or how important is stream temperature?

Ralph Abele
EPA Region 1
February 17, 2011
The Five Major Factors Which Determine the Integrity of Aquatic Resources

- Solubilities
- Adsorption
- Nutrients
- Organics
- Alkalinity
- Temperature
- D.O.
- pH
- Turbidity
- Hardness
- Velocity
- Land Use
- Ground Water
- Precipitation & Runoff
- Flow Regime
- High/Low Extremes

Chemical Variables

- Adsorption
- Nutrients
- Organics
- Alkalinity
- Temperature
- D.O.
- pH
- Turbidity
- Hardness
- Velocity
- Land Use
- Ground Water
- Precipitation & Runoff
- Flow Regime
- High/Low Extremes

Biotic Factors

- Parasitism
- Disease
- Reproduction
- Competition
- Predation
- Feeding
- Nutrients
- Sunlight
- Organic Matter

Energy Source

- Nutrients
- Sunlight
- Organic Matter Inputs
- 1st and 2nd Production
- Seasonal Cycles

Habitat Structure

- Siltation
- Sinuosity
- Current Substrate
- Canopy
- Instream Cover
- Bank Stability
- Width/Depth
- Channel Morphology
- Gradient
- Seasonal Cycles

INTEGRITY OF THE WATER RESOURCE

Principal Goal of the Clean Water Act

(Source: Yoder)
Recent Northeast Temperature Projects

- New England Association of Environmental Biologists mtg. 2008
- Northeast Aquatic Habitat Classification - NEAFWA funded TNC work (2008)
- EPA grants to UNH for thermal regimes of Northeast Streams and Thermal Impacts of Stormwater BMPs temperature work (2009-2011)
- RARE Stormwater BMP effectiveness grant (2010)
- EPA HQ Healthy Watersheds grant – Coldwater Fisheries of New England (2011)
Northeast Aquatic Habitat Classification System – Temperature + Gradient

Example of Simplified Northeast Stream Taxonomy (4433). Summary of 4 Size Classes, 4 Gradients, 3 Geology Classes, and 3 Temperature Classes

Source: Olivero and Anderson, NRC, Northeast Aquatic Habitat Classification System 2008
Statewide mapping based on flow, temp, fish, geology: 6,000 ecological segments x 11 ecological river types

(Seelbach, 2009)
In Massachusetts coldwater streams are identified based on the species present. Over 800 coldwater streams found statewide through fish surveys by MA DF&W. Many segments designated as Cold Water in state Water Quality Standards.

(Source: A. Norris, D. Ohman MDF&W)
Stormwater BMP Effectiveness Assessment Toolkit – EPA RARE grant
Naomi Detenbeck EPA ORD

• Focus on evaluating benefits of implementing stormwater BMPs to protect biotic integrity
• Build upon extensive datasets and Stressor-Response curves created for original R1 RARE
• Extension to fish communities
• Build on UNH BMP Thermal work
• S-R curves by Ecol. Unit/flow class
  • Flow, thermal, clean sediment metrics
  • Fish, macroinvertebrate metrics
  • Use taxa-specific regional ranges of habitat variables to infer expected species P/A
  • Extend to dev’t of BCG curves and strata
  • Diagnostic element w comparison of species tolerances w species loss curves
EPA Healthy Watersheds Pilot Project: *Coldwater Resources of New England – Coordinated Assessment and Protection*

- Analyze temperature regime of high quality coldwater streams in Connecticut
  *Dr. Jennifer Jacobs, UNH*

- Develop a multivariate analysis approach to examine effects of land use change, impervious cover and water withdrawal on the distribution and abundance of coldwater taxa
  *Dr. Matthew Baker UMBC, USGS, MDF&W*
USGS study *Factors Influencing Riverine Fish Communities in Massachusetts*

**MA GIS IC data**

**MDFW Fish Database**

**Flow Alteration**

**Statewide Dam database**

(Source: USGS)
Potential Stormwater and Coldwater Resource Protection Fact Sheet

- Develop a fact sheet for protecting and restoring coldwater drainages
- Focus on BMPs that buffer, not exacerbate thermal loading
- Vegetative buffers
- Identify regulatory opportunities through NPDES coordinated with state and local water and wetland regulations
Acknowledgements

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