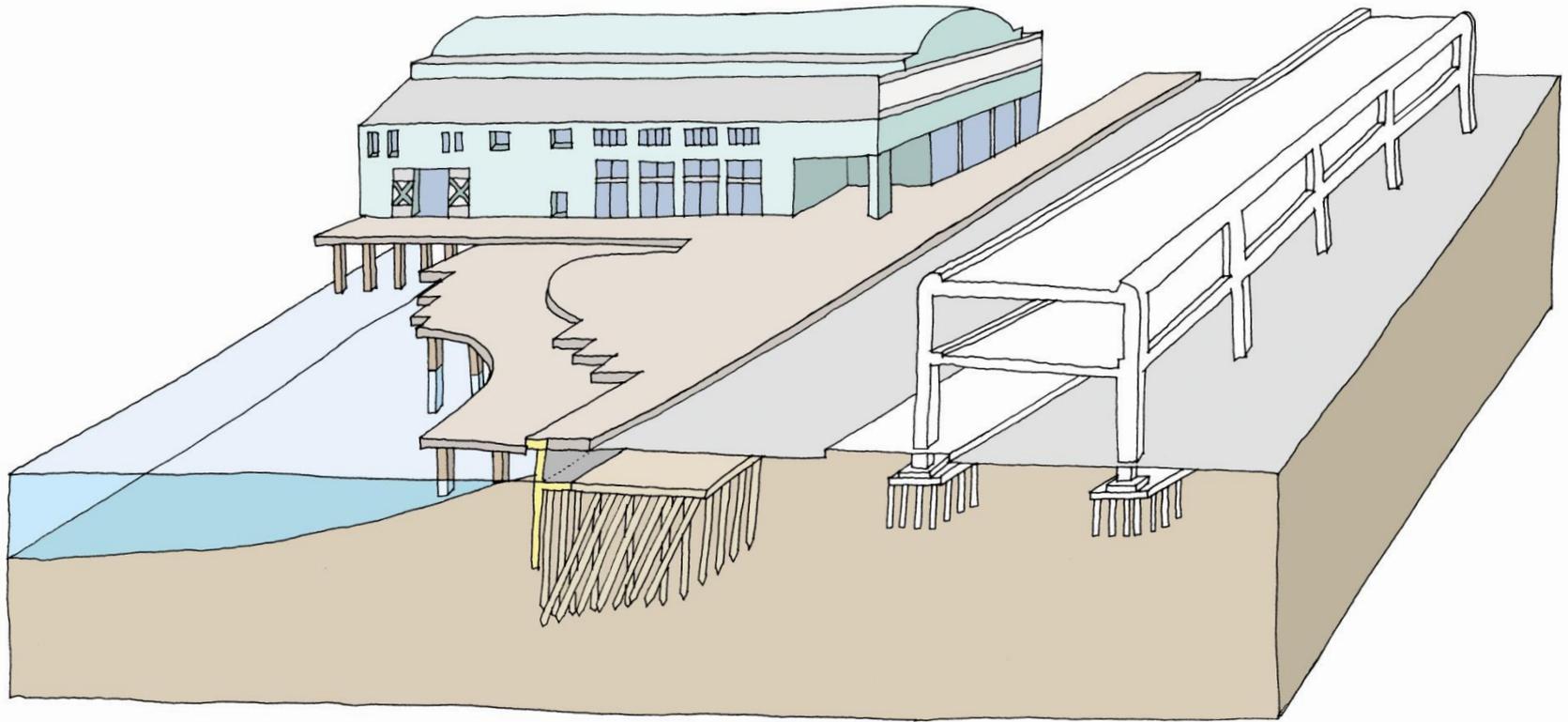
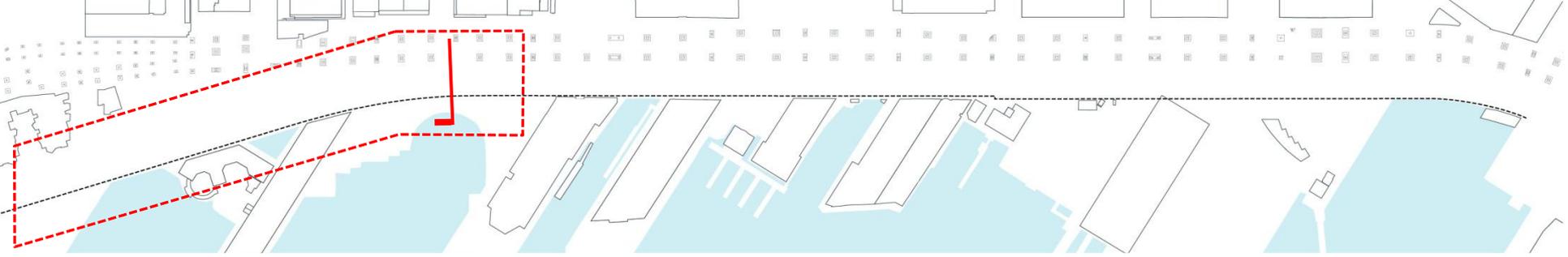
***Seattle City Council
Special Committee Briefing
May 29, 2012***

Today's Focus: Ecosystem Restoration

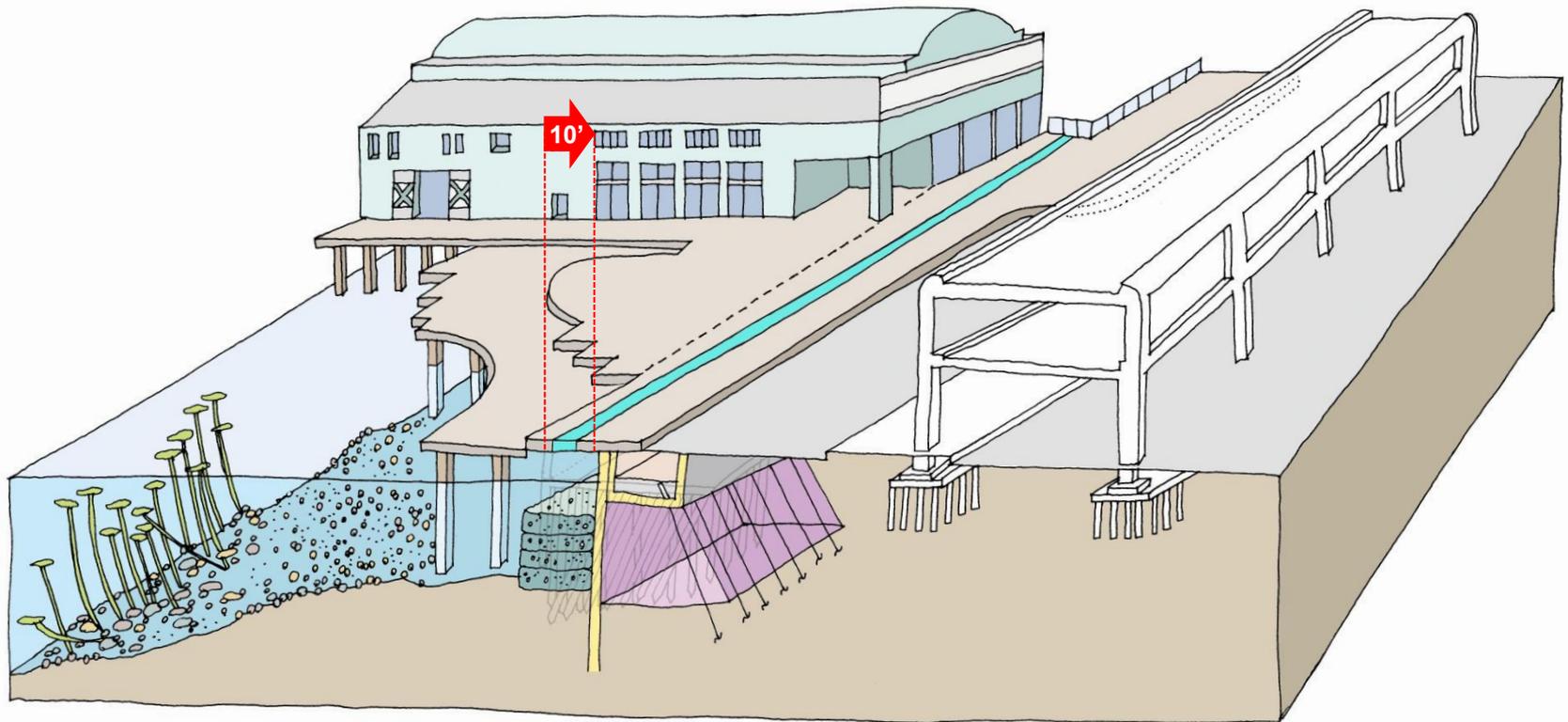
Seawall Project Purpose

- Reduce the risks of coastal storm and seismic damages
- Protect public safety, critical infrastructure, and associated economic activities along Seattle's central waterfront
- **Improve the degraded ecosystem functions and processes of the Elliott Bay nearshore in the vicinity of the existing seawall**





Existing Conditions



Proposed Project

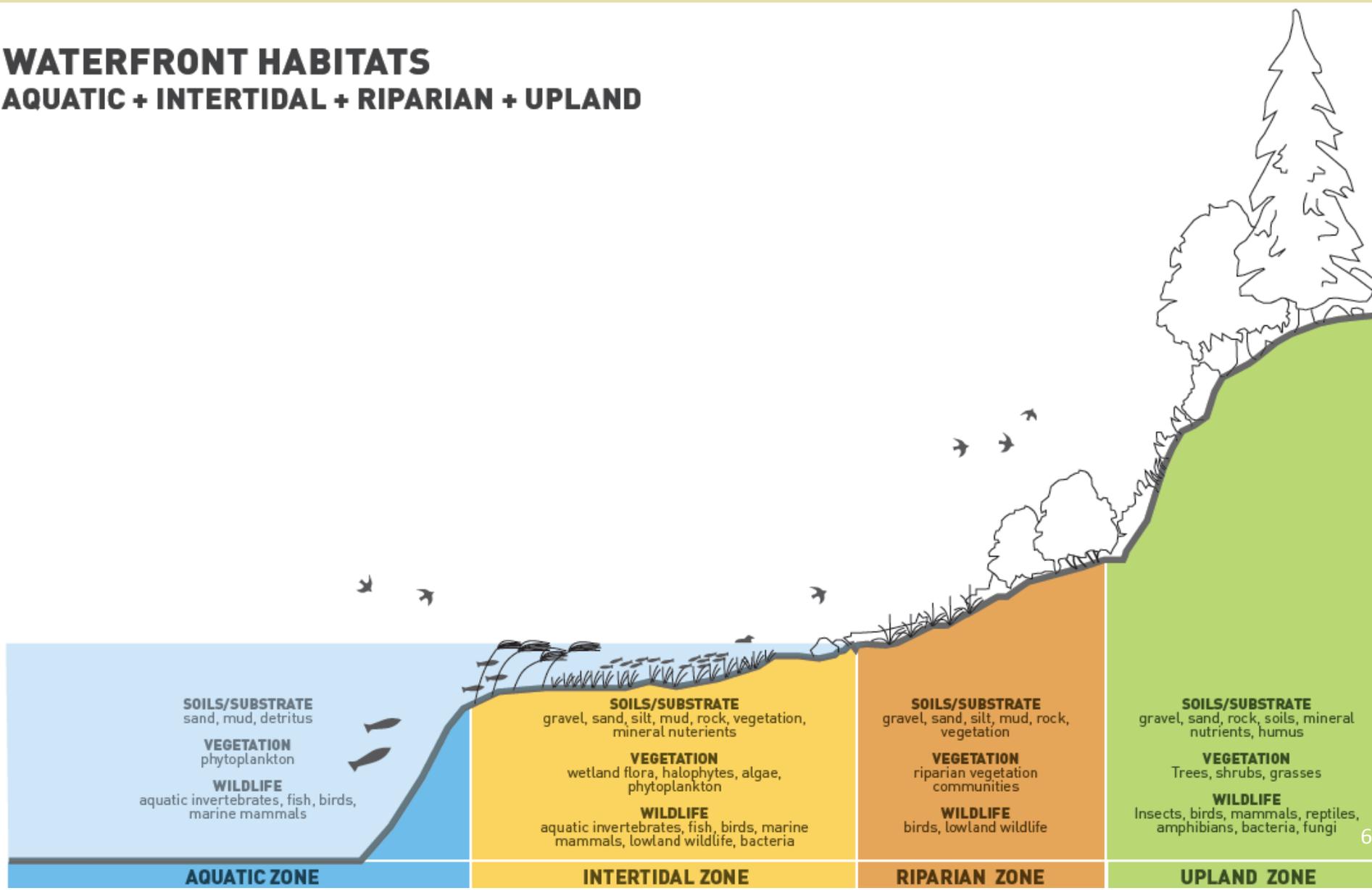
Waterfront Habitats

-  UPLAND HABITAT
-  RIPARIAN HABITAT
-  INTERTIDAL HABITAT
-  AQUATIC HABITAT



Nearshore Ecosystem: A Piece of the Puzzle

WATERFRONT HABITATS AQUATIC + INTERTIDAL + RIPARIAN + UPLAND



Why are we doing this?



