

# Forage Fish and the Nearshore

## Salish Sea

Jamey Selleck



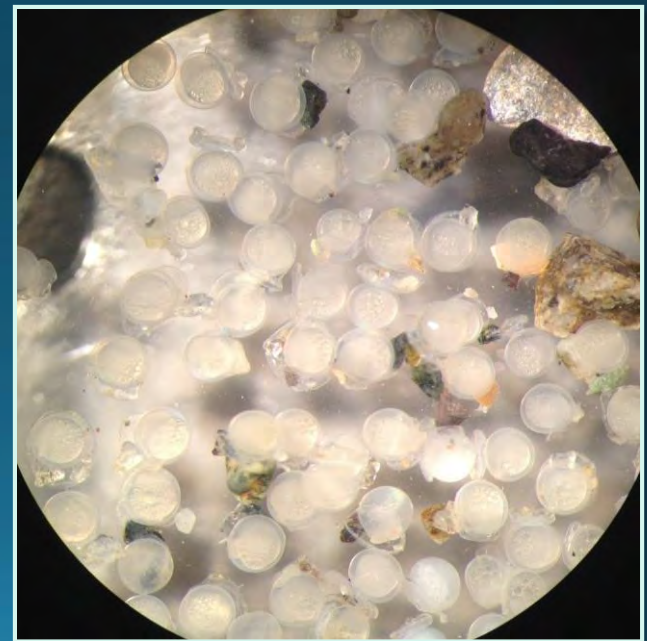
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# Overview

- Forage Fish
  - who, why, where?
- The Nearshore
- Monitoring
- MRC Projects
- WDFW, PSEMP, USGS
- Summary



# Who Are Forage Fish?

Fish that other fish eat (and birds and mammals)

- Smelt, sand lance, herring, eulachon, anchovy
- But also – juvenile salmon, hake, gadids
- Populations in decline



# Why Are Forage Fish Important?

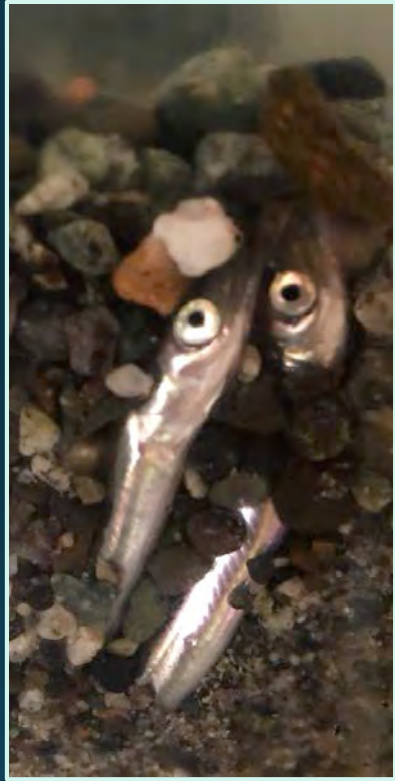
Primary driver for marine food web

- Fish, birds, and mammals



- 67% of Marbled Murrelet seasonal diet
- Main food for juvenile Chinook salmon
- Nearly entire diet for small lingcod

# Where Do Forage Fish Live?



Everywhere!

