If You Build it, They Will Come: Marine Habitat Provided by a Wastewater Outfall

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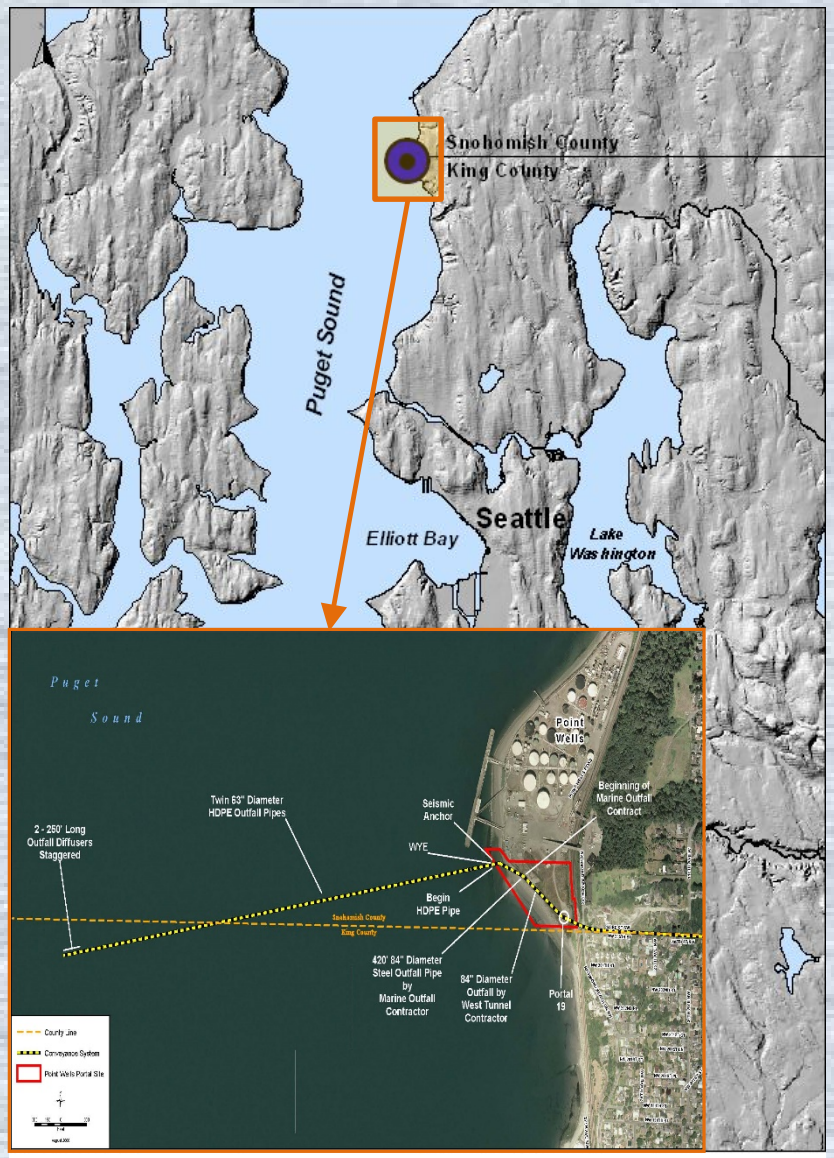
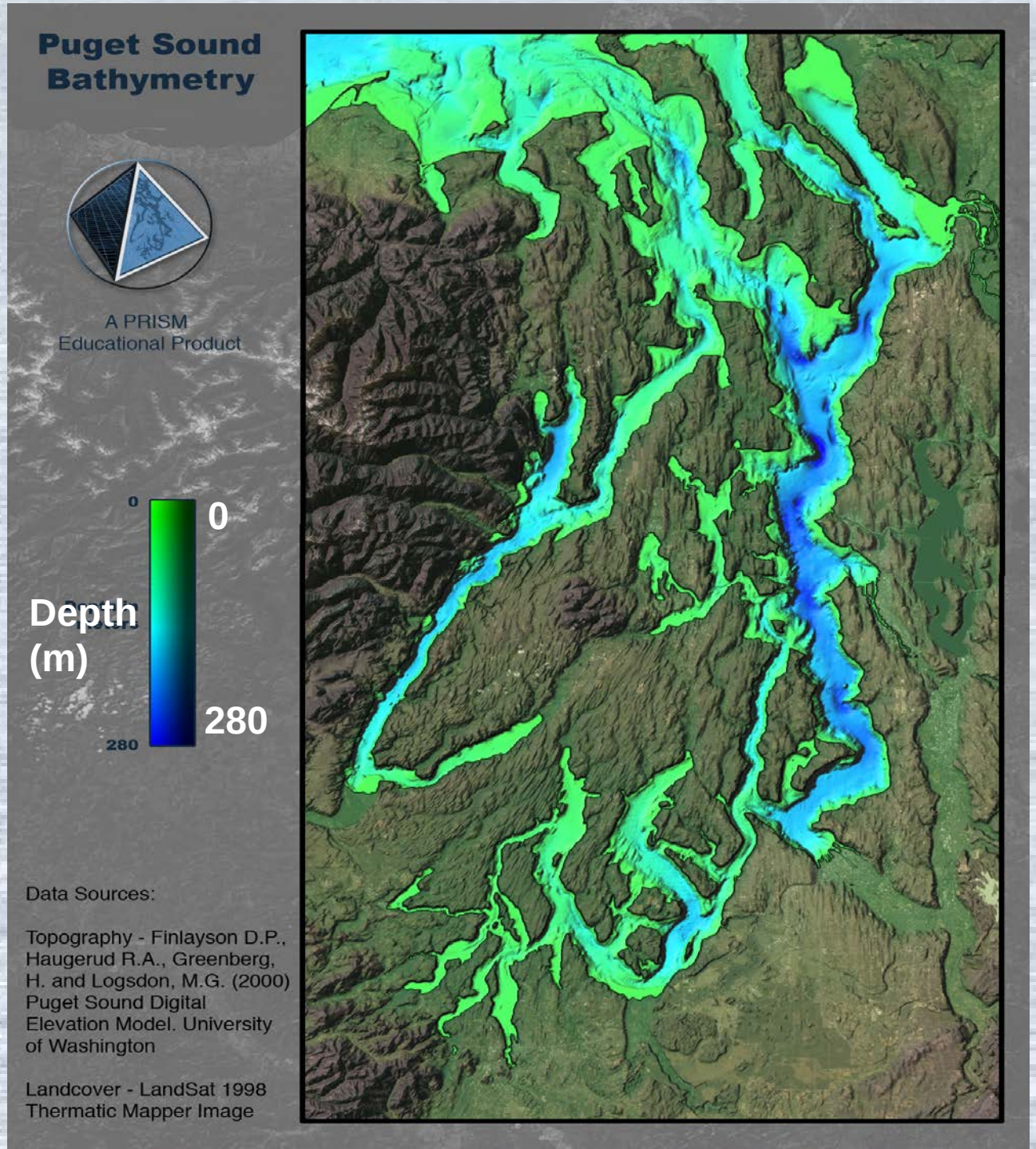
King County Dept. of Natural Resources & Parks

