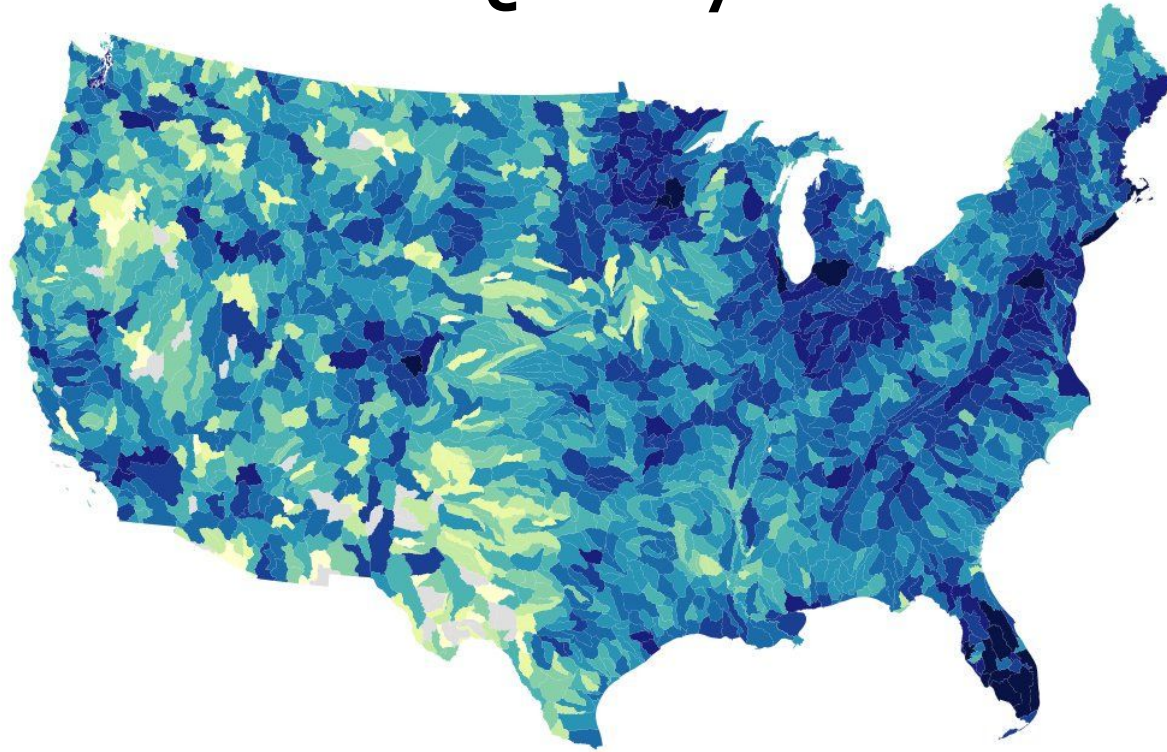


Water Quality Portal



Laura Shumway, EPA Water Data Integration Branch

Jim Kreft USGS Water Mission Area

NWQMC Face-to-Face

November 6, 2018



Water Quality Portal Background

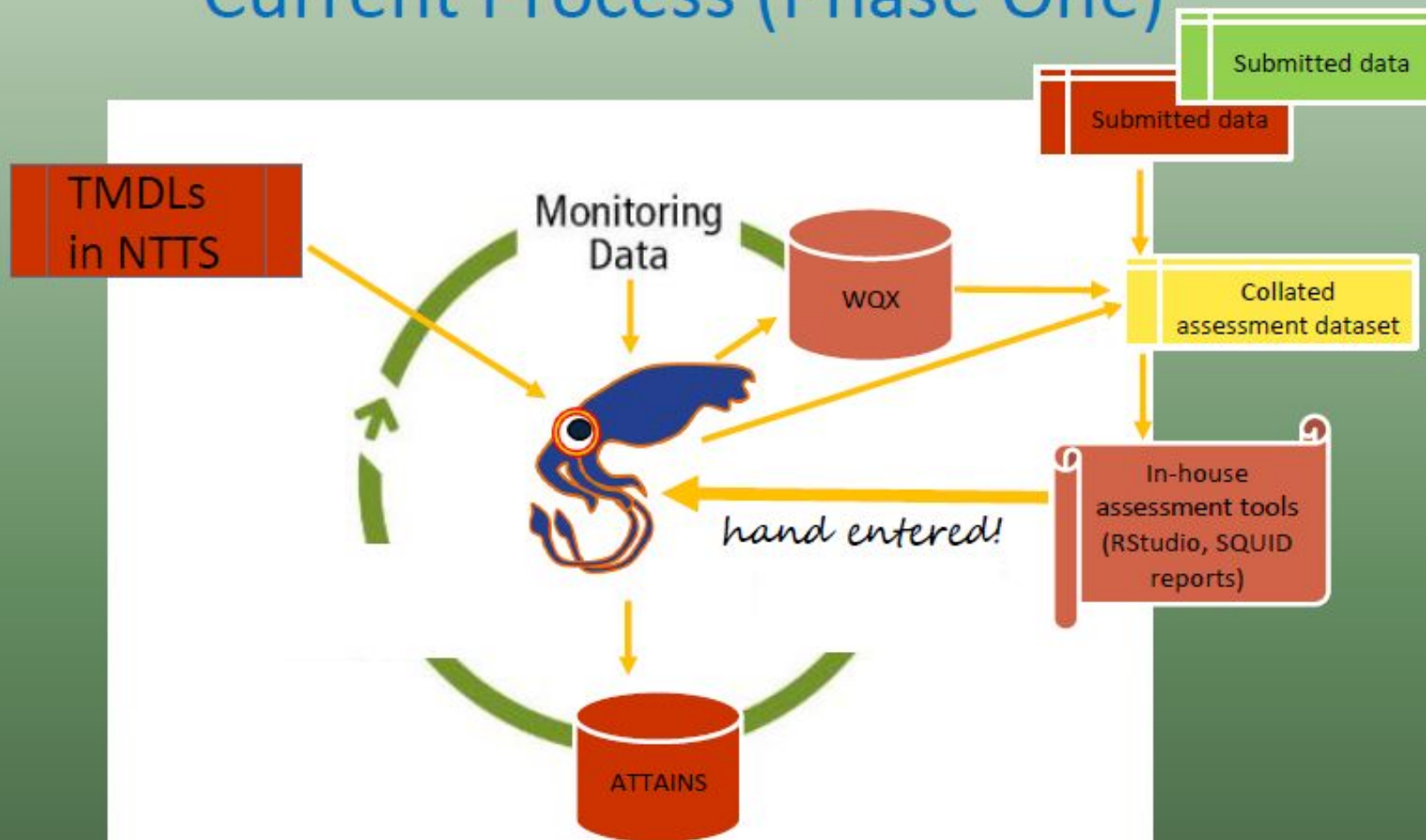
- The WQP **is** standalone web-service that allows users to easily download USGS, USEPA, and USDA water-quality data from a single website
- The WQP **is not** a system of record; instead it caches data from over 400 local, state, and federal databases for high (USGS-NWIS, USEPA-STORET, USDA-STEWARDS)
- The WQP **includes** water-quality data only (physical, chemical, biological, and monitoring site metadata)
- The WQP **does not include** climatic (precip/snowpack), hydrologic (flow, groundwater levels), or water-use data
- Data **must be** organized and formatted using the Water-Quality Exchange (WQX) template
- We **are implementing** WQP 5-yr strategic plan finalized in 2017

