



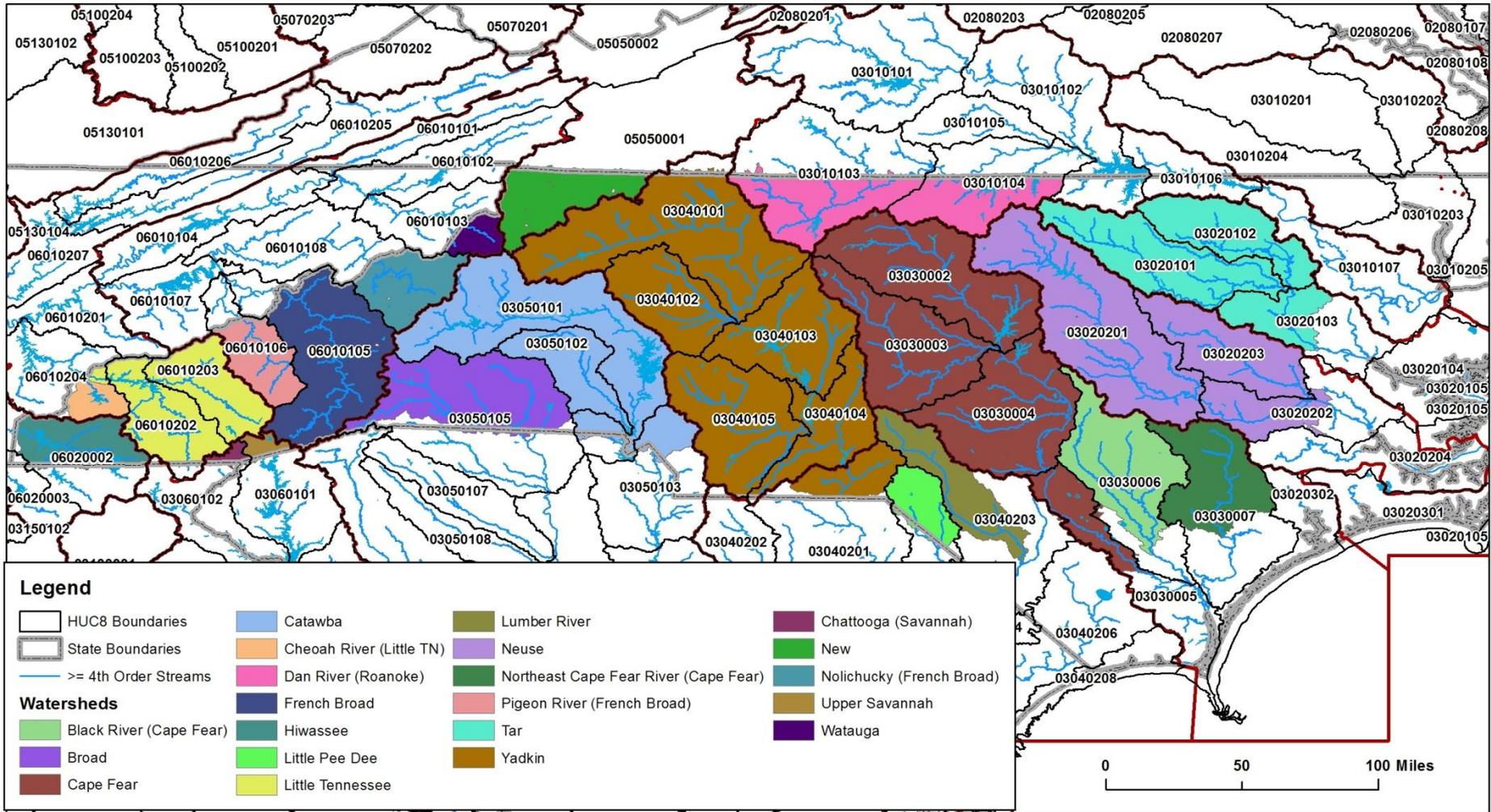
WaterFALL Status

11/27/12

Michele Cutrofello Eddy

Where we are....and where we're going

- Current ecological flow work for EDF
 - Mostly focused in NC
 - Assessing the hydrology and biology
 - Focus on locations with biological monitoring data
- Current resilience study for TNC
 - Assessing changes in flow metrics and baseflow contributions to flow as two components of a resiliency study for NC
 - Summarizing results to HUC12 and HUC8 levels
- Current development of a hydrologic foundation for the southeast U.S. for SALCC
- Beginning freshwater assessment pilot study for Louisiana for TNC



- Catchments average 1.7 km² in NC modeled area
- 58,187 modeled catchments across 21 watersheds
- Summarized to 1285 HUC12s
- Total modeled area: 100,000 km² or 38,700 mi²

Model Setup Scenario Management

Select Location

Latitude:

Longitude:

Go to Location

Catchments

Define Watershed

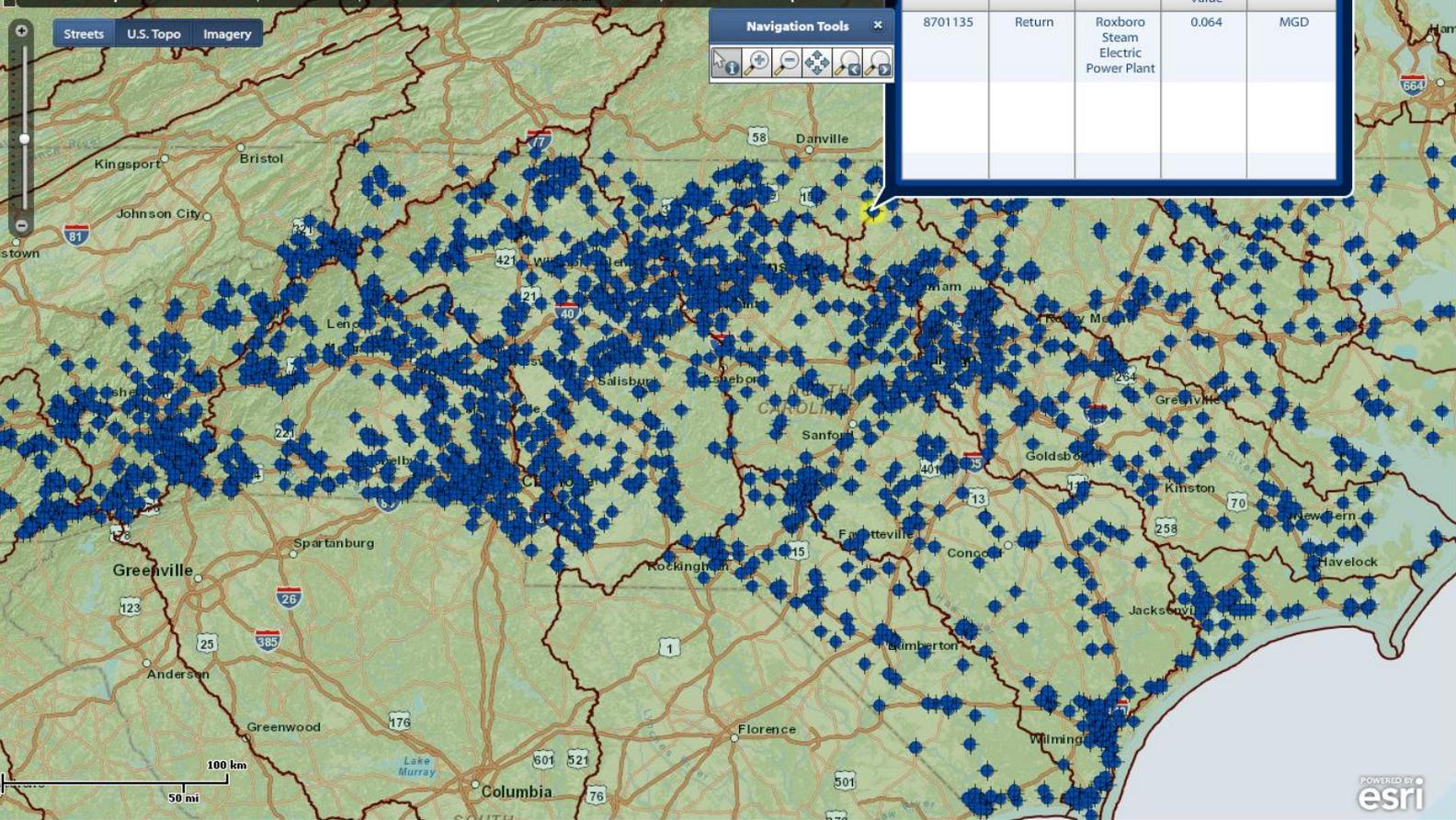
Scale: 1:2311162.22

Coordinates: 36.7372 / -79.2110

Active Layer: HUC6

Active Catchment:

