

# Subcommittee on Spatial Water Data Report to the Advisory Committee on Water Information

*Al Rea, USGS*

*Ed Clark, NOAA*

*January 18, 2018*



# The Value of Water Information Sharing

---

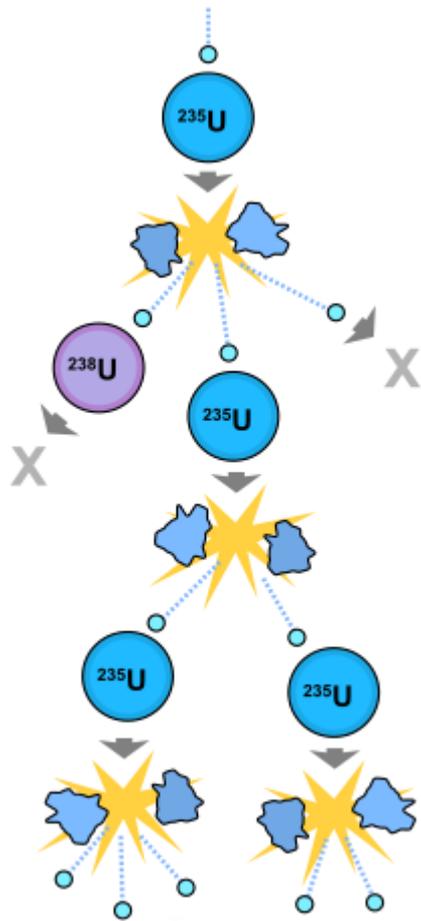
Potential Value = (data x quality) <sup>sharing</sup>

❖ From blog post by Stu Hamilton, Aquatic Informatics:

[http://aquaticinformatics.com/blog/hydrology/unbounde  
d-data-value/](http://aquaticinformatics.com/blog/hydrology/unbounde-d-data-value/)

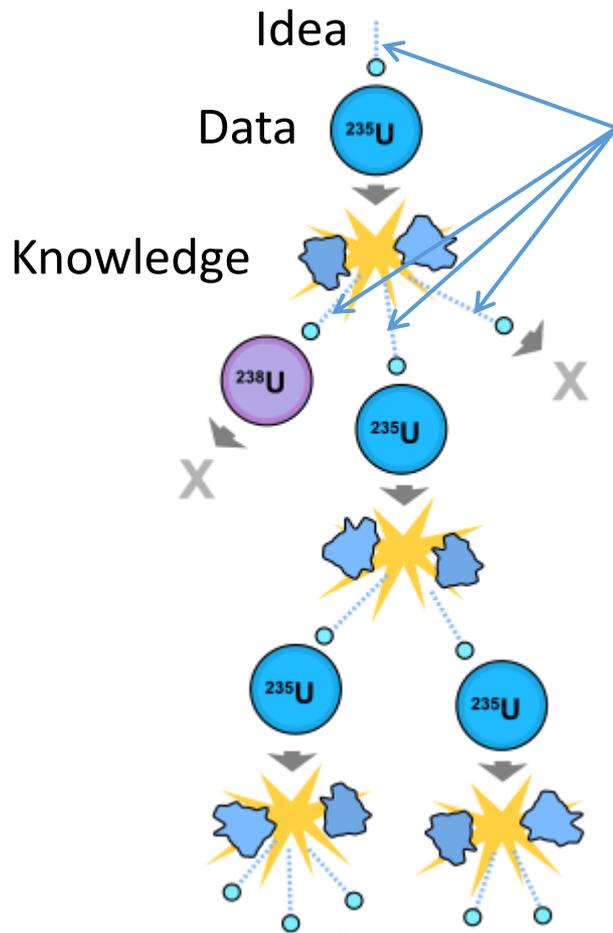
# Chain Reaction—an example from Physics

---



$$E = mc^2$$

# Information Sharing Chain Reaction



Information sharing

$$\textit{Knowledge} = \textit{data} \cdot \textit{quality}^{\textit{InfoSharing}}$$



# How can we facilitate water information sharing?

---

## ❖ Discoverability

- Standard frame of reference – NHDPlus HR
- Search engine for water data – NLDI

## ❖ Interoperability

- Network navigation functionality
- Data exchange via web services

# Open Water Data Initiative (OWDI) Roadmap

## Open Water Web

Water Data Catalog	Water Data as a Service	Enriching Water Data	Community for Water Data, Tools
Find Source Data	Consensus Standards	Network Routing	Marketplace for Knowledge
Create Themes	Visualization and Delivery	Coupling Models	Usage Tracking
Recruit / Engage Partners	Catalog and Serve	Geospatial Framework	Best Practices

