

The Water Quality Exchange: A Streamlined Way for Sharing Water Quality Data

Charles Kovatch

USEPA Office of Water

NWQMC Meeting April 29, 2014





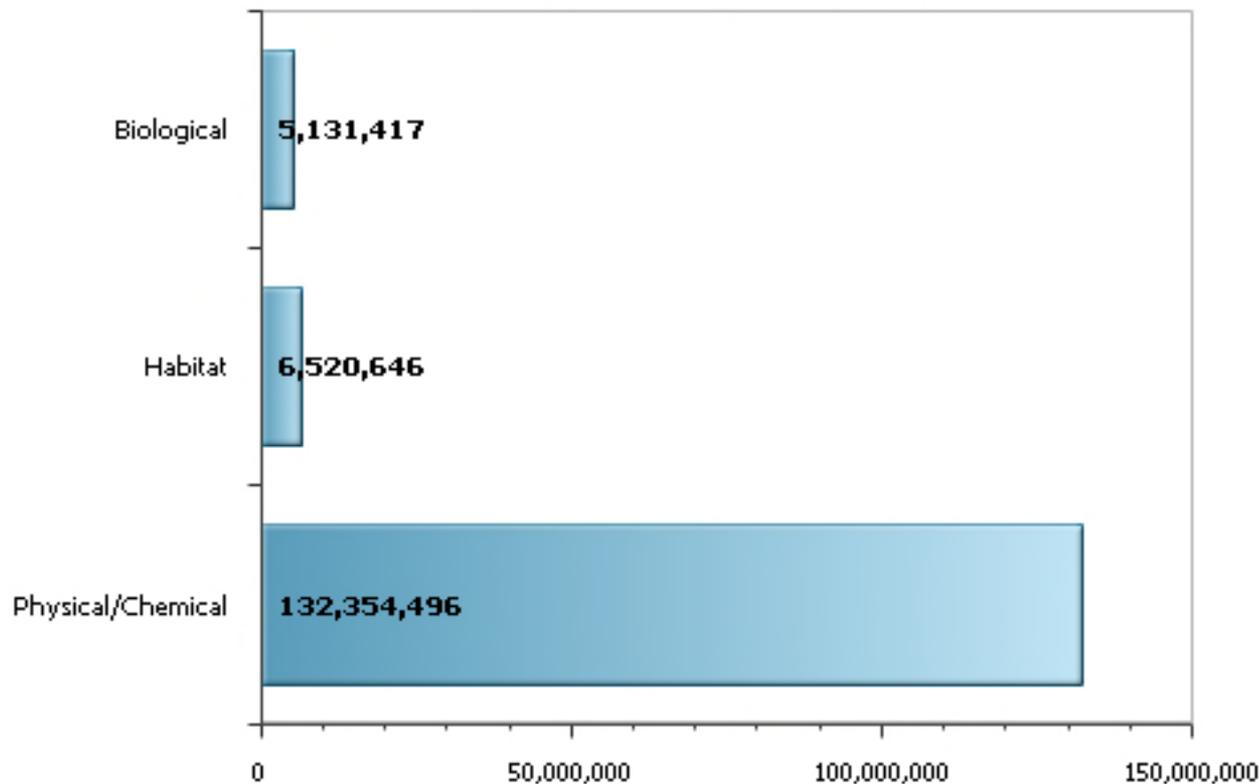
Overview

- We have a tool to help you to share water quality data and participate on the Water Quality Portal.
- Combined, the tool and Portal will increase the value of your data by making it available to multiple users.
- The tool lays out a community standard water data fields to improve water data sharing.



Water Quality Results in EPA STORET

Total Warehouse Records by Type





Agenda

- Overview of WQX
- “Demo” of tool
- Call for data



What does the tool do for you?

