

Status Report from the Subcommittee on Ground Water

Presentation to the Advisory Committee on Water Information
on the
National Ground Water Monitoring Program
July 13, 2010

Representing SOGW
And SOGW Sub-Groups

Several participants present today



Briefing Outline

- Topics from Today
- Subcommittee History and Products
- Pilot Studies
- Portal Plans
- Challenges for ACWI & SOGW

Acknowledgments

- Anne Castle – today’s introduction
- Matt Larsen – USGS efforts & support
- ACWI – approvals & encouragement
- NWQMC – interaction & continued help
- Participants here today:
 - Member orgs & participants
 - “Volunteer” speakers (Daryll Pope & Nate Booth)
 - Calling on others
- Special thanks: Chuck Spooner & Gail Mallard

Focus Items from A.M. Session

- Water SMART & Water Census
- Incentives for States, Tribes, Districts, etc.
- Cooperation between:
 - Organizations
 - Sectors
 - Competing entities
- Sharing of data effectively

“Ask not what

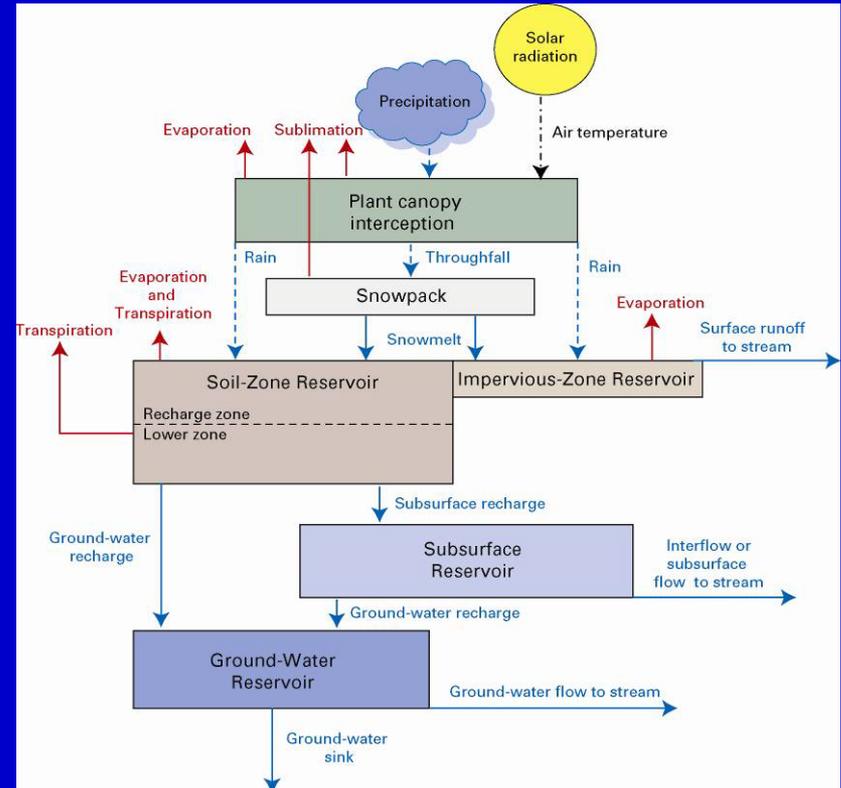
- At the end of our session today:
 - Challenges we face
 - How can you help?
 - What creative approaches exist?

Paraphrasing: “Ask what the Network can do for you AND ask what you can do for the Network!”

Comprehensive Water Monitoring

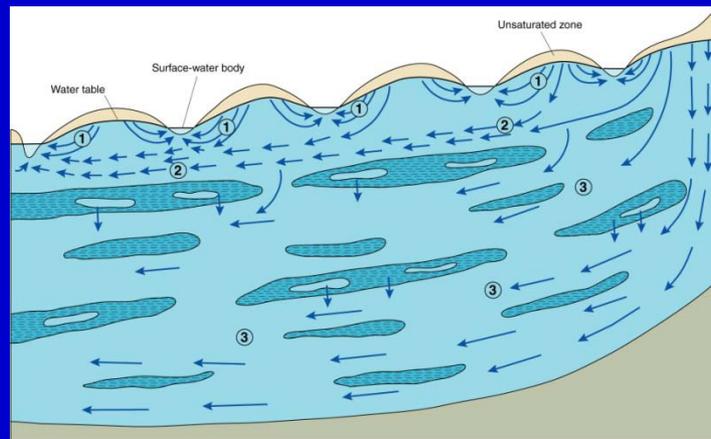
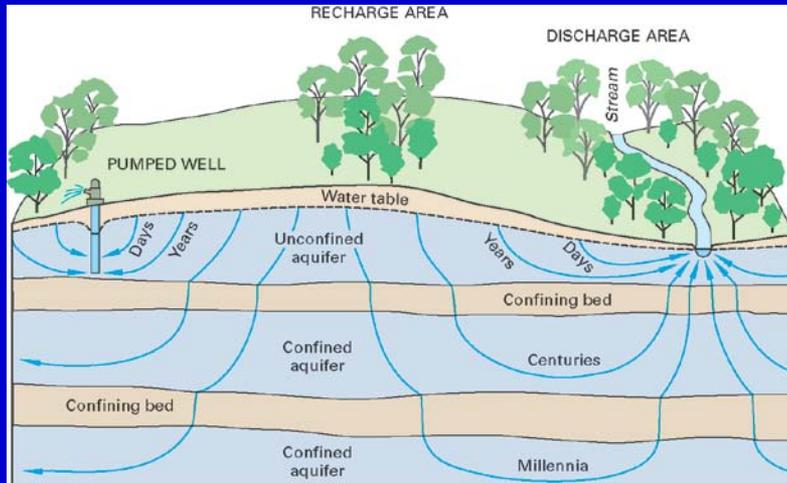
One step toward a long-term goal of “one place for water data”

- Atmospheric water
- Unsaturated Zone
- Surface-water discharge
- Surface-water quality (NWQMC)
- Ground-water levels (SOGW)
- Ground-water quality (NWQMC & SOGW)



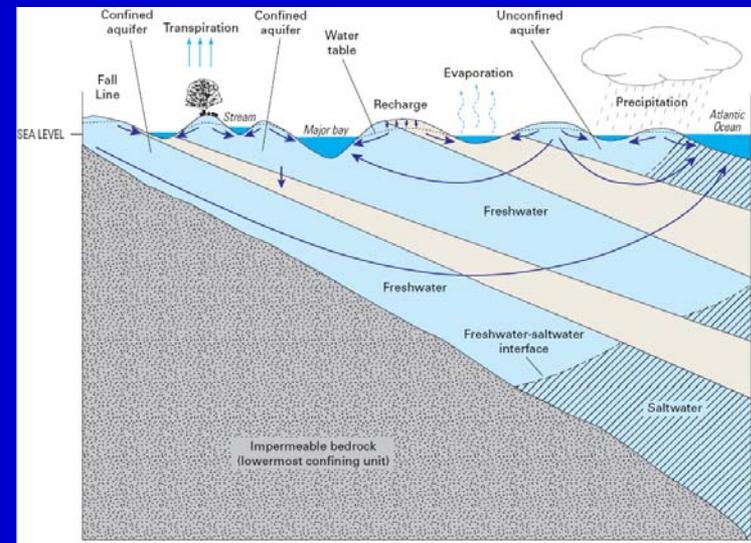
Special Aspects of Ground Water

- Spatial
- Temporal
- Geochemical



EXPLANATION

- | | |
|-------------------------------------------|--------------------------------------|
| High hydraulic-conductivity aquifer | ① Local ground-water subsystem |
| Low hydraulic-conductivity confining unit | ② Subregional ground-water subsystem |
| Very low hydraulic-conductivity bedrock | ③ Regional ground-water subsystem |
| Direction of ground-water flow | |



Not to scale

Modified from Leahy and Martin (1993)

EXPLANATION

- | | |
|--------------------------|----------------------------------------------|
| Aquifer | |
| Confining unit | |
| Ground-water flow paths— | Shows general direction of ground-water flow |

History of SOGW

NWQMC efforts in Ground-Water Quality Networks

- Ground Water people on NWQMC felt more GW effort needed.

