NC Water Resources Planning
April 4, 2011

Tom Fransen

North Carolina Division of Water Resources

“Water links us to our neighbor in a way more profound and complex than any other.“

-John Thorson

We expect a lot from our river basins.

- Aquatic Habitat
- Riparian Habitat
- Pollution Dilution
- Water Supply
- Power Generation
- Recreation

DWR
Division of Water Resources

The water wars of the West have moved east. The explosive growth of Atlanta is draining nearby rivers in the Southeast, threatening ecosystems and livelihoods in a region unused to resource shortages.

Marcello Ballve,
Pacific News Service

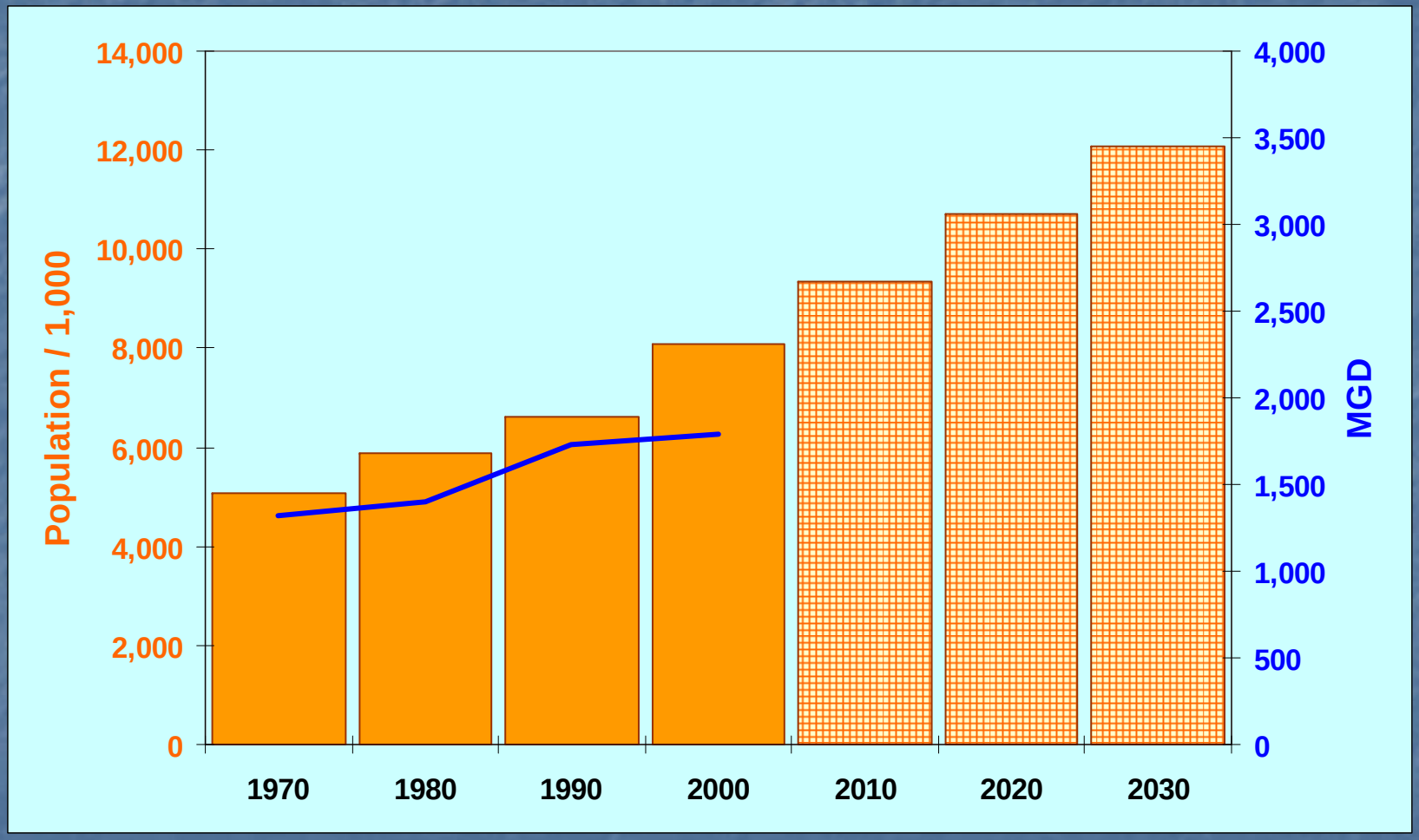
Water Wars

Whose water is it and WHY do I need a permit to use it?

2010 Ratified Bills

- Improve River Basin Modeling – H1743
  - Specifies what will be included in a basin model and models will be approved by the EMC.
- Water Infrastructure Information Needs – H1746
  - Improve the collection and utilization of water and wastewater infrastructure information.
- Water Supply System Capacity Planning – H1747
  - Revise LWSP when demand exceeds 80% of supply to show how future needs will be met.
- Amend WQ/IBT Laws – H1765
  - Applicants pay the notification costs and coastal "isolated river basins" follow the old .22I process until 7/1/2020.

Will we have enough water to meet the needs of a growing population?



NC water use excluding power generation

Drought Critical Period
Summer of 2002

Towns desperate for water

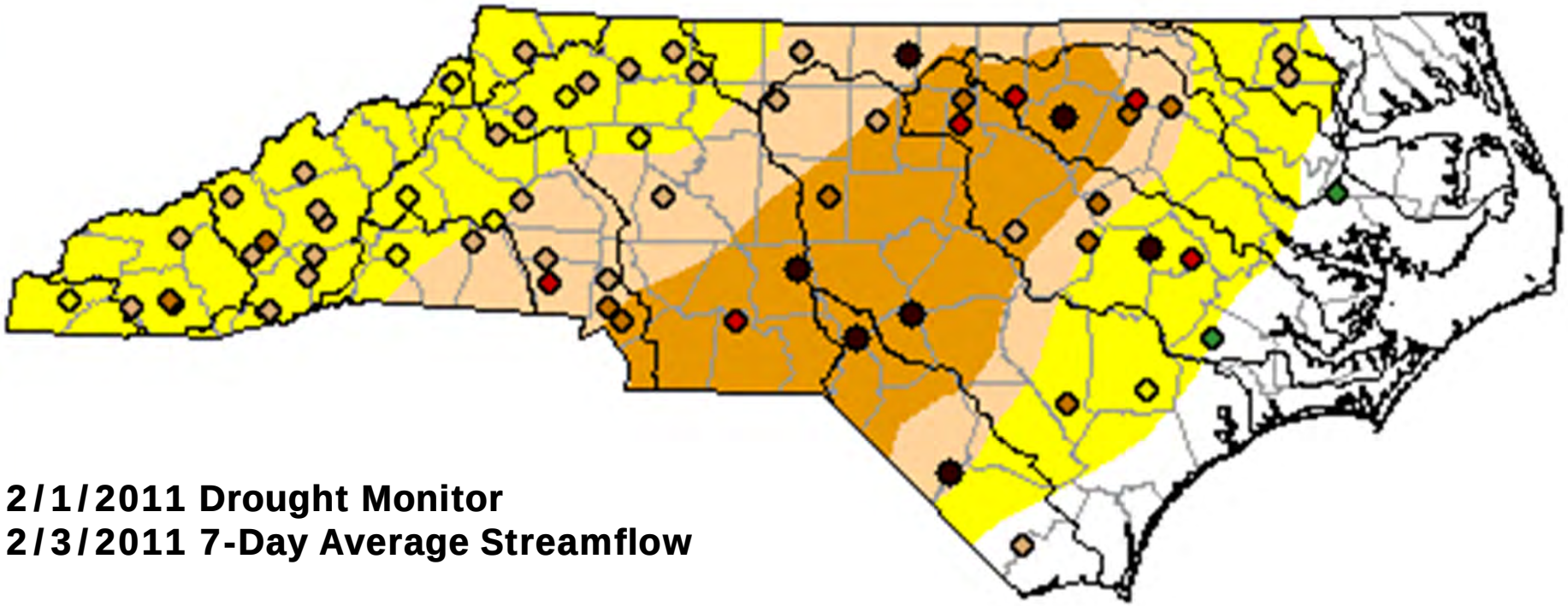
Above, Clint Beam, a Shelby firefighter, monitors a jury-rigged system that draws water from the city of Kings Mountain through the Cleveland County water system to Shelby. Using the fire truck as a pumping station, 870 gallons per minute are processed.