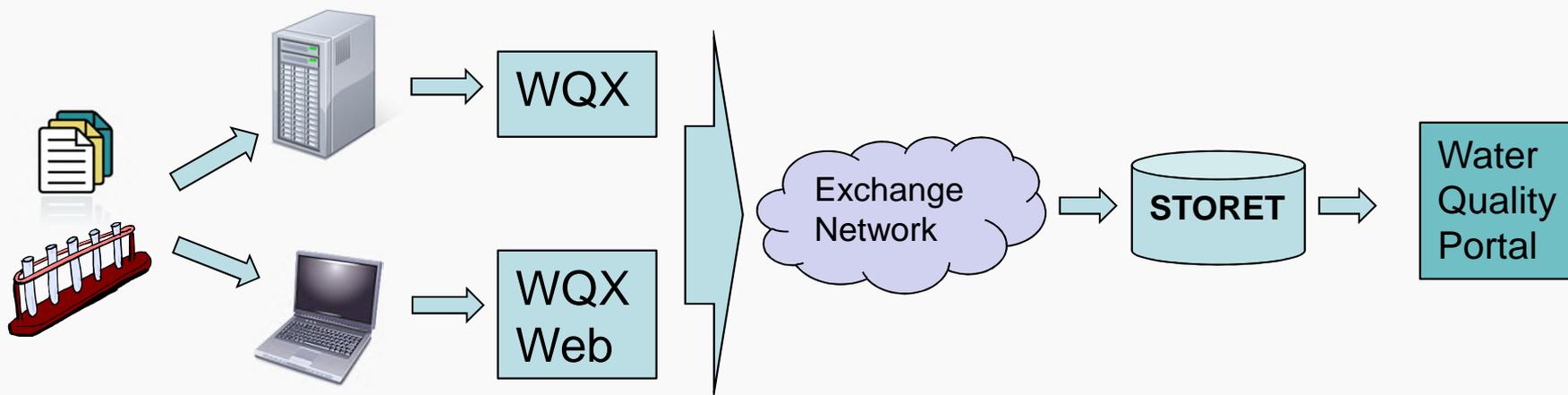
- Enables you to share data in one format
- Improves interoperability of data systems through the use of standard water monitoring data fields
- Enables you to publish data at a national level
- Increases your ability to use OTHERS data in conjunction with your data, as available in the Portal, for analysis and modeling
- Enables you to manage data in the format that best serves your program needs



What are the Tools?

- **WQX**
 - Water Quality Data eXchange
 - XML Schema that provides standard data elements and file format
 - Intended for high volume data users
- **WQX Web**
 - Water Quality Data eXchange Web Template
 - Is based in MS Excel
 - If you can use a spreadsheet, this is for you

What do the tools do?



- The tools benefit you by:
 - Enabling you to share data in one format
 - Enabling you to publish data at a national level
 - Allowing you to manage data in the format that best serves your program needs



What data can be collected?

- Physical conditions at the time of a site visit
- Water chemistry and bacteriological data
- Fish tissue data
- Biological Taxon Abundance data, including population census, frequency class, group summaries, and individual results
- Biological Index scores and their related metric scores
- Reference site information
- Toxicity data
- Habitat Assessment scores and their related metric scores





How do the tools work?

Question	Description	Data Field
WHO collected the sample?	Organization Name	Friends of the Potomac River
WHAT was collected?	Chemical Name	Copper
WHY was it collected?	Project Name	Quarterly Sample
WHERE was it collected?	Location Name Lat/Long	Memorial Bridge 40.594, -98.721
WHEN was it collected?	Date	July 24, 2012
HOW was it analyzed?	Method Name	USEPA 123ABC
WHAT were the results?	Result Value Result Units	5 ppm

- The tool benefits you by providing:
 - Structure to capture required data fields
 - A pick-list of common names for chemicals and analytical methods



How does the WQX XML Schema work?

- Establishes the structure to document a water monitoring sample through standard data fields
- Allows a data owner to use their existing database
- Requires a cross-walk between the database and WQX data standard
- Requires you to review the domain values or pick-list to match your database fields to the WQX schema
- Is designed for a high volume data owner
- Requires coding to generate the XML schema
- Allows for automated machine-to-machine data submission
- Is a high front end investment and high long term ROI



WQX XML Example

```
<?xml version="1.0" encoding="UTF-8" ?>
- <WQX xmlns="http://www.exchangenetwork.net/schema/wqx/2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.exchangenetwork.net/schema/wqx/2 http://www.exchangenetwork.net/schema/wqx/2/index.xsd">
- <Organization>
- <OrganizationDescription>
  <OrganizationIdentifier>WQXTEST</OrganizationIdentifier>
  <OrganizationFormalName>Test Organization</OrganizationFormalName>
  <OrganizationDescriptionText>Here is a description of the organization.</OrganizationDescriptionText>
  <TribalCode>001</TribalCode>
</OrganizationDescription>
- <Activity>
- <ActivityDescription>
  <ActivityIdentifier>RDC-4</ActivityIdentifier>
  <ActivityTypeCode>Sample-Routine</ActivityTypeCode>
  <ActivityMediaName>Water</ActivityMediaName>
  <ActivityStartDate>2010-07-19</ActivityStartDate>
  <ProjectIdentifier>SHARK</ProjectIdentifier>
  <MonitoringLocationIdentifier>NJDEP-ML1</MonitoringLocationIdentifier>
</ActivityDescription>
- <SampleDescription>
- <SampleCollectionMethod>
  <MethodIdentifier>10366-C</MethodIdentifier>
  <MethodIdentifierContext>WQXTEST</MethodIdentifierContext>
  <MethodName>HOBO? U22 Water Temp Pro v2</MethodName>
  <MethodDescriptionText>Depending on water conditions and desired measurement location, the logger should be appropriately weighted, secured,
    and protected. Some monitoring applications require precise placement of the temperature sensor, such as measuring the temperature of a flow
    at the bottom of a stream or river. Ensure that the logger is appropriately secured so that the temperature sensor is in the desired measurement
    location.</MethodDescriptionText>
</SampleCollectionMethod>
  <SampleCollectionEquipmentName>Miscellaneous (Other)</SampleCollectionEquipmentName>
</SampleDescription>
</Activity>
+ <Activity>
```



