P2P Network Webinar Series

That's So Meta: Metadata Workshop

Part 1: November 17, 2020 and Part 2: November 18, 2020

Program Updates

- Welcome
  - Ashley Ward, Internet of Water
- Take note for today's webinar
  - We are recording!
  - Other administrative notes
- Peer-to-Peer (P2P) Network

The Water Data Exchange (WaDE) Program Metadata

That's so Meta! Technical Workshop
Internet of Water Webinar
Nov 18, 2020

Adel Abdallah, Program Manager
Ryan James, Data Analyst
Western States Water Council

WESTERN STATES WATER COUNCIL

Outline

- Background: WSWC and WaDE
- WaDE 2.0 Architecture, Schema, and Vocabulary
- Demo of WaDE Portal: Water Rights Data
- Demo of WaDE Portal: Aggregate Water Data
- Next Steps

Workshop Audience

- 80 % are unfamiliar with WaDE and WSWC
- 60% works for an organization that publishes data and want to make that data more interoperable and findable with data from outside my organization
- 30% wants to learn about metadata and use it

Western States Water Council

A Voice for Water in the West

Mission

Founded in 1965

To ensure that the West has an adequate, secure and sustainable supply of water of suitable quality to meet its diverse economic and environmental needs now and in the future.

Water Data Exchange (WaDE)

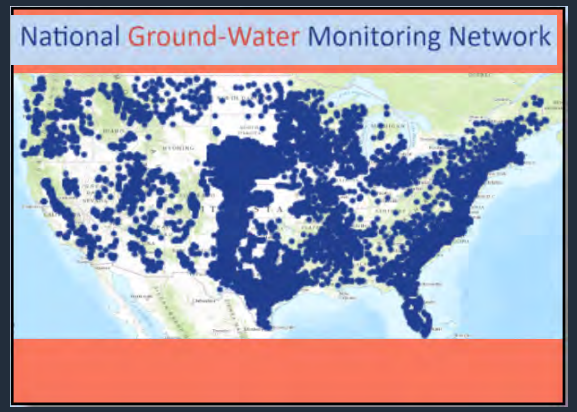
Established in 2012

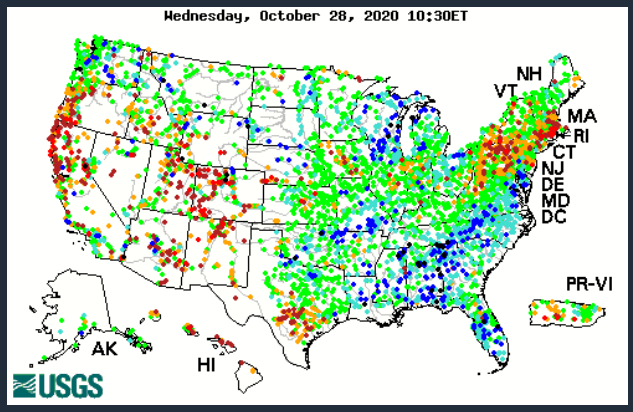
"a framework for member states to begin to share important water supply, water use, and water administration datasets with each other, with federal partners, and with the public"

Data Shared Through WaDE

- Water rights
- Aggregated water budget estimates
- Site-specific use and withdrawals
- Regulatory overlays

Example Data Shared by Federal Agencies



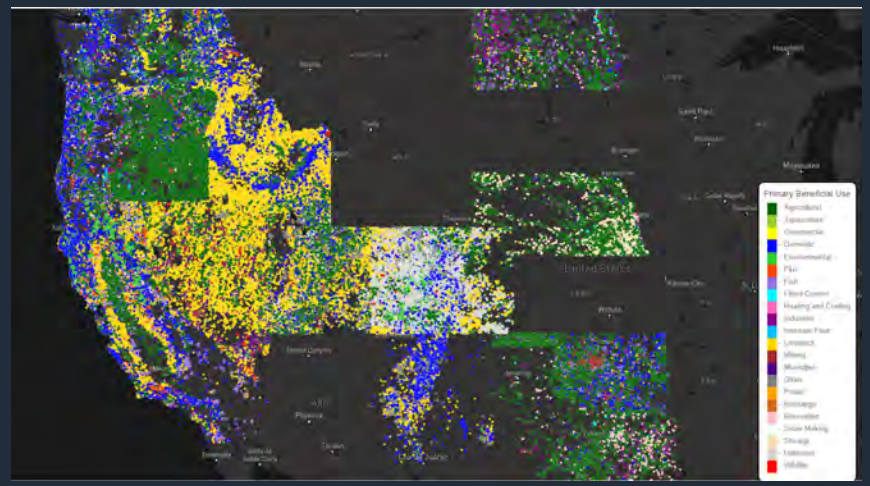


BUREAU OF RECLAMATION

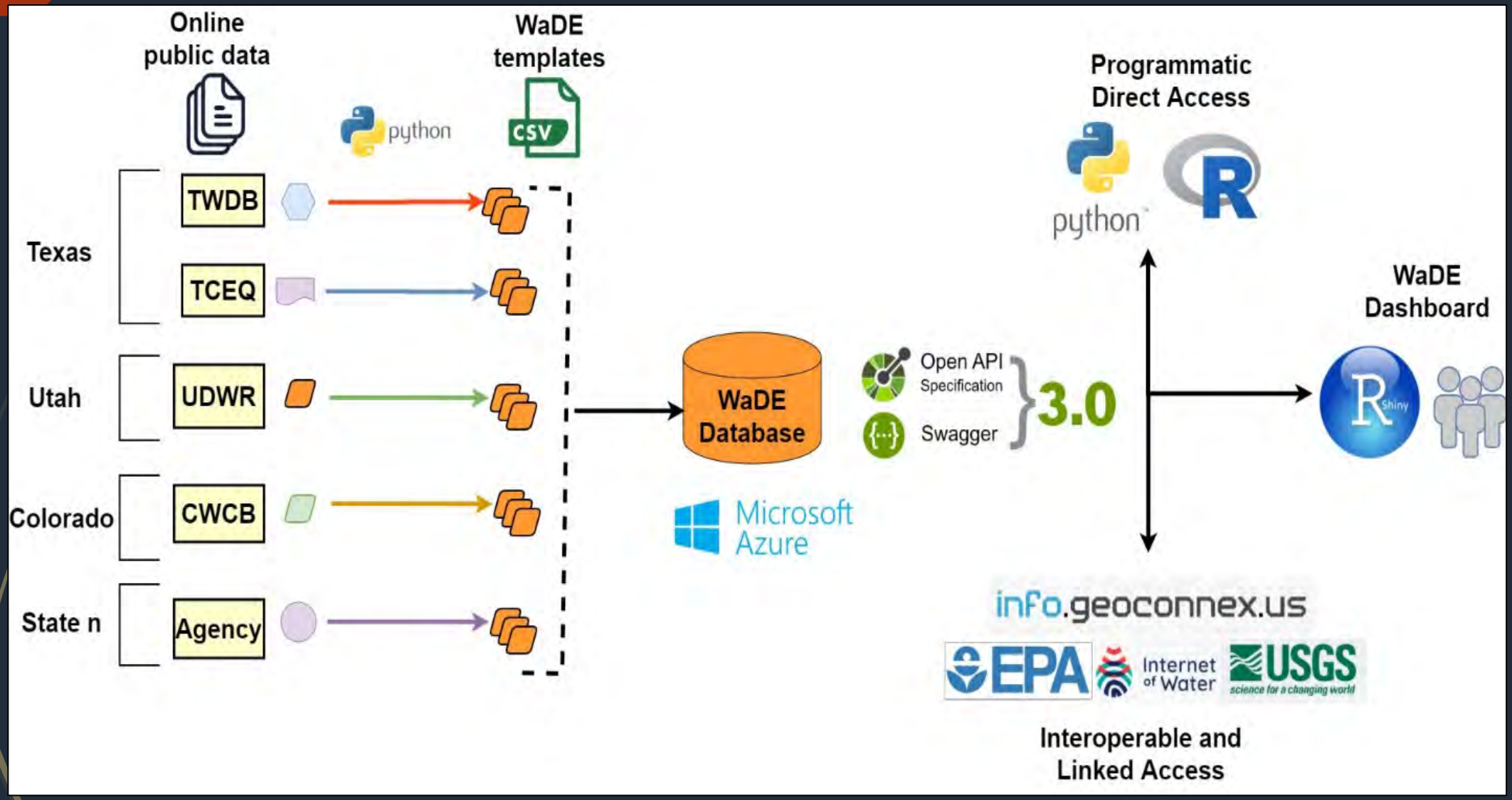
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Motivating Design Questions

- What are the appropriated water rights in an area sorted by date? List their beneficial use (s)
- What is the annual water budget in a watershed over time?
- How much water is being used in a location over time and for what purpose?
- What are the regulatory overlays in a watershed?



