Connecting Estuarine Dynamics and Fish Migration: Collaborative Modeling of Mercury Exposure in the Penobscot River

August 6th, 2025 | 9:00 am - 4:10 pm

University of Maine, IMRC Center 101 Stewart Commons, Orono, ME 04469

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Project Description

In the Penobscot River, tidal and river dynamics shift sediments and influence contaminant movement and deposition, posing risks to migratory fish such as river herring, striped bass, Atlantic salmon, and sturgeon. Long-standing mercury contamination has made some species unsafe to eat or use, limiting access to important cultural and subsistence resources. Understanding fish interactions with estuarine processes is key to identifying exposure pathways and reducing toxicity in these ecologically and culturally significant species.

Overview

This workshop will focus on the identification of key fish behaviors, biological processes, and environmental dynamics that influence contaminant exposure in anadromous species within the Penobscot River Estuary. In partnership with the Penobscot Nation, participants will collaboratively evaluate how biological processes (e.g., osmoregulation, predation) and external factors (e.g., salinity, temperature, suspended sediments, and flow conditions) interact to shape exposure risk. The goal is to refine ecological model components using both ecological knowledge and community input to better represent the complexity of fish-environment interactions.

Workshop Objectives:

* Support interdisciplinary and community-informed model development by sharing cultural, ecological, and biological perspectives on estuary processes and sea-run fish.
* Identify key stressors and internal/external drivers of contaminant exposure in anadromous fish.

Expected Outcomes:

* Participants will collaboratively identify and refine key behavioral and environmental processes driving contaminant exposure in anadromous fish.
* Participants will engage in hands-on development of an ecological model tailored to the Penobscot River.
* Each participant will be able to request a model output or simulation aligned with their management or personal interest. Results to be shared after the workshop.

# Agenda Overview \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8:30 – 9:00 AM: Coffee & Donuts**

* Wi-Fi, power strips, air conditioning/ heat, Nametags

**9:00 – 9:30 AM: Welcome and Introductions - Katrina**

*Ask about culturally important items (e.g., blessing, land acknowledgements) \**

* Personal introductions of all participants.
* Interactive activity with discussion prompts
  + Map Activity

“What motivated you to attend this workshop, and how do you see it benefiting your professional work or personal interests in environmental science?”

“What personal experiences or values connect you to the topics of environmental conservation, river ecosystems, or fish habitat management?”

**9:30 – 10:00 AM: Penobscot Nation History and River Overview**

* 9:30-9:55 AM *Invited Presentation:* Penobscot Nation representative. *Have prompt\**

*Prompts:*

* + Can you share the historical and cultural significance of the Penobscot River to the Penobscot Nation, particularly regarding sea-run fish species? How has the Nation’s relationship with the river evolved over time?
  + What challenges has the Penobscot Nation faced in preserving the river’s ecological and cultural importance, and what barriers exist to effective management of sea-run fish populations?
  + What research is the Tribe currently conducting or supporting on sea-run fish, particularly in relation to health, migration, conservation, or mercury contamination?
  + How are sea-run fish utilized by the Tribe today, whether culturally, ceremonially, or for sustenance?
  + What is the Tribe’s vision for the future of sea-run fish populations in the Penobscot River, and how can researchers and management agencies collaborate to support this vision?
* 9:55-10:00 AM: Q&A session.

**10:00 – 10:20 AM: Penobscot River Ecosystem Modeling Overview- Vanessa**

* 10:00-10:15 AM *Presentation by Vanessa*: Overview of Penobscot System.
  + System Overview
  + Introduction to Ecological Modeling
  + Workshop Objective
  + Modeling Outcomes
  + Discussion on species
* 10:15-10:20 AM: Q&A session.

**10:20-10:30 AM: Break**

**10:30-11:15 AM: Agent-Based Models- Vanessa**

* 10:30-10:50 AM *Presentation by Vanessa*: Overview of Ecological Modeling.
  + Introduction to Agent-Based Models
  + Novelty of Agent-Based Models
  + Demo Emergent Behaviors
  + Show Current List of Behaviors and Processes
* 10:50-11:15 AM: Q&A session. - Katrina to add any additions

**11:15 – 11:30 PM: Consensus Building and Prioritization - Menti**

* Review and consolidate the key species behaviors and processes.

**11:30 – 12:00 PM: Lunch Break**

* 11:05-11:35 PM:Jersey Mikes

Facilitators can set-up break out groups (should be done mostly before workshop begins)

**12:00 – 1:40 PM: Break-Out Groups- Internal Mechanisms (World Cafe)**

* 12:00-12:15 PM: Introduce break out group activity
* 12:15-1:35 PM: Break Out Discussions (20 minutes each)
  + 12:15 - 12:35 PM: Round 1
  + 12:35 - 12:55 PM: Round 2
  + 12:55 - 1:15 PM: Round 3
  + 1:15 - 1:35 PM: Round 4

**1:40-1:50 PM: Break**

**1:50-3:05 PM: Break-Out Groups- External Behaviors (World Cafe)**

* 1:35 -3:00 PM: Break Out Discussions (15 minutes each)
  + 1:50 -2:05 PM: Round 5
  + 2:05 -2:20 PM: Round 6
  + 2:20 -2:35 PM: Round 7
  + 2:35 - 2:50 PM: Round 8
  + 2:50 - 3:05 PM: Round 9 (extra for new or unidentified behavior)
* 3:05-3:10 PM: Discussion of Key Findings

**3:10-3:20 PM: “Wish List” Outputs**

* Participants individually write down “Wish List” of model outputs of interest for the system and reasoning behind them.

**3:20-3:30 PM: Break**

**3:30 – 4:00 PM: Building Partnerships**

* Collaborative session. (*does the Tribe want to showcase something they need help with or are working on?*)
  + Shared insights or cultural elements from the Penobscot Nation

(*opportunity here*) \*.

* + Opportunities to support or collaborate on tribal priorities.

**4:00 – 4:10 PM: Wrap-Up and Final Thoughts**

* Showcase Penobscot Model UI
* Collect participant final ideas, reflections, and feedback
* Closing remarks and next steps

**4:10 PM: Adjourn**

* Follow-Up Information (Contact Info)

**4:10-4:40 PM: Clean-Up**

* Clean up