STAFF PHOTOS BY MEL NAT HANSON

Worst-hit Piedmont communities begin pumping or trucking in water and further tightening restrictions

Under global warming drought could overtake much of the world by 2030.
UCAR 10/19/2010

Current Drought Conditions



2/1/2011 Drought Monitor
2/3/2011 7-Day Average Streamflow

	D4 Exceptional	D3 Extreme	D2 Severe	D1 Moderate	D0 Abnormally Dry	Normal	Wet
Drought Intensity							
Percentile Classes	<2	2-5	5-10	10-20	20-30	30-70	>70
7-Day Average Streamflow	●	●	●	●	●	●	●

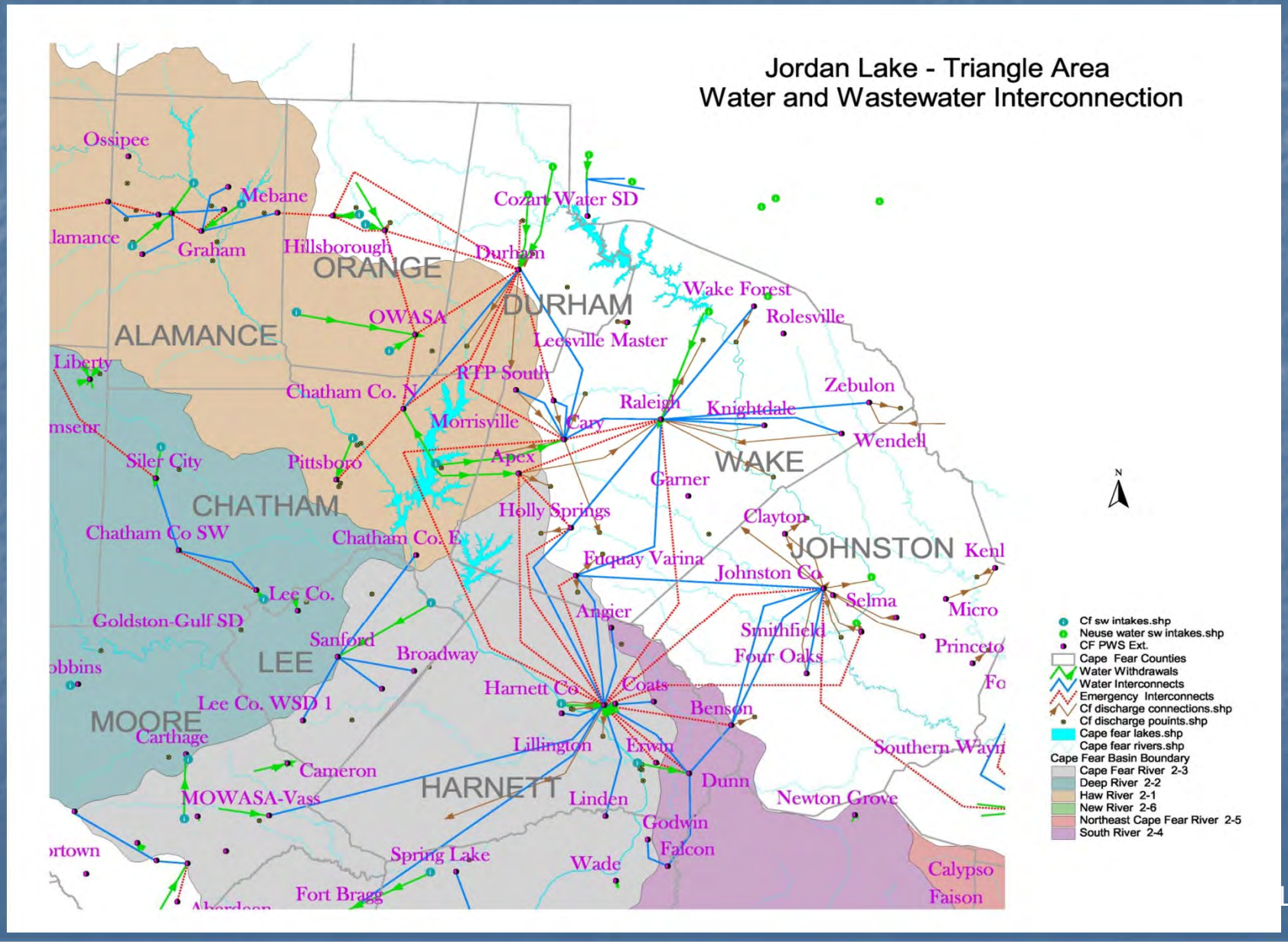
What North Carolina Is Doing To Provide Water Supplies For Future Needs.

- Focus 3 Major Areas
  - ***Data for Water Management***
  - Water Supply Planning
  - Regulation

Surface Water Gaging
Ground Water Monitoring

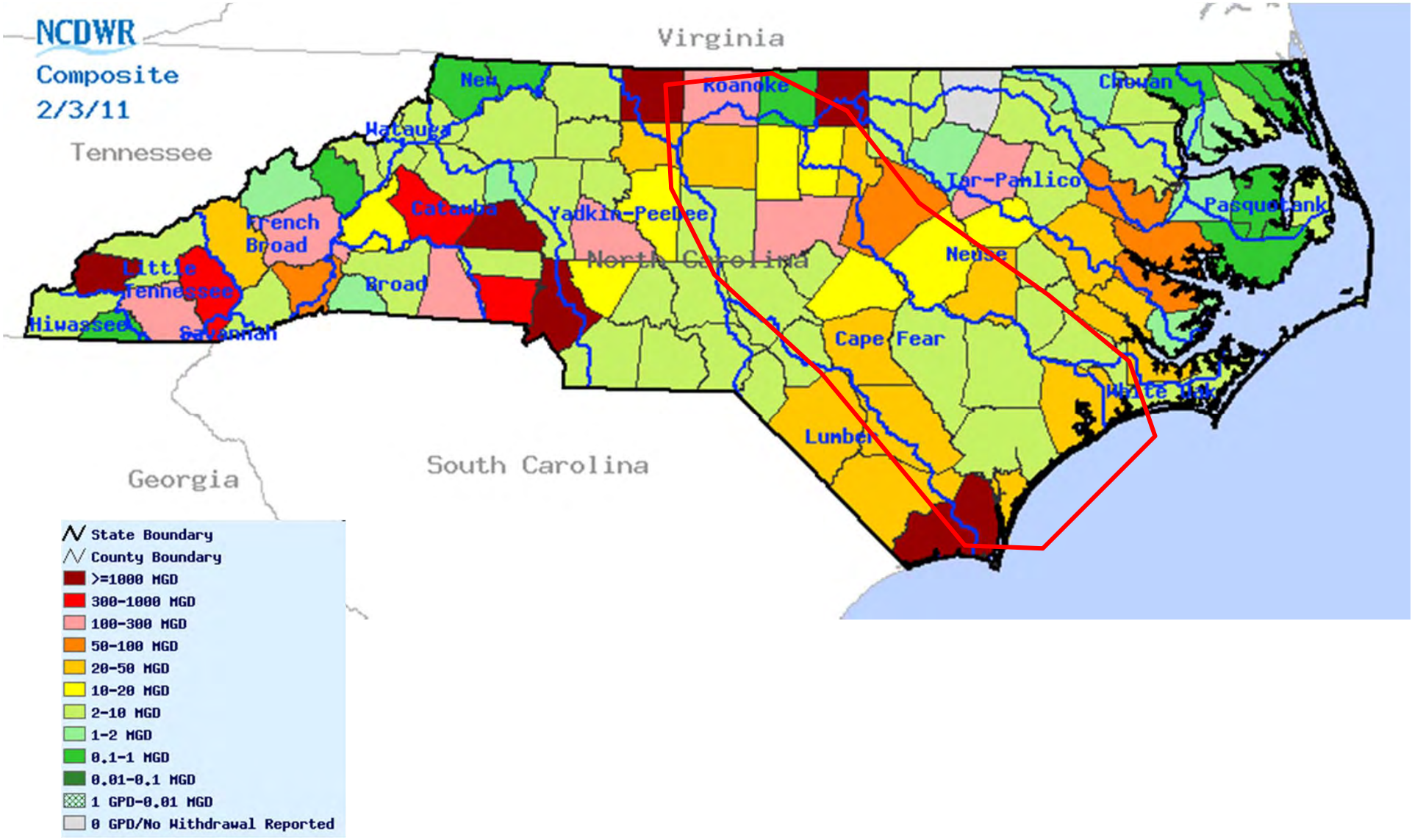
- Gage downstream of Jordan Dam in operation

