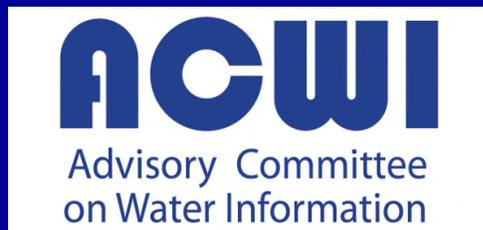


The National Groundwater Monitoring Network – A Ten-Year Odyssey

*Rick Copeland** – *Environ Consultant, FL Dept Environ Protect, Tallahassee, FL*
*Robert Schreiber*** – *Groundwater Hydrologist, CDM Smith, Cambridge, MA*

**Member and **Co-Chair – ACWI Subcommittee on Groundwater (SOGW)*



National Water Monitoring Conference – May 2-6, 2016
Session F6, National Groundwater Monitoring Network
May 4, 2016 from 10:30 to 12:00

Acknowledgements

- ACWI: Advisory Committee on Water Information
- SOGW: ACWI Subcommittee on Groundwater
 - Members and contributors
 - **Pilot-test & Participating Data Providers**
- NGWA & GWPC
- USGS & USEPA
- **Slides –**
 - Many authors
 - Pictures from USGS



Goals

- **Illustrate Lessons Learned**
 - Key Collaborations
 - Significant Steps
- **On-going Challenges:**
 - Continue to Collaborate & Coordinate
 - Persist in the Face of Withering Obstacles



***#1 Emphasis –
Stakeholder Involvement & Consensus***

Outline

- **Definition of “Odyssey”**
 - Typical Sequence
 - Critical Success Factors
- **Example Networks**
 - National
 - Florida
- **Challenges & Solutions**



Definition of “Odyssey” (Courtship-Honeymoon Analogy)

- Needs Identification, & Volunteer Pledges
- Problem Definition, & Key Player ID
- Net Design/Pilot-Testing, & Add Participants
- Initial Implementation, & Add More Help
- Full Implementation, & Honeymoon Period
- Continued Operation, & Need for Vigilance

First “Odyssey” Example

National Groundwater Monitoring Network (NGWMN)



National Ground Water Monitoring Network Data Portal (BETA)

National Ground Water Monitoring Network Data Portal of the Federal Advisory Committee on Water Information Subcommittee on Ground Water

This page serves as a gateway to a pilot U.S. National Ground Water Monitoring Network (NGWMN) data portal developed as part of a NGWMN pilot study. The Network Portal can be accessed [here](#) or by clicking the image below.

Information about the NGWMN and the Pilot study, definitions of terms used in the portal follow, and links to related websites follow.



Disclaimer: Please note that this is a beta version of the Pilot NGWMN Data Portal, which is still undergoing development and testing. Should you encounter any bugs, glitches, lack of functionality or other problems with the, please contact the site administrator immediately so they can rectify these accordingly.

Importance of National Monitoring Conferences to the Success of the National GW Network (NGWMN)

- **2006 in San Jose CA**
 - Ad Hoc Meeting of Interested Parties
 - Pledged Support from USGS & USEPA
- **2010 & 2012**
 - Collaborative Meetings
 - Surface Water / Groundwater Coordination
- **2008-16: Formal NGWMN Sessions**

Key Sources of Inspiration & Direction

- Professionals Committed to SOGW Success
- NGWMN's Oceans Monitoring Network Effort
- NGWA's White Paper
- Support from White House's OSTP
- EU's Excellent "Model" Monitoring Programs
- Statewide Monitoring Programs

ACWI's Subcommittee on Groundwater (SOGW)

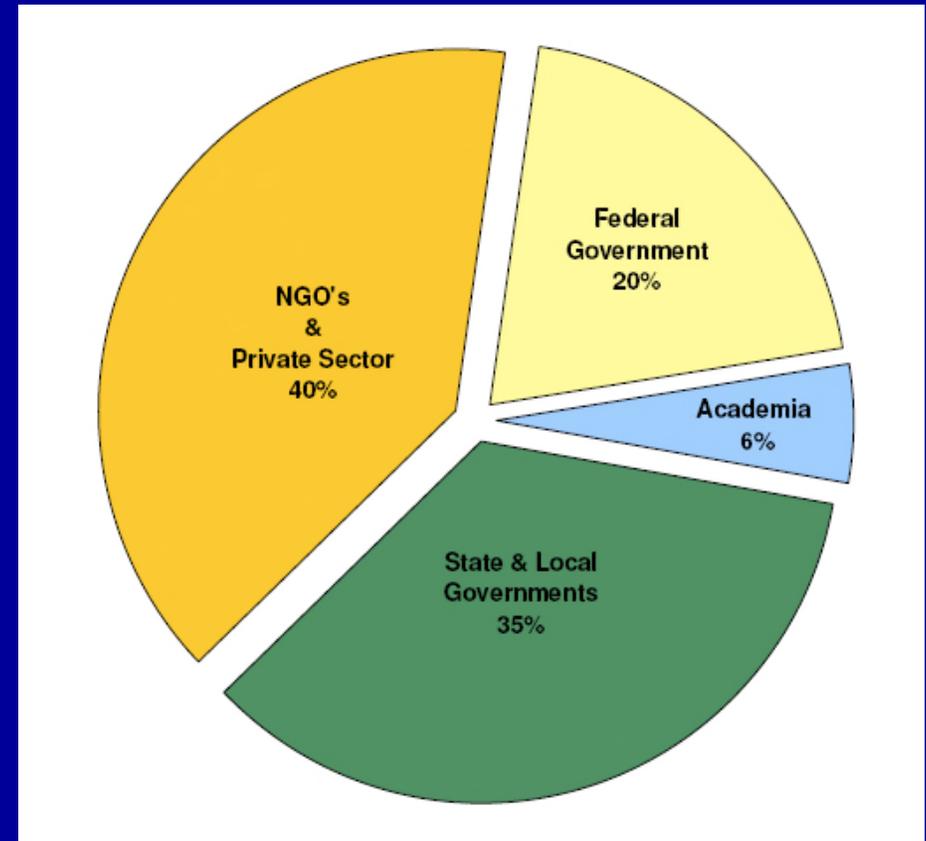
- Purpose: “...to ...(implement) a **nationwide, long-term groundwater quantity and quality monitoring framework** that...(will) provide information necessary for the planning, management, and development of groundwater supplies to meet current and future water needs, and ecosystem requirements.”
- Scope: “... to assist in assessments of the **quantity of U.S. groundwater reserves**, as **constrained by groundwater quality**.”

