

# Water-Use Data and Research Program (WUDR) Overview

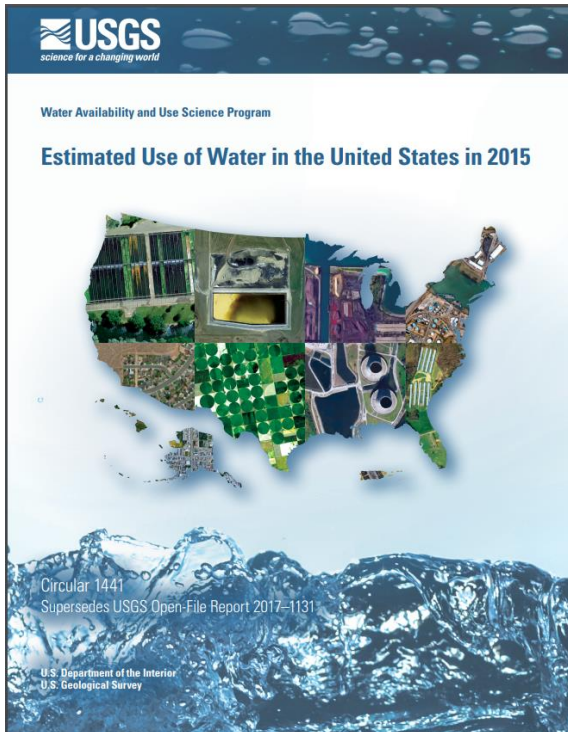


# Water Use Data and Research Program Overview Agenda

- USGS National Water Use Science Project and recent data
- Water-use priorities for the Nation
- WUDR History and Overview
- Water-use estimation from WUDR

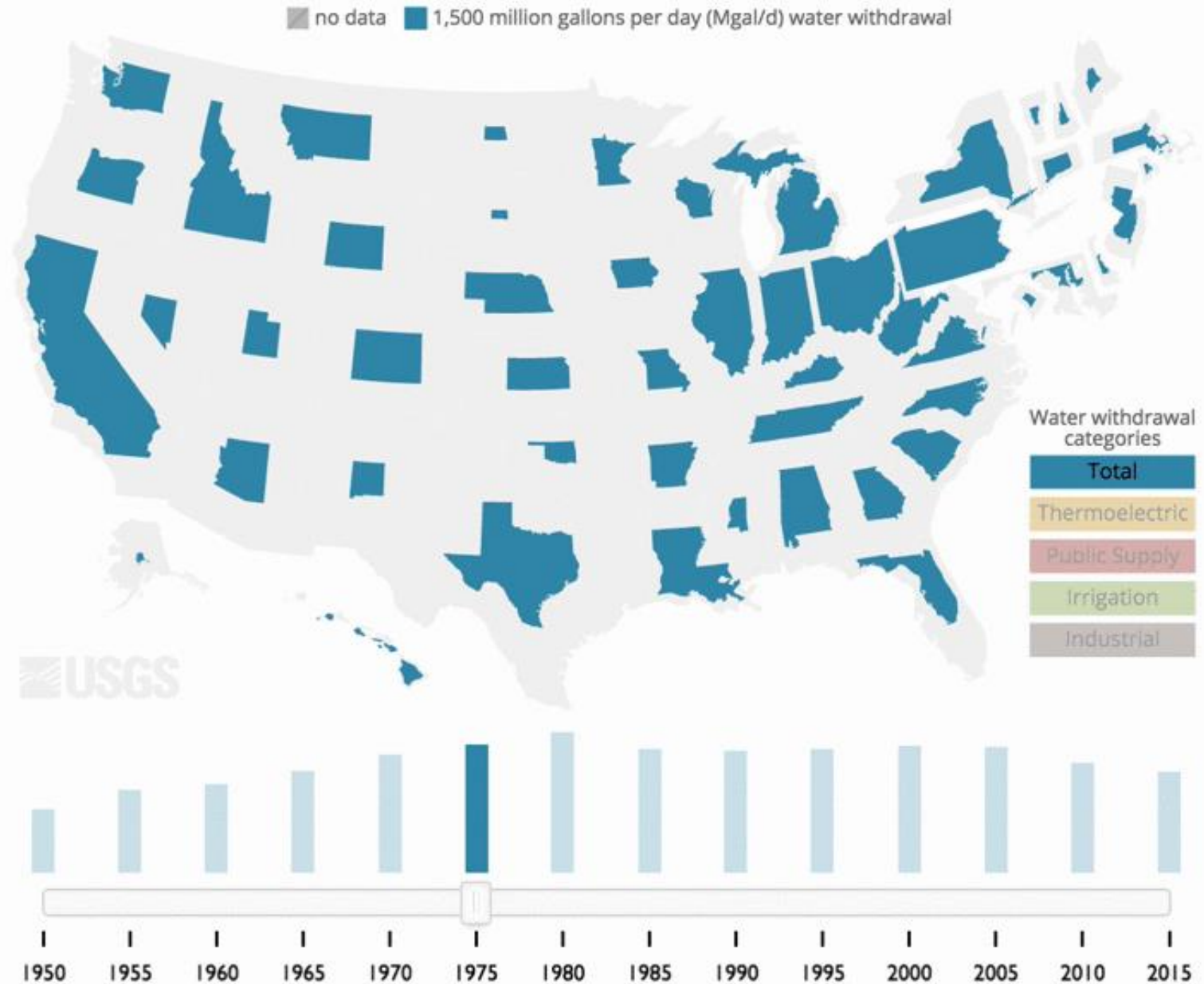


# USGS National Water Use Science Project

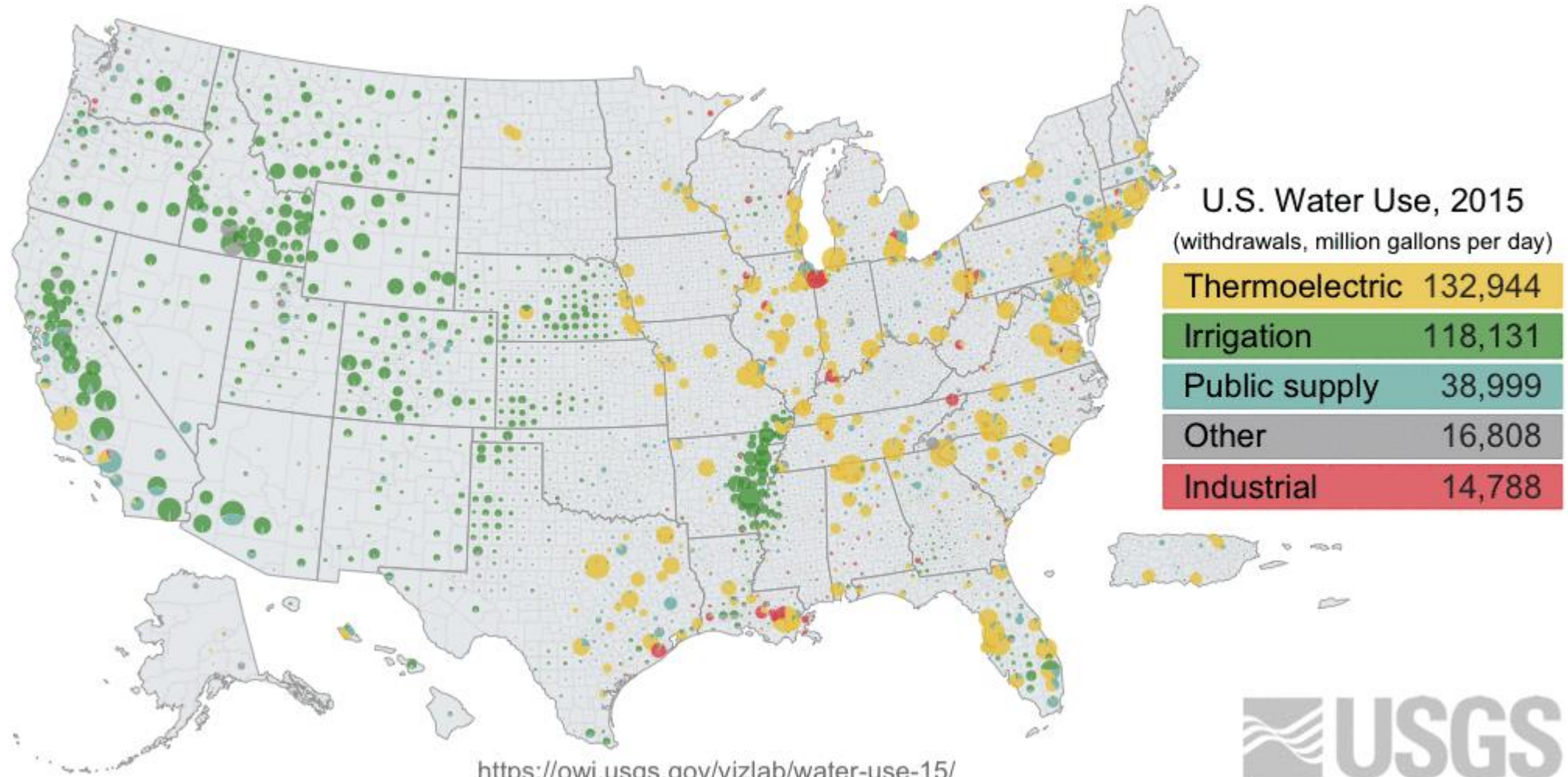


## How much water do we use?

In the map below, State size (area) is scaled proportionally to State freshwater use.