King County

Brightwater Treatment System Outfall

- Completed in 2008
- Twin 63-in (1.6m) diameter, mile long HDPE pipes
- Weighted down with collars
- Terminates at -600 ft MLLW (183m)



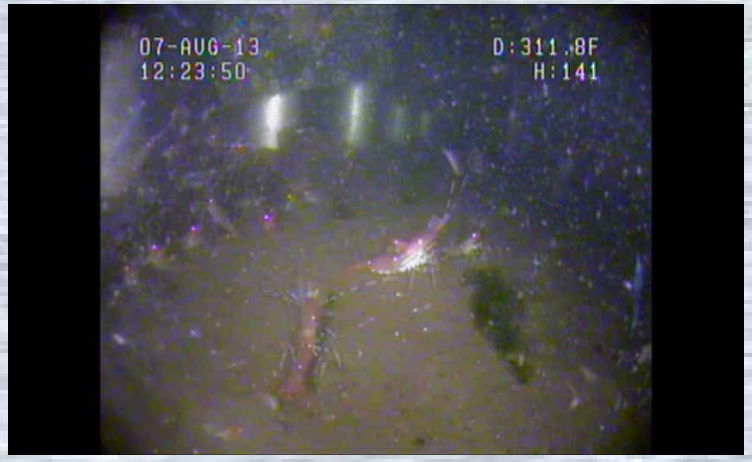


Map: University of Washington

ROV Surveys: 2009--2016

80-150 ft (30-46m) depth

300 ft (91m) depth



600 ft (183m) depth

Bocaccio: Puget Sound/Georgia Basin DPS listed as Endangered in 2010

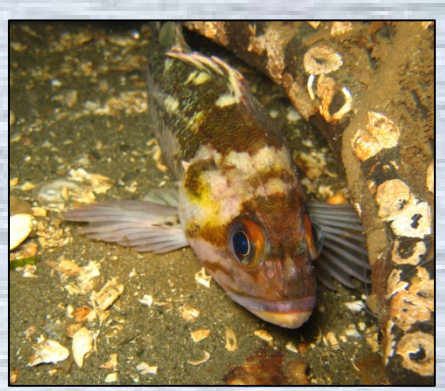
Photos: Bob Pacunski WDFW

Video: WDFW

Fish Species Observed

Copper rockfish
Brown rockfish
Quillback rockfish
Canary rockfish
Yellowtail rockfish
Bocaccio rockfish

Lingcod
Kelp greenling
Cabezon
Ratfish
Skate (sp?)
Pile perch
Surf perch



Photos: Jen Vanderhoof

One project led to another…..

- What is the effectiveness and amount of habitat artificial structures, such as outfall pipes, provide?
- Document presence and abundance of marine organisms on the pipes at various depths
- Do marine organisms attached to the pipe affect the structural integrity?

Study Design

- 2 ft x 1 ft pipe sections deployed in 2012
  - -100, -300, -600 ft MLLW
  - 10 “settlement plates”/depth
- 3 replicates/depth
- To retrieve at 2, 5, & 10yrs

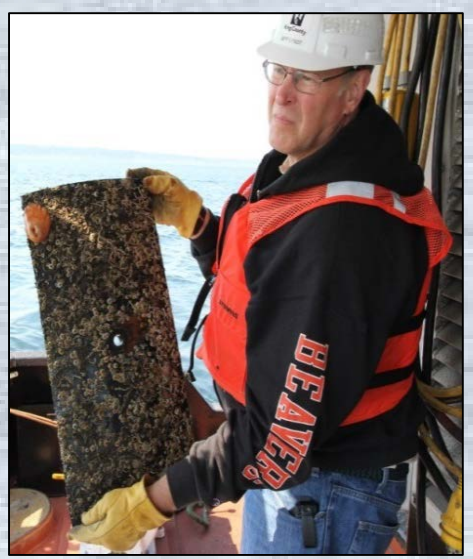
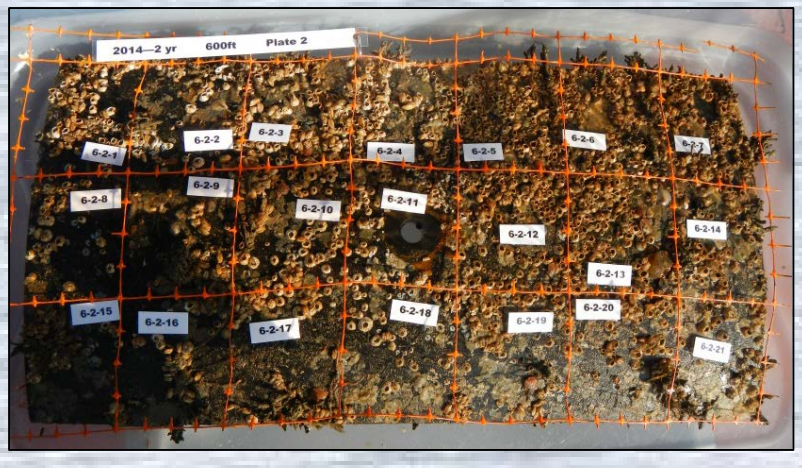
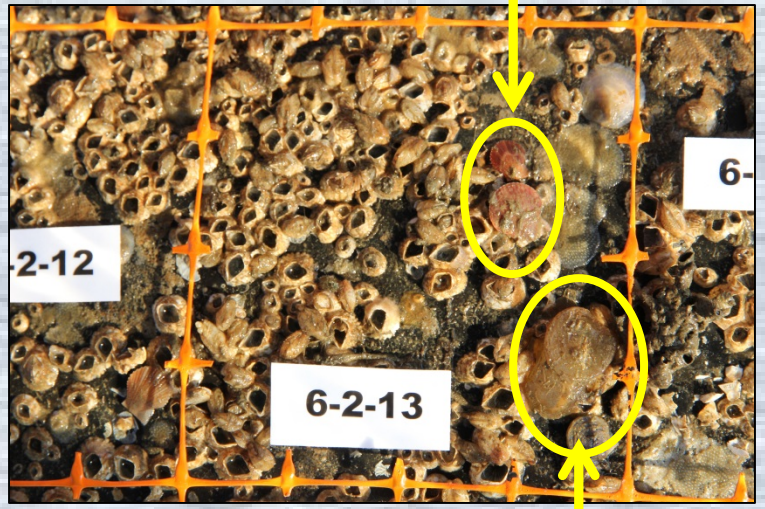