SOGW Members & Participants

- *American Society of Civil Engineers*
- *Ground Water Protection Council*
- *Interstate Council on Water Policy*
- *Association of American State Geologists*
- *National Ground Water Association*
- *Texas Commission on Environmental Quality*
- *US Geological Survey*
- *USEPA Headquarters and Region 8*
- *Association of State Drinking Water Administrators*
- *Water Environment Federation*
- *USDA Forest Service*
- *Association of State and Interstate Water Pollution Control Administrators*
- *.....and several more*

(Circa 2008)

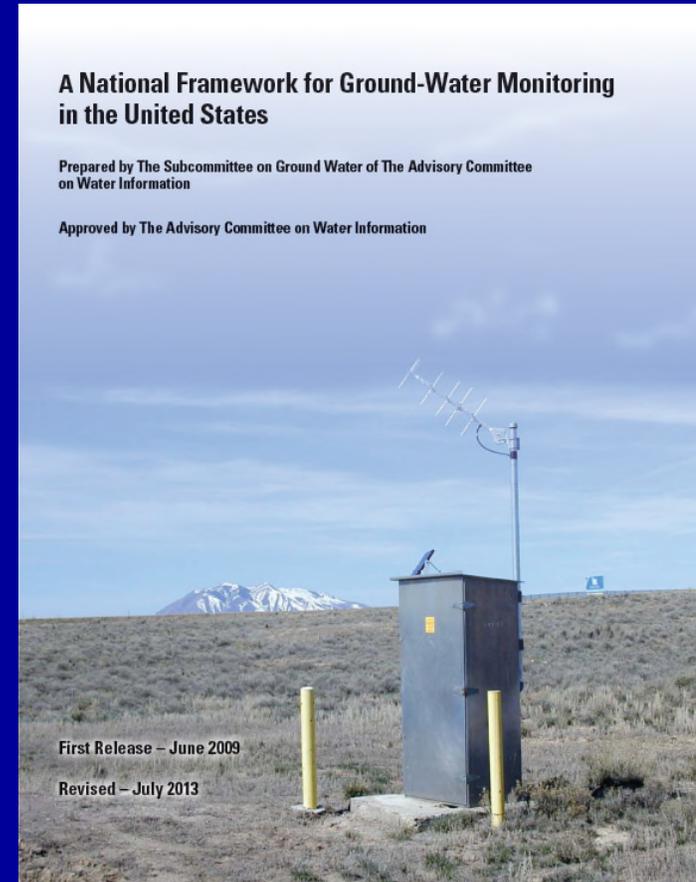
**Subcommittee & Work Groups:
>70 people from >54 organizations**



**Demonstrates Width and Breadth of
Collaboration and Coordination**

National GW Monitoring Network Success #1: Design Framework

- Feasible Design
- **Collaboration-Based**
- Inventory of Programs
- Guidance for Field Methods
- Guidance for Data & Mgmt
- Implementation Plan



The NGWMN

A Network of Networks



Advisory Committee
on Water Information

National Ground-Water Monitoring Network

NGWMN NETWORKS

Water level: ?

Subnetwork:
All
Background
Suspected Changes
Documented Changes

Monitoring
Category:
All
Surveillance
Trend
Special

Water quality: ?

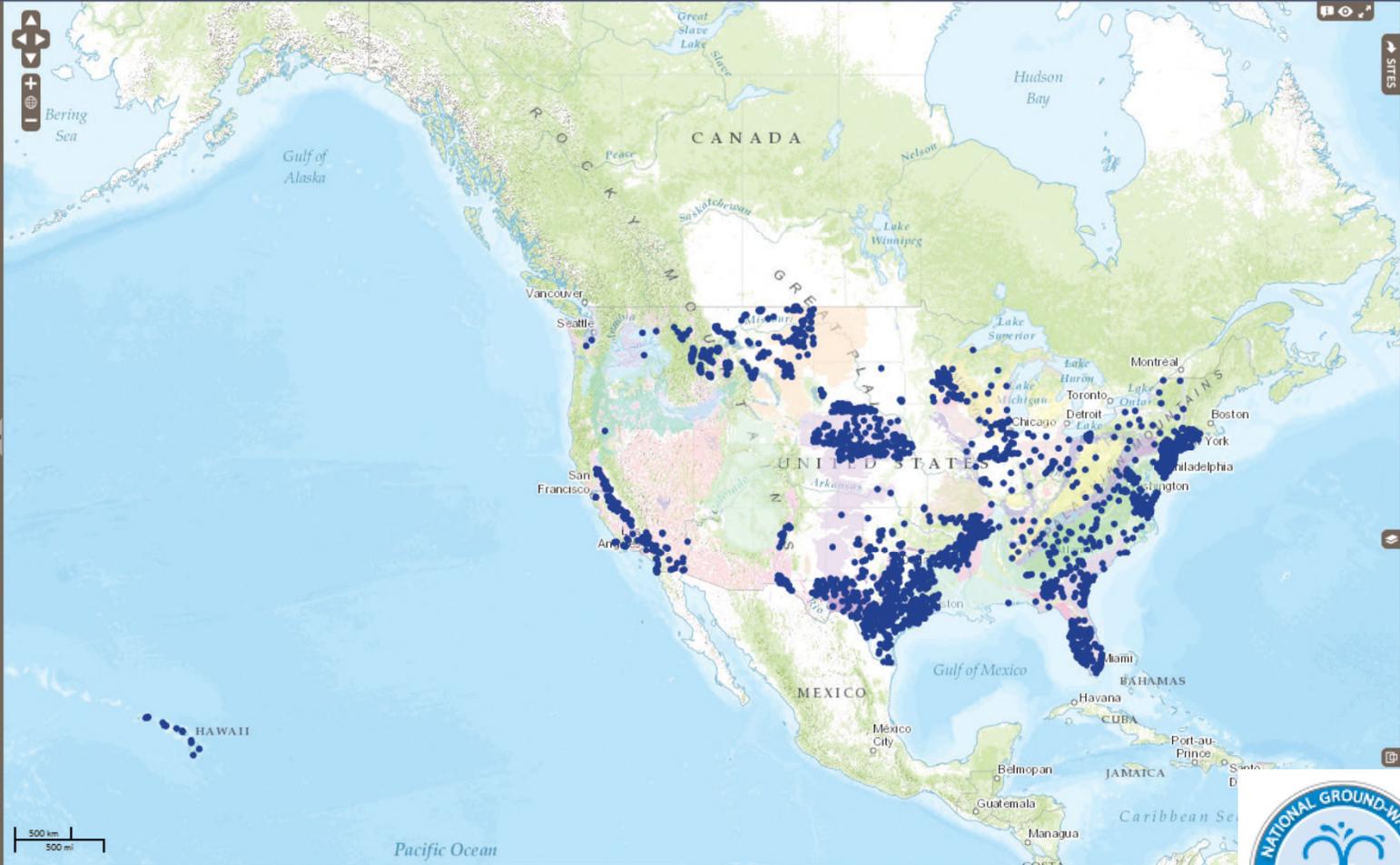
Subnetwork:
All
Background
Suspected Changes
Documented Changes

