Hydrologic Model Development For River Basin Water Resources Plan

Neela Sarwar
NCDEQ - DWR
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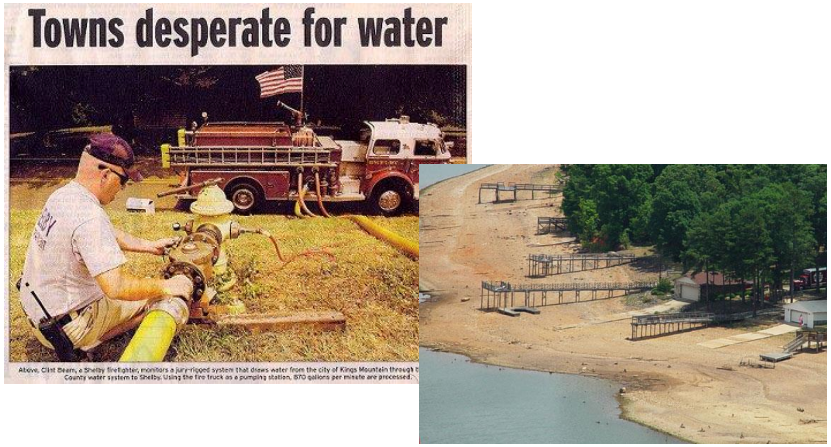
Department of Environmental Quality

Key Issues That Shape Current NC Water Planning and Modeling

Drought of 1998-2002

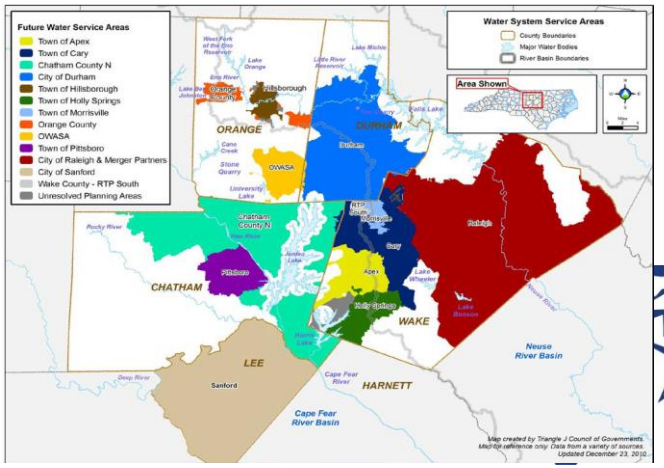


2007-08 Drought
Fontana Lake (Sept 9-10, 2007)

Interbasin Transfer
South Carolina vs. North Carolina

- Case originates in the Supreme Court. South Carolina seeks an equitable apportionment of the Catawba River, which starts in North Carolina and flows into South Carolina.
- Dismissed – December, 2010

Jordan Lake Partnership
Triangle Regional Water Supply Plan



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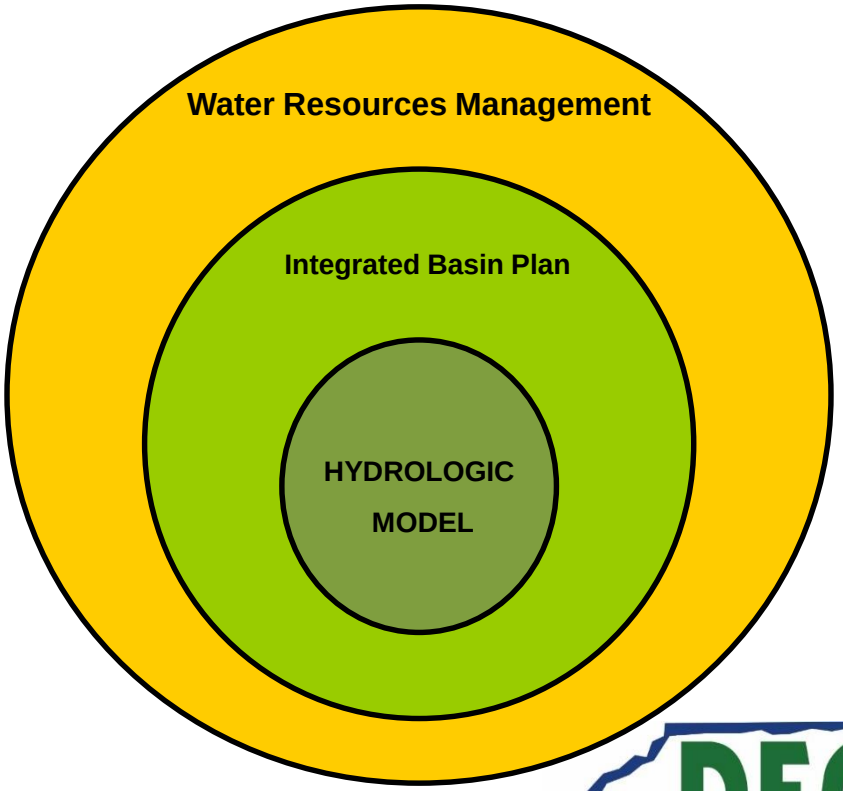
River Basin Water Resources Management

- Sustainable management
- Reliable, quantitative methods for planning
- Regulatory decision making



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Session Law 2010-143 – Improve River Basin Modeling

(3) Model. – Each basinwide hydrologic model shall:

a. Include surface water resources within the river basin, groundwater resources within the river basin to the extent known by the Department, transfers into and out of the river basin that are required to be registered under G.S. 143-215.22H, other withdrawals, ecological flow, instream flow requirements, projections of future withdrawals, an estimate of return flows within the river basin, inflow data, local water supply plans, and other scientific and technical information the Department deems relevant.

b. Be designed to simulate the flows of each surface water resource within the basin that is identified as a source of water for a withdrawal registered under G.S. 143-215.22H in response to different variables, conditions, and scenarios. ***The model shall specifically be designed to predict the places, times, frequencies, and intervals at which any of the following may occur:***