Water Systems



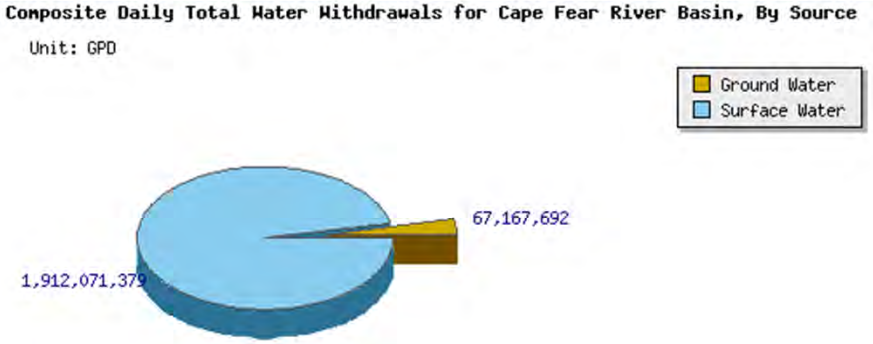
Cape Fear Water Withdrawals

http://www.ncwater.org/Water_Withdrawals/

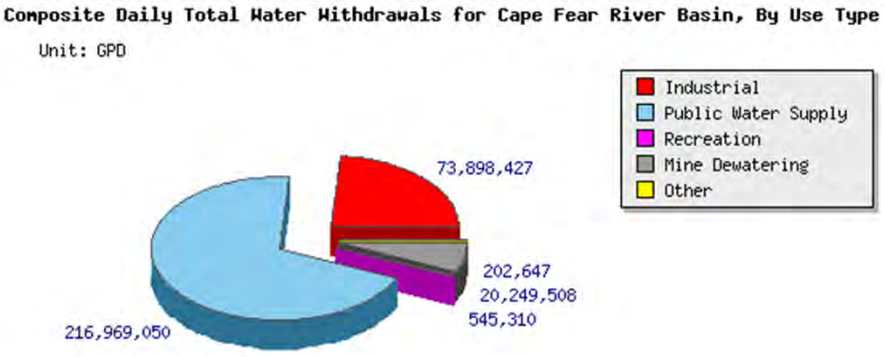


Cape Fear Water Withdrawals

Includes Thermal Electric Power



Without Thermal Electric Power



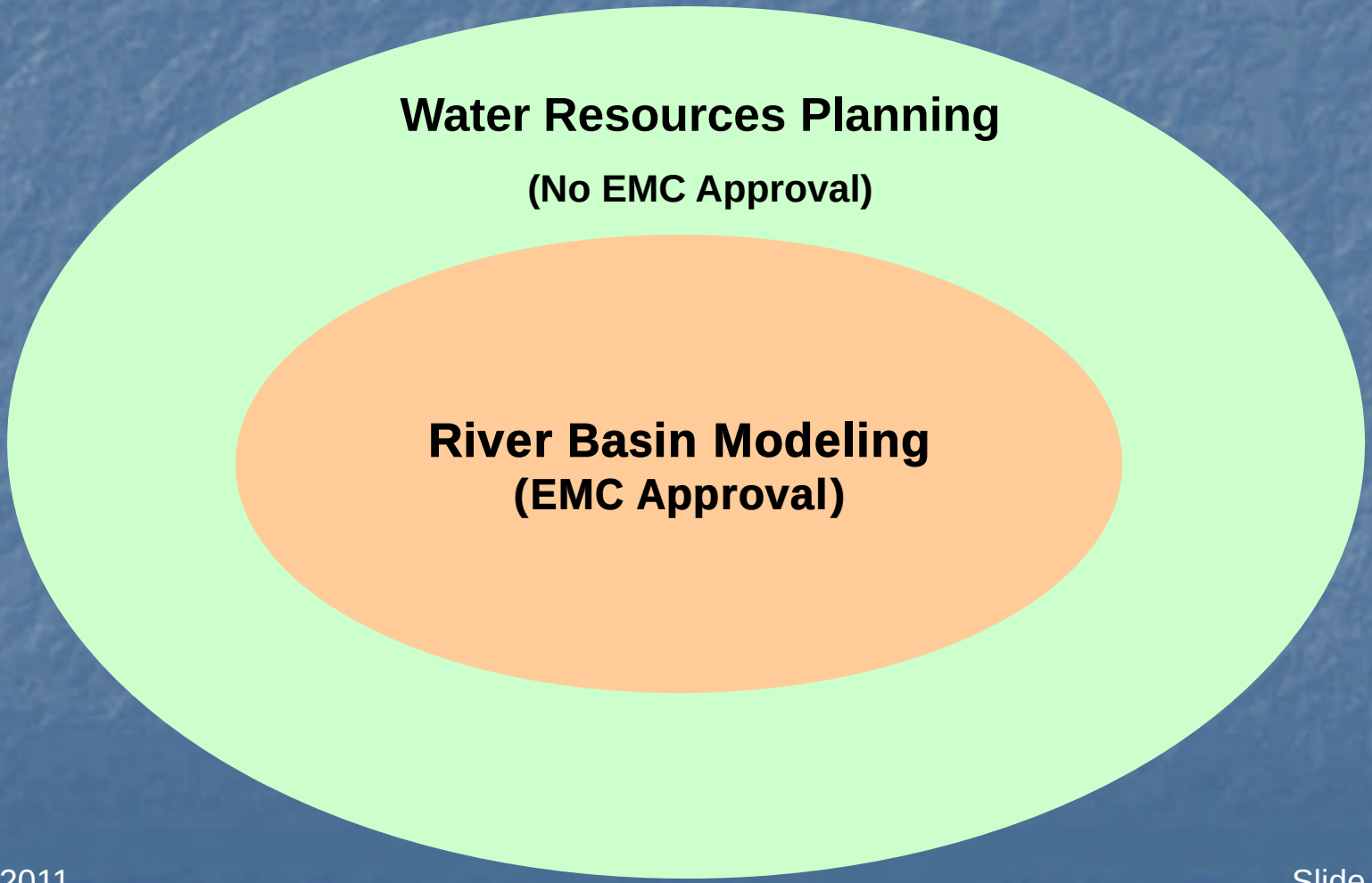
What North Carolina Needs to Do to Provide Water Supplies for Future Needs.

- Focus 3 Major Areas
  - Data for Water Management
  - ***Water Supply Planning***
  - Regulation

Value of Regional Water Supply Planning

	Total savings per mgd	Annual Net benefit per household	B/C Ratio
Atlanta	$1.48	$3.83	2.0
Boston	$3.45	$28.92	1.8
Seattle	$1.06	$6.95	2.1
Phoenix	$1.76	$10.32	4.3
Houston	$10.33	$14.44	1.7
Median	**$1.76**	**$10.32**	**2.0**

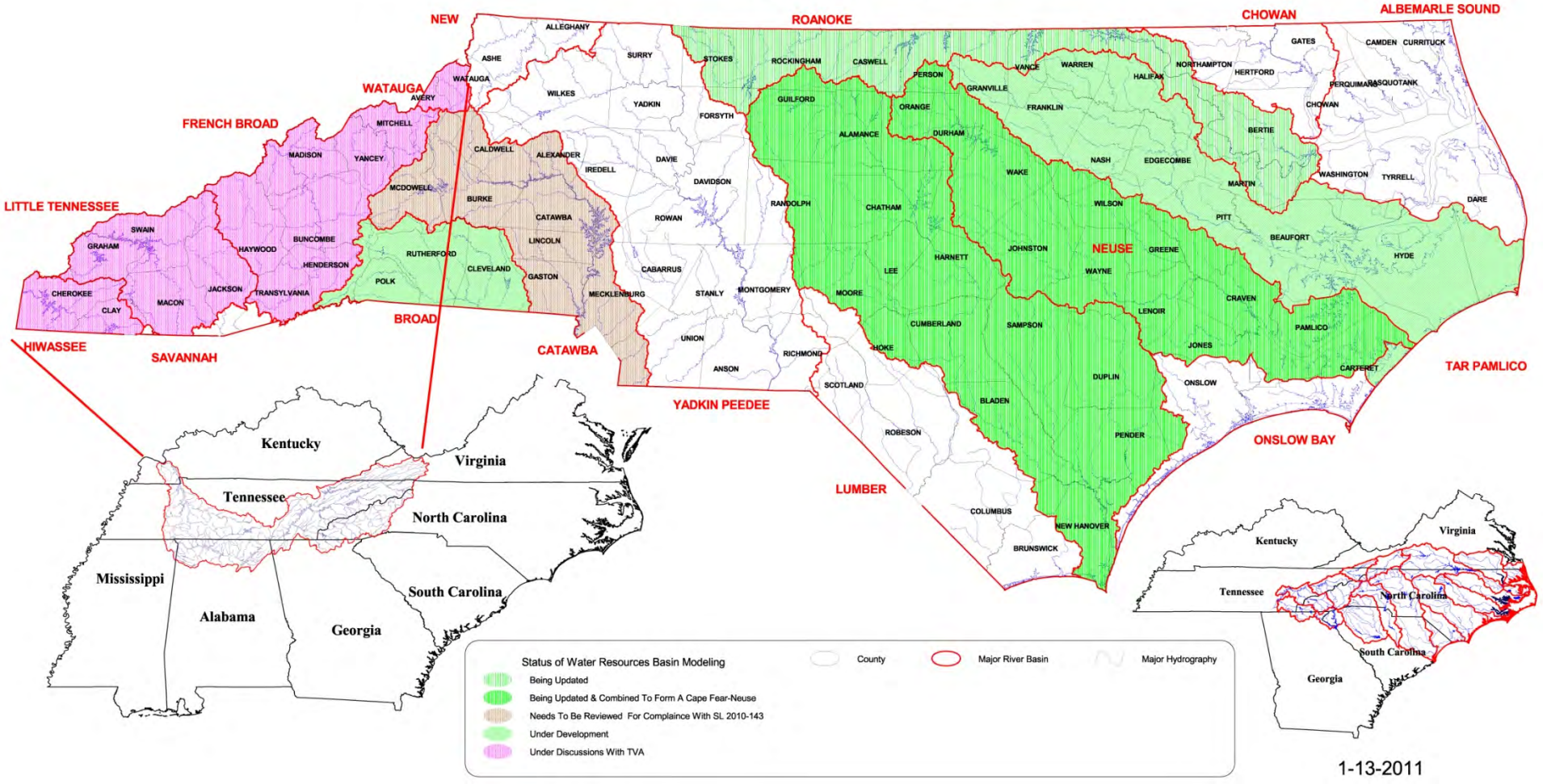
Water Resources Planning & Basin Modeling