- Diurnal vertical migration
- Deep water
- Shallow water
- Offshore
- Nearshore



# Life Cycle

## Eggs



## Spawn

- Broadcast
- Beach or shallow

## Development

- Two weeks in egg

## Larvae



## Juvenile



## Pelagic larvae

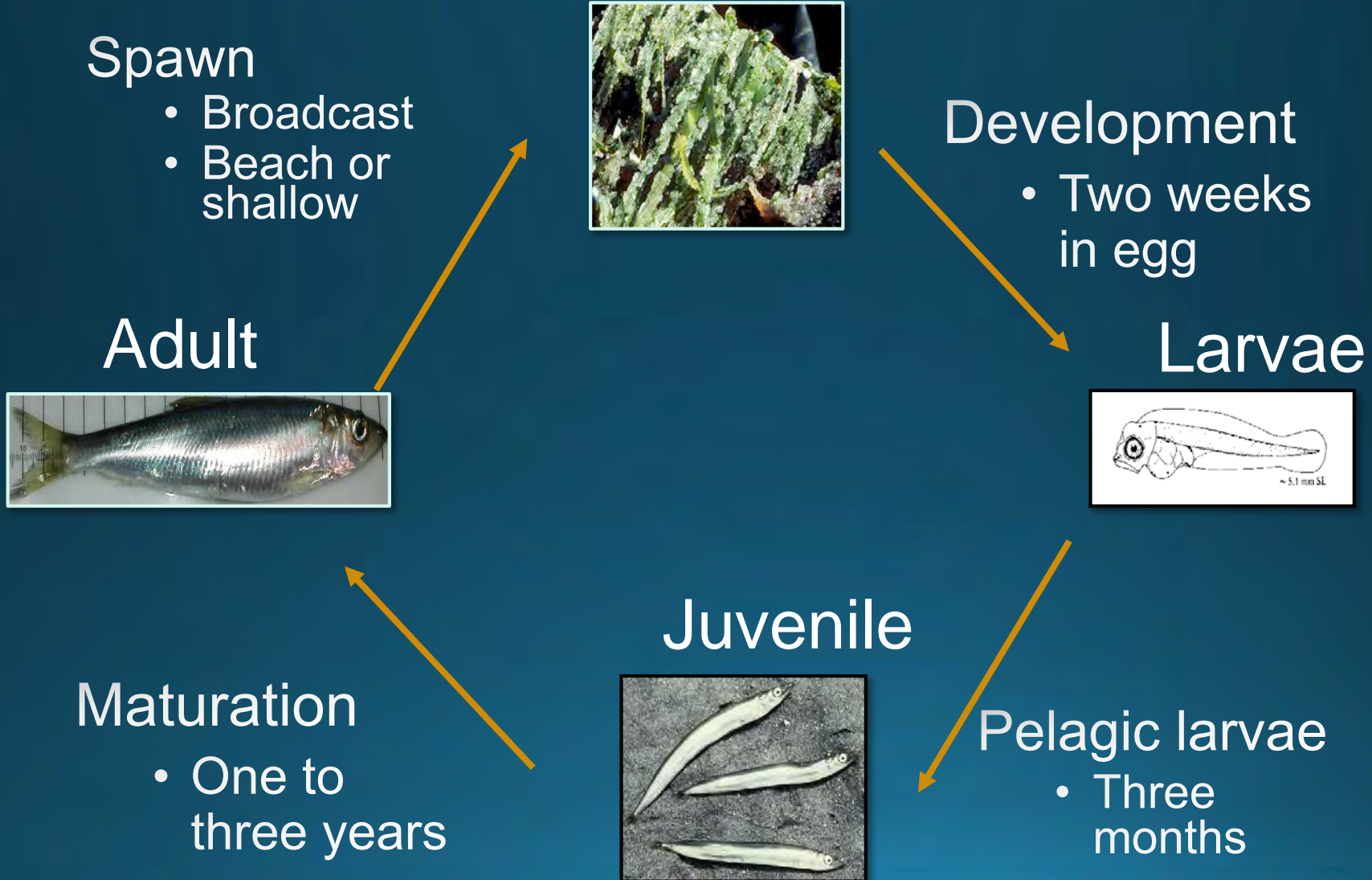
- Three months

## Adult



## Maturation

- One to three years



# Why Do Forage Fish Like the Nearshore?

Beach or shallow water spawning

- Surf smelt at 7-9' MLLW
- Pacific sand lance at 5-8' MLLW
- Herring on SAV
- Eulachon in river
- Anchovy in open pelagic



# Marine Shoreline

## Puget Sound Partnership

- No net loss of FF spawning habitat
- By 2020: armoring removed > amount of new armoring

