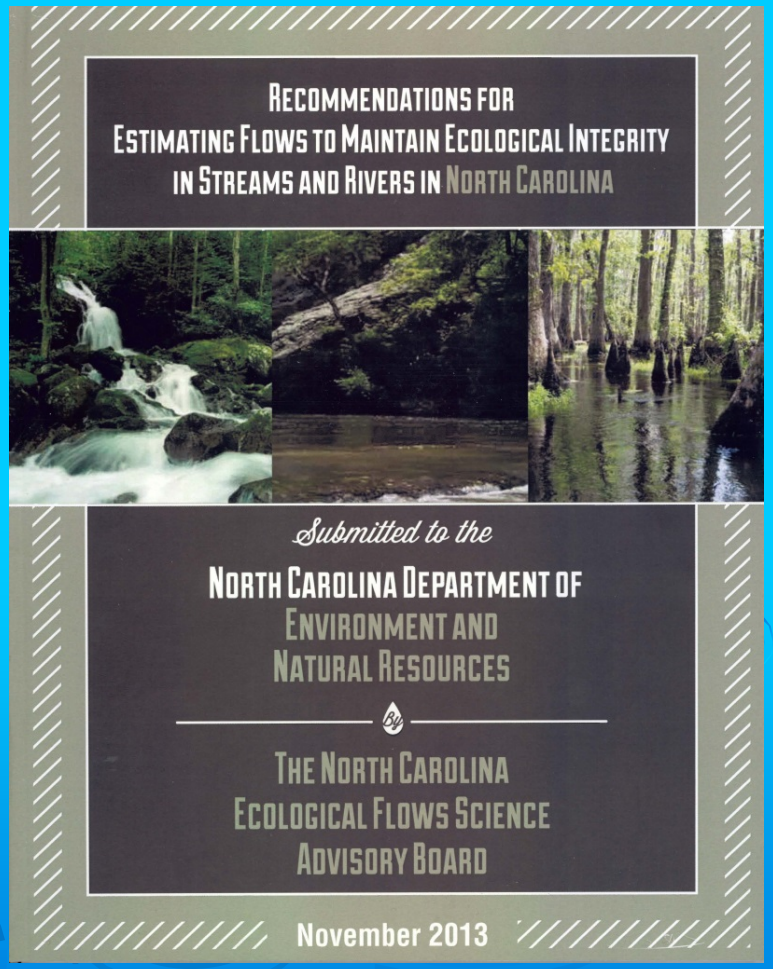
Report of the Ecological Flows SAB

What does it mean for water planning and policy?



March 21, 2014

Institute of Emerging Issues
UNC School of Government
Natural Resources Leadership Institute

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Division of Water Resources, NC DENR

Presentation Outline

1. How is DWR going to use the EFSAB's report recommendations?
2. How the pieces fit together.
3. Next Steps

Background

The ERC's *2008 Report of the Water Allocation Study* resulted in several session laws passed in 2009 And 2010. Session law 2010-143 was one of these Bills.

In addition to setting up the EFSAB, session law 2010-143 also included:

- Requirements for DENR to do a hydrologic model for each major river basin.
- The models need to answer 3 questions:
  1. Locations and time ecological flows may be adversely impacted.
  2. Locations and time yield may be inadequate to meet all essential uses.
  3. Locations and time yield may be inadequate to meet all needs.
- EMC model approval.
- Model approval is not rule making.
- The models and EFSAB report will not vary any existing or impose any additional regulations.

How will DWR implement an EFSAB recommendation? Modeling and Planning

Modeling and Planning Can Help Prevent This

... When Instream Flows are Included in the Equation

How will DWR implement the EFSAB recommendation?

- **Planning tool**
  - **Will not override existing permits, such as FERC license.**
  - **Will not replace site specific studies.**
  - **Will not change the SEPA minimum criteria – 20% 7Q10**
- **During the planning process if ecologic integrity is determined or projected to be adversely impacted, we will flag the river reach for additional studies.**

EFSAB Recommendations:

Ecological Flow Standard

Biological Response

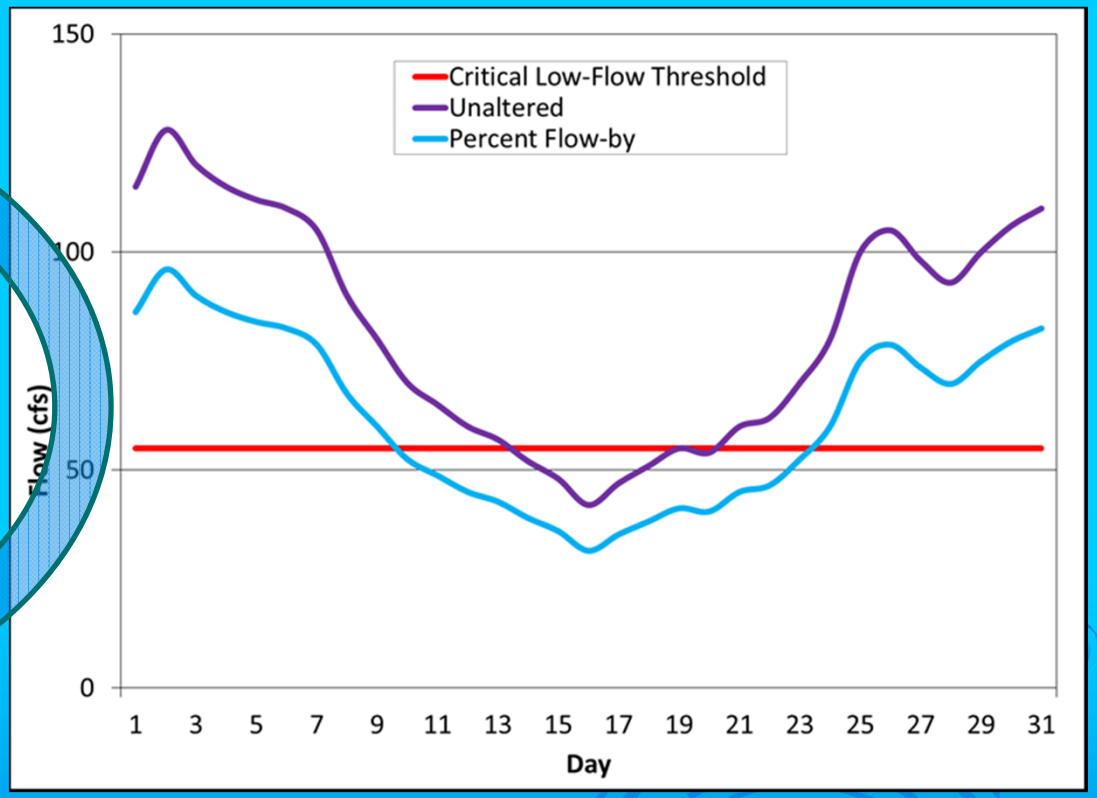
- DENR should evaluate the use of these models to assess changes in biological conditions associated with projected changes in flow
- A 5-10% change in biological condition suggested as an initial criterion for further review
  - Based on average range of EPT richness within the invertebrate condition classes (Excellent, Good, Good-Fair, Fair, and Poor) as defined by DENR
  - The 5-10% criterion represents a change of one-quarter to one-half of the width of a condition class
- DWR needs to do additional evaluation before we include in our planning process.

EFSAB Recommendations:

Ecological Flow Standard

Percentage of Flow

- Combine with a critical low-flow component
  - Protect the aquatic ecosystem during periods of drought
  - Prevent increasing the frequency or duration of extreme low flows that are damaging to ecosystem health
- Use 20th percentile flow as a critical low flow (by month)
- Ecological flow threshold is the larger of the flow-by and critical low-flow values



DWR is going to use an 85% flow-by without the critical low-flow. We need to do additional evaluation before including in our planning process.

Initial Planning Approach

- DWR is going to use the flow-by approach for planning purposes if there are no existing permitted flow requirements.
- EFSAB's report gave the range of 80% to 90%. Based on reviewing NC site specific study results we are going to use an 85% flow-by.