PLAN OF SEATTLE

1855 - 6

Showing the position occupied by the Decatur's crew, July 26, together with the line of Barricades erected and roads constructed.

*J. S. Phelps
Commodore U.S.N.*



ELLIOTT BAY

Original sketch
Enlarged & Revised
by *Charles S. Gifford*
December 1930

Elliott Bay



Seawall
Project





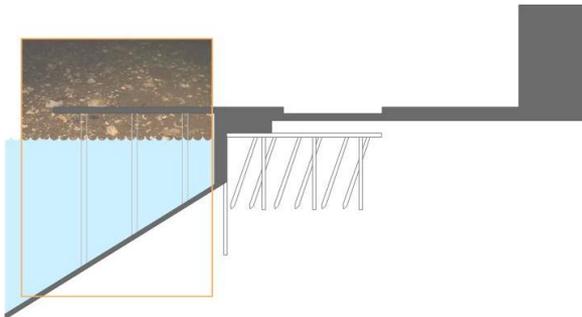
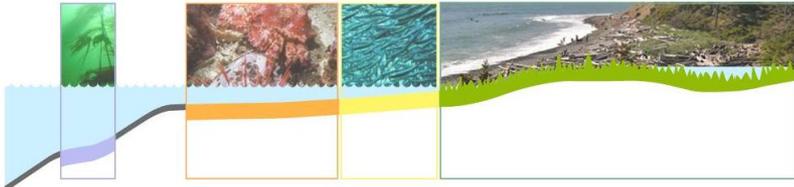


Today

Elliott Bay

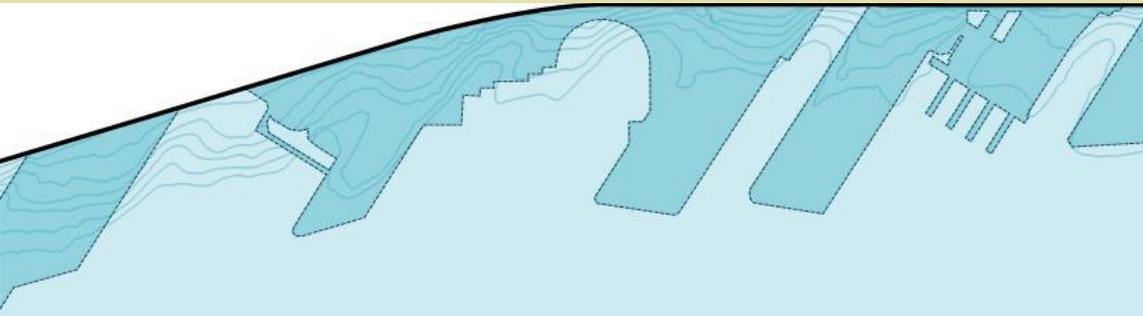


Seawall
Project



Elliott Bay  Seawall Project

Degraded Nearshore Habitats



- Migratory corridor
 - Depth
 - Light
- Nearshore ecosystem productivity
 - Aquatic and riparian vegetation
 - Macroinvertebrates
 - Substrate diversity



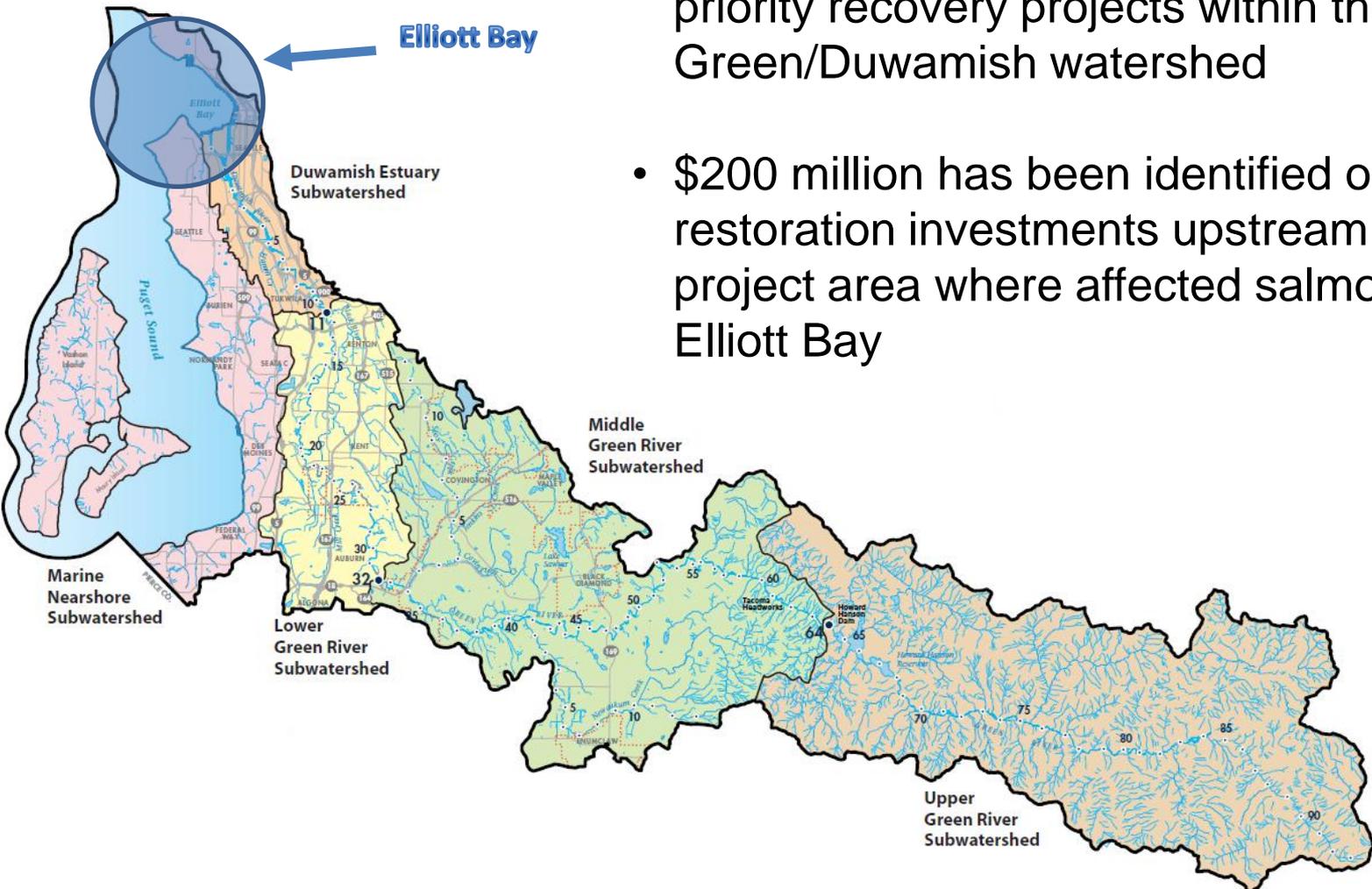
Threatened and Endangered Species

- Salmon
- Trout
- Puget Sound Rockfish



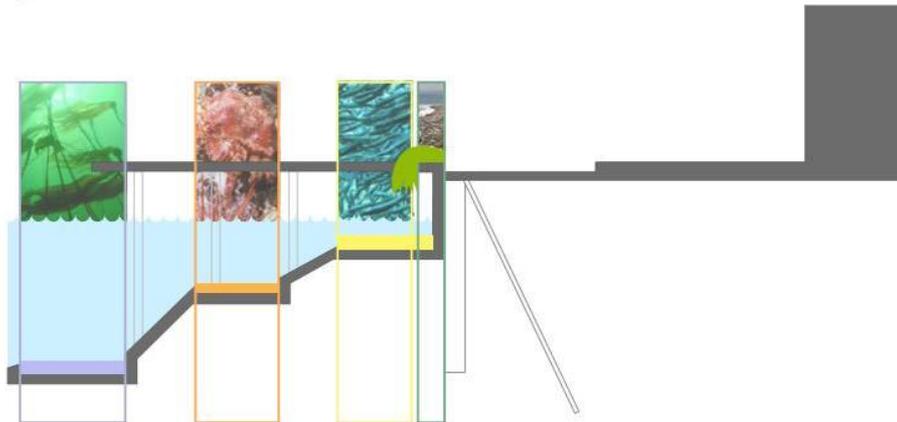
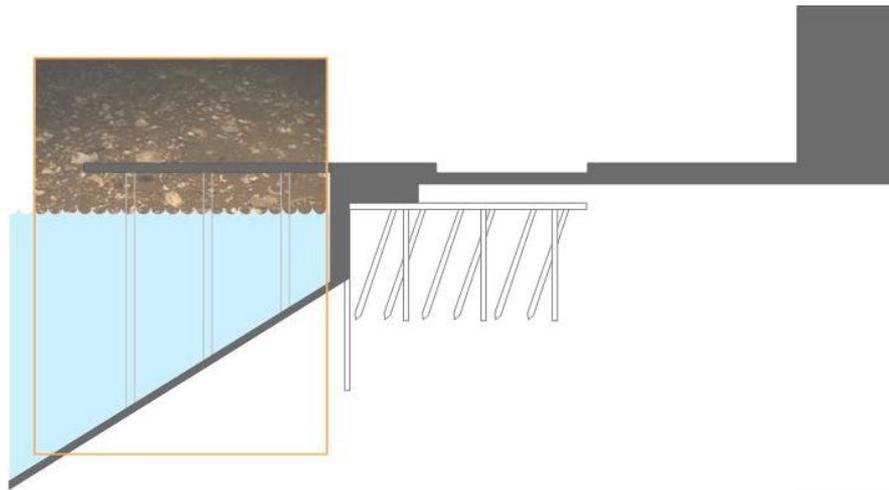
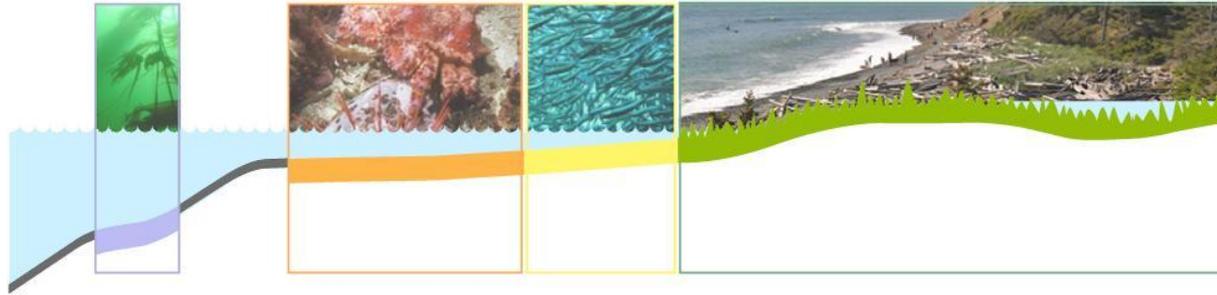
Regional Context: Salmon Recovery Plan

- \$250 million has been identified or spent in priority recovery projects within the Green/Duwamish watershed
- \$200 million has been identified or spent in restoration investments upstream of the project area where affected salmon use Elliott Bay



Regional Context: Salmon Recovery Plan







How are we doing this?

