February 16, 2016

*Department of Environmental Quality*

# *Freshwater in the North Carolina Coastal Plain: Understanding and Preparing for 21st Century Challenges*

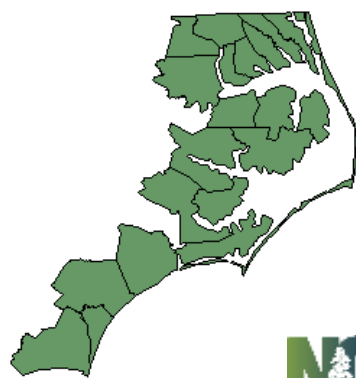
Ian McMillan
Chief, Basin Planning Branch
Division of Water Resources
Department of Environmental Quality

***Where is the water going? Accommodating needs and demands from diverse sectors and stakeholders***
February 16, 2016


3

North Carolina

| | |
|---|---|
| Beaufort | Hertford |
| Bertie | Hyde |
| Brunswick | New Hanover |
| Camden | Onslow |
| Carteret | Pamlico |
| Chowan | Pasquotank |
| Craven | Pender |
| Currituck | Perquimans |
| Dare | Tyrrell |
| Gates | Washington |



4

## River Basin Water Supply Planning

A tool to:

- Support long range, sustainable management of North Carolina's water resources
- Provide a reliable, quantitative method to plan for sustainable water use
- Provide an objective basis for management and regulatory decisions

5

We will utilize the Cape Fear Water Supply Evaluation and Central Coastal Plain Capacity Use Area (CCPCUA) as surrogates for water use in the Coastal Plain of the state.

6

The Cape Fear River Water Supply Evaluation is being developed as directed by House Bill 186/SL 2015-196, titled Cape Fear Water Resources Availability Study. The Cape Fear River Water Supply Evaluation focuses on the amount of water available from sources used by communities, industry and agricultural operations. While the analysis may show that water is available from a particular source, some water utilities may have to increase the pumping or treatment capacity to deliver the desired amount of water to meet customer demands in 2060. The Cape Fear – Neuse River Basins Hydrologic Model used for this analysis does not reserve water to protect ecological integrity and it does not include water quality data.

7

The OASIS hydrologic model characterizes surface water quantity conditions over the range of flows represented by the 81-year historic record. It characterizes water quantity conditions by evaluating the effects of withdrawals and inflows as water flows downstream from the headwaters to the model's terminal node where streamflows become tidally influenced.

This map shows the geographic boundaries and the subbasin designations used in this analysis. The red dots in each basin show the downstream limits of the Cape Fear – Neuse River Basins Hydrologic Model.

8

Surface water can be withdrawn from a stream or river as it flows past an intake, a run-of-river intake, or it can be withdrawn from an impoundment. Such an impoundment can be a managed reservoir which can control releases downstream or it can simply be a structure in the channel that creates a pool of water at the height of the structure and allows water to flow unrestricted over the top of the structure. The lock and dam facilities in the Cape Fear River are examples of the latter arrangement.

Managed reservoirs impound water during high flow periods for later use when stream flows would otherwise be insufficient to meet withdrawal demands and management goals. Run-of-river intakes simply withdraw a portion of the water in the stream as it flows by with withdrawals limited by the amount of water in the channel or by limits established to meet environmental management goals.

9

For planning purposes the potential yield or available supply can be estimated for reservoirs and run-of-river intake locations, but the methods for determining the yields are different. The potential yield of surface water sources is the amount of water that can be withdrawn during low flow or drought conditions. The potential yield is determined from data on the amount of water that is likely to be available based on the water that was available during a defined period in the recent past.

Run-of-river intake systems differ from reservoirs in that they are typically limited by the water flowing in the source stream with no ability to augment water supply during extended dry weather periods. During moderate to high flows this is not a problem. However, during low flow periods this inability to augment flows using stored water can be extremely critical. In some cases, even short-term low flow events can result in water shortages if alternative sources are not available to augment water supplies.

