

Salinity Network Workgroup (SNW) Meeting/Webinar

May 10, 2017

Chair: Rick Copeland (FDEP)

SNW Agenda

- Introduction and status of USGS Salinity Web Page(RC)
- Coastal Salinity Monitoring Network Status (RC)
- Possible GW Sampling Protocol Modifications (RC, SSB)
- Saline GW Quality Index Status (RC)
- GWL PRI – Status and Modifications (RC)
- Discussion (Group)
- Adjournment
- Roll Call (RC)

RC - Rick Copeland: DEP

SSB - Stephanie Sunderman-Barnes: DEP

Introduction

(Four Current Objectives of SMW)

- **Periodic Production of a Groundwater Level(GWL) Percentile Ranking Index (PRI) for the Upper Floridan Aquifer (UFA)**
- **Development of Coastal Salinity Monitoring Network(CSMN)**
- **Consideration of Revision of Sampling Protocols of Wells for the Purpose of Monitoring wells completed “close” to the Fresh-water/Salt-water interface**
- **Development of a Salinity GW Quality Index**

Development of a Florida Salinity Web page for the Salinity Network Workgroup

Last year, Scott Prinos (USGS) gave a presentation of a draft interactive web site designed for Salinity Monitoring

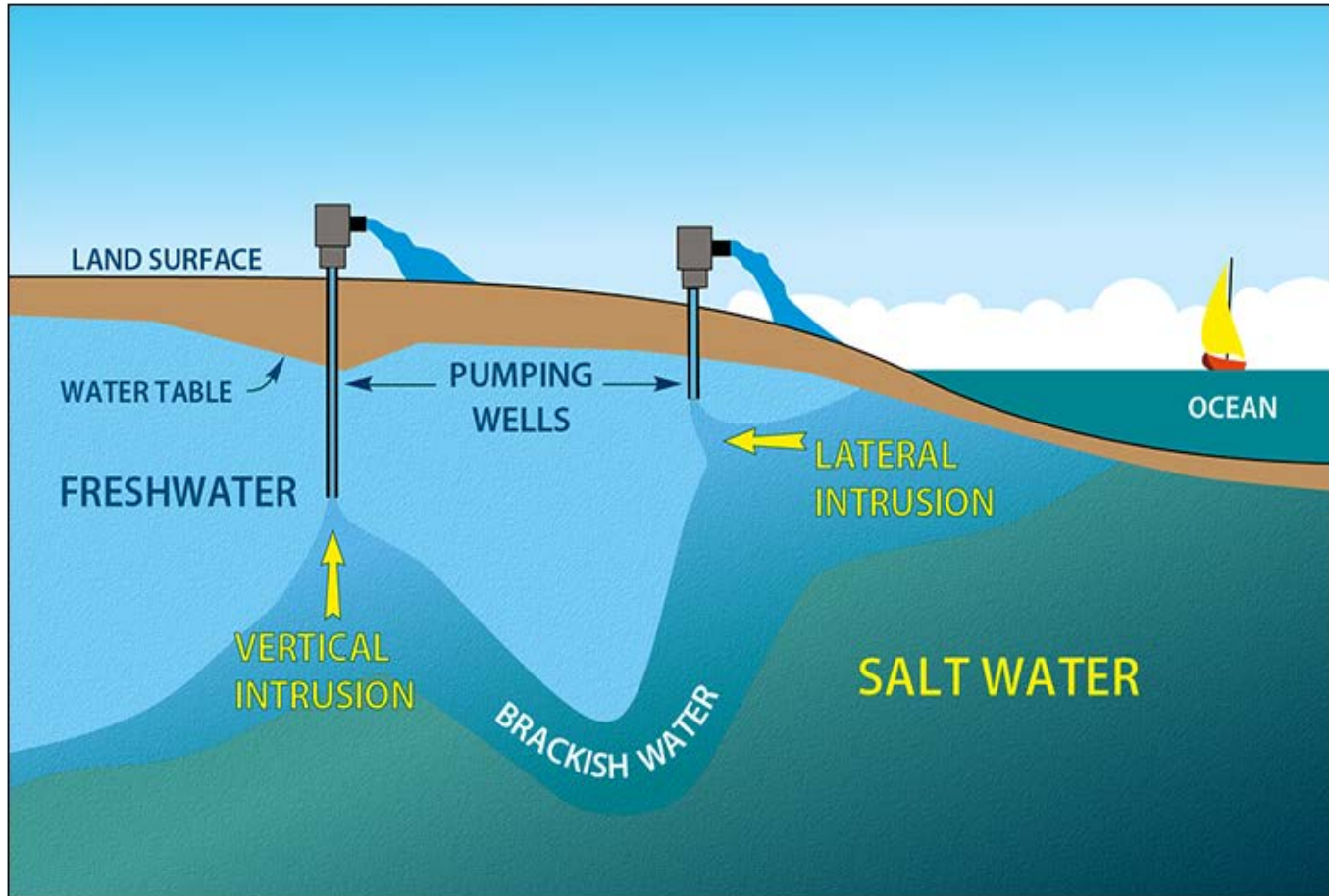
RC agreed to check to see if FDEP could find \$ for some CSMN sites to be added

When “WIN” (Watershed Information Network) becomes operational, DEP and USGS will begin with one well to get “kinks” worked out, and then proceed with additional wells, if funds are available and if SNW agrees

(1) Development of the Coastal Salinity Monitoring Network

- Not only the Salinity Network, but also a Coastal Salinity Monitoring Network (CSMN)- “Ring around the state”
 - Networks-of-existing networks
 - **No new \$**
 - Add wells and surface water sites in future
- Governor’s Office Supports CSN

Intrusion along Coast



Saint Johns River Water Management District (Date Unknown)

