NFSEG v1.1
Task C2 Meeting

December 7, 2017
Agenda

• Introduction / meeting objectives
• Status of model improvements
• Results Case 006E
  • Calibration statistics/summary – domain
  • Baseflow comparisons
  • Selected maps and scatter plots
  • Water budgets – model domain and groundwater basins
• Next Steps
• Public comments
Status of Model Improvements  
(since Case 4B)

- **HSPF**
  - Areal distribution of recharge from point injections in closed basins
  - Reparameterization of closed basins

- **MODFLOW**
  - Additional drainage features
  - Added Crescent Springs and Rock Sink Springs
  - Updated spring flow targets
  - Updated baseflow targets
  - Updated water use/well packages
  - Added variable anisotropy in layer 3
  - Prepared uncertainty/sensitivity analysis scope for review by panel/stakeholders
## Status of Model Improvements

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Status Dec 1 (006E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update river and drain packages</td>
<td>Complete</td>
</tr>
<tr>
<td>Update and recalibrate HSPF models</td>
<td>Implemented process to distribute recharge within closed basins On-going</td>
</tr>
<tr>
<td>Improve simulated SAS water levels</td>
<td>Added synthetic SAS head targets, Lawtey/Trail Ridge, Bradford County near Brooker Near Complete</td>
</tr>
<tr>
<td>Reassess the use of MNW2 package for modeling multi-aquifer wells</td>
<td>Complete</td>
</tr>
<tr>
<td>Improve simulated spring flows</td>
<td>Complete</td>
</tr>
</tbody>
</table>
# Status of Model Improvements

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<thead>
<tr>
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<tr>
<td>Improve baseflow simulations in the groundwater model in critical areas</td>
<td>Baseflow target analysis <strong>complete</strong>. Near Complete</td>
</tr>
<tr>
<td>Improve point-source recharge distribution</td>
<td>Near Complete</td>
</tr>
<tr>
<td>Improve aquifer parameter estimates in the model</td>
<td>Allowed for spatial variation in anisotropy in Layer 3 by adding additional pilot points throughout the model domain</td>
</tr>
<tr>
<td>Improvement</td>
<td>Status Dec 1 (006E)</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Null Space Monte Carlo Uncertainty Analysis</td>
<td>Draft scope reviewed and comments received Final scope - December 2017 On-going</td>
</tr>
<tr>
<td>Implement miscellaneous improvements and corrections.</td>
<td>Added synthetic UFA head targets, Lawtey (west of Trail Ridge), between Santa Fe and New Rivers, and Satsuma (north end of Crescent City Ridge) On-going</td>
</tr>
</tbody>
</table>
Status of Model Improvements

- Responses To Preliminary Comments
  - August - Provided draft responses to comments received through 6/30/17
  - September - Individual teleconferences with peer reviewers
  - HSPF – additional responses late December
  - MODFLOW - Majority of comments addressed
## Status of Model Improvements

<table>
<thead>
<tr>
<th>Peer Reviewer Comments/Topics</th>
<th>Status</th>
</tr>
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<tbody>
<tr>
<td>HSPF – Evaluation to determine if additional station data available for calibration</td>
<td>Complete</td>
</tr>
<tr>
<td>HSPF – model parameter maps</td>
<td>On-going</td>
</tr>
<tr>
<td>Baseflow target methodology</td>
<td>Complete</td>
</tr>
<tr>
<td>Mass balance summary – model-wide</td>
<td>Complete - updated with each case</td>
</tr>
<tr>
<td>Groundwater basin mass balances</td>
<td>Initial analysis complete (Case 006E)</td>
</tr>
<tr>
<td>Consideration of removal of temporal head differences as calibration targets</td>
<td>Complete - removed</td>
</tr>
<tr>
<td>APT to modeled transmissivity Comparison</td>
<td>Complete - updated with each case</td>
</tr>
</tbody>
</table>
Case 006e Calibration Statistics – Heads

