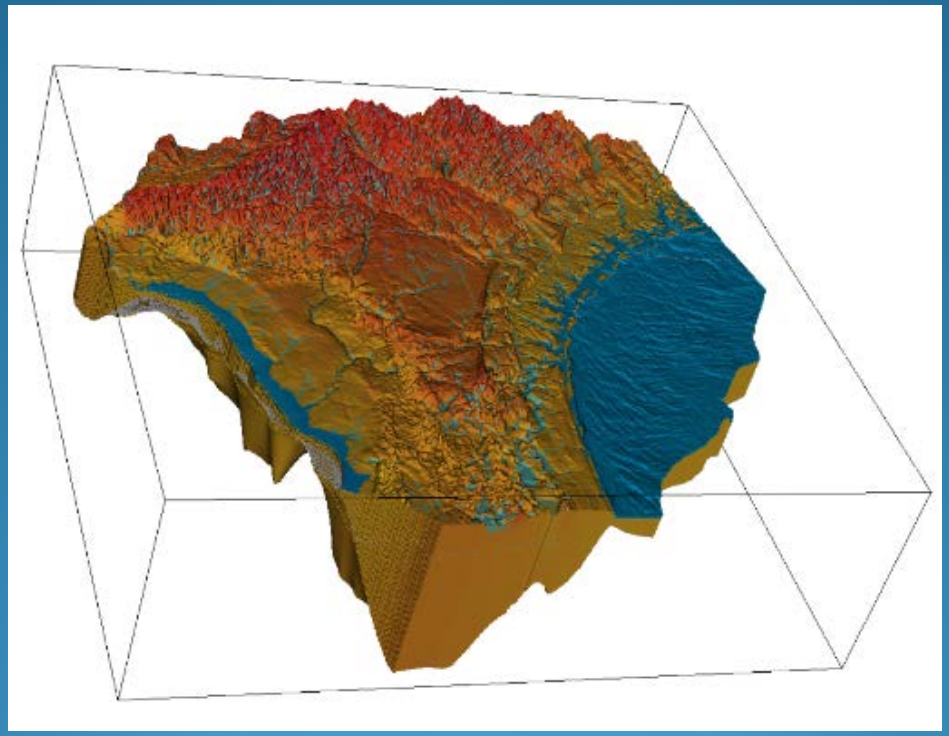
NFSEG v1.1
Task C2 Meeting



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

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

Status of Model Improvements

Improvement	Status Dec 1 (006E)
Improve baseflow simulations in the groundwater model in critical areas	Baseflow target analysis **complete**. **Near Complete**
Improve point-source recharge distribution	**Near Complete** Refinement of drainage well fluxes and redistribution of same to areal recharge Case 007
Improve aquifer parameter estimates in the model	Allowed for spatial variation in anisotropy in Layer 3 by adding additional pilot points throughout the model domain **On-going**

Status of Model Improvements

Improvement	Status Dec 1 (006E)
Null Space Monte Carlo Uncertainty Analysis	Draft scope reviewed and comments received Final scope - December 2017 **On-going**
Implement miscellaneous improvements and corrections.	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**

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

Peer Reviewer Comments/Topics	Status
HSPF – Evaluation to determine if additional station data available for calibration	Complete
HSPF – model parameter maps	On-going
Baseflow target methodology	Complete
Mass balance summary – model-wide	Complete - updated with each case
Groundwater basin mass balances	Initial analysis complete (Case oo6E)
Consideration of removal of temporal head differences as calibration targets	Complete - removed
APT to modeled transmissivity Comparison	Complete - updated with each case

Case 006e Calibration Statistics – Heads

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	1628
Residual mean	0.27
Abs(residual) mean	3.98
Residual std dev	7.79
Fraction within 5 ft	0.76
Fraction_within 2.5 ft	0.51

Summary statistics for weighted residuals:

Residual count	1628
Residual mean	-0.10
Abs(residual) mean	3.05
Residual std dev	4.98

Notes:
1. Synthetic Layer 1 Head Residuals: Included
2. Layer 2 Head Residuals: Excluded
3. Layer Filter Applied: None

Case 006E Calibration Statistics – Heads

Synthetic Targets Excluded

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

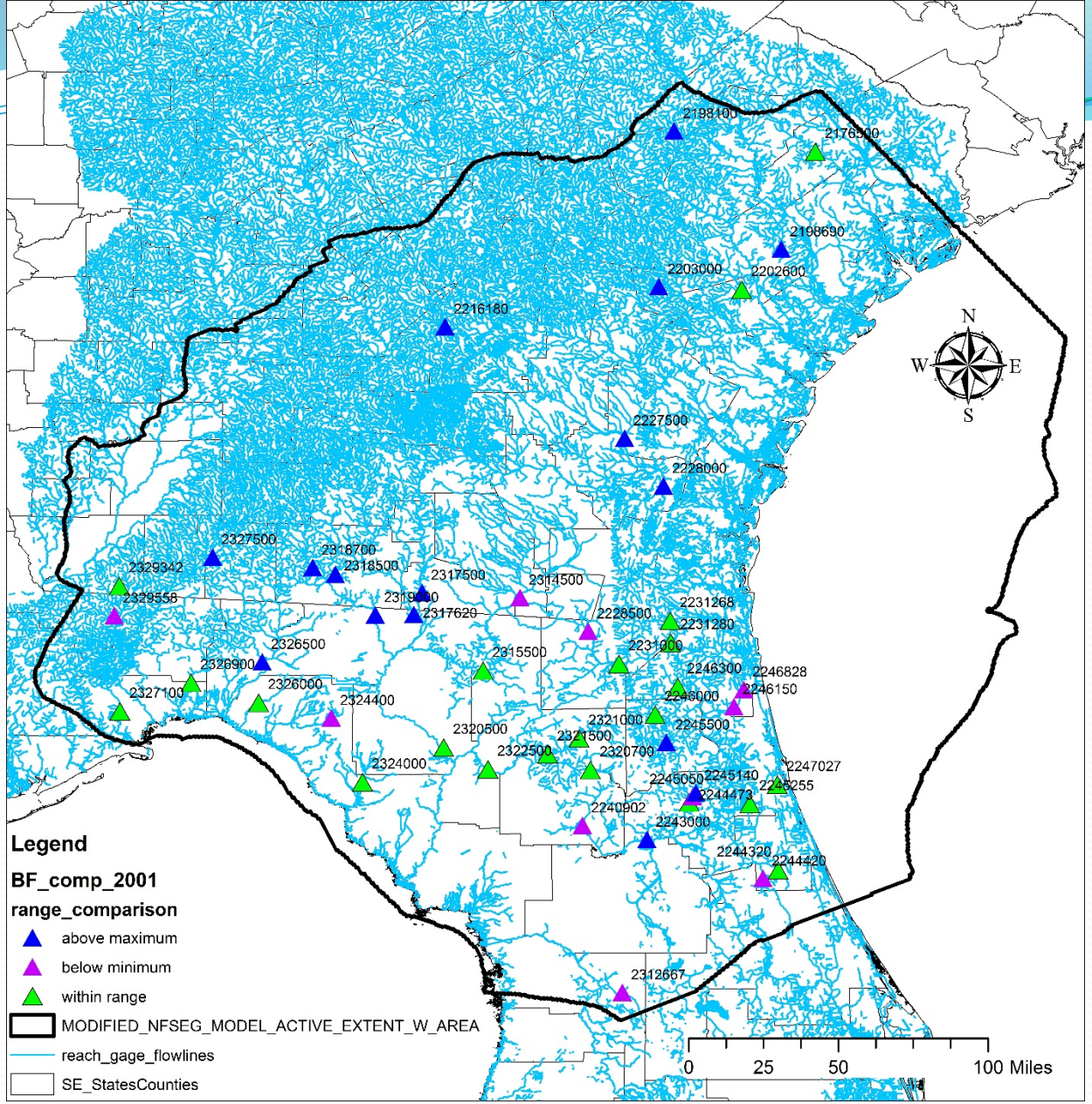
Summary statistics for unweighted residuals:

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

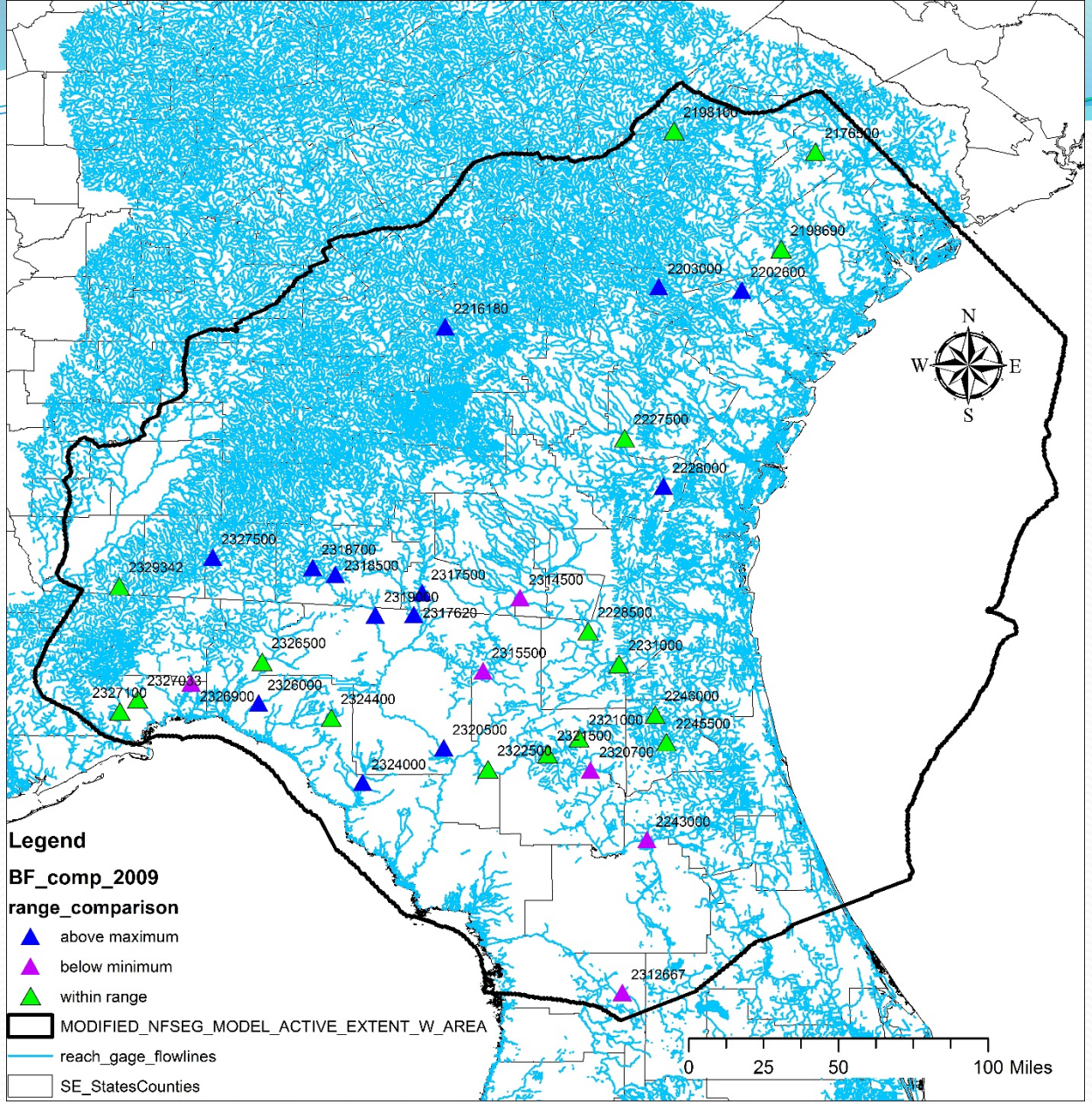
Summary statistics for weighted residuals:

Residual count	1282
Residual mean	-0.42
Abs(residual) mean	3.33
Residual std dev	4.72

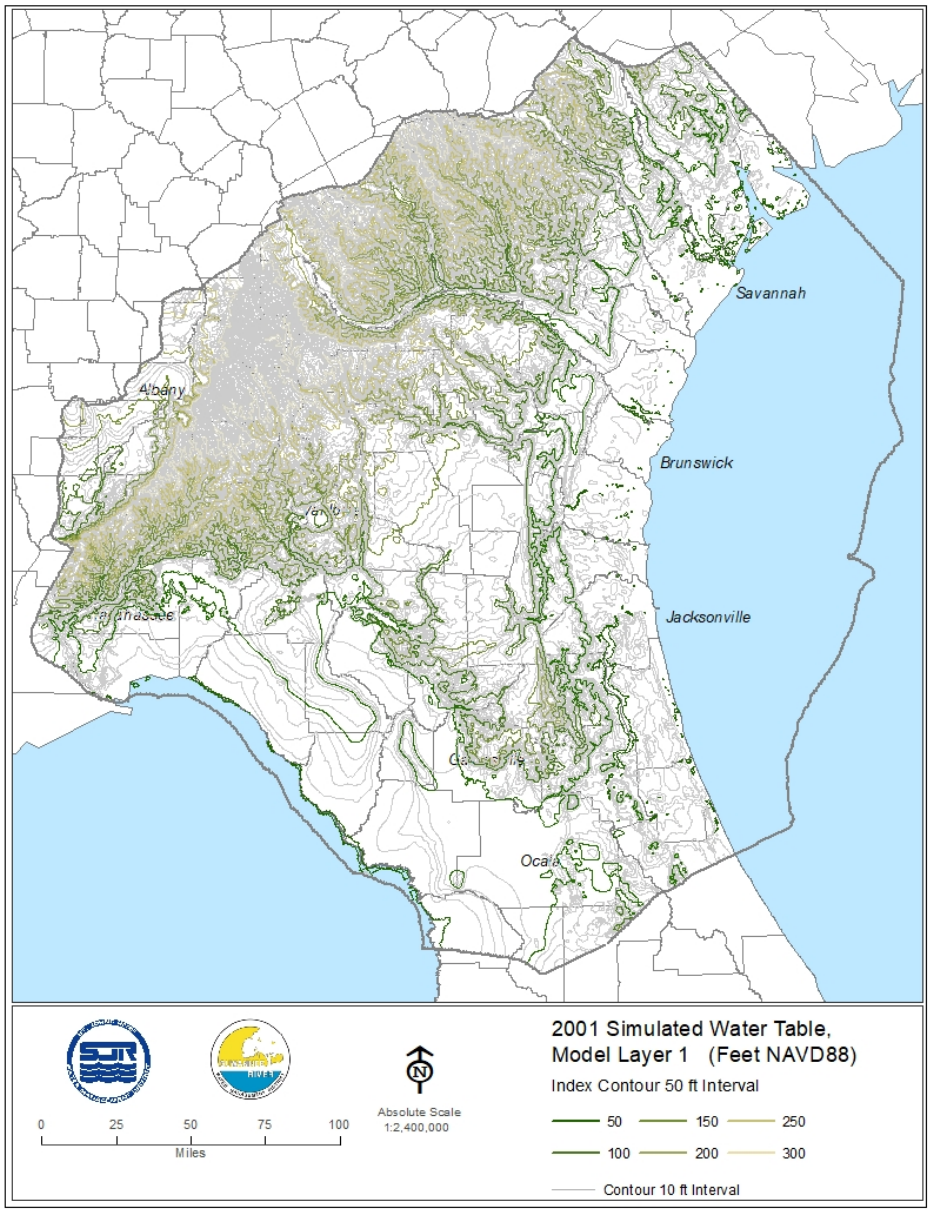
Notes:
1. Synthetic Layer 1 Head Residuals: Excluded
2. Layer 2 Head Residuals: Excluded
3. Layer Filter Applied: None