Monitoring
Category:
All
Surveillance
Trend
Special

>> FILTER MAP DATA

CURRENT STATUS

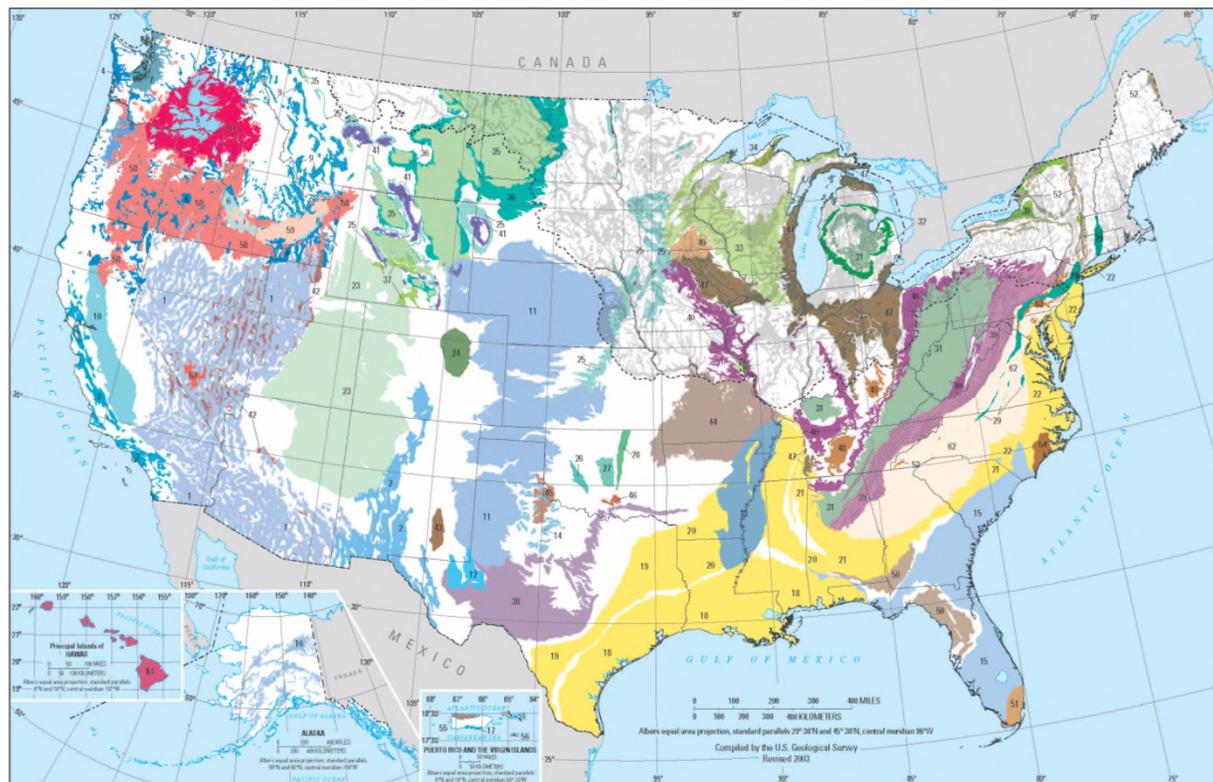
3022 Sites mapped
3022 Sites matching filter
2806 Water-level network wells



Advisory Committee
on Water Information



Principal Aquifers of the US, & Major Aquifers (Per States / Data Owners)