A commonly used estimate of expected low flow levels is a measure of flow called the “7Q10.” The 7Q10 low flow is the lowest average flow for seven consecutive days expected to occur on average once in 10 years based on the historic record.

10

Streamflows and water availability estimates generated by the model depend on the wastewater discharge volumes assumed in the model. If the assumptions about the proportions of withdrawals that are discharged as treated wastewater are changed then the flow estimates, and therefore the water availability estimates, will change. The model does not reserve water to protect ecological integrity nor does it limit withdrawals to volumes that would not threaten water quality in the vicinity of the withdrawal.

The results of this analysis show that, based on the assumptions in the model, including some increases in water allocations from Jordan Lake reservoir, there appears to be enough water to meet the estimated withdrawals needed to meet 2060 demands. Some communities may have to implement their water shortage response plans during droughts to manage demand and some communities may have to develop additional infrastructure to make use of it.

11

The Cape Fear Basin portion of the model includes the 27 surface water withdrawals in the Cape Fear River and its tributaries above Lock & Dam #1 in Bladen County. These withdrawals support 82 community and industrial water systems in the Cape Fear and the Neuse River Basin. The Neuse River Basin portion of the model includes the 13 surface water withdrawals in the Neuse River and its tributaries above New Bern. These withdrawals support 36 community and industrial water systems in the Neuse and the Cape Fear River Basin.

12

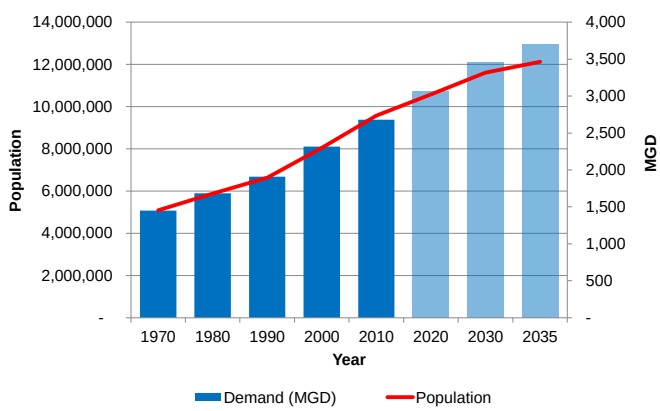
# Agricultural Water Use Survey

- Session Law 2008-143
- Prior to 2008, no official data set to represent agriculture
- Required NCDACS – ASD to collect annual information
- Who withdraw 10,000 gpd or more in any one day
- Survey remain confidential & combined with other reports to produce totals
- 6th statewide survey
- 88% response rate