Ground-Water Level Networks

- No national efforts for framework or data elements.

TIMELINE

January 2006:

- NGWA presentation to ACWI on report to OSTP about national GW monitoring network
- Initial ACWI “roundtable” discussion to form a GW subgroup

August 2006:

- Ad Hoc Steering Committee (SC) is formed

January 2007:

- ACWI establishes SOGW and gives them charge

January 2007- Present

- Bi-weekly conference calls; other Work Group efforts; two face-to-face meetings



History, continued

February 2009

- Framework for a National GW Monitoring Network approved by the ACWI

June 2009

- Framework Document Final

September 2009

- Request for Statements of Interest issued for Pilot Studies issued by SOGW

December 2009

- Five Pilots selected

January 2010 to present

- Initial “Kickoff” Conference call for Pilot Projects
- Pilots in progress

ACWI Charge to SOGW

Purpose: 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.

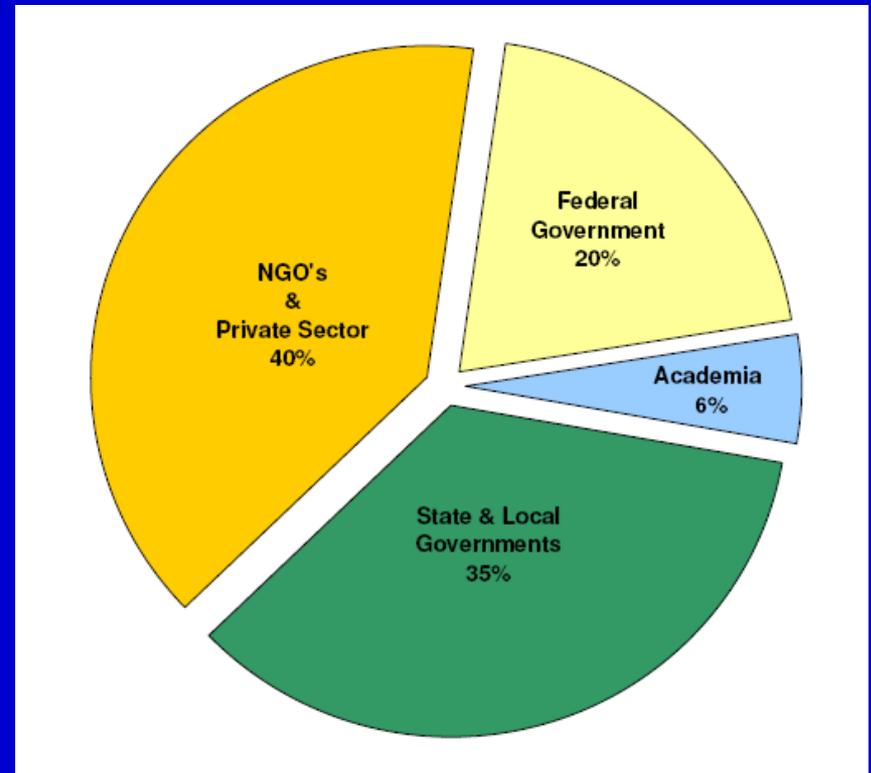
Scope: This national framework for ground-water monitoring and collaboration will be developed to assist in assessments of the quantity of U.S. ground-water reserves, as constrained by ground-water quality.

SOGW Members & Helping Hands

Subcommittee Members

- *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*
- *ASTM*

Subcommittee and Work Groups:
70 people from 54 organizations



SOGW Work Groups

**Subcommittee on
Ground Water**
Bob Schreiber, ACWI – ASCE
Bill Cunningham, USGS

Executive Secretary
Chris Reimer, NGWA

**GW Monitoring
Inventory
Work Group**

Quantity

Quality

**GW
Data Standards
and Data
Management
Work Group**
Chuck Job, USEPA
Scott Andres,
DE Geological Survey

**GW Field
Practices
Work Group**
Rod Sheets, USGS
Mike Nickolaus, GWPC

Quantity

Quality

**Pilot Oversight
Work Group**
Bill Cunningham, USGS

Pilot #1

Pilot #2

Pilot #3

Pilot #4

Pilot #5

Reports to ACWI

- **January 5, 2009 Draft Report completed**
- **Review Comments through January 30, 2009**
- **ACWI approval on February 11, 2009 (with suggested edits)**
- **Final Version June 2009**