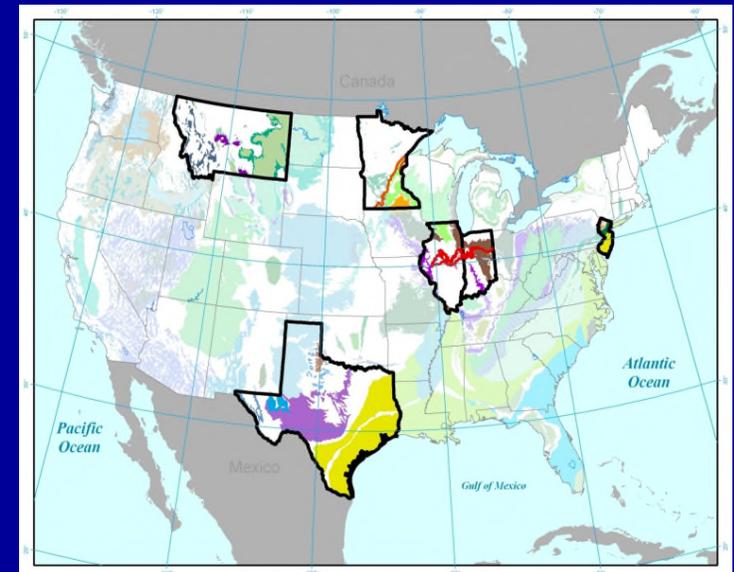


Subnetwork Well Types

- **Surveillance – Synoptic measurements**
 - periodic “census” sampling
- **Trend – Assess long-term trends**
 - temporal variations
 - “High” frequency sampling
- **“Backbone” – “Valuable” Trend wells**
 - Want long-term period of record

Network Pilot Projects Success #2

- Validated Design Concepts
- Evaluated Field Practices and Data Mgt Procedures
- Identified Network Gaps & Costs of Participation
- **Promoted Intra- and Inter-State Collaboration**
- Created Success #3.....



Network Web Portal - Success #3 (USGS Office of Water Information)



ACWI
Advisory Committee
on Water Information

National Ground Water Monitoring Network Data Portal (BETA)

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This page serves as a gateway to a pilot U.S. National Ground Water Monitoring Network (NGWMN) data portal developed as part of a NGWMN pilot study. The Network Portal can be accessed [here](#) or by clicking the image below.

Information about the NGWMN and the Pilot study, definitions of terms used in the portal follow, and links to related websites follow.



<http://acwi.gov/sogw>



Disclaimer: Please note that this is a beta version of the Pilot NGWMN Data Portal, which is still undergoing development and testing. Should you encounter any bugs, glitches, lack of functionality or other problems with the, please contact the site administrator immediately so they can rectify these accordingly.



Second “Odyssey” Example

Florida’s Statewide Groundwater Monitoring Network

Odyssey

FL Statutes 403.063 (1983)

Problems and Needs identified in early 1980s

Key players: DEP, USGS, WMDs, Counties, Academia

1984-1991: Defined **bkgrnd**, Designed Network

1991-1999: GW Mon Net (Bkgrnd Network (BN))

Unexpectedly (1996-1999)

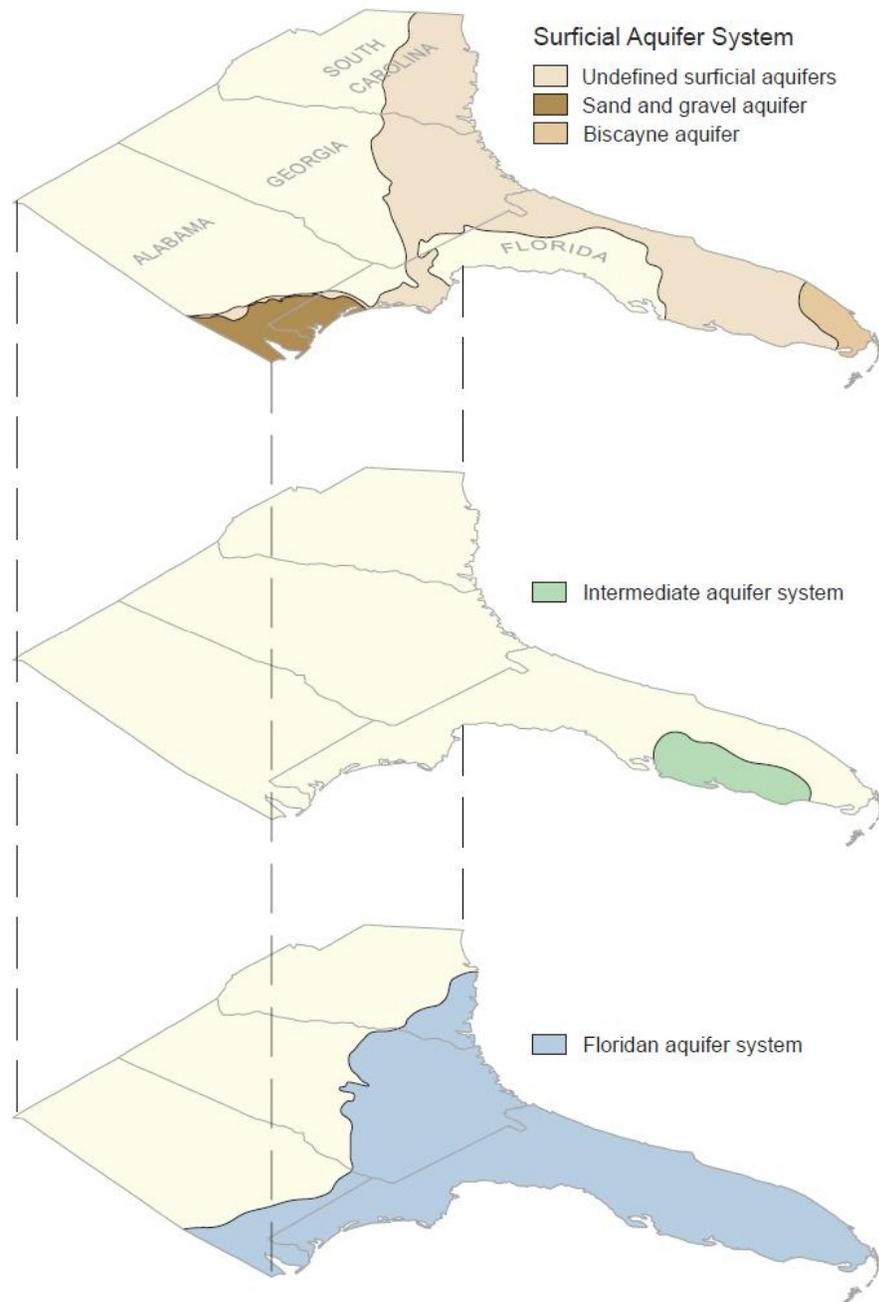
DEP management: Redesign and add surf water

