

Florida Salinity Network Meeting Agenda

- ◉ Welcome and Introduction
- ◉ Background and Reasons for “Sal” Net
- ◉ Examples of Previous GW Investigations
- ◉ Important Issues
- ◉ What is Actually Available
- ◉ Projected Work Efforts
- ◉ Future Direction
- ◉ Action Items
- ◉ Adjourn

Creation of a Statewide “Salinity” Monitoring Network

- First, presented to the FL. Water Resource Monitoring Council August 31, 2011
 - Council asked FDEP to **check feasibility**
- Today's objectives
 - **Is there support?**
 - **What might it look like?**

Reasons

- Concerns about declining GW quantity
- Concerns about changing GW quality
- Other issues?

Examples

(From CDM Inc.)



Example of Previous Investigations

- “Regional and Statewide Trends in Florida’s Spring and Well Groundwater Quality (1991-2003)”
 - (2009, Florida Geological Survey; Bulletin 69)
- “Relation of Aquifer Confinement and Long-Term Groundwater-Level Decline in the Floridan Aquifer System”
 - Williams, L.J., Dausman, A.,D., and Bellino, J.C., 2011, Proceedings of the 2011 Georgia Water Resources Conference, April 11-13, University of Ga., Athens, Ga.
- Others

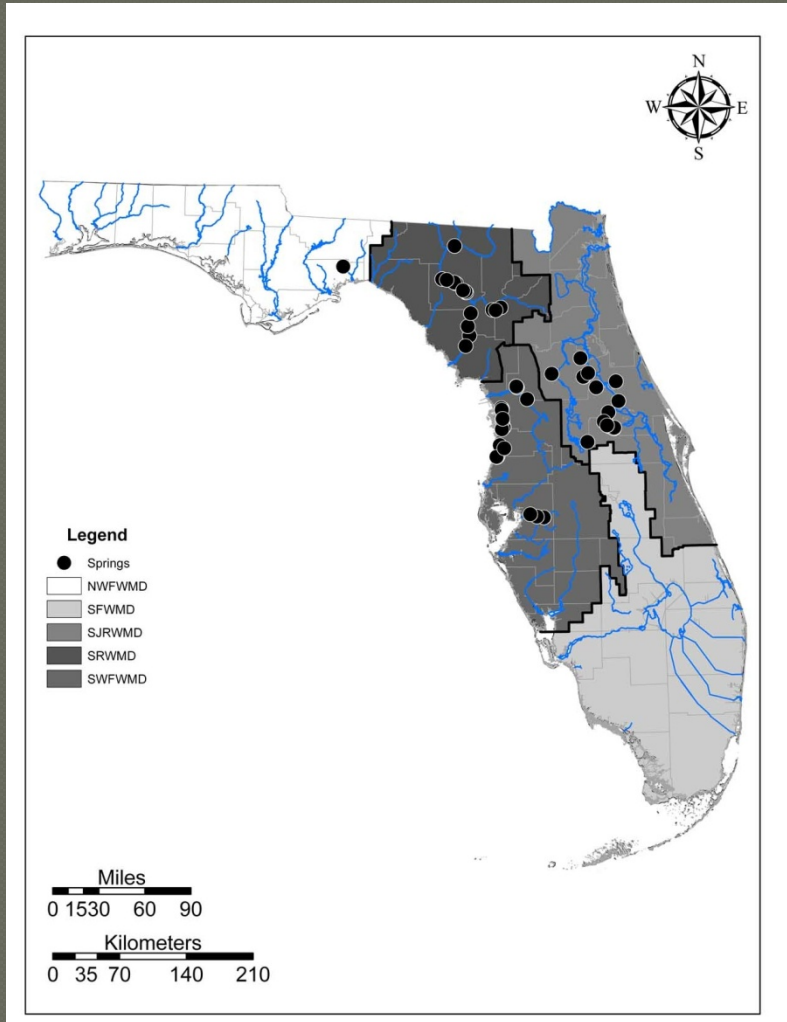
Example One

- ◎ Regional and Statewide Trends in Florida's Spring and Well Groundwater Quality (1991-2003)"(B69)
 - At that time FL interested in nutrient trends in springs
 - Evaluation also included well data
 - 1. Decreasing trends in spring flow and GW levels
 - 2. Increasing trends in salinity indicators
 - 3. Statewide in scale