- NHDPlus Flowlines
- USGS Gauges
- NHDPlus Catchments
- Alterations



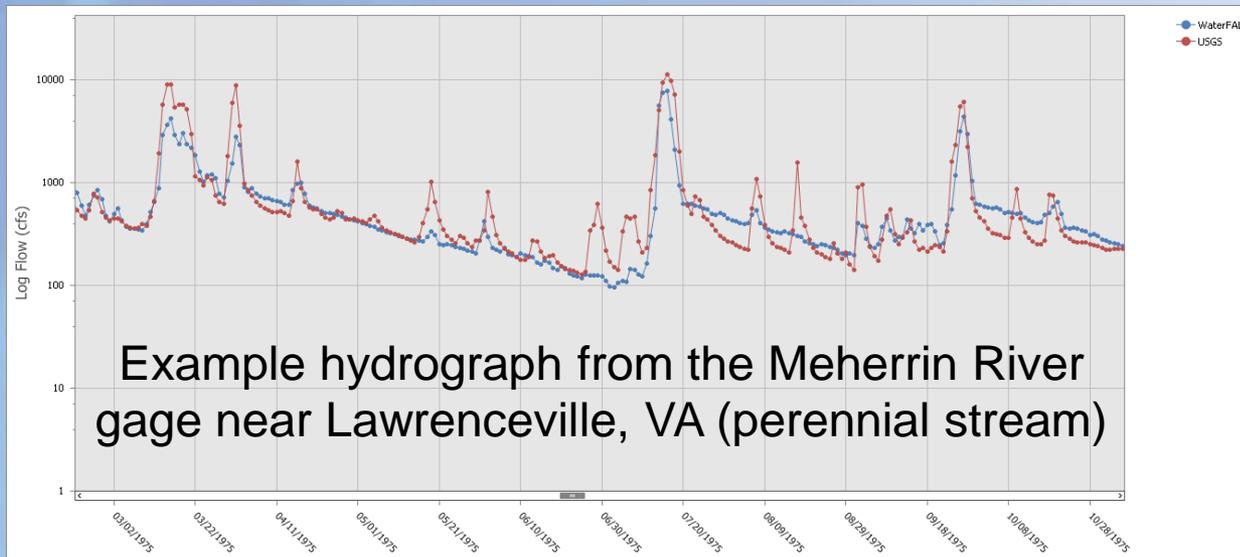
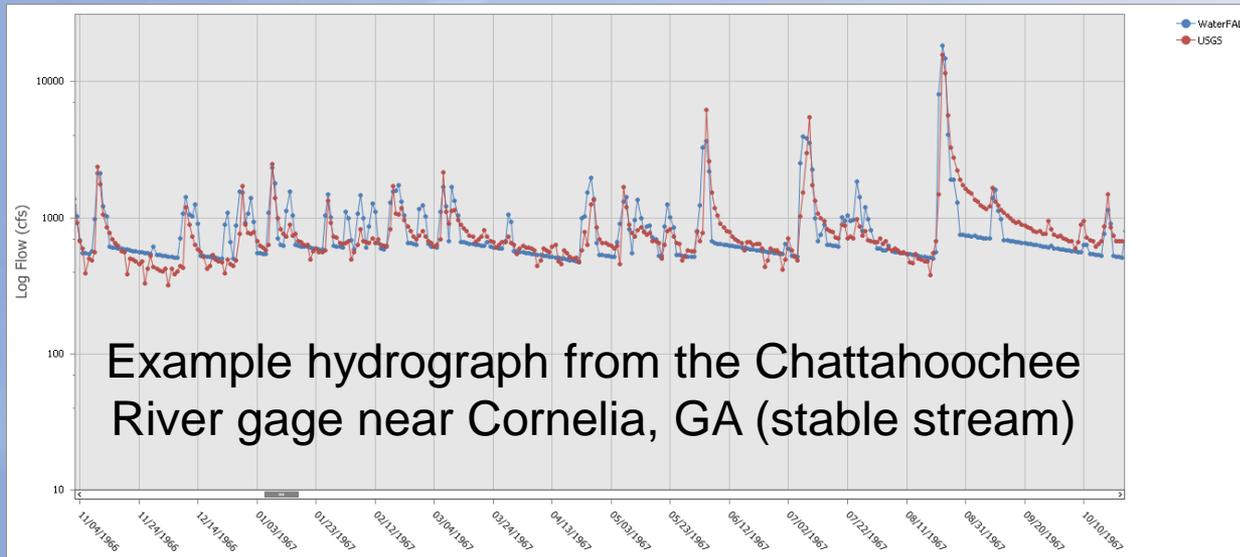
Alterations

COM ID	Type	Name	Average Value	Units
8701135	Return	Roxboro Steam Electric Power Plant	0.064	MGD

Calibration Notes

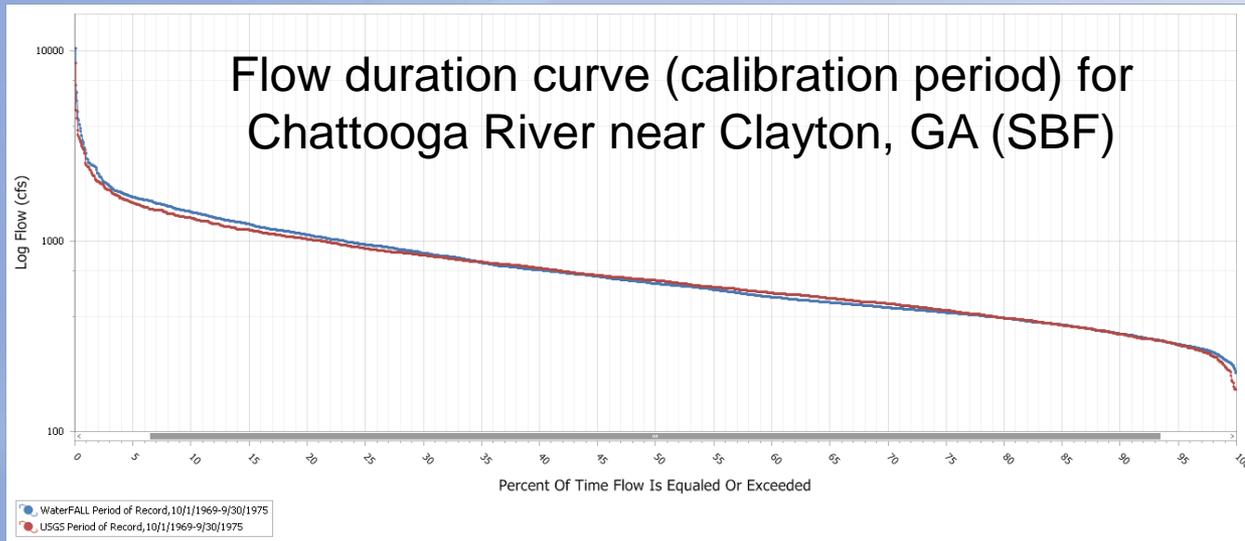
- Variety of performance metrics evaluated
 - Volume error over daily flows (#) – *automated calibration*
 - Nash-Sutcliffe Efficiency for daily flows (#)
 - Daily hydrograph (visual)
 - Flow duration curves (visual)
 - Monthly median and mean volumes (visual & #)
 - Ecoflow Metrics (#)
- General findings
 - No one area or stream type consistently out-performed others
 - Residuals/errors scattered; no consistent bias (that's good!)
 - Comparisons between WaterFALL and other rainfall-runoff models for prediction of ecoflow metrics are promising

Daily Hydrographs

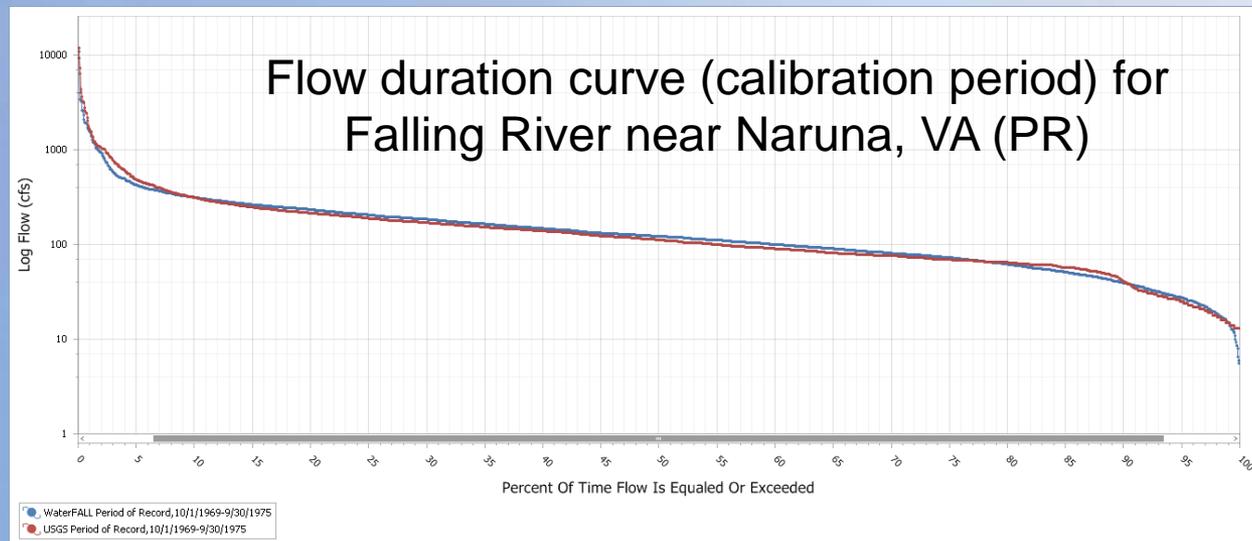


- Check for general patterns and trends
- Storm peaks and recessions
- Order of magnitude agreement