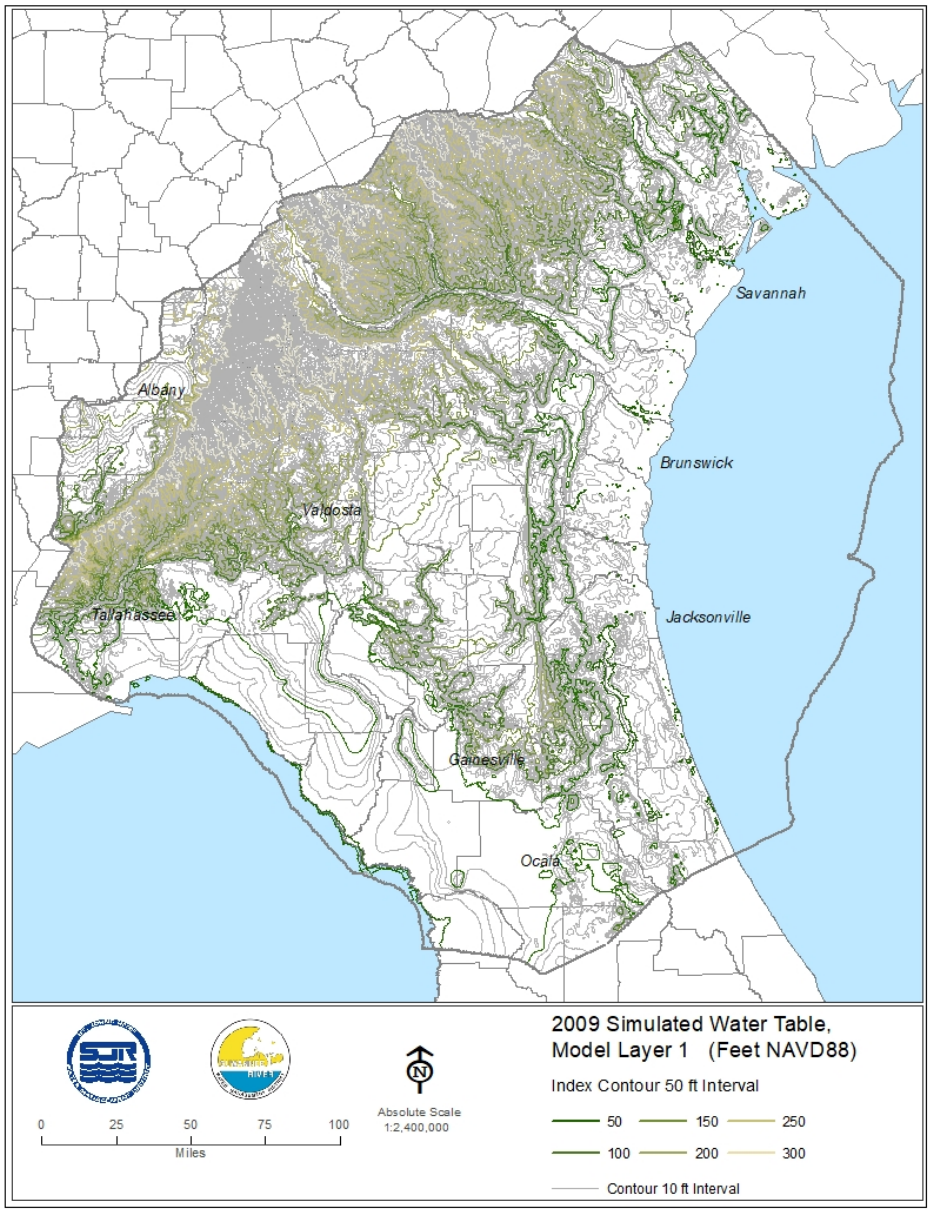


Case 006E Baseflow Comparison - 2001

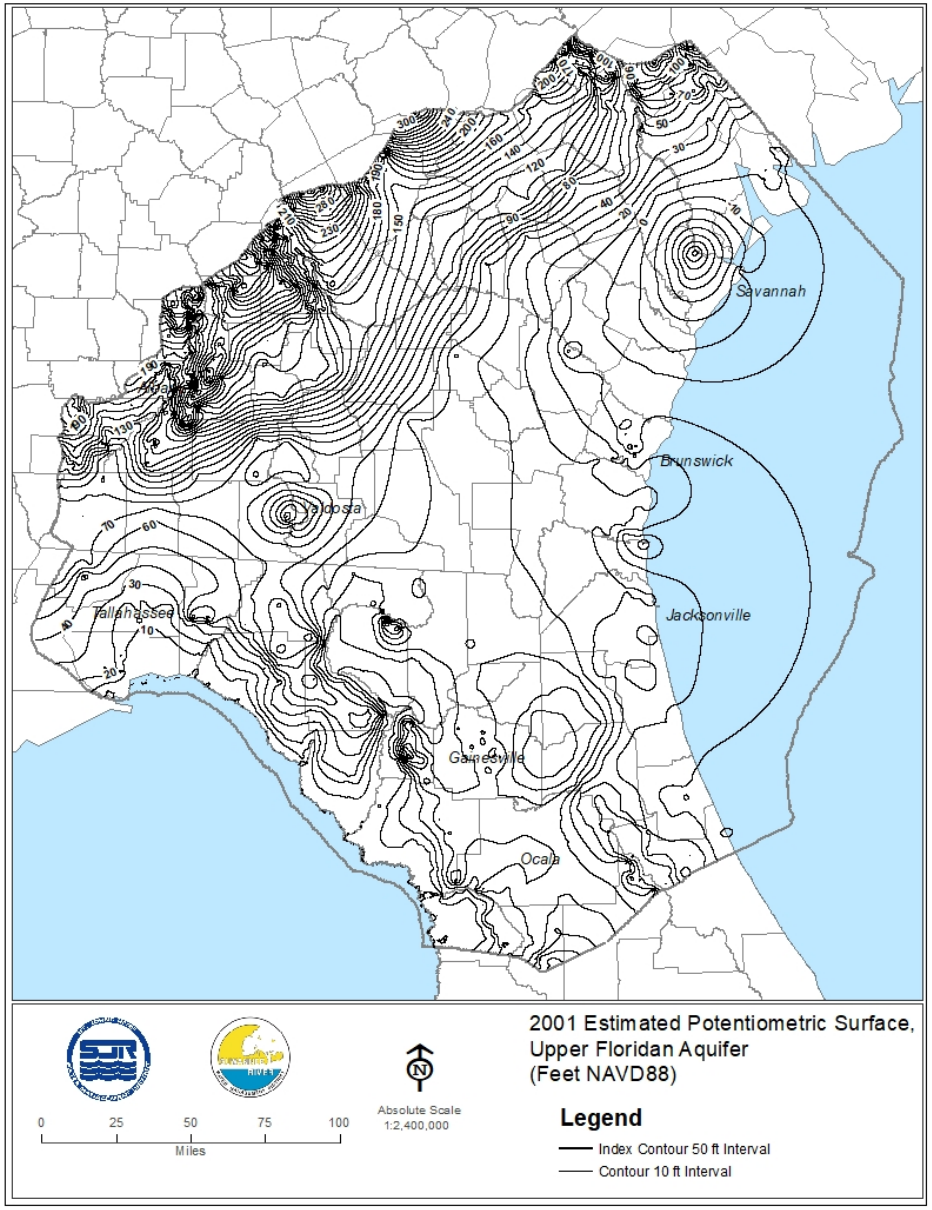


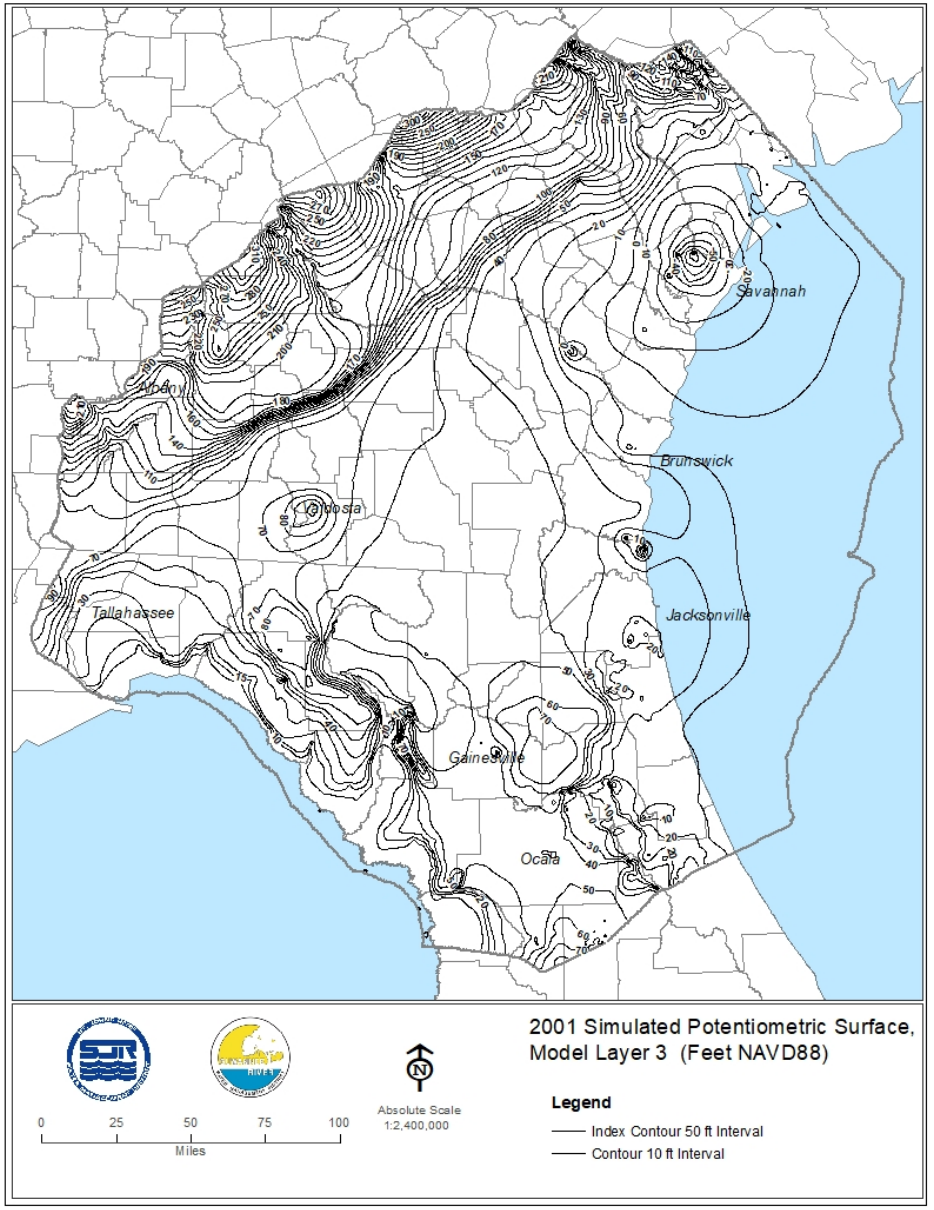
Case 006E Baseflow Comparison - 2009





Case 006E – L1 Simulated Heads





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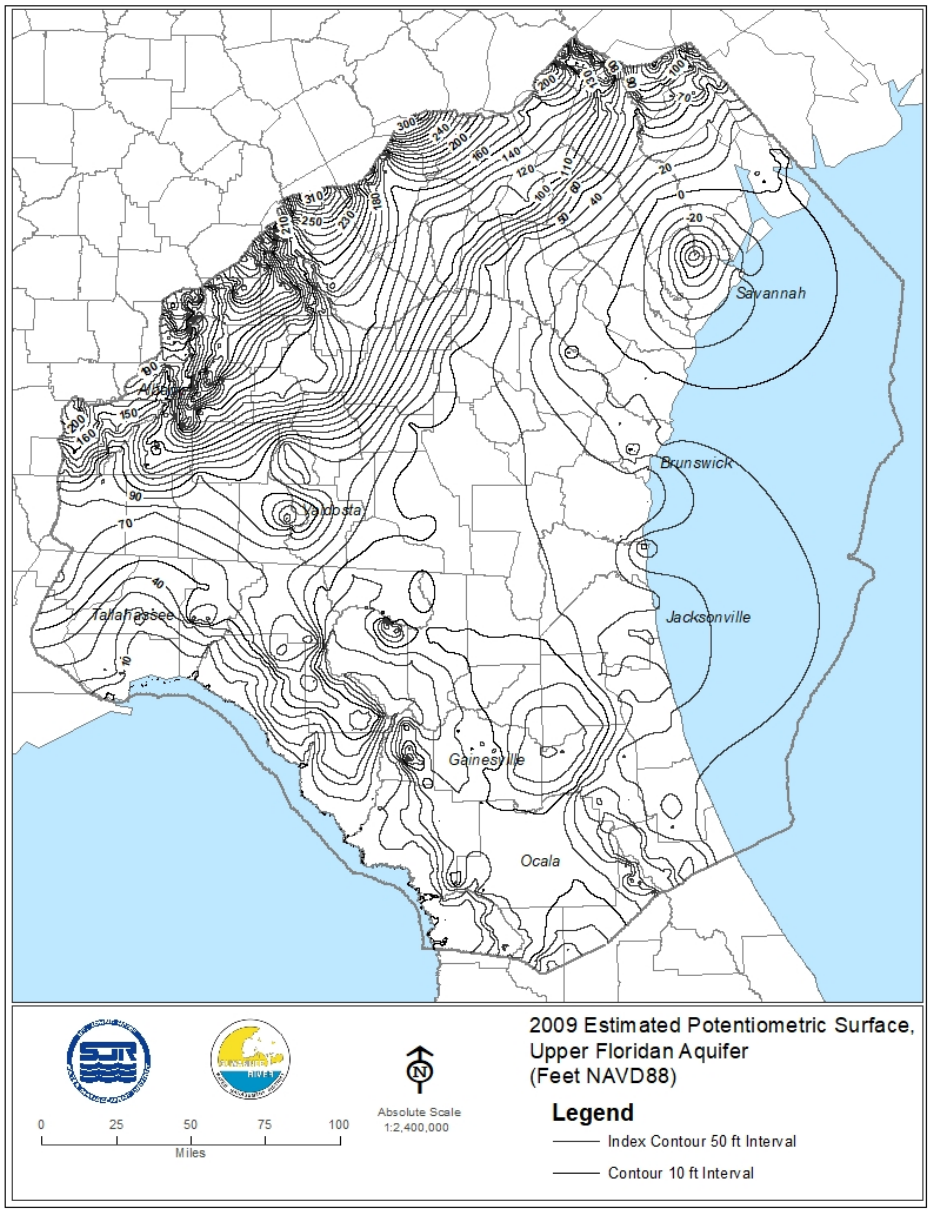
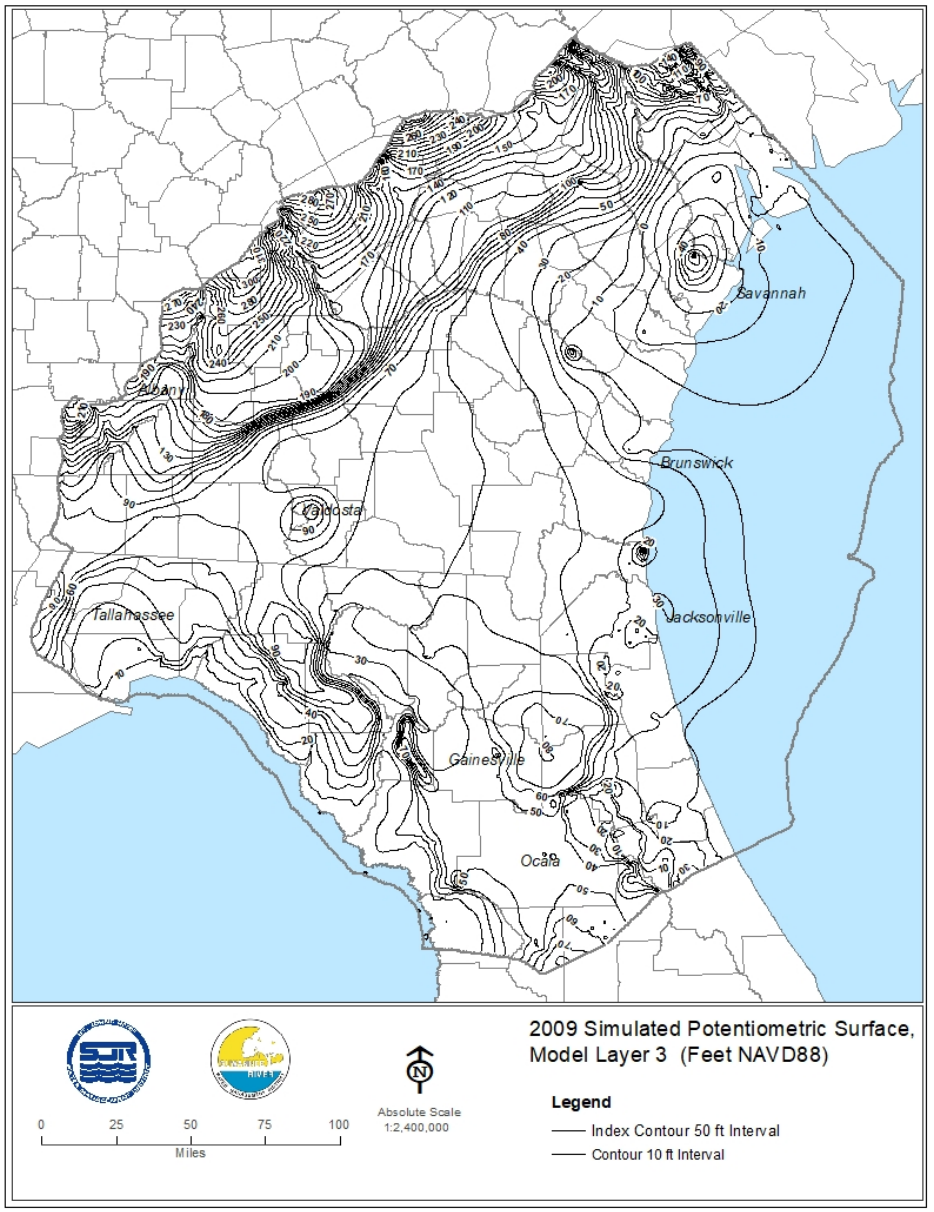
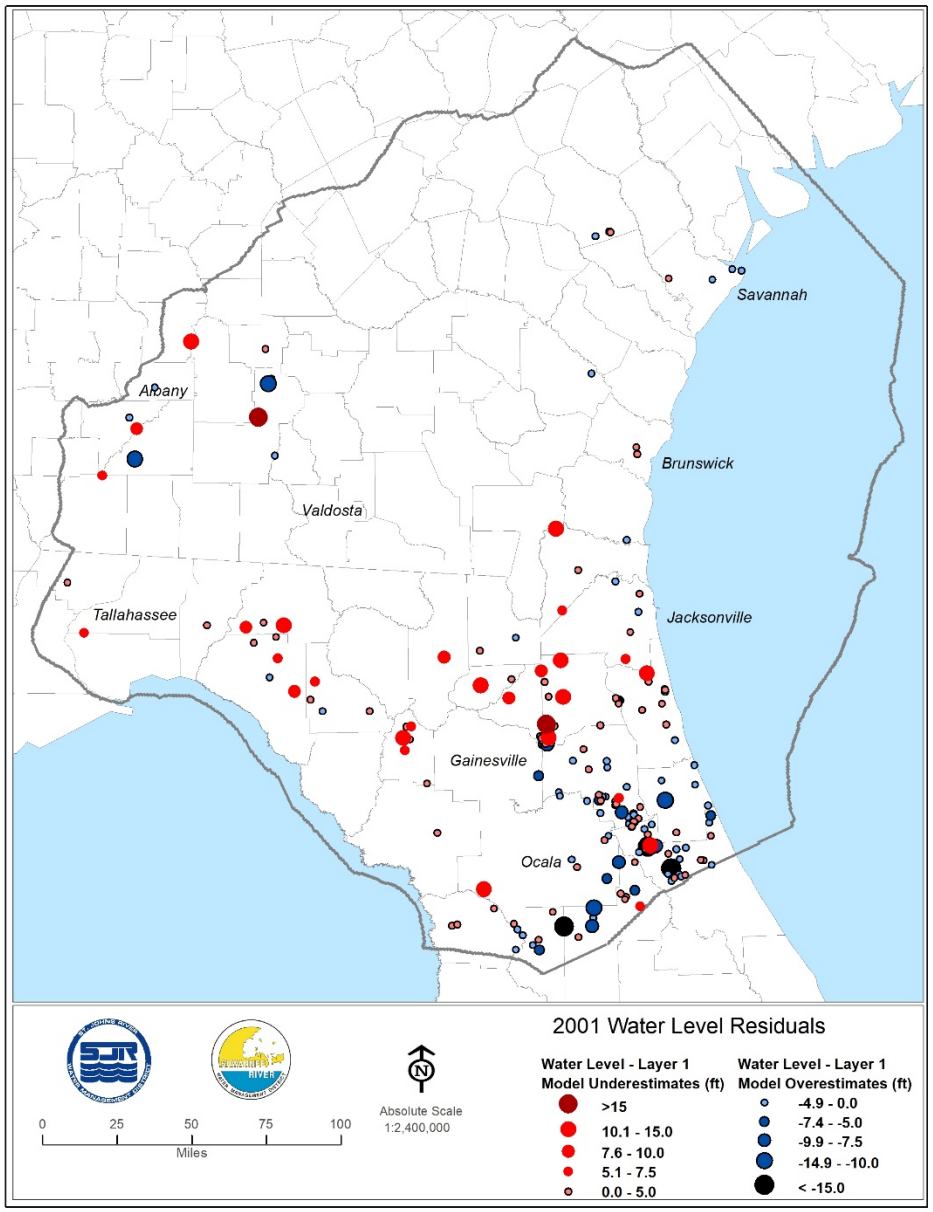
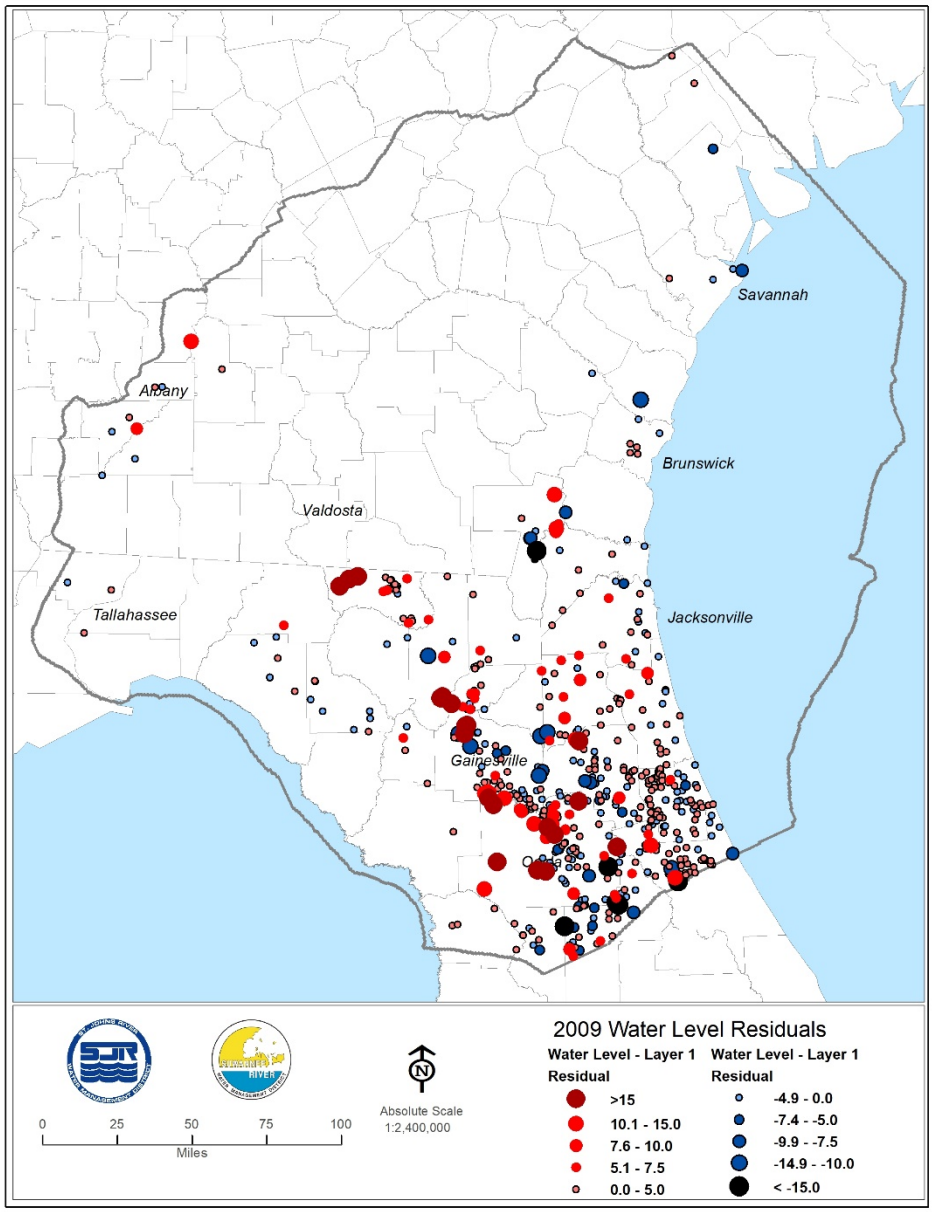




