



**ACWI**  
Advisory Committee  
on Water Information

# Report on the Open Water Data Initiative (OWDI)

National Monitoring Conference  
May 5, 2016

Al Rea, USGS National Geospatial Program

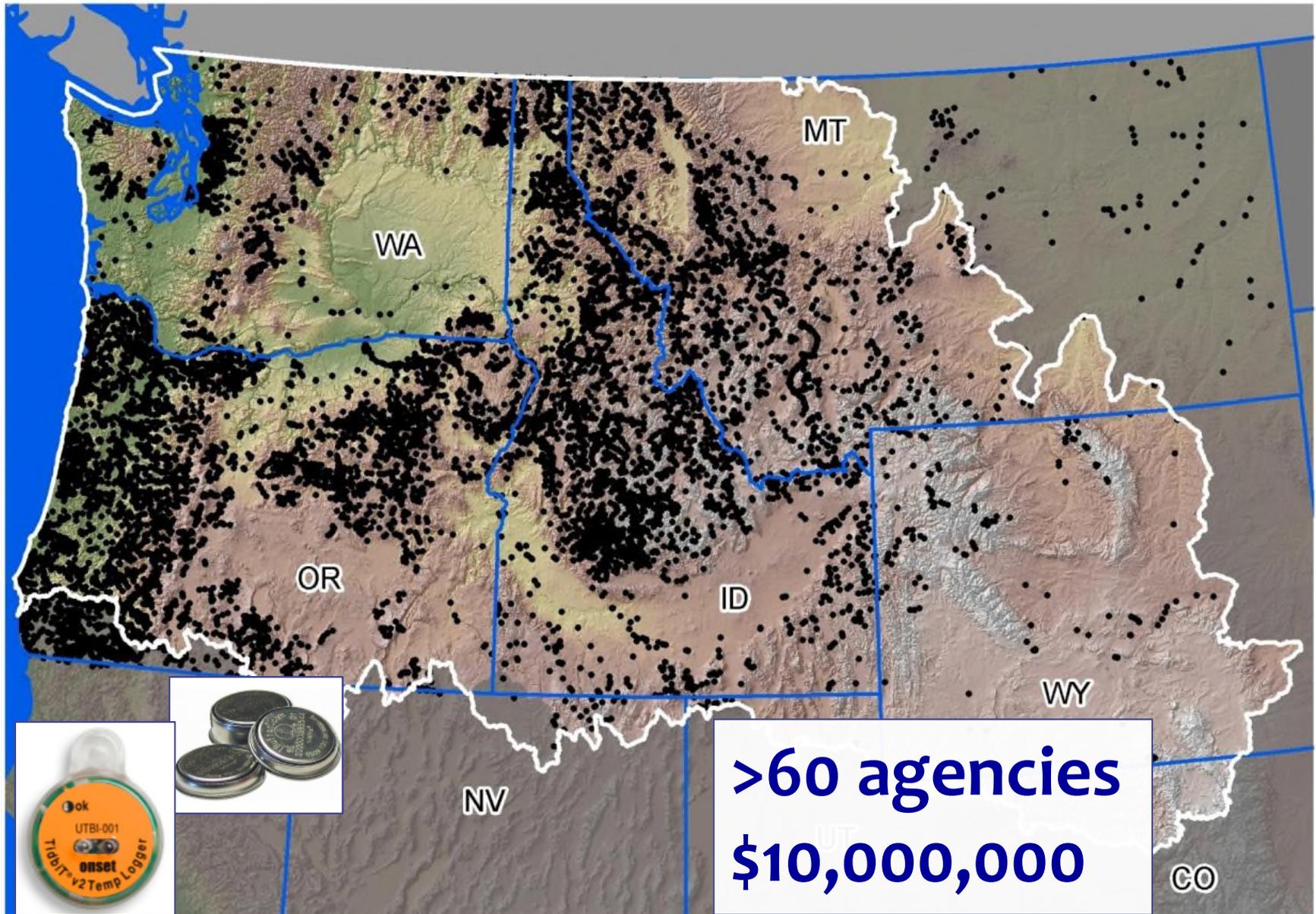
Subcommittee on Spatial Water Data

# OWDI as a Challenge

- ◆ Access to water data is difficult
  - Collected by hundreds of organizations
  - No common infrastructure
- ◆ Understanding connections requires a geospatial framework
  - Landscape to stream
  - Stream to stream
  - Infrastructure to stream