**A National Framework for Ground-Water Monitoring
in the United States**

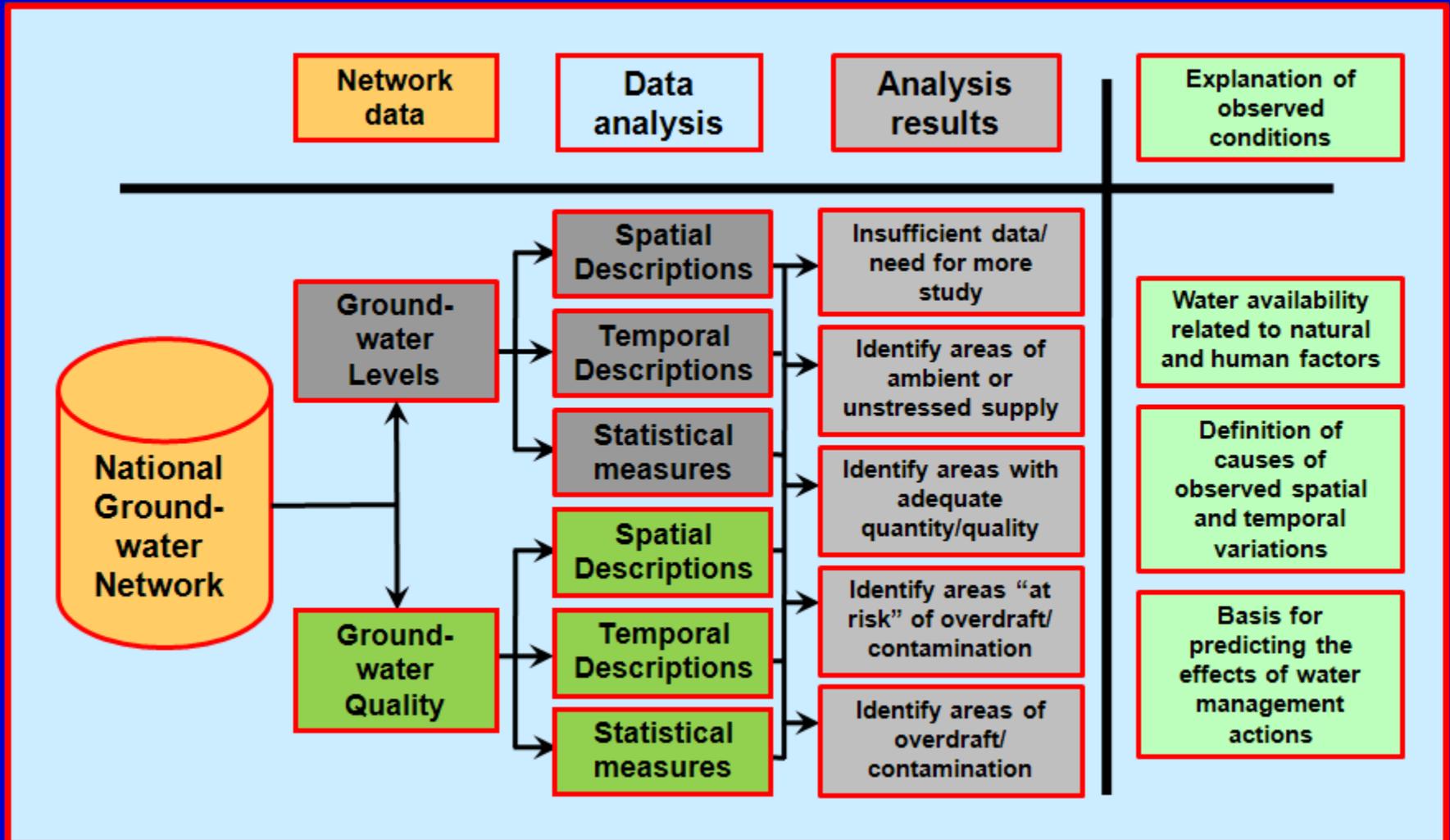
Prepared by

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

**Final Version approved by the Advisory Committee on Water Information
June 2009**

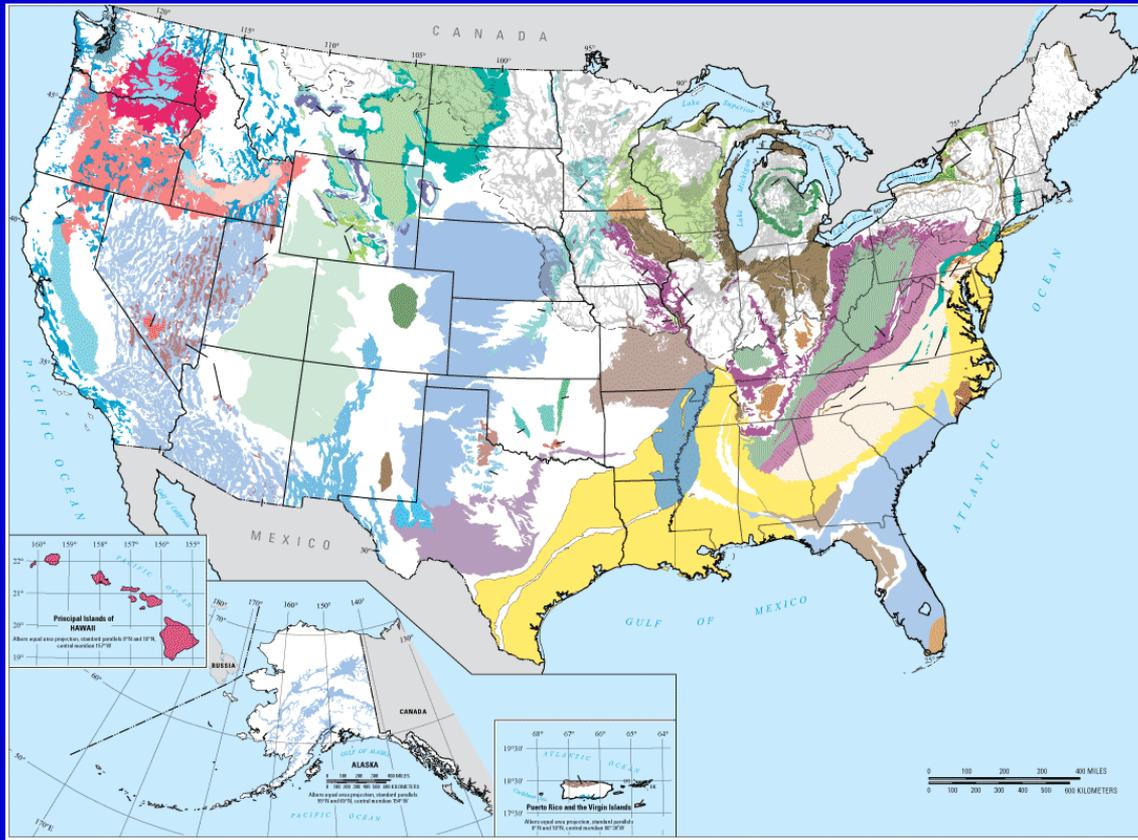
Chapter 3&4: Goals and Design

Relation between Levels and Quality



Chapter 3&4: Goals and Design

Principal and Major aquifers



GROUND WATER ATLAS OF THE UNITED STATES

U.S. Department of the Interior
U.S. Geological Survey

Chapter 3&4: Goals and Design

Types of Networks

Unstressed Subnetwork
(nonpumped or uncontaminated aquifers)

Baseline Period
(5 years of data)

Surveillance Monitoring Points
(Synoptic wells)

Trend Monitoring Points
(Backbone wells)

Special Studies
(Rare in this network)

Targeted Subnetwork
(affected aquifers)

Baseline Period
(5 years of data)

Surveillance Monitoring Points
(Synoptic wells)

Trend Monitoring Points
(Backbone wells)

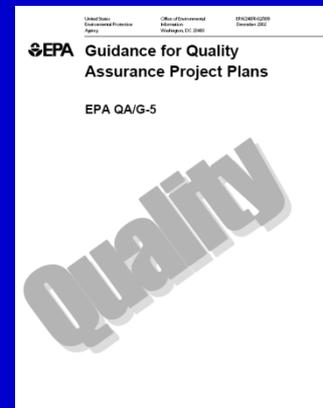
Special Studies

EXPLANATION

-  At least 5 years of data are collected to establish background conditions
-  Periodic census of ground-water levels and/or quality (i.e., "mass measurements" for potentiometric surface mapping)
-  Fewer wells monitored regularly (i.e., seasonal variability of water levels and/or quality)
-  Smaller areas to evaluate ground-water resources at risk of depletion or impairment

Chapter 5: Field Practices

- No strict requirements on specific aspects of individual data-collection programs used by NGWMN data providers---flexible and adaptable.
- Requires adequate documentation of techniques in order to ensure comparability of data and to assure quality in ground-water measurement and sampling activities.
- New technologies will be incorporated into the NGWMN as appropriate.



Chapter 6: Data Standards and Management

- Minimum Data Elements for wells and measurements are provided
- Minimum Data Elements coordinated with Methods Board
- A “Network Portal” is the most critical component, and needed early in the process
 - Existing systems evaluated included WQX/STORET, WQX/NWIS Web Services, NWISWeb, and CUASHI-HIS

Chapter 7:

Implementation/Recommendations

- 1. Establish a National Ground-Water Monitoring Network, according to the design-parameters in the Framework Document**
- 2. Explore and facilitate Federal funding opportunities, cooperative agreements, and any and all feasible options to help support the Network**
- 3. Initiate Pilot Projects**

Why Pilot Projects?

