



National Ground-Water Monitoring Network

Advisory Committee on Water Information—Subcommittee on Ground Water

NGWMN Data Portal System Overview, Demonstration, New Features and Steps to Becoming a Data Provider

Jessica Lucido

Office of Water Information

U.S Geological Survey

SOGW NGWMN Data Providers Meeting

December 8, 2016

Thursday Morning (8:00 - 12:00)

8:00 - 8:15: Welcome and Introductions (Jessica Lucido)

8:15 - 8:30: Overview of agenda and Groundwater Week opportunities (Jessica Lucido)

8:30 - 9:00: NGWMN Overview (Jessica Lucido & Dave Uselmann)

Portal Demo

System Overview

New and upcoming features (e.g. Monthly Water Level Statistics)

9:00 - 9:15: Overview of steps to become a data provider & web service guidance (Jessica Lucido)

9:15 - 9:45: OWI Demonstration of Data Portal Mediator & Data Transforms (Dave Uselmann)

9:45 - 10:00: **Break**

10:00 - 11:00: Panel Discussion - Demonstrations of web services from current data providers

Montana Bureau of Mines & Geology (Luke Buckley)

Illinois State Water Survey (Greg Rogers)

Utah Geological Survey (Paul Inkenbrandt)

Q&A

11:00 - 12:00 Breakout Discussion by Software Platforms

Databases (30 mins)

Server Software (30 mins)

Be prepared to discuss/share: Strengths and challenges meeting NGWMN web service requirements with your agency's chosen database and server software.

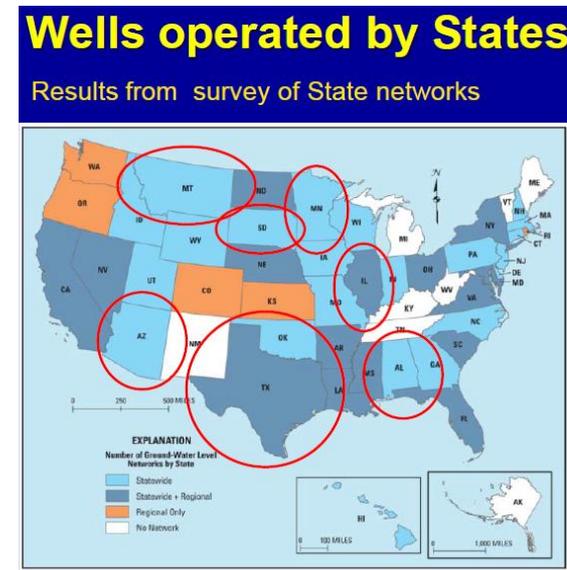
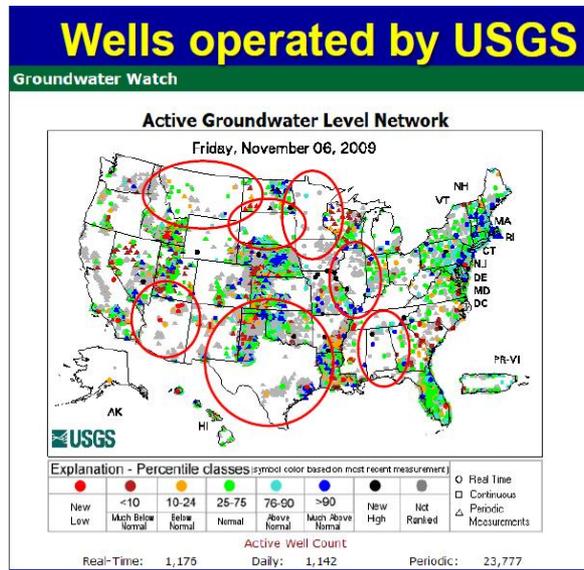
12:00 - 1:30: **Lunch LVCC Cafeteria or adjacent Westgate Hotel**

Objectives, Network Design & Design Advantages

SYSTEM OVERVIEW

NGWMN Objectives:

- Integrate National, State and Local GW data
- Make all data available through a single web portal
- Automated data transfer from data providers, through portal, to public user
- Dynamically access data from original source
- Real-time or near real-time data available
- Data Available
 - Well characteristics
 - Water levels
 - Water-quality

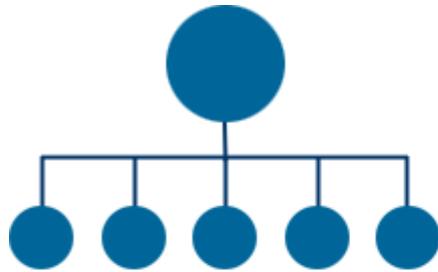


Design Principles

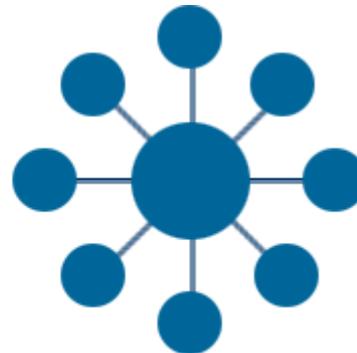
- Distributed** → Data stays with owner
- Seamless** → Acts as one virtual database
- Multi-access** → Multiple portals, tools
- Standards Based** → OGC's WFS & SOS, EPA's WQX, WaterML, GWML, GeoSciML

Strategy

- Implemented **hub** and **spoke** architecture
- A centrally managed well registry (**hub**) contains a minimum set of data elements for all wells
- Mediator (**hub**) transforms data from native to common format and aggregates into a single dataset
- Access state and national datasets (**nodes**) using standard protocols and mediate to common formats



centralized

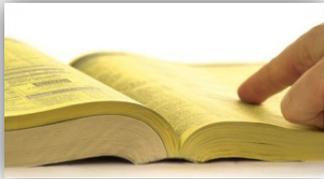


hub and spoke

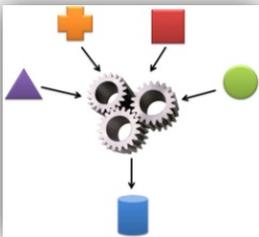
Hub Components:



Web Portal - Provides mapping interface to display and search wells



Well Registry - Harvests metadata to power web portal searching and intelligent parceling of search to nodes



Data Mediator - Collects data from each node and mediates independent formats to common ones

Syntactic Mediation (Naming Conventions):



MEAS_ID	DATE_TIME	WATER_LEVEL	UNIT_MEAS
1	05-06-2002 12:45	121.3	ft
2	05-07-2002 13:52	205.7	ft
3	05-08-2002 11:13	211.9	ft

MEASURE_NO	DATE	WATER_LEVEL_VA	UNITS
1	02-11-2007	45.43	m
2	04-23-2007	65.95	m
3	07-02-2007	85.23	m

OBSERVATION_ID	VALUE	UOM	DATETIME
1	121.3	ft	05-06-2002 12:45
2	205.7	ft	05-07-2002 13:52
3	211.9	ft	05-08-2002 11:13
4	149.0	ft	02-11-2007 00:00
5	216.4	ft	04-23-2007 00:00
6	279.6	ft	07-02-2007 00:00



Semantic Mediation (Vocabulary & Structure):