1964



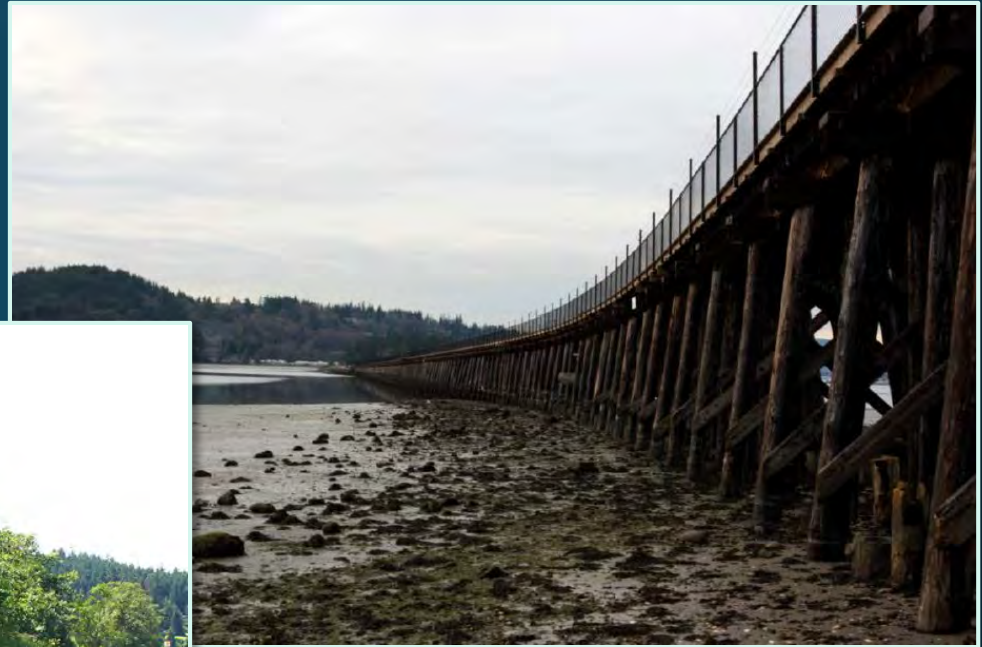
2006





# Heavily Impacted

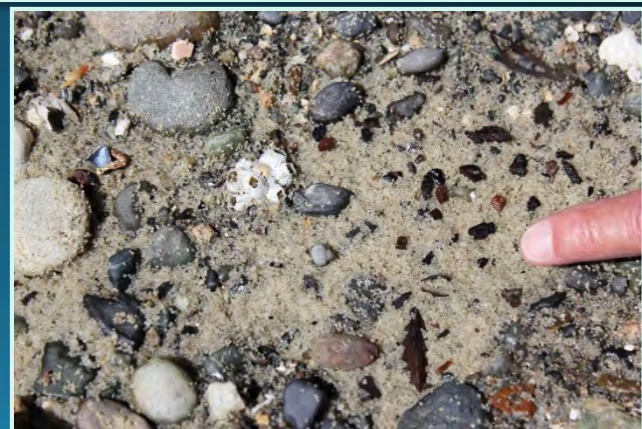
Creosote and concrete



# Shoreline Armoring

Bulkhead at ~9' MLLW

Shade



# Natural and Restored Beaches

Forage fish spawning – are they comparable?

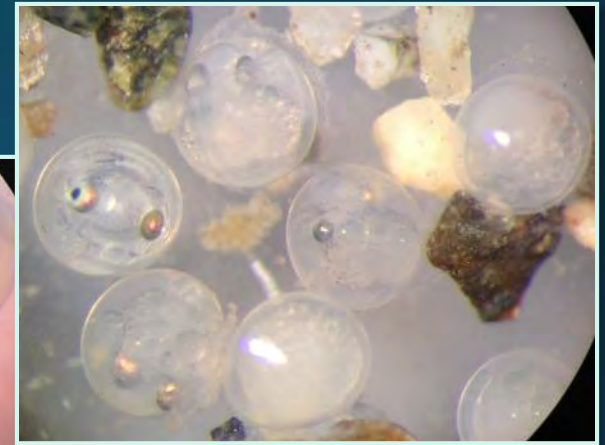
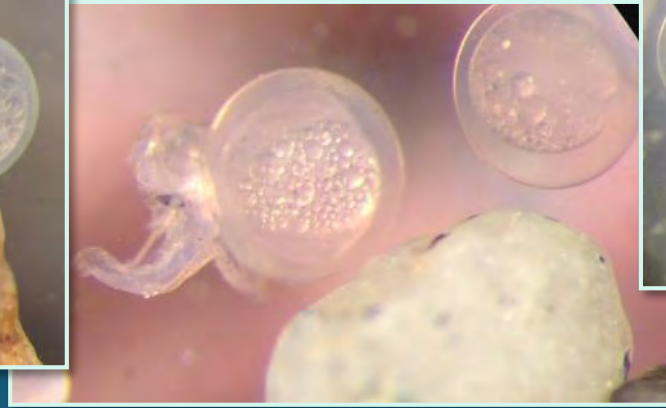
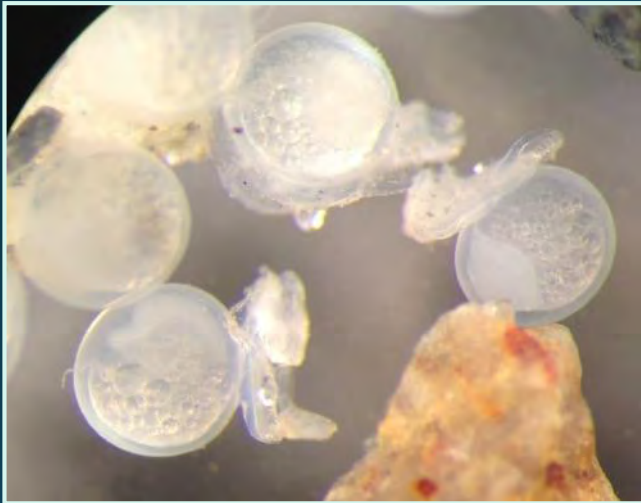