>45,000,000 hourly records  
>15,000 unique stream sites



>60 agencies  
\$10,000,000

# 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                  |



# Use Case Concepts

- ◆ Define use cases that respond to societal needs and cover broad range of water resources issues
- ◆ Identify critical data inputs — focus on these first
- ◆ Our emphasis is on the data, not the full solution



# OWDI Use Cases



## Use Case 1:

National Flood Interoperability Experiment

- ◆ Identify flood data including stream-flow observations, forecasts and impacts
- ◆ Developing *geospatial framework* and exploring data conflation



## Use Case 2:

Drought Decision Support System

- ◆ Identify water resources data including natural flow, reservoir storage and drought impacts
- ◆ Explore visualization of drought in Lower Colorado



## Use Case 3:

Spill Response Tool

- ◆ Review existing modeling applications and data requirements
- ◆ Exploring requirements for new/additional data (e.g. velocity forecasts and reservoir residence times)

# Common Data Needs

## ◆ NHDPlus V2.1

- National in single file geodatabase
- Denormalized (flattened) data model
- Available for download and as services

## ◆ Sites indexed to NHDPlus V2.1 network

- Streamgages
- NWS river forecast points
- Dams
- Large diversions and return flows
- ...and many others



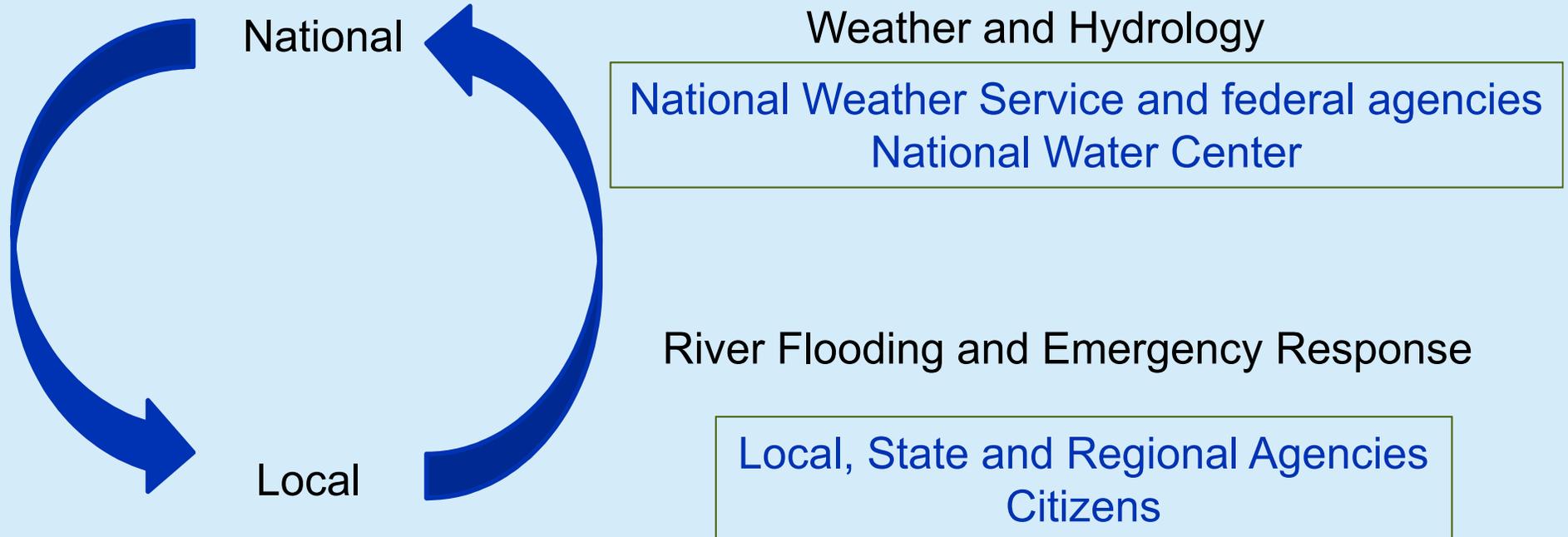
# National Flood Interoperability Experiment (NFIE) (Sept 2014 to August 2015)