Establishment of CSMN

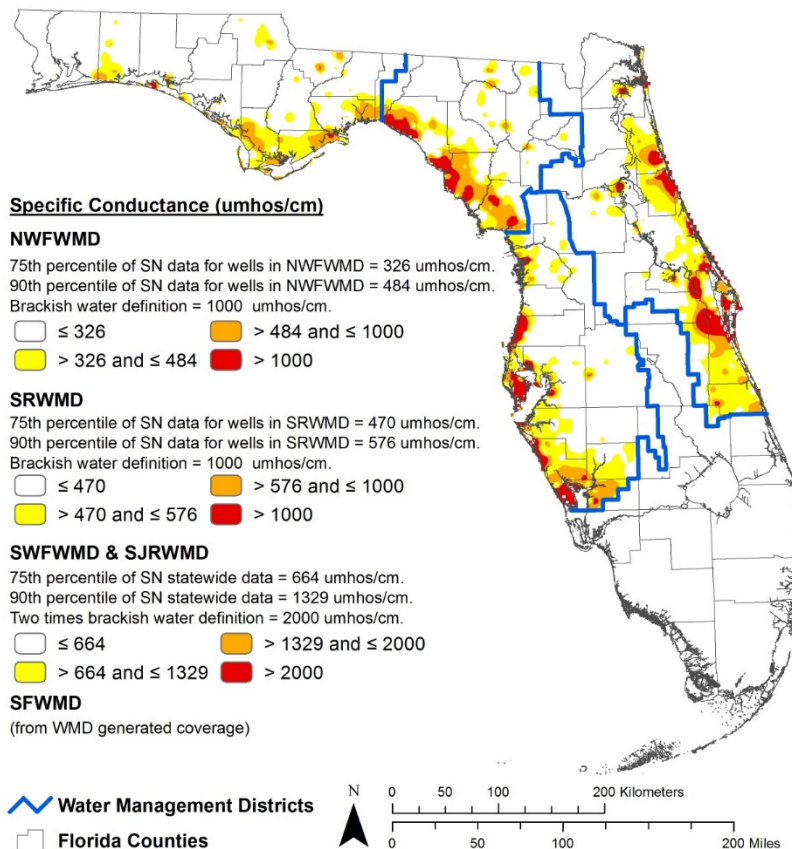
- “Let data suggest where to build Coastal SalNet”

Identify Potential CSMN Wells

- DEP generated greatest concentration maps (“Rind”)
- Then used WMD wells as candidate wells
- WMDs to determine:
 - Which wells (and aquifers)
 - Additional areas (if needed)

Specific Conductance in Status Network Wells

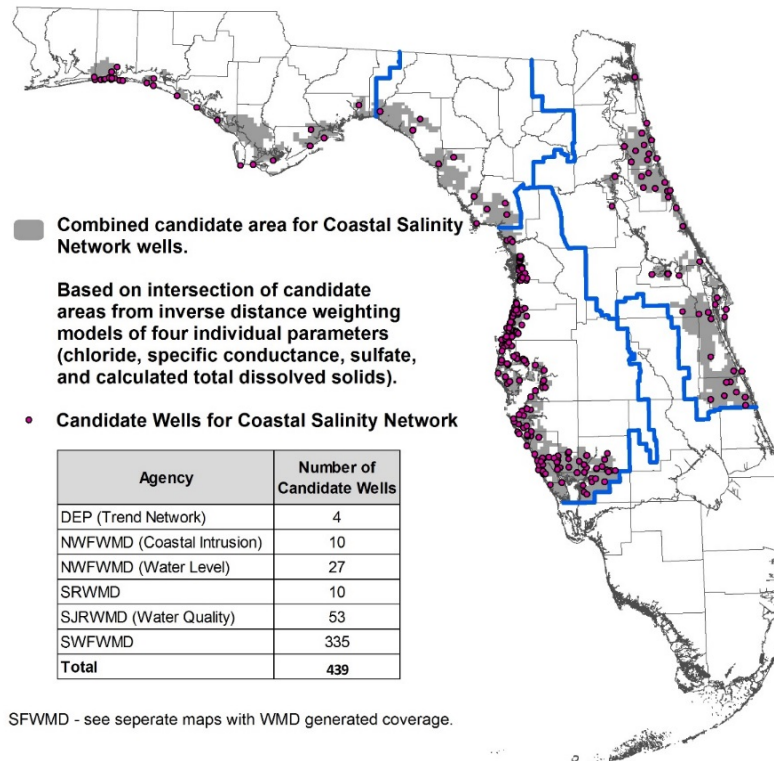
Specific Conductance in Status Network (SN) Wells (All Aquifers) Modeled Using Inverse Distance Weighting



Created November 3, 2015 by Florida Department of Environmental Protection staff in the Division of Environmental Assessment and Restoration. This map is a cartographic representation and is not intended for further analysis.

Coastal Salinity Network Wells

Candidate Coastal Salinity Network Wells Based on Combined Modeled Data (Chloride, Specific Conductance, Sulfate, Calculated TDS)



SFWMD - see separate maps with WMD generated coverage.

CSMN

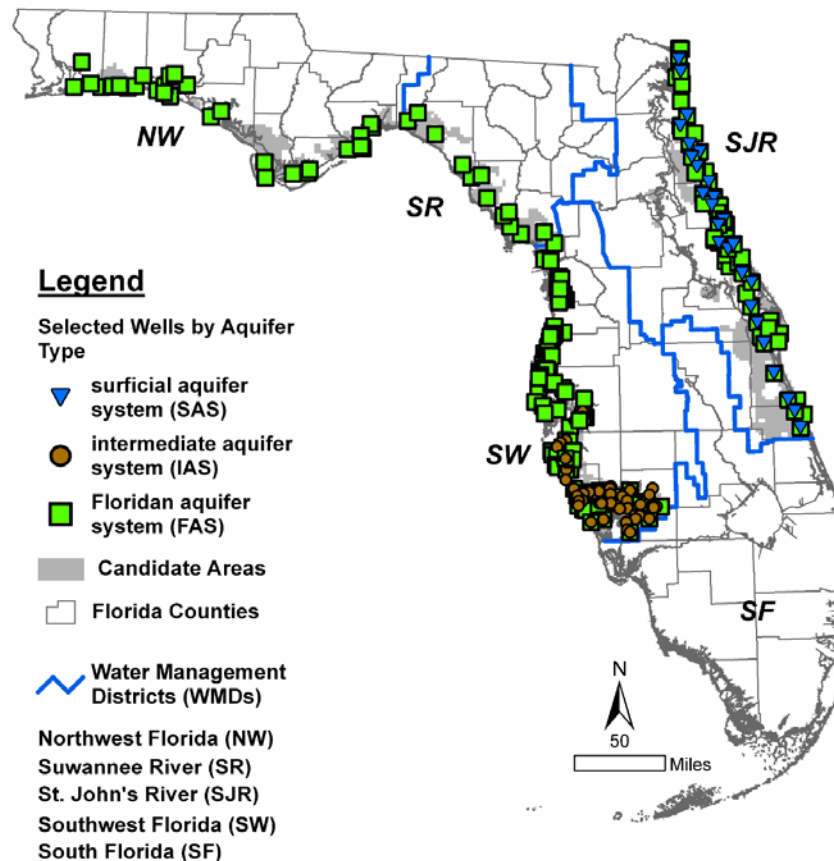
- WMDs finalize:
 - Areas, aquifers, and wells for CSMN
 - Forward pertinent information to DEP
- No WQ data to be sent to DEP at this time
- Once Water Information Network (WIN) Database system is operational, data can be obtained by all entities

Selection of Wells

- Almost Complete
 - SRWMD
 - 10 sites will be selected from 13 possibilities
 - NWFWMD
 - 4 sites proposed to be added in future
- SFWMD – Special Situation

