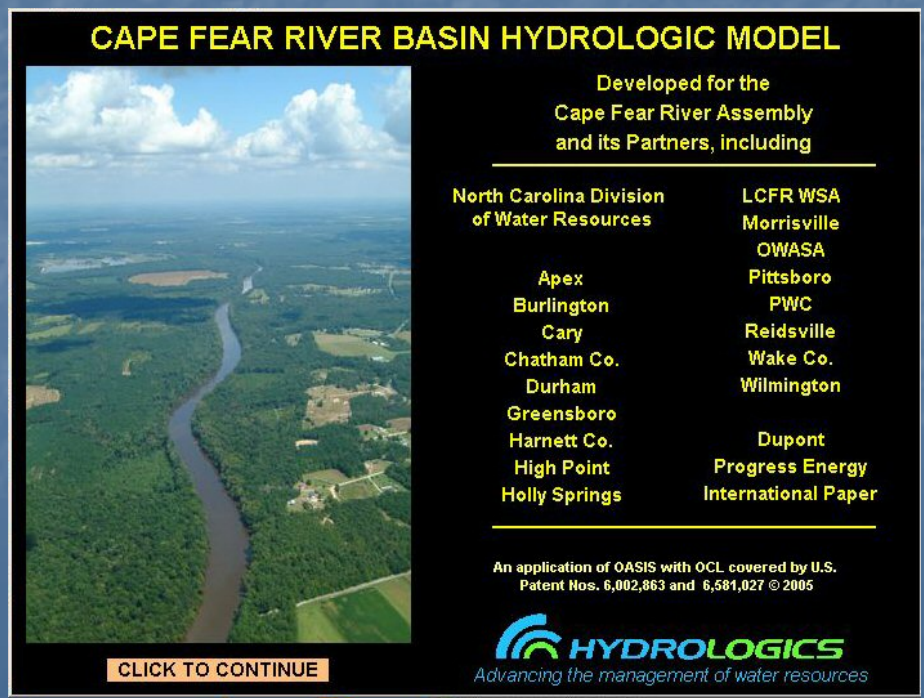
Jordan Lake Water Supply Allocations Round 4 Public Information Meeting

Cape Fear River Basin Hydrologic Model Update February 24, 2010



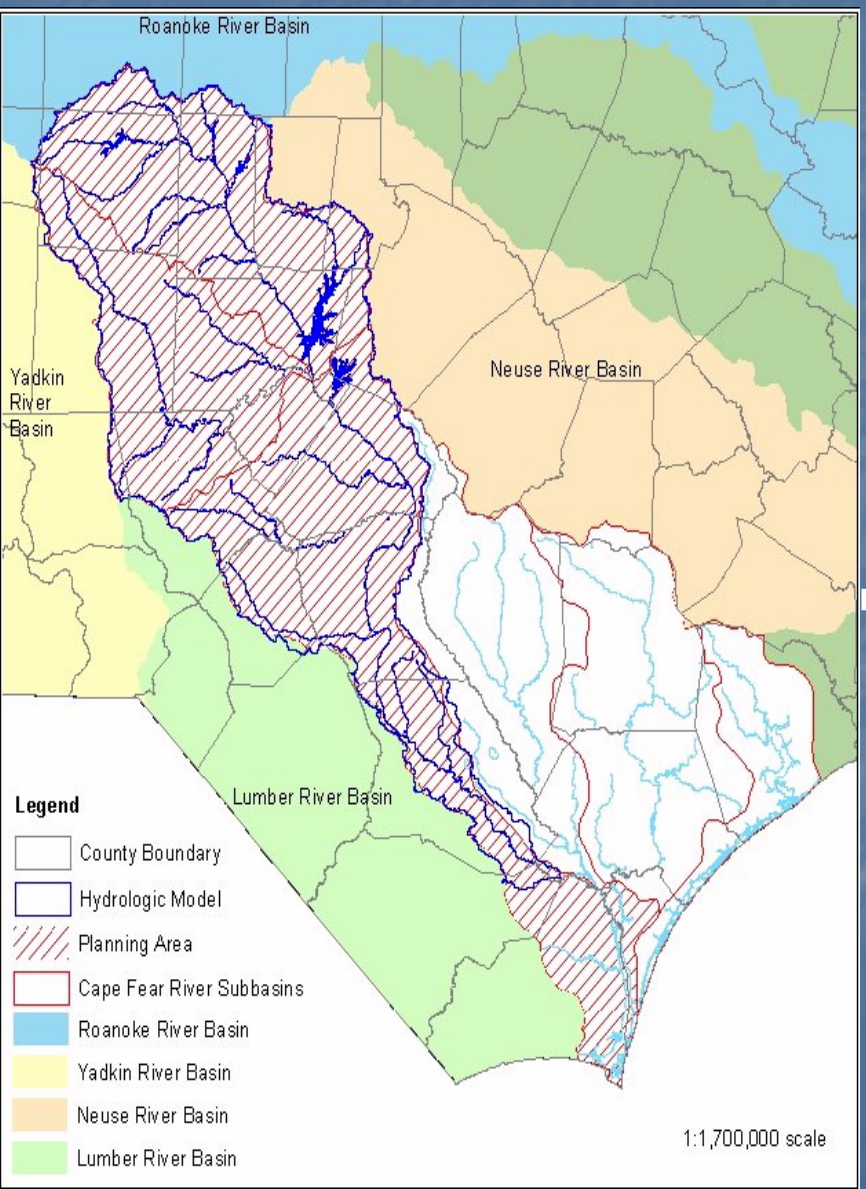
Model FAQ

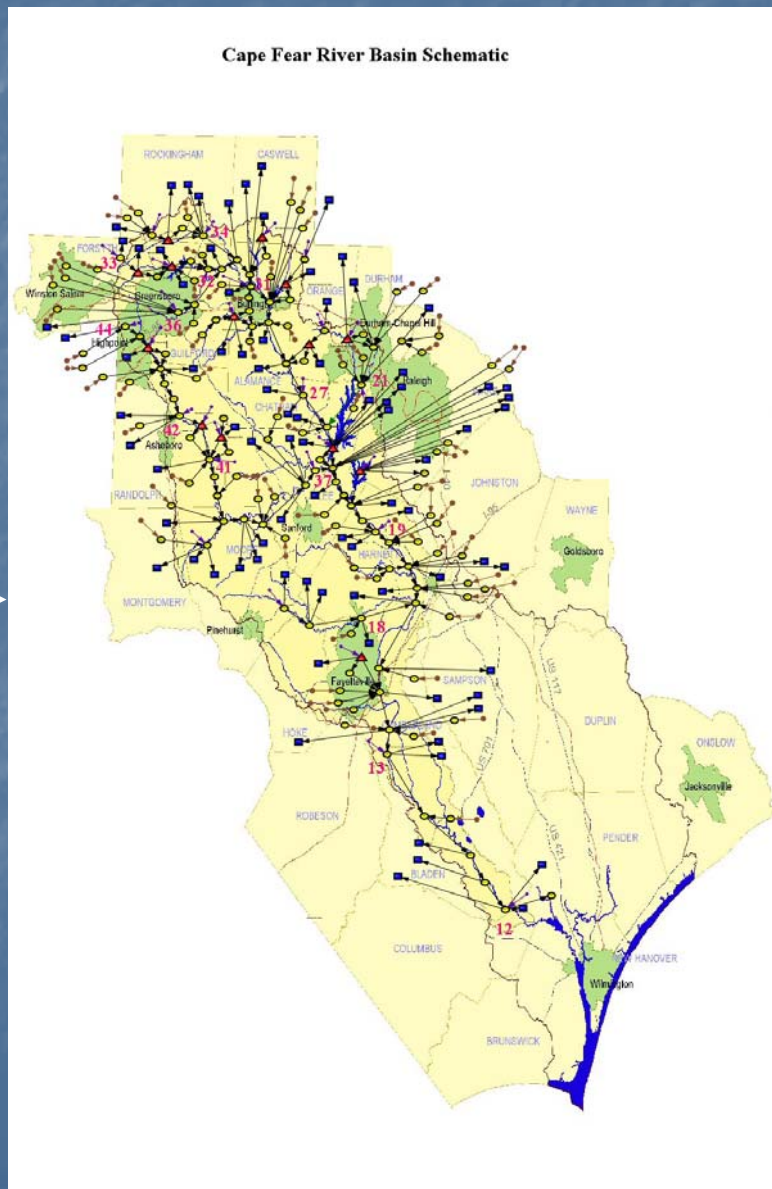
- **Who Owns the Model?**
  - The model is owned by all citizens of North Carolina..
- **Who Can Access the Model?**
  - Anyone with who needs to use the model to help manage water resources more wisely. The model is accessed via a server housed at the Division of Water Resources. Licensing constraints limit the number of people who can simultaneously access the model to five. If necessary, preference is given to water systems or representatives of water systems in the Cape Fear River Basin.
- **How Can I Open an Account?**
  - An account to access the Cape Fear OASIS model can be set up by contacting the Division of Water Resources.