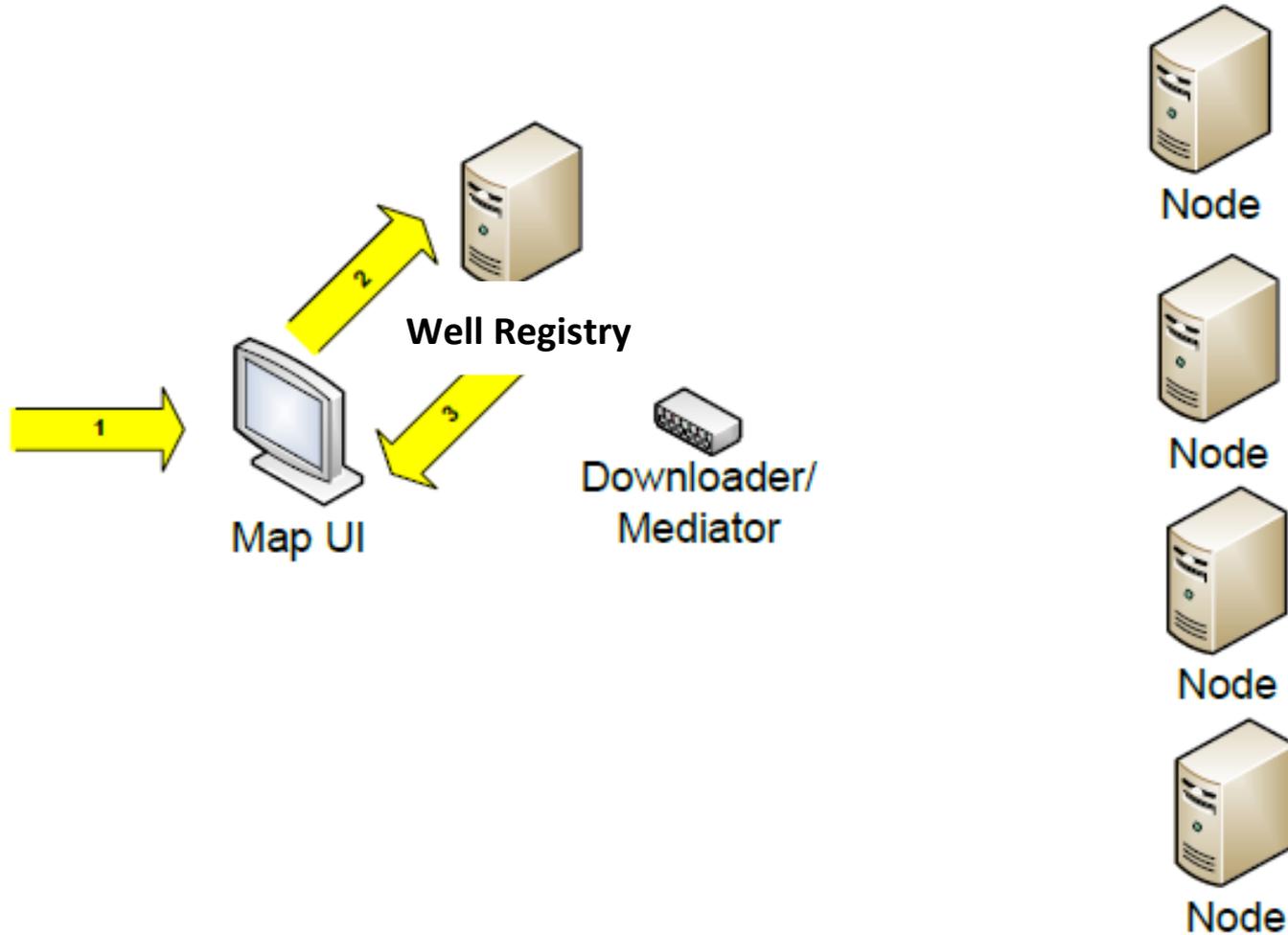
Sample#	Constituent	Value	Units
1	Chloride	2.7	mg/L
2	Temperature	14.8	°C
3	Nitrate	280	µg/L as N

Sample #	Temperature (°C)	Chloride (mg/L)	Nitrate (µg/L as N)
1	16.3	8.5	162
2	10.9	7.0	305

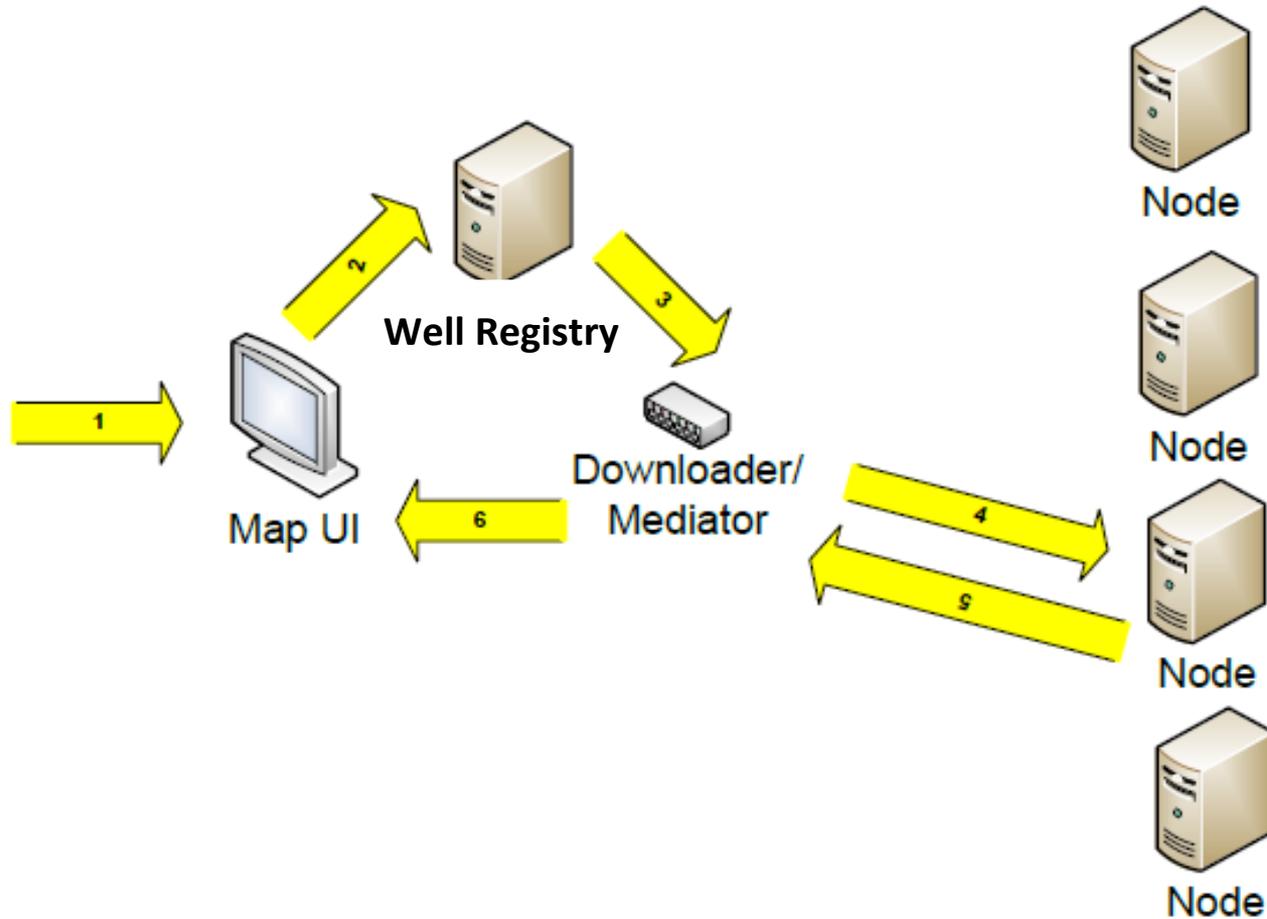
Sample#	Constituent	Value	Units
1	Chloride	2.7	mg/L
2	Chloride	8.5	mg/L
3	Chloride	7.0	mg/L
4	Temperature	14.8	°C
5	Temperature	16.3	°C
6	Temperature	10.9	°C
7	Nitrate	280	µg/L as N
8	Nitrate	162	µg/L as N
9	Nitrate	305	µg/L as N



