

INTEROPERABLE DATA SYSTEMS

December 9, 2008 -- NWQMC meeting, Reston VA

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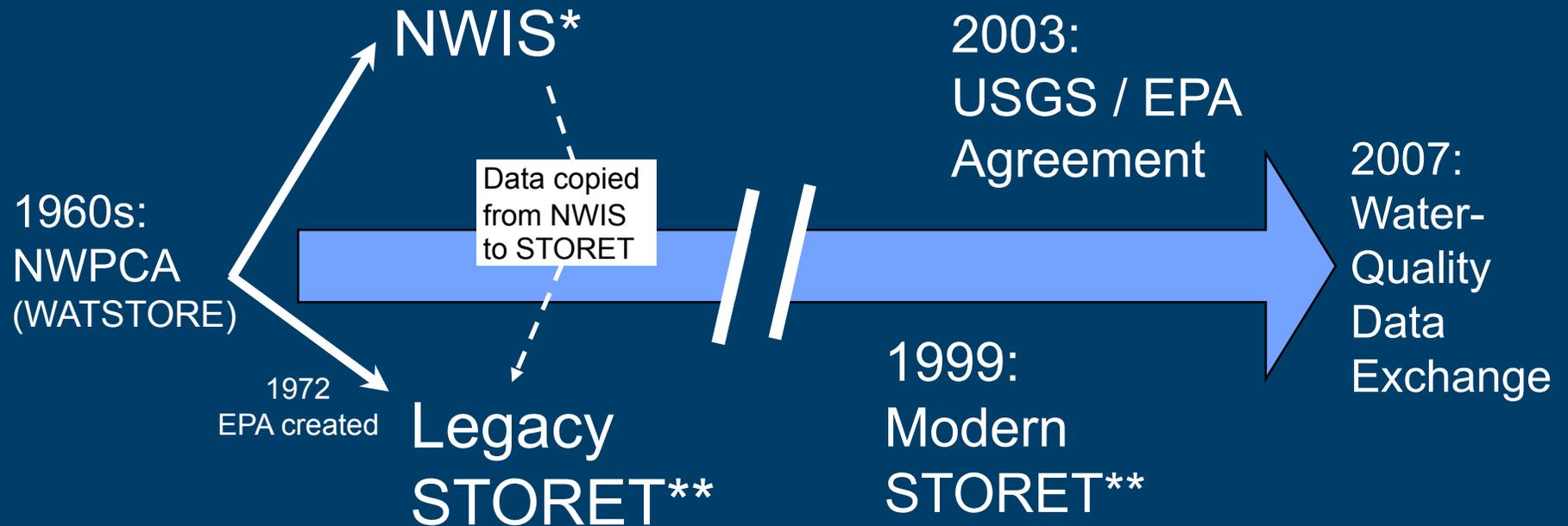


Agenda

- **USGS and USEPA water-quality data sharing**
- **Collaboration with NOAA**
- **Demo: data sharing and NMN Pilots**
- **Growing the water-quality data community**
- **Plans for the future**



USGS NWIS* & STORET Over Time



* USGS National Water Information System

** USEPA Storage and Retrieval System



Successful Data Sharing

- 1) 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

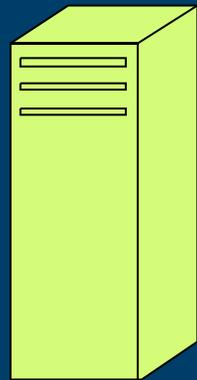
“An investigator will be able to explore the entire USGS and USEPA water-quality data holdings without needing to know which agency manages the desired data.”