Plate Assessment

- Assessed for total % cover in field
- Flexible mesh grid (21 cells) to aid estimation
- Macroscopic biota identified & counted in field
- Photographs taken of each plate & grid cell
- % cover & counts determined in office (Image J)
- Structural integrity tests
  - Assessment of scratches and/or gouges
  - Tensile strength test
  - Stress-crack resistance



cute scallops



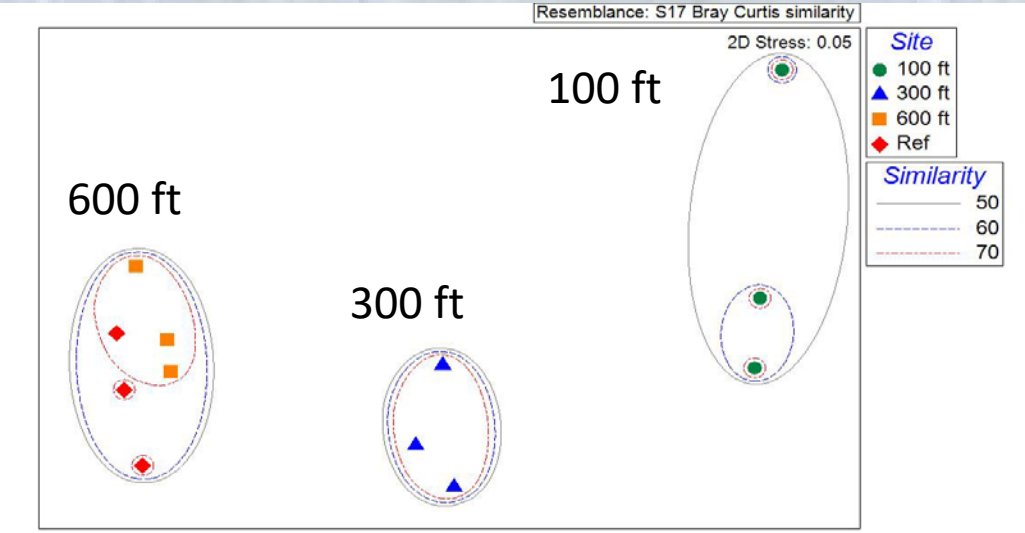
not as cute tunicate

Categories

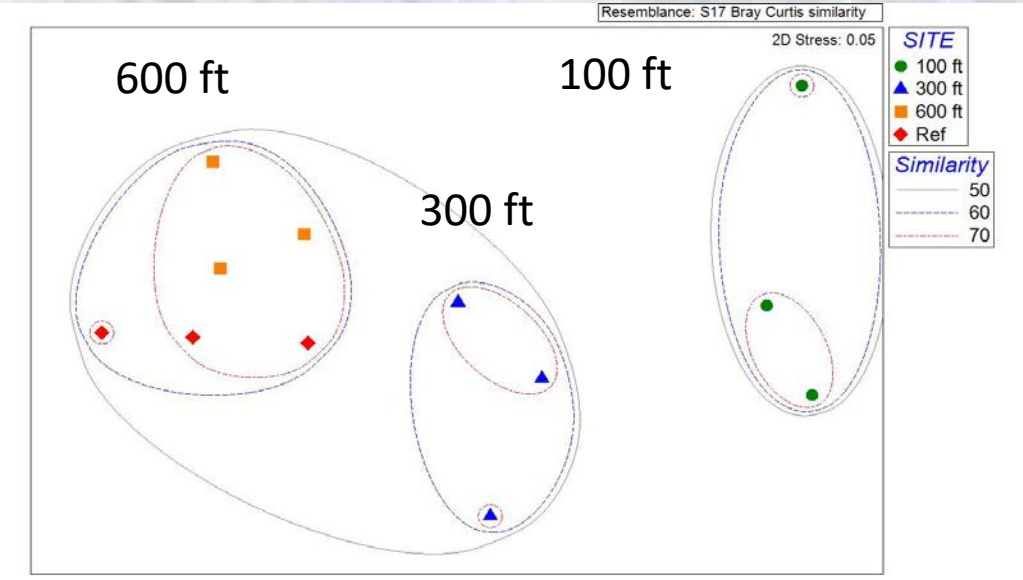
% Cover Categories	Phylum	Count Categories	Phylum
calcareous tubeworm	Annellida	polychaete: errant	Annellida
polychaete: tube	Annellida	amphipod/shrimp	Arthropoda
amphipod: tube	Arthropoda	Cancridae crab	Arthropoda
live barnacle	Arthropoda	Majoidae crab	Arthropoda
branched bryozoan	Bryozoa	sea urchin	Echinodermata
coral bryozoan	Bryozoa	gastropod	Mollusca
encrusting bryozoan	Bryozoa	*Trichotropis* gastropod	Mollusca
Ulva	Chlorophyta	flatworm	Platyhelminthes
tunicate	Chordata		
anemone	Cnidaria		
hydroid	Cnidaria		
bivalve: clam	Mollusca		
jingle shell	Mollusca		
limpet	Mollusca		
scallop	Mollusca		
slipper snail	Mollusca		
mussel	Mollusca		
calcareous sponge	Porifera		
demosponge	Porifera		
unidentified	--		

