

Update on USGS Integrated Water Research and Assessment Activities



Credit: Nicholas Tonelli

USGS Integrated Water Science

OBSERVE



Next Generation Water Observing System (NGWOS)

NGWOS collects real-time data on water quantity and quality in more affordable, rapid, and widespread ways than has previously been possible. The flexible monitoring approach enables USGS networks to evolve with new technology and emerging threats.

ASSESS



Integrated Water Availability Assessments (IWAA)

IWAAs examine the supply, use, and availability of the nation's water. These regional and national assessments evaluate water quantity and quality in both surface and groundwater, as related to human and ecosystem needs and as affected by human and natural influences.

PREDICT



Integrated Water Prediction (IWP)

IWP builds a powerful set of modeling tools to predict the amount and quality of surface and groundwater, now and into the future. These models use the best available science to provide information for more rivers and aquifers than can be directly monitored.

DELIVER



National Water Information System (NWIS) Modernization

NWIS data systems that house USGS water information are being modernized to maximize data integrity, simplify data delivery to the general public, and automate early warning to enable faster response times during water emergencies.



Integrated Water Availability Assessments (IWAAAs)

Address requirements outlined in SECURE Water Act

- Status and Trends of Water Resources - Quantity and Quality
- Develop National Scale Indicators of Availability
- Develop and Apply Predictive Tools

When fully implemented, IWAAAs will:

- Evaluate current water supply and demand, quality, and use;
- Evaluate long-term trends in water availability, inclusive of water quantity and quality;
- Provide seasonal to decadal forecasts of availability; and
- Inform water resource decisions through development of socioeconomic tools.