- Partnership between **NWS** and the **academic community** (Interagency Agreement between NSF and NOAA)
- Included a **Summer Institute** for 44 graduate students from 19 Universities at the National Water Center, June 1 to July 17, 2015



# Goal of the Experiment

- Close the gap between National Flood Forecasting and Local Emergency Response
- Demonstrate forecasting of flood impacts at “stream and street level”



# WaterML2 Observations from USGS and Forecasts from NWS for this location

## USGS Gage 08159000

## NWS Forecast Point ATIT2

### USGS Observed Flows, July 19

### NWS Forecast Flows, July 19-20

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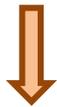
# Continental Hydrology

Blanco River at Wimberley

Two basins and one forecast point

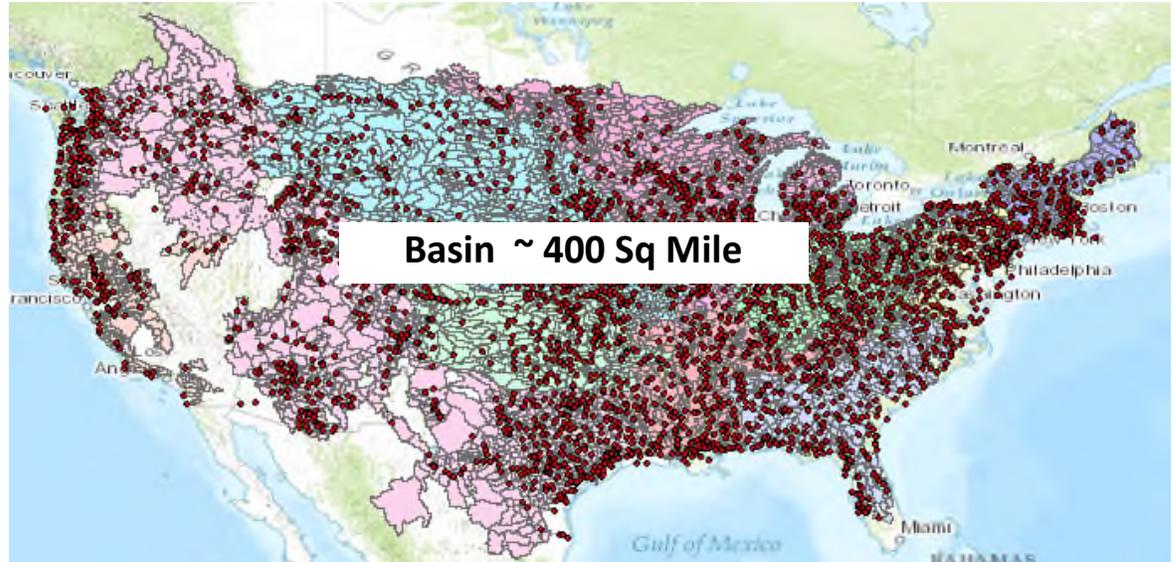


becomes

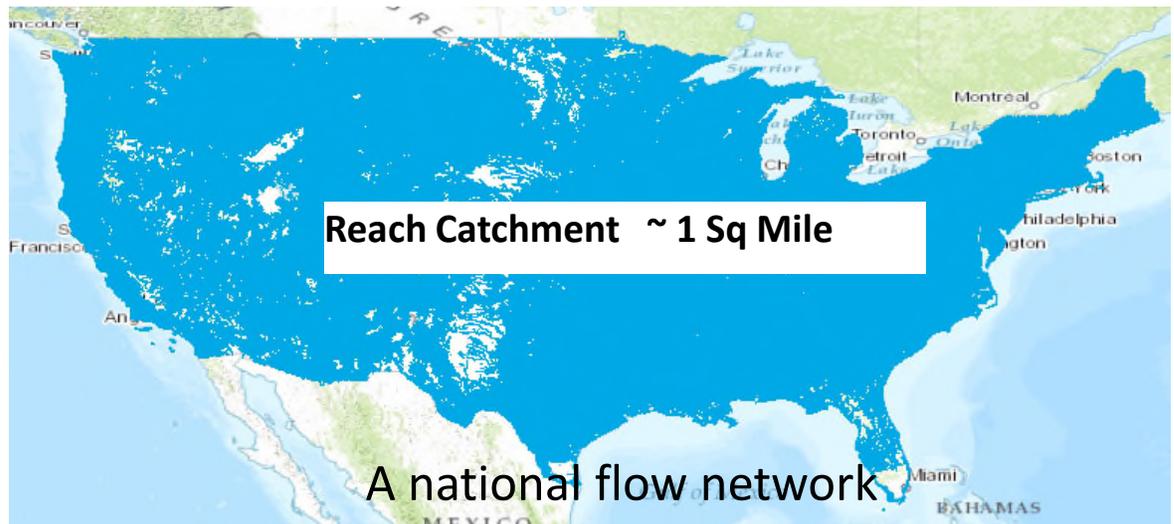


130 Catchments and Flowlines uniquely labelled

Current: 6600 basins and 3600 forecast points