# OWDI Use Cases

---



## Use Case 1:

National Flood Interoperability Experiment

**Completed**



## Use Case 2:

Drought Decision Support System

**Paused**

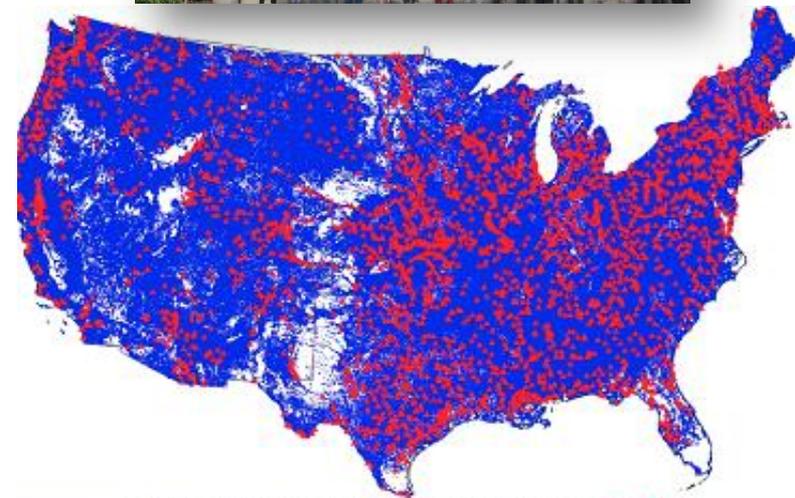


## Use Case 3:

Spill Response Tool

# National Flood Interoperability Experiment (NFIE)

- ◆ Partnership between NWS and the academic community
- ◆ Included a 2015 Summer Institute at the National Water Center for 44 graduate students from 19 Universities
- ◆ Goal - Help build a new high resolution, near real-time hydrologic simulation and forecasting model for the nation
- ◆ Results
  - Moving from modeling ~3,600 river forecast points at gages to forecasts for all 2.7 M NHDPlus flowlines – 750x the spatial resolution and better, more complete coverage
  - NWS accelerated their plans to make the National Water Model operational



Current NWS AHPS points (red)  
NWM output points (blue)



CUAHSI

UNIVERSITIES ALLIED FOR WATER RESEARCH

# Drought Use Case Work Group

---

## Public release of USBR data portal: Reclamation Water Information System (RWIS)

- ❖ Access to current and historical USBR water data
- ❖ Machine readable data downloads
- ❖ Web services and API
- ❖ <https://water.usbr.gov/>

## Reassignment of Bureau of Reclamation personnel

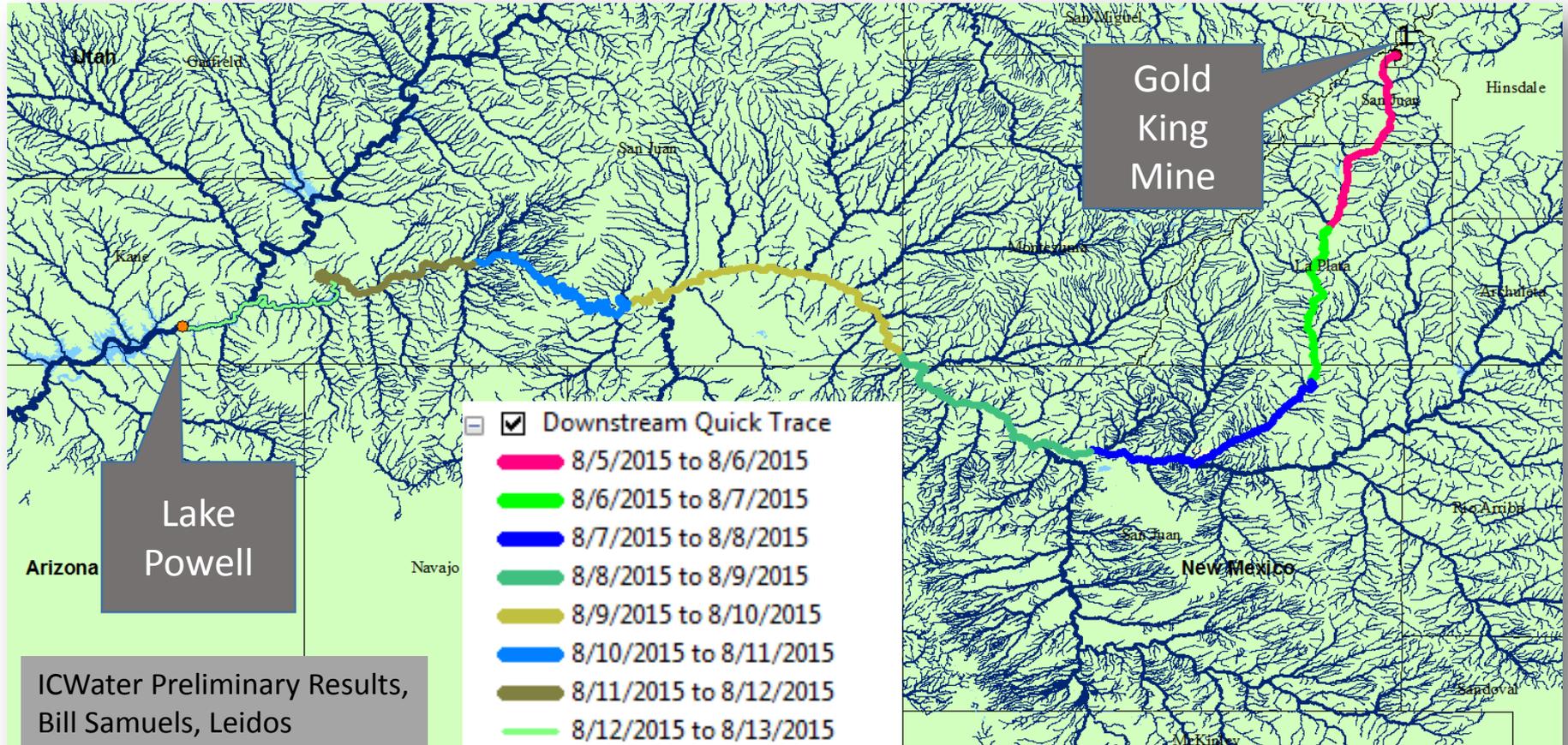
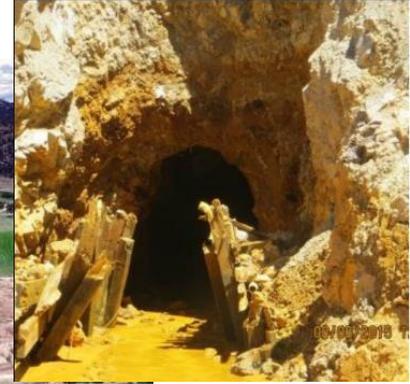
- ❖ Need USBR participation on SSWD
- ❖ Need someone to lead Drought work group