Interdisciplinary Habitat Approach

- Marine biology
- Coastal hydraulics
- Landscape architecture
- Urban design
- Civil engineering
- Structural engineering
- Geotechnical engineering
- Economics



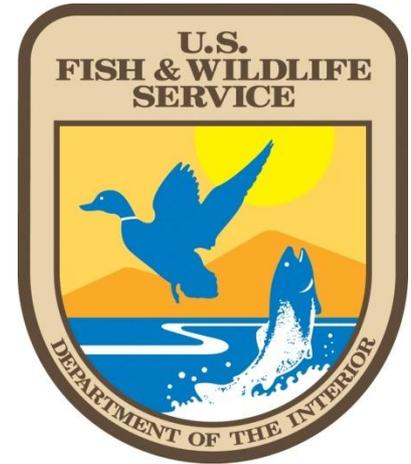
Collaboration and Coordination



NOAA FISHERIES SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



WASHINGTON STATE DEPARTMENT OF
Natural Resources



Washington
Department of
**FISH and
WILDLIFE**



THE SUQUAMISH TRIBE



UNIVERSITY of
WASHINGTON



**US Army Corps
of Engineers®**

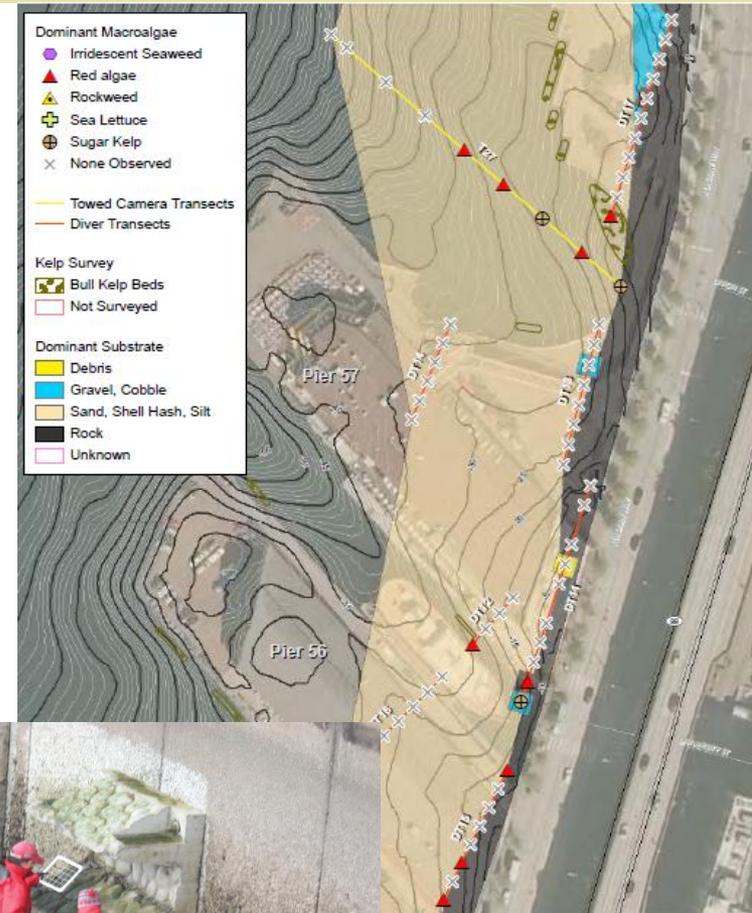
Establishing the State of the Science

- Elements of a functional salmonid migratory corridor
- Studies on effects of overwater structures
- Studies on light treatment options and effectiveness

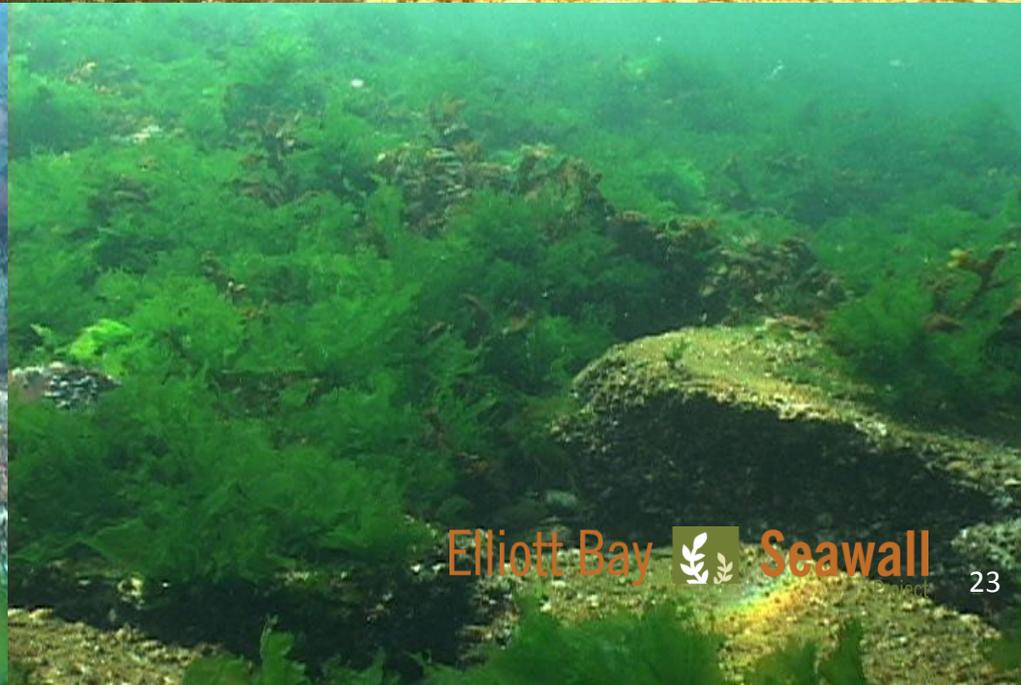


Seawall Habitat Investigations

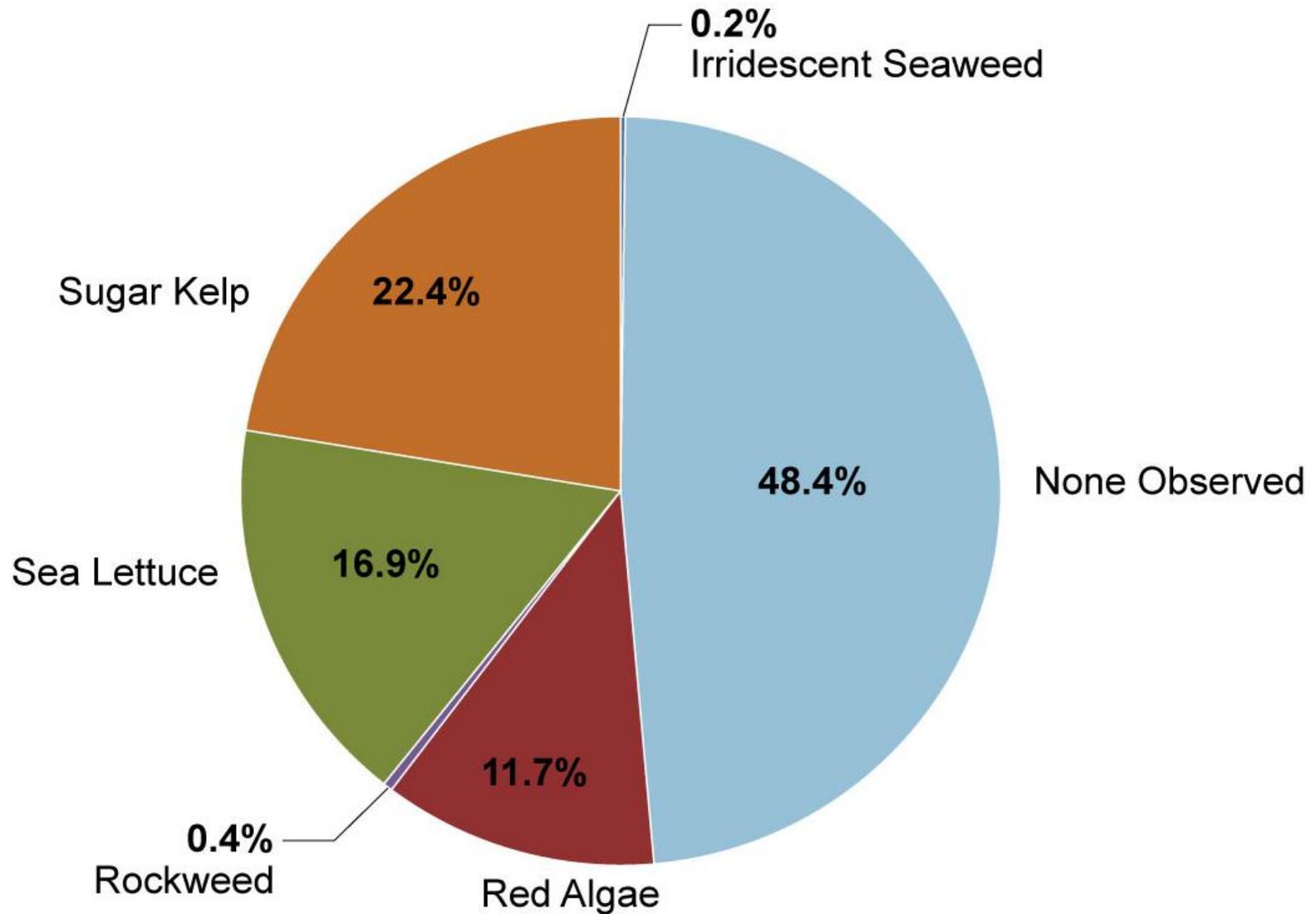
- Ongoing textured wall monitoring by UW
- Olympic Sculpture Park monitoring
- Vancouver Convention Center monitoring
- Habitat inventory and underwater video
- Salmonid out-migration and light data collection
- Fish use and distribution by season