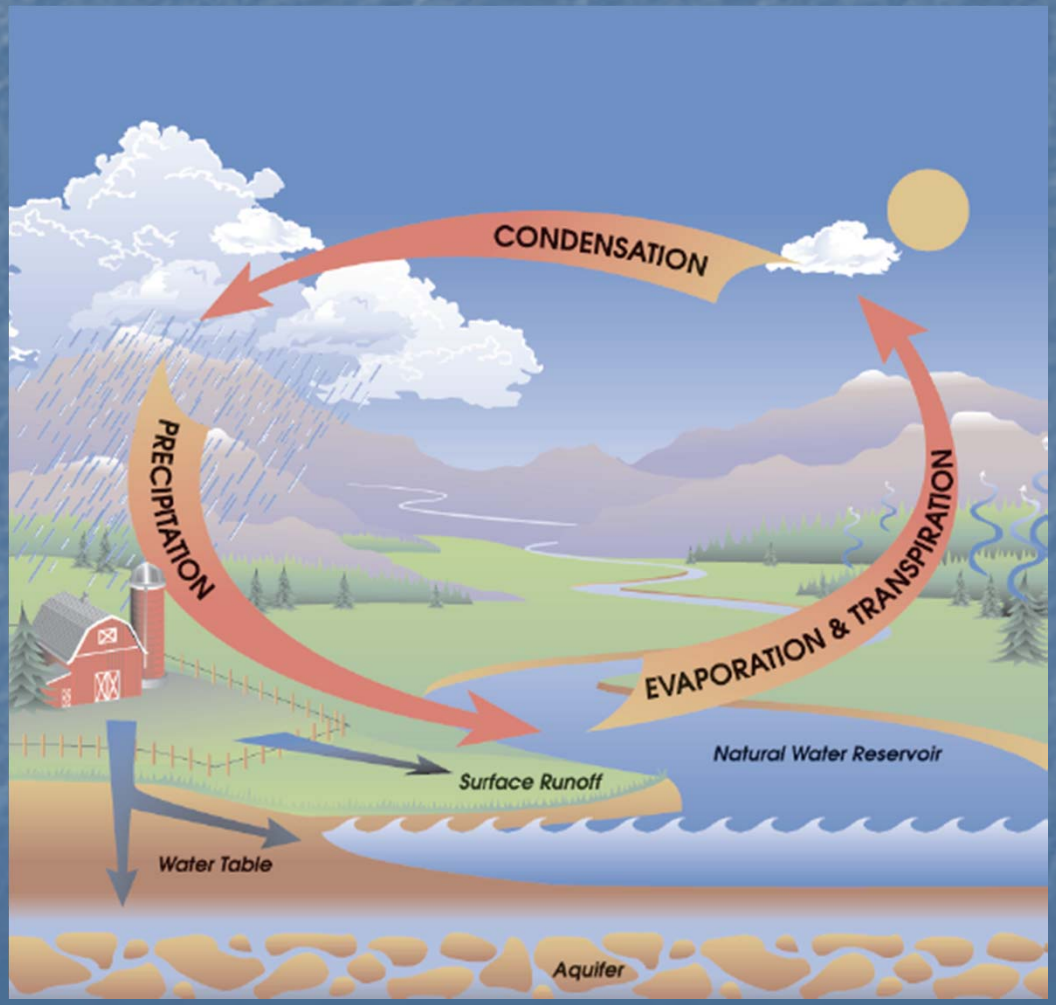
Modeling and Planning Can Help Prevent This

… If Instream Flows and Uses are Included in the Equation

Status of NC Hydrologic Basin Models



Modeling Basics
Hydrologic Cycle



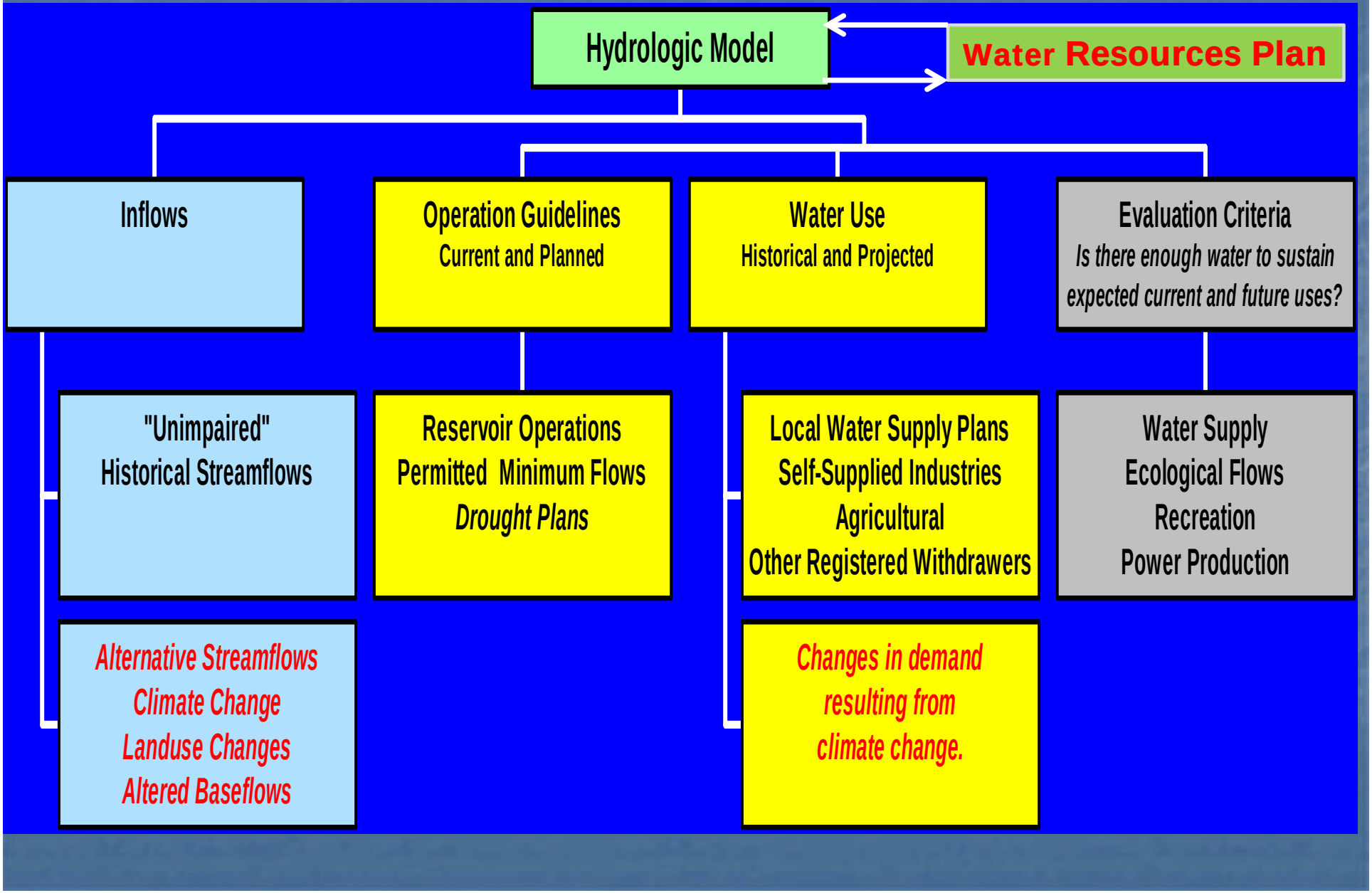
Questions

- Is there enough water to sustain expected uses now and in the future?
  - DWR does consider ecologic flows to be part of “expected uses”.
- Where, when and for how long could we expect to experience shortages?

River Basin Model Basics

- 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.

What is a River Basin Hydrologic Model?