# Spill Response

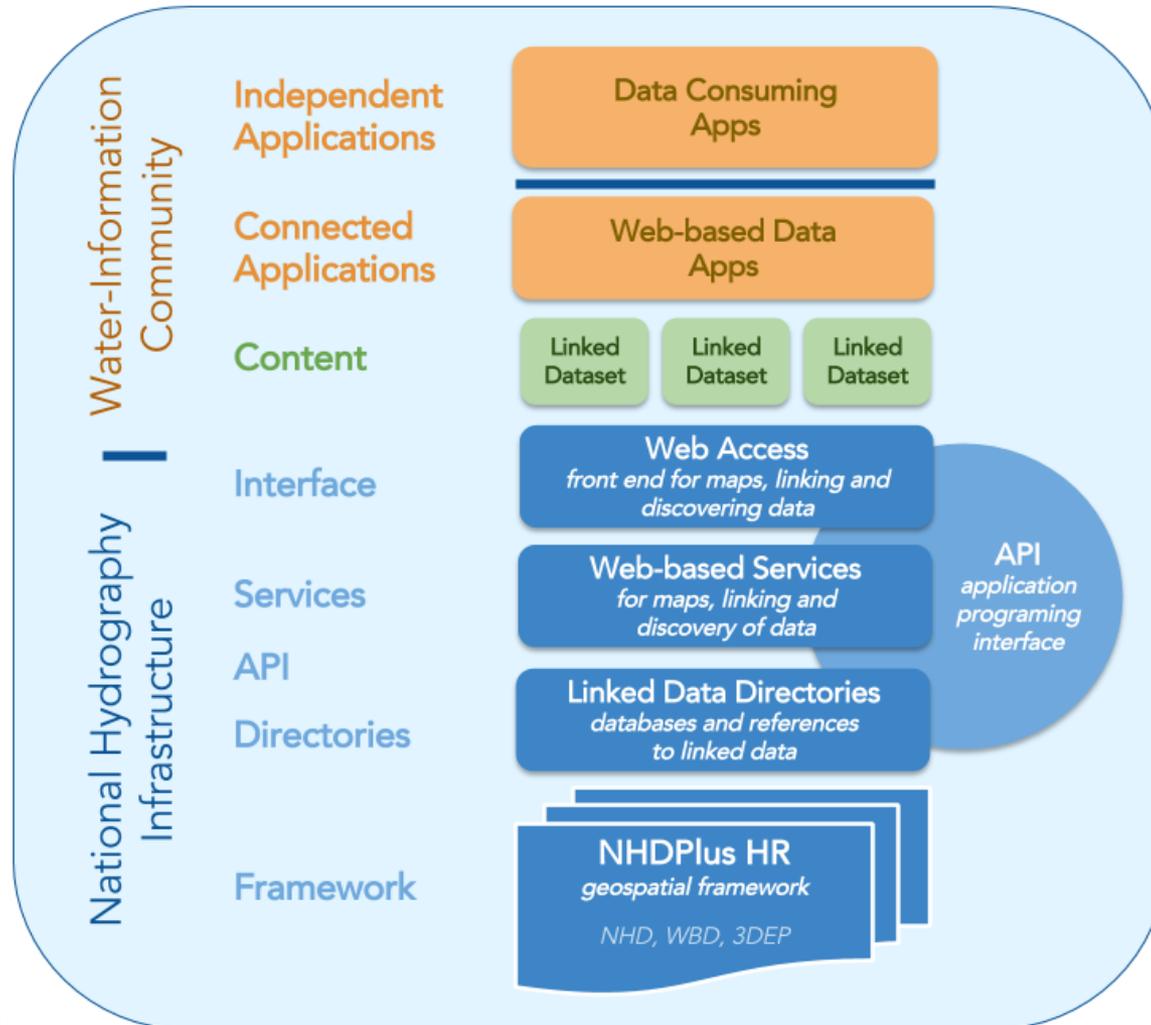
## Gold King Mine Spill

Identifying datasets for use case, ex. improving time of travel estimates