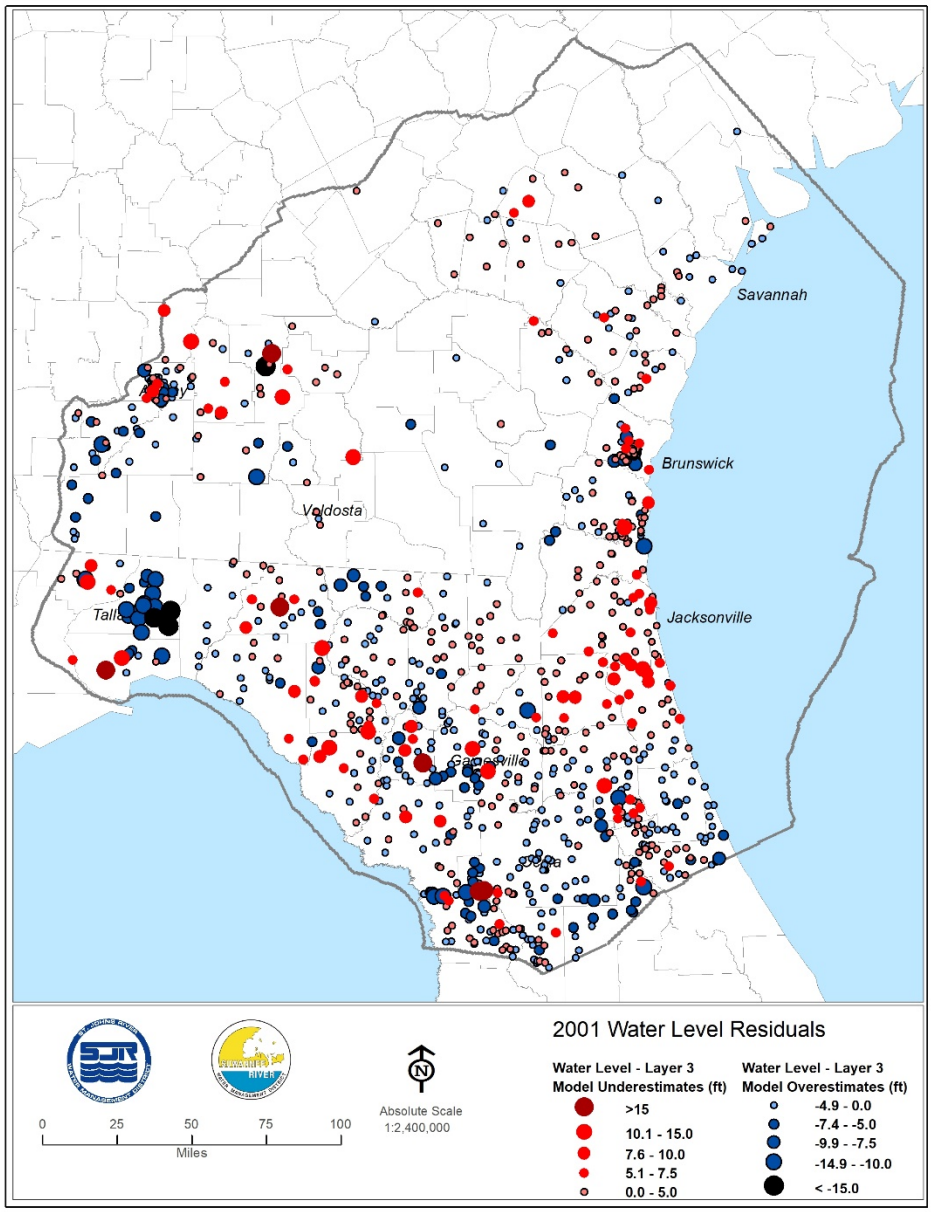
Case 006E – L3 Heads - 2009

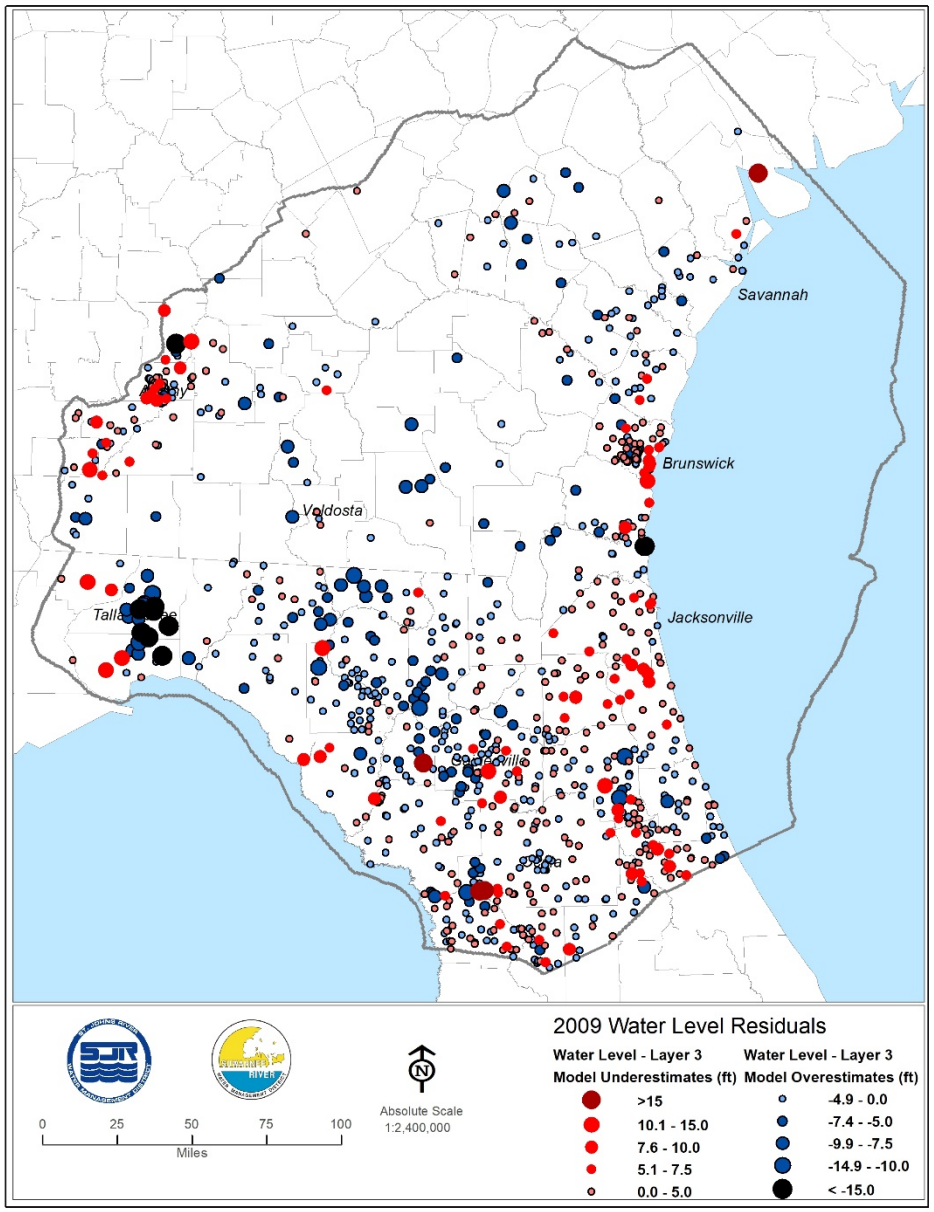




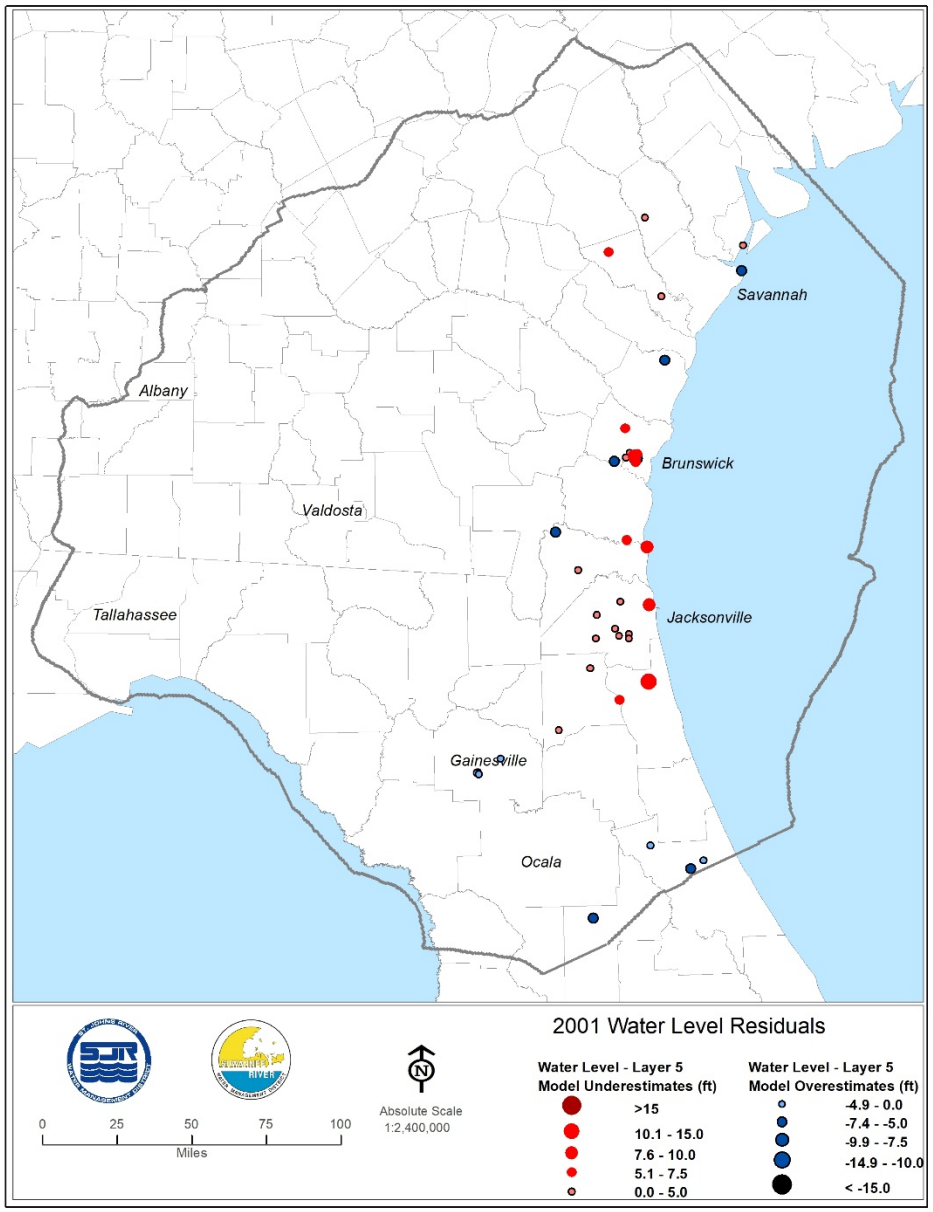
Case 006E – L1 Residuals

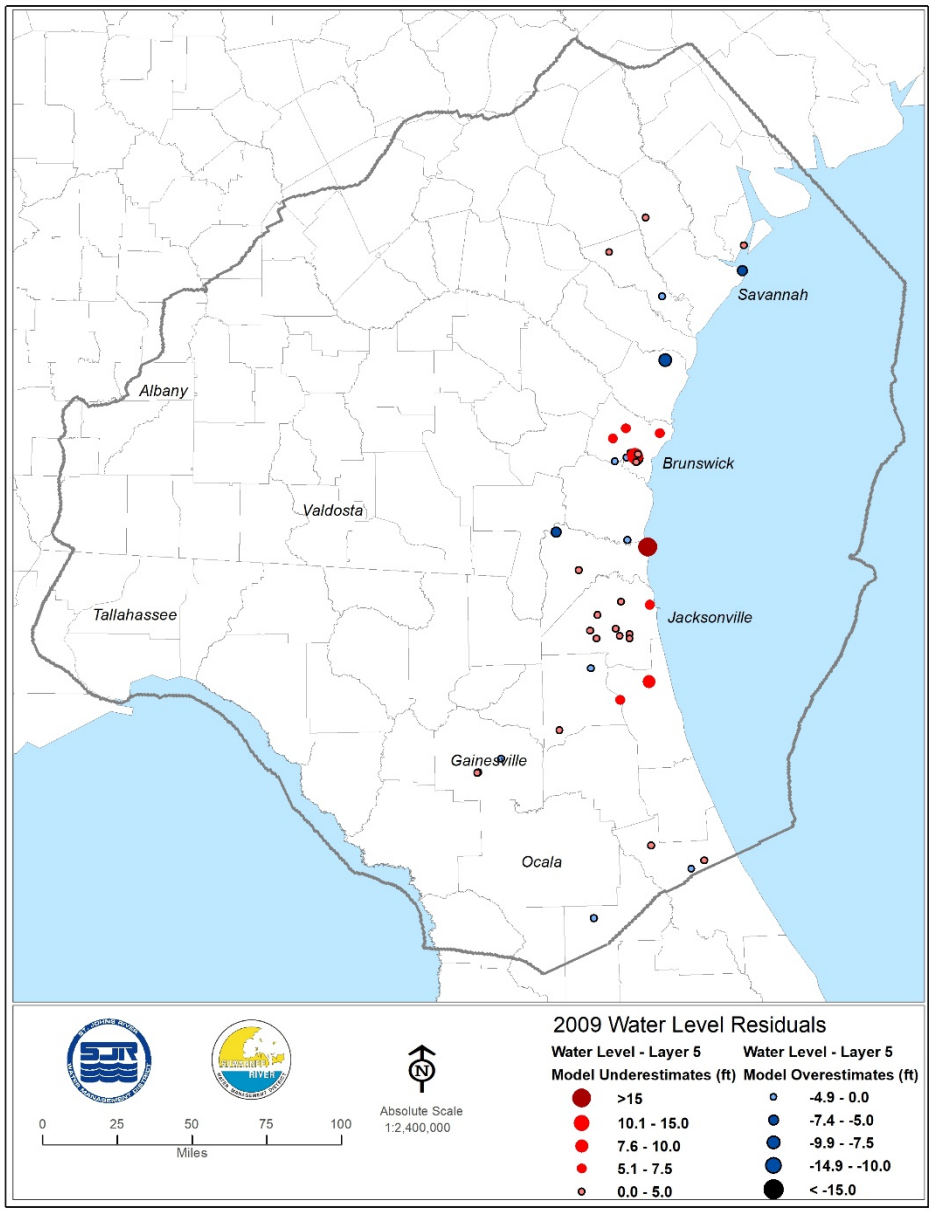
Note: 2009 Includes Synthetic Targets



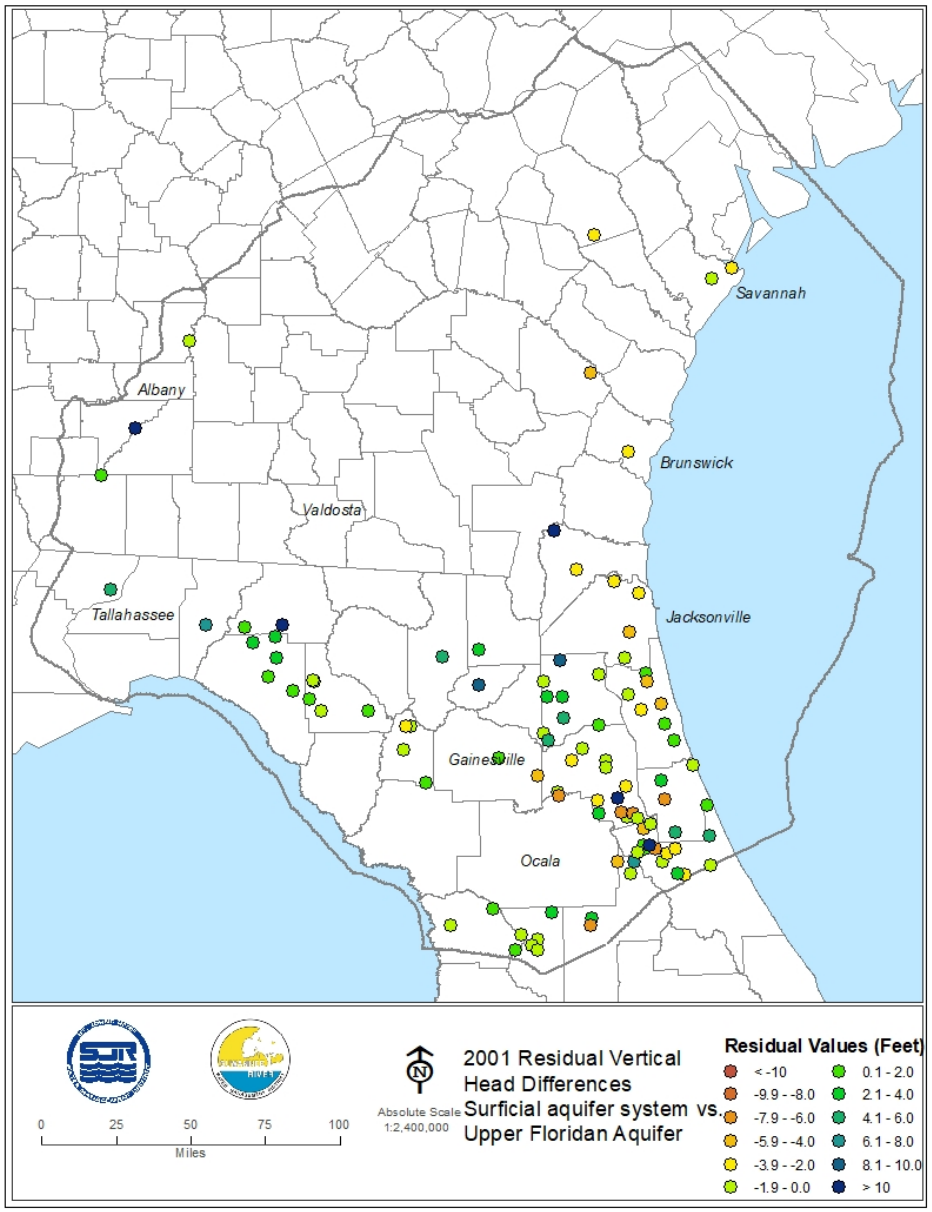


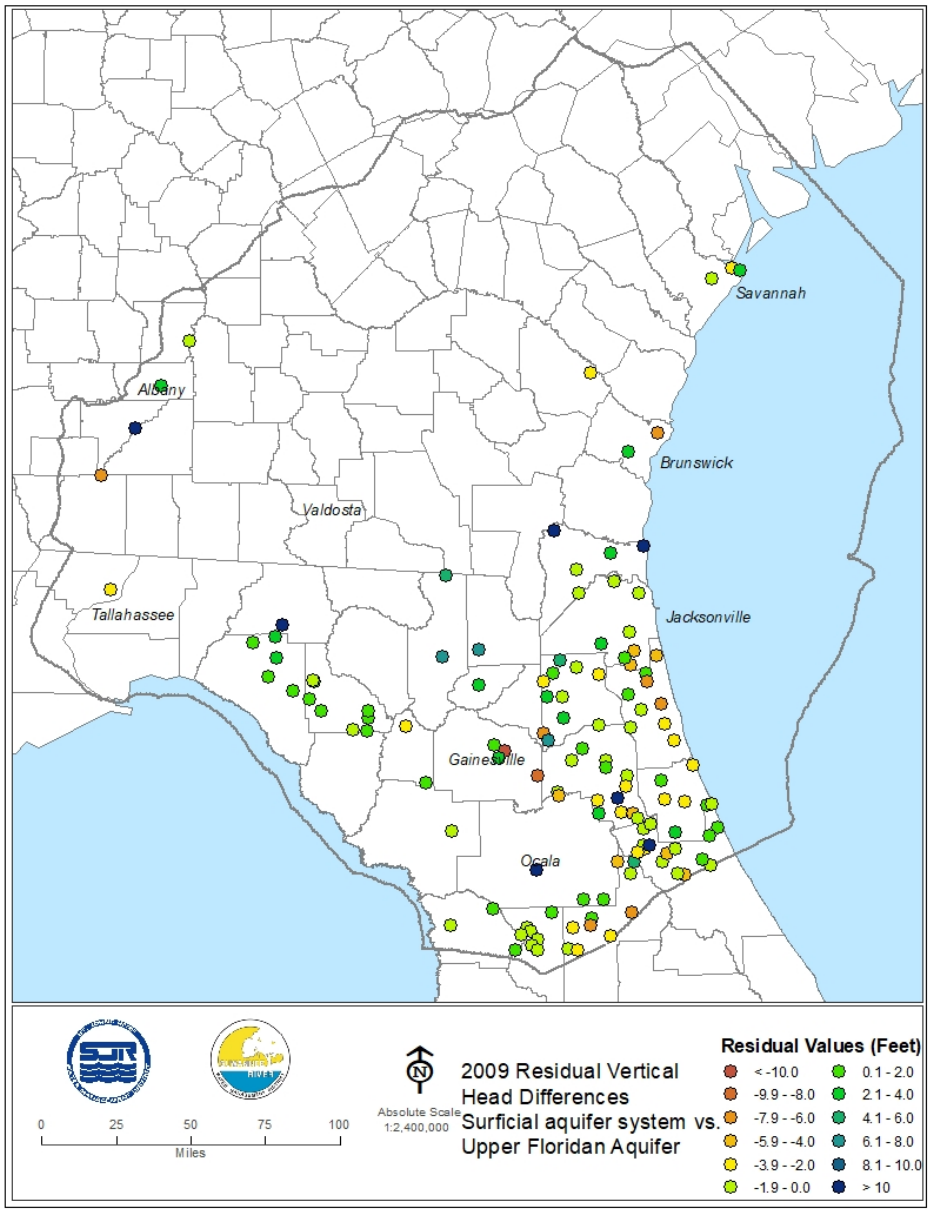
Case 006E – L3 Residuals



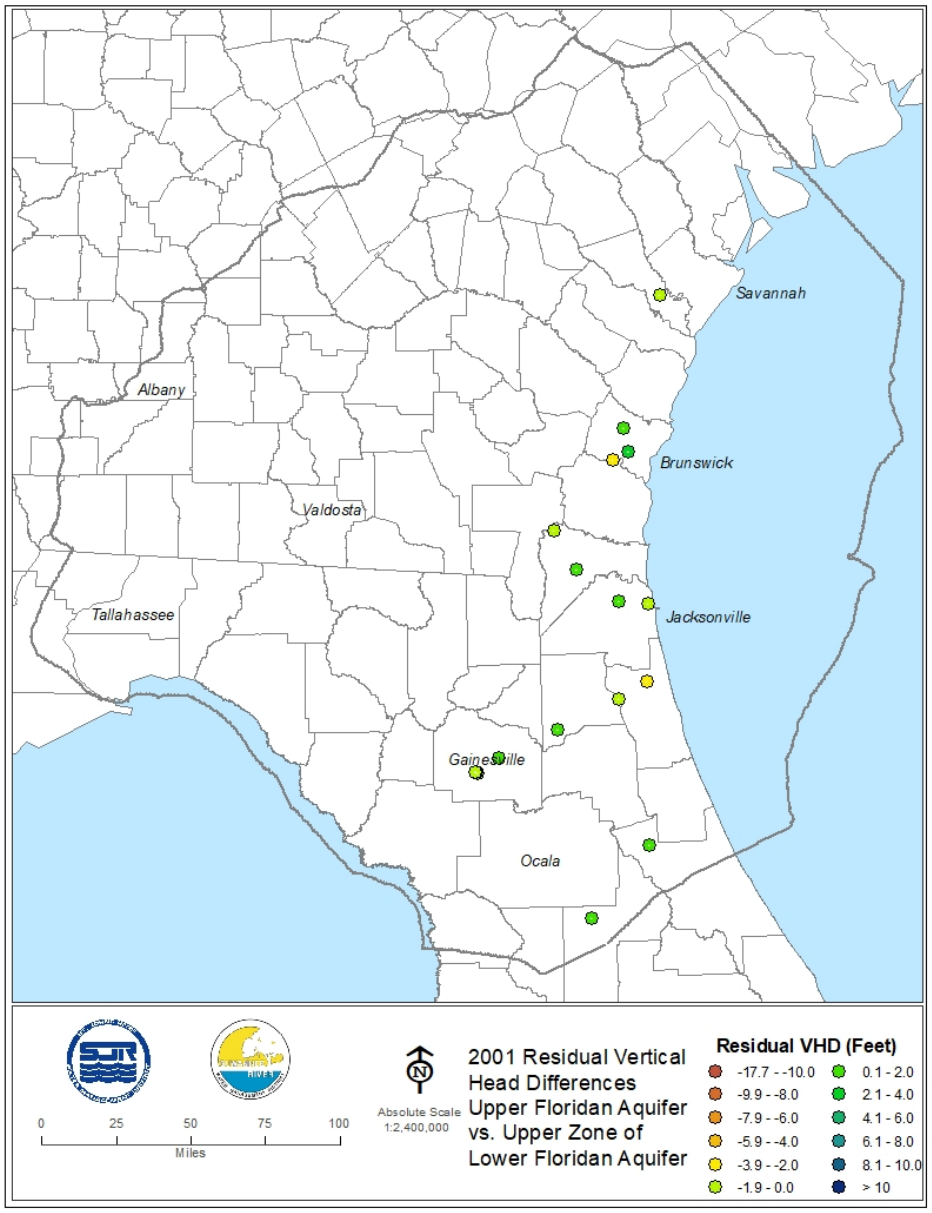


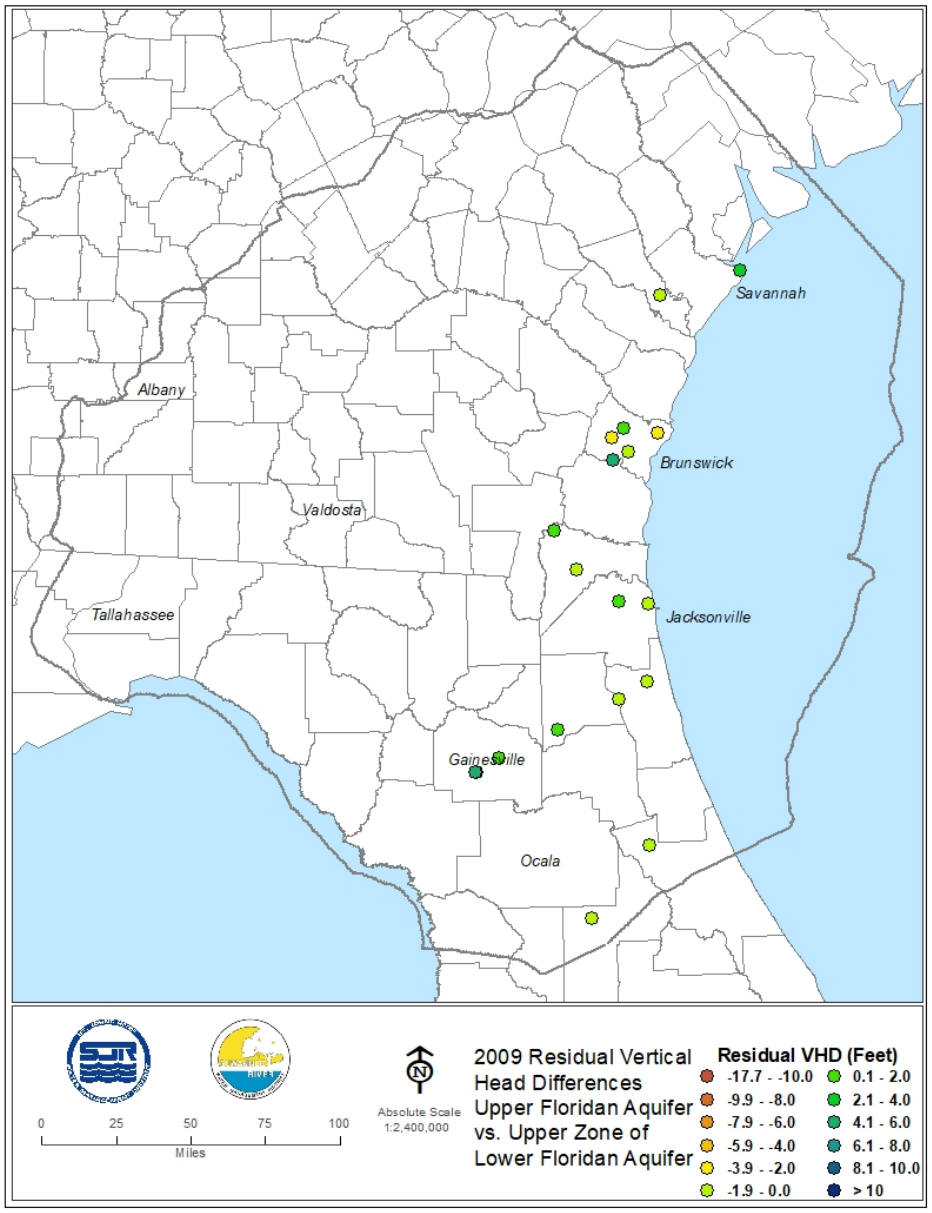
Case 006E – L5 Residuals



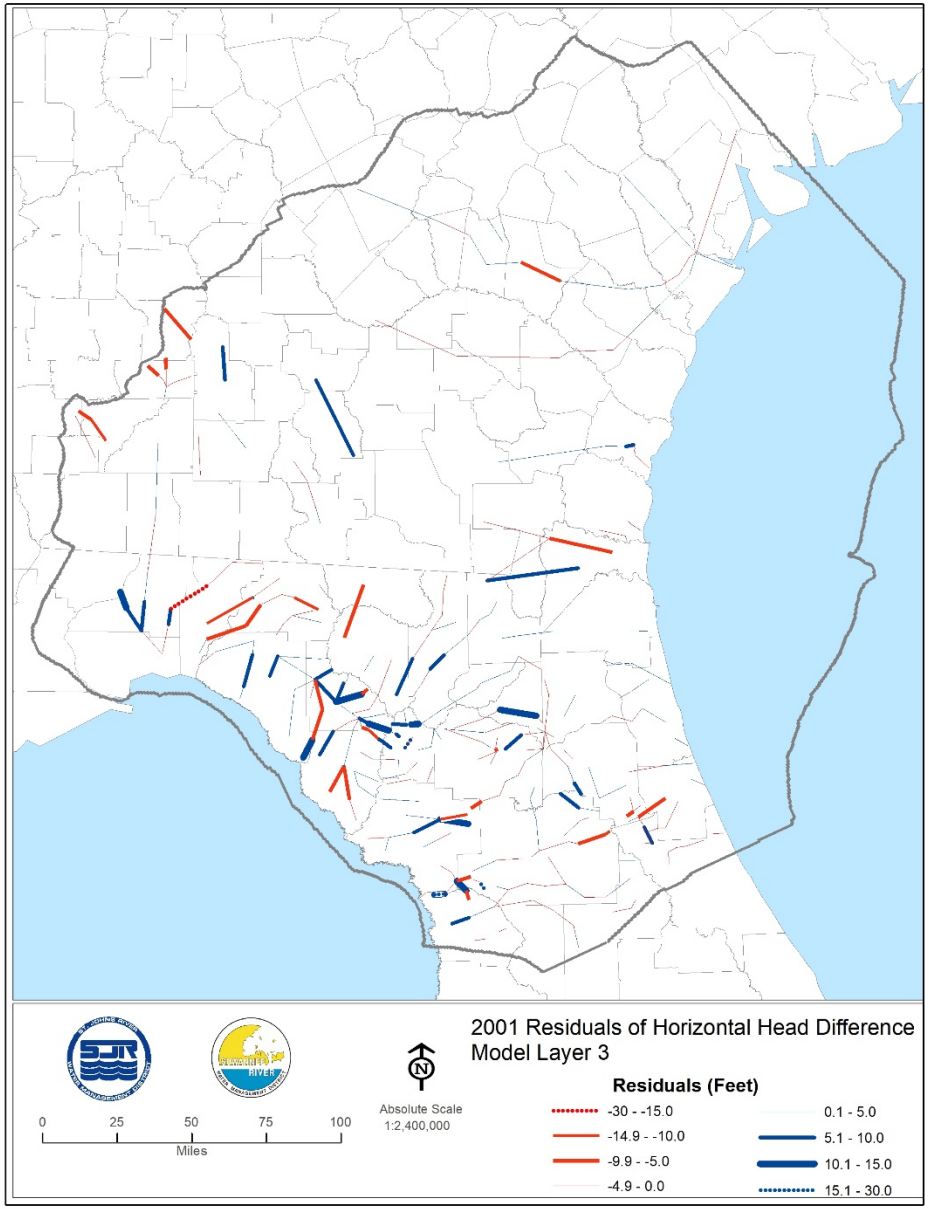


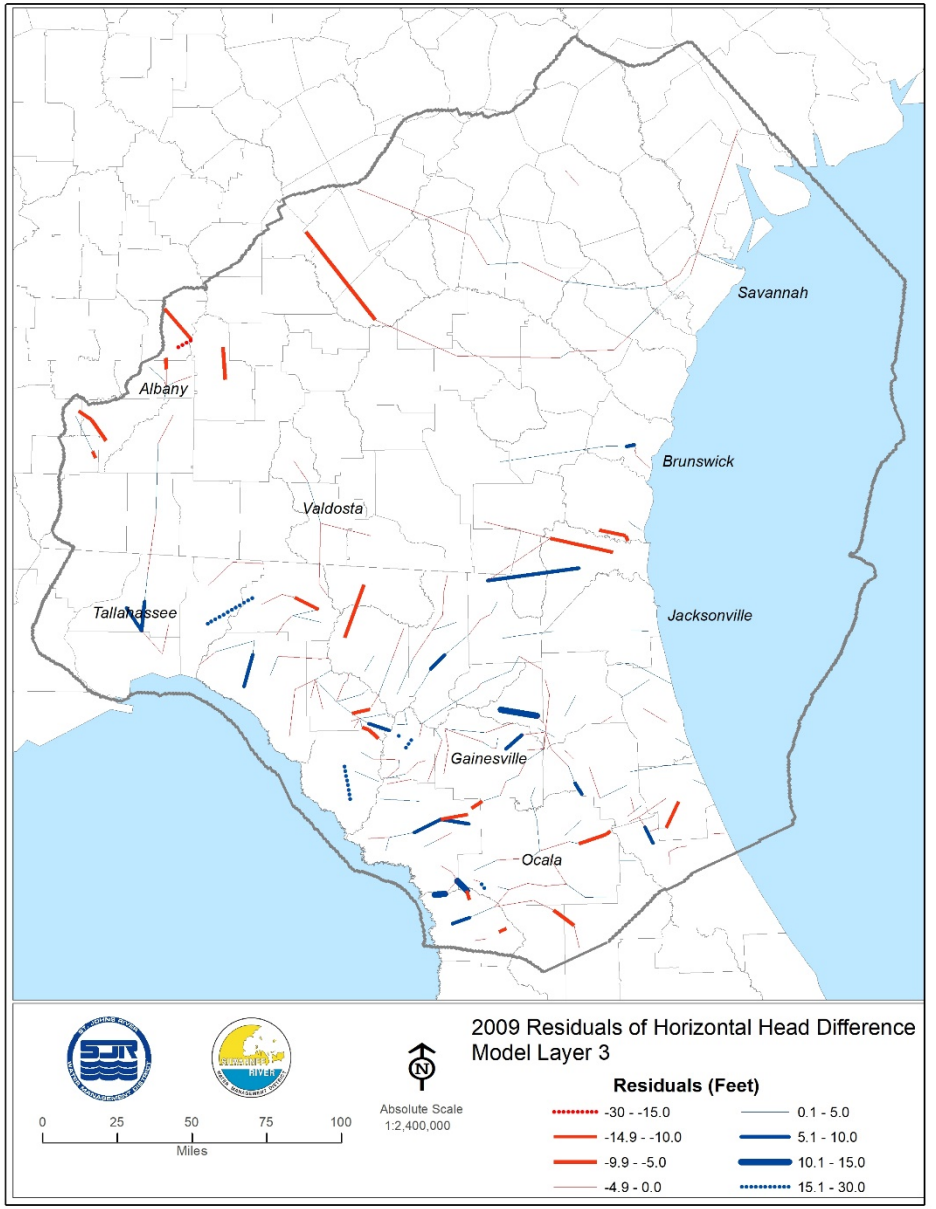
Case 006E – L1-L3 VHD Residuals



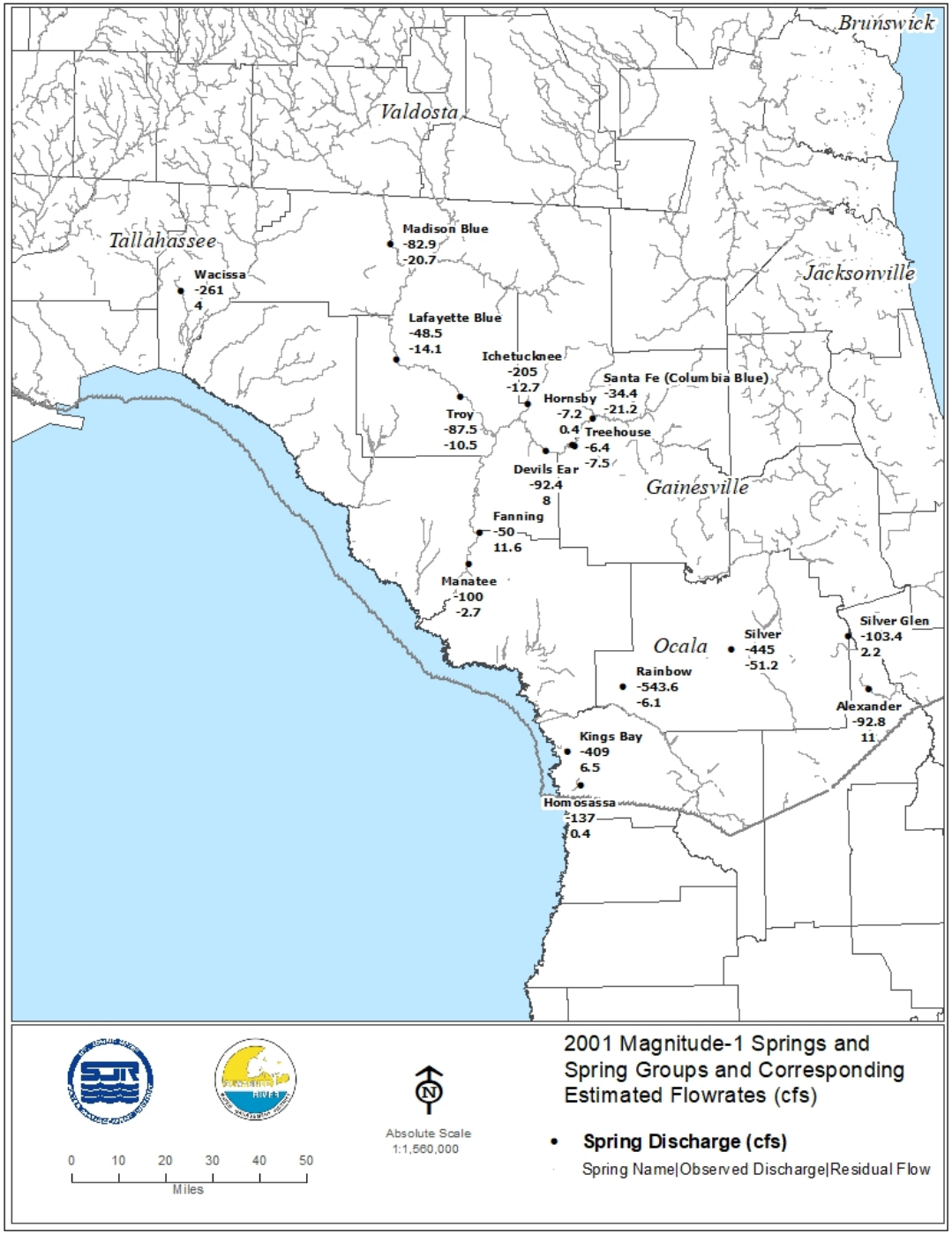


Case 006E – L3-L5 VHD Residuals

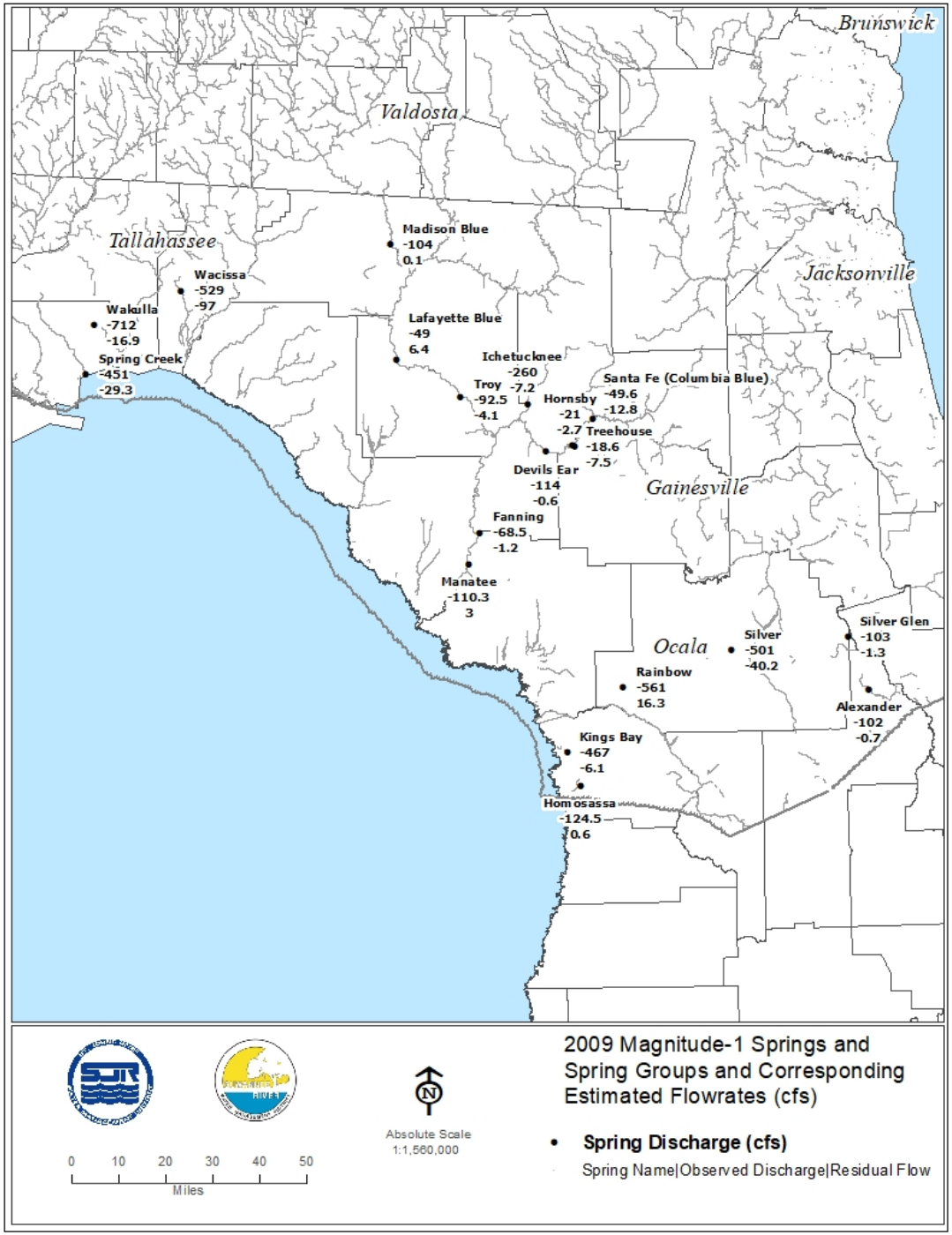




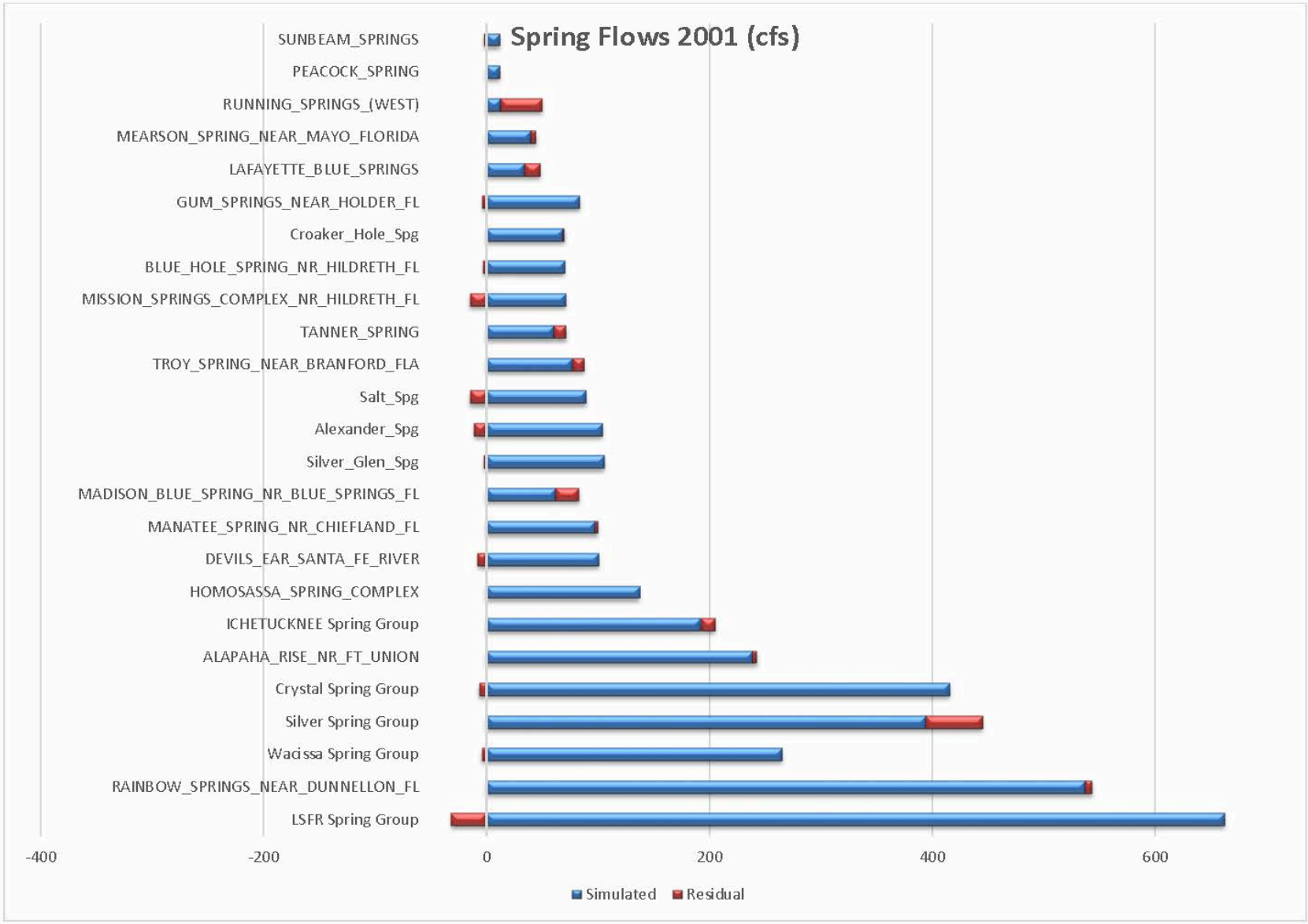
Case 006E – L3 HHD Residuals