Water Quality Portal Benefits

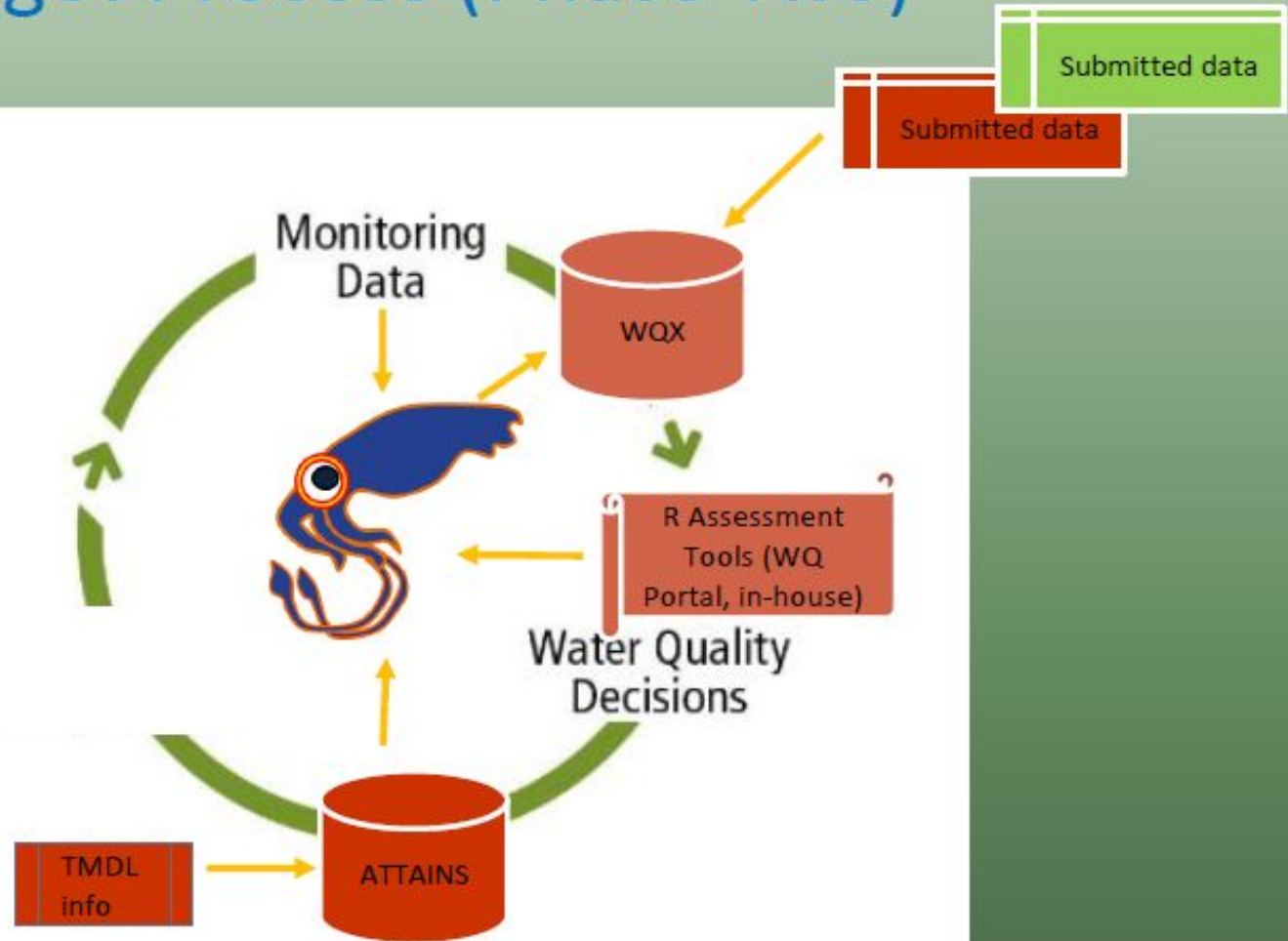
- One- Stop Data Shop (except for continuous)
 - Publicly available and easily accessible
- Standardized data protocol
- Standardized data output
- Easy to use interface with help desk
- Data updated regularly from sources
- Increases visibility of your data and your agency



Current Process (Phase One)



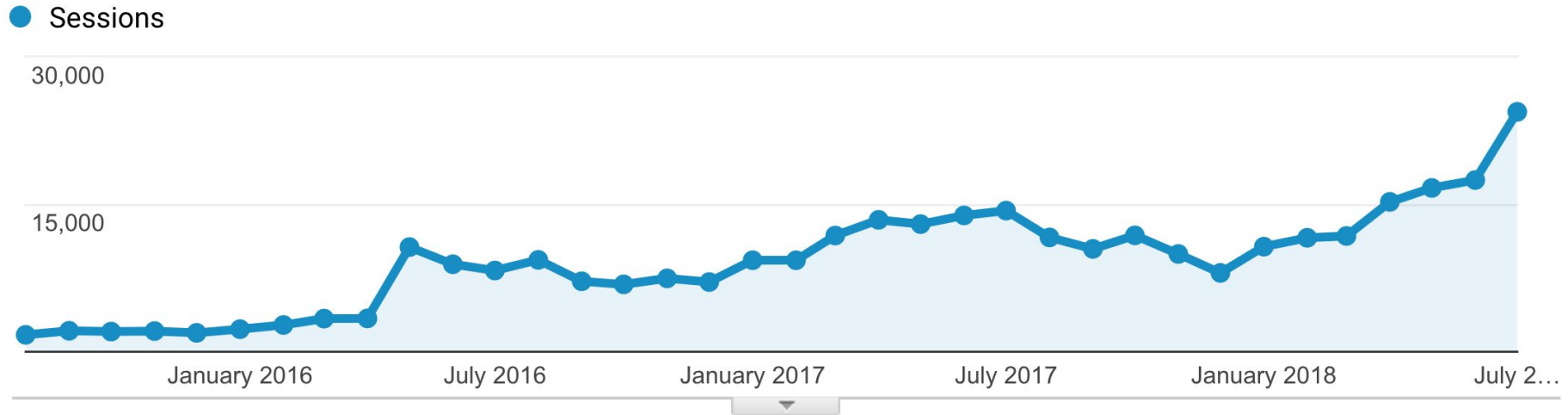
Target Process (Phase Two)



