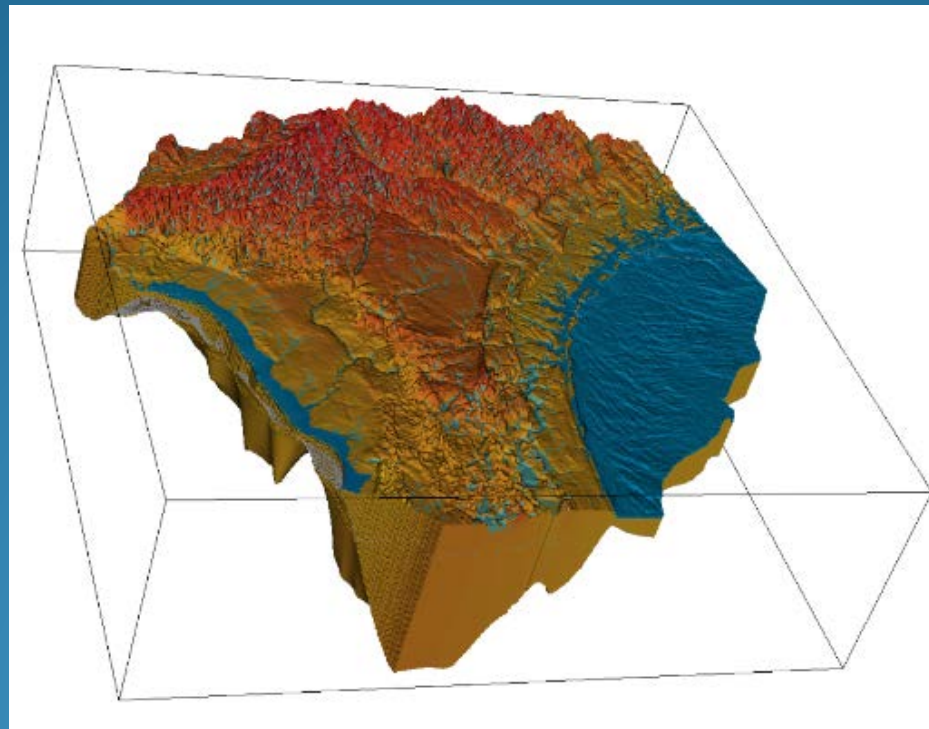


NFSEG V1.1

Task D1 Peer Review Meeting



April 18, 2018



Agenda

- Introduction/meeting objectives “Panel’s Meeting”
- Overview of NFSEG V1.1
- Peer Review Panel Preliminary Comments
- Technical Team/Stakeholder Preliminary Comments
- Sensitivity & Uncertainty Analysis
- Schedule/Next Steps
- Public Comments



NFSEG V1.1 Overview

- Why Model Was/Is Needed
 - Evaluate inter-district and interstate pumping impacts
 - Tool for Water Supply Planning, Minimum Flows and Levels, and Water Use Permitting
 - Developed by SJR and SR Water Management Districts in collaboration with NWF and SWF WMD's, technical team, and stakeholders



Project History

- Model Development Timeline
 - Technical Team formed **2012**
 - NFSEG V1.0 completed, support for North Florida Regional Water Supply Plan **late 2016**
 - NFSEG V1.1 completed for final peer review **April 2018**
 - Peer Review Panel
 - Tech Team provided candidate recommendations **May 2016**
 - Panel Kick-off meeting **March 2017**
 - Meeting notes, presentations, model files etc., are archived at <https://northfloridawater.com/groundwaterflowmodel.html>



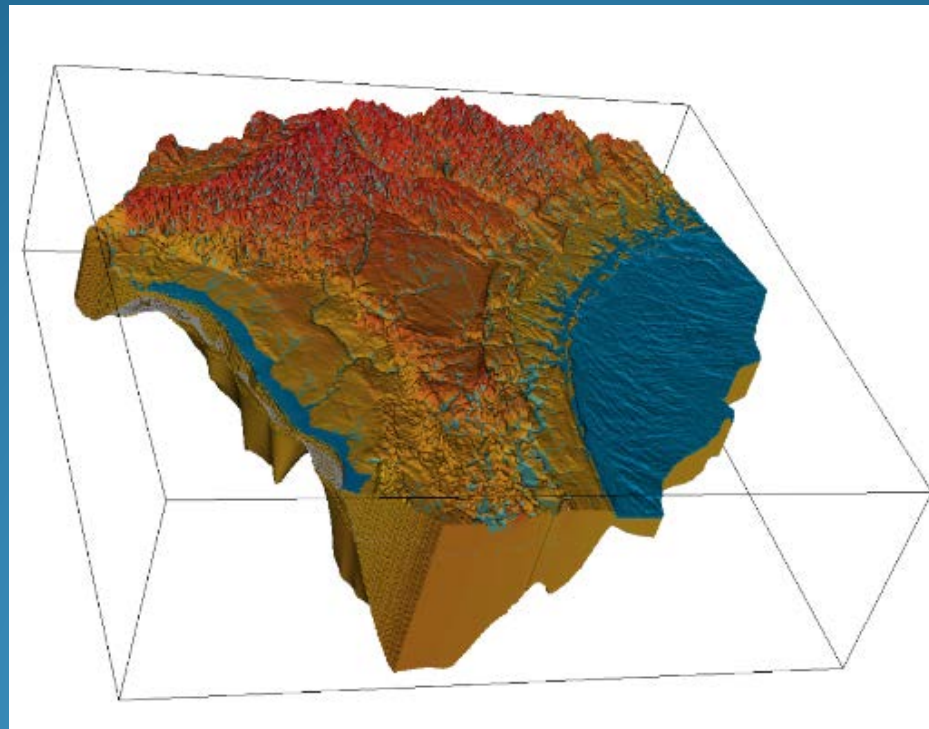
Model Development Features

- Calibrated HSPF Surface Water Models
 - Calibration constrained recharge and MSET
 - Quantified return flows
- Reduction/Elimination of Lateral Boundary Effects
- Dual Steady-State Calibration Years – 2001/2009
- PEST Facilitated Calibration
 - Uncertainty Evaluation
- Verification Simulations
 - 2010
 - No Pumping



NFSEG V1.1

2001/2009 Calibration

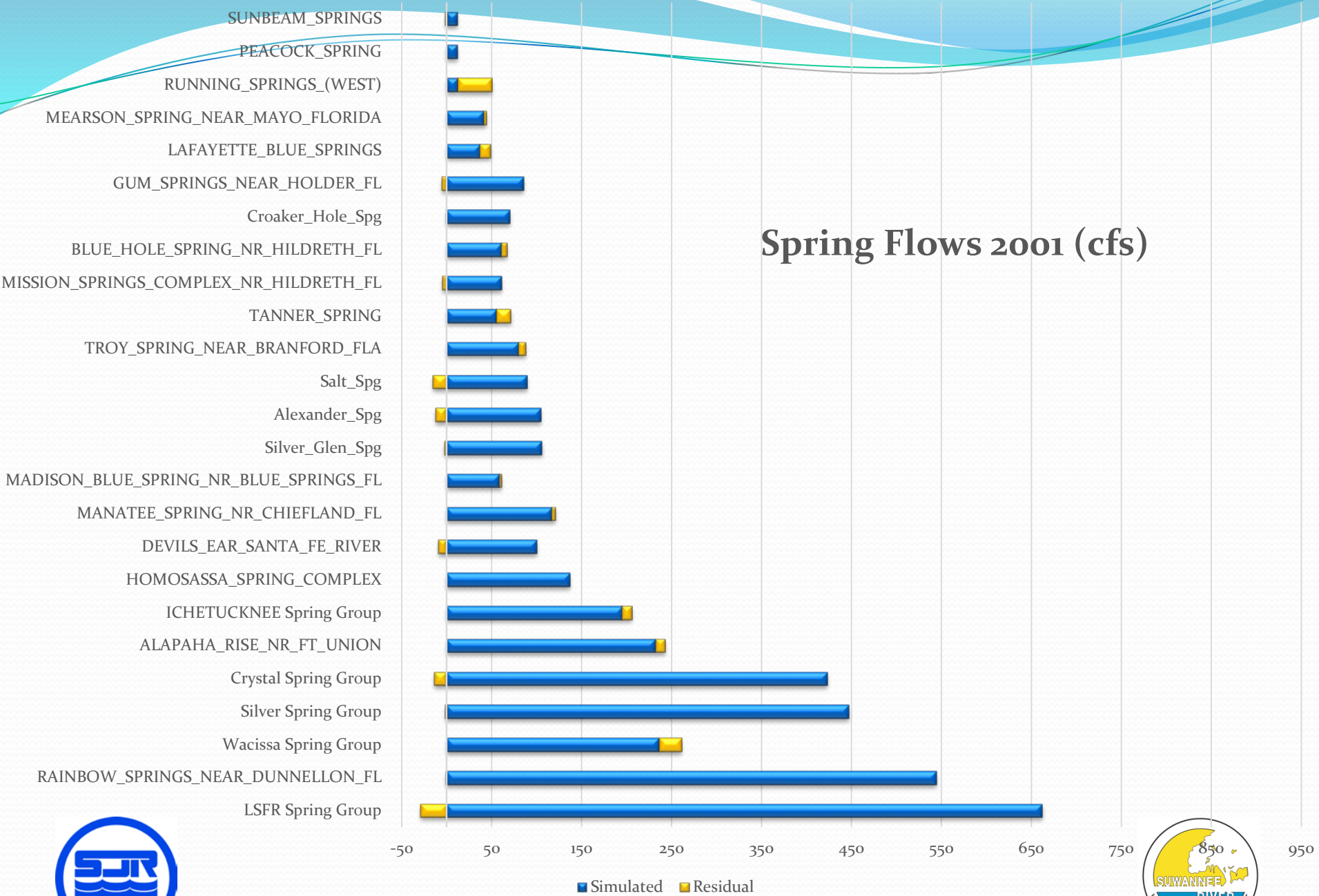


V1.1 Calibration Statistics – Heads

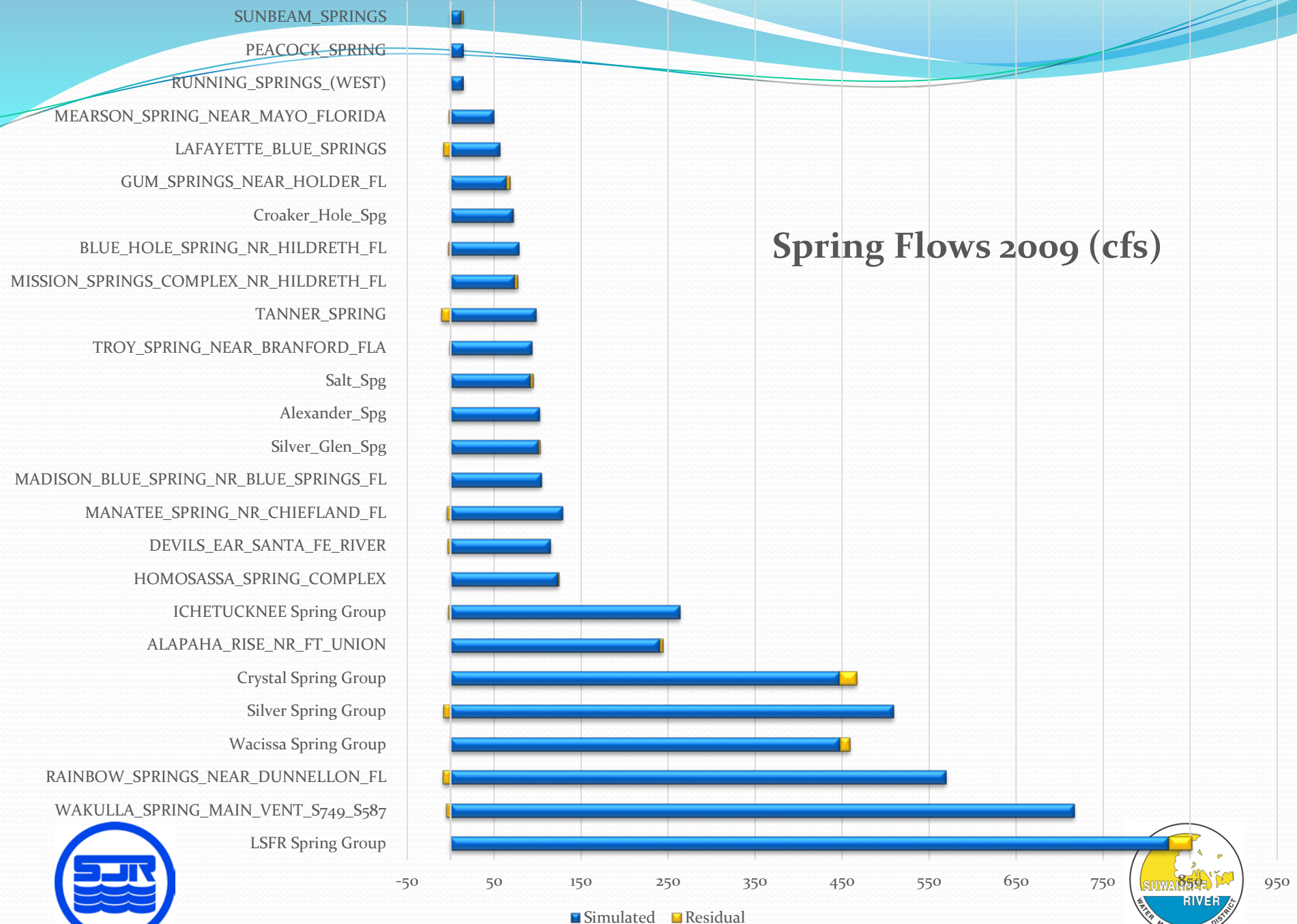
Statistical Criterion	Proposed Target	All Target Wells		Layer 3 Only	
		2001	2009	2001	2009
-5 feet < Residual < 5 feet	80%	72%	74%	76%	76%
-2.5 feet < Residual < 2.5 feet	50%	42%	48%	43%	49%
Mean of Residuals		0.1	0.3	-0.4	-0.9
Standard Deviation of Residuals		6.6	8.4	4.8	4.6
Mean of Absolute Residuals		4.4	4.4	3.6	3.4
Number of Targets		1355	1738	977	993