Final Coastal Salinity Network Wells

Final Selection Coastal Salinity Network Wells Chloride, Specific Conductance, Sulfate, Calculated TDS



CSMN Monitoring Sites

WMD	Aquifer System	No. Sites
NWFWMD	FAS	28
SRWMD	FAS	10
SJRWMD	FAS	70
	IAS	3
	SAS	29
SWFWMD	FAS	152
	IAS	63
		Total = 355

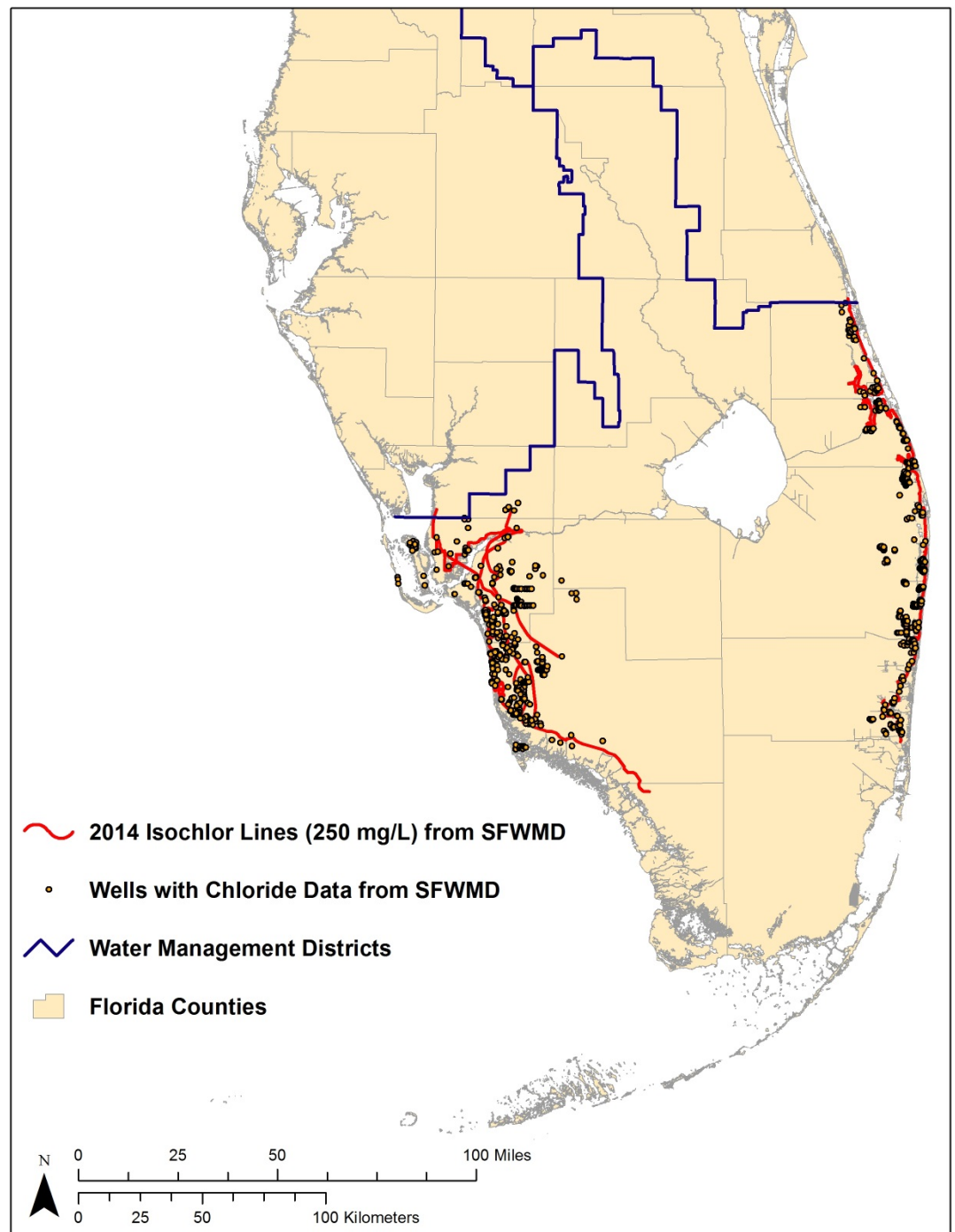
10 of 13 potential sites to be selected (SR)

4 additional sites proposed in (NW)

Sites to be sampled for salinity indicators such as **Na, Cl, SO₄, TDS, SC**

SFWMD area

Example of 250 mg/L
isochlor maps for
various aquifers in
south Florida



Example of 1000 mg/L
isochlor map, and more,
of Biscayne aquifer in
Miami-Dade County, FL