NFIE: 2.7 million stream reaches and catchments from NHD Plus



A national flow network

# National Water Model

## IOC Experimental Output (FY16)

- **Hydrologic Output**

- River channel discharge and velocity at 2.7 million river reaches
- Surface water depth and subsurface flow (250 m CONUS+ grid)

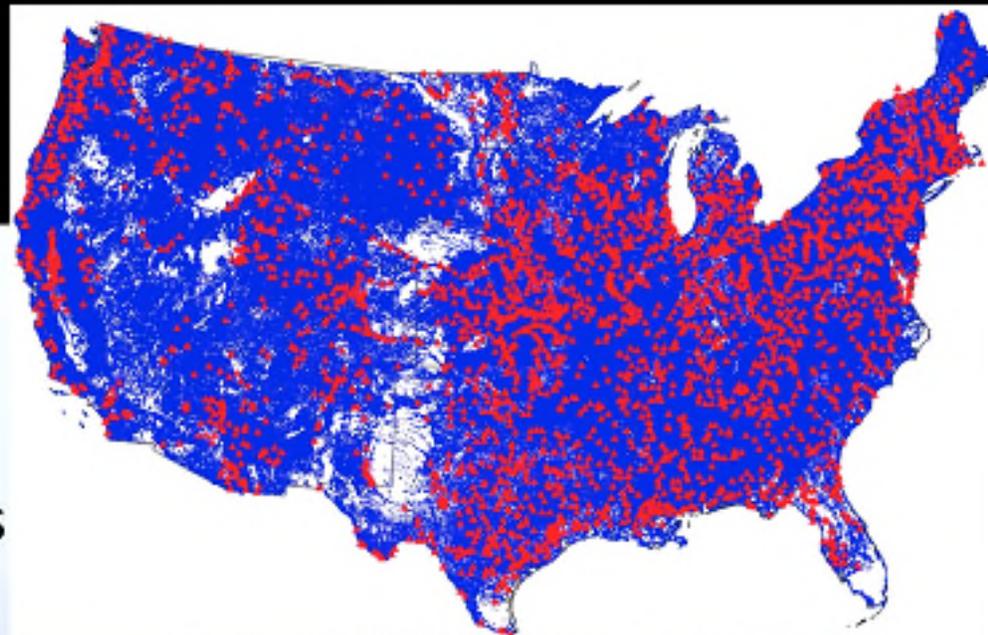
- **Land Surface Output**

- 1km CONUS+ grid
  - Soil and snow pack states
  - Energy and water fluxes

- **Data Services**

- Public-facing NWC website
- Data feed to River Forecast Centers
- NOMADS data service

(slide – Ed Clark, NOAA-NWS)



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

### Howard County, Maryland (300k People)



Current River Forecast Points: Zero  
WRF-Hydro Forecast Points: 300+

# WRF-Hydro Operational Configuration

Analysis &  
Assimilation

Short-Range

Medium-Range

Long-Range

Cycling Frequency

Hourly

Hourly

Daily

Daily (16 mem)

Forecast Duration

- 3 hrs

0-18 hours

0-10 days

0-30 days

Meteorological Forcing

MRMS blend/  
HRRR/RAP bkgnd.