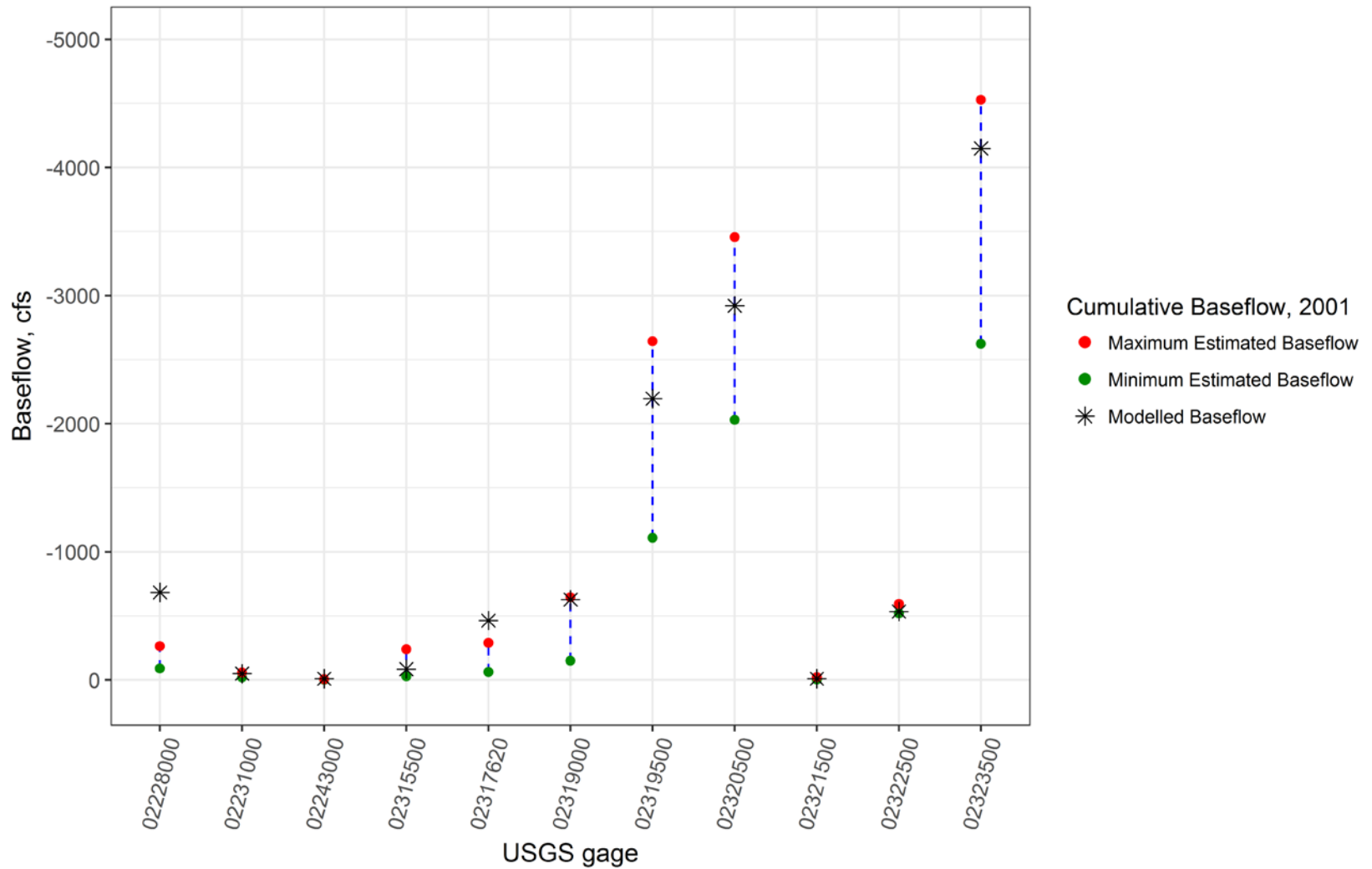
Spring Flows 2001 (cfs)



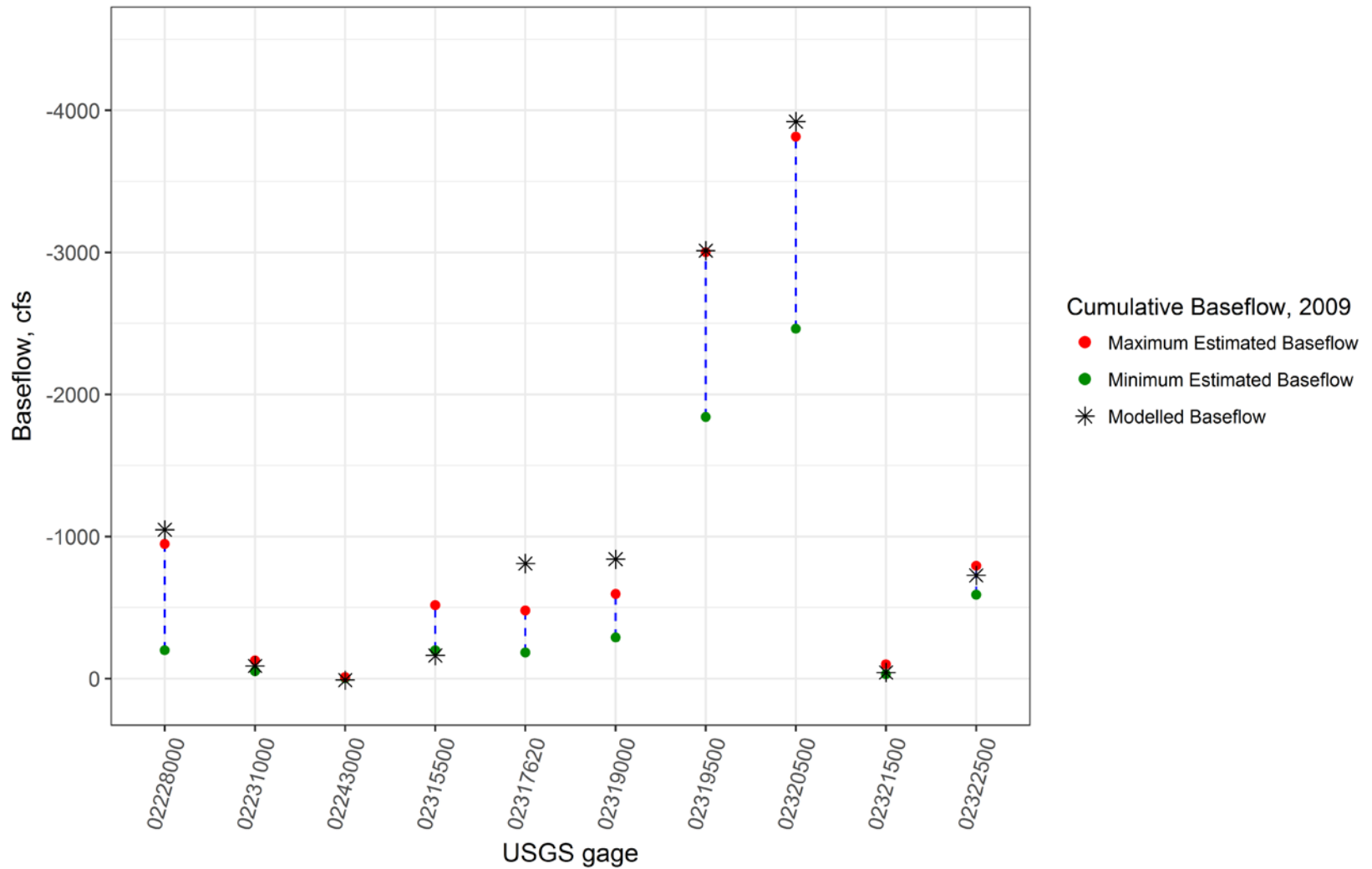
Spring Flows 2009 (cfs)



