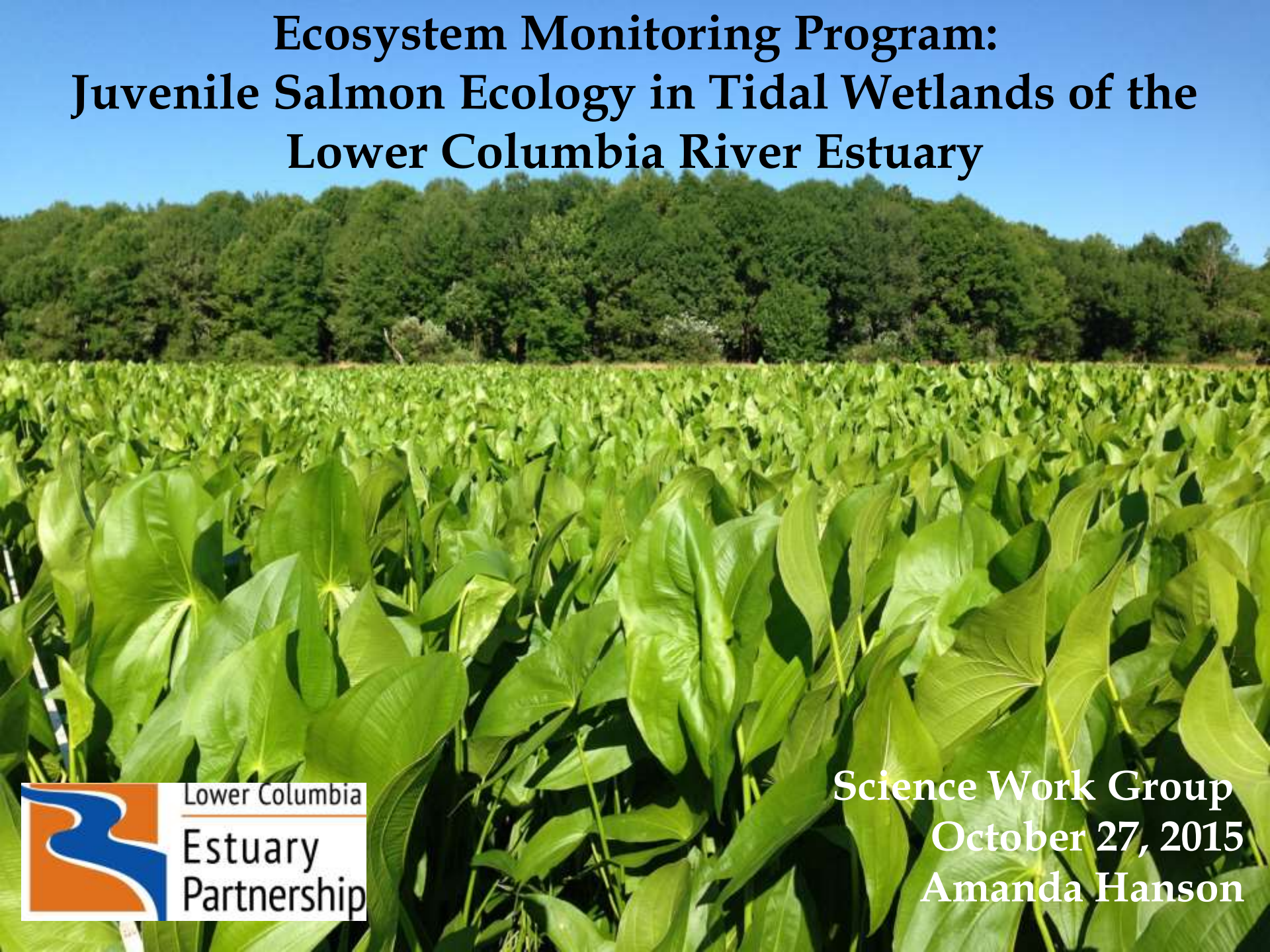
Ecosystem Monitoring Program: Juvenile Salmon Ecology in Tidal Wetlands of the Lower Columbia River Estuary



