

Data Delivery and Mapping Over the Web

National Water-Quality Assessment Data Warehouse

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The U.S. Geological Survey (USGS) began its National Water-Quality Assessment (NAWQA) Program in 1991, systematically collecting chemical, biological, and physical water-quality data from study units (basins) across the Nation. In 1999, the NAWQA Program developed a data warehouse (fig. 1) to better facilitate national and regional analysis of data from 36 study units started in 1991 and 1994. Data from 15 study units started in 1997 were added to the warehouse in 2001. The warehouse currently contains and links the following data:

- Chemical concentrations in water, sediment, and aquatic-organism tissues and related quality-control data from the USGS National Water Information System (NWIS),
- Biological data for stream-habitat and ecological-community data on fish, algae, and benthic invertebrates,
- Site, well, and basin information associated with thousands of descriptive variables derived from spatial analysis, like land use, soil, and population density, and
- Daily streamflow and temperature information from NWIS for selected sampling sites.

The warehouse contains data for about 2,000 water-quality and biological constituents or properties analyzed in samples



Figure 2. Mapping interface example—mercury in streambed sediment.



Figure 1. Data warehouse home page (<http://water.usgs.gov/nawqa/data>).

collected at about 7,600 surface-water sites and 8,100 wells selected to be representative of various land uses. About 48,000 nutrient samples, 30,000 pesticide samples, and 8,100 volatile organic compound samples were collected from the water column. About 2,600 samples from streambed sediment and animal tissue were collected and analyzed for hydrophobic compounds. Most water, sediment, and tissue samples were analyzed for more than 40 different compounds. The biological and ecological data listed above were collected at many of the same stream sites. Collectively, these data represent about 14 million records in the data warehouse.

Data for environmental samples of water, sediment, and tissue, as well as the site and well information and daily streamflow and temperature data, were made available in 2000 through the data warehouse home page (fig. 1). An example of a popular retrieval option (using the “MAP SITES & RESULTS” application) showing locations of NAWQA Program sites and concentrations of selected chemicals is shown in figure 2. Most NAWQA data are available through the public version of the data warehouse—exceptions include the most recent water year’s data, some biological data, and some site-, basin-, and well-descriptive variables and quality-control data that are available by request from individual study units.

SWmaster - crosstab-basic

Worksheets

[count](#)
[serial](#)
[crosstab-basic](#)
[crosstab-expanded](#)

Parameters Needed

Select values for the following parameters.

* Indicates required field

- * Choose State (s)
- For additional multi-selection help: see "Data Retrieval Tips" link on the left side of the homepage
- * Choose County(s)
- * Choose NAWQA Study Unit(s)
- * Enter HUC
(Use % as a wildcard)
- * Choose Land Use(s)
- * Choose Lab Schedule(s)
- * Choose Parameters(s)
- * Enter Minimum for Result Value
- * Filter to only see detects?
- * Choose water year(s)

Go

local computer, users select from the "RETRIEVE DATA" section (fig. 1, left frame): the desired medium type, for example Ground Water, Surface Water/Bed Sediment, Mixed, Animal Tissue, Daily Stream Discharge, or Bio Community. A new viewer window appears that allows the user to choose output options; after selecting a type of output (such as "Serial (Long) Output"), users select their search criteria, such as State, study-unit, land-use, laboratory schedule or parameter information (fig. 3). Additional selection criteria are available depending on the type of retrieval. After the retrieval is completed, users select an export-file format.

Results of data retrievals (fig. 4) can be displayed in a variety of table formats depending on the needs and choices of the user. Data tables can be exported and saved locally in a variety of popular formats, including Excel, tab-delimited, and HTML.

Government officials, consultants, researchers, and the public retrieve data from the NAWQA Data Warehouse.

Figure 3. Example of the search-criteria interface retrieval option.

