Ecosystem Monitoring Program: Juvenile Salmon Ecology in Tidal Wetlands of the Lower Columbia River

Lower Columbia
Estuary
Partnership

Science Work Group
October 23, 2018

Ecosystem Monitoring Program (EMP)

- Status and trends monitoring of conditions in lower river
  - Started in 2005 to provide basic information, fill knowledge gaps on tidal freshwater section of lower river
  - Data used extensively in restoration design and comparison to action effectiveness data
    - Only monitoring in lower river that collects spatial and temporal variability of concurrent habitat, fish, food web, and abiotic conditions
    - Tidally influenced emergent habitats used by juvenile salmonids for rearing and refugia
    - Sites are relatively undisturbed shallow water vegetated habitats – used as end points for restoration design
    - Created an inventory of habitats across estuary-tidal freshwater continuum
- Funded by BPA/NPCC

EMP Sampling Timeline (2005-Now)

Stratified sampling based on 8 hydrogeomorphic reaches (A-H)

- 2007-2012: focus on identifying spatial heterogeneity
  - rotated sites annually to new, un-sampled reach
  - 1 fixed site at Campbell Slough in Reach F
  - Habitat, fish, prey and water quality
- 2011: Added food web (primary, secondary production, isotopes, biogeochemistry)
- 2011-2013: Shift focus to temporal variability - added more fixed sites, dropped rotating
  - 5 sentinel sites represent estuarine-tidal freshwater continuum:
    - Ilwaco Slough (Reach A)
    - Welch Island (Reach B)
    - Whites Island (Reach C)
    - Campbell Slough (Reach F)
    - Franz Lake (Reach H)
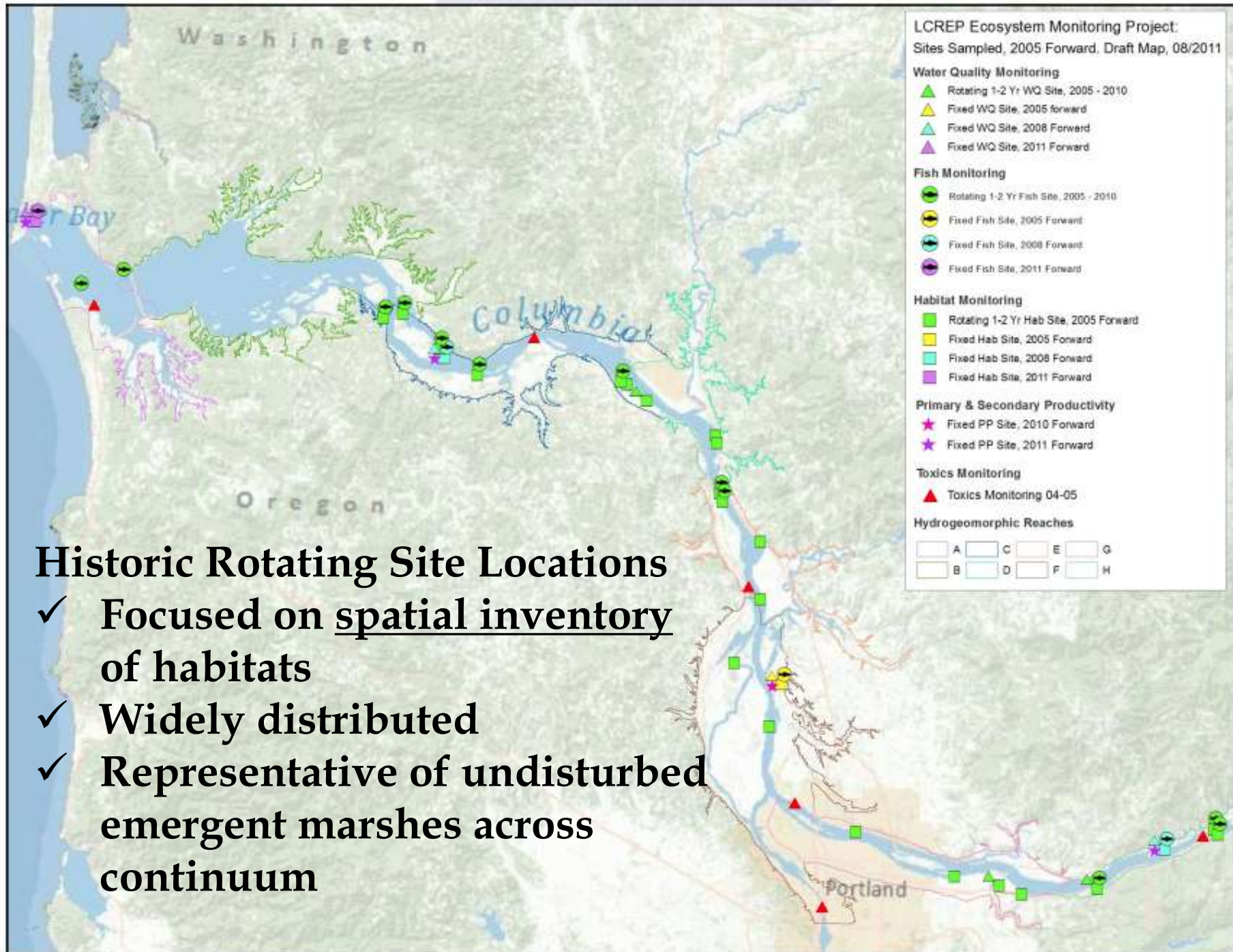
Historic Rotating Site Locations
- ✓ **Focused on <u>spatial inventory</u> of habitats**
- ✓ **Widely distributed**
- ✓ **Representative of undisturbed emergent marshes across continuum**