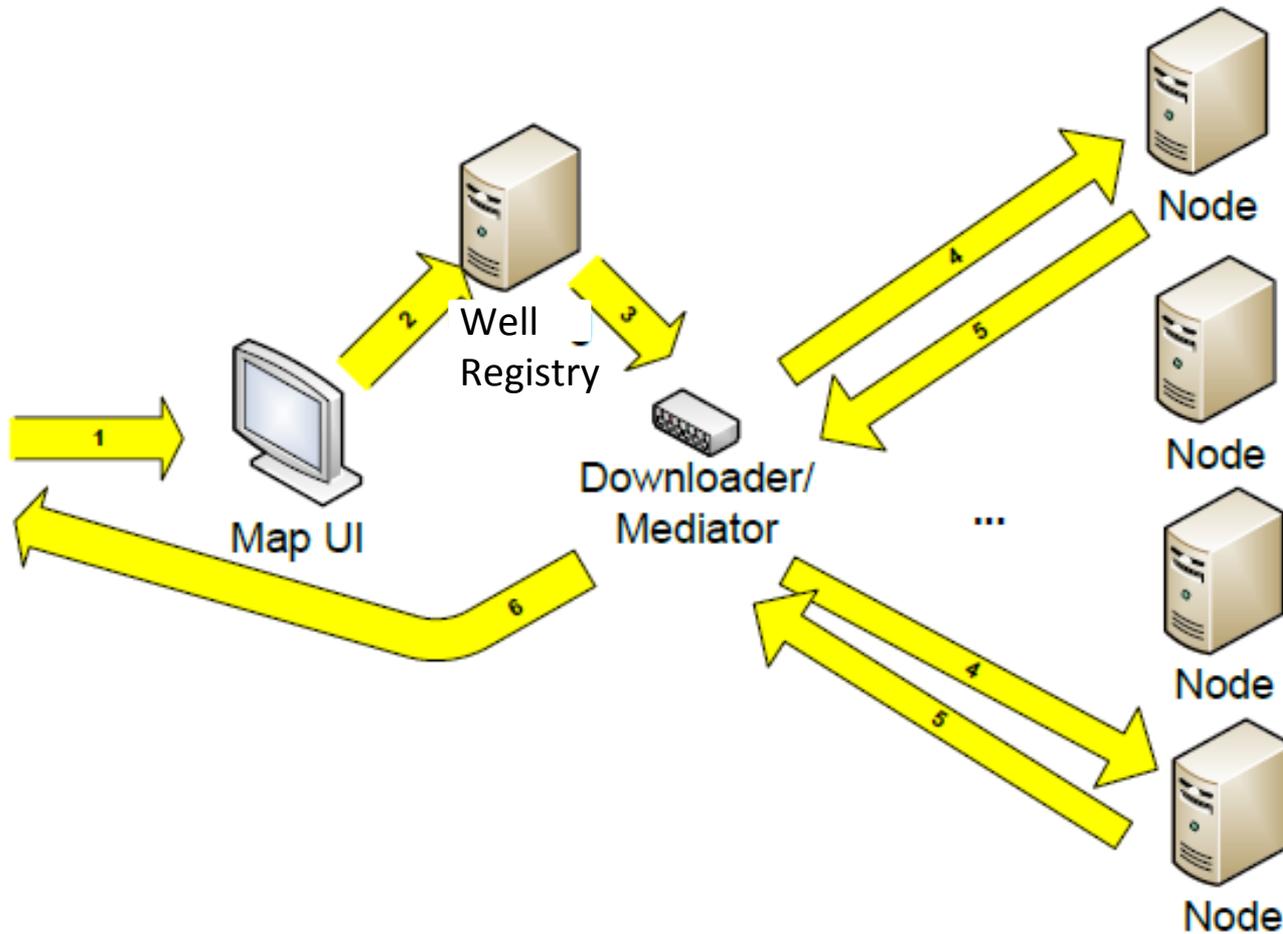
Map Request Workflow:



Site Detail Workflow:



Data Retrieval Workflow:



Architecture Advantages

- Data providers maintain ownership of dataset and have control over which data is exposed
- Allows data providers some flexibility for implementation
- Common, inexpensive and well-supported software components for data providers
- Data providers can re-purpose portal web services
- Integration with international groundwater community

Water Level Statistics, Web Analytics,

NEW & PLANNED FEATURES

New Features

- Put content management in place
- Enhanced web analytics
- Improved Handling of Significant Figures
- Water Level Statistics
- Water Level Status Map
- Attribution of Agencies with USGS Cooperative Matching Funds

National Ground-Water Monitoring Network Cooperative Agreements

The USGS is working with the Federal Advisory Committee on Water Information's (ACWI) Subcommittee on Ground Water (SOGW) to develop and administer the NGWMN. The NGWMN is designed as a cooperative groundwater data collection, management, and reporting system that will be based on data from selected wells and springs in existing Federal, State, Tribal, and local groundwater monitoring networks. The Network is envisioned as a long-term collaborative partnership among Federal and non-Federal data providers that will help address present and future groundwater management questions facing the Nation.

The USGS National Ground-Water Monitoring Network (NGWMN) offered funding to agencies in 2015 to support the NGWMN. Work on these projects included completion of tasks started during the NGWMN Pilot projects. The work also provided support to several agencies to start the process of becoming a new data provider. Projects initiated in 2015 are described in [this document](#).

The USGS National Ground-Water Monitoring Network (NGWMN) offered two competitive funding opportunities for the NGWMN in FY 2016. Funds were available to new data providers to select and classify sites within existing monitoring programs, to set up web services that will link the data to the [NGWMN Portal](#), and to produce a report describing this process. Funds were available to existing data providers to maintain web services and keep site information current. Existing data providers could also receive funding to collect data to improve site information, to maintain wells, and to drill new or replacement Network wells. The projects awarded in both rounds of funding in 2016 are described in [this document](#).

The USGS National Ground-Water Monitoring Network (NGWMN) Cooperative Funding Opportunity for 2017 to support the NGWMN is currently open on [grants.gov](#). The funding will be for a 2-year period in 2017-2018. Cooperative agreements will provide support for both new and existing data providers in the NGWMN. The USGS will fund new data providers to select and classify sites within existing monitoring programs, to set up web services that will link the data to the [NGWMN Portal](#), and to produce a report describing this process. Existing data providers can apply for funding to maintain web services and keep site information current. Data providers may also apply for funding to collect data to improve site information, to maintain wells, and to drill new or replacement Network wells.

Water Level Statistics

National Ground-Water Monitoring Network

Site Number USGS-414315091252002	Site Name 080N05W22CBCB2 1941Elmira Depot 5 IACRN-4	
National Aquifer Name N400SLRDVN	Local Aquifer Name 350SLRN	State & County Iowa, Johnson County
Well Depth 82.5 feet	Aquifer Type Confined	

For information on the methods behind the statistics see [this page](#).

All available continuous and periodic data are used in calculating these statistics. For water level data that comes from the USGS National Water Information System, only approved values are used.

Overall Water Level Statistics (Depth to water, feet below land surface)

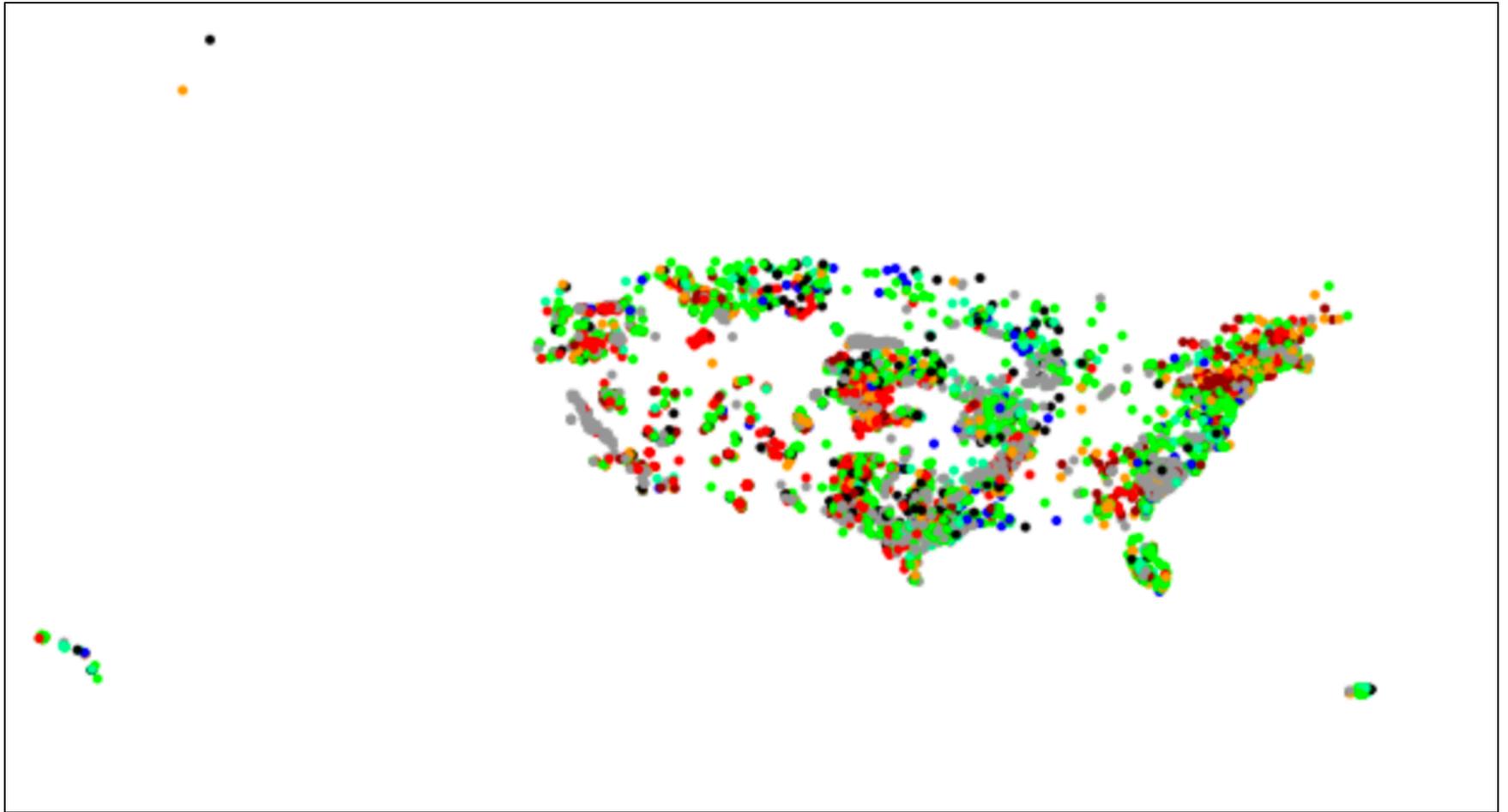
Highest Water Level	Median Water Level	Lowest Water Level	First Measurement Date	Last Measurement Date
102	120	160	1/12/12	5/12/16