- Test the concepts and produce information to evaluate the costs and technical feasibility of the NGWMN
- Improve the “Framework Document” of the NGWMN
- Use this information in the **Implementation Phase** of the National Ground Water Monitoring Network

Pilot Candidates: Casting a Wide Net

- Request for “Statements of Interest” released September 14, 2009
- National Webinar held October 6, 2009
- No promise of funding!
- SOGW Fixed Maximum Pilots = 5
 - Variation in scales
 - Strong and weak coordination
 - Multi-state or other multiple aquifer/stakeholder situation
 - Consider “issue focused” selection such as SW-GW interaction or saltwater intrusion

Pilots: Selecting the Pilots

- Prior to receiving Statements of Interest, the WG created scoring criteria based on the key elements of the RSOI
- Preference toward covering different types of monitoring programs: Multi-state, strong collaboration, and weak collaboration
- SOI's were scored and ranked. Nine strong SOI's were received

Pilot Selection Committee

- Committee included representatives from the SOGW with long-term involvement in the process

Federal Government	State Organizations	Professional Organizations
USEPA	AASG	NGWA
USGS	ASDWA	ASCE
	GWPC	

- 5 Pilots Selected. Selections approved by SOGW on December 7, 2010

Pilot Timeline

October 30, 2009	SOI due
Mid-December, 2009	Pilot Projects selected
January 1, 2010	Pilots Projects begin
December 31, 2010	Pilot Project reports due
March 31, 2011	SOGW Pilot Project synthesis due
March 31, 2011	USGS summary report due

USGS Responsibilities

- Prototype Portal development
- Coordination with Pilot projects
- Provide limited staff support for inventories of Pilot Project data holdings and participate in analyses of data management issues
- Coordinate work related to refining the network design for national issues and will work with Pilot Project partners on study area issues

SOGW Responsibilities

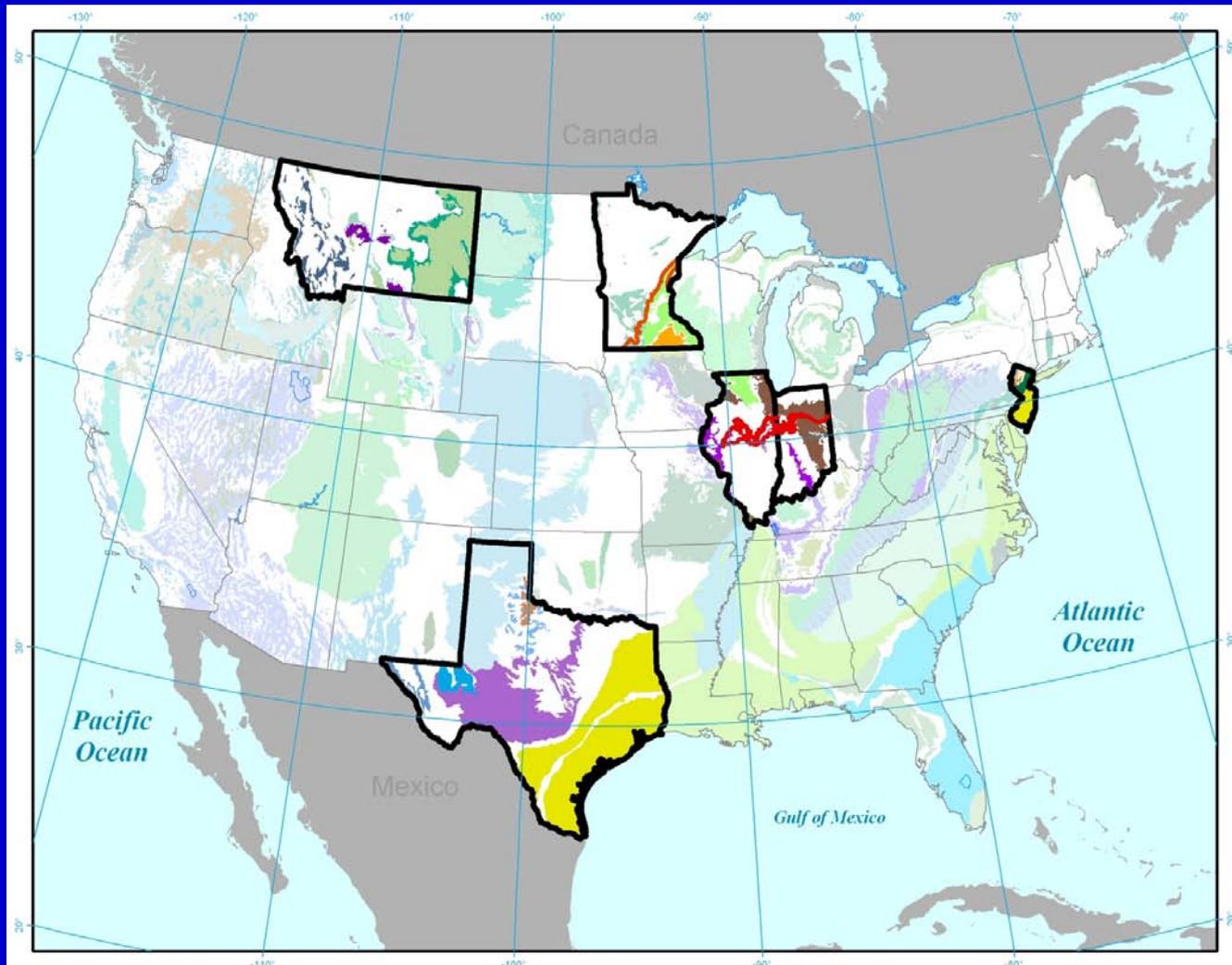
Report

- As necessary, revise the Framework Document “*A National Framework for Ground-Water Monitoring in the United States*”
- Complete a synthesis report summarizing the pilot studies

Pilot Status

- Daryll Pope

National Ground Water Monitoring Network Pilot Projects



Summary of Pilot Tasks

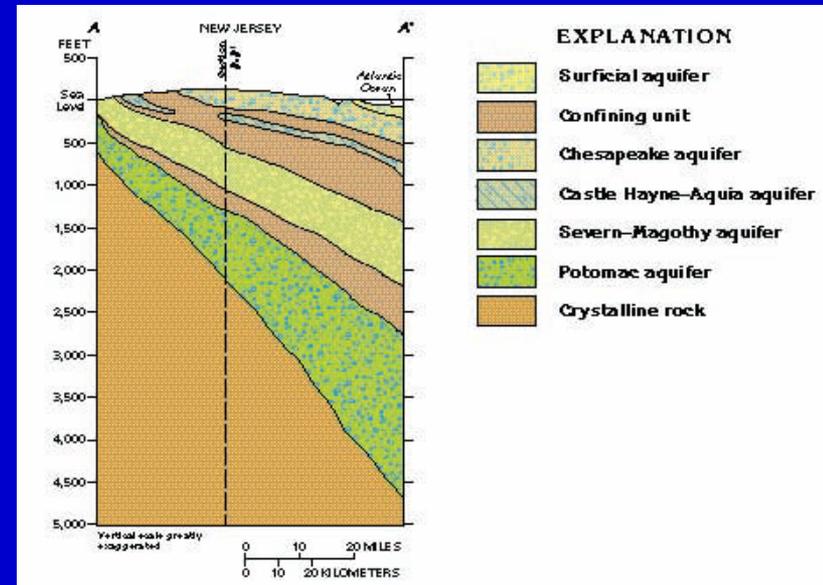
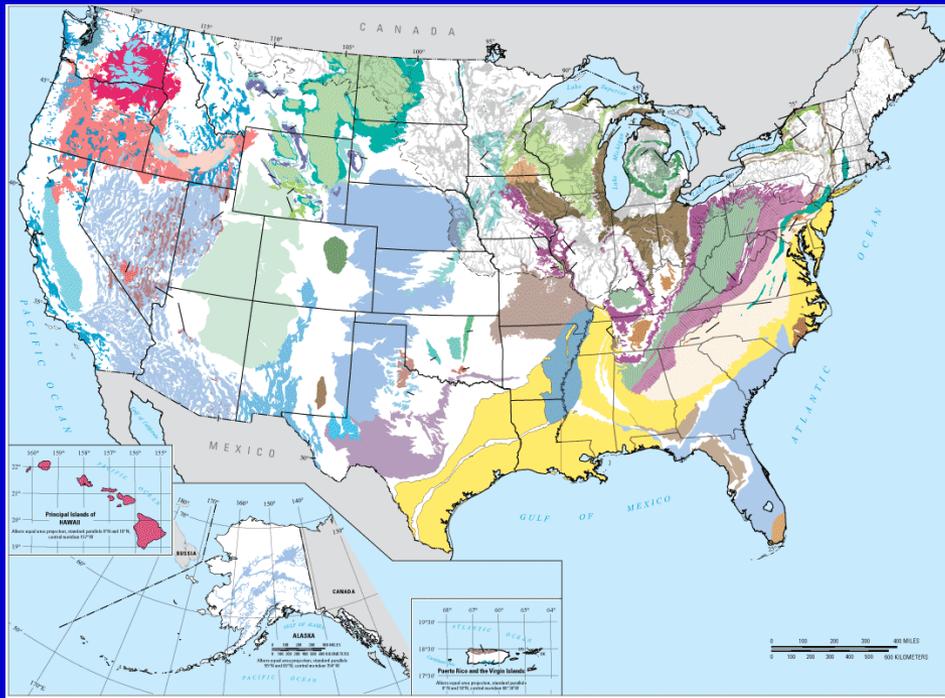
- Evaluate the network within the concepts in “Framework for a Nationwide Ground Water Monitoring Network”
 - **Select aquifers, well characteristics, frequency, analytes, “flagging”, 3D spatial distribution**
- Evaluate field practices, data elements stored in the GW database, and data management procedures and their documentation,
- Evaluate ability to transmit data to the data portal
- Identify all costs of potential participation in the NGWMN
- Report on the results of the Pilot