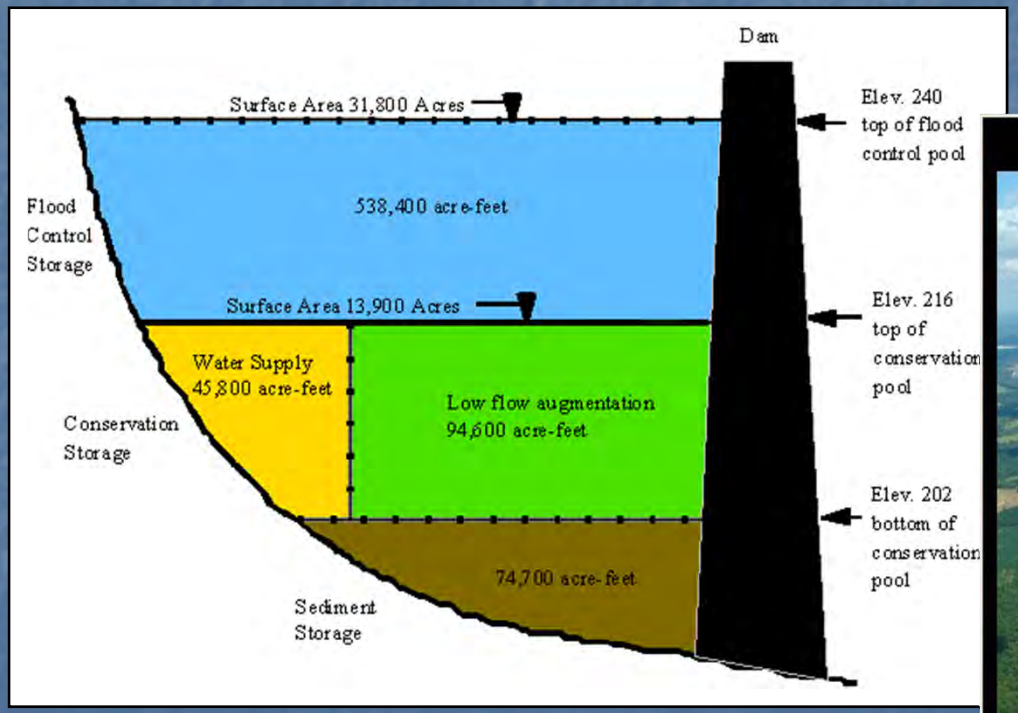
Hydrologic Stationarity

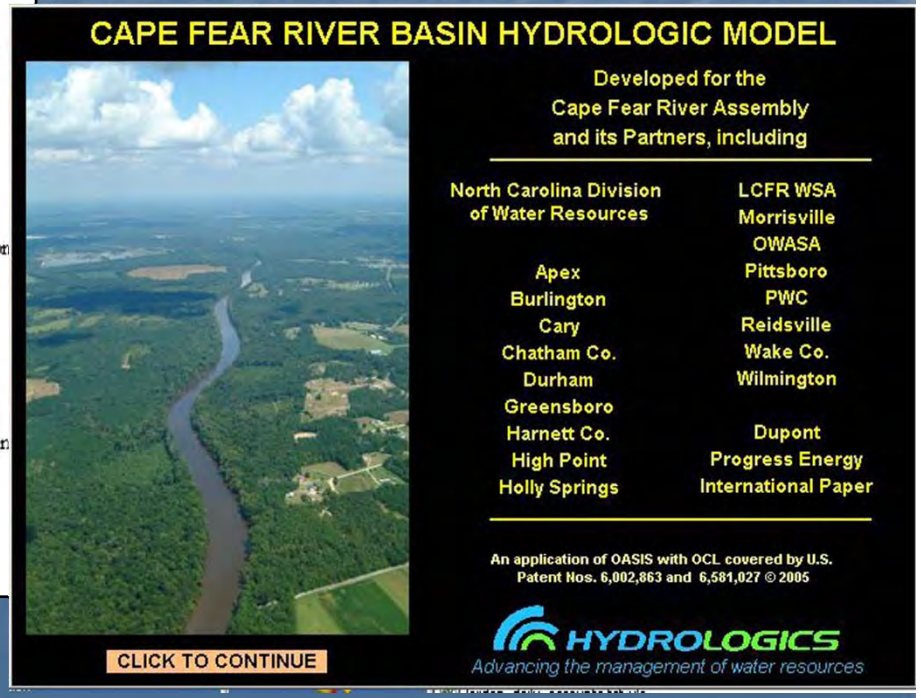
- Key Assumption – The future will be statistically indistinguishable from the past.
- Is stationarity dead?
  - Climate change and coping with non-stationarity in water and ecosystem management.

Hydrologic River Basin Modeling Software

OASIS – A modeling program for simulating water supply systems.

OASIS' Flexibility In Simulating Reservoir Operations Is One Of The Reasons We Selected It As Our Preferred Model.





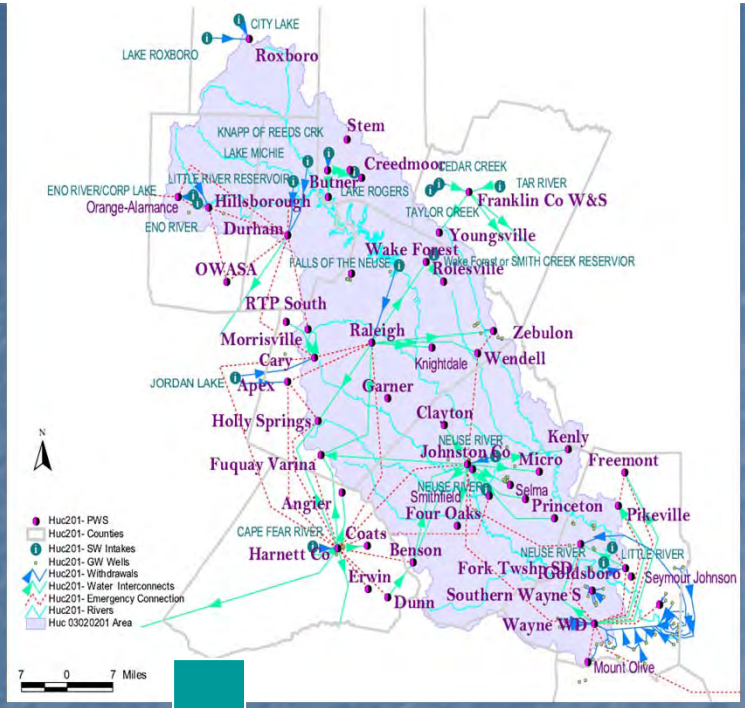
Basin Modeling Limits

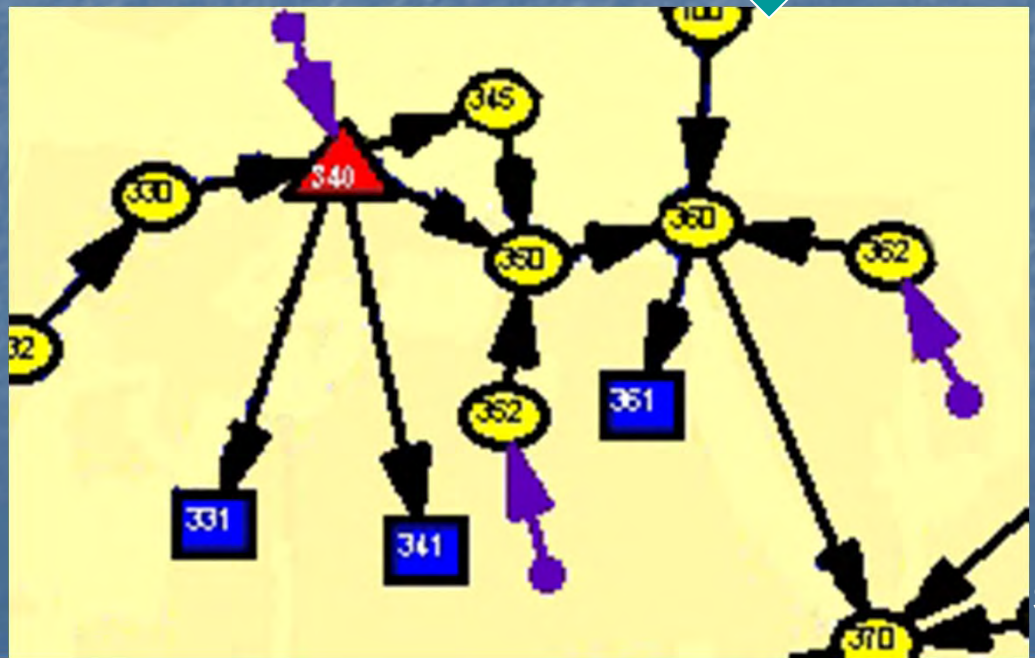
- Basin Model is not a water quality model.
  - OASIS can be linked to a water quality model.
  - The outputs can be used to define boundary conditions to a water quality model.
- The OASIS general is not the model for flood studies.
  - OASIS does use channel geometry which is needed to flood stages associated with flooding events.
  - OASIS has been successfully on the Lower Roanoke for flood plain flooding.
- The OASIS does not simulate ground water.
  - OASIS can be linked to a ground water model.
  - The outputs can be used to define boundary conditions to a ground water model.

Nodes And Arcs

Nodes are locations of interest
- Reservoirs
- Demands
- Junctions

Arcs represent flow between nodes
- Stream reaches
- Canals
- pipelines
- Groundwater seepage
- Etc.