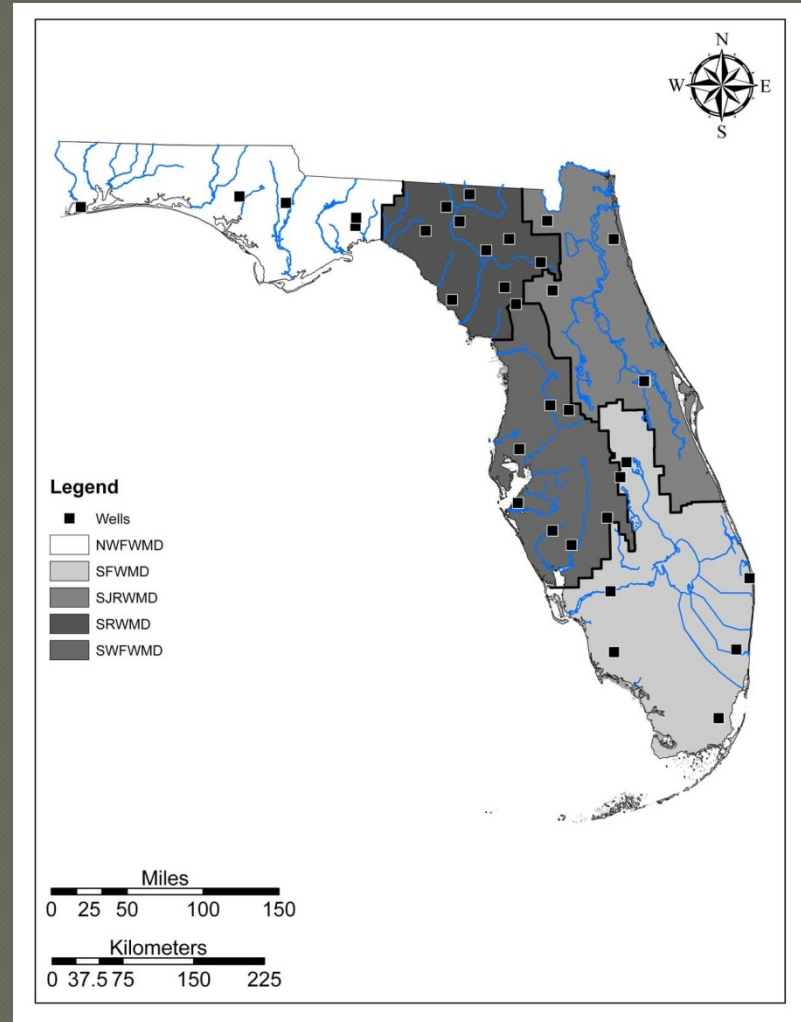
Analytical Process

- ◉ Wanted the most # of fixed-stations with longest record, and same period of record
- ◉ Ended with:
 - 57 Springs
 - 46 Wells
 - 48 Analytes
 - 1991-2003

From B69 (2009)
Revised in 2011



57 Springs



46 Wells

Trend Analyses

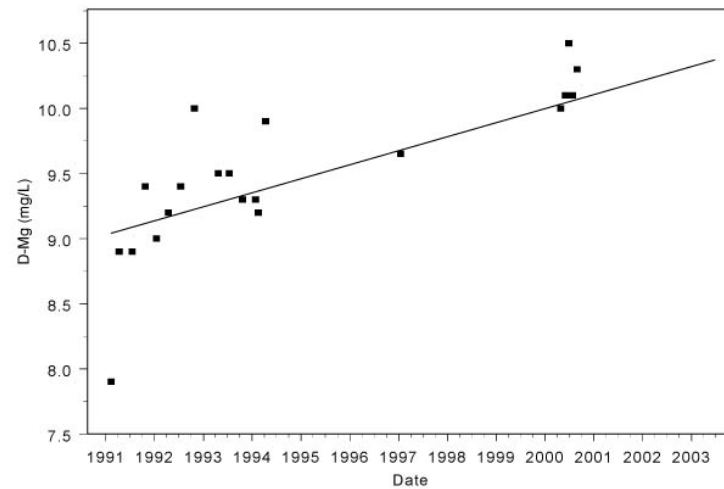
◎ First

- De-seasonalized data
- Mann-Kendall Test for trends
- One-tailed test at $\alpha = 0.05$ (95% Confidence)

◎ Second

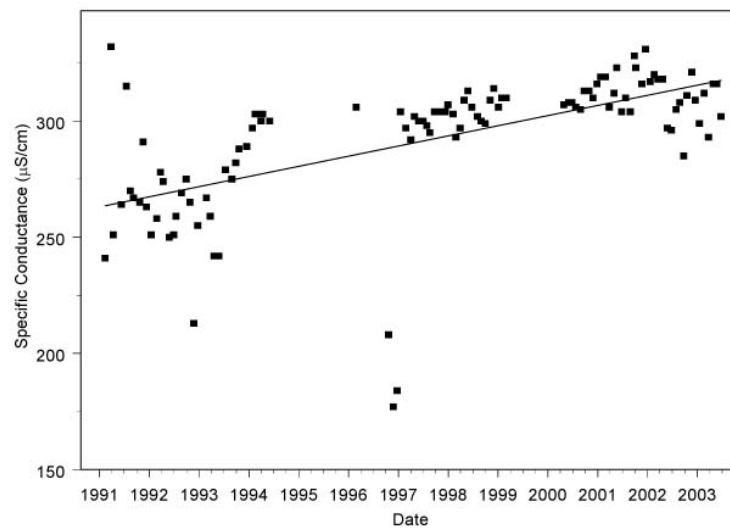
- Assigned significant trends as
 - Upward (+), Downward (-), No trend (not counted)
- Sign Test (proportions of + or -) for:
 - WMD scale
 - Statewide scale

Wakulla Spring Time Sequence A (1991-2003)