2000 on: Status and Trend Networks

Critical Factors

- **Direct Funding:** Has never increased since 1983
- **Since 2000:** less WMD direct participation
- **Design: Status Network (SN) (from 2000 on)**
 - Includes potentially impacted & BN wells
- **1991-2016 Trend wells (monthly or quarterly)**
- **1991-1999: 3-yr cycle for statewide “Census” (BN)**
- **2000-2016: varied from 4 to 5 to 1-yr cycles (SN)**
 - SN - random sampling

Sequence of Aquifers

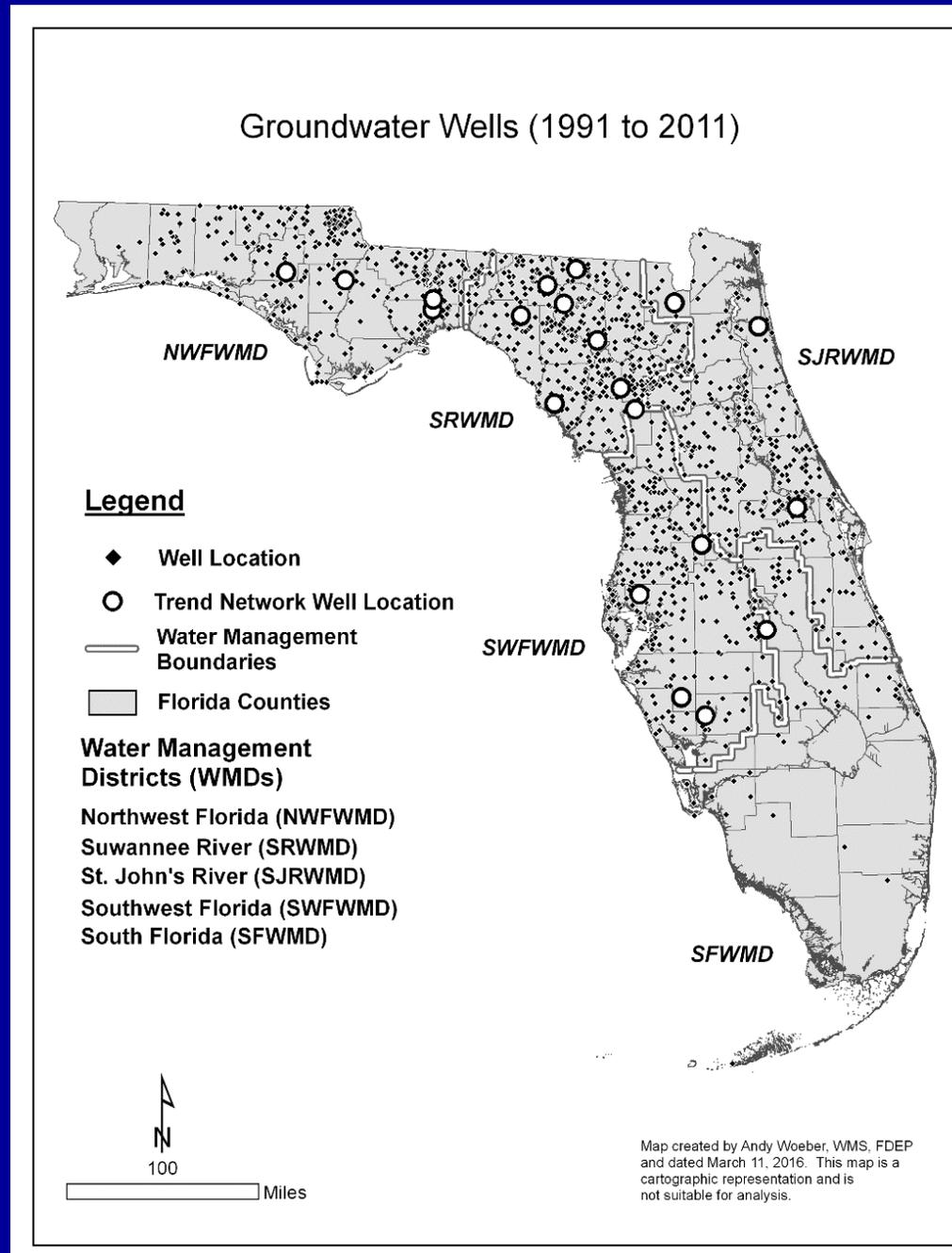


NGWMN Background Subnetwork		Suspected Changes Subnetwork		Documented Changes Subnetwork	
Surveillance	Trend	Surveillance	Trend	Surveillance	Trend
	Backbone		Backbone		Backbone

FL GWMN Subnets		Suspected Changes (included in SN)		Documented Changes (Currently inactive)	
SN (includes BN wells)					
Surveillance	Trend	Surveillance	Trend		
	(Separate Network) All are Backbone	1991-1999 VISA Net	(No Active Trend Wells)		