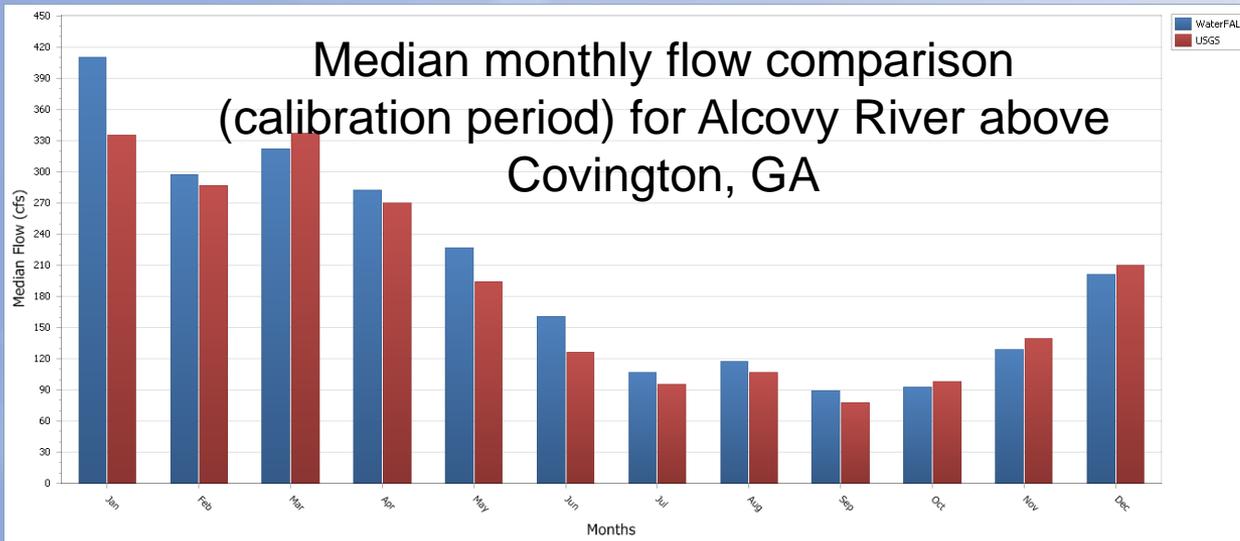
Flow Duration Curves



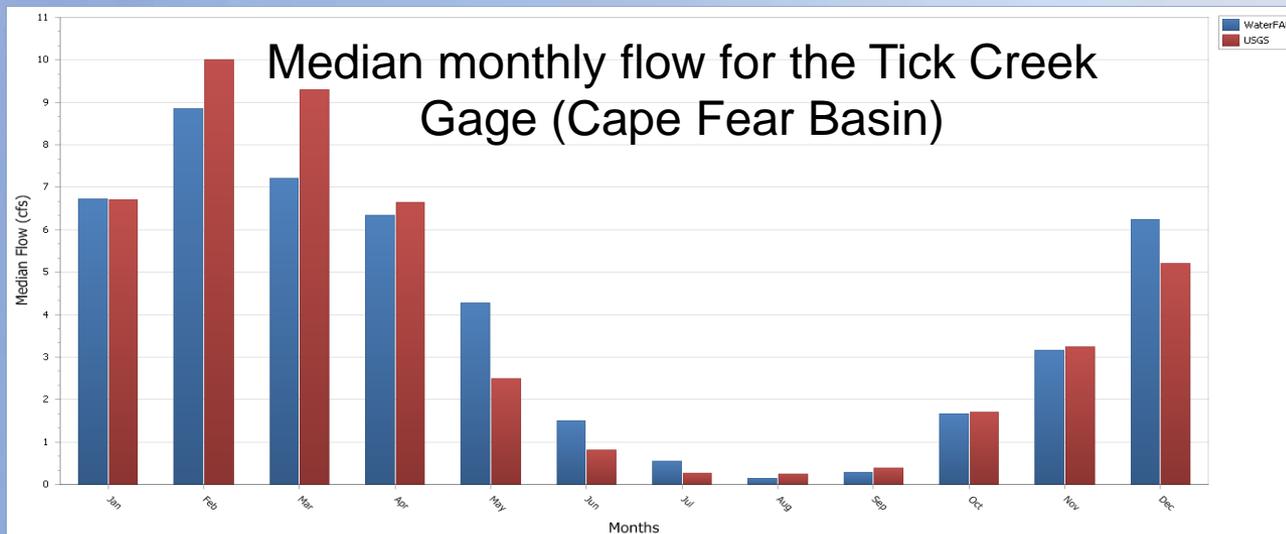
- Examine high, median, and low flow representations by WaterFALL
- Check for behavior and magnitude

