Fish Passage and Fisheries Engineering

Values

Providing safe passage for fish in the design or modification of hydraulic structures is important for restoring ecological conditions and recovering endangered species. Fisheries engineering also includes designing facilities to exclude fish from entrapment in water intake facilities, support for hatchery facilities, and instream habitat improvement. Effective fish passage and fisheries engineering design integrates hydrology, geomorphology, hydraulics, and fish biology and physiology to ensure that dams, road crossings, and other structures maintain or restore access to valuable habitat.

Services

NHC provides a wide range of assessment and design services for fish passage, screening, and ecological flow management and other fisheries related projects. Target species vary in different areas, but include salmon, steelhead, bull trout, cutthroat trout, cui-ui, and lamprey. Our experienced staff applies agency fish passage design criteria in projects and works collaboratively with agencies and stakeholders to develop innovative designs in especially challenging or unique situations.

OUR SERVICES INCLUDE:

- **Fish passage barrier identification and assessment**
- **Field services such as bathymetric surveying, and flow and velocity measurements**
- **Hydrologic and hydraulic analysis, and fluvial geomorphology and sedimentation studies**
- **Modeling of hydraulic performance, including physical and multi-dimensional models**
- **Hatchery intake and operations improvements**
- **Instream habitat improvements**

Technical Approach and Capabilities

NHC preferentially applies a geomorphic or stream restoration approach to aquatic organism passage to achieve sustainable infrastructure design. Where conditions require hydraulic structure design, we apply a range of simple to sophisticated tools tailored to the project. Our designs are based on field data, understanding of the temporal and physical components necessary for biological success, and detailed modeling and analysis. For challenging or complex situations, NHC applies our in-house capabilities in 3-dimensional numerical modeling and physical modeling to better understand fine-scale hydraulic conditions that may affect fish passage. By collaborating with project stakeholders, aquatic ecologists, and fisheries biologists, NHC develops functional and sustainable solutions based on both sound science and consensus from multiple perspectives.

Experience

NHC has developed designs for passage by aquatic organism at dams, diversions, intakes, road crossings, grade control structures, and other infrastructure. This experience includes protecting or restoring both upstream and downstream migration for a full range of life stages that considers the temporal and behavioral patterns of the target species.

- **Barrier Assessment and Monitoring**
  NHC has experience in field surveys, barrier classifications, geomorphic evaluations, fish counts and tracking, and flow and velocity measurements.
- **Barrier Removal**
  Studies have evaluated conditions for the siting and design of river engineering works, and documented natural and anthropogenic components of channel changes and trends in erosion and sedimentation.
- **Naturalized Channels, Roughened Riffles, and Fishways**
  Many NHC projects use roughened channel or step pool designs to mimic natural channel processes in creating habitat and allowing fish passage.
- **Fish Ladders**
  NHC has completed many designs and construction documents and has overseen construction of fish ladders and other structures to facilitate upstream passage.
- **Fish Bypass, Collection, and Screening**
  NHC has developed hydraulic designs to provide downstream passage at facilities ranging from major hydroelectric dams to local irrigation and water supply facilities.
- **Construction Services and Post-Construction Evaluation**
  NHC provides engineering services during construction and post-construction evaluation of projects, including detailed flow and velocity measurements over a range of flows.

Measurement of velocity for fish passability

Fish ladder at diversion structure

Rock steps provide fish passage through culvert

Construction monitoring

Benefits

Our services protect sensitive species, restore ecological connectivity, and provide efficient and functional solutions to providing safe aquatic organism passage. We provide expertise for a wide range of project types, numerous species of concern, a variety of river morphologies, and hydrologic conditions varying from arctic to tropical climates. These designs are developed in collaboration with agencies and stakeholders to ensure that objectives are clearly defined and successfully met.

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NHC provides specialized scientific and engineering services to protect, manage, and develop water resources