

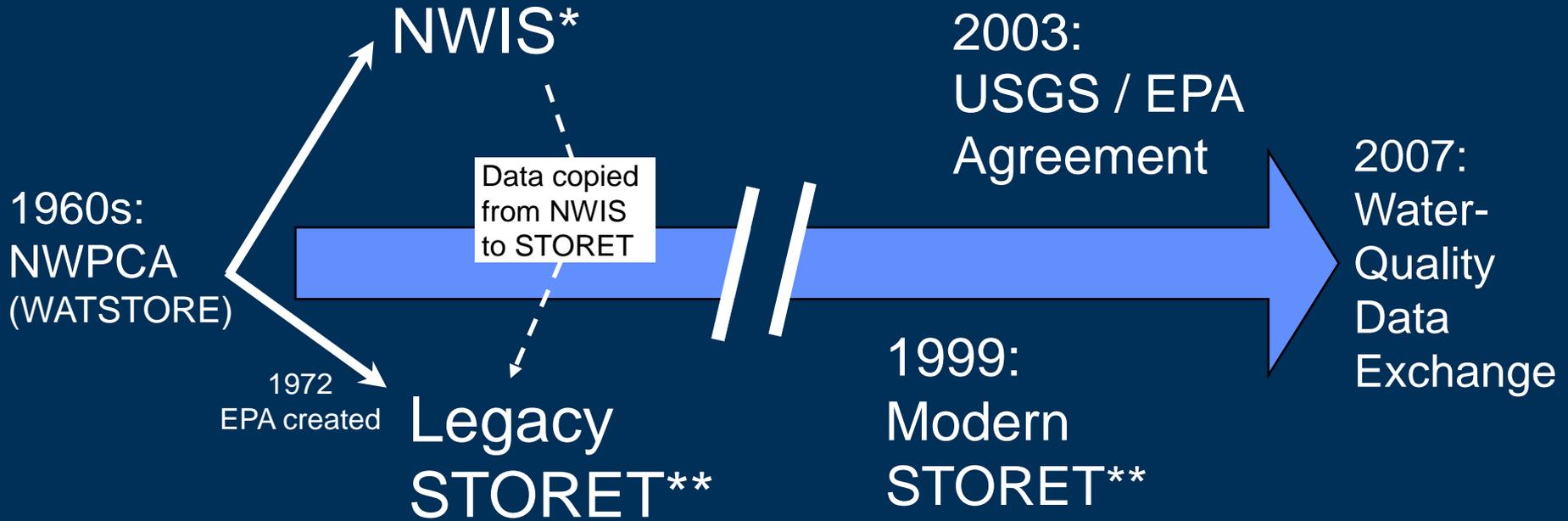
WATER-QUALITY DATA EXCHANGE

**USGS: Nate Booth, Jon Scott, Dorrie Gellenbeck, Tom Kunicki,
John Hollister, I-Lin Kuo, Jessica Thompson, Lorraine Murphy**