Range of Cumulative Baseflow Estimates vs. Modelled Baseflow



Range of Cumulative Baseflow Estimates vs. Modelled Baseflow



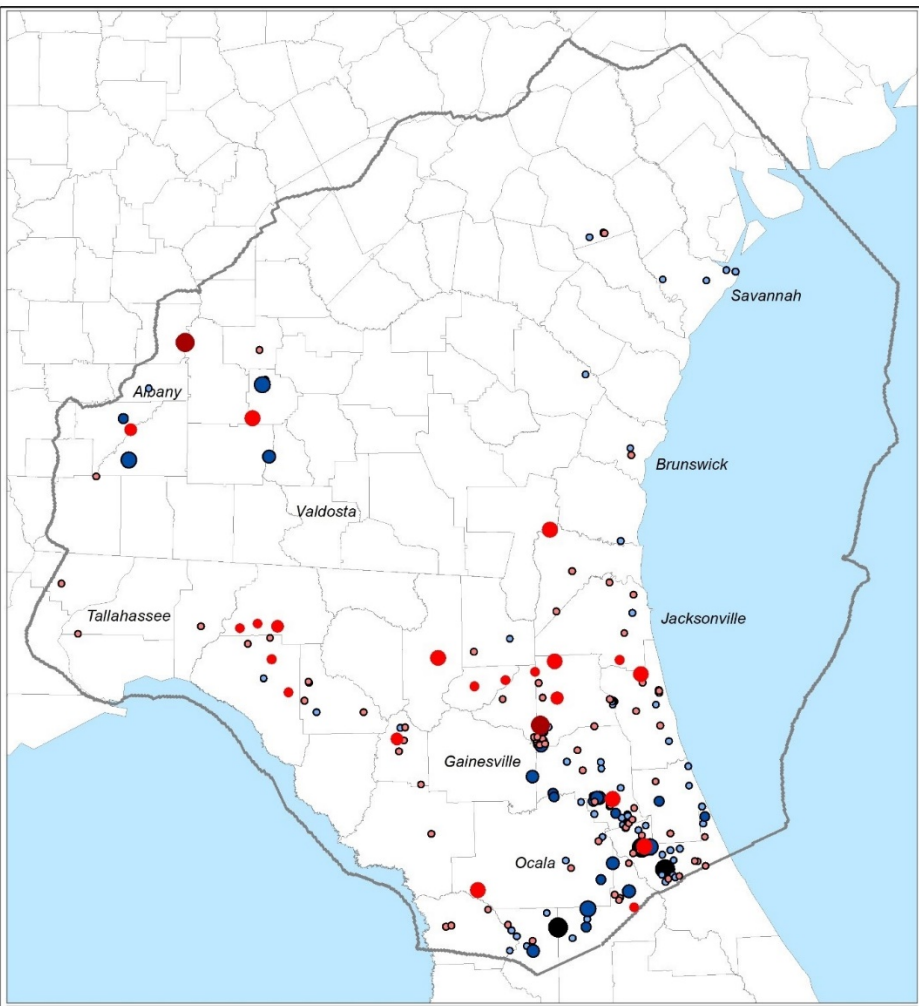


2001

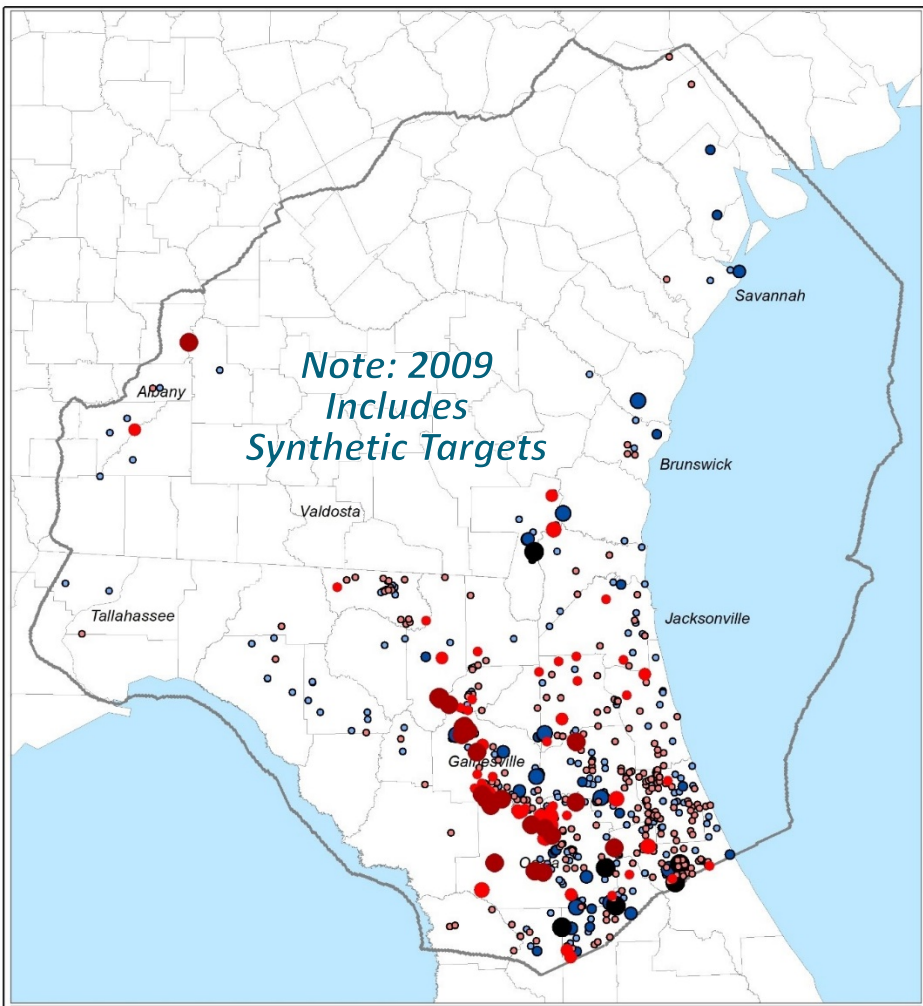
L1 Heads

2009



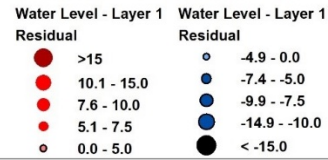


2001 Water Level Residuals



Note: 2009
Includes
Synthetic
Targets

2009 Water Level Residuals

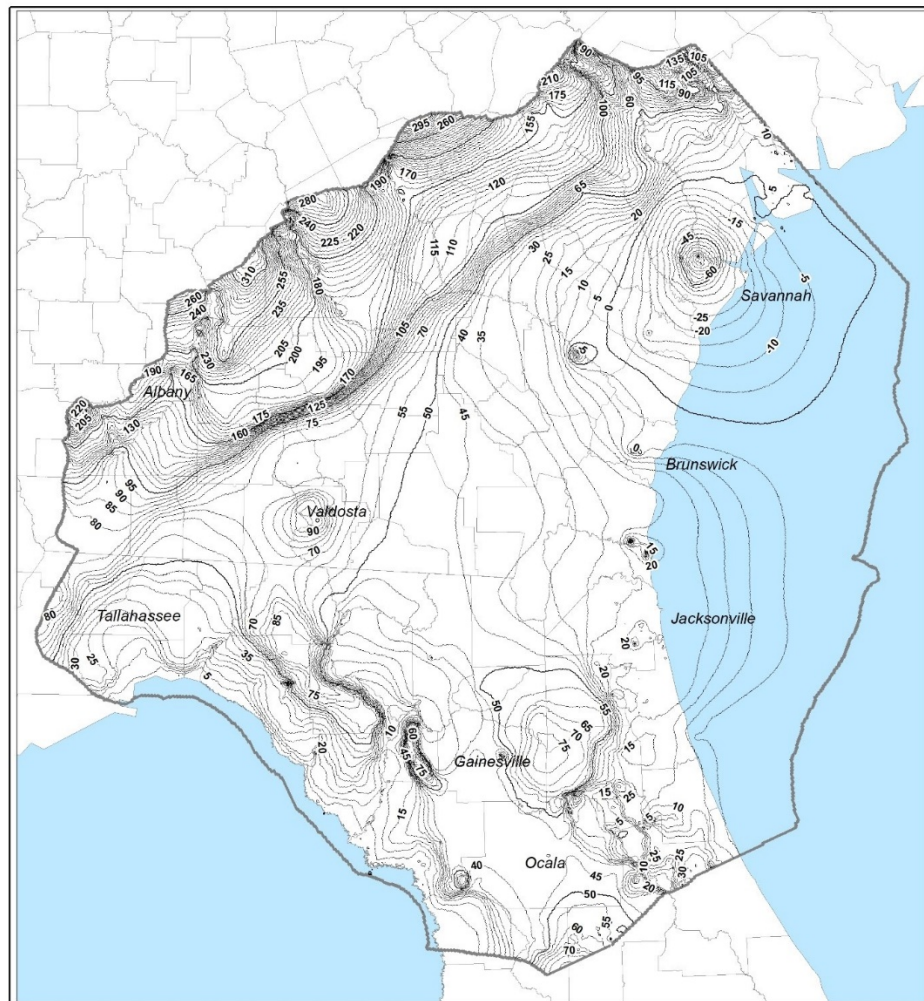
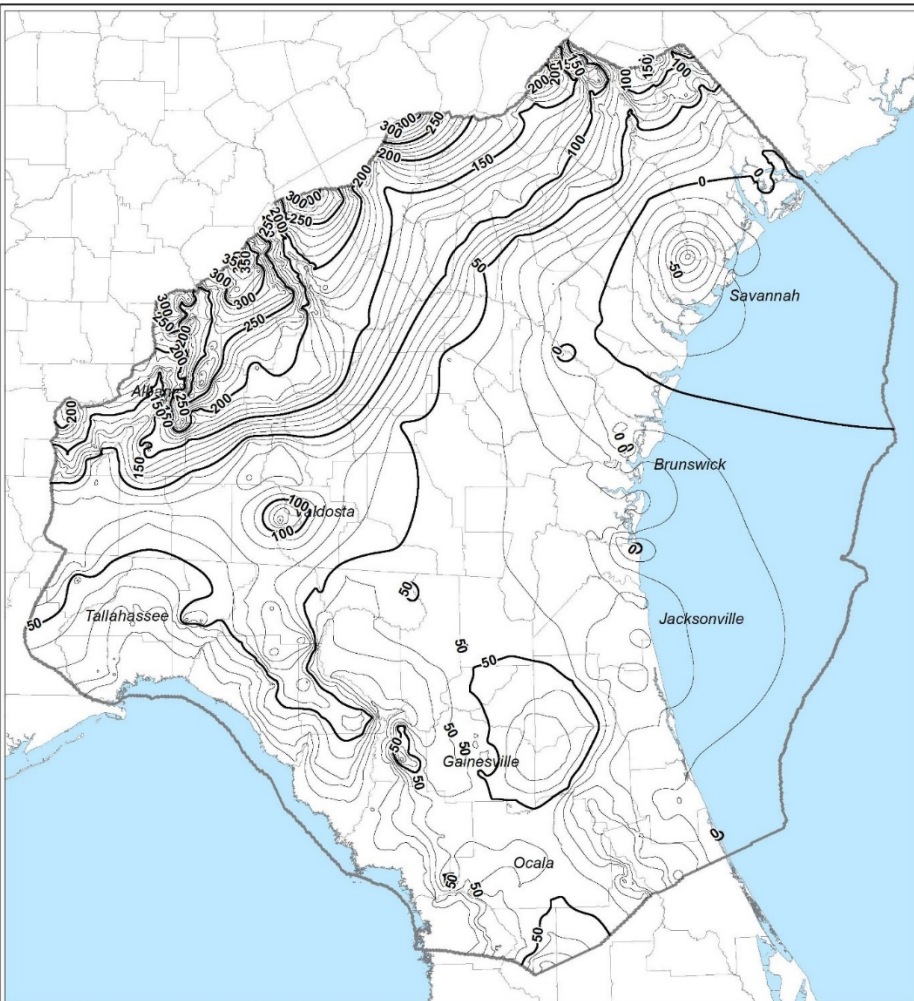


2001

L1 Residuals

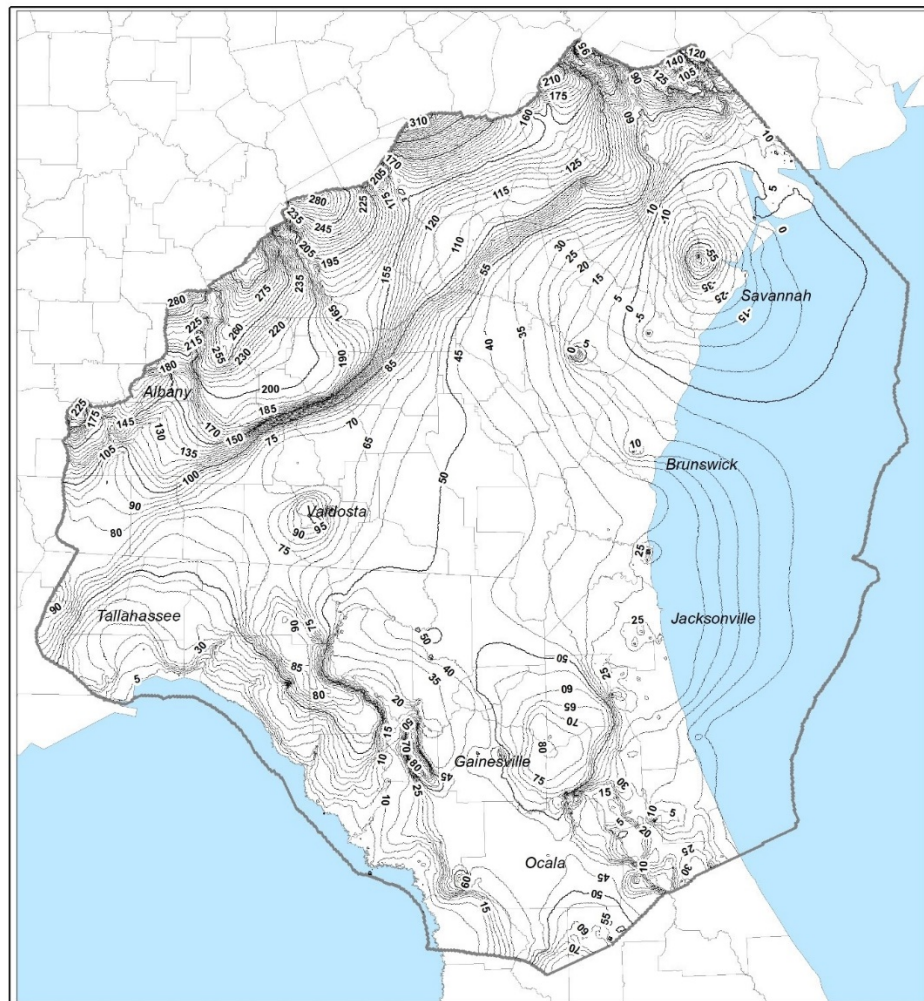
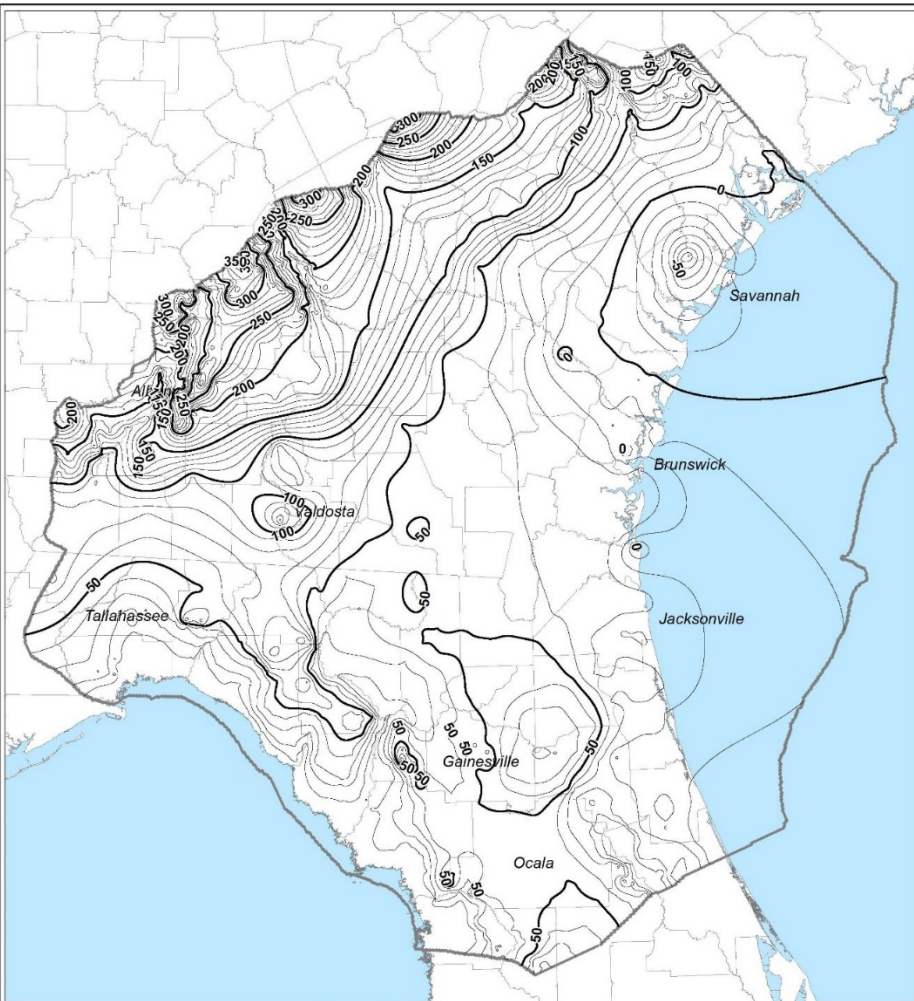
2009