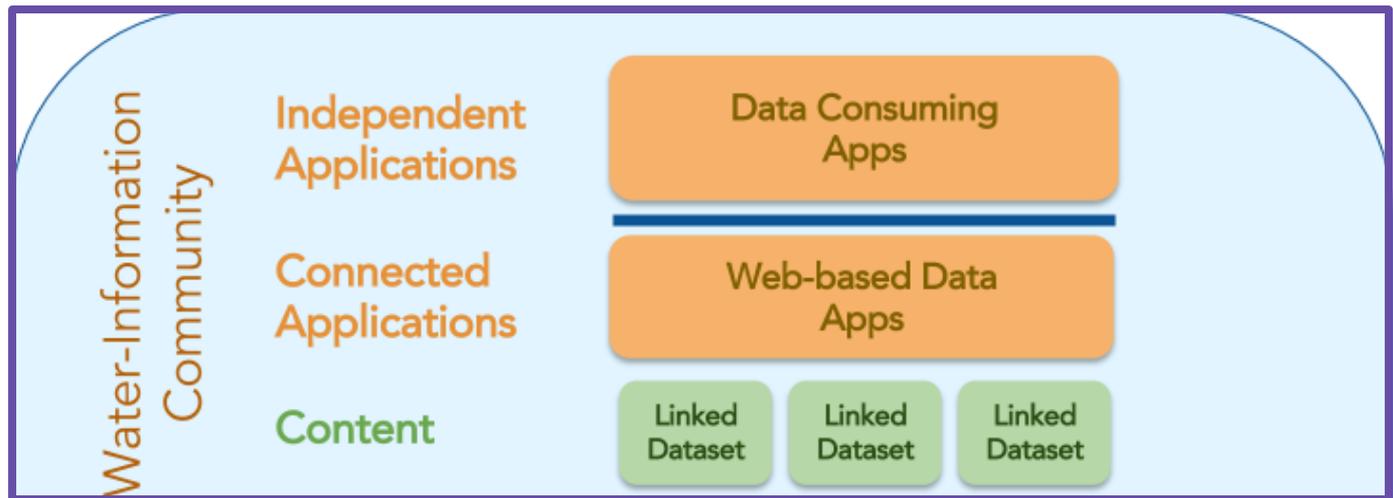
ICWater on desktop – ultimate goal to provide as a web service



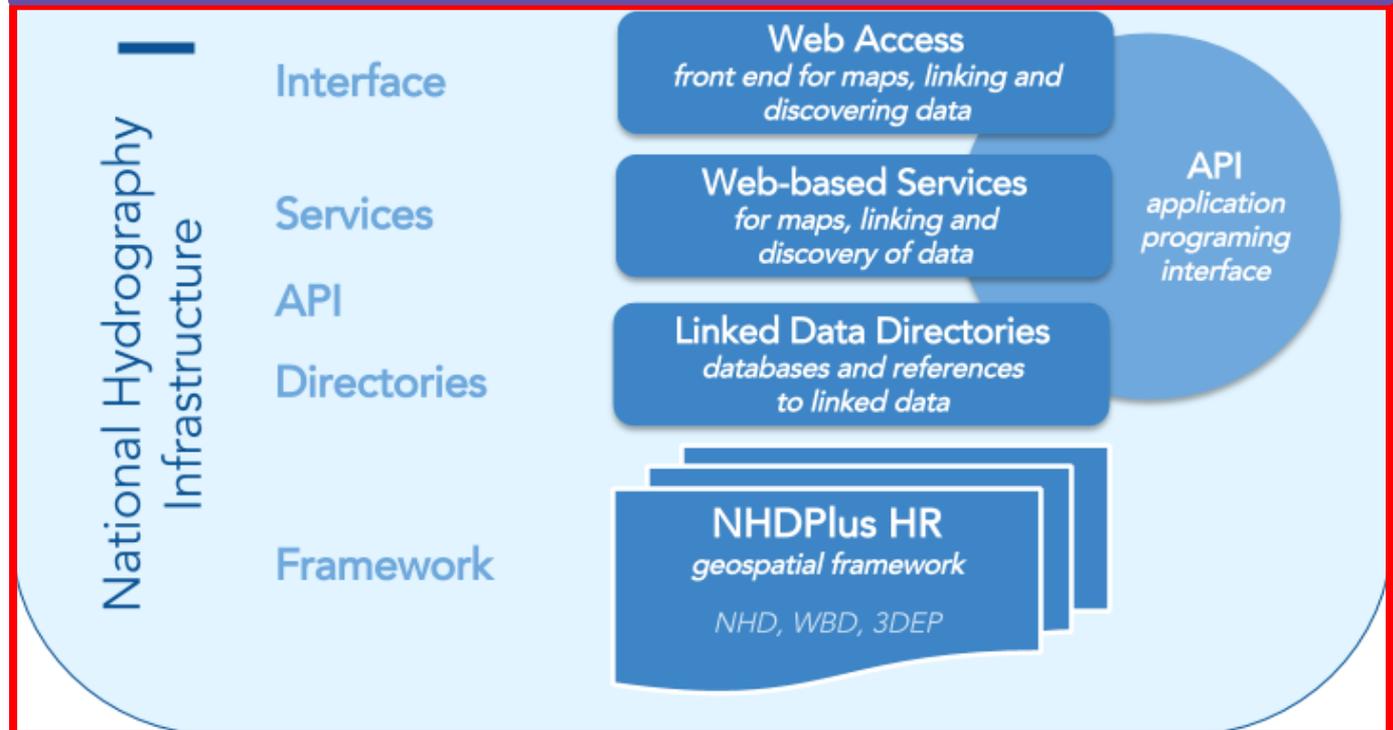
# A System Approach to Water Information



