



Hydrologic Model Water Demands for Electricity Generation

July 12, 2017

*Department of Environmental Quality
Division of Water Resources*



Hydrologic Modeling

- **Surface Water Quantity Focused**
- **Provides a broad perspective picture based on available data**
- **Based on mathematically described relationships**
- **Compares current and future withdrawal needs to historic water availability**
- **Not intended for day-to-day operation guidance**

Electric Generation Withdrawals

- **Included in the set of modeled withdrawals**
- **Subject to water availability**
- **Important considerations**
 - *Mandated operating rules*
 - *Water levels*
 - *Required flows*
 - *Drought response*
 - *Other users of water source*
 - *Ecological impacts*
 - *Supply limitations*
 - *Reliability of supply*

Water Sources

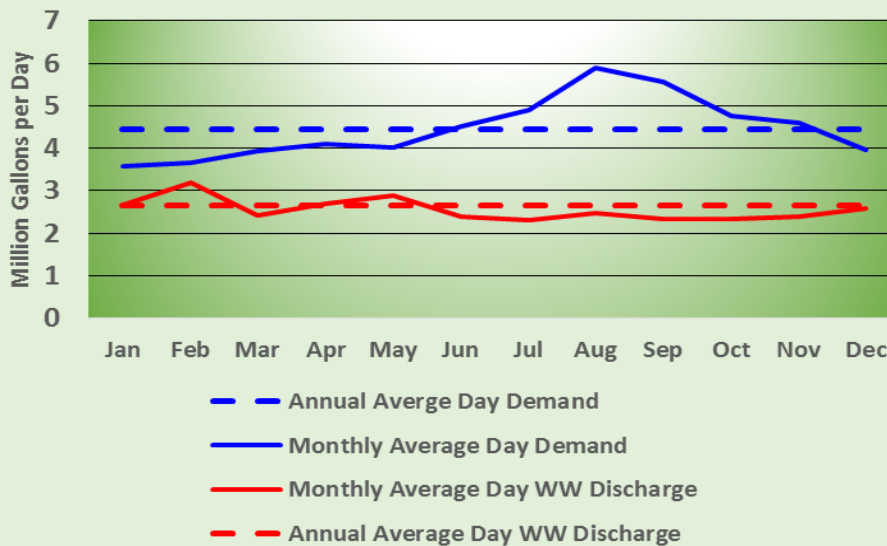
- **Primarily surface water**
- **Utility owned/controlled reservoirs**
- **Other impoundments**
- **River withdrawals**
- **Regulatory requirements set by source, the timing of construction and/or licensing**

Modeling Withdrawals and Return Flows

Modeled Annual Average Surface Water Withdrawals and Return Flows in Million Gallons per Day (MGD)

Model Node	Surface Water Withdrawer	Wastewater Proportion	2010 Current Conditions	2035 Estimated Demand	2045 Estimated Demand	2060 Estimated Demand	Estimate Type
31	Reidsville Demand_02-79-020		3.530	4.347	4.459	4.666	Demand
	Reidsville nc0046345 and nc0024881	0.594	2.097	2.582	2.649	2.772	WW Return
123	Greensboro Total Demand_02-41-010		35.240	48.485	55.312	67.399	Demand
	Lake Townsend nc0081671	0.132	4.652	6.400	7.301	8.897	WW Return
	North Buffalo Creek nc0024325	0.283	9.973	13.721	15.653	19.074	WW Return
	Ozborne nc0047384	0.737	25.972	35.733	40.765	49.673	WW Return
	Mitchell nc0081426	0.02	0.705	0.970	1.106	1.348	WW Return