# Monitoring Survival

Repeated monitoring - Eggs develop 2 weeks

Track egg development (summer especially)

Survey complete area, mark locations



# Survey Considerations

## Beach

- Prior known spawning
- Range 4-9' MLLW
- Seasonally vary by region

Surf smelt - all year

Sand lance - Nov-Feb

Herring - Jan-Jun

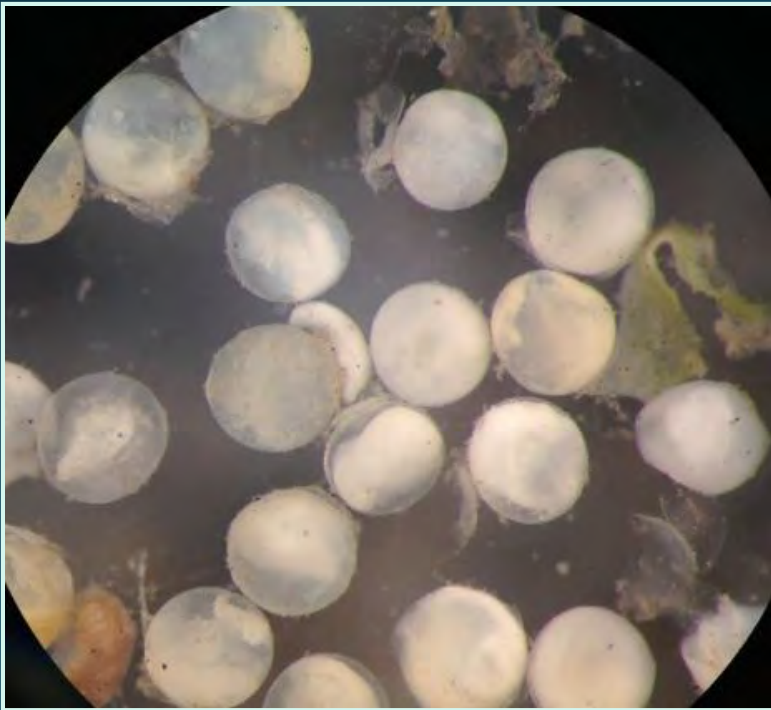


# Surface Spawning

Impacted habitat

On bolder and cobble

Low survival



# Natural habitat

Winter spawning