Monthly Water Level Statistics (Depth to water, feet below land surface)

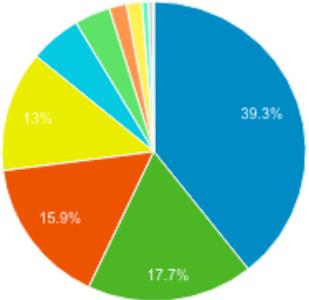
Month	Lowest Median	10th %ile	25th %ile	50th %ile	75th %ile	90th %ile	Highest Median	Number of Years
Jan	20.99	19.36	18.04	16.84	15.32	14.46	13.12	58
Feb	20.80	18.43	17.65	16.12	15.38	14.13	13.35	59
Mar	20.60	18.08	16.97	15.59	14.83	14.00	12.40	57
Apr	19.61	17.80	16.06	15.30	13.90	12.19	6.08	57

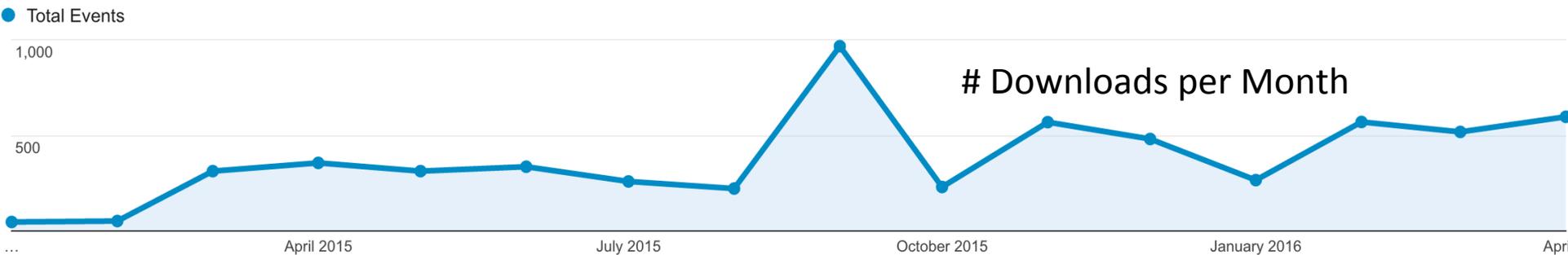
Statistics calculated on 11/15/2016

Map Display



1 Using Stats to Evaluate Feature Use

Event Category	Total Events	Total Events	Contribution to total: Total Events
	41,359 % of Total: 100.00% (41,359)	41,359 % of Total: 100.00% (41,359)	
1. Identify	16,274	39.35%	
2. panel filter	7,316	17.69%	
3. panel filter option	6,582	15.91%	
4. Download	5,372	12.99%	
5. panel	2,275	5.50%	
6. Data Type	1,572	3.80%	
7. filters	760	1.84%	
8. ExternalLink	679	1.64%	
9. download options	286	0.69%	
10. save filters accessed	57	0.14%	
11. map layers	44	0.11%	
12. save filters	37	0.09%	
13. help button	22	0.05%	



NGWMN NETWORKS

Water level: ?

Subnetwork: ?

- Background
- Suspected Changes
- Documented Changes

Monitoring Category: ?

- Surveillance
- Trend
- Special

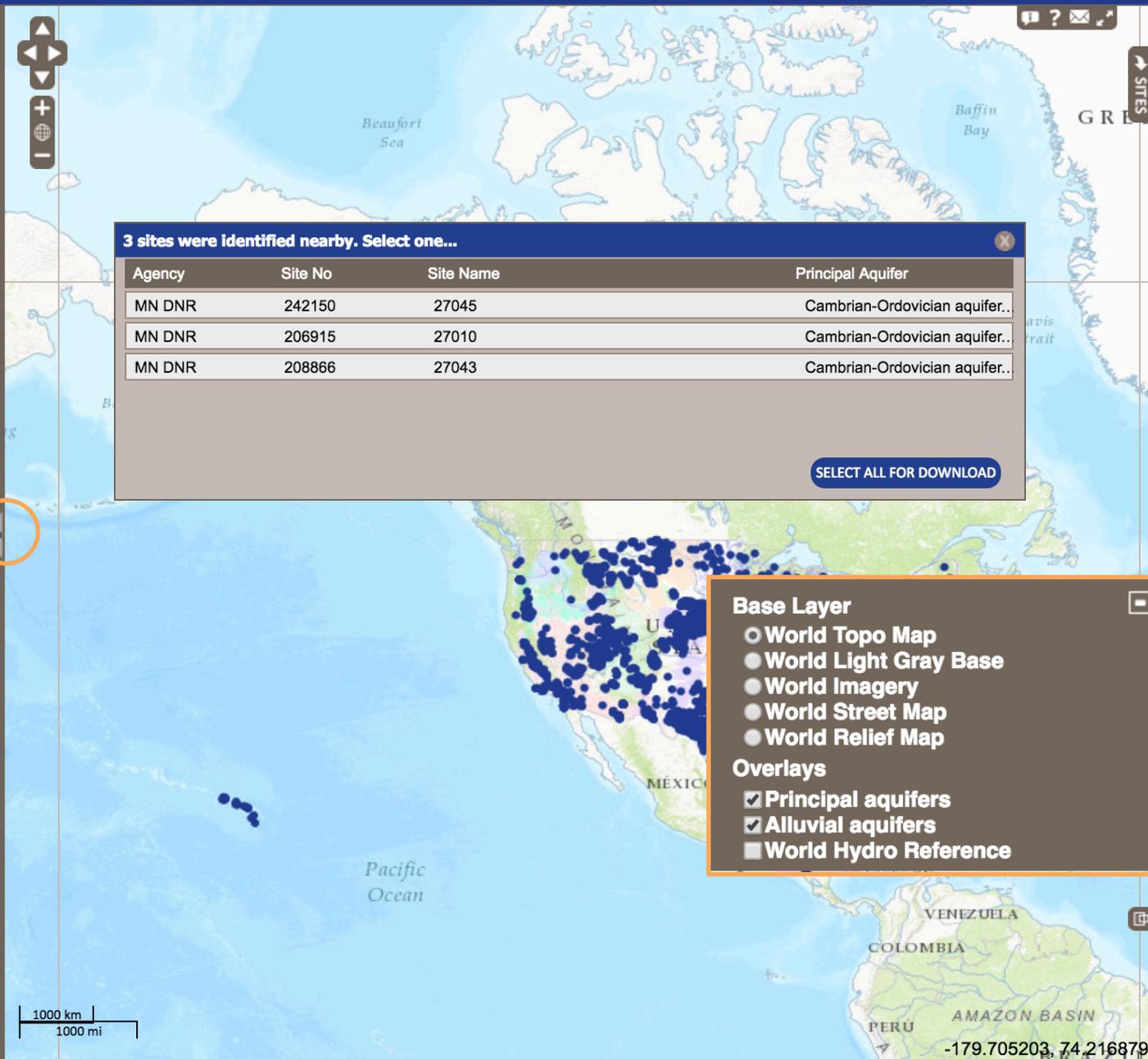
Water quality: ?

Subnetwork: ?

- Background
- Suspected Changes
- Documented Changes

Monitoring Category: ?

- Surveillance
- Trend
- Special



3 sites were identified nearby. Select one...

Agency	Site No	Site Name	Principal Aquifer
MN DNR	242150	27045	Cambrian-Ordovician aquifer..
MN DNR	206915	27010	Cambrian-Ordovician aquifer..
MN DNR	208866	27043	Cambrian-Ordovician aquifer..