1. Yield may be inadequate to meet all needs.

2. Yield may be inadequate to meet all essential water uses.

3. Ecological flow may be adversely affected.

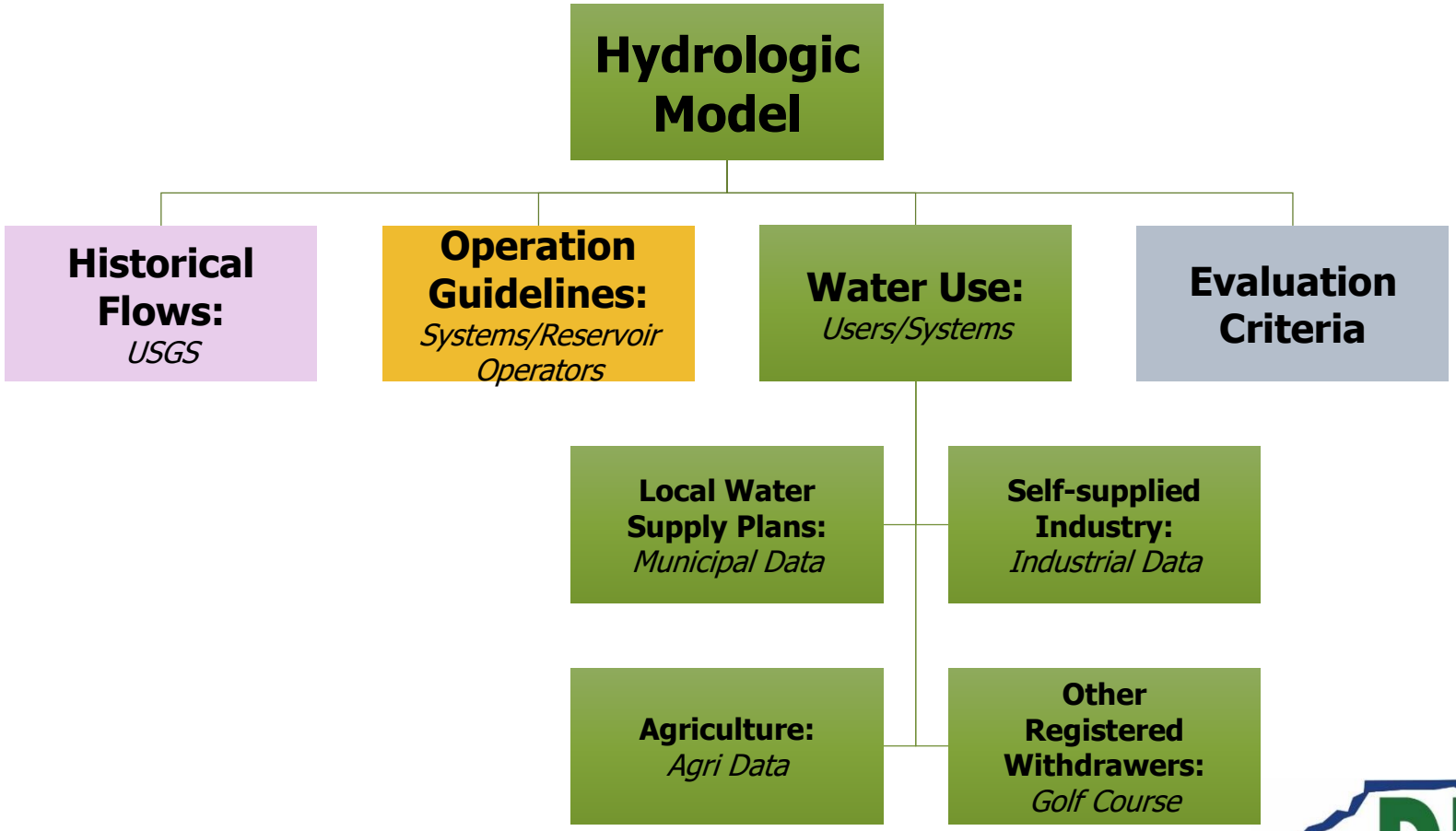
c. Be based solely on data that is of public record and open to public review and comment.

River Basin Plan and Model

- **Water Resources Plan**
  - Combines Water Use Data + Hydrologic Model
  - Answers to critical questions for long range (50 yr) water supply availability and other services.

