



National Ground-Water Monitoring Network

Advisory Committee on Water Information—Subcommittee on Ground Water

Status Report from the Subcommittee on Ground Water

Activities related to the National Ground Water Monitoring Network

Robert Schreiber, Co-Chair, CDM Smith and ASCE

Charles Job, USEPA

Jessica Lucido, USGS

Bill Cunningham, Co-Chair, USGS



Presentation to the Advisory Committee on Water Information, August 20, 2014

Presentation Outline

- Background, Framework, and Pilot Results
 - Bob Schreiber, CDM Smith
- NGWMN Portal
 - Jessica Lucido, USGS
- New Water Quality Pilots
 - Charles Job, U.S. EPA
- Implementation Plans
 - Bill Cunningham, USGS
- Terms of Reference Request
 - ACWI input and decision requested



→ 1st & 2nd segments especially important for new ACWI members

Acknowledgements

- SOGW Members and contributors
- ACWI, NWQMC, & other ACWI groups:
 - Coastal network
 - Ongoing support, guidance, & interaction
- Executive Secretary & admin support
 - NGWA
 - USGS HQ & CIDA
- Many others

Why is There an SOGW?

- Overall: Need to raise visibility of GW
 - Literally Invisible
 - Lacking Public Attention (“GW Floods”?)
 - Often a “2nd Cousin”
 - No GW Sub-Group in ACWI < 2006
 - Difficult & Costly to Characterize

Importance of Groundwater

- 99% of Earth's Freshwater Reserves
- Base Flow to Surface Waters
- Primary or Sole Source:
 - Rural Areas
 - Long Island, Cape Cod, etc.
- Multiple Threats – in 3D
- Easily Damaged & Slow to Recover

SOGW Grand Overview

- Created to fill “GW Gap” of ACWI
- Sole Purpose:
 - National GW Monitoring Network (“NGWMN”)
 - Mantra: “Walk Before Running”
- Congressional Authorization w/o Appropriation
 - Volunteer Efforts So Far
- Lessons-Learned and Products-Created
 - Inform & Facilitate “Open Data Initiative”

Part 1 of “Why Do We Need the NGWMN?”

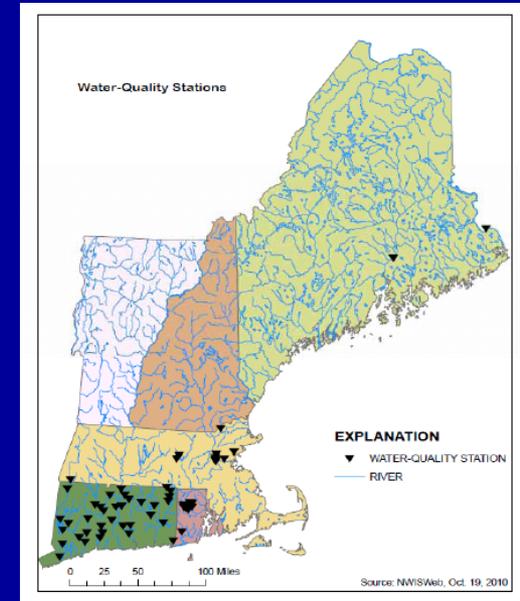
Critical Needs Cited by Key Entities

- 2003 GAO Report
 - 36 States expect water shortages
- 2005 NGWA/AASG Survey
 - GW shortages expected in 43 states
 - Calls for cooperative monitoring
- 2006 Heinz Report
 - GW data inadequate for national reporting
- As surface water supplies are fully (or over-) allocated, users turn to ground water [multiple organizations]

Part 2 of “Why Do We Need the NGWMN?”

What GW Analysts Need

- Trend-Tracking
- Impacts-Identification
- Analysis & Assessment
- Planning & Management
- Fill Data Gaps →



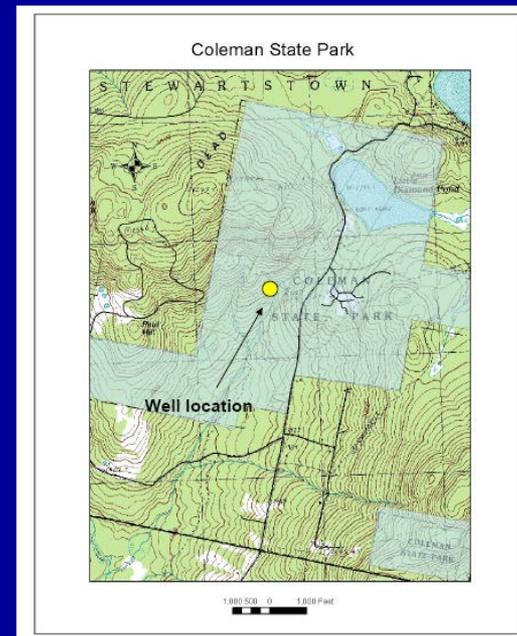
(Morrison, USGS)

We also need a better acronym than “NGWMN” (please help!)

Part 3 of “Why do we need the NGWMN?”

Key “Drivers” = Impact Factors

- Underground Injection Control (UIC)
- GW Under the Influence of Surface Water
- Sea Level Rise & Saltwater Intrusion
- Hydraulic Fracturing
- Sustainability
- “Energy-Water Nexus”
- Drought
- Nutrients
- Land Use Change



Part 4 of "Why do we need the NGWMN?"

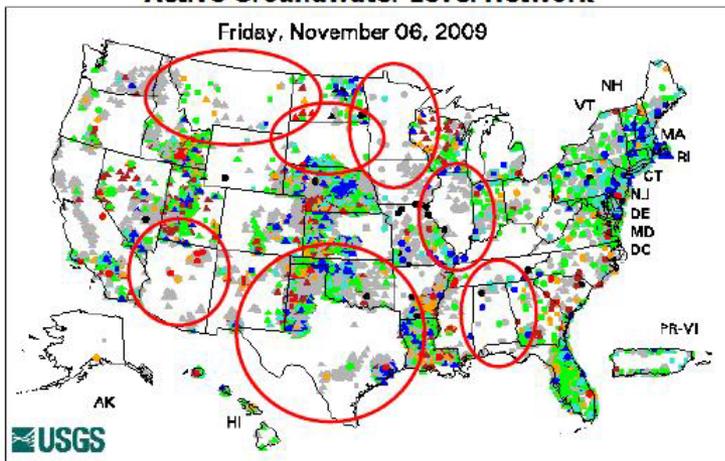
Lack of Consistent Coverage

Wells operated by USGS

Groundwater Watch

Active Groundwater Level Network

Friday, November 06, 2009



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

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

Active Well Count

Real-Time: 1,175 Daily: 1,142 Periodic: 23,777

Wells operated by States

Results from survey of State networks



P.L. 111-11 SECURE Water Act 2009

(B) in coordination with the **Advisory Committee and State and local water resource agencies—**

- (i) assess the current scope of groundwater monitoring based on the access availability and capability of each monitoring well in existence as of the date of enactment of this Act; and
- (ii) develop and carry out a monitoring plan that maximizes coverage for each major aquifer system that is located in the United States;
and.....

P.L. 111-11 SECURE Water Act 2009

(C) prior to initiating any specific monitoring activities within a State after the date of enactment of this Act, **consult and coordinate with the applicable State water resource agency** with jurisdiction over the aquifer that is the subject of the monitoring activities, and comply with all applicable laws (including regulations) of the State.