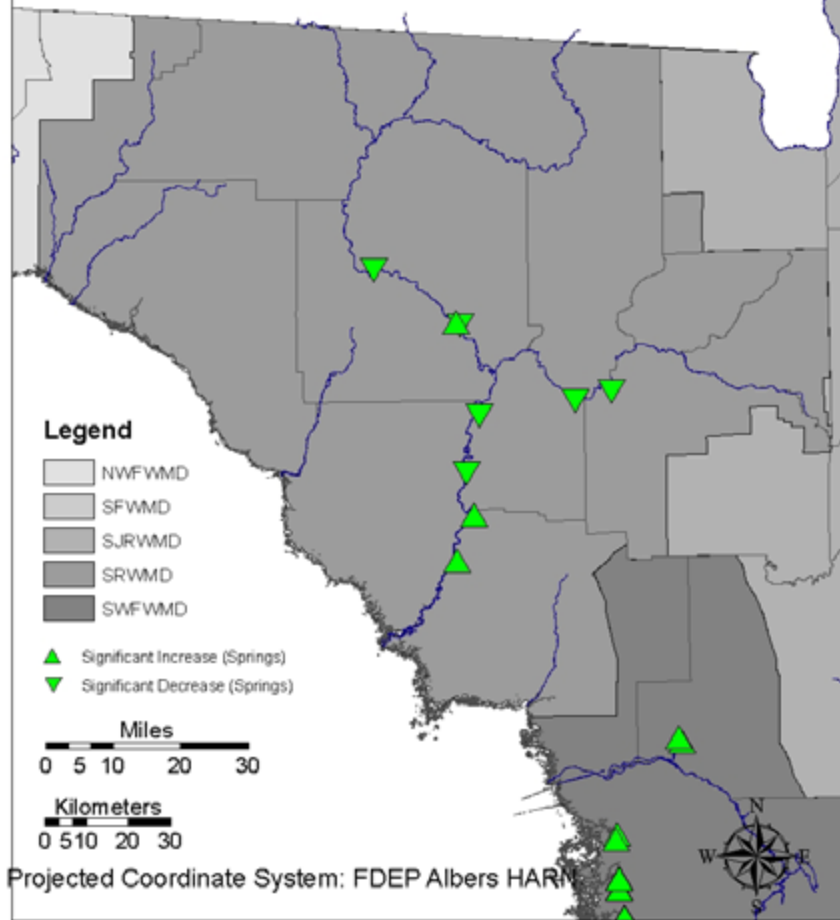
MK p-value = 0.0002 $n_B = 15$ $n_C = 6$
 WT p-value = 0.0112 SS = 0.0750

Wakulla Spring Time Sequence A (1991-2003)

