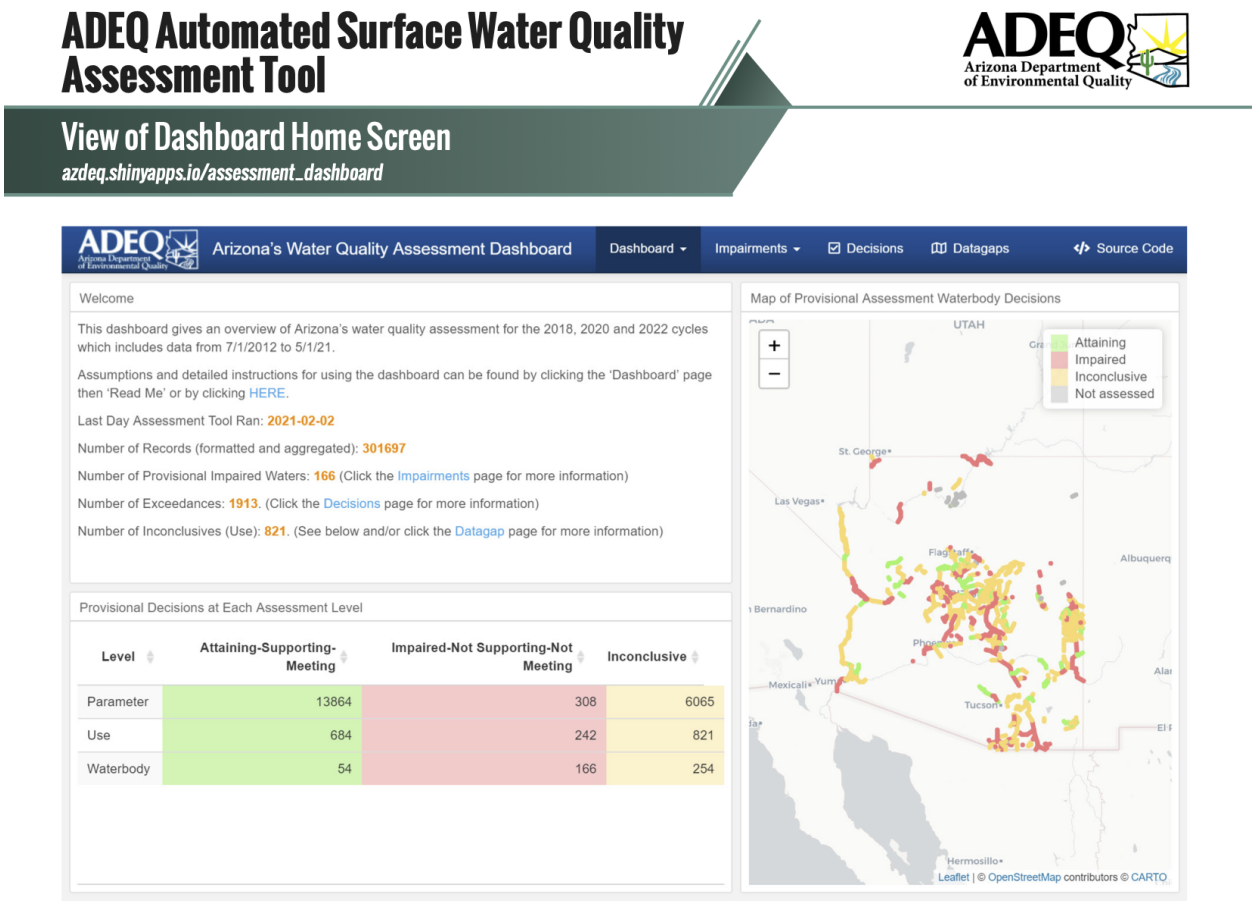
2021 NASCIO State IT Recognition Awards - ADEQ Submission



Executive Summary:

Arizona's Automated Surface Water Quality Assessment Tool (ASWQAT) takes data from the U.S. Environmental Protection Agency (EPA) water quality portal (www.waterqualitydata.us) and determines assessment decisions at the parameter, use and waterbody levels. Arizona uses this tool to make weekly 'provisional impairment' and 'impairment removal' decisions and to report this information to EPA through the ATTAINS system (https://www.epa.gov/waterdata/attains) every two years.

Idea (25%)

What problem or opportunity does the project address?