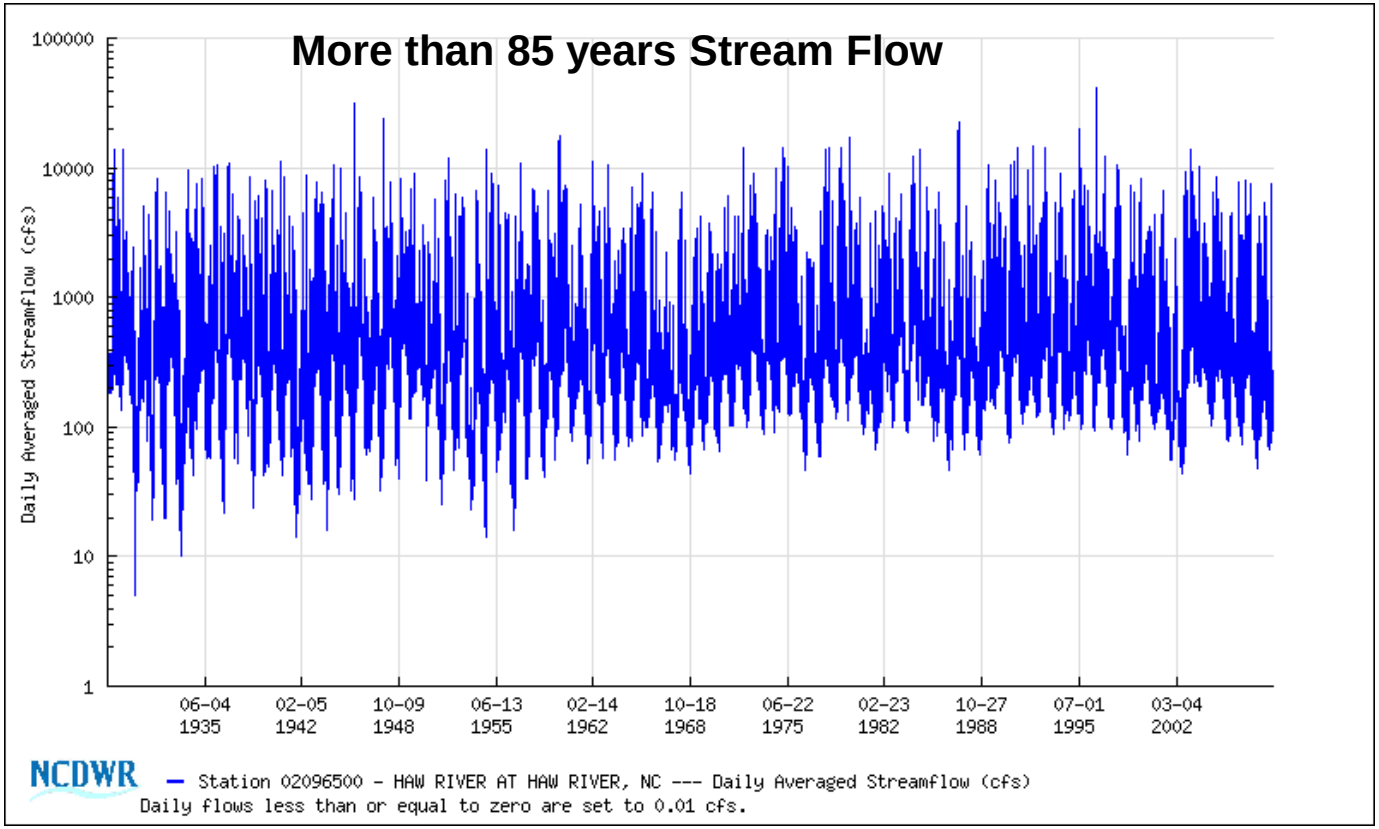
- **Hydrologic Model**
  - Represents surface water movement only

Process Components



Process Components

Historical Flows:
USGS



Process Components

Operation Guidelines:
Systems/Reservoir Operators




- **Instream flow - quantity and timing**
  Specific flow to protect
  - Aquatic habitats
  - Water quality
  - Intake coverage
  - Recreation

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

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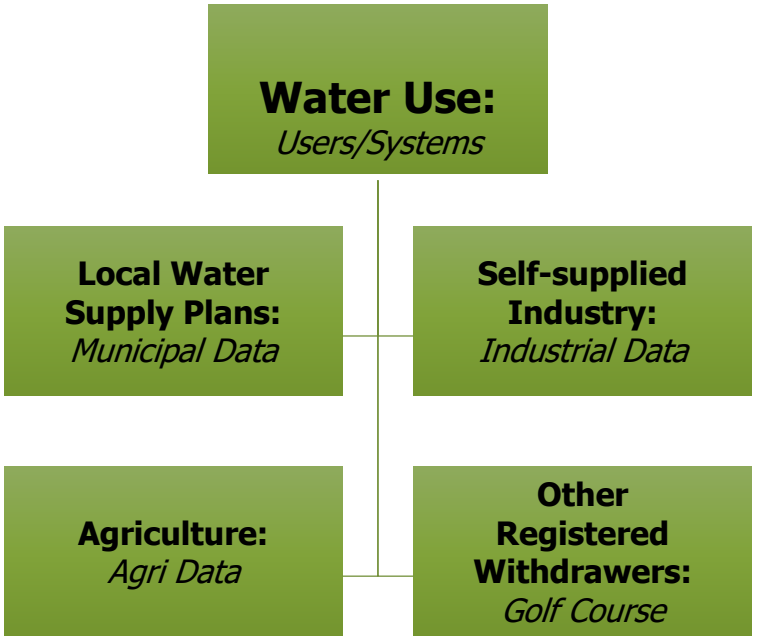
Process Components