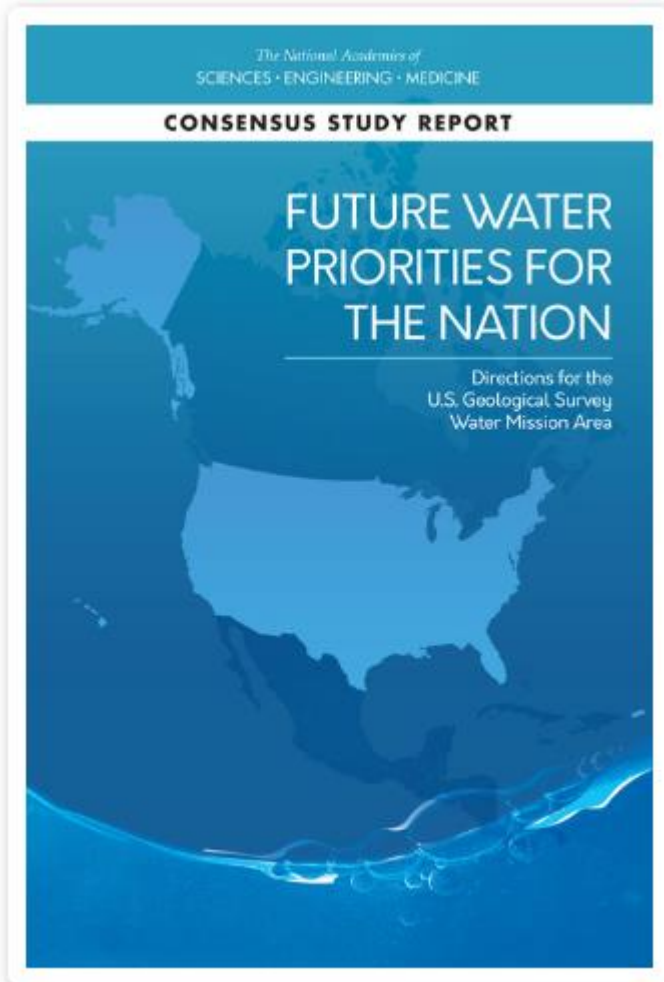


# Water Use in the United States



# Future Water Priorities for the Nation

## Directions for the USGS Water Mission Area



### Recommendations:

Strategically enhance the **temporal and spatial collection** of water quantity, quality, and water-use data

Coordinate with agencies and organizations on **data delivery**

Increase focus on the **relationships** between human activities and water

Develop a robust water accounting system

**Efficiently execute water accounting**

Assess and Present **Uncertainty** in the Reported Data

Should include **consumptive and non-consumptive water use**

**Collaborate with agencies and organizations** on water-data standards and categories

The report can be found at:  
<https://www.nap.edu/catalog/25134>

The National  
Academies of

SCIENCES  
ENGINEERING  
MEDICINE

# Collaboratively Improving Water Use Reporting

## Improve Water Use Data Delivery Nationally

By 2022, USGS will report daily water use estimates for 90% of the total water use in the Nation. Improvements to State water use reporting are a critical component of this strategic goal. Five-year reporting will focus on water availability and trends in factors that impact availability, such as water use.

## USGS Water Use Model Development

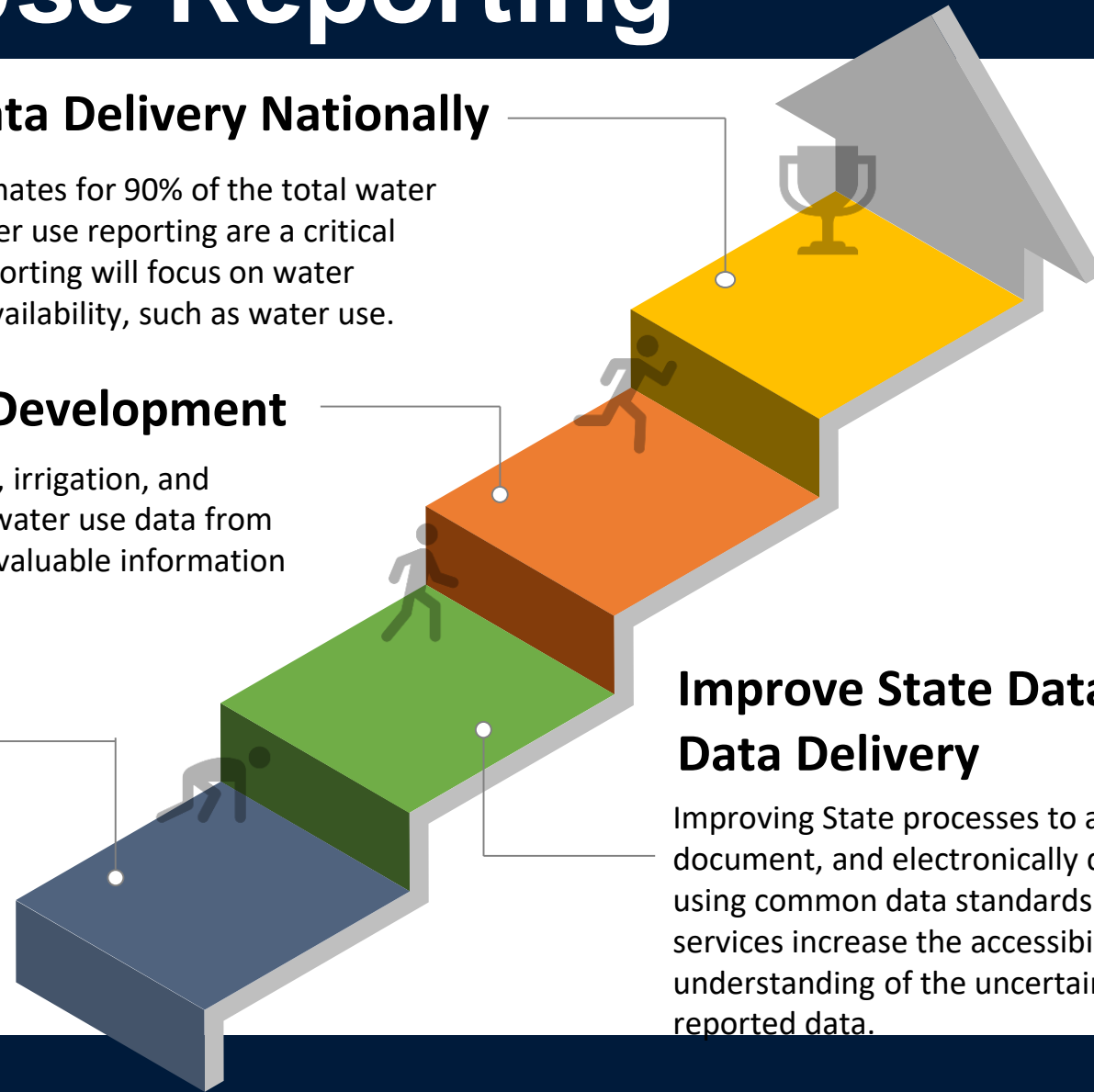
USGS is developing daily water use models for public supply, irrigation, and thermoelectric uses. These models need current, accurate water use data from State agencies. The models will provide resource managers valuable information needed to make management decisions.