SOGW – Terms of Reference

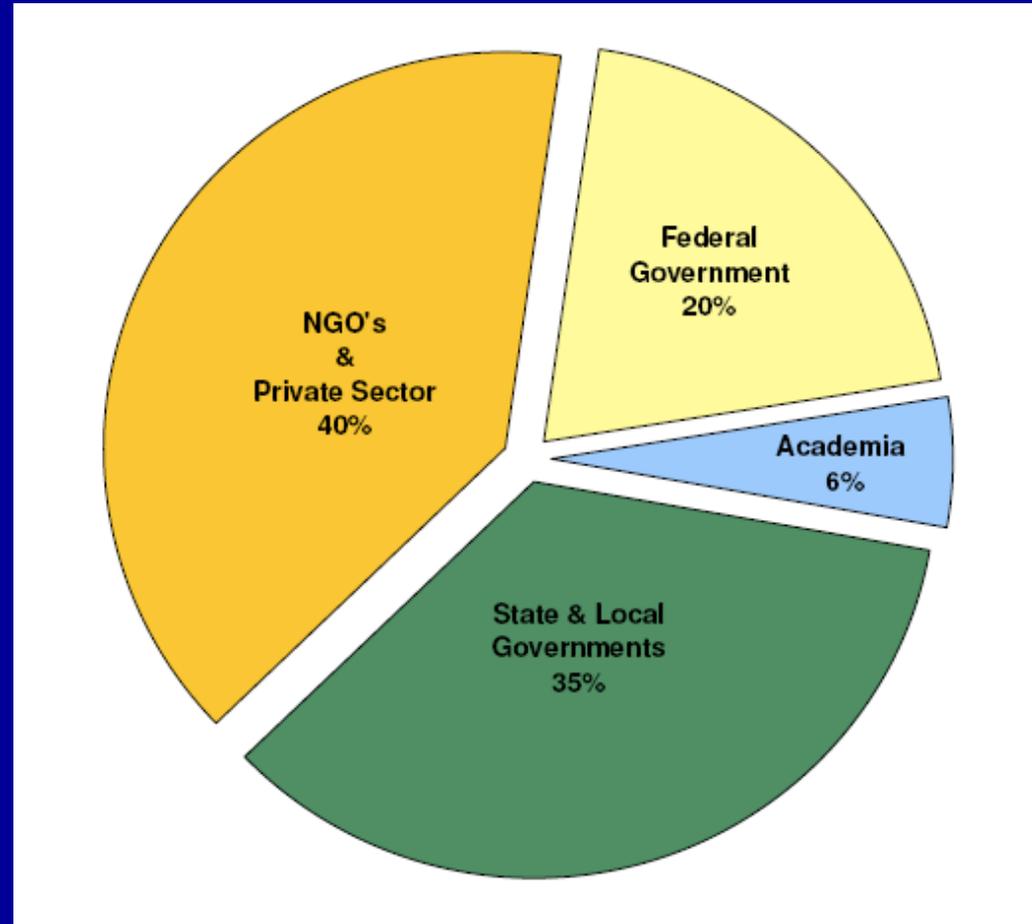
The overall goal of the SOGW is to develop and encourage implementation of a nationwide, long-term ground-water quantity and quality monitoring framework that would provide information necessary for the planning, management, and development of ground-water supplies to meet current and future water needs, and ecosystem requirements.

SOGW – Terms of Reference

Scope: This national framework for ground-water monitoring and collaboration will be developed to assist in assessments of the quantity of U.S. ground-water reserves, as constrained by ground-water quality.

SOGW's Early Participation – Now Enhanced

- ASCE
- GWPC
- ICWP
- AASG
- NGWA
- TCEQ
- USGS
- USEPA HQ & Region 8
- ASDWA
- WEF
- USDA NFS
- ASIWPCA
- ASTM



SOGW Planned Approach

- Determine “current picture” of GW monitoring
- Agree upon network design principles
- Identify field methods and data standards
- Determine approach for compiling data
- Pilot the network design and approach
- Revise as needed per pilot-testing results
- Develop implementation plan

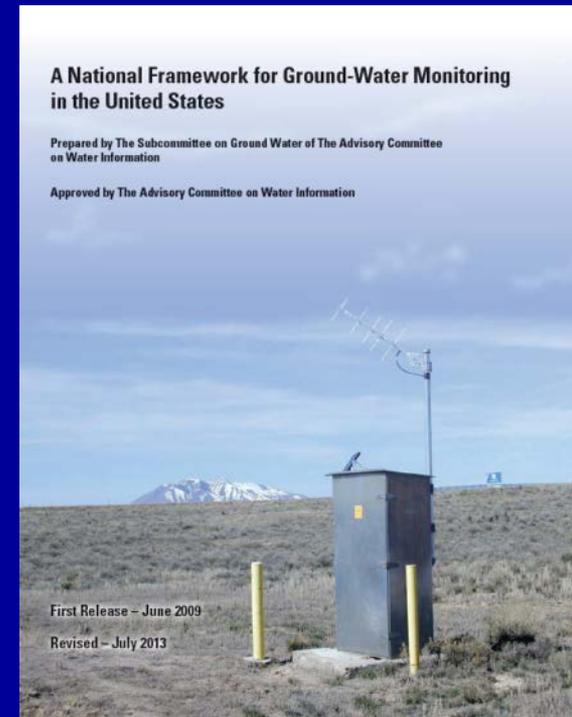
SOGW Actual Timeline

January	2007	SOGW formed by ACWI
February	2009	Framework Document approved
December	2009	Five pilot projects selected
January	2011	Pilot projects report results
July	2011	Web portal version 1 public release
September	2011	Pilot project synthesis report
Summer	2013	Framework Document revisions
Fall	2013	Web portal updated version
	2014	WQ piloting – 2 States
	2015+	Formal full-scale implementation

