



Federated Data Systems in the Information Age

Presentation to the ACWI Streamflow Collaborative December 11, 2018

Dr. Emily K. Read
Chief, Web Communications
Water Resources Mission Area
U.S. Geological Survey

U.S. Department of the Interior
U.S. Geological Survey



Image credit: USGS

What is the U.S. Geological Survey?

A non-regulatory, non-enforcement federal science agency

USGS is an agency of the U.S. Department of the Interior. Our scientists develop new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.

USGS provides science about

- Natural hazards that threaten lives and livelihoods
- Water, energy, minerals, and other natural resources we rely on
- Impacts of climate and land-use change

USGS Water

Observe, understand, predict, and deliver timely water information

Water information is fundamental to national and local economic well-being, protection of life and property, and effective management of the Nation's water resources.

USGS Water works with partners to monitor, assess, conduct targeted research, and deliver information on a wide range of water resources and conditions including

- Streamflow
- Groundwater
- Water quality
- Water use and availability

Image credit: NASA

Why is Integration of Streamflow Data Needed?

And how will the information be used?

- Finding relevant water data can be challenging: the 80-20 rule applies
- All available data is needed to address hydrologic research questions and meet operational needs
- Shared data models and federated data systems can provide benefit

Multi-agency Federated Data Portals

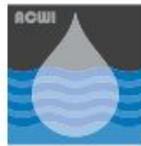
Bringing data together

- Data from multiple providers made available through single interface and/or application programming interface (API)
- Data providers maintain ownership and control of data
- Harmonization of data and/or common data standards may or may not be enforced

Multi-Agency Federated Data Portals

USGS led or co-led

- ACWI NWQMC
 - Water Quality Portal <https://www.waterquality.us>
 - National Environmental Methods Index <https://www.nemi.gov/home/>
- ACWI SoGW National Groundwater Monitoring Network Data portal <https://cida.usgs.gov/ngwmn/>



National Water Quality Monitoring Council

Working together for clean water



NEMI

National Environmental Methods Index



Multi-Agency Federated Data Portals

WaDE: <http://wade.westernstateswater.org/>

- Water use and water supply data from 15 Western states
- Water Data Exchange (WaDE) protocol
- States, Western States Water Council, and foundation funded
- *In progress:* USGS-WaDE discussions on how to increase access to latest water use / supply data across the US.

WaDE



The Water Data Exchange or WaDE project enables states to share data with each other and the public in a more streamlined and cost-effective way. WaDE provides access to water allocation, supply, and demand data that are maintained by state and other governmental agencies.

Multi-Agency Data Portals

CUAHSI HydroShare and HydroClient: <http://data.cuahsi.org/>

- Project data and project models hosting platform
- Federal agency data hosting: USGS, USDA/NRCS SNOTEL, NOAA, EPA STORET, NASA GLDAS
- WaterML 1.1 exchange protocol
- NSF-funded



Multi-Agency Data Portals

Compare and contrast

	Standards-driven	Broad adoption	Motivation: Grant Program	Motivation: Hosting / Platform
WQP	✓	✓		✓
NGWMN	✓		✓	✓
CUAHSI HydroShare	✓			✓
WaDE	✓		<i>In development:</i> USGS grant program	✓



Additional motivation: Regulatory / enforcement, e.g., EPA enforcement of Clean Water Act

Challenges to a multi-agency streamflow delivery system

USGS Water Integrated Information Dissemination Division

Technical

- Data volume, consensus standards, representation of uncertainty, data quality

Policy (USGS)

- ACWI has been an effective forum for collaboration because federated systems such as WQP or NGWMN are not bound by existing USGS data policies

Cultural (USGS)

Vision for a Multi-Agency Streamflow Delivery System

USGS Water Integrated Information Dissemination Division

- ~~Streamflow~~ Continuous water information delivery system
- Collaborate and build on existing committees, systems, and initiatives
 - e.g., ACWI, EPA Interoperable Watershed Network Pilot ([Slaweck et al. 2017](#)), CUAHSI HydroClient, USGS NWIS, and/or Duke University [Internet of Water](#)
- Data providers maintain ownership and control of data
- Providers comply with community-consensus (OGC) data exchange standards when available
 - Active, community development of standards when needed (e.g., continuous WQ standards)

Vision for a Multi-Agency Streamflow Delivery System

What is your vision?

What's missing from this discussion?

What are the attributes of a streamflow portal of the future?

What role should ACWI Streamflow Collaborative have in the development?

Dr. Emily K. Read
Chief, Web Communications

eread@usgs.gov



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