**Subcommittee  
on Spatial  
Water Data**



**Focus of  
National  
Hydrography  
Infrastructure  
Working  
Group**



# NHDPlus High Resolution Status

---

Public release of Beta products began in April, 2017

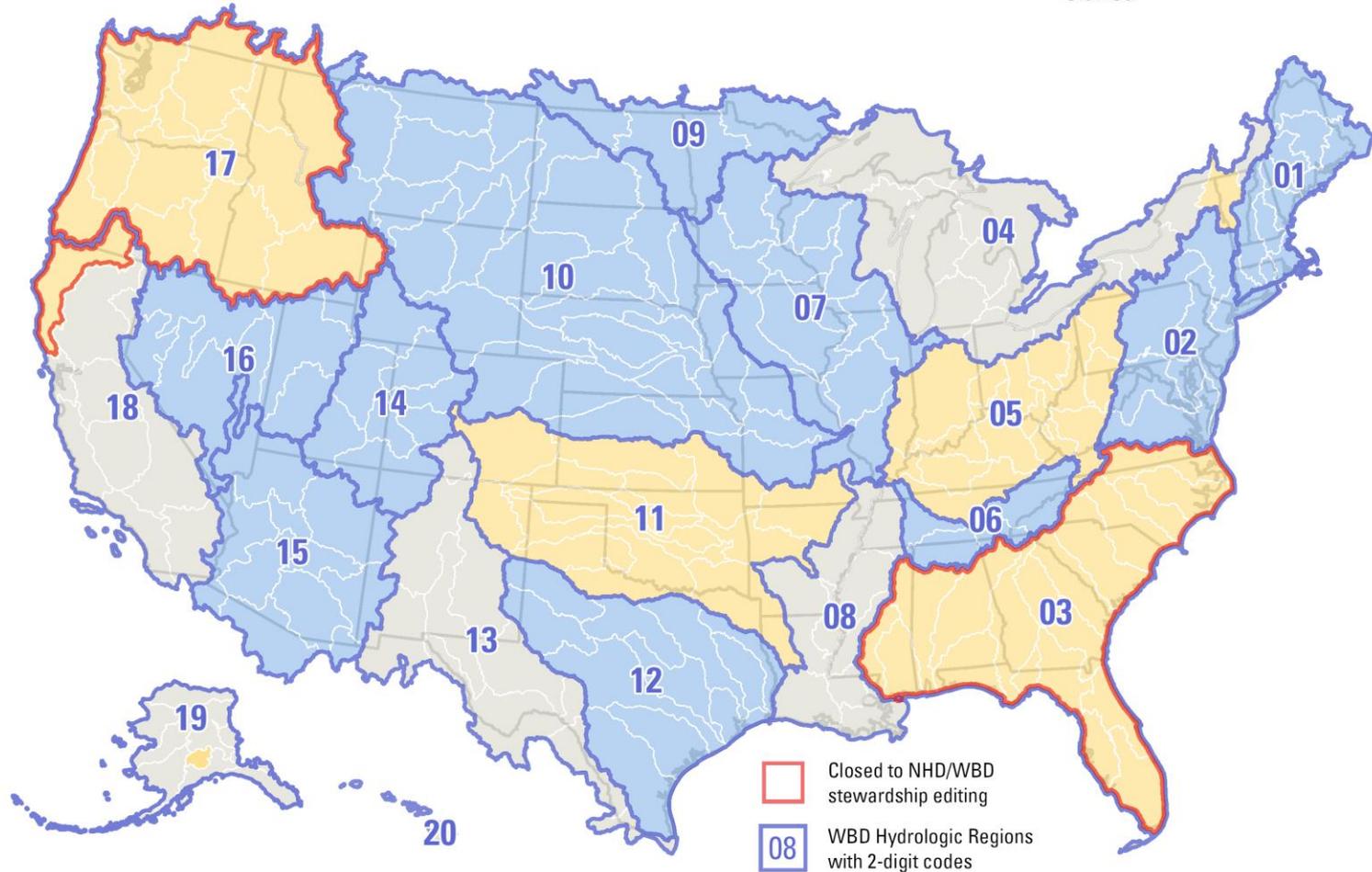
- ❖ Foundation of a scalable hydrographic reference framework
- ❖ 10 regions (> 40% of CONUS)
- ❖ Built using:
  - NHD-HR data at 1:24,000 scale or better
  - 10-meter 3DEP elevation
  - Watershed Boundaries Dataset (WBD)
- ❖ Additional data will be released as completed by region
- ❖ Beginning Beta QC effort
  - Community participation is critical
  - New web-based Markup Tool will be used

## NHDPlus High Resolution Availability

■ NHDPlus HR Beta available

■ NHDPlus HR Beta in production

■ NHDPlus HR Beta production not started



# Network Linked Data Index (NLDI)

---

- ❖ Linked data, e.g. flow or water quality observations
- ❖ Search engine for Hydro Linked Data
  - “crawls” and indexes sources for fast access
  - Web services enable upstream/downstream queries using NHDPlus stream network
- ❖ **Web-based extensible design**—any surface-water data can be linked and shared via web services
  - Currently implemented as pre-filter in Water Quality Portal
  - Could be added to any web app
  - Currently no general-purpose front end

# Network Linked Data Index—Status Update

---

- ❖ Available data sources:
  - NHDPlus ComID
  - HUC12 pourpoints
  - NWIS sites
  - WQP sites
- ❖ In testing data sources
  - NJ sensor network
  - NPDES
- ❖ Basin delineation
- ❖ Basin characteristics – in testing
- ❖ ArcGIS wrapper for NLDI services – in testing

# Water Quality Data Discovery

## Using the Hydro- Network Linked Data Index



National Water Quality Monitoring Council

Working together for clean water

### Water Quality Portal

The Water Quality Portal (WQP) is a cooperative service sponsored by the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the National Water Quality Monitoring Council (NWQMC). It serves data collected by over 400 state, federal, tribal, and local agencies.