Depth Differences After 2 Years

Non-motile species
(% cover)

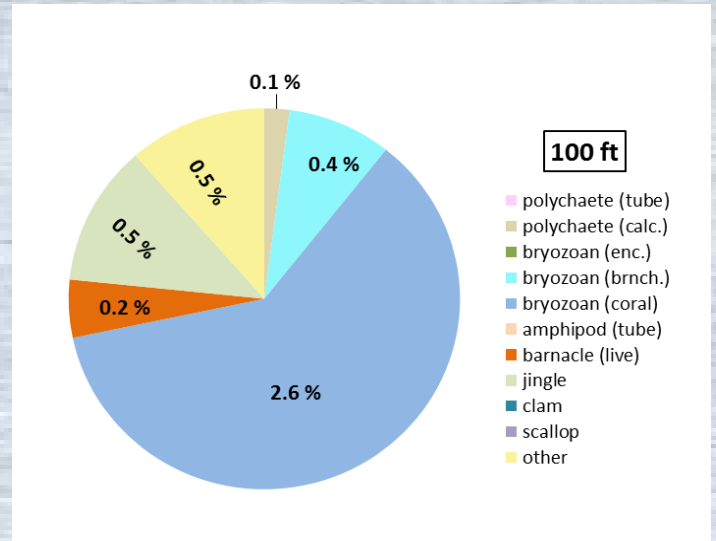


Motile species
(presence/absence)