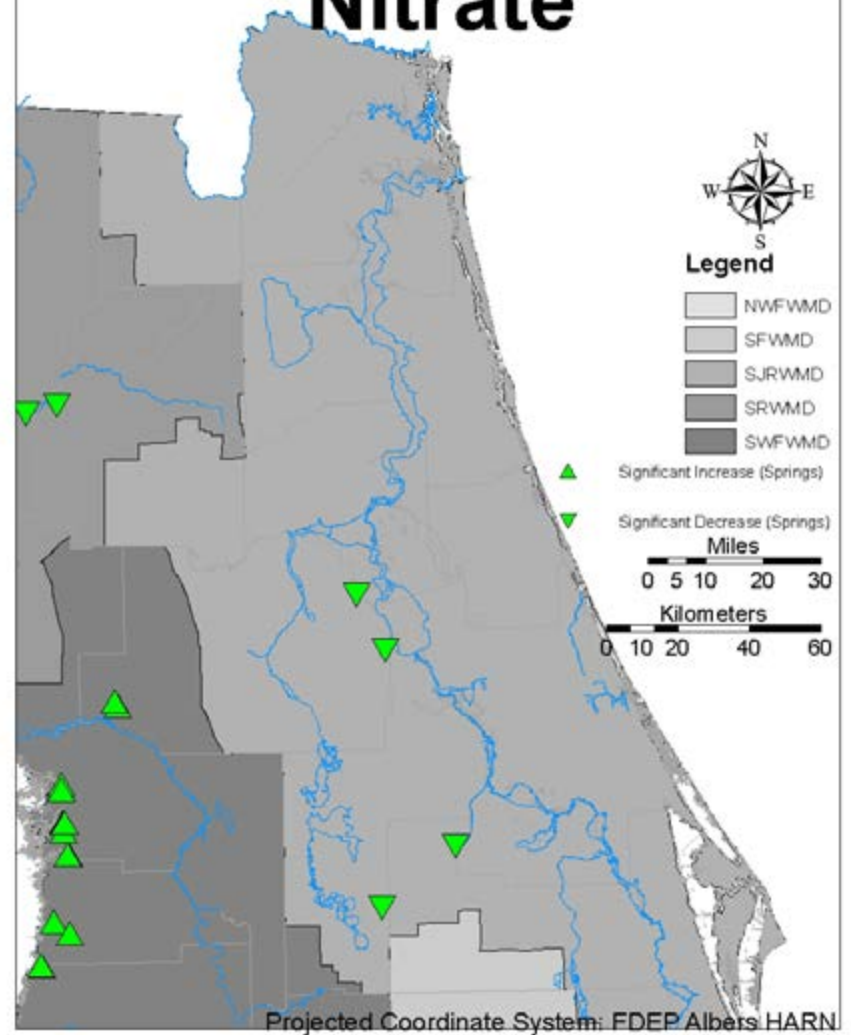


MK p-value <0.0001 $n_B = 52$ $n_C = 53$
 WT p-value <0.0001 SS = 0.52587

Nitrate

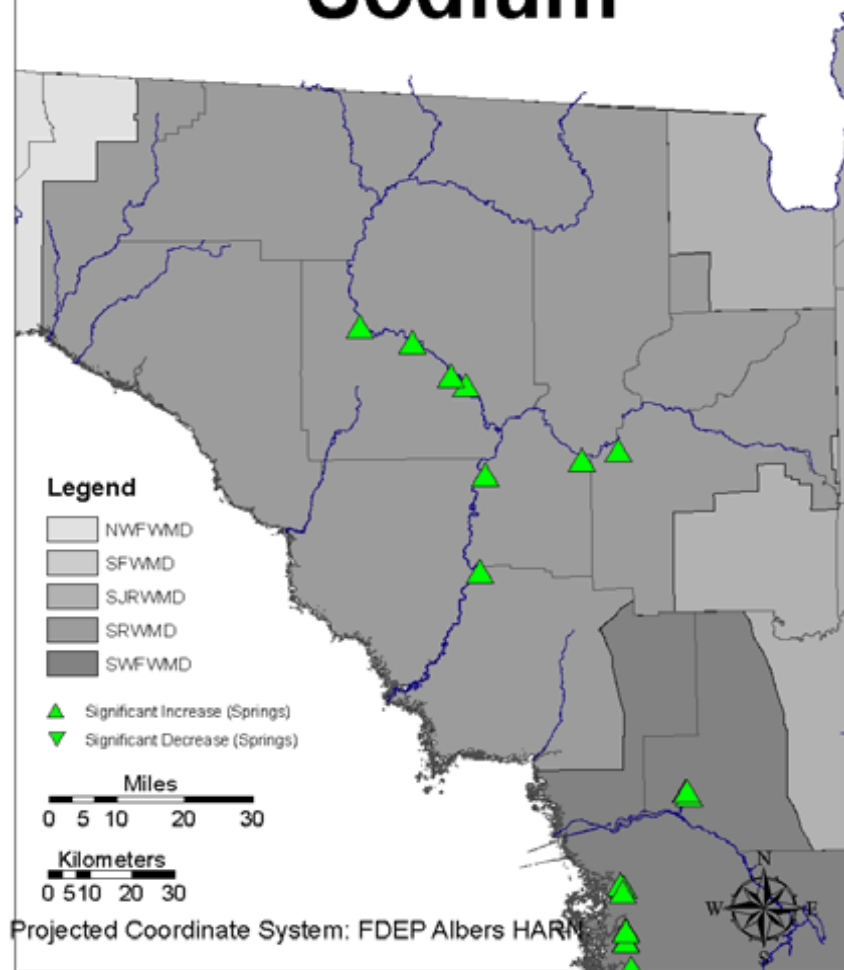


Nitrate

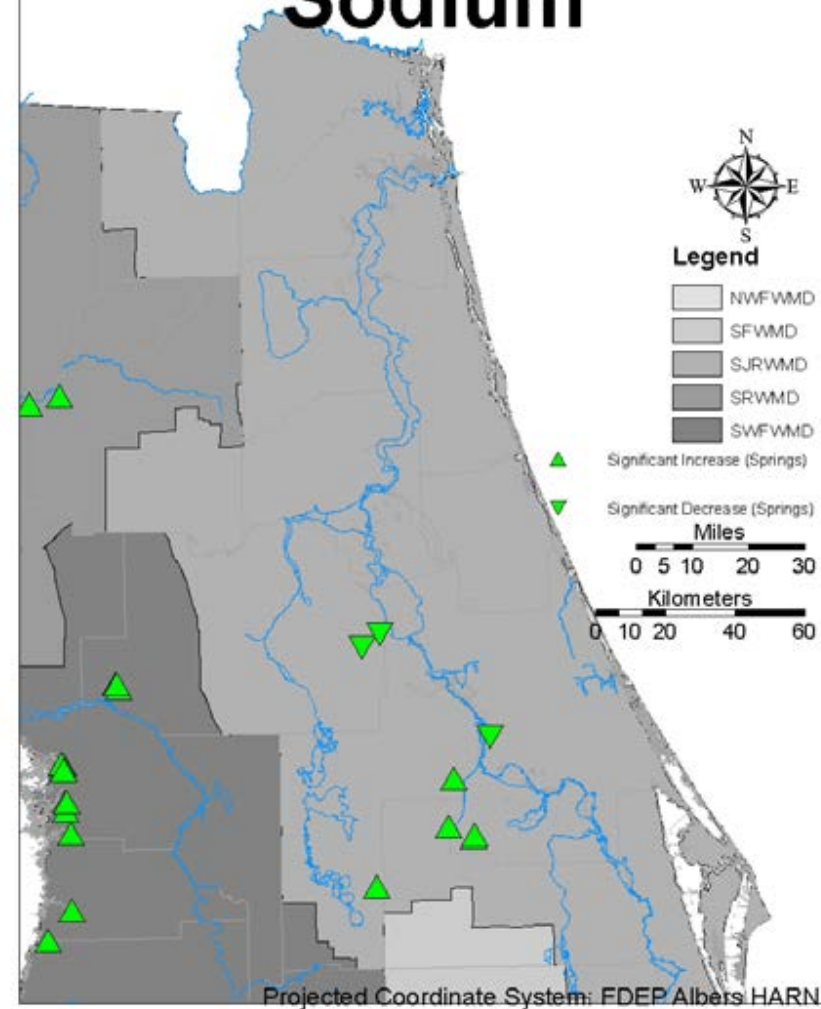


1991 – 2003

Sodium



Sodium



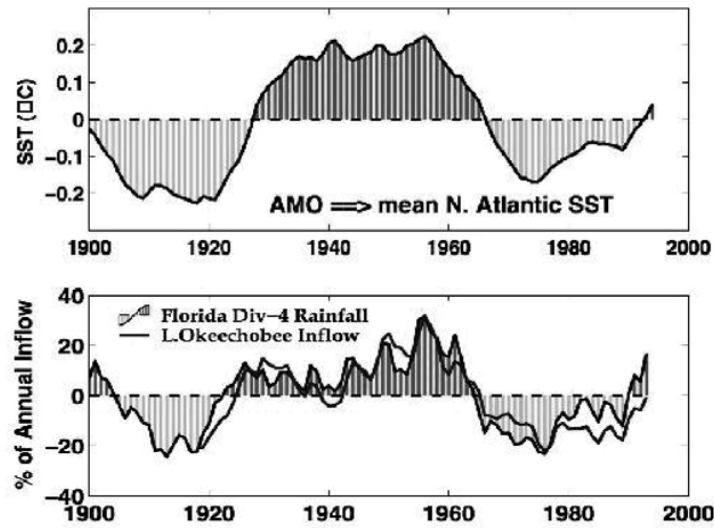
1991 - 2003

Statewide Spring Trends 1991-2003 (from B69, 57 springs, Sign Test)