SELECT ALL FOR DOWNLOAD

Base Layer

- World Topo Map
- World Light Gray Base
- World Imagery
- World Street Map
- World Relief Map

Overlays

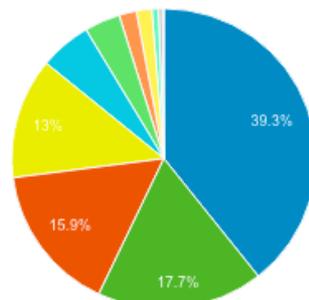
- Principal aquifers
- Alluvial aquifers
- World Hydro Reference

FILTER MAP DATA

CURRENT STATUS

4801 Sites mapped
 4801 Sites matching filter
 3967 Water-level network wells
 1231 Water-quality network wells

1 Using Stats to Evaluate Feature Use

Event Category	Total Events	Total Events	Contribution to total: Total Events
	41,359 % of Total: 100.00% (41,359)	41,359 % of Total: 100.00% (41,359)	
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10. save filters accessed	57	0.14%	
11. map layers	44	0.11%	
12. save filters	37	0.09%	
13. help button	22	0.05%	

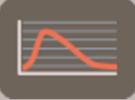


>> NGWMN NETWORKS

>> FILTER MAP DATA 

>> Principal Aquifer

>> Available Data

 Water Level

 Water Quality

 Well Log

>> Site Type

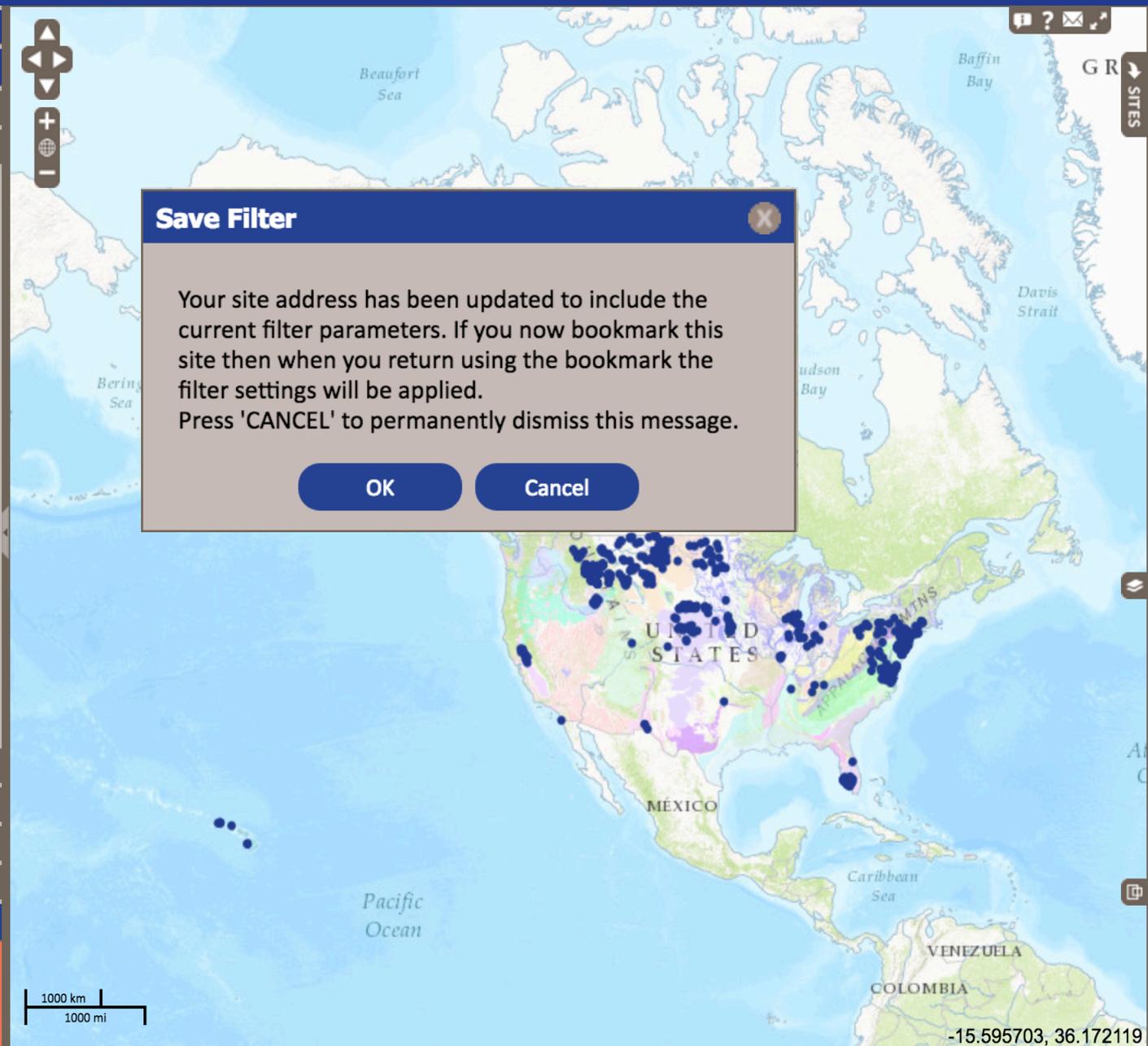
>> State and County

>> Contributing Agency

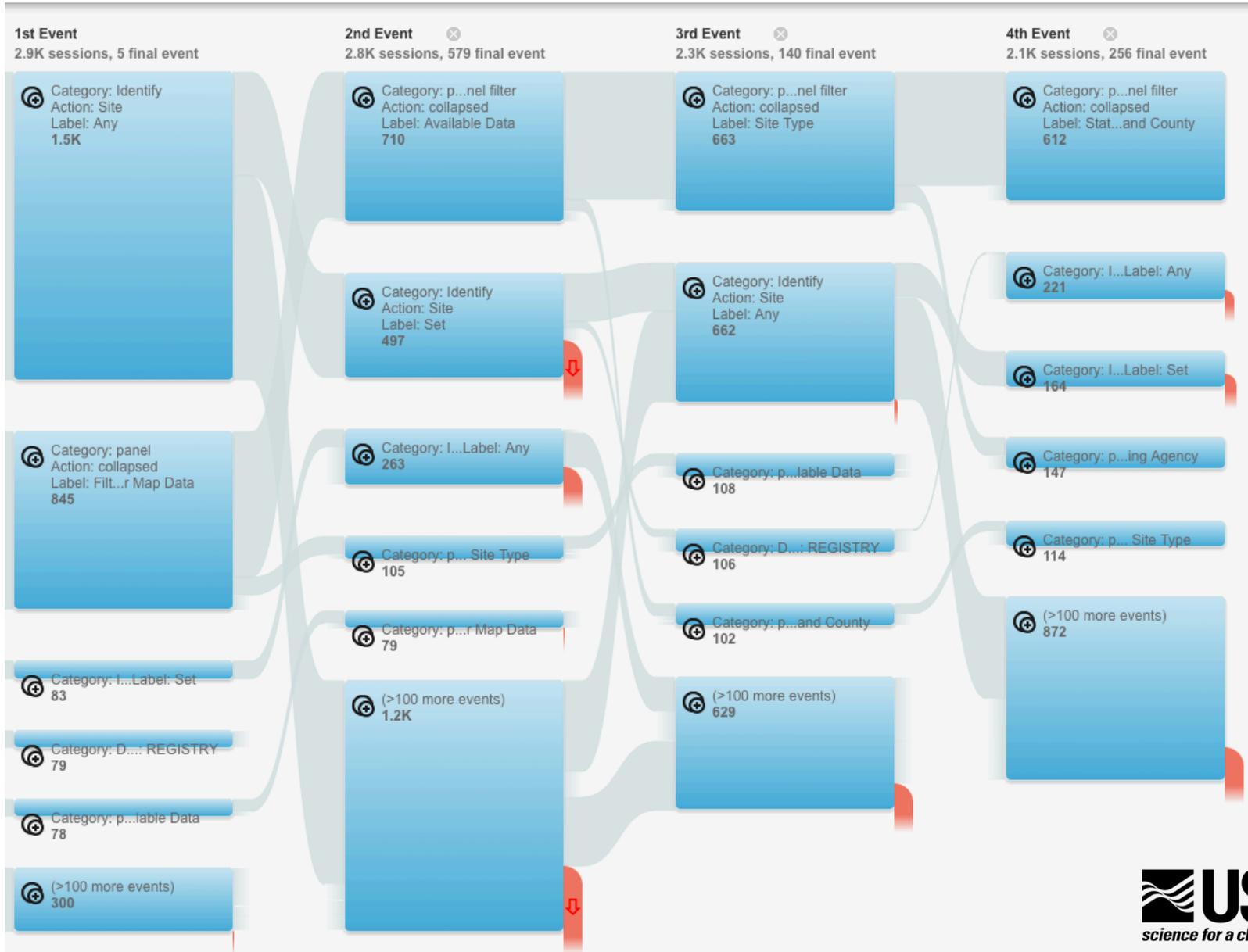
>> Aquifer Characteristics

CURRENT STATUS

985 Sites mapped
985 Sites matching filter
818 Water-level network wells
545 Water-quality network wells



2 Analyzing Workflows



2 Analyzing Workflows

2nd Event 2.8K sessions, 579 final event

3rd Event 2.3K sessions, 140 final event

4th Event 2.1K sessions, 256 final event

5th Event 1.9K sessions, 85 final event

6th Event 1.8K sessions, 139 final event

7th Event 1.7K sessions, 63 final event

Category: p...nel filter
Action: collapsed
Label: Available Data
695 / 710

Category: p...nel filter
Action: collapsed
Label: Site Type
619 / 663

Category: p...nel filter
Action: collapsed
Label: Stat...and County
567 / 612

Category: p...nel filter
Action: collapsed
Label: Cont...ing Agency
564 / 613

Category: p...nel filter
Action: collapsed
Label: Aqu...cteristics
644 / 723

Category: p...ter option
Action: checked
Label: Avail...ater Level
691 / 782

>> NGWMN NETWORKS

>> FILTER MAP DATA

>> Principal Aquifer

>> Available Data

Site Type

Water Level

Water Quality

Well Log

All

WELL

SPRING

Multiple states

One state, multiple counties

States:

All

Alabama

Alaska

Arizona

Arkansas

California

Colorado

Connecticut

Delaware

Florida

Georgia

Hawaii

Idaho

Illinois

Indiana

Iowa

Kansas

Kentucky

Louisiana

Contributing Agency

All

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

Utah Geological Survey

Lithology:

All

Carbonate-rock aquifers

Igneous and metamorphic-rock

Other rock

Sandstone and carbonate-rock

Sandstone aquifers

Semiconsolidated sand aquifer

Unconsolidated sand and grav

Aquifer Type:

All

CONFINED

UNCONFINED

>> Site Type

>> State and County

>> Contributing Agency