Pilot “Kickoff” Conference Call

- “Kickoff” call held on January 28, 2010. All Pilots represented.
- Pilot states expressed genuine enthusiasm for the project
- Expectations expressed included
 - Evaluating their own networks
 - Identifying data gaps
 - Working with their neighboring states
 - Contributing to a National need
 - Making their data more available to the public
- Volunteer Effort

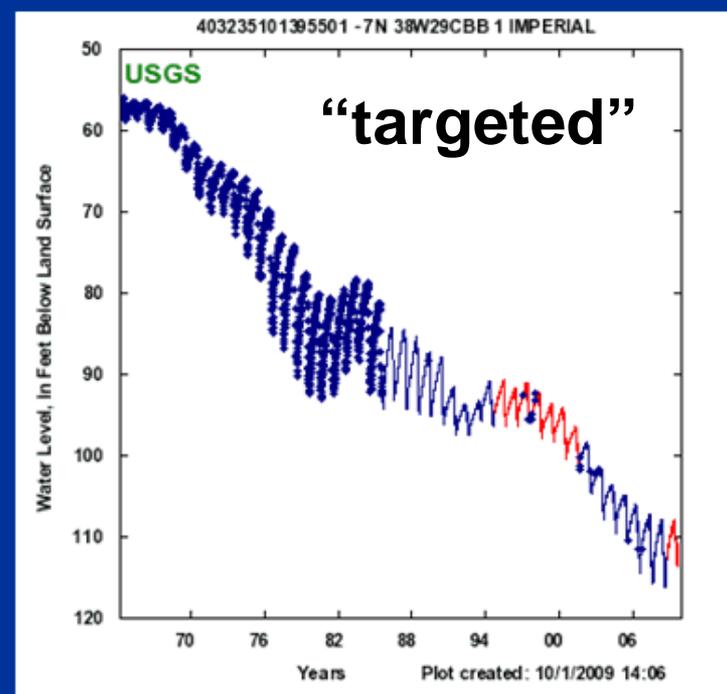
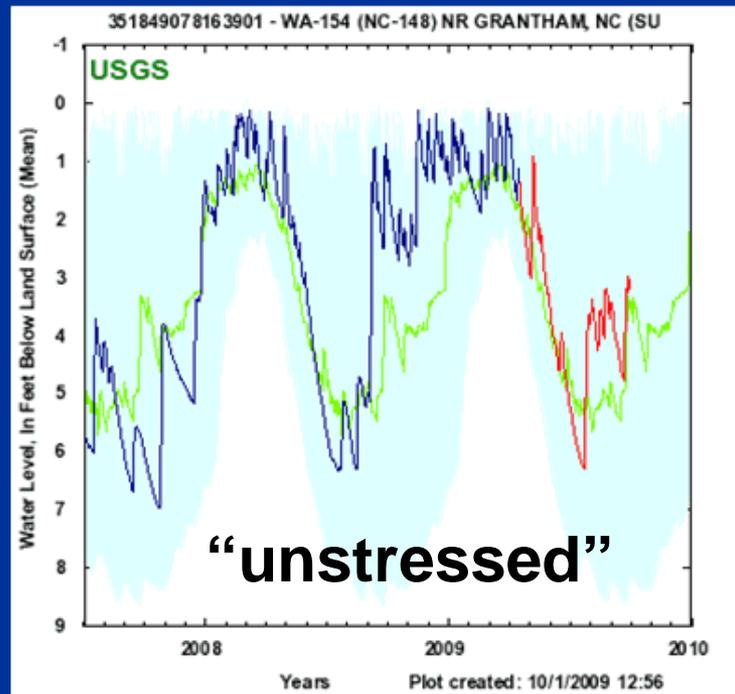
Pilot Tasks: Network Evaluation

- Evaluate potential monitoring points within each principal, major or other important aquifer for potential inclusion in the NGWMN



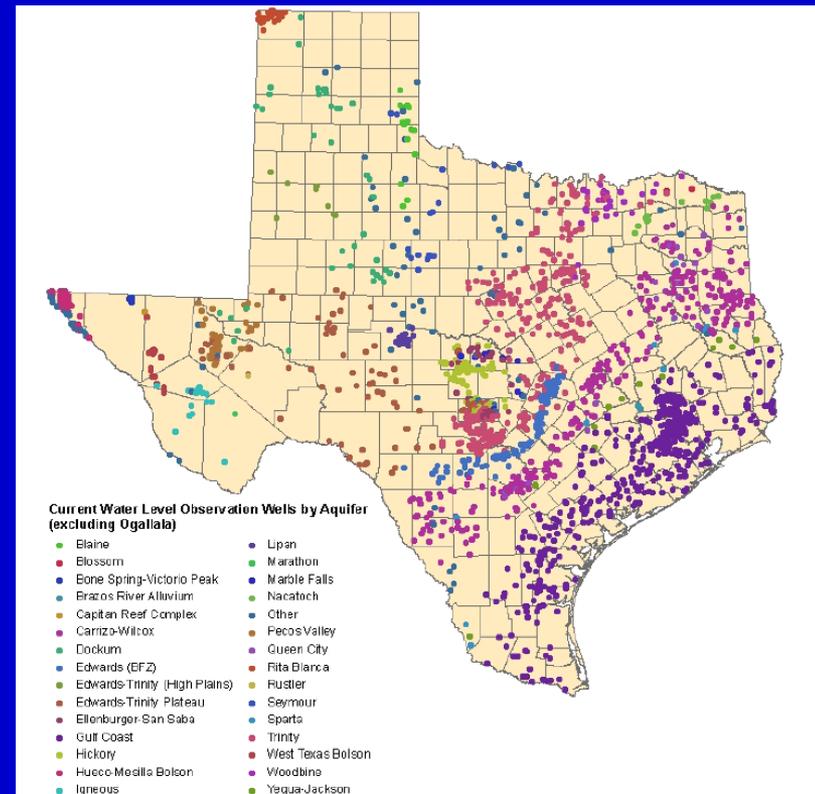
Pilot Tasks: Network Evaluation

- “Flag” all or a subset of proposed monitoring points as meeting NGWMN’s “targeted” or “unstressed” subnetwork design criteria