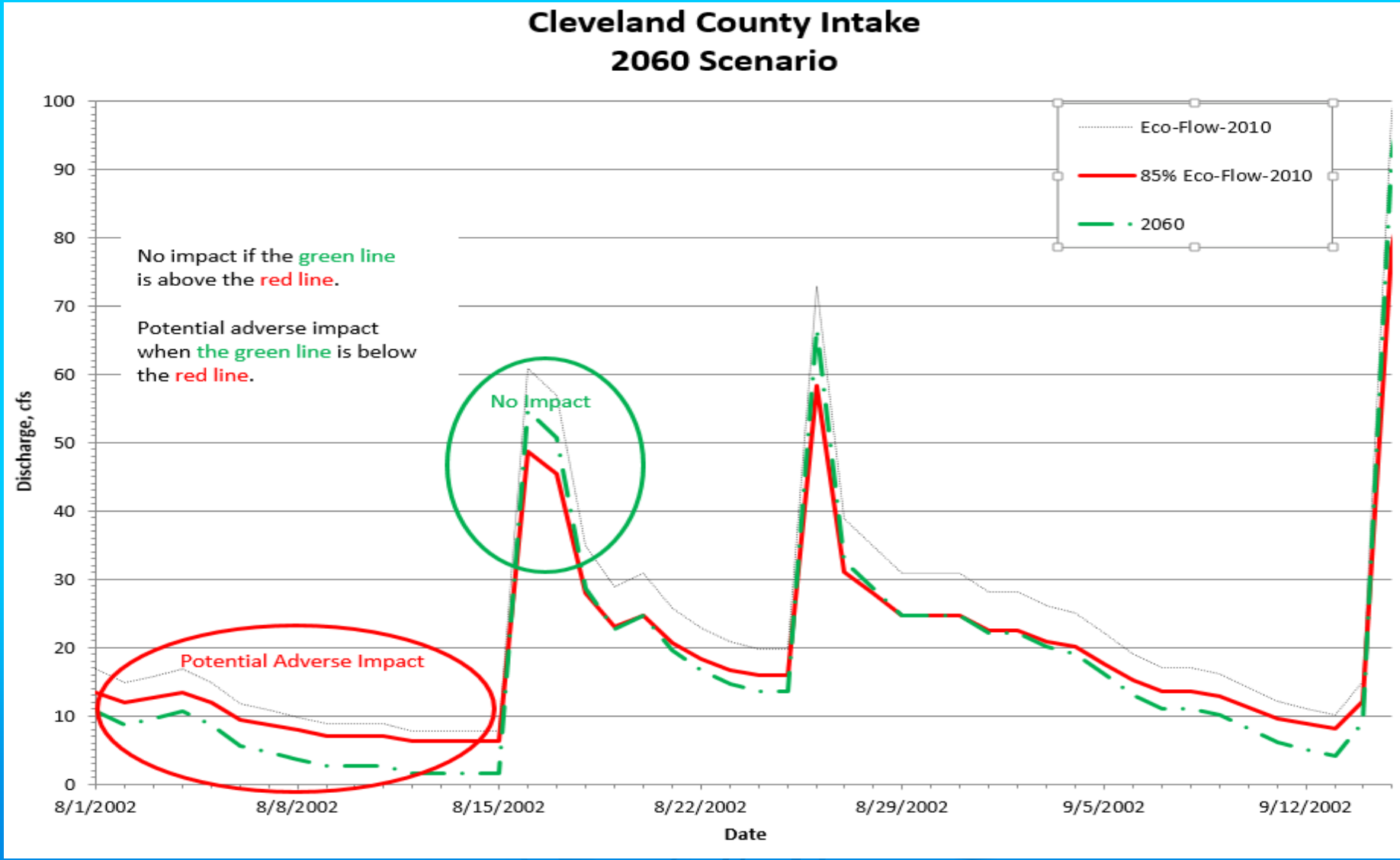
Example Using the 85% Flow-By

For modeling purposes we will use ECOFLOW-2010 as the prevailing ecological conditions. We will evaluate ecological flows at all river nodes as follows:

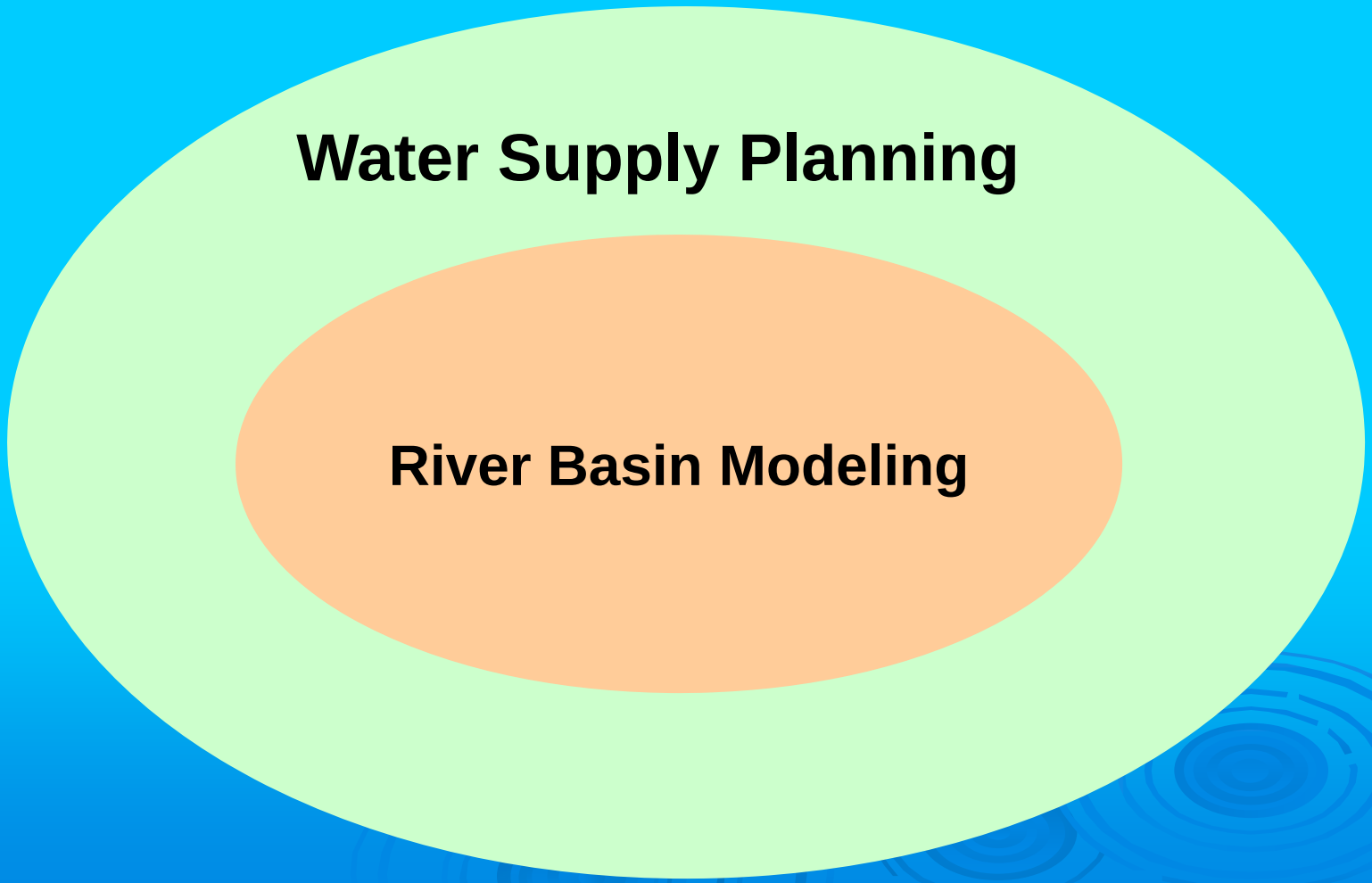
- Use the ecological flow requirements in permits, for example FERC licenses. Ecological flow is adversely impacted if the permitted flow requirements are violated.
- If there are no permitted flows, ecological flow is adversely impacted will be evaluated using the approach of an 85% flow by requirement.

# Times Threshold Exceeded		Condition	Action
Full	Trimmed 10% - 90%		
0	0	Green	None
1+	0	Yellow	Review existing management policies and water usage to determine what maybe contributing to the deviations.
1+	1+	Red	Additional review needed. Review could include review of existing biological data, or site-specific evaluation.