>> Aquifer Characteristics

>> Site Type

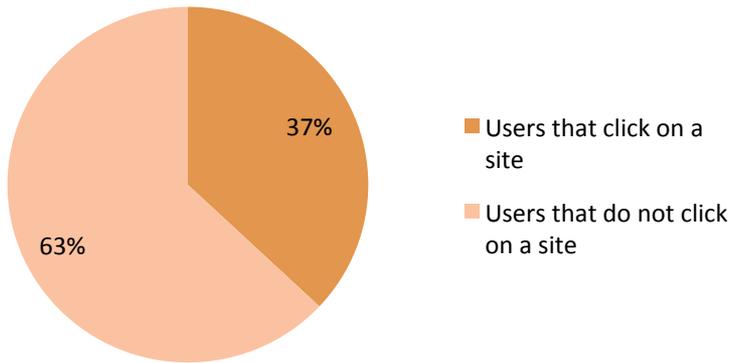
>> State and County

>> Contributing Agency

>> Aquifer Characteristics

3 Using Goals to Focus Development

% Users that Click on Sites

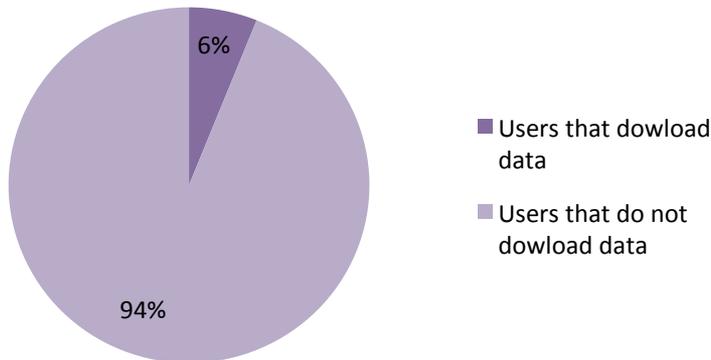


Goal Conversion Rate

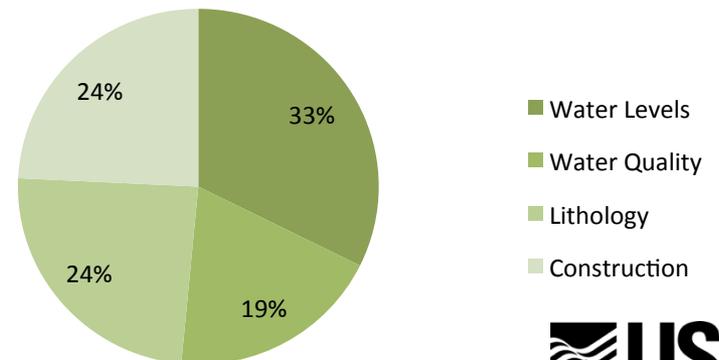
59.75%



% Users that Download Data



Data Download Types



Attribution of Agencies with USGS Cooperative Matching Funds

National Ground-Water Monitoring Network

The **National Ground-Water Monitoring Network (NGWMN)** is a compilation of selected wells monitoring groundwater aquifers all around the nation. The **NGWMN Data Portal** brings groundwater data together in one place to provide users with current and reliable information for the planning, management, and development of groundwater resources.

ABOUT THE NETWORK | THE DATA PORTAL | DATA PROVIDERS | GET INVOLVED

Data Providers

Current Data Providers | Resources for New Data Providers
| Pending Data Providers

Current Data Providers

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 following agencies are currently contributing to the NGWMN.

The agencies listed below participated in the pilot phase of the NGWMN. More data providers will be added to the network when full implementation occurs.

Arkansas Natural Resources Commission



USDA NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service

EPA
United States Environmental Protection Agency



MISSOURI DEPARTMENT OF NATURAL RESOURCES
Missouri Geological Survey

Wofford Farm

SUMMARY | WELL LOG | WATER LEVELS

Agency	U.S. Geological Survey
Site Name	Wofford Farm
Site #	373653091330101
Site Type	WELL
Lat/Long(NAD83)	37.6147, -91.5504
Well Depth	355 ft
Local Aquifer Name	Gasconade Dolomite
National Aquifer Name	Ozark Plateaus aquifer system
Aquifer Type	UNCONFINED
Water Level Network	Trend - Documented Changes
Water Quality Network	-
Additional info	link



051389-- New Lisbon 1 Obs

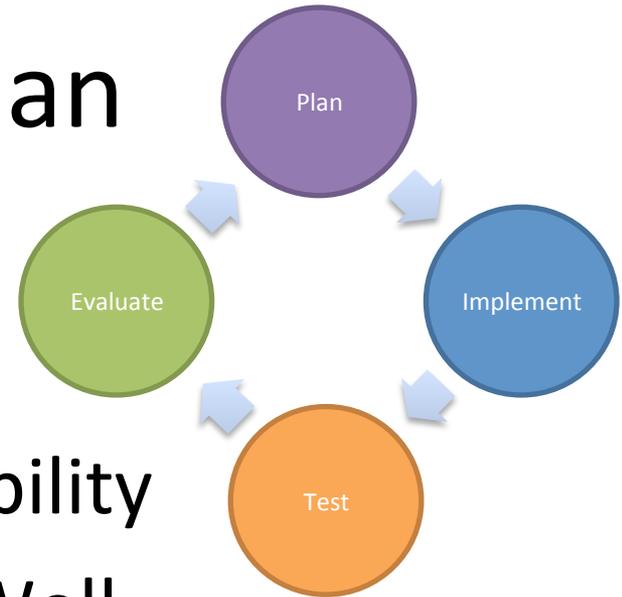
SUMMARY | WELL LOG | WATER LEVELS | WATER QUALITY

Agency	U.S. Geological Survey
Site Name	051389-- New Lisbon 1 Obs
Site #	395309074352101
Site Type	WELL
Lat/Long(NAD83)	39.8859, -74.5888
Well Depth	920 ft
Local Aquifer Name	Magothy-Raritan-Potomac Aquifer System, Upper Aquifer
National Aquifer Name	Northern Atlantic Coastal Plain aquifer system
Aquifer Type	CONFINED
Water Level Network	Trend - Documented Changes
Water Quality Network	Surveillance - Background
Additional info	link



SELECT FOR DOWNLOAD

FY17 Feature Plan



- Data Provider Pages
- Well Registry Bulk Loading Capability
- Support Deleting Sites through Well Registry Management System
- Provider capability for NGWMN to be used for the High Planes Aquifer studies
- Systems Operation & Maintenance