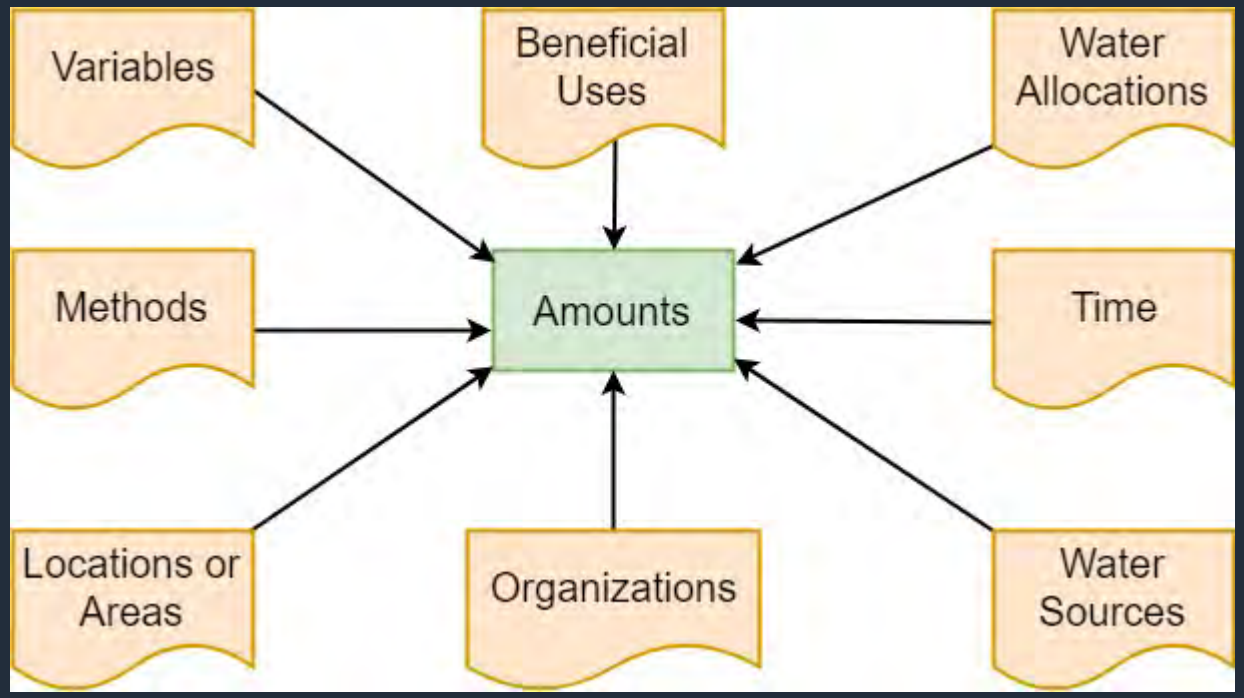
WaDE 2.0 Architecture



https://github.com/WSWCWaterDataExchange

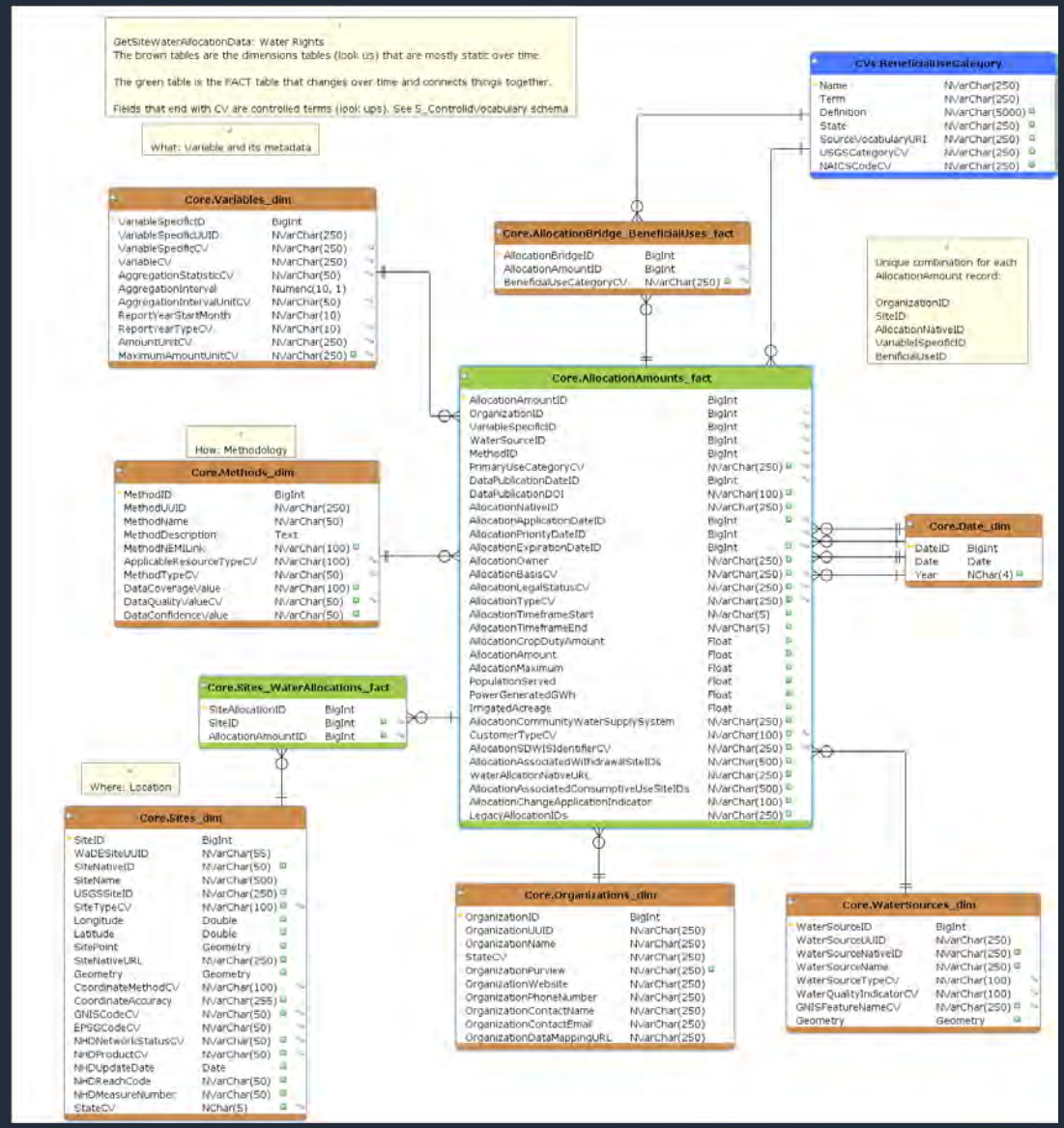
WaDE 2.0: New Metadata and Schema

- Scalability, monitoring, updates, and efficiency in a centralized system
- Support geospatial and time series water use data
- Agreed-upon metadata and vocabularies across the Councils' members and with USGS



WaDE 2.0 Schema

- Reconciles differences in syntax and semantics
- Entity relationship diagrams using the dimensional model (star schema) to support Online Analytical Processing (OLAP)



http://schema.westernstateswater.org/diagrams/index.html

WaDE 2.0 “Translates” Water Terminology

- 32 metadata terms

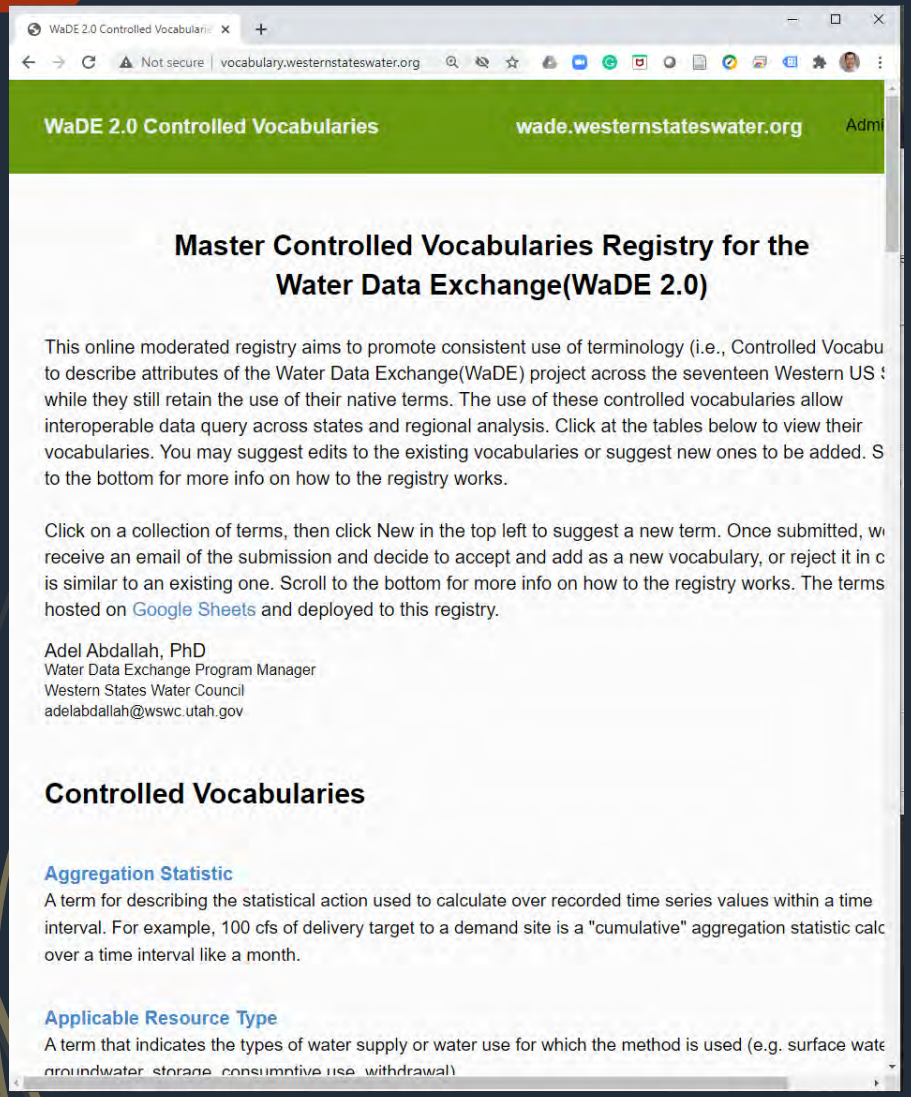
Irrigation Method, Customer Type, Crop Type, Site Type, Water Source Type, Water Allocation Type, Applicable Resource Type, Data Quality Value, Report Year Type, Water Quality Indicator, Water Allocation Basis, Method Type, Legal Status, Regulatory Status

#	Key Term	# of States Unique Terms	# of WaDE Unique Terms
1	Beneficial Use Category	347	22
2	Water Source Type	34	5
3	Site Type	134	31
4	Legal Status	85	?
5	Water Allocation Type	92	?

Legal Status: Absolute / Approved / Certificated / Decreed / Licensed / Registered / Reserved / Vested/ Conditional / Deferred / Permit

Water Allocation Type: Application / Change / Permit / Temporary/Exempt /Claim /In Review

WaDE 2.0 Controlled Vocabulary Repository



	A	B	C
1	**Name**	**State**	**WaDEname**
2	Agricutural Spraying	MT	Agricultural
3	Cranberry	OR	Agricultural
4	Harvesting of Cranberries	OR	Agricultural
5	Individual Irrigation	WA	Agricultural
6	Irrigated Agriculture	US	Agricultural
7	Irrigated agriculture_ground	TX	Agricultural
8	Irrigated agriculture_reuse	TX	Agricultural
9	Irrigated agriculture_surface	TX	Agricultural
10	Irrigation	CA, CO, ID, MT, ND, NM, NV, OK, OR, UT, WA	Agricultural
11	Irrigation and Domestic	OR	Agricultural
12	Irrigation and Livestock	OR	Agricultural
13	Irrigation from Natural Stream	NE	Agricultural
14	Irrigation Livestock and Domestic	OR	Agricultural
15	Irrigation of Cranberries	OR	Agricultural
16	Irrigation Storage	ID	Agricultural
17	Irrigation Unknown	WA	Agricultural
18	Irrigation-Carey Act	NV	Agricultural
19	Irrigation-DLE	NV	Agricultural
20	Nursery Uses	OR	Agricultural
21	Practicably Irrigable Acreage	OR	Agricultural
22	Primary and Supplemental Irrigation	OR	Agricultural
23	Recharge For Irrigation	ID	Agricultural
24	Subirrigation	ID	Agricultural
25	Supplemental Irrigation	OR	Agricultural
26	Supplemental Irrigation and Incident	NE	Agricultural

http://vocabulary.westernstateswater.org/

WaDE 2.0 Data Sharing Templates

United States Geological Survey
Water Availability and Use Science Program

Water Use Data and Research (WUDR) Data Transfer Guidance

The USGS National Water Information System (NWIS) is in the process of a complete modernization, using a combination of contracts for commercial software such as Aquatic Informatics' Aquarius data management system, and some software developed by USGS. The two water-use subsystems of NWIS, SWUDS (Site-Specific Water-Use Data System) and AWUDS (Aggregate Water-Use Data System), will be redeveloped into a single Water-Use Data System as part of this process. The current structures and input systems are expected to change significantly in the move to a combined database with a more modern architecture. Until this modernization effort is complete, USGS will continue to store water-use data in SWUDS and AWUDS.

The Water-Use Data and Research (WUDR) program encourages the development of data services to more efficiently share data with the USGS, and with other stakeholders the grantee identifies. WUDR applicants and grant funding recipients have requested guidance on what to provide if they are seeking to use a data services approach for delivery of their water use information. Until the NWIS modernization effort has defined formats for USGS-specific water-use data services, the **USGS WUDR program recommends that grantees use the WaDE data schema (that is, the data dictionary) developed by the Western States Water Council's (WSWC) Water Data Exchange (WaDE) Program to provide data services that can be accessed by SWUDS and AWUDS.** USGS will work with States that have existing data services using other schemas and those already in the process of developing a custom schema to be able to process their data as well. States whose grant proposals did not include the development of data services may, of course, share data as described in their proposals.