EMP Trends Sampling Sites
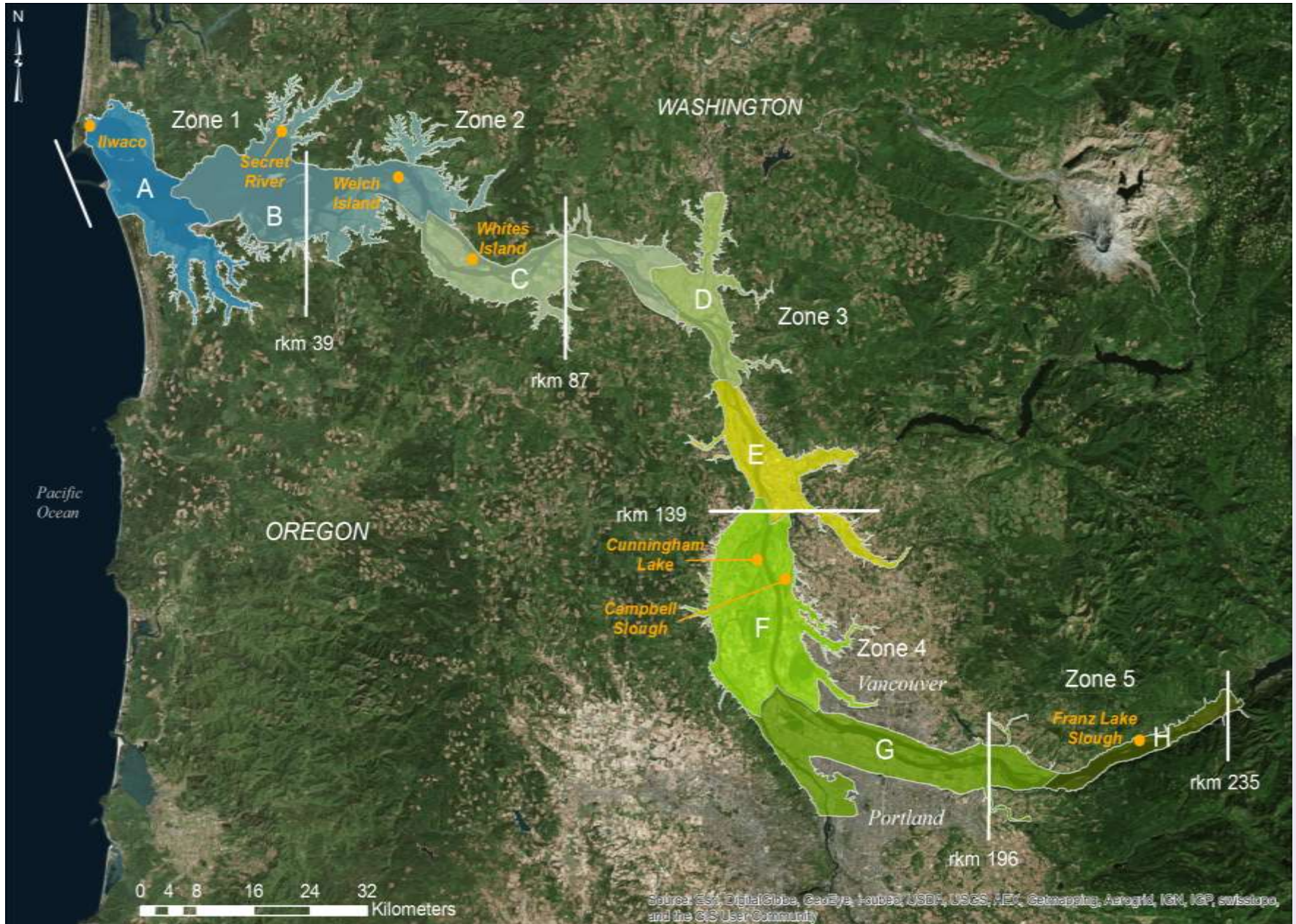
EMP Components