Pilot Tasks: Network Evaluation

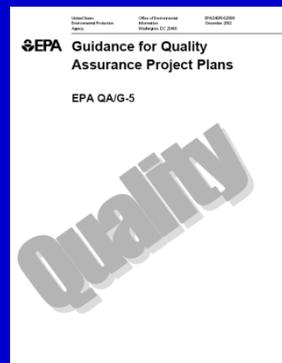
- Identify data gaps
 - Spatial gaps
 - Well characteristics
 - Frequency of water-level measurement
 - Frequency of sampling
 - Analyte lists



Pilot Tasks: Network Evaluation

Field Practices

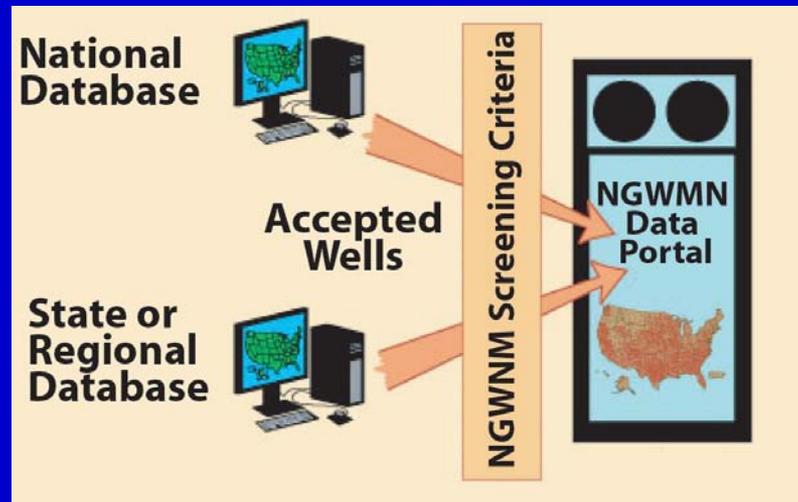
- Determine whether the data provider's field practices meet NGWMN criteria and what changes may be required
- Evaluate the documentation of the field procedures



Pilot Tasks: Data Management

Data Management

- Determine whether the data management standards meet the NGWMN criteria
- Evaluate data storage in comparison to the minimum data elements in Appendix 5
- Evaluate ability to interface with a NGWMN data portal



Pilot Tasks: Interface with Data Portal group

- Work with Portal group to determine how to get data for portal
- Ideally will be through web services
- Determine how to map fields in pilot databases to Portal database

Pilot Tasks: Pilot Report

Pilots will complete a report on their work by December.

A report template/outline was provided to the Pilots this spring

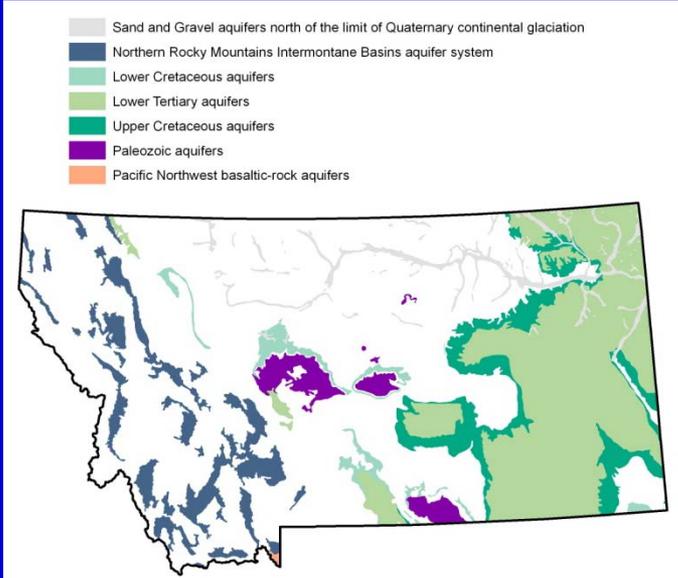
Several pilots have already begun working on writing sections of the report. We have found it useful to discuss these at our monthly calls and hope this will continue

Pilot Tasks: Cost Estimates

Identify “Ballpark” Costs for:

- Pilot participation
- Operation and management of NGWMN wells
- Interface with data portal
- Capital and O&M needed to fill data gaps
 - Spatial gaps, by aquifer
 - Temporal gaps in water-level measurement and water-quality sampling
 - Analyte gaps

Montana



- **Statewide Principal Aquifers**
 - Sand and gravel aquifers
 - Upper Tertiary,
 - Lower Tertiary,
 - Northern Rocky Mountains Intermontane Basins,
 - Pacific Northwest basaltic rock,
 - Upper Cretaceous,
 - Lower Cretaceous,
 - Paleozoic aquifer systems
- **Primary Agency**
 - Montana Bureau of Mines and Geology
- **Pilot Leader**
 - Tom Patton: Senior Research Hydrogeologist and Program Leader
- **Pool of Candidate Wells**
 - More than 900 wells

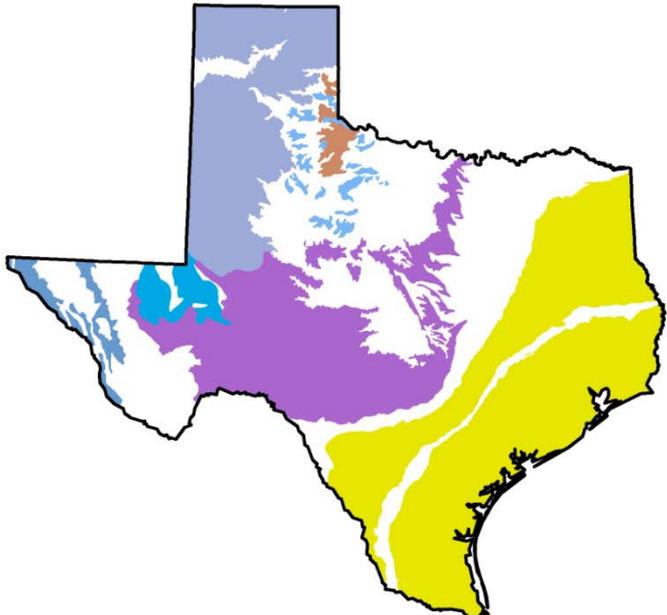
Montana Status

Using conceptual model of flow to select wells

- **Monitoring Point Selection**
 - Nearly completed
 - Cross-sections through intermontane basins from Recharge-discharge
- **Categorizing wells**
 - On track
- **Field practices**
 - Well documented practices that generally meet standards
- **Data management**
 - Well documented practices that generally meet standards
- **Data gaps**
 - Some field practices and database issues have been documented
- **Data portal**
 - Able to make database changes as needed
 - Planning on setting up web services to provide data to the Portal

Texas

- Rio Grande aquifer system
- High Plains aquifer (not included in Pilot)
- Pecos River Basin alluvial aquifer
- Seymour aquifer
- Coastal lowlands aquifer system
- Texas coastal uplands aquifer system
- Edwards-Trinity aquifer system
- Blaine aquifer



Principal/Major Aquifers

- Edwards-Trinity aquifer system,
 - 6 major subunits
- Seymour aquifer,
- Blaine aquifer,
- Pecos River Basin alluvial aquifer,
- Coastal lowlands aquifer system,
- Texas coastal uplands aquifer system,
- Rio Grande aquifer system

