

Recommendations of the *Ad-hoc* Working Group of the
North Carolina Ecological Flows Science Advisory Board

July 16, 2013

Basis:

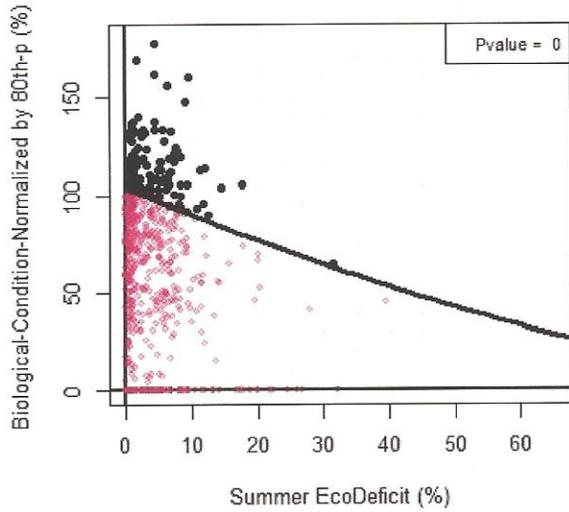
- North Carolina General Assembly Law 1743 requires NCDENR to determine the minimum flows needed maintain ecologic integrity of surface waters.
- Quantitative relationships between changes in flows and the health of biologic assemblages within surface waters have not been previously established for North Carolina.
- An *ad-hoc* working group of the EFSAB has been working for several months to derive data-based correlations between changes in surface water flows and ecologic responses. Work has included both fish and benthos.
- The timeframe and resources devoted to this effort have been highly constrained.
- Based on the data available and our best scientific judgment, the members of the *ad-hoc* working group have reached consensus on a set of recommendations for establishing an ecological threshold in accordance with House Bill 1743.

Recommendations:

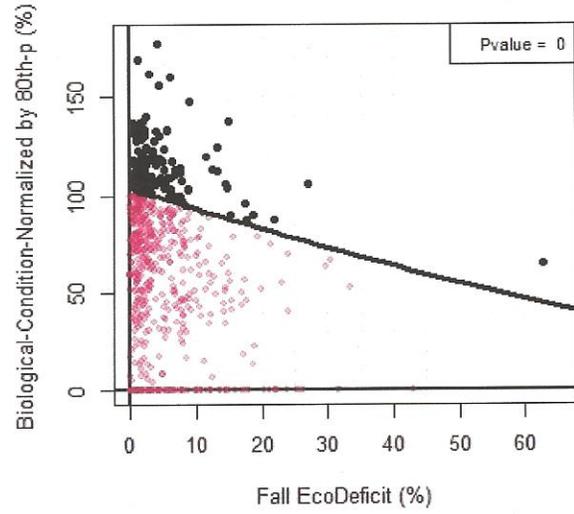
1. The diversity of species within the riffle-run guild should be used as basis for measure of ecological integrity for fish populations using the Shannon-Weaver index. Ecological integrity of benthos should be based on EPT Richness.
2. A reduction in fish diversity or benthos species richness of 10 percent or more represents a probable violation of ecological integrity.
3. Five metrics should be considered by NCDENR in evaluating further alteration of existing surface water flow conditions.
 - i. Decrease in average annual 30-day minimum flow rate;
 - ii. Summer eco-deficit
 - iii. Fall eco-deficit
 - iv. Winter eco-deficit
 - v. Spring eco-deficitThe months included in the calculation of seasonal eco-deficits currently correspond to the seasons used in PHABSIM evaluations, but can be manipulated to conform to the monthly minimum flow requirements established by SCDHEC.
4. The statistical model employed to establish ecological responses to changes in flow metrics should be based on:
 - i. Fish data normalized by the 80th percentile Shannon-Weaver index value by drainage basin
 - ii. Benthic data normalized by the 80th percentile EPT Richness value (within the Excellent DWQ Benthic Site Condition Class) by Omernick Ecoregion Level 3
 - iii. non-linear 80th quantile regressions of the normalized data.
5. Further data collection and research should be undertaken to enhance the preliminary flow-biology relationships developed through the work of the *ad-hoc* working group.

Riffle-Run Fish Guild Response to Seasonal EcoDeficits

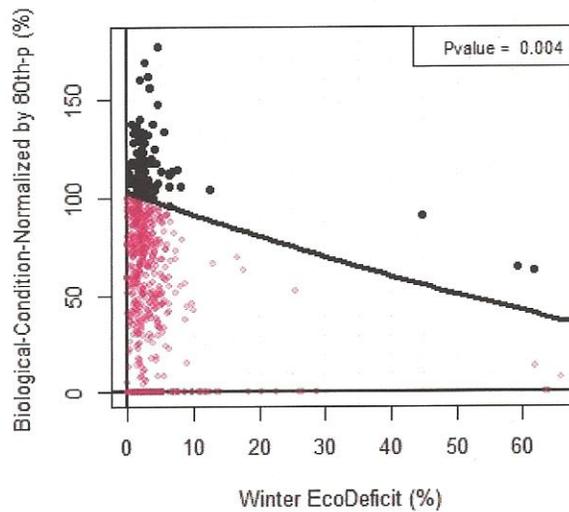
Summer - 80th Quantile Regression (n=637)



