Volunteer Monitoring Data Storage in Montana
Complementary roles of MT-eWQX (EQuiS) and the MSUEWQ Data Hub

Volunteer monitoring groups are often interested in management of water quality data to facilitate short-term and long-term access for both technical and non-technical audiences. Technical audiences need to know a lot about how data was collected (metadata) to know what the data can be used for. Non-technical audiences are often less interested in the nitty-gritty of how the data was collected and just want to understand the general story the data is telling.

The best option for long-term data and metadata storage for volunteer data (and a requirement if public funding is used) is MT-eWQX (Montana EQuiS Water Quality Exchange), and the associated national database known as the national Water Quality Exchange warehouse (WQX). The WQX database replaces the former EPA STORET database. It houses data from state partners (like MDEQ) as well as federal entities such as the EPA, USGS, National Park Service, and Tribes. The online Water Quality Portal (WQP) is the public interface that pulls from this WQX database. Data uploaded to the MT-eWQX database is pushed to the WQX database approximately weekly and is then publicly available through the online WQP. https://www.waterqualitydata.us/

Data upload to MT-eWQX requires a robust set of quality assurance measures to help guarantee the rigor of the data. Upload also requires information about analytical methods used, accuracy of methods (reporting limits), whether samples were analyzed in a timely manner (hold time exceedances), etc. This data about the data (metadata) is critical for any subsequent rigorous scientific work with the data.

While data is publicly available through the WQP, downloading it is a cumbersome process that requires working with the data in spreadsheets or other software. The WQP does not have any built-in data visualization options, so the user must be able to work with the data to create plots or summaries for interpretation.

A common goal for volunteer monitoring is public engagement with the data collection and use. In partnership with MDEQ and stream team partners, MSU Extension Water Quality (MSUEWQ) created the Data Hub to make volunteer collected data readily available for public access. The MSUEWQ Data Hub does not store the extensive metadata that is required for WQX, but instead complements the robust long-term repository role of the WQX by facilitating easy visual exploration of data.

The Data Hub stores both numeric data and photos as well as information about stream team programs along with pictures and bios for volunteers. The Data Hub does not seek to be comprehensive but rather to provide the data that volunteer groups are most commonly interested in along with basic information necessary to interpret the data.

While it is possible for data to be directly uploaded to the Data Hub with no accompanying upload to WQX, it is highly recommended to always upload data to WQX. The metadata required, quality assurance measures in place, and robust infrastructure supporting WQX make it the clear choice for long-term data storage. The MSUEWQ Data Hub seeks to complement WQX by making data more readily accessible and digestible by citizens. The Data Hub also facilitates quick exploratory plotting to identify patterns, to spark curiosity that might lead to more detailed inquiries.

MT-eWQX national WQX

	A	H	L	M	N
1	#Activity_ID ▾	Characteristic_Name ▾	Result_Value ▾	Result_Value_Unit ▾	Result_Qualifier ▾
2	#Text(35)	Text(120)	Text(20)	Text(12)	Text(5)
3	20200831_BC-ROAD	Total Phosphorus, mixed fo 0.007		mg/l	
4	20200831_BC-ROAD	Total nitrogen, mixed form 0.05		mg/l	
5	20200831_BC-ROAD	Orthophosphate 0.006		mg/l	H
6	20200831_BS-VARNEY	Total Phosphorus, mixed fo 0.012		mg/l	
7	20200831_BS-VARNEY	Total nitrogen, mixed form 0.33		mg/l	
8	20200831_BS-VARNEY	Orthophosphate 0.006		mg/l	H
9	20200831_CC-HWY	Total Phosphorus, mixed fo 0.008		mg/l	
10	20200831_CC-HWY	Total nitrogen, mixed form 0.08		mg/l	

Supports robust long-term storage of data and metadata **Yes** ✓   Supports interactive visualization of data by the public **No** ✗

- Emphasis on secure long-term storage of data and metadata
- Montana DEQ stores data in MT-eWQX (aka EQuiS) database
- MT-eWQX pushes data to the national Water Quality Exchange (WQX)
- Uploading data to MT-eWQX requires robust quality assurance and metadata
- MT-eWQX data is accessible via the national WQP (not directly from MT-eWQX)
- No data visualization options are built into the WQP
- Downloading data from the WQP can be somewhat cumbersome

MSUEWQ Data Hub
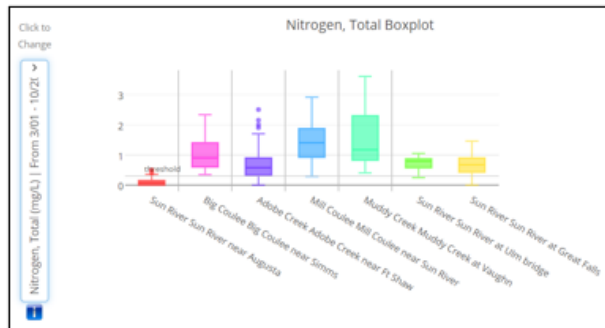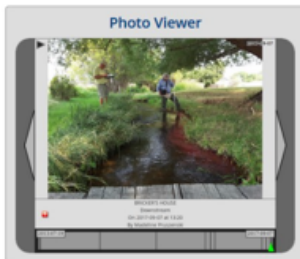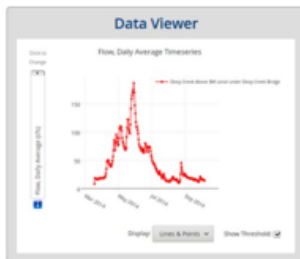
Supports robust long-term storage of data and metadata **No** ✗   Supports interactive visualization of data by the public **Yes** ✓

- Emphasis on public access and exploration of data
- Stores water quality numeric data and photos
- allows easy plotting of data with different plot styles (boxplots, time series, regressions, etc.)
- Easily downloaded to make your own plots
- Direct data upload is possible/simple, but we encourage uploading to MT-eWQX first and then working with MSUEWQ to transfer data from WQP to Data Hub