- **Habitat and Hydrology** - Habitat accessibility/quality for fish, macrodetritus production and flux offsite

- **Mainstem and Abiotic Site Conditions** – water quality, organic matter and nutrient flux; factors affecting primary productivity and food-web resources during peak salmon outmigration period

- **Food Web** - Role of different food web components in supporting juvenile salmon (primary/secondary production)

- **Fish and Fish Prey** - Assessment of salmonid habitat use, prey availability, and diet preference

EMP Team

Joe Needoba (OHSU) – Mainstem and Abiotic Site Conditions

Roger Fuller and Katrina Poppe (ETG), Sarah Kidd (EP) – Habitat Structure
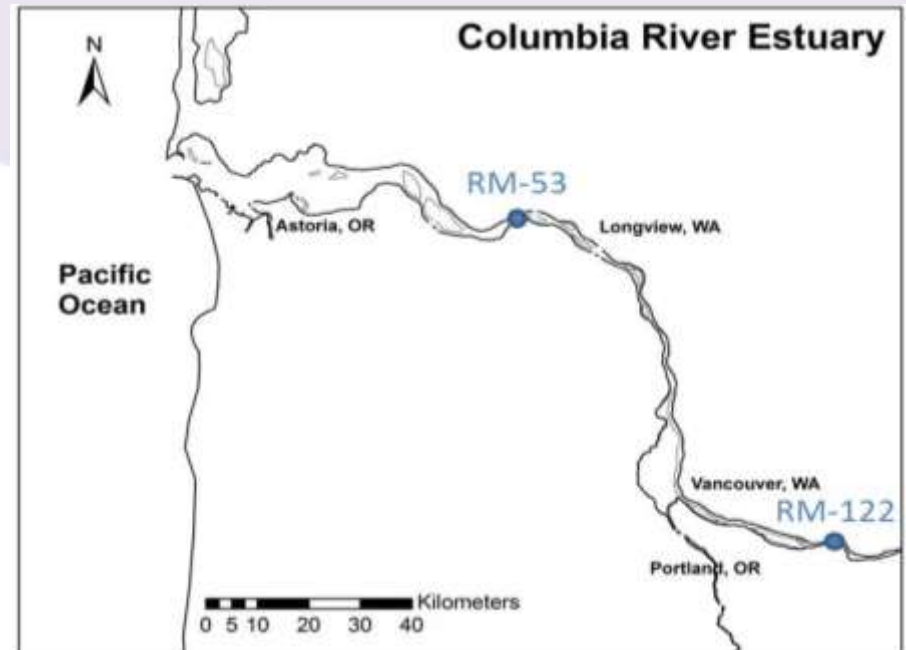
Tawnya Peterson (OHSU) – Food Web