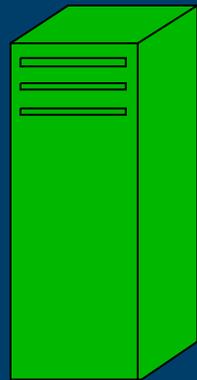
EOS: Scott, 2008



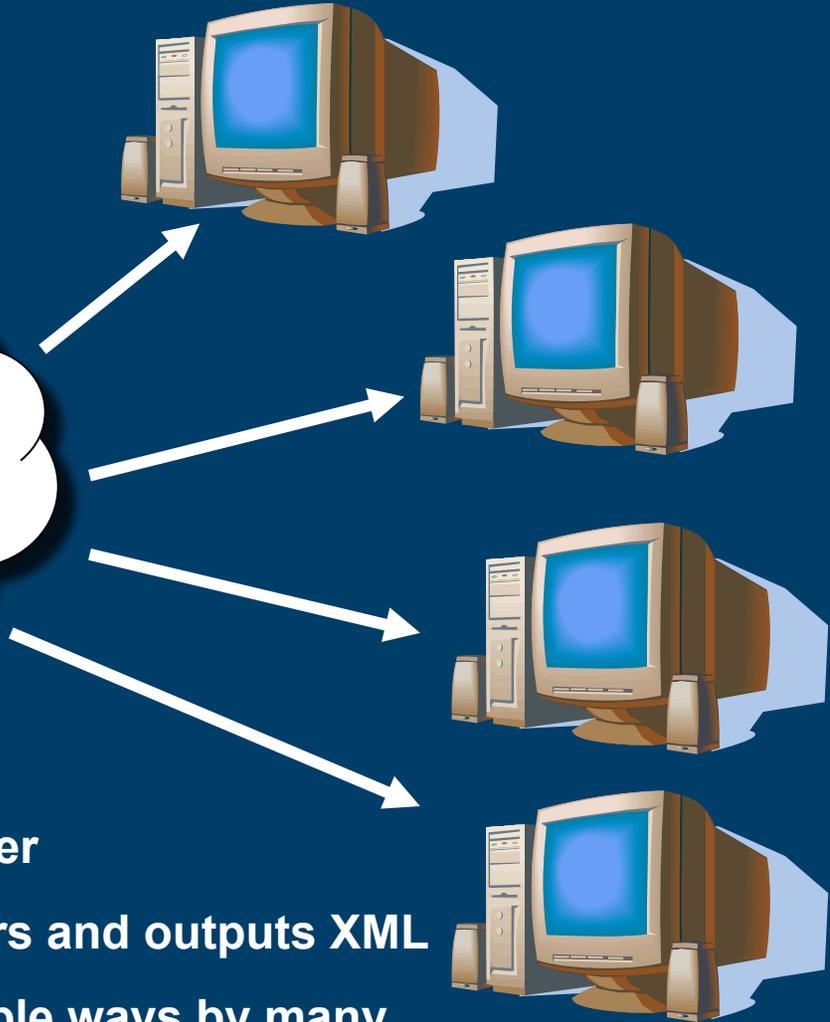
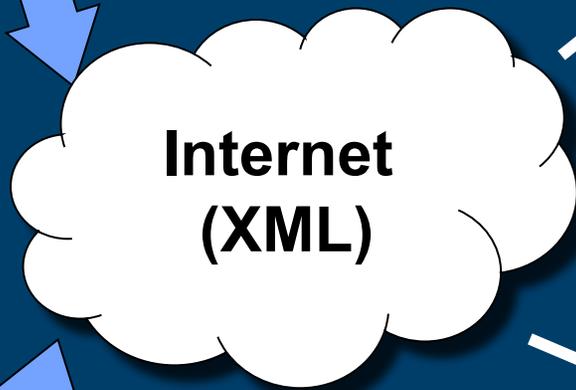
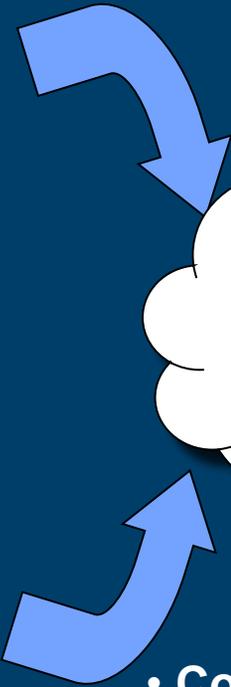
What is a Web Service?