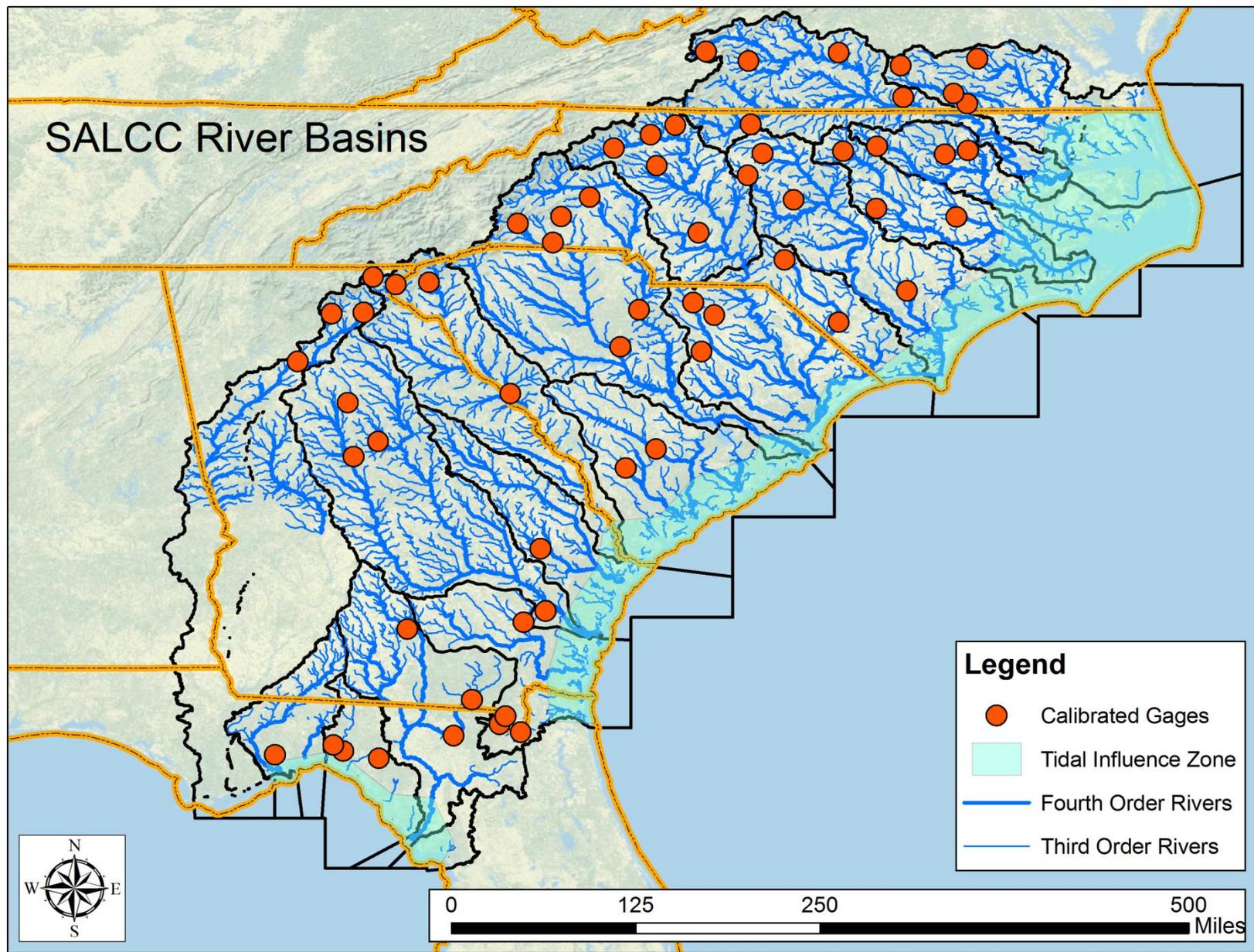


Monthly Flows



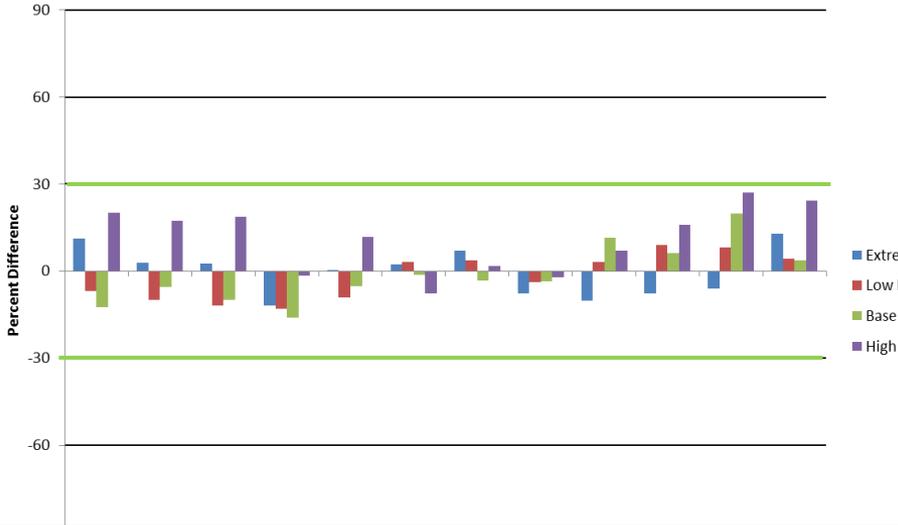
- Check for seasonality/patterns
- Seasonal bias?



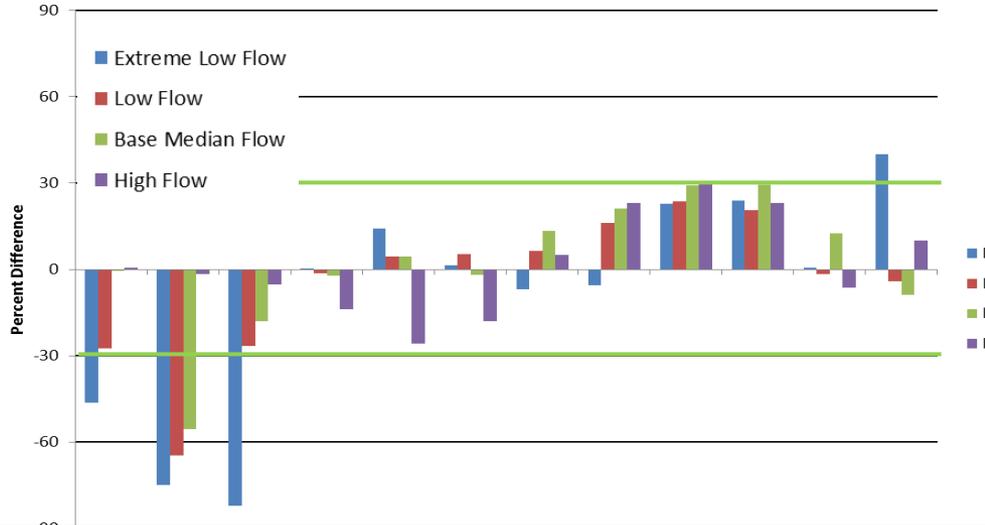


Ecoflow Metrics – RTI’s Percentile Version

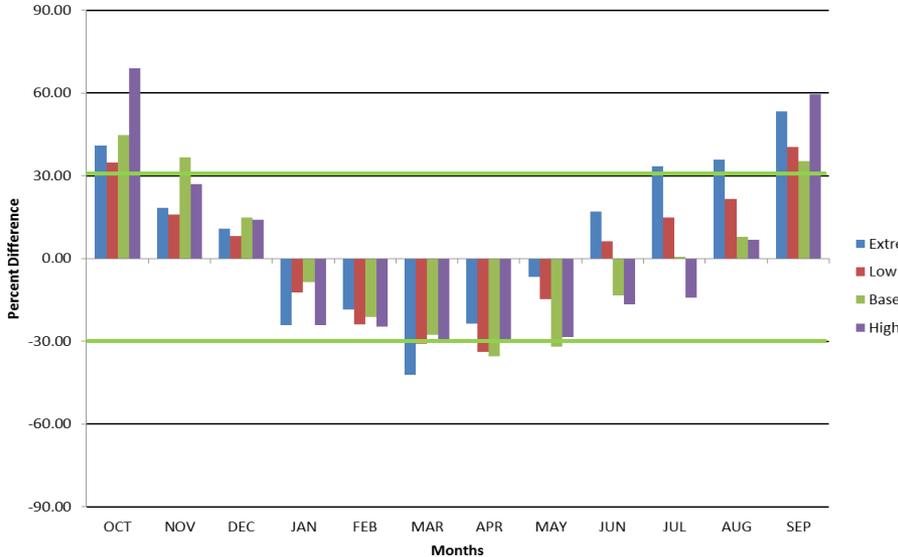
Ecoflow Metrics for the Tallulah River Gage near Clayton, GA



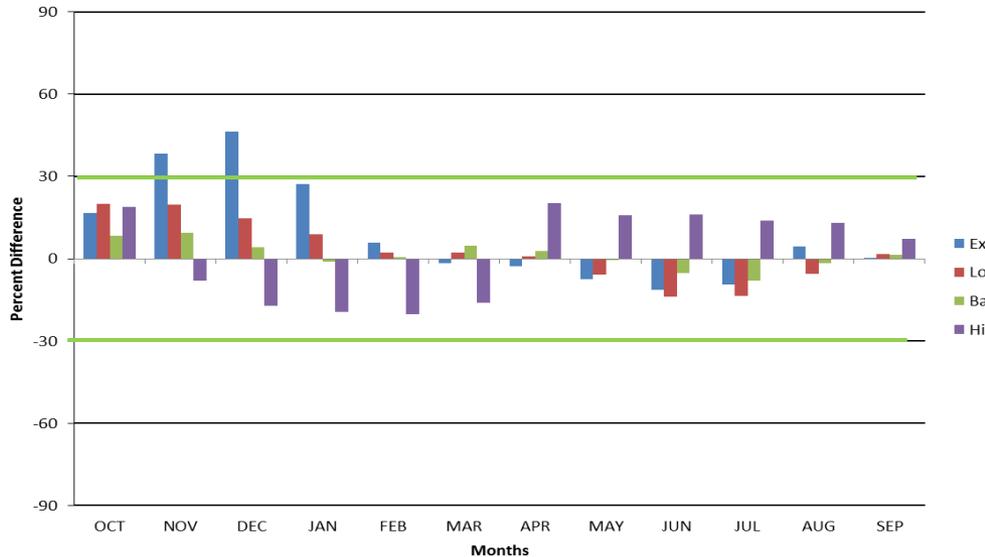
Ecoflow Metrics for the Fishing Creek gage near Enfield, NC