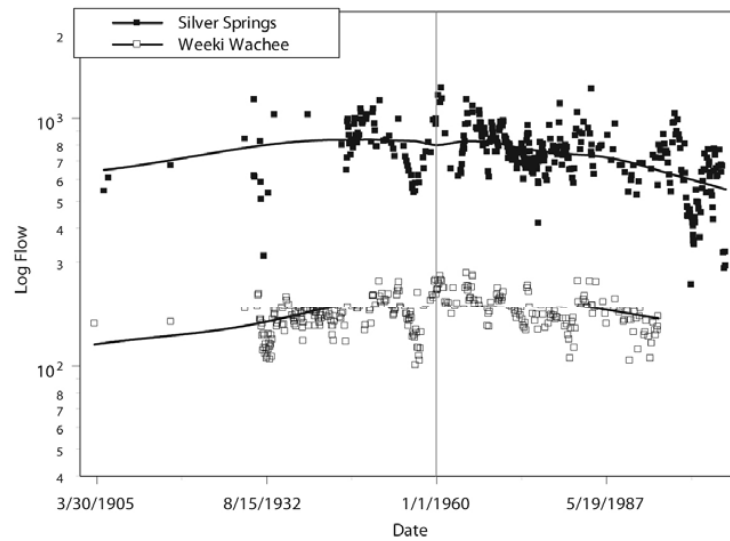
Analyte	Plus	Minus	Direction	P-Value
Alk	29	1	Up	< 0.001
Ca	31	2	Up	< 0.001
Cl	27	4	Up	< 0.001
F	16	0	UP	< 0.001
Flow	3	14	Down	0.006
K	20	3	Up	0.001
Mg	32	2	Up	< 0.001
Na	30	4	Up	< 0.001
NO3	25	11	UP	0.020
SC	24	9	Up	0.014
SO4	27	8	Up	0.001
Sr	27	1	Up	< 0.001
TDS	18	2	UP	< 0.001