How does the WQX Web Tool work?

- Establishes the structure to document a water monitoring sample through standard data fields
- Allows a data owner to use their existing database
- Requires a cross-walk between the database and WQX data standard
- Requires you to review the domain values or pick-list to match your database fields to the WQX Web template
- Is designed for a lower volume data owner
- Requires no coding to generate the XML schema
- Allows for manual user-to-machine data submission
- Is a lower front end investment and short term ROI



Data Entry and Data Formatting with WQX Web

Clipboard Font Alignment Number Styles Cells Edit

E2 Domain values last updated: 03/02/2012 10:38:00 AM

USEPA WQXWeb Physical Chemistry Template Domain values last updated: 03/02/2012 10:38:00 AM
Version 1.04

- This template is a data entry spreadsheet that guides data owners through organizing water quality data into a format that meets WQX data validation requirements.
- This template is intended to be paired with the WQXWeb Import Configuration - Import PhysChem Results.bin. Changes to the order of columns or the data format in this WQX Web template spreadsheet also need to be applied to the WQXWeb Import Configuration.
- Please refer to the latest version of the "WQXWeb Template Dictionary" for a detailed explanation of the contents within each data entry worksheet, in addition to a complete list of WQX Allowable Values. The dictionary also contains a list of all the columns available in each Data Entry worksheet.

Worksheets are color coded by function. The single pink tab contains buttons used to export data, the three yellow tabs are used to enter data, and the green tabs are reference lists for data columns that allow only specific values.

Group Name	Use	Worksheet Name	Description
Export	Use buttons on this tab convert Data Entry Worksheets (yellow tabs) to .txt files	Export	The Export tab contains buttons to automatically export data from each of the data entry worksheets into tab delimited files ready to be imported into WQXWeb.
Data Entry Worksheets	A template for submission of water quality monitoring data. Projects, Monitoring Locations and Results templates are provided for users	Projects	The Project tab contains information about the water quality data collection program
		Monitoring Locations	The Monitoring Locations tab contains information about the sites where water quality data is being collected
		Results	The Results tab contains the field and laboratory water quality data collected.
Allowable Values/ Look-up Lists/ Domain Values	Tables of allowable values for specific columns in the Data Entry worksheets. All green-colored cells contain the values that should be used in the worksheets. Others cells are included for additional reference.	Allowed Values - Monitoring Locs	This tab contains multiple tables of listing the values that can be entered in particular columns in the Monitoring Locations tab.
		Allowed Values - Results	This tab contains multiple tables of listing the values that can be entered in particular columns in the Results tab.
		Characteristics	This tab contains a table of all Characteristics in STORET that can be used in the Characteristic Name field in the Results tab. The table also has fields to indicate if a particular Characteristic requires a Sample Fraction or Field/Lab Analytical Procedure (or both) for a particular characteristic.
		Analytical Methods	This tab contains a list of all nationally available result analytical methods. Additional methods can be defined by an organization in the "Analytical & Collection Methods" tab.
		Units of Measure	This tab contains a single table listing all result units of measure available in WQX.
		Analytical & Collection Methods	This tab can be used to record organization specific Result Analytical Methods and Sample Collection Methods. Data entered in this tab is not exported to WQXWeb.

For assistance with using this template, please refer to the US EPA STORET/WQX online resources at <http://www.epa.gov/storet/>
 The most recent copy of this template and corresponding dictionary can be downloaded from http://www.epa.gov/storet/wqx/wqxweb_downloads.html
 If you have questions or comments about this template, please send email to the STORET Help Desk at STORET@epa.gov

Instructions Export Projects Monitoring Locations Results Allowed Values - Monitoring Loc Allowed Values - Results Characteristics Analytical Methods Url



WQX Web: Monitoring Location Fields

- Pre-populated Domain Values assist in entering data and reducing input errors.