USEPA: Kristen Gunthardt, Kevin Christian



USGS NWIS* & STORET Over Time



* USGS National Water Information System

** USEPA Storage and Retrieval System



Water-Quality Data Exchange

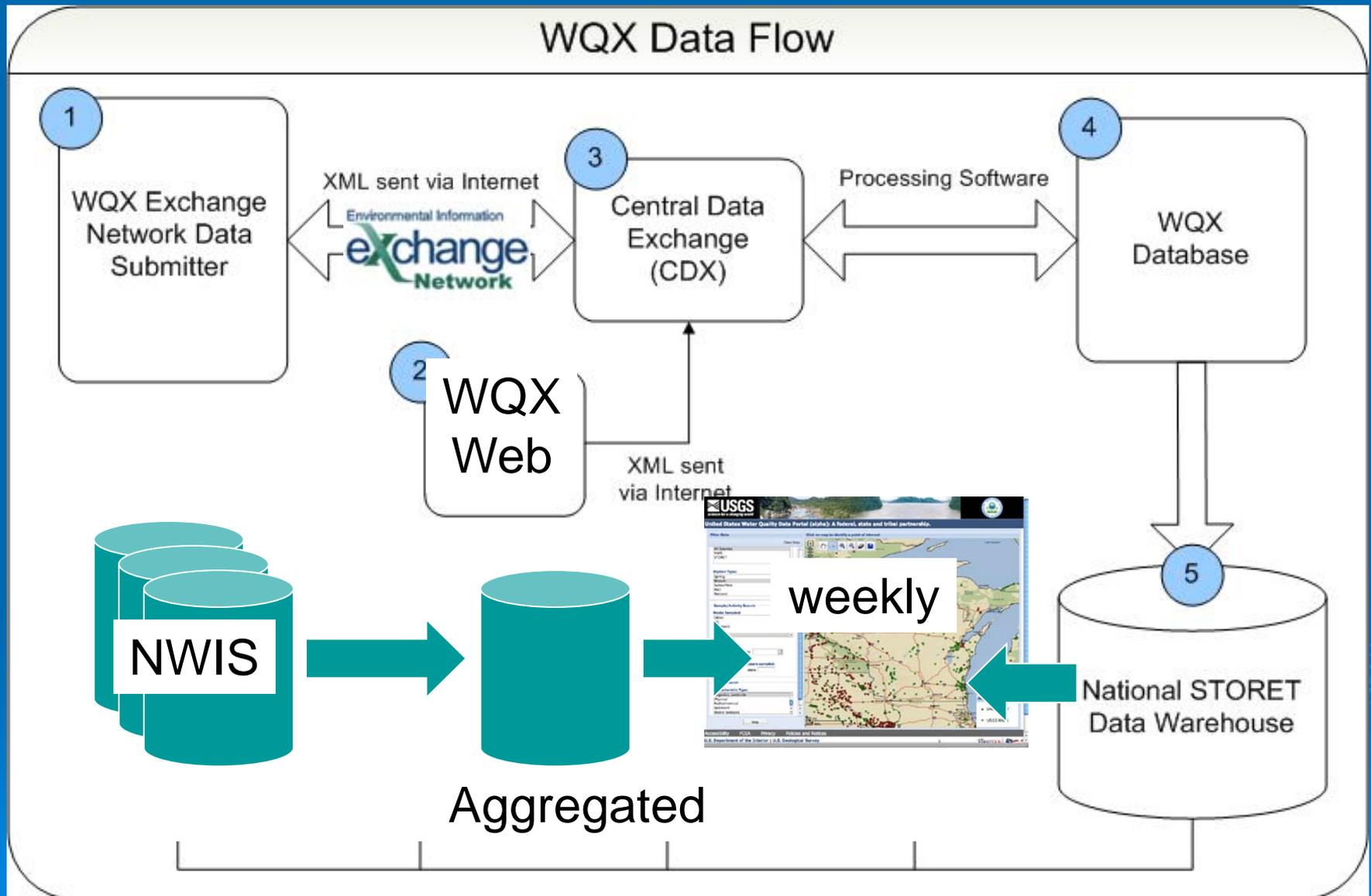
- Data stays with the owner but appears as a single database
- Data format based on NWQMC WQ Data Elements
- Common definitions and semantics
 - EPA's Substance Registry System for chemicals
 - Chemical groups, Site types, Sampling media
- Common web services for serving Monitoring Locations and Water-Quality Results

Project Objectives

- 1) Common format and nomenclature ✓
- 2) Web services to serve monitoring data ✓
- 3) Services for users to find sites and data
- 4) Portal to merge disparate web service feeds

✓ = Phase One complete

How it works – data flow



WQX Status

- >25 State agencies have been successful in flowing data via WQX since 2007
 - >45 Tribal organizations have been successful in flowing data using WQX or WQX Web
 - The STORET Warehouse contains over 450,000 monitoring locations (places where sampling has taken place)
 - The STORET Warehouse contains over 93 million result records
- 
- The background of the slide features several concentric white circles of varying sizes, resembling ripples on water, set against a solid blue background.

Available Now





USGS Home
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National Water Information System (NWIS) Water-Quality Web Services

Location Parameters

Bounding Box ?

North:

West: East:

South:

Distance within ?

miles from

Latitude:

Longitude:

State: [select](#)

County: [select](#)

Note: input fields accept semicolon delimited values (where valid)

[Download Sites Only](#)

[Download Results](#)

[Show Request](#)

[Reset](#)

Site Parameters

Site Type: [select](#)

Organization ID: [select](#)

Site ID: ?

HUC: ?

Result Parameters

Sample Media: [select](#)

Characteristic Group: [select](#)

Characteristic: [select](#)

NWIS PCODE: 5-digit

Activity ID: ?

Start Date (MM-DD-YYYY)

after and before

File Format

data

- WQX-XML ?
 Comma-separated
 Tab-separated
 MS Excel

Excel 2003 and earlier versions have a limit of 65,536 rows. If your download file exceeds this limit, only the first 65,536 rows will open.

map

- Keyhole Markup Language (KML)
 KML output is available for the "Download Sites Only" option.