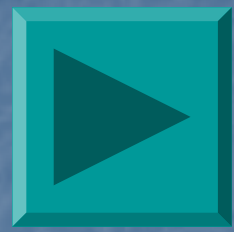
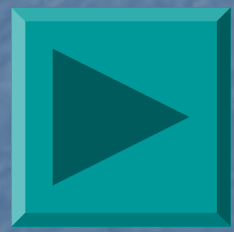
Model Limits

- This model is not a water quality model.
  - The outputs can be used to define boundary conditions to a water quality model.
- The model can not be used for flood studies.
- The model will not be helpful in studying the impacts of the removal of the lock and dams.
  - The outputs could be used to define boundary conditions to other models.
- The model does not simulate ground water.

Model Coverage





- Modeling Basics 
- Model Updates 

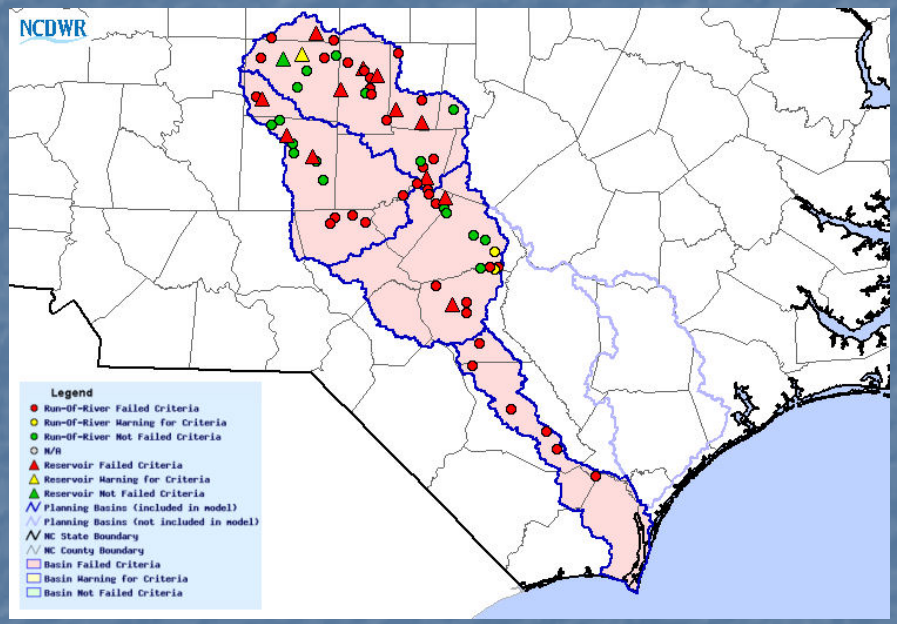
Model Updates

Water Resources Policy Act of 2009 Lessons from demonstration project.

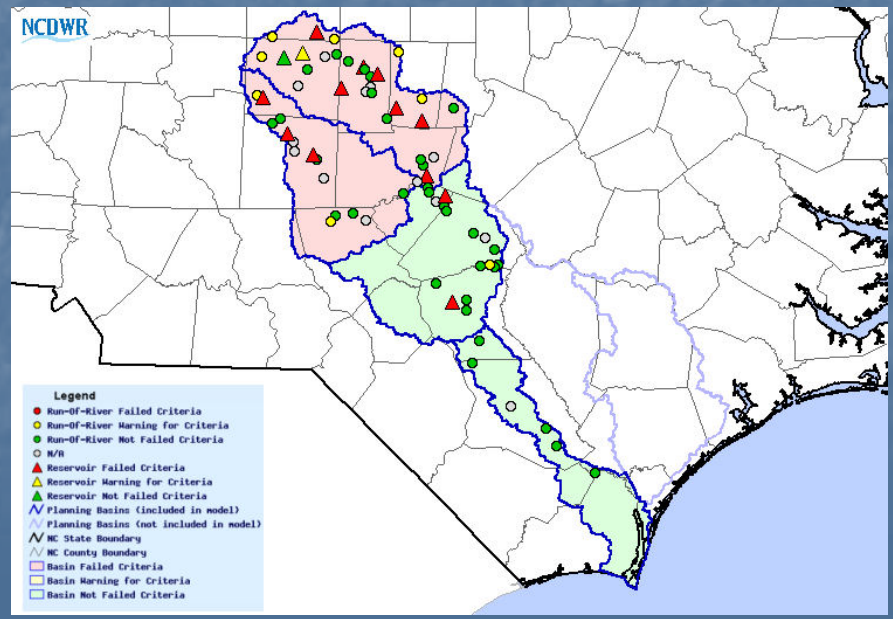
- Summary of June 2009 Model Simulations
  - 4 Model Simulations
    - Each simulation was daily with a record from 1/1/1930 through 12/31/2005
    - 672 input values change for the 4 simulations.
    - The baseline required approximately 150 simulations to determine the yield for the 14 reservoirs.
  - Develop A Water Withdrawal Decision Support System (DSS)
    - For the 4 simulations the DSS processed 79,057,632 output data values.
- Model Changes Needed For Future Models
  - Local inflow at all flow nodes.
  - Better historical information.
  - Link system withdrawals and discharges.
  - Link multiple intakes for a systems.

Example DSS Results

Overall Summary



Withdrawal Yield Analysis



Minimum Updates
Estimated Cost $75,000 and 6 months to complete.

- Update inflows from 2005 to current.
  - Update of withdrawals, discharges, agricultural uses, and reservoir operations.
- Calibrate smaller reservoirs, if historical data is available.
- Simplify Jordan Lake drought code.
- Improve coding of operations of OWASA and Fayetteville.
- Link withdrawal and discharges.
- Update documentation.

Additional Updates
No cost or time estimates.

- Add Siler City's reservoir.
- Add Progress Energy skimming.
- Add instreamflow ecological flow nodes.
- Include water shortage plans and switch to turn on/off.
- Sensitivity analysis parameters (± percentage) – inflows, evaporation, precipitation, and/or withdrawals.
- Combine Cape Fear and Neuse models.
- Add a feature to let users select runs, plots and tables from a "common directory.

Discussion

- What other model updates need to be considered?

Funding

- DWR will not be able to contribute funding for this update.
  - DWR will be doing the data collection for this update.
- If it is acceptable to the potential funding partners DWR has asked Triangle J to assist with coordinating the funding and contracting.

Discussion

- Ideas on funding?
- Contract issues?

Next Steps

- Join the model email list.
  - Cape-Fear-Model-join@lists.ncmail.net
- Cape Fear Model meeting.
  - Wednesday March 17th
  - 10:00 AM Jordan Lake State Park Recreation
    - or join in by webconferencing

Questions

Contact Information

Tom Fransen
919-715-0381

jordan-water-supply@lists.ncmail.net
www.ncwater.org

DWR
Division of Water Resources

Contact Information

- Email Lists
  - Cape-Fear-Plan-join@lists.ncmail.net
  - Cape-Fear-Model-join@lists.ncmail.net
- DWR Staff
  - *Email* - jordan-water-supply@lists.ncmail.net
  - *Primary Contact* – Tom Fransen – (919)715-0381
  - *Water Supply Planning* – Don Rayno (919)715-3047
  - *Contracts & IBT* – Toya Ogallo (919)715-0389

Agenda

- 10:00 – 10:15 – Opening Remarks
- 10:15 – 10:45 – Water Supply Allocation Process
- 10:45 – 11:15 – Water Supply Plan Update
- 11:15 – 12:00 – Open Discussion
- 12:00 – 1:00 – Lunch Break
- 1:00 – 1:30 – Basin Model Update
- 1:30 - 2:15 – Open Discussion – Changes
- 2:15 - 3:00 – Discussion - Who is going to pay?
- 3:00 - 3:15 – Wrap Up and Next Steps

Letter of Interest

- Any unit of local government interested in receiving a Jordan Lake water supply storage allocation is being requested to submit a Letter of Interest to the Division of Water Resources by Friday April 1, 2010. This letter does not commit your organization to an actual application. The purpose of the letter is to identify potential applicants to assist in the basin water supply planning. In the letter please include your organization's contact information. Identify who will be the primary contact and if you will be using a consult their contact information.
- jordan-water-supply@lists.ncmail.net or send the letters to:
- Division of Water Resources