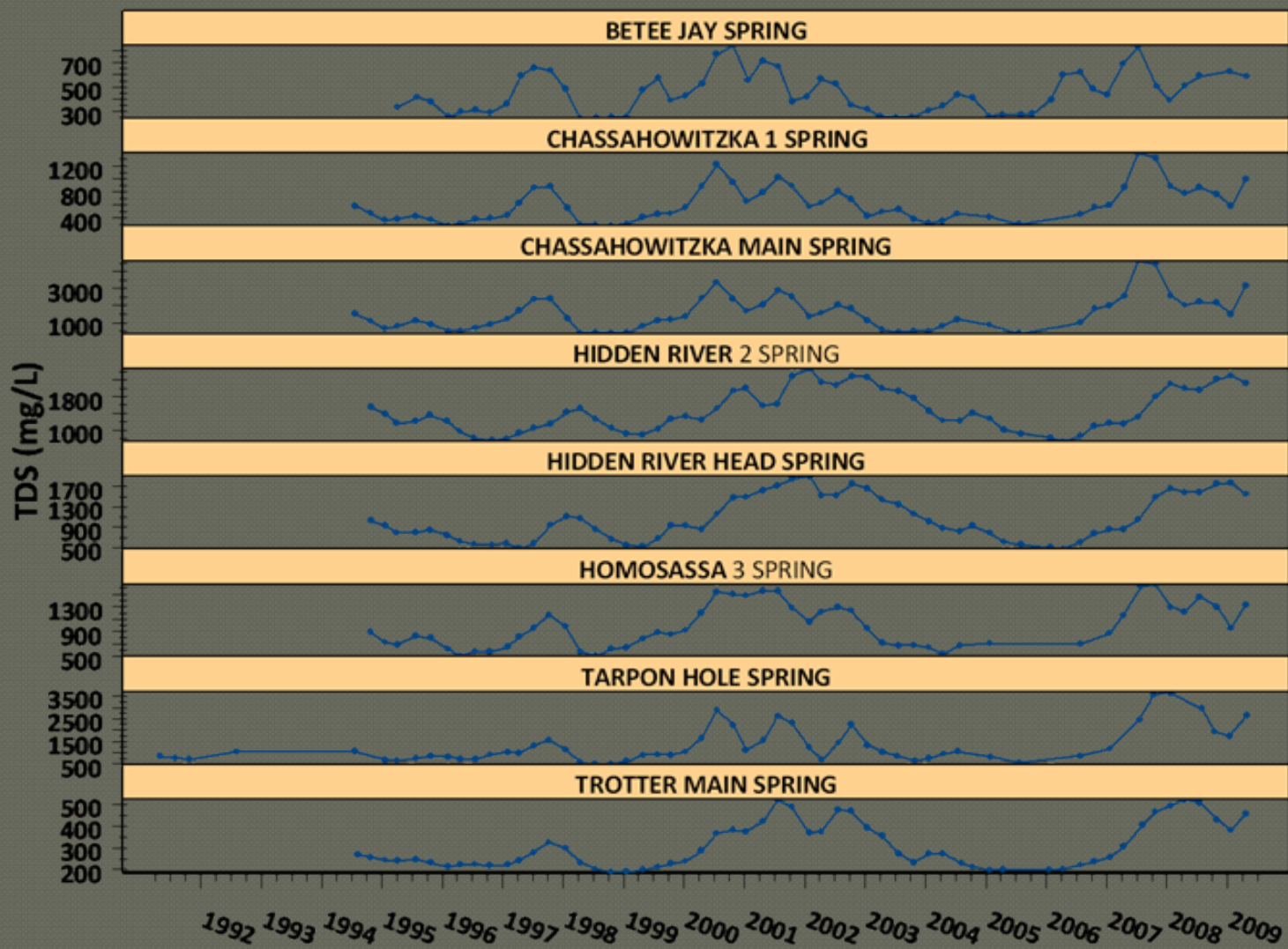
Ouch!!

- ◉ Let's Look at Some Confounding Factors!!
- ◉ Nature Happens!