## Improve State Water Use Reporting

State agencies are looking for ways to improve water use data and tools to more accurately report and understand water use needs for multiple sectors. This information is critical to effective water resources availability management.

## Improve State Databases and Data Delivery

Improving State processes to acquire, maintain, document, and electronically deliver water use data using common data standards and innovative web services increase the accessibility, and understanding of the uncertainty associated with reported data.



# SECURE Water Act

- WUDR was authorized under the **Science and Engineering to Comprehensively Understand and Responsibly Enhance Water Act** or **SECURE Water Act** in 2009.

Develop datasets

Improve

water-use data

Understand water availability

Working with states

# WUDR Overview

The USGS Water-Use Data and Research Program (WUDR) is authorized under the SECURE Water Act Section 9508 (c).

## SECURE goals for WUDR

- **Improve the availability, quality, compatibility, and delivery** of water use data that is collected and/or estimated by States to support National water use assessments
- **Integrate** State water resource agency water-use or water-availability **datasets** into USGS databases

## Support for USGS Strategic Goals and Priorities

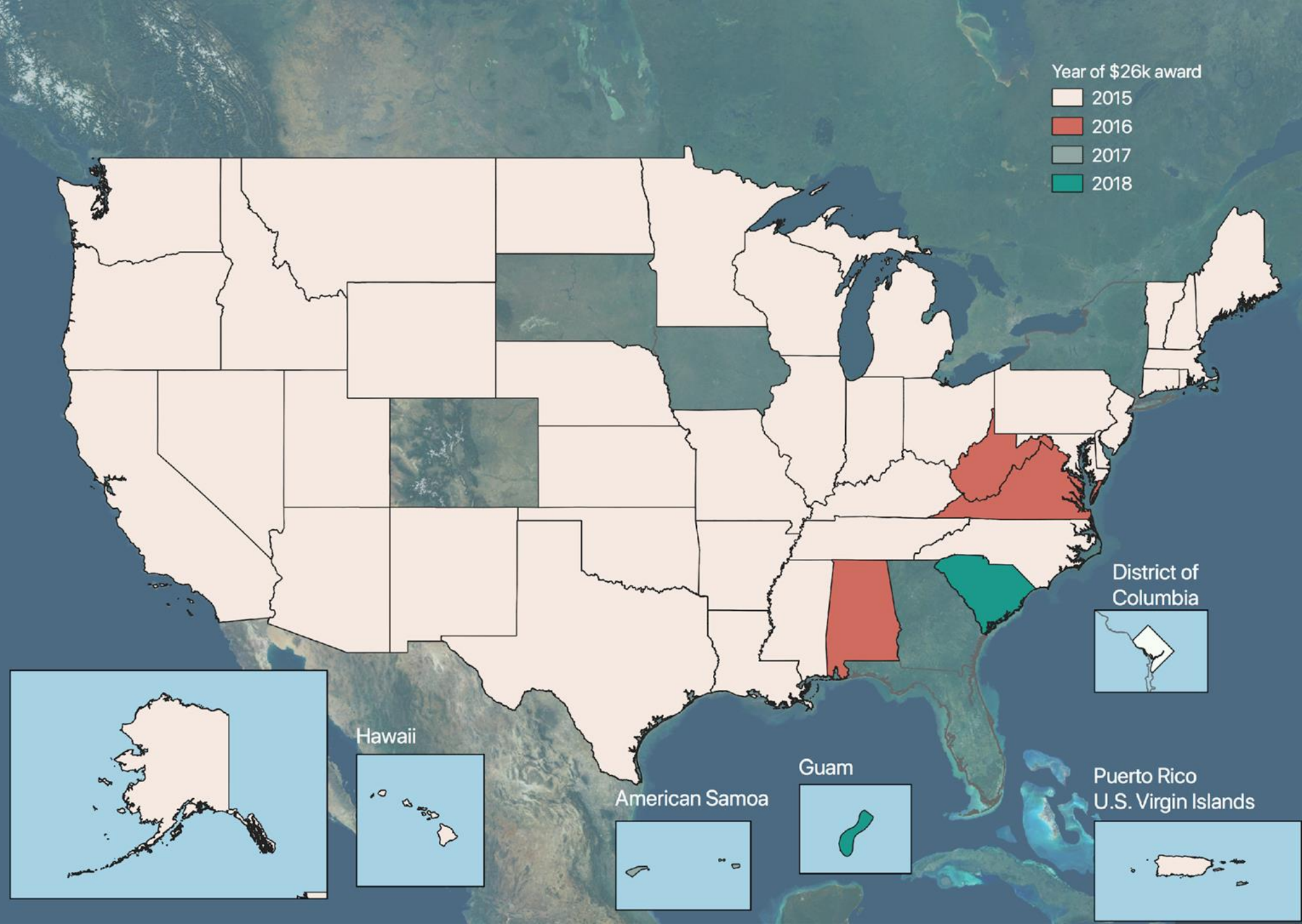
- In addition, data and delivery improvements at the state level support **USGS model development**



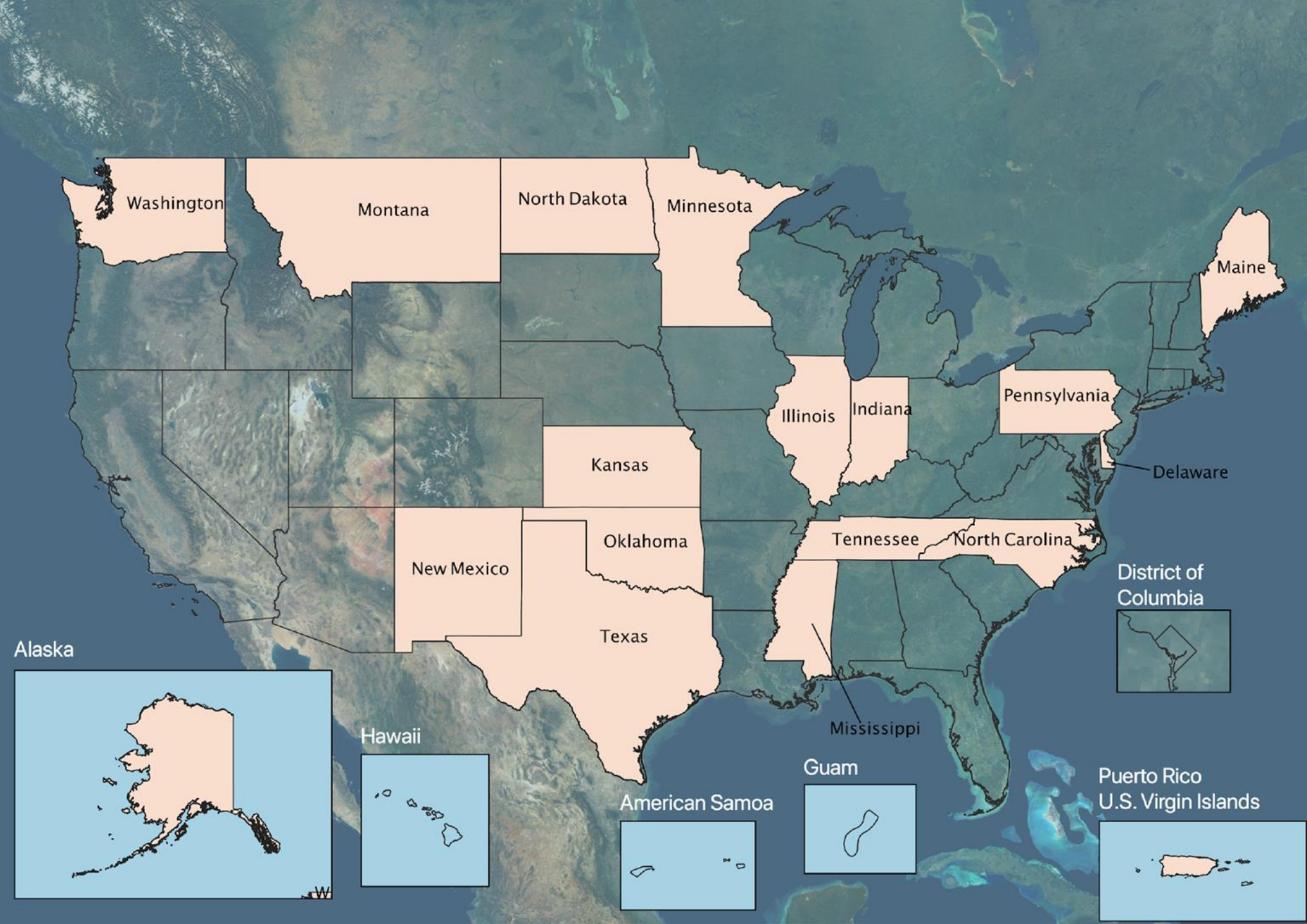
# WUDR Guidelines

- USGS authorized \$12,500,000 for Grants Program in 2009
- Each State can receive a maximum of \$250,000, cumulatively, in grant funding
- Annual appropriations of \$1,500,000 SINCE FY2015
  - Non-competitive awards of \$26K available to each State to document current water-use data collection, research, and future priorities
  - FY2016-2018, 40 competitive and 8 non-competitive grants awarded totaling over \$3.5 million
- States are required to deliver water use data according to USGS standards and data transfer guidance