National GW Monitoring Network

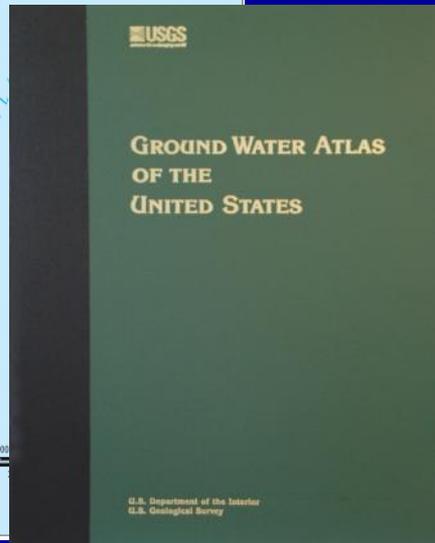
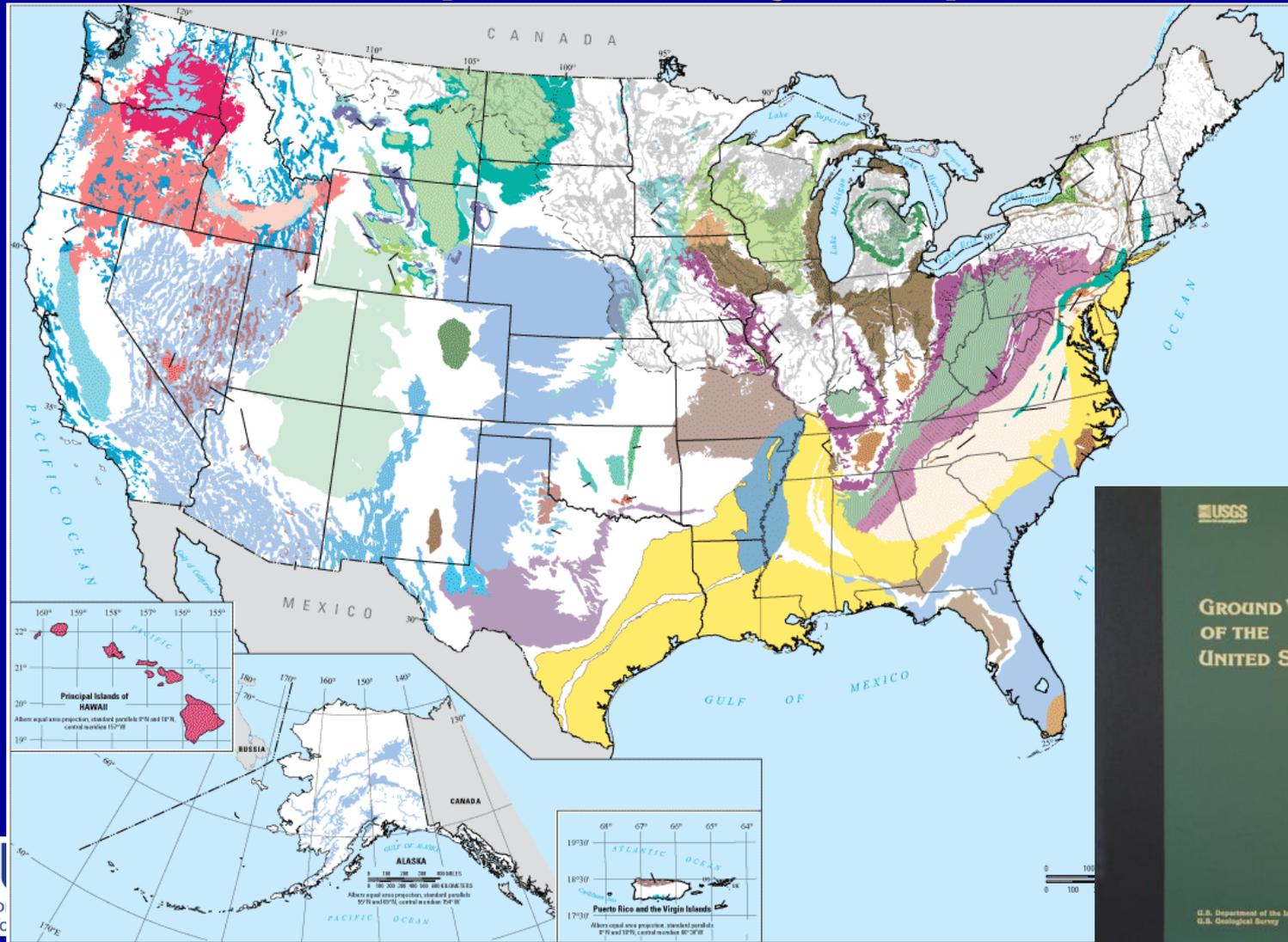
“Framework Document”

- Design for a collaborative National GW Monitoring Network
- Inventoried Federal and State monitoring programs
- Guidance for Field Methods
- Guidance for Minimum Data Elements, Standards, & Mgmt
- Implementation Plan and Recommendations
- 2009 and 2013



Network Design

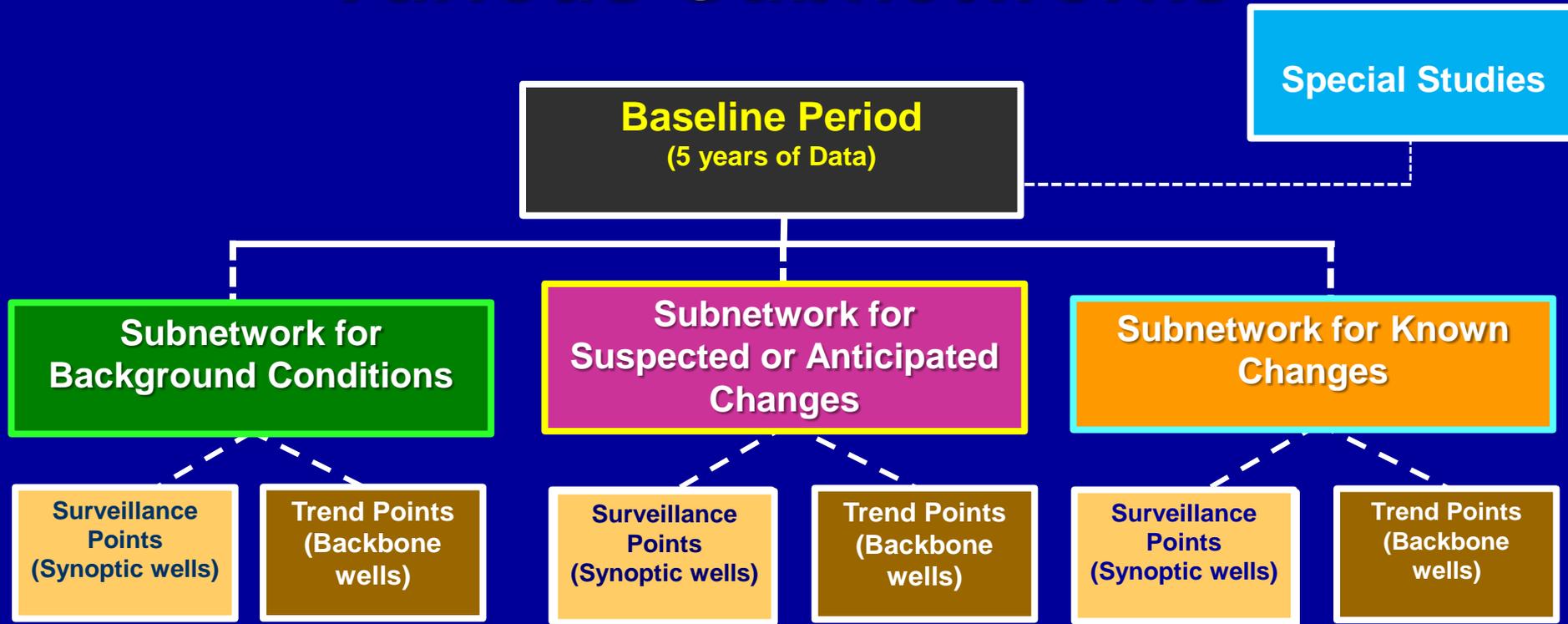
→ Principal and Major Aquifers



NGWMN Design Elements

- Principal and major aquifers
- GW levels and quality, but focus is availability
- Priority on wells/springs with long-term data
- Network, not a Warehouse or Master Database
- Not for specific science question
- Willing data providers: State, Federal, Tribes, others
- Sites classified by local experts / data providers
- Data available to all without restriction or cost
- Data provider is the authoritative data source

Network Design: Various Subnetworks

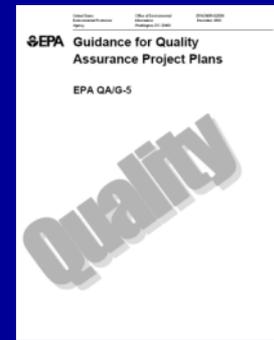


“Classified” based on water level or water quality change
and on frequency of data collection