Downscaled HRRR/  
RAP blend

Downscaled GFS

Downscaled &  
bias-corrected CFS

Spatial Discretization & Routing

1km/250m/NHDPlus  
Reach

1km/250m/NHDPlus  
Reach

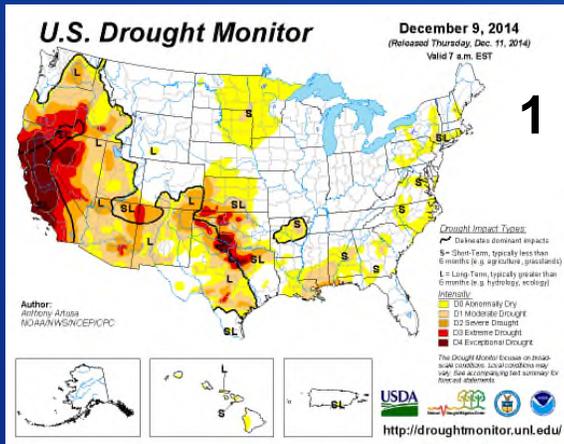
1km/250m/NHDPlus  
Reach

1 km/NHDPlus Reach

Assimilation of USGS Obs

Reservoirs (1615 water bodies parameterized with level pool scheme)

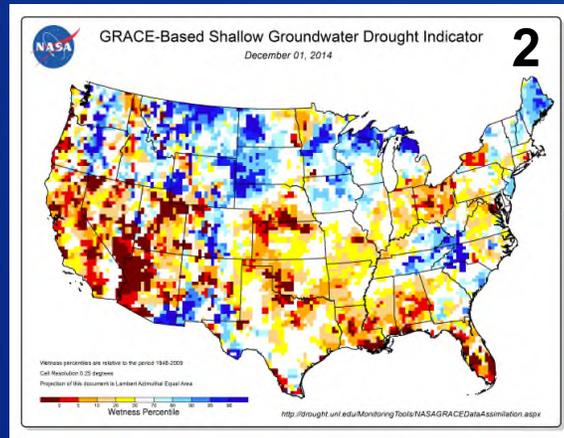
# Drought and Water Data



Has your community been **IMPACTED BY DROUGHT?**

Tell us by submitting a "CoCoRaHS Drought Impact Report"

**8**

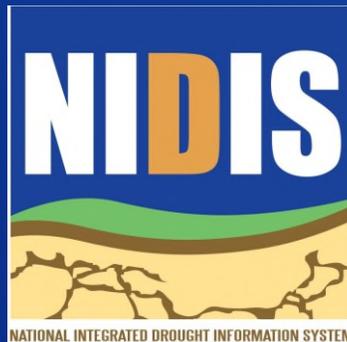


## Drought Information Sources

1. USDA Drought Monitor
2. NASA GRACE Drought Indicators
3. Western Water Assessment
4. National Drought Resilience Partnership
5. Western Governors' Drought Forum
6. National Drought Mitigation Ctr
7. National Integrated Drought Information Ctr – Drought Portal
8. Community Collaborative Rain, Hail and Snow Network (crowdsource)

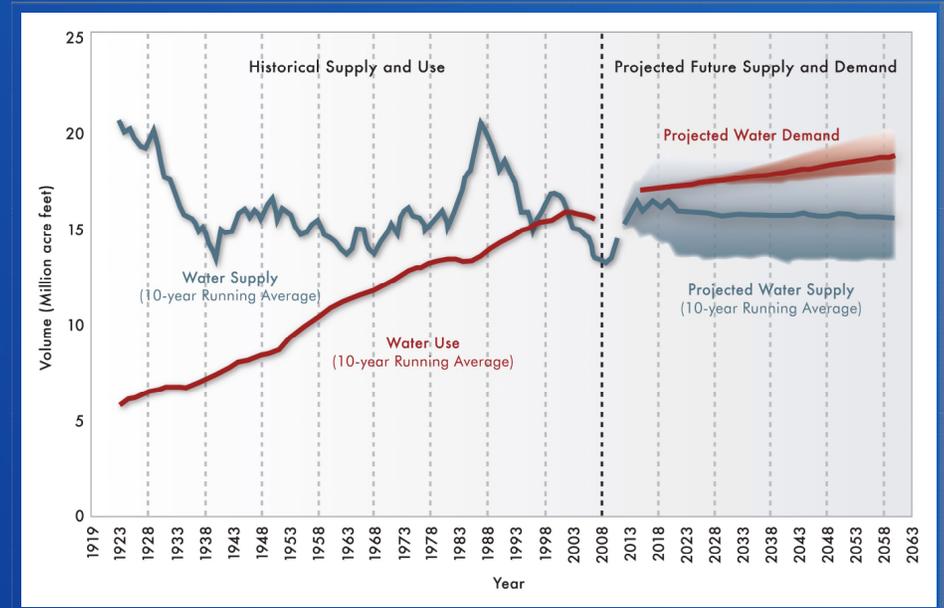
## Not pictured:

- Western States Water Council WaDE
- NOAA-NWS Climate Prediction Ctr & NWS River Forecast Centers,
- NRCS Forecast maps
- Drought webpages of states
- Info from conferences, workshops and studies on drought planning and impacts



RECLAMATION

# Web Visualization: Drought in the Lower Colorado River Basin



<https://www.doi.gov/water/owdi.cr.drought/en/index.html>

Angela Adams - Bureau of Reclamation  
aadams@usbr.gov – 702-293-8491

RECLAMATION

# Gold King Mine Spill

## ICWater Preliminary Results





# Status: Water Data Catalog

- ◆ Network-Linked Data Index
  - Federated data model
  - Data discovery using upstream/downstream navigation
- Data quality info
- Machine readable ontologies



Open Water Data Initiative (OWDI) Water Use Dataset Workgroup

Summary

The Open Water Data Initiative (OWDI) Water Use Dataset Workgroup folder within Sciencebase contains a brief report that documents existing water use datasets and their primary characteristics, identifies important water use data gaps and current efforts to address those gaps, and provides recommendations on how to incorporate water use datasets into the OWDI framework. It will also serve as a repository for a water use dataset inventory and support an interface that details the current status of national, regional, state and local water use datasets, and provides access back to the online data sources.

Water Use Dataset Resources

Click on the tabs below for further information.

Openly Published:  Yes  Pending  No [What is "Openly Published"?](#)

- Ground Water Protection Council - FracFocus
- Ground Water Protection Council/U.S. Energy Information Administration - Open EI
- Lawrence-Livermore National Laboratory - National and State Water-Energy Sankey Diagrams
- USGS Ancillary Estimates of Water Use - 1985 - 1995
- USGS Consumptive Use Estimates - 1985 - 1995
- USGS National Groundwater Monitoring Network/Portal
- USGS Principal Aquifer Withdrawals - 2000
- USGS Water Withdrawals - 1950 - 2010
- Dept. of Energy / Sandia National Laboratory Energy and Water in the Western and Texas Interconnects
- Great Lakes Commission - Great Lakes Regional Water Use Database

Provides comparable water use information on withdrawals, diversions and consumptive uses for the Great Lakes Commission (<http://www.glc.org>).

Publication Format: Annual reports, website (can query the database)  
 Published using "Open" formats? Yes, database can be queried through the website, but cannot be accessed in an automated fashion (web services).  
 Period of Record: 1994 - 2014  
 Timestep: Annual  
 Spatial Extent: By jurisdiction (state and province), by basin, and by sector of use



# Network-Linked Data Index

- ◆ Dave Blodgett, Dave Steinich, Jim Kreft, at USGS-OWI
- ◆ Network-based search engine integrated with Water Quality Portal
- ◆ Ultimately allows federated network-based search through ScienceBase
- ◆ Working on API documentation
- ◆ Open source in GitHub repository