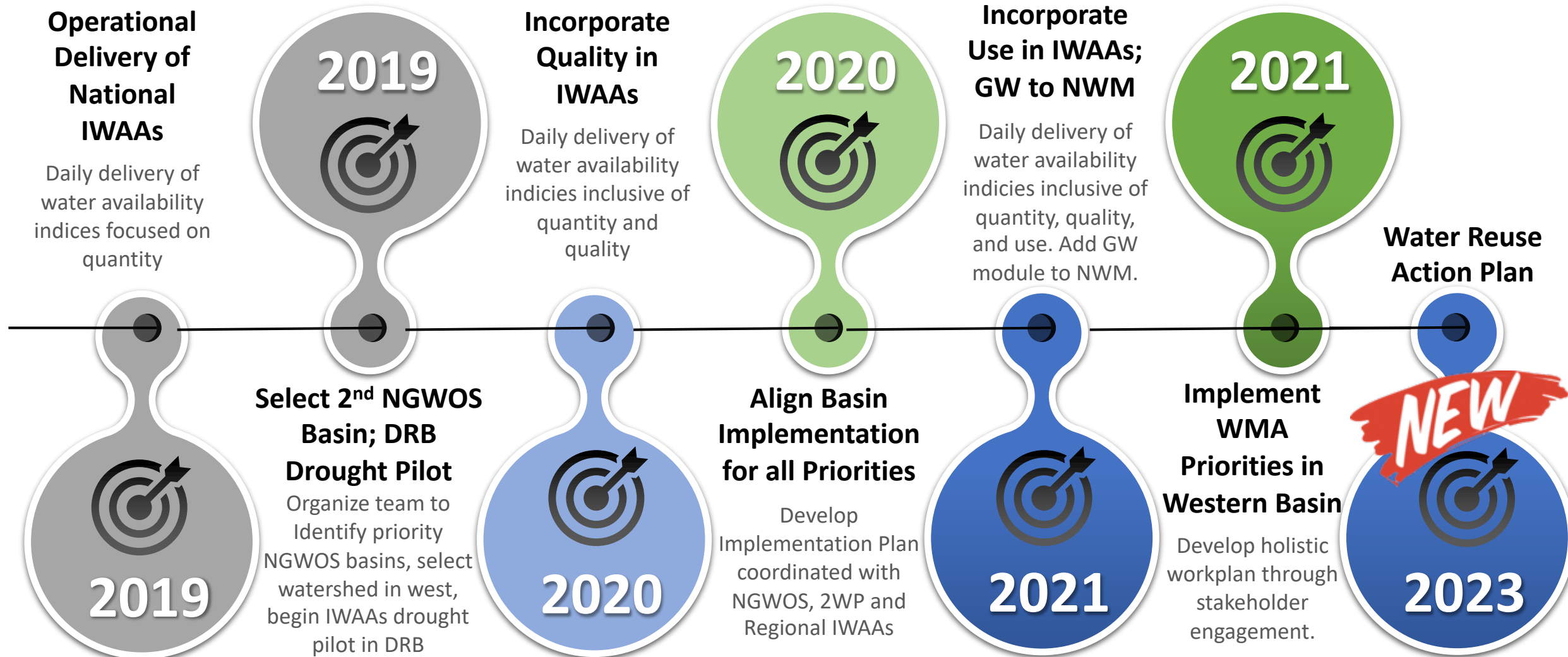


What is Integrated Water Prediction?

IWP will be a National asset supporting the Nation's earth and biological system prediction capability of system structure, function and evolution over a range of temporal and spatial scales:

- USGS *science* – *our observations, process understanding, models, and data delivery system* - will be an engine that drives prediction of
 - Surface and subsurface hydrological processes
 - Stream temperature
 - Surficial and relevant landscape processes
 - Transport, storage, and biogeochemical alteration of constituents
 - Ecological processes