• Primary Agencies

- Texas Water Development Board (TWDB)
- Texas Commission on Env. Quality

• Pilot Leader

- Janie Hopkins, Groundwater Monitoring Section Manager, TWDB

• Pool of Candidate Wells

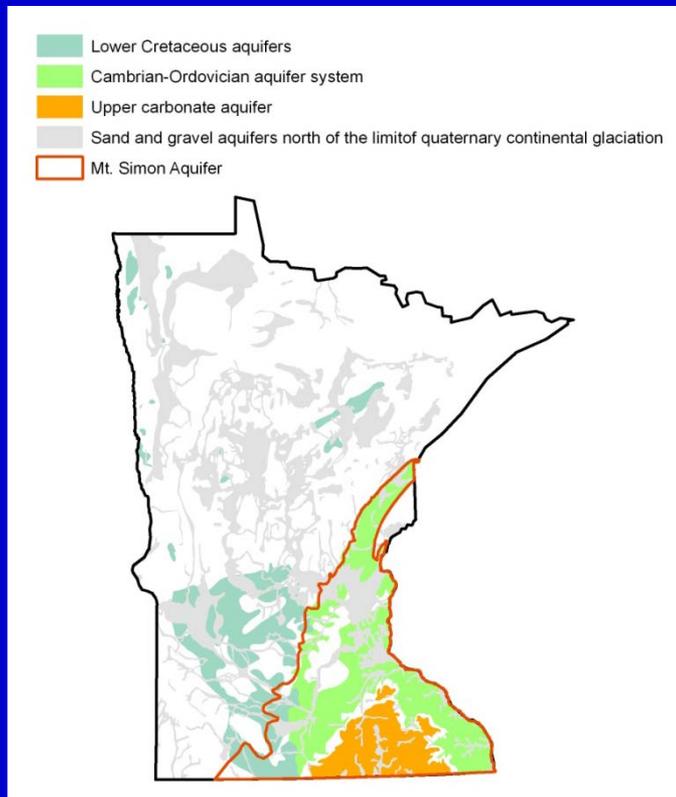
- About 7,000 wells in the Texas monitoring Program

Texas Status

Lots of candidate wells, multiple data sources

- **Monitoring Point Selection**
 - Nearly completed with Chorizo-Wilcox
 - Ready to start on next aquifer
- **Categorizing wells**
 - Categorizing as wells are selected for each aquifer
- **Field practices**
 - Generally match
- **Data management**
 - Generally match
 - Some database changes coming
- **Data gaps**
 - Should not be too many wells needed because of large pool. However, some counties have been identified with limited data.
- **Data portal**
 - Should be starting soon
- **Report**
 - Have presented some sections of report for discussion

Minnesota



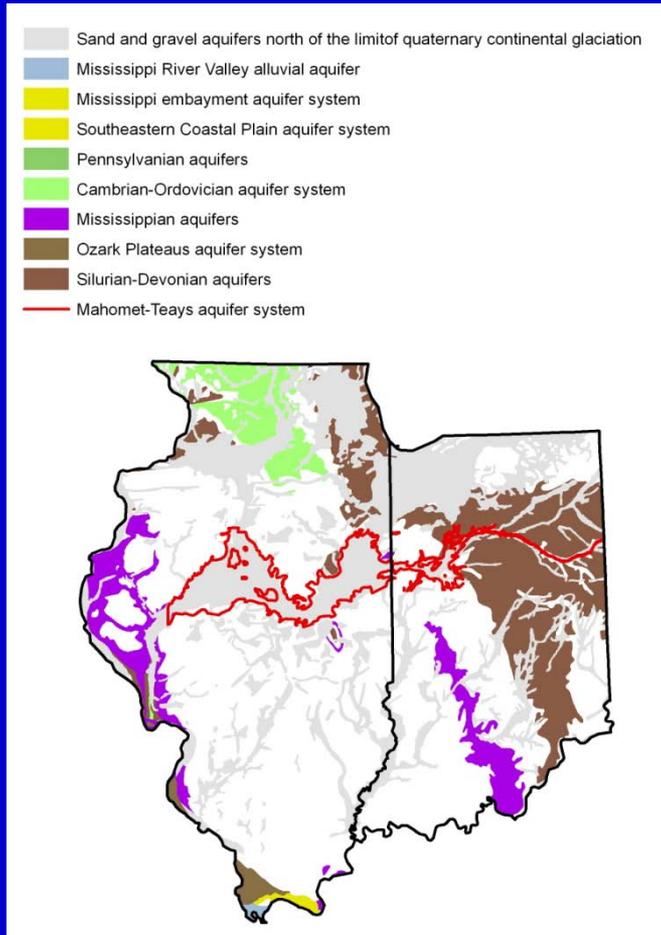
- **Principal/Major Aquifers**
 - Cambrian-Ordovician aquifer system
 - Upper Ordovician aquifers
 - Prairie du Chien-Jordan aquifers
 - Tunnel City/Wonewoc aquifers
 - Mt. Simon aquifer
- **Primary Agencies**
 - Minnesota DNR
 - Minnesota Pollution Control Agency
- **Pilot Leader**
 - Mike MacDonald: Hydrologist, Minnesota Dept of Natural Resources
- **Pool of Candidate Wells**
 - About 140 wells are in the target aquifer system, of more than 700 statewide

Minnesota Status

Manageable scope. Interagency collaboration within MN

- **Monitoring Point Selection**
 - Used wells from existing network that met criteria. Focused on one aquifer system.
- **Categorizing wells**
 - Completed. Raised some questions early about shallow irrigation wells that are affect water levels seasonally, but not in the long term.
- **Field practices**
 - Began looking at these. Still need to work on WQ more
- **Data management**
 - Have not really started yet
 - Database changes
- **Data gaps**
 - Shallow/deep aquifers
- **Data portal**
 - Have not started
- **Report**
 - Planning to start writing sections soon

Illinois-Indiana



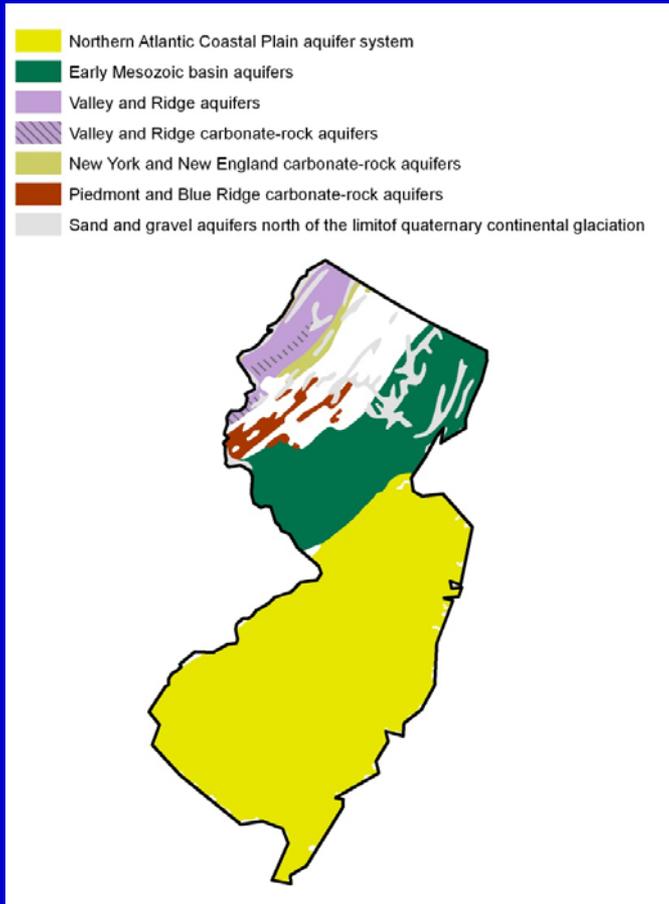
- **Major/Principal Aquifers**
 - Sand and Gravel aquifers
 - **Mahomet-Teays**
- **Primary Agencies**
 - Illinois State Water Survey
 - Illinois State Geological Survey
 - Indiana Department of Natural Resources, Division of Water
 - USGS offices in IL and IN
- **Pilot Leader**
 - Al Wehrmann: Head of the Center for Groundwater Science, Illinois State Water Survey
- **Pool of Candidate Wells**
 - More than 180 wells in IL and IN