	A	B	C	D	E	F	G	H	I
	Monitoring Location ID	Monitoring Location Name	Monitoring Location Type	HUC Eight-Digit Code	Monitoring Location Latitude	Monitoring Location Longitude	Monitoring Location Source Map Scale	Monitoring Location Horizontal Collection Method	Monitoring Location Horizontal Coordinate Reference System
1									
2	WQXTEST16465	WQXTEST 16465 POTOMAC RIVER NEAR	River/Stream	02070008	38.94978	-77.12764	2400	Interpolation-Map	NAD83
3	WQXTEST27576	WQXTEST 27576 FAKE RIVER, NOWHERE	River/Stream	02070008	38.94978	-77.12764	2400	Interpolation-Map	NAD83
4			River/Stream						
5			River/Stream Ephemeral						
6			River/Stream Intermittent						
7			River/Stream Perennial						
8			Riverine Impoundment						
9			Seep						
10			Spring						
11			State/Local Air Monitoring St.						





WQX Web: Results Fields

- ▶ Template provides structure to populate the metadata: Who, What, When, Where, How on each sample result.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Project ID	Monitoring Location ID	Activity Type	Activity Media Name	Activity Start Date	Activity Start Time	Sample Collection Method ID	Sample Collection Equipment Name	Characteristic Name	Result Value	Result Unit	Result Sample Fraction	Result Analytical Method ID	Result Analytical Method Context
1														
2	SL_MONIT	TWPK01	Field Msr/Obs	Water	2001-10-03	10:03:00			Temperature, water	49.46	deg F		2550	APHA
3	SL_MONIT	TWPK01	Field Msr/Obs	Water	2001-10-03	10:03:00			Turbidity	43	NTU		2130	APHA
4	SL_MONIT	LOPK01	Sample-Routine	Water	2001-09-10	9:48:00	STNDRD_SCP	Water Bottle	Ammonia-nitrogen	0.9022	mg/l	Dissolved	4500-NH3(C)	APHA
5	SL_MONIT	TWPK01	Sample-Routine	Water	2001-09-10	9:48:00	STNDRD_SCP	Water Bottle	Nitrate	7.2	mg/l	Dissolved	353.3	USEPA
6														
7														
8														
9														
10														
11														
12														
13														
14														





Field Biological Data Mapped to WQX



Name of Organism

Size of Organism

Organism Characteristics

NRSA 2013 FISH COLLECTION

Reviewed By (initials) _____

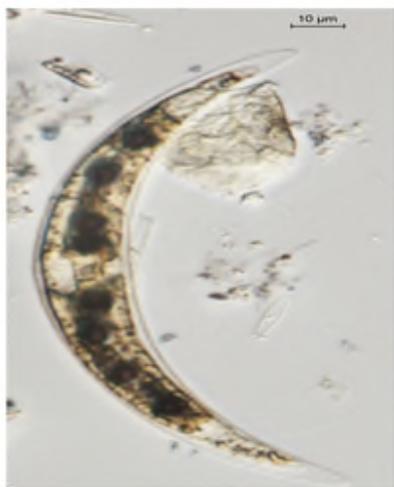
Site ID: _____ Date: ____/____/____ Page ____ of ____

Line #	Common Name	Hybrid? (Y/N)	Intro-duced? (Y/N)	Tally and Counts				Annot Count	Mortality Count	VOUCHER			Voucher Tag #	Vouchers Retained	File
				<150 mm	150-300 mm	300-450 mm	>450 mm			Unw/Rng	QA	Photo			
1		<input type="radio"/>	<input type="radio"/>							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		<input type="radio"/>	<input type="radio"/>							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			



WQX Web Biological Template

About STORET/ WQX
Data download
Online Tutorials
Data Submittal
Useful Internet Links
Support
Tools/ Web Services
Frequent Questions
Helpdesk
Sitemap



WQX Web Biological Template (ZIP 1.1MB)

The Biological Template is provided to assist in formatting biological results. The template is made up of two Microsoft Excel spreadsheet files that are meant to be used together to assist with data tracking and entry. The WQX Web Template Dictionary file provides guidance on the appropriate use of each data element, highlighting the data elements that are available in the WQX Web Template and showing the additional data elements that a user may add to the template. The dictionary covers data elements for all templates including Physical-Chemical Results, Biological Results, Habitat Results, Activity Metrics and Indices, and Continuous Monitor Results. *Note this template does not include the data elements for submitting biological metrics or indexes; these are handled using a separate WQX Web template file.

