Summary

In most US states, we do not have a clear picture of who supplies drinking water to which communities, and many states that do have maps of water system service area boundaries are not available in a publicly accessible format. On Native American Reservations, information on water system service areas is even more localized and data sharing more limited.

Without accurate service area boundaries, we are unable to identify which communities lack access to safe, reliable, and affordable drinking water, nor can we adequately understand and plan for drought or natural disaster scenarios, or track if we are reaching Justice40 water goals to target federal spending to priority communities.

With accurate service area boundaries, we can better understand who receives unsafe drinking water and better track and direct funding to priority communities to improve public health. We can look at the intersection of demographic and population growth data, water pollution, and other environmental exposures like air pollution within communities to more fully understand environmental injustices a community may face. We can inform and improve water supply resilience as well as natural disaster and emergency planning. Utilities and government agencies can more easily identify nearby systems available for consolidation, interconnection, or emergency assistance.

Current state of data

Only eleven states have service area boundary data for more than 90% of their community water systems, either publicly available or accessible through a data use agreement. Fifteen more states and DC have incomplete service area boundary data that is publicly available or accessible through a data use agreement. These incomplete datasets have better coverage for larger water systems but include only point locations in Alaska and less than 20% of community water systems in Colorado and Florida, among other limitations. Another five states have service area boundary data that is not public. This leaves 19 states with no centralized information on the service areas of the thousands of drinking water systems they regulate and communities they serve.

EPIC’s Approach

This project aims to create a geospatial data layer of community water system (CWS) service area boundaries for the US. We are not mapping facilities or pipe locations. We are collaborating with SimpleLab to create a national approximation of service area boundaries. The national approximation will serve as a starting point to address the data gap in US drinking water systems, and we will engage and enable regulatory stakeholders to improve the boundaries over time. In the first quarter of 2022, we will summarize existing data and identify priority data gaps. By April 2022, SimpleLab will have a first draft geospatial data layer to approximate CWS service area boundaries for the US. From April to November 2022, we will provide preliminary map access to limited stakeholders for feedback, determine opportunities for refinement, and plan next steps. Throughout the project, we are having conversations with cross-sector stakeholders to inform the project direction, methodology and data management plan.

1 https://doi.org/10.1002/aws2.1266. These five states are Louisiana, South Dakota, Kentucky, New York, and New Hampshire.
EPIC is gathering existing service area boundary data and modeling best approximations where no data exist or the data are not publicly available. We are working with the Internet of Water Coalition to engage academics, consulting firms, and state agencies that have developed this data to date to improve our modeling methods and understand the resources needed to maintain an accurate service area database over time. We are also engaging federal regulators and water associations that understand the landscape of key stakeholders and beneficiaries of this information.

Given the variation in water systems across the U.S., we will increase the accuracy of our service area approximations by creating distinct methodologies based on the type of water system. For example, municipal systems will be matched to municipal census boundaries and mobile home park systems will be matched to point locations in the federal database of all mobile home parks. Investor owned utilities are also a large group of systems for which data are likely available from the private utilities themselves or public utility commissions.

In this first approximation, we have limited resources to accurately approximate service area boundaries, and there are trade-offs between the number of systems and the overall population we may be able to accurately approximate. Nearly 90% of the water systems in the U.S. serve less than 10,000 people and more than half serve less than 500 people. Focusing on large water systems would require the least time to provide data for the greatest population but would leave small rural systems behind. We aim to strike a balance in our approach.

For longevity and upkeep, EPA and states will need to have an active role in using, supporting, and updating service area boundaries. We encourage states and regulators to share service area boundary data publicly. We are also engaging all regulators to build the value proposition of a national service area database and get stronger buy-in on the final approximation data.

Limitations

There are nearly 50,000 community water systems in the U.S., and their boundaries are unique and complex, so any national approximation method will be imperfect. Without on-the-ground context from regulators and water systems themselves, there is no way to predict exactly where one water system ends and another begins or where households begin to get water from domestic wells on the edge of town.

We are using other existing data sources to estimate service area boundaries, but these other data sources also vary in quality and are limited in their ability to predict the location and extent of water system service area boundaries. For example, public addresses of water system locations may be outside the actual service area, may be PO boxes with no real location information, or may be missing from EPA's database entirely. Using existing census city boundaries for municipal systems is also imperfect, with environmental justice implications. It is uncommon for a water system's boundaries to align perfectly with city limits. Instead, cities may extend water service outside city limits and charge a higher rate for those customers, or there may be pockets within the city where the water system does not provide water for historical reasons. Some water system boundaries in our approximation will inevitably be large circles around a water system address. We acknowledge all the issues with approximating service area boundaries and are committed to creating a map that can be easily improved by regulators and stakeholders with on-the-ground knowledge.

Service area boundaries won't solve all problems. High accuracy will be required to usefully identify households lacking public water infrastructure, and even existing service area boundaries are often not precise enough for this application. To direct Justice40 funding to priority communities, we need to match water systems to census income and demographic data using service area boundaries. However, census data have limitations too. We must be mindful that the highest resolution census data are only available for “block groups” of 600-3,000 people which could potentially lead to mischaracterization of very small water systems (<500 people). Take, for example, a low-income mobile home park serving only 50 people next to a high-income suburb. The census data would report a high median household income for all households in the area, making it more difficult for the mobile home park water system to qualify for grant funding to improve an outdated well or treatment system.
Drinking water supply on Native American Reservations is more complex than in US states

The Safe Drinking Water Act and Clean Water Act did not directly and formally address Native American communities until the 1990s, leading to a deficit of funding for Native water systems compared to non-native communities. Native American populations are still the least likely group in the US to lack access to safe drinking water. Residents may receive drinking water from a reservation utility (e.g. Navajo Tribal Utility Authority), a municipal water system, domestic wells, hauled water, or they may lack access to premised plumbing. This project aims to fill information gaps through interviews and engagement with water leaders across Native American Reservations and qualitative GIS analysis that looks at the overlap of community water system boundaries onto reservations. For example, preliminary geospatial data show Texas water systems serving drinking water to reservations, but conversations with tribal water leaders indicate the reservations are not provided water from the neighboring CWS. A database exists for information on infrastructure within Native American reservations, but the database is not used by all tribes and does not have reporting requirements for water system service areas. There exists an opportunity to improve data quality for tribal water systems and ensure national service area boundary maps do not misrepresent water supply on reservations.

We also recognize the sensitivity around sharing water data created, collected, and owned by tribes. There are concerns that third party use of these data along with census data will not prioritize rural tribes for funding. We aim to better understand these concerns to collect and publish data that will help address the justified concerns of Native Americans.

Current Work and Next Steps

EPIC is working with SimpleLab and other collaborators to develop a national approximation of community water service area boundaries. The first draft national approximation is expected by April 2022.

EPIC is connecting with stakeholders across the water sector to better understand water provision across Native and Non-Native lands, including universities, water associations, law firms, policy centers, government agencies, and tribal resource management departments.

We are collaborating with Internet of Water to enable water systems and regulators to verify, update, and improve boundaries over time. This will build off of the Internet of Water’s tool to easily allow authorized personnel with no GIS experience to update and adjust boundaries.