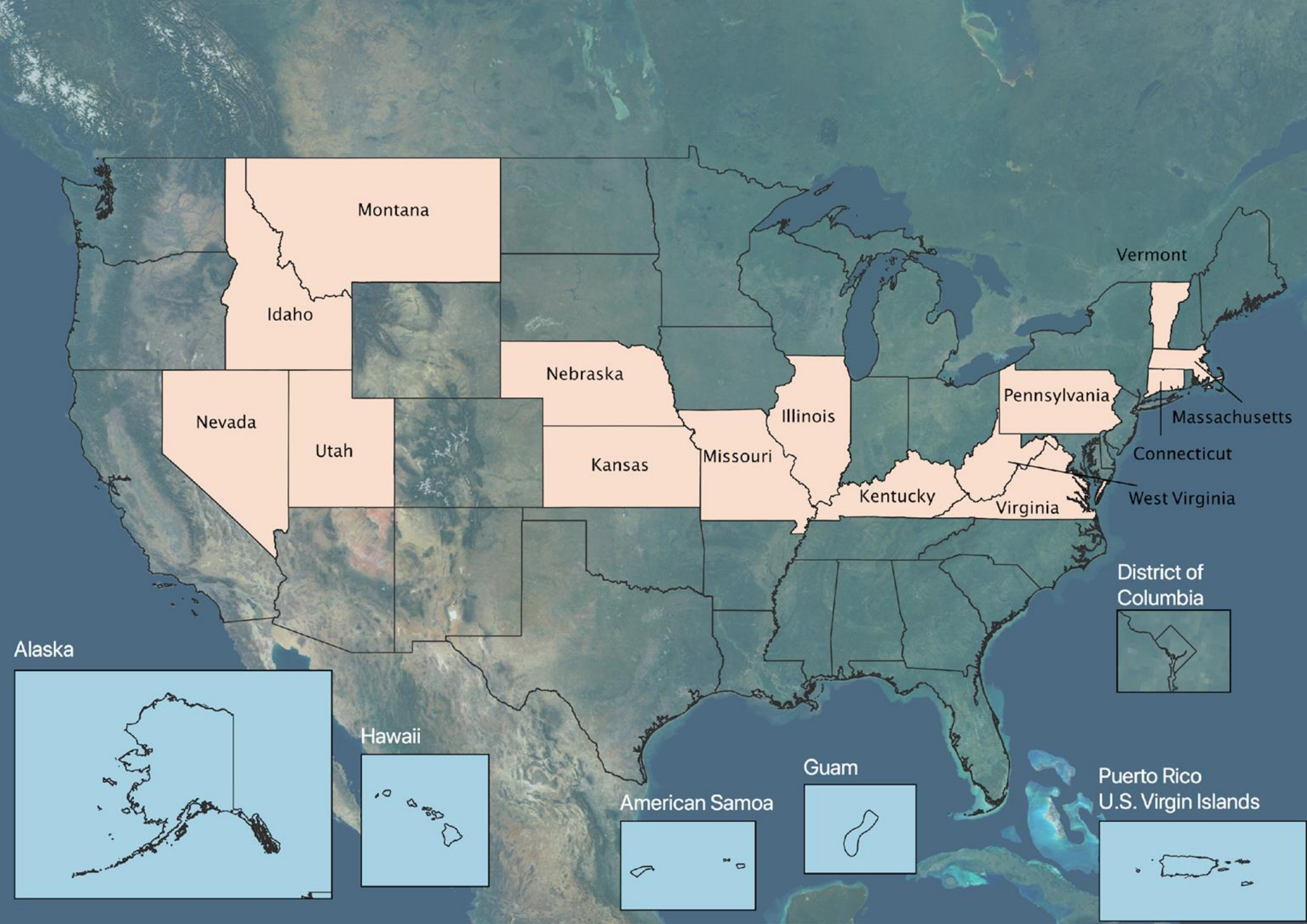
# Non-competitive awards summary



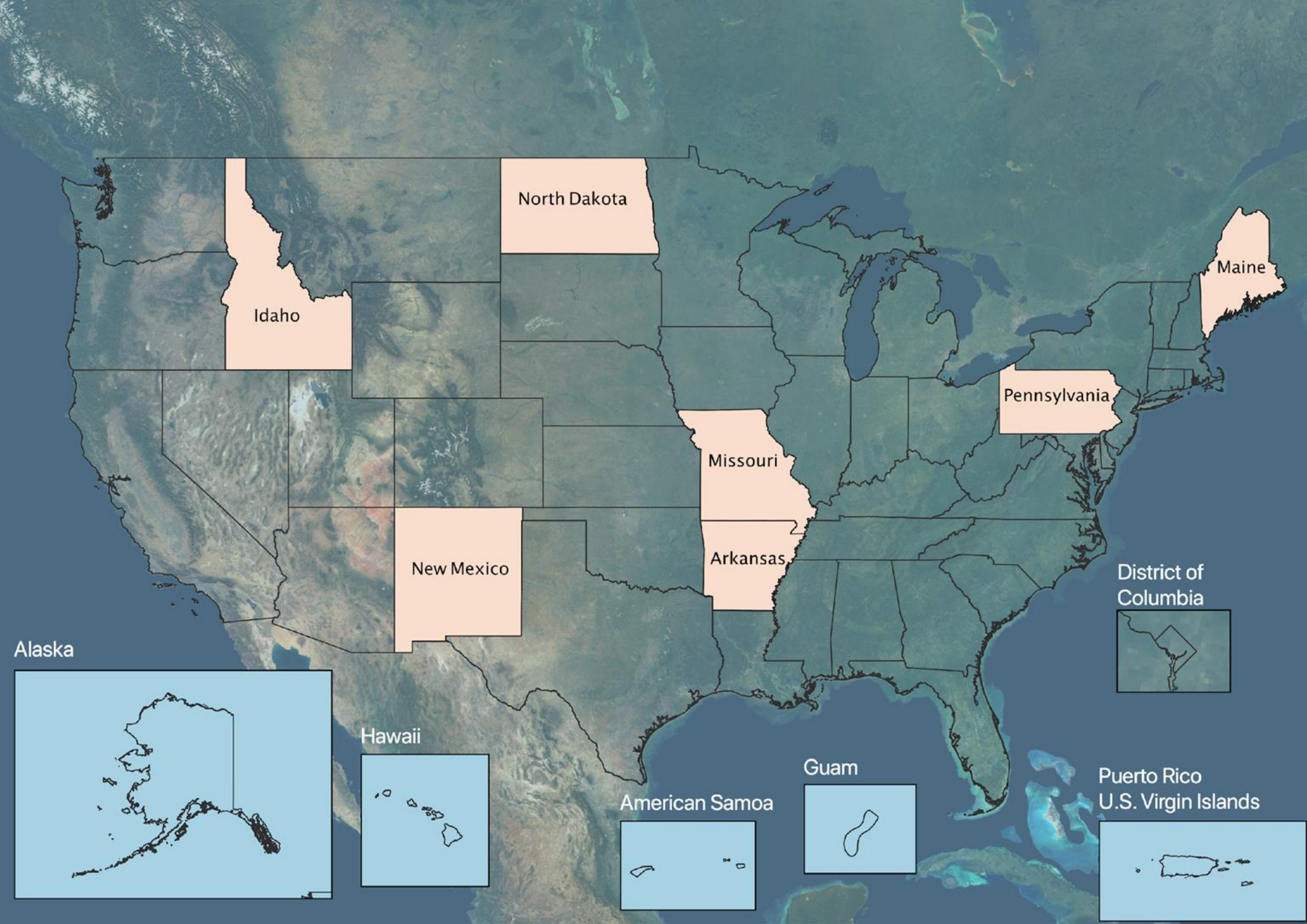
# 2016 Awards



# 2017 Awards

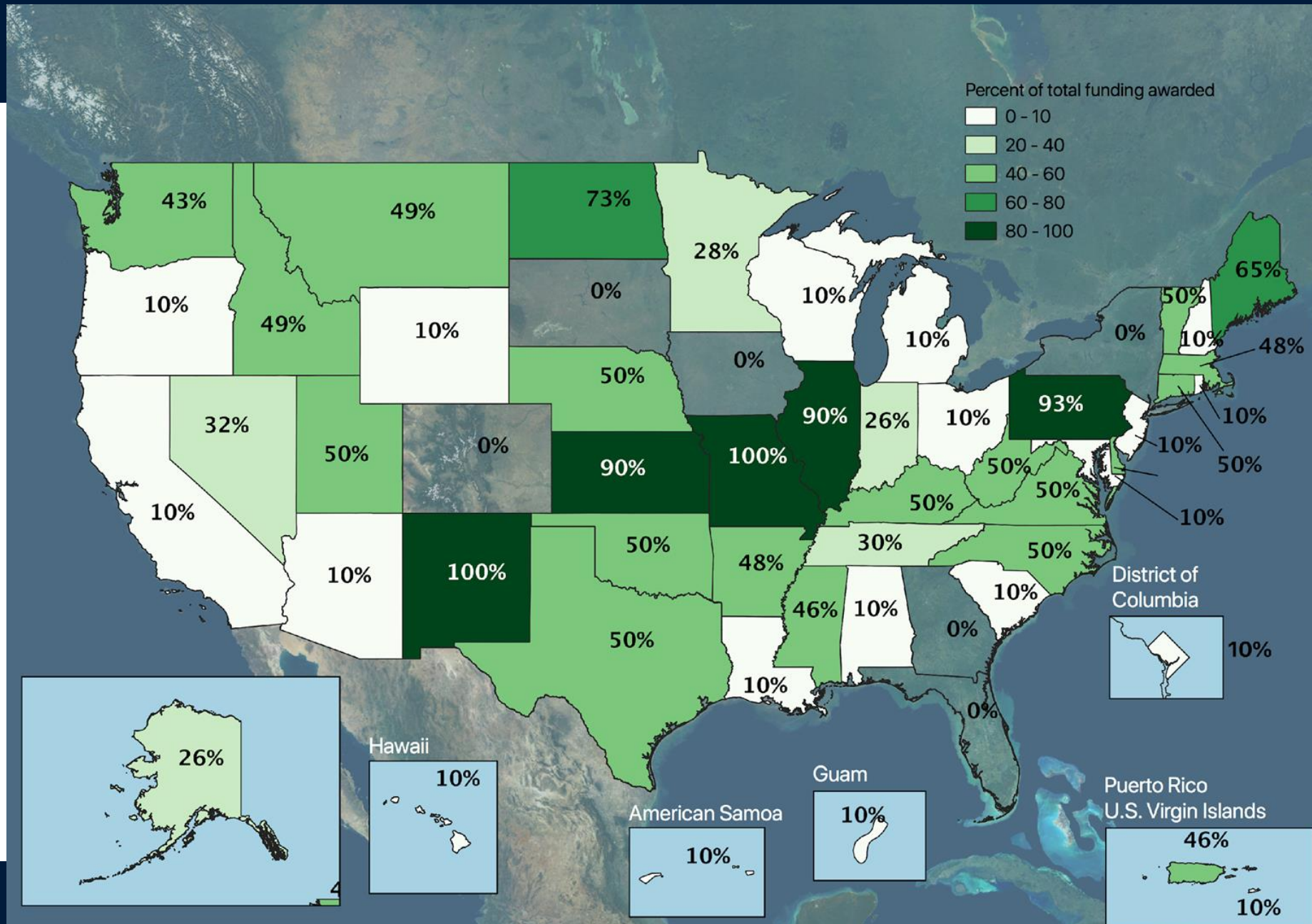


# 2018 Awards



# Percent of total funding awarded from Fiscal Years 2015-2018

- Percentages reflect funding as of May 1, 2019



# WUDR FY2019 and FY2020

- **Federal Fiscal Year 2019 Program Announcement**
  - The Program Announcement was available on grants.gov and closed on May 31, 2019.
  - Once the contracts are finalized, a listing of the proposals will be made available on the WUDR webpage.
- **Federal Fiscal Year 2020 Program Announcement**
  - Program Announcement has been written and is starting the process of going through reviews and Secretarial clearance.