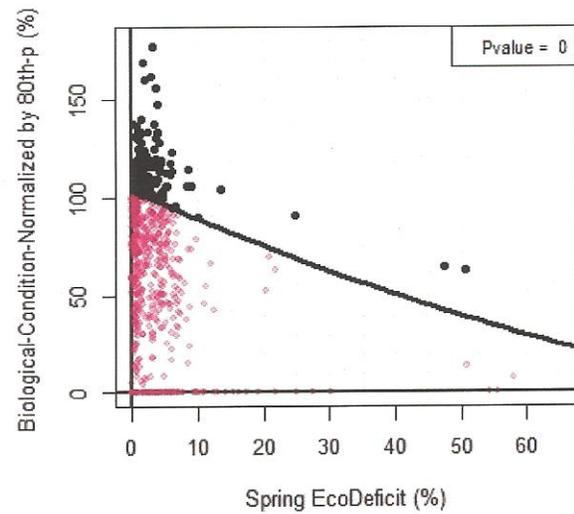
Fall - 80th Quantile Regression (n=637)



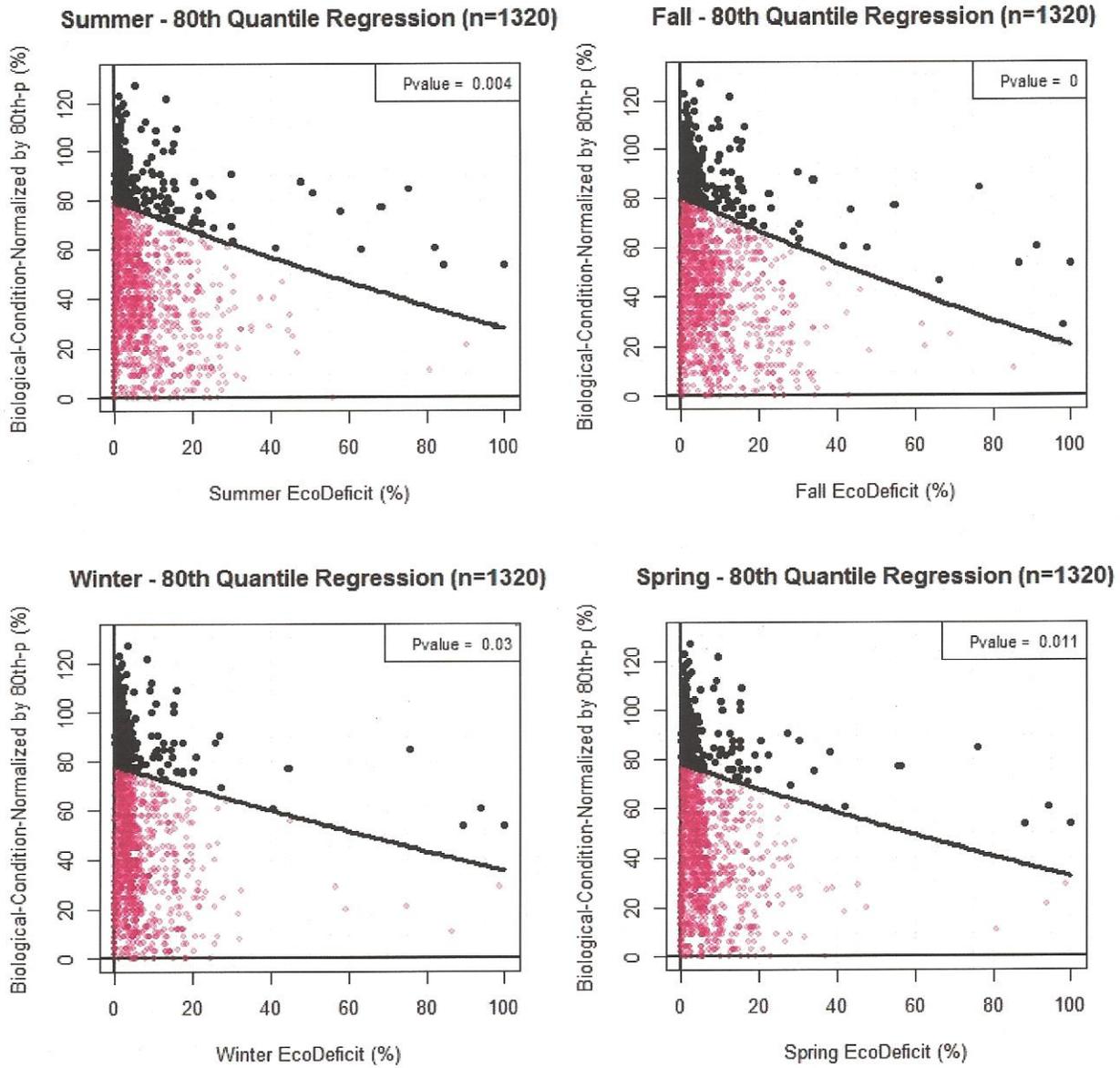
Winter - 80th Quantile Regression (n=637)



Spring - 80th Quantile Regression (n=637)



Benthic EPT Richness Response to Seasonal EcoDeficits



Riffle-Run Fish Guild and Benthic EPT Richness Response to Decreases in Annual 30 Day Minimum Flow