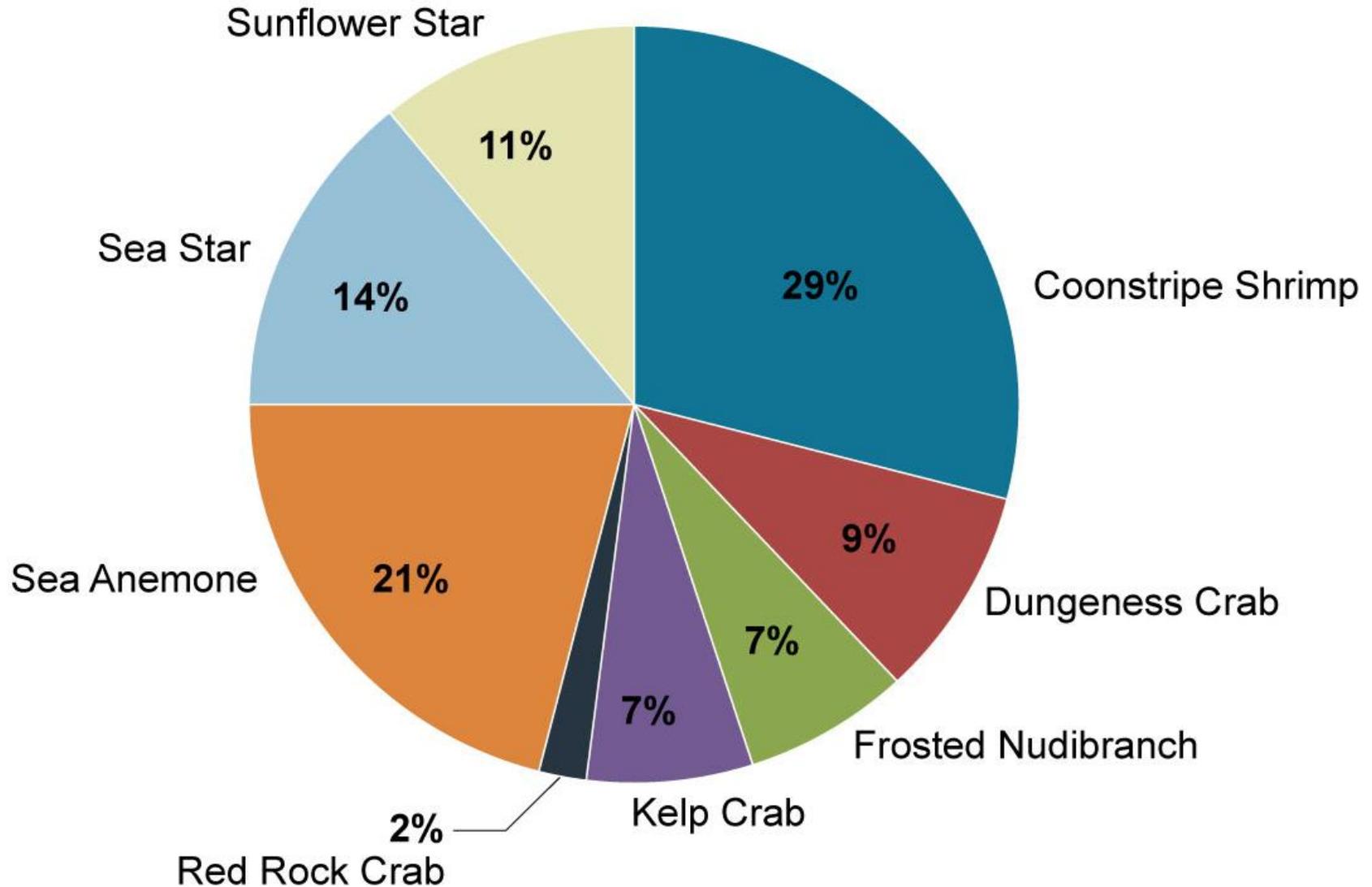
Habitat Mapping in Fall 2010



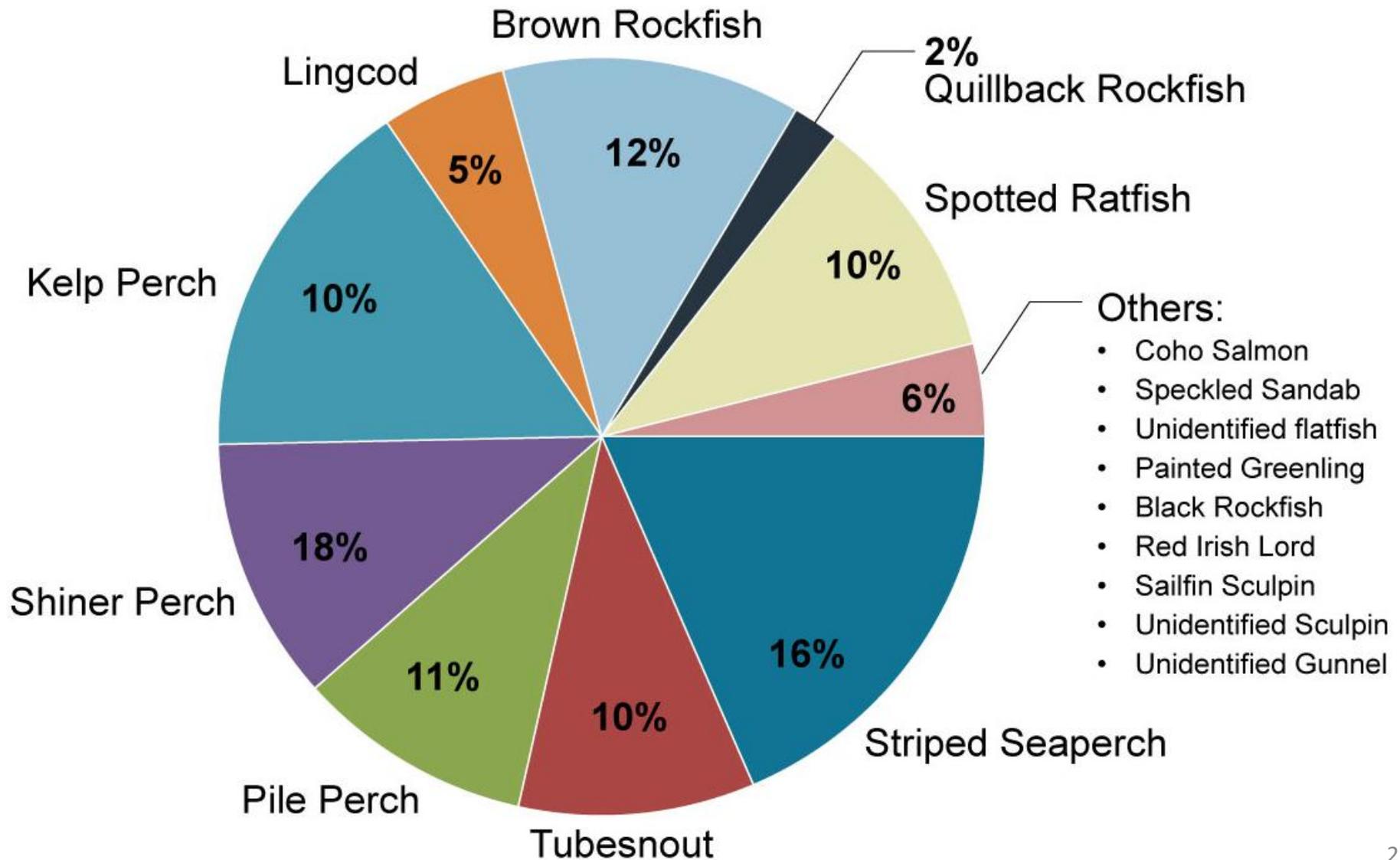
Dominant Macroalgae Observations



Invertebrate Observations

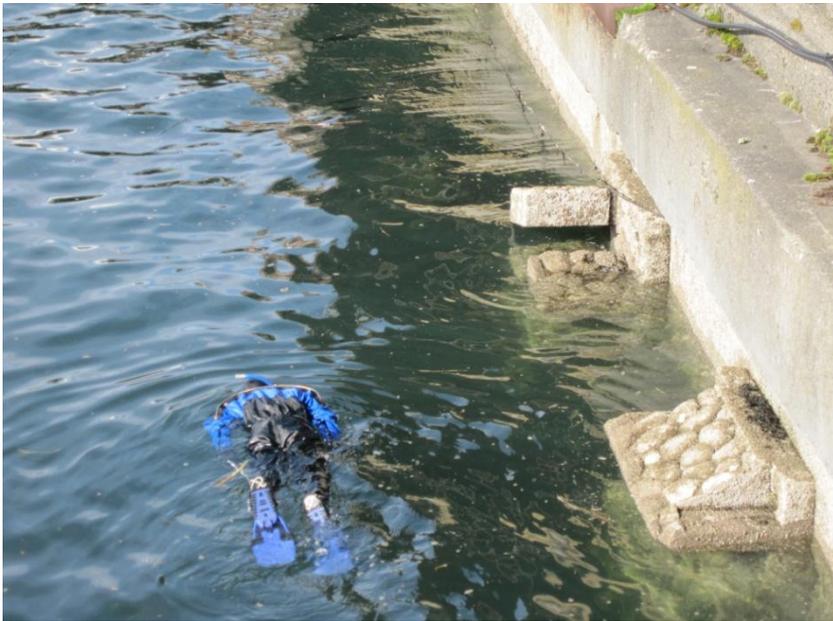


Fish Observations



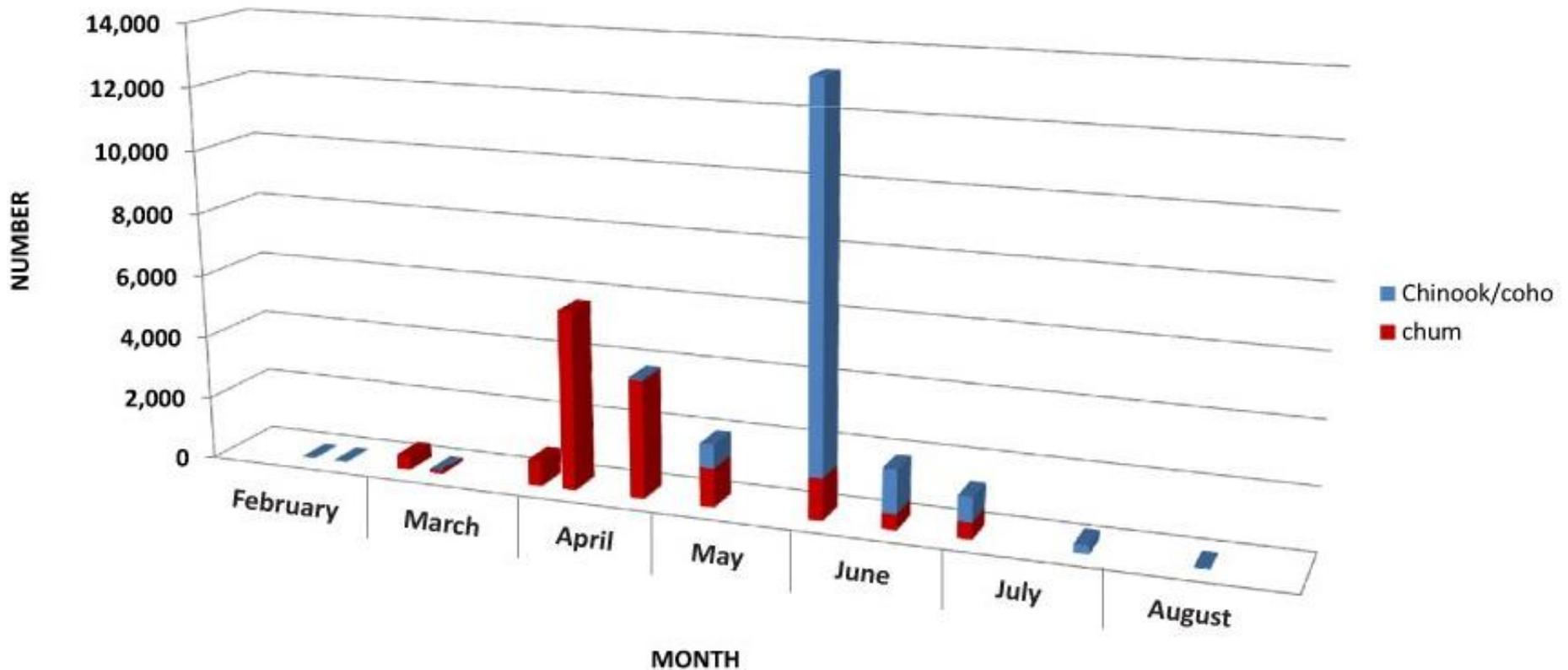
Fish Surveys 2011-2013

- Fish surveys conducted along the seawall between Piers 48 and 70
- February 2011 to September 2011: snorkel and land-based surveys
- October 2011 to March 2013: snorkel, scuba, and netting



Fish Survey Preliminary Results

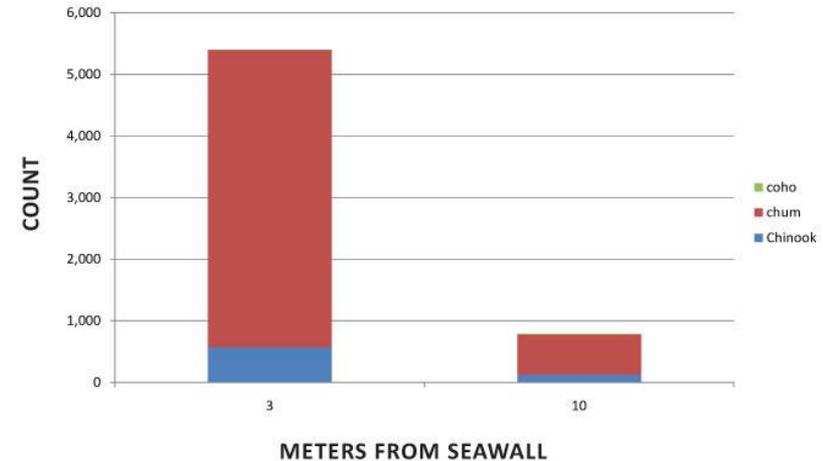
JUVENILE SALMON OBSERVED IN SNORKEL TRANSECTS



Fish Survey Preliminary Results

- During snorkel surveys, observations included:
 - More juvenile salmon nearer to seawall or pier
 - More chum salmon along the seawall than along the piers
 - Fewer Chinook along the seawall than the pier portion of transects
 - Juvenile salmon most frequently in the upper third (the surface) of the water column

JUVENILE SALMON AT THE 3-METER AND 10-METER TRANSECTS



Fish Survey Preliminary Results



Light Measurements

- Stark contrasts between light and dark contribute to fish delays
- Light monitoring incorporated into snorkel and land-based survey
- Juvenile salmon avoided going under piers or shaded areas near piers



2012 Light Penetrating Surfaces Experiment

- Use Pier 62/63
- Install summer 2012
- Evaluate 4 types of LPS
 - Glass panel
 - Glass blocks
 - Grating
 - Solar tube



Textured Habitat Panel Study

- Evaluated textures, fins, shelves, troughs at Aquarium for two years (2008 and 2009)