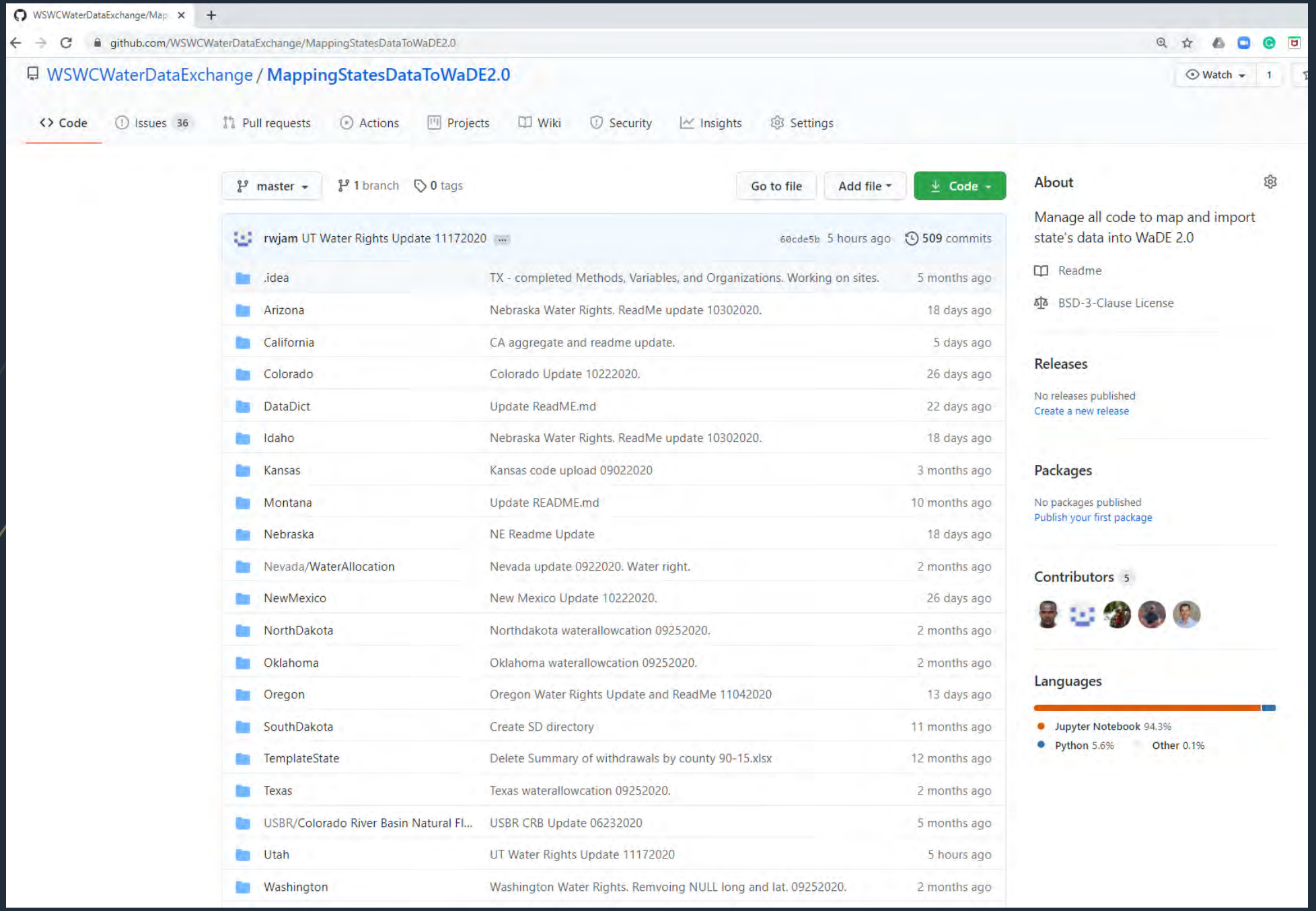
More on WaDE: WaDE was developed to help the member States of the Western States Water Council share water use and water supply data in a common framework. Data that the States choose to share are then made available through a portal. Although initially developed for western States, the WaDE schema supports water-use data concepts for the rest of the U.S. as well. For WUDR grantees, WaDE schema data services may be implemented independently of the WaDE portal—that is, there is no need to engage with the WaDE program in order to utilize the WaDE schema to provide data. Grantees which are not in WSWC member States should contact Adel Abdallah if interested in participating as data providers in the WaDE portal.

The WaDE schema and API documentation is currently under redesign with an expected completion date of August 2019. USGS is providing input to this effort to make the data more easily integrated with NWIS and to ensure the schema covers USGS data requirements. When complete, the schema, related database components, and API documentation will be made available on the WaDE web site. A draft version can be viewed here.

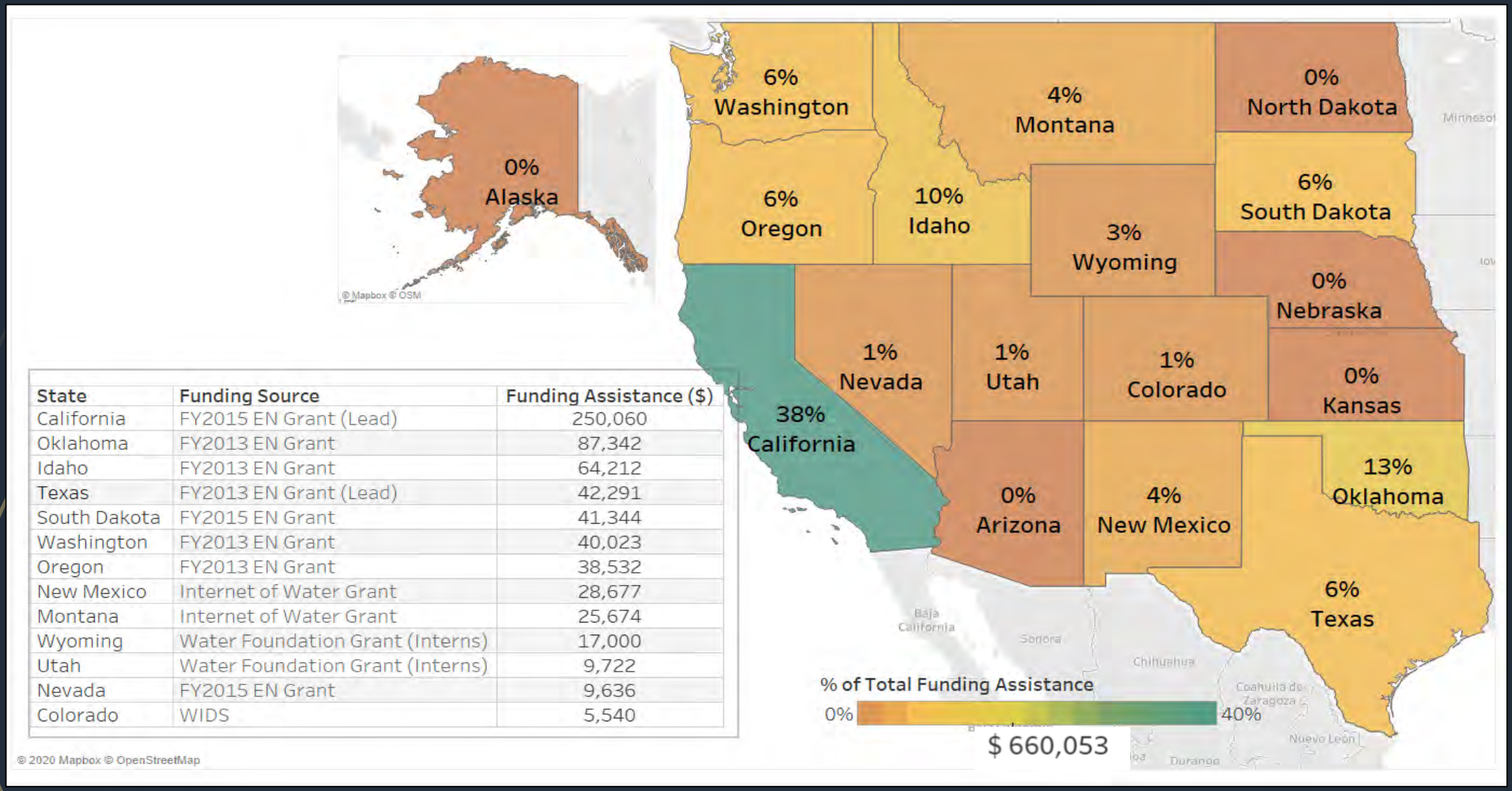
	A	B	C	D	E	F	G	H	I
1	This workbook provides a template and data dictionary for time series aggregate								
2	basin wide use and budget data accoroding to the Water Data Exchange (WaDE) 2.0								
3	schema. For more info, visit								
4	https://github.com/WSWCWaterDataExchange/WaDE2.0								
5									
6	By								
7	Adel Abdallah, WaDE Program Manager								
8	Email: adelabdallah@wswc.utah.gov								
9	Ryan James, Data Analyst / Hydroinformatics Specialist								
10	Oct, 2020								
11						Colors indicate			
12	Western States Water Council					Required field			
13	https://www.westernstateswater.org/					Option field			
14									
15	Sharing metered data through WaDE 2.0 requires metadata and data in six tables								
16	Each table lists its field names, their physical data type, and whether they are								
17	optional or required metadata, an example data entry, and the description of metadata								
18									
19	All the metadata tables are populated one time only except the SiteVariableAmounts table								
20	stores references to the metadata tables and a record of data that often changes over time								
21									
22									
23				D					
24	WaDE 2.0 Specific Terminology →			OrganizationContactEmail					
25	Definition / Description →			Email to contact person.					
26	Example →			abc@co.com					
27									
28									
29									

Instructions | Organizations | Variables | WaterSources | Methods | ReportingAreas | Amounts_time_series

https://github.com/WSWCWaterDataExchange/MappingStatesDataToWaDE2.0/tree/master/DataDict


WSWCWaterDataExchange/Map
github.com/WSWCWaterDataExchange/MappingStatesDataToWaDE2.0
WSWCWaterDataExchange / MappingStatesDataToWaDE2.0
Watch 1
Code
Issues 36
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
master
1 branch
0 tags
Go to file
Add file
Code
rwjam UT Water Rights Update 11172020
60cde5b 5 hours ago
509 commits
.idea TX - completed Methods, Variables, and Organizations. Working on sites. 5 months ago
Arizona Nebraska Water Rights. ReadMe update 10302020. 18 days ago
California CA aggregate and readme update. 5 days ago
Colorado Colorado Update 10222020. 26 days ago
DataDict Update ReadME.md 22 days ago
Idaho Nebraska Water Rights. ReadMe update 10302020. 18 days ago
Kansas Kansas code upload 09022020 3 months ago
Montana Update README.md 10 months ago
Nebraska NE Readme Update 18 days ago
Nevada/WaterAllocation Nevada update 0922020. Water right. 2 months ago
NewMexico New Mexico Update 10222020. 26 days ago
NorthDakota Northdakota waterallowcation 09252020. 2 months ago
Oklahoma Oklahoma waterallowcation 09252020. 2 months ago
Oregon Oregon Water Rights Update and ReadMe 11042020 13 days ago
SouthDakota Create SD directory 11 months ago
TemplateState Delete Summary of withdrawals by county 90-15.xlsx 12 months ago
Texas Texas waterallowcation 09252020. 2 months ago
USBR/Colorado River Basin Natural Fl... USBR CRB Update 06232020 5 months ago
Utah UT Water Rights Update 11172020 5 hours ago
Washington Washington Water Rights. Remvoing NULL long and lat. 09252020. 2 months ago
About
Manage all code to map and import state's data into WaDE 2.0
Readme
BSD-3-Clause License
Releases
No releases published
Create a new release
Packages
No packages published
Publish your first package
Contributors 5
Languages
Jupyter Notebook 94.3%
Python 5.6%
Other 0.1%

Assistance to Secure Funding to Member States



State	Funding Source	Funding Assistance ($)
California	FY2015 EN Grant (Lead)	250,060
Oklahoma	FY2013 EN Grant	87,342
Idaho	FY2013 EN Grant	64,212
Texas	FY2013 EN Grant (Lead)	42,291
South Dakota	FY2015 EN Grant	41,344
Washington	FY2013 EN Grant	40,023
Oregon	FY2013 EN Grant	38,532
New Mexico	Internet of Water Grant	28,677
Montana	Internet of Water Grant	25,674
Wyoming	Water Foundation Grant (Interns)	17,000
Utah	Water Foundation Grant (Interns)	9,722
Nevada	FY2015 EN Grant	9,636
Colorado	WIDS	5,540

Why Does this WaDE Program Matter?