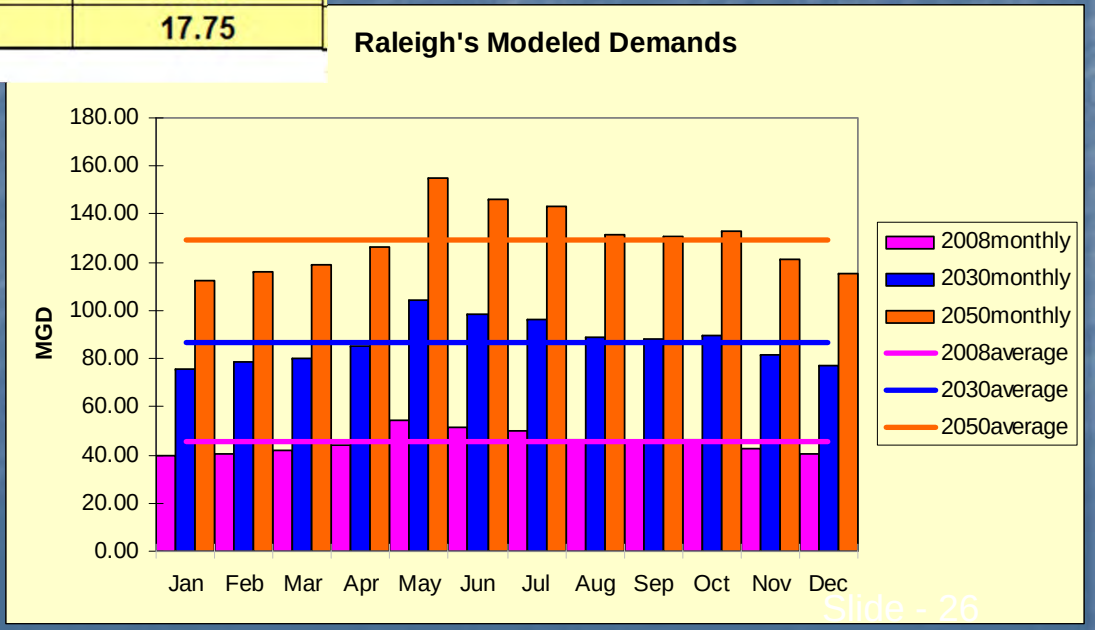
Water Demands

Annual Average Use

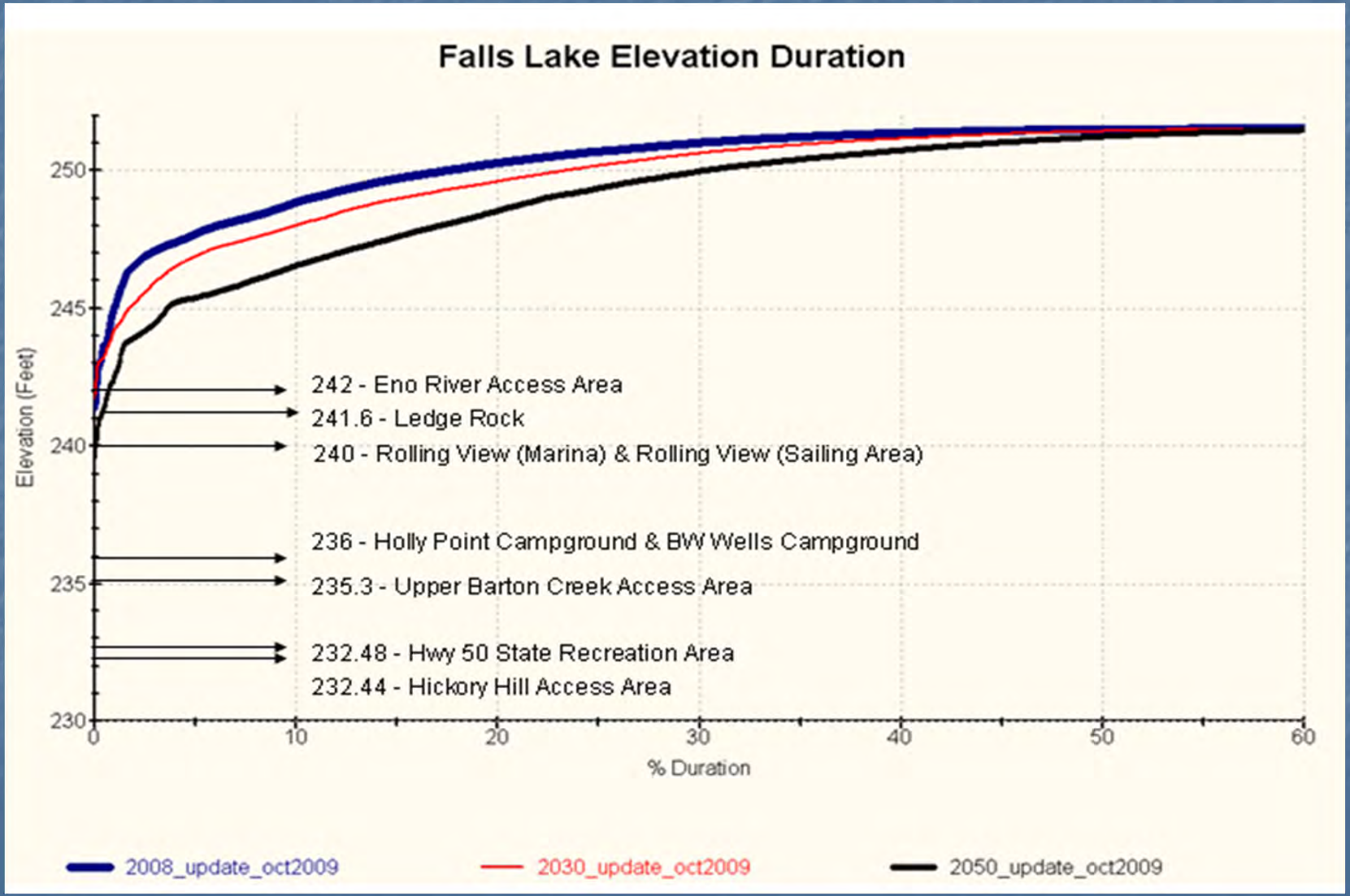
Systems	2008 Demand (MGD)	2030 Demand (MGD)	2050 Demand (MGD)
Orange-Alamance	0.161	0.19	0.21
Hillsborough	1.136	2.029	2.76
Durham	24.385	35.826	40.923
South Granville WASA	2.576	5.966	10.006
Raleigh	45.22	86.99	129.23
Wilson	8.92	11.214	13.557
Johnston County	7.201	11.854	19.598
Smithfield	2.988	4.64	5.951
Progress Energy - Lee	7.67	7.67	7.67
Goldsboro	4.645	7.733	9.928
Neuse Regional WASA	6.08	12.58	17.292
Weyerhaeuser	15.37	17.75	17.75