Compress

zip

[Accessibility](#) [FOIA](#) [Privacy](#) [Policies and Notices](#)

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

URL: http://qwwebsiteservices.usgs.gov/portal.html

Page Contact Information: [USGS Water Quality Web Services](#)

Page Last Modified: Tue Apr 27 2016 12:21:49 GMT-0500



http://qwwebsiteservices.usgs.gov



STORET/ WQX

U.S. ENVIRONMENTAL PROTECTION AGENCY

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Location Parameters

Bounding Box ?

North:

West: East:

South:

Distance within ?

miles from

Latitude:

Longitude:

State: [select](#)

County: [select](#)

Site Parameters

Site Type: [select](#)

Organization ID: [select](#)

Site ID: ?

HUC: ?

Result Parameters

Sample Media: [select](#)

Characteristic Group: [select](#)

Characteristic: [select](#)

Activity ID: ?

Start Date (MM-DD-YYYY)

after and before

File Format

data

WQX-XML ?

Comma-separated

Tab-separated

MS Excel

Excel 2003 and earlier versions have a limit of 65,536 rows. If your download file exceeds this limit, only the first 65,536 rows will open.

map

Keyhole Markup Language (KML)

KML output is available for the "Download Sites Only" option.

Compress

zip

Note: input fields accept semicolon-delimited values (where valid)

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Last updated on Wednesday, October 28th, 2009.
<http://www.epa.gov/storet/>
[Print As-Is](#)

http://storetnwis.epa.gov/storetqw

Example Output (Excel)

data[1].xls - Microsoft Excel

Home Insert Page Layout Formulas Data Review View

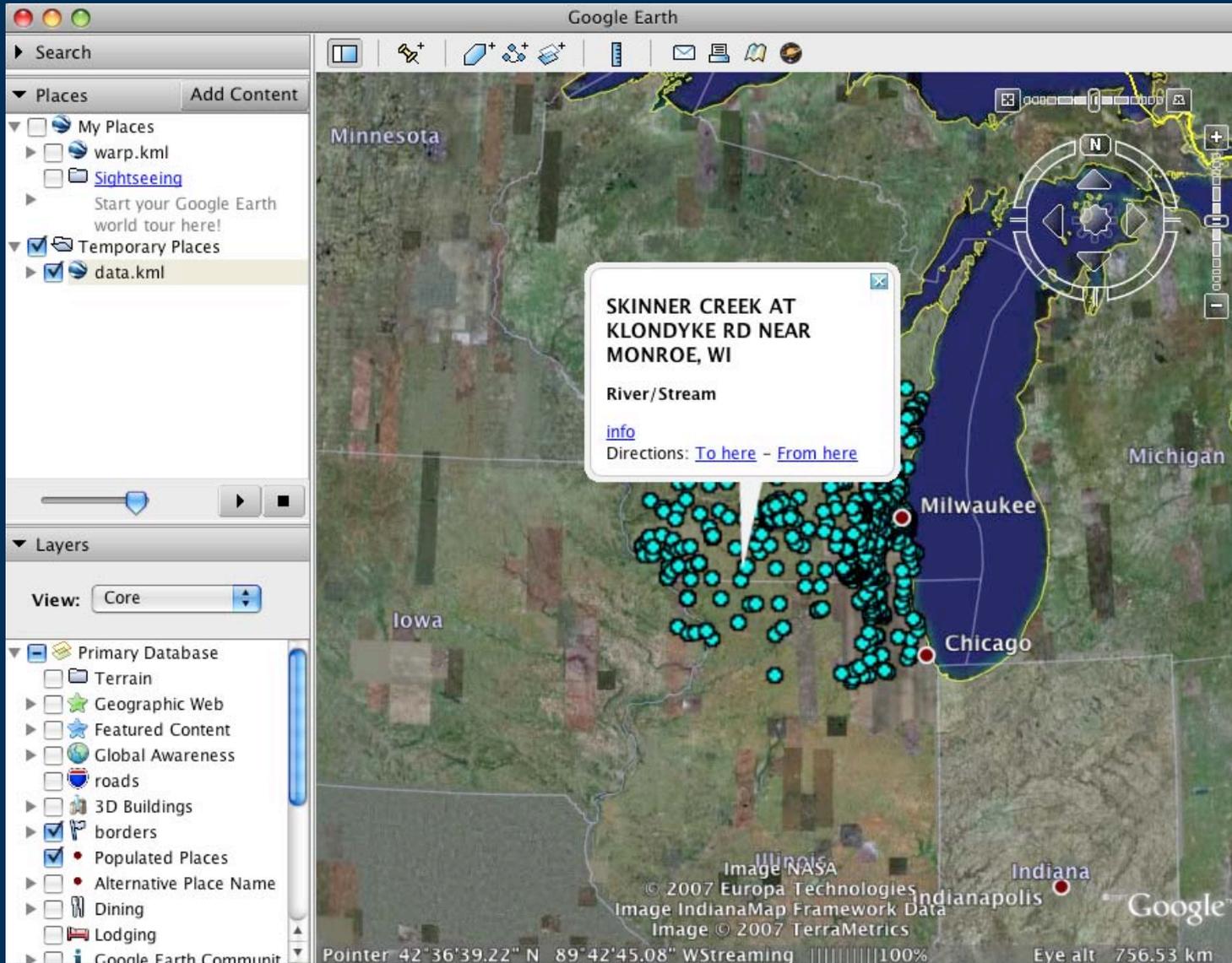
Clipboard Font Alignment Number Styles Cells Editing