Lower Columbia Estuary Partnership

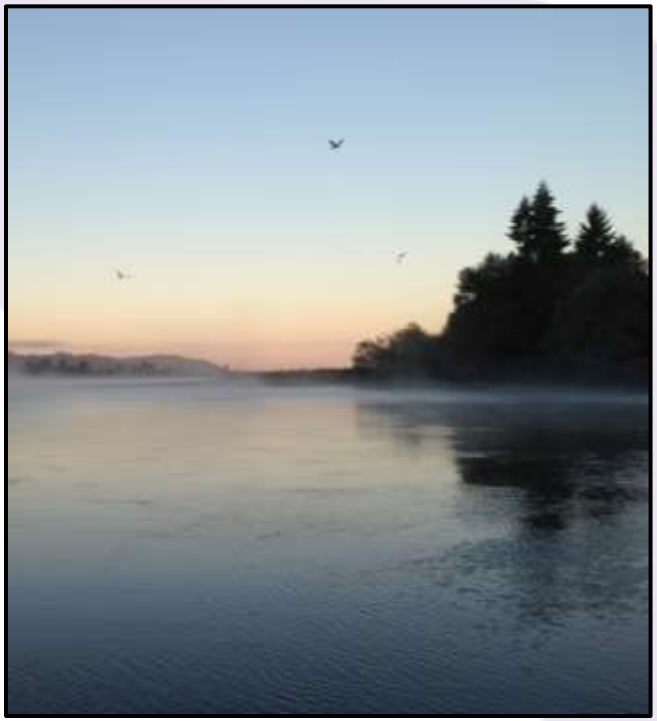
Science Work Group
October 27, 2015
Amanda Hanson

Ecosystem Monitoring Program

- Estuary Partnership CCMP, long-term monitoring strategy for the lower Columbia River
- Comprehensive and integrated assessment of status (spatial variation) and trends (temporal variation) of habitat, fish, food web, and abiotic conditions in the lower river
  - Tidally influenced emergent habitats used by juvenile salmonids for rearing and refugia
- Collaborative effort with multiple partners
- Supported by funding from BPA/NPCC

Ecosystem Monitoring Program Goals

- Characterize structure and function of estuarine and tidal freshwater habitats
  - Provide baseline data about estuarine resources
  - Track trends in ecosystem condition over time
  - Better understand range of ecological variability