This template contains sample data that can be imported into WQX Web using the following import configuration (for more information regarding how to use Import Configuration files in WQX Web, please see the WQX Web tutorials):

- [IMPORT BIOLOGICAL RESULTS](#)

- Online Tutorials
- Biological Template Dictionary

http://www.epa.gov/storet/wqx/wqxweb_downloads.html



WQX Web Biological Data Template

- The Biological and Metric- Index Templates assist in formatting biological and habitat metrics and indices data.

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	
	Sample Collection Method ID	Sample Collection Equipment Name	Sample Collection Equipment Comment	Characteristic Name	Result Detection Condition	Result Value	Result Unit	Result Sample Fraction	Result Status ID	Result Value Type	Biological Intent	Subject Taxonomic Name	Sam Al
1													
2	GRE:BEN-Kick	D-Frame Net		Count		2	count		Final	Actual	Population Census	Dicranota	
3	GRE:BEN-Kick	D-Frame Net		Count		11	count		Final	Actual	Population Census	Baetis	
4	GRE:BEN-Kick	D-Frame Net		Count		15	count		Final	Actual	Population Census	Hydropsychidae	
5	GRE:BEN-Kick	D-Frame Net		Count		1	count		Final	Actual	Frequency Class	Cheumatopsyche	
6	GRE:BEN-Kick	D-Frame Net		Count		1	count		Final	Actual	Frequency Class	Chironomini	
7	FISH:Elec:Tow:A	Tow Net		Length, Total (Fish)		350	mm		Final	Actual	Individual	Prosopium spilonotus	
8	FISH:Elec:Tow:A	Tow Net		Weight		408	g		Final	Actual	Individual	Prosopium spilonotus	
9	FISH:Elec:Tow:A	Tow Net		Fish Anomalies - Tumors		4	count		Final	Actual	Group Summary	Prosopium spilonotus	
10	FISH:Elec:Tow:A	Tow Net		Count		6	count		Final	Actual	Frequency Class	Prosopium spilonotus	
11	FISH:Elec:Tow:A	Tow Net		Mercury		0.2	mg/kg	Total	Final	Actual	Toxicity	Prosopium spilonotus	Whole
12	FISH:Elec:Tow:A	Tow Net		Lead		450	mg/kg	Total	Final	Actual	Tissue	Prosopium spilonotus	Whole
13													
14													





Converting Spreadsheet Data to WQX Web Compatible Format

USEPA WQXWeb Physical Chemistry Template
Version 1.04

Domain values last updated: 03/02/2012 10:38:00 AM

Export Projects

Export Monitoring Locations

Export Results

These Export buttons will export data entered in the three yellow-colored Data Entry worksheets ('Projects', 'Monitoring Locations', and 'Results') into separate tab delimited text files. You will be prompted to choose a location where to save the file. The name of the most recent exported file will be saved in the 'Last Export Saved' table below.

The tab delimited text files exported using these buttons can be imported into WQXWeb using unique import configurations for each file.

Last Export Saved:

Projects	C:\Documents and Settings\bisese\Desktop\ExportProject20120302.txt
Monitoring Locations	C:\Documents and Settings\bisese\Desktop\ExportMonitoringLocations20120302.txt
Results:	C:\Documents and Settings\bisese\Desktop\ExportPchemResults20120302.txt

Notes:

- Project and Monitoring Locations need to be submitted before Results can be submitted for the first time.
- The "Export Monitoring Location" button converts the County Name into a County Code as required by WQXWeb
- Once Projects and Monitoring Locations have been submitted then do not need to be resubmitted except to update information about them.
- Users can manually export data by saving any one of the Data Entry worksheets in 'Text-file tab-delimited' format. For the 'Monitoring Locations' worksheet this will not convert the County Name into a code