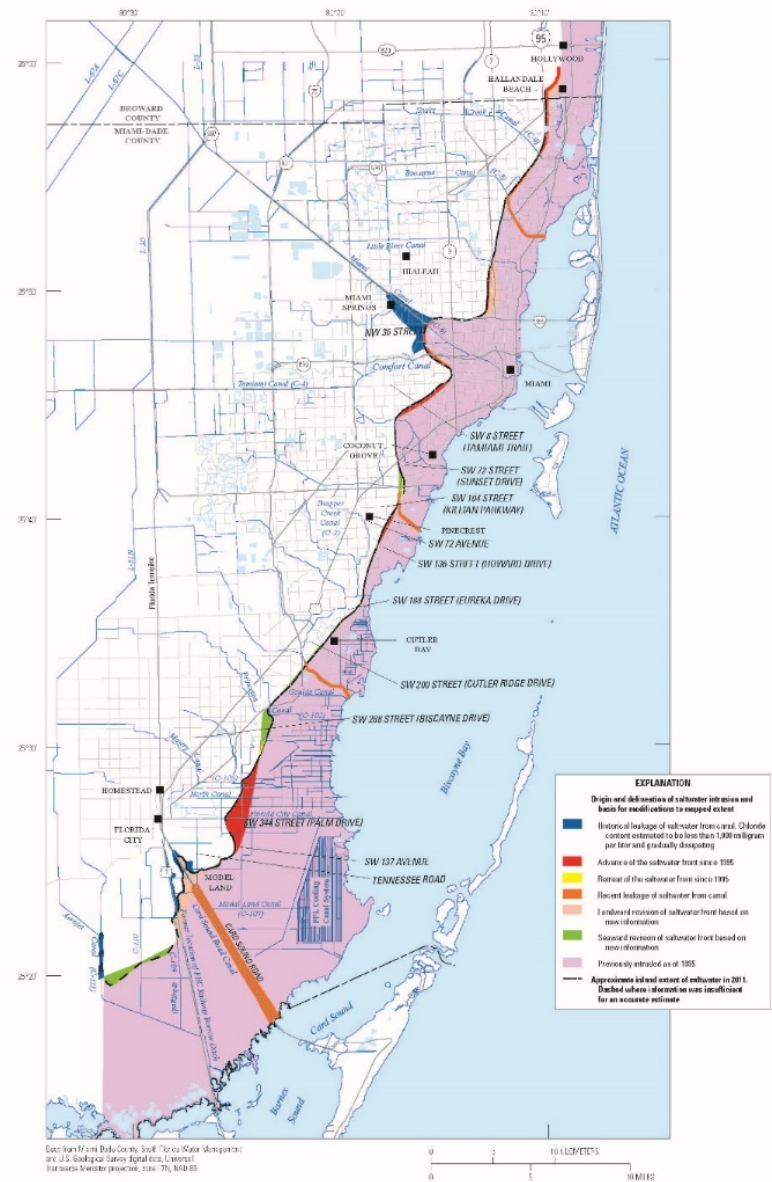


Figure 17. Map showing the origin and delineation of saltwater intrusion in the Biscayne aquifer and the basis for modifications to its mapped extent.

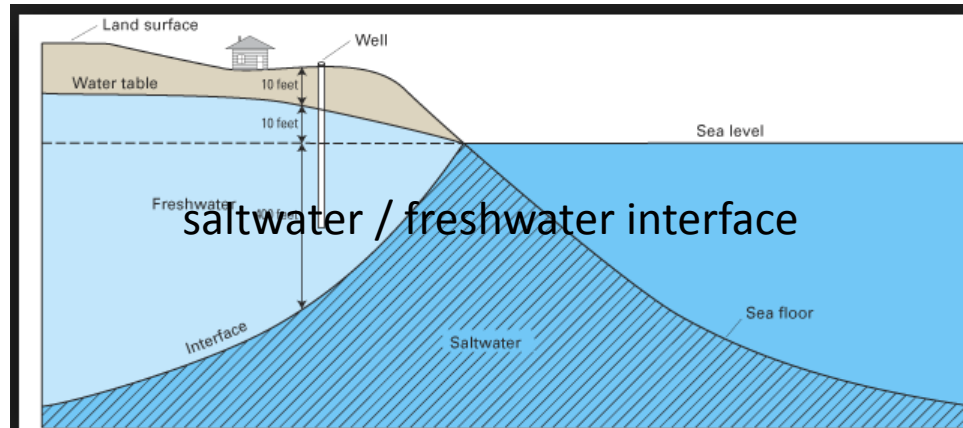
Questions

- Is it time to add surface water sites to the CSMN?
 - If yes, what types of sites should be considered?
 - Should the surface water portion of the CSMN be an estuary network?
 - If yes, should a special subgroup be formed?
- Is there an advantage to waiting until data are available in “WIN”? Or, should we begin searching the “Water Cat”?

2. Proposed Methods for sampling saltwater/freshwater interface

- Revisions to FDEP Standard operating Procedures for Sample Collection

Saltwater / Freshwater Interface



**Where purpose is to monitor the
Freshwater/Saltwater Interface in wells completed
“close” to the interface**

- Current Standard Operating Procedures (SOPs)
 - Place purging pump at top of water column (if screen / open hole > **10ft**) or within screen / open hole interval (if screen / open hole $\leq$ **10ft**)
 - Problem – Salinity can vary within screened / open interval. Current SOPs do not address this.
- Want sample of maximum salinity
- Purging may move FW/SW interface position

Current SOPs

- If well has in-place plumbing
 - Use current SOPs
- If well has ≤ 10 ft of screen or open hole
 - Use current SOPs

Proposed changes to SOPs (1)

- **If well has >10 ft of screen (or open hole) and no in-place plumbing**
- **1.** Micro-purging (low-flow purging)
 - Conduct Specific Conductance (SC) profile down well
 - Place pump at point of max SC or
 - Within 5 ft of bottom of wells screen (or open hole)
 - Purge < 500 mL/min for a minimum of 1 equip volume
 - Commence stabilization/sampling procedures
 - Use same pump for purging and sampling

Proposed changes to SOPs (2)

- **2.** No purging: Use non-isokineic thief sampler, such as double check-valve bailer, or Kemmerer sampler
 - Conduct SC profile down well
 - Afterwards, lower device (≤ 2 cm/sec to target depth)
 - Trigger the device to close, according to manufacturer's instructions
 - Retrieve sample (≤ 2 cm/sec to surface)
 - Note sampler may shut at incorrect depth**
 - Check SC from a small portion of sample
 - If it is anomalous from previous data, obtain another sample



Proposed Changes to Rule

- Proposed SOP Revisions for wells used for sampling wells completed close to the FW/SW interface
 - November 2016: Sent to SNW Reviewers for comments
 - Comments received by RC
 - Revisions synthesized and forwarded to appropriate DEP staff for possible inclusion as DEP rule revision
- December 2016: “Not at this time”; **Needs further vetting**
Will consider revisions “Down the Road”

Vetting Requires Questions to be Addressed

- (1) Does your agency Sample/Monitor GW quality in wells completed close to the FW/SW interface?
 - (1b) If your agency monitors potential change in the FW/SW interface, do the wells include those which have > 10 ft of screen (or open hole)?
 - If answer to (1b) is yes, what sampling procedures do you follow?
 - (Provide online version or cite specific sampling SOPs and author)

Questions (1)

- (2) Does your agency support the development of a special DEP-approved SOP for monitoring the FW/SW interface in wells with > 10 ft screen (or open hole) and no in-place plumbing?
- (3) Regarding the proposed SOP (sent to you earlier), what general concerns do you have, if any, for using the proposed SOP?

Questions (2)

- (4) If the SNW were to proceed further with the development of a special SOP for sampling wells with > 10 ft screen/open hole, and no in-place plumbing, does your agency prefer...
 - a. Develop a “White Paper” to be sent to DEP, outlining the background and the need for the development and inclusion of a special SOP into the DEP Quality Assurance Rule, F.S.C 61-160?
 - B. Develop an alternative to the DEP-approved sampling SOP for used by SNW participants for sampled wells completed “close” to the FW./SW interface?
 - Note if this method is preferred, SNW members will be required to follow DEP procedures for alternative and modified field procedure approval.
 - Both a. and b. require presenting data demonstrating that the proposed SOP exceeds the performance of current DEP SOPs