Multiple Data Sources and Types

- Portal Data Records (347 million total)
 - USGS
 - Biodata: 1.4 million
 - NWIS: 103 million
 - EPA (STORET/WQX): 242 million
 - ARS/STEWARDS: 1.2 million
- Data Contributors
 - Federal- EPA, USGS, USCOE(regional), NPS, USBR(Regional) NOAA (DIVER In Progress!)
 - States and Territories- 50+ multiple in progress
 - Tribes- over 250
- Data Types
 - Physical/Chemical
 - Biological
 - Metrics
 - Activities
 - QA/QC
- Depends on the WQX Data Model

Portal Usage- Visits



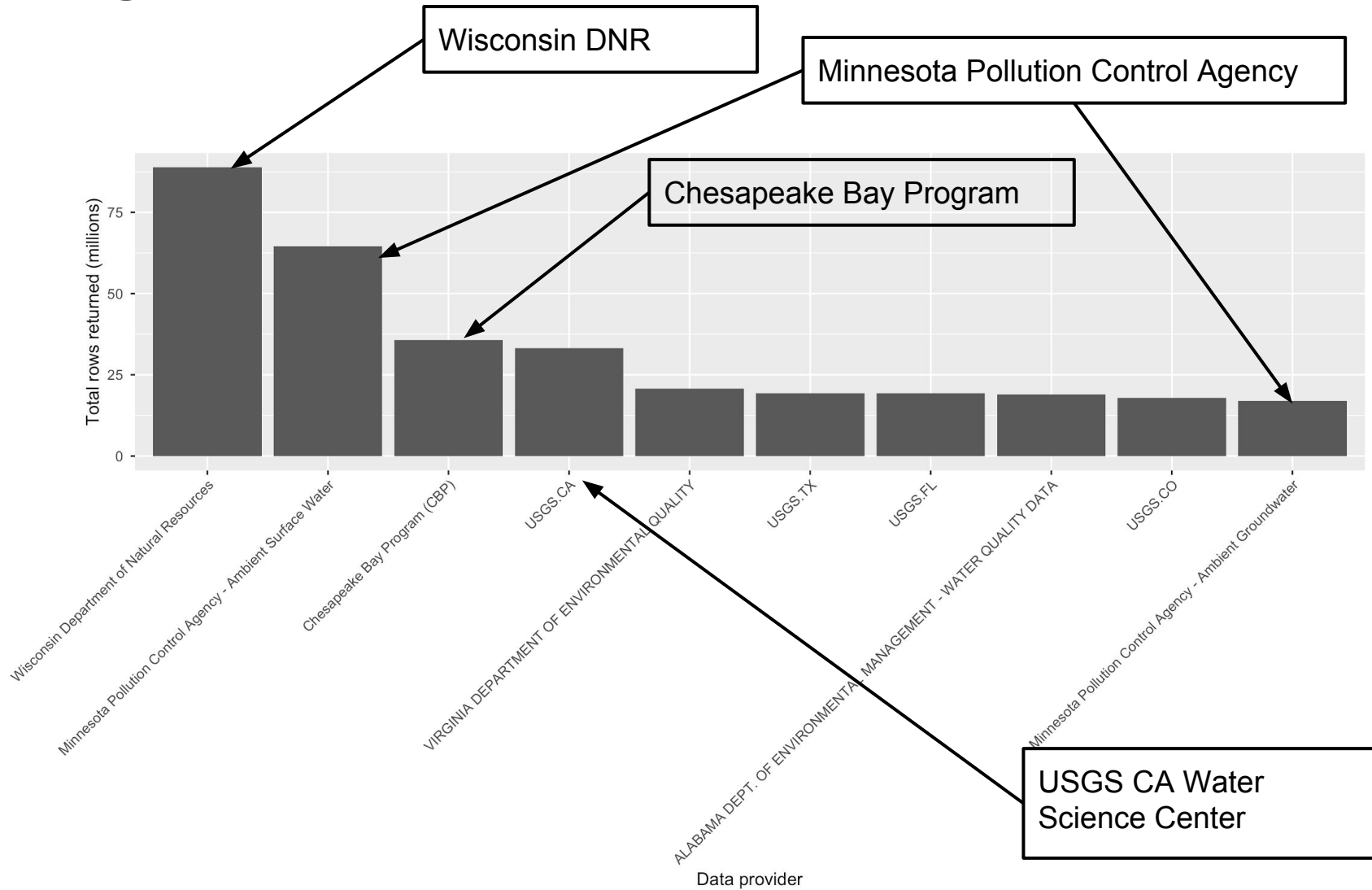
July 2018- 24K visits from 21K users, all time record!