<https://cida.usgs.gov/ngwmn/>

NGWMN PORTAL DEMO

Populating the Well Registry & Hooking Up New

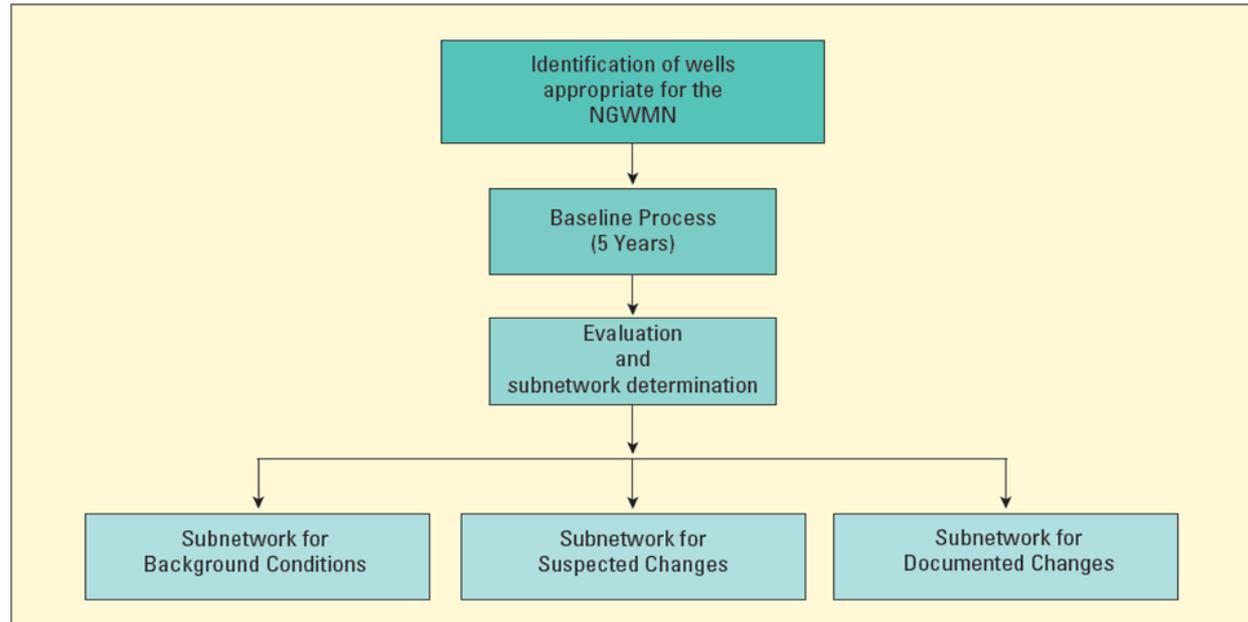
STEPS IN BECOMING A DATA PROVIDER

Steps to Include New Data Provider

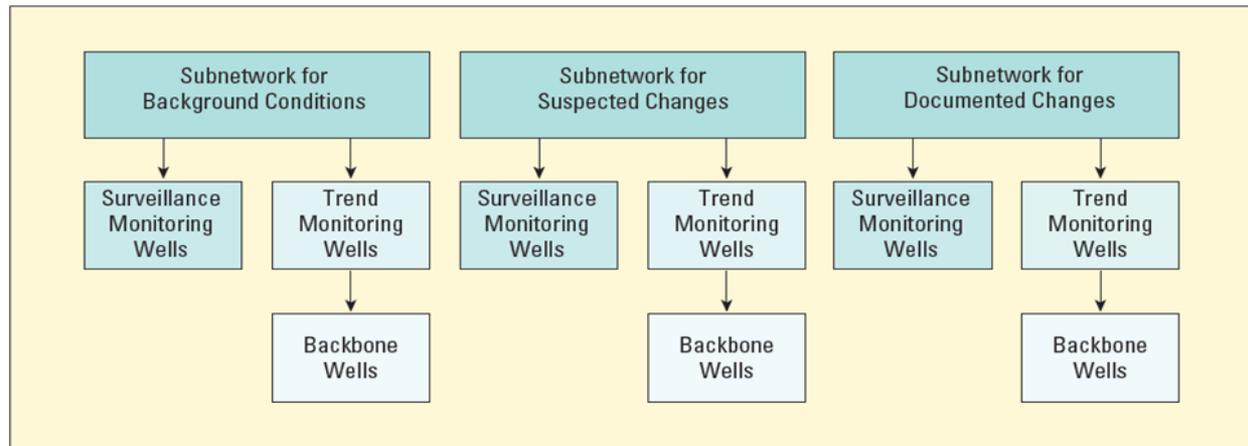
1. Well Selection & Classification
2. Gather Metadata
3. Populate Well Registry
4. Web Service Set-up
5. Map & Hook-up Services
6. Ongoing Service & Well Registry Maintenance

STEP 1: Well Selection & Classification

1a. Classify Well in Sub-Network



1b. Define Monitoring Category



Steps to Include New Data Provider

1. Well Selection & Classification
- 2. Gather Metadata**
3. Populate Well Registry
4. Web Service Set-up
5. Map & Hook-up Services
6. Ongoing Service & Well Registry Maintenance



Credit: USEPA

STEP 3: Populate Well Registry

NGWMN Well Registry

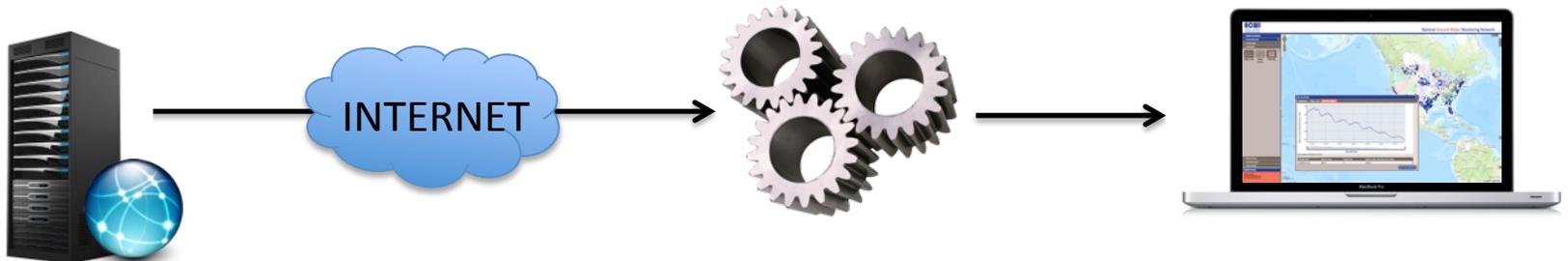
Agency: National Aquifer: State: Display Flag: [Add a New Well](#) [Cancel](#)

row(s) 1 - 15 of 821 [Next](#) >

NGWMN Site ID	Display Well?	Agency CD	Agency Name	Site No	Site Name	State	County	National Aquifer	Local Aquifer	Latitude	Longitude	Datum CD	Altitude	Altitude Units	Vertical Datum C
MBMG:3533	Yes	MBMG	Montana Bureau of Mines and Geology	3533	MBMG RESEARCH WELL 85-17A	MONTANA	ROOSEVELT	Sand and gravel aquifers (glaciated regions)	112OTSH, GLACIAL OUTWASH (PLEISTOCENE)	48.21579	-105.03977	NAD83	2065	ft	NGVD29
MBMG:4297	Yes	MBMG	Montana Bureau of Mines and Geology	4297	MBMG RESEARCH WELL * GWQQC-17	MONTANA	DANIELS	Lower Tertiary aquifers	125FRUN, FORT UNION FORMATION	48.95422	-105.51967	NAD83	2705	ft	NGVD29
MBMG:1575	Yes	MBMG	Montana Bureau of Mines and Geology	1575	BM-01B (MBMG)	MONTANA	MUSSELSHELL	Lower Tertiary aquifers	125MMCB, MAMMOTH COAL OF THE FT UNION FM.	46.35916508	-108.4411843	NAD83	3830	ft	NGVD29
MBMG:1845	Yes	MBMG	Montana Bureau of Mines and Geology	1845	USGS TERRY 1C	MONTANA	PRAIRIE	Lower Tertiary aquifers	125TLCK, TULLOCK MEMBER (OF FT UNION FM.)	46.84068	-105.31938	NAD83	2343	ft	NGVD29
MBMG:1846	Yes	MBMG	Montana Bureau of Mines and Geology	1846	USGS TERRY 1A	MONTANA	PRAIRIE	Upper Cretaceous aquifers	211FHHC, FOX HILLS-HELL CREEK AQUIFER	46.84081	-105.31886	NAD83	2341	ft	NGVD29
MBMG:2031	Yes	MBMG	Montana Bureau of Mines and Geology	2031	FRESER MIKE	MONTANA	FERGUS	Lower Cretaceous aquifers	217FCK, FIRST CAT CREEK SANDSTONE (BASE OF COLORADO GP)	47.11639451	-109.5088417	NAD83	3761	ft	NGVD29
MBMG:2061	Yes	MBMG	Montana Bureau of Mines and Geology	2061	BURLINGTON NORTHERN * BNTC-801	MONTANA	GARFIELD	Upper Cretaceous aquifers	211FHHC, FOX HILLS-HELL CREEK AQUIFER	47.1195	-106.10447	NAD83	2645	ft	NGVD29
MBMG:2315	Yes	MBMG	Montana Bureau of Mines and Geology	2315	TOWN OF BELT 1978 EAST WELL	MONTANA	CASCADE	Paleozoic aquifers	330MDSN, MADISON GROUP OR LIMESTONE	47.38379	-110.92347	NAD83	3515	ft	NGVD29
MBMG:2394	Yes	MBMG	Montana Bureau of Mines and Geology	2394	HARPER ROBERT (TODD)	MONTANA	CASCADE	Paleozoic aquifers	330MDSN, MADISON GROUP OR LIMESTONE	47.524058	-111.413006	NAD83	3330	ft	NGVD29
			Montana Bureau of Mines and Geology		DEPT FISH WILDLIFE AND				217KOTN,						