A1 OrganizationIdentifier

	AE	AF	AG	AH	AI	AJ
1	ResultDetectionConditionText	CharacteristicName	ResultSampleFractionText	ResultMeasureValue	ResultMeasure/MeasureUnitCode	ResultStatusIde
957		Nitrate-nitrite	Dissolved	0.063	mg/l as N	Historical
958		Ammonia and ammonium	Dissolved	0.033	mg/l as N	Historical
959		Ammonia and ammonium	Dissolved	0.04	mg/l NH4	Historical
960		Nitrogen, Kjeldahl	Total	0.30	mg/l as N	Historical
961		Phosphorus	Total	0.013	mg/l	Historical
962		Phosphorus	Total	0.008	mg/l	Historical
963		Phosphorus	Total	0.024	mg/l	Historical
964		Phosphorus	Total	0.009	mg/l	Historical
965		Phosphorus	Total	0.020	mg/l	Historical
966		Phosphorus	Total	0.007	mg/l	Historical
967		Phosphorus	Total	0.030	mg/l	Historical
968	Not Detected	Phosphate	Dissolved			Historical
969		Nitrogen, mixed forms (NH3), (NH4), organic, (NO2) and (NO3)	Total	0.33	mg/l	Historical
970		Nitrogen compounds, organic	Total	0.29	mg/l	Historical
971		Nitrate-nitrite	Dissolved	0.032	mg/l as N	Historical
972		Ammonia and ammonium	Dissolved	0.007	mg/l as N	Historical
973		Ammonia and ammonium	Dissolved	0.01	mg/l NH4	Historical
974		Phosphorus	Total	0.014	mg/l	Historical
975		Nitrogen, Kjeldahl	Total	0.30	mg/l as N	Historical
976		Ammonia and ammonium	Dissolved	0.02	mg/l NH4	Historical
977		Nitrogen, Kjeldahl	Total	0.30	mg/l as N	Historical
978		Ammonia and ammonium	Dissolved	0.014	mg/l as N	Historical
979		Phosphorus	Total	0.012	mg/l	Historical
980	Not Detected	Phosphate	Dissolved			Historical
981		Nitrogen, mixed forms (NH3), (NH4), organic, (NO2) and (NO3)	Total	0.35	mg/l	Historical
982		Nitrogen compounds, organic	Total	0.29	mg/l	Historical
983		Nitrate-nitrite	Dissolved	0.050	mg/l as N	Historical
984		Phosphorus	Total	0.006	mg/l	Historical
985		Phosphorus	Total	0.018	mg/l	Historical
986		Phosphorus	Total	0.009	mg/l	Historical
987		Phosphorus	Total	0.014	mg/l	Historical
988		Phosphorus	Total	0.005	mg/l	Historical
989	Not Detected	Phosphorus	Total			Historical
990		Nitrogen, Kjeldahl	Total	0.30	mg/l as N	Historical
991	Not Detected	Ammonia and ammonium	Dissolved			Historical
992		Nitrate-nitrite	Dissolved	0.016	mg/l as N	Historical
993		Nitrogen, mixed forms (NH3), (NH4), organic, (NO2) and (NO3)	Total	0.32	mg/l	Historical
994	Not Detected	Phosphate	Dissolved			Historical
995		Phosphorus	Total	0.008	mg/l	Historical

Ready Count: 146888 100%

Google Earth (KML)



What's coming...