August 2017-July 2018:

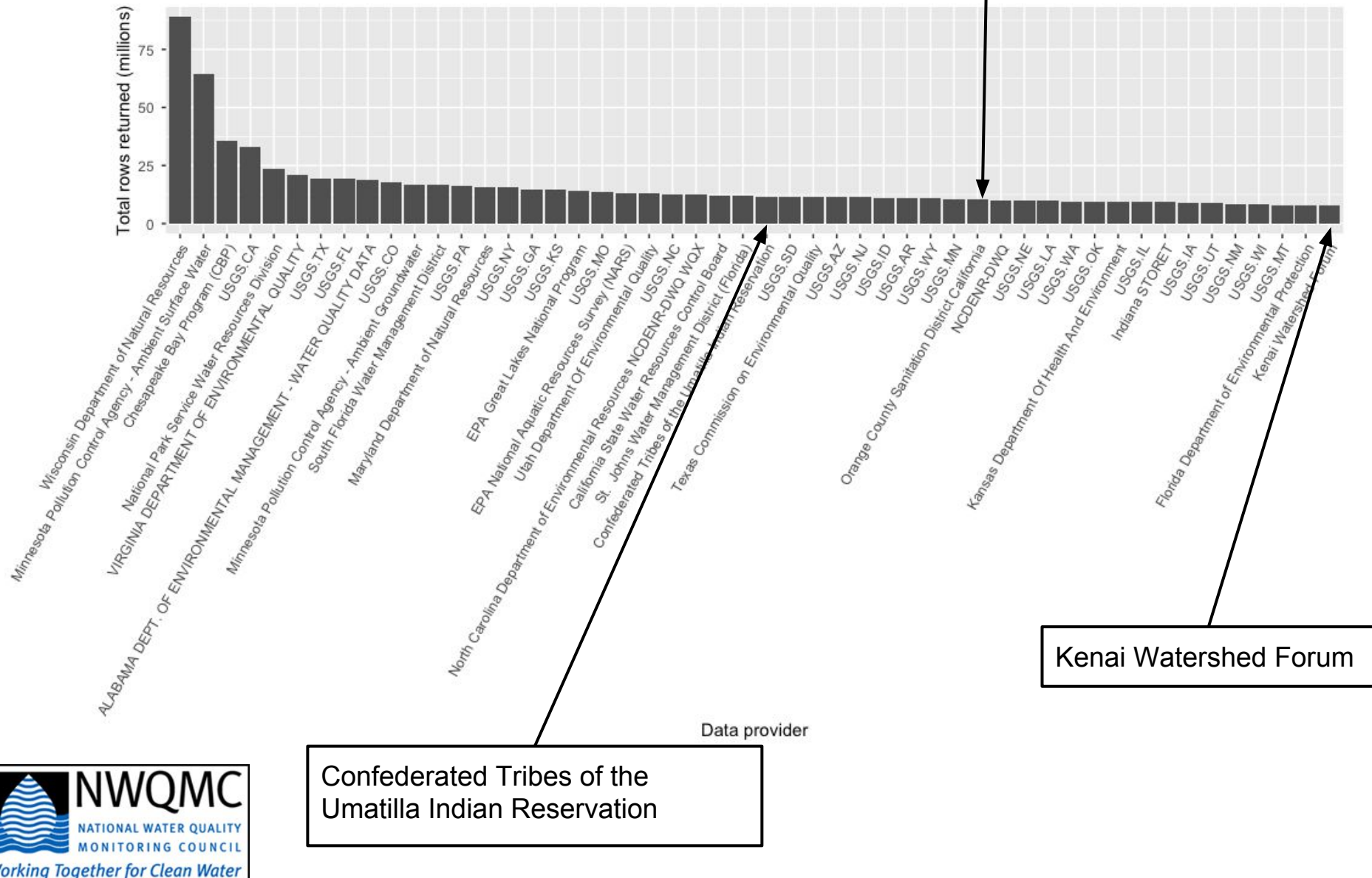
- New users: 126,195 (32% increase!)
- Returning users: 13,496 (32% increase!)
- Total sessions: 159,475 (29% increase!)

The WQP can now aggregate and present statistics on how often and how much any organization's data is being accessed

Organization-level download stats



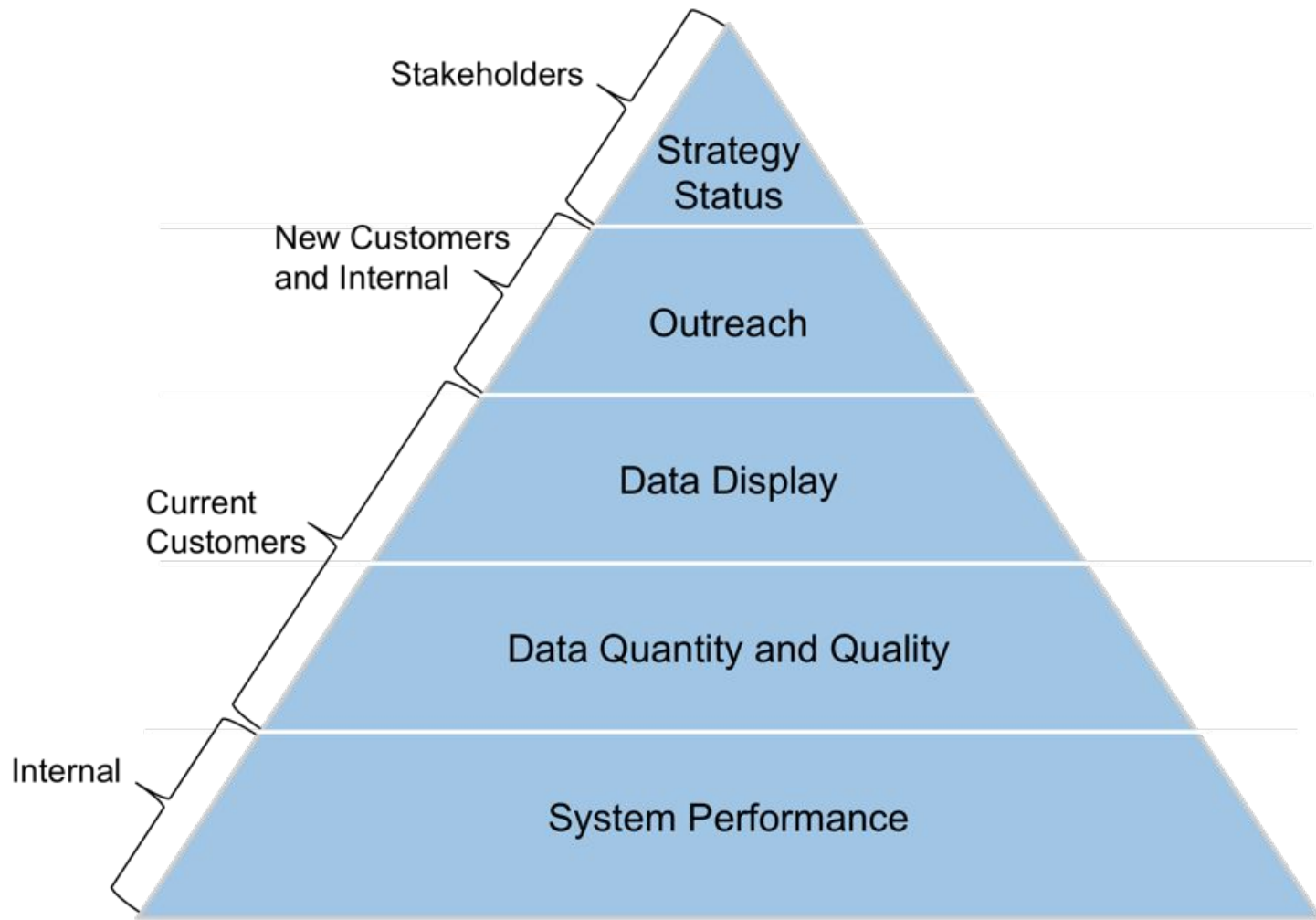
The tail is long:



Internet of water

- Standards
 - WQX
 - OGC
- Metadata
- Common Hydrography
 - WBD/NHD are now one!
- Discoverable/searchable

WQP Strategic Plan



System Performance

Goals	Activity 2017-2019	Complete
1.1 Improve EPA delivery to Portal	STORET data transfer design plan <ul style="list-style-type: none"> - STORET decomissioned 6/28/18 - Monitoring System Performance - Exploring more effective data loads 	Y
1.2 Improve USGS delivery to Portal	Work closely with NWIS modernization team to align the Portal with future USGS system state and requirements <ul style="list-style-type: none"> - Planned FY19-21 	
1.3 Assess Portal platform	Portal system platform update plan <ul style="list-style-type: none"> - Documentation and standardization - Cloud readiness 	Y

System Performance- future

Goals	Activity 2019-2021
1.4 Portal Interface Usability (note: data delivery prioritized over interface enhancements)	<ul style="list-style-type: none"> • Usability testing • Adoption of US Web design standards • Advanced vs basic interface • Additional data display
1.5 Alternative Download formats	<ul style="list-style-type: none"> • Cloud-native public datasets (https://aws.amazon.com/opendata/public-datasets/)
1.6 Cloud migration	<ul style="list-style-type: none"> • WQP is running on the cloud
1.7 Facilitate Co-development	<ul style="list-style-type: none"> • Non-USGS federal partners can collaboratively develop this system
1.8 Connect to other systems	<ul style="list-style-type: none"> • Internet of Water, other potential ACWI systems
1.9 Maintain system performance	<ul style="list-style-type: none"> • Maintain uptime consistently across platforms • Maintain download speeds,, allow for more concurrent users
1.10 Enhance geospatial web services	<ul style="list-style-type: none"> • Explore other data profiles and display

Data Quantity and Quality

Goals	Activity 2017-2019	Complete
2.1 Reduce data-in barriers	Hold (2) training webinars, (1) on-site training, update WQX Web tool <ul style="list-style-type: none"> - WQX web 2.80 - Training in NJ, TEN, TLEF. NWQMC Denver 	Y
2.2 All fifty states submit data	EPA will reach out to remaining states <ul style="list-style-type: none"> - Visited remaining states - New WQX API services to help 	
2.3 Biological data	Work with (3) states <ul style="list-style-type: none"> - Will be adopting biodata taxa tracking - Working wi biodata to develop WQX 3.0 data requirements - Target biological experts for recommendations for schema revisions 	
2.4 Portal Services	Serve habitat, metrics, index data. <ul style="list-style-type: none"> - Now serve projects, Mon loc weighting, Organizations, user requested data profiles, attachments, summary services Generate plan for integrating with continuous water-quality data. <ul style="list-style-type: none"> - Will release data appliance in 2018 - in USGS plan 	
2.5 Legacy STORET	Determine options for moving forward	Y
2.6 Data Quality	Identify data quality issues. Generate data quality plan. Begin addressing (2) issues. <ul style="list-style-type: none"> - Nutrients - Metals - QA requirements - Coordinated WQ Mon & Reporting groups 	Y
2.7 Expand QA Data from the Portal	Develop a plan to serve additional QA data <ul style="list-style-type: none"> - Portal now serves QA metadata and QAPP attachments 	
2.8 Explore error reporting approaches	Pilot approaches for reporting data issues	

Data Quantity and Quality - future

Goals	Activity 2019-2021
2.9 Statistical reports with download	Result ranges for each unique unit/characteristic combination
2.10 Data quality summary per station (see mock up)	Build station pages
2.11 Standardized data delivery	Unit and Characteristic conversion and standardization
2.12 Summarization services	<ul style="list-style-type: none">• Monitoring Location•
2.13 Support for Data DOIs/Data Packages	Generate citable artifact linked to organization
2.13 Track data completeness/fitness for use	<ul style="list-style-type: none">• QAPP documented• Statistics on metadata completeness• Facilitate guidelines for evaluating data<ul style="list-style-type: none">◦ Work with different user communities to develop data evaluation guidelines and approaches◦ ◦ Be very careful about setting “tiers”, can

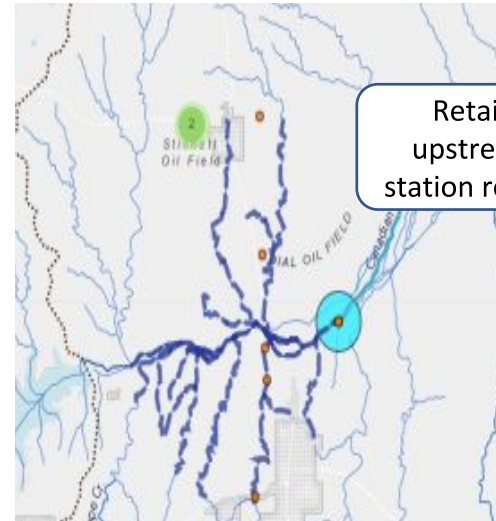
(TCFOMAIN-10035)

OrganizationIdentifier	TCEQMAIN
OrganizationFormalName	Texas Commission on Environmental Quality
MonitoringLocationIdentifier	TCEQMAIN-10035
MonitoringLocationName	CANADIAN R UPSTREAM OF FM2277
MonitoringLocationTypeName	River/Stream
HUCEightDigitCode	11090106
LatitudeMeasure	35.7373
LongitudeMeasure	-101.3593
HorizontalCollectionMethodName	Interpolation-Photo
HorizontalCoordinateReferenceSystemDatumName	NAD83
ProviderName	STORET

Retain station metadata report (but lets make it smaller?)