(3) Saline GWQ Index

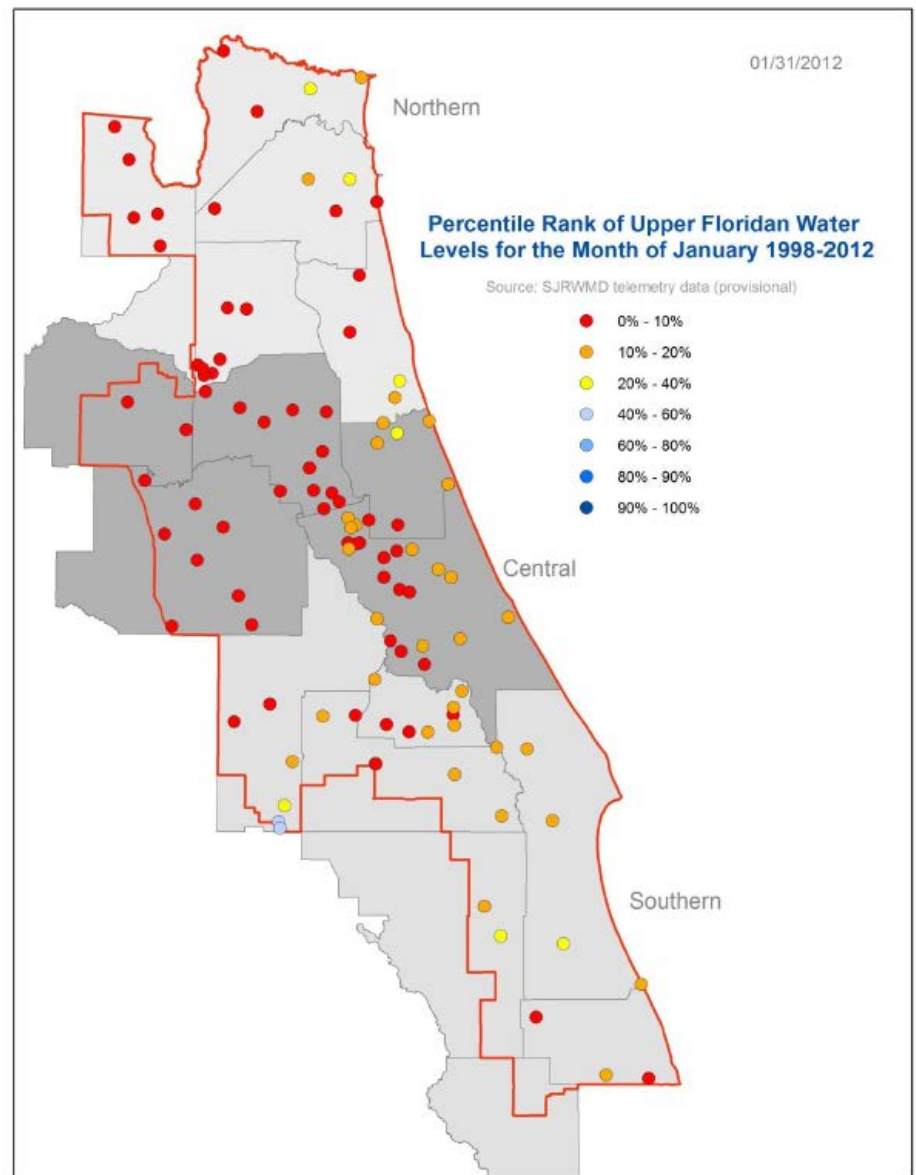
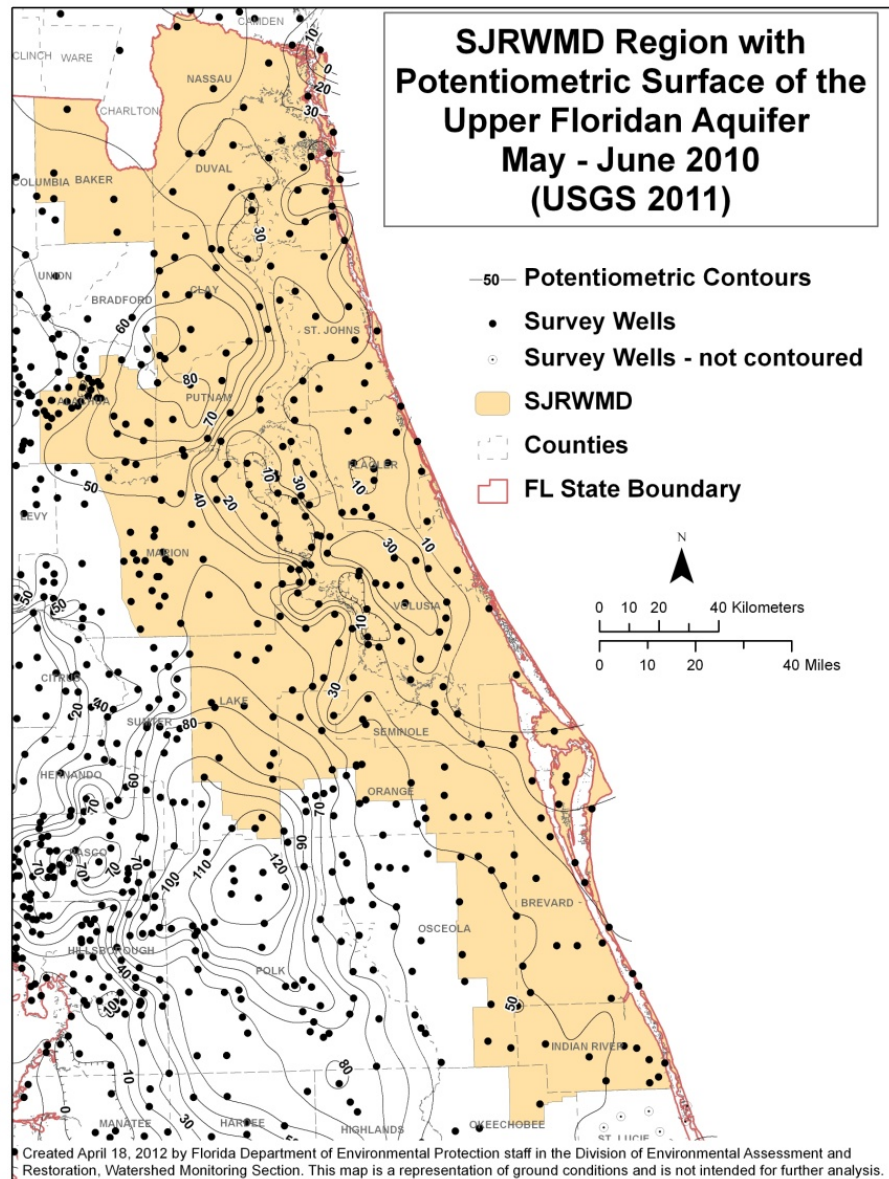
Currently this objective is on hold

- Previously discussed possibility of using chloride (Cl) as the index
 - If so, would need to consider thresholds
 - E.G. 250 mg/L , 1,000 mg/L
- Other analytes under consideration include:
Sulfate (SO₄), Sodium (Na), and Total Dissolved Solids (TDS)