USGS



EPA



- Computer-to-computer
- Uses input parameters and outputs XML
- Can be used in multiple ways by many applications

What is currently available?

USGS

- 85K surface water sites and 275K wells
- 4.3M samples
- 72M results
- Output in:
 - XML
 - Excel
 - KML



USEPA

- Over 349K surface water and well sites
- Over 75M results
- Output in:
 - XML



Common

- Substance Registry System (SRS)
- Site types
- Chemical groups
- XML schema

Collaboration with NOAA

- Talks to date with IOOS
 - Semantics (common vocabularies)
 - Schemas (common data elements)
 - Services (common core services)
 - Catalogs or summary services that facilitate data discovery
- Collaboration to focus on the targeted needs of different NOAA, USGS and EPA programs
 - Continuous monitoring data
 - Sample-based monitoring data
- Data display for better discovery may be a first accomplishment



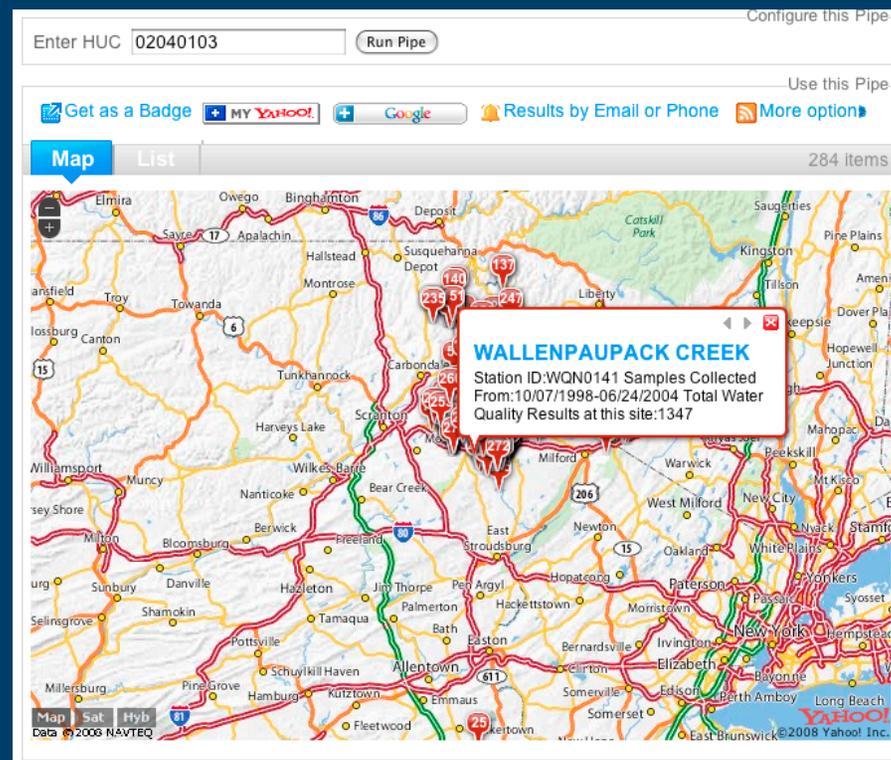
Demo 1: Lake Michigan Pilot: Extract nutrient data from USGS + state data collection efforts in common format

The screenshot shows a Microsoft Excel spreadsheet with the following data:

Routine	USGS ID	Parameter	Unit	Value 1	Value 2	Quality	Quality	Quality	Value 3	Value 4	
Routine s	USGS-040	USGS	Phospho	0.016	Dissolved	Accepted	Actual		666	666	
Routine s	USGS-040	USGS	Nitrogen	0.82	Total	Accepted	Calculatec		600	600	
Routine s	USGS-040	USGS	Phospho	0.029	Total	Accepted	Actual		665	665	
Routine s	USGS-040	USGS	Nitrogen	0.59	Total	Accepted	Actual		625	625	
Routine s	USGS-040	USGS	Ammoni	0.1	Dissolved	Accepted	Calculatec		71846	71846	
Routine s	USGS-040	USGS	Ammoni	0.074	Dissolved	Accepted	Actual		608	608	
Routine s	USGS-040	USGS	Nitrate-nitrite	mg/l as N	0.228	0.228	Dissolved	Accepted	Actual	631	631
Routine s	USGS-040	USGS	Nitrogen compounds, organic	mg/l	0.52	0.52	Total	Accepted	Calculatec	605	605
Routine s	USGS-040	USGS	Nitrogen, Kjeldahl	mg/l as N	0.62	0.62	Total	Accepted	Actual	625	625
Routine s	USGS-040	USGS	Phosphorus	mg/l	0.019	0.019	Dissolved	Accepted	Actual	666	666
Routine s	USGS-040	USGS	Nitrogen, mixed forms (NH3), (mg/l	0.87	0.87	Total	Accepted	Calculatec	600	600	
Routine s	USGS-040	USGS	Nitrogen compounds, organic	mg/l	0.56	0.56	Total	Accepted	Calculatec	605	605
Routine s	USGS-040	USGS	Nitrate-ni HOLDING TIME EXCEL	mg/l as N	0.249	0.249	Dissolved	Accepted	Actual	631	631
Routine s	USGS-040	USGS	Ammonia and ammonium	mg/l as N	0.063	0.063	Dissolved	Accepted	Actual	608	608
Routine s	USGS-040	USGS	Ammonia and ammonium	mg/l NH4	0.08	0.08	Dissolved	Accepted	Calculatec	71846	71846
Routine s	USGS-040	USGS	Phosphorus	mg/l	0.039	0.039	Total	Accepted	Actual	665	665
Routine s	USGS-040	USGS	Phosphorus	mg/l	0.014	0.014	Dissolved	Accepted	Actual	666	666
Routine s	USGS-040	USGS	Nitrogen, mixed forms (NH3), (mg/l	0.72	0.72	Total	Accepted	Calculatec	600	600	
Routine s	USGS-040	USGS	Nitrogen compounds, organic	mg/l	0.49	0.49	Total	Accepted	Calculatec	605	605
Routine s	USGS-040	USGS	Nitrate-nitrite	mg/l as N	0.21	0.21	Dissolved	Accepted	Actual	631	631
Routine s	USGS-040	USGS	Ammonia and ammonium	mg/l as N	0.018	0.018	Dissolved	Accepted	Actual	608	608
Routine s	USGS-040	USGS	Ammonia and ammonium	mg/l NH4	0.02	0.02	Dissolved	Accepted	Calculatec	71846	71846
Routine s	USGS-040	USGS	Nitrogen, Kjeldahl	mg/l as N	0.51	0.51	Total	Accepted	Actual	625	625



Demo 2: Delaware Basin Pilot: Find sites from Delaware Basin



Demo 3: HydroExcel tool

The screenshot shows the HydroExcel tool interface with the 'Data Source' worksheet selected. The worksheet contains instructions for setting up a web service and a table of available services.

Data Source

In the box next to **WSDL Location**, input (hint: copy and paste) the WSDL location for the WaterOneFlow Web Service you want to access.

This web service will be used in all other worksheets.

WSDL locations for some known Web Services are provided below.

For an updated list of Web Services registered with CUAHHSI, visit HIS Central at <http://hiscentral.cuahsi.org>.

Click **Get Capabilities** to see what functionality is available with the Web Service.

Some services may not support all the methods that this spreadsheet utilizes. For example, consider a service that provides access to a gridded dataset. Since the data are based on a grid, and not on discrete sensor locations or "sites", the service will not support a GetSites or GetSiteInfo method, and so you will not be able to use the Sites, Site Info, or Site Catalog worksheets with that service.

Click **Open Service Web Page** to open a web page that may have more information about the Web Service.

Click **Get Sites** to jump to the Sites worksheet and download a list of sites from the Web Service.

Click **Get Variables** to jump to the Variables worksheet.