Retain header but simplify

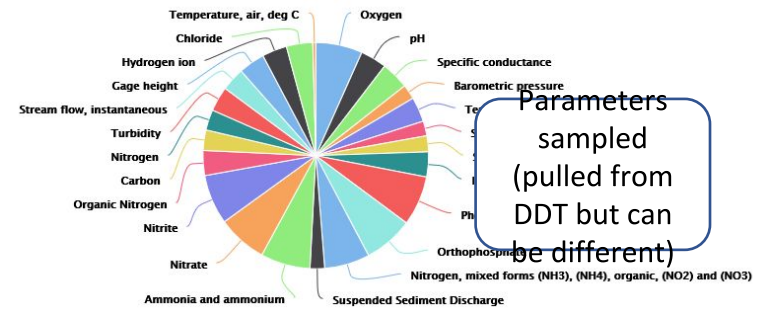
Retain station
metadata
report (but
lets make it
smaller?)



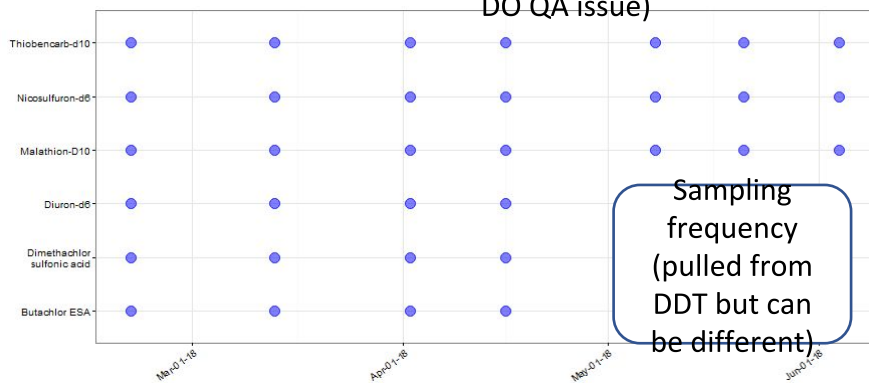
Retain
upstream
station report

Characteristic	Unit	Speciation	Fraction	Min	Max	Mean
Total Nitrogen, mixed forms	mg/l	as N	Unfiltered	Not detected	25.6	0.4
pH	None		Unique	4.4	9.5	5.6
Dissolved Oxygen (DO)	mg/l		parameter combinations	3.2	12.5	4.7
Dissolved Oxygen (DO)	NTU			4.9	11.8	6.3

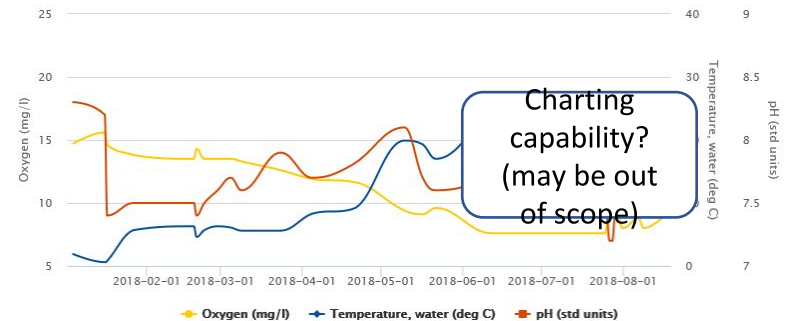
Unique
parameter
combinations
(for QA – see
DO QA issue)



Parameters sampled (pulled from DDT but can be different)



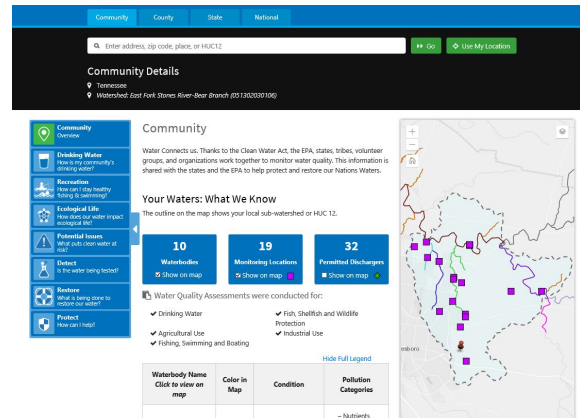
Sampling frequency (pulled from DDT but can be different).



Charting
capability?
(may be out
of scope)

Data Display

Goals	Activity 2017-2019	Complete
3.1 Portal Functions	Plan for new functions on data quality, monitoring trends and mapping <ul style="list-style-type: none"> - Station summary service - Organization summary service - To be developed: Period of record, and geospatial queries - HUC, county, state 	Y
3.2 Data Tools	Plan for (1) new analytical tool for data discovery or assessment. <ul style="list-style-type: none"> - DDT complete - DAT in draft 	Y
3.3 WIS User Focus Group	Develop year two development goals	
3.4 Data summary display	WQP Data summarized at different scales and resolutions State → County and different size watersheds Organizational → monitoring location	



New summary services used in How's My Waterway 2.0!

Outreach

Goals	Activity 2017-2019	Complete
4.1 Increase Council Knowledge	Develop outreach plan, factsheet and conduct (2) webinars <ul style="list-style-type: none"> - Communication plan - Factsheet - How to use the WQP - In progress- How to publish your data to the portal factsheet 	
4.2 Identify data users and uses	Develop data user community framework and (2) use case profiles <ul style="list-style-type: none"> - The WQP can now aggregate and present statistics on how often and how much any organization's data is being accessed - Portal Bibliography 	
4.3 Identify new data suppliers	Identify (1) new federal partner and (3) new state data suppliers <ul style="list-style-type: none"> - NOAA - Water Reporter - Army Corps discussions - Horizon oil group - promote portal 	Y
4.4 Write a peer reviewed paper about the Portal	Aim for publication in 2019 <ul style="list-style-type: none"> - In progress - Water Quality Portal Web Services 	
4.5 Promote the Portal at national scale meetings	Present at NWQMC, AGU, others <ul style="list-style-type: none"> - Presentations scheduled for NWQMC 2019, WEFTEC 	Y
4.6 Implement communication plan	<ul style="list-style-type: none"> • See communication plan 	
4.7 Marketing	<ul style="list-style-type: none"> • Produce and refine messages • Pilot messages • Create specific campaigns to reach target audiences 	
4.8 Improving outreach for data loading opportunities	<ul style="list-style-type: none"> • Update WQP support pages • Keep WQP and WQX pages in sync • Track which organizations WQX team supports for onboarding, etc 	
4.9 More Outreach avenues	<ul style="list-style-type: none"> • Regional and state monitoring councils • Regional data management coordinators 	