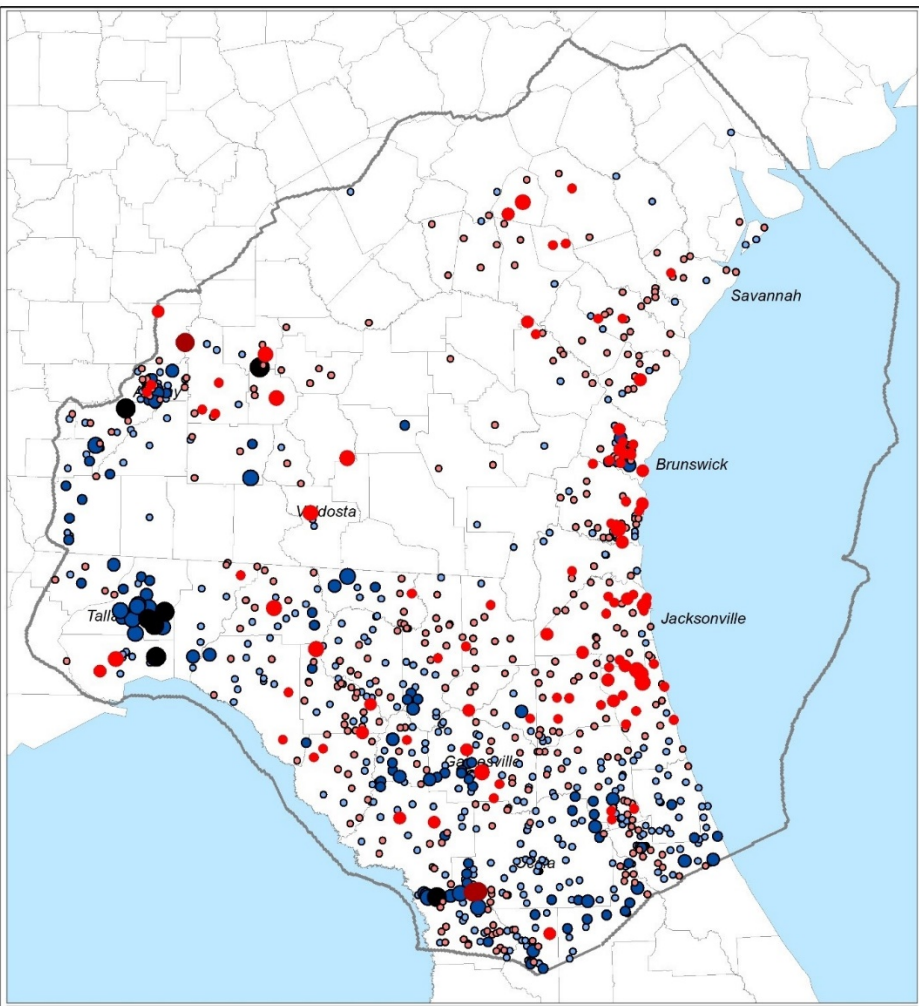
L3 Heads - 2001





L3 Heads - 2009





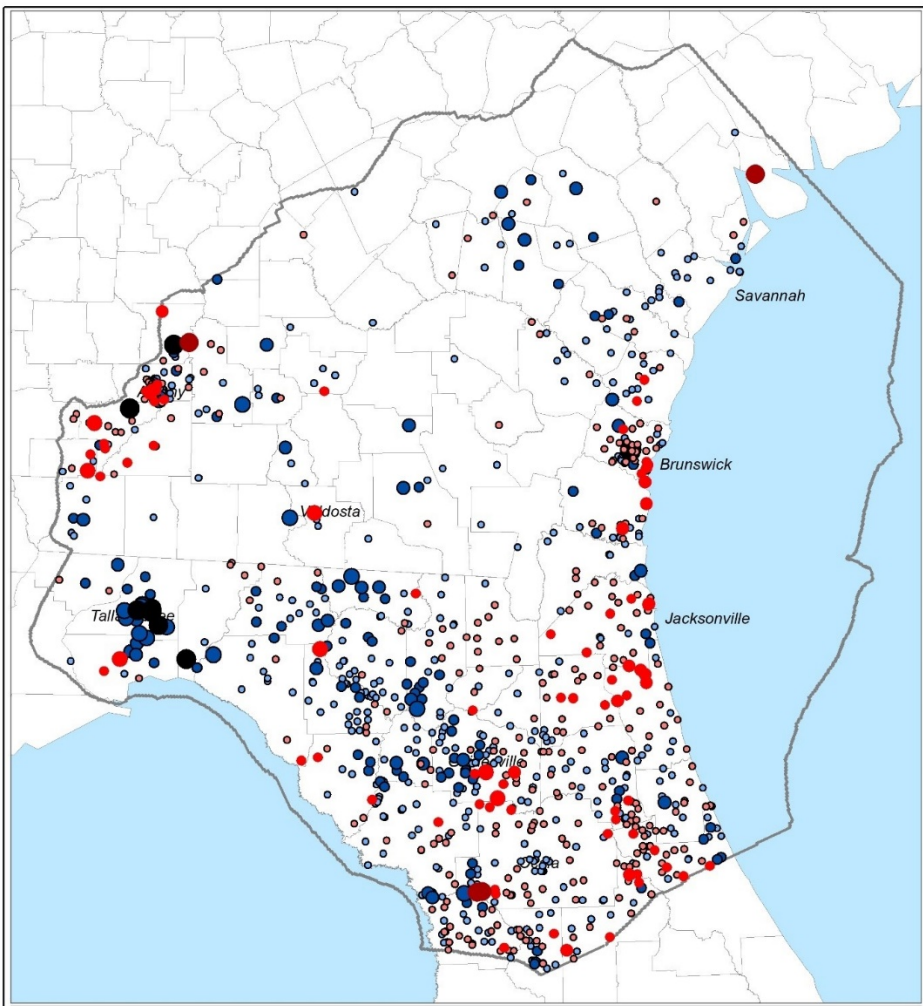
2001 Water Level Residuals




Absolute Scale
1:2,400,000

0 25 50 75 100
Miles

Water Level - Layer 3 Model Underestimates (ft)	Water Level - Layer 3 Model Overestimates (ft)
● >15	○ -4.9 - 0.0
● 10.1 - 15.0	● -7.4 - -5.0
● 7.6 - 10.0	● -9.9 - -7.5
● 5.1 - 7.5	● -14.9 - -10.0
○ 0.0 - 5.0	● < -15.0



2009 Water Level Residuals




Absolute Scale
1:2,400,000

0 25 50 75 100
Miles

Water Level - Layer 3 Model Underestimates (ft)	Water Level - Layer 3 Model Overestimates (ft)
● >15	○ -4.9 - 0.0
● 10.1 - 15.0	● -7.4 - -5.0
● 7.6 - 10.0	● -9.9 - -7.5
● 5.1 - 7.5	● -14.9 - -10.0
○ 0.0 - 5.0	● < -15.0

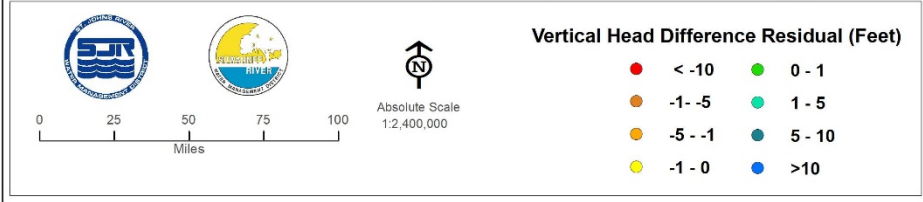
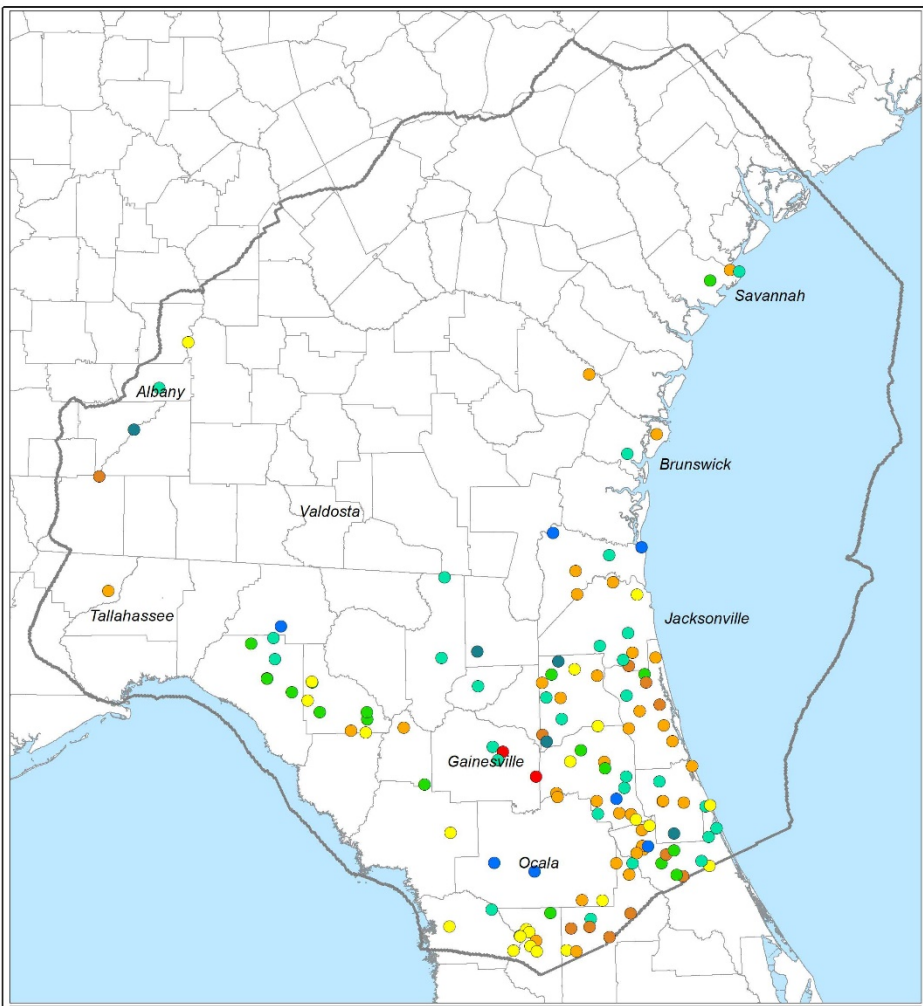
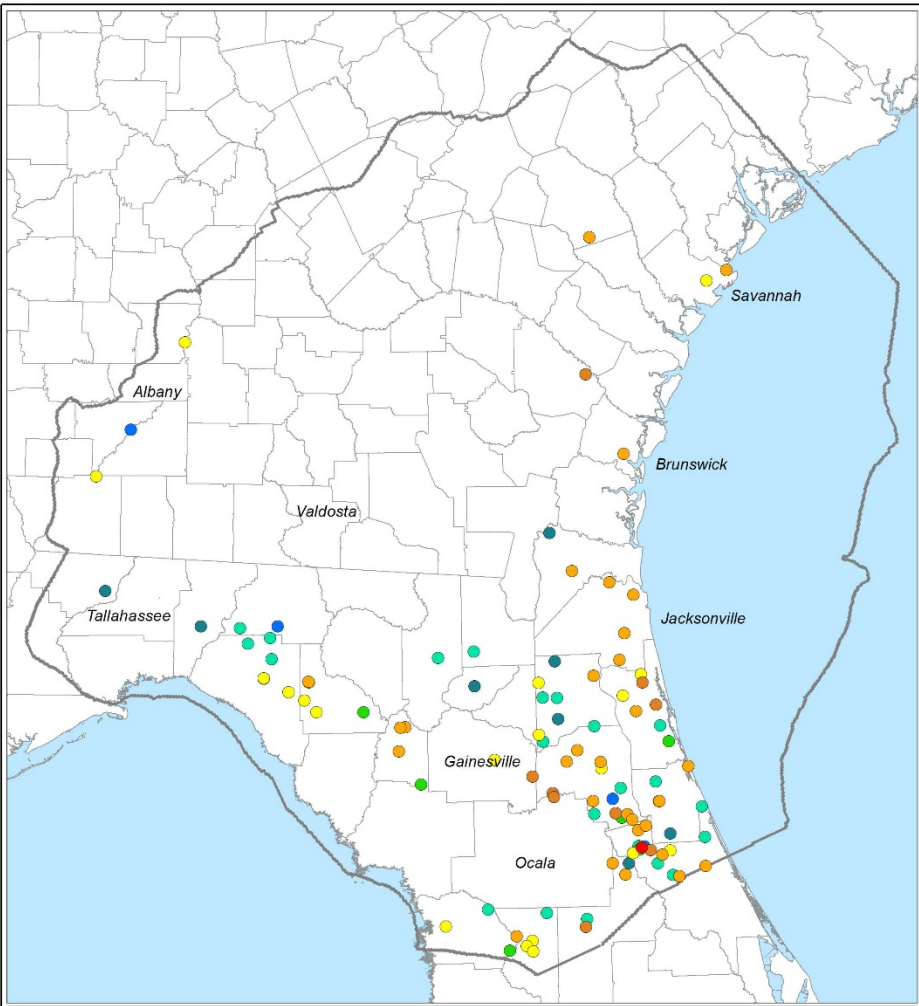


2001

L3 Residuals

2009



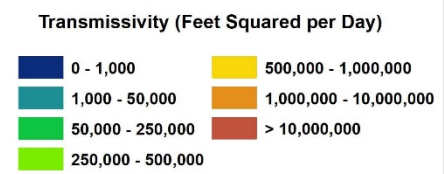
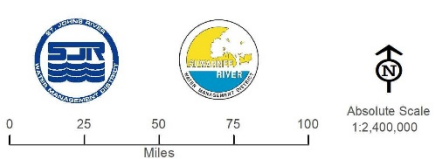
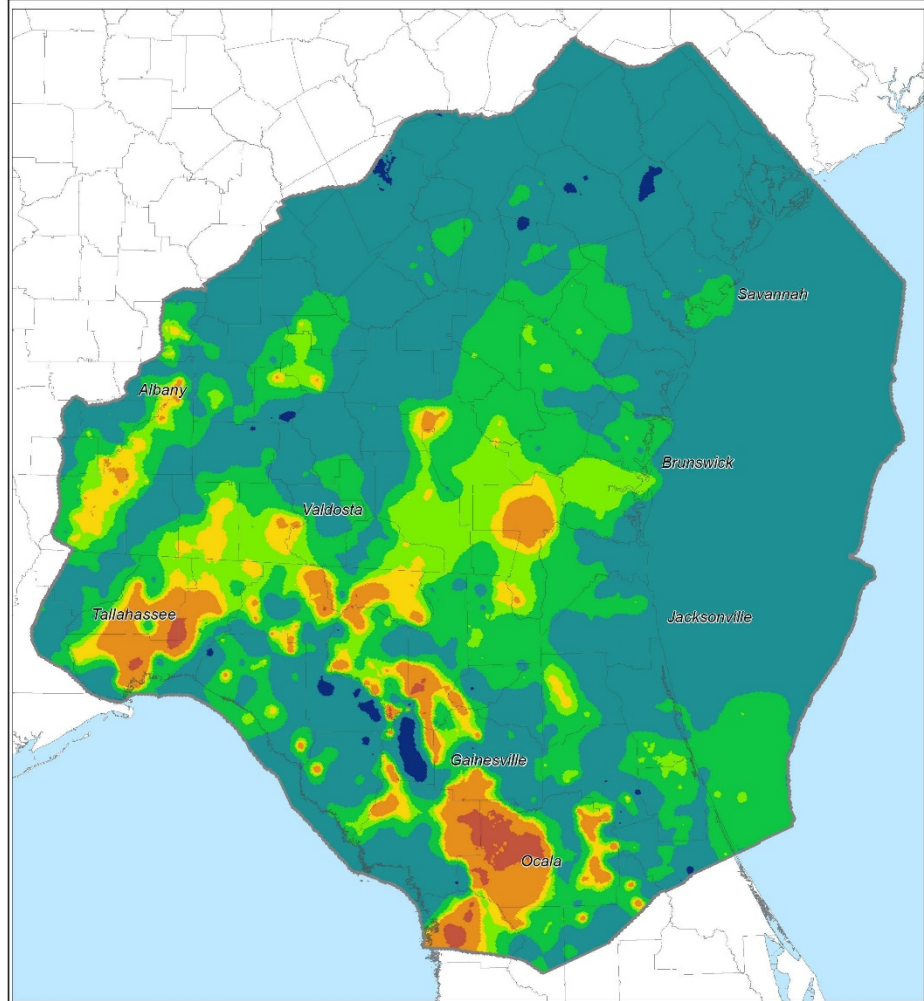
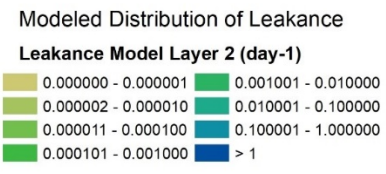
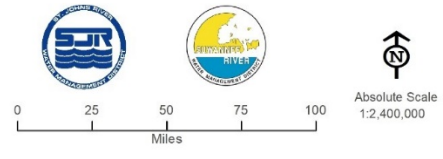
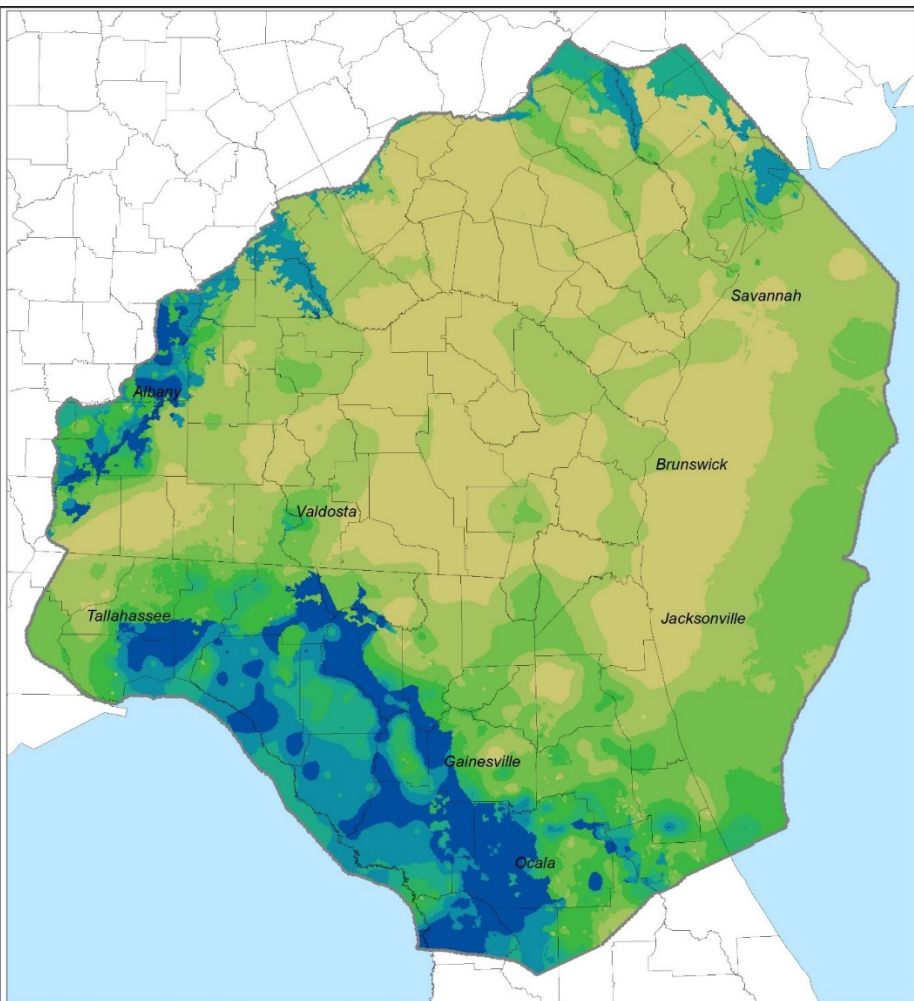