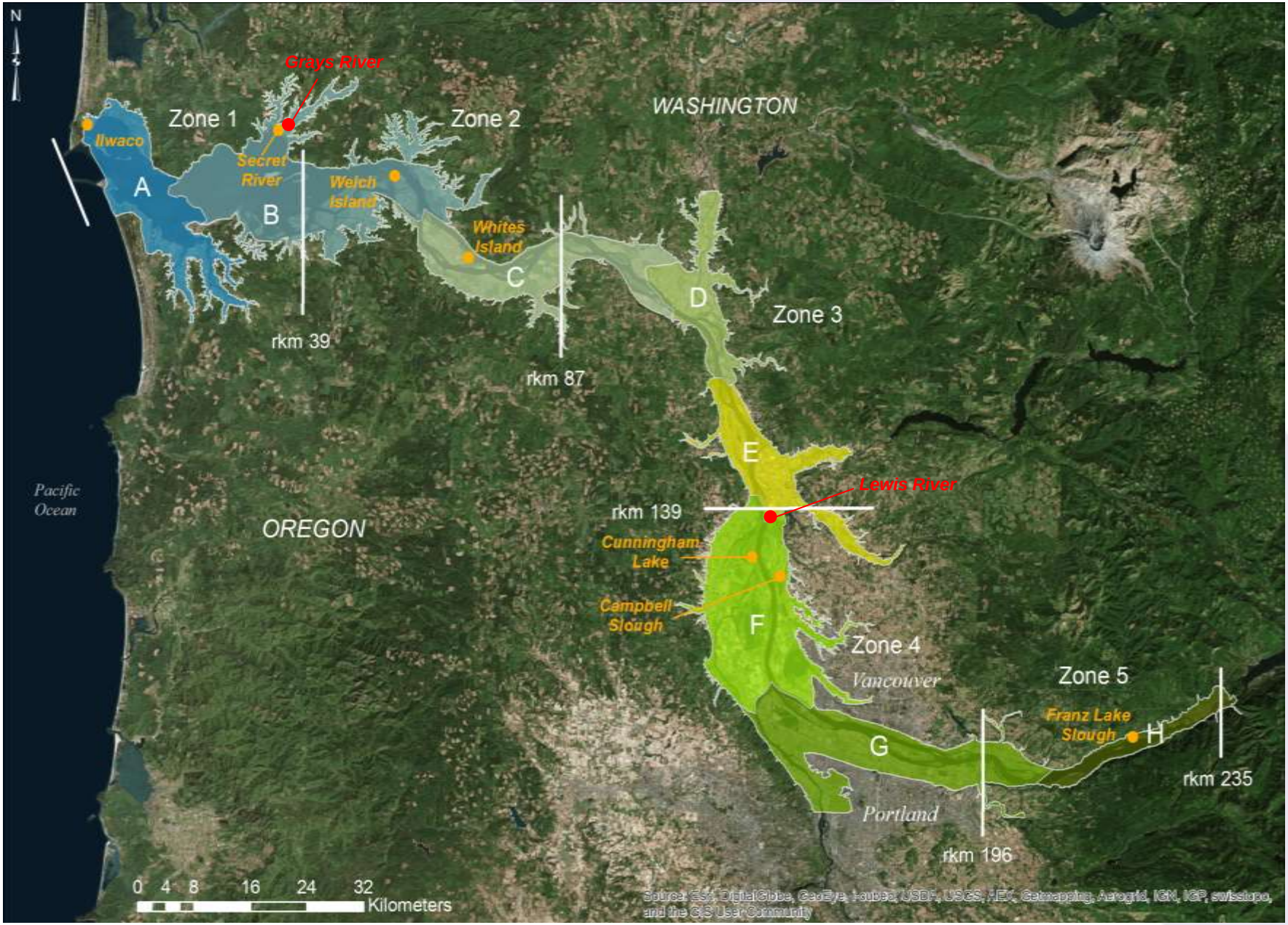
Ecosystem Monitoring Program Progress

- Pre-2004: research focused on lower reaches, lack of information from tidal freshwater reaches
- 2004-2007: habitat and toxic contaminant monitoring in water, sediment, and fish
- 2007-2015: focus on understanding role of estuarine habitats in juvenile salmon life history
- Synthesis of results:
  - 2005 to 2010: habitat structure, hydrology, water quality, fish
  - 2005 to 2013: variability of habitat structure, hydrology, water quality, fish; food web synthesis

EMP Sampling Design (2005-2015)

- Stratified sampling based on 8 hydrogeomorphic reaches (A-H) :
  - Co-located fish, prey, WQ, and vegetation sampling initiated in 2007
  - Addition of food web monitoring in 2011
  - Spatial analysis of habitats (or "status") across the lower river
  - Fixed sites for inter-annual variability (or "trends")
  - Tributary sampling in 2015 (fish/food web)
- Sampling occurs primarily in **relatively undisturbed tidally influenced emergent wetlands**

EMP Trends Sampling Sites



Habitat Structure and Hydrology (PNNL)

2005-2015, Reaches A-H

- Percent veg cover, species richness, water level elevation, inundation, channel morphology, sediment accretion
- Summer and winter vegetation biomass
- Accessibility/quality for fish, macrodetritus production

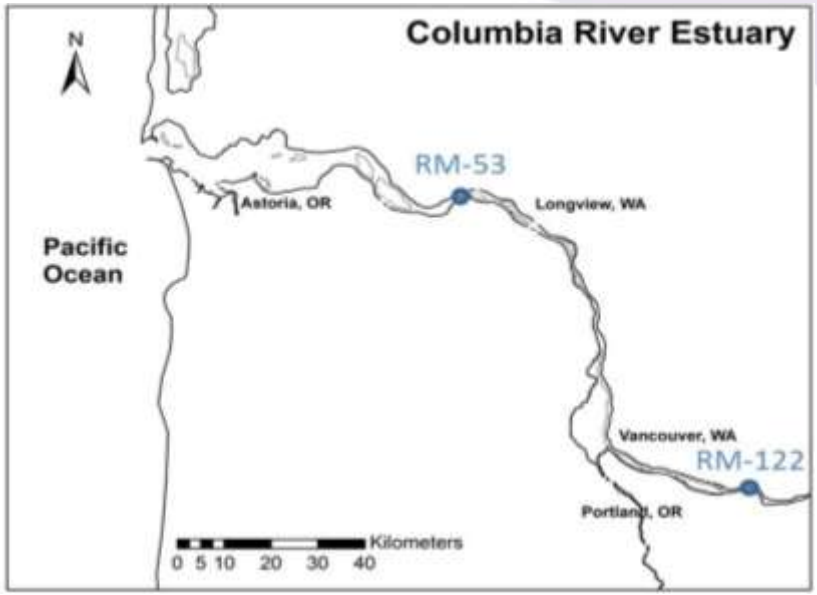
Abiotic Site Conditions (OHSU)