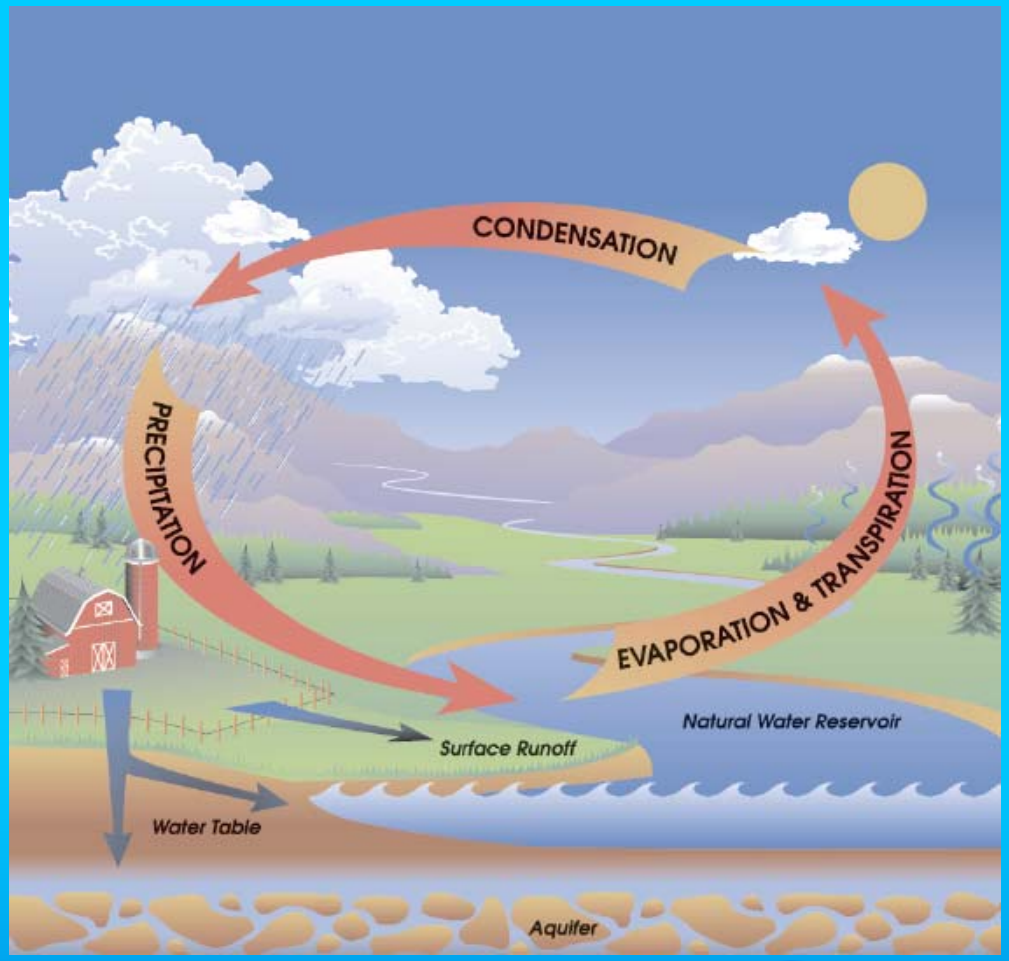
85% Flow-By Example



Water Resources Planning & Modeling



Hydrologic Cycle

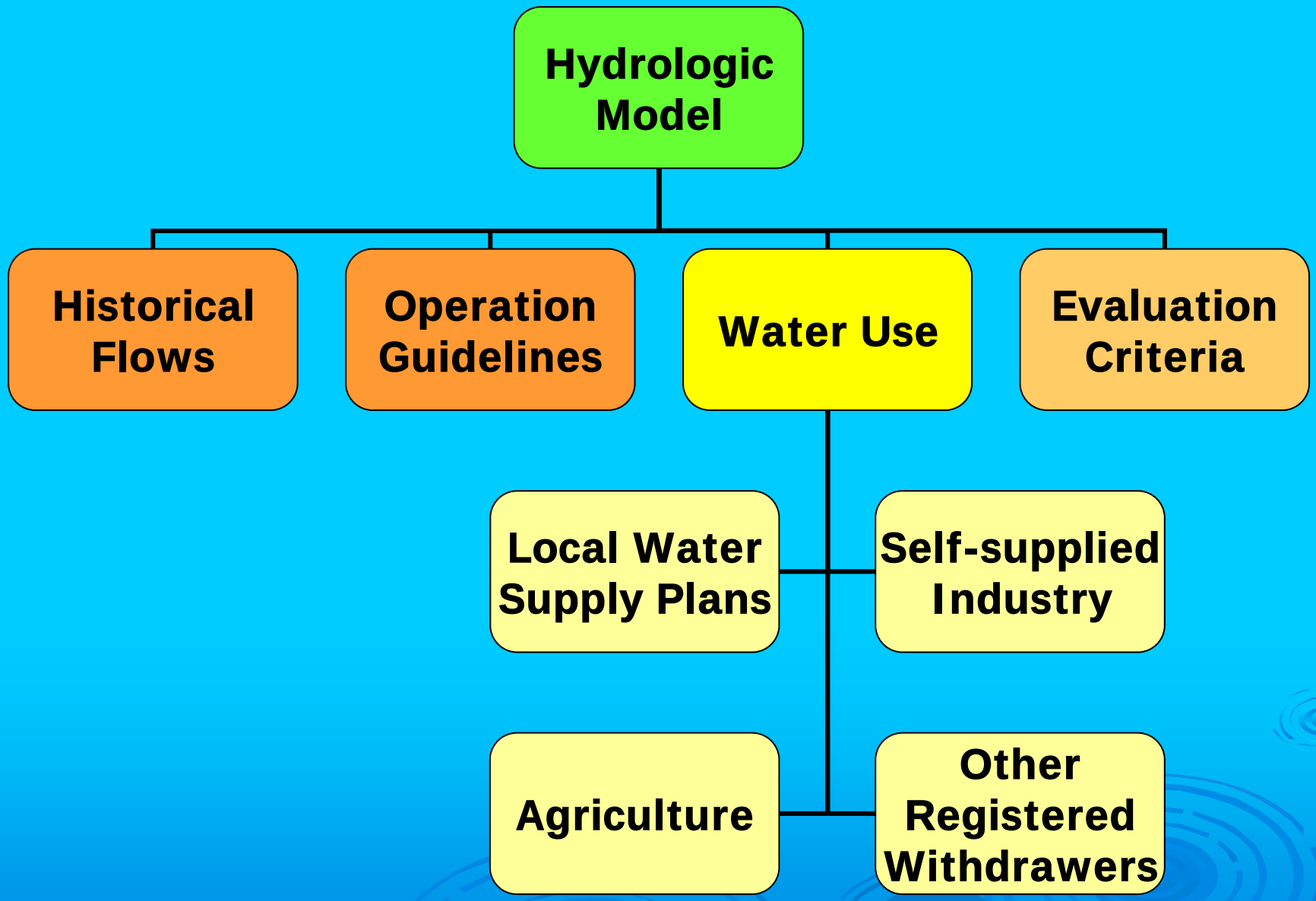


- **Water Balance Model**
  - **Inflow – Outflow = Change in Storage**
- **Model is like a checkbook**
  - **Inflow = Salary**
  - **Outflow = Expenses**
  - **Storage = Bank Account**
- **The complexity is developing the data and equations to describe the 3 variables.**

"All models are wrong, but some are useful."
Andrew Gelman, Professor of statistics at Columbia

Model Basics:

- Models <u>water quantity</u> as water moves downstream considering additions and deletions at specified locations.
- Built on OASIS with OCL™ platform developed by HydroLogics, Inc.
- Not for flood analysis
- Does not model water quality
- Does not directly model ground water


Hydrologic Model
Historical Flows
Operation Guidelines
Water Use
Evaluation Criteria
Local Water Supply Plans
Self-supplied Industry
Agriculture
Other Registered Withdrawers

Operations Guidelines

Examples

- **Quantity and timing of specific flows**
  - **Aquatic habitats**
  - **Water quality protection**
  - ✓ **Intake coverage**
  - **Recreation**

- **Reservoir water level limits and timing**
  - **Structural limits**
  - **Aquatic habitat protection**
  - ✓ **Intake coverage**
  - **Boat ramp access**
  - **Authorized purposes and storage allocations**

Water Use

Principle Data

- **Water Withdrawal Registrations**
  - **Agriculture > 1,000,000 gallons per day**
  - **Non-agriculture > 100,000 gallons per day**
- **Local Water Supply Plans**
  - **Local Government Water Systems**
  - **Other Large Community Water Systems**