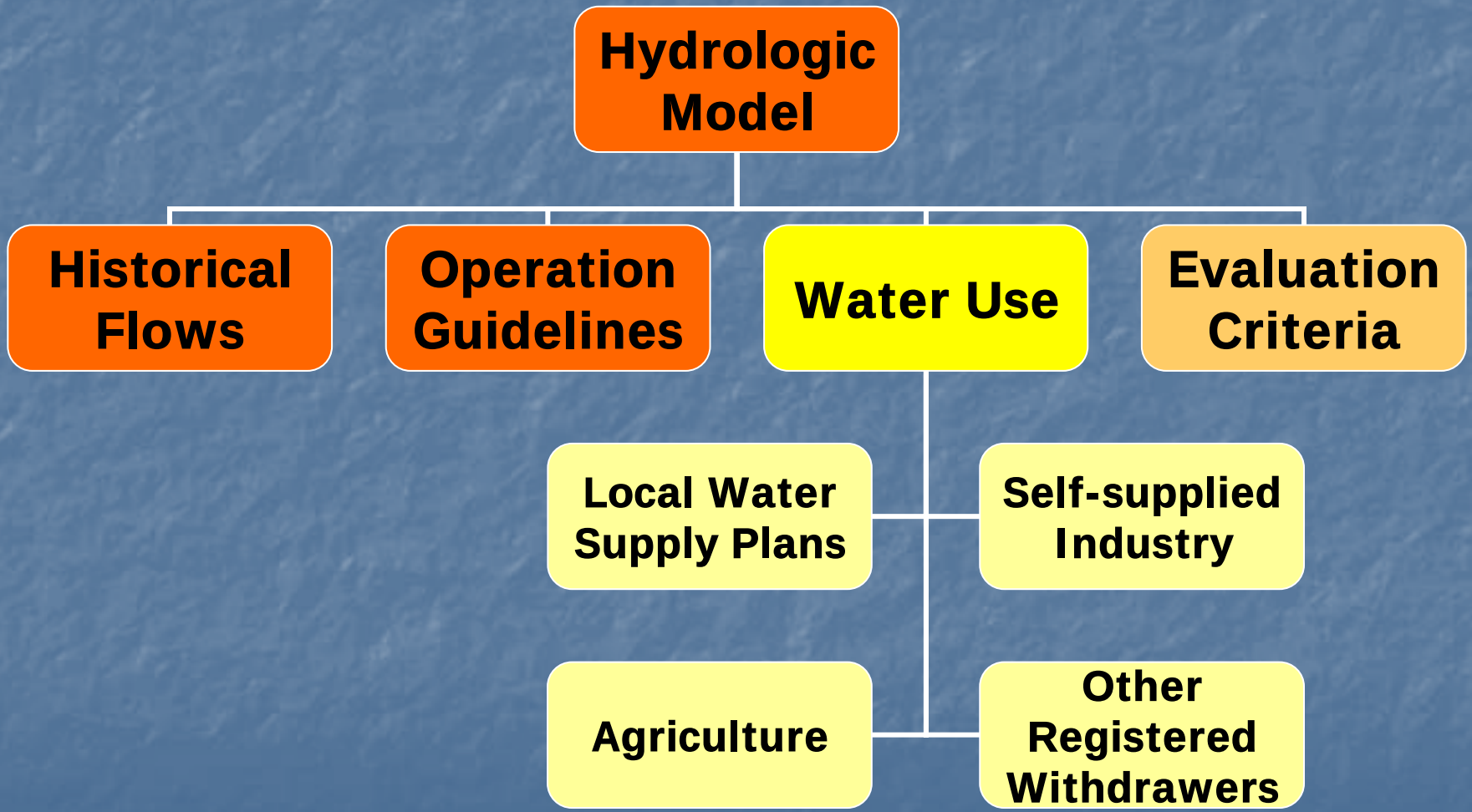
  Attn: Tom Fransen

  1611 Mail Service Center

  Raleigh, NC 27699-1611.

Modeling Basics

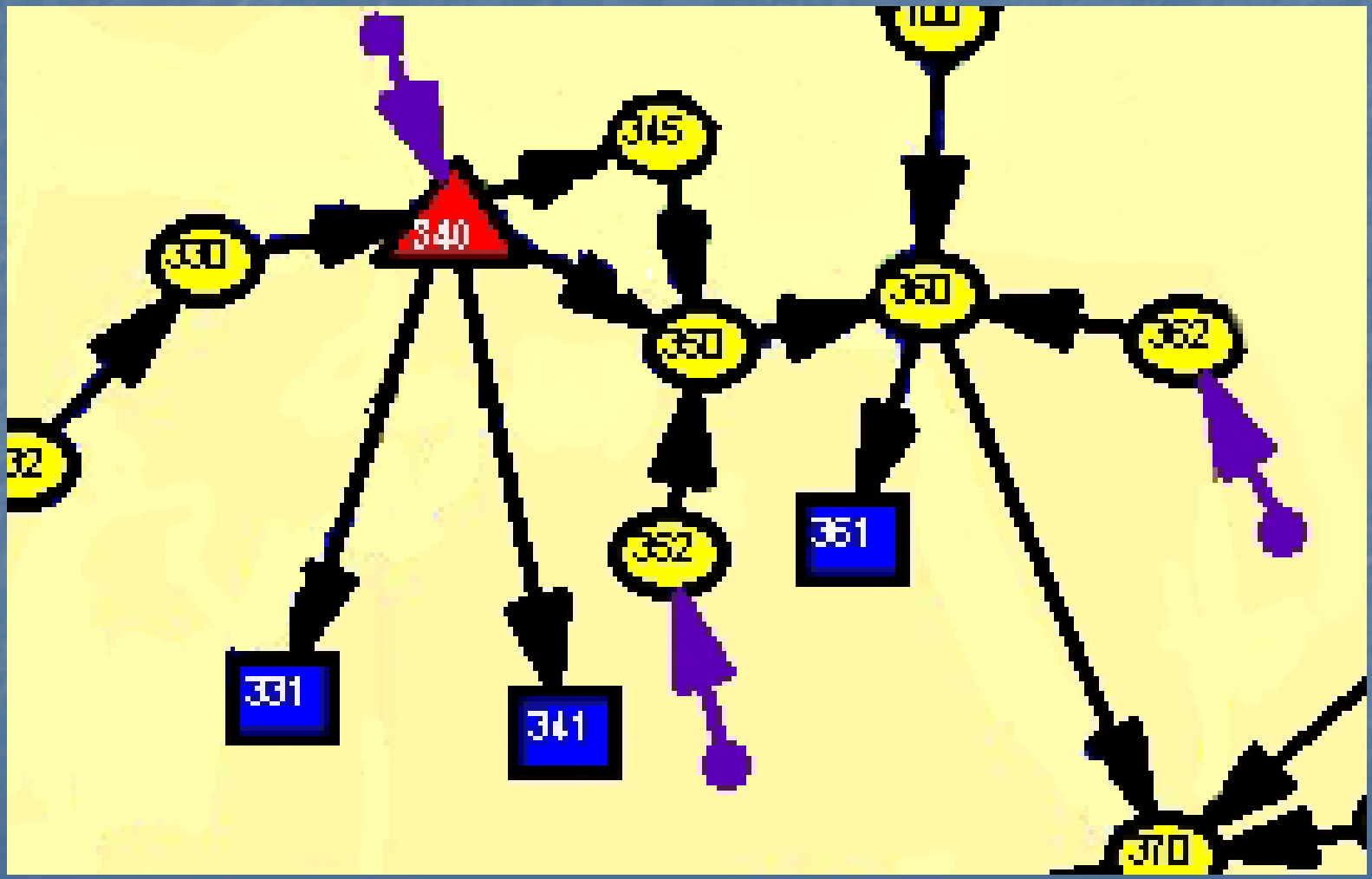
What is a River Basin Hydrologic Model?



Benefits

- Common analysis tool to study the impacts of new and expanding projects.
- Saves the cost developing a new model for project.
  - Value added approach.
- Open approach, easier for everyone to understand the assumptions and interpretation of the results.

