

Title: Developing agent-based models to inform both physio-chemical and biological changes in aquatic ecosystems

Abstract: This webinar introduces the fundamentals of agent-based modeling using GoFish (<https://vmahan1998.github.io/GoFish/>), a modular framework designed for modeling migratory fish and their interactions with aquatic environments. Participants will be guided through the core components of an agent-based model, including defining agents, representing spatially and temporally explicit environments, and implementing behavioral rules. Using migratory fish as a case study, the webinar demonstrates how movement, environmental cues, and simple decision making can be translated into applied modeling. The webinar will also highlight how modular components can be developed and re-used to create agent-based models that link biological processes such as migration and foraging with physico-chemical conditions to assess risk and vulnerability through emergent patterns of population response. Rather than focusing on complex implementation, the webinar emphasizes conceptual understanding and practical model design, and by the end of the session participants will have a clear roadmap for developing their own agent-based models and an understanding of how modular approaches like GoFish support reproducible and extensible ecological modeling across systems.

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Bio: Vanessa Quintana is an ORISE Fellow and ecological modeler specializing in agent-based and coupled hydrodynamic modeling of aquatic ecosystems. She holds a PhD in Marine Sciences, and her work focuses on understanding how environmental conditions, organism behavior, and physiology interact to shape ecological dynamics, risk, and vulnerability in real world systems. Her research spans the development of modeling frameworks, software tools, and applied research products that integrate hydrodynamics, sediment and contaminant transport, and biological processes. Her work includes the development of agent-based models, habitat models, and integrated modeling systems used to evaluate migration dynamics, contaminant exposure, and ecosystem change. Her work emphasizes the development of open and accessible modeling resources, including software tools, tutorials, and public facing applications, to support transparency, reproducibility, and broader use of ecological modeling. She prioritizes modular design, clarity in assumptions, and co-development with Tribal partners, federal agencies, and local knowledge holders to ensure that models reflect both ecological realism and decision context.