2001

L1-L3 VHD Residuals

2009



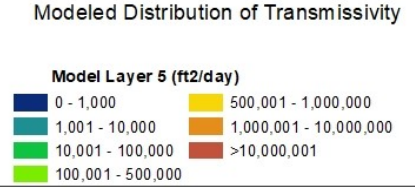
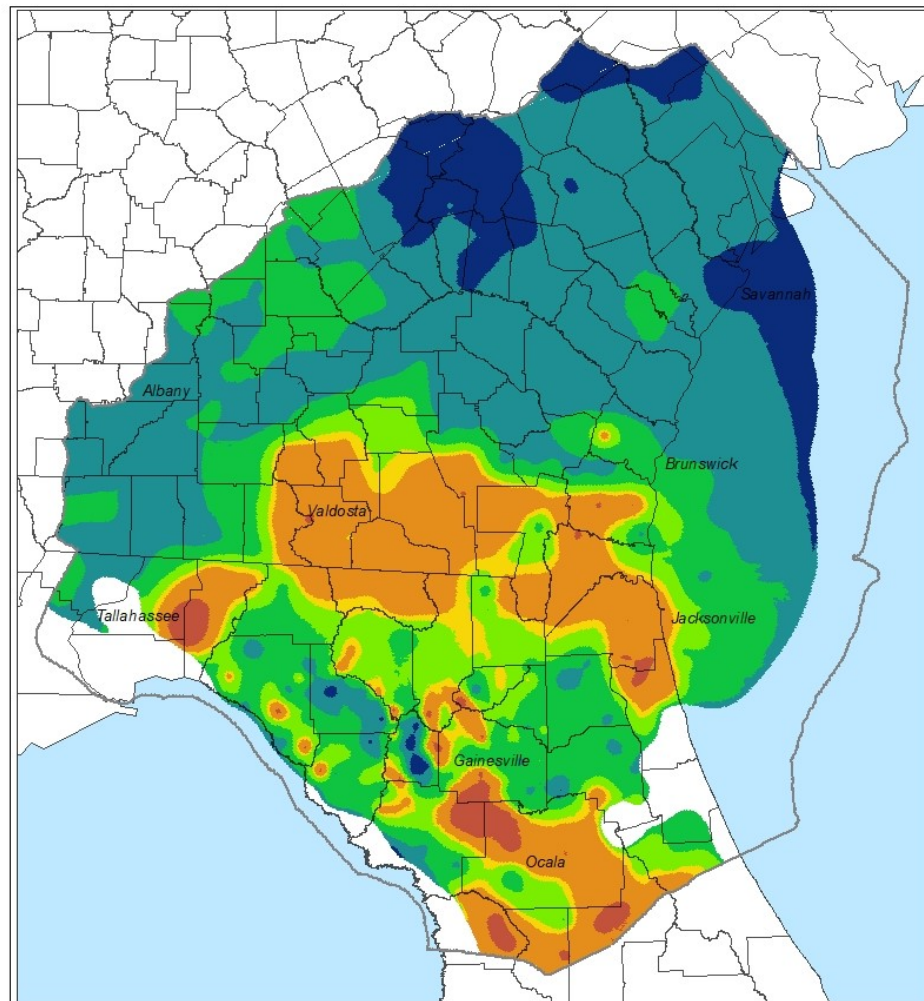
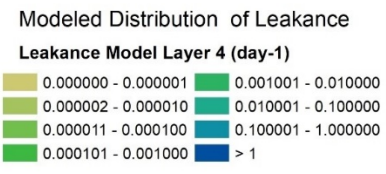
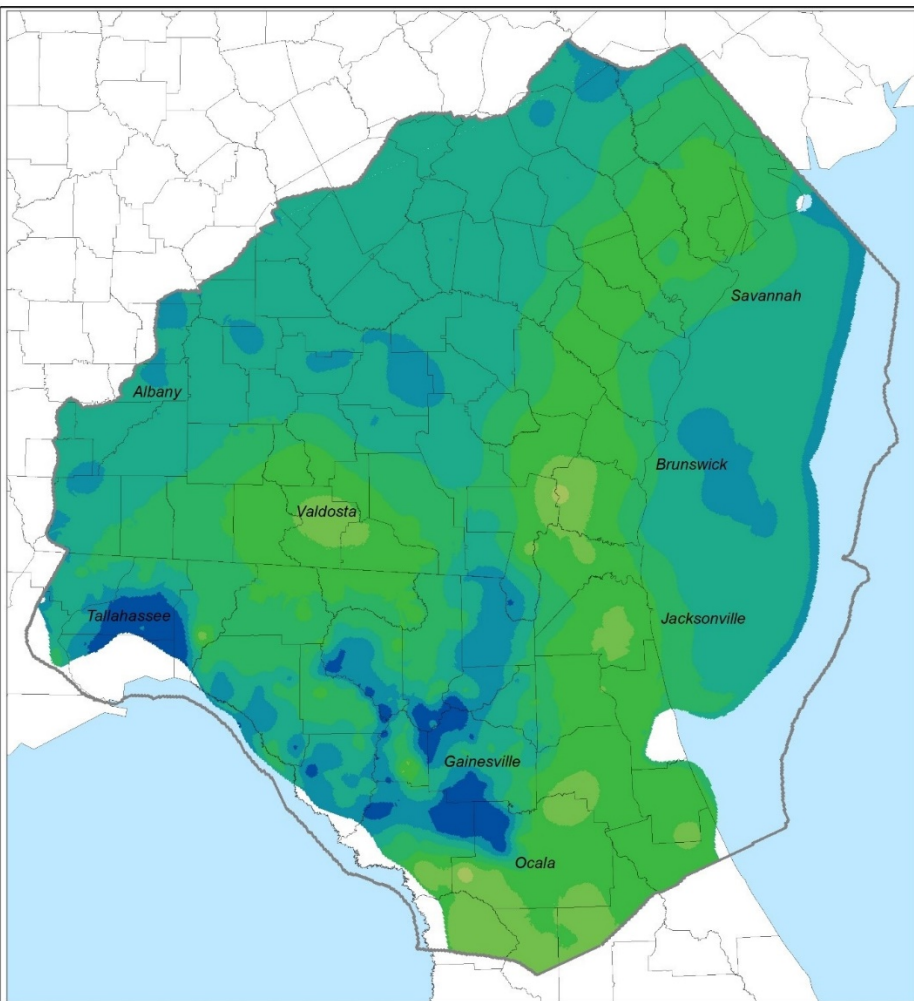