ComID

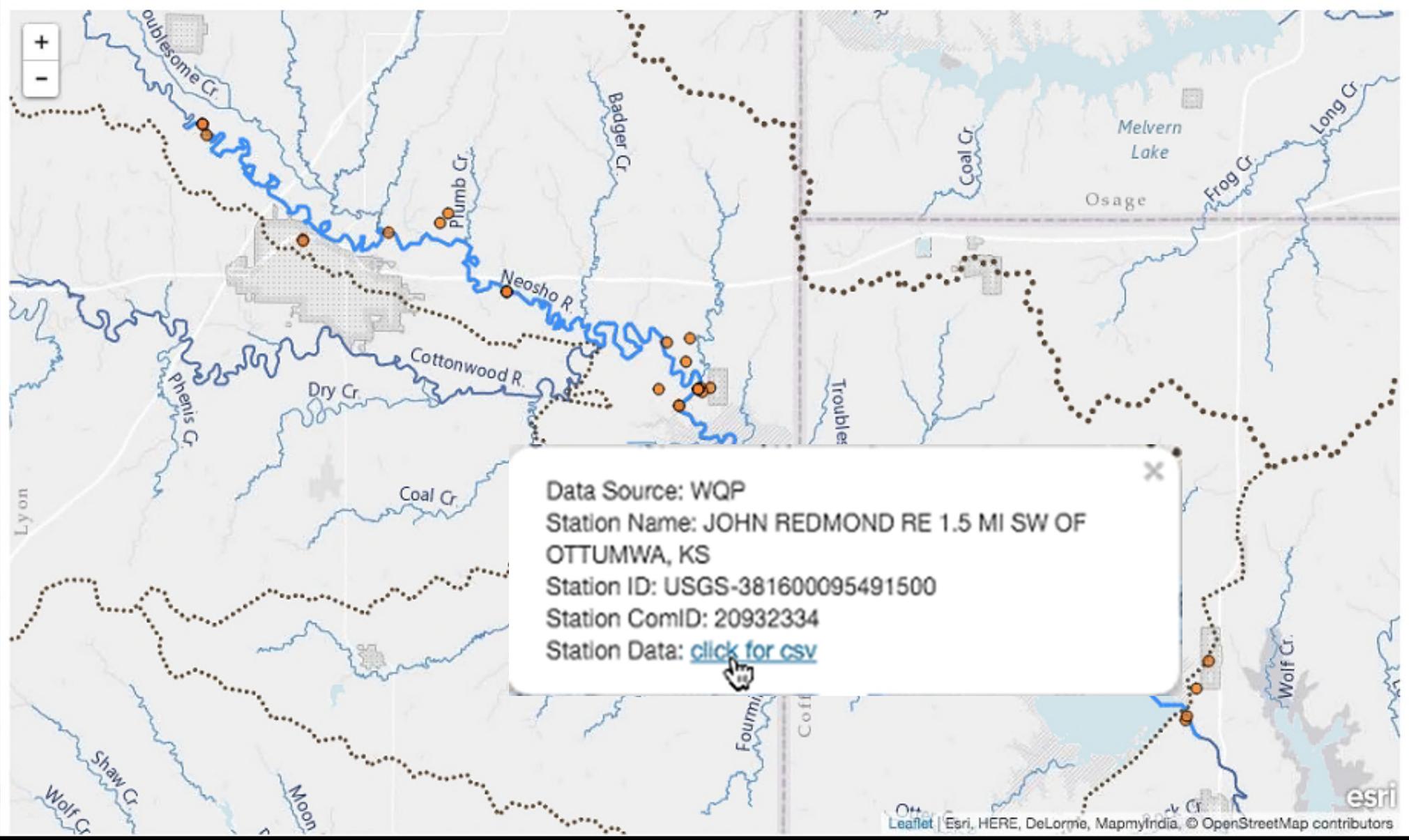
Query Type

distance

- Upstream Main
- Downstream Main
- Downstream with Diversions
- Upstream with Tributaries



ComID  Query Type  distance



Data Source: WQP  
Station Name: JOHN REDMOND RE 1.5 MI SW OF OTTUMWA, KS  
Station ID: USGS-381600095491500  
Station ComID: 20932334  
Station Data: [click for csv](#)

HUC:  ?

NLDI Site Service: ?

Characteristics:  ?

Project ID:  ?

Parameter Code:  ?  
(NWIS ONLY)