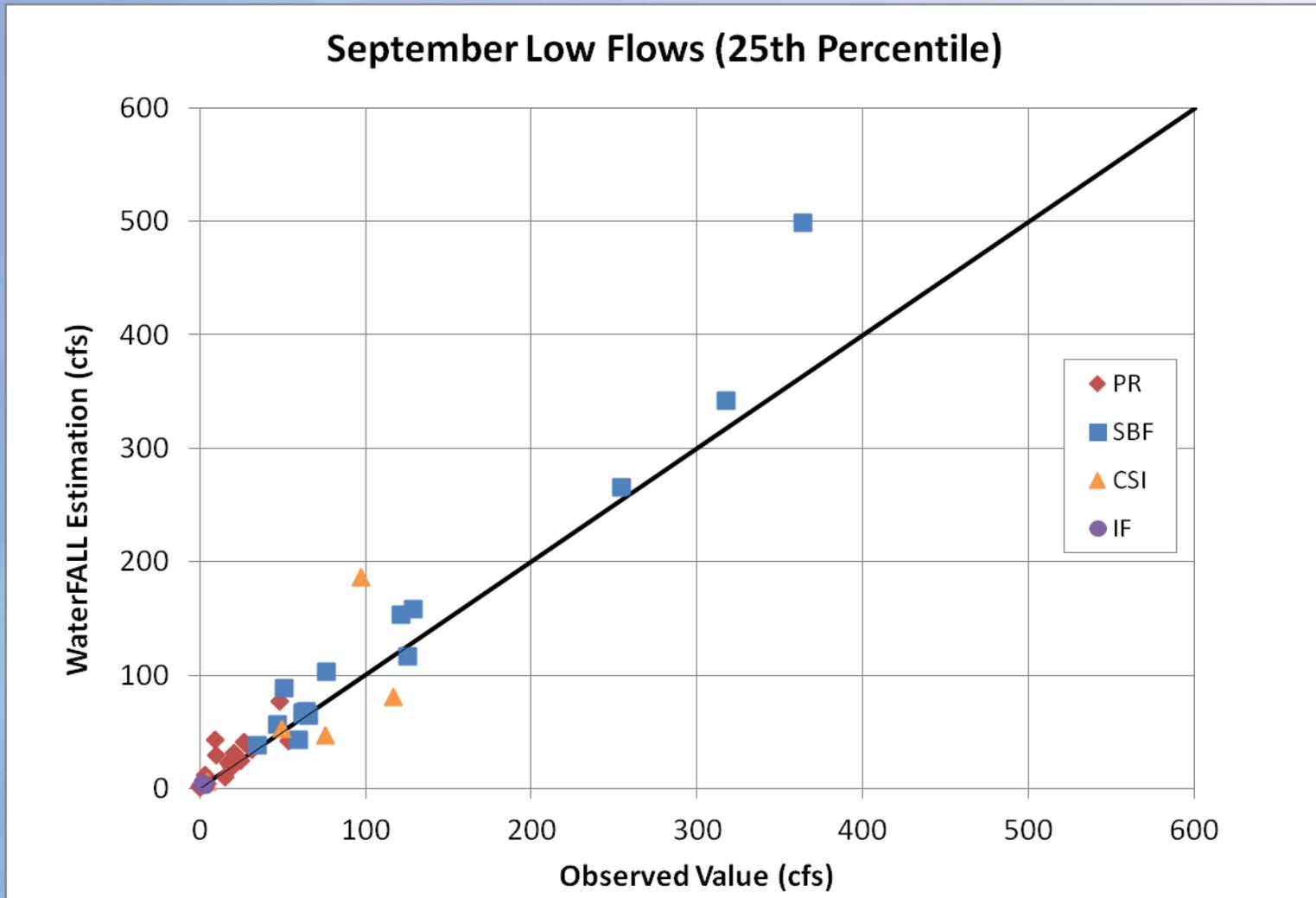
Ecoflow Metrics for the Deep River gage near Randleman, NC



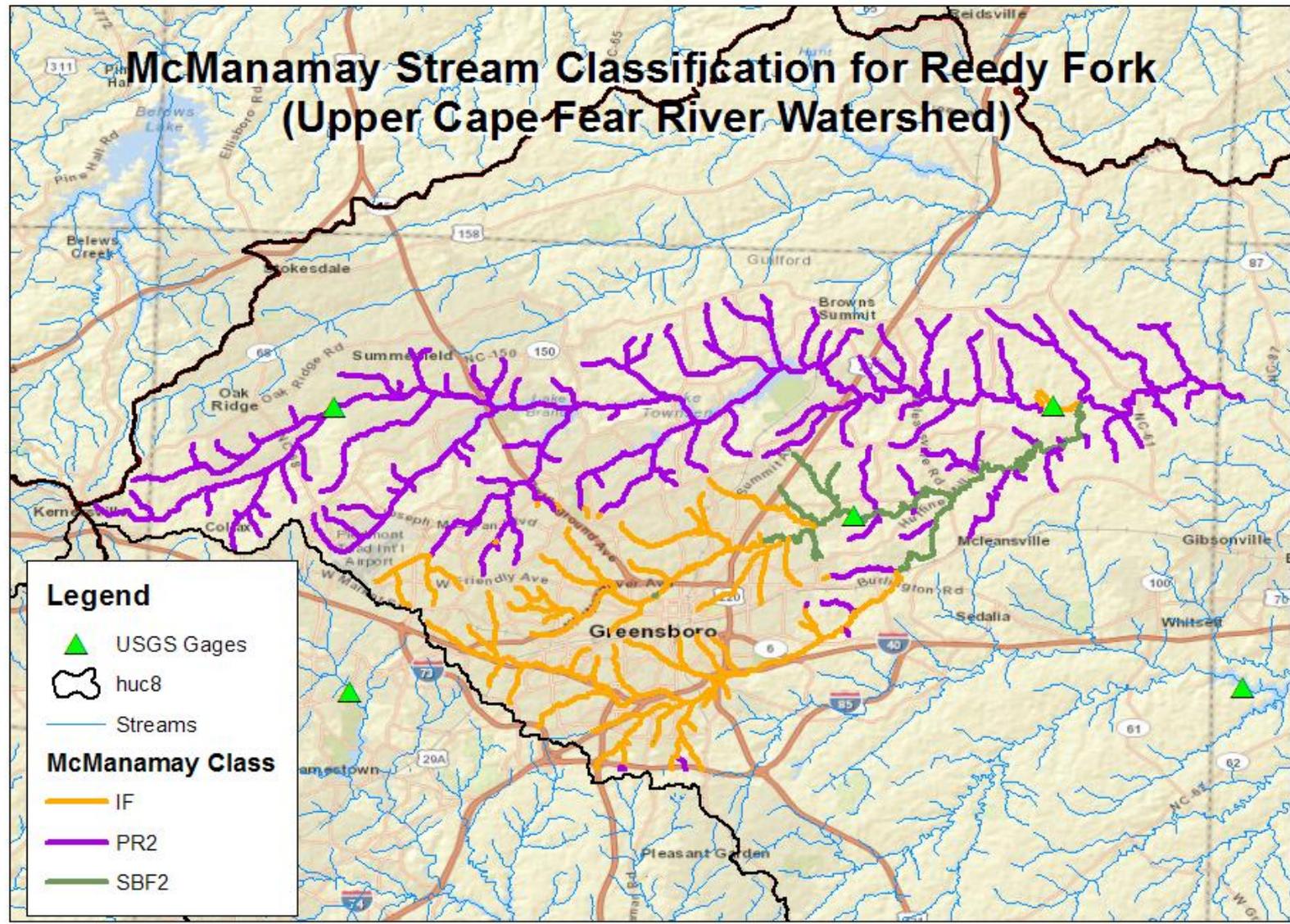
Ecoflow Metrics for the Cove Creek Gage near Lake Lure, NC



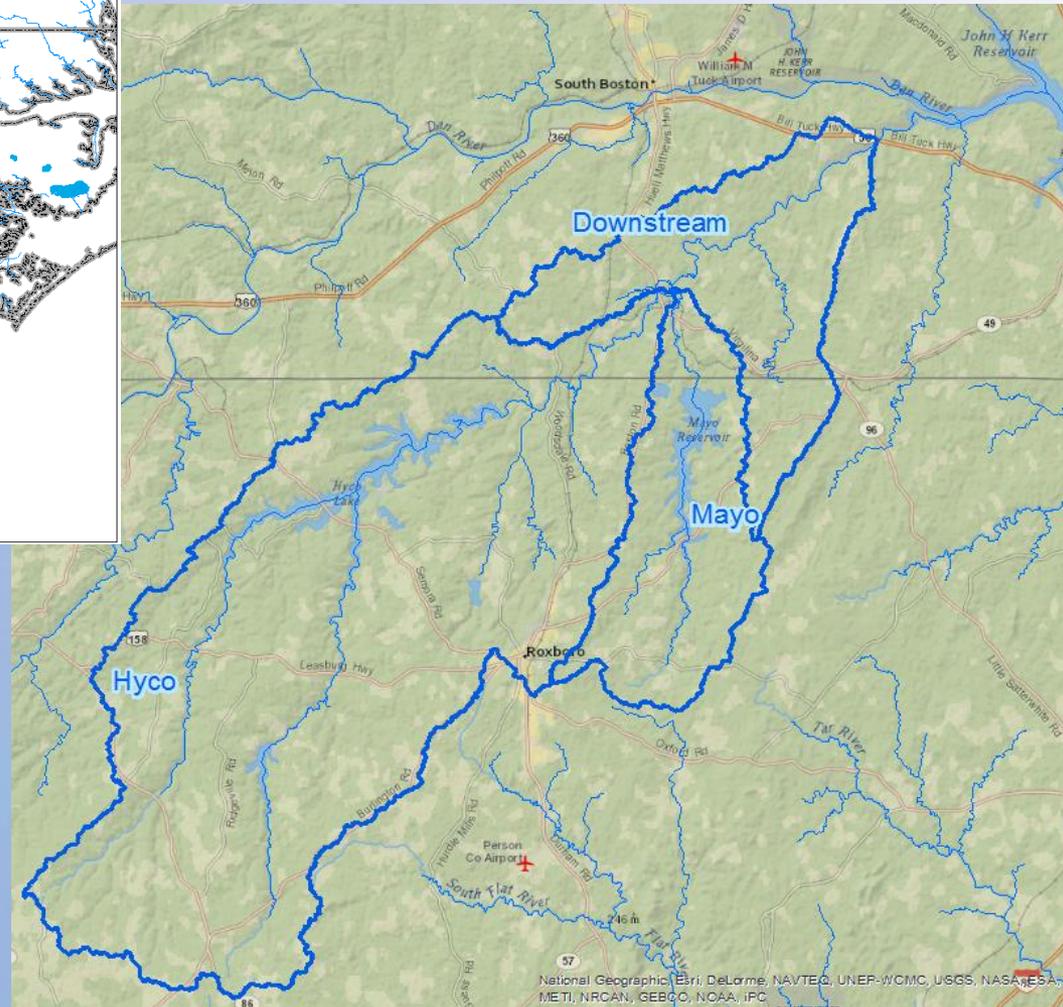
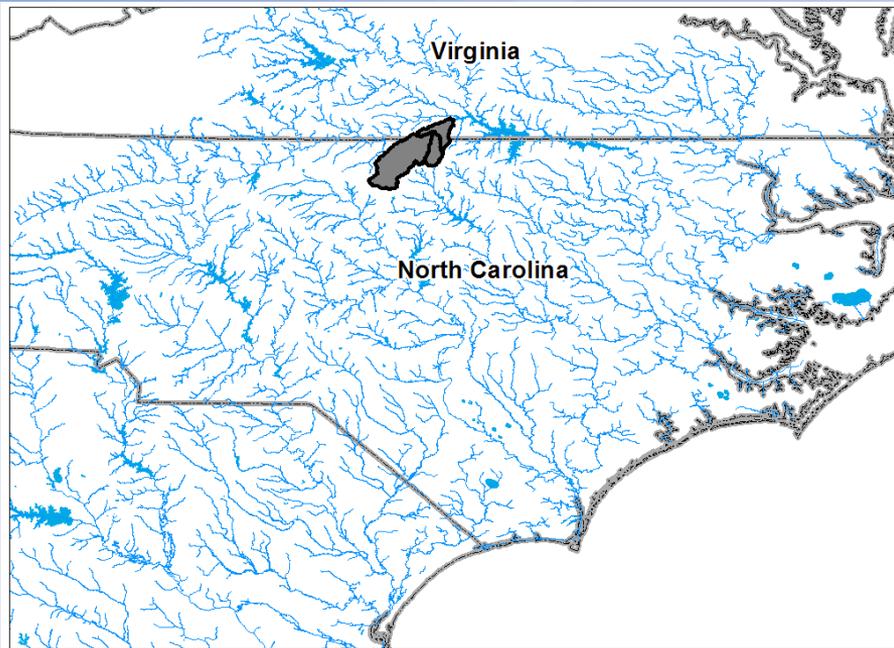
Ecoflow Metric Estimation Across Classes