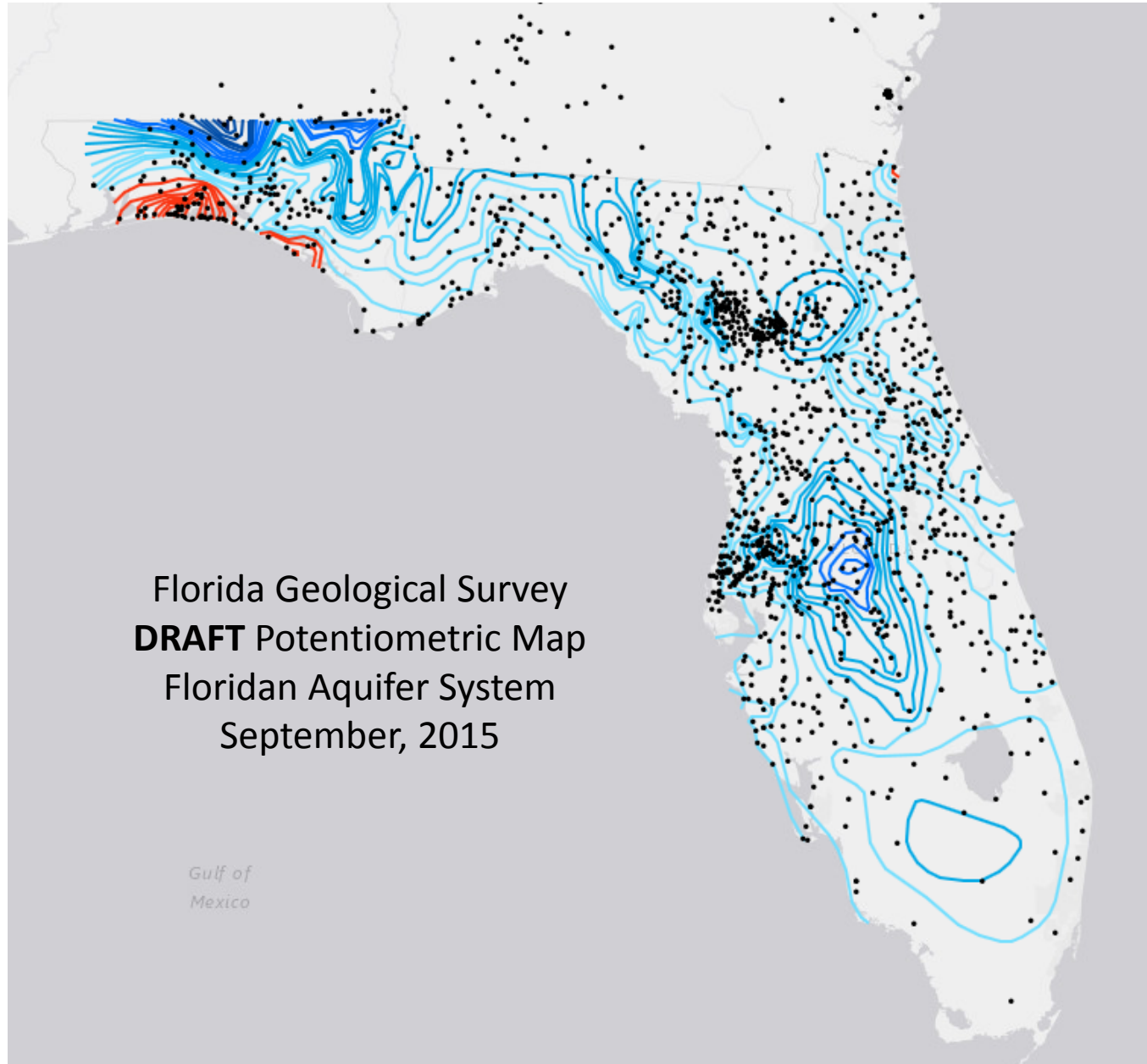
(4) GWL Percentile Ranking Index

- Periodically create **composite** statewide PRI maps, along with explanatory text
- Pilot study for UFA for May 2010
 - “Groundwater Level Conditions for the Upper Floridan Aquifer Based on Percentile Ranks, Pilot Study for May, 2010”
 - Completed in late 2014
- Commence (2015) production twice/year
 - May (LOW GWLs) and September (HIGH GWLs)