Source: NCDENR, Division of Water Resources

Seasonal Use Patterns



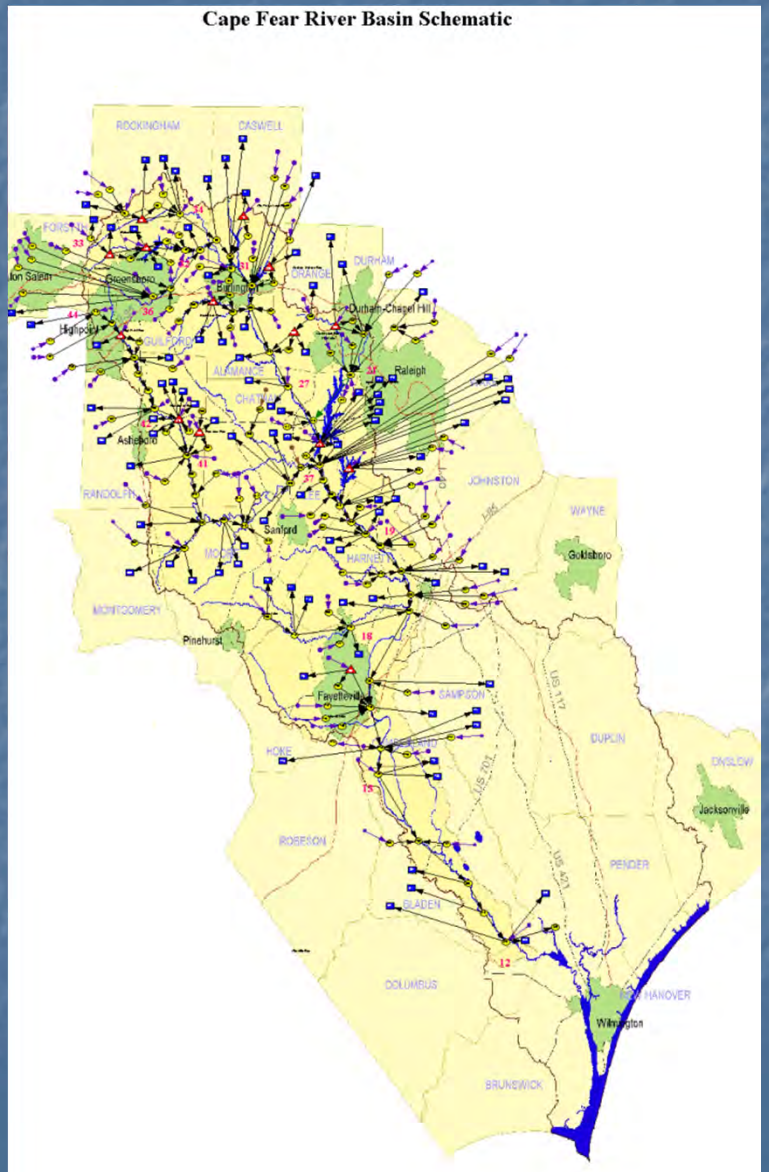
Impacts to reservoir water levels

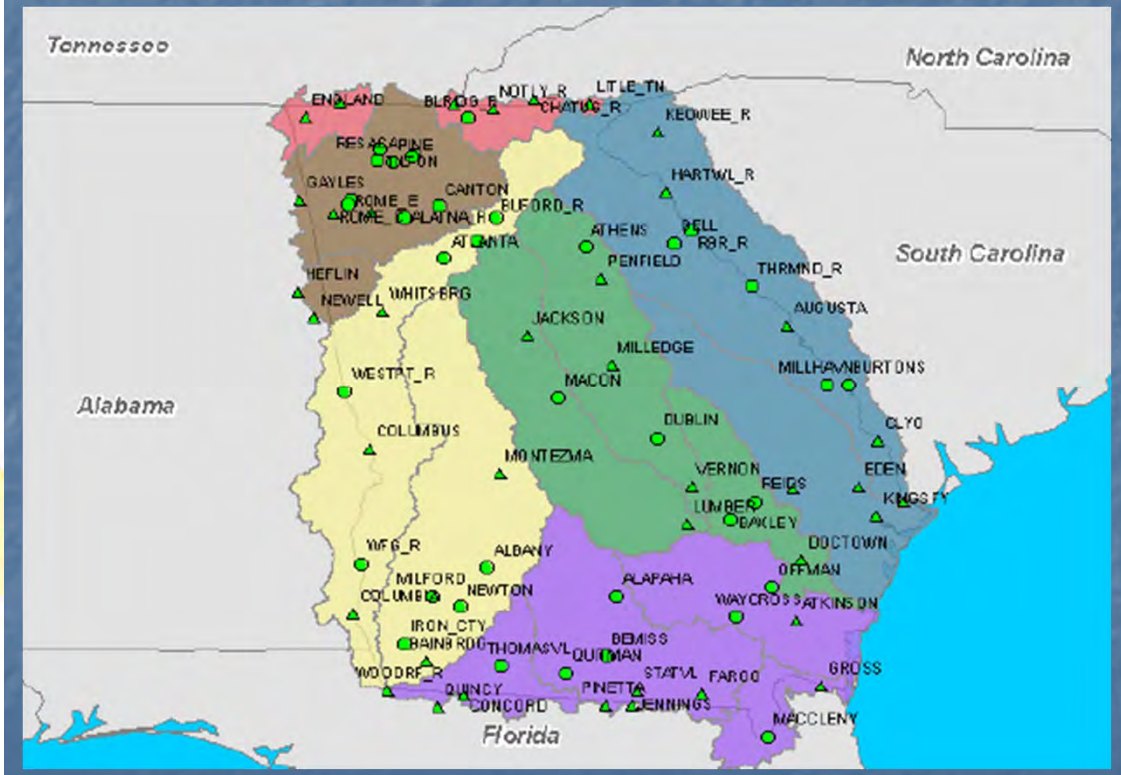


Data + Modeling = Management

- One of the most sophisticated programs in SE.
- Accomplished with a minimal amount of resources.

NC – GA Model Comparison





What North Carolina Needs to Do to Provide Water Supplies for Future Needs.

- Focus 3 Major Areas
  - Data for Water Management
  - Water Supply Planning
  - ***Regulation***

What if there is not enough water?

Projected growth greatly exceeds available supply.

- Opportunity for local solutions:
  - New sources, interconnections, IBTs, etc...
- One regulatory option currently available:
  - EMC designates area a “Capacity Use Area”
- One area in State already designated as CUA:
  - 15 Counties in Central Coastal Plain CUA.

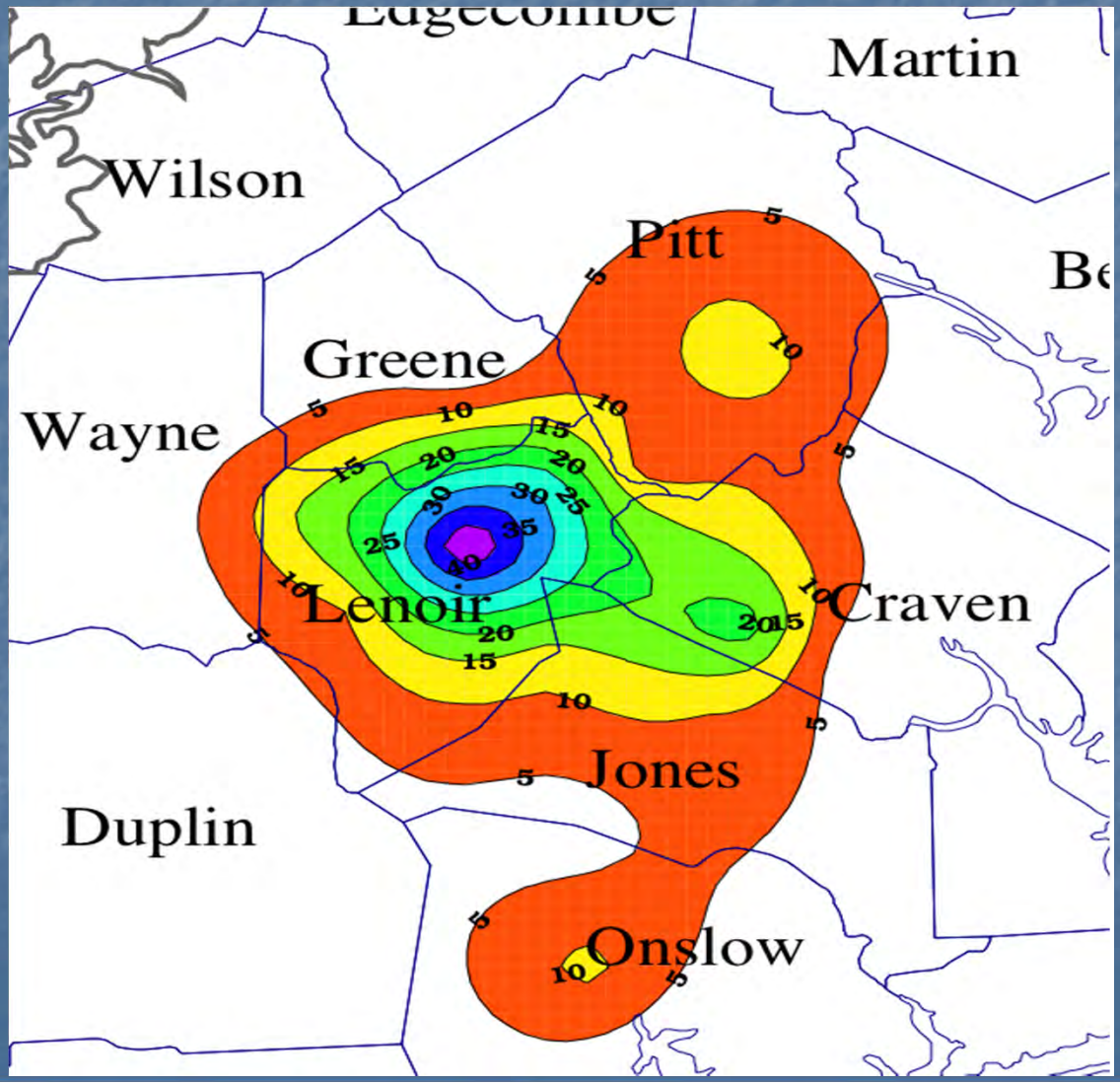
NC Riparian Rights

- Riparian property owners have right to "reasonable use" of water.
- Can not adversely affect quantity or quality.
- Maintain instream flow at "reasonable" level.
- Impairment often a water quality issue.

The Water Use Act of 1967 G.S. 143-215.11 to .22

- Phosphate mining in Beaufort County led to creation of the Water Use Act
  - Reasonable regulation to conserve and maintain water resources so they can be used to the fullest extent possible
- Central Coastal Plain Capacity Use Area – The only CUA in the State.

Black Creek Aquifer in CUA Ground Water Levels Improvement



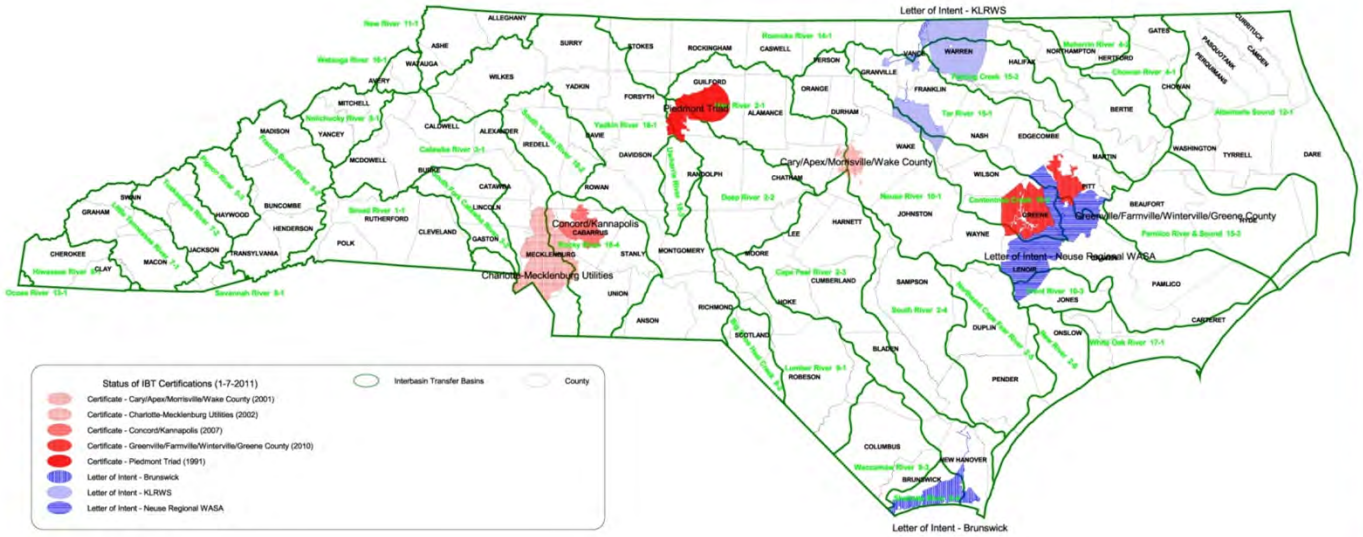
What is an Interbasin Transfer?