### Hydrologic condition: 2001

<table>
<thead>
<tr>
<th>Summary statistics for unweighted residuals:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual count</td>
<td>1261</td>
</tr>
<tr>
<td>Residual mean</td>
<td>-0.16</td>
</tr>
<tr>
<td>Abs(residual) mean</td>
<td>3.76</td>
</tr>
<tr>
<td>Residual std dev</td>
<td>5.20</td>
</tr>
<tr>
<td>Fraction within 5 ft</td>
<td>0.74</td>
</tr>
<tr>
<td>Fraction within 2.5 ft</td>
<td>0.44</td>
</tr>
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### Hydrologic condition: 2009

<table>
<thead>
<tr>
<th>Summary statistics for unweighted residuals:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual count</td>
<td>1628</td>
</tr>
<tr>
<td>Residual mean</td>
<td>0.27</td>
</tr>
<tr>
<td>Abs(residual) mean</td>
<td>3.98</td>
</tr>
<tr>
<td>Residual std dev</td>
<td>7.79</td>
</tr>
<tr>
<td>Fraction within 5 ft</td>
<td>0.76</td>
</tr>
<tr>
<td>Fraction_within 2.5 ft</td>
<td>0.51</td>
</tr>
</tbody>
</table>

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</tr>
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</tr>
</tbody>
</table>

**Notes:**
1. Synthetic Layer 1 Head Residuals: Included
2. Layer 2 Head Residuals: Excluded
3. Layer Filter Applied: None
### Hydrologic condition: 2001

Summary statistics for unweighted residuals:
- Residual count: 1261
- Residual mean: -0.16
- Abs(residual) mean: 3.76
- Residual std dev: 5.20
- Fraction within 5 ft: 0.74
- Fraction within 2.5 ft: 0.44

Summary statistics for weighted residuals:
- Residual count: 1261
- Residual mean: -0.16
- Abs(residual) mean: 3.62
- Residual std dev: 4.95

### Hydrologic condition: 2009

Summary statistics for unweighted residuals:
- Residual count: 1282
- Residual mean: -0.40
- Abs(residual) mean: 3.42
- Residual std dev: 4.85
- Fraction within 5 ft: 0.77
- Fraction within 2.5 ft: 0.51

Summary statistics for weighted residuals:
- Residual count: 1282
- Residual mean: -0.42
- Abs(residual) mean: 3.33
- Residual std dev: 4.72

**Notes:**
1. Synthetic Layer 1 Head Residuals: Excluded
2. Layer 2 Head Residuals: Excluded
3. Layer Filter Applied: None
Case 006E Baseflow Comparison - 2001
Case 006E Baseflow Comparison - 2009
Case 006E – L1 Simulated Heads
Case 006E – L1 Residuals

Note: 2009 Includes Synthetic Targets
Case 006E – L3 Residuals
Case 006E – L1-L3 VHD Residuals
Case 006E – L3 HHD Residuals
Case 006E
Mag. 1
Springs/Springs Groups
2001
Spring Flows 2009 (cfs)
Case 006E
Cumulative Baseflows 2001

2001 Estimated Cumulative Baseflow Rates

Gage ID| Measured Flow | Residual Flow

See Table 11 for USGS Gage ID

NHD Flowlines
Contributing Basin Area
Case 006E
Cumulative Baseflows 2009

2009 Estimated Cumulative Baseflow Rates

Gage ID| Measured Flow | Residual Flow
---|---|---
17 | 659.7 | 323.3
27 | 311.7 | 588.3
29 | 553.6 | 186.4
41 | 85.7 | 7.6
52 | 78.4 | 14.7

See Table 11 for USGS Gage ID

NHD Flowlines
Contributing Basin Area
Case 006E
Hydraulic Conductivity
L1
Case 006E
Leakance
L2
Case 006E
Transmissivity L3
Normalized APT to Model Transmissivity
Layer 3 – Semi-Confined
Normalized APT to Model Transmissivity
Layer 3 – Unconfined
Case 006E Leakance L4
Case 006E
Transmissivity
L5
2009 Model-wide Mass Balance

**Layer 1**
- L1 CH: 0.33
- L1 DRN: 2.61
- L1 RIV: 2.41
- L1 Q_LAT: 0.00
- L1 Q_WEL: 0.00 (L1 Q_WEL: 4.23 mgd)
- L1 to L2: 2.10