Decreased desiccation

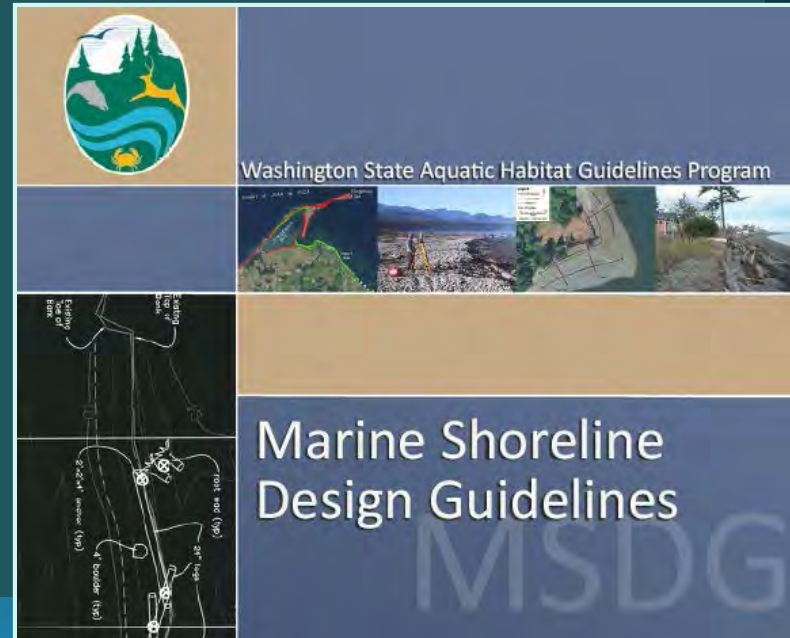
Higher survival rates



# Substrate Matters

Sand/Pebble/Cobble

Summer mortality can be 90-100%

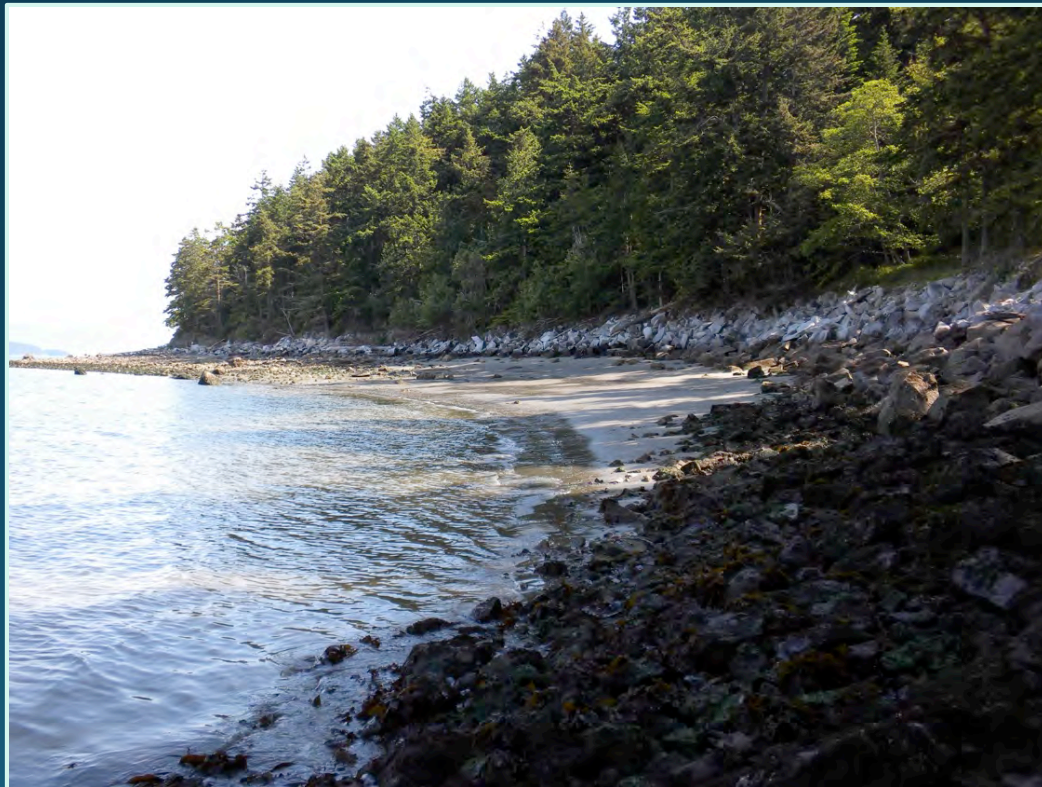




# Skagit MRC

## Shannon Point

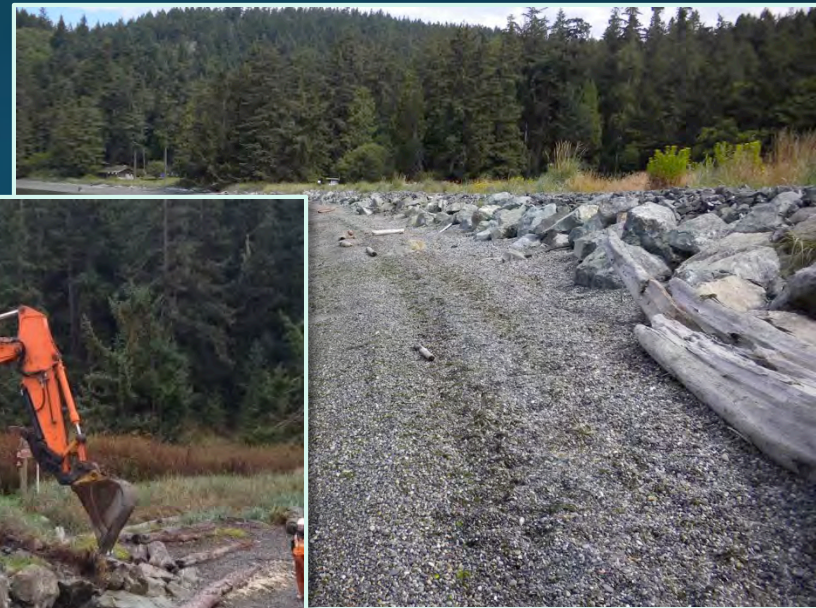
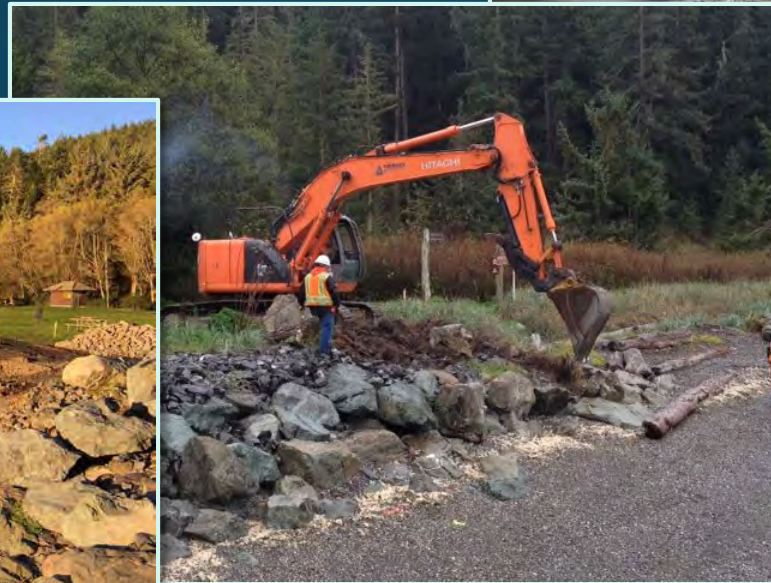
- Reference Beaches – spawning and beach seine surveys
- Rip rap removal, LWD and beach stabilization
- beach nourishment and riparian planting if needed