Data Warehouse Interface

The NAWQA data warehouse home page includes a variety of options for retrieving data collected at NAWQA Program sites, generating location maps and summary graphics, information about program background and design, and guidance pages and tutorials for navigating through the data warehouse pages and using the applications. Information contained in the data warehouse is accessed using a series of selection windows. To retrieve a dataset from the data warehouse and copy the resulting table to a



						Primary Schedule Name	Nutrients - Nitrogen and Phosph			
						Parameter Short Name	Ammonia_wf	NH3+orgN_wf		
						Parameter Code	00608	00623		
						Report Units	mg/L as N		mg/L as N	
						Remark	Value	Remark	Value	
Place Name	Land Use Group	Land Use Code	Total Area in sq. miles	Sample Medium Desc	Result Datetime					
ANCHOR R AB TWITTER C NR HOMER AK	OTHER	fo	104.00	SURFACE WATER	20-Aug-01 05:20 PM	--	.02700	--	.28500	
ANCHOR R AT ANCHOR POINT AK	OTHER	fo	226.00	SURFACE WATER	16-Apr-01 04:00 PM	--	.00300	--	.19700	
					20-Aug01 12:20 PM	--	.01300	--	.36600	
STARISKI C NR ANCHOR POINT AK	OTHER	fo	48.40	SURFACE WATER	17-Apr-01 03:30 PM	--	.00700	--	.24100	
					25-Aug-01 02:20 PM	--	.01500	--	.22600	
NINOLCHIK R AT NINILCHIK AK	OTHER	fo	135.00	SURFACE WATER	06-Oct-98 05:01 PM	--	.05100	--	.20800	
					02-Nov-98 01:10 PM	--	.05800	--	.20200	
					04-Jan-99 05:30PM	--	.07400	--	.17500	
					01-Mar-99 03:35: PM	--	.05500	--	.17400	

Figure 4. Example of output using the surface water cross-tabulation retrieval option.

Mapping Concentrations of Chemicals Using Only Your Web Browser

Users can create maps showing the location of sampling sites and concentrations of chemical compounds at the sampling sites (fig. 5). The maps can be modified by the user to show results from NAWQA study units throughout the United

States (fig. 2) or the display can be “zoomed in” to focus on specific areas of interest (fig. 5). In addition to modifying the view of sampling sites, users also can select chemical compounds of interest, type of site, groupings of sites by State, USEPA region, and NAWQA study unit (basin), and specify “break points” to modify the range of concentrations that are displayed. Also, individual sampling sites on the map can be selected to show the site name, site identification number, different site characteristics, and results of all the analyses.