2005-2015, Reaches A, C, F, H

- Continuous water-quality data (temperature, DO, pH, specific conductance) – April to July
- Factors affecting primary productivity and food-web resources during juvenile salmonid migration

Mainstem Conditions (OHSU)

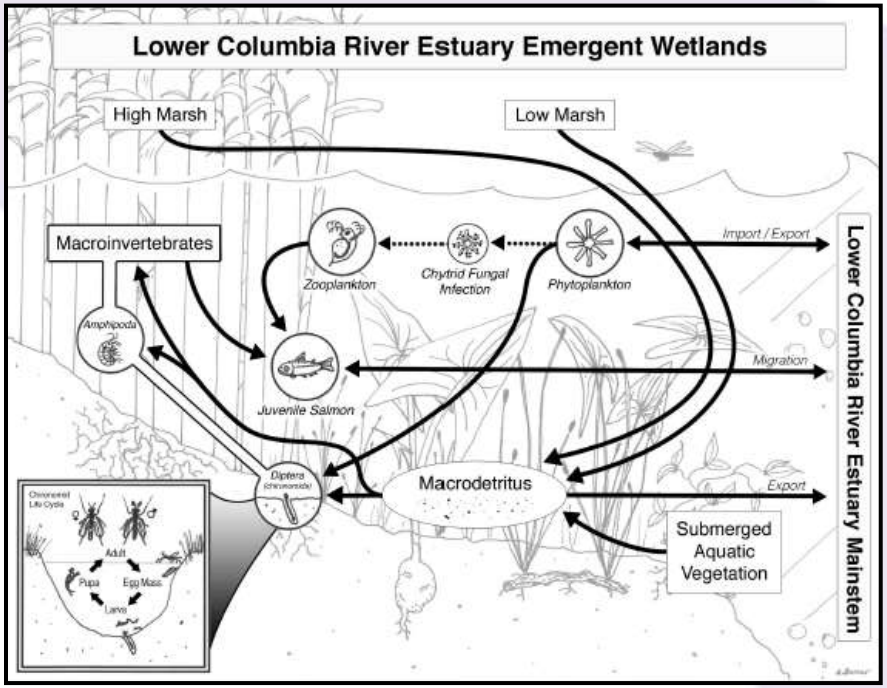
- Center for Coastal Margin Observation and Prediction (CMOP) platforms
  - RM122 (Port of Camas-Washougal; Reach G), 2012-2015
  - RM53 (Beaver Army Terminal; Reach C)
- Temperature, conductivity, chlorophyll *a* fluorescence, dissolved oxygen, colored dissolved organic matter, nitrate, nitrite, and dissolved ortho-phosphate
- Cycling and flux of OM and nutrients



Food Web (OHSU, PNNL)

2011-2015, Reaches A-H

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



Fish Prey (UW)

2007-2013, 2015; Reaches A-H

- Monthly samples at trend sites - April to July
- Neuston tows (open water/emergent vegetation), Chinook stomach contents, benthic cores
- Salmon prey production, availability, and diet preference

Fish (NOAA)

2007-2015, Reaches A-H

- Monthly beach seine sampling (year-round)
- Fish: Species richness, abundance, CPUE, stock ID, length, weight, otoliths (growth), marked/unmarked, condition, contaminants, residency

Importance of the EMP

- Multiple listed salmonid species use shallow-water wetland habitats
- Collect data on a wide range of metrics
- Baseline data from high quality habitats
  - Natural variation
  - Anthropogenic influence
  - Climate change

Importance of the EMP

- Fills data gaps and addresses scientific uncertainties
- Provides context and reference data for Action Effectiveness monitoring
  - Reference sites
  - Overlapping metrics (vegetation, hydrology, invertebrates, temperature)
- Inform regional restoration strategies
  - Hydrology/vegetation modeling

EMP Team

Amy Borde (PNNL) – Habitat and Hydrology

Joe Needoba (OHSU) – Mainstem and Abiotic Site Conditions

Tawnya Peterson (OHSU) – Food Web

Jeff Cordell and Mary Ramirez (UW) - Fish Prey

Lyndal Johnson (NOAA) – Fish Community