Interns: **Sasha Hardy** and **Logan Pallin**

Senior mentor: **António Baptista**

Frontline mentor: **Grant Law**

Advising roles: **Mojgan Rostaminia**

Project Title: Salmon habitat opportunity in a changing estuary

Context for Project: Juvenile salmonids originating from spawning grounds in the Columbia River Basin migrate to the ocean through a complex river-to-shelf environment, and return. Changes in the spatial and temporal use of freshwater, estuarine and ocean habitats by diverse salmon stocks has resulted in dramatic decreases in numbers, diversity and resilience of fish. CMOP's SATURN collaboratory, and in particular its Virtual Columbia River, have been used to characterize the natural variability and changing trends in estuarine habitat opportunity for ocean-bound juveniles.

Brief Description: The students, working as a team, will seek to use simulations of the Virtual Columbia River to characterize the spatial and temporal detail of salmon habitat opportunity in two specific regions of the estuary: the tidal-freshwater Cunningham Slough and the marine-influenced Baker Bay. Of primary importance in this project is evaluating whether the local spatial resolution and skill of the Virtual Columbia River is sufficient to render salmon habitat opportunity calculations practically meaningful in either or both regions. CMOP field observations (including temporary stations in Cunningham Slough and a new SATURN station in Baker Bay) will be used to assess modeling skill. The different sizes and exposure to ocean influence of the two regions, make them useful contrasts in terms of both (1) modeling skill and (2) variability and susceptibility to impact (from climate change and hydropower operations) of the local salmon habitat opportunity.

Anticipated Outcomes/Broader Impact: The project will examine the skill of the Virtual Columbia River in areas of the estuary where the modeling system has not been assessed in detail, using recent data that has not yet been analyzed by other CMOP projects. Results will inform collaborative studies between CMOP, USGS and CRITFC in support of the review by the U.S. Entity's Sovereign Review Team of technical matters associated with the U.S. Canada Columbia River Treaty Review process. The Sovereign Review Team is comprised of five tribal members designated to represent 15 tribes; state representatives from Oregon, Washington, Montana and Idaho; and 11 federal agency representatives including the Corps and BPA Treaty co-coordinators.

Tentative timeline:

Week 1:
Logan - Readings and discussion. Salmon at River's End report, Michaela Burla's work, previous interns' work, USGS report on Columbia River classification system.

Week 2:
Logan - Begin work with ARC-GIS, including conversion and input of grid files, shapefiles for regions of interest in the Columbia River, developing facility with generating maps of spatial data. Begin working with observational data from Cunningham Slough, including basic time series processing, model data extraction, and model-observation comparison strategies. Matlab training.

Week 3:
Logan *- Evaluate model skill. Continue developing model-data extraction methods. Collect and Start making maps of modeled PHO criteria data. Matlab training.*
Sasha *- (Starts Wednesday) Readings and discussion. Salmon at River's End report, Michaela Burla's work, previous interns' work, USGS report on Columbia River classification system. Logan debriefs on work already completed*

Week 4:
Logan *- Use spatial plots of model data to assess accuracy, and to evaluate representativeness of study regions to broader reaches. Begin identifying systemic problems with model output, and propose appropriate changes to calibration/grid schemes. Introduce to CRITFC. Begin building PHO maps.*
Sasha *- Matlab training. Model data extraction. Plotting spatial data.*

Week 5:
Logan *- Evaluate the results of changes to the calibration/grid scheme. Develop method for comparing changes in PHO between scenarios and control runs.*
Sasha *- Quantify effects of climate change using sealevel rise scenarios. Build and compare PHO maps.*

Week 6:
Logan *- Prepare and present mid-summer presentations and summaries of work accomplished*
Sasha *- Prepare and present Mid-summer presentations and summaries of work accomplished*

Week 7:
Logan *- Generate story/synthesis for main project. Begin writing text to support the poster, focusing on materials and methods, and processes in the Cunningham Slough.*
Sasha *- Generate story/synthesis for main project. Begin writing text to support the poster, focusing on materials and methods, and processes in Baker Bay.*

Week 8:
Logan *- Generation of analyses, data maps, and figures*
Sasha *- Generation of analyses, data maps, and figures*

Week 9:
Logan *- Compile and edit final text, complete powerpoint and poster*
Sasha *- Compile and edit final text, complete powerpoint and poster*

Week 10:
Logan *- Practice and deliver preliminary presentation*
Sasha *- Practice and deliver preliminary presentation*

Week 11:
Sasha *- Utilizing feedback from first presentation, develop new methods for analysis and display of data.*

Week 12:
Sasha *- Incorporate new resources into existing presentation materials. Practice and deliver final presentation*