Outreach

Goal	Activities
4.10 Establish Open Source User Community	<ul style="list-style-type: none">• Share data tools and services• Establish feedback loop for enhancements
4.11 Regional Outreach	<ul style="list-style-type: none">• Facilitate materials for regional representatives for WQP outreach•
4.12 User outreach at multiple levels	<ul style="list-style-type: none">• Give data use examples at multiple levels of sophistication•

Over 100 publications cite the WQP

- A GIS-Based Compilation of Spring Locations and Geochemical Parameters in the Appalachian Landscape Conservation Cooperative (LCC) Region
- Global aquifers dominated by fossil groundwaters but wells vulnerable to modern contamination
- Large-scale modeled contemporary and future water temperature estimates for 10774 Midwestern U.S. Lakes
- A database of georeferenced nutrient chemistry data for mountain lakes of the Western United States.
- Late-Pleistocene precipitation $\delta^{18}\text{O}$ interpolated across the global landmass
- Watershed-scale impacts of stormwater green infrastructure on hydrology, nutrient fluxes, and combined sewer overflows in the mid-Atlantic region
- https://www.waterqualitydata.us/apps_using_portal/

Strategy Status

Goals	Activity 2017-2019	Complete
5.1 Identify status of monitoring data/programs	Identify data partners and display needs. Develop (1) view or map display of water monitoring partners and data holdings	
5.2 Develop NMN Networks based on WQP Data	Develop surface-water quality network, among others, from WPA sites - Workgroup 3 - Lori Sprague	
5.3 Identify new collaboration opportunities	Display active monitoring to support coordinated efforts	
5.4 Submitting organization reports	<ul style="list-style-type: none"> • Submission status/Dashboard • Track organization submittals (start with council) • Organization summary report • Tracking which organizations are submitting data without a 106 grant requirement 	
5.5 Keep council informed on Portal use	<ul style="list-style-type: none"> • Dashboard of usage statistics <ul style="list-style-type: none"> ◦ Downloads, ◦ Rows of data ◦ Users • Dashboard of data holding summary <ul style="list-style-type: none"> ◦ Types ◦ locations ◦ etc 	

Breakout

- Discuss each of the 5 concepts
 - System Performance
 - Data Quality and Quantity
 - Data Display
 - Outreach
 - Strategy Status

Questions?

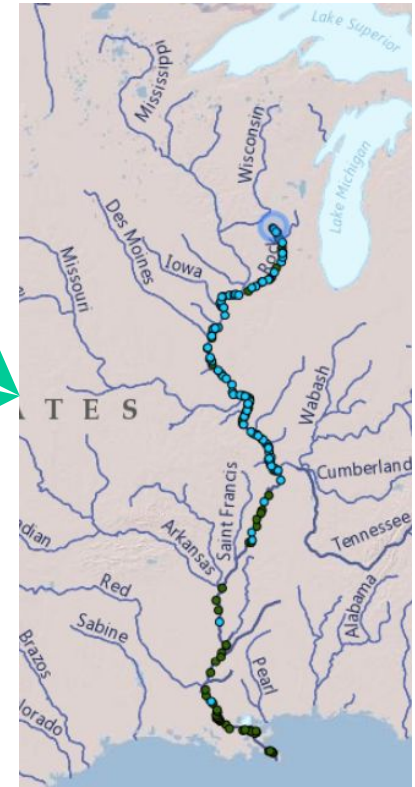
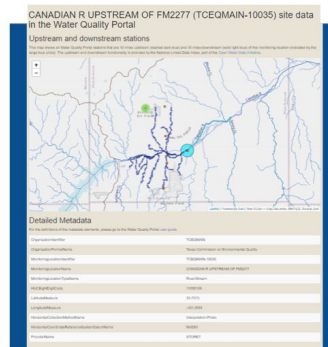
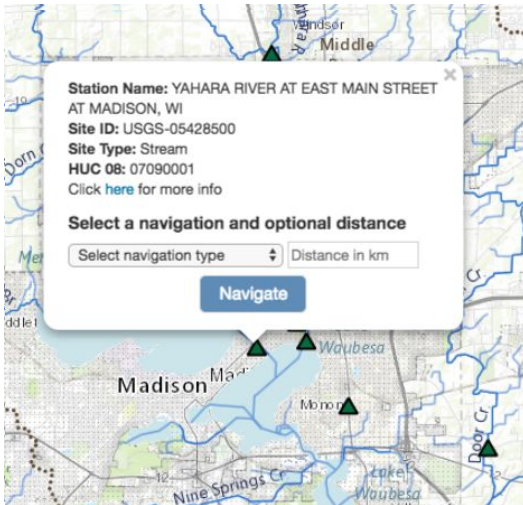
- jkreft@usgs.gov
- Shumway.Laura@epa.gov