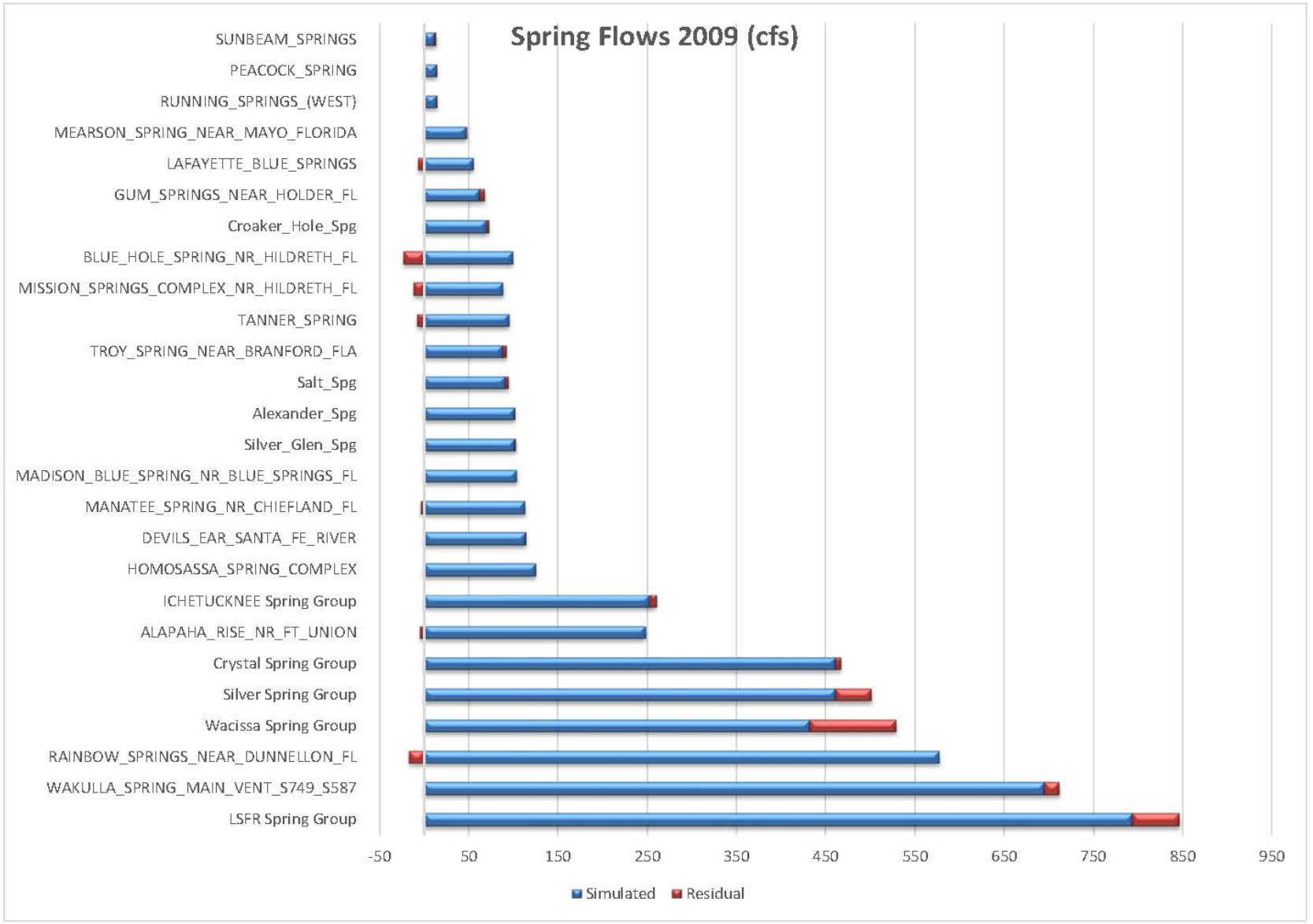


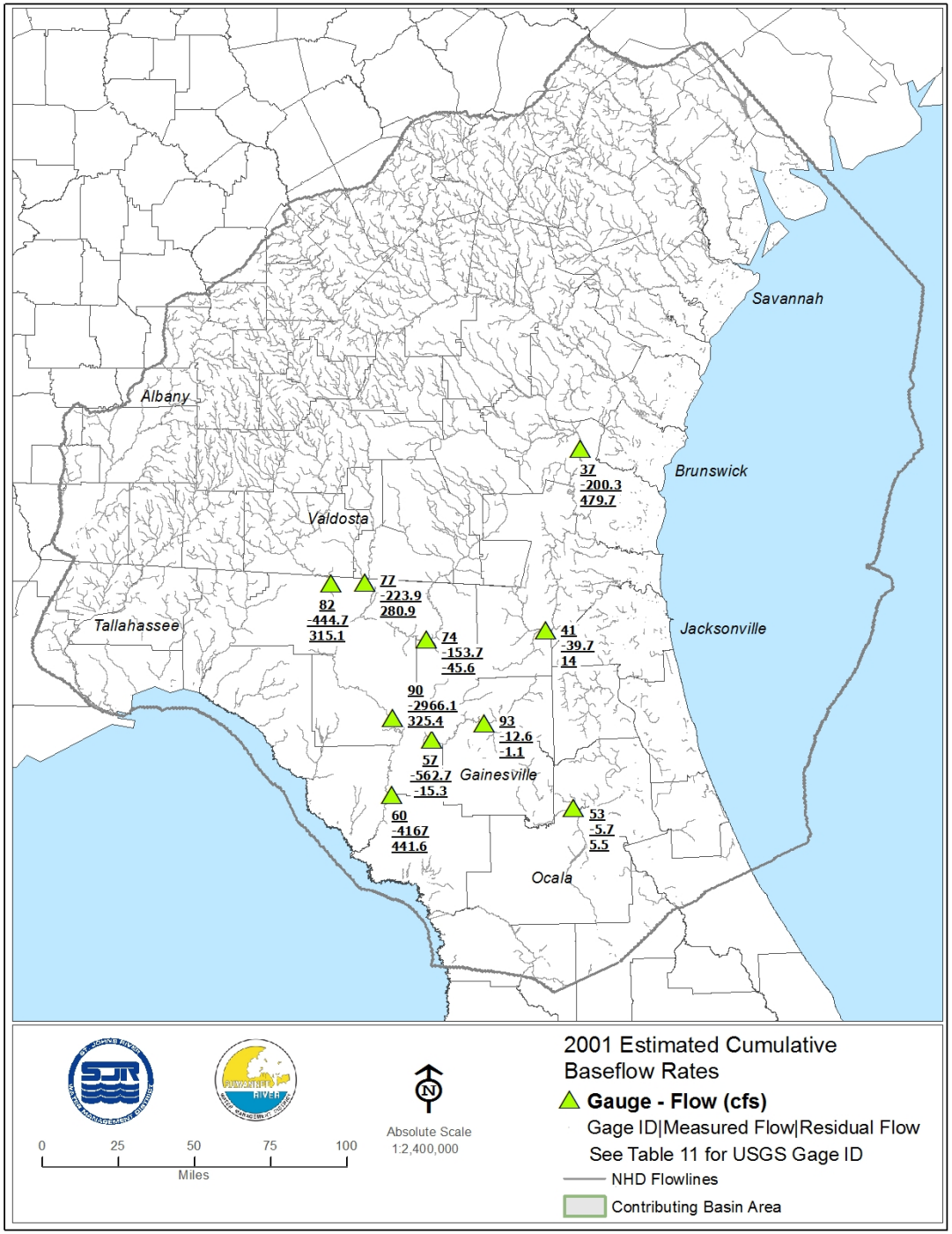
Case 006E Mag. 1 Springs/Springs Groups 2001



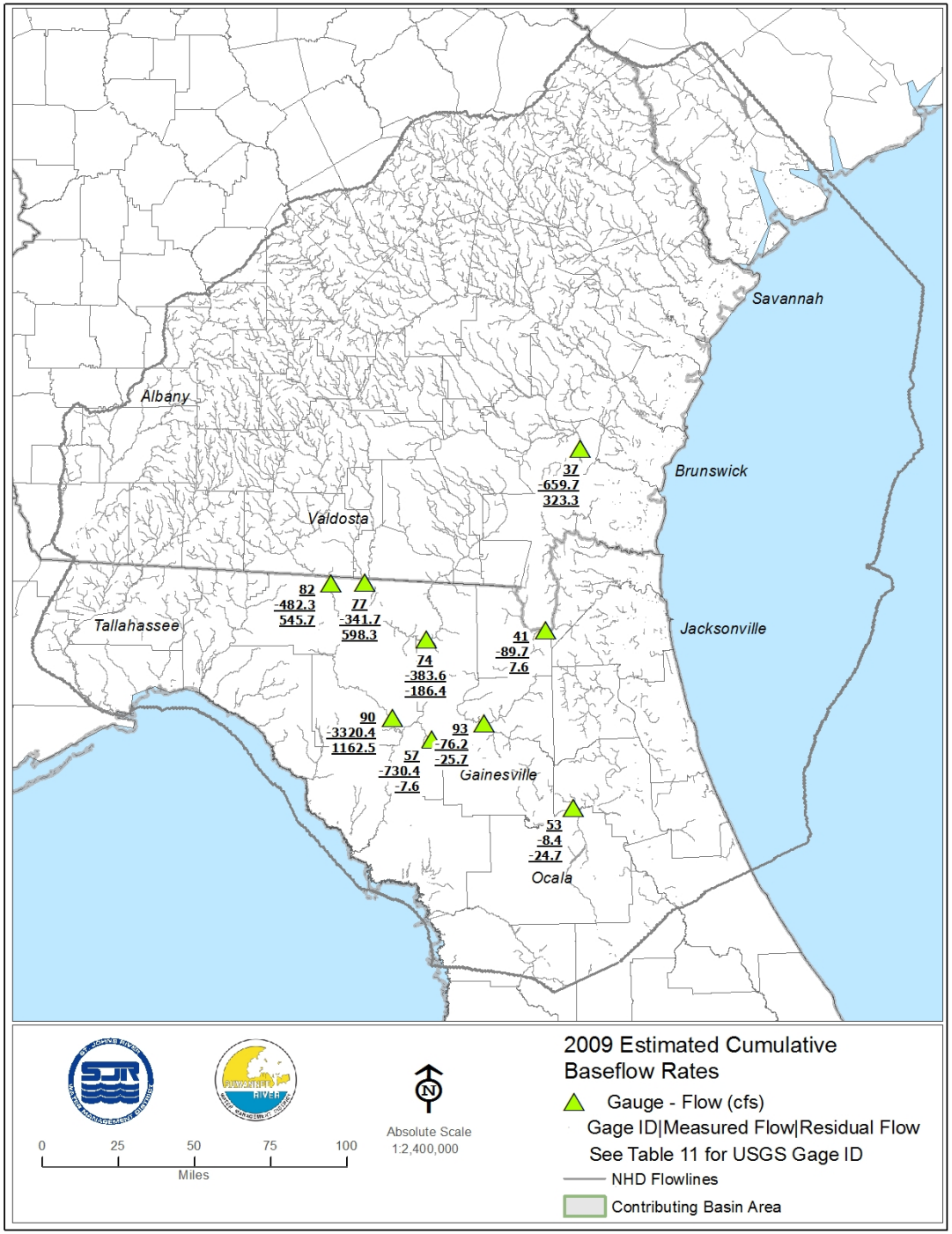
Case 006E Mag. 1 Springs/Springs Groups 2009


Spring Flows 2001 (cfs)
SUNBEAM_SPRINGS
PEACOCK_SPRING
RUNNING_SPRINGS_(WEST)
MEARSON_SPRING_NEAR_MAYO_FLORIDA
LAFAYETTE_BLUE_SPRINGS
GUM_SPRINGS_NEAR_HOLDER_FL
Croaker_Hole_Spg
BLUE_HOLE_SPRING_NR_HILDRETH_FL
MISSION_SPRINGS_COMPLEX_NR_HILDRETH_FL
TANNER_SPRING
TROY_SPRING_NEAR_BRANFORD_FLA
Salt_Spg
Alexander_Spg
Silver_Glen_Spg
MADISON_BLUE_SPRING_NR_BLUE_SPRINGS_FL
MANATEE_SPRING_NR_CHIEFLAND_FL
DEVILS_EAR_SANTA_FE_RIVER
HOMOSASSA_SPRING_COMPLEX
ICHETUCKNEE Spring Group
ALAPAHA_RISE_NR_FT_UNION
Crystal Spring Group
Silver Spring Group
Wacissa Spring Group
RAINBOW_SPRINGS_NEAR_DUNNELLON_FL