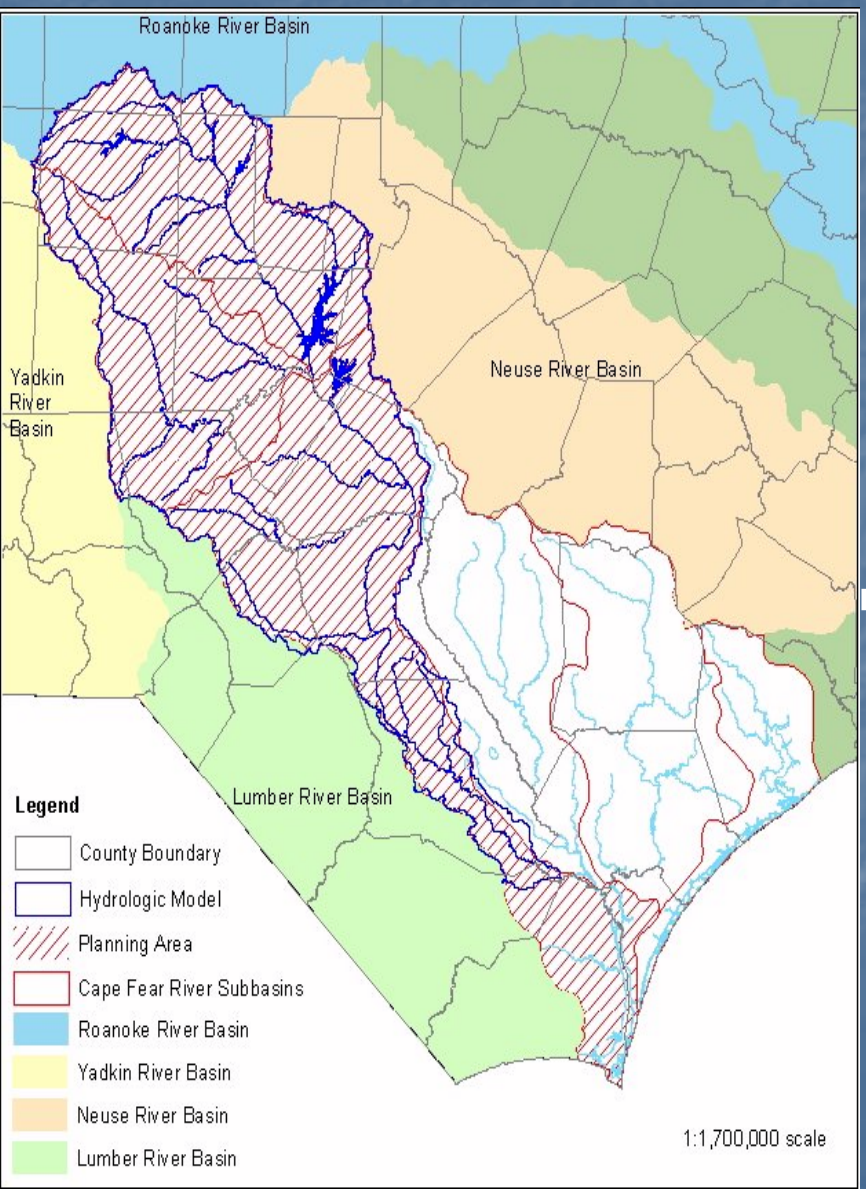
Nodes And Arcs

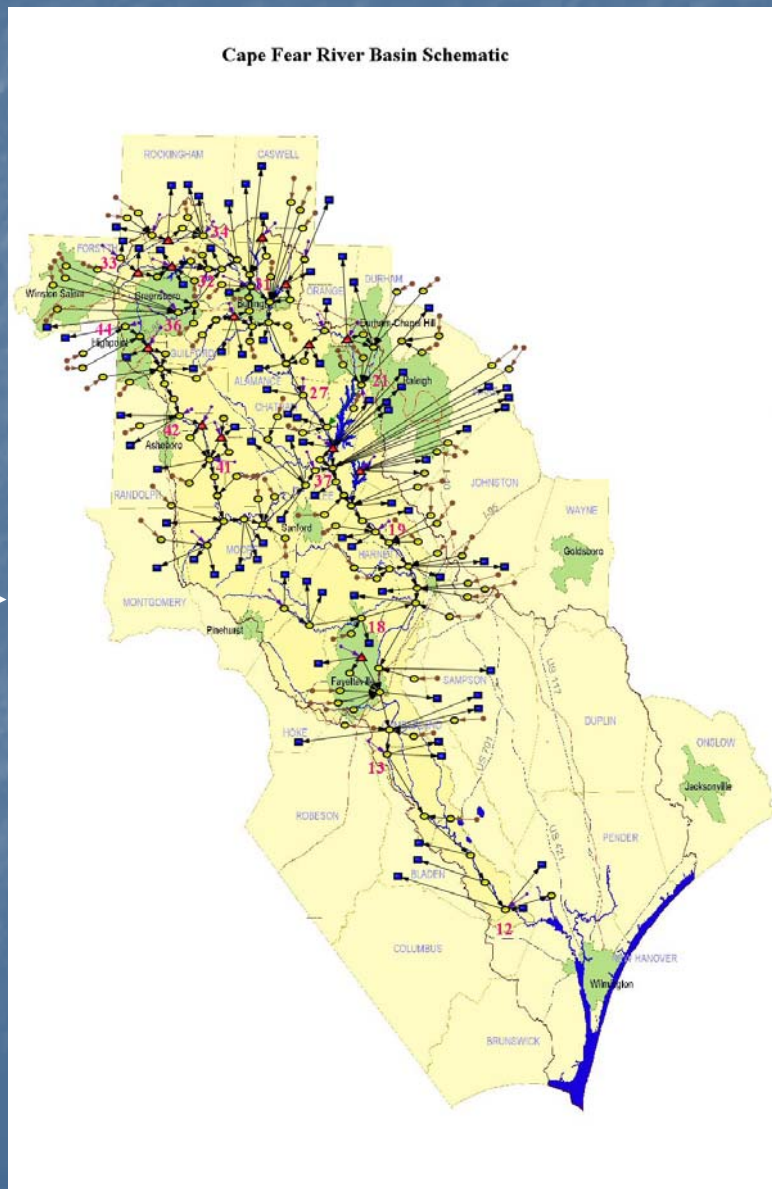


Disclaimer

- General Disclaimer
  - NOT a water quality model.
  - NOT to be used for flood studies.
  - Does NOT simulate ground water.
- Cape Fear Model Disclaimer
  - Calibration/Verification only at key nodes.
  - Not all flow nodes have a local inflow.

Model Coverage





Model Node Summary

Node Type	Number of Nodes
Total	259
Overallocation Analysis	70
Reservoirs	14
Flow	56
Water Withdrawals	95
Public Water Systems	40
Industrial	12
Irrigation	43
Waste Water Discharges	74

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.

Model Basics Part 2

- Daily Time Step
- Model Period 1/1/1930 – 12/31/2005
  - Positional Analysis (Forecast) Version of the model is updated weekly 1/1/1930 – current.
- Model Nodes - 224
  - Demand – 85
  - Reservoirs – 14
- Jordan Lake Drought Plan

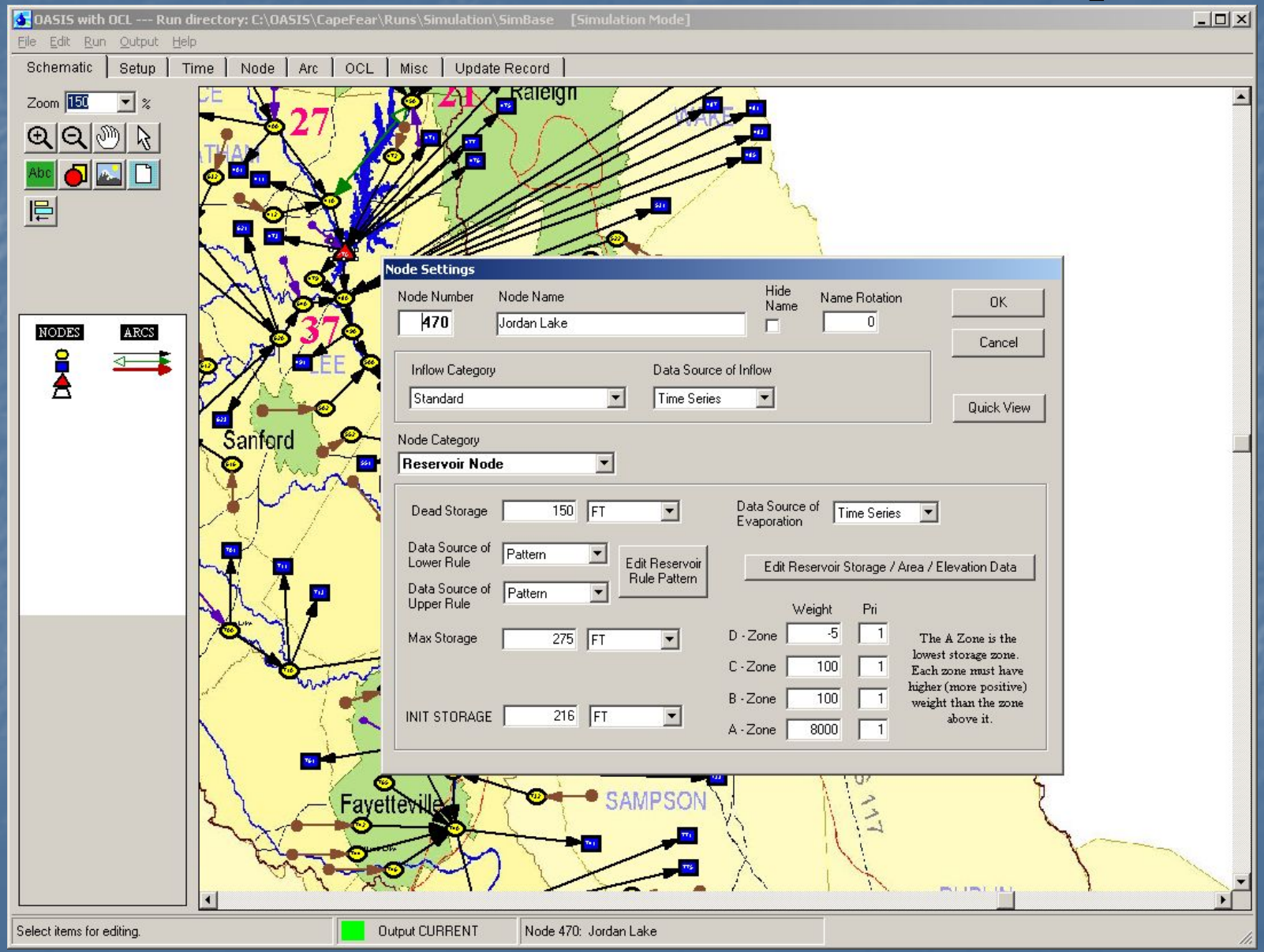
Key Model Assumptions

- 67 years of historical streamflows will represent typical streamflows in the future.
- Withdrawal and discharge locations will remain the same regardless of the demands or permit limits.
- No limit on the amount of a withdrawal as long as water is available.