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

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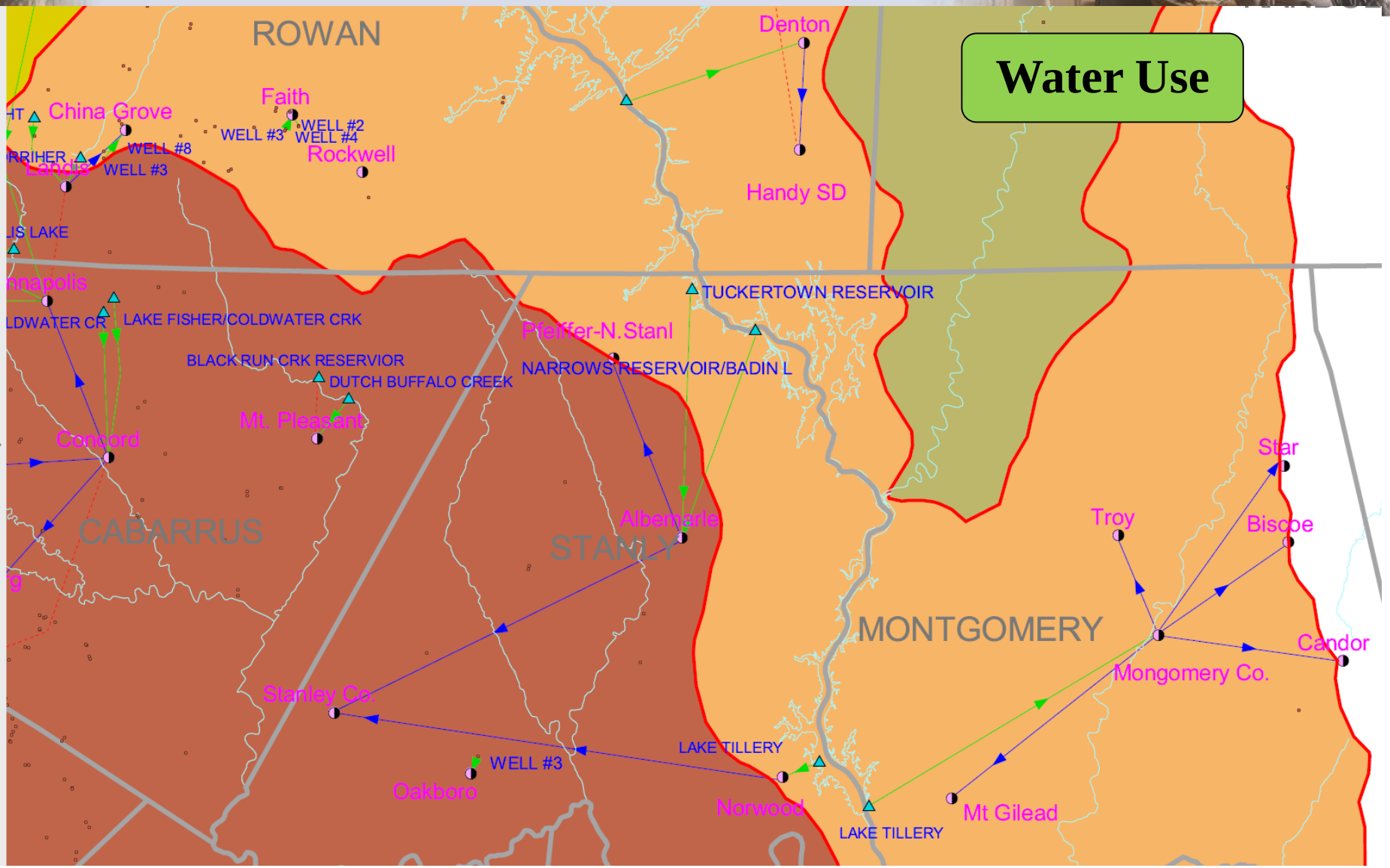
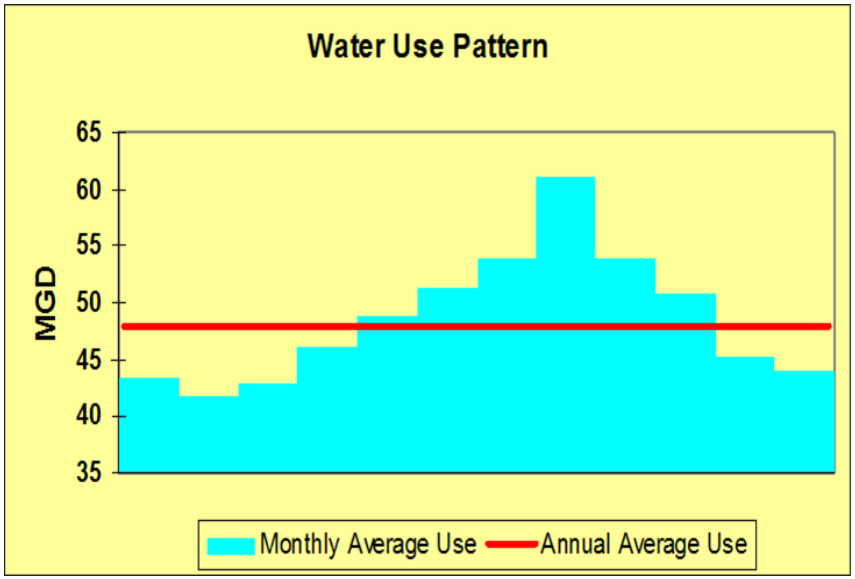
Process Components



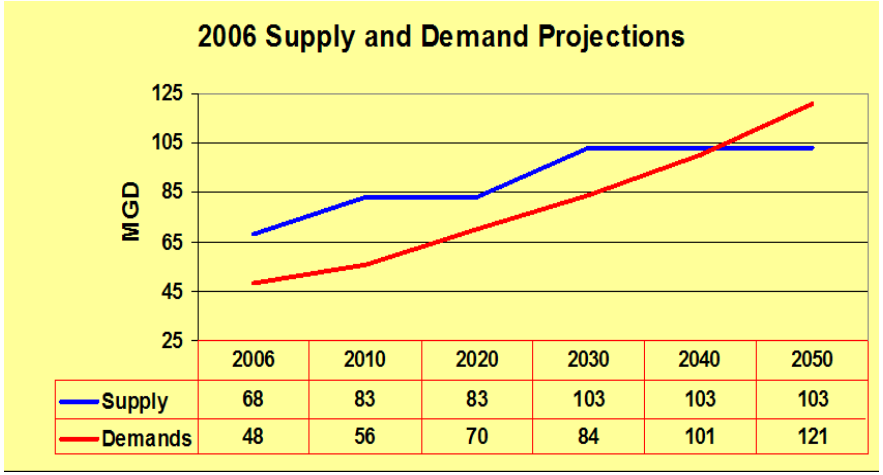
Process Components

Water Use

Seasonal Use Pattern /
Avg Annual Demands



50 yr Projected Demands



	2006	2010	2020	2030	2040	2050
Supply	68	83	83	103	103	103
Demands	48	56	70	84	101	121

