Topics

• What is OASIS?
• Inflow development/verification
• Strengths
• Weaknesses
What is OASIS?

- A patented, mass balance, water resources simulation/optimization model
- Runs on a daily timestep with a 75+ year period of hydrologic record
- Runs in two modes
  - Simulation
  - Position Analysis
- Purposes:
  - Alternatives evaluation (planning/finding balance)
  - Real-time operations (following the plan)
  - Gaming
Model Input

- Time series data
  - Unregulated inflows
  - Evaporation
  - Precipitation
- Static data
  - Physical data
    - Reservoir SAE, turbine characteristics, channel capacities, etc.
    - Withdrawals, discharges, demands
- Operating Data, e.g.
  - Rule curves
  - Minimum releases/environmental flows
  - Drought and flood management policies
  - Energy requirements
Model Output

- Tables and Graphs of
  - Flow
  - Elevation, and
  - Derived attributes, e.g. habitat availability, energy, revenue, water supply shortages, recreation days

for every time step

at every point in the system
Inflow Development

• Unimpaired (unregulated, unaltered) inflows necessary for evaluating alternative facilities, operating policies and demand levels

• Impairments include water withdrawals/discharges and reservoir regulation (including net evaporation)

• Methodology: Force inflows to match monthly unimpaired gage flows; disaggregate to daily based on a proximate unimpaired gage
# Gages Used

<table>
<thead>
<tr>
<th>USGS Number</th>
<th>Description</th>
<th>Period of Record</th>
<th>Drain. Area</th>
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Gage Map

Tar R. nr Tar R. (72 cfs, 0 cfs)
Tar R. Louisburg (215 cfs, 4 cfs)
Cedar Ck.
Tar R. Reservoir (399 cfs, 10 cfs)
Fishing Ck. (245 cfs, 3 cfs)
Swift Ck. (93 cfs, 3 cfs)
Tar R. Nashville
Tar R. Tarboro (1,164 cfs, 38 cfs)
Conetoe Ck.
Tar R. Greenville (1,297 cfs, 31 cfs)

Gage has significant impairment
Gage has moderate impairment
Gage has little or no impairment
(2007 average flow and monthly minimum flow)
Unimpairing Inflows

• Instream nodes (e.g., stream gaging sites)
  – Adjust inflows for upstream withdrawals and returns

• Reservoirs
  – Use drainage-area adjusted, unimpaired stream gages immediately upstream
  – Otherwise, back-calculate from reservoir outflows and change in storage, adjust for upstream impairments
Developing Inflows (cont’d.)

• Inflow records modified to eliminate negatives caused by time of travel issues and errors in impairments
• Fill in missing inflow records by correlating with unimpaired inflows at other nodes
  – USGS Fillin program computes correlations on a monthly basis
  – Filled-in records must be scaled to ensure that actual unimpaired flow at downstream points is preserved
• Monthly flows/gains disaggregated to daily flows using local unimpaired gage to preserve natural variation
  – Impairment data is often only available on a monthly average, and can cause noise on a daily basis
  – Tidal influence at Greenville can impact daily readings
  – Goal: to build daily flows whose variation is representative of history while preserving monthly gage flows as ground truth
## Spreadsheet Showing Gage Unimpairment

02082506 - Tar R BL Tar R Reservoir nr Rocky Mt - All flows in cfs unless otherwise noted

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<thead>
<tr>
<th>Date</th>
<th>Reservoir</th>
<th>WW Discharges</th>
<th>Withdrawals</th>
<th>Total Withdrawals</th>
<th>Total Adjustment</th>
<th>Below Tar</th>
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Unimpaired Gage = daily gage flow adjusted for impairments upstream
Naturalized Inflow = monthly unimpaired gage flow disaggregated to daily to preserve natural variation
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Naturalized Inflow = monthly unimpaired gage flow disaggregated to daily to preserve natural variation
Verification – Tar River Reservoir

Tar River Reservoir Elevation

Elevation (FT)

Year

Computed

Historic
Strengths

- A systems approach
  - All management aspects captured, including WSRP
  - Allows for investigation of creative solutions
- It’s fast
- It’s easy to use
- Can be linked to other models
- Nodes and arcs can be added after the model is “done”
Weaknesses

- No output between inflow nodes
- Not appropriate for flood routing
- Stationarity ?
Questions?