**Layer 2**
- L2 RIV: 0.33
- L2 to L3: 1.77
- L2 Q_LAT: 0.00
- L2 Q_WEL: 0.00 (L2 Q_WEL: 0.00 mgd)

**Layer 3**
- L3 RIV: 0.01
- L3 GHB: 1.68
- L3 Q_LAT: 0.00
- L3 Q_WEL: 0.36 (L3 Q_WEL: 1031.41 mgd)
- L4 to L3: 0.28

**Layer 4**
- L4 Q_LAT: 0.02
- L4 Q_WEL: 0.00 (L4 Q_WEL: 0.01 mgd)
- L5 to L4: 0.26

**Layers 5-7**
- L567 Q_LAT: 0.32
- L567 Q_WEL: 0.06 (L567 Q_WEL: 183.72 mgd)

**County Boundaries**
- GA
- AL
- SC

**MassBal Polygon:** Modelwide Active L1

**Sim Name:** NFSEG_PEST 2009

ZB_NAME: Modelwide Active L1 Number of Cells: 266895 Area Per Cell: 6,250,500 SF
All units expressed as inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
Groundwater Basins
2009 Mass Balance

RCH: 13.64
GW ET: 7.40

Layer 1
L1 CH: 0.03
L1 DRN: 3.05
L1 RIV: 2.70
L1 Q_LAT: 0.00
L1 Q_WEL: 0.00 (L1 Q_WEL: 0.00 mgd)

L1 to L2: 0.45

Layer 2
L2 RIV: 0.09
L2 to L3: 0.36

Layer 3
L3 RIV: 0.02
L3 GHB: 0.01
L3 Q_LAT: 0.01
L3 Q_WEL: 0.33 (L3 Q_WEL: 461.83 mgd)

L3 to L4: 0.01

Layer 4
L4 Q_LAT: 0.05
L4 Q_WEL: 0.00 (L4 Q_WEL: 0.00 mgd)

L4 to L5: 0.06

Layers 5-7
L567 Q_LAT: 0.05
L567 Q_WEL: 0.01 (L567 Q_WEL: 7.77 mgd)

ZB_NAME: GWB_1 Number of Cells: 129393 Area Per Cell: 6,250,500 SF
All units expressed as Inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
2009 Mass Balance

RCH: 20.61
GW ET: 3.56

Layer 1
L1 CH: 0.00
L1 DRN: 1.02
L1 RIV: 9.06
L1 Q LAT: 0.02
L1 Q WEL: 0.00
(L1 Q WEL: 0.00 mgd)

Layer 2
L2 RIV: 4.61
L2 to L3: 2.41

Layer 3
L3 RIV: 0.00
L3 GHB: 0.00
L3 Q LAT: 0.08
L3 Q WEL: 2.91
(L3 Q WEL: 288.73 mgd)

Layer 4
L4 to L3: 0.43

Layer 5-7
L5 to L4: 0.41

L567 Q LAT: 0.45
L567 Q WEL: 0.03
(L567 Q WEL: 3.33 mgd)

County Boundaries
- GA
- AL
- SC

Sim Name: NFSEG_PEST 2009
MassBal Polygon: GWB_2

ZB_NAME: GWB_2 Number of Cells: 9280 Area Per Cell: 6,250,500 SF
All units expressed as Inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
2009 Mass Balance

SIMULATED MASS BALANCE REPORT

MassBal Polygon: GWB_3

ZB_NAME: GWB_3  Number of Cells: 32612  Area Per Cell: 6,250,500 SF
All units expressed as Inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
2009 Mass Balance

Layer 1
- L1 CH: 0.20
- L1 DRN: 1.21
- L1 RIV: 1.09
- L1 Q_LAT: 0.00
- L1 Q_WEL: 0.01
  (L1 Q_WEL: 4.70 mgd)
- L1 to L2: 0.38

Layer 2
- L2 RIV: 0.00
- L2 Q_LAT: 0.00
- L2 Q_WEL: 0.00
  (L2 Q_WEL: 0.00 mgd)
- L2 to L3: 0.39

Layer 3
- L3 RIV: 0.00
- L3 GHB: 0.01
- L3 Q_LAT: 0.08
- L3 Q_WEL: 0.25
  (L3 Q_WEL: 120.21 mgd)
- L3 to L4: 0.21

Layer 4
- L4 Q_LAT: 0.00
- L4 Q_WEL: 0.00
  (L4 Q_WEL: 0.01 mgd)
- L4 to L5: 0.21