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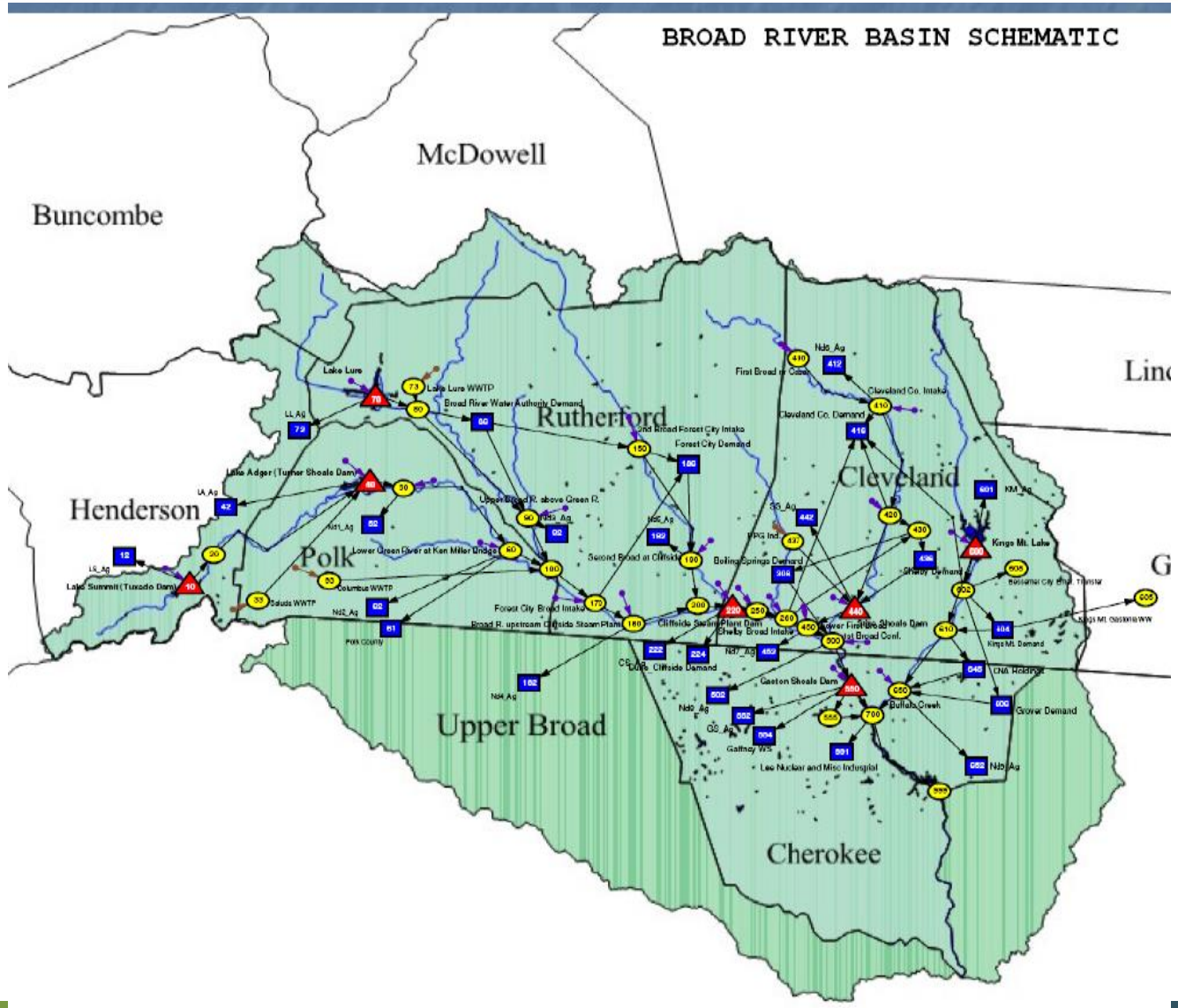
Process Components

Hydrologic Model



Process Components

Hydrologic Model

Major Assumptions

- Future withdrawals will come from current intake locations
- Future wastewater discharges will be same percent of withdrawals at the same locations
- Sellers will continue to meet buyers' needs
- Future flows will be within the range of flows in the historical record
- Local utilities are the best judges of future system growth

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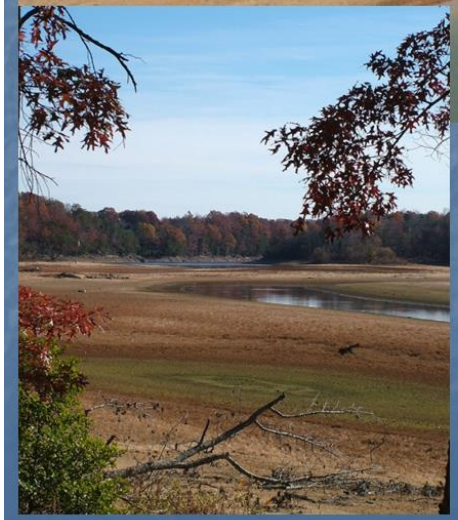
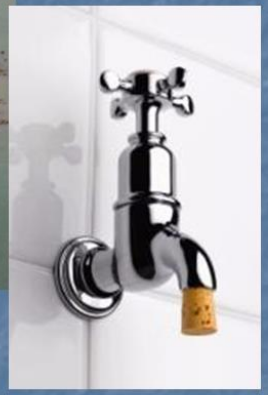
Process Components

How often?
What's the chance?