# Island MRC

## Bowman Bay

- In construction! In the news ([goskagit.com](http://goskagit.com))!
- Rip rap removal, LWD and beach stabilization



# Skagit MRC

- Northwest March's Point – completed Fall 2014
- Assisted by the Samish Tribe
- Forage fish have returned!



# Island MRC

- Cornet Bay – Island County MRC
- Creosote bulkhead removal, nourishment, regrading, and vegetation enhancement
- Forage fish live there, but do not spawn



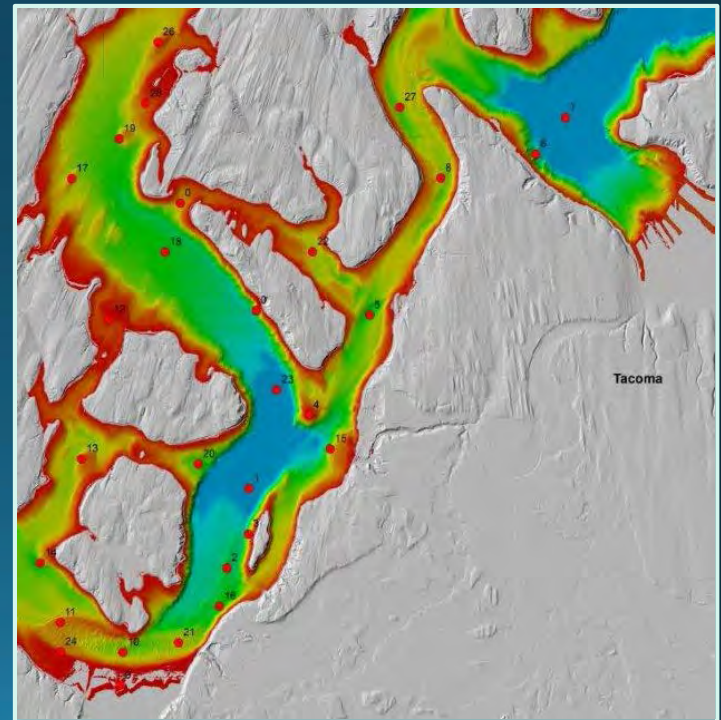
# Who Else?

