

FISH PASSAGE ENGINEERING SPECIALIZATION

A civil and environmental engineering graduate degree option at the **University of Massachusetts-Amherst** developed in partnership with the **U.S. Fish & Wildlife Service** and **U.S. Geological Survey** designed to prepare students for a career in the fields of fishway design, dam removal, stream restoration, watershed ecology through interdisciplinary course work in civil engineering, resource conservation, and ichthyology.

Environmental Impact of Stream Barriers

Historical fish migration routes linking feeding and spawning habitats have been significantly impacted by culverts, dikes, dams, and other stream barriers on waterways throughout the U.S. and the world.

- An estimated 2.5 million barriers to fish migration exist in the U.S.
- Approximately 25,000 dams in the Northeastern U.S.
- Culverts densities can exceed 1 per 5 river km in some drainages

Engineering Solutions

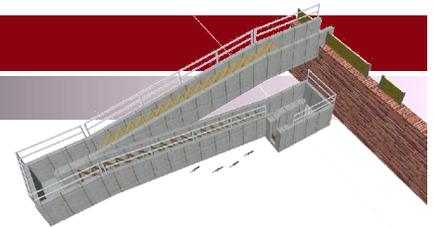
Engineers have an important role to play in reducing and eliminating the environmental impact of stream barriers. Various methods ranging from dam removal to structural fishways have been shown to be effective in restoring fish passage and opening up new habitat.

- Dam removal
- Nature-like fishways
- Stream restoration
- Culvert replacement
- Volitional fish ladders
- Non-volitional fish lifts

These solutions are interdisciplinary and highly complex. Fish passage engineers must have expertise in several disparate scientific disciplines including civil & hydraulic engineering, hydropower operations, computer-aided drafting and design, fish ecology, watershed hydrology, and stream morphology.

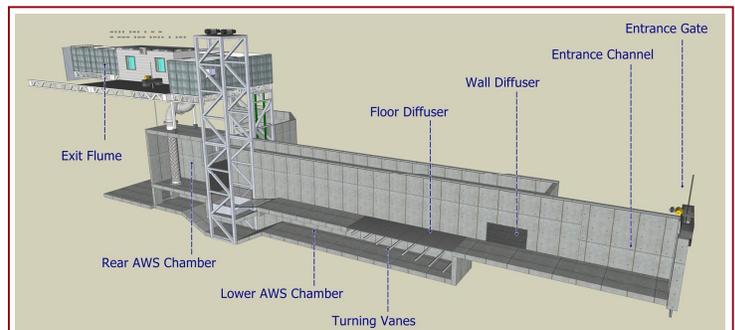
Education and Partnership

The US Fish and Wildlife Service and the USGS Conte Anadromous Fish Research Laboratory have joined with the Department of Civil and Environmental Engineering under a cooperative agreement to establish a Fish Passage Engineering & Ecohydrology partnership. This complementary partnership links together unique regional resources to address a growing professional demand while cooperatively fostering research in the fields of watershed ecology and fish passage engineering.



The Department of Civil and Environmental Engineering offers a graduate specialization designed to provide students with the skill set to enter this exciting field. By partnering with other fish passage experts within the U.S Fish and Wildlife Service, the U.S. Geological Survey, and the Department of Environmental Conservation, CEE has developed a curriculum that augments its nationally ranked programs in civil and environmental engineering with:

- graduate-level courses in hydraulics and hydrology
- fishway design classes taught by licensed professional engineers
- field visits to local fish passage structures and hydropower sites
- practicums at a premier ecohydraulics research facility
- interaction with practicing biologists, engineers and other subject-matter experts
- research and internship opportunities



USFWS engineers have developed fish lift designs which offer numerous advantages over volitional ladders at medium to high head projects.

Requirements for Specialization

Complete Requirements for M.S. Civil Engineering or M.S. Environmental Engineering and take these courses:

- CEE 597F Design of Fish Passage Facilities
- CEE 561 Open Channel Hydraulics
- CEE 560 Hydrology; and

Minimum of 4 cr. Hours in fisheries related coursework such as CEE 596 Conte Practicum, or ECO 607J Ecology of Diadromous Fish

FOR MORE INFORMATION CONTACT:

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