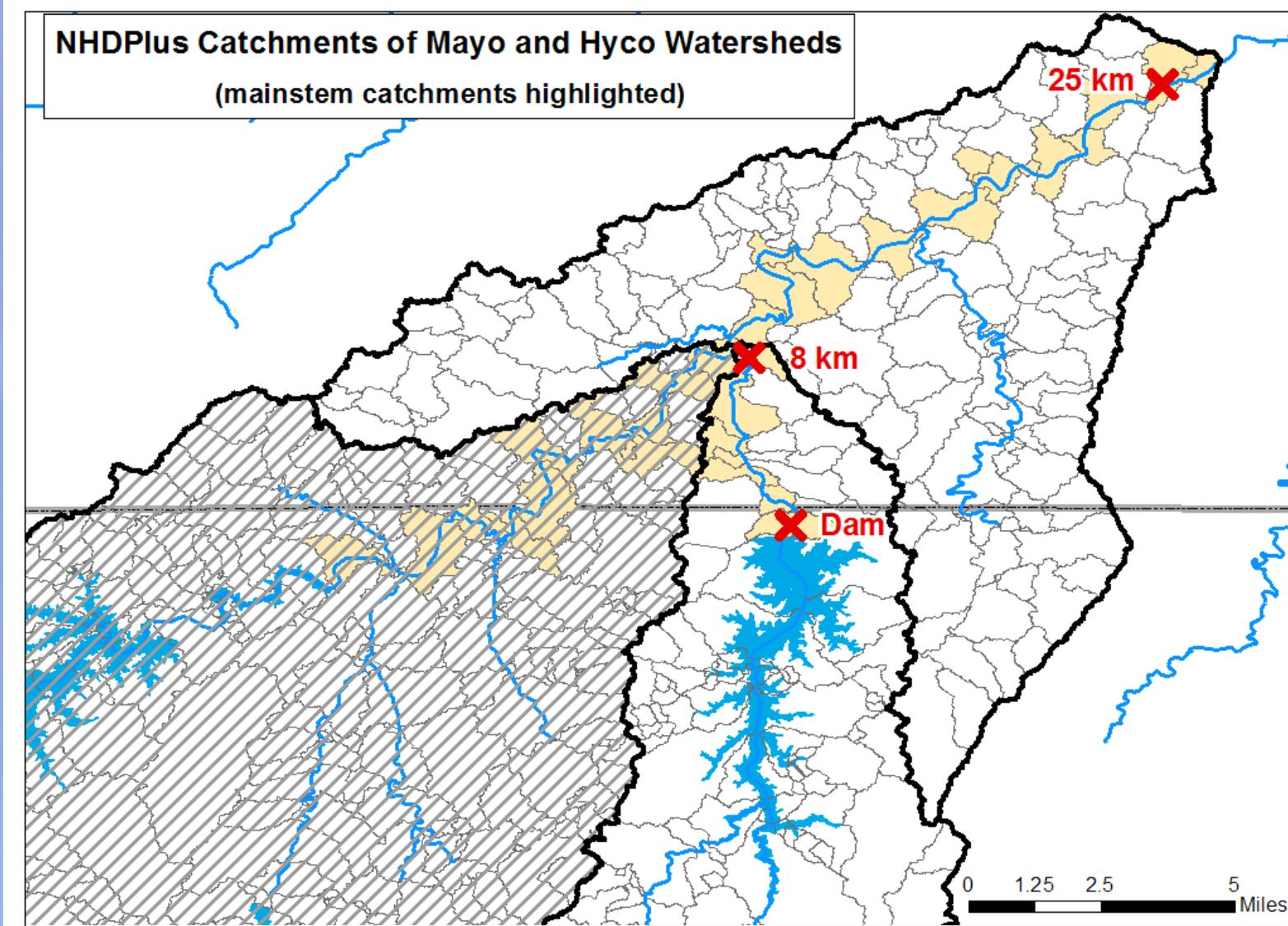
“Coloring In” the State with Stream Classes