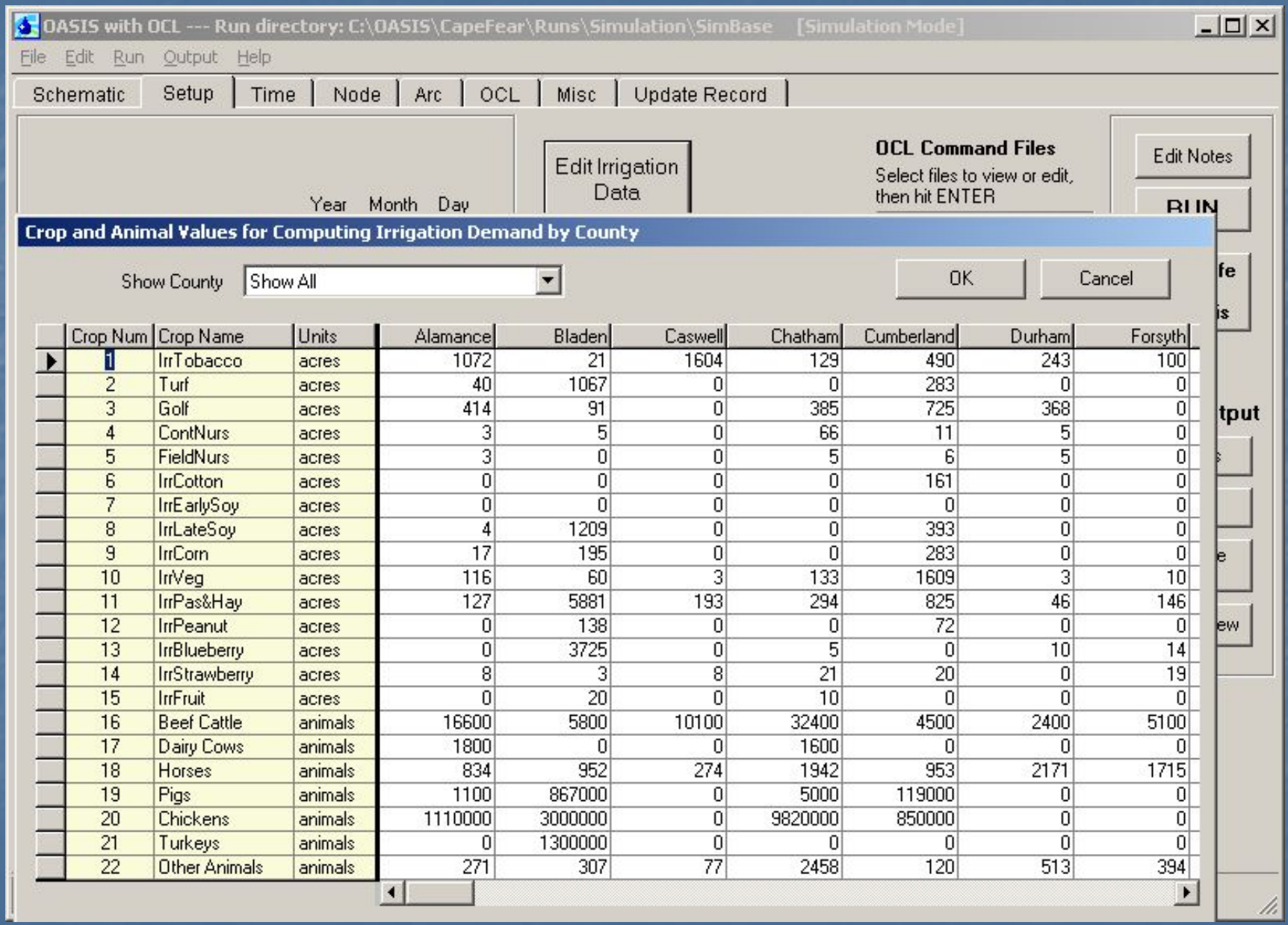
Model Inputs

- Historical Data
  - Streamflow
  - Net Lake Evaporation
- Current & Projected Data
  - Daily Withdrawals using a Monthly Pattern
  - Daily Discharges using a Monthly Pattern
  - Reservoir Operations