LSFR Spring Group
-400
-200
0
200
400
600
Simulated
Residual

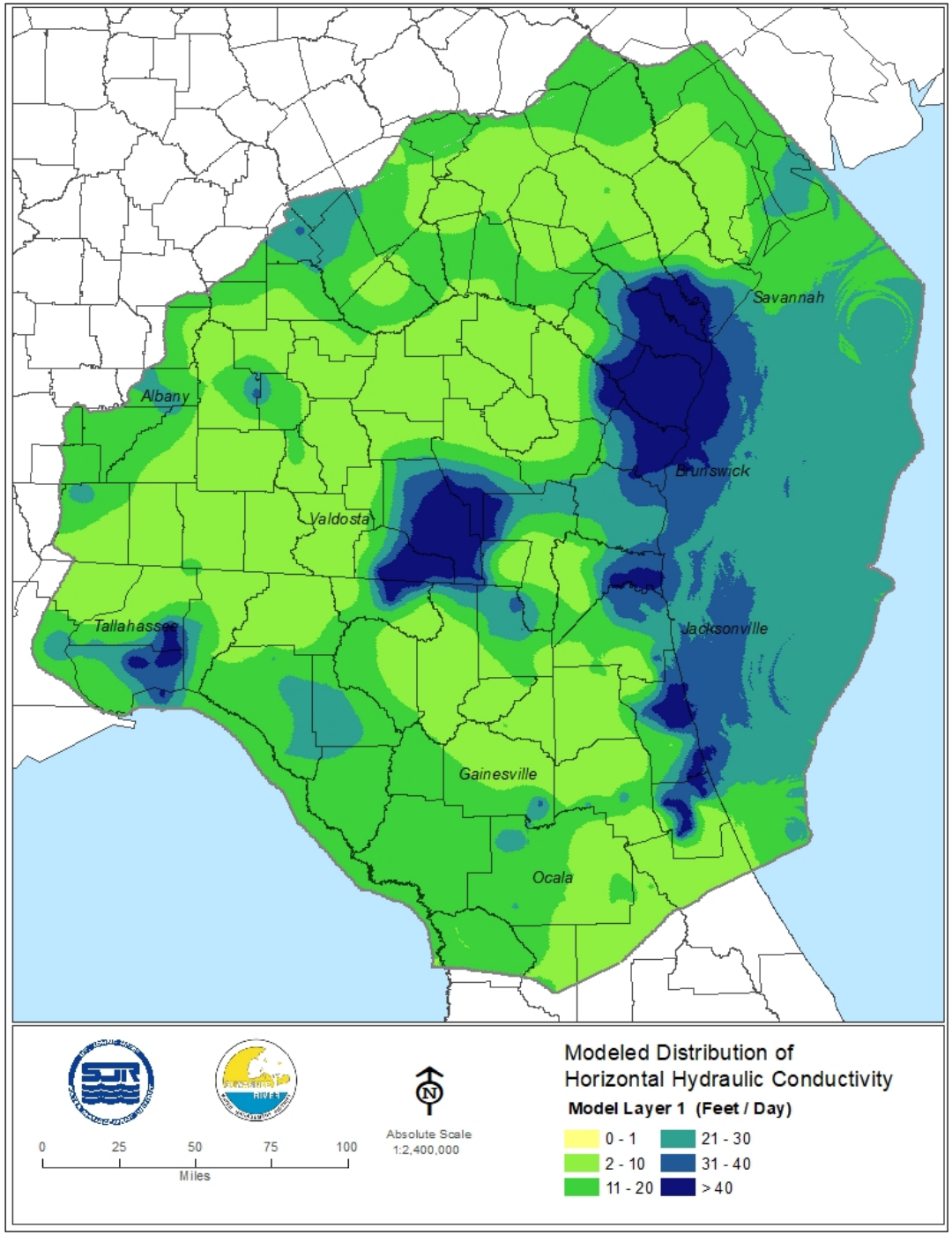

Spring Flows 2009 (cfs)
SUNBEAM_SPRINGS
PEACOCK_SPRING
RUNNING_SPRINGS_(WEST)
MEARSON_SPRING_NEAR_MAYO_FLORIDA
LAFAYETTE_BLUE_SPRINGS
GUM_SPRINGS_NEAR_HOLDER_FL
Croaker_Hole_Spg
BLUE_HOLE_SPRING_NR_HILDRETH_FL
MISSION_SPRINGS_COMPLEX_NR_HILDRETH_FL
TANNER_SPRING
TROY_SPRING_NEAR_BRANFORD_FLA
Salt_Spg
Alexander_Spg
Silver_Glen_Spg
MADISON_BLUE_SPRING_NR_BLUE_SPRINGS_FL
MANATEE_SPRING_NR_CHIEFLAND_FL
DEVILS_EAR_SANTA_FE_RIVER
HOMOSASSA_SPRING_COMPLEX
ICHETUCKNEE Spring Group
ALAPAHA_RISE_NR_FT_UNION
Crystal Spring Group
Silver Spring Group
Wacissa Spring Group
RAINBOW_SPRINGS_NEAR_DUNNELLON_FL
WAKULLA_SPRING_MAIN_VENT_S749_S587
LSFR Spring Group
-50
50
150
250
350
450
550
650
750
850
950
Simulated
Residual



