Ecohydraulics

Values

Ecohydraulics is the synthesis of engineering and biological sciences, which links the roles of physical processes such as hydraulics, sediment transport, and geomorphology to ecological systems. Ecohydraulics work encompasses basic field studies and monitoring to complex computational fluid dynamics (CFD) modeling. Ecohydraulics provides the technical linkage between physical and ecological processes needed to evaluate proposed development and infrastructure projects, management activities, and operations that affect the aquatic environment – an increasingly important issue in today's world.

Services

OUR SERVICES INCLUDE:

- **Designing and conducting field physical, biological, and environmental monitoring programs for environmental assessment and project design**
- **Monitoring and modeling stream flows using numerical approaches that characterize habitat suitability and evolution**
- **Designing constructed wetland and stormwater management systems to provide appropriate hydro-periods for establishment and maintenance of wetland ecosystems**
- **Providing hydrologic and hydraulic design criteria for stream, wetland, estuarine, and coastal habitats to meet specific riparian and aquatic ecological objectives**
- **Assessing aquatic organism passage and movement in complex hydrodynamic environments using multi-dimensional numerical or physical modeling**
- **Assessing environmental effects, supporting formal review processes, and acquiring regulatory approvals and permits**

Technical Approach and Capabilities

NHC provides ecohydraulic analysis and design by integrating hydraulic design, environmental engineering, geomorphology, and fisheries and biological sciences. This approach is applied as the basis for designing functional habitat restoration, as well as for assessing the effects of proposed or existing infrastructure such as dams and water control works, operations, and water use.

Experience

Instream Flow Analysis

Comprehensive instream flow assessments and analyses using hydrological, hydraulic, and physical habitat simulation (PHABSIM) techniques supported by 1-, 2-, and 3-dimensional CFD numerical modeling. NHC has also developed hydrological, biological, and ecological criteria to assess instream flow regimes for aquatic and riparian ecosystems, and has interpreted biological data to develop hydraulic habitat use criteria and ecological metrics to assess spatial and temporal aspects of instream flow regimes.

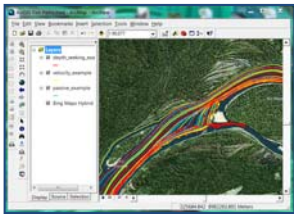
Surveying a diversion channel as part of the Bridge Coastal Fish and Wildlife Restoration Program

Cariboo Dam fishway was designed to provide more natural flow hydraulics

Flow Ramping and Stranding Assessments

Development of highly specialized tools to assess the hydraulics and potential effects of unsteady flow effects in stream and river channels that may strand and/or otherwise impact fish and other aquatic species. These tools help assess the ecological aspects of flow regime changes, water quality impacts, and stream productivity.

2-D ecohydraulic numerical model developed to assess fish movement



Hydraulic Success Criteria

Hydrologic, hydraulic, and sedimentation analyses to establish indicators of ecological success such as wetland hydro-period characteristics, tidal marsh evolution, floodplain inundation for spawning, spawning gravel transport, egg detachment and transport, and fish passage.

Habitat Protection and Creation

Projects combining aquatic habitat restoration with flood management, recreation, channel stabilization, and infrastructure development. NHC has provided analyses and design services for salmonids, cyprinids, smelt, and other sensitive fish species, and to restore aquatic and riparian habitats for other imperiled species.

Fish Movement, Migration, and Exclusion

NHC has performed many high resolution ecohydraulic analyses to evaluate fish migration and exclusion systems, including analyses that incorporate fish behavior and physiological criteria.

Benefits

NHC's ecohydraulic services promote sound restoration of physical conditions in aquatic environments to achieve sustainable ecological objectives. Incorporating ecological restoration backed with sound hydrotechnical analysis into multi-objective projects provides clients and stakeholders with the information needed to effectively plan, permit, design, cost, and implement projects.

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