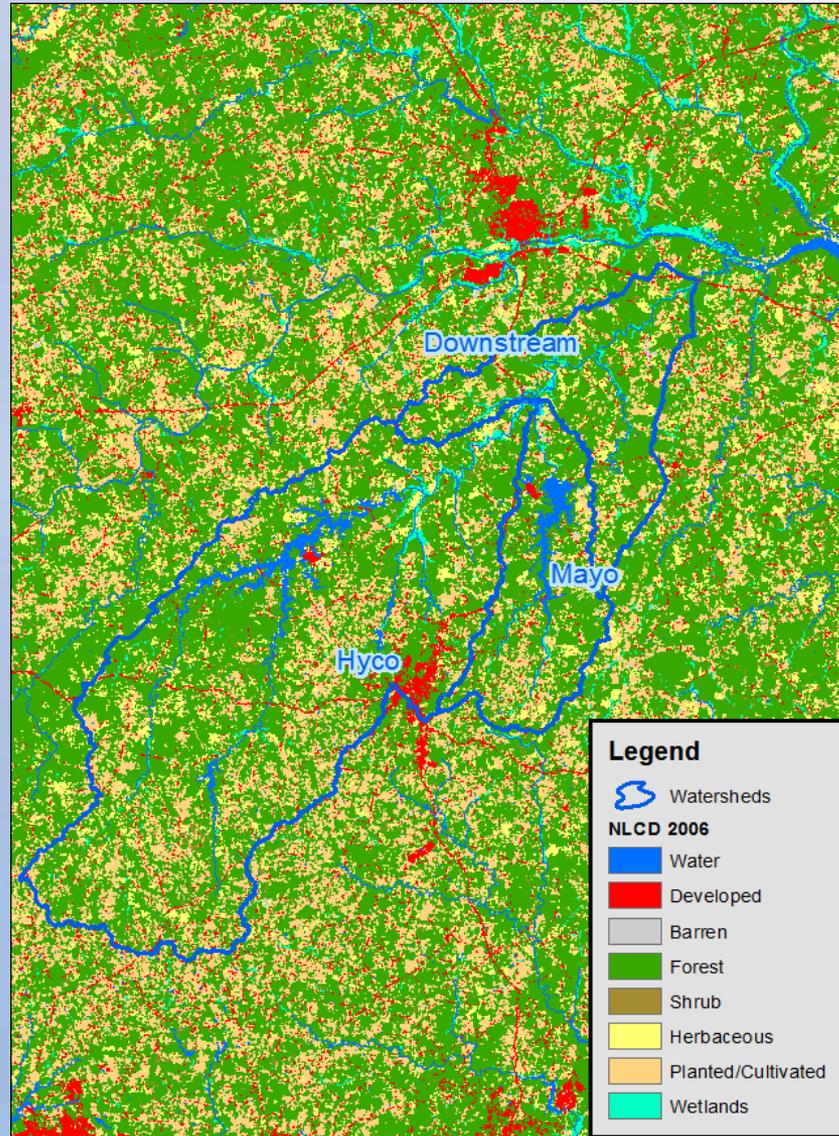
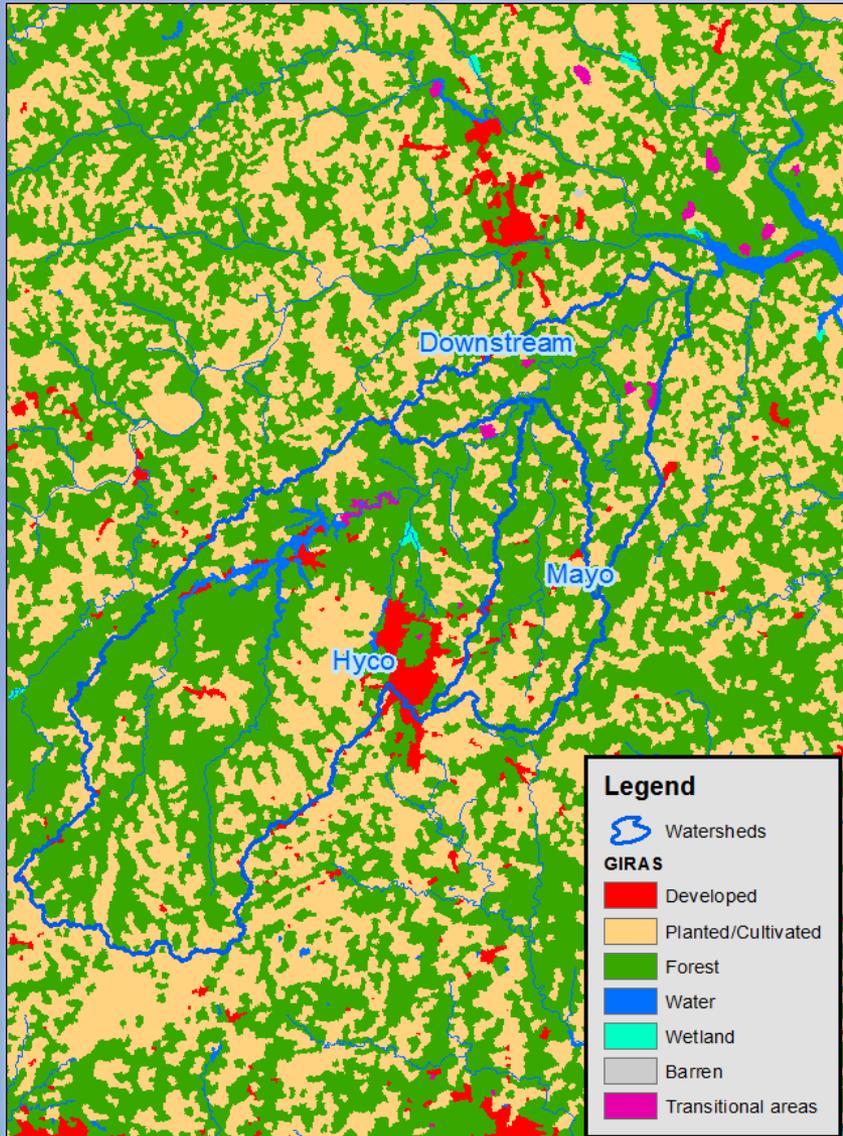
Mayo Creek “Sphere of Influence” Example



Mayo Creek "Sphere of Influence" Example

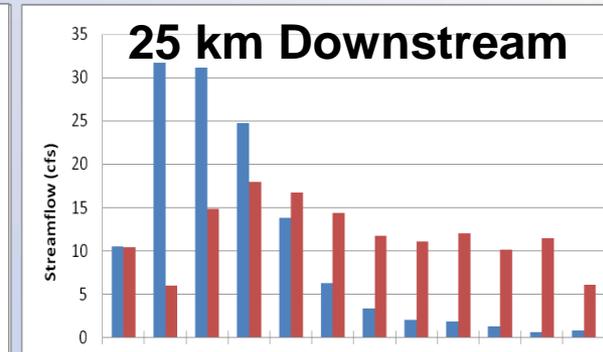
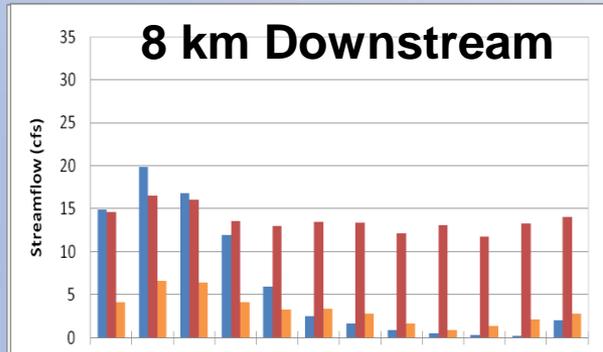
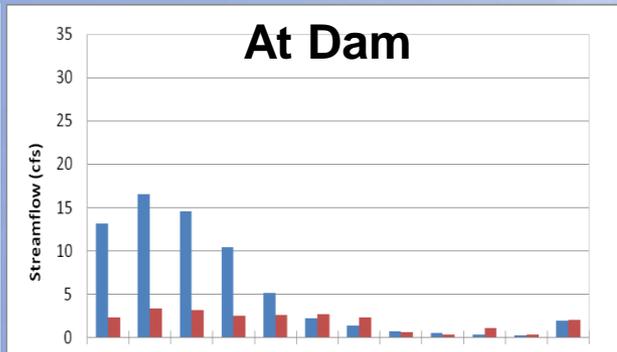


Mayo Creek: Pre- and Post-Alteration

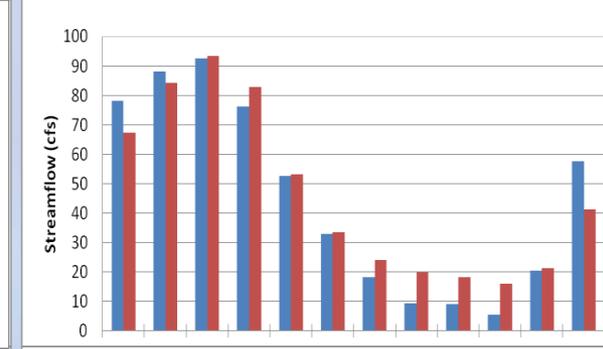
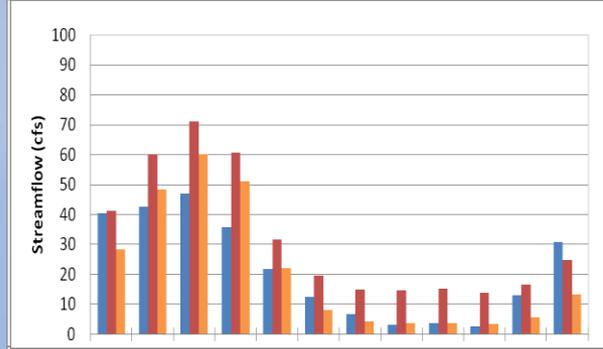
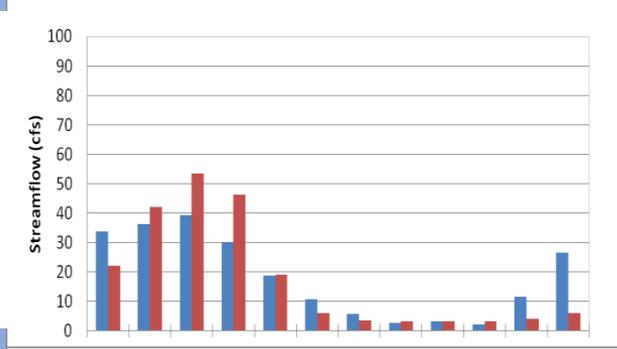