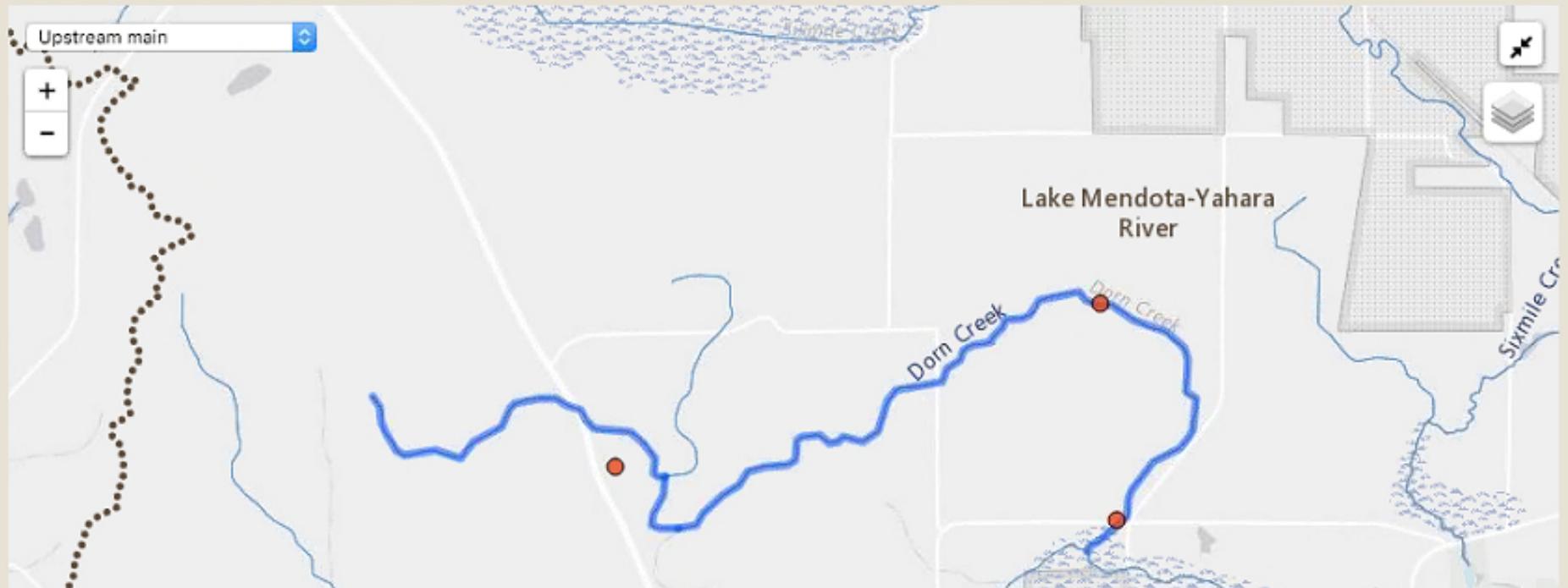
Minimum results per site:  ?

Date range - from:  to:

Biological sampling parameters: ?

Assemblage:  ?

Taxonomic Name:  ?



Filters Find a repository...

+ New repository

nldi-db Network Linked Data Index Database Component Updated 20 minutes ago

PLpgSQL 1 star 1 fork

nldi-crawler Network Linked Data Index Crawler Updated 3 days ago

Java 0 stars 1 fork

nldi-services Network Linked Data Index Navigation Web Services Updated 3 days ago

Java 0 stars 1 fork

People

coobr01 Brad Cooper

dblodgett-usgs David Blodgett

dsteinich David Steinich

Invite someone

# Status: Water Data as a Service

- ◆ NWS forecasts and NWIS data as WML2
- ◆ Robust serving capacity is necessary
- ◆ Slow services aren't used
- ◆ Repackaged seamless NHDPlus data for download—useful variation
- Metrics of service usage needed
- Many more datasets



# Status: Enriching Water Data

- ◆ Linking data to a standardized geospatial framework (e.g. NHDPlus)
  - Sites with observations and measurements
  - Modeling parameters for catchments
- Network trace (upstream/downstream) capability is key



# Status: Water Data and Tools Marketplace - Community

- ◆ Community dialogue (SSWD, AWRA, etc.)
- ◆ Code/tool/procedure open source repository (GitHub)
- Web-based forum needed (wiki or similar)



# OWDI Resources:

- ◆ ArcGIS Online web map showcasing some OWDI data services:

<http://arcg.is/1EIL4bP>

- ◆ National denormalized NHDPlus V2.1 download:

<ftp://ec2-54-227-241-43.compute-1.amazonaws.com/NHDplus/NHDPlusV21/Data/NationalData/>



# Future Open Water Web

- ◆ Unified scalable spatial framework—  
NHDPlus High Resolution
- ◆ Network-Linked Data Index
- ◆ Navigation services
- ◆ Community blueprint and sharing
- ◆ Open is Standard Operating Procedure



Subcommittee on Spatial Water Data



# For more information:

Co-chairs SSWD:

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



Subcommittee on Spatial Water Data