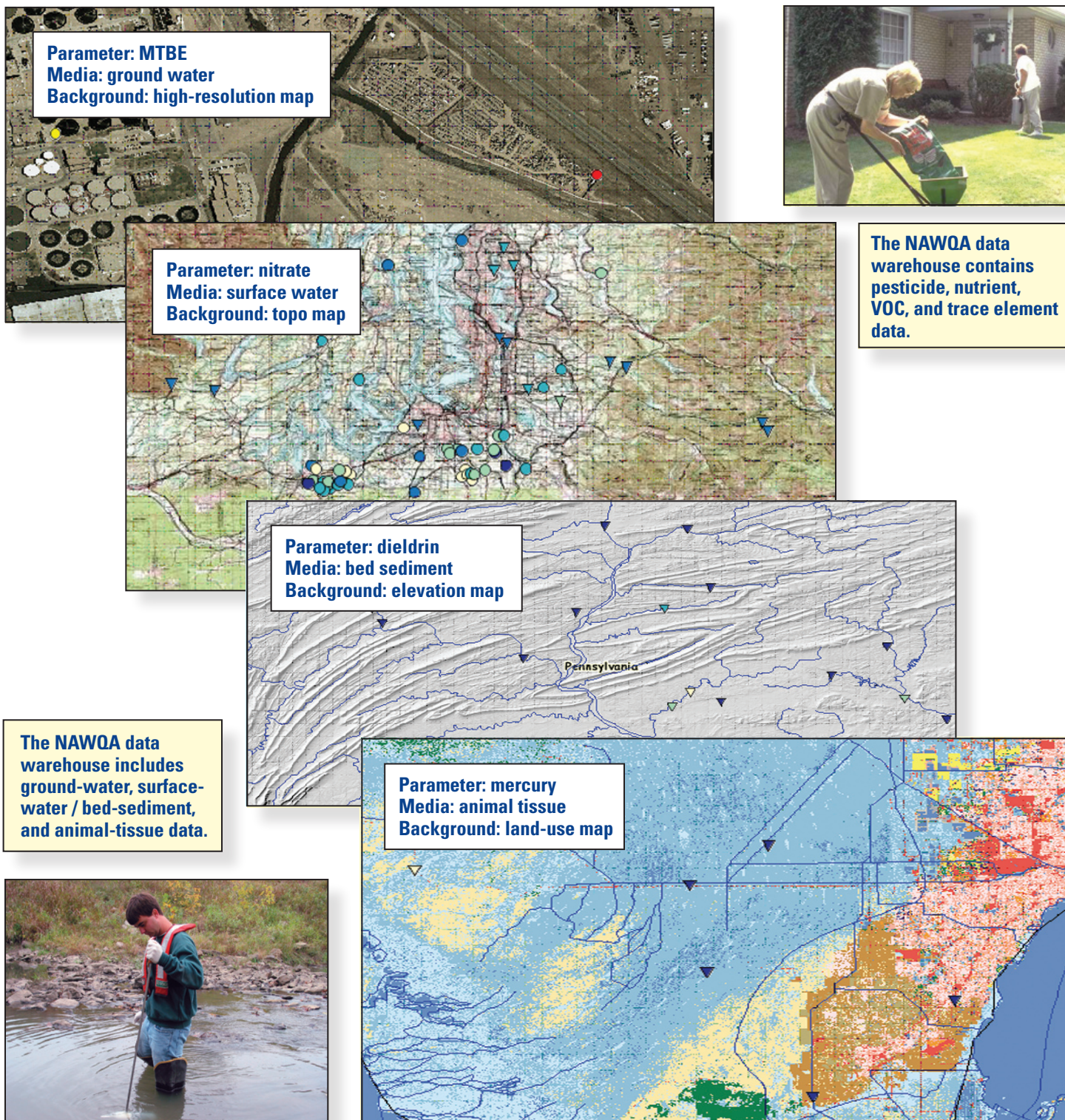


Figure 5. Maps showing location of sites where a chemical compound (parameter) was detected, with concentration indicated by color of site symbols.

Biological Information

Biological community samples (fish, benthic invertebrates, algae) are collected in streams and rivers as part of ecological studies in the NAWQA Program. During the Program's first decade of operation (1991–2001), studies were conducted to assess the occurrence and distribution of fish, invertebrate, and algal communities.

The retrievals for fish, invertebrate, and algal communities include sample count, taxonomic list, and sample abundance (fig. 6). The retrieval process for biological-community samples is similar to the process described in the "Data Warehouse Interface" section. Note the link to ITIS (Integrated Taxonomic Information System) reports.

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NAWQA Data Home

MAP SITES & RESULTS
Map Chemical Conc.

RETRIEVE DATA
Site Information
Constituent Finder
Ground Water
Surface Water/ Bed Sediment
Mixed (SW & GW)
Animal Tissue
Daily Stream Discharge
Bio Community

Biological Community Samples

Select a data retrieval option:
[Sample Count](#)
[Taxonomic List Fish](#)
[Taxonomic List Invert](#)
[Taxonomic List Algae](#)
[Sample Abundance Fish](#)
[Sample Abundance Invert](#)
[Sample Abundance Algae Periphyton](#)
[Sample Abundance Algae Phytoplankton](#)