L2 Leakance

Transmissivity

Layers 1-3 unconfined region,
 Layer 3 confined region





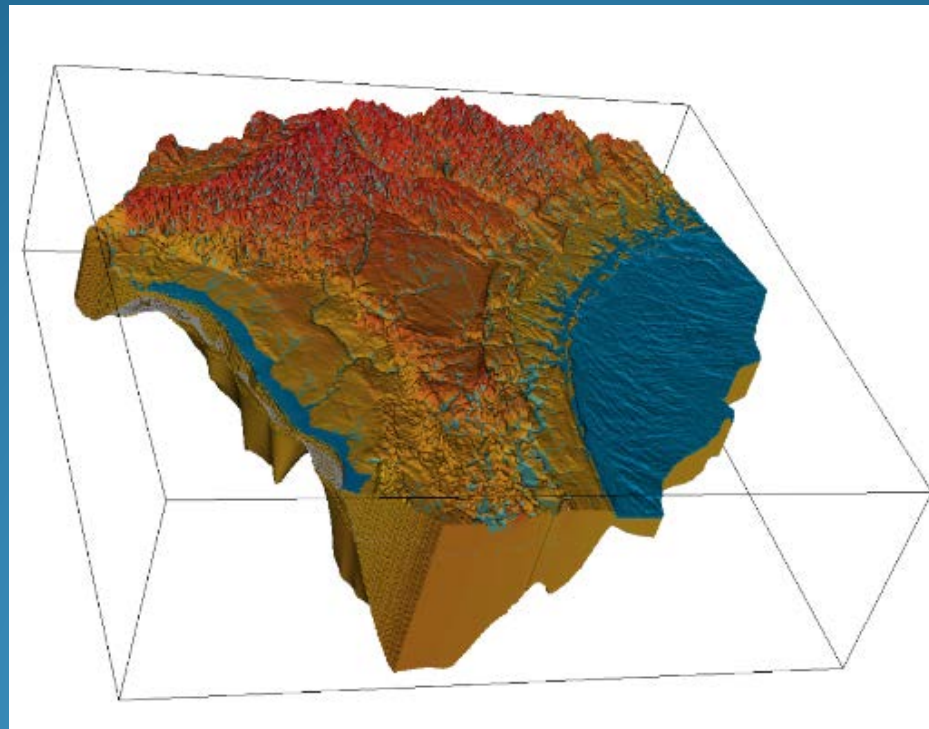
L4 Leakance

L5 Transmissivity

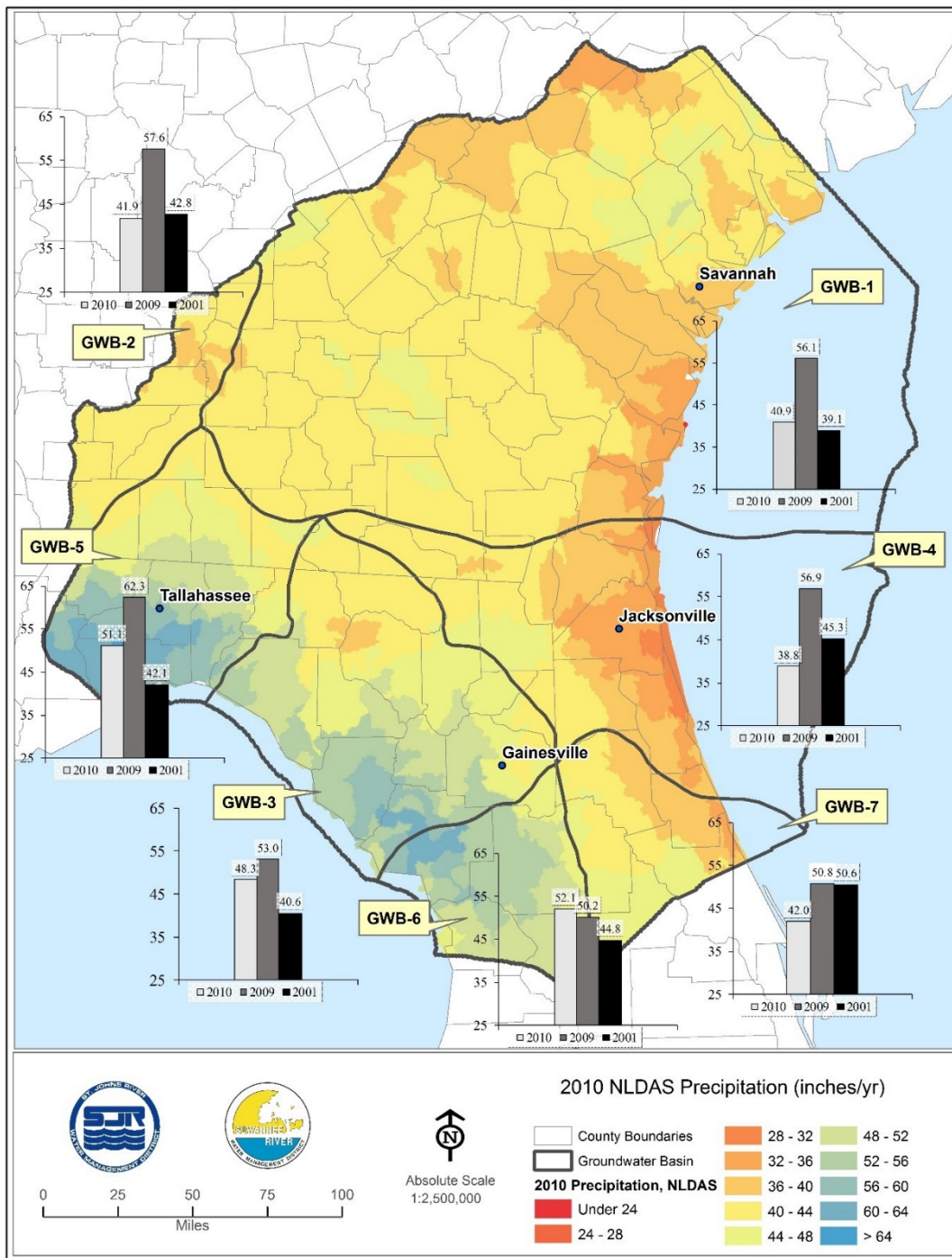


NFSEG V1.1

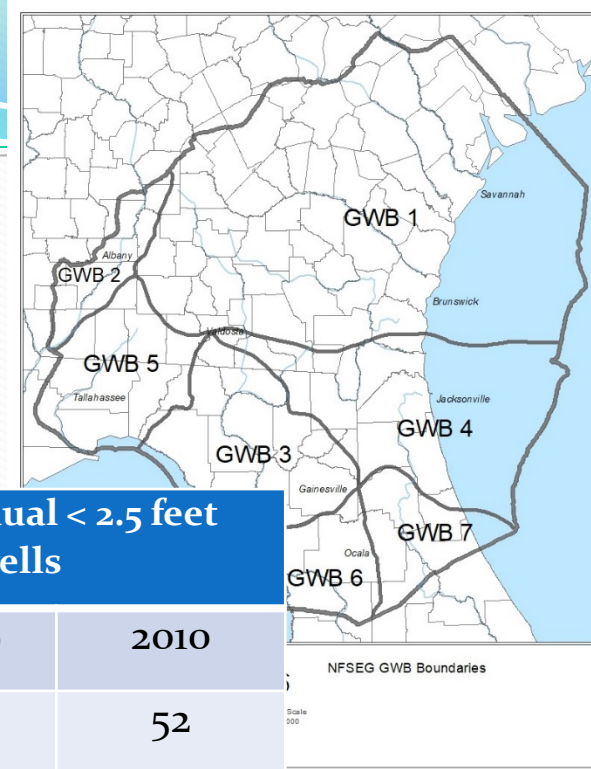
2010 Verification Simulation



2010 Verification Simulation Rainfall Comparison



2010 Verification – L3 Heads

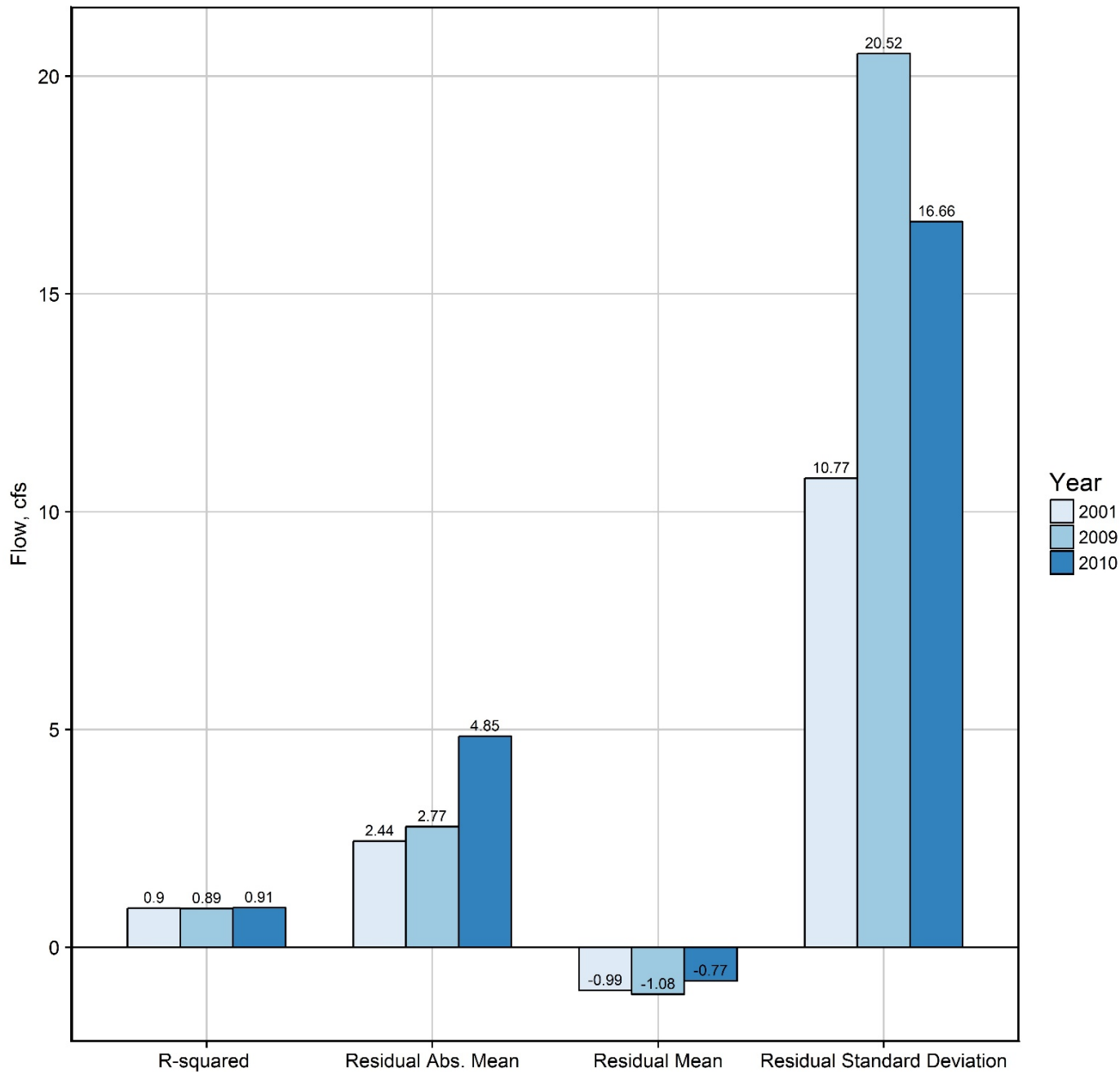


Groundwater Basin	-5 feet < Residual < 5 feet % of wells			-2.5 feet < Residual < 2.5 feet % of wells		
	2001	2009	2010	2001	2009	2010
GWB-1 (144 wells)	79	81	83	43	45	52
GWB-2 (94 wells)	70	76	65	32	40	30
GWB-3 (179 wells)	79	74	69	51	41	40
GWB-4 (131 wells)	73	81	70	44	60	34
GWB-5 (39 wells)	46	41	44	23	31	18
GWB-6 (126 wells)	83	83	75	50	63	55
GWB-7 (116 wells)	85	84	85	47	58	53
Model-wide (829 wells)	77	78	73	44	50	43

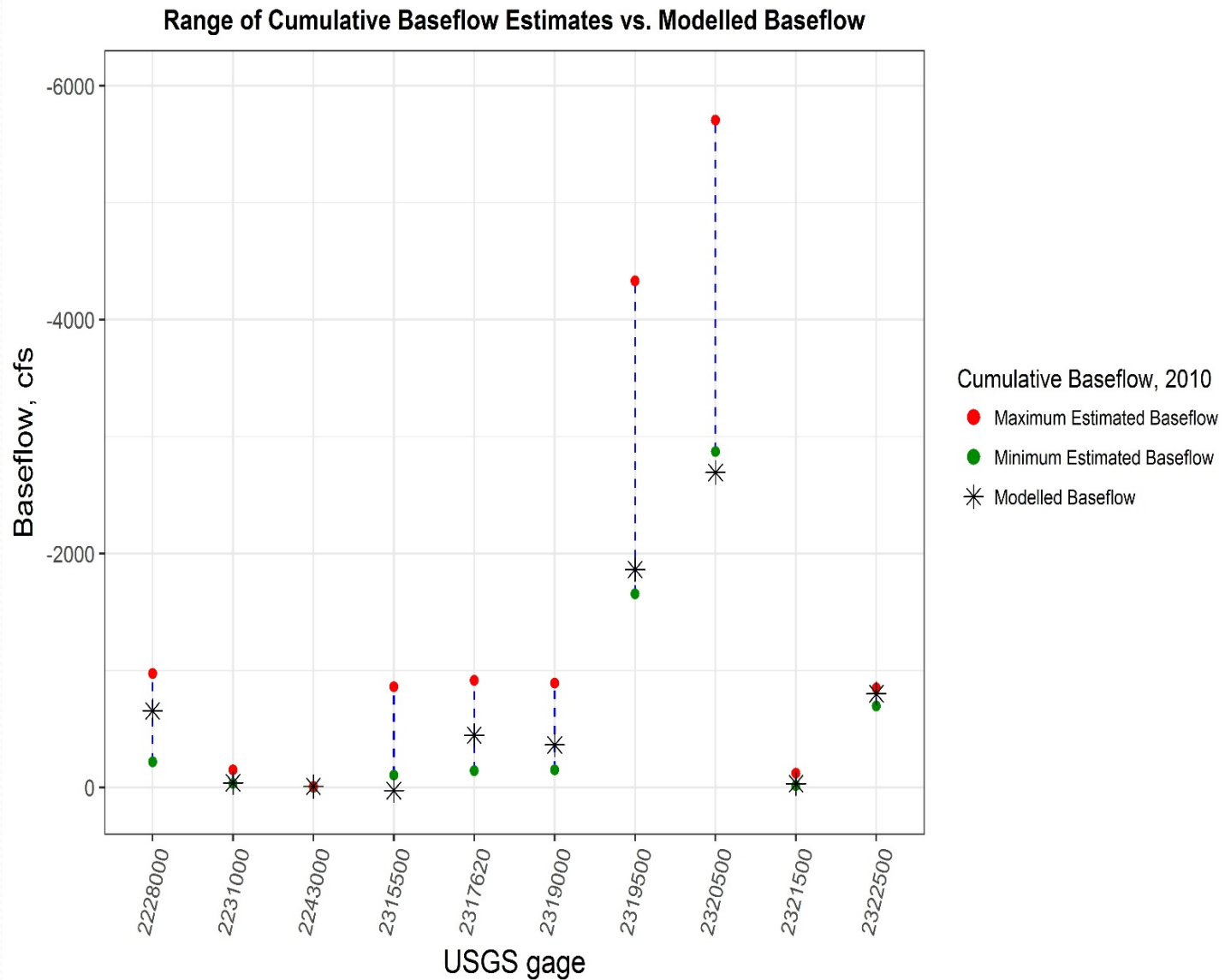
*Note: Only observations common in all years (2001, 2009 and 2010) were used in this analysis.

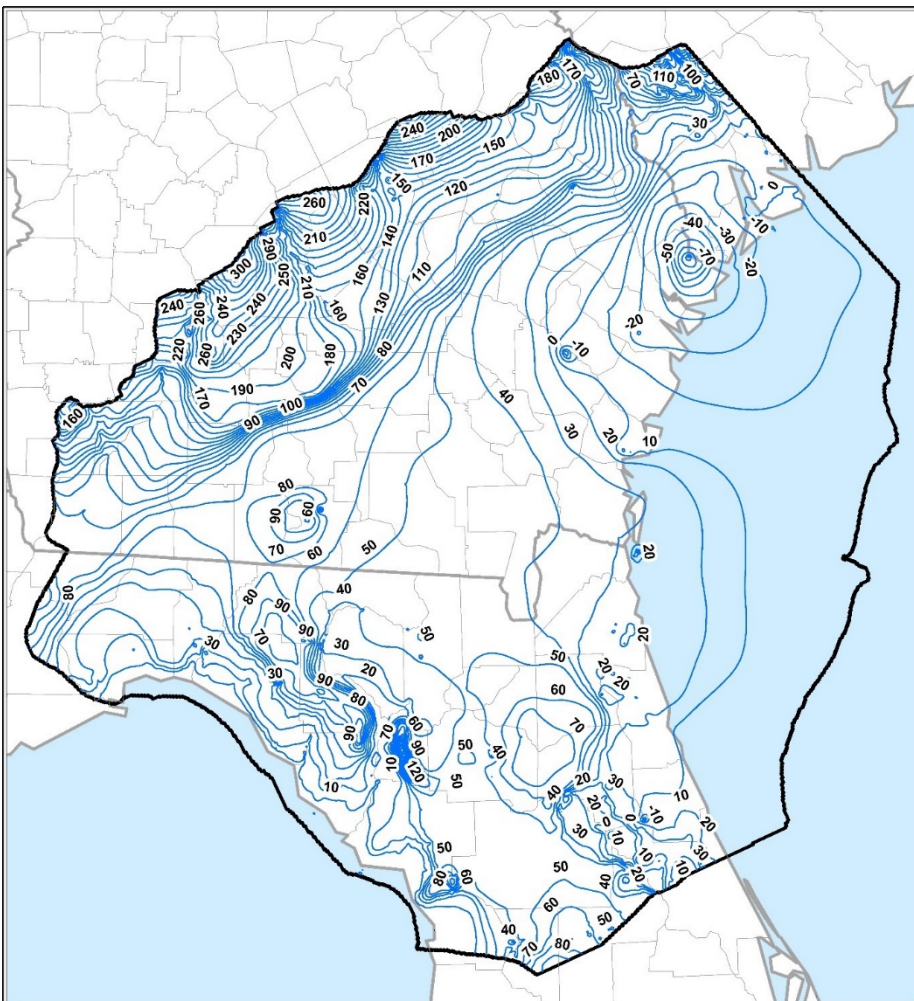


Residual Spring Flow Statistics



Cumulative Baseflows - 2010

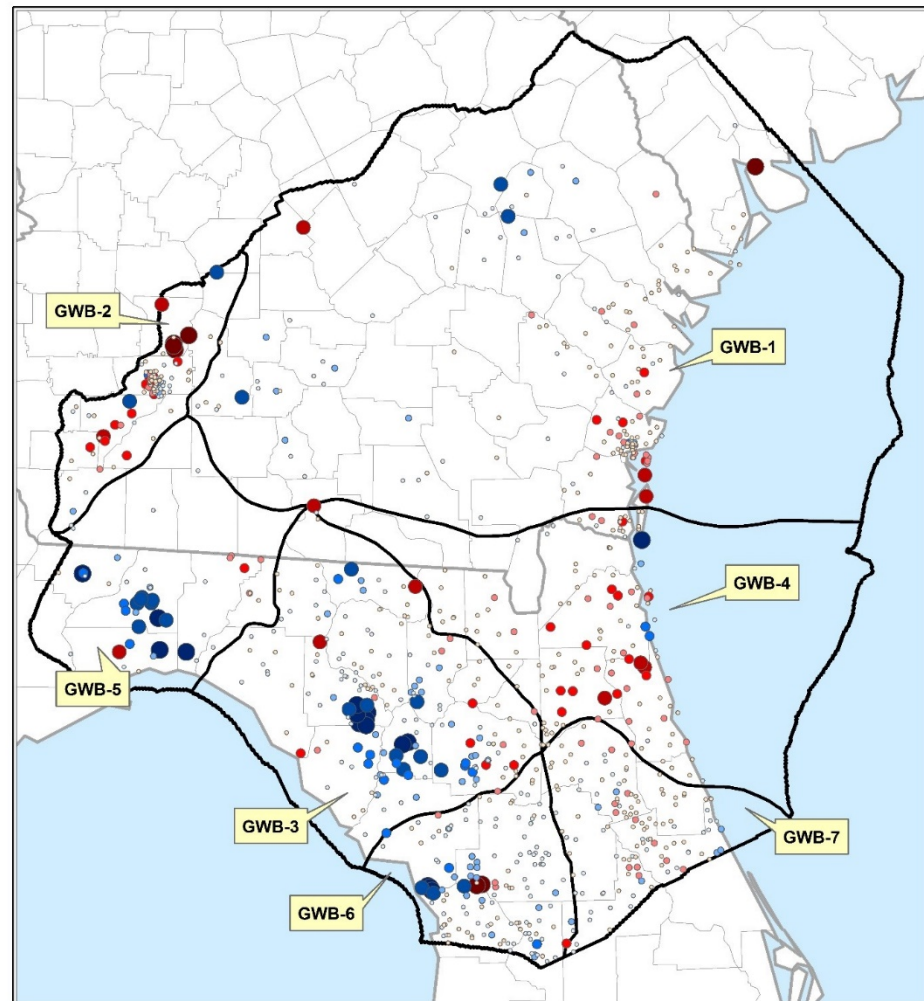




Simulated Potentiometric Surface, 2010

— UFA Pot Surface 10 ft contour

Absolute Scale
1:2,400,000



2010 Model Layer 3 Water Level Residuals

Water Level Overestimate (ft)		Water Level Underestimate (ft)		□ GW Basin
●	< -15.0	○	0.0 - 5.0	
●	-14.9 - -10.0	○	5.1 - 7.5	
●	-9.9 - -7.5	○	7.6 - 10.0	
●	-7.4 - -5.0	○	10.1 - 15.0	
○	-4.9 - 0.0	●	> 15.0	