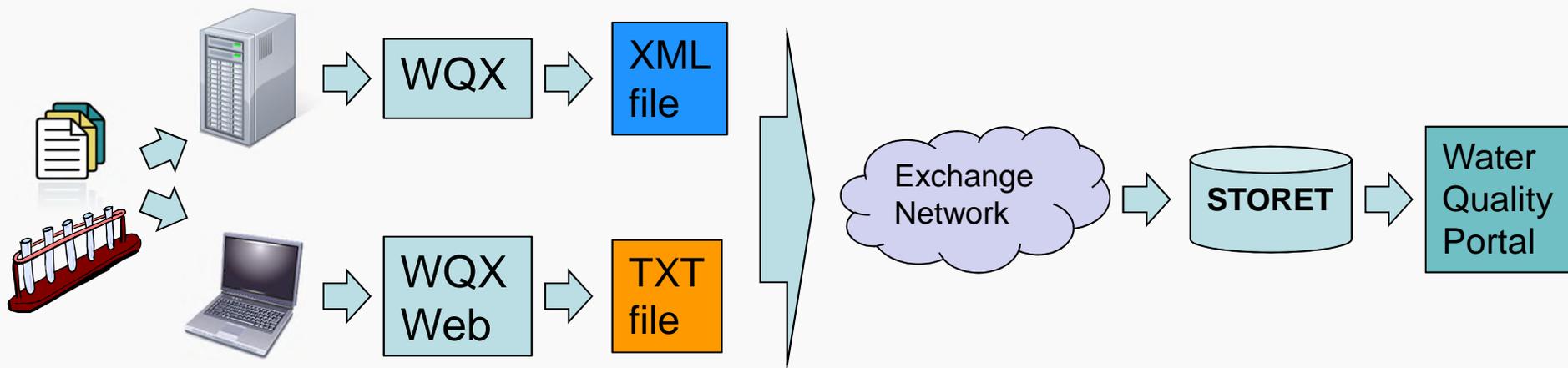
Security Note: In order to use the export buttons on this page you must enable macros for this Excel spreadsheet, or set the macro security to 'Medium.' For more information on how to change macro security settings see the following articles:

[Change Macro Security](#)
[About Macro Security](#)

For assistance with using this template, please refer to the US EPA STORET/WQX online resources at <http://www.epa.gov/storet/>
The most recent copy of this template and corresponding dictionary can be downloaded from http://www.epa.gov/storet/wqx/wqxweb_downloads.html
If you have questions or comments about this template, please send email to the STORET Help Desk at STORET@epa.gov



What do the tools do? - Review



- Join 400 federal, states, and tribal, agencies and watershed organizations already using the WQX and WQX Web file formats



What do WQX and WQX Web do for you?

- Improve interoperability of data systems through the use of standard water monitoring data fields
- Increase the value of your data by making it available to multiple users through the Water Quality Portal
- Increase your ability to use OTHERS data in conjunction with your data for analysis and modeling