What about data quality? Field Practices

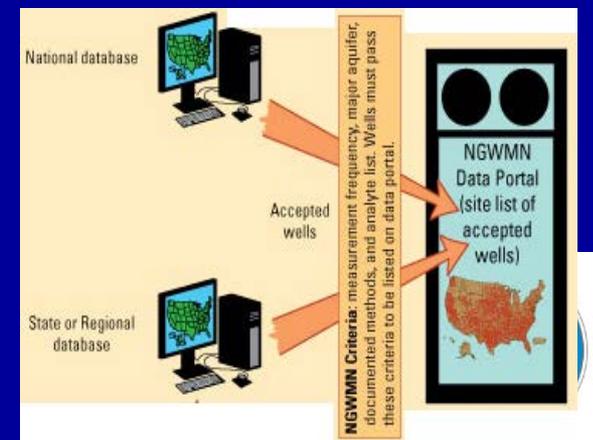


- Few absolute requirements--flexible and adaptable.
- Requires documentation of techniques to ensure comparability and assure quality in ground-water measurement and sampling activities.
- Documentation must be available to the user — known provenance

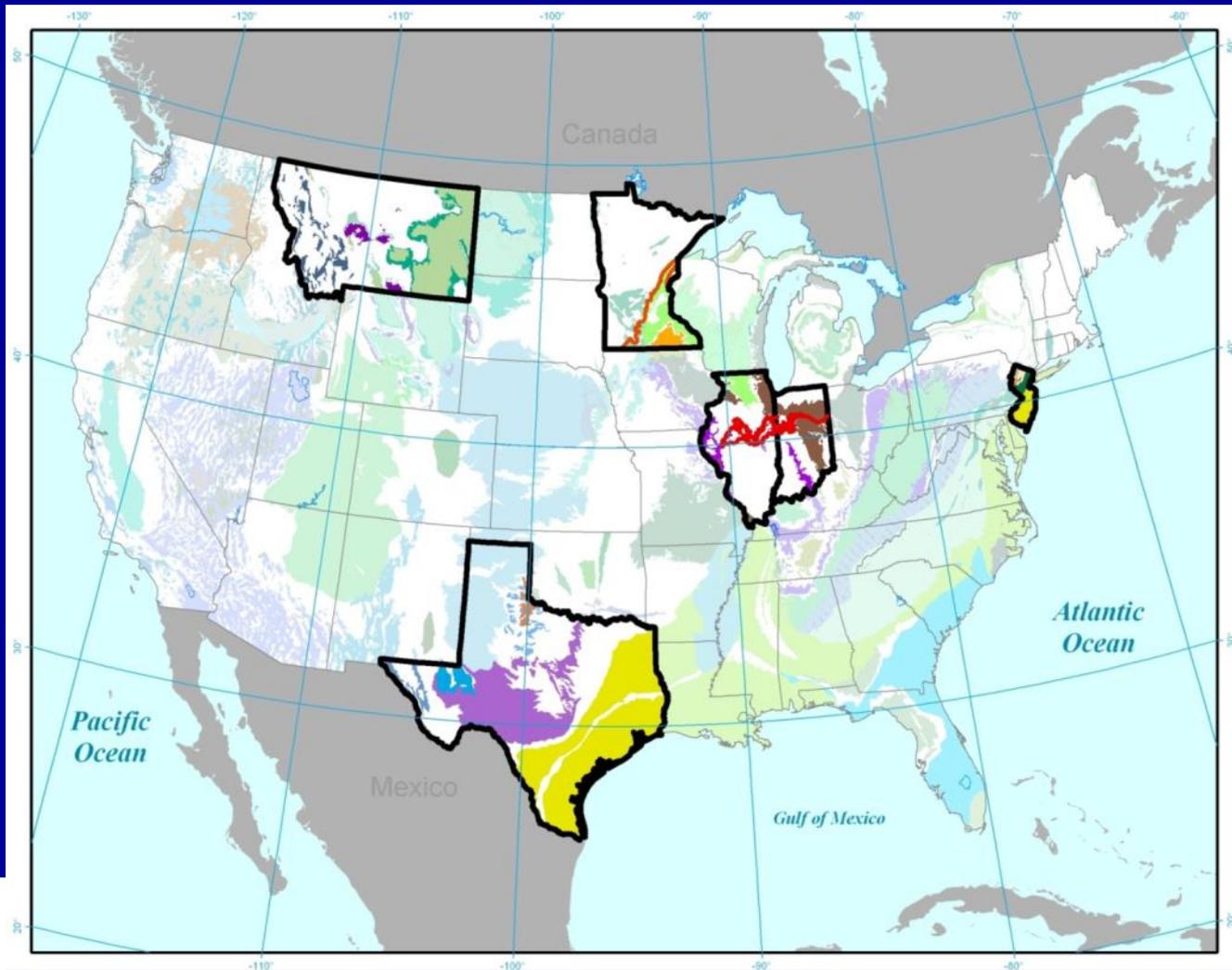


Data Standards & Management

- Minimum Data Elements for wells, measurements, and results are established: source agency, location, depth, aquifer, analytical method.....
- NGWMN data must be freely available without restriction via the NGWMN Data Portal



National Ground Water Monitoring Network Pilot Projects



NGWMN Pilot Studies

- Validated Design Concepts
- Evaluated Field Practices and Data Mgt Procedures
- Identified Network Gaps & Costs of Participation

The Subcommittee on Ground Water of The Advisory Committee on Water Information

National Ground-Water Monitoring Network— Results of Pilot Studies



September 2011

Pilot Conclusions

- A collaborative NGWMN is feasible.
- Pilot states record data differently and use different database platforms, but most “minimum data elements” are available.
- Incremental costs of incorporating data from existing state monitoring systems are low. Existing monitoring will not fill all data gaps.
- **The NGWMN Internet data portal is a key element to the success of a NGWMN**

Pilots Benefitted from:

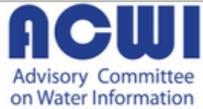
- Single, consistent dataset for shared interstate GW resources
- Data sharing among state agencies
- Critical review of procedures:
 - Field data collection
 - Data management
- Raised awareness for GW monitoring

Side Trip – Advice for Open Data Initiative from NGWMN Efforts

- “Walk Before Running”
- Learning from Other Countries
- Inclusive Standards & Procedures
- USGS CIDA – Serving Others beyond USGS
- Pilot-Testing Value
- Data-Owners Retain Data-Ownership
- Web Portal Transferability

→ Segue to Network Portal

NGWMN Data Portal



National Ground-Water Monitoring Network

The **National Ground-Water Monitoring Network (NGWMN)** is a compilation of selected groundwater monitoring wells from Federal, State, and local groundwater monitoring networks across the nation.

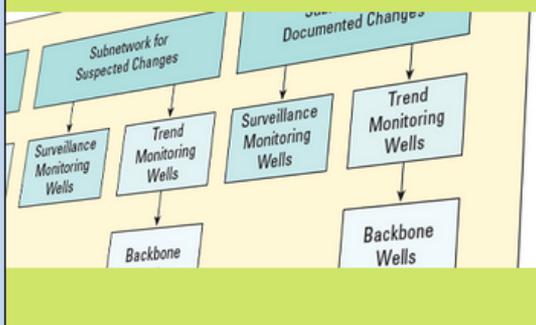
The **NGWMN** is a product of the [Subcommittee on Groundwater](#) of the Federal Advisory Committee on Water Information ([ACWI](#)).