Water-Quality Data Exchange Portal



United States Water Quality Data Portal (alpha): A federal, state and tribal partnership.

Filter Data

Clear Map

All Sources
NWIS
STORET

Station Type:

Spring
Stream
Subsurface
Well
Wetland

Sample/Activity

Media Sampled

Other

Date Range:

Minimum # of days/year

days: 1

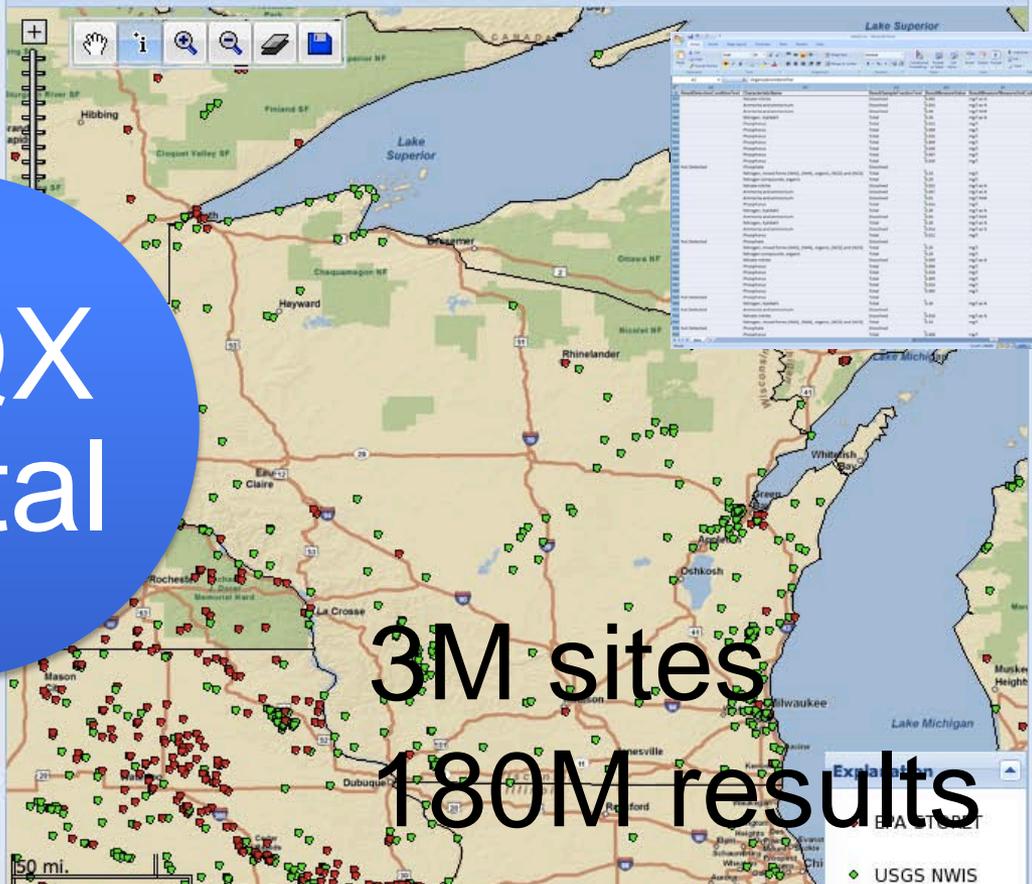
years:

Result Search

Characteristic Type:

Organics, pesticide
Physical
Radiochemical
Sediment
Stable Isotopes

Click on map to identify a point of interest



3M sites

180M results



USGS NWIS



EPA STORET

Data Standards
(WQX, SRS,
NEMI)



Web Services



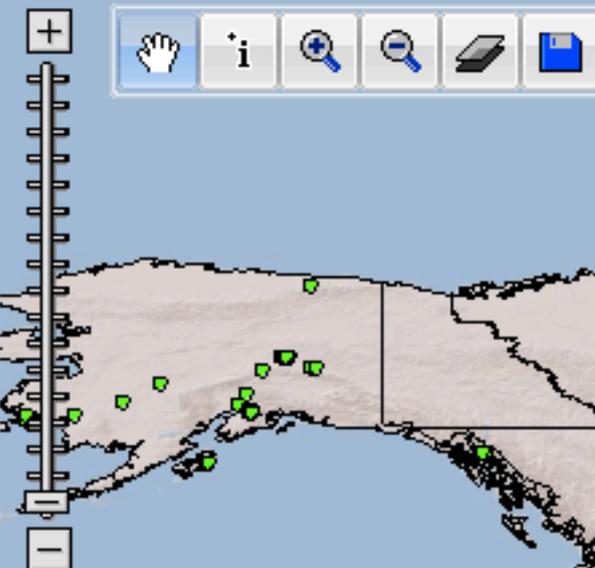
Catalog /Register

Accessibility
U.S. Department of the Interior



Click and drag map

Clear Map



ch

Years sampled:

Years:



United States Water Quality Data Portal (alpha): A federal, state and tribal partnership.