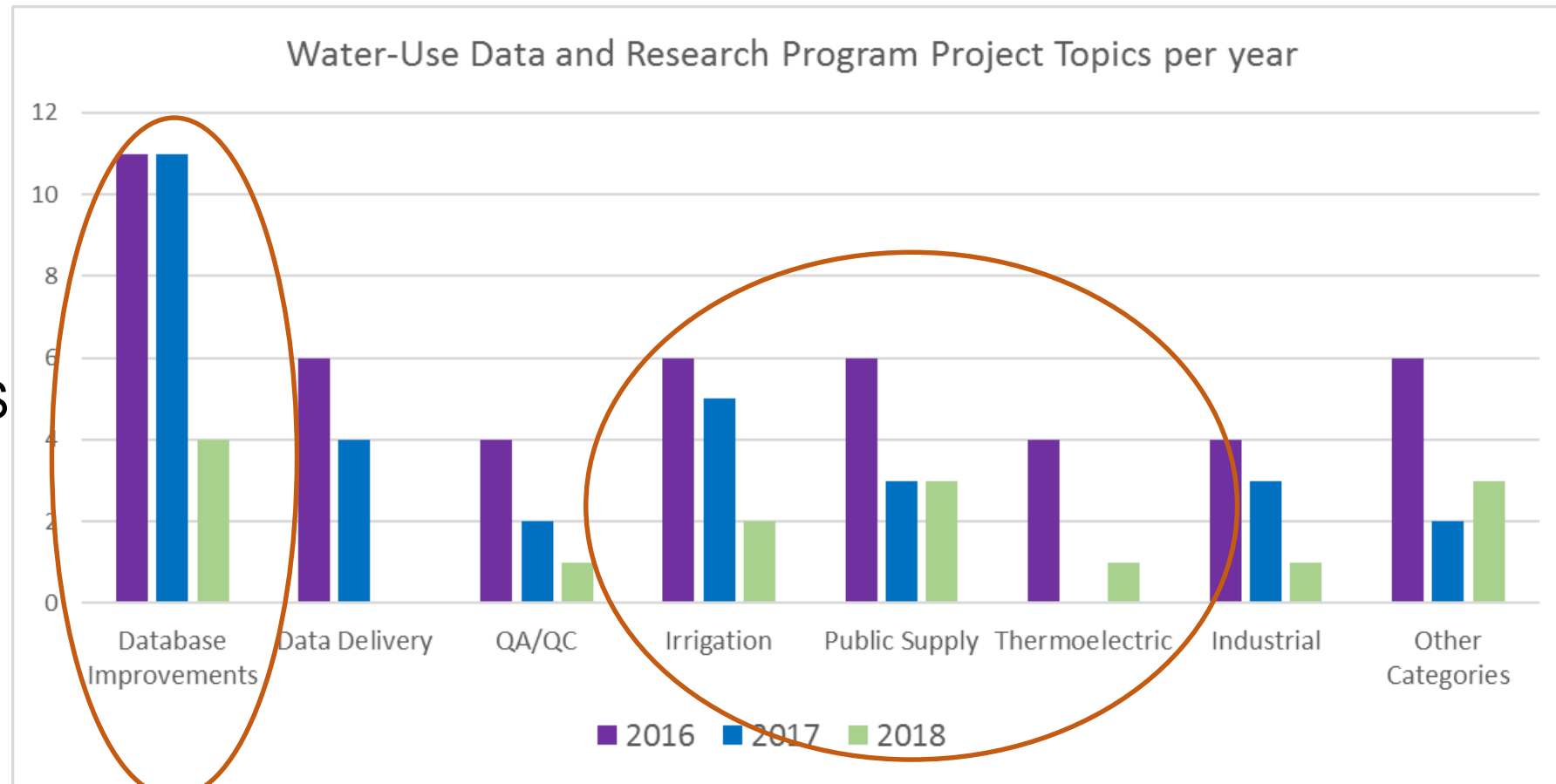
# WUDR Program Priority Topics

- Improve the collection or **QA processes** of water use data
- Improve the **transfer** of water-use data **to USGS**
- Improve water-use data for **Irrigation, Public Supply, or Industrial** use categories
  - Collection of monthly rather than annual withdrawals
  - Acquiring source of water (major aquifer systems or stream)
  - Reporting public-supply deliveries to other categories (commercial, industrial, domestic)
  - Estimating consumptive use
  - Metadata – data is compliant with **USGS** quality and conformity standards
- **Develop methods or coefficients** to **improve water-use estimates** where measured or reported data are not available



