Environmental Flows

Quantity, timing and quality of water flows required to sustain freshwater ecosystems and the human livelihood and well-being that depend on these ecosystems

Brisbane Declaration, 2007
Importance of stream flow

“Master variable”

Organisms

Energy cycling

Physical habitat
Riverine organisms are adapted to the natural variability of flow regime timing, magnitude, frequency, rate of change, and duration.
Flow alteration

Goal protect flow components that sustain the ecosystem and human interests

Understand the relationship between stream flow and ecology.
Objectives

1. Quantify relationships between stream flow and biotic response to better inform water flow standards throughout the state of South Carolina
   A. Flow metric
   B. Biological data

2. Calculate economic value of ecosystem services provided by instream flows
Hydrologic data

- RTI International
- WATERFALL model: Watershed Flow and ALLocation system
- 208 flow metrics for each stream segment!
  - 171 environmental flow metrics
  - 37 flow alteration metrics
  - Timing, magnitude, frequency, rate of change, and duration
Fish data

- 440 sites
- Wadeable streams
- Standardized
- SCDNR
- Altered and reference sites

Biological response metrics
- Richness
- Sensitivity
- % green sunfish
- Simpson's diversity index.
Macroinvertebrate data

- ~ 600 sites
- SCDHEC
- Standardized

Metrics so far:
- Simpson’s Diversity index
- Taxa Richness
- Percent contribution of Chironomidae
- Tolerance
- Odonata and Megaloptera index
- Percent contribution of individuals belonging to Orders Ephemeroptera, Plecoptera, and Trichoptera (EPT)
Determine flow-ecology relationships

- Flow metrics from RTI international: 208 flow metrics
  - Last week

- Biological response data:
  - Wadeable streams
  - 1040 sites!
  - Fish
  - Macroinvertebrates
Determine flow-ecology relationships associated

Objective: Identify relationships between key flow metrics and biotic response to better inform water flow standards throughout the state of South Carolina

Statistics: Threshold analyses

After F-E are found

Percent-change plots
Goal 2: Calculate economic value of ecosystem services provided by instream flows

- Willingness to pay survey

- First, estimate the impact of flow alteration
Future work

- Huge data sets!
- Finish modeling of flow-ecology relationships
  - Find thresholds
- Finalize and conduct survey
- Create final report
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