Absolute Scale
1:2,400,000



2010 L3 Heads & Residuals



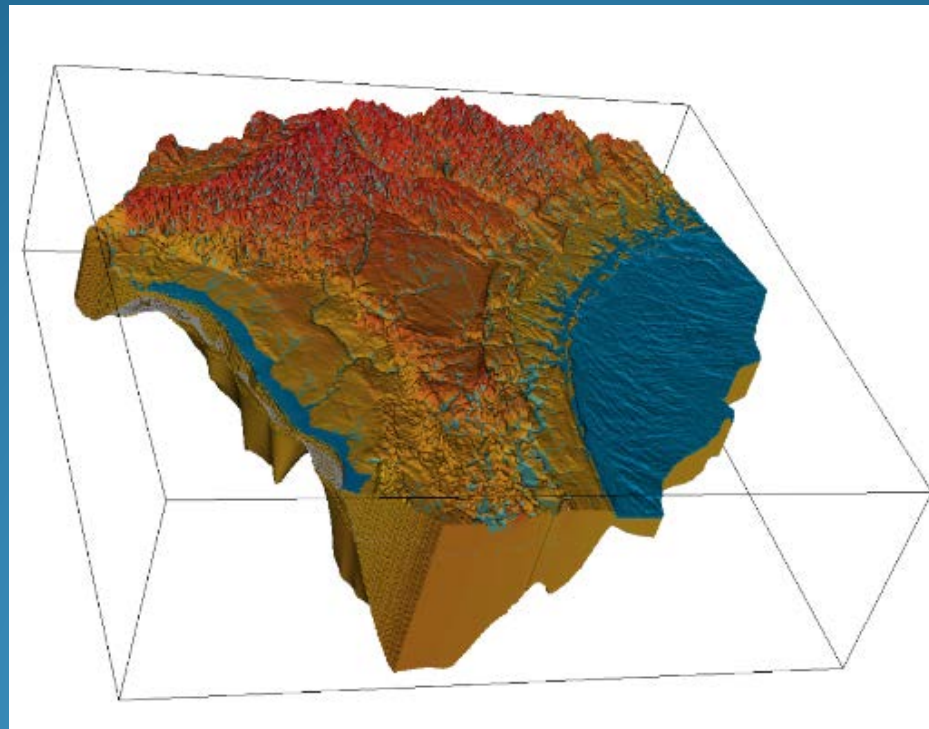
2010 Verification Synthesis

- Distribution of Rainfall, Recharge Is Different from 2001/2009
 - Heads
 - Residuals Compare Favorably to 2001/2009
 - UFA Potentiometric Surface Good Fit to Observed
 - Spring Flows
 - Residuals Compare Favorably to 2001/2009
 - Baseflows
 - Uncertainty in Targets, Simulated Values Fall Within Range of Estimates
- Overall, NFSEG V1.1 yielded a satisfactory result in simulating the 2010 condition, indicated satisfactory calibration



NFSEG V1.1

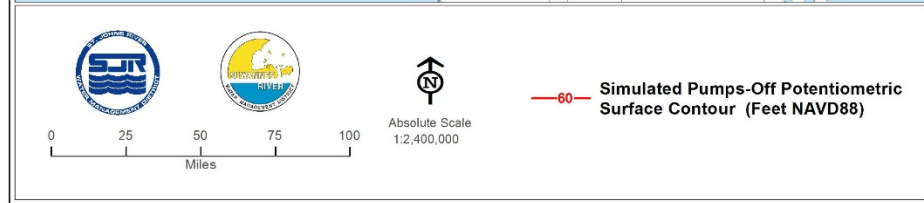
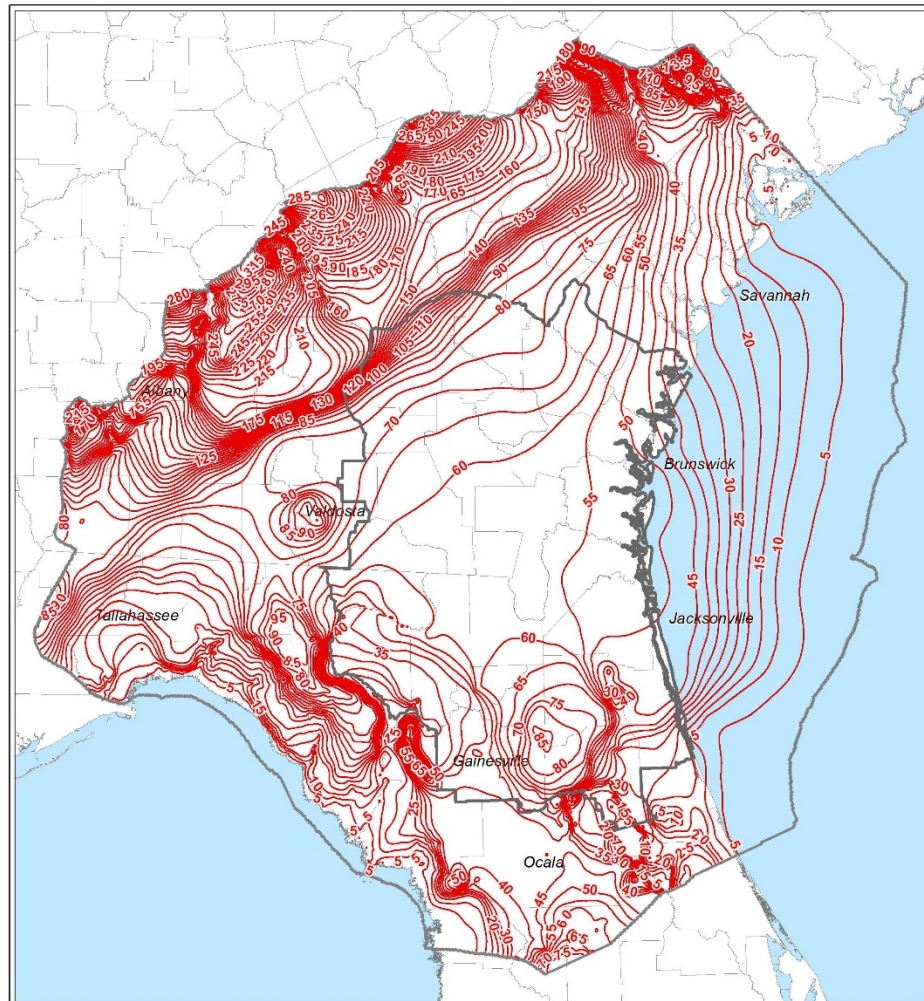
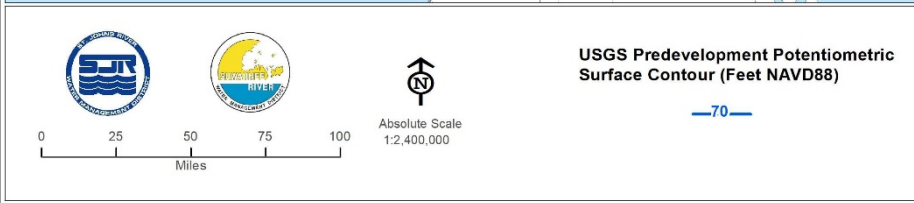
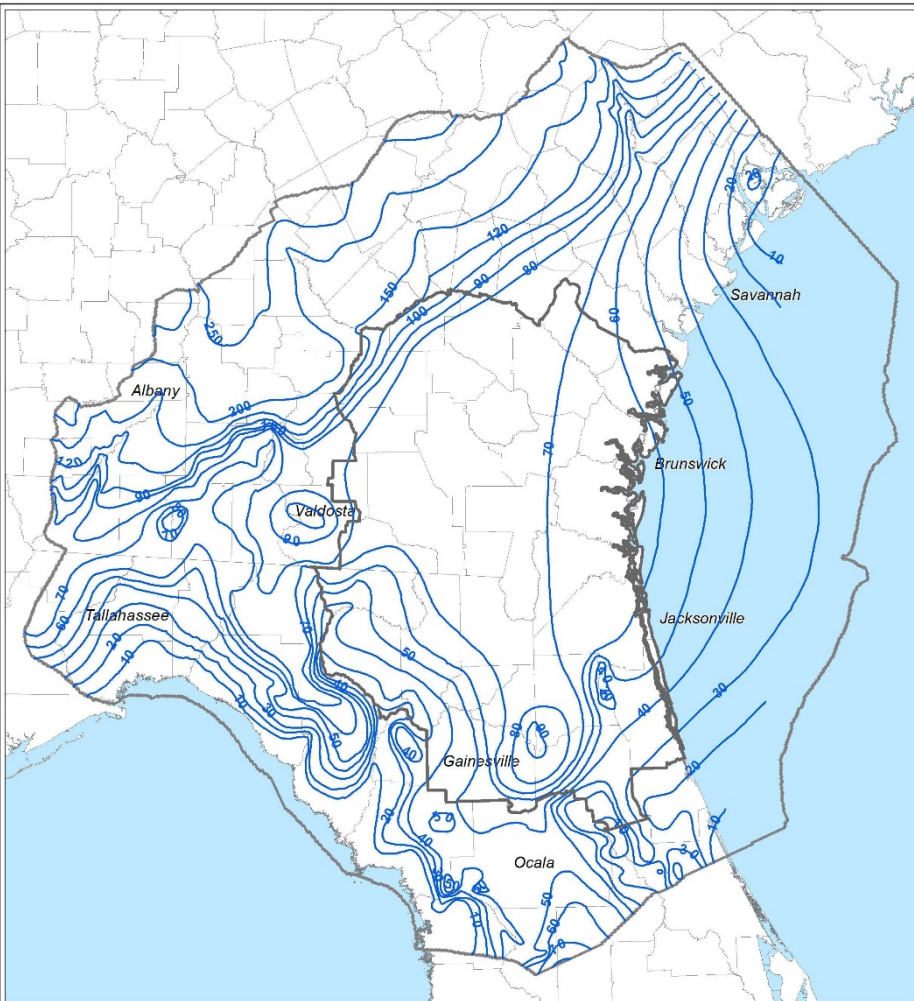
No Pumping Simulation



No-Pumping Simulation

- Removed Pumping From 2009 Calibrated Model
- Reasonableness Checks
 - Comparison to USGS Predevelopment UFA Water Levels
 - Comparison to 1932/1933 Observed Spring Discharges
 - Increase In Flooding – Layer 1