Layers 5-7
- L567 Q_LAT: 0.13
- L567 Q_WEL: 0.35
  (L567 Q_WEL: 165.92 mgd)

SIMULATED MASS BALANCE REPORT
MassBal Polygon: GWB_4

ZB_NAME: GWB_4  Number of Cells: 44932  Area Per Cell: 6,250,500 SF
All units expressed as Inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
2009 Mass Balance

Sim Name: NFSEG_PEST  2009
MassBal Polygon: GWB_5

ZB_NAME: GWB_5  Number of Cells: 22127  Area Per Cell: 6,250,500 SF
All units expressed as Inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
SIMULATED MASS BALANCE REPORT
MassBal Polygon: GWB_6

ZB_NAME: GWB_6  Number of Cells: 12958  Area Per Cell: 6,250,500 SF
All units expressed as Inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
2009 Mass Balance

Layer 1
- RCH: 11.54
- L1 CH: 0.14
- L1 DRN: 2.44
- L1 RIV: 2.73
- L1 Q_LAT: 0.01
- L1 Q_WEL: 0.03 (L1 Q_WEL: 4.50 mgd)

Layer 2
- L2 to L1: 0.69
- L2 RIV: 0.01
- L2 Q_LAT: 0.00
- L2 Q_WEL: 0.00 (L2 Q_WEL: 0.00 mgd)

Layer 3
- L3 RIV: 0.00
- L3 GHB: 2.26
- L3 Q_LAT: 0.09
- L3 Q_WEL: 0.74 (L3 Q_WEL: 105.50 mgd)

Layer 4
- L4 to L3: 3.61
- L4 Q_LAT: 0.00
- L4 Q_WEL: 0.00 (L4 Q_WEL: 0.00 mgd)

Layers 5-7
- L5 to L4: 3.61
- L567 Q_LAT: 3.67
- L567 Q_WEL: 0.06 (L567 Q_WEL: 8.93 mgd)

Counties:
- Bradford
- Clay
- St. Johns
- Alachua
- Putnam
- Marion
- Flagler
- Volusia
- Lake
- Sumter
- Orange
- Seminole
- Brevard

Sim Name: NFSEG_PEST 2009
MassBal Polygon: GWB_7

ZB_NAME: GWB_7  Number of Cells: 13348  Area Per Cell: 6,250,500 SF
All units expressed as Inches Per Year over the selected cells (except where noted)
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.
Next Steps
Case 007 Updates

- Adjust drainage well flows to better match prior models
  - Peninsular Florida model, adjusting for rainfall using 1993/1994 rainfall relative to 2001 and 2009 Recharge updates
- Adjust recharge to reflect changes to drainage well fluxes
- Add vertical head difference target(s)
  - L1-L3, Brooker/Bradford County
- Update horizontal head differences
  - targets in NWFWM and correct zero-valued targets
- Apply NWFWM-provided parameter bounds
- Improve baseflow matches – Suwannee River gages
Uncertainty Analysis

- Two main components
  - Traditional sensitivity analysis and composite-scaled sensitivities
  - Nonlinear uncertainty analysis
    - Assessment of parameter and prediction uncertainty
- Stakeholder comments
  - Final SOW will strive to incorporate comments
2010 Verification

- Water use and boundary condition arrays - complete
- Run with case 007
- Results in draft NFSEGv1.1 model and documentation
No Pumping Scenario

- Draft strategy on-going
  - Proposed approach for scenario implementation
  - Proposed methodology for evaluation of simulation results, i.e., reasonableness check
- Panel/Technical team/stakeholders review - January
- Incorporate comments received - early February
- Results provided with NFSEGv1.1 draft model document
Schedule

- Finalize model improvements Dec-2017
- Finalize uncertainty scope Dec-2017
- Run 2010 verification scenario Jan-2018
- Complete uncertainty analysis Feb-2018
- Run pumps-off scenarios Feb-2018
- NFSEb1.1 model / documentation Mar-2018
- Peer review panel workshop Apr-2018
- Draft peer review report late Apr-2018
- Stakeholder comments May-2018
- WMDs resolution document late May-2018
- Final peer review report Jun-2018
- Post NFSEb1.1 Jun/Jul-2018
Public Comments