Biological community samples (fish, invertebrates, algae) are collected in streams and rivers as part of ecological studies in the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program. Information from these ecological studies, together with chemical and physical data, provide an integrated assessment of water quality at local, regional, and national scales. During the program's first decade of operation (1991 - 2001), ecological studies were conducted to assess the occurrence and distribution of algal, invertebrate, and fish communities in about 59 study units (Gilliom and others, 1995). In the second decade of the program (2001 - 2011) biological community samples will be collected at selected sites to

Kingdom: Animalia
Taxonomic Rank: Species
Synonym(s): Ictalurus nebulosus
Common: Ameiurus nebulosus (Lesueur)
Taxonomic Serial No.: 164043

Taxonomy and Nomenclature

Kingdom: Animalia
Phylum: Chordata
Subphylum: Vertebrata
Superclass: Mammalia
Class: Mammalia
Order: Siluriformes
Family: Ictaluridae
Genus: Ameiurus
Species: Ameiurus nebulosus

Family	Genus	Species	Subspecies	Taxon	CommonName	ITISTSN
1 Ictaluridae	Ameiurus	Ameiurus brunneus	NULL	Ameiurus brunneus	snail bullhead	164035
2 Ictaluridae	Ameiurus	Ameiurus melas	NULL	Ameiurus melas	black bullhead	164039
3 Ictaluridae	Ameiurus	Ameiurus natalis	NULL	Ameiurus natalis	yellow bullhead	164041
4 Ictaluridae	Ameiurus	Ameiurus nebulosus	NULL	Ameiurus nebulosus	brown bullhead	164043
5 Ictaluridae	Ameiurus	Ameiurus platycephalus	NULL	Ameiurus platycephalus	flat bullhead	164045
6 Amiidae	Amia	Amia calva	NULL	Amia calva	bowfin	161104
7 Aphredoderus	Aphredoderus	Aphredoderus sayanus	NULL	Aphredoderus sayanus	pirate perch	164405
8 Cyprinidae	Campostoma	Campostoma oligolepis	NULL	Campostoma oligolepis	largescale stoneroller	163509
9 Cyprinidae	Campostoma	Campostoma pauciradii	NULL	Campostoma pauciradii	bluefin stoneroller	163511
10 Cyprinidae	Carassius	Carassius auratus	NULL	Carassius auratus	goldfish	163350
11 Catostomidae	Catostomus	Catostomus commersoni	NULL	Catostomus commersoni	white sucker	553273

Genus: Ameiurus Rafinesque, 1820 - bullheads
Species: Ameiurus nebulosus (Lesueur, 1819) - barbotte brune, brown bullhead

Figure 6. Biological community information.

Daily Stream Discharge Information

Users can retrieve stream discharge (mean daily values) for NAWQA sites equipped with instruments to monitor streamflow (fig. 7).

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NAWQA Data Home

MAP SITES & RESULTS
Map Chemical Conc.

RETRIEVE DATA
Site Information
Constituent Finder
Ground Water
Surface Water/ Bed Sediment

Daily Discharge

Query for Daily River Discharge values:
[Serial \(Long\) Output](#)

PLEASE NOTE: Multiple Selection of Search Criteria is available---for example, searching in the same query for results from Connecticut AND Virginia. For information about multi-selects, check "Data Retrieval Tips" under HELP on the left side of the page.

Other Tips
Export Files: when exporting data to a local computer, tab- or comma-delimited files generally

Parameters Needed
Select values for the following parameters.
* Indicates required field

- * Choose State (s): Do Not Search by State
- * Choose County(s): Do Not Search by County
- * Choose NAWQA Study Unit(s): Apalachicola-Chattahoochee-Flint R
- * Enter HUC: Do Not Search by HUC (Use % as a wildcard)
- * Choose Land Use(s): Do Not Search by Land-Use
- * Minimum for Discharge (cfs): 10000
- * Choose water year(s): Do Not Search by Parameter Name