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< 1 mm

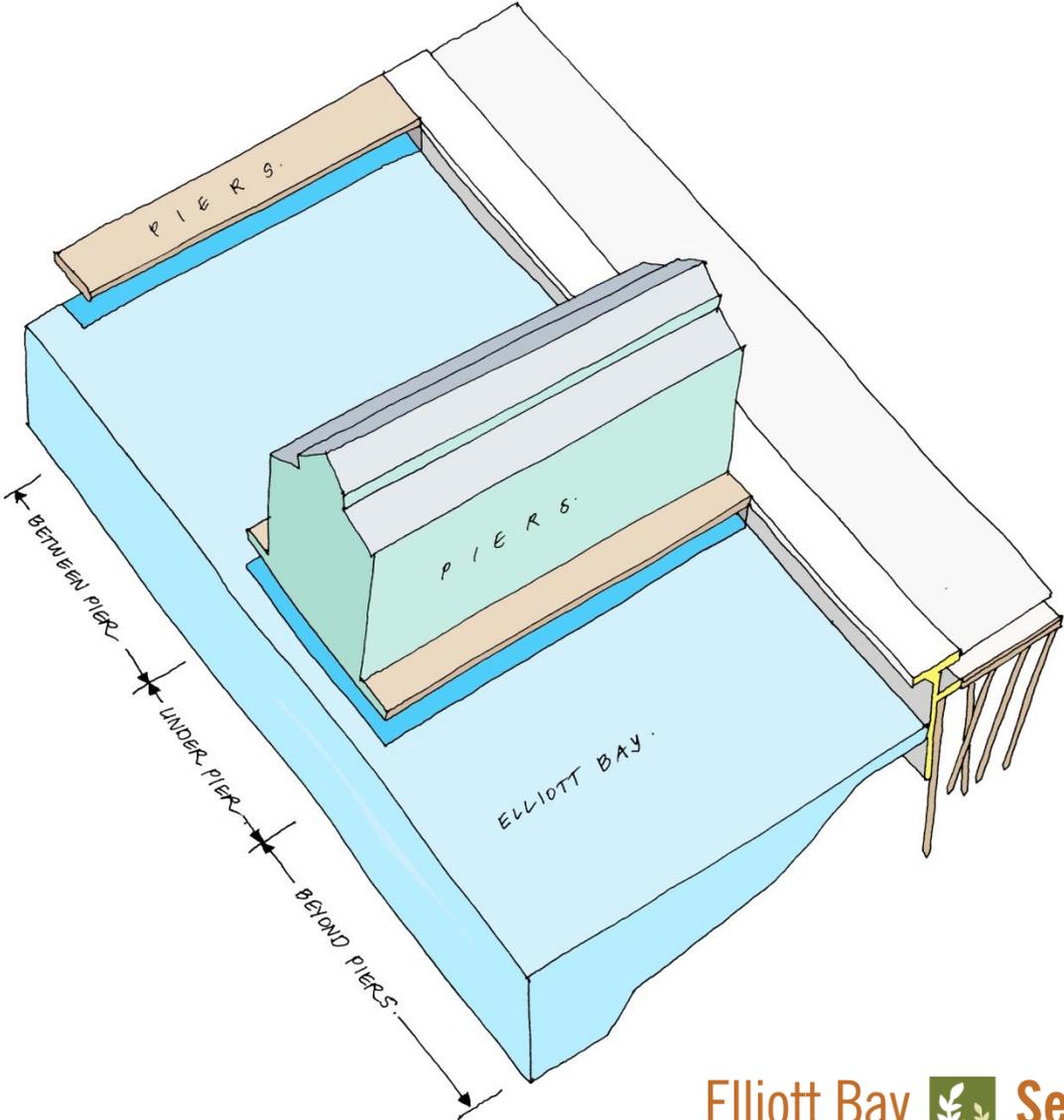


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≤ 1mm

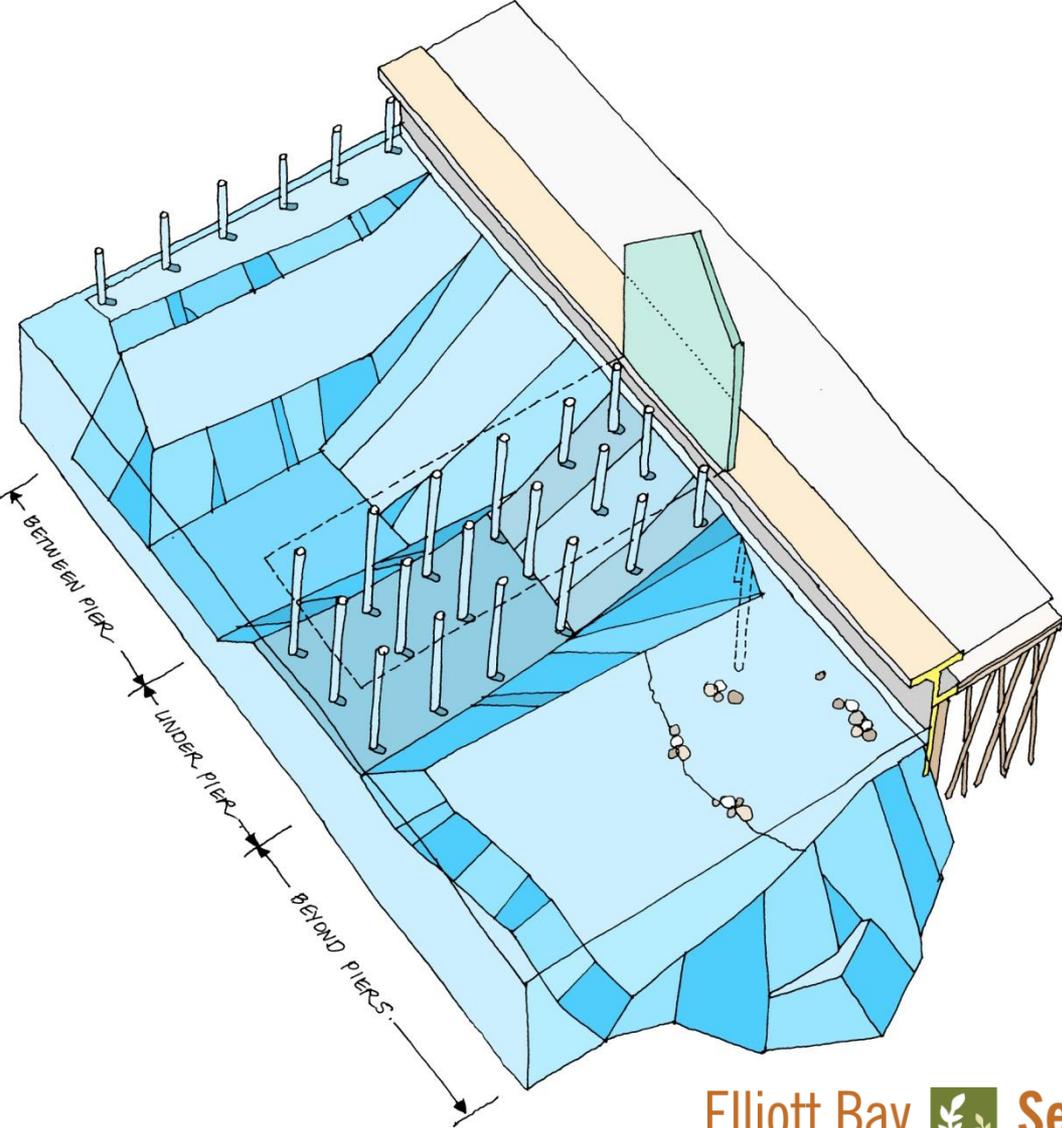
What are the opportunities?