Illinois/Indiana Status

Large group participating in pilot from multiple agencies/states

- **Monitoring Point Selection**
 - Are really building network in this process.
 - Data from a variety of sources
 - Public supply wells for QW network
- **Categorizing wells**
 - Is proceeding
- **Field practices**
 - Have not done much yet
- **Data management**
 - Have not done much yet
- **Data gaps**
 - Good progress on identifying areas where monitoring is needed.
- **Data portal**
 - Have not started yet
- **Report**
 - Have not started yet

New Jersey



• Statewide Principal/Major Aquifers

- Northern Atlantic Coastal Plain,
 - 10 major subunits
- Early Mesozoic Basin,
- Piedmont and Blue Ridge crystalline rock,
- Piedmont and Blue Ridge carbonate rock

• Primary Agencies

- New Jersey Geological Survey
- USGS NJ Water Science Center

• Pilot Leader

- Karl Meussig: State Geologist, New Jersey Geological Survey

• Pool of Candidate Wells

- More than 1,000 wells

NJ Status

4 Networks, 2 WL, 2 WQ: 1 WL Trend. Multiple aquifers

- **Monitoring Point Selection**
 - Complete
 - Public supply wells for WL surveillance network
- **Categorizing wells**
 - In progress
- **Field practices**
 - Generally comply
- **Data management**
 - Generally comply
- **Data gaps**
 - Have identified database gaps (Lithology)
 - Sampling frequency on surveillance networks
- **Data portal**
 - Continuous WL, QW data, and main site data is available through web service.
- **Report**
 - Planning to start writing sections soon.

Overall issues

- Most pilots are working on Water levels first.
- Categorizing wells as Targeted/unstressed is proceeding. Several different approaches, decision to allow pilots to continue and evaluate approaches after reports are complete.
- Sampling frequency for QW
- Baseline periods for surveillance networks
- Public supply wells
- Major/Regional aquifers

Data Portal Work

- Nate Booth

Pilot Data Portal

- Design underway at the USGS Center for Integrated Data Analytics in Madison, WI led by Nate Booth
- Portal will be a new system, designed with knowledge of the data exchange standards used by:
 - The EPA/USGS Water Quality Data Exchange (a STORET and NWIS Data Portal)
 - The Open Geospatial Consortium and associated Groundwater Interoperability Experiment (USGS, NRCan, CSIRO, and CUAHSI)
- Goal is automated data transfer from data providers, through portal, to public user. Intermediate approach may be needed

Pilot Data Portal

- What the portal is:
 - An access point for all NGWMN wells, springs and associated data
 - A map interface for NGWMN wells and springs
 - An access point for data from non-NGWMN wells and springs that meet NGWMN criteria
- What the portal is not:
 - Repository for all ground-water data collected across the Nation
 - A master database for all NGWMN wells

Pilot Data Portal Approach

- Common registry of NGWMN wells
- Access well characteristics, water levels and water-quality data through data exchange services
- Data formats based on ACWI SOGW Data Elements codified in international standards where possible

Hydrology Domain Working Group

- A joint working group of the OGC and WMO constituted as an OGC Domain Working Group.
- Brings together interested parties to develop and promote the technology for greatly improving the way in which water information is described and shared.
- Co-chaired by representatives nominated by the OGC TC and the World

Expected Outcomes

- An agreed **feature model** (ie. what are the features of the hydrosphere (from an information perspective) and how are they related.)
- An agreed **observation model**.
- Agreed **vocabularies**, endorsed by the community, and by WMO in particular. Agreeing on semantics is a long process, but we should be able to recommend some vocabularies

Also: services carrying the above

Summary

- Robert Schreiber

Connections and Collaboration: Within ACWI Subcommittees

- National Water Quality Monitoring Council
 - NWQMC Meetings
 - Methods Board
 - National Monitoring Conference
- Subcommittee on Hydrology
 - Nascent Data Portal discussions
- Sustainable Water Resources Roundtable
 - Ad hoc group advising USGS Water Census

Connections and Collaboration: Outside of ACWI Subcommittees

- Office of Science Technology and Policy
- National Environmental Status and Trends (NEST) Indicators project
- Groundwater Interoperability Experiment
 - Natural Resources Canada (Canadian Geological Survey)
 - Australian Commonwealth Scientific and Research Organization
 - CUASHI Hydrologic Information System
 - Open Geospatial Consortium

Significant Outreach Effort

Regular updates to the ACWI and to the National Water Quality Monitoring Council

2007 Presentations and Publications

Hill Visits, including Napolitano, Bingaman, and others in May 2007

Texas Groundwater Protection Committee, IAH Newsletter article, Ground Water Monitoring Review article, EPA GW Protection Strategy Work Groups, Region 8, 9, and 10, 2007 Midwest Ground Water Conference, NGWA Expo 2007

2008 Presentations and Publications

National Monitoring Conference, April 2008 (Exhibit and 5 talks)

NGWA Summit Technical Presentations April 2008 (2 talks)

State Meetings: Water Management Association of Ohio 2008, Montana AWRA Section 2008

WEF-TEC 2008 (Article and Presentation)

Association of American State Geologists Annual Meeting, June 2008

CUASHI Biennial Colloquium July 2008

Ground Water Protection Council Technical Presentations Sept 2008 (2 talks)

Western States Water Council, November 2008

NGWA Expo, December 2008

Scheduled 2009 Presentations and Publications

CA Groundwater Resources Association Feb 2009

NGWA Summit April 2009

NGWA June 2009

Future Plans

- Complete Pilot Studies in CY2010
- Test Pilot Portal in CY2010
- Complete Pilot Report in April 2011
- Be prepared for full NGWMN Implementation in FY12

“Back to the Future”

- “Ask what you can do....AND”
- Key challenges:
 - Support / funding
 - Linkages to related Networks
 - “Use” part of “quantity” data
 - Real-time and remote sensing data
 - Innovative / new methods
 - Cost-efficiency
 - Sampling location & info preservation

Comparing SW and GW

Categories	Surface Water	Ground Water
Agency Focus	NOAA, USEPA	USGS, USEPA
Delineation	HUC/Watershed	Aquifer
Spatial Extent	1D or 2D some 3D	3D/multiple layers
Sampling Frequency	Faster movement	Slower movement
Water Levels	Flooding & Storage	Stored Quantity
Cross-Over Key Factor	Saltwater Intrusion	Base Flow to Surface Waters
Public Attention Factor	Urban Dependence	Rural & Agriculture Dependence
Sampling Access	Visible, Easy	Not Visible, Difficult
Statistical Sampling Design	Mature, Often	Some, Seldom
Real-Time & Time-Series Sampling	Maturing	Increasing
WQ Drivers	CWA, OSA	SDWA, UIC, CERCLA/RCRA, CWA?
Key WQ Problems	D.O./hypoxia	Nitrogen, toxics, Natural, saltwater intrusion
Key quantity problems	Floods, drought, sea level rise	Sustainable yield