River Basin Water Resources Plan/
Hydrologic Model Development Process

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NCDEQ - DWR
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Department of Environmental Quality
Why Need River Basin Plans

Water Resources Plans support

- Sustainable management
- Reliable, quantitative methods for planning
- Objective management and regulatory decision making
3 Critical Questions

• Water Resources Plan Combine –

*Water Use Data + Hydrologic Model*

• 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*

Department of Environmental Quality
Process Components

Hydrologic Model

- Historical Flows
- Operation Guidelines
- Water Use
- Evaluation Criteria

River Basin Water Resources Plan

- Local Water Supply Plans
- Self-supplied Industry
- Agriculture
- Other Registered Withdrawers
Process Components

More than 75 years Stream Flow

Station 02096500 - HAW RIVER AT HAW RIVER, NC --- Daily Averaged Streamflow (cfs)

Daily flows less than or equal to zero are set to 0.01 cfs.
Process Components

• Quantity and timing of specific flows
  • Aquatic habitats
  • Water quality protection
    ✓ Intake coverage
  • Recreation

• Reservoir water level limits and timing
  • Structural limits
  • Aquatic habitat protection
    ✓ Intake coverage
  • Boat ramp access
  • Authorized purposes and storage allocations
Process Components

• Water Withdrawal Registrations
  • Agriculture > 1,000,000 gallons per day
  • Non-agriculture > 100,000 gallons per day

• Local Water Supply Plans
  • Local Government Water Systems
  • Other Large Community Water Systems
Process Components

Water Use
Process Components

Seasonal Use Pattern / Avg Annual Demands

Water Use Pattern

50 yr Projected Demands

2006 Supply and Demand Projections

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply</th>
<th>Demands</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>68</td>
<td>48</td>
</tr>
<tr>
<td>2010</td>
<td>83</td>
<td>56</td>
</tr>
<tr>
<td>2020</td>
<td>83</td>
<td>70</td>
</tr>
<tr>
<td>2030</td>
<td>103</td>
<td>84</td>
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<tr>
<td>2040</td>
<td>103</td>
<td>101</td>
</tr>
<tr>
<td>2050</td>
<td>103</td>
<td>121</td>
</tr>
</tbody>
</table>
Process Components
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
Process Components

How often?
What’s the chance?

Evaluation Criteria
Process Components

- Reservoir Water Levels
Process Components

- Stream Flows
• Flow Regime Changes

Stream Condition Middle Deep River (Node 280)
June - November

<table>
<thead>
<tr>
<th>% of Days at Flow Level</th>
<th>Unimpaired</th>
<th>2003 Demands</th>
<th>2030 Demands</th>
<th>2050 Demands</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10% of QAA*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 - 20% of QAA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 - 30% of QAA</td>
<td></td>
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</tr>
<tr>
<td>30 - 40% of QAA</td>
<td></td>
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</tr>
<tr>
<td>40 - 50% of QAA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - 60% of QAA</td>
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<td></td>
</tr>
<tr>
<td>60 - 100% of QAA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 - 200% of QAA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;200 of QAA</td>
<td></td>
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</table>
Process Components

- Water Supply Deficits

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

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

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.
3 Critical Questions – Evaluation Criteria

• 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?
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 cannot discharge the same percent of wastewater?
Project Organization

Data Collection
HDR

Model Development
HydroLogics

Data, Model Evaluation & Plan Development
NCDWR
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-french-broad-staff@lists.ncmail.net
    • dwr-new-watauga-staff@lists.ncmail.net

- E-mail list serve Subscriptions for Stakeholders
  • https://lists.ncmail.net/mailman/listinfo/dwr-french-broad-model
  • https://lists.ncmail.net/mailman/listinfo/dwr-new-watauga-model

- Model Development Project Lead at DWR
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