Reidsville 2045 Withdrawal and Return Patterns

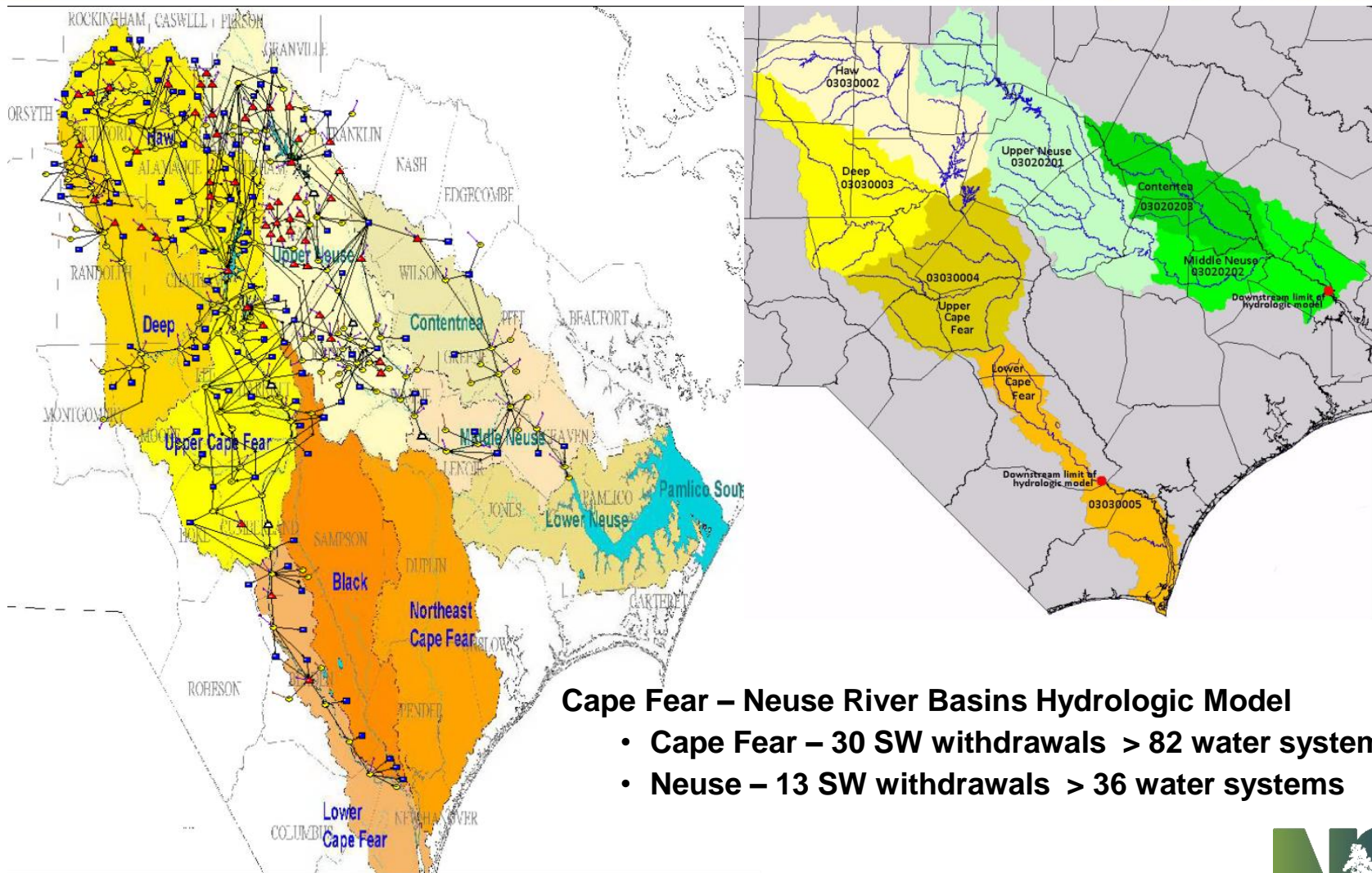


- Each water withdrawal is characterized by an individualized withdrawal and return flow pattern
- Municipal demand patterns vary by month
- Agricultural withdrawals vary by time of the year and precipitation
- Electric generating facilities are included

Hydrologic Models with Power Plants

- **Catawba-Wateree River Basin**
- **Yadkin-Pee Dee River Basin**
- **Broad River Basin**
- **Roanoke River Basin**
- **Cape Fear-Neuse River Basins**