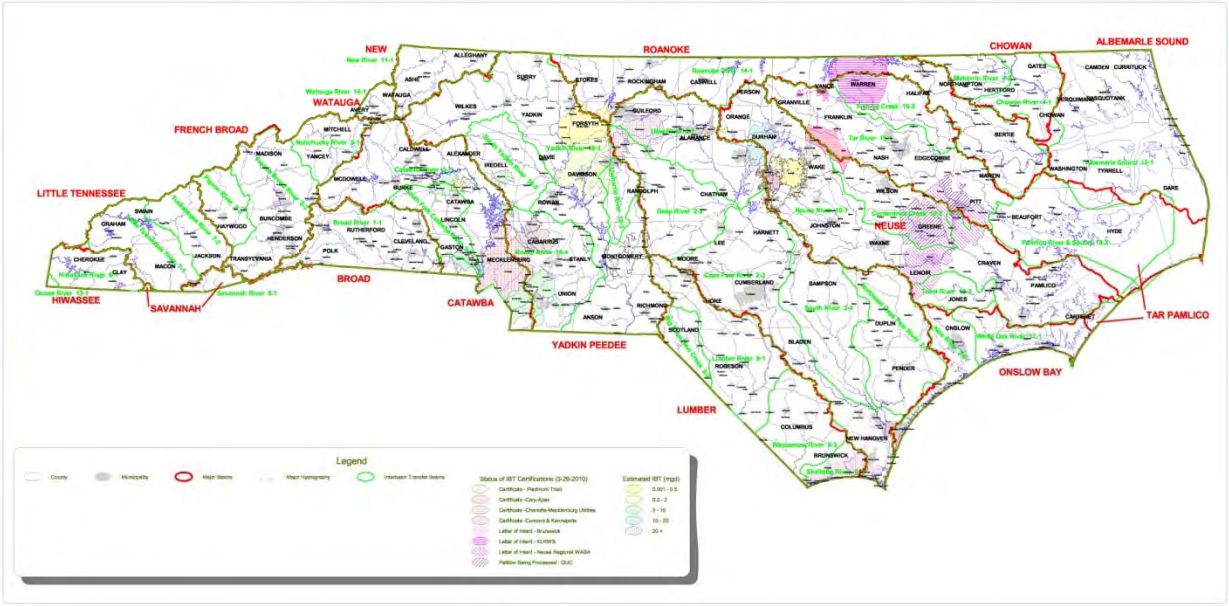
An interbasin transfer is the movement of ***surface water*** from one river basin into another.

The purpose of the Interbasin Transfer Law is to take a pause to be sure it is good public policy before moving water from one river basin into another.

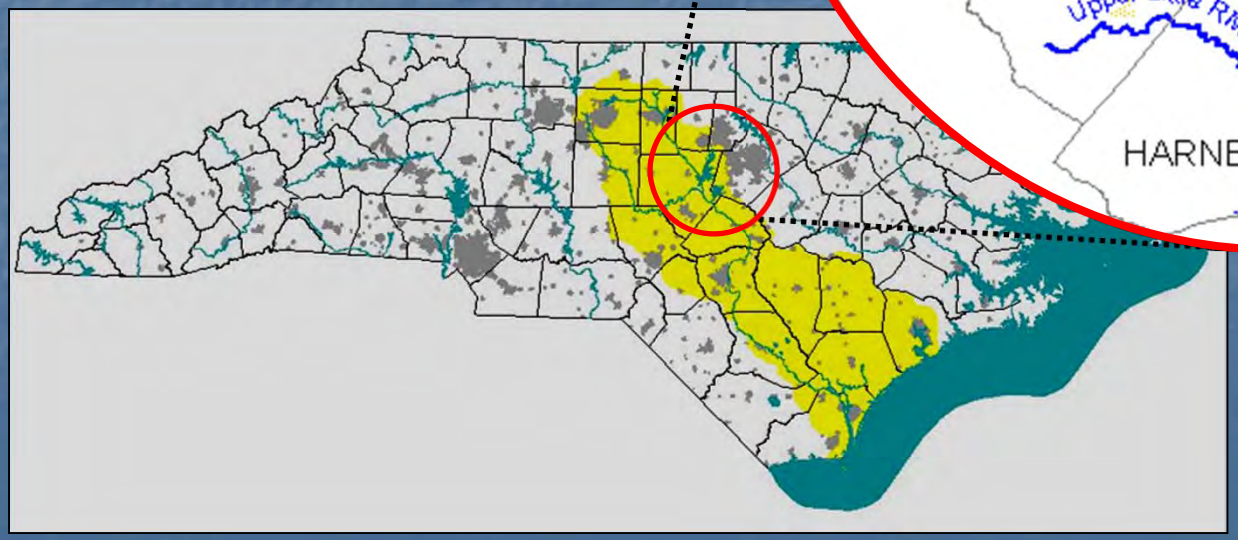
The Interbasin Transfer Law does **NOT** prohibit transfers.

NC Interbasin Transfers



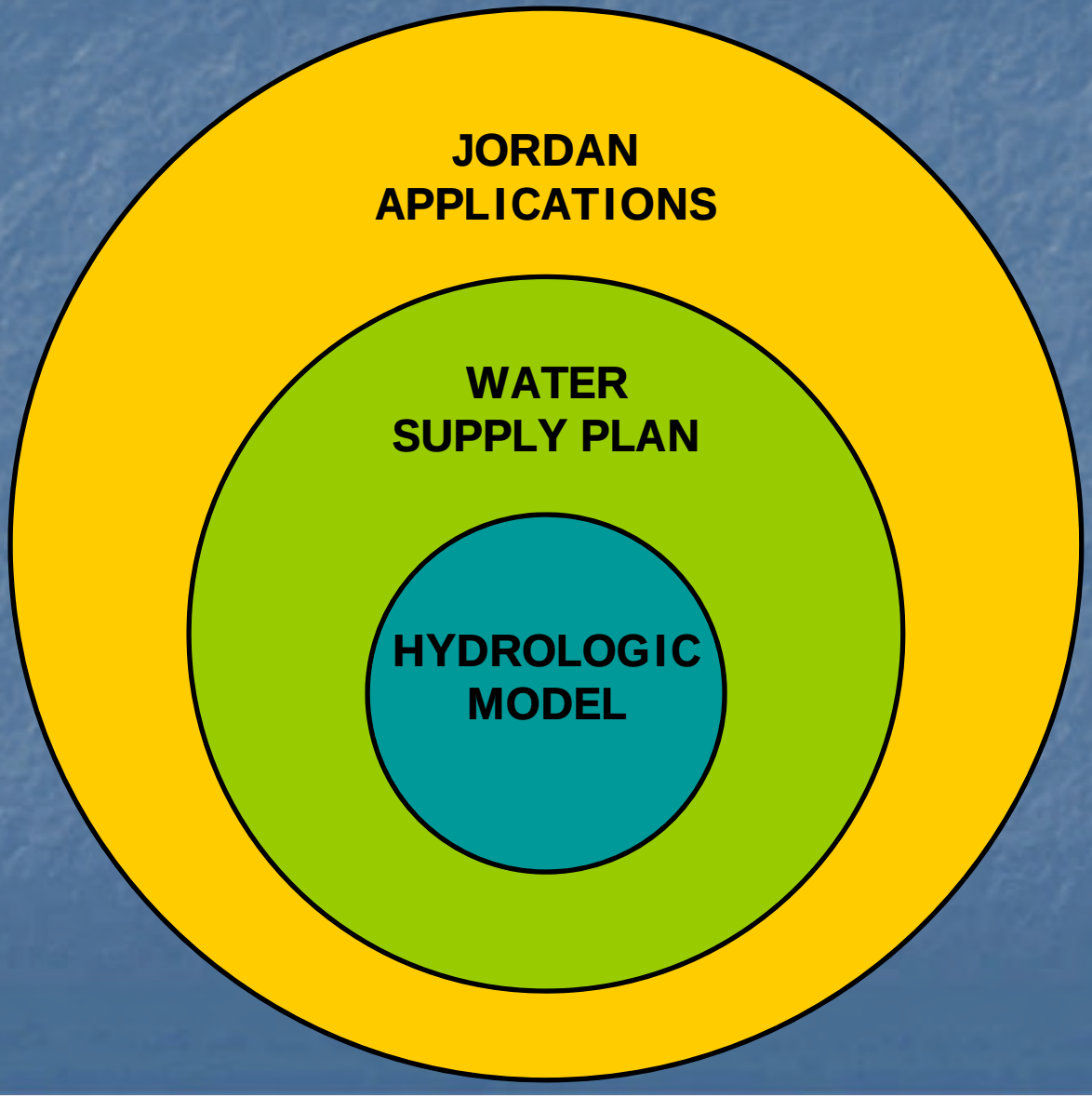


Jordan Lake Overview



Jordan Lake WS Allocation
Round 4 Allocation Process

Three Simultaneous Tracks



Addition Information

Division's Website - http://www.ncwater.org/

Today's Presentation - http://www.ncwater.org/basins/

- Data
  - http://www.ncwater.org/wrisars/
- Planning & Modeling
  - http://www.ncwater.org/basins/Cape_Fear/
- Regulation
  - http://www.ncwater.org/Permits_and_Registration/Capacity_Use/
  - http://www.ncwater.org/Permits_and_Registration/Interbasin_Transfer/
- Drought
  - http://www.ncwater.org/Drought_Monitoring/
  - http://www.ncwater.org/Drought_Monitoring/weekly.php

Questions

Contact Information

Tom Fransen
919-715-0381
Tom.Fransen@ncdenr.gov
www.ncwater.org