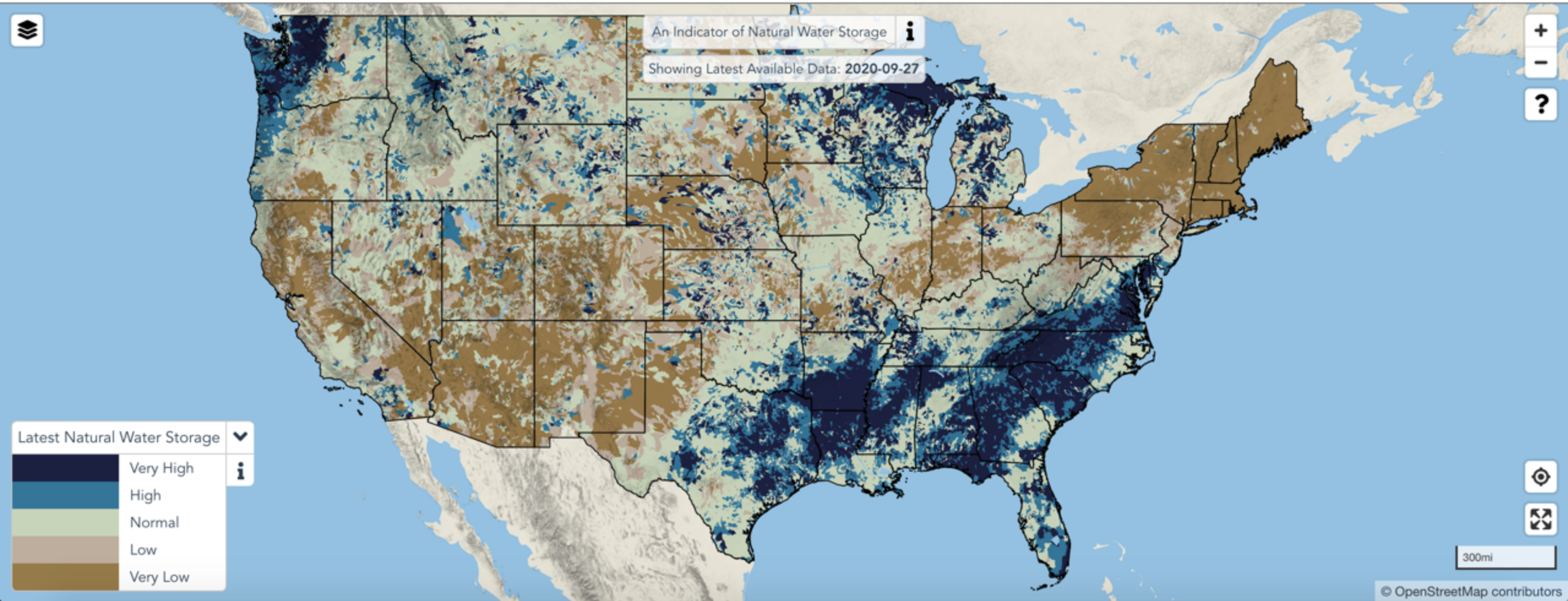
Deliverable Milestones



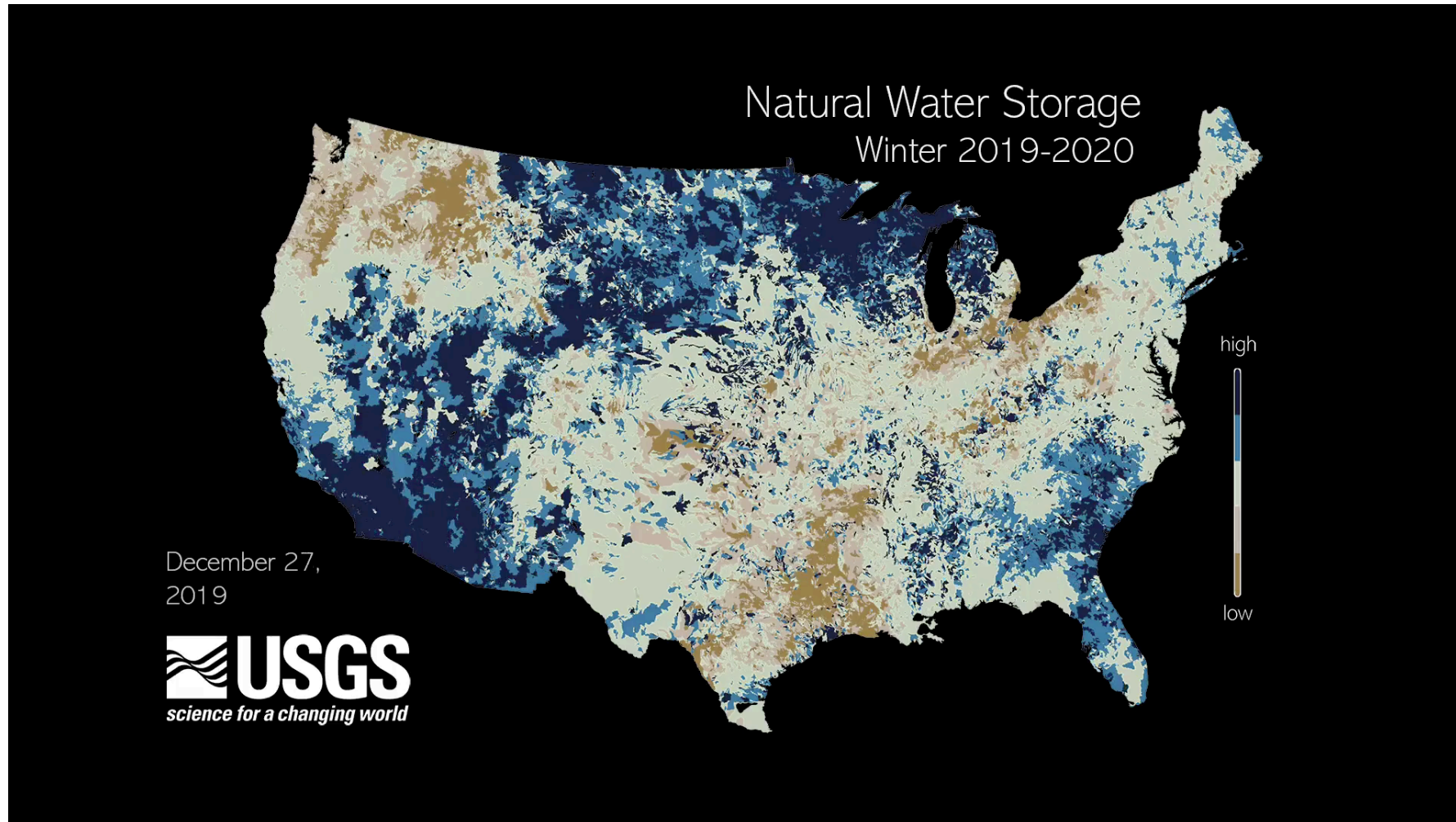
National Concept Map



National Integrated Water Availability Assessments-Concept Map



National Concept Map - Visualization





Delaware River Basin Regional IWAAAs

- Drought – climatic drivers of drought in the DRB 1901-2015
 - McCabe, G.J., Wolock, D., 2020, Hydro-climatic drought in the Delaware River Basin, Journal of the American Water Resources Association, 1-14, <https://doi.org/10.1111/1752-1688.12875>
- Surface-water-quality trends have been generated using historic, multisource data
 - Shoda, M.E., Murphy, J.C., Falcone, J.A., and Duris, J.W., 2019, Multisource surface-water-quality data and U.S. Geological Survey streamgauge match for the Delaware River Basin: U.S. Geological Survey data release, <https://doi.org/10.5066/P9PX8LZO>.
 - Murphy, J.C., and Shoda, M.E., 2020, Pooling resources across organizations—Multisource water-quality data for the Delaware River Basin: U.S. Geological Survey Fact Sheet 2020–3006, 2 p., <https://doi.org/10.3133/fs20203006>.
 - Murphy, J.C., and Shoda, M.E., 2020, A historical look at changing water quality in the Delaware River Basin: U.S. Geological Survey Fact Sheet 2020–3007, 2 p., <https://doi.org/10.3133/fs20203007>.



Delaware River Basin Regional IWAAAs

- Baseflow estimates for 49 reference locations, and spatial and temporal variability and trends in low flows in the DRB has been described
 - Foks, S.S., Miller, M.P., and Hopple, J.A., 2020, Daily-timestep and monthly-timestep estimates of baseflow at 49 reference stream gages located within 25 miles of the Delaware River basin watershed boundary for the years 1950 through 2015: U.S. Geological Survey data release, <https://doi.org/10.5066/P9XY70L4>.
 - Hammond, J.C., 2020, Annual low flow, climate and watershed properties for 325 USGS gages in and near the Delaware River Basin: U.S. Geological Survey data release, <https://doi.org/10.5066/P92UYECV>
- Calibration of the first version of the National Groundwater Model (NGWM) cutout for the DRB is complete
- Algal stressor models will be created based on new data collected at 40 sites in New Jersey based on 2019 and 2020 data collection