1. Enable Regional Water and Energy Planning
2. Support Water Transfers and Markets
3. Improve State-Federal-Tribal Cooperative Federalism
4. Improve Interstate Watershed Transparency and Cooperation
5. Enable Water Data-Driven Research and Science: Objective Analysis and Modeling

WaDE 2.0 Front End Portal

Coming Soon…

WaDE Demo Apps and Examples
Data Type App #1: Water Allocation Map

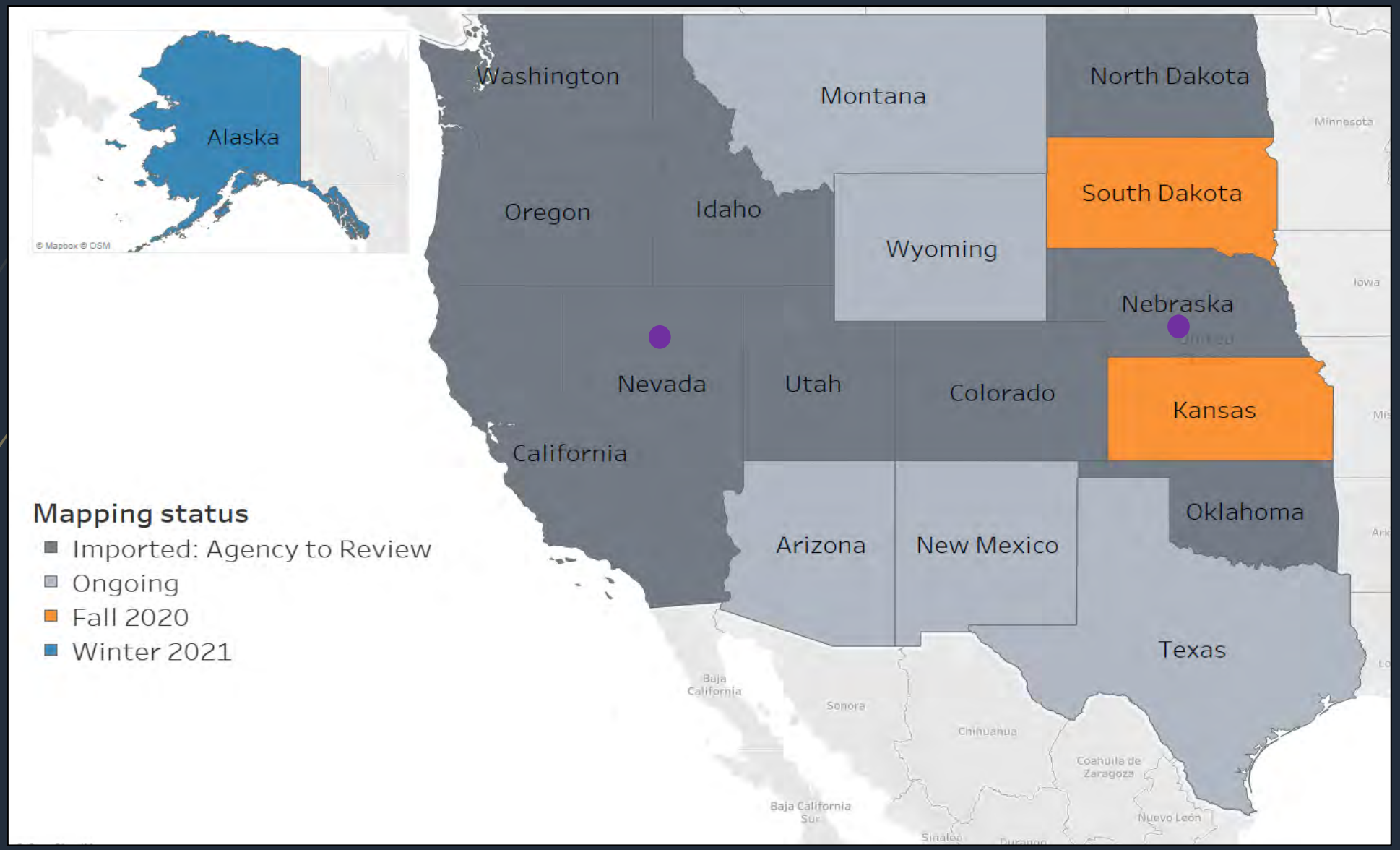
Use Case Examples

- Water rights for fish and wildlife and instream flow.
- State-recognized federal water rights: Forest Service / US Army.
- State-recognized federal ground water rights.

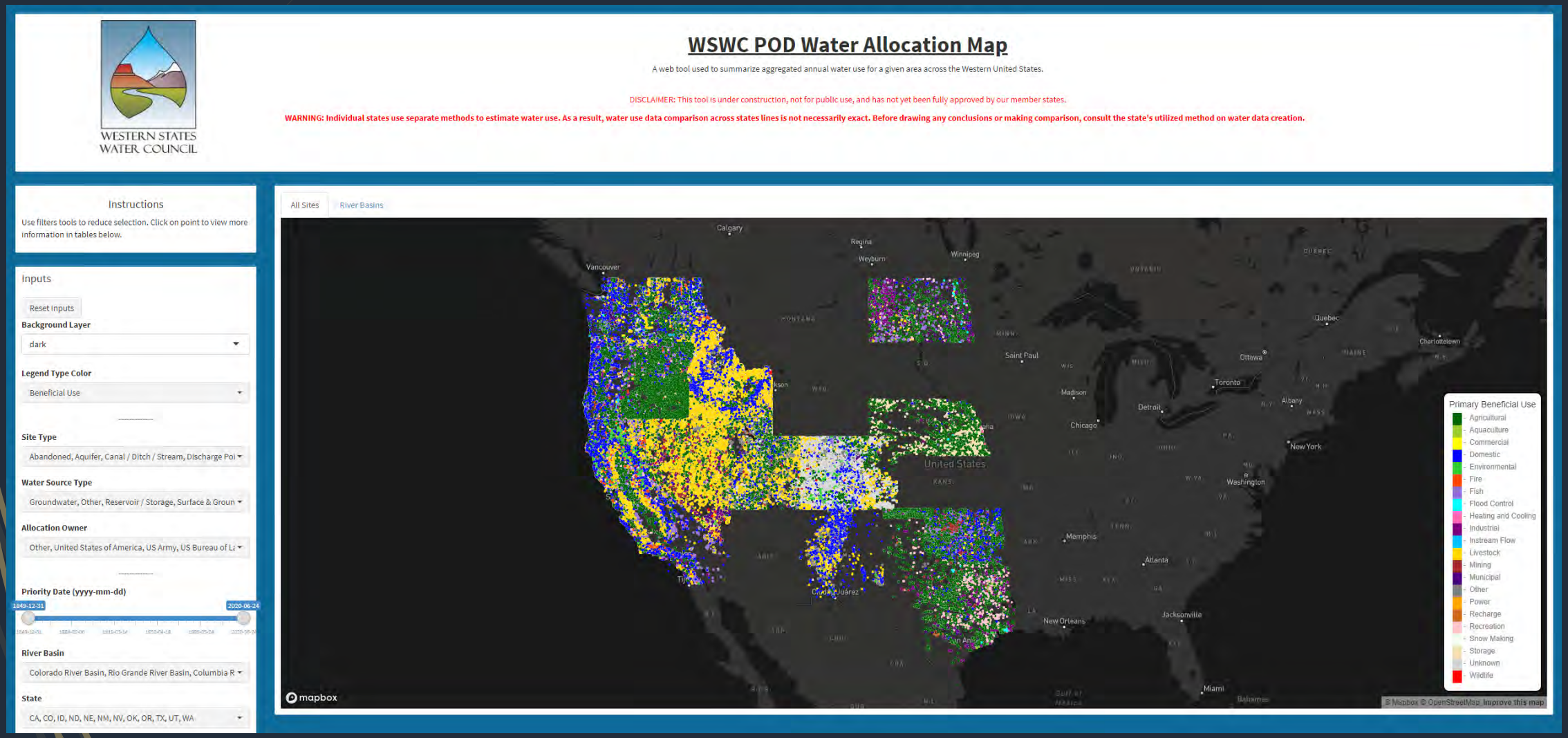
Water Allocation Map Metadata

- Organization: the state agency responsible for housing the water right metadata.
- Water Sources: source of water for a right (i.e. well, river, creek, etc).
- Variable: higher level indicator of what the water right data is measuring (i.e. withdrawal, consumptive use, return flow, etc).
- Methods: indicator of how the state determined the water right data (i.e. calculated, measured, estimated, survey, reported, etc).
- Beneficial Uses: state defined intended use for the water right (i.e., Agricultural, Domestic, Commercial, etc).
- Sites: point of diversion site information from the water source associated with the water right (i.e., Native ID, latitude, longitude, etc) (PoU in development).
- Water Allocation: information associated with the water right (i.e., volumetric quantity or a flow rate, priority date, etc).