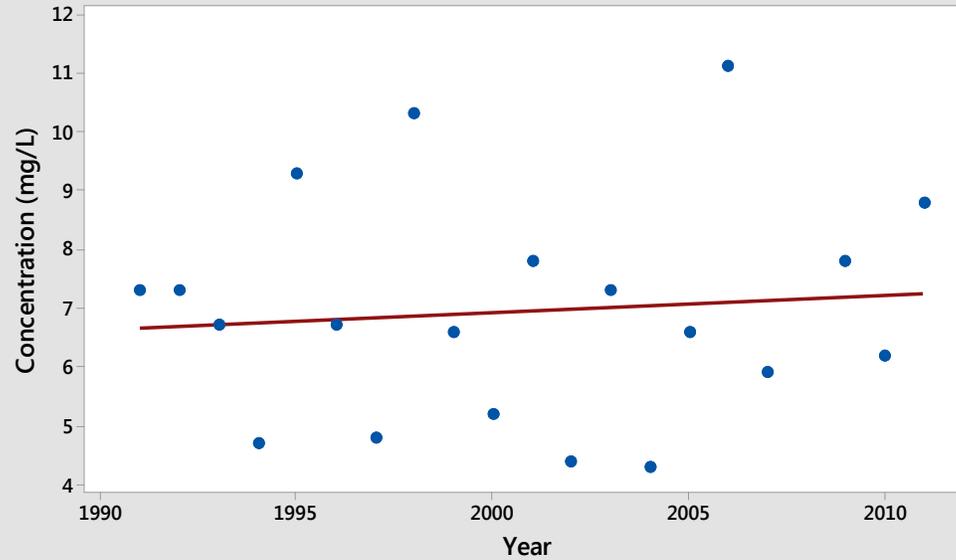
“DEP” Wells with Na and Cl data

Floridan Aquifer System



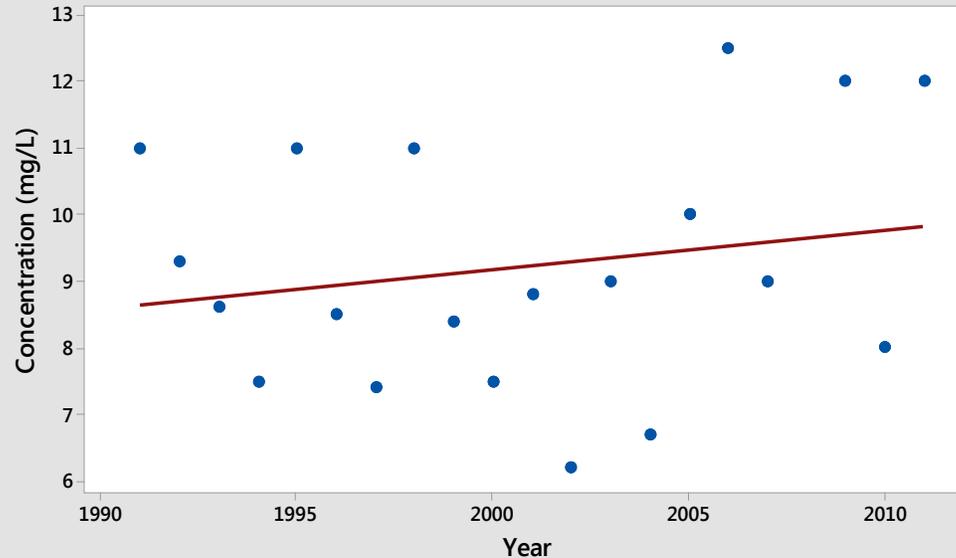
Annual Na and Cl Medians – SN Wells Surveillance

Median Sodium Concentrations - BN and SN Wells (1991-2011)



Outlier (2008) was removed for visual reasons.

Median Chloride Concentrations - BN and SN Wells (1991-2011)



Outlier (2008) was removed for visual reasons.

FL Water Resource Monitoring Council

Salinity Network Workgroup (SNW) (2012)
Analogous to the SOGW

Sal Net: “**Quant constrained by Qual**”