Go

Land Use Code	Total area, sq. mi.	Sample Medium Desc	Date Desc	Day	Parameter Short Name	Parameter Code	Report Units	Value	
03 mx	322.0	SURFACE WATER	26-NOV-1992	331	Discharge	00060	cfs	18,500	
03 mx	322.0	SURFACE WATER	09-MAR-1998	68	Discharge	00060	cfs	16,100	
03 mx	322.0	SURFACE WATER	08-JUL-1994	189	Discharge	00060	cfs	18,500	
03 mx	322.0	SURFACE WATER	04-MAR-2001	63	Discharge	00060	cfs	12,400	
02 mx	1027.0	SURFACE WATER	09-JAN-1998	9	Discharge	00060	cfs	18,800	
02 mx	1027.0	SURFACE WATER	23-JAN-1998	23	Discharge	00060	cfs	12,500	
AHABA RIVER AT CENTREVILLE AL	03150202 mx	1027.0	SURFACE WATER	07-JAN-1998	7	Discharge	00060	cfs	21,200
AHABA RIVER AT CENTREVILLE AL	03150202 mx	1027.0	SURFACE WATER	07-FEB-2004	38	Discharge	00060	cfs	15,600
AHABA RIVER AT CENTREVILLE AL	03150202 mx	1027.0	SURFACE WATER	05-APR-2000	96	Discharge	00060	cfs	22,800
AHABA RIVER AT CENTREVILLE AL	03150202 mx	1027.0	SURFACE WATER	04-APR-2000	95	Discharge	00060	cfs	34,100

Figure 7. Examples of output table using the daily discharge option.

Site and Chemical Constituent Information

The “Site Information” option on the data warehouse home page provides details about NAWQA sampling sites. In addition to site information, several types of maps are available, including topographic maps (fig. 8).

Place Name	SW Site Type Desc	Total area, in sq. mi.	Huc	Latitude 1983	Longitude 1983	Lat Long Accuracy Desc	TopoZone Map
WAR EAGLE CREEK NEAR HINDSVILLE, AR	STREAM	263.00	11010001	36.2000750000	-96.8551955560	S	
KINGS RIVER NEAR BERRYVILLE, AR	STREAM	527.00	11010001	36.4259916667	-93.6231916667	1	
YOCUM CREEK NEAR OAK GROVE, AR	STREAM						
BUFFALO RIVER NEAR BOXLEY, AR	STREAM						
LITTLE BUFFALO RIVER AT MURRAY, AR	STREAM						
SHOP CREEK AT PARTHENON, AR	STREAM						
BUFFALO RIVER NEAR EULA, AR	STREAM						
RICHLAND CREEK NEAR WITTS SPRING, AR	STREAM						
BUFFALO RIVER NEAR ST. JOE, AR	STREAM						
WATER CREEK NEAR ENENING STAR, AR	STREAM						
BIG CREEK NEAR BIG FLAT, ARK.	STREAM						

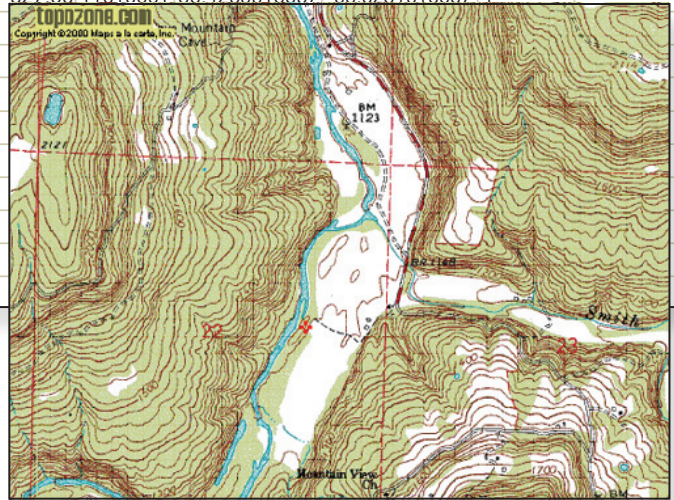



Figure 8. Types of site information retrievals available—table and map displaying site information.