#### DOWNLOAD DATA

Download water-quality data in  
Excel, CSV, TSV, and KML  
formats.

#### HOW TO USE THE WQP

User Guide  
Web Services Guide  
FAQs  
Upload Data

#### NATIONAL RESULTS COVERAGE

Water-quality data in your state.

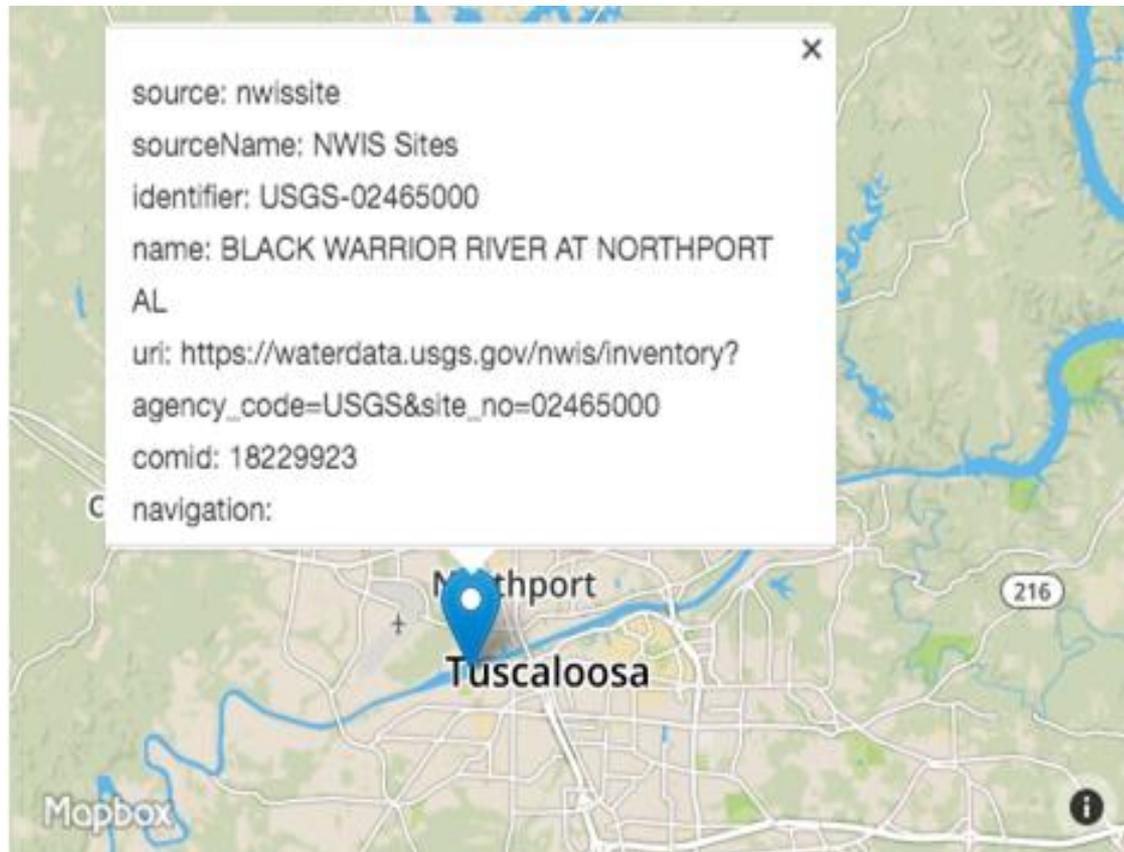
#### ABOUT THE WQP

What is the WQP?  
Contributing organizations  
Other Water Quality Portals  
Explore WQP Sites