Prior to the development of the Automated Surface Water Quality Assessment Tool (ASWQAT), the process of collecting, analyzing, and publishing water quality data took Arizona Department of Environmental Quality (ADEQ) staff nine months to complete. The manual process dominated the department's small team and limited their time on other mission critical projects. The desire to improve this process had been long standing and found its catalyst with collaboration between ADEQ's Surface Water Monitoring and Assessment (Surface Water) and Information Technology (IT) teams.

Why does it matter?

ASWQAT enables ADEQ to efficiently and effectively determine if designated uses for lakes and streams are meeting federal (Clean Water Act) water quality standards, which is critical to protecting public health and the environment in Arizona.

ADEQ has slashed the time it takes to conduct a complete statewide surface water quality assessment of over 500 lakes and streams by 99.996%. Gathering, formatting and reporting all data now takes roughly 15 minutes instead of the nine months of staff time previously required.

ASWQAT increases visibility into where restoration activities are effective, as well as into data gaps that can be filled. This allows the agency to hyper-focus limited resources for greater mission outcomes to maximize protection of public health and environment.

What makes it different?

The unique features of ADEQ's ASWQAT include:

- **The Code and Tools are Open Source**, free and shareable. ASWQAT's open source nature allows ADEQ to leverage existing code from other agencies and share code with other states for their programs.
- **Fast**. Total run times to complete a full state surface water quality assessment typically take under nine minutes.
- **Cloud computing**. Servers are only used when needed, which reduces cost.
- **Arizona's Water Quality Assessment Dashboard.** Users can interact with ASWQAT at https://azdeq.shinyapps.io/assessment_dashboard/.
- **Extreme automation**. Every step of the process is fully automated, from gathering the data from the national water quality portal, to creating a final statewide surface water quality assessment report for EPA.

What makes it universal?

Surface water quality assessment and reporting to EPA (Clean Water Act) is a need that all states share. Many of the steps in the assessment process, like gathering data and comparing results to standards, are universal. ADEQ has presented on how these common threads can be used by all states at several national conferences. The ASWQAT tool has been very well received and generated enough interest that ADEQ has made the base code available to the public on GitHub (https://github.com/AZDEQ/Water-Assessment-Calculator-Public).

Implementation (25%)

What was the roadmap?

ADEQ is in its ninth year of implementing the Arizona Management System (https://ams.az.gov/ and see ADEQ's AMS results: https://www.azdeq.gov/ams), a LEAN management system. ADEQ's LEAN transformation has reduced waste in the agency, improved services to customers and furthered our mission to protect and enhance public health and the environment of Arizona. Continuously improving data gathering and reporting efficiency is a priority for ADEQ.

Who was involved?

The ASWQAT project took shape in a collaborative effort between ADEQ's Surface Water andIT teams and was built in three phases:

Phase 1 - A year long project with an external contractor to build a prototype 'proof of concept'.
Phase 2 - Internal development by our Surface Water team to build out needed functionality completing the requirements.
Phase 3 - A collaboration between the Surface Water and IT teams to mature the ASWQAT into an Enterprise-grade application.