## Puget Sound Partnership

- PSEMP Forage Fish and Food Webs Workgroup
- <https://sites.google.com/a/psemp.org/psemp/for>

## USGS - Acoustic tags

- Ross Point, Sinclair Inlet
- No data yet



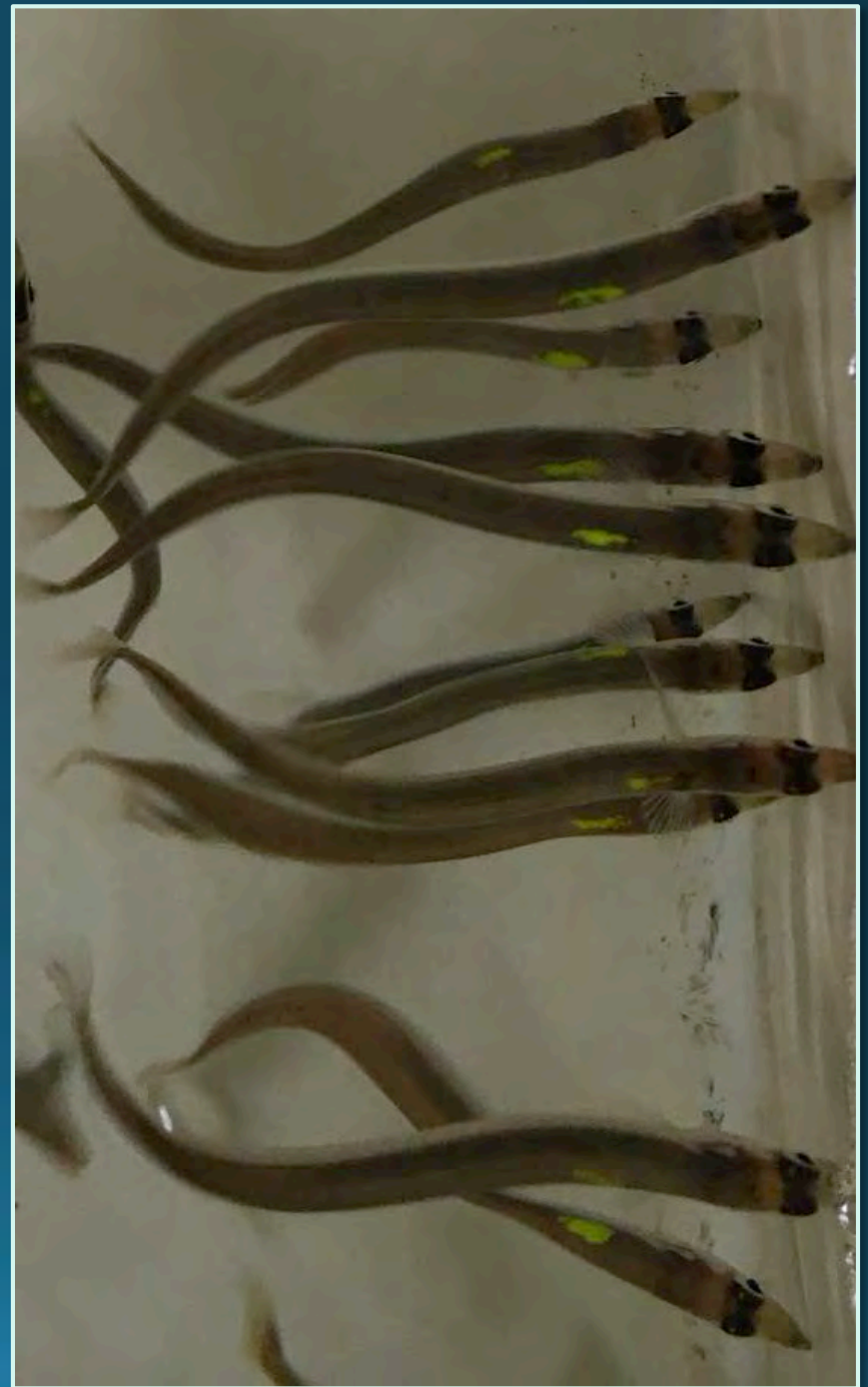
# WDFW

New 2-yr funding

- Mid-water trawls
- Acoustic surveys
- Away from spawning

Tagging Patterns

- Residence
  - Males monthly
  - Females >4 months
- Range
  - Across Inlets
  - 7 months



# PSP in Sand Lance?

- Toxic algal blooms concentrated in forage fish tissue
- Sand lance (AK)
- YOY herring (Fraser, BC)
- Potential influence on mammal, bird, and salmon decline?