Filter Data

All Sources

 NWIS
 STORET

Clear Map

Station Type:

 Spring
 Stream
 Subsurface

Click and drag map


 SLAUGHTERHOUSE CREEK - BACKWATER POND ✕

Download ▾

Site Information

Source	Organization Name	Station Id	Station Type	Station Name
STORET	WIDNR_WQX	WIDNR_WQX-443429	Stream	SLAUGHTERHOUSE CREEK - BACKWATER ...

Site Summary

Characteristic Name	Characteristic Type	Activity Media	First Sample	Last Sample	# days sampled
1,2,3-Trichloropropane	Organics, pesticide	Water	09-26-2000	09-26-2000	1
1,2-Dibromo-3-chloropropane	Organics, pesticide	Water	09-26-2000	09-26-2000	1
1,2-Dichloroethane	Organics, pesticide	Water	09-26-2000	09-26-2000	1
1,2-Dichloropropane	Organics, pesticide	Water	09-26-2000	09-26-2000	1
1,3-Dichloropropane	Organics, pesticide	Water	09-26-2000	09-26-2000	1
Ethylene dibromide	Organics, pesticide	Water	09-26-2000	09-26-2000	1
Methyl bromide	Organics, pesticide	Water	09-26-2000	09-26-2000	1
cis-1,3-Dichloropropene	Organics, pesticide	Water	09-26-2000	09-26-2000	1
p-Dichlorobenzene	Organics, pesticide	Water	09-26-2000	09-26-2000	1

Close



United States Water Quality Data Portal (alpha): A federal, state and tribal partnership.

Filter Data

Clear Map

All Sources
NWIS
STORET

Station Type:

Spring
Stream
Subsurface
Well
Wetland

Sample/Activity Search

Media Sampled:

Other
QC
Sediment
Soil
Water

Date Range:

to

Minimum # of days/years sampled:

days: 1 years:

Result Search

Characteristic Type:

Organics, pesticide
Physical
Radiochemical
Sediment
Stable Isotopes

Map

Click on map to identify a point of interest



Export Map Data

Select an export and file type for your data. File will be zipped (.zip):