SJR Potentiometric Surface & PRI

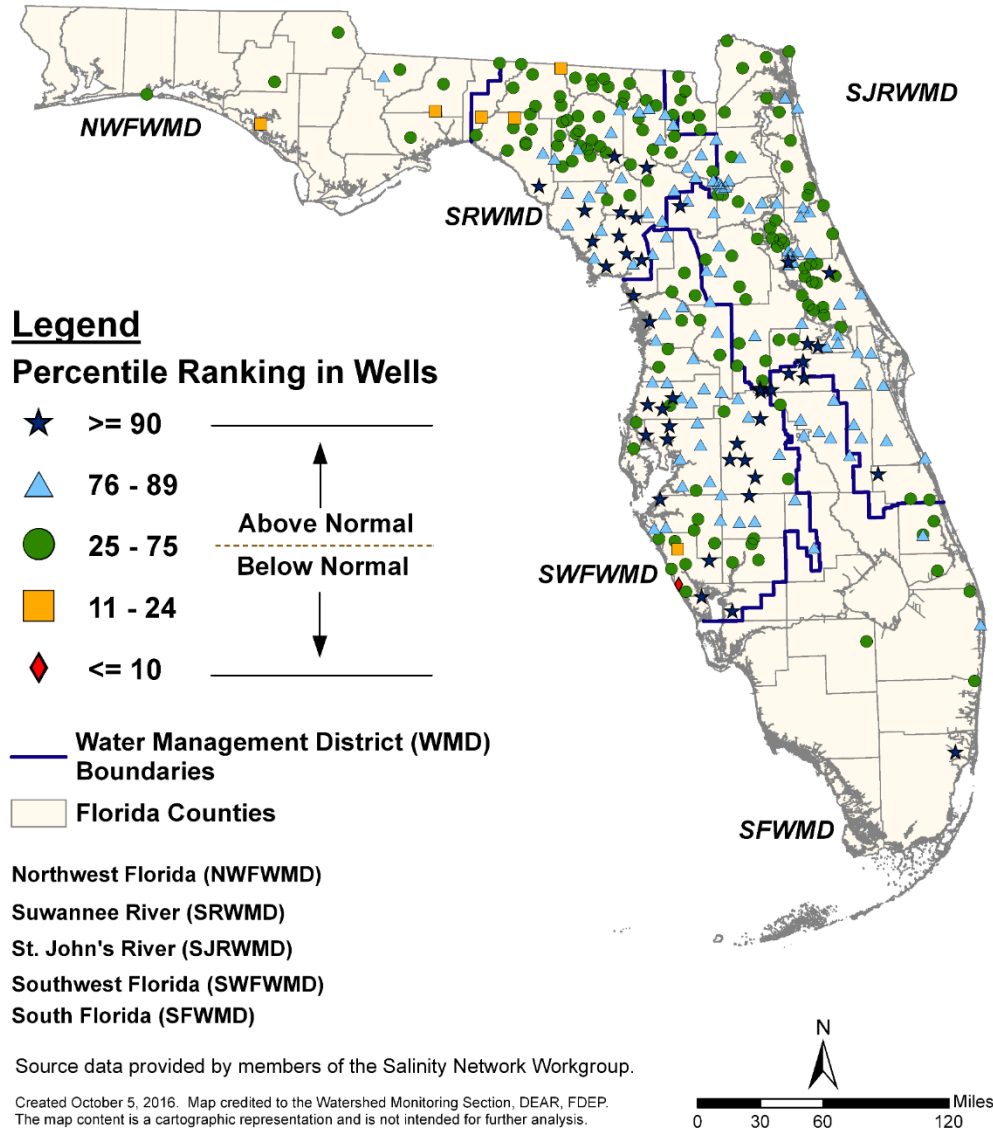


Floridan Aquifer Potentiometric Surface



Groundwater Levels in Percentile Ranks (UFA)

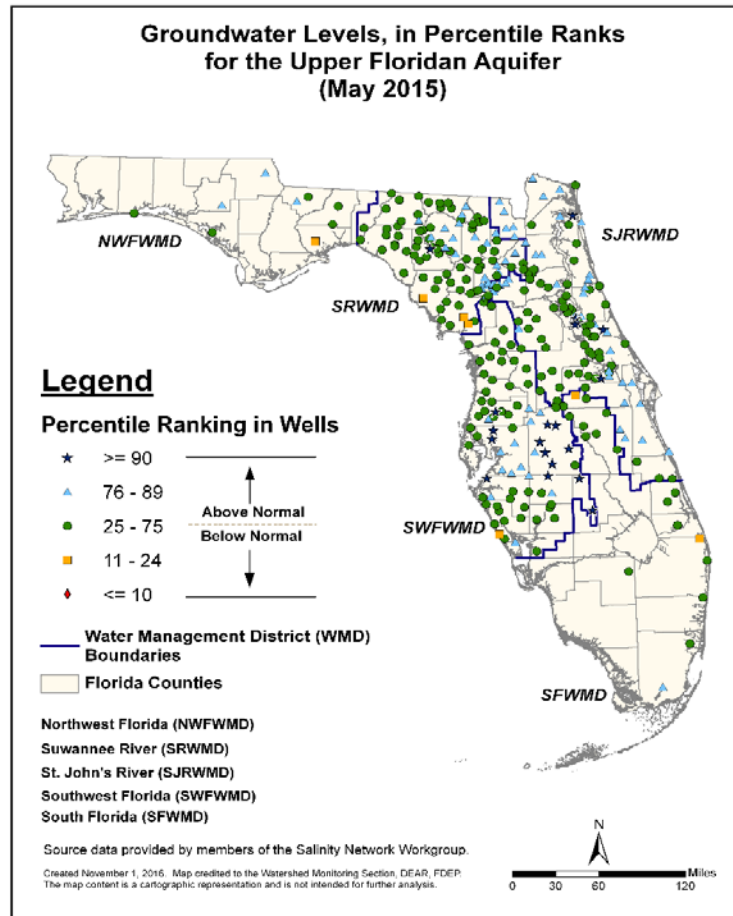
DRAFT Groundwater Levels, in Percentile Ranks for the Upper Floridan Aquifer (September 2015)



Map and Text

- Each map to be accompanied by an explanation page
- Lag time – As of 11/2016, working on May and September, 2015 maps
- When complete, each map/text to be uploaded to a link
- Same scenario for May and Sept Maps Since May of 2015

Current Inconsistencies with PRI Map



- PRI map is composite
 - Inconsistent
 - Well Densities per WMD
 - Periods of Record (POR)
 - Methodologies
- For PRI map
 - Over time, possibly decrease density of wells in SR, SJ, & SW?
- Can we can adopt a more “Standardized” method?

SR- SRWMD
SJ- SJRWMD
SW- SWFWMD

Next Several Slides Modified From Comments Regarding the Ground Water Level (GWL) Percentile Ranking Index

Lucia Baldwin, PhD
Senior Scientist
Compliance & Reporting Section

FWRMC Salinity Network Workshop
November 9, 2016

Percentile Rank Functions in Excel

Array
21
22
22
23
23
24
25
28
37
45
48
67

What percentage of the data has values under 23?

(#obs < x = 3; n = 12)

PERCENTRANK (array, 23) = 27%

PERCENTRANK.INC (array, 23) = 27%

PERCENTRANK.EXC (array, 23) = 31%

Excel 2007

Excel 2010, 2013,
2016,

.INC function = $[(\# \text{ obs} < x) / (n-1)] \cdot 100$

Value (x) we want to rank

- X is a GWL value representative for May/Sept of each year
- Monthly median of max daily values – SFWMD
- Value registered nearest 15th of the month – NFWMD
- Daily mean on the 27th of the month – SRWMD

Option for Choosing the Array / Data Set Against Which Value x Is Ranked

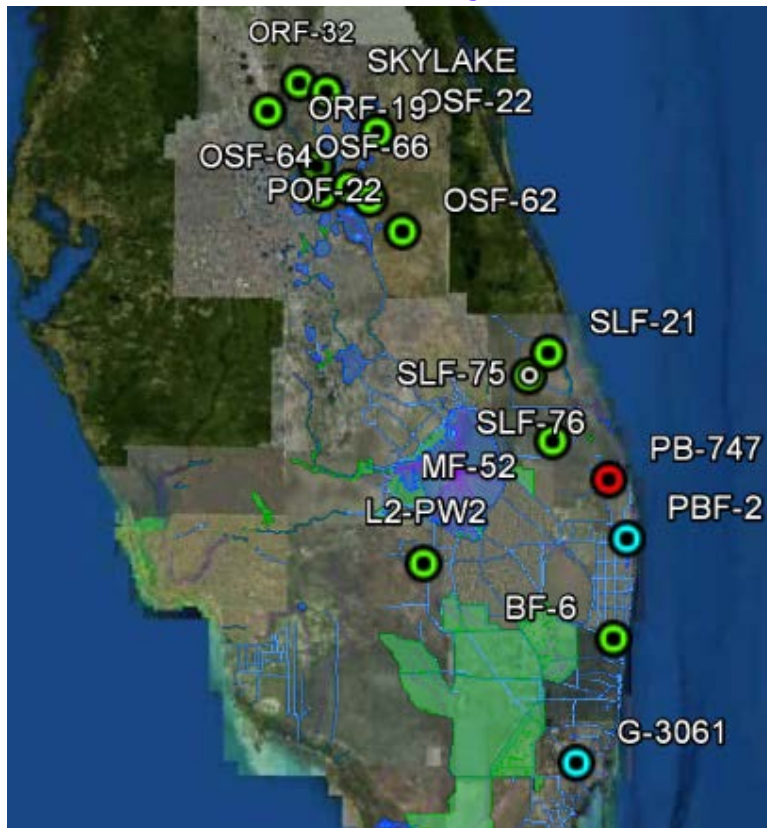
- All similar values registered for entire period of record
- Similar values registered during the same month (or same week), or season, for the POR