Edit Basic Model Input



Irrigation Data

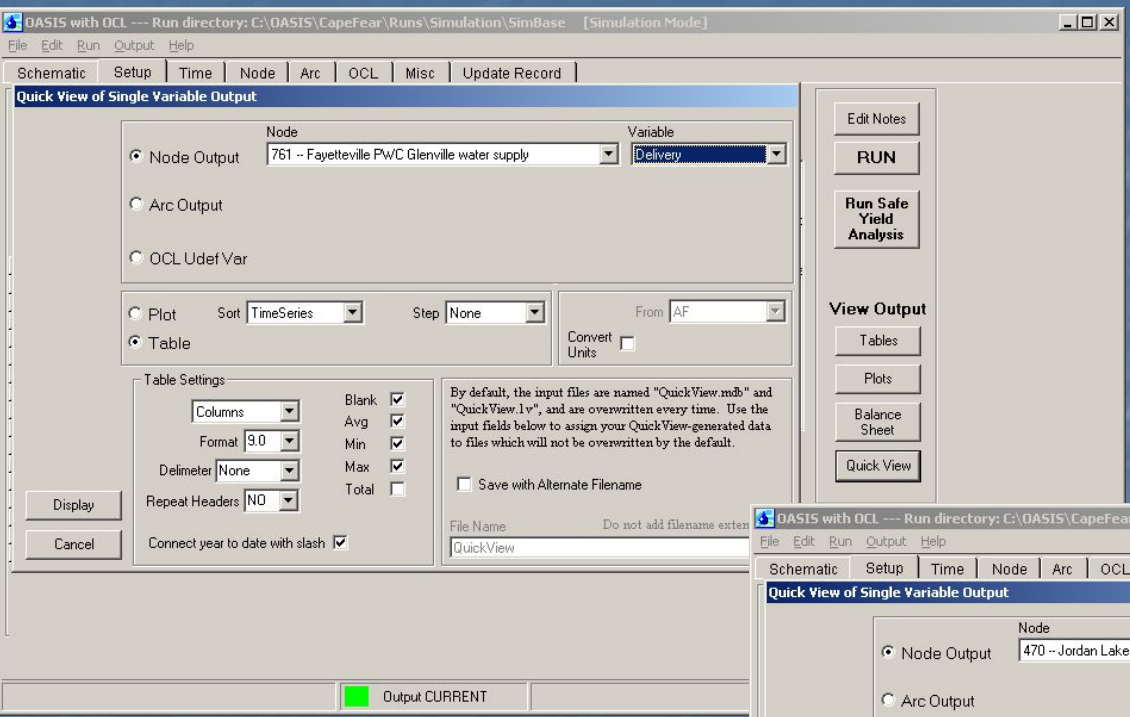


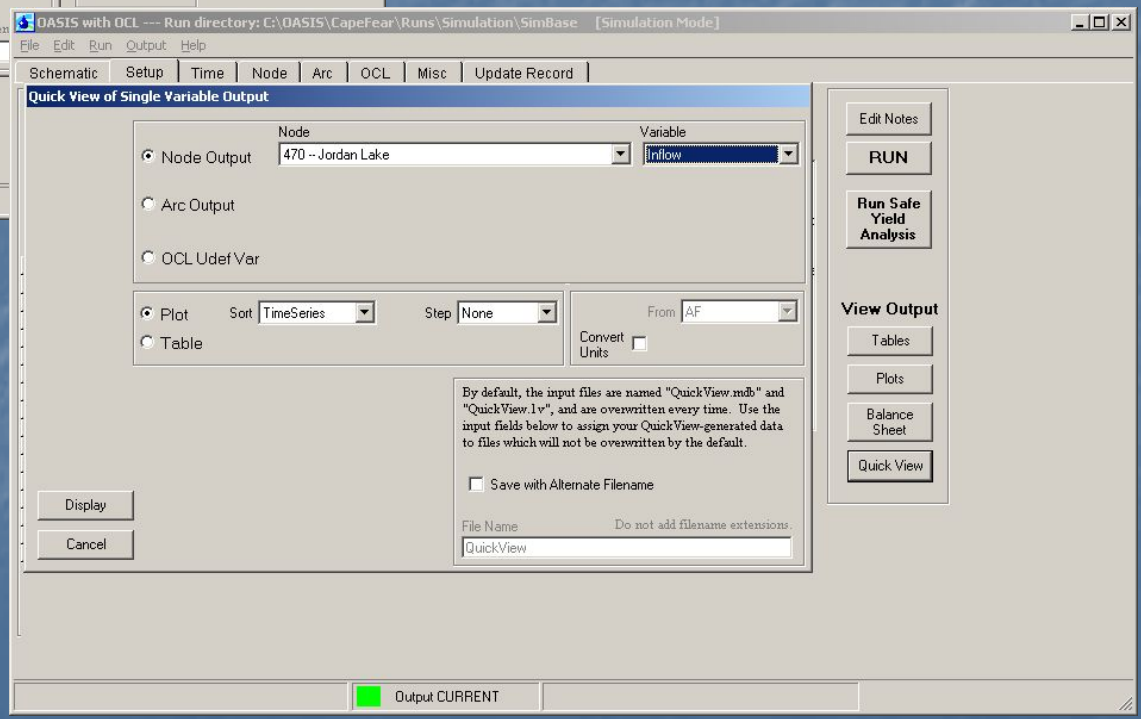
Crop Num	Crop Name	Units	Alamance	Bladen	Caswell	Chatham	Cumberland	Durham	Forsyth
1	IrrTobacco	acres	1072	21	1604	129	490	243	100
2	Turf	acres	40	1067	0	0	283	0	0
3	Golf	acres	414	91	0	385	725	368	0
4	ContNurs	acres	3	5	0	66	11	5	0
5	FieldNurs	acres	3	0	0	5	6	5	0
6	IrrCotton	acres	0	0	0	0	161	0	0
7	IrrEarlySoy	acres	0	0	0	0	0	0	0
8	IrrLateSoy	acres	4	1209	0	0	393	0	0
9	IrrCorn	acres	17	195	0	0	283	0	0
10	IrrVeg	acres	116	60	3	133	1609	3	10
11	IrrPas&Hay	acres	127	5881	193	294	825	46	146
12	IrrPeanut	acres	0	138	0	0	72	0	0
13	IrrBlueberry	acres	0	3725	0	5	0	10	14
14	IrrStrawberry	acres	8	3	8	21	20	0	19
15	IrrFruit	acres	0	20	0	10	0	0	0
16	Beef Cattle	animals	16600	5800	10100	32400	4500	2400	5100
17	Dairy Cows	animals	1800	0	0	1600	0	0	0
18	Horses	animals	834	952	274	1942	953	2171	1715
19	Pigs	animals	1100	867000	0	5000	119000	0	0
20	Chickens	animals	1110000	3000000	0	9820000	850000	0	0
21	Turkeys	animals	0	1300000	0	0	0	0	0
22	Other Animals	animals	271	307	77	2458	120	513	394

Model Output

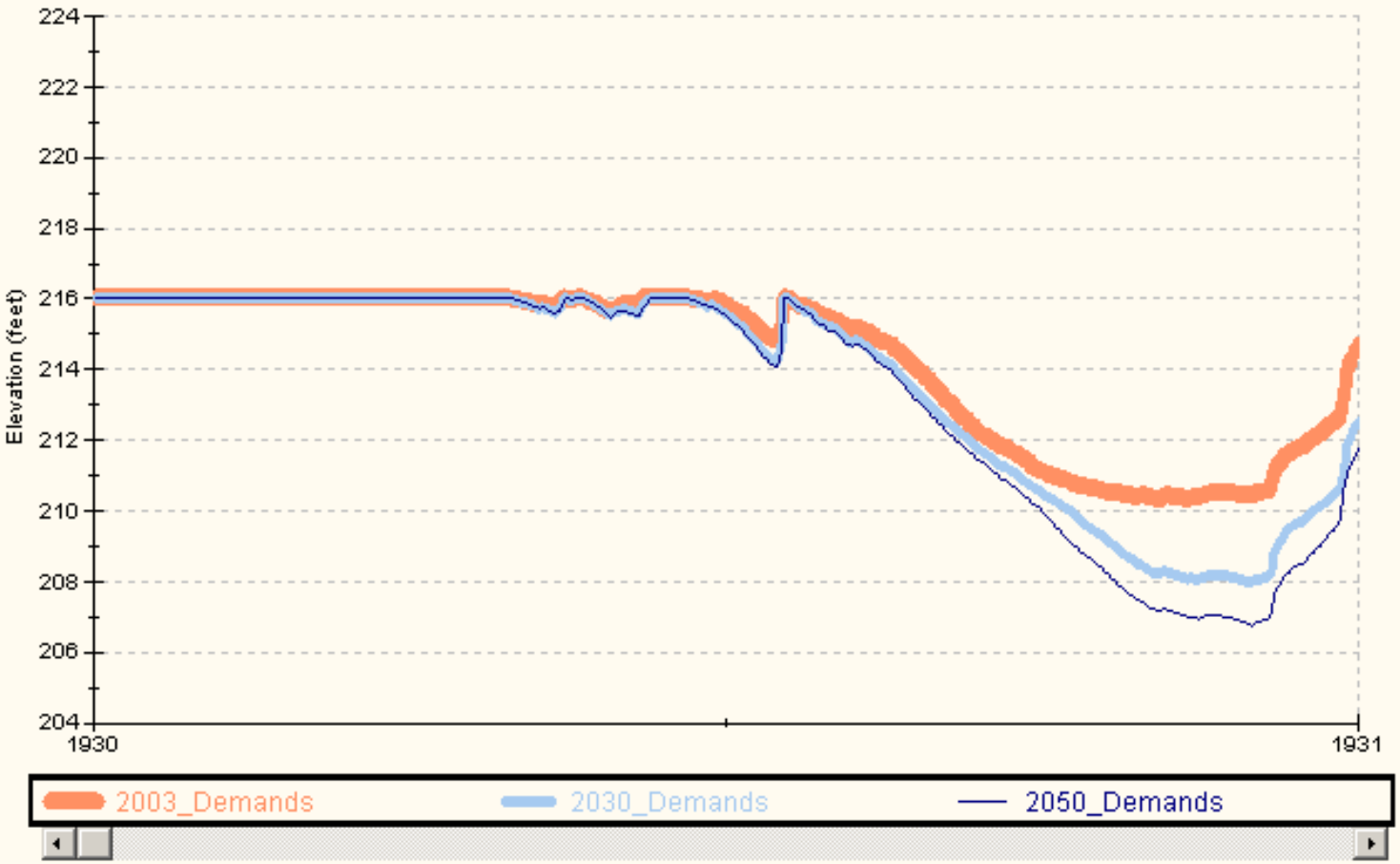
- Streamflow
- Reservoir
  - Inflows
  - Outflows
  - Levels & Storage
- Withdrawals
- Discharges