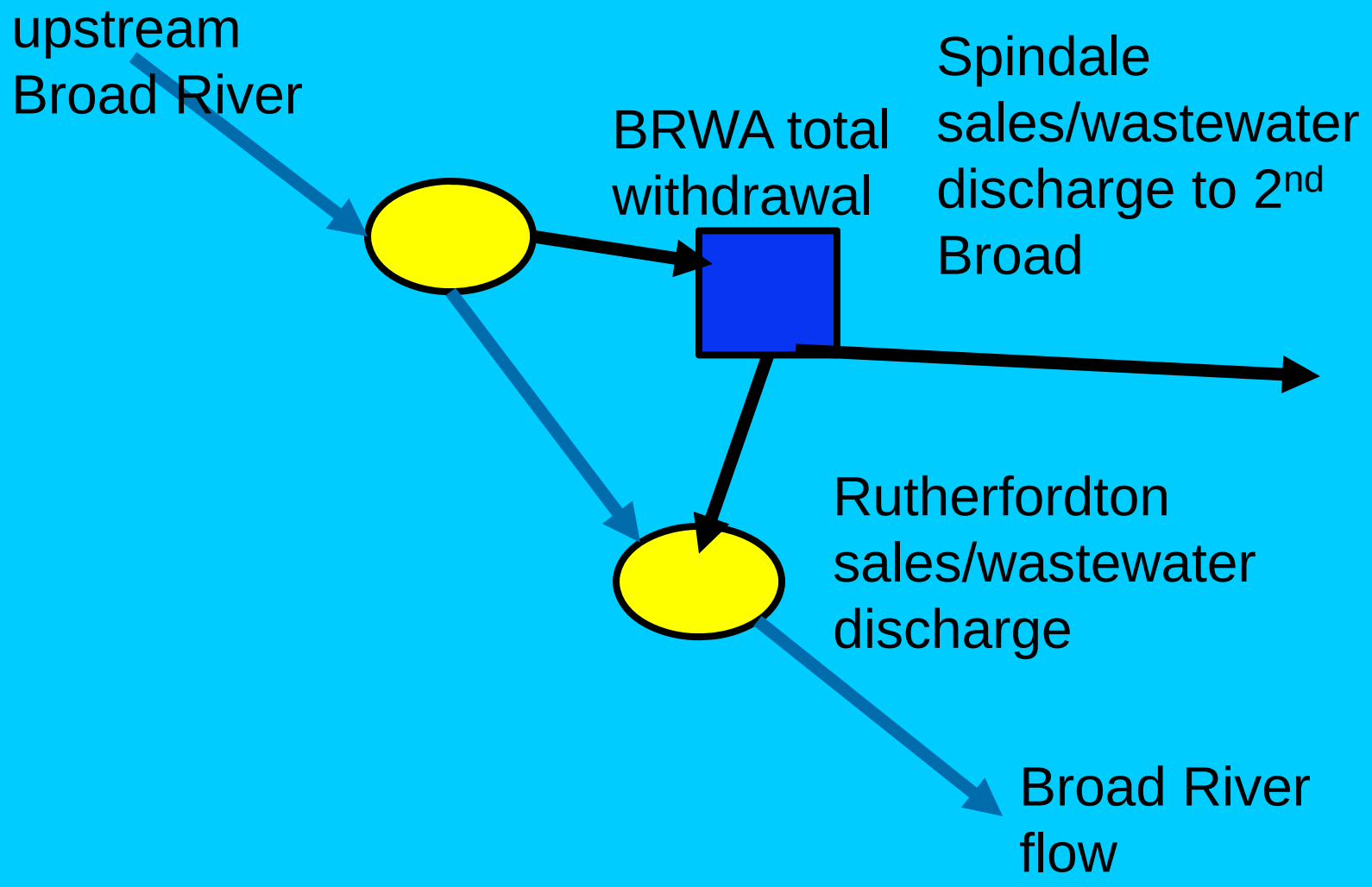
Data Sources

- **Municipal & Industrial Withdrawals**
  - **DWR**
  - **Water Users**
- **Wastewater Discharges (NPDES)**
  - **DWQ**
  - **Dischargers**
- **Agricultural Water Use**
  - **National Agricultural Statistics Service (NASS)**
  - **Ag Statistics from NC Dept. of Agriculture (NCDA)**
  - **Ag Extension Agents and Questionnaire**

Municipal & Industrial Data Analysis

- **Withdrawals & Discharges**
  - **1930s to *Current Year***
  - **Monthly Time Series**
- **Fill Gaps in Series**
  - **Linear Interpolation – Census Data**
  - **User Records of Facility Start/Stop Dates**

BRWA System - Simplified



Demand Pattern

Demand Pattern at Node 86, 'Broad River Water Authority Demand'

Month	Day	Demand
1	1	0.983
1	31	0.983
2	1	0.942
2	29	0.942
3	1	0.942
3	31	0.942
4	1	0.970
4	30	0.970
5	1	1.021
5	31	1.021
6	1	1.081
6	30	1.081
7	1	1.069
7	31	1.069
8	1	1.113
8	31	1.113
9	1	1.047
9	30	1.047
10	1	1.007
10	31	1.007
11	1	0.929
11	30	0.929
12	1	0.896
12	31	0.896