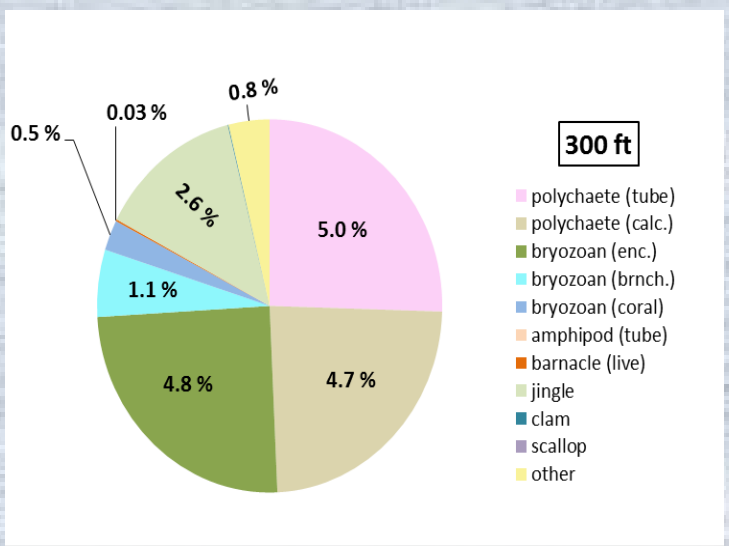


% Cover By Depth After 2 Years

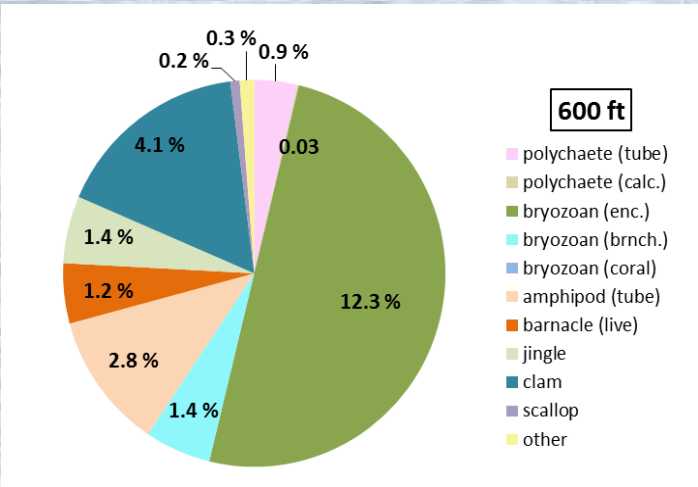
total cover: **4.3 %**



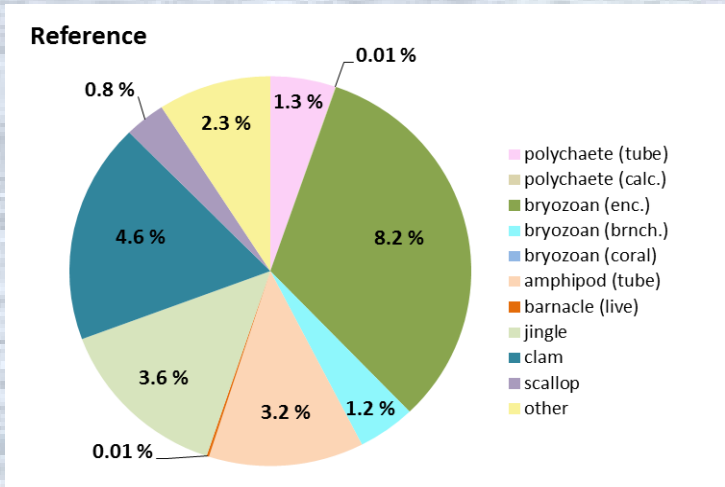
total cover: **47.9 %**



total cover: **60.0 %**

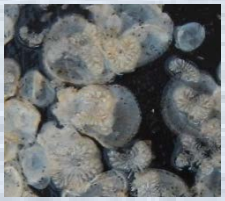


total cover: **67.8 %**



Settling Plate Summary

100 ft | **300 ft** | **600 ft/Ref**



coral bryozoans

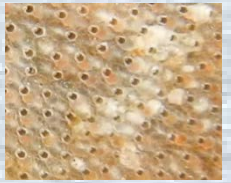
calcareous tubeworm

checkered hairysnail

tunicates

scallops

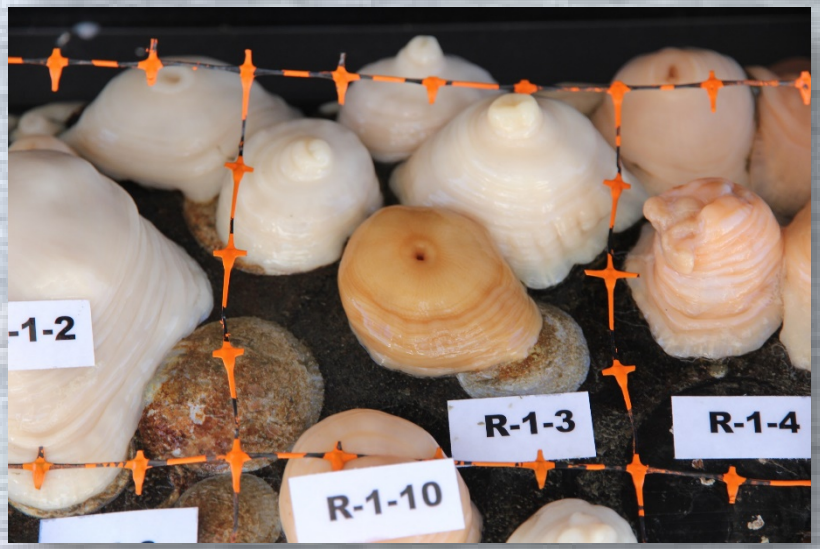
encrusting bryozoans



clams

amphipods

Photos After 5 Years



Take Home Messages

- Brightwater outfall structure is providingmultiple habitat functions
- Something for everyone
- Make as structurally complex as possible to provide the most benefit