Cape Fear-Neuse River Basins Hydrologic Model



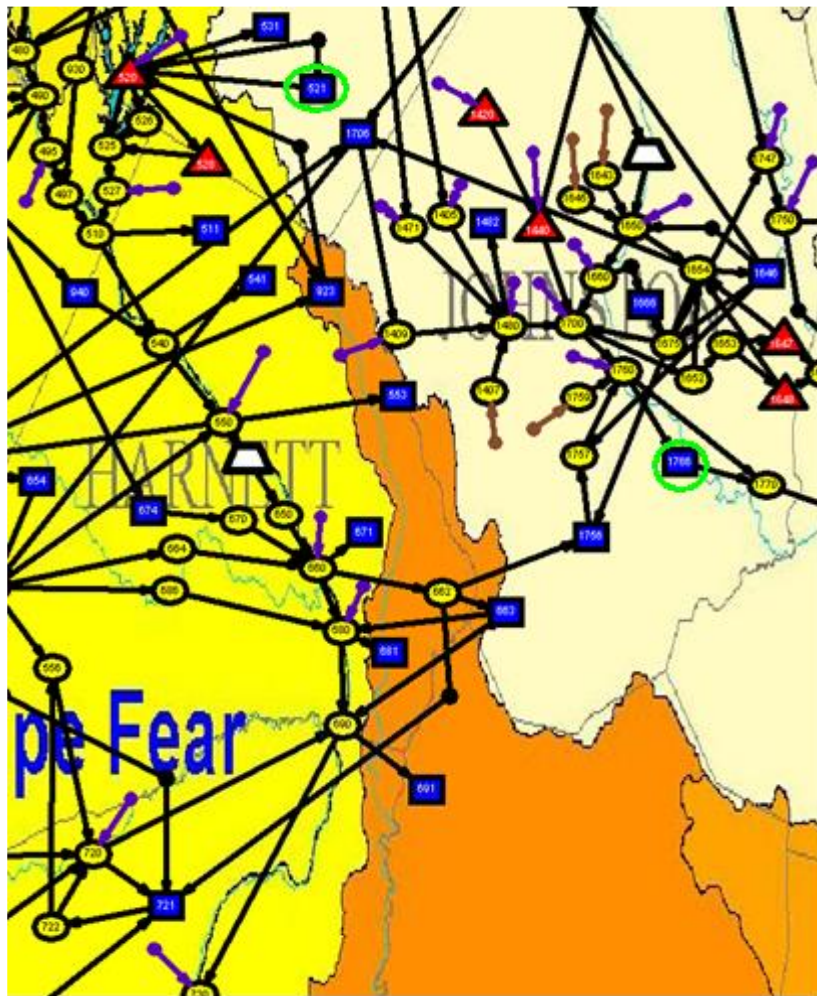
Cape Fear – Neuse River Basins Hydrologic Model

- Cape Fear – 30 SW withdrawals > 82 water systems
- Neuse – 13 SW withdrawals > 36 water systems

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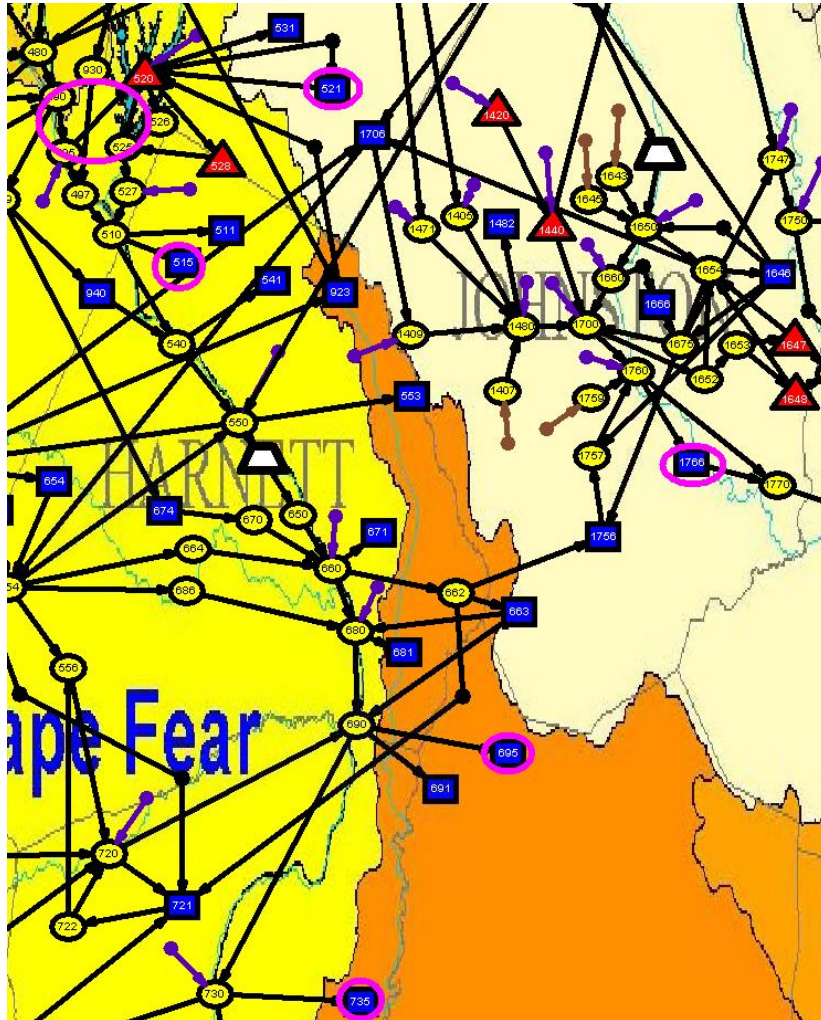


2010 Demand Model Scenario



The 2010 demand scenario included water withdrawals from Harris Lake for the existing Harris Nuclear Station and withdrawals from the Neuse River for the HF Lee Energy Complex in Wayne County.