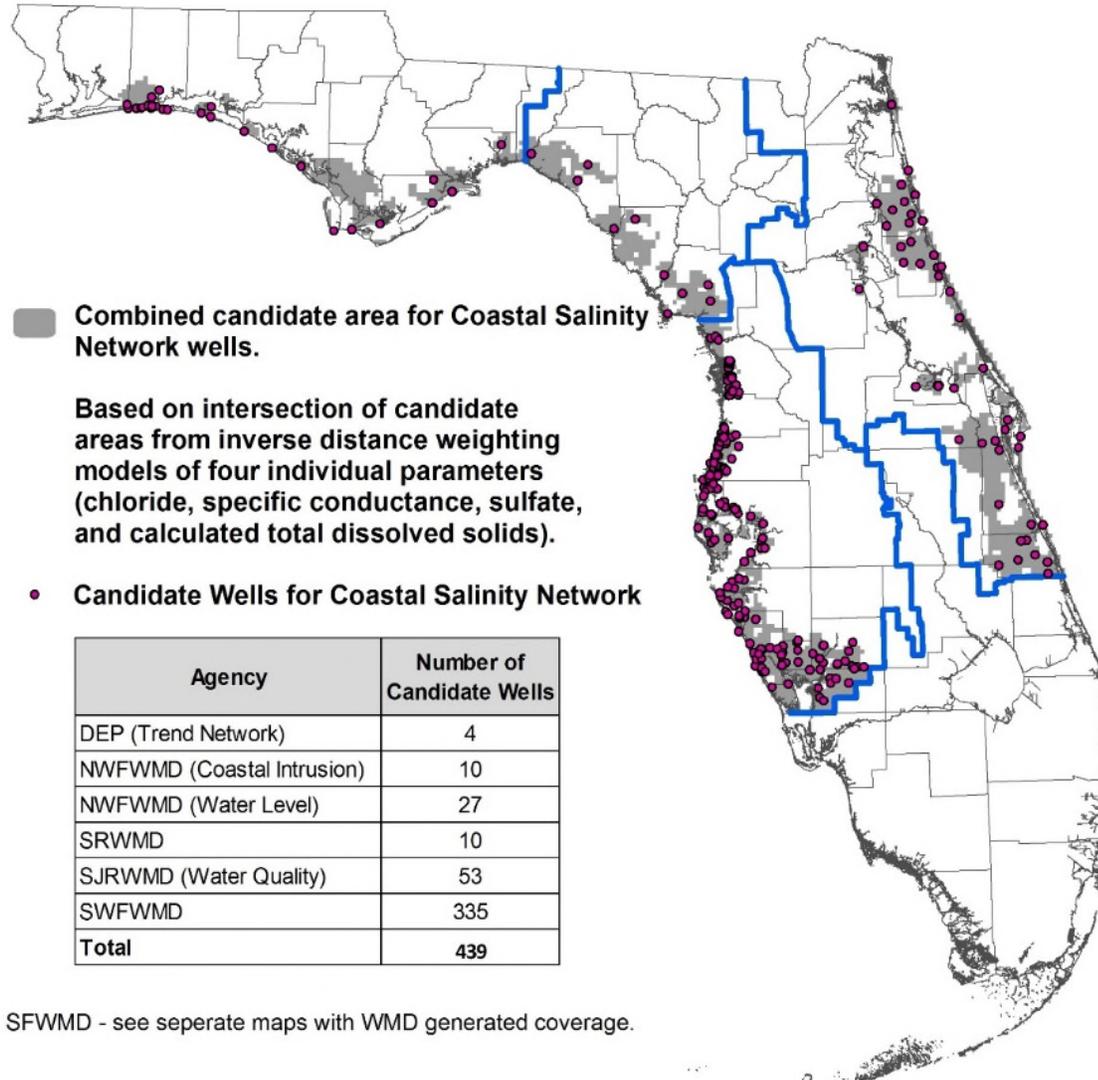
Network of Existing Networks

Currently over 20 agencies

No Funds

“Success is our ability to cooperate”

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



SFWMD - see separate maps with WMD generated coverage.

Water Management Districts

Florida Counties



0 50 100 200 Kilometers

0 50 100 200 Miles

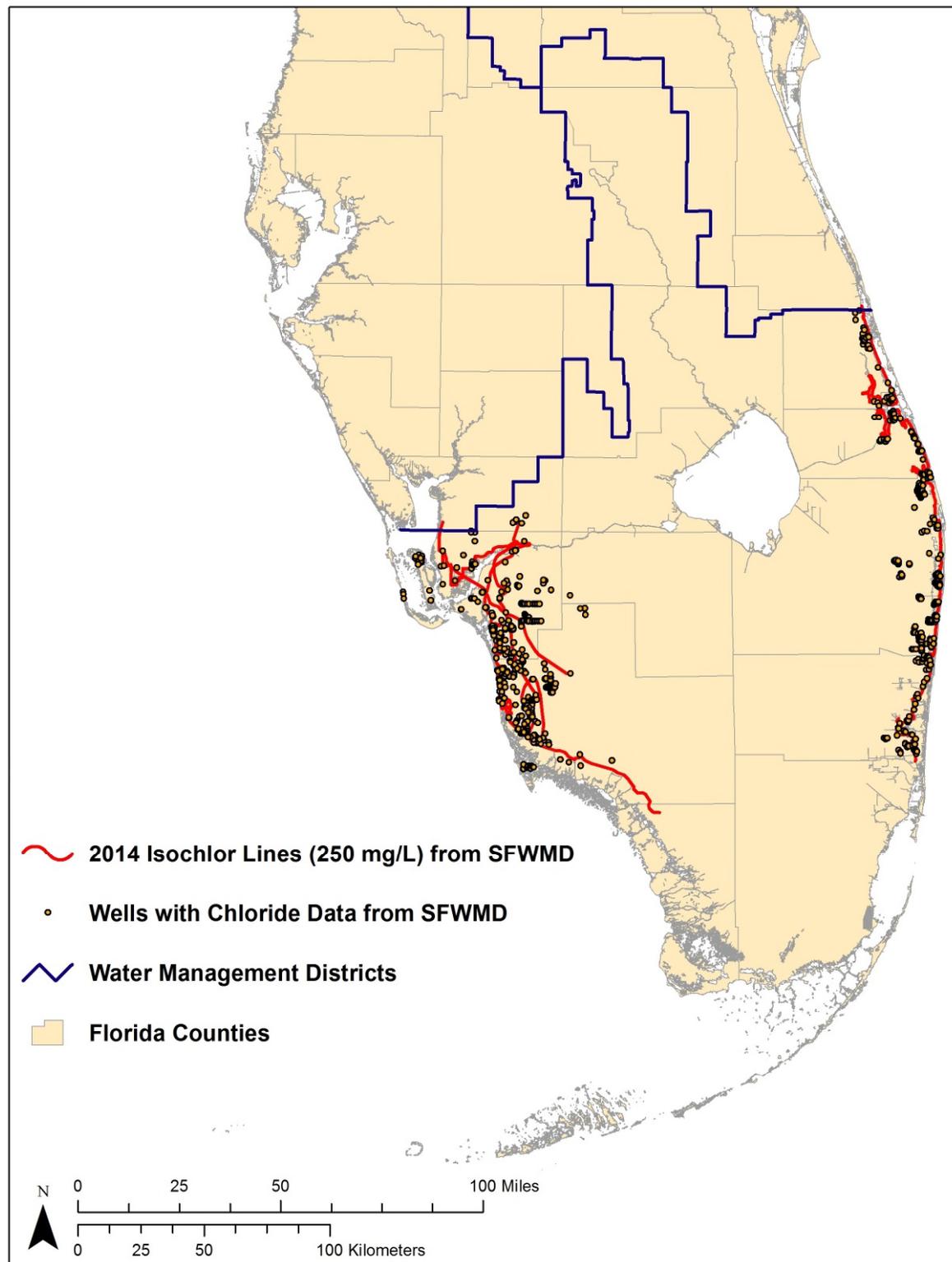
Created November 3, 2015 by Florida Department of Environmental Protection staff in the Division of Environmental Assessment and Restoration. This map is a cartographic representation and is not intended for further analysis.