# WUDR Project Summary

- 40 projects over 3 years
- Over half focus on database improvements
- States with multiple-year awards (ID, IL, KS, ME, MO, MT, NM, ND, PA)



# Water-Use Data and Research Program States with Competitive Awards and completed Projects

FY2016

- Alaska
- Delaware
- Indiana
- **Illinois**
- **Kansas**
- **Maine**
- **Minnesota**
- **Mississippi**
- **Montana**
- **New Mexico**
- **North Carolina**
- **North Dakota**
- Oklahoma
- **Pennsylvania**
- **Puerto Rico**
- **Tennessee**
- **Texas**
- **Washington**

FY2017

- Connecticut
- **Idaho**
- Illinois
- Kansas
- Kentucky
- Massachusetts
- **Missouri**
- **Montana**
- Nebraska
- Nevada
- **Pennsylvania**
- **Utah**
- **Vermont**
- Virginia
- West Virginia

FY2018

- Arkansas
- Idaho
- Maine
- Missouri
- New Mexico
- North Dakota
- Pennsylvania

# WUDR Database Improvements Projects



## Documents and Links

### 2018

- [FY18 WUDR Program Awards](#)
- [2018 WUDR Program Announcement](#) (PDF)
- [2018 Question and Answer Sessions](#) (PowerPoint .pptx)

### 2017

- [FY17 WUDR Program Awards](#)
- [2017 WUDR Program Announcement](#) (PDF)
- Recordings of the 2017 Question and Answer Sessions (.mp4 files)
  - [Session 1](#) (February 28, 2017)
  - [Session 2](#) (March 8, 2017)

### 2016

- [2016 WUDR Program Awards](#)
- [2016 WUDR Program Announcement](#) (.docx)
- [2016 Question and Answer Session](#) (PowerPoint)

## Cooperative Funding Awards, FY18

The USGS Water-Use Data and Research program is pleased to announce the recipients of FY18 cooperative agreements. Awards were made to agencies in 7 States, for a total of \$590,000 in funding.

Department Name	Project Title	Project Summary
Arkansas Natural Resources Commission	Water Use Data Entry, Storage, and Retrieval Improvements to the Arkansas Natural Resources Commission's Water Use Database with Geographic Information Systems Integration	This project will build the hardware, software, World Wide Web, and workflow system to enable migration of the Arkansas Water Use Database from the USGS Arkansas Water Science Center to the Arkansas Natural Resources Commission and improve the collection process and quality assurance of water data, retrieval, and transfer of data to USGS. ARNC will improve the collection and dissemination of water use data through a searchable database with all pertinent information pertaining to the geographical location of water withdrawals. Arkansas currently has tier 1 abilities with some tier two levels with the intent to improve all tiers to level 2. Data will be received electronically directly into the database with data reported on paper being scanned into the system. This will then be connected to ANRC's ArcGIS system through a Arkansas Water Use Database Entry, Storage, and Retrieval Improvements FY2018 FY18 WUDR Program Application purchased module. This will allow ANRC to supply to the public and other agencies a geographical representation of all our agency's current water use information.
Idaho Department of Water Resources	2018 Idaho Water Use Data and Research - Idaho Department of Water Resources (IDWR) Water Use Field Tools for Surface Water and Irrigated Land Delineation from Imagery	This project aims to improve the accuracy and collection of water measurement data by developing a standardized field tool for surface water collection for water masters in Idaho and serving the data to the public. The majority of water use in Idaho is for irrigation, and therefore water masters will primarily inventory and measure water at diversions used for irrigation. However, since some of the water is used for other purposes including municipal, recreation and fish propagation, the proposed work could also benefit other water use categories. This work will improve the quality and increase the number of measurements of water use data collected by increasing efficiency and standardization. This project will also create a methodology for using Sentinel Imagery Normalized Difference Vegetation Index to determine irrigation status using a three-class classification (irrigated, non-irrigated, semi-irrigated). Determining irrigated land acres is an essential dataset for determining water budget, one of many input parameters used in modelling scenarios that are being developed for Idaho aquifers and planning regions. The intent is to develop a procedure that is portable between differing geographic agricultural areas.

<https://water.usgs.gov/wausp/wudr/>

# WUDR Data-Transfer Guidance



USGS Home Contact USGS Search USGS

Water-Use Data and Research program

Home Water-Use Open Forum Documents Contact Internal

## Water-Use Data and Research Program

Water managers across the United States require more complete, timely, and accurate water-availability information to support policy and decision-making, specifically, data associated with water withdrawals and consumptive use. Recognizing the limitations of current water-use data, the SECURE Water Act authorized a program that supports activities related to data collection and methods research and development at the State level. The USGS Water-Use Data and Research program (WUDR) will provide financial assistance through cooperative agreements with State water resource agencies to improve the availability, quality, compatibility, and delivery of water-use data that is collected or estimated by States. The Act requires that these State water use and availability datasets be integrated with appropriate datasets that are developed and/or maintained by the USGS.



Federal fiscal year 2015 (FY2015), was the first year that funding was appropriated for this program. In FY15 funding was distributed to State Water-Resource Agencies non-competitively, in the amount of \$26,000 per state. The funding was provided to allow each State to evaluate their current water-use data in relation to USGS baseline standards for each category of water user and to develop a workplan to improve it. In FY2016 and subsequent years, funding will be distributed under a competitive proposal process.

What's the latest?	Water-Use Open Forum	Important Links
<p>Posted Tuesday, 09-Jul-2019 11:33:17 EDT</p> <p><a href="#">2019 WUDR Program Announcement</a> (PDF)</p> <p><a href="#">Q&amp;A sessions for the 2019 grant process</a> (.pptx)</p> <p><b>Program Awards</b></p> <ul style="list-style-type: none"> <li><a href="#">FY18 Program Awards list</a></li> <li><a href="#">FY17 Program Awards list</a></li> <li><a href="#">FY16 Program Awards list</a></li> </ul>	<p>The USGS is pleased to host a monthly <a href="#">water-use webinar series</a> to provide the greater water-use community with an opportunity to share challenges, and solutions to water-use data issues such as data collection, data storage, quality assurance, analysis, and data dissemination.</p> <p><a href="#">More information, including the list of previous presentations</a></p> <p>The next presentation will be:</p>	<p><a href="#">USGS Data-Transfer Guidance</a> (PDF)</p> <p><a href="#">2019 WUDR Program Announcement</a> (PDF)</p> <p><a href="#">Contacts</a></p> <p><a href="#">Grant Application Information</a></p> <p><a href="#">Baseline Standards Table</a></p> <p><a href="#">ICWP Stakeholder meetings</a></p>