Monthly Flows at Three Points Along River

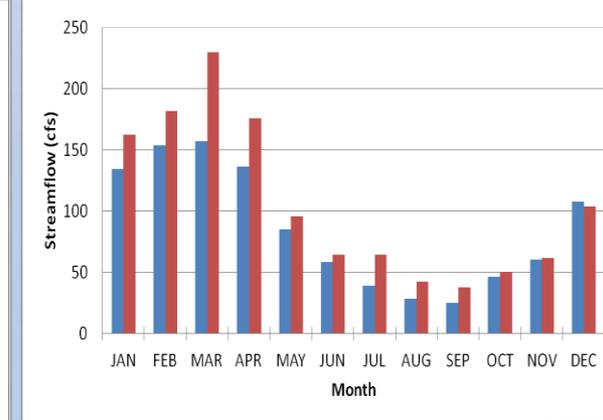
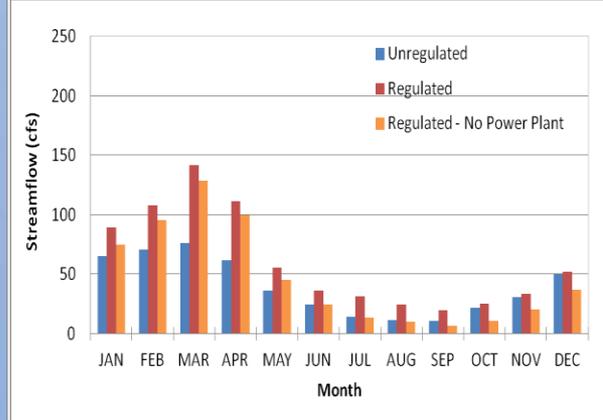
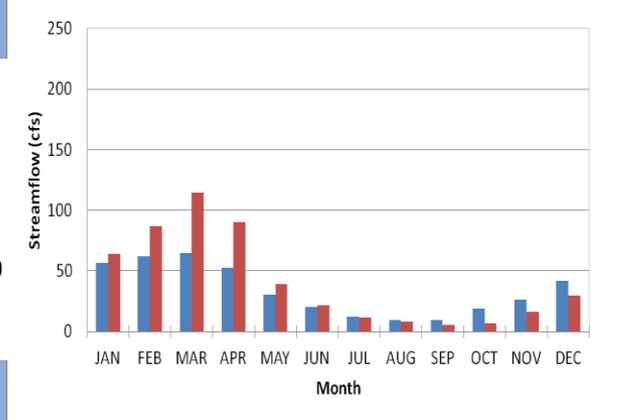
Extreme Low Flows



Median Flows



High Flows



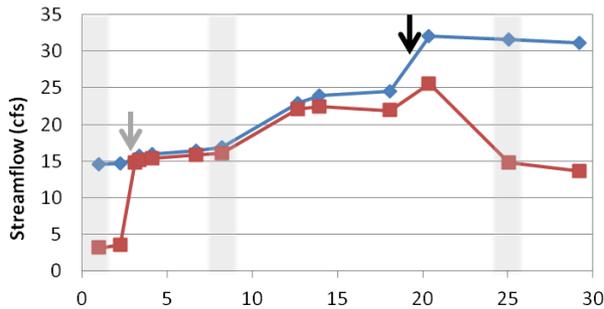
Unreg: PR Reg: CSI

Unreg: PR Reg: PR

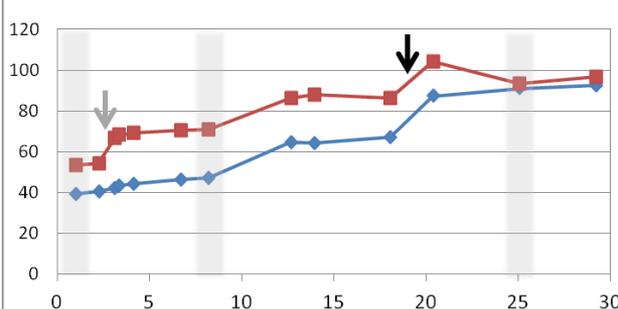
Unreg: PR Reg: PR

Persistence of Alterations Downstream

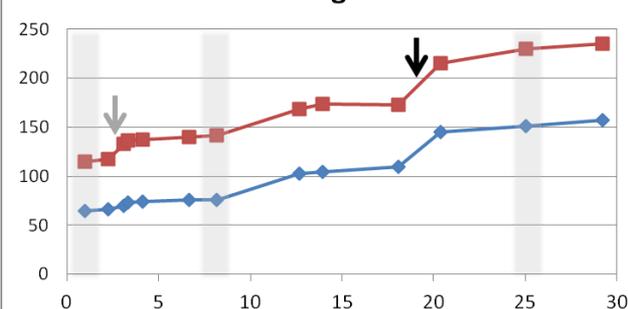
March: Extreme Low Flows



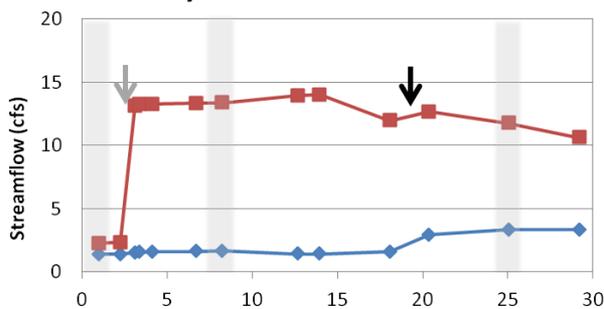
March: Median Flows



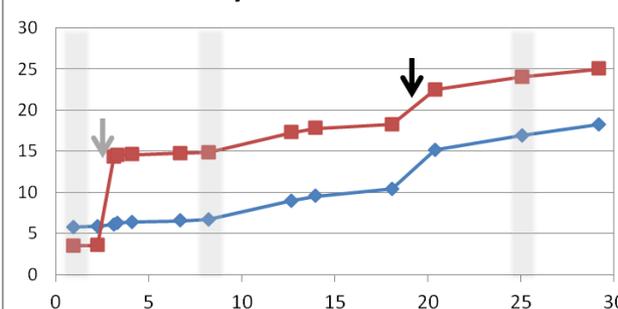
March: High Flows



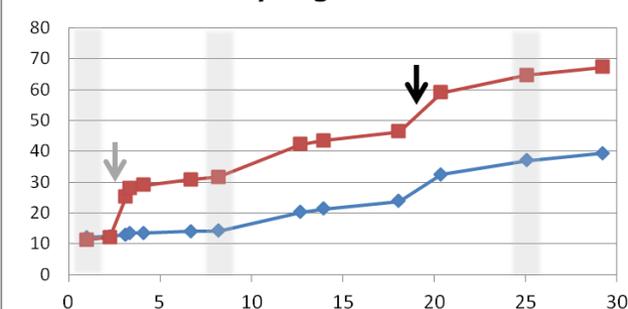
July: Extreme Low Flows



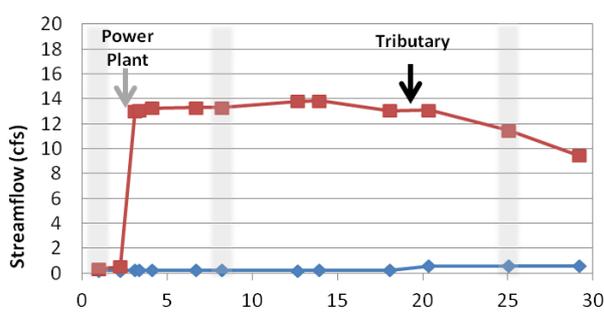
July: Median Flows



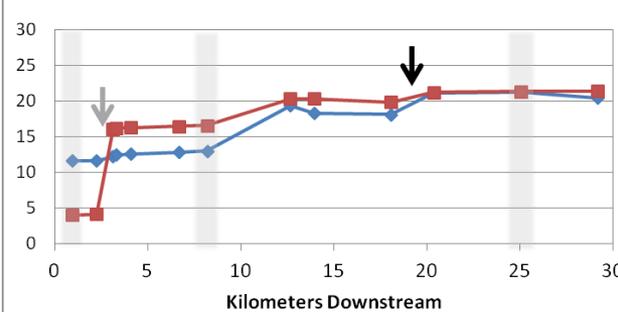
July: High Flows



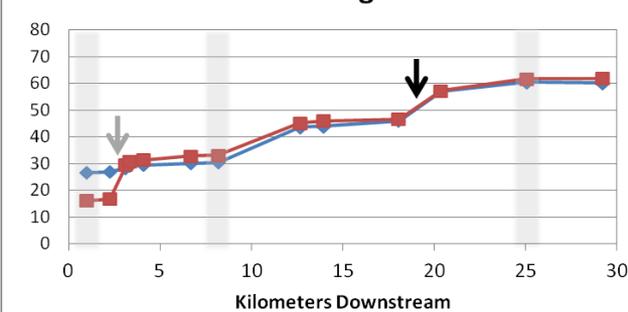
November: Extreme Low Flows



November: Median Flows



November: High Flows



—●— Unregulated —■— Regulated

Interpreting Hydrologic Metrics for Ecological Flow Development

- What metrics are important to the biology?
 - Consider life cycles, flow requirements, migration....
- Define the “sphere of influence”. How far downstream do the impacts persist?
 - *Is the distance over which the impacts persist acceptable given perceived benefit of the alteration?*
 - *Does this distance drastically change based on hydrologic regime and/or some ratio of drainage area and alteration? Can thresholds be determined based on these characteristics?*
- Are certain seasons more impacted than others?
 - *Can regulations be set by season or month?*
- Are effects more prevalent at different points of the flow regime?
 - *Leads to the actual metric that will be used in setting regulations or guidelines*

Stay tuned.....

Michele Cutrofello Eddy

Environmental Engineer

919.990.8458

mcutrofello@rti.org (for now)

RTI's WaterFALL™

<https://waterfall.rti.org>