MGD Units

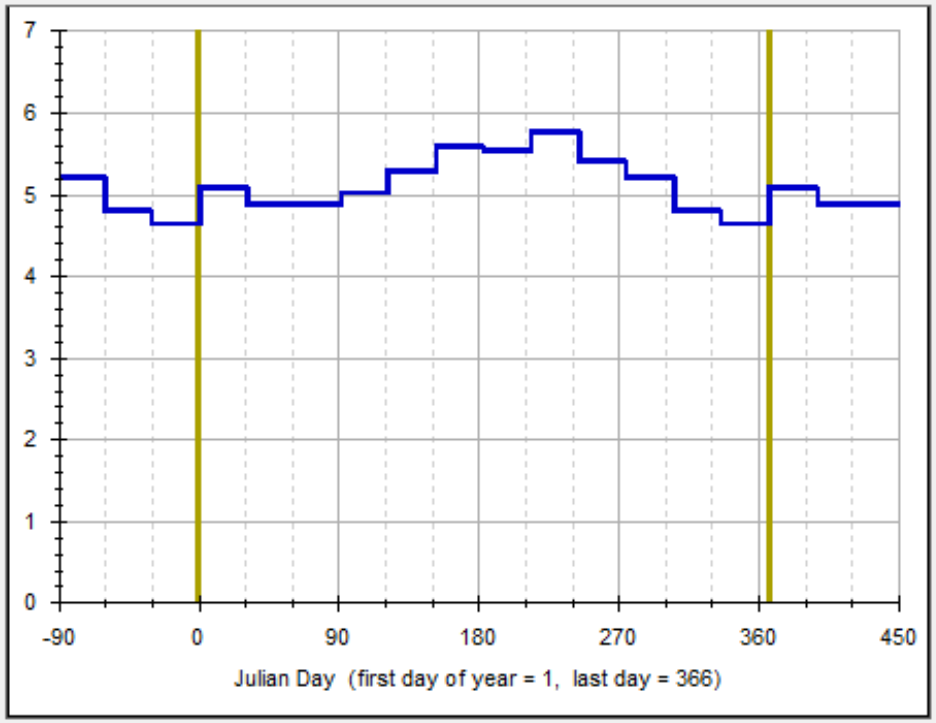
5.17 Multiplication Factor

Change Node

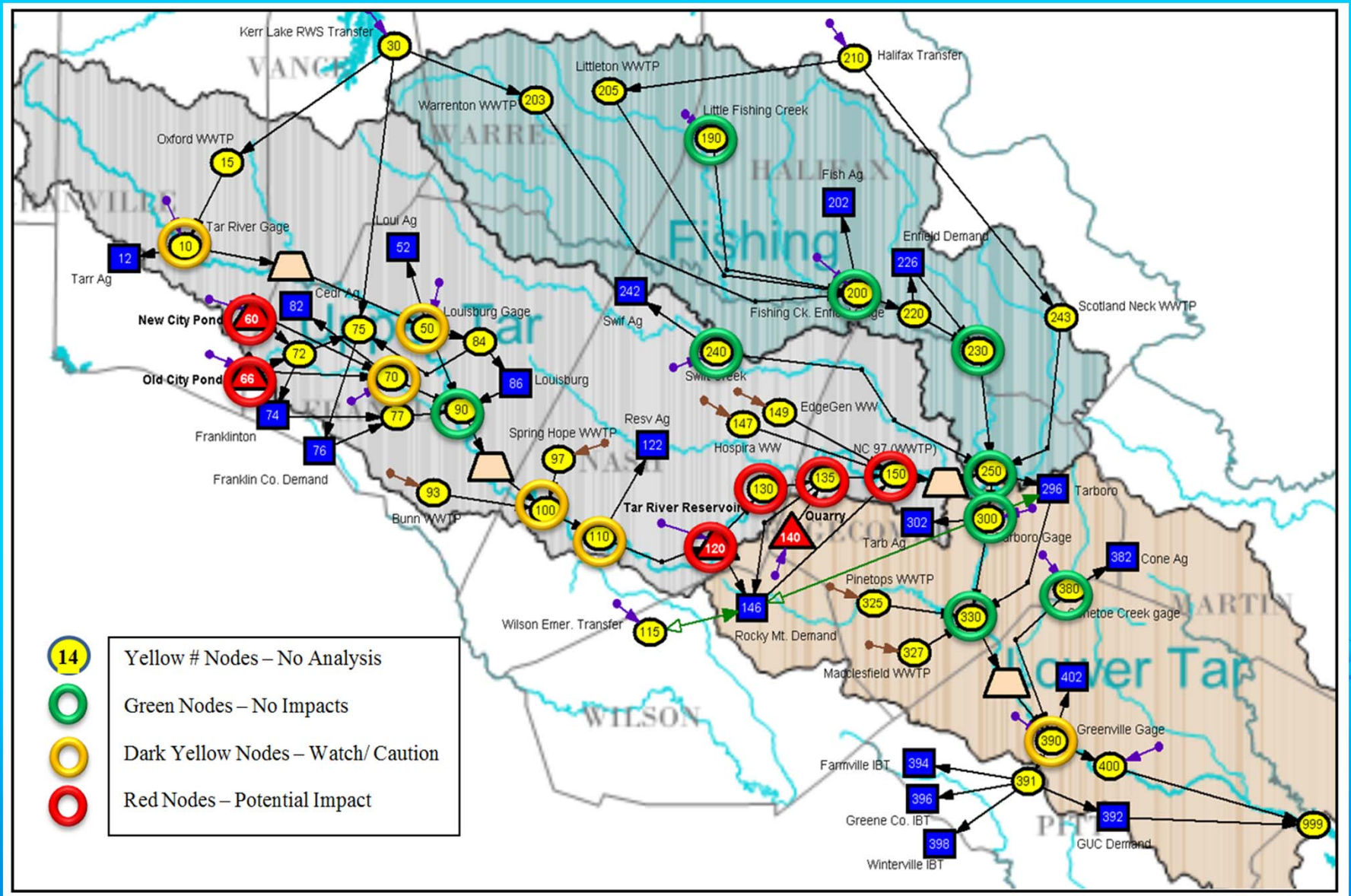
Import Data

OK

Cancel



Tar Basin 2030 - Eco-Flow Impacts



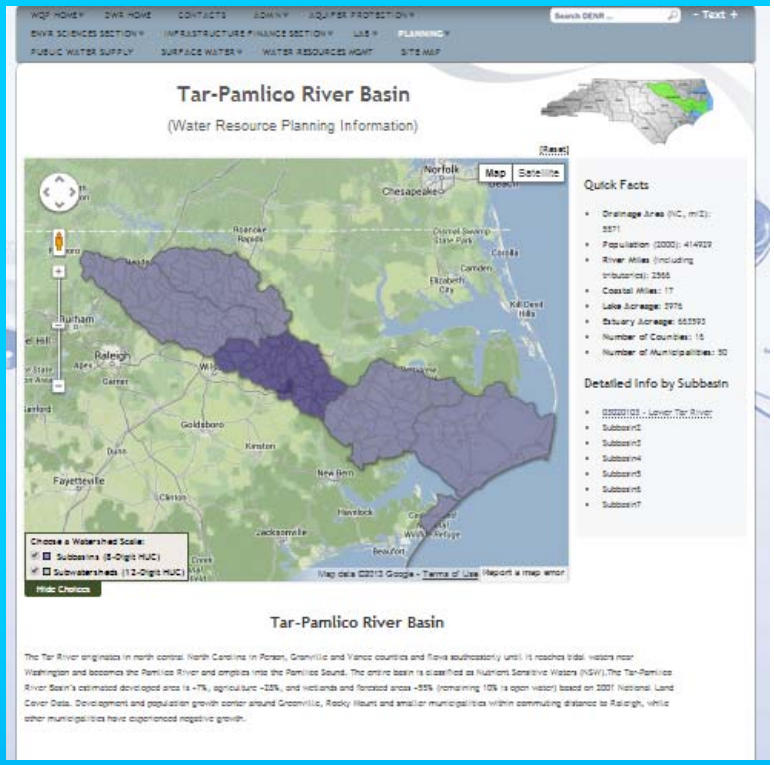
Yield To Meet All Needs and Essential Needs