Evaluation Criteria



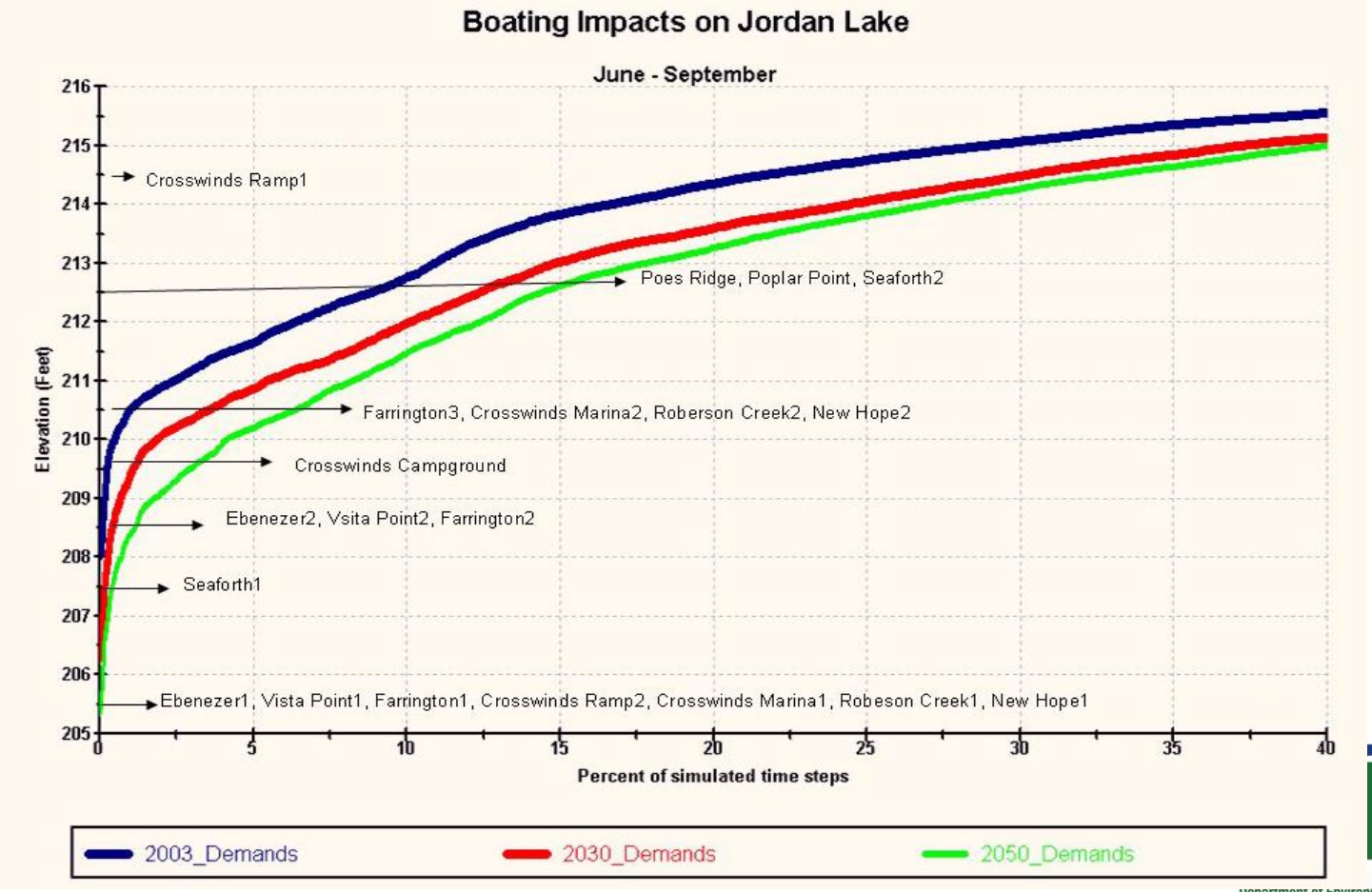


DEQ

Process Components

Evaluation Criteria

- **Reservoir Water Levels**



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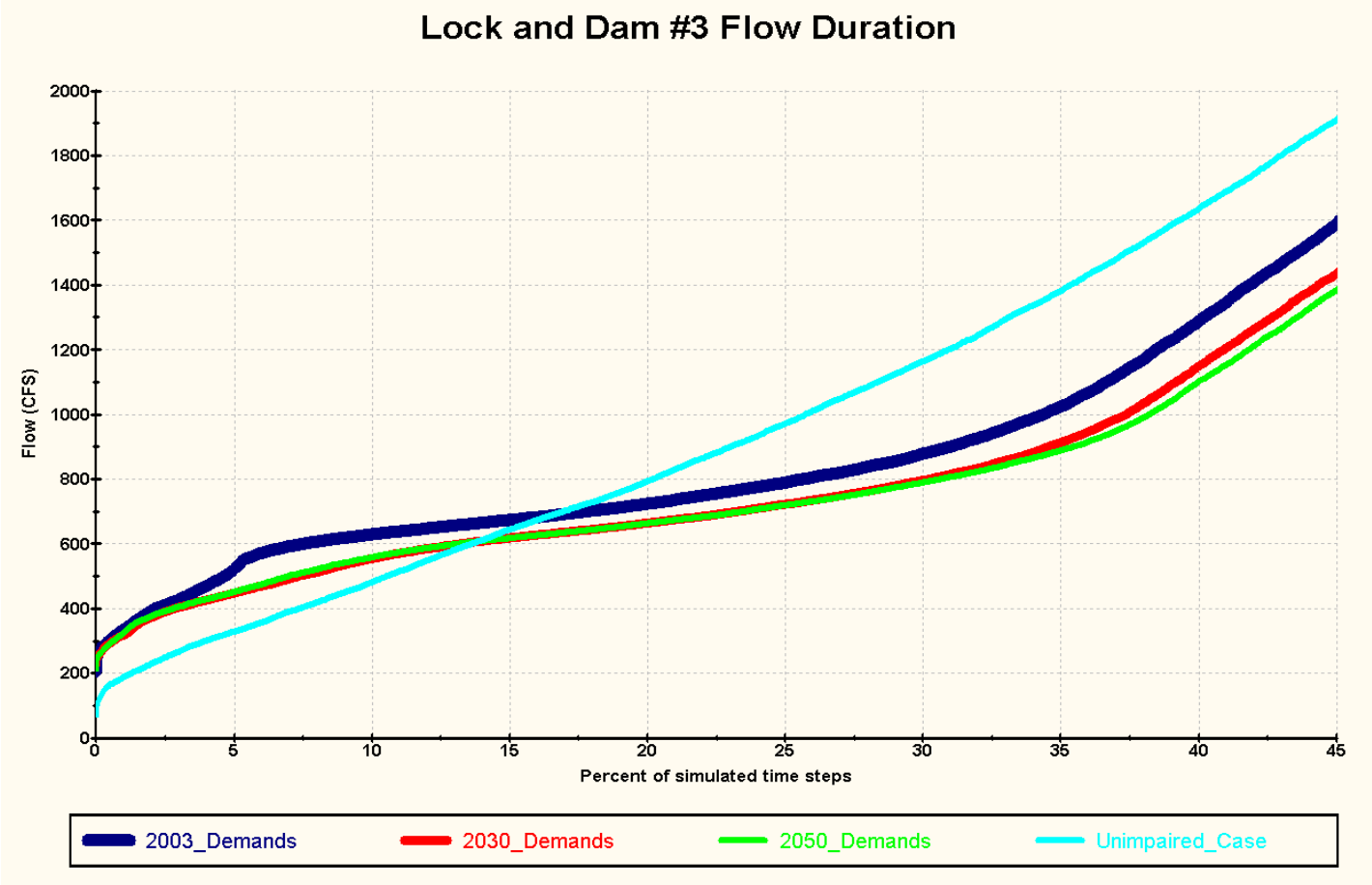
Process Components

