Instream Flow Biological Assessment.

- Objectives of Analysis
- IFIM & PHABSIM – what they mean
- Existing NH/Vermont Studies used
- Pennsylvania Method to access available habitat at different flow rates for entire species
- Scaled results to compare species

Goal of the Analysis

The goal was to find a method to visually display general differences in available habitat for a range of species at different flow rates that exist in NH rivers, during each of the 4 seasons.

IFIM & PHABSIM – what they mean.

- IFIM is the Instream Flow Incremental Methodology (IFIM).

  It is used to assess the potential impacts of water withdrawals or diversions on aquatic species.

- PHABSIM is the Physical Habitat Simulation (PHABSIM) computer model.

  It is a site specific method that quantifies the relationship between flow and habitat, resulting in Weighted Usable Area (WUA) curves for selected life stages of target species.

  Input data include field-measured parameters for representative stream reaches and literature values that weight life stage/species preferences for different physical habitat conditions.

Existing NH/Vermont IFIM Studies used

- A preliminary assessment of previous IFIM studies in New England was undertaken to determine their suitability as data sources for relating "trigger" flows under the proposed Instream Flow Rules to estimate habitat availability.

- Two studies were selected for inclusion in an objective analysis of the relationship between streamflow and habitat availability. Both of these studies were very well documented, the target species and physical characteristics of the study reaches including the upstream drainage area, are comparable. However, in one case flows are highly regulated (Waterbury Vt. Hydroelectric Project) whereas flows in the other case (Saco River Withdrawal -- Mt. Attitash Lift Corp) are unregulated.

Existing NH/Vermont IFIM Studies used - 5 points

- Full range of stream habitat studied (all mesohabitats). Studies that evaluated habitat types ranging from shallow-fast water to deep-slow water were deemed to be more appropriate for examining potential impacts on as many species as possible.

- Regulated or non-regulated rivers. Since a complete picture of NH rivers would need to include both of these flow regimes, an effort was made to find studies that spanned the different flow conditions.

- Maximum number of species possible. IFIM studies that included species that were sensitive to different flow conditions (high flow as well as low flow) were preferred.

- Quality of available discharge (flow) data used for the study. Studies done in the vicinity of a United Stated Geological Survey, Water Resource Division gauging station with a continuous record of daily flow data were preferred.

- Studies that investigated high as well as low flow conditions were preferred.

Existing NH/Vermont IFIM Studies used - Saco River NH

Saco River Study:

- Species: Brown Trout, Rainbow Trout, Salmon, Longnose Dace, White Sucker

- Habitat Suitability Criteria : Velocity, Depth, Substrate Type as well as Temperature for the Rainbow Trout.

- Percent Mesohabitat :

  Riffle/Pool/Run/Channelized

  47.2% / 11.6% / 39.0%/ 2.2%

- Non-regulated River

Existing NH/Vermont IFIM Studies used - Little River VT

Little River Study:

- Species: Brown Trout, Rainbow Trout, Longnose Dace, Longnose Sucker, Macroinvertebrates
- Habitat Suitability Criteria : Velocity, Depth, Substrate Type
- Percent Mesohabitat :

  Riffle/Pool/Run/Gorge

  39% / 18% / 30%/ 13%

- Regulated River

Pennsylvania Method to access available habitat at different flow rates for entire species.

- At the suggestion of the NH Fish and Game Dept., a method recently used in the States of Pennsylvania and Maryland by the Susquehanna River Basin Commission to assess the differences in available habitat at different flow rates for Brown and Brook Trout throughout the various months of the year was investigated and chosen as the method to be used.
- The method used is called the Renormalized Weighted Usable Area (RMWUA) method. This consists of a two-step process.

Pennsylvania Method to access available habitat at different flow rates for entire species. .– how the Renormalized Weighted Usable Area (RMWUA) method works – Steps 1 and 2 :

- The amount of habit available in to an individual life stage of a species (adult, juvenile, spawning, etc.) across the full range of flows is related to a common denominator so that they can be directly compared. The common denominator used is the maximum recorded value among the selections, and amounts to expressing the WUAs at each flow rate as a percentage of the maximum value.

  2) The minimum values from step 1 at each flow rate from each species are then

compared, and the lowest value chosen. These value are again divided by a common divider, this time the maximum value from all the chosen values from among all the flow rates.

Pennsylvania Method – .Saco River example

WUA Example : Saco River, Brown Trout, summer graph.

The bottom Red Line represents the minimum of the polled life stages at

each flow. All the values are then scaled by dividing by the highest

red value on the graph – this is called "normalizing".

Scaled results to compare species

In order to arrive at a general sense of the difference in habitat available for aquatic life forms in NH rivers at different flow rates, a method had to be found to concurrently display all the available data together for all the species studied, in a format that clearly displayed prevalent trends in the data.

Because a method with results independent of the drainage area of the sampled sites was a goal of the investigation, it was decided to use a common statistical parameter to relate changes in habitat. The seasonal Q50 flow rates were chosen as this base flow rate.

Because the flows are either above or below this flow rate 50 percent of this time, differences in habitat from the amount at Q50 are a good general indicator of the magnitude of relative changes.

Scaled results to compare species – NHDES method