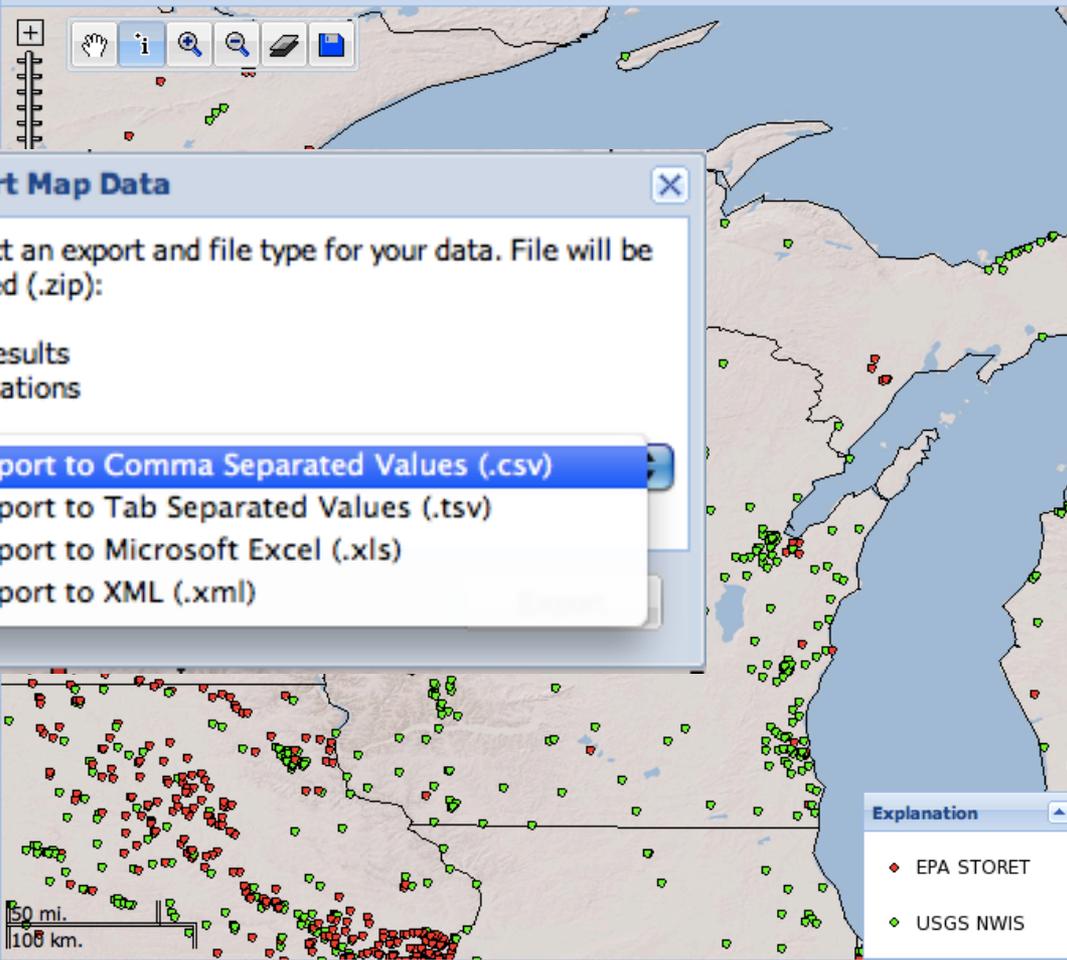
Results
 Stations

✓ Export to Comma Separated Values (.csv)

Export to Tab Separated Values (.tsv)

Export to Microsoft Excel (.xls)

Export to XML (.xml)



Explanation

- ◆ EPA STORET
- ◆ USGS NWIS



Future Work

- **Further Integration**
 - Common spatial frameworks (NHD, Aquifers)
 - Common analytical method metadata (NEMI)
- **House cleaning**
 - Fix Duplicates
 - Identify miscoded data
- **New Collaborations**
 - NOAA IOOS
 - USDA
 - CUAHSI

Collaborations

- Development of an international water data transfer standard within OGC / WMO: WATERML2
- Ties with NOAA Integrated Oceans Observing System (IOOS), USDA Agricultural Research Service (ARS), CUAHSI
- Catalog of monitoring locations across agencies, organizations and scientific disciplines





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 Meteorological Organisation's (WMO) Commission for Hydrology (CHy).
 - **Current Co-Chairs: Ilya Zaslavsky (SDSC), Ulrich Looser (GRDC) and David Lemon (CSIRO)**
 - **> 50 Participants, > 30 Organisations**

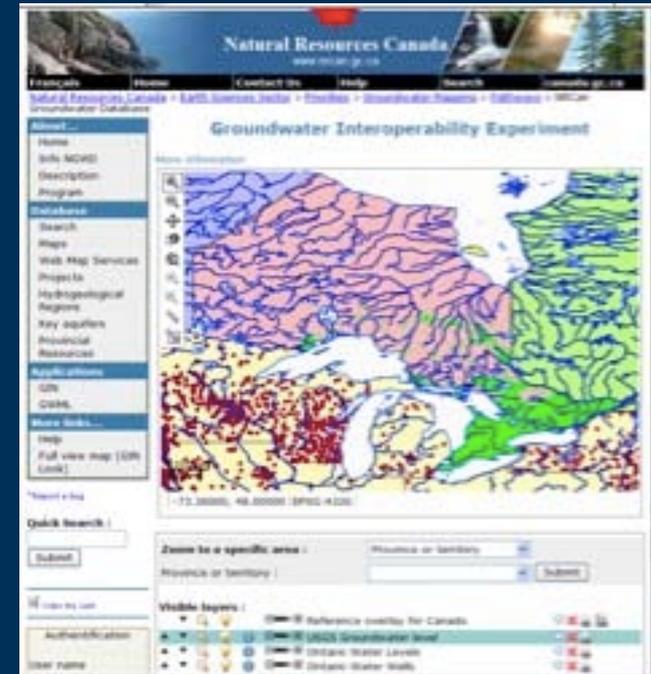
Expected Outcomes



- 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

Groundwater Data Exchange – OGC/WMO HydroWG Interoperability Experiment

- Test and enhance OGC standards for water observations
- Exchange groundwater well characteristics and water levels with Canada
- Next steps: streamflow, water-quality



Recommended Web Services and Data Encodings

Water Observations

Data Type

Web Service

Encoding

In-situ data (buoys, piers, towed sensors)