Northwest Spring Flow by Region: Southwest and East





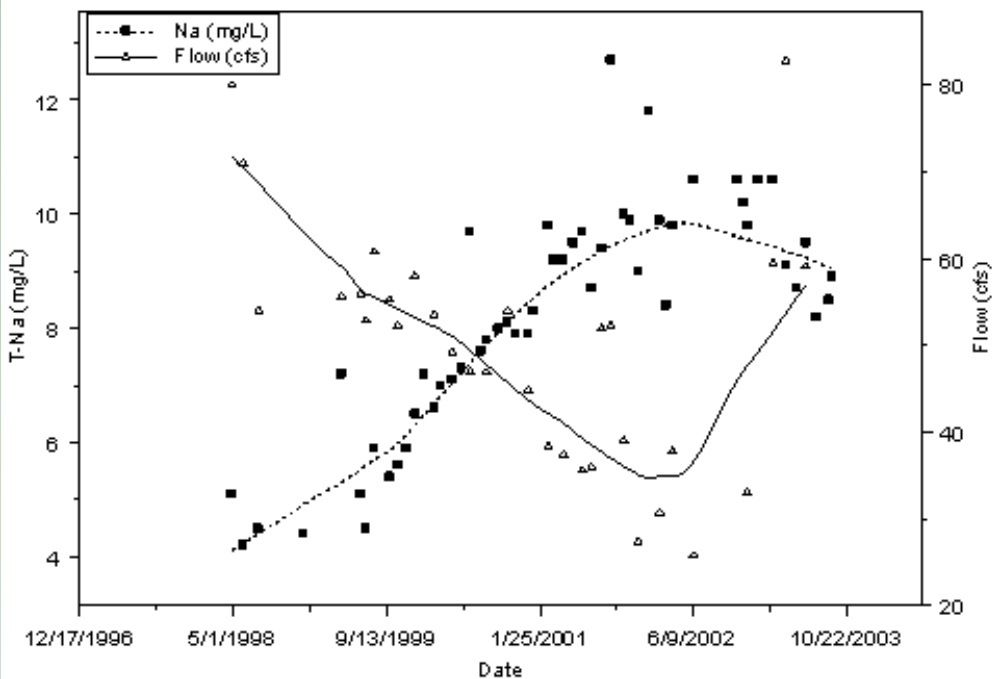
Back on Track

◉ Severe Drought Late 1998-2000

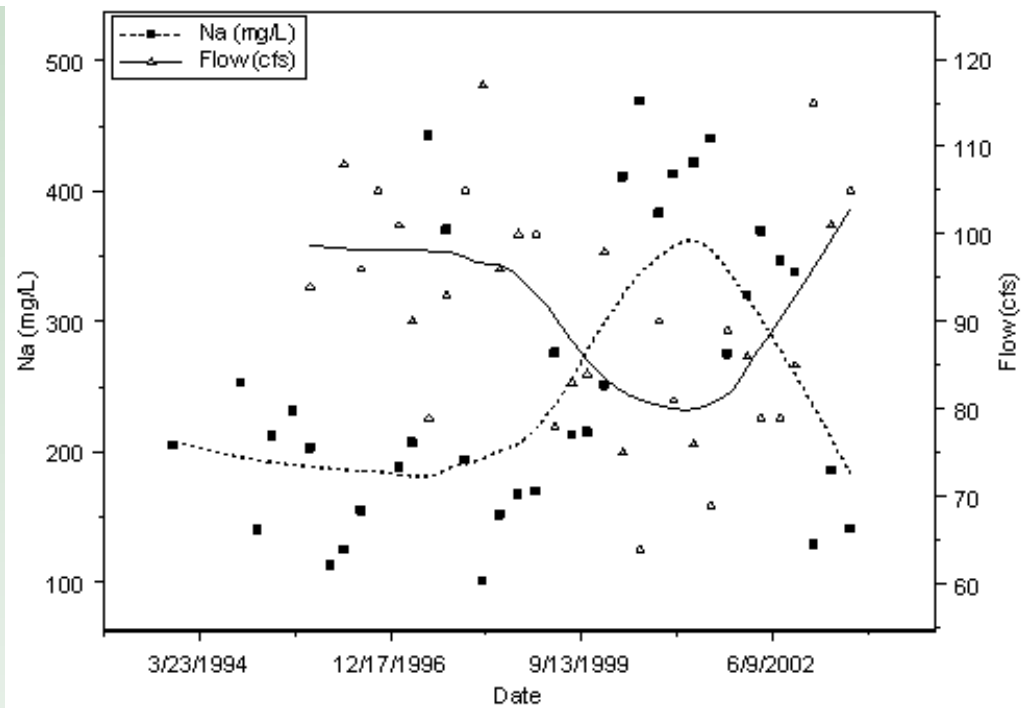
◉ Since that time

- GW Levels & spring flows not fully recovered
- Quality degraded (**many↑ trends**)
 - e.g. - Na, Cl, SC increased
- Scale of Problem – Statewide
 - **But based on a limited # of stations**
- Due to:
 - Decreases in rainfall and subsequent recharge
 - Changes in GW withdrawals?

Poe Spring Time Sequence A (1991-2003)

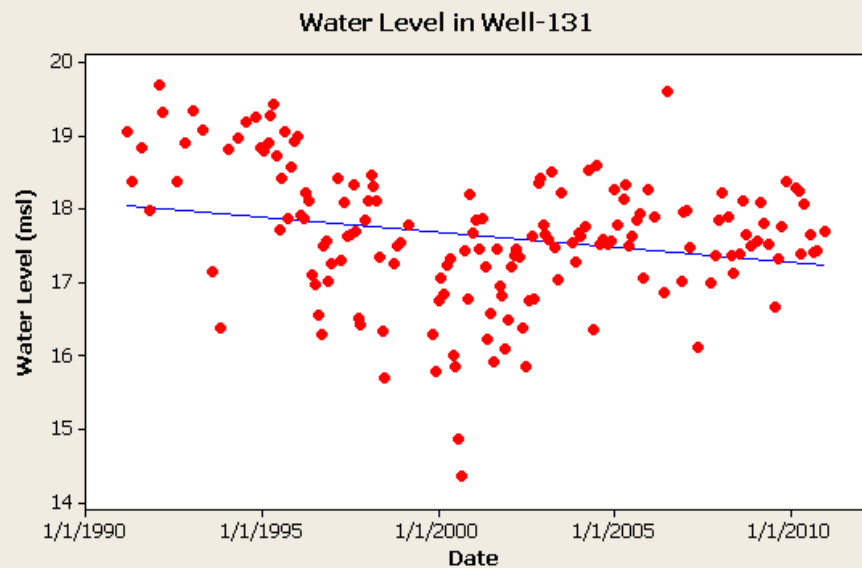


Homosassa No. 3 Time Sequence A (1991-2003)

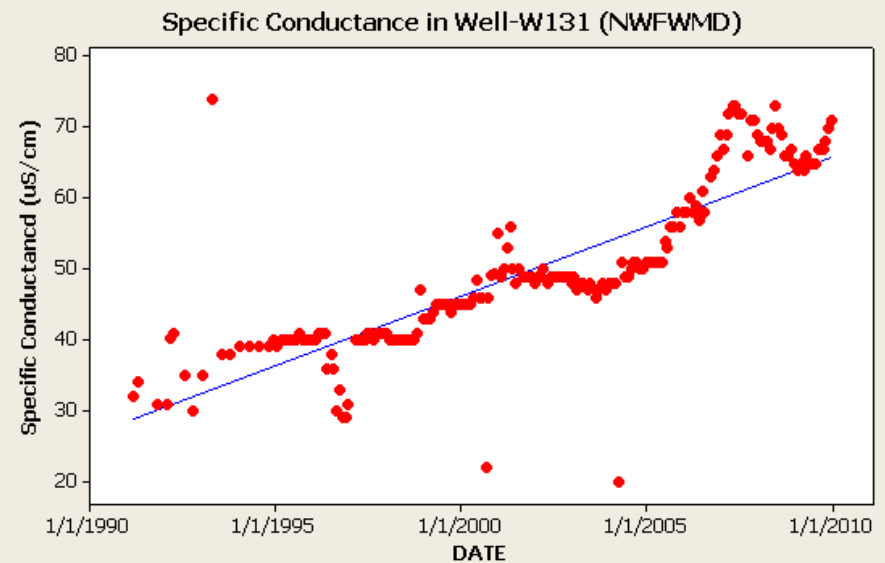


Example of GW Degradation

WATER LEVEL



SPECIFIC CONDUCTANCE



Example Two

- Williams, L.J., Dausman, A.,D., and Bellino, J.C., 2011, Relation of Aquifer Confinement and Long -Term Groundwater - Level Decline in the Floridan Aquifer System, Proceedings of the 2011 Georgia Water Resources Conference, April 11-13, University of Ga., Athens, Ga.