Status of Water Rights Data Mapping

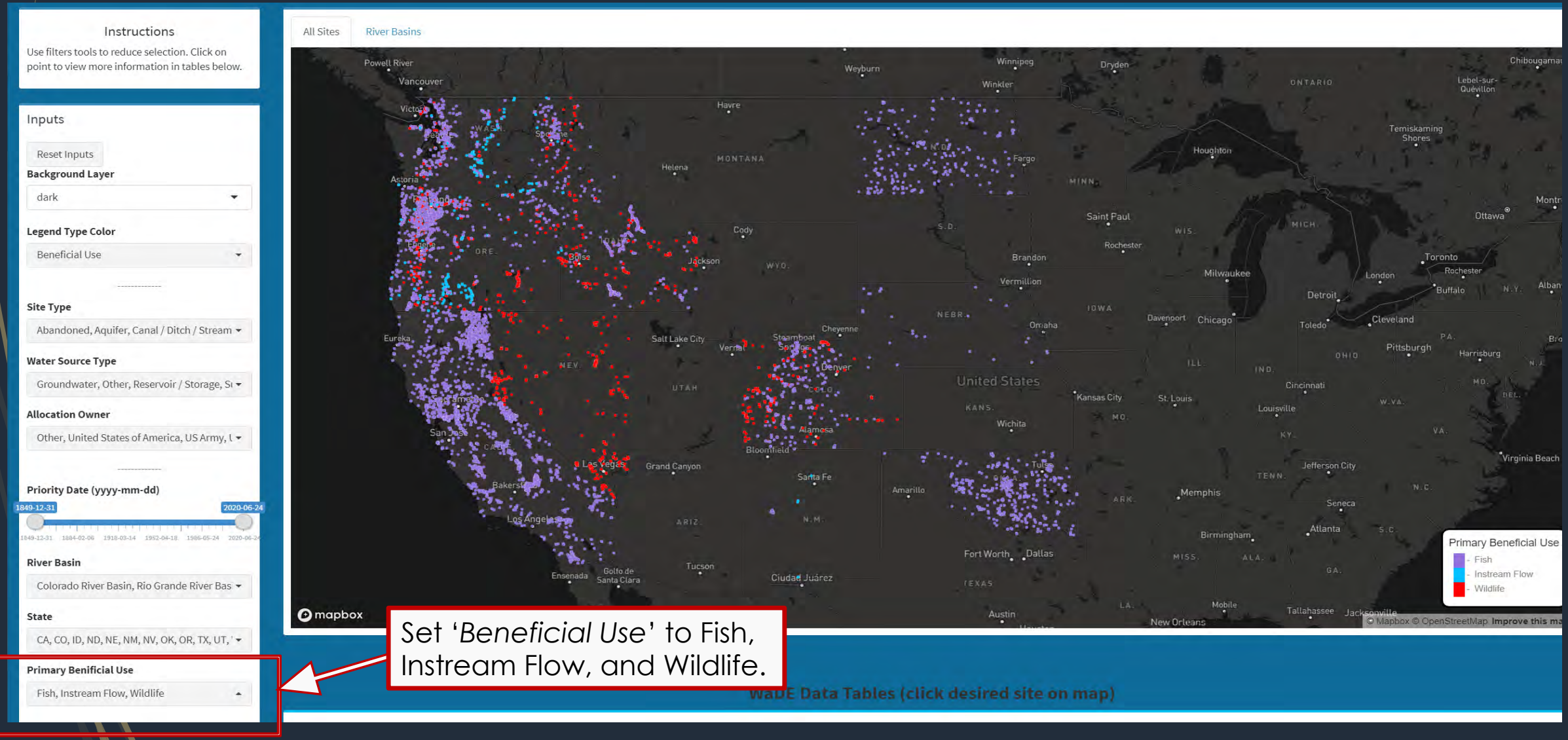


WaDE Demo: App #1 POD Water Allocation Map



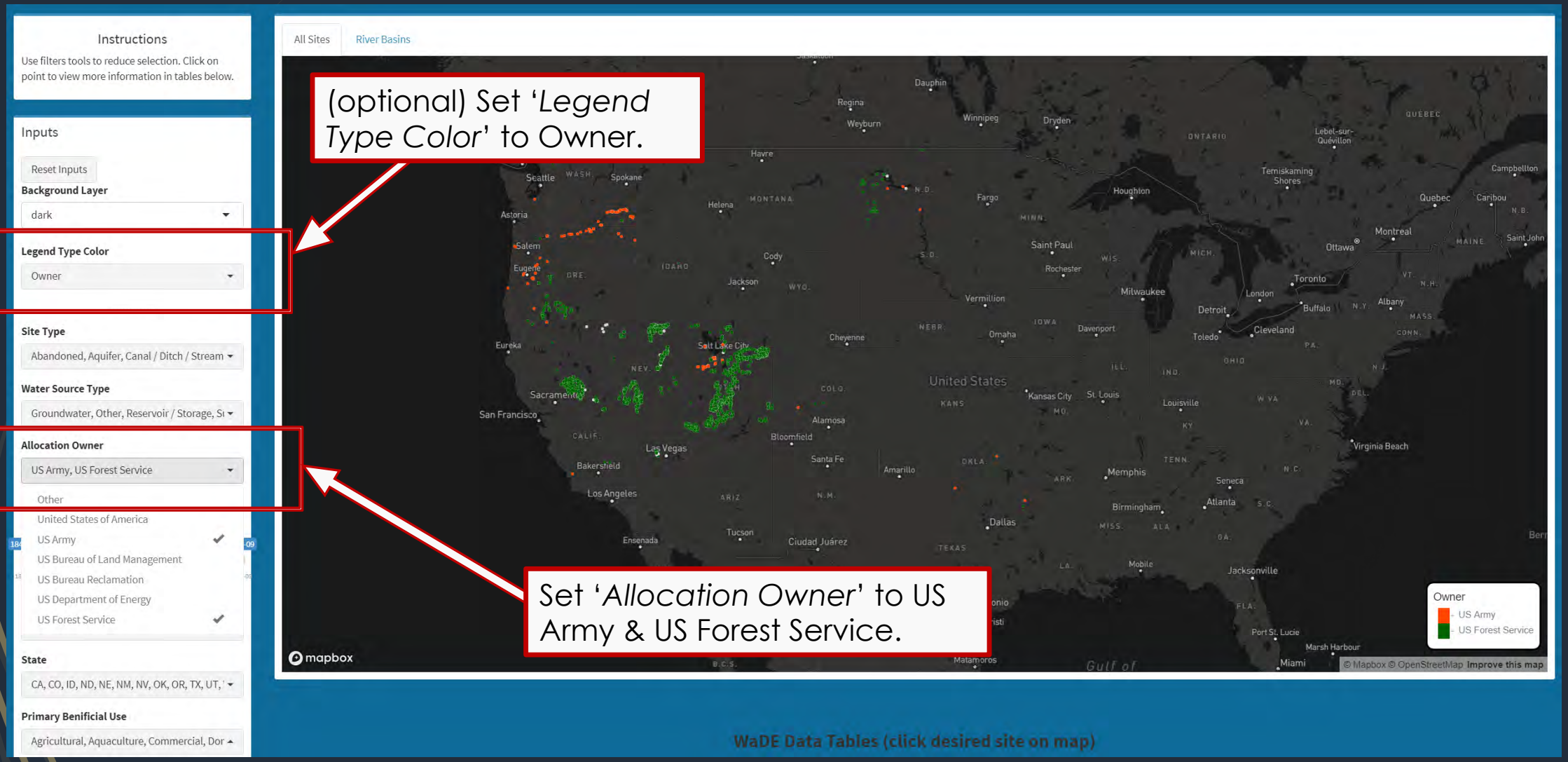
WaDE Demo: App #1 POD Water Allocation Map

(Water rights for fish and wildlife and instream flow)



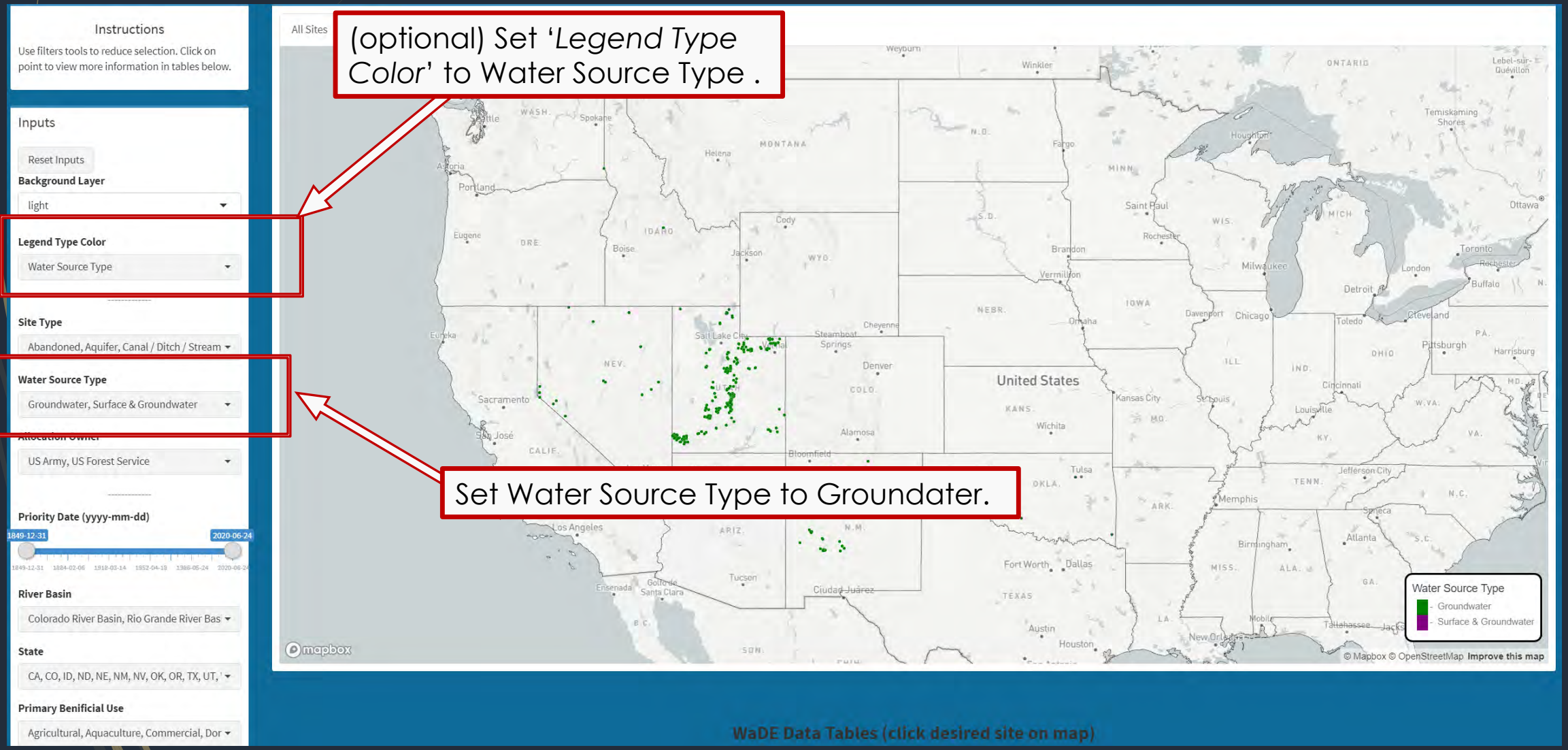
WaDE Demo: App #1 POD Water Allocation Map

(State-recognized federal water rights: Forest Service / US Army)



WaDE Demo: App #1 POD Water Allocation Map

(State-recognized groundwater federal water rights: Forest Service / US Army)



WaDE Demo: App #1 POD Water Allocation Map

(State-recognized US and Forest Service water rights for Groundwater > 0.7cfs)
(metadata ex)

Clicking on a Site returns all relent metadata (e.g., Organization, Water Sources, Variable Specifics, Methods, Beneficial Uses, Sites, Water Allocation

BeneficialUses

Show 10 entries Search:

Term	State	Definition	Name	SourceVocabularyURI	USGSCategory	NAICSCode
Irrigation	CA, CO, ID, MT, ND, NM, NV, OK, OR, UT, WA		Irrigation			
Other	CO, UT, CA, NV, OK, OR, WA		Other			

Showing 1 to 2 of 2 entries Previous 1 Next

Sites

Show 10 entries Search:

NativeSiteID	Longitude	Latitude	SiteGeometry	CoordinateMethodCV	AllocationGNISIDCV	HUC8	HUC12	County	PODorPOUSite
29-4478_N964.0E473.0S4	-112.03347839455	41.4544617884016		Unspecified					POD
29-4478_S1183.0W718.0N4	-112.056779094474	41.4485558466267		Unspecified					POD

Showing 1 to 2 of 2 entries Previous 1 Next

WaDE Demo Apps and Examples
Data Type App #2: Aggregate Water Use Map

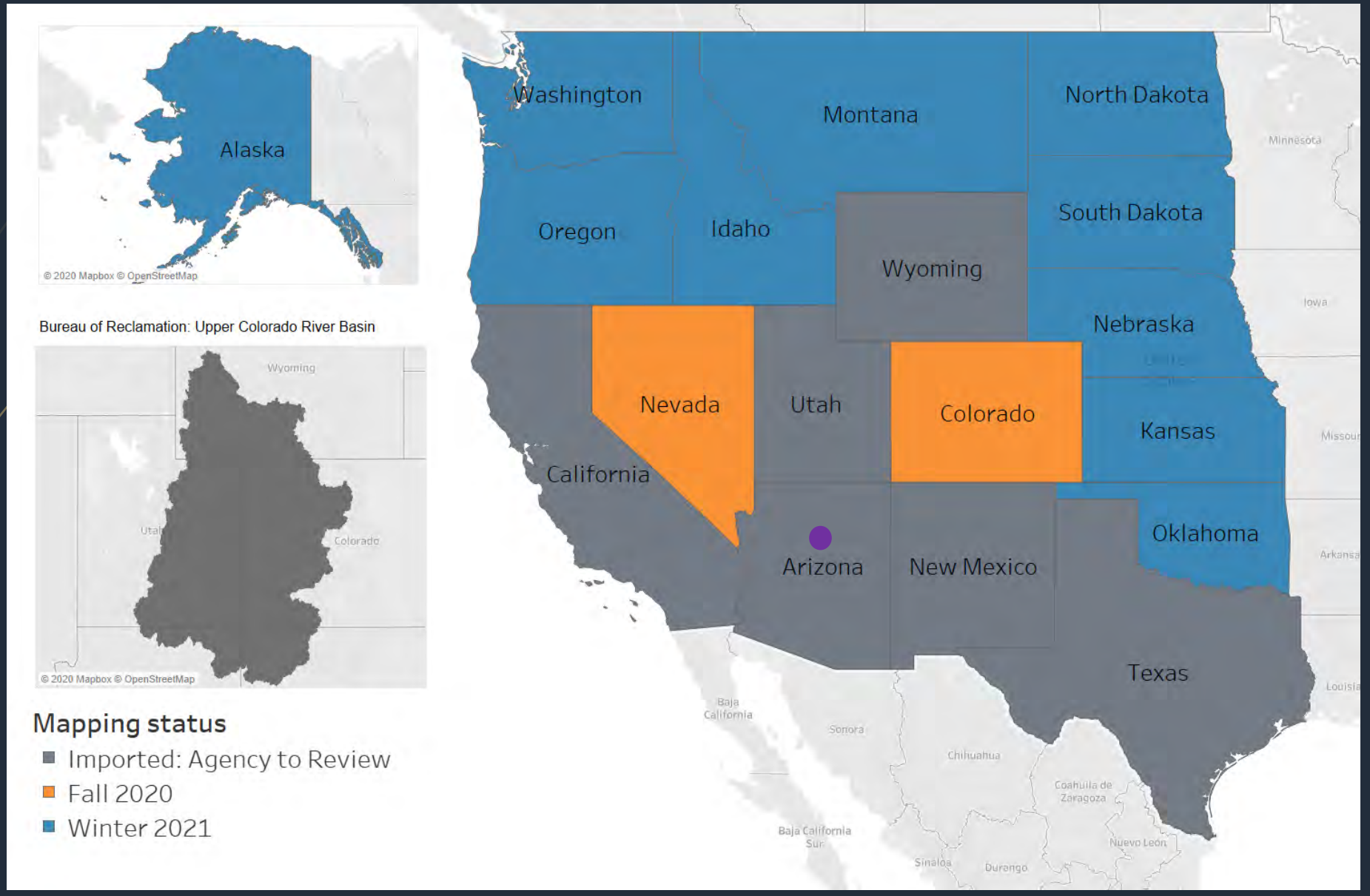
Use Case Examples

- Show the highest annual water use in 2010 in Texas.
- Show annual water use per beneficial use in the Green River Planning Basin, WY.