The **NGWMN Data Portal** provides access to groundwater data from multiple, dispersed databases in a web-based mapping application. The portal contains current and historical data including water levels, water quality, lithology, and well construction. The NGWMN is transitioning from a pilot phase into full implementation. In the future we will be adding additional data providers to the network.

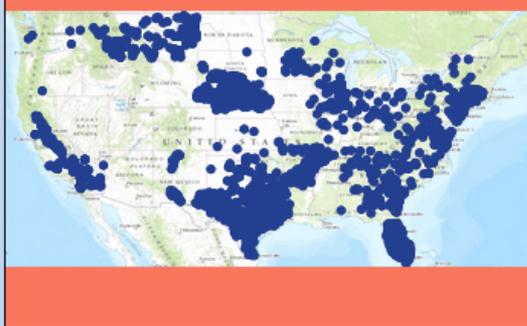
NETWORK STATUS:

- 3023 wells
- 29 states
- 48 Principal Aquifers
- 4,587,063 Water Levels
- 215,912 Water Quality Samples

LEARN about the Network



EXPLORE the Network



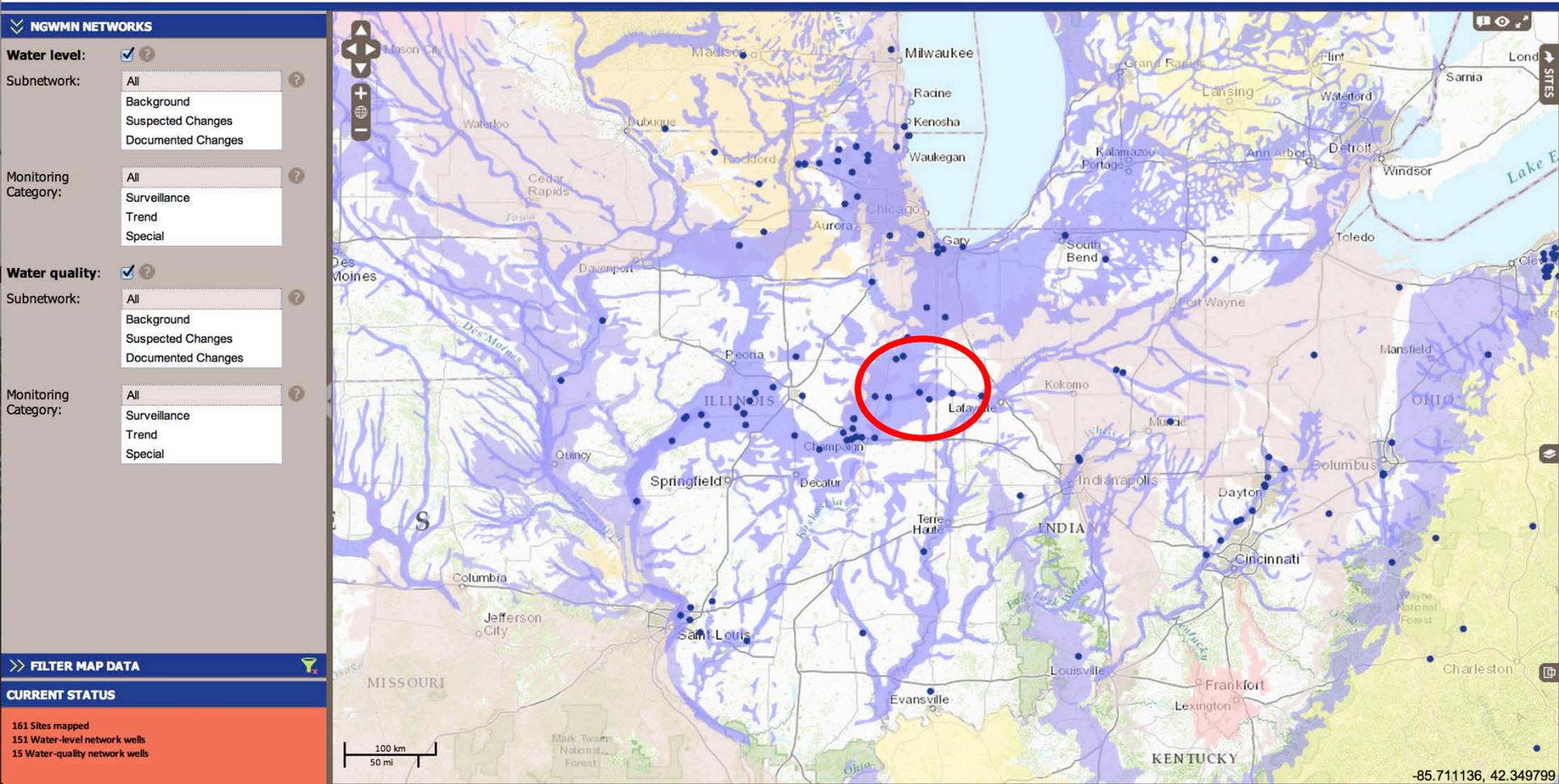
Distributed Architecture

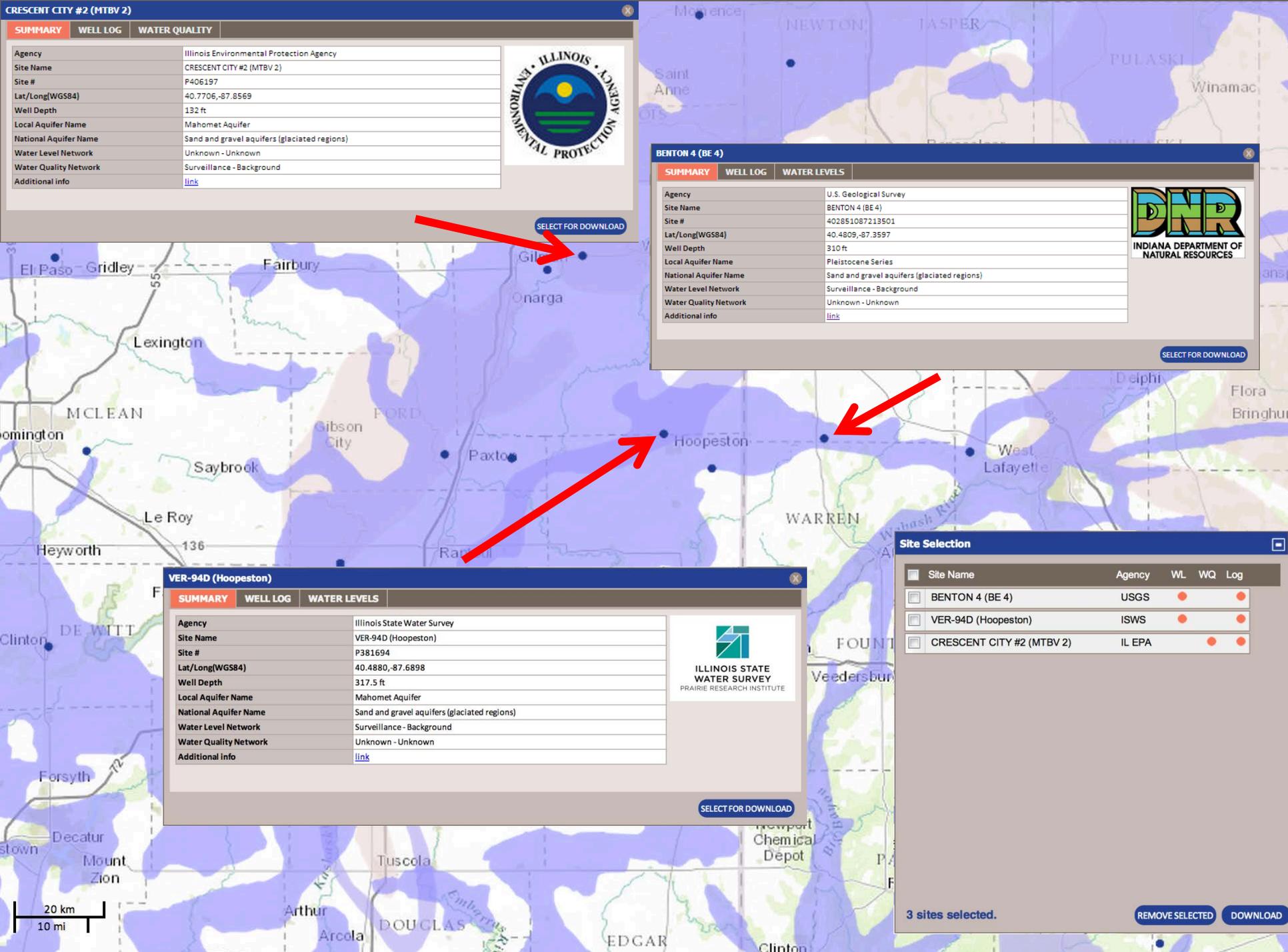


Illinois-Indiana Example



National Ground-Water Monitoring Network





CRESCENT CITY #2 (MTBV 2)

SUMMARY	WELL LOG	WATER QUALITY
Agency	Illinois Environmental Protection Agency	
Site Name	CRESCENT CITY #2 (MTBV 2)	
Site #	P406197	
Lat/Long(WGS84)	40.7706, -87.8569	
Well Depth	132 ft	
Local Aquifer Name	Mahomet Aquifer	
National Aquifer Name	Sand and gravel aquifers (glaciated regions)	
Water Level Network	Unknown - Unknown	
Water Quality Network	Surveillance - Background	
Additional info	link	



[SELECT FOR DOWNLOAD](#)

BENTON 4 (BE 4)

SUMMARY	WELL LOG	WATER LEVELS
Agency	U.S. Geological Survey	
Site Name	BENTON 4 (BE 4)	
Site #	402851087213501	
Lat/Long(WGS84)	40.4809, -87.3597	
Well Depth	310 ft	
Local Aquifer Name	Pleistocene Series	
National Aquifer Name	Sand and gravel aquifers (glaciated regions)	
Water Level Network	Surveillance - Background	
Water Quality Network	Unknown - Unknown	
Additional info	link	



[SELECT FOR DOWNLOAD](#)

VER-94D (Hoopeston)

SUMMARY	WELL LOG	WATER LEVELS
Agency	Illinois State Water Survey	
Site Name	VER-94D (Hoopeston)	
Site #	P381694	
Lat/Long(WGS84)	40.4880, -87.6898	
Well Depth	317.5 ft	
Local Aquifer Name	Mahomet Aquifer	
National Aquifer Name	Sand and gravel aquifers (glaciated regions)	
Water Level Network	Surveillance - Background	
Water Quality Network	Unknown - Unknown	
Additional info	link	



[SELECT FOR DOWNLOAD](#)

Site Selection

Site Name	Agency	WL	WQ	Log
<input type="checkbox"/> BENTON 4 (BE 4)	USGS	●	●	●
<input type="checkbox"/> VER-94D (Hoopeston)	ISWS	●	●	●
<input type="checkbox"/> CRESCENT CITY #2 (MTBV 2)	IL EPA	●	●	●

3 sites selected.

[REMOVE SELECTED](#) [DOWNLOAD](#)

Methods of Site Selection

The screenshot displays the NGWMN website interface with several filtering menus highlighted by red circles:

- NGWMN NETWORKS** (Left sidebar menu)
- State and County** (Dropdown menu with options: Multiple states, One state, multiple counties; and a list of states: ALABAMA, ARKANSAS, CALIFORNIA, CONNECTICUT, FLORIDA, GEORGIA)
- Contributing Agency** (Dropdown menu with options: Illinois Environmental Protection Agency, Illinois State Water Survey, Minnesota Department of Natural Resources, Minnesota Pollution Control Agency, Montana Bureau of Mines and Geology, Texas Water Development Board, U.S. Geological Survey)
- Principal Aquifer** (Dropdown menu with options: Ada-Vamoosa aquifer, Alluvial aquifers, Arbuckle-Simpson aquifer, Basin and Range basin-fill aquifers, Biscayne aquifer, California Coastal Basin aquifers, Cambrian-Ordovician aquifer system, Castle Hayne aquifer, Central Oklahoma aquifer, Central Valley aquifer system, Coastal lowlands aquifer system, Columbia Plateau basaltic-rock aquifers)
- Available Data** (Menu with icons for Water Level, Water Quality, and Well Log)

At the bottom left, a 'FILTER MAP DATA' section shows the current status:

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

The background features a map of the United States with numerous blue dots representing monitoring sites, and labels for geographical features like the Rocky Mountains, Gulf of Mexico, and Atlantic Ocean.

NGWMN NETWORKS

Water level: ?

Subnetwork: **All**

- Background
- Suspected Changes
- Known Changes

Monitoring Category: **All**

- Surveillance
- Trend
- Special

Water quality: ?

Subnetwork: **All**

- Background
- Suspected Changes
- Known Changes

Monitoring Category: **All**

- Surveillance
- Trend
- Special

FILTER MAP DATA

Principal Aquifer

Available Data

Water Level **Water Quality** **Well Log**

TIPPECANOE 17 (TC 17)

SUMMARY WELL LOG WATER LEVELS WATER QUALITY

Agency: U.S. Geological Survey (National Water Information System)

Site Name: TIPPECANOE 17 (TC 17)

Site #: 402734087033401

Lat/Long(WGS84): 40.4595, -87.0595

Well Depth: 212.54 ft

Local Aquifer Name: Outwash

National Aquifer Name: Sand and gravel aquifers (glaciated regions)

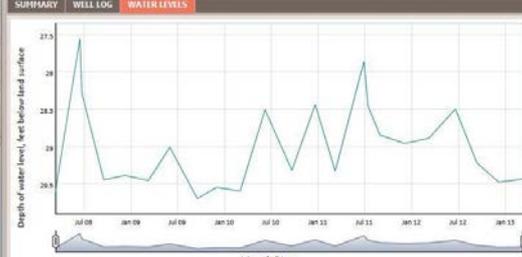
Water Level Network: Surveillance - Background

INDIANA DEPARTMENT OF NATURAL RESOURCES

SELECT FOR DOWNLOAD

BIG SPRING FISH HATCHERY - WELL FWPL-06

SUMMARY WELL LOG WATER LEVELS



SELECT FOR DOWNLOAD

SMITH AL

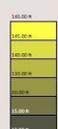
SUMMARY WELL LOG WATER LEVELS

Longitude: 47.3237

Latitude: -106.9149

Elevation: 2630.00 ft.