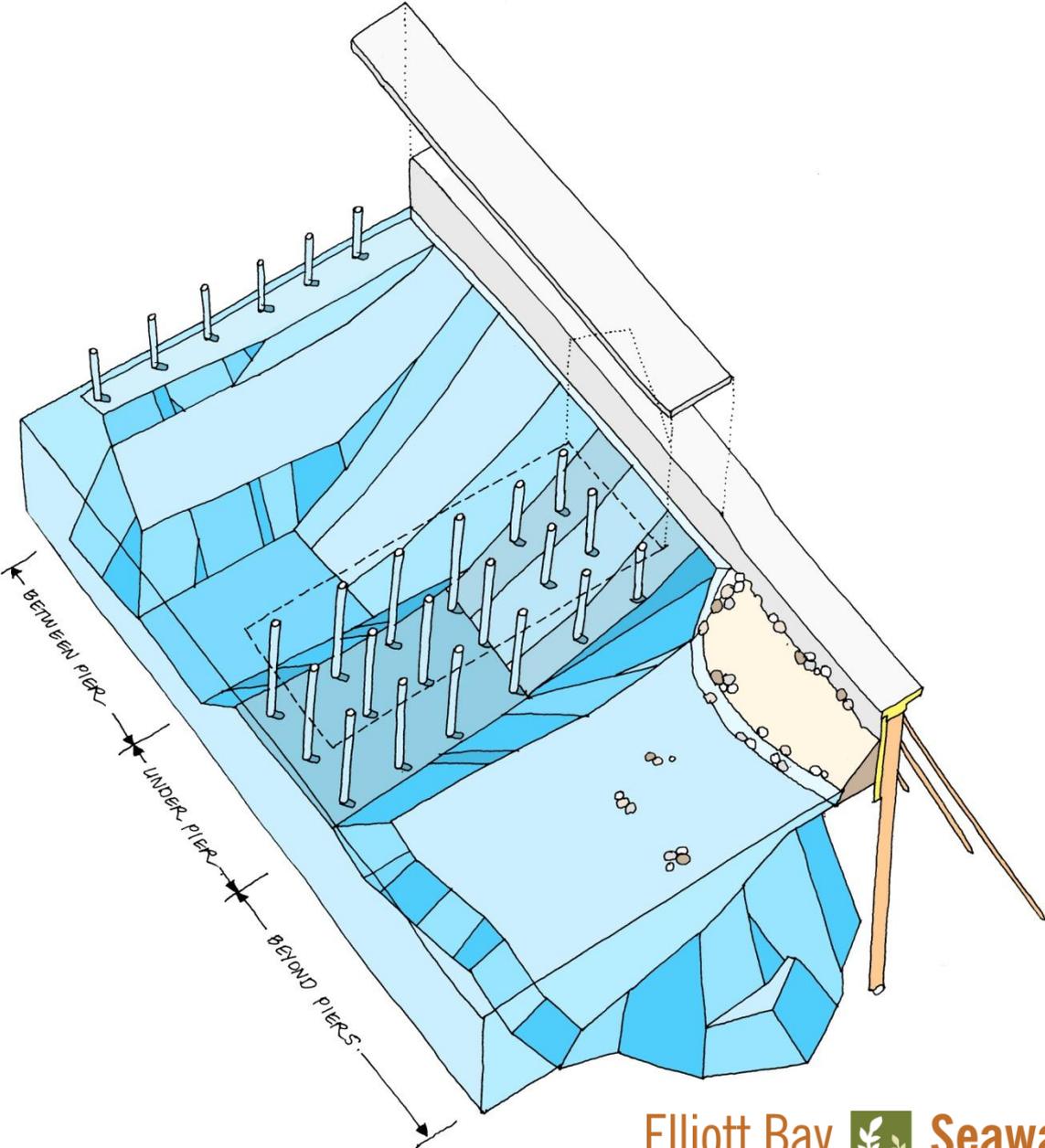
Existing Condition



Existing Condition



Existing Condition
New Seawall

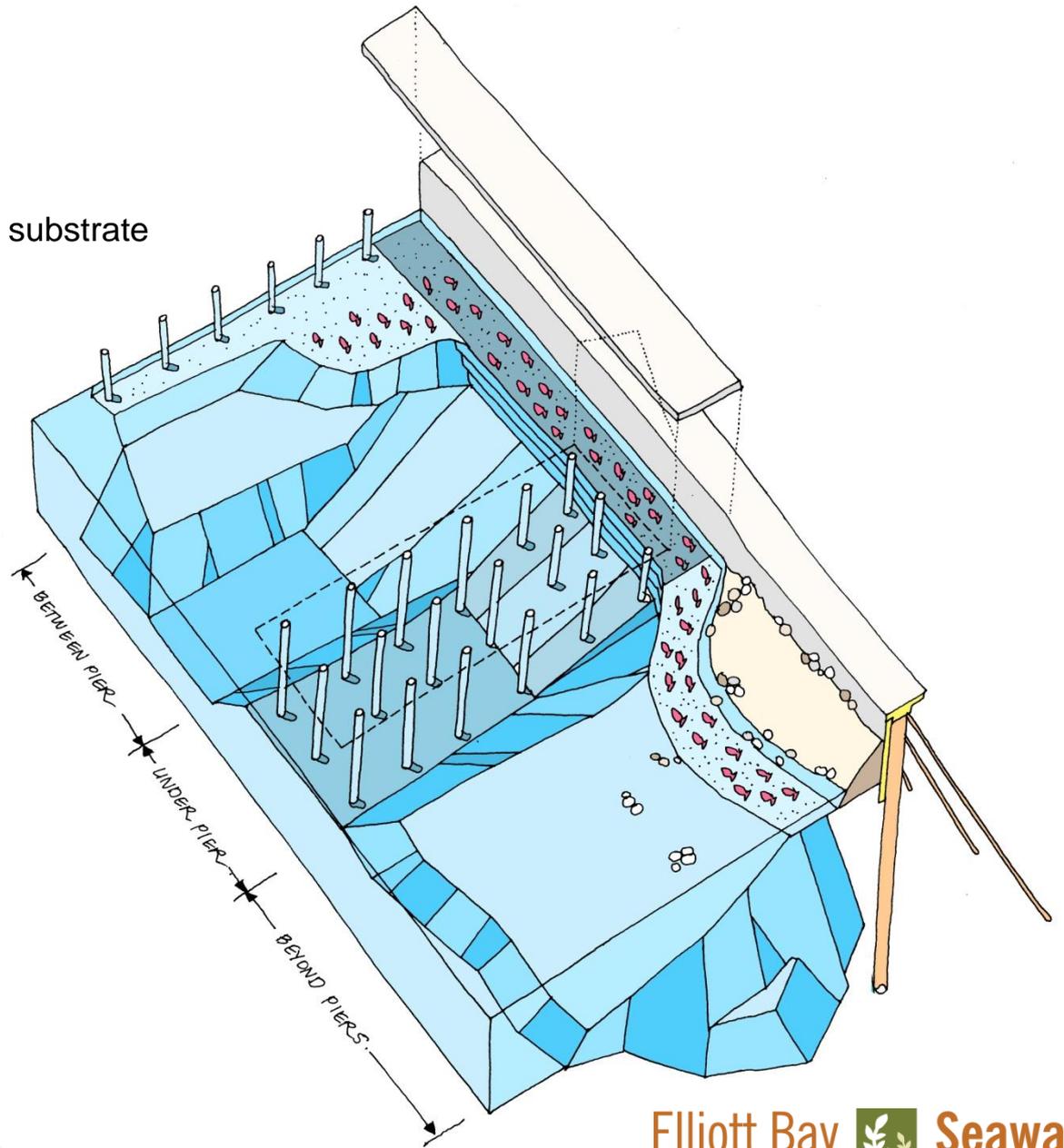


Existing Condition

New Seawall

Intertidal Corridor

- Depth of -2.5 feet NAVD88 with substrate



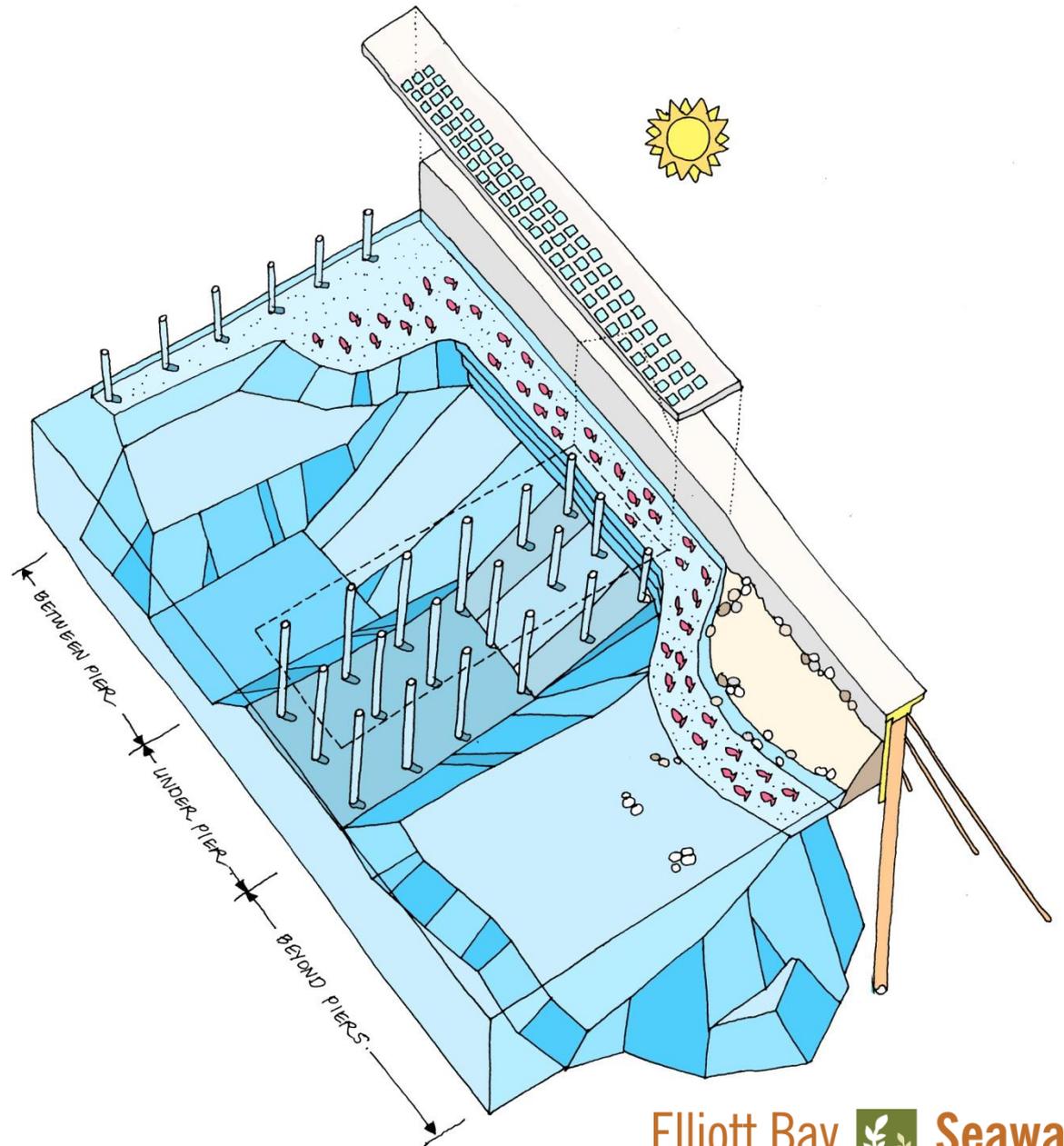
Existing Condition

New Seawall

Intertidal Corridor

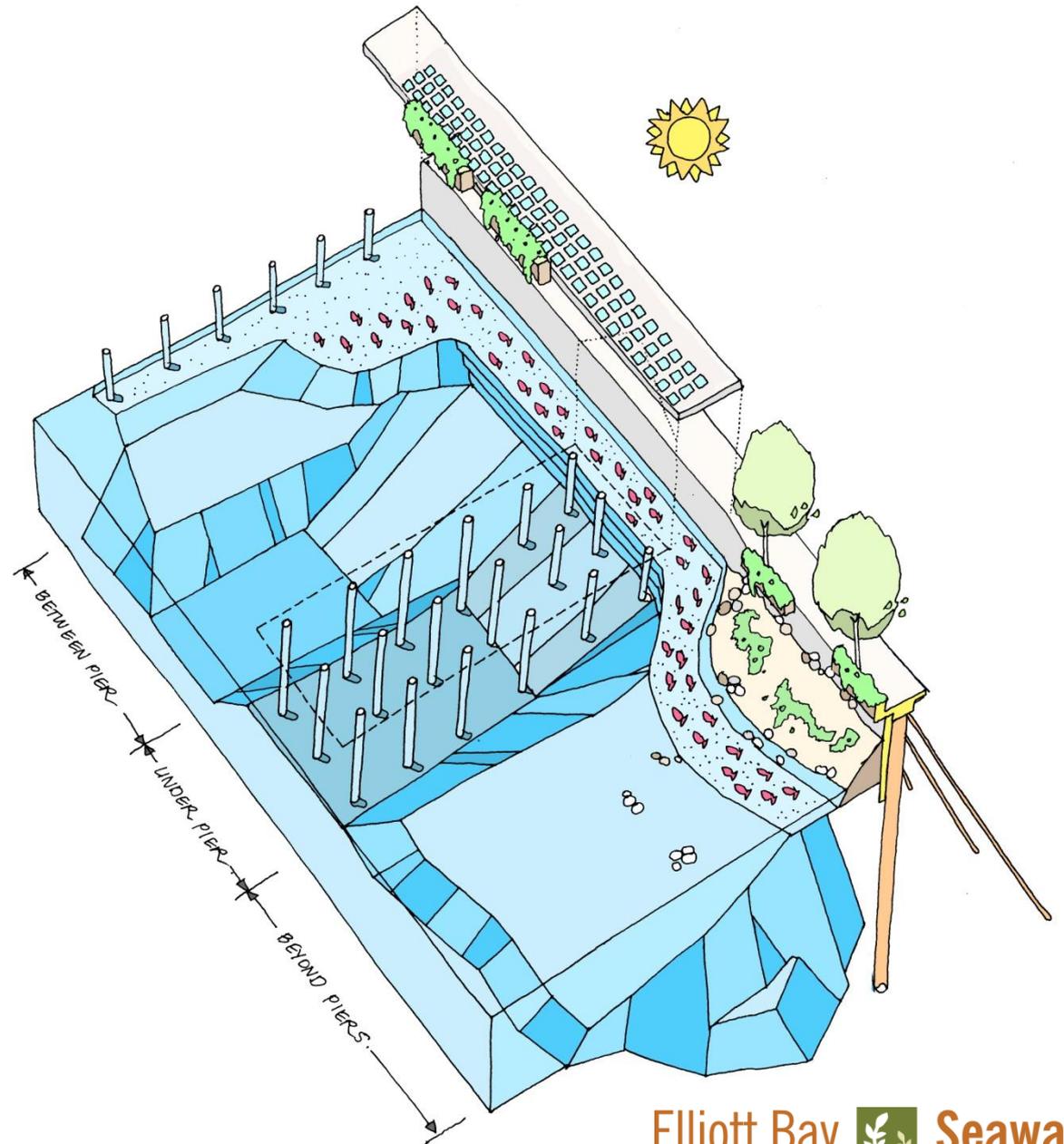
Lighting

- Glass blocks
- Grating
- Prisms
- Solar tubes
- LED lighting

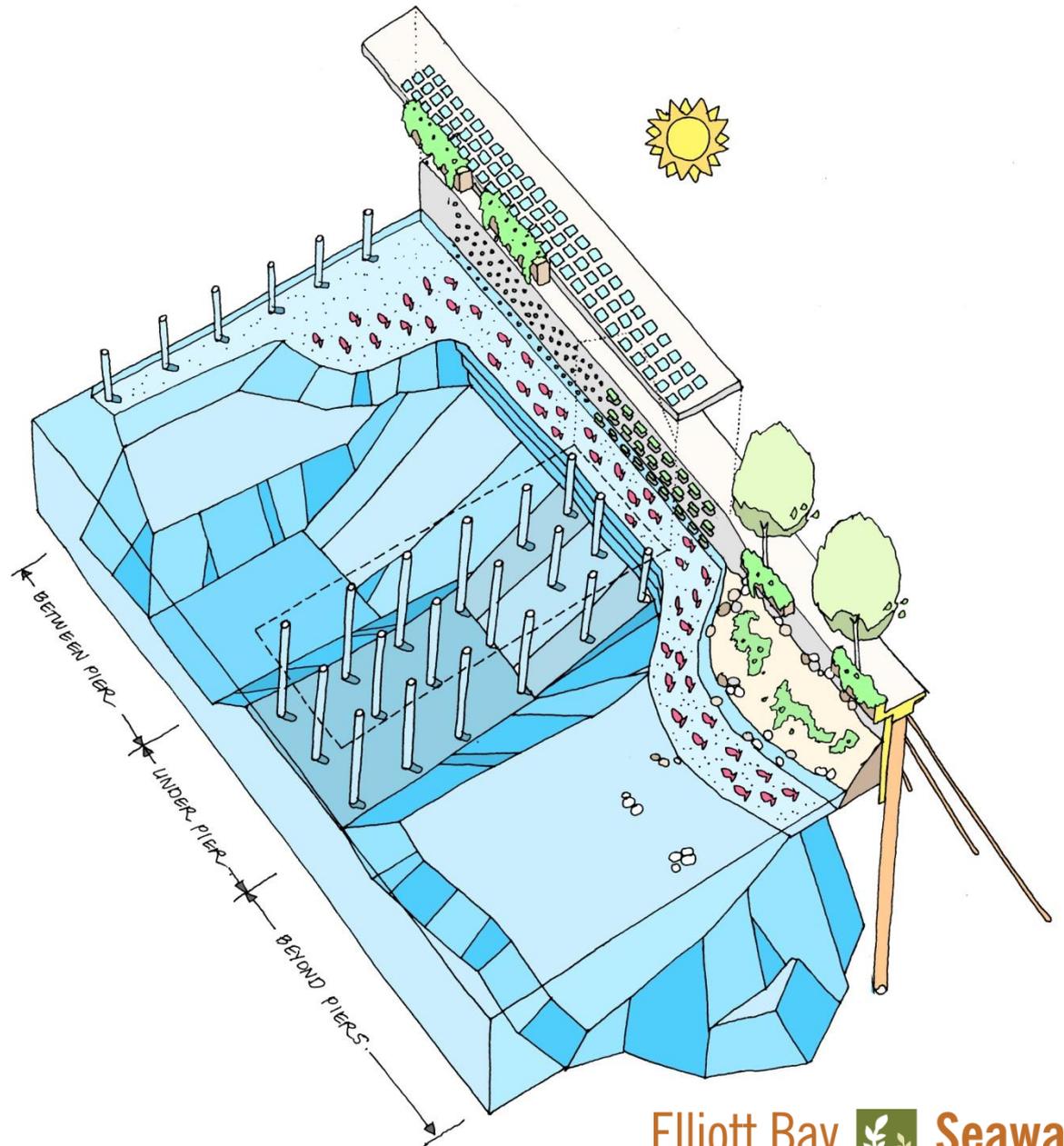


Existing Condition
New Seawall
Intertidal Corridor
Lighting
Riparian Vegetation

- Willows
- Shore pine
- Sitka spruce
- Alder
- Dune grasses



Existing Condition