# NLDI NWIS Site

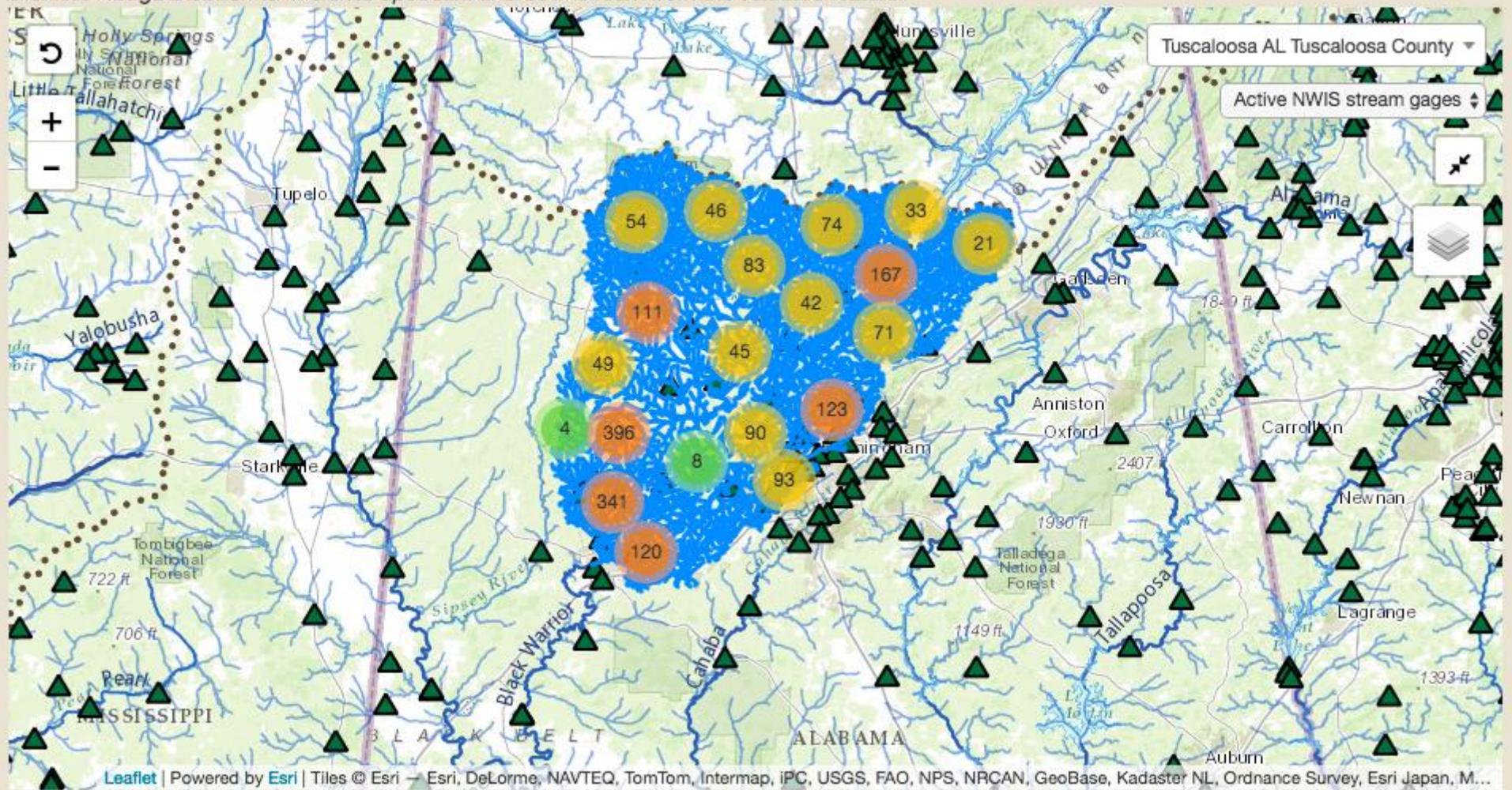
<https://cida.usgs.gov/nldi/nwissite/USGS-02465000>



# Water Quality Data Discovery

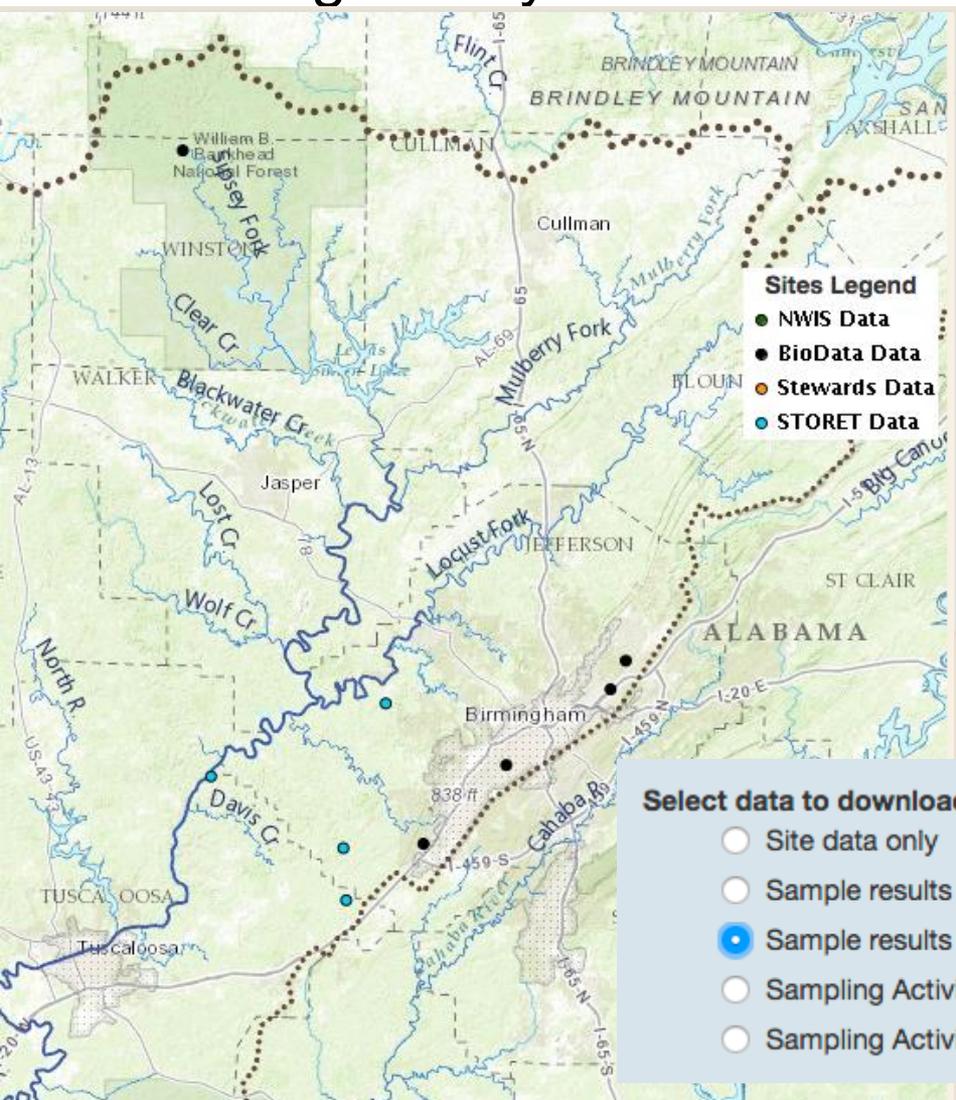
## Using the Hydro-Network Linked Data Index

Zoom in to see the points to search up and downstream from. Click on a point, fill out the navigation type and optional distance in the popup, and then click the Navigate button to find sites upstream and downstream from the selected feature.