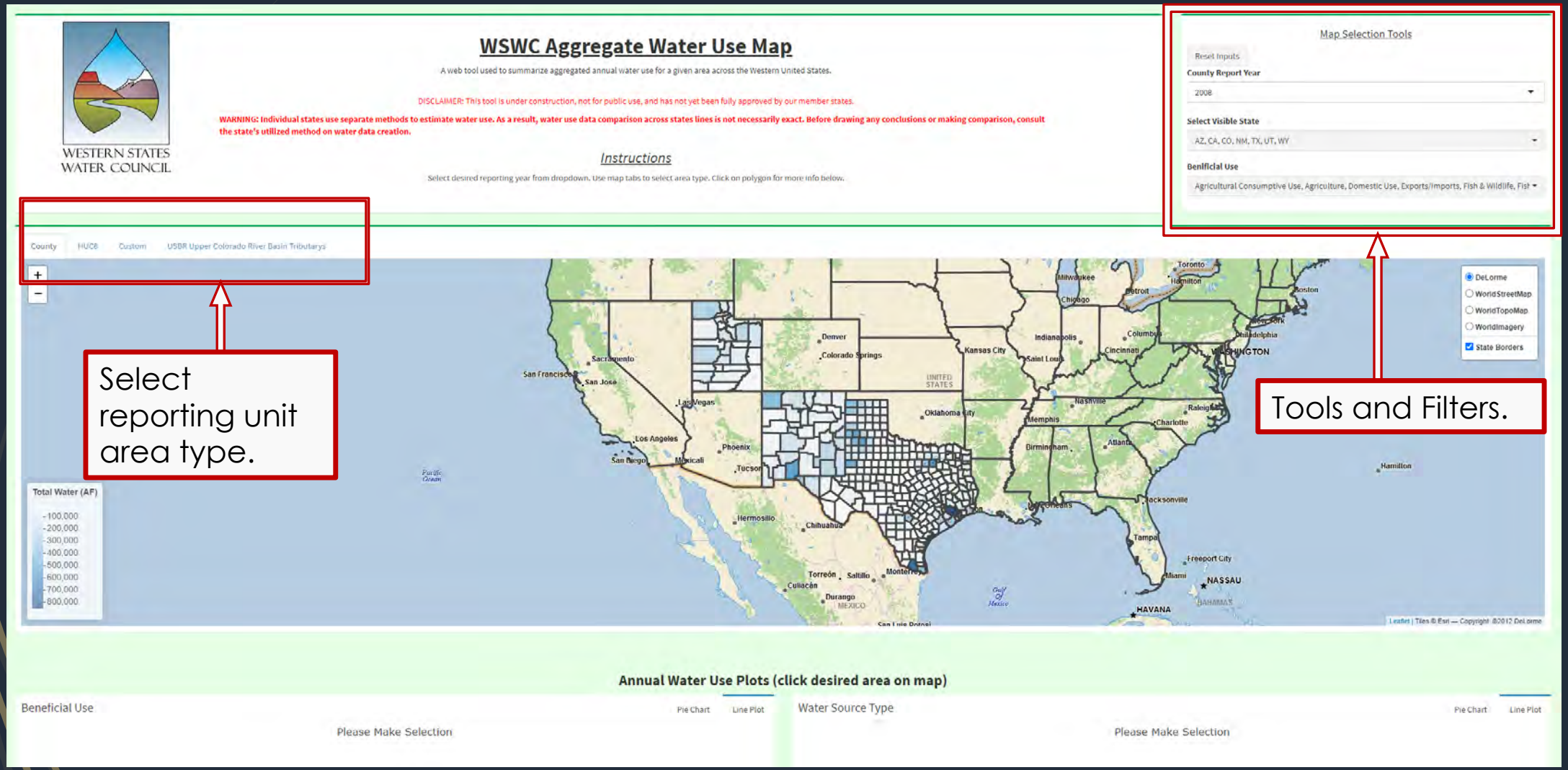
Aggregate Water Use Map Metadata

- Organization: the state agency responsible for housing the water right metadata.
- Water Sources: source of water for a right (i.e. well, river, creek, etc).
- Variable: higher level indicator of what the water right data is measuring (i.e. withdrawal, consumptive use, return flow, etc).
- Methods: indicator of how the state determined the water right data (i.e. calculated, measured, estimated, survey, reported, etc).
- Beneficial Uses: state defined intended use for the water right (i.e., Agricultural, Domestic, Commercial, etc).
- Reporting Unit: agency defined area (polygon) where the data is aggregated to (i.e., Native ID, shape type, etc).
- Aggregated Amount: time series information associated with the aggregated data (i.e., volumetric quantity or a flow rate, recorded year, etc).

Status of Aggregate Water Use Data Mapping

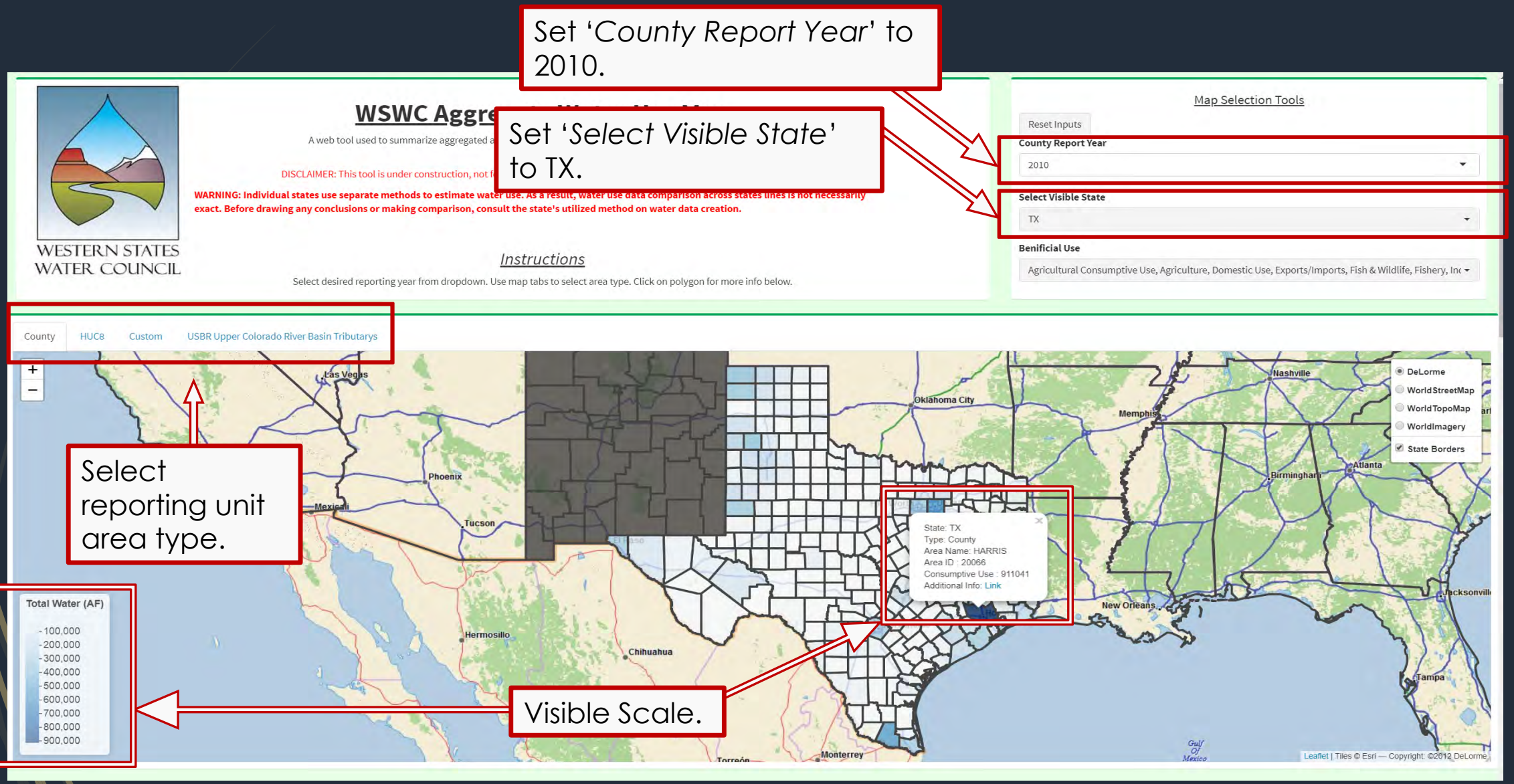


WaDE Demo: App #2 Aggregate Water Use Map



WaDE Demo: App #2 Aggregate Water Use Map

(Show the highest annual water use in 2010 in Texas)

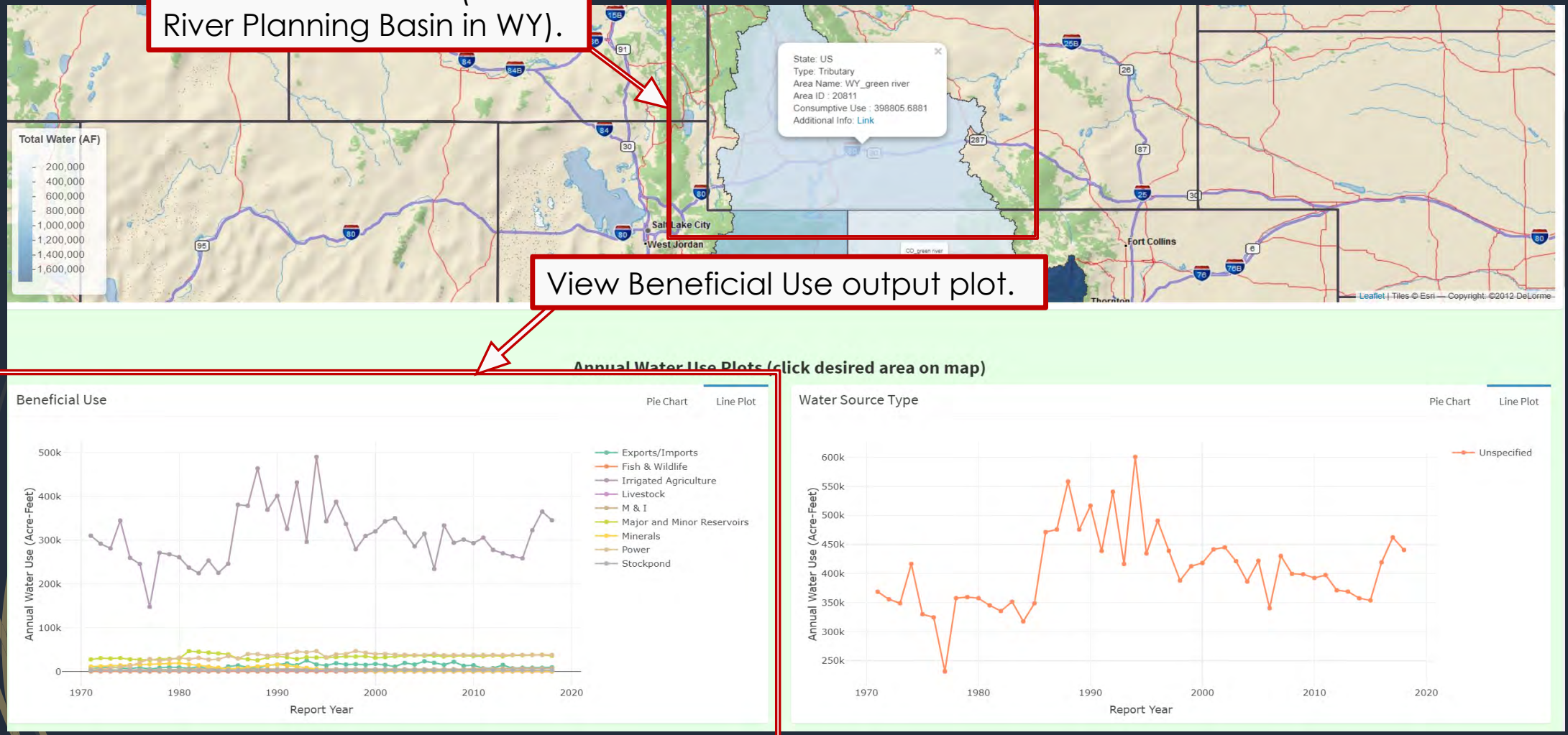


WaDE Demo: App #2 Aggregate Water Use Map

(Show annual water use per beneficial use in the Green River Planning Basin, WY)