New Seawall
Intertidal Corridor
Lighting
Riparian Vegetation
Textured Wall



Existing Condition

New Seawall

Intertidal Corridor

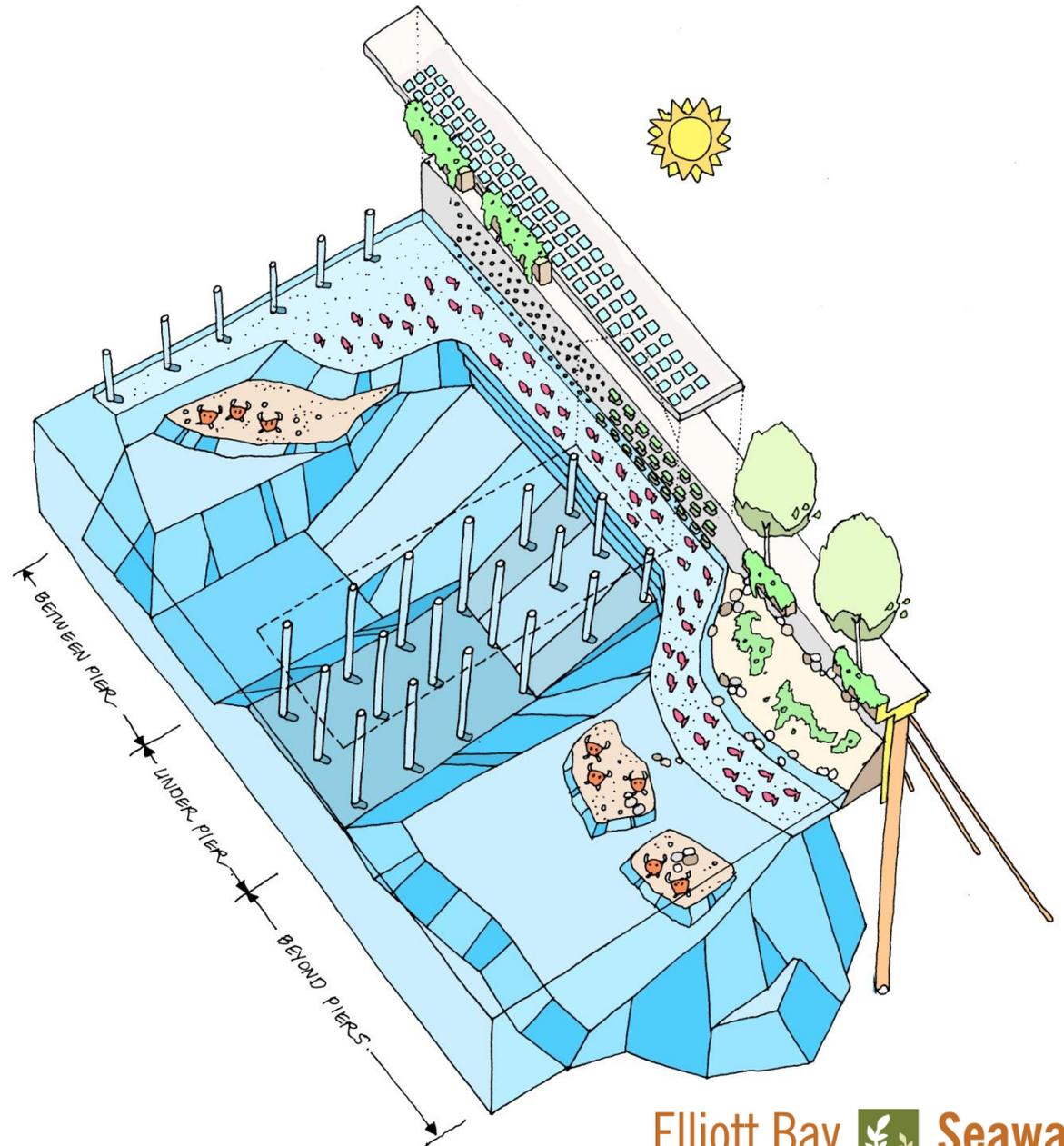
Lighting

Riparian Vegetation

Textured Wall

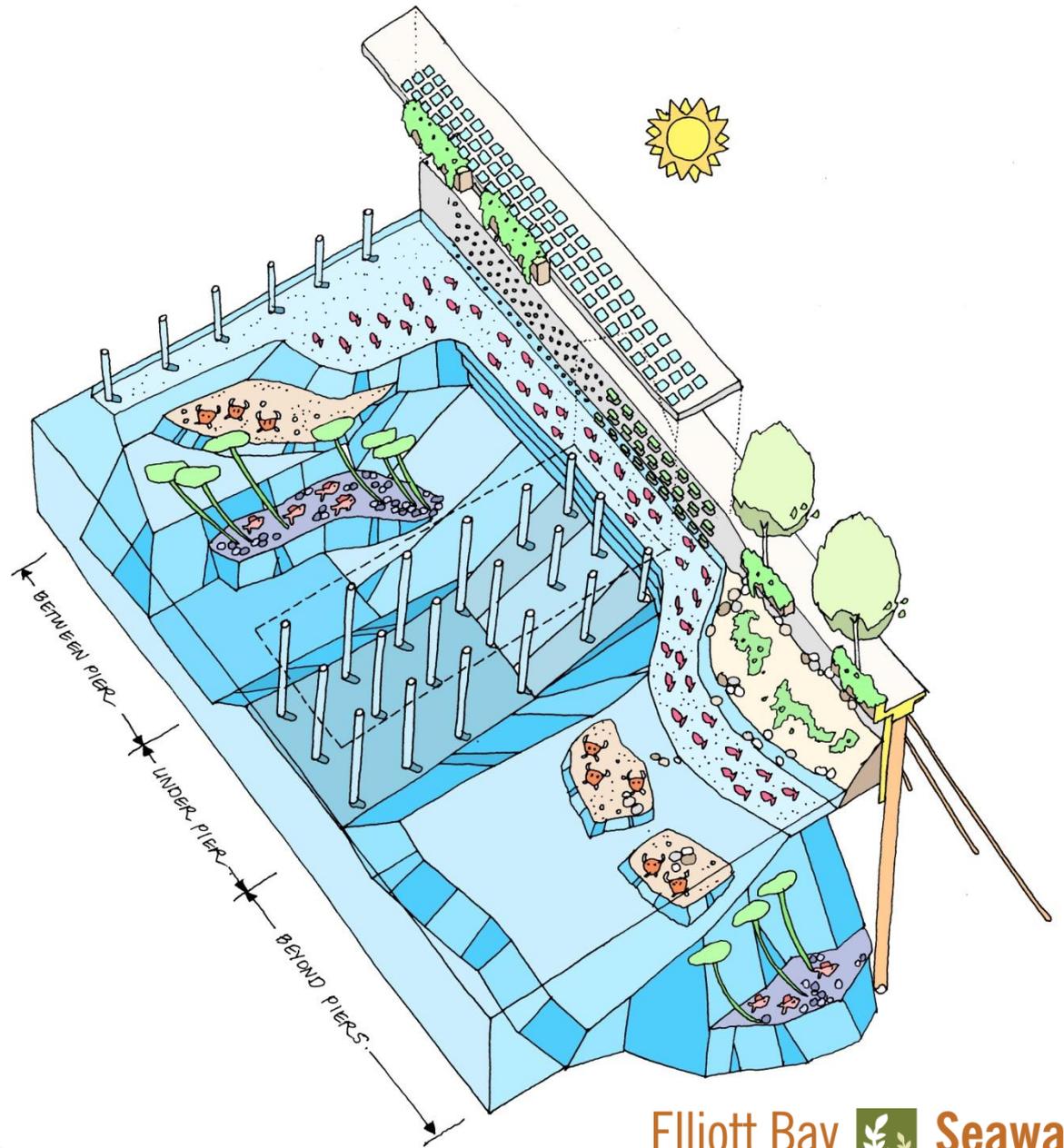
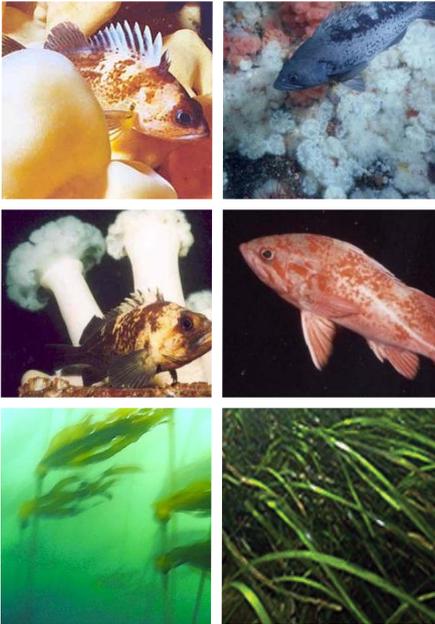
Substrate Enhancement

- Depth of -10 feet NAVD88
- Substrate for juvenile crabs and other invertebrates



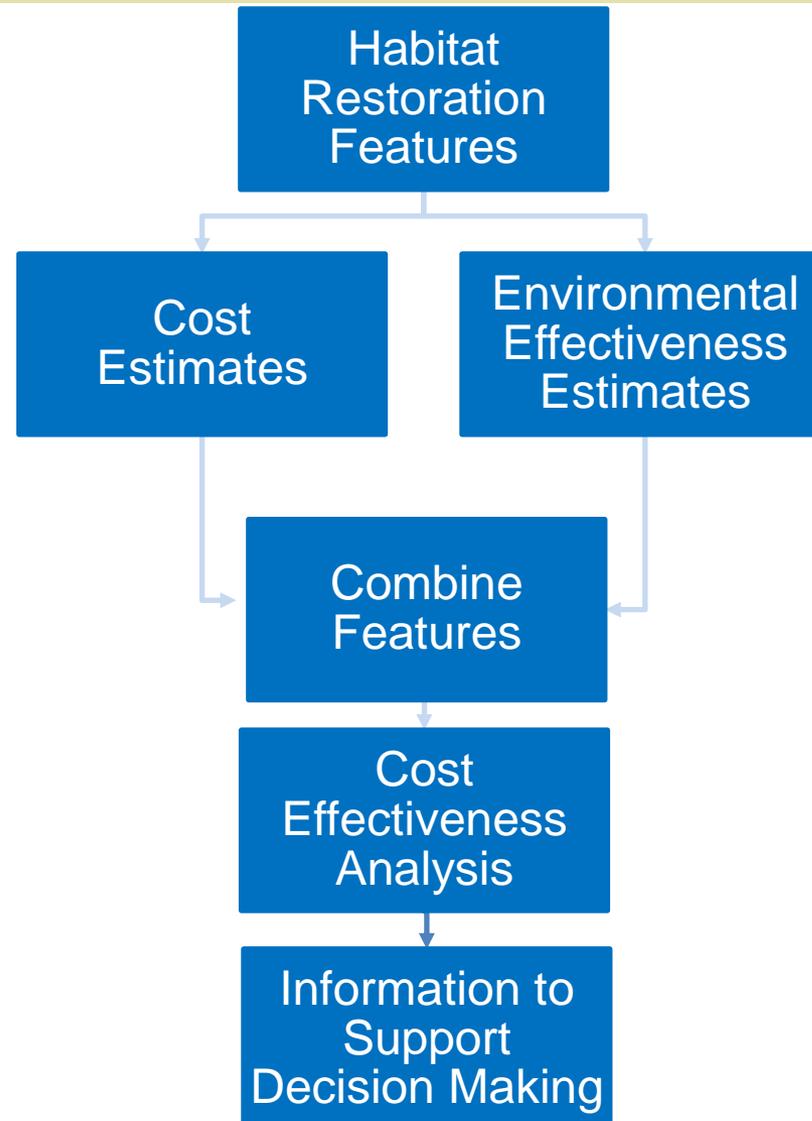
Existing Condition
 New Seawall
 Intertidal Corridor
 Lighting
 Riparian Vegetation
 Textured Wall
 Substrate Enhancement
Cobble Reefs

- Depth of -25 feet NAVD88
- Rockfish and kelp colonization



How do we know a good investment?