## 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.

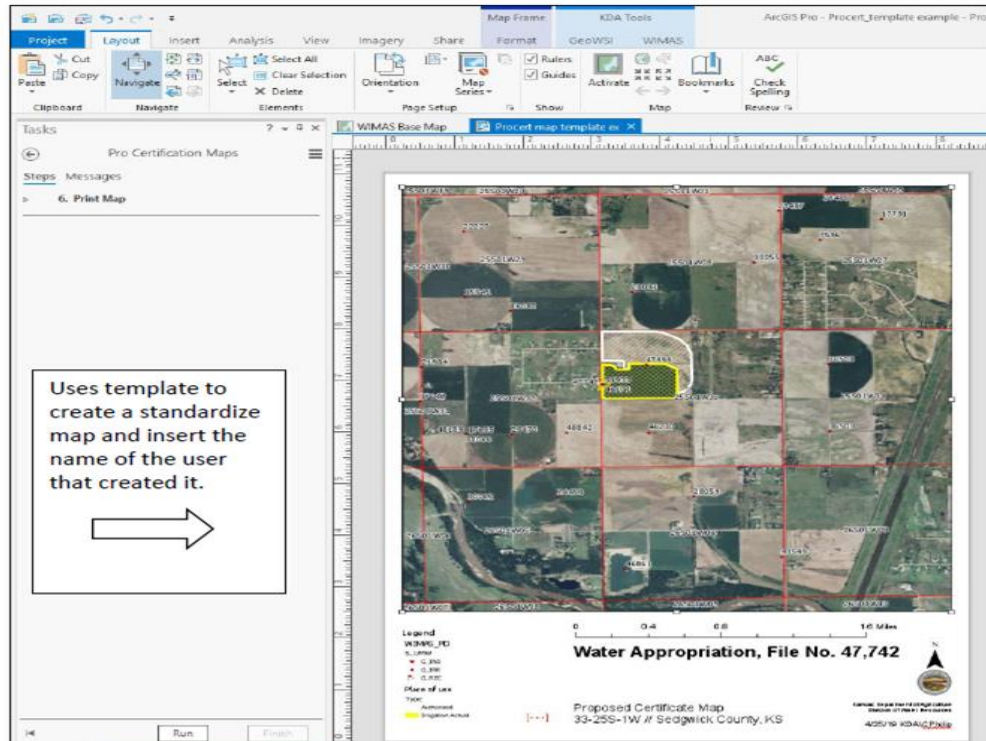
The Water-Use Data and Research (WUDR) program encourages the development of data services to more efficiently share data with the USGS, and with other stakeholders the grantee identifies. WUDR applicants and grant funding recipients have requested guidance on what to provide if they are seeking to use 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.

<https://water.usgs.gov/wausp/wudr/>

# WUDR Highlights: Kansas



Awarded in fiscal years 2016 and 2017



## Support for USGS Goals:

- Improve water use and water right data accessibility, transferability and document storage
- Enhanced quality checks and improved data
- More accurate points of diversions
- Data important to USGS WBEEP Daily HUC-12 Estimation

*“We were super-stoked about the link to DocuWare too honestly –it is where we keep all the scanned files documents and submitted water use reporting documents for each water right, so our staff are constantly flipping between the two (especially as our agency moves more and more toward paperless), so that link will save our staff a ton of time. Pretty exciting!”*

– Ginger Pugh, Kansas Department of Agriculture

# WUDR Web Portal Project Highlights

## North Carolina

**Water Use Data Query Builder**

**Dataset (Required)**

Please select... ▼ ?

**Parameters (Optional)**

**Filter by date:**  Do not filter  
 Range  
 Year(s)

**Filter by county:**  Do not filter (all)  
 Select from drop-down  
 Multiple

**Limit # of Results:**

**Generate Query**

RESET FORM

[Overview of Datasets](#)

[Query Builder](#)

## Utah

Utah Division of Water Rights

**Water Use Data Portal**

[Choose Data Selection Criteria](#)

[Variables List](#)

Click Each Bar To Expand Options

Required ▼

Please Select One Format To Display Your Data

- Comma Separated Values (CSV)
- eXtensible Markup Language (XML)
- JavaScript Object Notation (JSON)

Display Units In

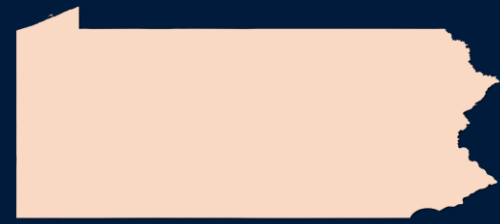
- Gallons
- Barrels
- Thousands Gallons
- Millions Gallons
- Acre Feet

Return Search Results With System Status Active  Return Search Results With System Status Inactive

PWS System Filters ▼

[Water Use Data Portal](#)

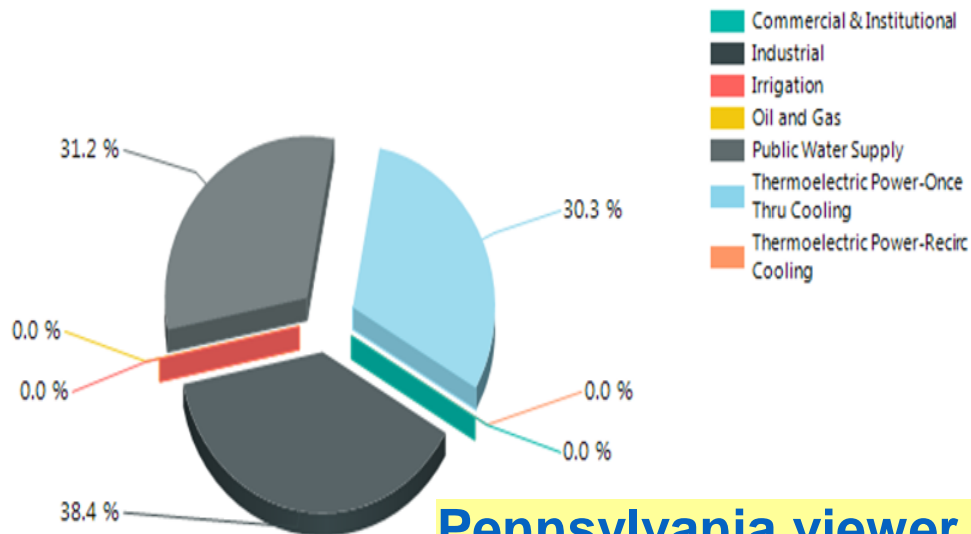
# WUDR Highlights: Pennsylvania



## Support for USGS Goals:

- Redesigned reporting portal
- Enhanced quality checks and improved data
- Developed separate report viewers to easily share data with USGS
- Data important to USGS WBEEP Daily HUC-12 Estimation

- Awards were made in fiscal years 2016, 2017, and 2018
- *Before project, usually 20 percent of about 10,000 annual reports did not pass an acceptance review – preliminary results show that only 3% are not accepted*

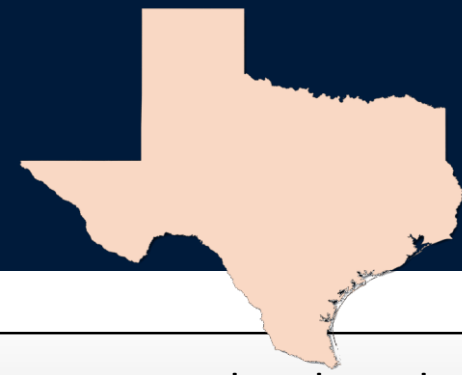


[Pennsylvania viewer plot](#)

*“Thank you for supporting our project. We are starting to see the benefits; more reports are accepted the first time around than before and (we) have gotten some positive feedback from the reporting community. Here’s a comment we recently received: Just wanted to send a message of appreciation for the recent re-design of the Chapter 110 reporting portal. The new site is much more user friendly, and we’re already realizing efficiencies during this reporting cycle.”*