Tables or Plots



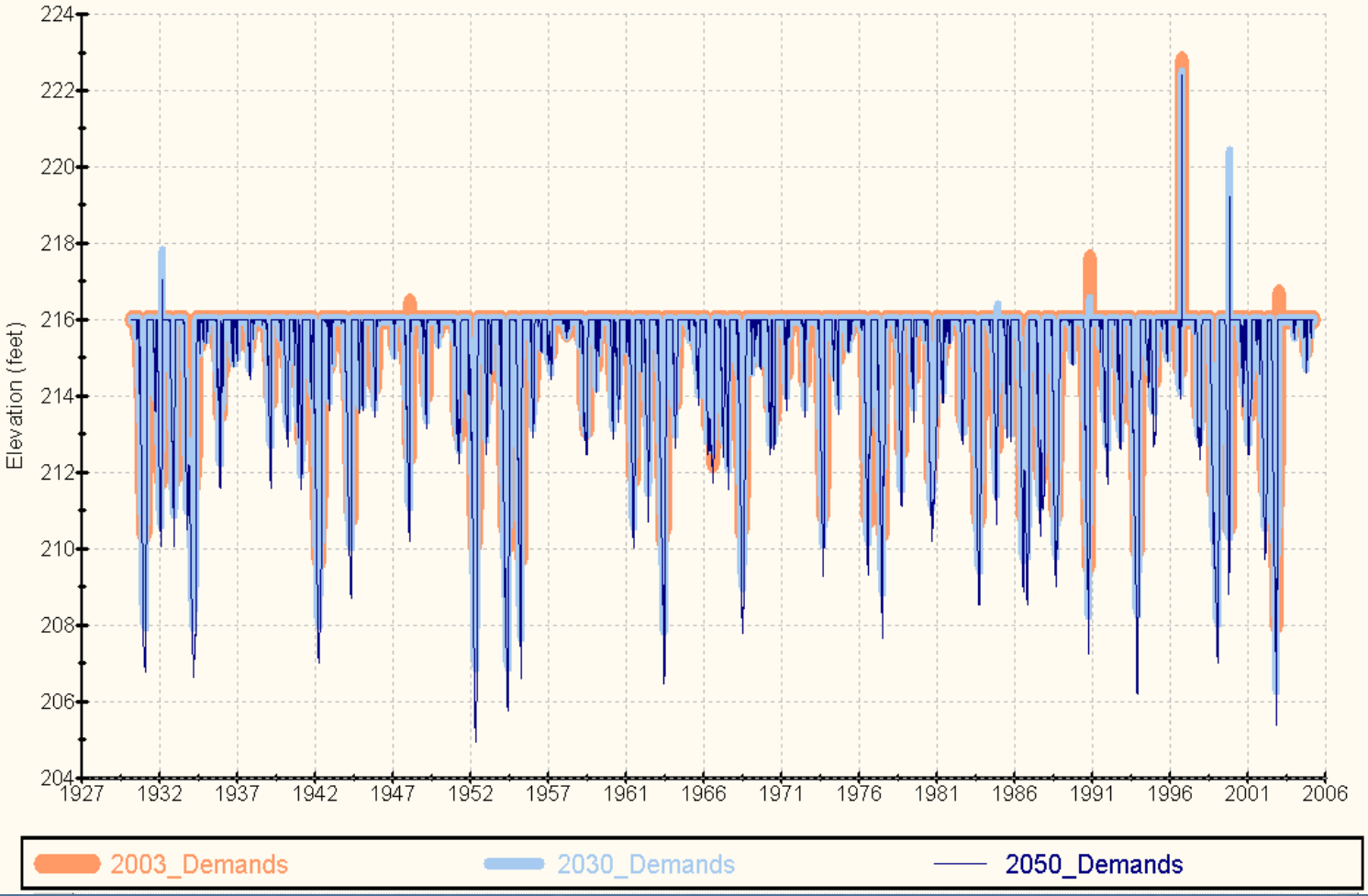


Jordan Lake Elevation

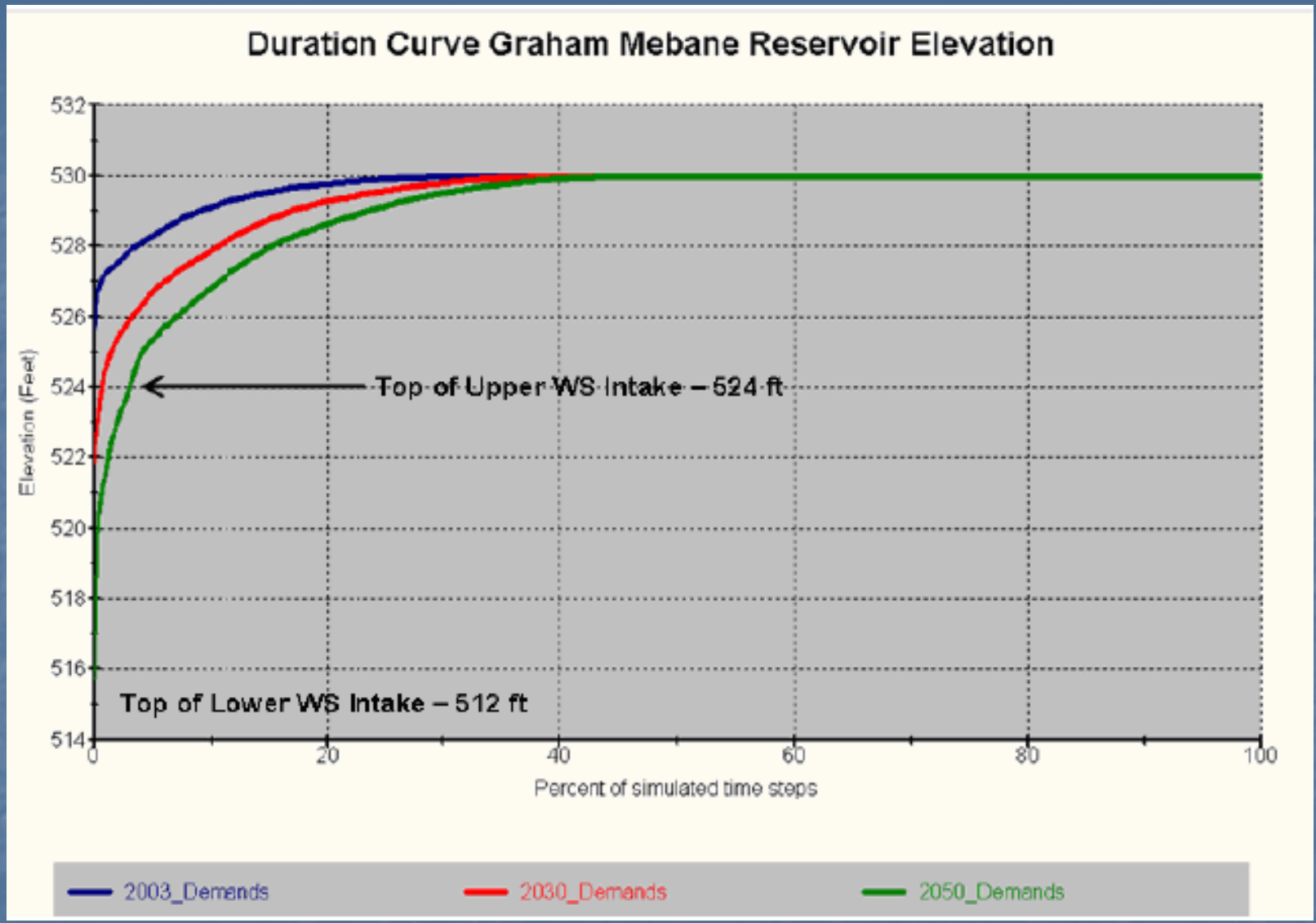


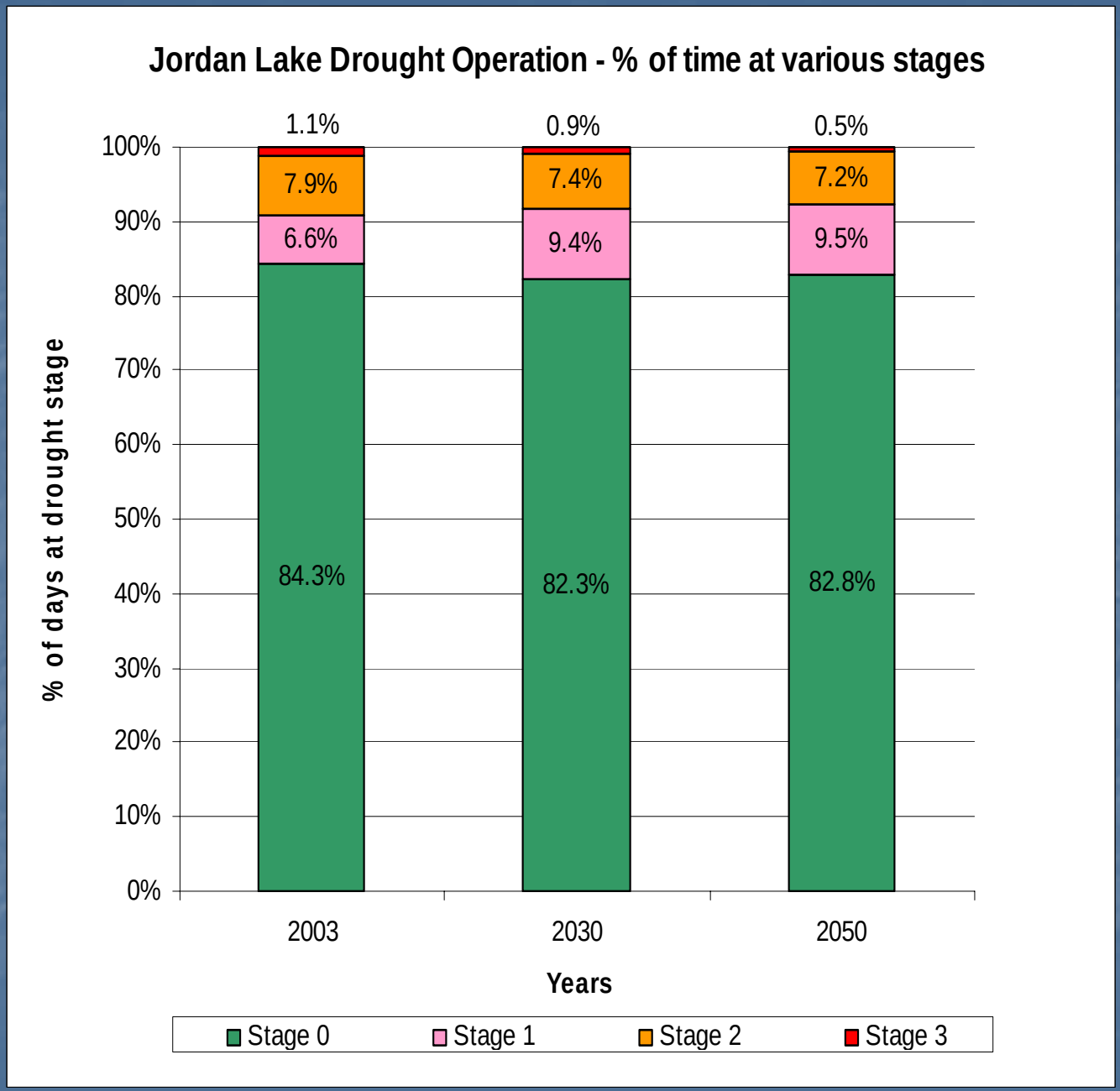
Draft Results-Not for Planning Use

Jordan Lake Elevation



Draft Results-Not for Planning Use


Duration Curve Graham Mebane Reservoir Elevation
532
530
528
526
524
522
520
518
516
514
Elevation (Feet)
Top of Upper WS Intake – 524 ft
Top of Lower WS Intake – 512 ft
0
20
40
60
80
100
Percent of simulated time steps
2003_Demands
2030_Demands
2050_Demands