Process for Habitat Evaluation



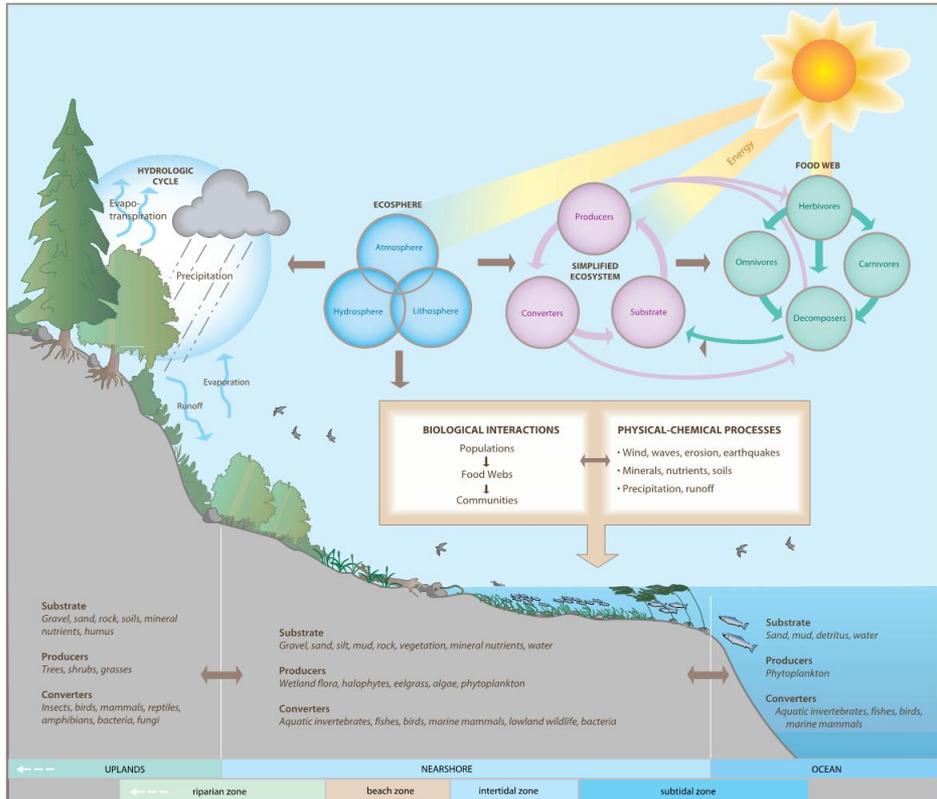
Cost Estimates for Habitat Features

- Life cycle cost estimates for 50 year period of analysis
 - Lands, easements, relocations
 - Construction costs
 - Operation and maintenance costs

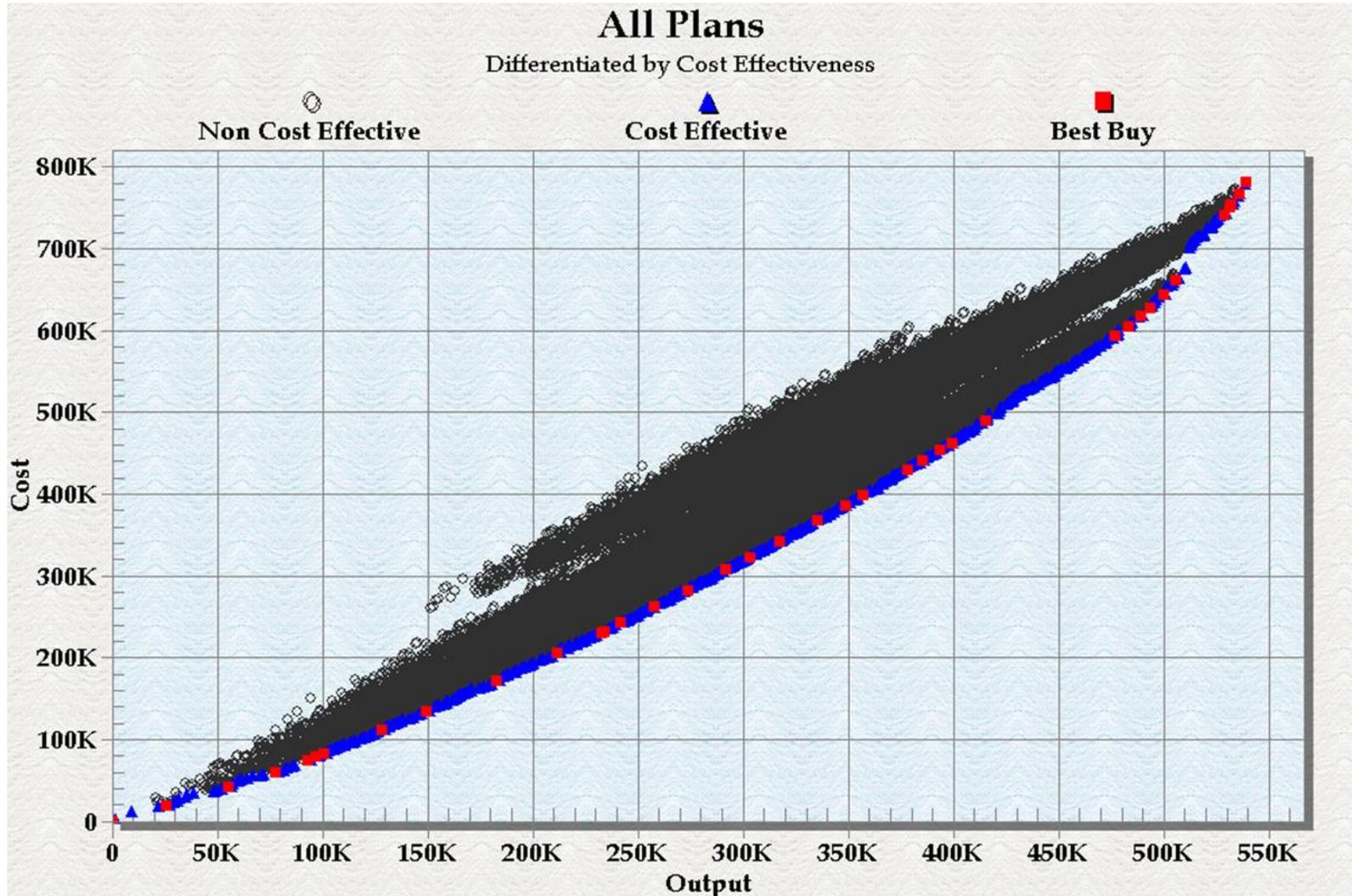


Effectiveness of Measures: Evaluation Model

- Water depth
- Wave energy/scour
- Sediment size/type
- Sediment quality
- Primary productivity/vegetation
- Invertebrates/food web
- Salmonids
- Waterbirds/shorebirds
- Biota movements/migration
- Piers/shading/light



Example Cost Effectiveness Analysis



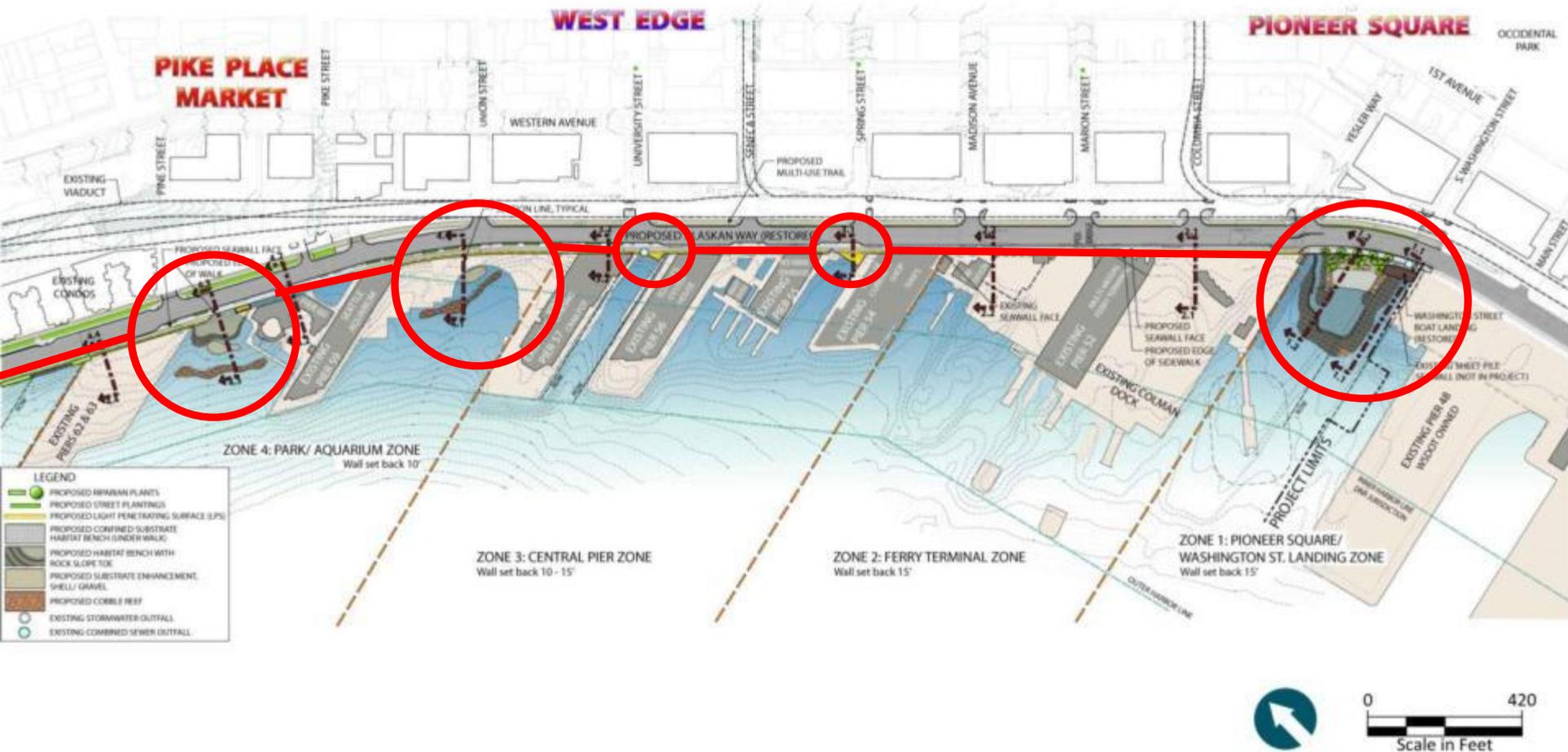
Example Incremental Cost Analysis

- Organizes data to help determine level of investment
- “Is it worth it?”



Proposed Project

- Creates 2 acres of new aquatic habitat



Evaluation and Monitoring

- Monitoring plan will be required for Hydraulic Project Approval and ESA consultation
- Types of monitoring and/or evaluation may include:
 - Salmon migration and behavior surveys
 - Light studies
 - Productivity studies
- Costs associated are minimal



Upcoming Topics for Council Discussion

- Project schedule update
- CRAVE Workshops: Opportunities for final design
- Report on construction contracting workshop
- Approach to Waterfront coordination