Future challenges

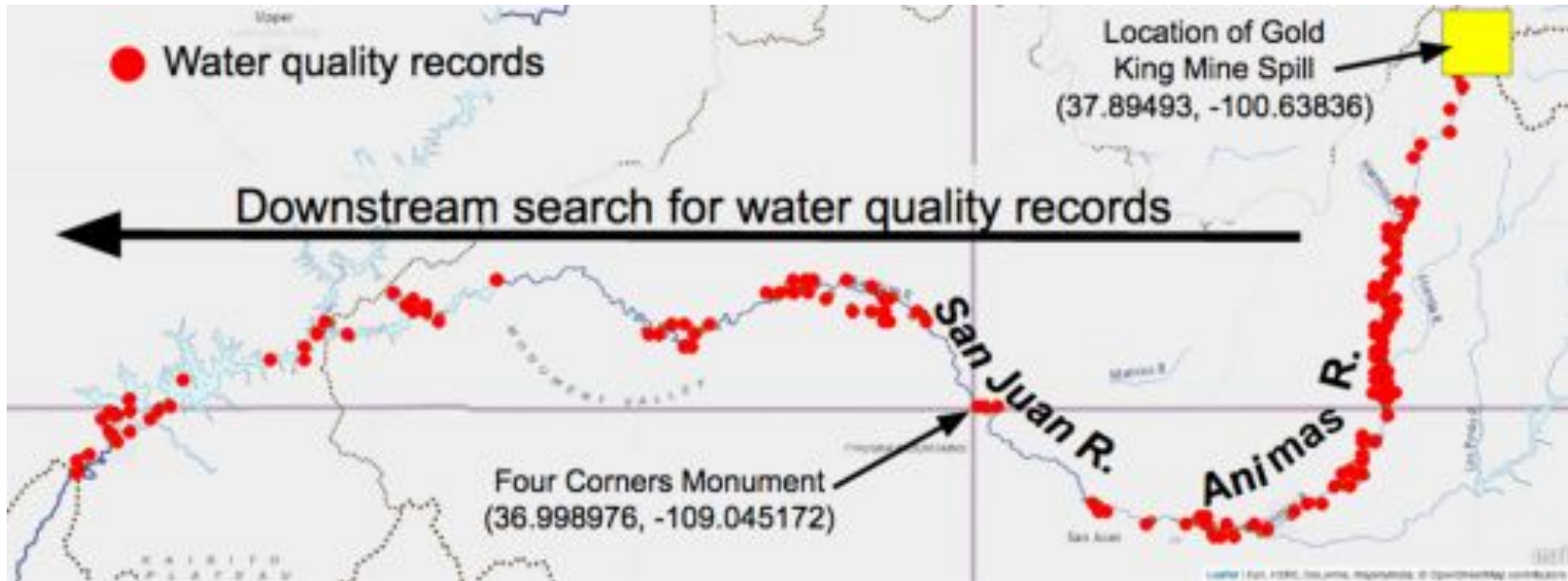
- Integration of network concept
- Integration with continuous monitoring data
 - WQP data model (WQX) is discrete focused
 - Continuous monitoring data is ever more important for water quality monitoring
 - Interagency integration of continuous data is an unsolved problem (though EPA has promising pilot work)

Sites with Nutrient data, downstream from the Yahara River bridge

SITE PARAMETERS	SAMPLING PARAMETERS
Site Type: <input type="text" value="Stream"/> ? Organization ID: <input type="text" value="All"/> ?	Sample Media: <input type="text" value="All"/> Characteristic Group: <input type="text" value="Nutrient"/>



Leveraging Downstream Queries



Can answer questions in minutes that took days or weeks previously- see Young 2016

Water Resources Research

Volume 53, Issue 2, pages 1735-1745, 12 FEB 2017 DOI: 10.1002/2016WR019993

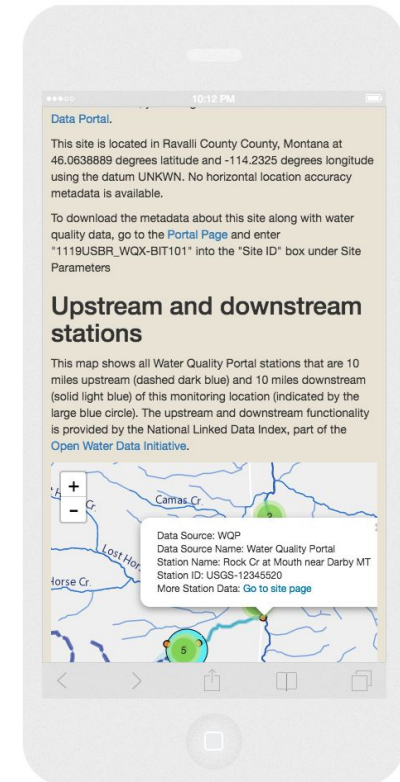
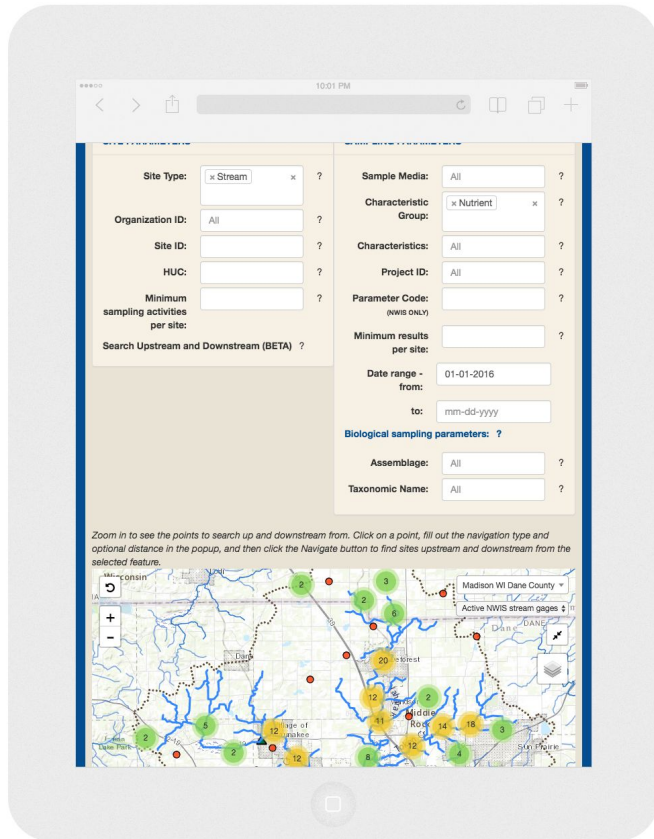
<http://onlinelibrary.wiley.com/doi/10.1002/2016WR019993/full#wrcr22485-fig-0003>

Young, Dwane, 2016 NWQMC

https://acwi.gov/monitoring/conference/2016/2_wednesday_may4/G3/2-G3_Young_Portal_inTight_TimeFrames_secure.pdf

Built Using Responsive Design

Water Quality Portal works on any device with a modern web browser



FY18 goals

- System Performance
 - Explore hosting alternatives (e.g. cloud)
 - Continue incremental data loading improvements
- Data Quantity and Quality
 - Additional endpoints: Project, Indexes, Files
 - Continue discussions around data quality
 - Work with new organizations to submit data
- Data Display and discovery
 - Summarization service- lead to summary data on user-relevant pages
 - EPA team working on data analysis tool
- Outreach/Education
 - Portal Communication Plan (With NWQMC WIS)
 - Factsheets and other outreach materials
- Strategy and status- Continued discussion with NWQMC