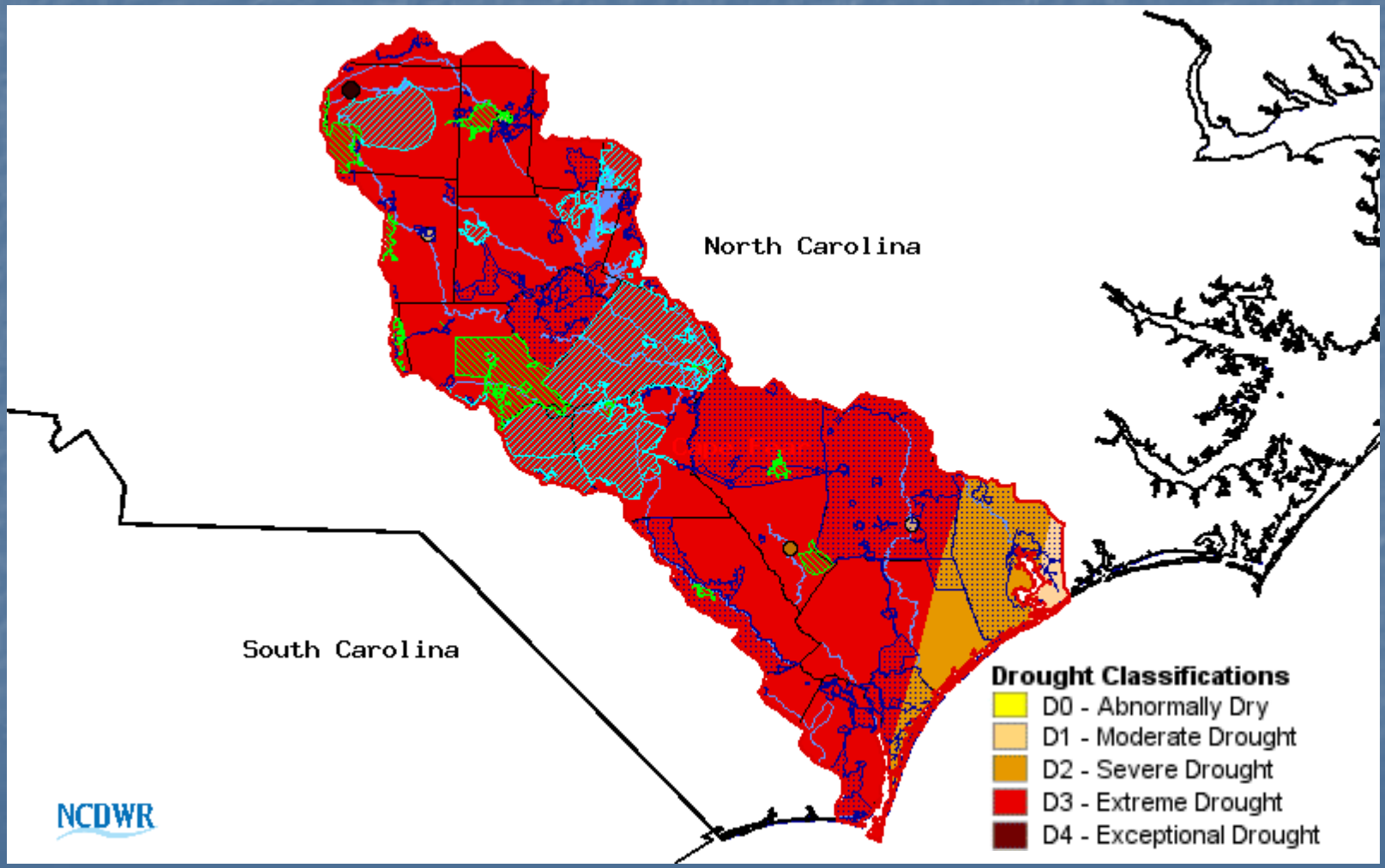


Draft Results-Not for Planning Use

Performance Measures (Evaluation Criteria)

- Reservoir Reliability
  - Reservoir Levels
  - Storage Remaining
- Lake Recreation
  - May 1 – September 30 boat ramp usability
  - October 1 – January 31 duck hunting
- Lake Fish Spawning – lake level stability April 1 – June 30
- Demand Reliability

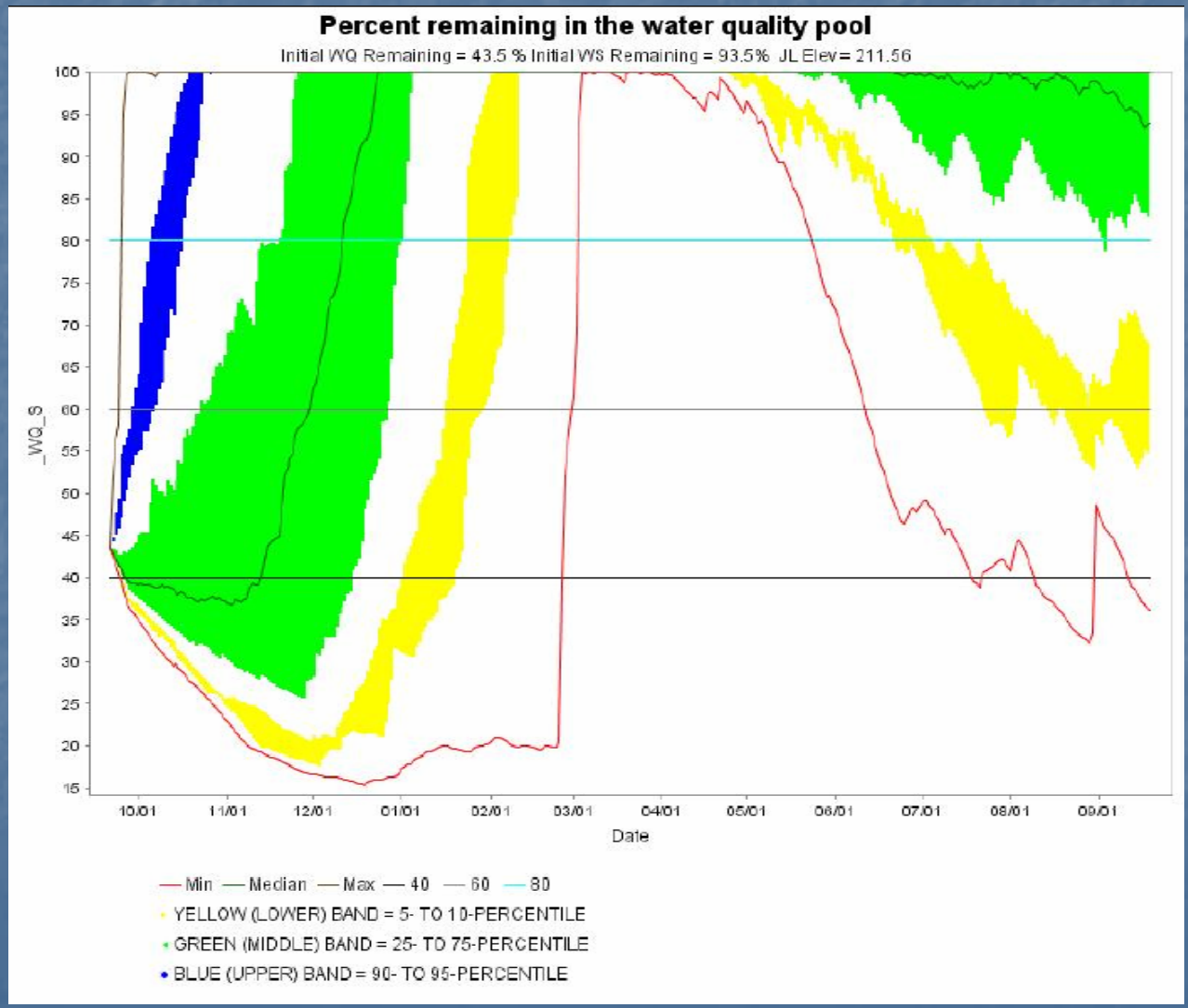
Drought Management



2007 Jordan Lake Drought Operations

Drought Level	Water Quality Storage Remaining (%)	Jordan Dam Minimum Release (cfs)	Jordan Dam Maximum Release (cfs)	Lillington Daily Average Flow Target (cfs)	Suggested Water Supply Conservation Status
0	80 – 99.9	40	600	600 ±50	Normal
1	60 – 80	40	600	450 - 600 ±50	Voluntary
2	40 – 60	40	600	300 - 450 ±50	Mandatory
3	20 – 40	200		None*	Mandatory, but Emergency at 30%
4	00 – 20	100		None*	Emergency

Drought Operations



Model Access