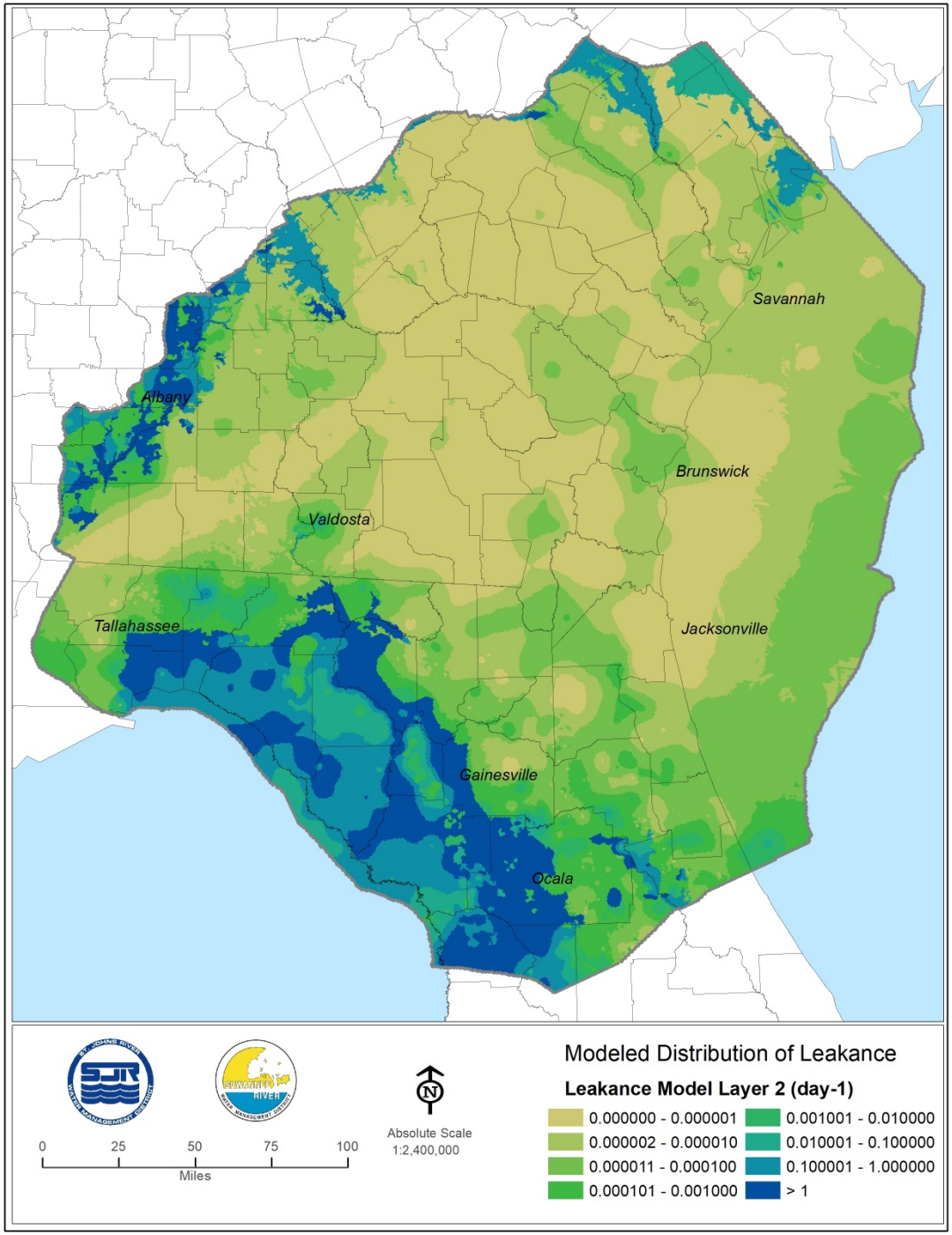
Case 006E Cumulative Baseflows 2001



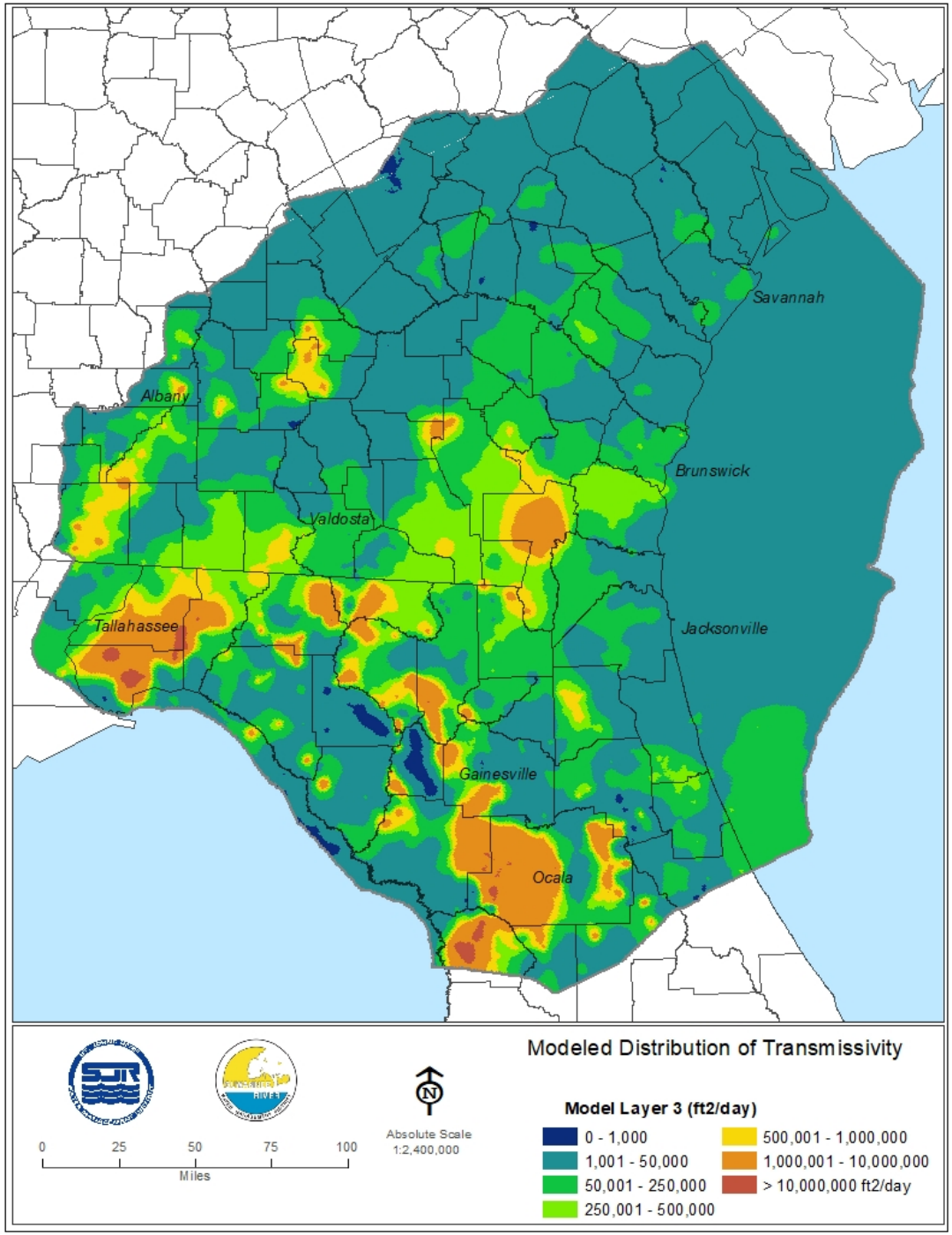
Case 006E Cumulative Baseflows 2009



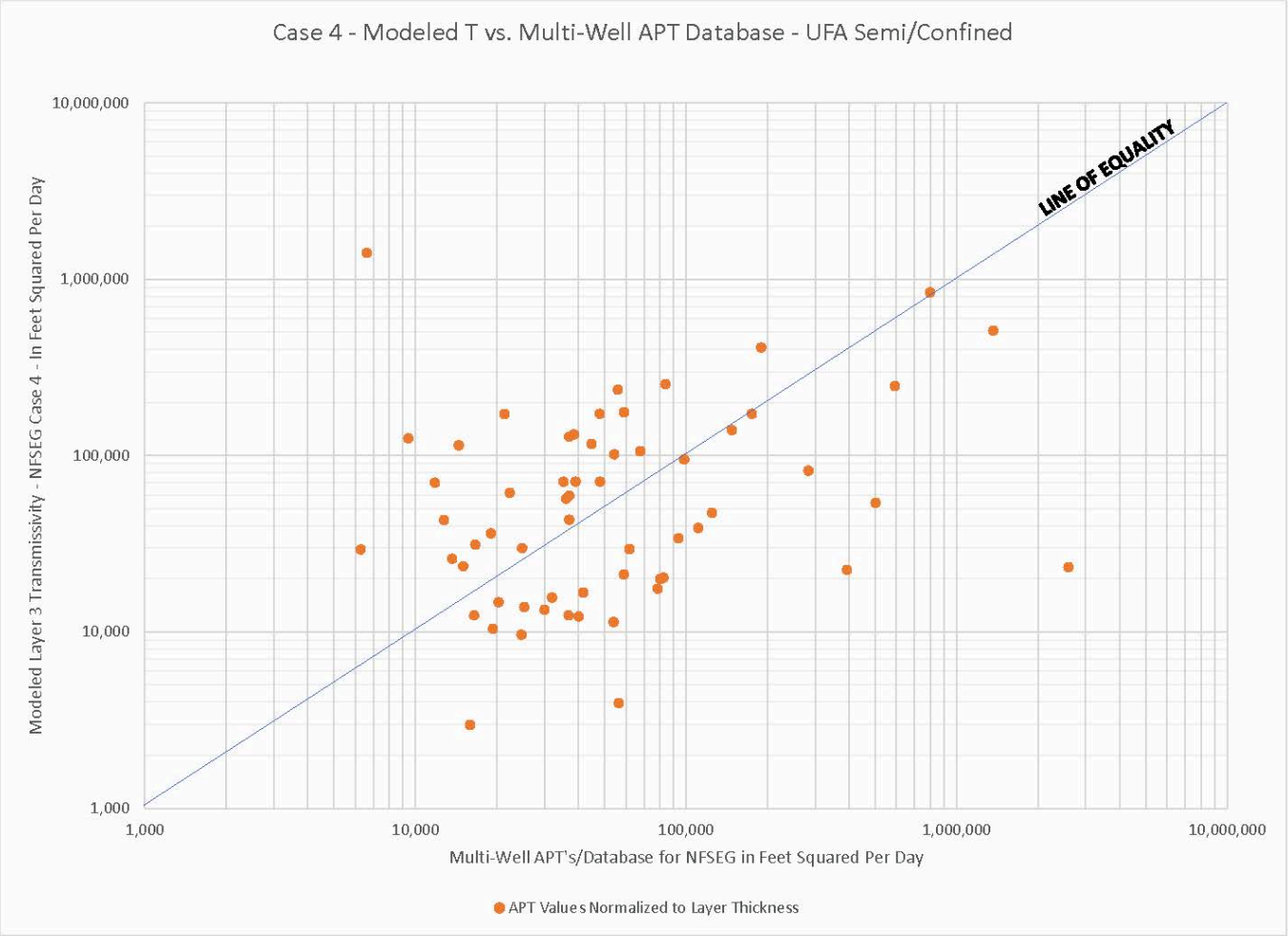
Case 006E Hydraulic Conductivity L1



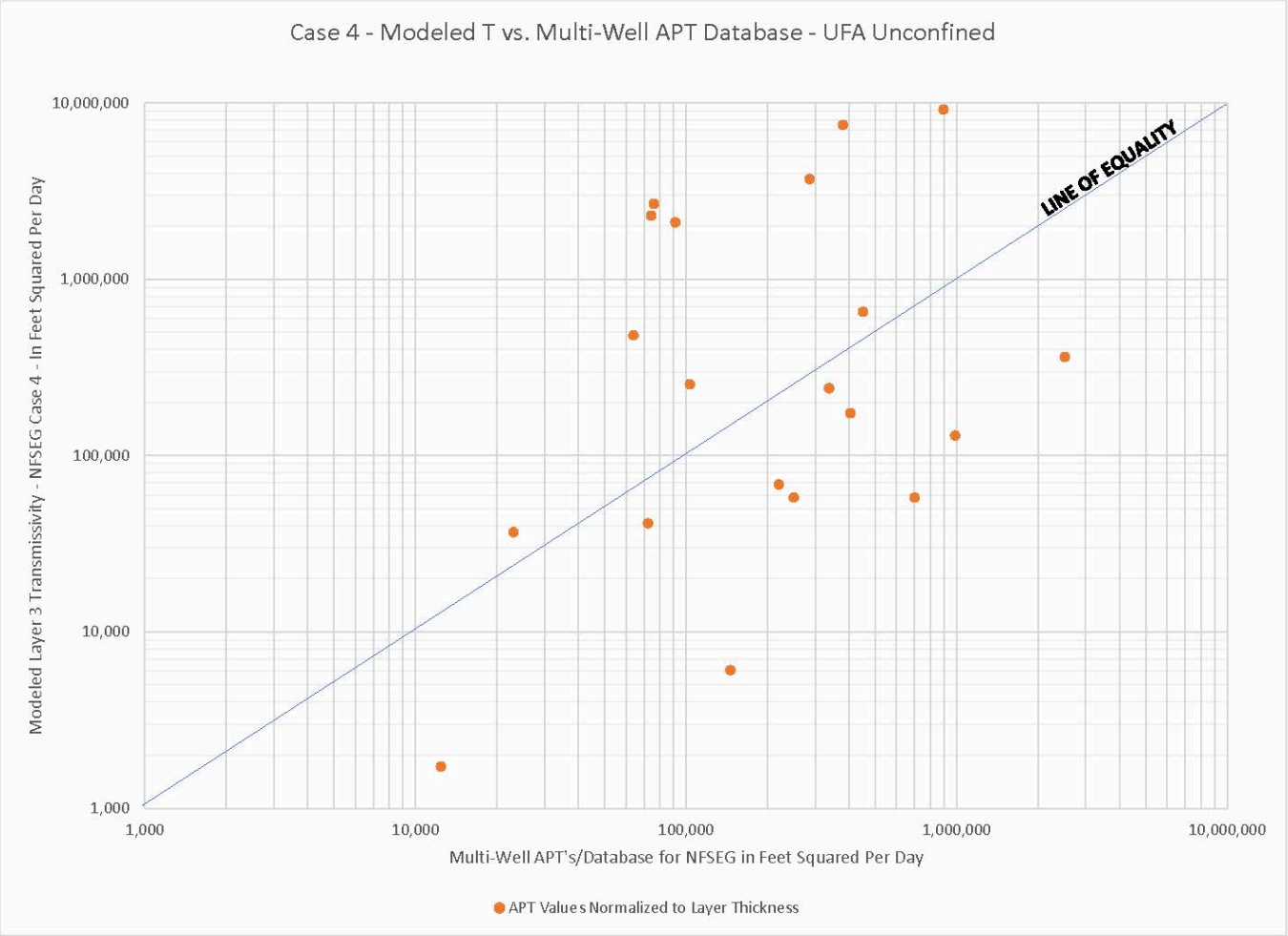
Case 006E Leakance L2



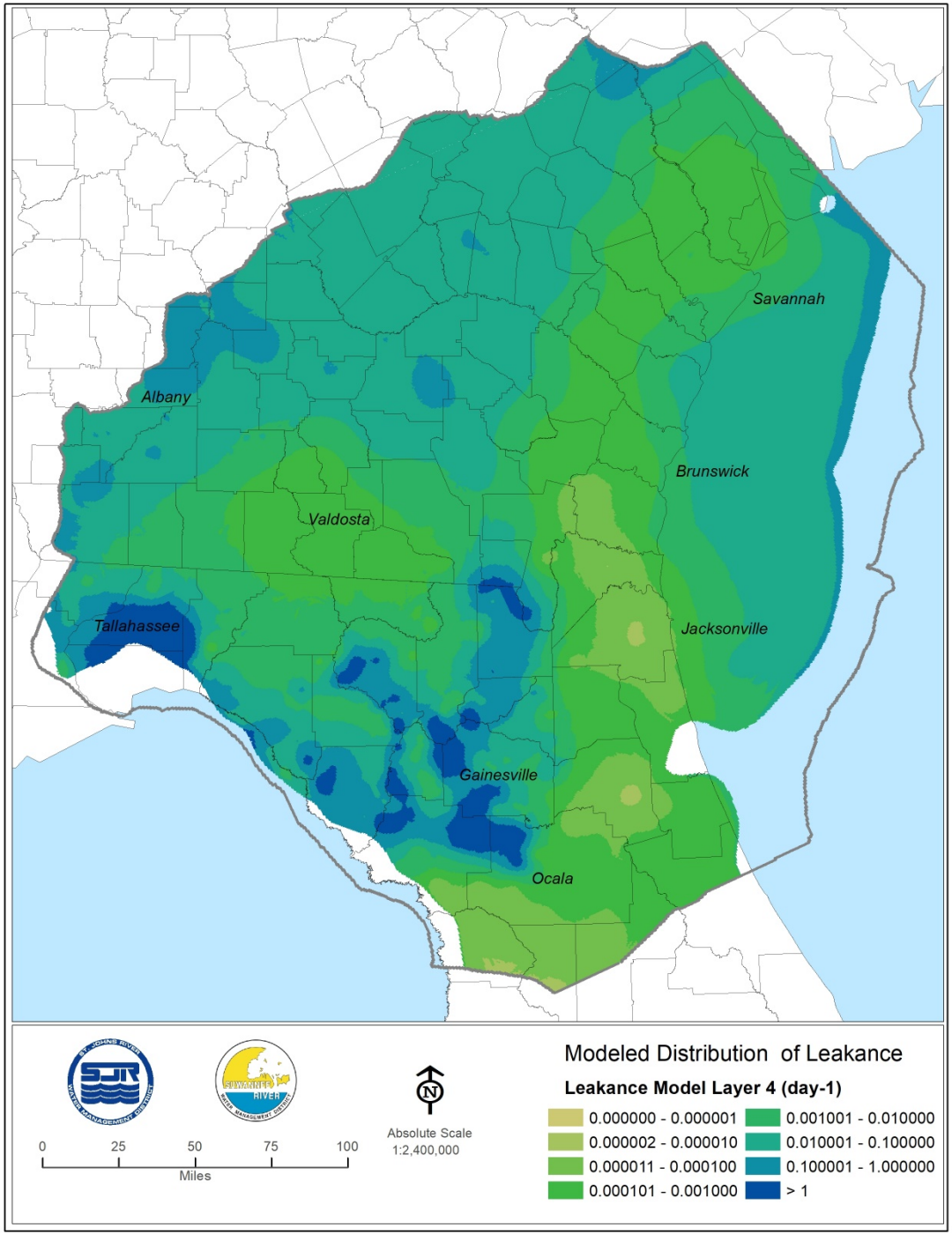
Case 006E Transmissivity L3



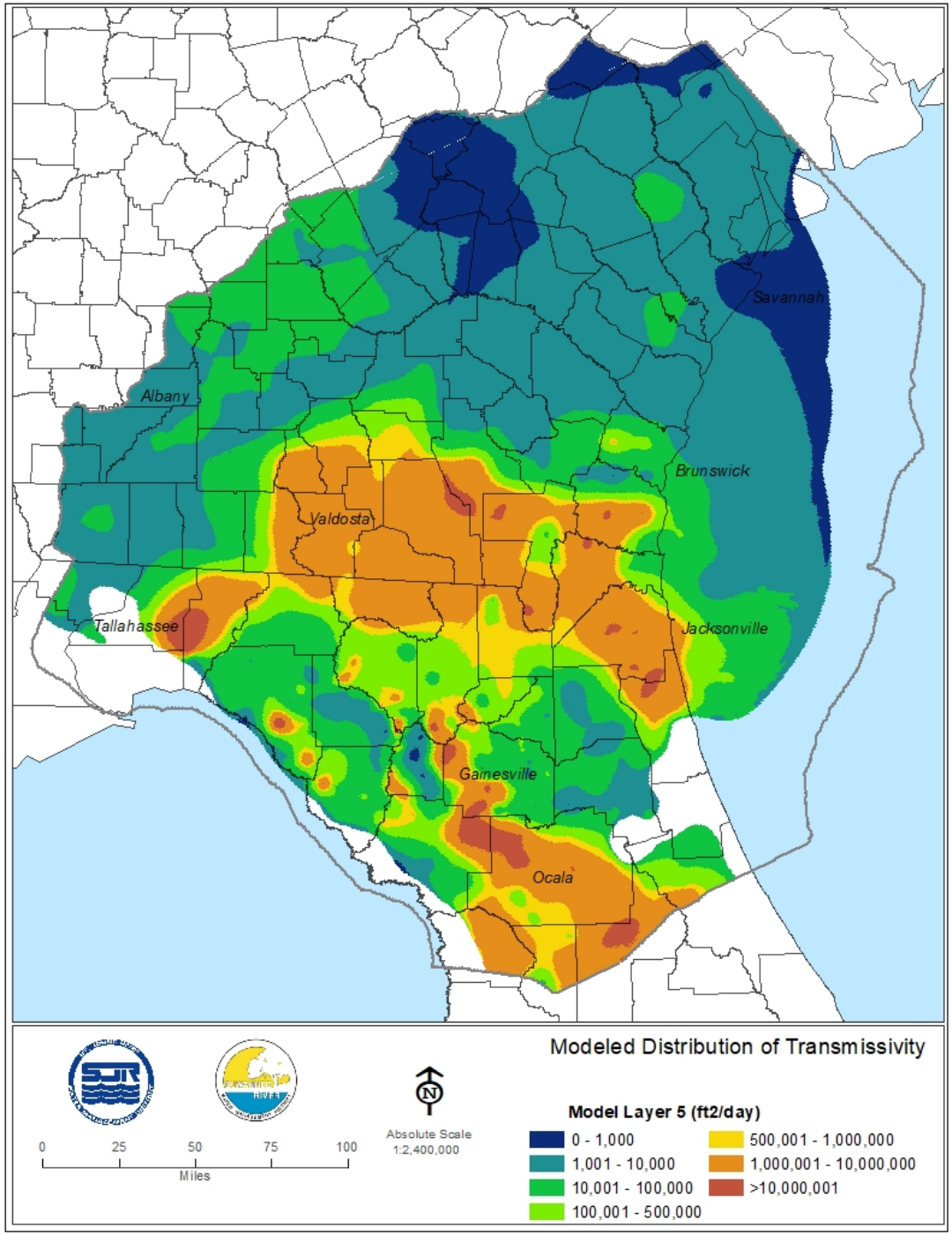
Normalized APT to Model Transmissivity Layer 3 – Semi-Confined