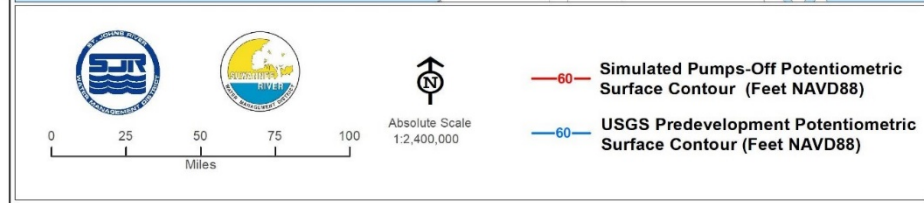
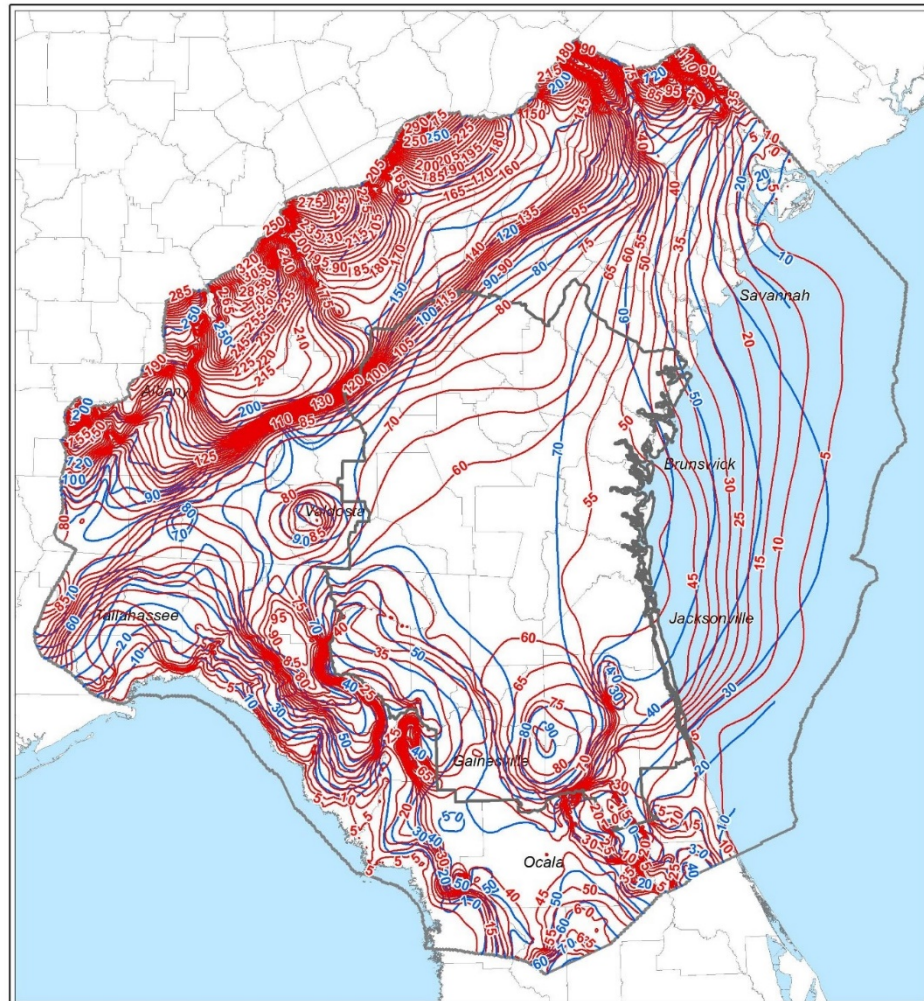
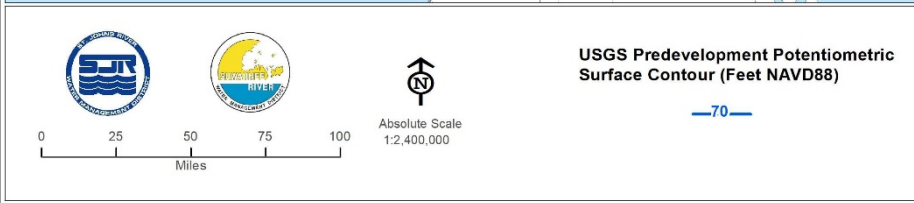
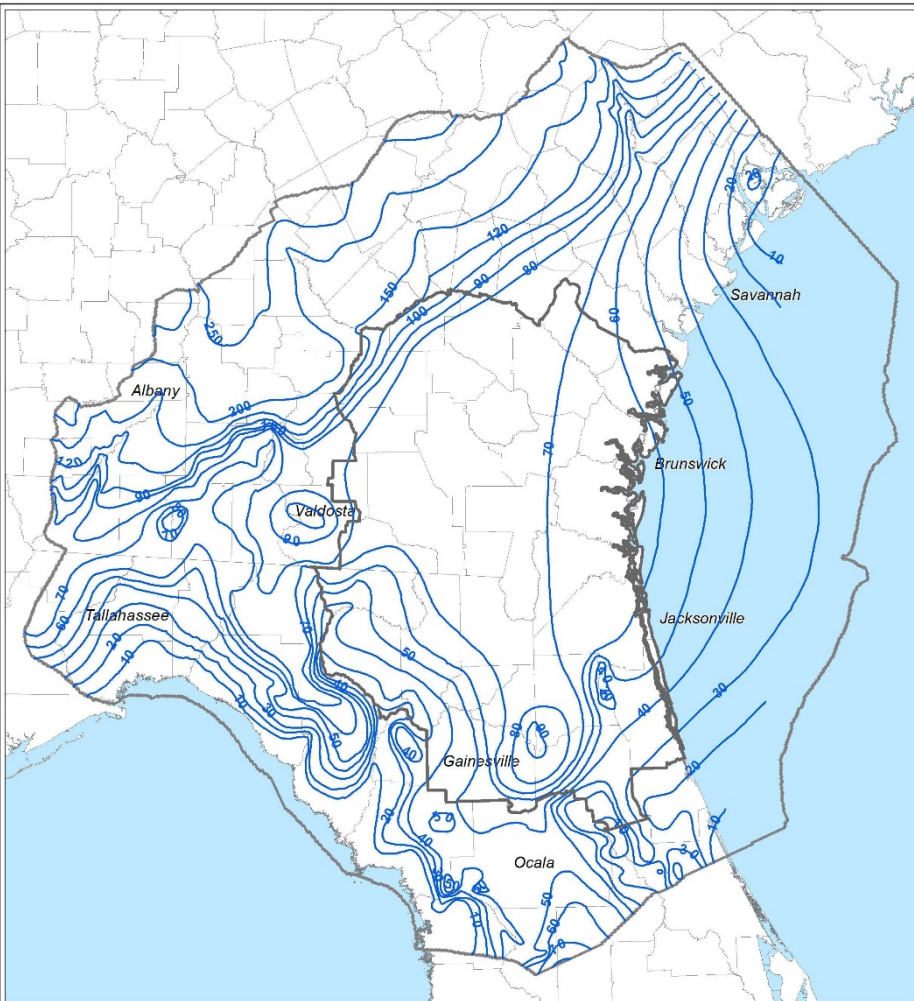




USGS Predevelopment FAS-
Pot. Surface
Johnston et al 1980

L3 Simulated Heads
2009 Boundary Conditions

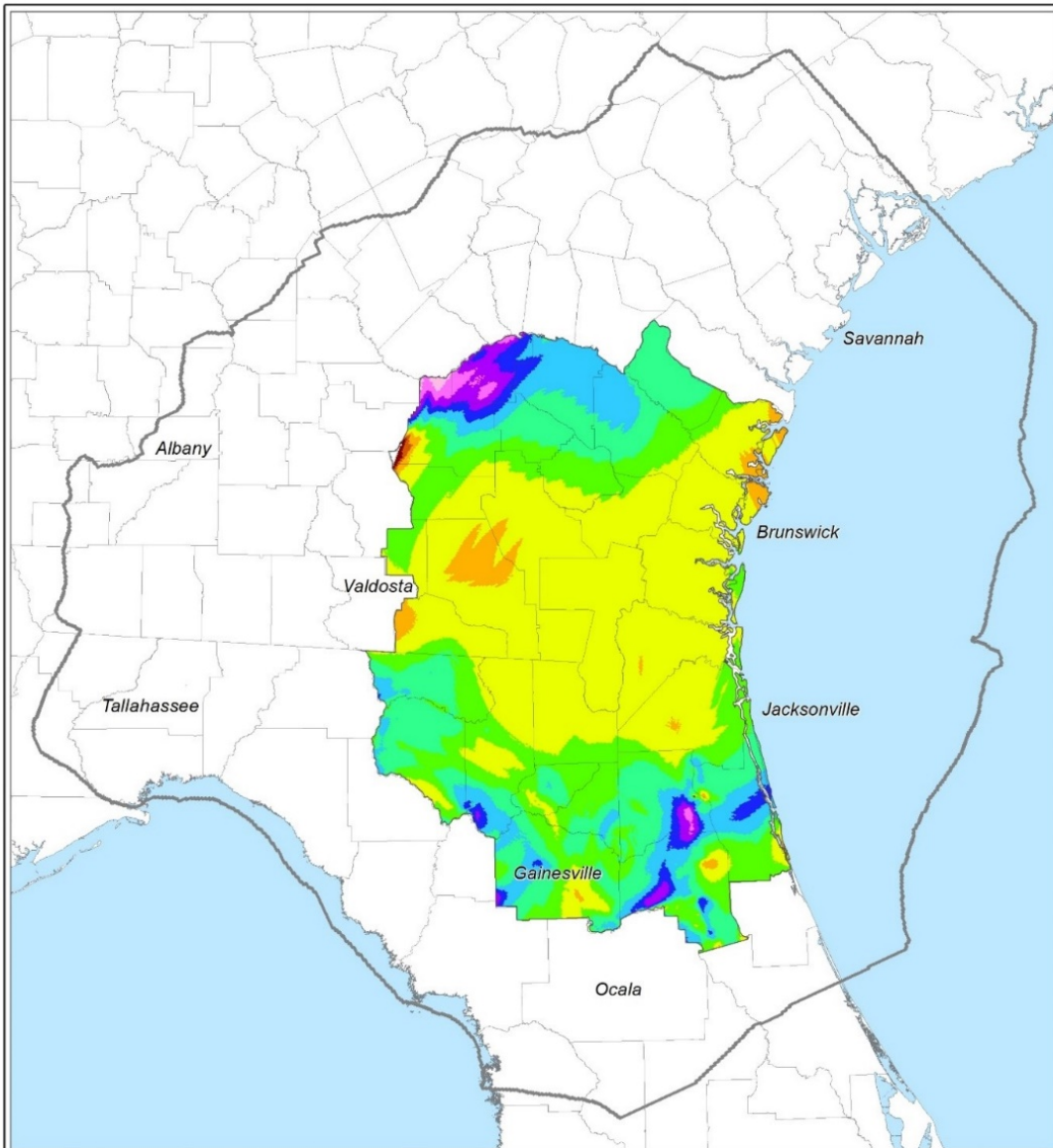




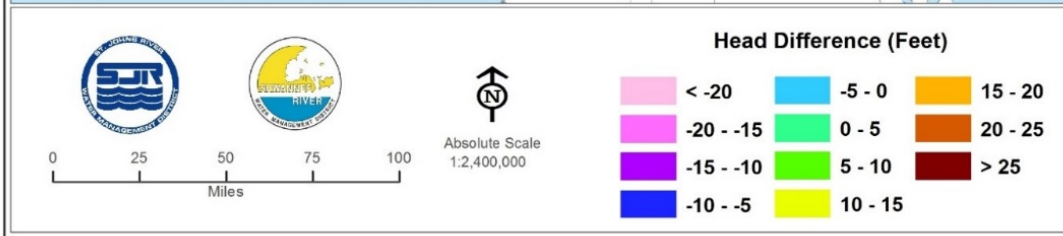
USGS Predevelopment FAS-
Pot. Surface
Johnston et al 1980

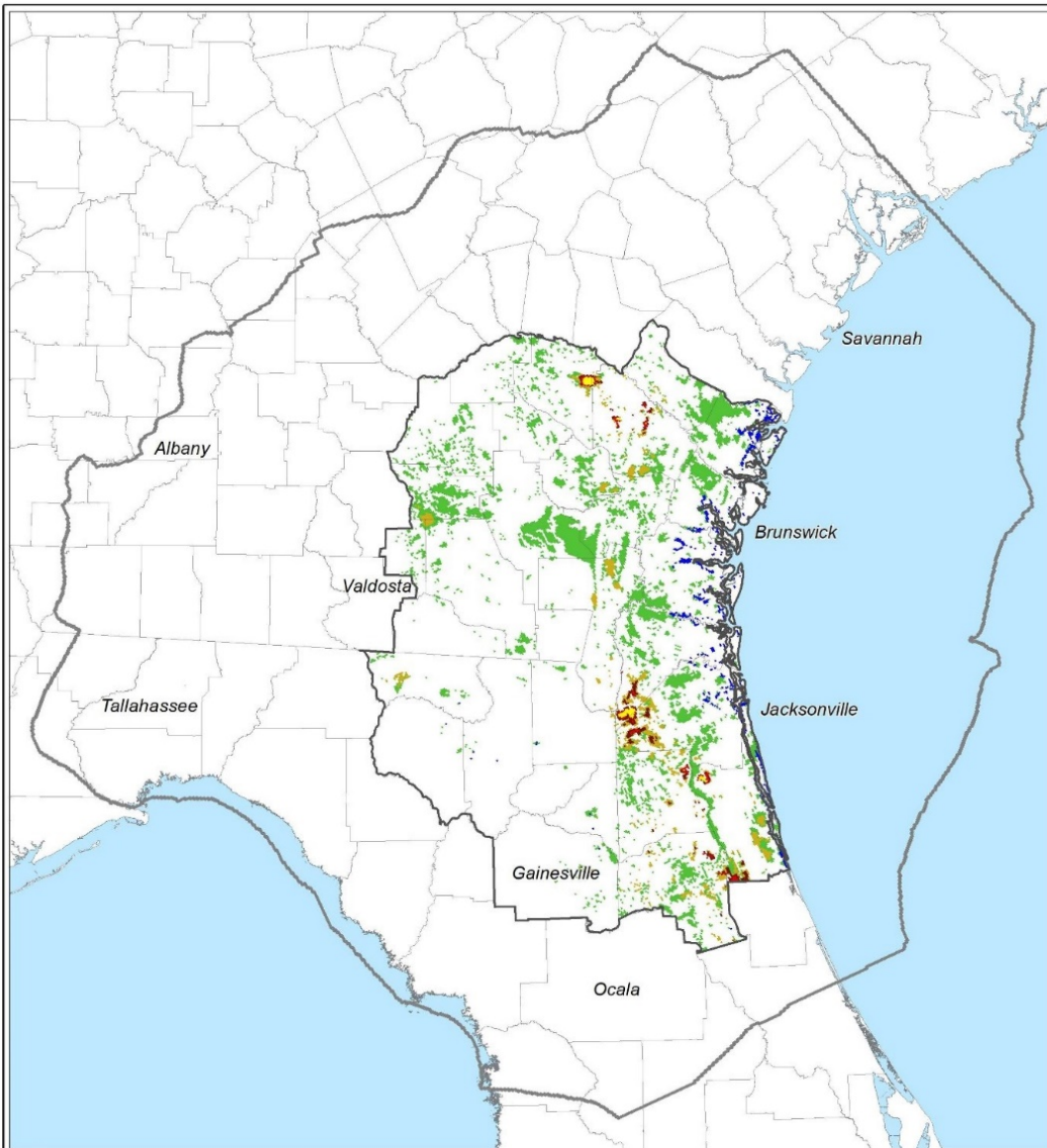
USGS PD FAS Pot. Surface
and L3 Simulated Heads
2009 Boundary Conditions





Difference Between USGS Predevelopment UFA Potentiometric Surface and Simulated L3 Heads No Pumping





Increase in Flooding Difference Between Simulated 2009 and No-Pumping Heads – L1



Spring	2009 Simulated Discharge (cfs)	No-pumping Simulated Discharge (cfs)	Stringfield (1936) Observed Discharges				
			Minimum Discharge (cfs)	Date	Maximum Discharge (cfs)	Date	Mean Discharge (cfs)
Silver	509	555	526	6/6/1933	1240	9/9/1933	808
Rainbow	570	593	487	10/3/1932	910	10/4/1933	652
Itchetucknee	264	270	260	6/4/1932	467	6/30/1930	340
Homosassa	124	127	141	2/14/1933	177	3/15/1932	159
Manatee	129	131	149	3/14/1932	n/a	n/a	149
Silver Glen	101	103	90	2/7/1933	125	3/17/1931	104
Alexander	102	103	112	2/12/1931	124	2/7/1933	68
Juniper	15	15	106	2/7/1933	117	3/3/1932	112
Fanning	68	70	79	3/14/1932	109	10/25/1930	94
Salt	92	93	62	2/7/1933	105	5/5/1931	85
Poe	43	44	31	3/14/1932	87	2/19/1917	59
Madison Blue	104	120	75	3/15/1932	n/a	n/a	75
White	6	1	36	11/4/1931	67	5/8/1927	48
Suwanacoochee	29	32	18	3/16/1932	41	11/6/1931	30
Ponce de Leon	21	23	20	3/7/1932	22	2/11/1929	21

Simulated Spring Discharges Compared to Stringfield (1936) Observations



Peer Review Panel Comments



Schedule/Next Steps

- Peer review panel workshop 4/18/2018
- NFSEGV1.1 model/documentation
 - Chapters 1-6 complete, posted 4/05/2018
 - Chapters 7-10 being finalized, posted 4/25/2018
 - 7 - Sensitivity Analysis
 - 8 - Uncertainty Analysis
 - 9 - Capabilities/Limitations
 - 10 - Summary/Conclusions
 - Appendices and Reference List
- Draft peer review report mid May-2018
- Stakeholder comments mid May-2018
- WMDs resolution document June-2018
- Final peer review report Late June-2018
- Post NFSEGV1.1 July-2018



Public Comments