Jeff Cordell, Mary Ramirez (UW) - Fish Prey

Regan McNatt, Susan Hinton (NOAA) – Fish Community

Mainstem Conditions (OHSU)

- Center for Coastal Margin Observation and Prediction (CMOP) platforms
  - RM122 (Port of Camas-Washougal; Reach G), 2012-2018
  - RM53 (Beaver Army Terminal; Reach C)
- Temperature, conductivity, chlorophyll *a* fluorescence, dissolved oxygen, colored dissolved organic matter, nitrate, nitrite, and dissolved ortho-phosphate
- Cycling and flux of OM and nutrients
- Understanding of riverine influences on floodplain habitat conditions (e.g., temperature, DO, etc)
- Understanding of riverine vs marine influences on estuary
- Understanding of how lower Columbia tributaries effect conditions in mainstem

Columbia River Estuary

N

Astoria, OR

RM-53

Longview, WA

Pacific Ocean

Vancouver, WA

RM-122

Portland, OR

Kilometers
0 5 10   20   30   40

Food Web (OHSU, UW)

2011-2018, Reaches A-H

- Food web monitoring at trend sites – April to July
- Primary Production: biomass and productivity of phytoplankton and periphyton (attached algae), stable-isotope analysis (plant, insect, and fish tissue), nutrient concentrations, macrodetritus
- Secondary Production: zooplankton abundance, species composition
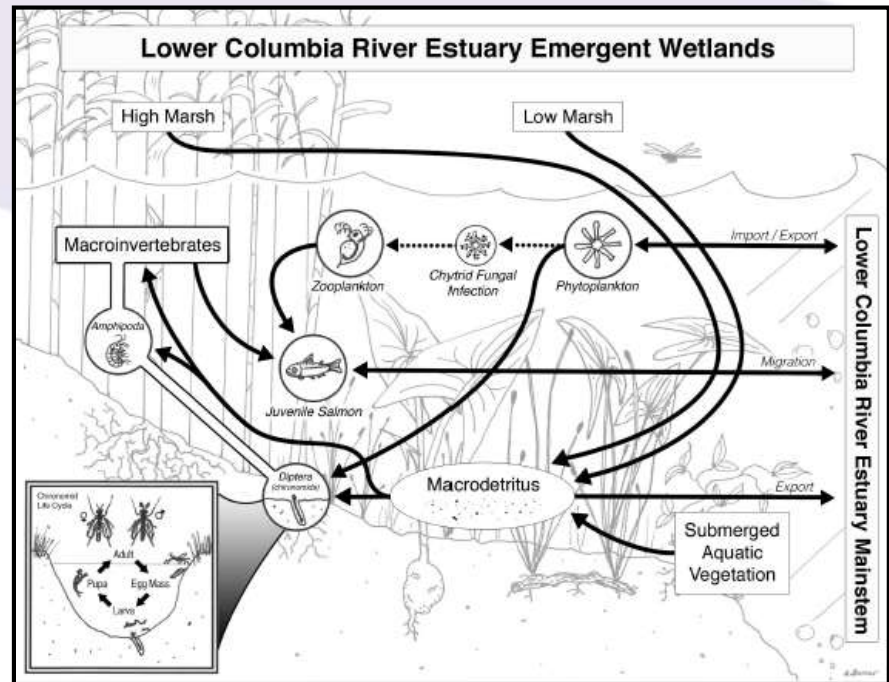
Fish (NOAA)

2007-2018, Reaches A-H

- Monthly seine sampling (Feb – Jun, then quarterly)
- Fish: Species richness, abundance, CPUE, stock ID, length, weight, otoliths (growth), marked/unmarked, condition, residency, contaminants (historically)