Normalized APT to Model Transmissivity Layer 3 – Unconfined

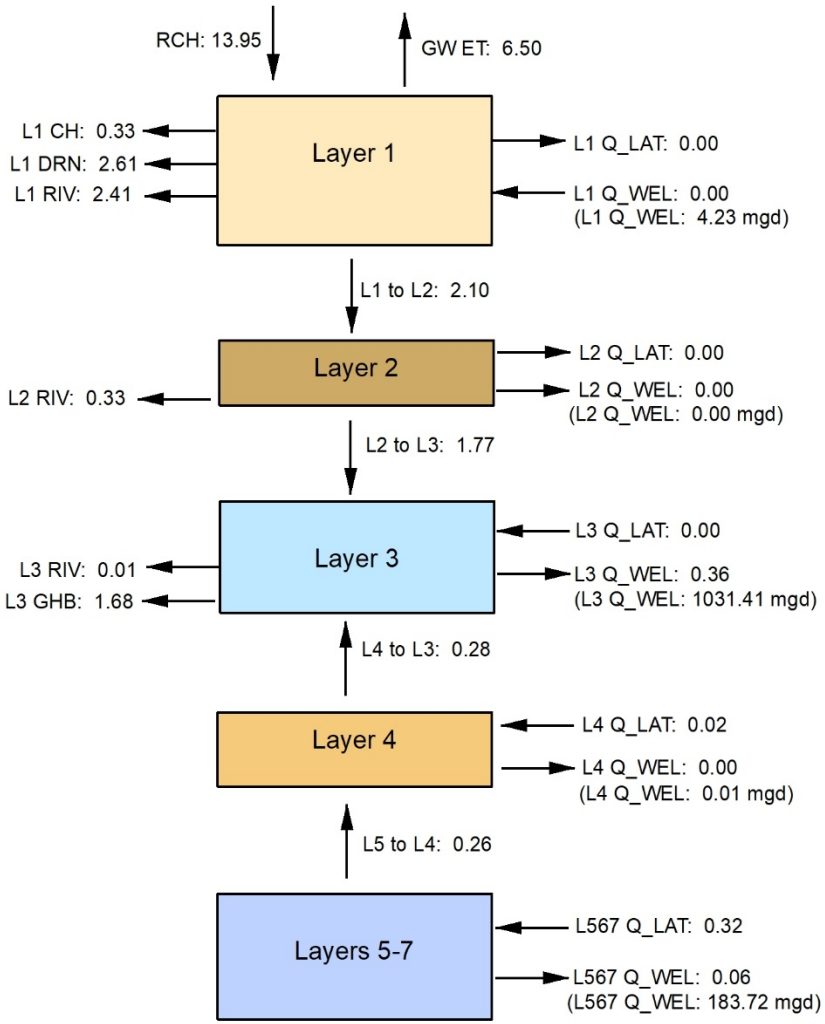


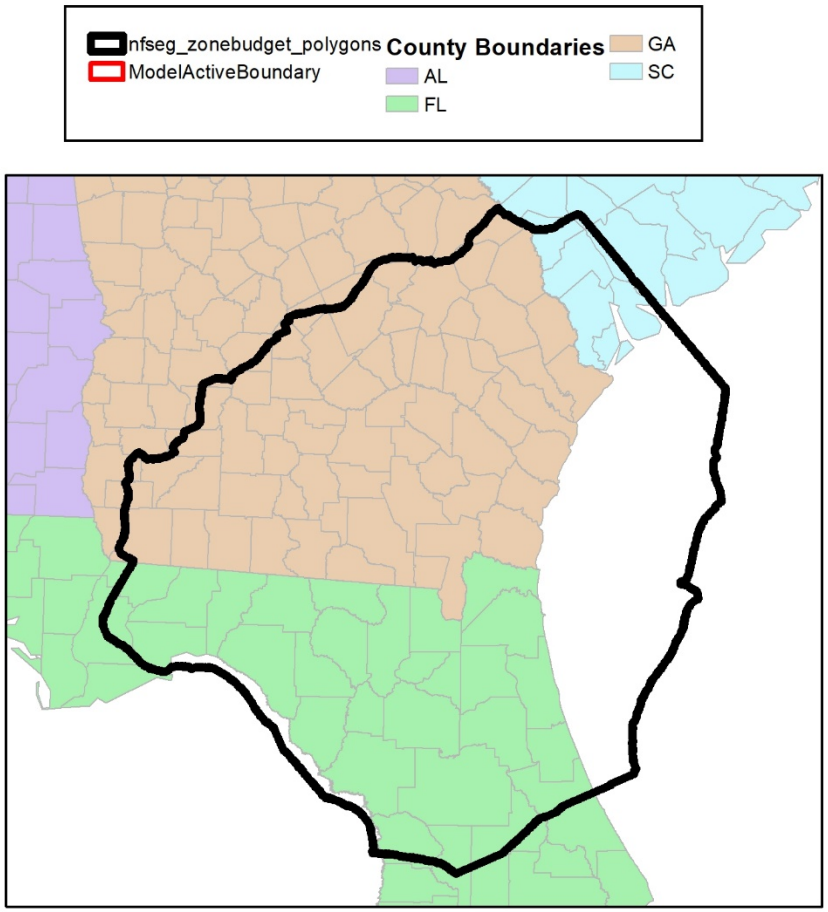
Case 006E Leakance L4



Case 006E Transmissivity L5

2009 Model-wide Mass Balance





Sim Name: NFSEG_PEST 2009

SIMULATED MASS BALANCE REPORT

MassBal Polygon: Modelwide Active L1

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.

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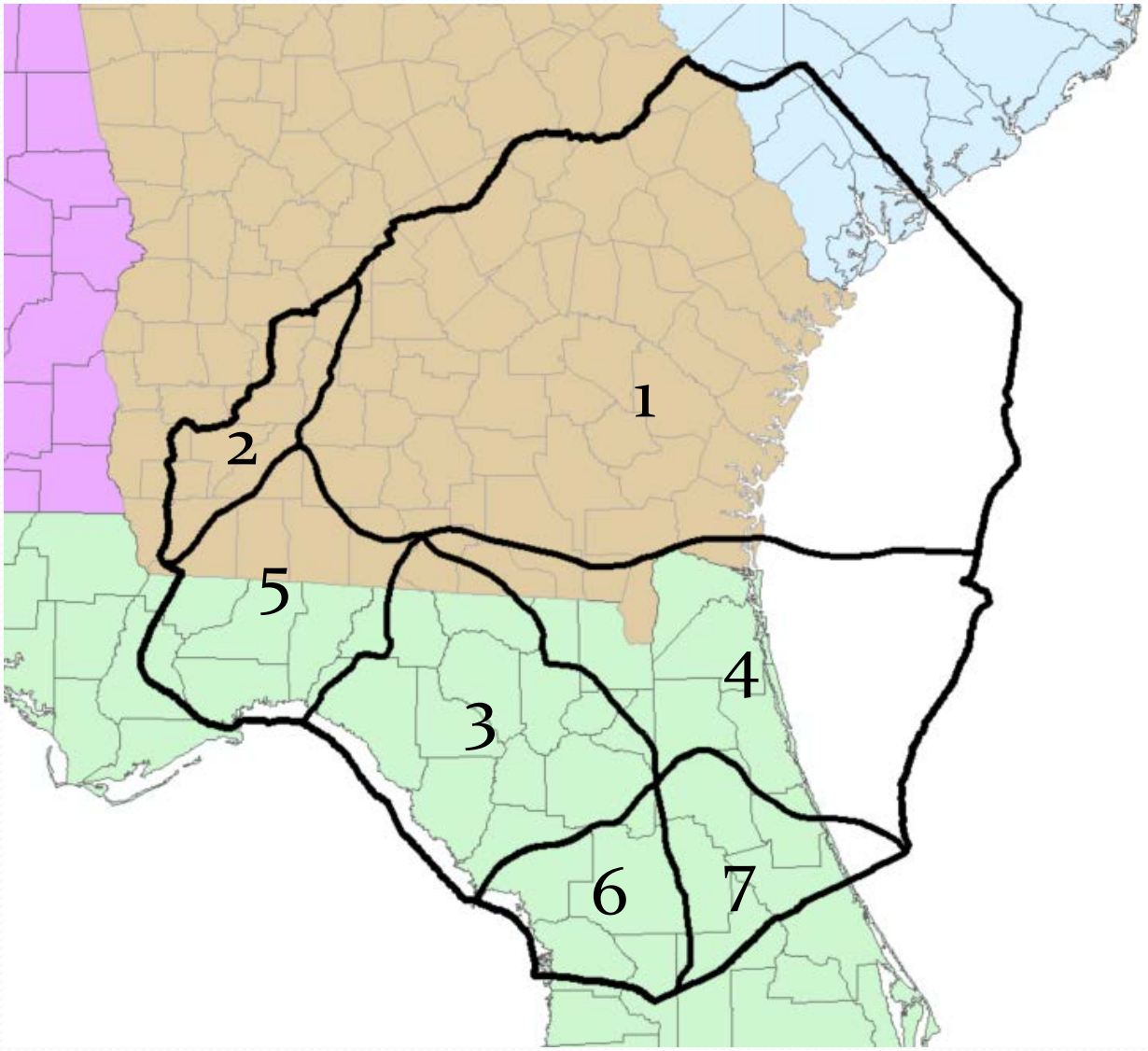
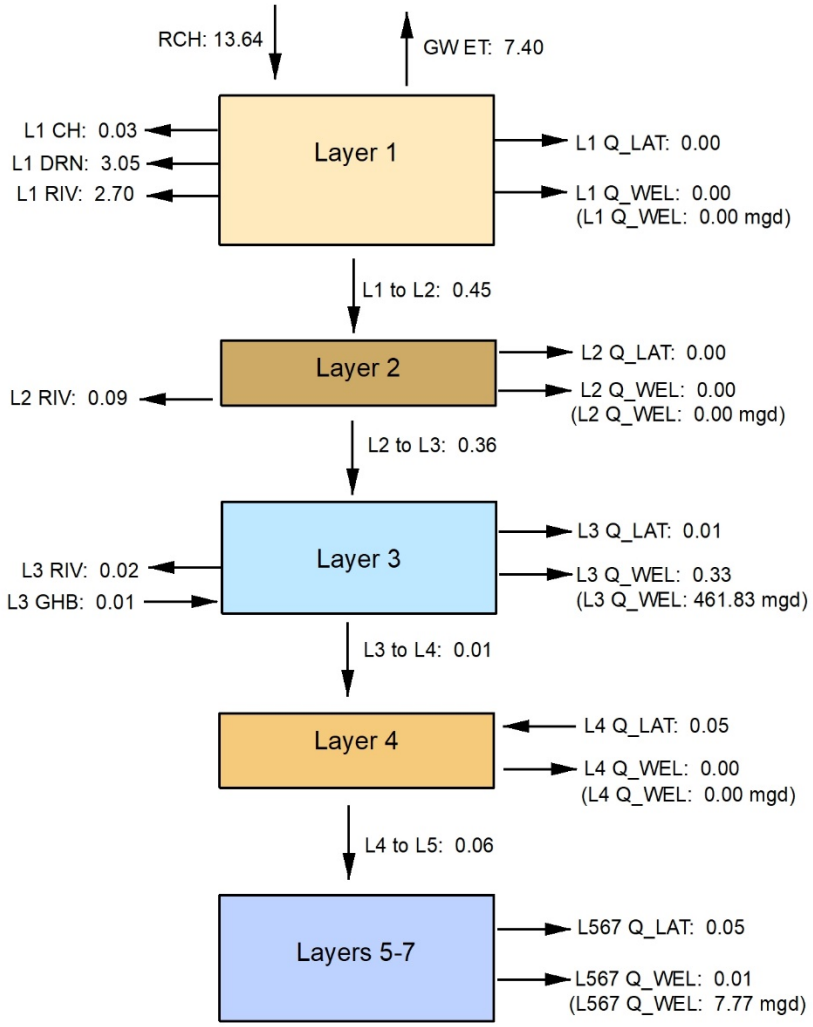
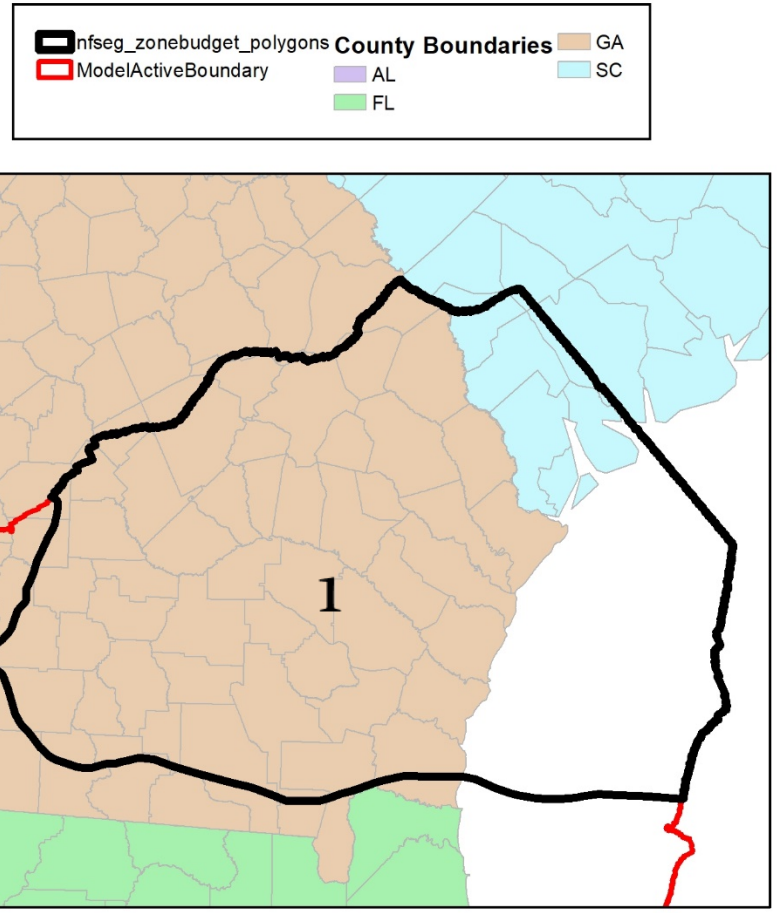
Groundwater Basins



2009 Mass Balance





Sim Name: NFSEG_PEST 2009

SIMULATED MASS BALANCE REPORT

MassBal Polygon: GWB_1

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.

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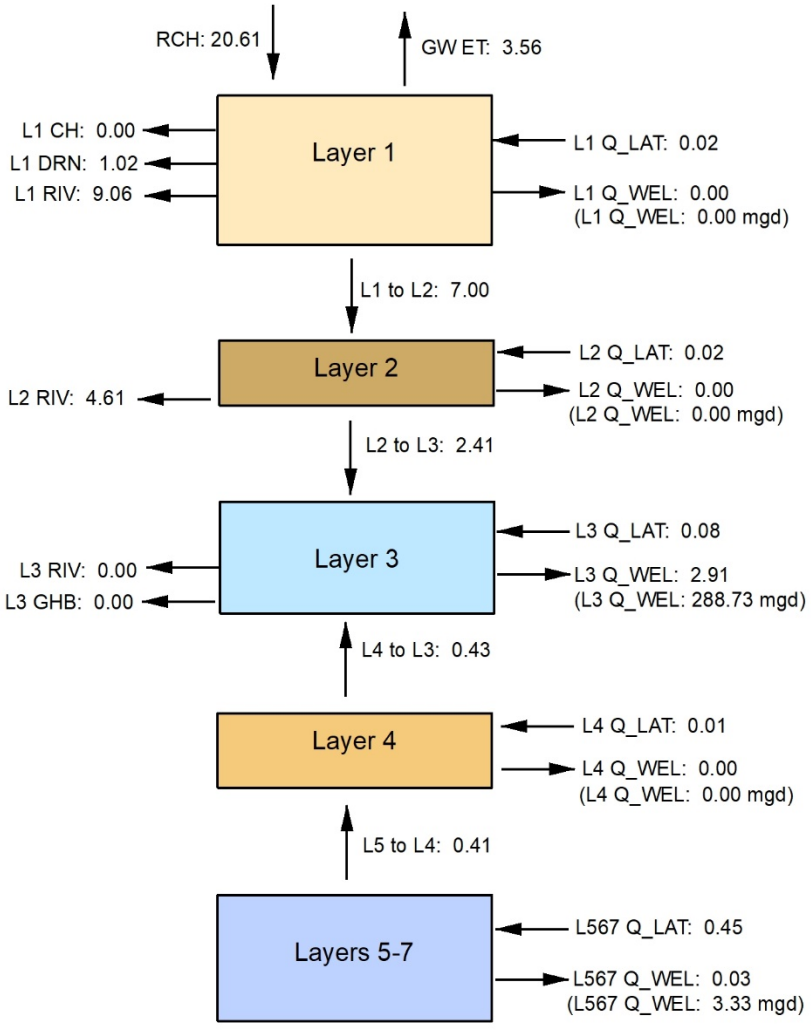
2009 Mass Balance



ZB_NAME: GWB_2 Number of Cells: 9290 Area Per Cell: 6,250,500 SF
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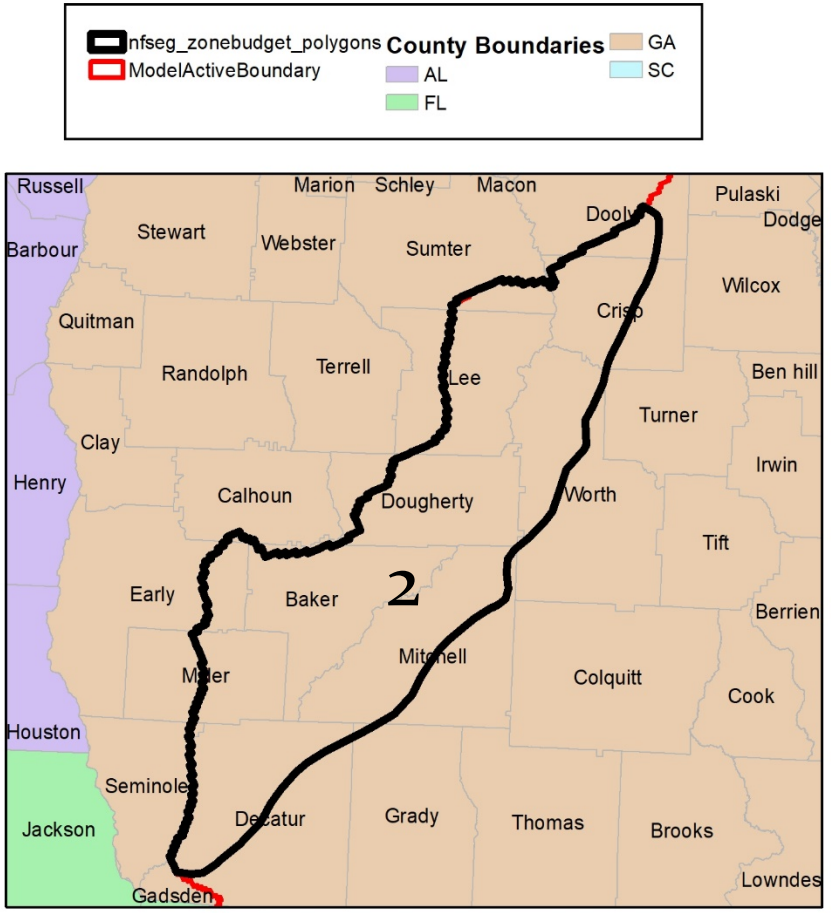
Values reflect the net water balance for all cells in zone corresponding to the direction indicated.