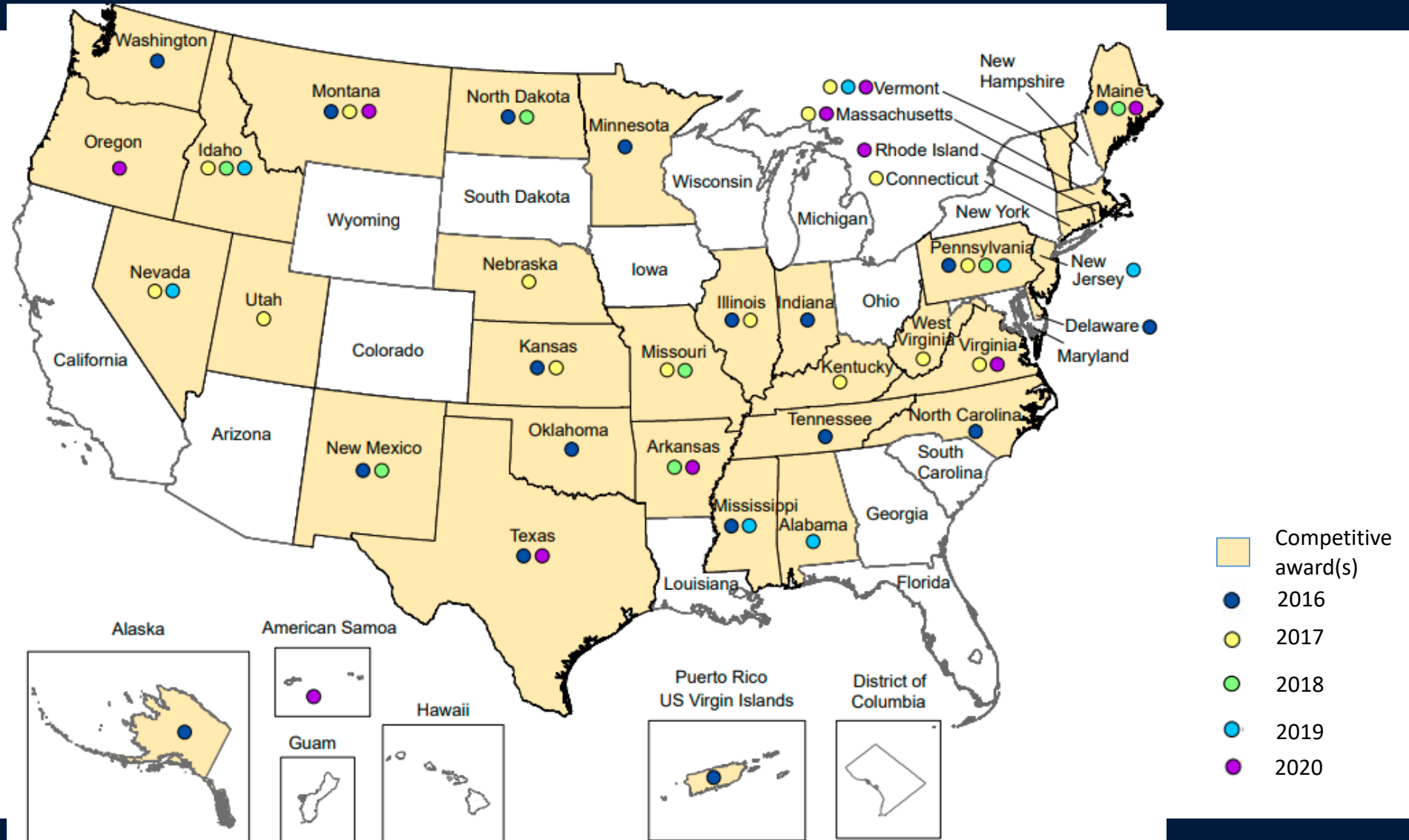
Upper Colorado River Basin Regional IWAAs

- Planning started in FY20 – drought, snow
- Phase 1 Implementation starts in FY21
 - A retrospective analysis of existing data and water availability assessment and prediction capacity
 - A detailed strategic modeling plan to improve the water-availability prediction capacity for IWAAs core and regionally relevant water-availability components and metrics.
 - A detailed strategic plan to improve representation of trends of IWAAs core and external and internal stakeholder-priority availability components.
 - A catalog of and access structure to historic data sets and current observation networks relevant to core and regionally significant water-availability conditions for the UCOL.
 - Multi-source harmonized and screened data sets for use in water-availability assessment, prediction model capacity building and assessment of availability trends and drivers of trends.
 - System and architecture for regular updating multi-source data sets for use in trends assessment and sequencing model tools.