ACWI

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on Water Information



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



Example of 250 mg/L isochlor map, and more, of Biscayne aquifer in Miami-Dade County, FL

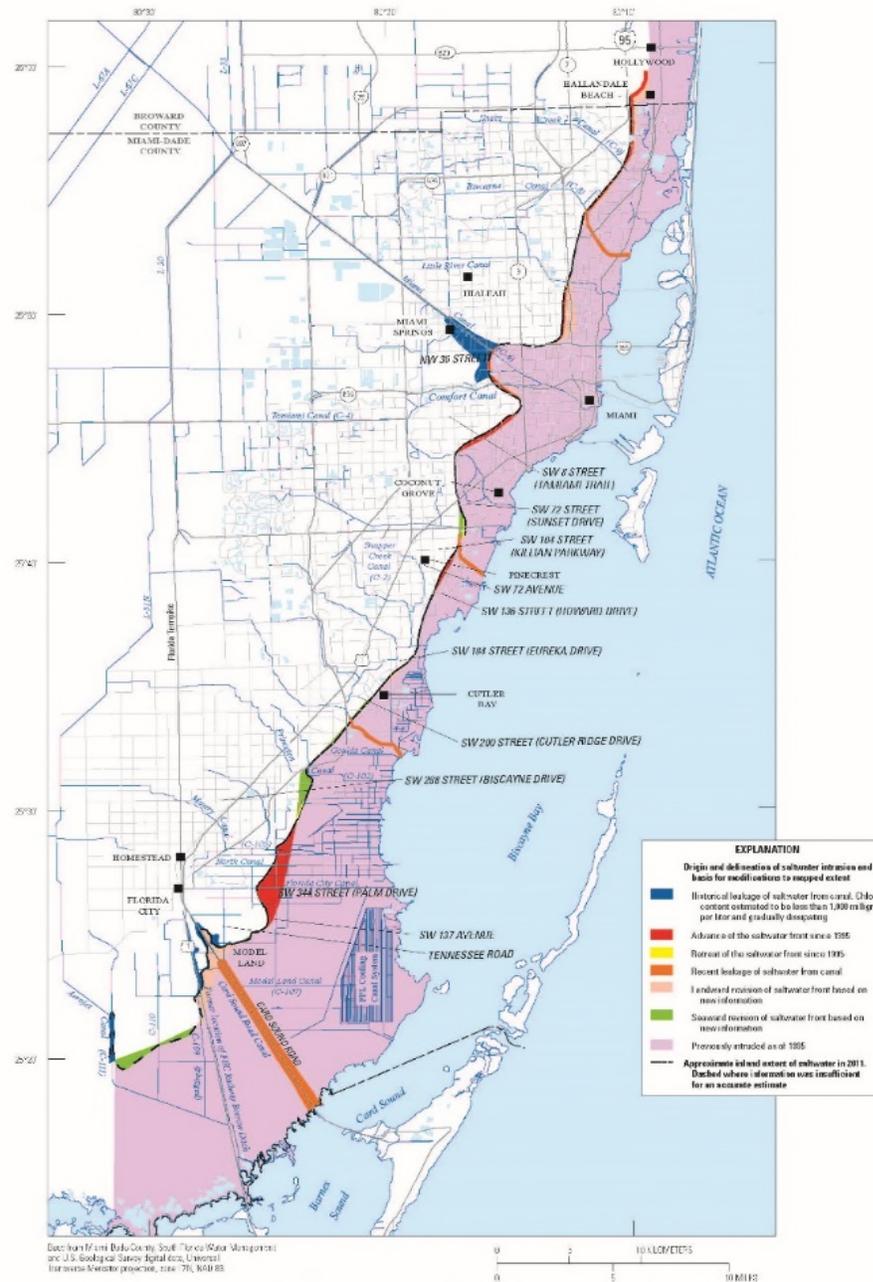
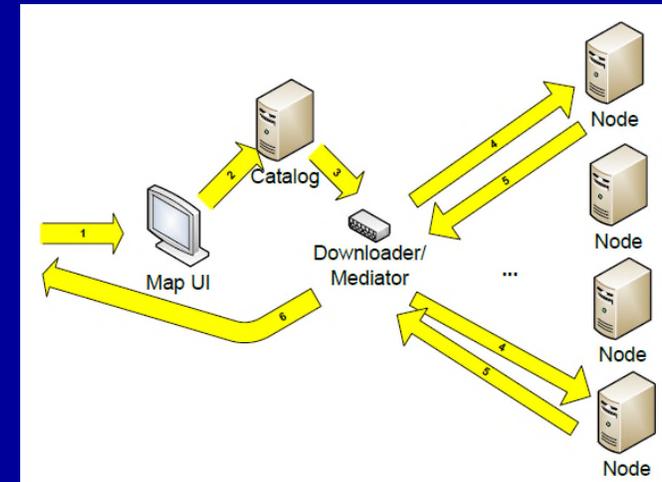


Figure 17. Map showing the origin and delineation of saltwater intrusion in the Biscayne aquifer and the basis for modifications to its mapped extent.

National GW Monitoring Network Contact & Website Information

- Website:

- SOGW: www.acwi.gov/sogw
- See “Products of Interest” for:
 - Framework Document
 - Pilot Studies Reporting
 - Network Portal



- SOGW Co-Chairs:

- Bob Schreiber: schreiberrp@cdmsmith.com
- Bill Cunningham: wcunning@usgs.gov

- Executive Secretary:

- Lauren Schapker: lschapker@ngwa.org

FL GW Monitoring Network Contact and Database Info

1990 to 2016: GWIS/OGWIS (databases)

≈2018: Water Information Network (WIN)

All GW (and SW) data in FL to FDEP database

FL will then develop a NGWMN portal?

Products

<http://www.dep.state.fl.us/water/monitoring/index.htm>

Critical Success Factors

- Problem and Needs Identification
- Early Groundwork & Foundation-Building
- Collaboration Across Sectors & Boundaries
- Effective Leadership & Delegation of Roles
- Essential Funding, Increasing Over Time
- “Walk Before Run” Mantra
- Realistic Understanding of Time Required
- Persistence & Commitment

Questions?

- **Rick Copeland**
- **Florida Depart Environmental Protection**
- **Tallahassee, FL 32399**
- **850-245-8503**
- **rick.copeland@dep.state.fl.us**