Specify the web service that will be used in all worksheets	
WSDL Location	http://his02.usu.edu/littlebearriver/cuahsi_1_0.asmx?WSDL
Below, results from Get Capabilities indicate which worksheets should work with the selected Web Service.	
Sites	TRUE
Variables	TRUE
Site Info	TRUE
Site Catalog	TRUE
Time Series	TRUE

Web Services for National Data Sources	
Data Source	WSDL Location
United States Geological Survey	http://river.sdsc.edu/wateroneflow/NWIS/DailyValues.asmx?WSDL
United States Geological Survey	http://river.sdsc.edu/wateroneflow/NWIS/Groundwater.asmx?WSDL
United States Geological Survey	http://river.sdsc.edu/wateroneflow/NWIS/UnitValues.asmx?WSDL
United States Geological Survey	http://river.sdsc.edu/wateroneflow/NWIS/Data.asmx?WSDL
Oak Ridge National Laboratory	http://river.sdsc.edu/wateroneflow/DAYMET/Service.asmx?WSDL
National Centers for Environmental Prediction	http://river.sdsc.edu/wateroneflow/NAM12k/Service.asmx?WSDL
Environmental Protection Agency	http://river.sdsc.edu/wateroneflow/EPA/cuahsi_1_0.asmx?WSDL
NASA	http://river.sdsc.edu/wateroneflow/MODIS/Service.asmx?WSDL
USDA-ARS	http://river.sdsc.edu/snotel/cuahsi_1_0.asmx?WSDL

Web Services for Academic Investigator Data	
University	WSDL Location
Utah State University	http://his02.usu.edu/littlebearriver/cuahsi_1_0.asmx?WSDL
Utah State University	http://his02.usu.edu/mudlake/cuahsi_1_0.asmx?WSDL
University of Iowa	http://his08.ihr.uiowa.edu/nexrad/cuahsi_1_0.asmx?WSDL
University of Iowa	http://his08.ihr.uiowa.edu/water_quality/cuahsi_1_0.asmx?WSDL
University of Iowa	http://his08.ihr.uiowa.edu/tippingbucket/cuahsi_1_0.asmx?WSDL