Evaluation Criteria

- **Stream Flows**



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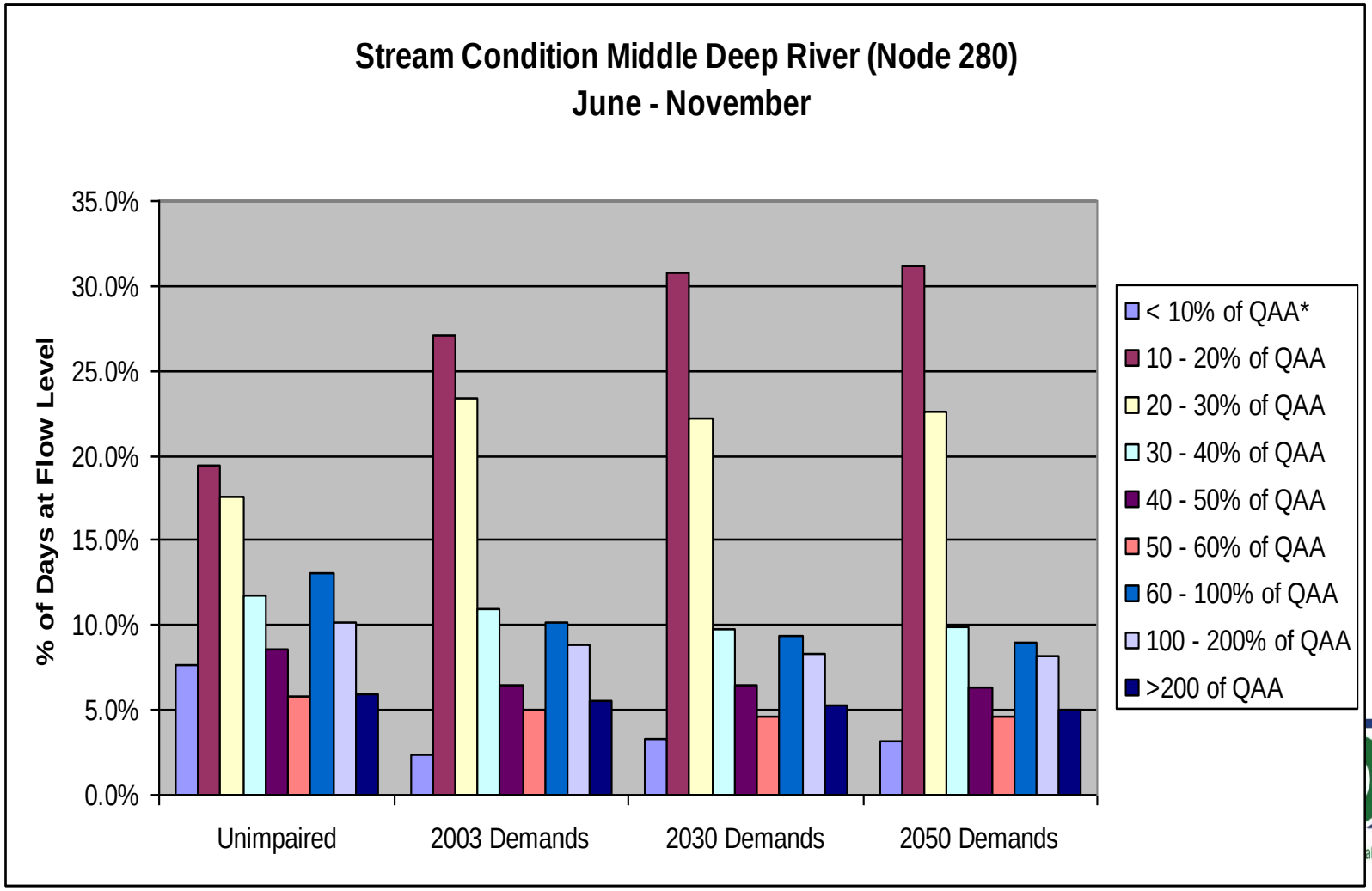
Process Components

Evaluation Criteria



Process Components

Evaluation Criteria

- **Water Supply Deficits**

Table 4-3: Water Supply Demand & Deficits Predicted by the Neuse River Basin Hydrologic Model, 2050 Scenario

Model Scenario / Water Systems	2050 Average Demand (mgd)	2050 Average Deficit (mgd)	Longest Deficit Period (Days)	Years Demand Not Fully Met Out of 78
Orange-Alamance	0.21	0.14	30	2
Hillsborough	2.76	1.84	30	2
Piedmont Minerals	0.25	0.16	30	2
Raleigh	129.23	86.18	124	36
Durham	40.92	29.13	60	5
SGWASA	10.01	8.7	79	14

Longest Deficit (Days) = The greatest number of consecutive days over the entire 78 year record that the full water supply demand may not be met.
Years Demand Not Met = The number of years out of a total of 78 annual flow patterns that the full water supply demand may not be met.
Systems in Red are those for which a deficit is predicted in any scenario seven or more years out of the 78 year record.