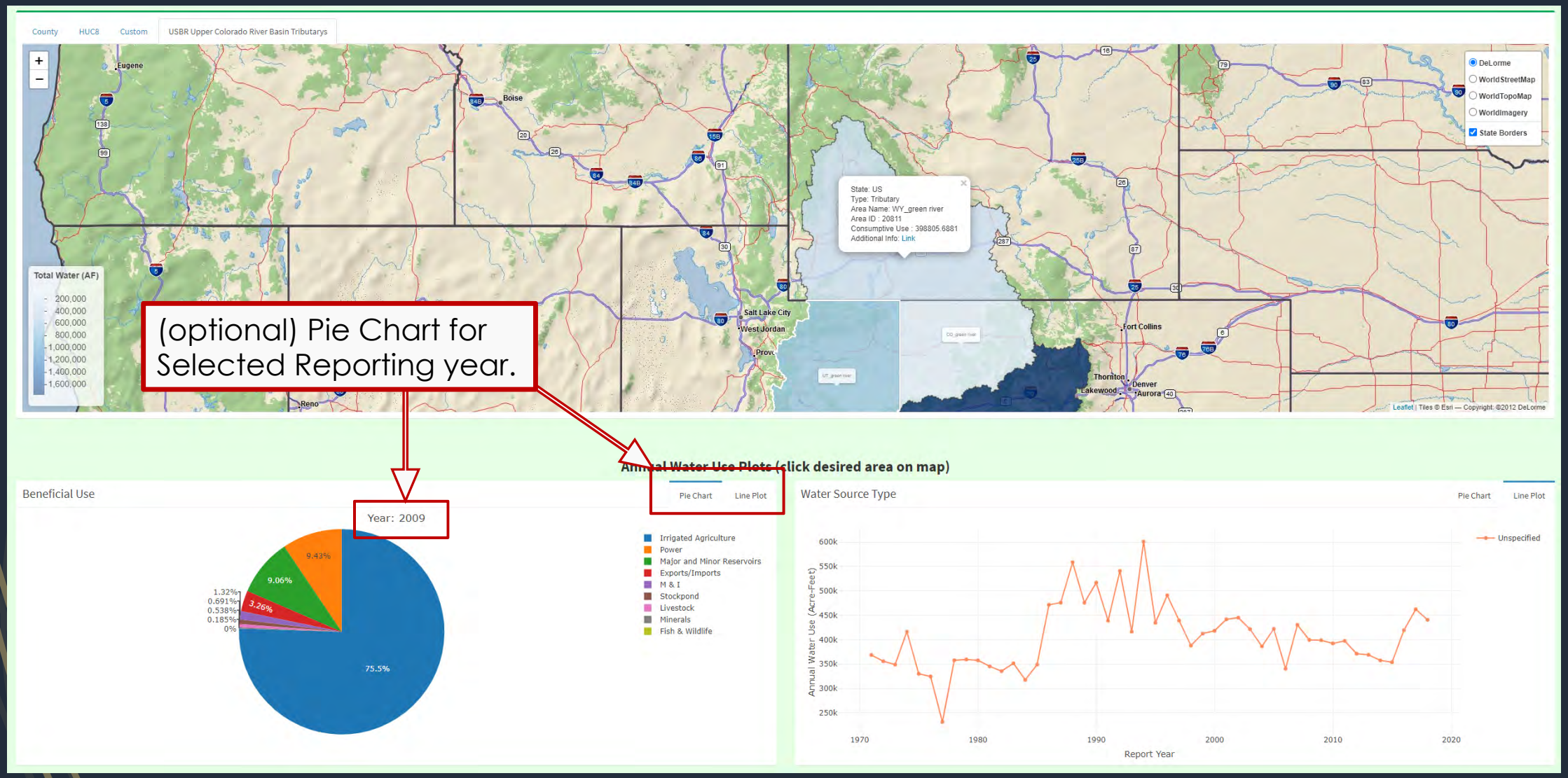
Select desired area (Green River Planning Basin in WY).

View Beneficial Use output plot.



WaDE Demo: App #2 Aggregate Water Use Map

(Show annual water use per beneficial use in the Green River Planning Basin, WY)

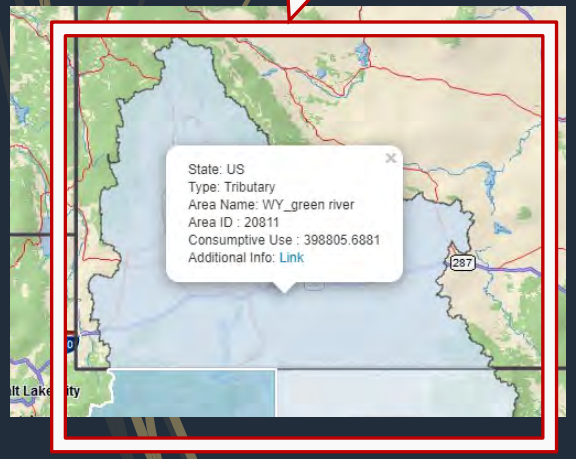


WaDE Demo: App #2 Aggregate Water Use Map

(Show annual water use per beneficial use in the Green River Planning Basin, WY)

(metadata ex)

Clicking on a Reporting Unit returns all relent metadata (e.g., Organization, Water Sources, Variable Specifics, Methods, Beneficial Uses, Reporting Unit, Aggregate Amounts



BeneficialUses

Show 10 entries Search:

Term	State	Definition	Name	SourceVocabularyURI	USGSCategory	NAICSCode
US_ExportsImports	US		Exports/Imports			
US_FishWildlife	US		Fish & Wildlife			
US_IrrigatedAgriculture	US		Irrigated Agriculture			
US_Livestock	US		Livestock			
US_MI	US		M & I			
US_MajorandMinorReservoirs	US		Major and Minor Reservoirs			
US_Minerals	US		Minerals			
Power	ID, UT, CA, NE, NV, OK, US, WA		Power			
US_Stockpond	US		Stockpond			

Showing 1 to 9 of 9 entries Previous 1 Next

AggregatedAmounts

Show 10 entries Search:

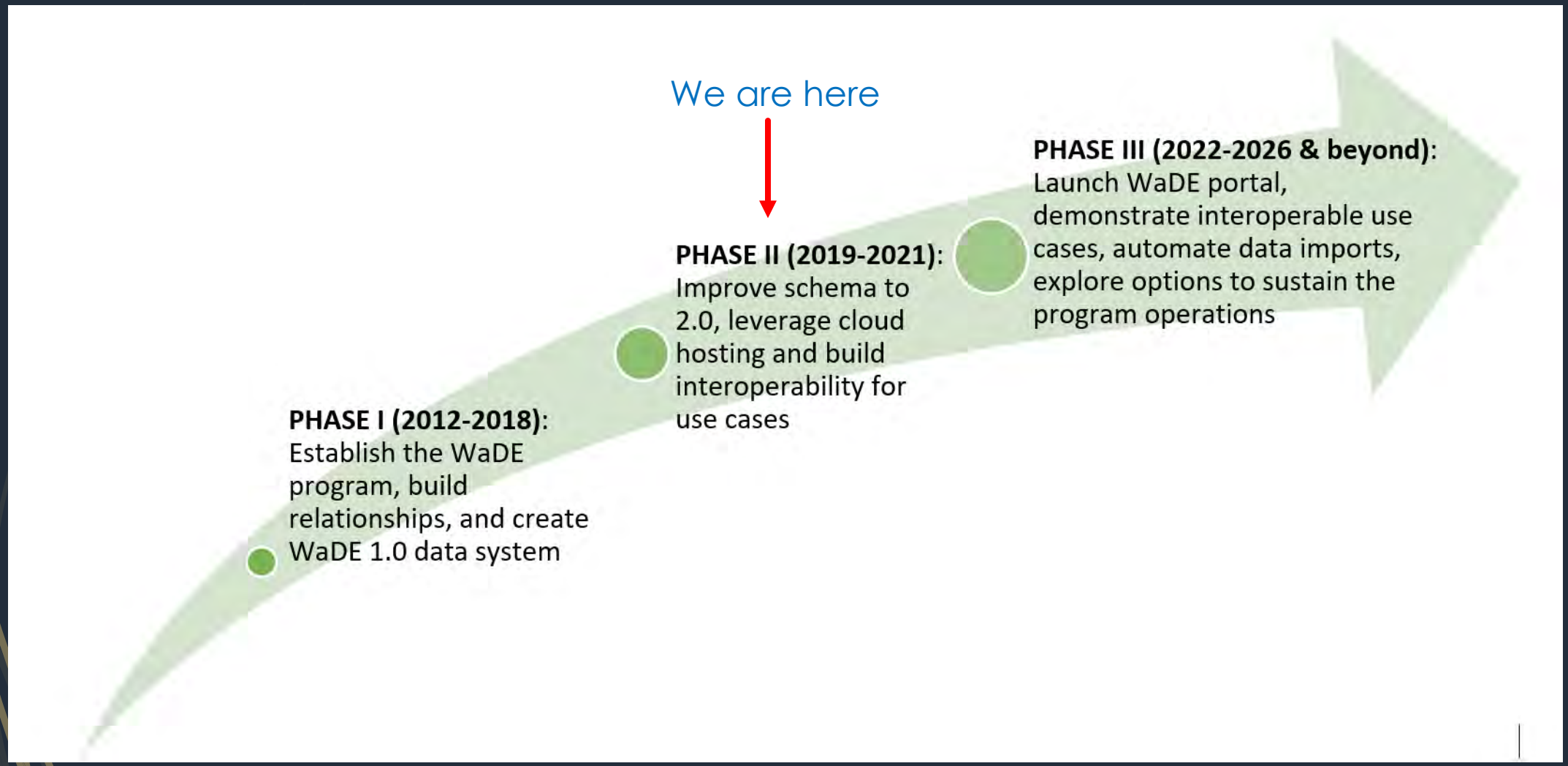
Variable	VariableSpecificTypeCV	MethodUUID	ReportYear	TimeframeStart	TimeframeEnd	WaterSourceUUID	Amount	PopulationServed	PowerGeneratedGWh	IrrigatedAcreage	DataPublicationDate	BeneficialUses	PrimaryUse
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	2425.3397				2020-06-19T00:00:00	Livestock	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	309916				2020-06-19T00:00:00	Irrigated Agriculture	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	200				2020-06-19T00:00:00	Fish & Wildlife	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	6058.5277				2020-06-19T00:00:00	Exports/Imports	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	11080				2020-06-19T00:00:00	Minerals	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	5700				2020-06-19T00:00:00	Power	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	3300				2020-06-19T00:00:00	M & I	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	27487.2729				2020-06-19T00:00:00	Major and Minor Reservoirs	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1971			USBR_2	2574.6603				2020-06-19T00:00:00	Stockpond	Irrigation
Consumptive Use	Consumptive Use	USBR_Colorado River Basin Natural Flow and Salt Summary Data	1972			USBR_2	291759				2020-06-19T00:00:00	Irrigated Agriculture	Irrigation