Acknowledgements

ROV:

- Jim Devereaux: King County Environmental Lab ROV team leader
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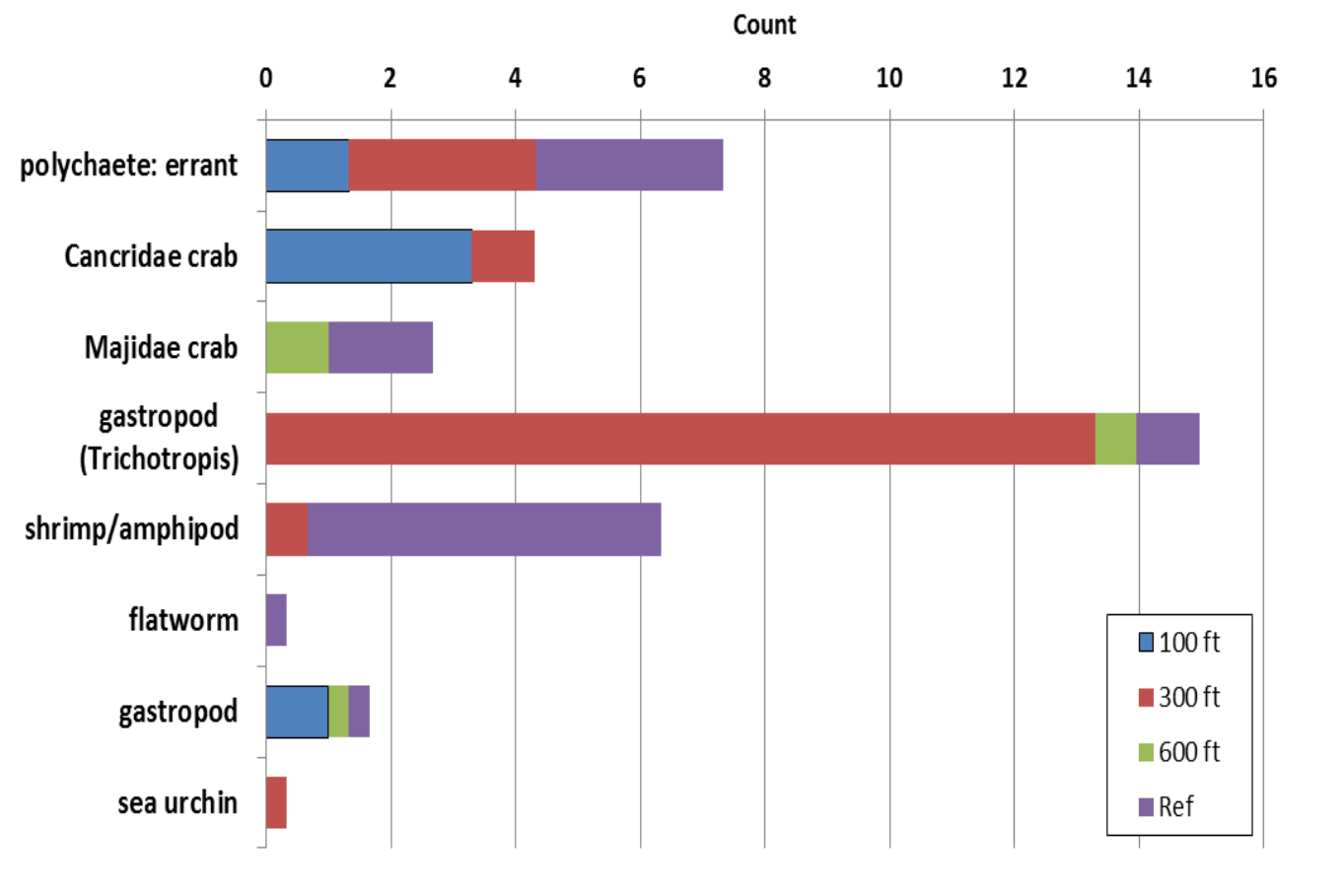
- Maggie Dutch-WA Dept. of Ecology
- Dany Burgess-WA Dept. of Ecology

Questions?

Motile Species By Depth: 2 Years