# Water Quality Data Discovery

## Using the Hydro-Network Linked Data Index



### SAMPLING PARAMETERS

Sample Media:  ?

Characteristic Group:  ?

Characteristics:  x

Project ID:

Parameter Code:

Minimum results per site:

Date range:

- Select data to download:
- Site data only
  - Sample results (physical/chemical metadata)
  - Sample results (biological metadata)
  - Sampling Activity
  - Sampling Activity Metrics

Your query will return **3,296** sample results from **7** sites:  
From BIODATA: 3,175 sample results from 5 sites  
From NWIS: 0 sample results from 0 sites  
From STEWARDS: 0 sample results from 0 sites  
From STORET: 121 sample results from 2 sites  
Click Continue to download the data



# NLDI is embedded in the Water Quality Portal

❖ <https://www.waterqualitydata.us/>



❖ Enables entirely new queries, e.g. “All metals analyses downstream of X,Y for 500 km”

# NLDI Additional Information

---

- ❖ <https://owi.usgs.gov/blog/nldi-intro/>
- ❖ <https://cida.usgs.gov/nldi/about>
  
- ❖ [jkreft@usgs.gov](mailto:jkreft@usgs.gov)
- ❖ [dblodgett@usgs.gov](mailto:dblodgett@usgs.gov)

# A similar application: EPA's WATERS GeoViewer

The screenshot displays the EPA WATERS GeoViewer interface. On the left, the 'Operational layers' panel is visible, with 'Surface Water Features' selected. The main map shows a network of streams in orange and yellow, overlaid on a street map of Washington, D.C. A search bar at the top center contains the text 'Find surfacewater'. On the right, the 'Upstream / Downstream Search' panel is open, showing search parameters: 'Stream Selection Type\*' is set to 'Upstream with Tributaries', 'Starting Point\*' is marked with a red square, and 'Max Distance (km)\*' is set to 15. The 'Search For These Linked Data\*' section has several checkboxes, with '10001 : 303(d) Listed Impaired Waters' checked. An 'Execute' button is at the bottom right of the search panel.

**Operational layers**

- Result: Point Linked Data
- Result: Linear Linked Data
- Result: Streams Selected
- Feature Layers
  - EPA Linked Data
  - 303(d) Listed Impaired Waters
  - 305(b) Assessed Waters
  - Beaches
  - Clean Watersheds Needs Survey
  - Fish Consumption Advisories
  - Fish Tissue Data
  - Facilities that Discharge to Water
  - TMDLs on Impaired Waters
  - Water Monitoring
  - Nonpoint Source Projects
  - Other Linked Data
  - Surface Water Features
    - Flow Direction
    - Streams
    - Canals

**Upstream / Downstream Search**

Input Output

Stream Selection Type\*  
Upstream with Tributaries

Starting Point\*

Max Distance (km)\*  
15

Search For These Linked Data\*

- 10001 : 303(d) Listed Impaired Waters
- 10002 : 305(b) Assessed Waters
- 10003 : Beaches
- 10006 : Clean Watersheds Needs Survey
- 10009 : Fish Consumption Advisories
- 10010 : Fish Tissue Data
- 10015 : Facilities that Discharge to Water
- 10018 : TMDLs on Impaired Waters
- 10012 : Water Monitoring
- 10011 : Nonpoint Source Projects
- 10030 : USGS Streamgages

[Help](#) **Execute**

<https://www.epa.gov/waterdata/waters-geoviewer>

# NLDI Current Capabilities

---

- ❖ What can you do with this now?
  - Water Quality Portal is initial application
  - EPA's WATERS GeoViewer is a general browse and query app for NHDPlus Medium Resolution (1:100,000)
  - NLDI for NHDPlus HR is being researched
- ❖ Reference your data to NHD (MR or HR)
  - Linked data (e.g. water withdrawals, permits, water rights)
  - Hydro Event Management (HEM) desktop application
  - Web-based tools in development <https://maps.usgs.gov/hydrolink/>

# Linked Data Challenges

---

Planning for support and scaling up of common spatial data infrastructure

- ❖ Develop similar services for NHDPlus HR
- ❖ Where should NLDI services be hosted?
- ❖ Plan for scaling up based on demand
- ❖ Further development of functionality
- ❖ Further development will require funding support

[inlandwaters.geoplatform.gov](http://inlandwaters.geoplatform.gov) is a possibility, but can it support the load long-term?

# Possible New Use Case

---

## Inland bathymetric data

- ❖ Strong interest from many parties
- ❖ Short term – inventory existing bathy data, link to NHD
- ❖ Longer term
  - Data model and standards development
  - Develop a strategy to acquire widespread bathy data

# For more information

---

Subcommittee on Spatial Water Data (SSWD) Co-chairs:

Al Rea - [ahrea@usgs.gov](mailto:ahrea@usgs.gov)

Ed Clark - [edward.clark@noaa.gov](mailto:edward.clark@noaa.gov)