STEP 4: Web Service Set-up

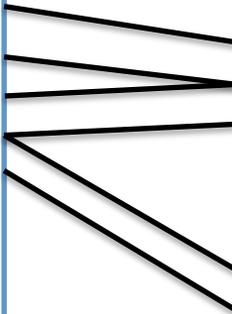
- Many options for Servers
 -  **GeoServer**
 - WMS1.3.0 & WFS2.0 service built-in (from database table or view)
 - Support for Oracle, SQL Server, Postgres, MySQL
 -  **ArcGIS Server**
 - 52N ArcGIS Server SOS Extension
 - WMS1.3.0 & WFS1.1 service built-in (from geodatabase or map)
 -  **MapServer**
open source web mapping
 - WMS1.3.0 & WFS2.0 service built-in (from mapfile)
- USGS provides example implementations & technical expertise



STEP 5: Map & Connect Services

ISWS - Water Level	
COLUMN NAME	DATA TYPE
❑ P_NUMBER	VARCHAR2 (10 Byte)
❑ MEASUREMENT_DATE	VARCHAR2 (10 Byte)
❑ MEASUREMENT_TIME	VARCHAR2 (15 Byte)
❑ DEPTH_TO_WATER_FT	NUMBER
❑ MEASUREMENT_POINT	VARCHAR2 (100 Byte)

NGWMN - Water Level		
COLUMN NAME	DATA TYPE	DEFAULT
❑ AGENCY_CD	VARCHAR2 (10 Byte)	'ISWS'
❑ SITE_NO	VARCHAR2 (10 Byte)	
❑ TIME	DATETIME	
❑ ORIGINAL_VALUE	NUMBER	
❑ ORIGINAL_UNIT	VARCHAR2(10 Byte)	'feet'
❑ ORIGINAL_DIRECTION	VARCHAR2(10 Byte)	
❑ ORIGINAL_PARAMETER	VARCHAR2(50 Byte)	
❑ DEPTH_TO_WATER_FEET	NUMBER	
❑ OBSERVATION_METHOD	VARCHAR2(100 Byte)	



XSLT Mediator Pipeline

- 5a. 1x mapping of data element for each service provided is required
- 5b. Make sure required elements are provided
- 5c. Build new transformation pipeline in NGWMN mediator

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" xmlns:hw="http://apache.org/coconon/request/2.0"
3 xmlns:om="http://www.opengis.net/om/2.0" xmlns:sw="http://www.opengis.net/swe/2.0"
4 xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xs="http://www.w3.org/2001/XMLSchema-instance" xmlns:wml2="http://www.wro.net.au/water2"
5 xmlns:sd="http://www.iscslil.org/2005/gml" xmlns:gsoc="http://www.iscslil.org/2005/goc" xmlns:svs="http://www.opengis.net/svs"
6 xmlns:sp="http://www.ogcs.org/OGC/2.0" xmlns:ngwmn="http://www.opengis.net/ngwmn" xmlns:uogs="gov.usgs.cida.ngwmn" version="2.0"?>
7 <xsl:output method="xml" version="1.0" encoding="UTF-8" indent="yes"/>
8 <xsl:template match="/">
9 <xsl:variable name="agency" select="ISWS"/>
10 <xsl:variable name="agencyURL"="http://www.isws.illinois.edu/about.asp"/>
11 <xsl:variable name="agencyName"="Illinois State Water Survey"/>
12 <xsl:variable name="toDate"=">
13 <xsl:comment unknown/xsl:comment>
14 </xsl:variable>
15 <xsl:variable name="identificationInfoURL"="urn:OGC:unknown"/>
16 <xsl:variable name="firstNode" select="wfs:FeatureCollection/gml:featureMembers[1]/ngwmn:WV_ISWS_WATER_LEVELS[1]/>
17 <xsl:variable name="wellId"="<xsl:value-of select="$agency"/> <xsl:value-of select="$wellNumber"/>"/>
18 <xsl:variable name="wellName" select="$firstNode/ngwmn:WELL_NAME[1]/>
19 <xsl:variable name="obsId"="<xsl:value-of select="$agency"/> <xsl:value-of select="$wellNumber"/>"/>
20 <xsl:variable name="obsIdentifierCodeSpace"="urn:usgs:edu:illinois:isws"/>
21 <xsl:variable name="samplingIntervalId"="invalid.isi.<xsl:value-of select="$obsId"/>"/>
22 <xsl:variable name="beginTime"=">
23 <xsl:comment unknown/xsl:comment>
24 </xsl:variable>
25 <xsl:variable name="endTime"=">
26 <xsl:comment unknown should be something like 1982-08-04T00:00:00.000"/>
27 </xsl:variable>
28 <xsl:variable name="phenonTimeId"="invalid.pt.<xsl:value-of select="$obsId"/>"/>
29 <xsl:variable name="resultTimeId"="invalid.pt.<xsl:value-of select="$obsId"/>"/>
30 <xsl:variable name="procedureId"="urn:ogc:object:Sensor:usgs-gw.<xsl:value-of select="$obsId"/>"/>
31 <xsl:variable name="locationId"="invalid.loc.<xsl:value-of select="$obsId"/>"/>
32 <xsl:variable name="srs" select="$firstNode/ngwmn:GEOG/gml:Point/GISName"/>
33 <!-- Need to reverse and remove comma, should be urn:ogc:def:crs:EPSG:4326 -->
34 <xsl:variable name="latLong" select="$firstNode/ngwmn:GEOG/gml:Point/GISName"/>
35 <xsl:variable name="wellTitle"="Sensor Site <xsl:value-of select="$obsId"/>"/>
36 <!-- This might be passed in as a parameter -->
37 <xsl:variable name="wellInfoServiceBaseURL"="http://cida.usgs.gov"/>

```

Steps to Include New Data Provider

1. Well Selection & Classification
2. Gather Metadata
3. Populate Well Registry
4. Web Service Set-up
5. Map & Hook-up Services
- 6. Ongoing Service & Well Registry Maintenance**



DEMONSTRATION OF DATA PORTAL MEDIATOR

DATA PROVIDER IT PANEL

Databases & Server Software

TECHNOLOGY BREAKOUT DISCUSSION

Thursday Afternoon (1:30-4:00) Room N203/N204, LVCC

1:30-2:00: Demonstration & Discussion of NGWMN Web Services (Dave Uselmann)

2:00 - 2:45: Breakout: Discussion of how we can improve the process of becoming a data provider (Jessica Lucido & Dave Uselmann facilitate)

Be prepared to discuss/share: How well the tip sheets conveyed the requirements, challenges and experiences of using the Well Registry Management System, challenges and experiences of setting up web services and the mapping process, etc.

2:45 - 3:00: **Break**

3:00 - 3:45: Breakout: Discussion of how we can improve data consistency in the portal (Jessica Lucido & Dave Uselmann facilitate)

Be prepared to discuss/share: Areas of data inconsistency, NGWMN data quality, quality of metadata, ideas for improving consistency, etc.

3:45 - 4:00: Wrap up & Recommendations (Jessica Lucido)

4:00 - 5:00: SOGW Check-out Session (4- 5 pm)