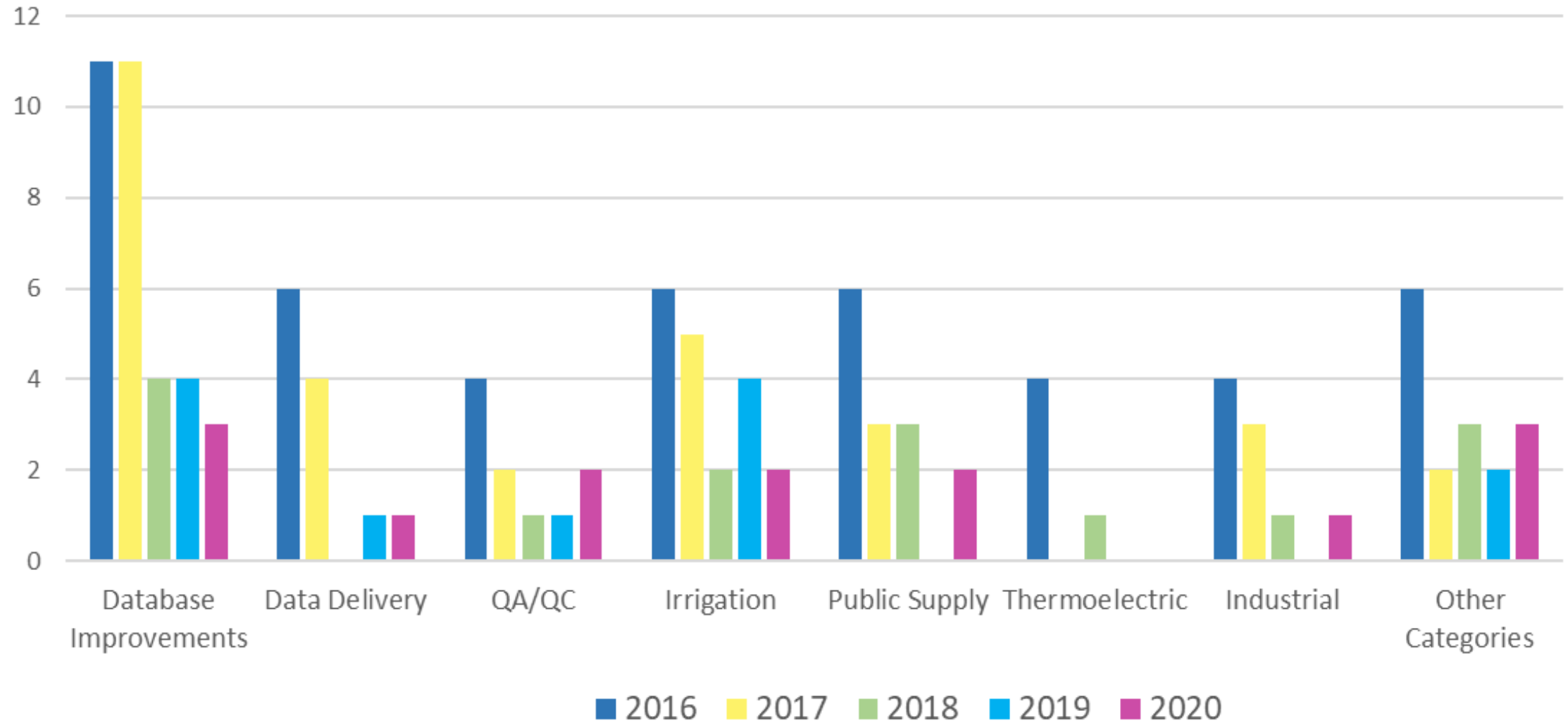
Developing Water Use Models

- National IWAA development - daily water withdrawals for 2015, for all HUC12s in the U.S. for Thermoelectric, Irrigation, and Public Supply water-use as a factor have been provided to the Concept Map visualization for testing
- Data release of final 2015 Thermoelectric, Irrigation, and Public Supply water-use as a factor estimates are on target for a December 2020 publication
- National daily withdrawals and consumptive use models for thermoelectric power generation and irrigation at the HUC12 scale are on target for completion by December 31, 2020.
- Results will be evaluated and model revised to improve uncertainty to meet December 31, 2022 target for operational models
- Operational models are dependent on close coordination with NHM and OpenET project