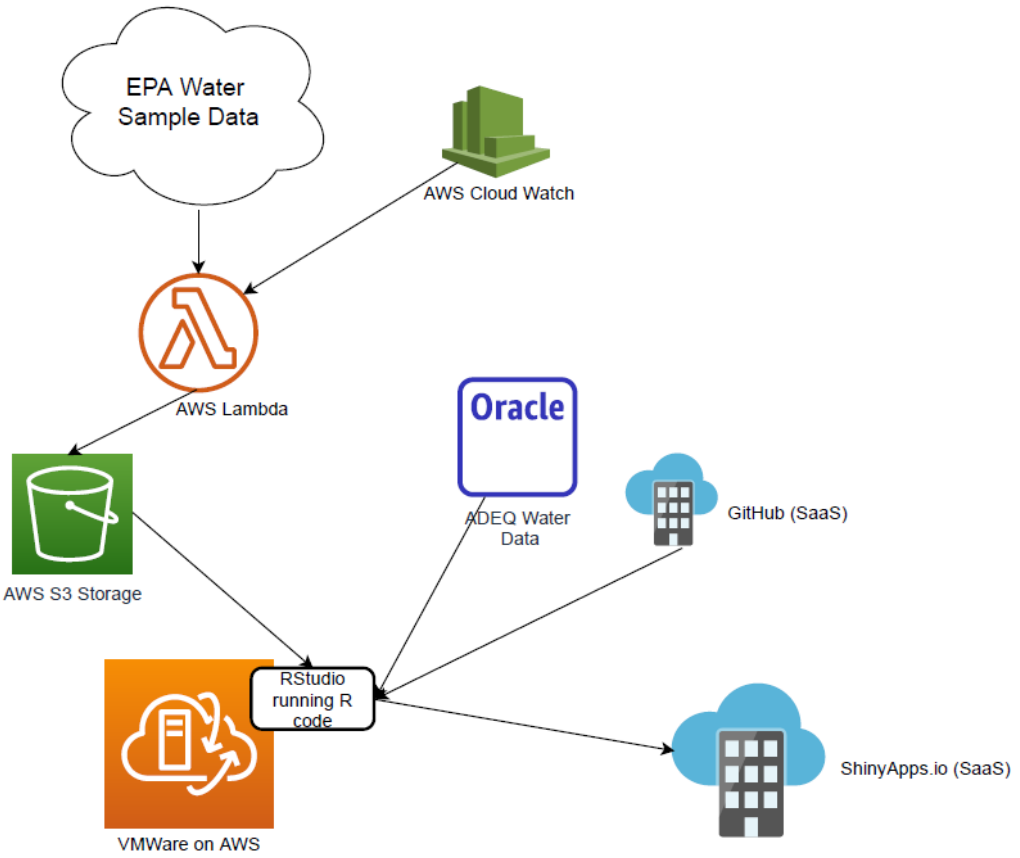
In discussing the process and earlier efforts to automate, the project team came up with a plan to bring together the ADEQ's new Amazon Web Services (AWS) Cloud environment and the Surface Water team's embrace of leading edge data science tools.

How did you do it?

ADEQ's IT teams use a robust mature Agile Development and Project Management methodology. Approaching this project from this perspective, the IT team mapped out the general requirements and worked through the details as they became apparent. The high level list of requirements included:

- Create an Enterprise application following the IT principles of security, visibility and maintainability.
- Leverage the new data science technologies of 'R code' and the 'RStudio' development environment.
- Leverage the newly acquired AWS Cloud Environment and AWS Tools.

Architecture



Cloud Watch - Scheduling EPA Data Pull
Lambda - Python code pulls data from EPA
S3 - Storage for EPA data and other configuration data
VMWare on AWS - Production Server resides here
GitHub - Version Control
ShinyApps.io - Visual display of the result data

Impact (50%)

What did the project make better?

ASWQT's extreme automation process reduced the overall time to produce assessment decisions from nine months to about 15 minutes. Leveraging the common schema from the water quality portal means that ADEQ can directly use external data without having to format or maintain external providers' data. Necessary data entry that previously required a dedicated full-time employee has now been reallocated to performing mission critical work like restoring waters.

ASWQAT's ability to rapidly identify data gaps has enabled ADEQ to reduce laboratory costs by more than $250,000 annually. Previous sampling approaches had an expensive fixed suite of parameters sampled multiple times per year. ASWQAT enables ADEQ to develop tailor-made sampling plans that account for data collected by other agencies in a timely manner.

How do you know?

The results of the ADEQ ASWQAT tool can be found here and are published weekly:

- Guide to ADEQ's ASWQAT Tool (https://azdeq.shinyapps.io/assessment_dashboard/_w_cdd270a6/#section-readme)
- Dashboard (https://azdeq.shinyapps.io/assessment_dashboard/_w_cdd270a6/)
- Impairments (https://azdeq.shinyapps.io/assessment_dashboard/_w_cdd270a6/#section-impairments)
- Decisions (https://azdeq.shinyapps.io/assessment_dashboard/_w_cdd270a6/#section-decisions)
- Data Gaps (https://azdeq.shinyapps.io/assessment_dashboard/_w_cdd270a6/#section-datagap)

Using ASQWAT, ADEQ has provisionally removed three entire Arizona waterbodies from the federal impaired list, and eliminated 45 different parameter impairments from lakes and streams in Arizona.

What now?

As part of ADEQ's commitment to continuous improvement, ADEQ's Surface Water and IT teams are continuing to work together to refine and develop new reporting tools to assess surface water quality in relation to designated uses statewide.