<http://his.cuahsi.org/hydroexcel.html>



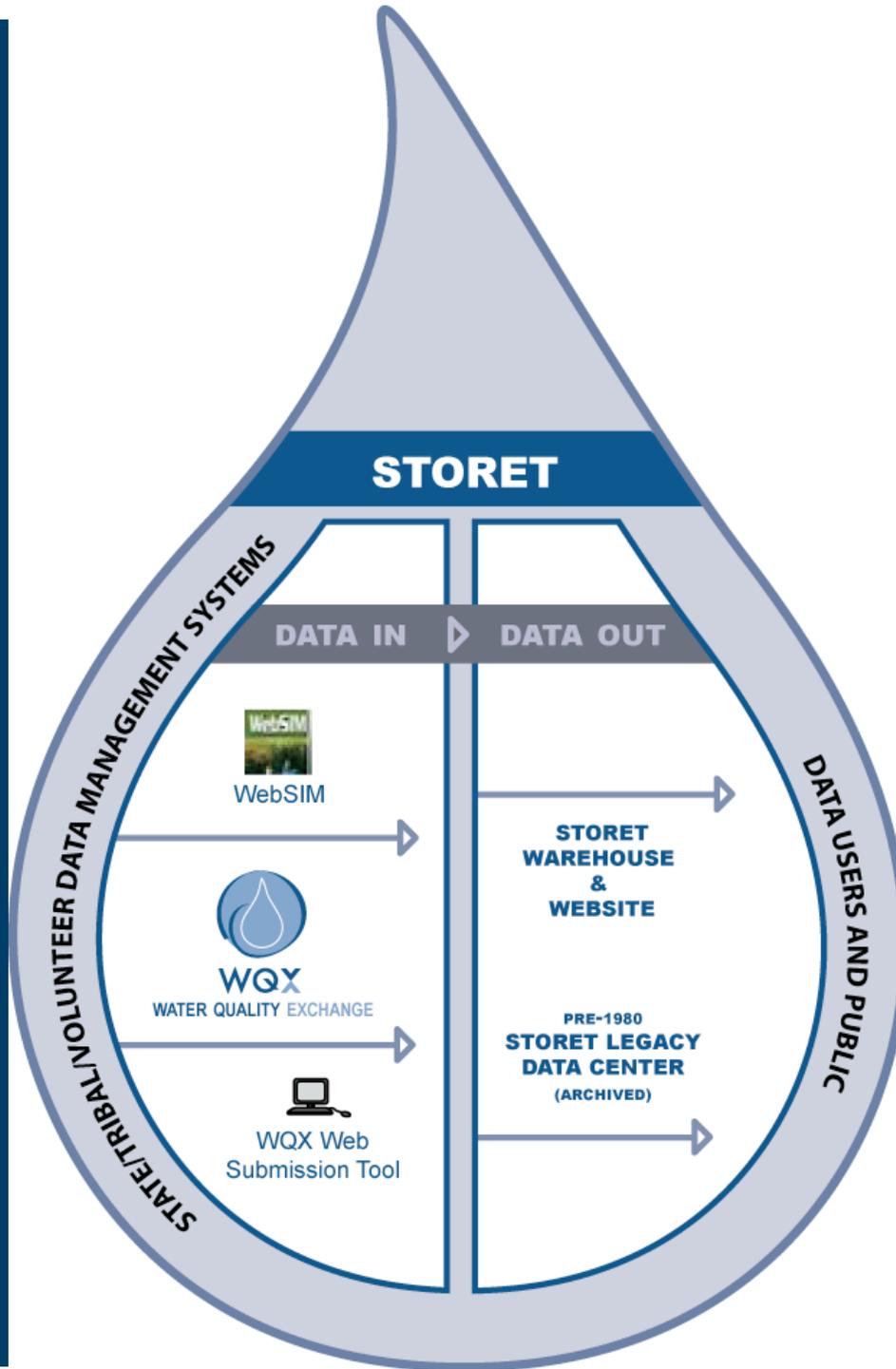
Points from Demos

- **Software vendors embrace web services and provide new opportunities for hydrologic applications**
- **Many individual, targeted applications will be developed rather than ONE super one**
- **Progress is still needed in making a simple one-stop-shop for monitoring data**

Water-Quality Data Community

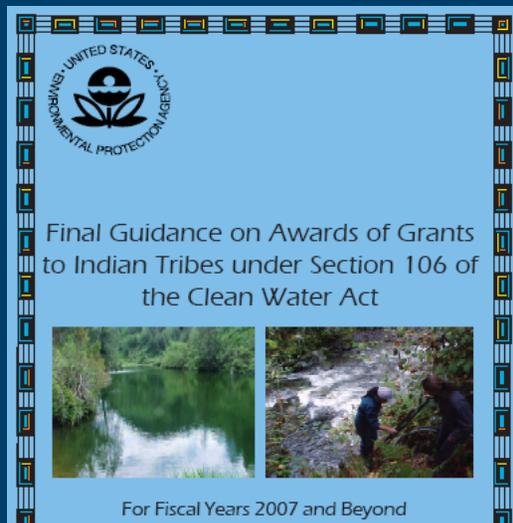
- Applications encourage new producers and consumers of monitoring data
- WQX Web for smaller organizations such as volunteers or tribes
- Other examples: NPSTORET, EDAS2





WQX Web

- A new tool that is easy to use for submitting data to EPA
- Accepts basic input formats (i.e. Excel Spreadsheets)
- Tool has translations for mapping data to WQX domain values or defaults
- Tool creates WQX file that a user can send through the WQX framework



Future Emphasis

- Data Exchange improvements
 - Common spatial framework (NHD)
 - Common analytical method metadata (NEMI)
- New applications
 - Mapping web services (OGC)
 - Data catalog services
 - Portal
- Collaboration
 - USGS Streamflow
 - NOAA IOOS
 - Real-time water quality monitors



For more information...

<http://qwwwebservices.usgs.gov>

http://www.epa.gov/storet/web_services.html

<http://ioos.noaa.gov>