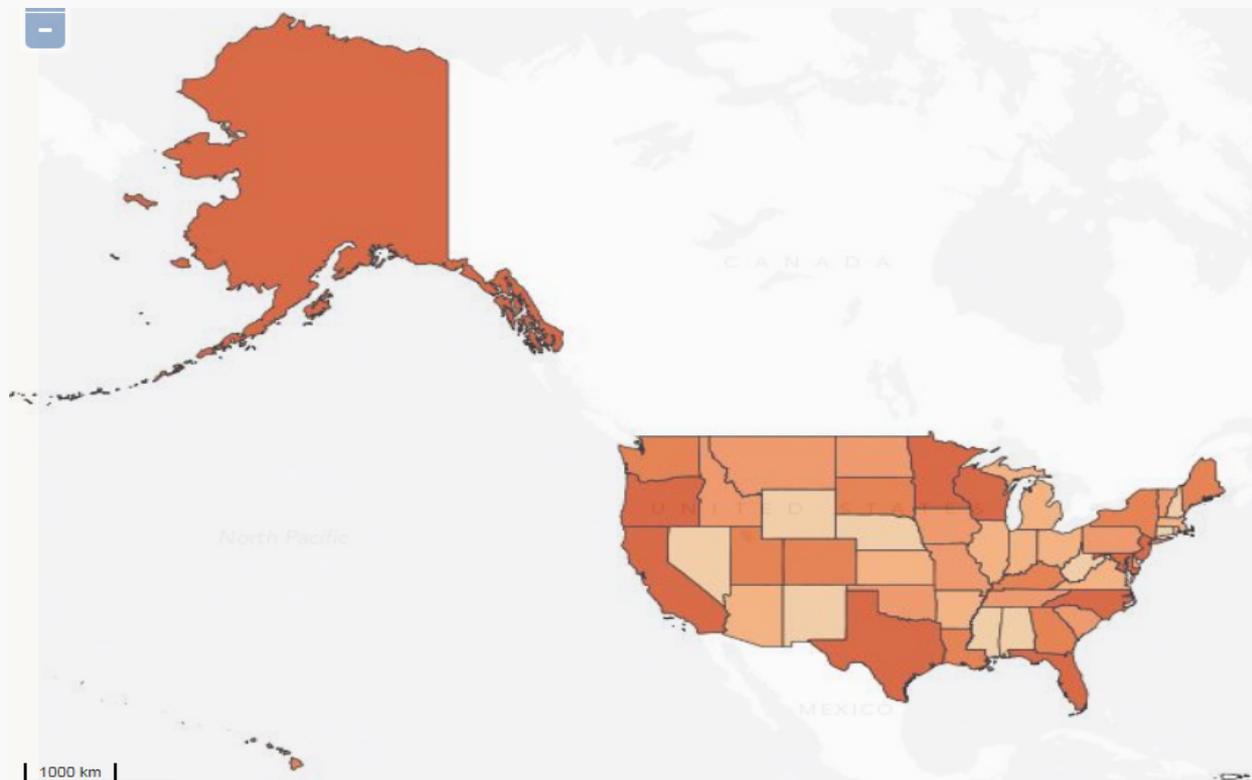


What do WQX and WQX Web do for you?

- Enable you to manage data in the format that best serves your program needs and share data based on common data elements
- Assure that your water data results contain the critical pieces of information to increase the utility of your data for analysis and modeling
- Provide a pick-list of common names for chemicals and analytical methods



What do WQX and WQX Web do for you?

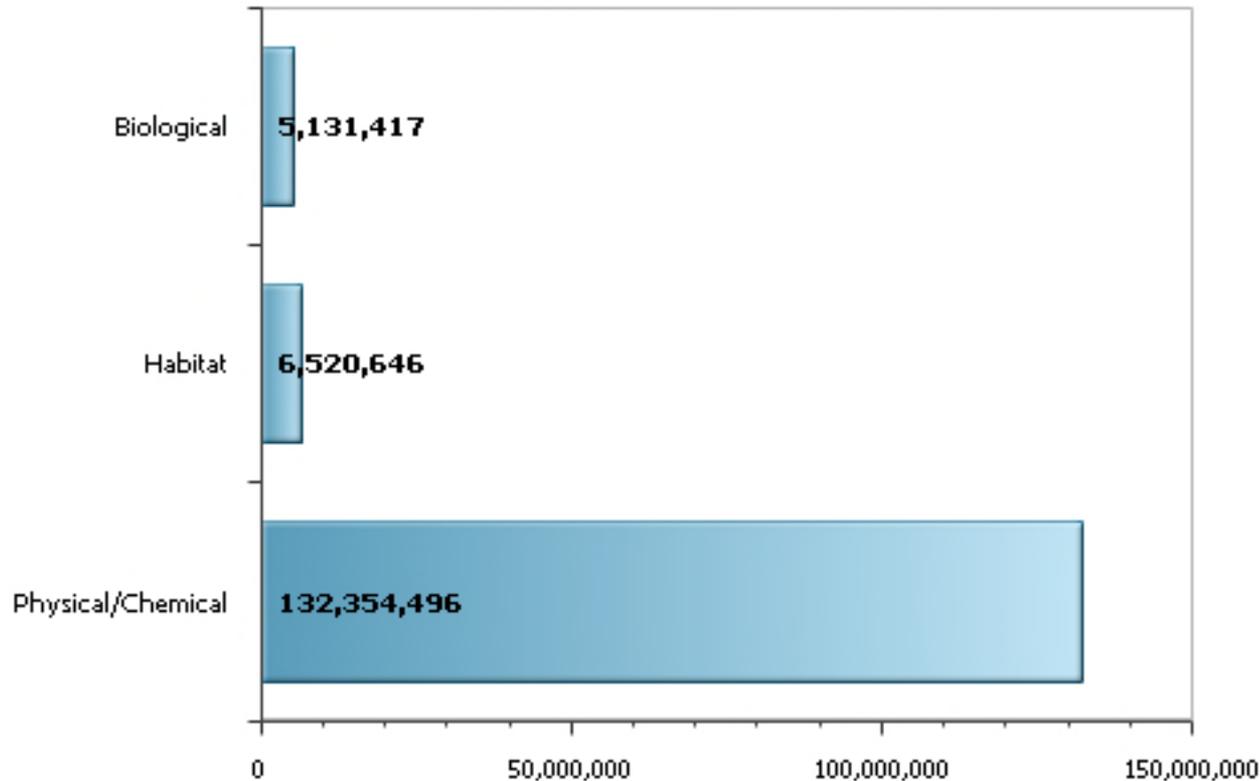


- Enable quick access to your data in one format and the Water Quality Portal for access to over 230 million records nationally