The “Constituent Finder” option on the data warehouse home page allows users to obtain information about specific chemicals that the NAWQA Program has investigated. For example, the Constituent Finder can be used to retrieve information about atrazine (fig. 9).



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NAWQA Data Home

MAP SITES & RESULTS

Map Chemical Conc.

RETRIEVE DATA

Site Information

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Ground Water

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Mixed (SW & GW)

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NAWQA Program Home

Constituent Finder Application

Search by Parameter Name:
(i.e. phos) (%=wildcard)

Search by HUC:
(i.e. 608)

AND/OR

Select a Sampling Schedule:

AND/OR

Limit parameters returned to only those that are seen more than X percent of the time. Enter Percent:

State:

Parameter Code Name:

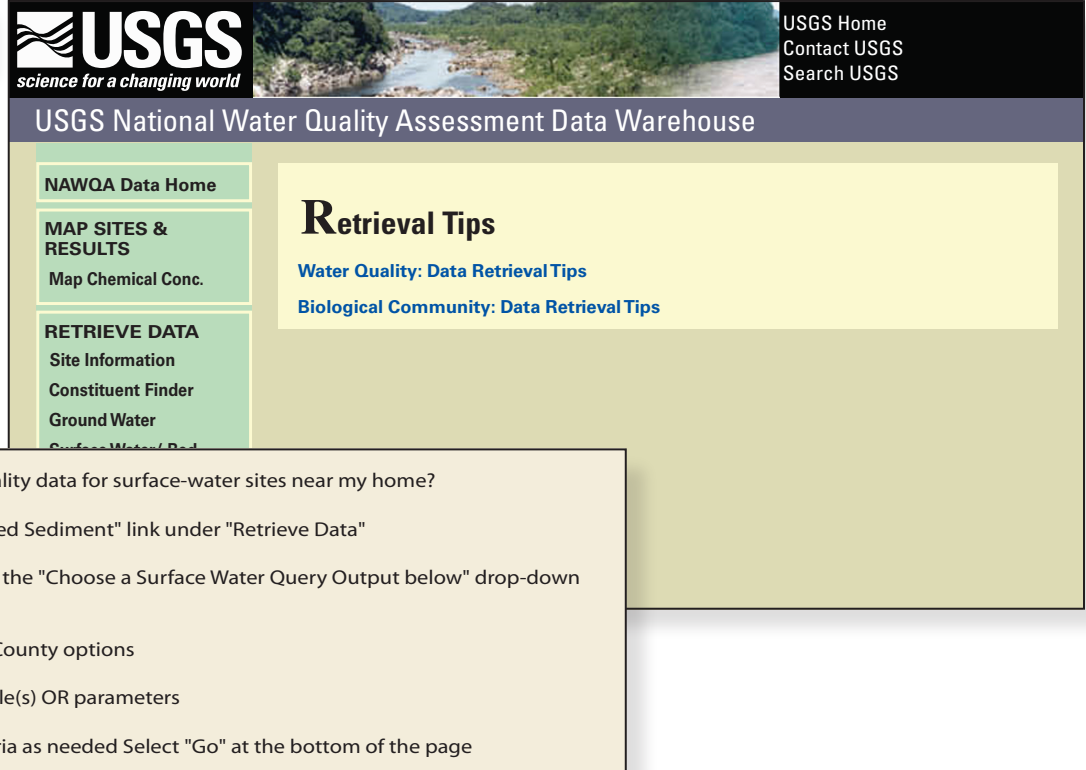
Page 1 25 rows per page

River Basin	Site Type Code	State and County	USGS Station ID	Place Name	Remrk	Value
Central Arizona Basins	GW	AZ - COCHISE	320705110182001	D-15-20 21bda	<	0.001
			315712110205401	D-17-20 18bbb	<	0.001
			315657110250401	D-17-19 17ddd2	<	0.001
			315520110130501	D-17-21 29dca	<	0.001
			314953110124201	D-18-21 33bbb	<	0.001
			314945110010001	D-18-23 32abc	<	0.001
			314507110050101	D-19-22 27acc	<	0.001
			314127110055501	D-20-22 16ddb	<	0.001
			314115110205601	D-20-20 18ccc	<	0.001
			313848110192501	D-20-20 32deb2	<	0.001
			313752110270201	D-21-19 06cc Unsvr	<	0.001
			313403110001501	D-21-33aaa	<	0.001

Figure 9. Chemical constituent information.