- **Yield to meet all needs**
  - **All withdrawals - run the model without drought plans. Meets all withdrawals if no shortages.**
  - **Combine the withdrawal and ecological flow analyzes to determine if the yield for all needs are met.**
- **Yield to meet essential needs**
  - **Essential withdrawals - run the model with drought plans. Meets essential withdrawals if no shortages.**
  - **Combine the withdrawal and ecological flow analyzes to determine if the yield for essential needs are met.**

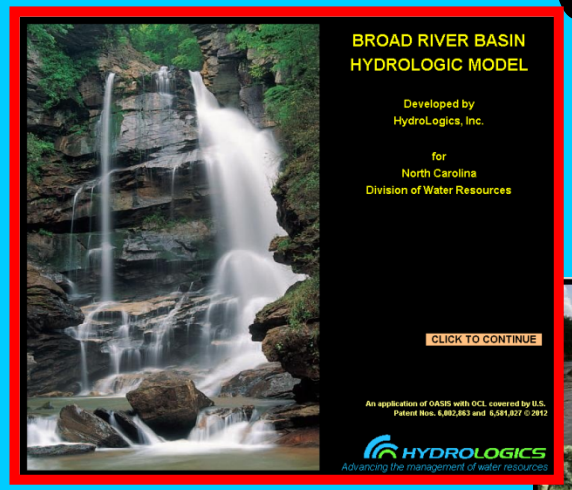
Division of Water Resources Initial Basin Planning Yield and Ecological Flow Node Evaluation Procedure										
		Withdrawal Evaluation			All Needs Evaluation			All Needs Evaluation		
		Withdrawals to meet all needs (Model without drought plans.)	Withdrawals to meet essential needs (Model with drought plans.)	Ecological Flows Evaluation	Yield may be adequate to meet all needs.	Yield may be adequate to meet all needs but needs additional review.	Yield may be inadequate to meet all needs.	Yield may be adequate to meet essential needs.	Yield may be adequate to meet essential needs but needs additional review.	Yield may be inadequate to meet essential needs.
Withdrawals Nodes										
	No Shortages	✓	✓		✓	✓		✓	✓	
	Shortage or minimum flow violation or reservoir depletion.	✗	✗				✗			✗
Permitted Ecological Flow Nodes										
	All days able to meet permitted flow requirements.			●	●			●		
	One or more days not able to meet permit requirements.			◆			◆			◆
Non-Permitted Ecological Flow Nodes										
	No flows below 85% of the eco-flow 2010 baseline.			●	●			●		
	No flows between the 10th and 90th percentile below 85% of the eco-flow 2010 baseline.			●		●			●	
	One or more days flows between the 10th and 90th percentile are below 85% of the eco-flow 2010 baseline.			●			●			●
				Composite Node Rating	⚑	⚑	⚑	⚑	⚑	⚑

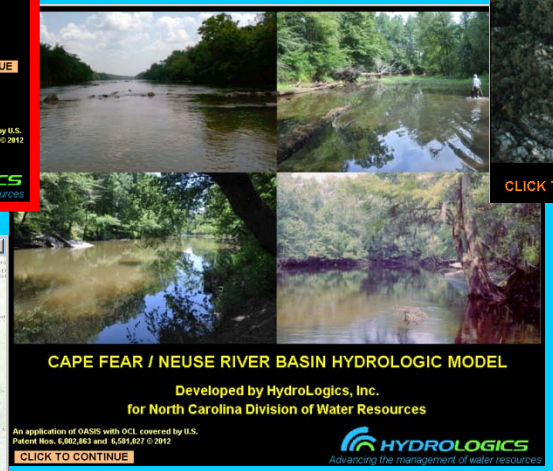
New Integrated River Basin Planning Vision

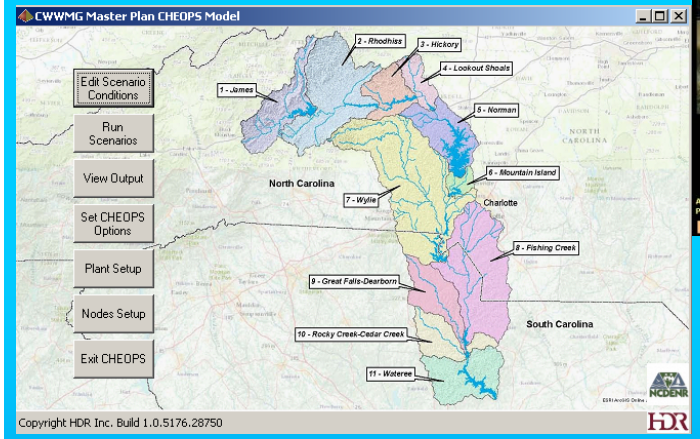
- The concern about basin scale won't be an issue.
  - Data will carry 3 geospatial tags.
    - HUC
    - Hydrogeological
    - Political
  - We will be able to provide assessments by river basin, watershed, a ground water prospective, county, or group of counties. Eventually allow user defined assessments areas.
- The Division only collects and maintains data we use. We don't ask for and store the same information multiple times in multiple locations.



Questions







Contact Information

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