Well Depth: 145.00 ft.



Depth From (ft)	Depth To (ft)	Lithology	Description
140.00	145.00	CLAY	CLAY
110.00	140.00	SAND	SAND
20.00	110.00	SHALE	SHALE
15.00	20.00	COAL	COAL
12.00	15.00	ROCK	ROCK
0.00	12.00	SAND	SAND

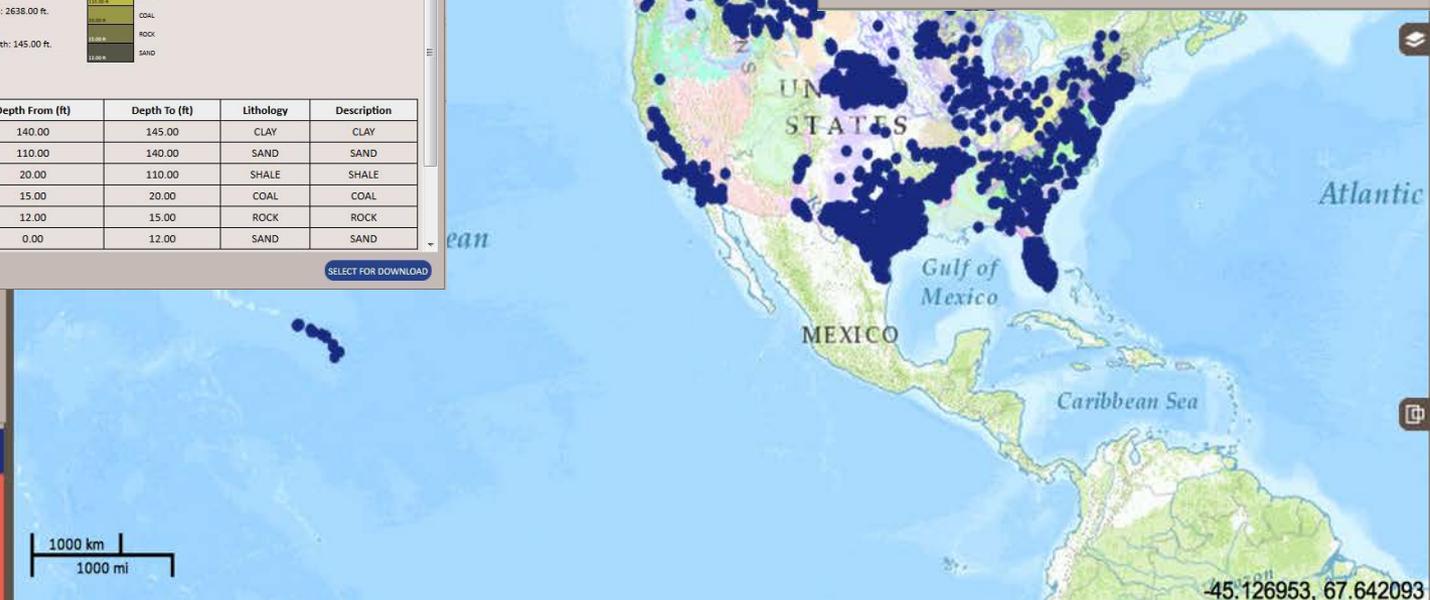
SELECT FOR DOWNLOAD

Site Selection

Site Name	Agency	WL	WQ	Log
<input type="checkbox"/> BENTON 4 (BE 4)	USGS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> VER-94D (Hoopeston)	ISWS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> CRESCENT CITY #2 (MTBV 2)	IL EPA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> SMITH AL	MBMG	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> GRANT 10 (GT 10)	USGS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> MPCA Ambient Network Site 1152	MPCA	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 66018	MN DNR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

7 sites selected.

REMOVE SELECTED DOWNLOAD



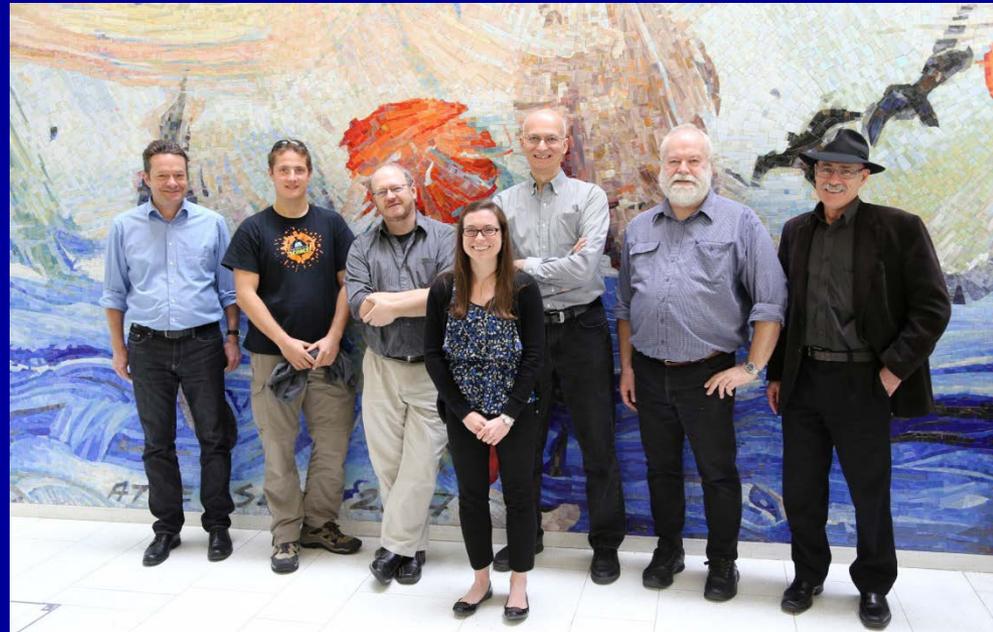
CURRENT STATUS

3022 Sites mapped

2806 Water-level network wells

Groundwater Data Standards

- GWML2 in development (4 packages)
 - main, groundwater flow, groundwater well and groundwater constituent
- Groundwater Interoperability Experiment 2
- 5 Use Cases:
 - Commercial
 - Policy
 - Environmental
 - Scientific
 - Technologic