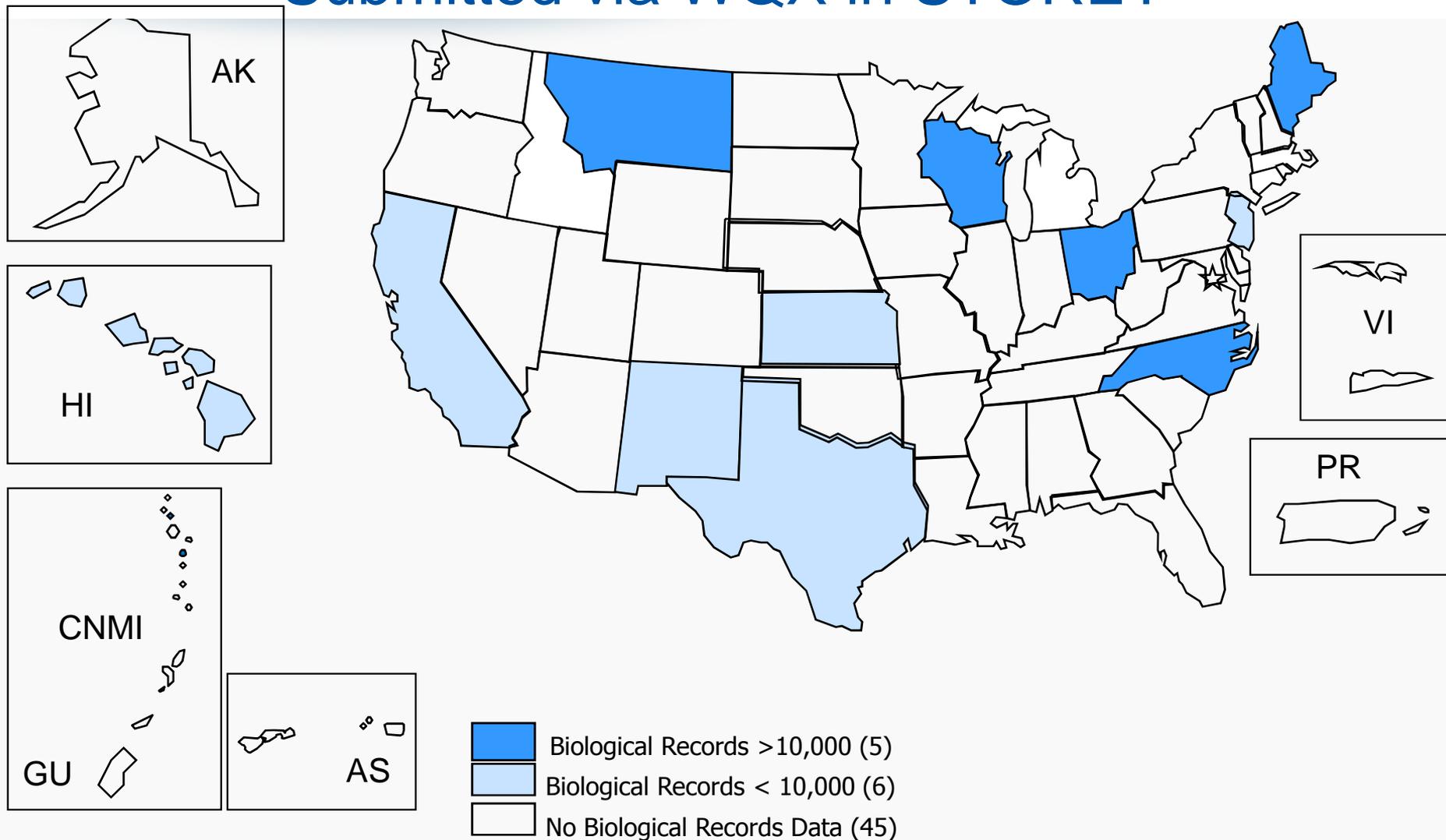


Water Quality Results in STORET

Total Warehouse Records by Type



Status of State *Biological* Water Monitoring Results Submitted via WQX in STORET





Next Steps for WQX

- Continue working with states to flow *physical and chemical* data using WQX
- Review data from the 11 states using WQX to flow *biological* data to EPA
- Identify other states who are interested in increasing *physical and chemical* data and/or flowing *biological* data
- Work with the Portal team to flow biological data from the Portal



User Support and Technical Assistance

- STORET Help Desk
 - 800-424-9067; STORET@epa.gov
- Monthly User Calls
- STORET List Serve
- Helpful Websites:
 - WQX <http://www.epa.gov/storet/wqx/index.html>
 - WQX Web
http://www.epa.gov/storet/wqx/wqxweb_downloads.html





Stop by our booth

- WQX Demo at 9:30-10:00 a.m.
- Water Quality Portal Demo at EPA and USGS booth