– Michael Hill, Pennsylvania Department of Environmental Protection

# WUDR Highlights: Texas

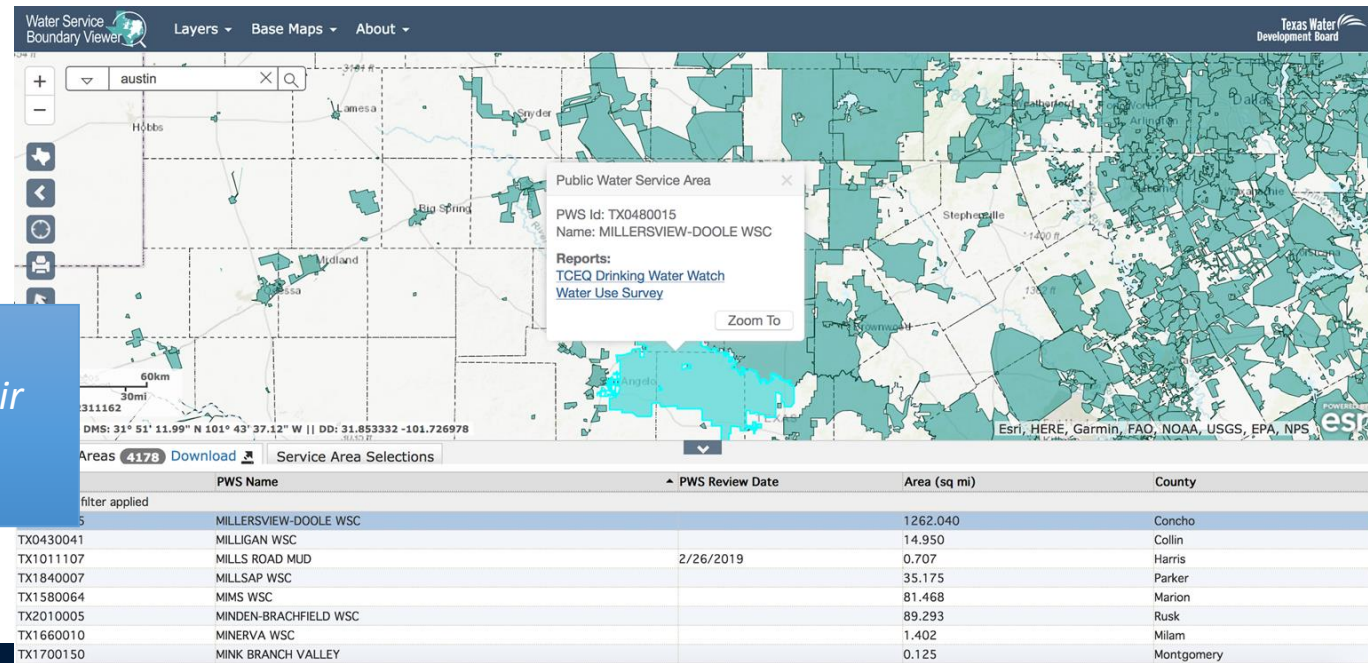


- Award was made in fiscal year 2016.
- [Texas Water System Service Area Viewer Development Project](#)
- Shows the public supply water service boundary areas

- Spatially depicts where public supply water is being extracted and used
- Knowing where public-supply water is delivered is fundamental to understanding where demands on water resources are and how those demands are being met
- Data important to USGS WBEEP Daily HUC-12 Public Supply Estimation

*“We have received a lot of interest in the application by authorized users, many of whom have edited and updated their service boundary through the application.”*

- Kathie Dahlberg, Texas Water Development Board





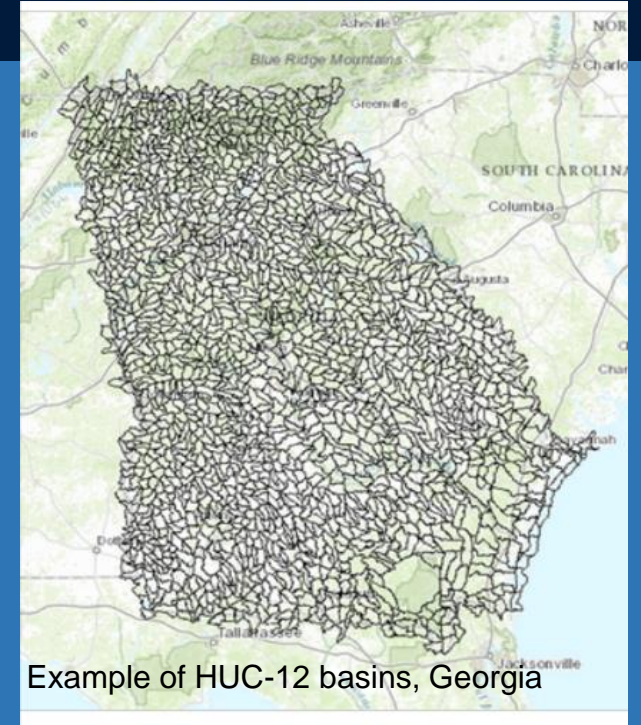
# Water Use Estimation from WUDR

## Water Budget Estimation and Evaluation Project (WBEEP)

- Develop model strategies for daily **Hydrologic Unit Code (HUC-12)** estimates of **thermoelectric, public supply, and irrigation** withdrawal
- Inclusive of consumptive use

## Needs:

- **Data (Annual, Monthly, Daily, Real-time)**
- Policy for water-use data management
- Development of **data services with State Water Resource agencies**
- **Continuous delivery of water use data**



HUC12 watersheds average about 30 square miles in size

There are over 100,000 HUC 12 watersheds in the United States

# WUDR Program Summary: Improvements to WBEEP Data Categories

## Public Supply

- Alaska
- Idaho
- Kentucky
- Maine
- Mississippi
- Montana
- New Mexico
- North Dakota
- Tennessee
- Texas
- Utah



## Thermoelectric

- Alaska
- Illinois
- Minnesota
- Missouri
- Tennessee



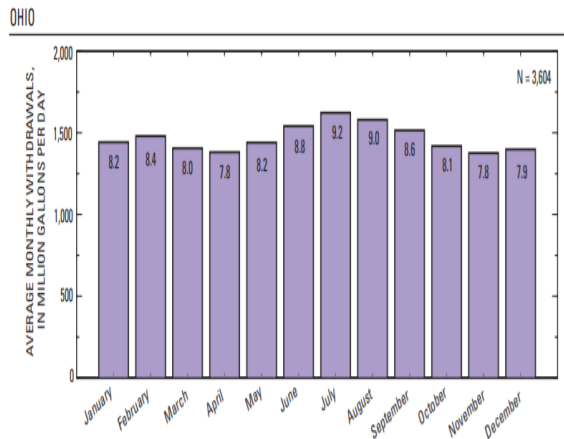
## Irrigation

- Alaska
- Idaho
- Illinois
- Maine
- Massachusetts
- Missouri
- Montana
- Nevada
- New Mexico
- Puerto Rico
- Tennessee
- Pennsylvania



# Water Budget Estimation and Evaluation Model – Public Supply Component Data Needs

**Site-specific  
withdrawals**  
(Daily, Monthly  
and/or Annual)



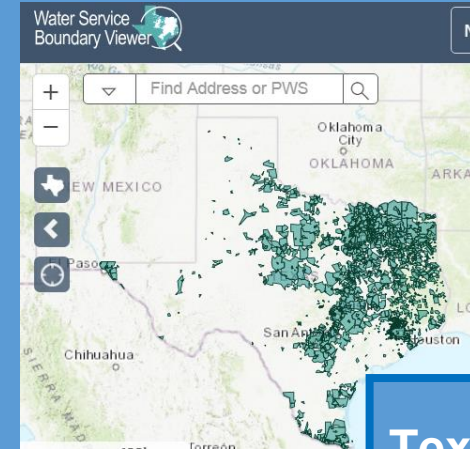
Alaska  
Mississippi  
Montana  
North Dakota  
Tennessee  
Maine  
Utah

**Spatially Relate  
Sites**



Idaho  
New Mexico

**Ancillary Data**  
(like Water Supply  
Service Areas)



Texas  
Kentucky  
Maine

# Water Budget Estimation and Evaluation Model – Thermoelectric Component Data Needs

## Cooling System Technology



Generation technology type (coal-fired, nuclear)



Withdrawals  
(verification/validation)



## Operational Status

Base load

Peaking Plant

Net Generation



Salinity

Fresh water

Saline water

Water Source  
Surface water



Groundwater



**Product:** Daily surface-water and groundwater withdrawals at the HUC-12 level

# Water Budget Estimation and Evaluation Model – Irrigation Component Data Needs

Irrigated acres  
(spatial and temporal)

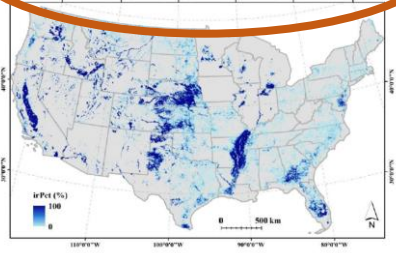
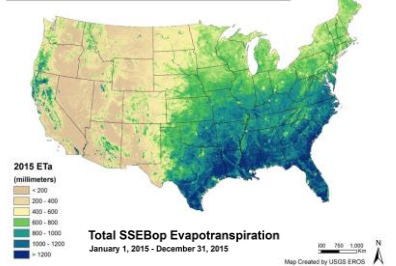


Figure 1. Spatial distribution of irrigated croplands based on our new Landsat Irrigation Dataset (LANDI) for the year 2012. The LANDI map is aggregated to 3km grids for visual purpose (iPct = irrigation proportion within a pixel).

Evapotranspiration



Soil moisture

(naturally available water)



System efficiencies



Conveyance losses



Consumed  
irrigation  
water

Withdrawals  
(validation)

Water Source

Surface water



Groundwater



Product:

Daily surface-  
water and  
groundwater  
withdrawals at  
the HUC-12  
level

# Questions



<https://water.usgs.gov/wausp/wudr/>