Other Investigations

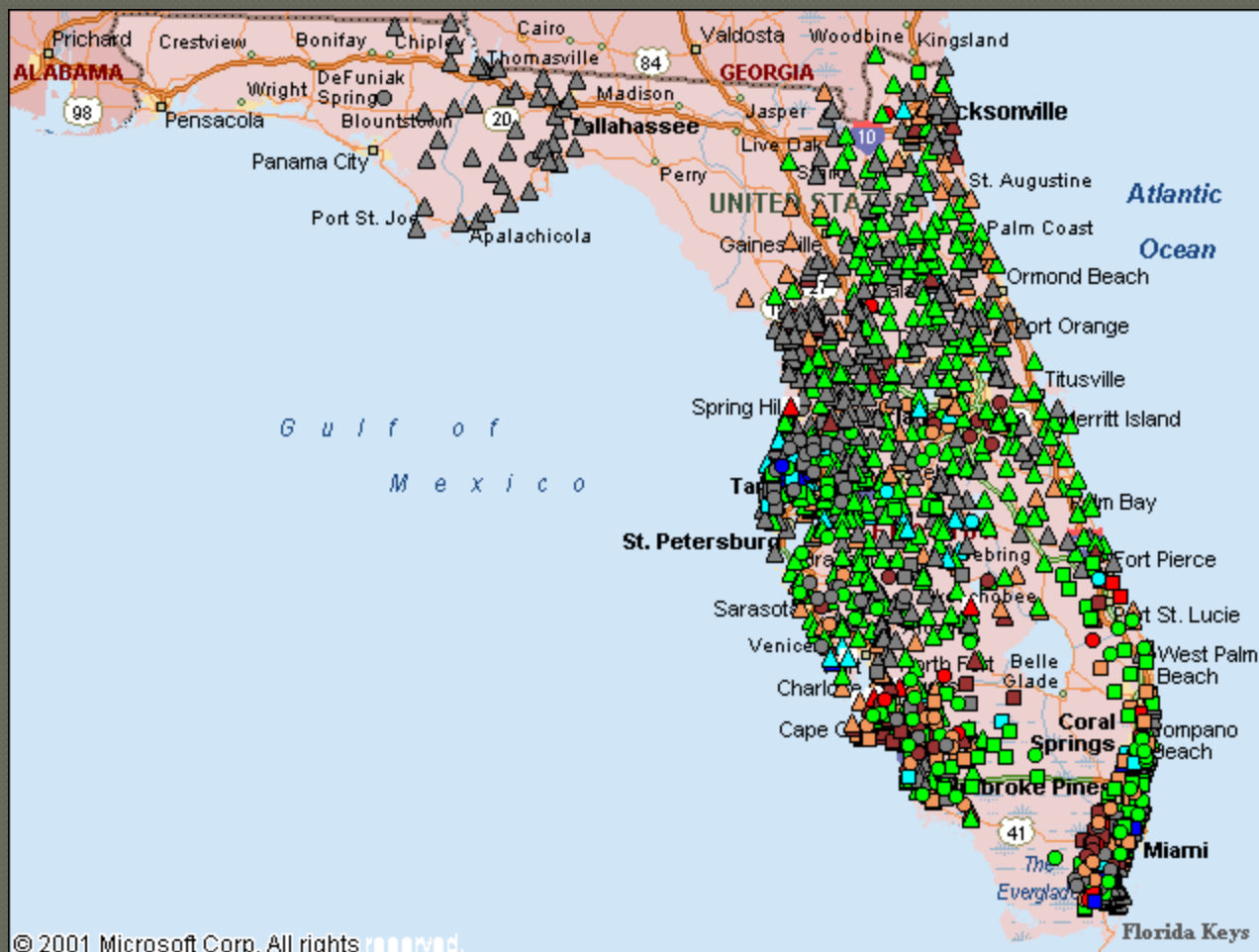
- ◉ Coastal GW Quality Monitoring Network/Water-Use Permit Net. Report Volume VI - SWFWMD
 - Trends in Chloride and Sulfate until about 2007
- ◉ Others? In future presentations

◎ What Is Actually Available?

Florida Active Water Level Network

Hover mouse over site for information.

Click site to open page with county information and site selection.



Explanation - Percentile classes (symbol color based on most recent measurement)

●	●	●	●	●	●	●	●	○ Real Time
Low	<10	10-24	25-75	76-90	>90	High	Not Ranked	□ Continuous
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal			△ Periodic Measurements

What about Volunteer Monitoring

- Possibly to be a part of the Salinity Network?