Water-Use Data and Research (WUDR) Program Competitive Awards



Water-Use Data and Research Program project topics by year



Water-Use Data and Research Program Status

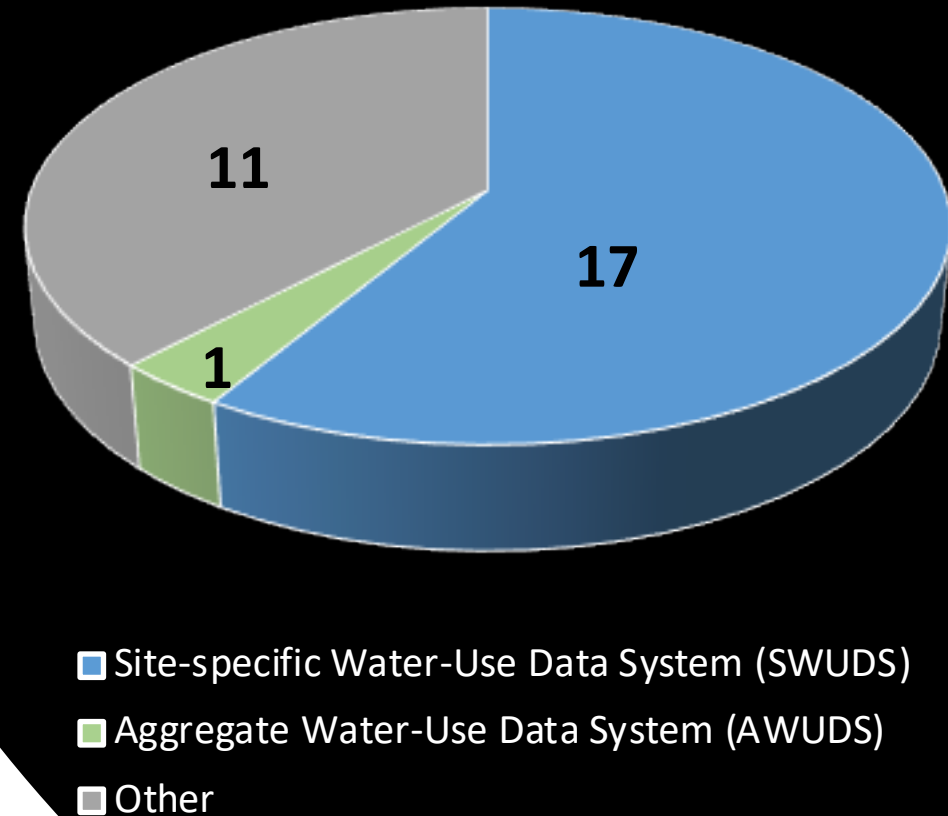
- About **5.8 million dollars** has been awarded from 2015 to 2020 (this include non-competitive (\$26,000 awards for States to write a workplan) and competitive awards)
- There have been **57 competitive awards** (2016 to 2020).
- There have been a **few no cost extensions due to covid-19**.
- **Eight States have less than \$25,000 in available funding**
- **Eight States have between \$25,000 to \$100,000 in available funding.**
- **New in 2020** WUDR awards
 - 10 total awards made
 - Two awards included project work to develop **data dashboards** to display water-use data to the public.



Water-Use Data and Research (WUDR) Program Deliverables: Data

- The USGS has **received 29 data sets** (as of Oct. 1, 2020)
- Data transfer guidance is available on the WUDR website (<https://water.usgs.gov/wausp/wudr/>).
- **Not all data can fit into USGS water-use databases** (model data, GIS maps, public supply service areas).
- The USGS National Water Information System (NWIS) is in the **process of a complete modernization** and the two water-use subsystems of NWIS, SWUDS and AWUDS, will be redeveloped into a single Water-Use Data System as part of this process.

Water-Use Data and Research (WUDR) Program
Possible Storage Location for Data



Notable “other” New Project Starts in FY21

- **National Drought Prediction** – using machine learning to predict drought
- **Water Quality Gap Analysis** – identifying regional water quality research priorities
- **Water Quality Proxies** – surrogate methods for HABs, PFAs, and select metals
- **Quantifying Interbasin Transfer** – developing predictive capacity

Questions