Model Additions for Electric Generation



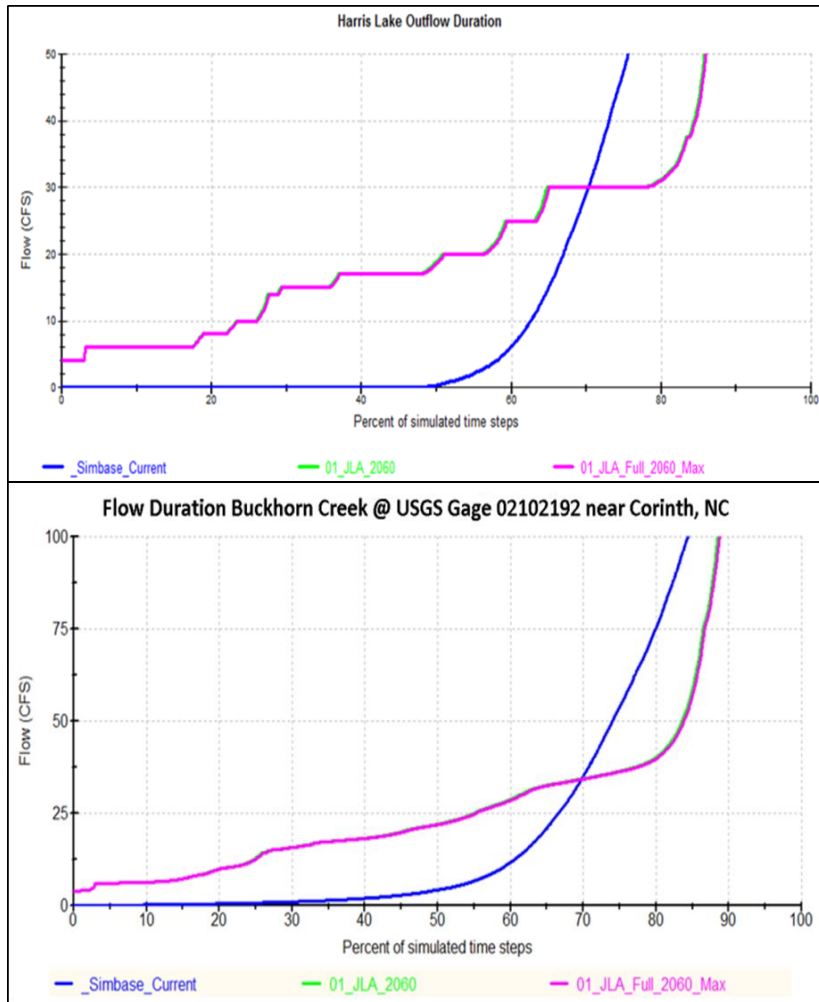
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Model revisions to address potential increases in net water withdrawals in 2045 to support increased electric generation capacity

- Increase storage in Harris Lake
- Arc 495.520_Cape Fear River withdrawal to supplement Harris Lake
- Habitat based releases from Harris Lake to Buckhorn Creek
- 35 mgd @ Node 521_Larger withdrawal for Harris Nuclear Station
- 8 mgd @ Node 515_Possible Combined Cycle Station in Chatham County
- 4 mgd @ Node 695_Possible Combined Cycle Station in Cumberland County
- 8 mgd @ Node 735_Possible Combined Cycle Station in Southern Cumberland County
- 4 mgd @ Node 1766_Possible Combined Cycle Station at HF Lee Energy Complex in Wayne County



Harris Lake Outflow and Buckhorn Creek Flows



Before its acquisition by Duke Energy, Progress Energy proposed an increase to generating capacity at the Harris Nuclear Station in Wake County. Studies of that proposal identified needs to:

- raise water level in the reservoir
- supplement inflow to Harris Lake using a withdrawal from the Cape Fear River
- require minimum releases from Harris Lake into Buckhorn Creek

The revised hydrologic model used for the Cape Fear River Surface Water Supply Evaluation and the Jordan Lake Water Supply Allocation Recommendations includes these features