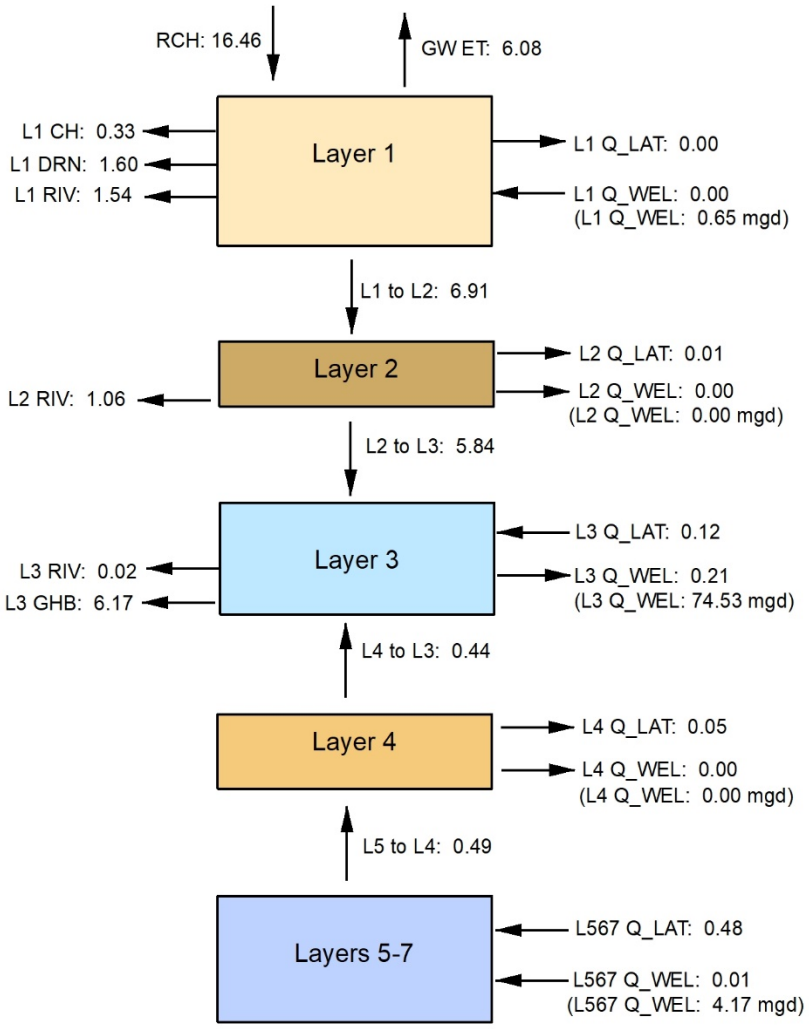


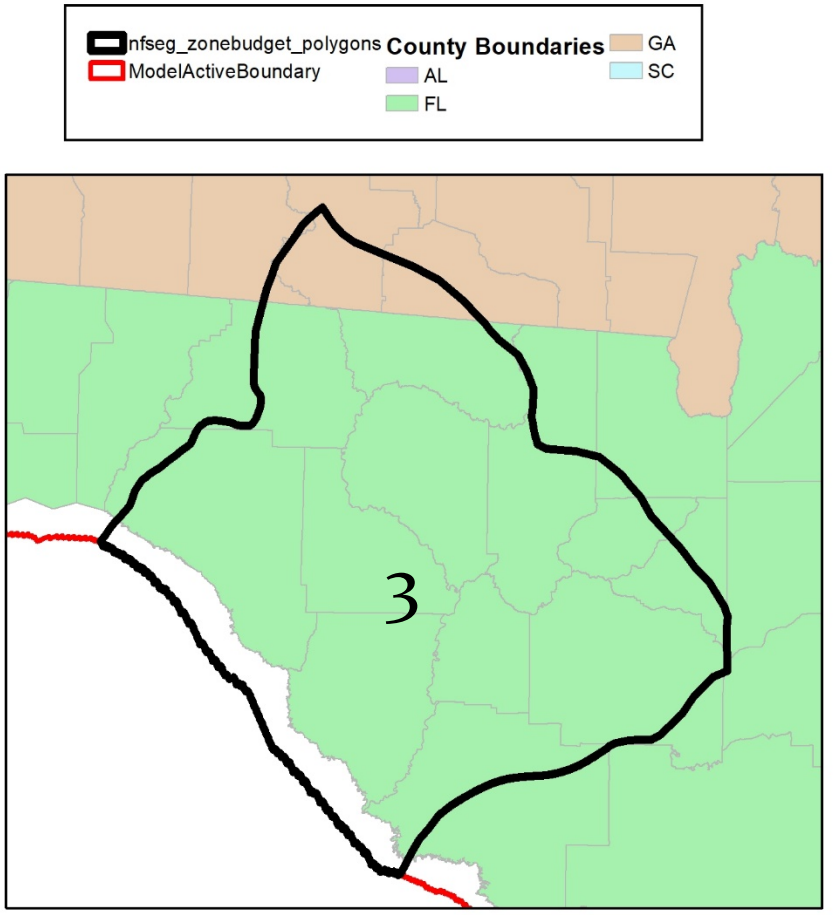
Sim Name: NFSEG_PEST 2009

SIMULATED MASS BALANCE REPORT

MassBal Polygon: GWB_2

2009 Mass Balance





Sim Name: NFSEG_PEST 2009

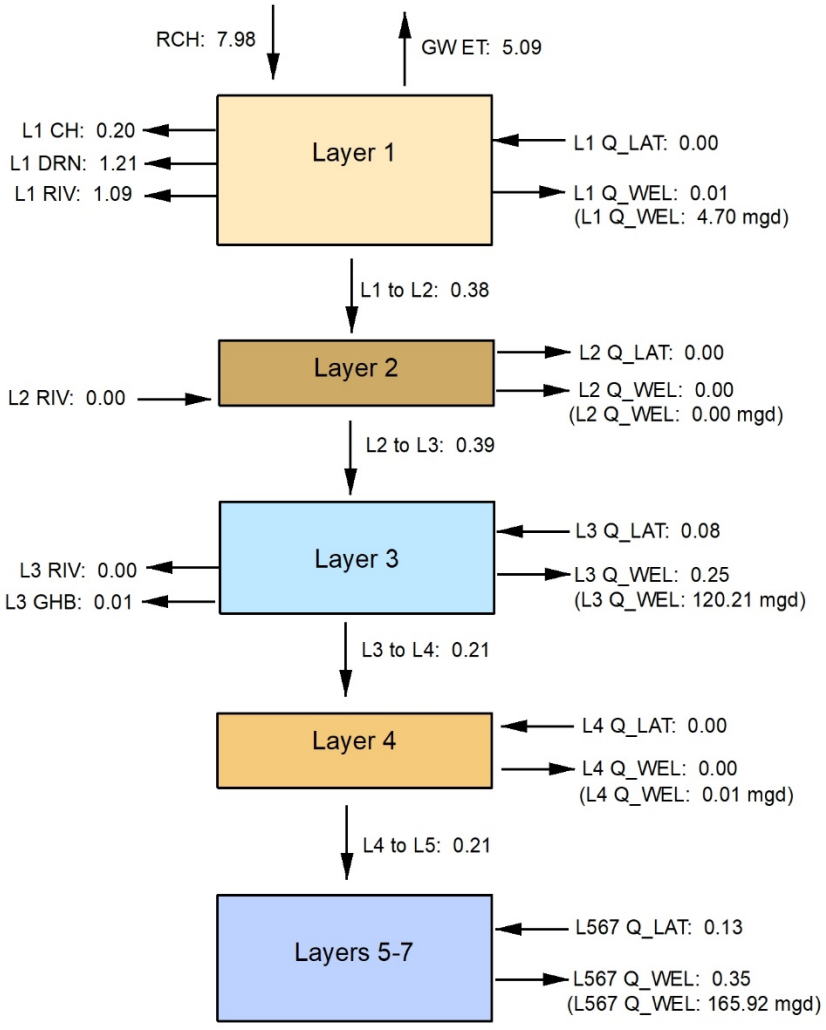
SIMULATED MASS BALANCE REPORT

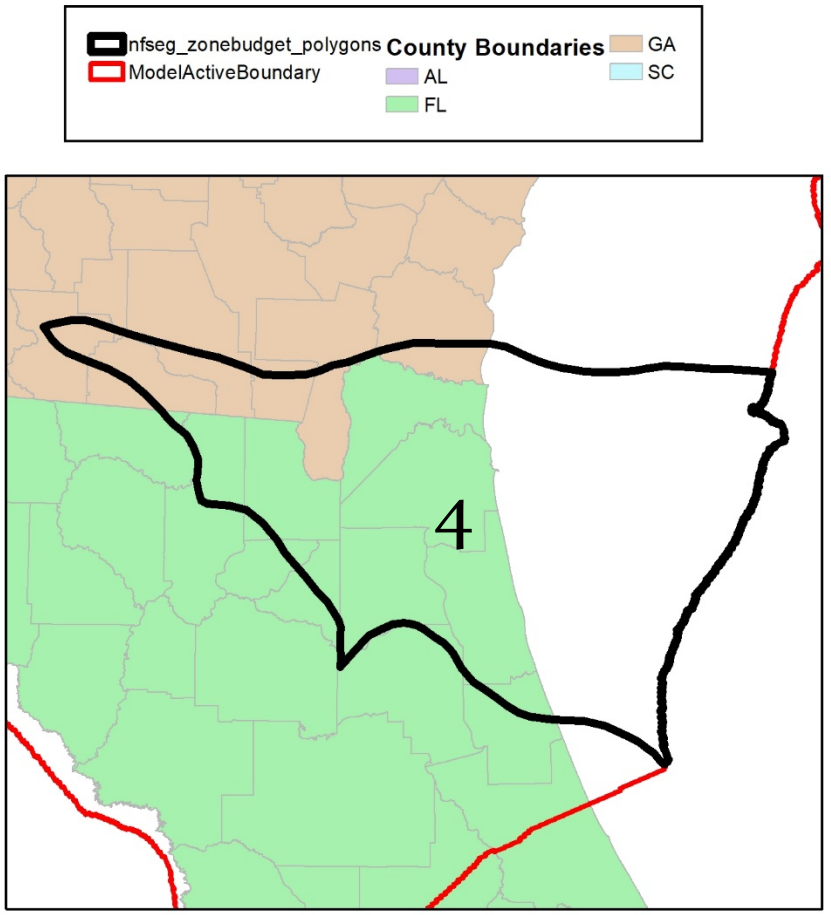
MassBal Polygon: GWB_3

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.

T:\NFSEGv1_1\Workspace_PEST_case006e\pest_postproc\templates\nfseg_zonebudget.mxd 12/1/2017 tdesmara

2009 Mass Balance





Sim Name: NFSEG_PEST 2009

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.

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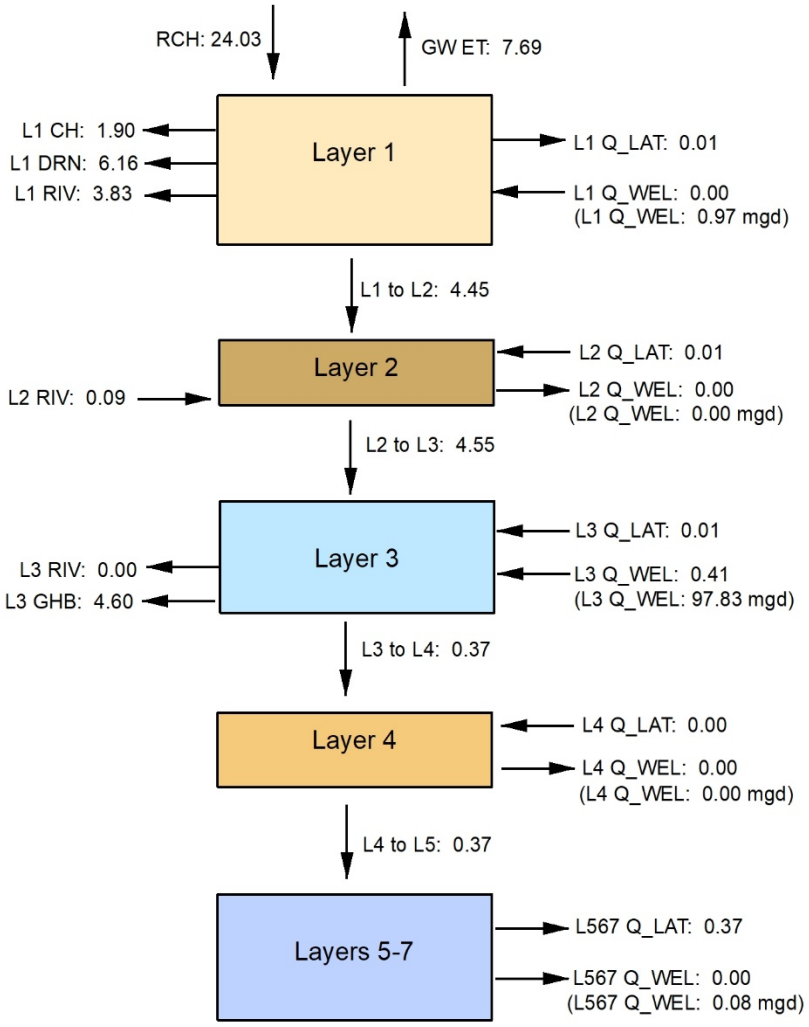
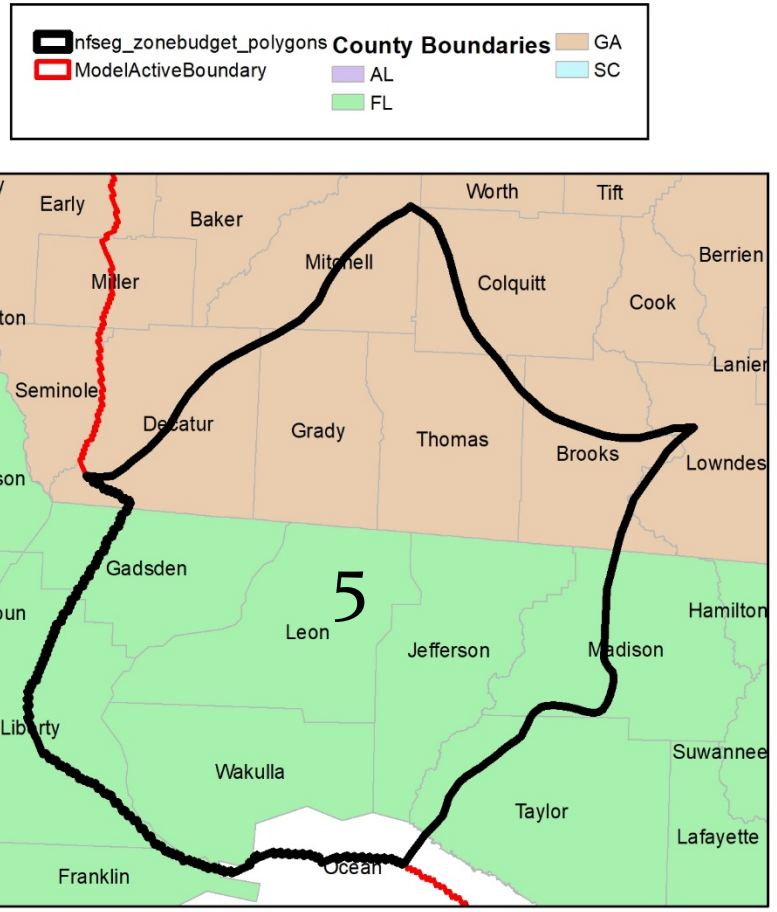
2009 Mass Balance



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.



Sim Name: NFSEG_PEST 2009

SIMULATED MASS BALANCE REPORT

MassBal Polygon: GWB_5

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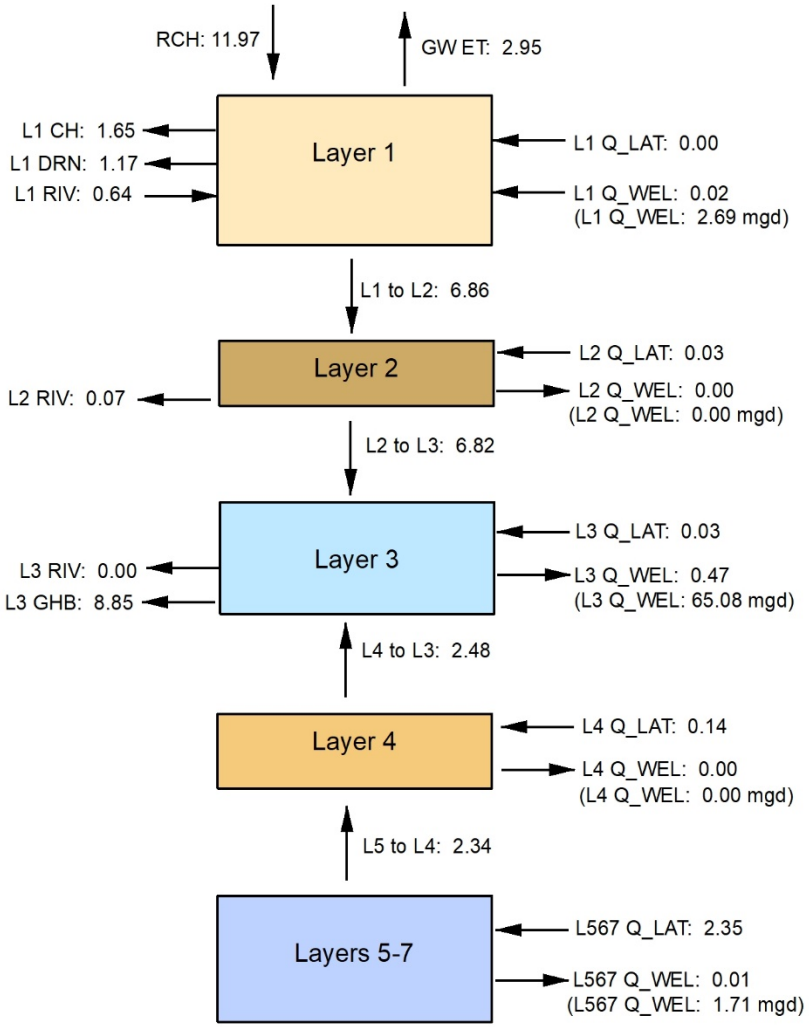
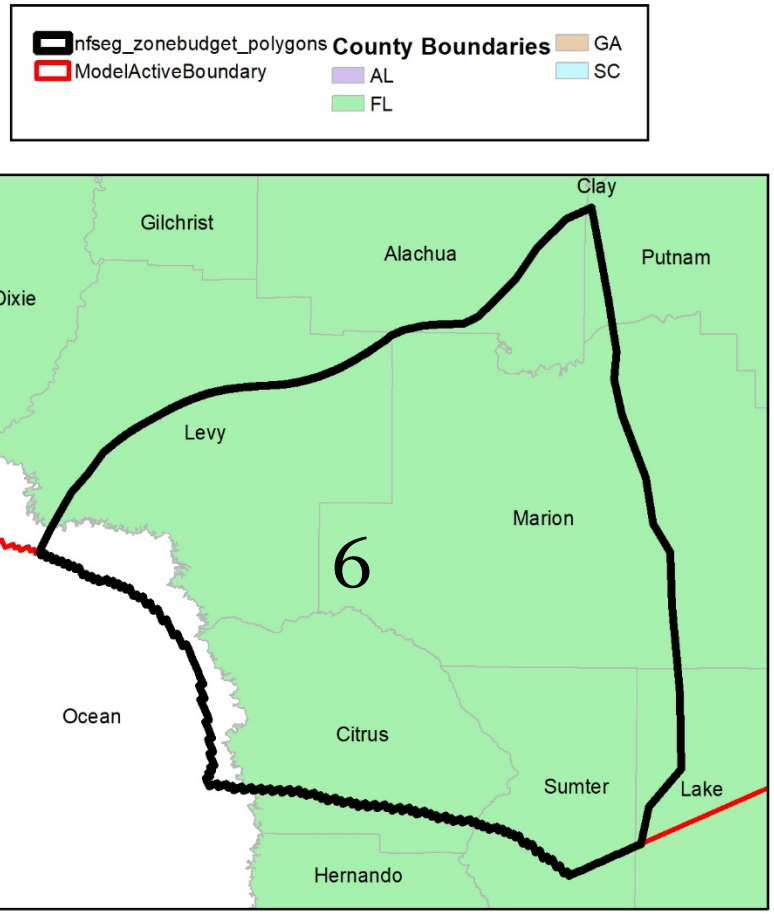
2009 Mass Balance





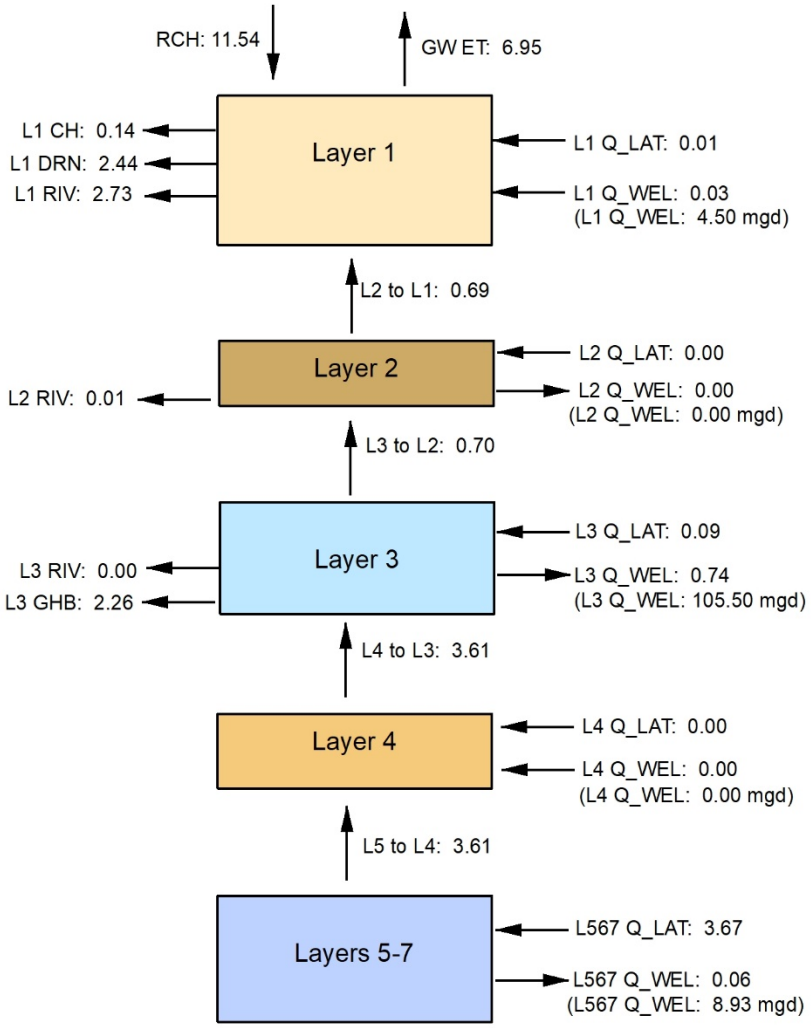
Sim Name: NFSEG_PEST 2009

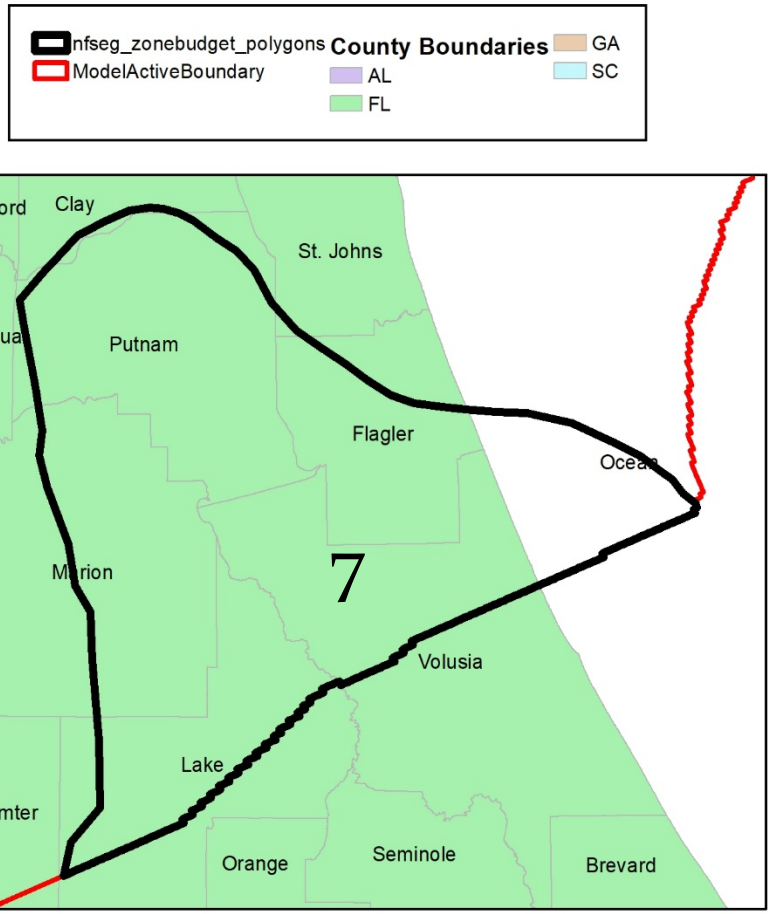
SIMULATED MASS BALANCE REPORT

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





Sim Name: NFSEG_PEST 2009

SIMULATED MASS BALANCE REPORT

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 NWFWMD and correct zero-valued targets
- Apply NWFWMD-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
• NFSEGv1.1 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 NFSEGv1.1	Jun/Jul-2018

Public Comments