Process Components

Evaluation Criteria

Review of 3 Critical Questions

- What is the answer to each of the evaluation questions?
- Are there areas where there may be problems meeting expected demands?
- When can we expect to have shortages and how can we adapt when there is a shortage?

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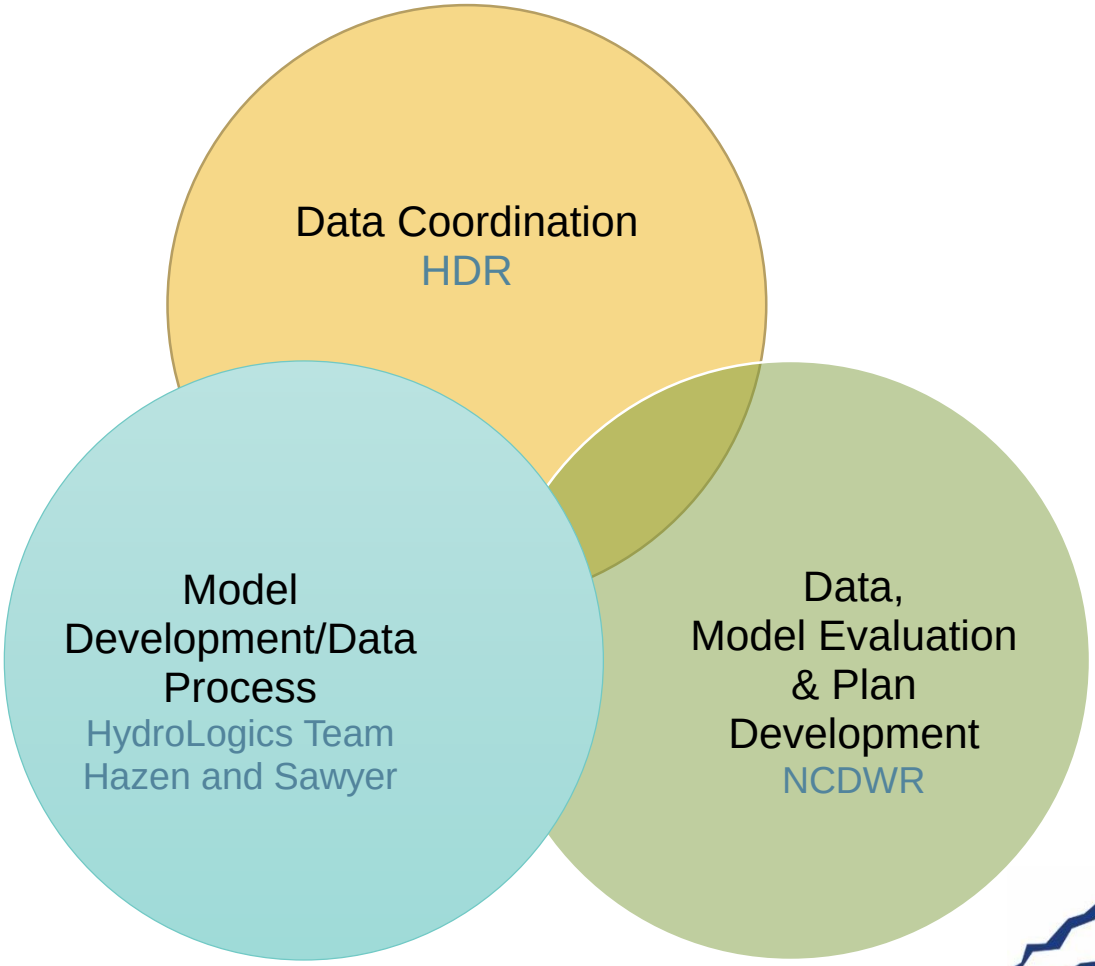
Process Components

Evaluation Criteria

Water Management/Planning - Identify Potential Risks：

- Would a reasonable reduction in demands avoid the identified problems?
- Could an alternative source meet expected demands?
- What happens if future droughts are longer or more severe?
- What happens if we can not discharge the same percent of wastewater?

Project Organization



Model Development Tasks and Your Participations

- **Task 1-** Inflow Data Development
  - Historic Data Collection
  - Impairment Data
- *Task 2 - OASIS Application Development*
- **Task 3 -** Organize and Conduct Meetings
  - Coordinate with stakeholders
  - Meetings
- *Task 4 – Deliverables*
- **Task 5 -** Training and Installation
  - Model on DWR's server
  - Access with account for users

Project Participants

- List of General Stakeholders
  - Municipal and Community water users
  - Industrial and Agricultural users
  - Other users
  - NGOs
  - River Keepers
  - Agencies
  - Institutions

Project Contacts

- Basin Webpages
  https://www.ncwater.org/Data_and_Modeling
- Contacts at NCDWR
  - E-mail to staff for questions or concerns
  - dwr-yadkin-lumber-staff@lists.ncmail.net

- E-mail list serve Subscriptions for Stakeholders
  - https://lists.ncmail.net/mailman/admin/dwr-yadkin-lumber-model

- Model Development Project Lead at DWR
  Neela Sarwar,
  Water Resources Engineer
  neelufa.sarwar@ncdenr.gov
  (919) 707-9028