OGC Sensor Observation Service (SOS)

XML based on OGC Observations and Measurements (O&M)

Gridded data (model outputs, satellite)

OpenDAP and/or OGC Web Coverage Service (WCS)

NetCDF using Climate and Forecast (CF) conventions

Images of data

OGC Web Map Service (WMS)

GeoTIFF, PNG etc.
-possibly with standardized styles

Questions?



home

network basics

management

network policies

partner benefits

build a node

data exchanges

build an exchange

data standards

progress

grants

press room

message board

network wiki

sign up for
 network email
 alerts today!

welcome

to the National Environmental Information Exchange Network website. The Exchange Network is a partnership among states, tribes, and the U.S. Environmental Protection Agency that is revolutionizing the exchange of environmental information. Partners on the Exchange Network share data efficiently and securely over the Internet. This new approach is providing real-time access to higher quality data while saving time, resources, and money for partner states, tribes, and territories.

network news

Exchange Network Open Call Scheduled for April 15th
[more details...](#)

Job Opportunity: ECOS Seeks Exchange Network Project Manager
[more details...](#)

The Exchange Network is Now on Facebook!
[more details...](#)

Register for the 2010 Exchange Network National Meeting

REGISTER NOW >

recent message board threads

Thread Title	Author	Start Date
Making Handler Ver5 Insta...	Darryl	12/21/09 at 04:07 PM
Node 2 Installation Quest...	Caltexan	08/18/09 at 01:54 PM
EPA Asbestos Schema 1	mahern	07/23/09 at 01:22 PM
Web Based Node 2 Client	ian	06/26/09 at 02:05 PM
OpenNode2 Web Client	ian	06/26/09 at 01:59 PM

stay connected!

Use these tools to keep up on the latest news and share your own thoughts and ideas on the Exchange Network.

network connection

Visit the new Exchange Network blog for Exchange Network news, musings, and an opportunity to join the conversation.

network wiki

Check out the Exchange Network Wiki to find information for Network partners by Network partners.

network email alerts

Receive email updates on new data exchanges, guidance documents, and other news. You can also view an archive of previous email alerts.

progress and profiles

Click the map to find contact information for fellow exchange network partners. You can also view partners' progress toward implementing data exchanges.



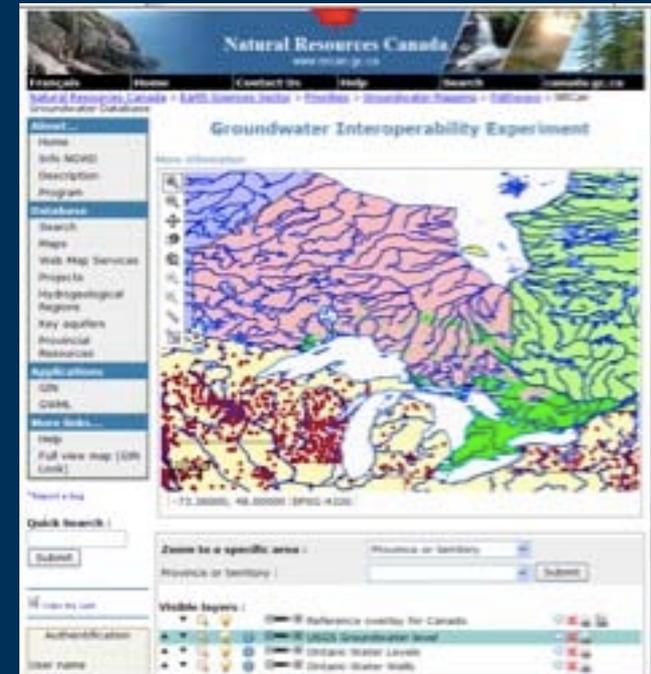
■ Operational
■ In Development
■ Not Yet Started

The WQX Schema

- **Organization** – who collected the data
- **Project** – why was the data collected
- **Monitoring location** – where was the data collected
- **Activity** – when and how was the data collected
 - **Results** – the data itself (e.g. parameter concentrations, toxicity test results)
- **Activity Groups** – A way to link associated sampling activities

Groundwater Data Exchange – OGC/WMO HydroWG Interoperability Experiment

- Test and enhance OGC standards for water observations
- Exchange groundwater well characteristics and water levels with Canada
- Next steps: streamflow, water-quality



Great Lakes Restoration Initiative – DOI backbone to GLOS (IOOS)

6

- Support cross-agency and cross-discipline data analysis (integrated science) through a broad standards-based virtual observatory

