Managing Movement of Threatened, Endangered, and Invasive Species Using Corps Water Resources Infrastructure

Research Need
Managing the movement and distribution of mobile aquatic biota are critical elements of the Corps’ ecosystem restoration business line. The goal of the proposed work is to develop planning and engineering tools for application at Locks and Dams (L&Ds) that allow Corps’ scientists and engineers to develop project alternatives that selectively pass desirable aquatic species and block or impede aquatic nuisance species (ANS). These tools will allow Corps’ scientists and engineers to develop innovative designs and management plans to help restore the range and abundance of migratory fish (many of which are threatened or endangered species - T&ES) and other desirable species, while limiting the range expansion of ANS. This work has national implications for management and future replacement of Corps navigation facilities.

Project Objectives & Plan
This research is intended to be conducted in parallel with a Pittsburgh District ongoing navigation modernization feasibility study for three locks on the upper Ohio River, and the USFWS Biological Opinion on Ohio River Navigation System operation and maintenance. Anticipated products include:

- Tech Note: Novel approach for using computational fluid dynamics (CFD) modeling to support feasibility studies.
- Software: Generalized CFD models of L&Ds for feasibility studies of proposed fish passage strategies.
- Movement rules that can be used to forecast the migratory path made by different target fish species.
- Generalized protocols to assess selective fish passage at L&Ds that can be applied Corps-wide.
- Adaptive Management Plan for application of fish passage strategies at Corps L&Ds.
Payoff
L&Ds are a major component of the Nation’s navigation infrastructure and also have the potential for dual use as a major contributor to the Corps ecosystem and restoration business line. The extension to dual use is possible with relatively little additional investment and either no impact or very little impact on navigation efficiency. This work, with its initial formulation at Pittsburgh District (LRP), will establish a sound foundation for the design and evaluation of selective fish passage strategies at replacement lock chambers on the Upper Ohio River to support a Great Lakes and Ohio River Division environmental commitment.

This work also supports initiatives identified in the MOU executed between The Nature Conservancy and Great Lakes and Ohio River Division for cooperative projects involving dam management for native fish passage, floodplain protection, invasive species, and fish and mussel reproduction needs. It further supports initiatives of the Council on Environmental Quality and Pennsylvania Fish and Boat Commission to restrict the spread of Asian carp. Methods developed in this WU will be broadly applicable to CE navigation infrastructure nationwide.

Products
White Papers
Smith (in review) “Building a Generalized Fish Passage Assessment Tool for Application at Corps Lock and Dams”, *EMRRP Technical Notes Collection*. ERDC/TN EMRRP-XX-XX. U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.

Project Activities
Laboratory and computational fish movement studies/simulations to assess attraction flow effectiveness; Non-physical barrier simulation at a Lock and Dam (Deterrence technology will be an important consideration for fish movement management – tools are needed to anticipate impacts and plan implementation)

\(^1\)Project Alias – Work Unit Documentation Title: Managing Movement of Threatened, Endangered, and Invasive Species Using Corps Water Resources Infrastructure