# Who Can Study Forage Fish? YOU!



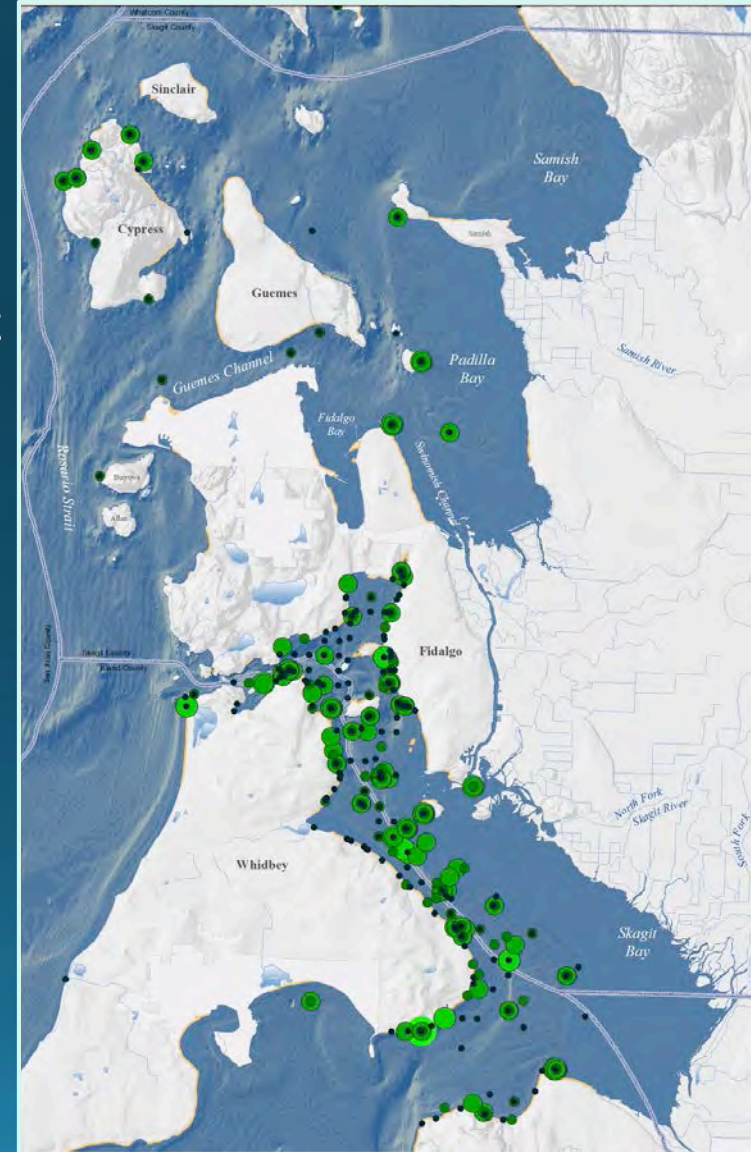
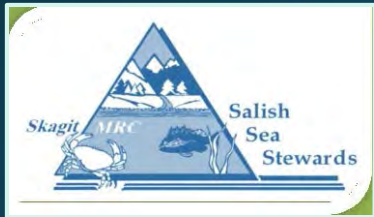


# Who Can Study Forage Fish? Resources!

NWstraits.org

[http://wdfw.wa.gov/conservation/research/projects/marine\\_beach\\_spawning/index.html](http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/index.html)

Salish Sea Stewards



# Summary

Forage Fish Rock!

Nearshore Habitats are Vital!

Urban and Natural Shorelines Can Coexist!

Restoration is Happening!

You Can Be Involved Too!



# THANKS!

Northwest Straits Commission

Skagit County MRC

Jason Morgan – NW Straits Foundation