Showing 1 to 10 of 432 entries Previous 1 2 3 4 5 ... 44 Next

Next Steps

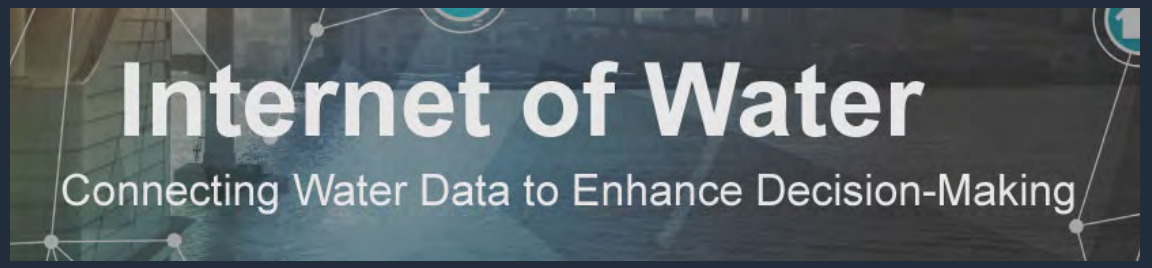
- Work to secure funding for WaDE beyond Oct 2021
- Continue connecting member states data into WaDE
- Work with our IT Contractor on designing WaDE Portal 2.0
- Support WaDE data interoperability with USGS and IOW Geoconnex U.S. Hydrologic Features
- Beta release WaDE 2.0 system to our partners and the public in Summer or Fall 2021

WaDE Phase III



Funders, Collaborators & Partners

Water Foundation
Mitchell Foundation
MOORE Foundation
EPA Exchange Network Grant Program
Western States Water Agencies

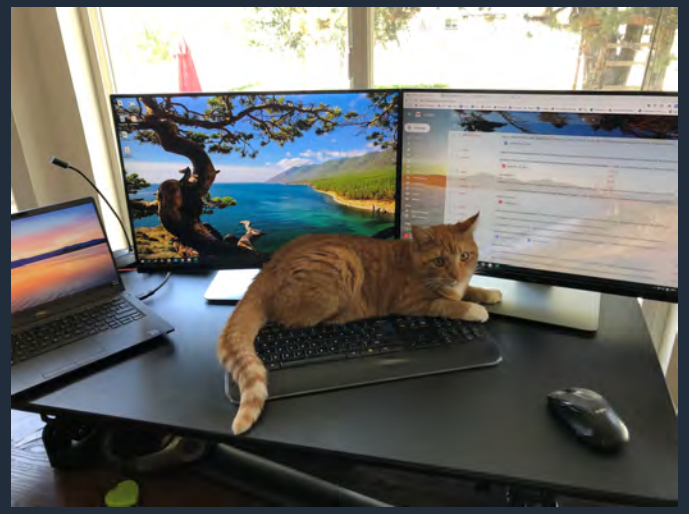


Thank You!

Adel Abdallah, WaDE Program Manager
Ryan James, WaDE Data Analyst

Questions?

adelabdallah@wswc.utah.gov
https://www.westernstateswater.org/



WESTERN STATES WATER COUNCIL

Duke
NICHOLAS INSTITUTE
FOR ENVIRONMENTAL POLICY SOLUTIONS
Internet of Water
That's so Meta
Demonstration of Geoconnex.us – Data Discovery using an internet of water
Technical Workshop
November 18, 2020
Kyle Onda: kyle.onda@duke.edu

GEOCONNEX.US

A framework for metadata for data discovery

A searchable index that will underly a user-friendly search engine allowing easy discovery of all water data published by all organizations.

How Geoconnex works

Persistent IDs
A persistent, unique identifier for each location or feature for which data is published

Landing Pages
Provide stable locations on the internet representing real-world features that data can link to and be linked from

Links Data
Enables data to be linked together based on geography, hydrography, and key words

GEOCONNEX.US – WHAT WILL IT DO?

Allow users to connect disparate data together across silos created by organizations and disciplines

GEOCONNEX.US – WHAT WILL IT DO?

Allow users to connect disparate data together across silos created by organizations and disciplines

GEOCONNEX.US – ONE THING, MANY LABELS

What data is available about this stream reach?

USGS Gage

Stream flow data for this specific stream reach

ComID = 8896260

State DEQ Habitat Assessments

Habitat surveys within this specific watershed

HUC12 = 030300020607

University Water Quality Stations

Nitrogen measurements within this specific watershed

Watershed = Morgan Creek

GEOCONNEX.US — ONE THING, MANY LABELS

USGS Gage

Data about ComID = 8896260

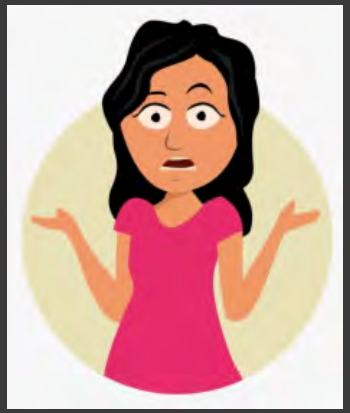
State DEQ Habitat Assessments

Data about HUC12 = 030300020607

University Water Quality Stations

Data about Watershed = Morgan Creek

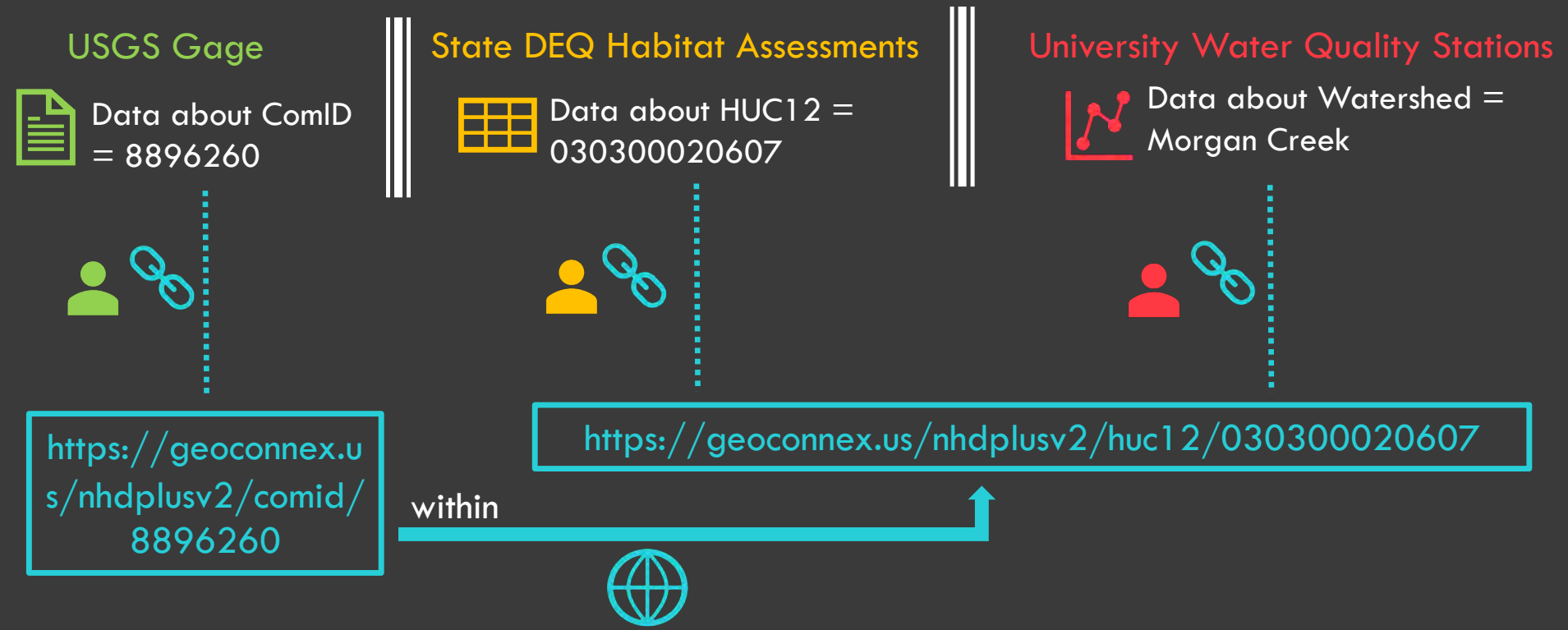
Are these data about the same thing?



If not, are they about related things?

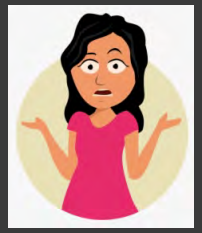
If so, how would I find them together?

GEOCONNEX.US — MANY LABELS, ONE MAP



GEOCONNEX.US — ONE THING, MANY DATA

What data is available, relevant to this location?



near

https://geoconnex.us/nhdplusv2/comid/8896260

within

https://geoconnex.us/nhdplusv2/huc12/030300020607

Subject Of

Subject Of

USGS Gage

ComID = 8896260

State DEQ Habitat Assessments

HUC12 = 030300020607

University Water Quality Stations

Watershed = Morgan Creek

GEOCONNEX.US

Let's explore reference features you can link data to in

https://info.geoconnex.us

METADATA

It is HARD to use data without rich metadata

It is SLOW to integrate data without linked metadata

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Metadata discovery activity
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Kyle Onda: kyle.onda@duke.edu

EXERCISE

Creating information from 2 published datasets on the same topic

	https://geoconnex.us/demo/pws/ca	https://geoconnex.us/demo/pws/nc
Data richness (columns)	45	18
Metadata richness	Poor	Rich
Geoconnex links	No	Yes

EXERCISE

As a data analyst, you want to find out:

- service population size
- poverty rate of service city
- water quality regulation violations

from many utilities so that you can evaluate the relationship between water prices, affordability, and service quality.

EXERCISE

California Public Water System Boundary dataset https://geoconnex.us/demo/pws/ca

North Carolina Public Water System Boundary dataset https://geoconnex.us/demo/pws/nc

Utility	Where does the boundary data come from?	What is the service population size?	What is the poverty rate in the city the utility serves?	Were there any drinking water regulation violations in the past 5 years?
City of Sacramento, CA				
City of Raleigh, NC				

EXERCISE

North Carolina Public Water System Boundary dataset https://geoconnex.us/demo/pws/nc

California Public Water System Boundary dataset https://geoconnex.us/demo/pws/ca

Utility	Where does the boundary data come from?	What is the service population size?	What is the poverty rate in the city the utility serves?	Were there any drinking water regulation violations in the past 5 years?
City of Sacramento, CA	"ICE downloaded from SACOG (2009) and linked to PICME pwsid"	D_POPULATI = 501,344 ?	18.3%	None
City of Raleigh, NC	CWS Provided service area shapefile to DEQ	603,000	13.7%	Bromate monitoring 2016 HAA5 2015

EXERCISE

North Carolina Public Water System Boundary dataset https://geoconnex.us/demo/pws/nc

California Public Water System Boundary dataset https://geoconnex.us/demo/pws/ca

Sacramento:

3/4 questions answered definitively

143 seconds

Raleigh:

4/4 questions answered definitively

73 seconds

Basic tasks | Require content knowledge | Require content + specific data system knowledge | Possible failure points

AUTOMATION?

Basic tasks | Require content knowledge | Require content + specific data system knowledge | Possible failure points

AUTOMATION?

No Geoconnex IDs:

Download Boundaries Dataset

Ensure PWSID is same thing as EPA SDWIS PWSID

Call Envirofacts API using PWSID

Download Census Place File

Spatial join boundary data with Census Place data, retrieve GEOID

Call Census API using GEOID

With Geoconnex IDs:

Download Boundaries Dataset

GET geoconnex id

GET CITY_SERVED_URI

GET SDWIS link

GET Census link

GEOCONNEX

TO DATA PROVIDERS:

- Reference geoconnex IDs in your published metadata!
- Host data as feature-level landing pages
- Mint geoconnex IDs for your own websites and/or APIs about your data!

- https://geoconnex.us for guidance on minting geoconnex IDs
- https://geoconnex.us/demo for a graphical, R-based version of this demo

Q & A

Please submit your *content-related questions* in the webinar's **Q&A box**. The moderator will read your question aloud.

Administrative questions can be placed in the **"Chat" box**.

Final Notes

IoW Contact Information:
internetofwater@duke.edu
https://internetofwater.org/

SAP2P Network:
Website: https://internetofwater.org/state-agency-p2p-network/
Webinars: https://internetofwater.org/webinars/

Join us for continued conversation at the IoW P2P Forum:
https://p2pforum.internetofwater.org/

Poll: Please participate in a quick poll!

Follow-Up Information

- Links to the webinar recording and slides will be distributed once posted

Thank you for your participation!