Percentile Rank of Median GWL for September 2015

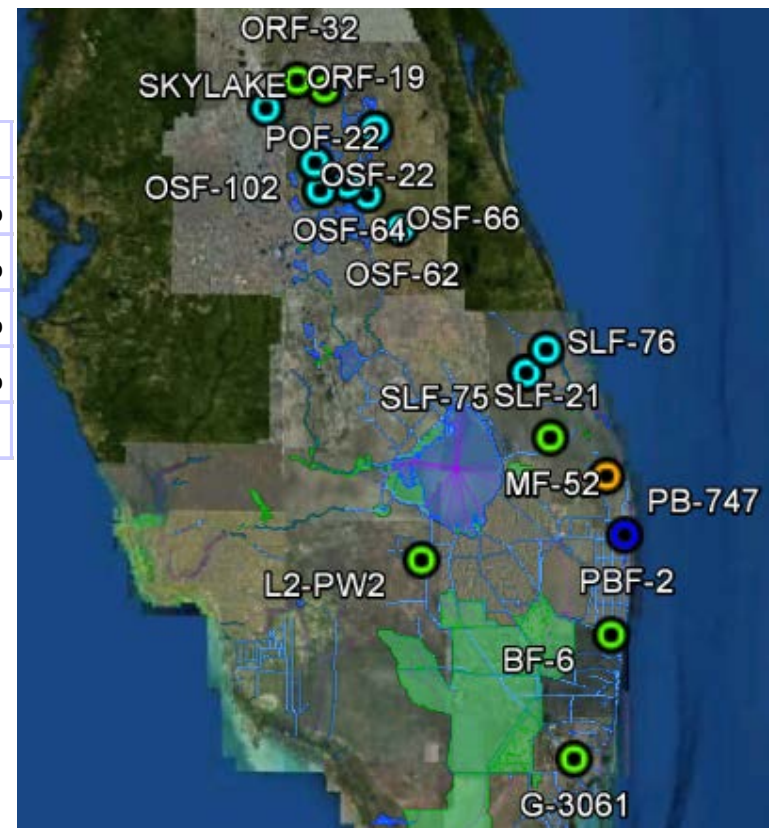
Station	Vrs All GWL	Vrs Sept GWL
BF-6	69.6	38.6
G-3061	93.1	69.4
L2-PW2	75.6	34.4
MF-52	74.9	36.0
ORF-19	98.1	88.4
ORF-32	92.6	83.4
OSF-102	88.8	79.2
OSF-22	84.8	61.8
OSF-62	82.3	59.7

Mapped GWL Percentile Ranks of SFWMD Stations

PRs of May 2016 Median vs. **All**
Daily Values



PRs of May 2016 Median vs. **May**
Daily Values



Back to Current Discussion

Differences in Methodologies

- In equations used by participating agencies,
 - divide either by $(n-1)$ or (n)
 - As n increases, differences variability decreases.
- The value (x) we want to rank is inconsistent among, but consistent within, agencies.
 - As long as agencies do not change their own definition of (x) , the effect of having a non-standardized definition is minimal regarding the statewide GWL PRI map.
- Period of Record (POR) is inconsistent among agencies
 - As agency PORs increases in length, the probability of catching the max and min values of (x) increases.
 - Nevertheless, expect inconsistent PORs to remain an issue

Differences in Methodologies

- **Array:** Data set against which value (x) is ranked
 - Very Significant Issue
- Since Nov 2016, attempts have been made for all participants to use a more “Standardized” array
 - All similar values registered by week, month, season for entire POR
 - All similar values registered for entire POR
- **However, participants have disagreements**
 - At current time, **array issue** not resolved

Differences in Methodologies (1)

- I propose that the SNW have a special meeting/webinar to discuss the pros and cons of each method.
- How about **middle to late June**?

Differences in Methodologies (2)

- Special Meeting
- Discuss pros and cons of using different arrays
- Can SNW adopt a “Standardized” array?
 - If not, does the SNW:
 - Cease efforts to produce statewide PRI maps and text?
 - Use both methods?
 - Select one method?
 - Other ideas?
- Other issues? “Let’s get everything on the table”

Differences in Methodologies (3)

- With a modification of the methodologies, the SNW needs to:
 - Revise the text in the GWL PRI Pilot study, including a table and possible revisions to the corresponding appendices
 - I sent out a draft table and asked participants to review

PRI Equation by Agency

Agency	PRI Equation: PRI =	For each well, Value (x) we want to rank	Data Set against which value (x) is ranked	Beginning of Period of Record
DEP	$[(\# \text{ obs} < x) / (n-1)] \cdot 100$	x = monthly median of representative month (May or Sept)	All similar Q or M x values for entire POR	1991
NFWMD	PERCENTRANK.INC (Excel™ 2010 Formula)	x = value nearest 15 th of representative month	All similar Q or M values for entire POR	Variable, Earliest 1936
SRWMD	$[(\# \text{ obs} < x) / (n)] \cdot 100$	x = daily mean on 27 th of representative month	All similar monthly median values of x for entire POR	1976
Ala Co	$[(\# \text{ obs} < x) / (n-1)] \cdot 100$	x = monthly median of representative month	All similar monthly values of x for entire POR	1990
SJRWMD	$[(\# \text{ obs} < x) / (n-1)] \cdot 100$	x = monthly median of representative month	All similar monthly values of x for entire POR	1998
SWFWMD	$[(\# \text{ obs} < x) / (n-1)] \cdot 100$	x = median daily maximum value of last week of representative month	All similar values of last week of representative month for entire POR	1989
SFWMD	PERCENTRANK.INC (Excel™ 2016 Formula)	x = maximum daily value of representative month	All similar registered values for entire POR	2004

- **Discussion**

- **Adjourn**

- **Next Regular SNW Meeting/Webinar**

Wednesday, November 8, 1:00 - 3:00 PM

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