Data from 2014 NC Agricultural Water Use Survey, NCDACS-ASD

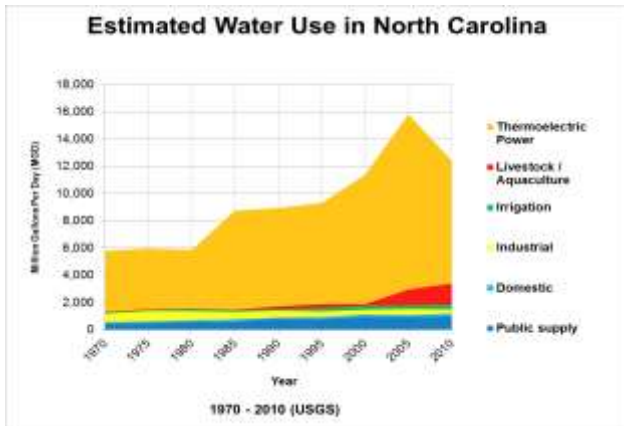
13

# State Water Resources Outlook



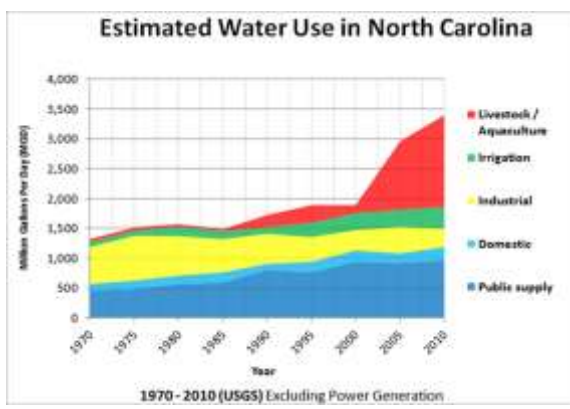

14

## Water Resources Outlook

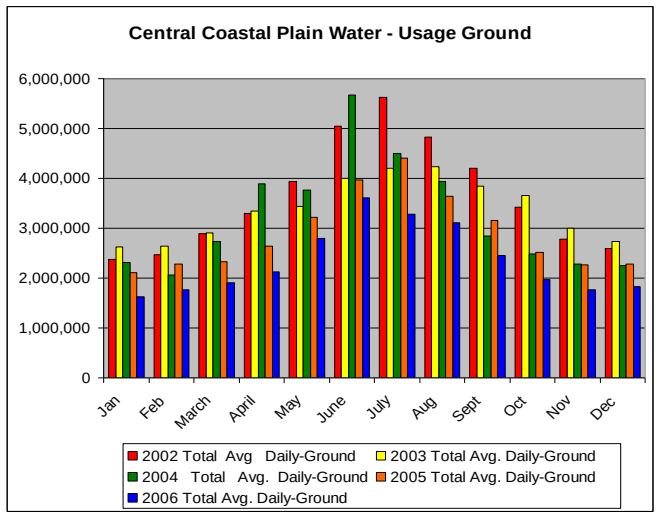



15

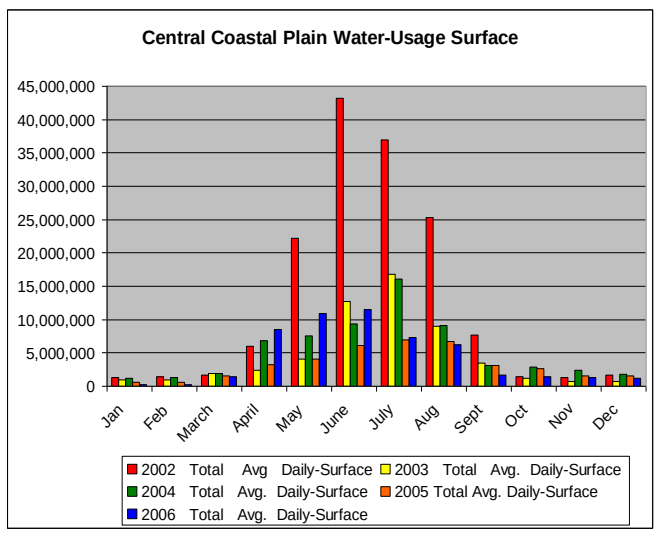
## Water Resources Outlook



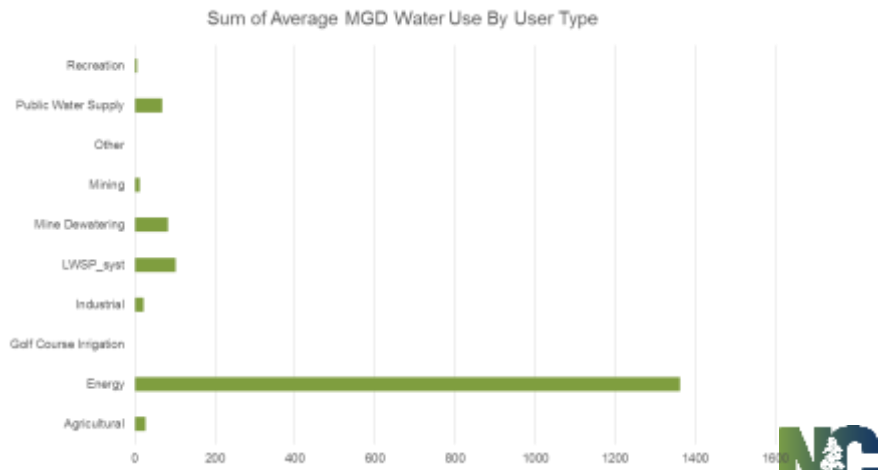

16


Central Coastal Plain Water - Usage Ground
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec
2002 Total Avg Daily-Ground
2003 Total Avg. Daily-Ground
2004 Total Avg. Daily-Ground
2005 Total Avg. Daily-Ground
2006 Total Avg. Daily-Ground

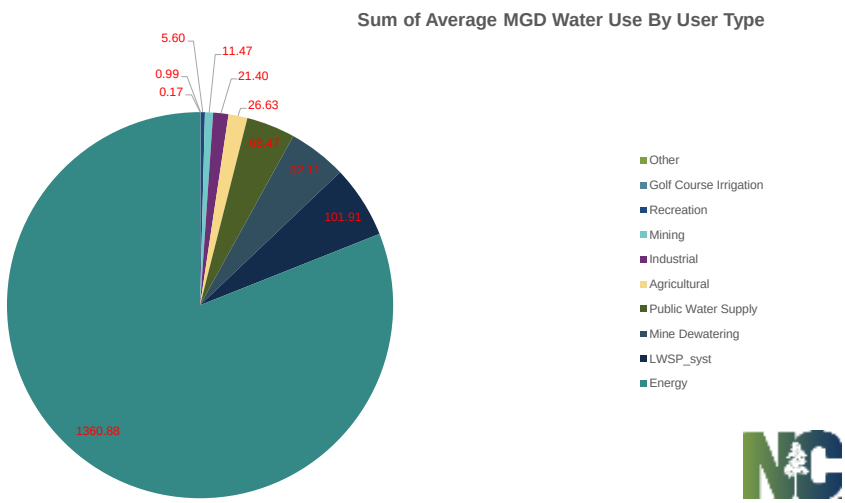
17


Central Coastal Plain Water-Usage Surface
45,000,000
40,000,000
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec
2002 Total Avg Daily-Surface
2003 Total Avg. Daily-Surface
2004 Total Avg. Daily-Surface
2005 Total Avg. Daily-Surface
2006 Total Avg. Daily-Surface

18


Sum of Average MGD Water Use By User Type
Recreation
Public Water Supply
Other
Mining
Mine Dewatering
LWSP_syst
Industrial
Golf Course Irrigation
Energy
Agricultural
0
200
400
600
800
1000
1200
1400

19


Sum of Average MGD Water Use By User Type
5.60
11.47
0.99
0.17
21.40
26.63
68.47
82.11
101.91
1360.98
Other
Golf Course Irrigation
Recreation
Mining
Industrial
Agricultural
Public Water Supply
Mine Dewatering
LWSP_syst
Energy

20

Central Coastal Plain Capacity Use Area (CCPCUA)


15 counties in the central portion of the Coastal Plain

Currently 289 permit holders and 64 active registrations

21

## Central Coastal Plain CUA

- 1 Capacity Use Area in NC – CCPCUA
- Covers 15 eastern Counties in NC
- Intended to prevent “de-watering” & salt water encroachment in aquifer
- Registration required for withdrawals > 10,000 gpd.
- Permit required for withdrawals > 100,000 gpd
- 206 active permits at this time
- Phased reduction of withdrawals also mandated
- Beginning August 2013 20-50% reductions for certain areas seeing water level decline or salt water intrusion
- 2018 begins phase 3 reductions of 30-75% from initial base rate

22

# QUESTIONS



## Contact Information

Ian McMillan
Basin Planning Planning Branch
Division of Water Resources
919-707-9026
Ian.mcmillan@ncdenr.gov