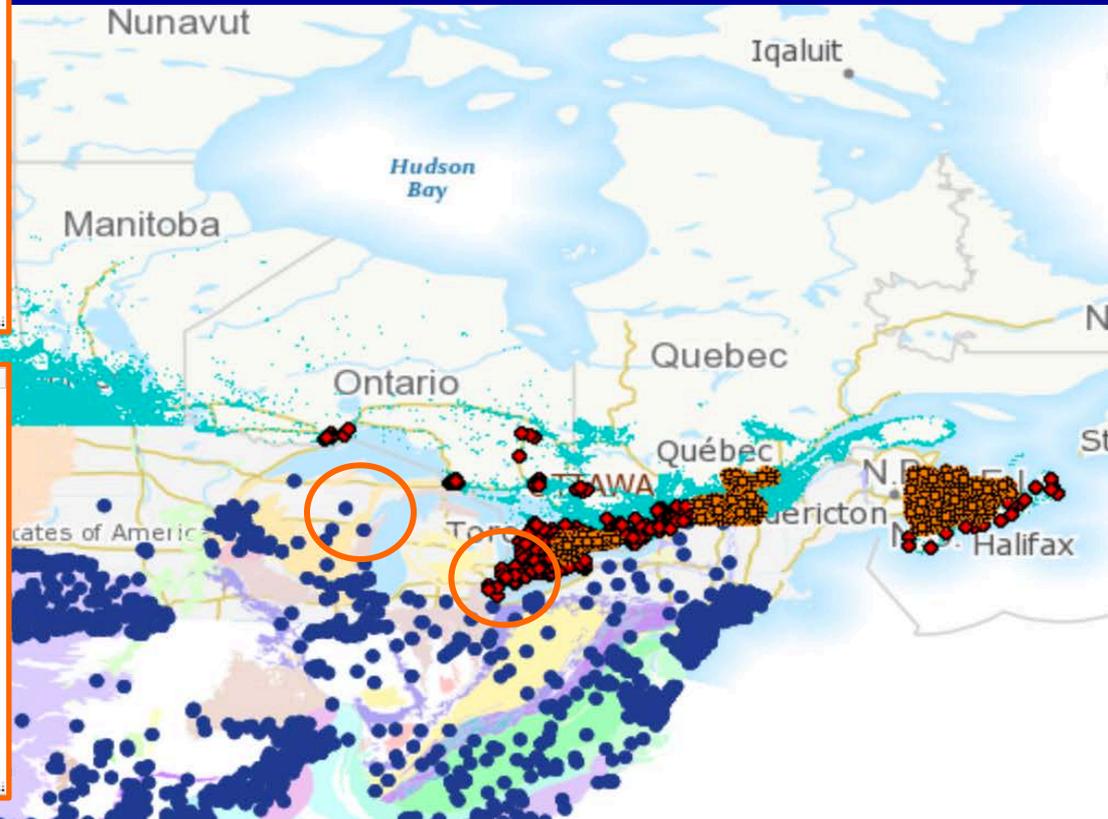
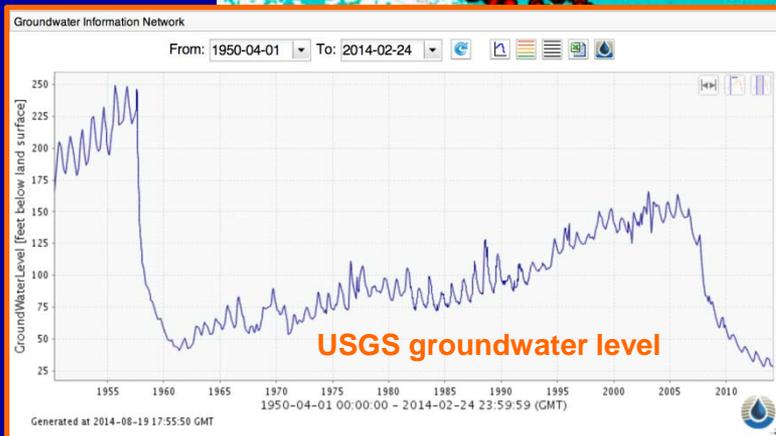
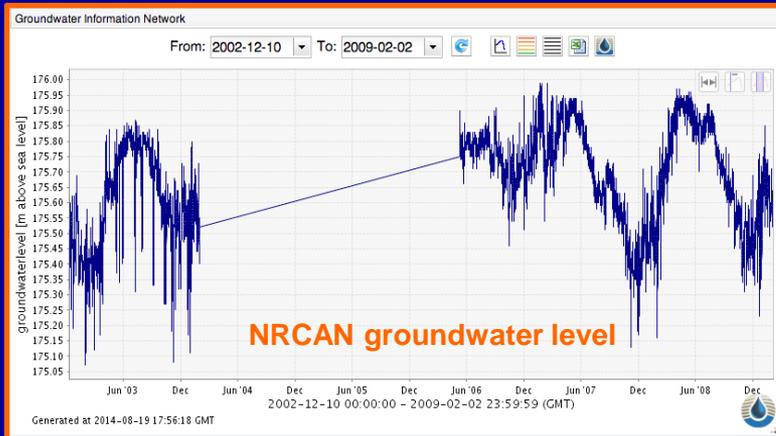
From left to right: Bernhard Wagner (GSG), Alex Kmoch (U Salzburg), Eric Boisvert (NRCAN), Jessica Lucido (USGS), Boyan Brodaric (NRCAN), Peter Dahlhaus (FedUni), Bruce Simmons (CSIRO)

International Coordination

Data Interoperability

CAN: water wells (NRCAN); groundwater levels

USA: water wells (USGS); groundwater levels



Water Quality Pilots

- Water quality is an important part of ground-water availability
- Several initial NGWMN pilots included water quality, but limited or absent in others
- US EPA stepped forward to develop new Water Quality Pilots by providing analytical services



EPA Regional Laboratories Support

- **Basis:**
 - Wells selected fit Framework well categories
 - Analytes fit Framework criteria
 - States may not have analytical capability yet
- **Initial Analytical Support to States:**
 - For some contaminants, states not ready to analyze
 - Providing interim support during early phases
 - Within Regional budgeted resources and capacity
 - Enables NGWMN to start and provide states time necessary to arrange permanent analytical support

States Seeking EPA Lab Support for NGWMN Samples

- Ongoing (Began in FY2014)
 - Utah Pilot – 3 rounds of testing done through EPA Region 8 (Denver)
 - New England Pilot (MA, NH) – First Round planned September 2014 through EPA Region 1 (Boston)
 - Future
 - Delaware – Proposed to join in Water Quality pilot through EPA Region 3 (Philadelphia)
- Segue to Implementation



Implementation Next Steps, FY15+

Pending available resources

- SOGW will solicit new data providers and initiate the “**National Program Board.**”
- National Program Board will begin to identify “backbone” sites and assess “data gaps”.
- USGS will initiate cooperative agreements to help support data providers
- NGWMN portal capabilities will expand with new data providers
- Pilot program for EPA analytical services will expand
- USGS will incorporate remaining USGS water-level sites, and add water-quality sites

Network Implementation: *Recommended Management Structure*

Management of the National Ground-Water Monitoring Network (NGWMN)

Data Providers

[Networks and Individual Sites That Meet NGWMN Criteria]

Federal

State

Tribal

Regional

Local

Other

Advisory Committee on Water Information
Subcommittee on Ground Water

[Federal Interface]

U.S. Geological Survey
Management and Operations Group

[Day-to-day operations]

NGWMN Program Board
[Representatives from Data Providers]

[Guidance and Direction]

Program Board Implementation

Balancing Act – Funding Priorities

- Support for existing versus new participants
 - How to support for “spin up” costs while maintaining long-term monitoring?
- Add new wells or increase frequency?
- Water levels versus water quality?
- Drilling?
- Innovative methods?

Terms of Reference (TOR)

- Current TOR – develop Framework & NGWMN
- Framework – SOGW key implementation role(s)
- Proposed TOR – allow SOGW to help guide implementation of the NGWMN
- SOGW requests approval of TOR edits submitted to ACWI on August 19, 2014.

Contact Information

- Weblinks:
 - SOGW: www.acwi.gov/sogw
 - Web portal: Contact SOGW Co-Chairs
- SOGW Co-Chairs:
 - Bob Schreiber: schreiberrp@cdmsmith.com
 - Bill Cunningham: wcunning@usgs.gov
- SOGW Executive Secretary:
 - Searching right now for replacement

Questions/Discussion