Online Help

Users can access several types of online help to assist in creating retrievals and formatting output (fig. 10).



The screenshot shows the USGS National Water Quality Assessment Data Warehouse website. At the top left is the USGS logo with the tagline "science for a changing world". To the right is a landscape image of a river. In the top right corner, there are links for "USGS Home", "Contact USGS", and "Search USGS". The main header is "USGS National Water Quality Assessment Data Warehouse". Below this is a navigation menu with three main sections: "NAWQA Data Home", "MAP SITES & RESULTS" (with a sub-link "Map Chemical Conc."), and "RETRIEVE DATA" (with sub-links "Site Information", "Constituent Finder", "Ground Water", and "Surface Water/Bed Sediment"). To the right of the menu is a yellow box titled "Retrieval Tips" containing two links: "Water Quality: Data Retrieval Tips" and "Biological Community: Data Retrieval Tips".

Question: How do I locate water-quality data for surface-water sites near my home?

Answer: Select the "Surface Water/Bed Sediment" link under "Retrieve Data"

- Select an output format from the "Choose a Surface Water Query Output below" drop-down menu, then press "Go"
- Select the desired State and County options
- Select the desired lab schedule(s) OR parameters
- Select additional search criteria as needed Select "Go" at the bottom of the page

Using Search Criteria

Search criteria are used to specify what data should be retrieved. Most retrievals allow you to specify search criteria for several variables (e.g. NAWQA Study Unit, State, and County). In most cases you are asked to select the criteria from drop-down lists (e.g. State). In a few cases you are asked to input a value directly (e.g. Huc).

Helpful Hints

- Use [Sample Medium](#) to specify the type(s) of samples that you are interested in. This criterion is not available for the fish community queries. But it is available for the Sample Count, invertebrate, and algae queries
- If you run a retrieval and then decide to run it again, the second retrieval will use the same search criteria unless you edit them. For example, if you retrieve data by state and then want to retrieve data by study unit you'll need to clear the state selection first.

Miscellaneous hints

Information can be expanded; adjust the window as needed.

Refresh" button on the browser menu bar (and/or open up a new browser session),

Something overwhelmed the system in your data request. Enter password - JQPUBLIC

ify must be true for data to be retrieved. For example, if you specify the following
y: state={Colorado or Nebraska} and NAWQA study Unit={South Platte}, then you
sites in Colorado or Nebraska that are part of the South Platte Study. To make the
ave Study Unit set to 'Do Not Search by Study Unit'.

ms that are false, the results of the query will be "This worksheet doesn't contain
{Iowa} and NAWQA study unit={Southern Florida}). Similarly, if both the "Enter or
"Enter or Select Parameter Name" search criteria are used, then results of the
query will be "This worksheet doesn't contain any data". Be sure that either "Do not search by lab schedule" or "Do
not search by parameter name" is selected from the appropriate search criterion. Occasionally, after multiple
queries have been performed using the same browser window, a data retrieval will result in the message "This
worksheet doesn't contain any data". The "fix" for this situation is re-run the query after having closed all browser
windows (and then opening a new browser window and re-attaching to the data warehouse.)

Figure 10. Examples of online help options.

Additional Information about the NAWQA Data Warehouse and NAWQA Program

Information about the data warehouse and direct access to the data described in this fact sheet are available at:

<http://water.usgs.gov/nawqa/data>

Information about the NAWQA Program is available at:

<http://water.usgs.gov/nawqa>

Contacts for the NAWQA Data Warehouse:

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