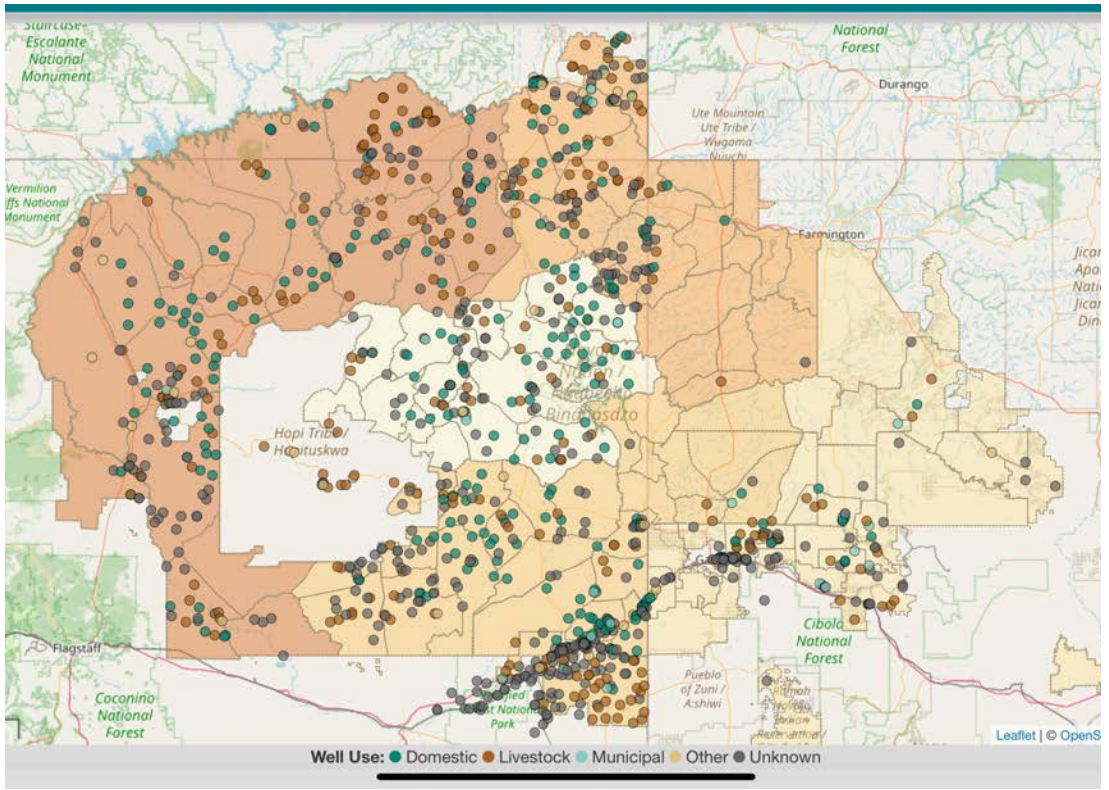
Using Mobile Applications to Visualize Water Quality Data for Underserved Communities: An Overview of the Navajo WaterGIS Application



WRRC Annual Conference, July 2023

Presented By Joseph Hoover

Karletta Chief, Jani Ingram, Randy Akee, Daniel Beene, Nikki Tulley, Ronson Chee, Chris Shuey, Stephanie Carroll, and Johnnye Lewis

Southwest Research and Information

THE UNIVERSITY OF ARIZONA
ARIZONA INSTITUTE FOR RESILIENCE
Indigenous Resilience Center

ARIZONA
Agnese Nelms Haury
Program in Environment and Social Justice

Addressing community water quality concerns in unregulated sources

Context

Consumption of unregulated drinking water poses a public health concern because:

- No requirements for water quality testing (Backer and Tosta, 2011)
- Undetected contaminants – trace metals, radionuclides, microbial (DeSimone et al., 2009)
  - Metals exposure associated with:
    - Kidney and cardiovascular disease, diabetes, neurocognitive disorders and a variety of cancers

Objective

- Reach across institutional silos to consolidate and use water quality data for research and community engagement

Approach

- Collect available results, metadata, quality control
- Harmonize data and store in a relational geospatial database
- Statistical analysis using left-censored methods and spatial statistics/GIS
- Architecture informed by Indigenous Data Sovereignty Principles

Compiled water quality results from numerous sources

Water quality data collected by:

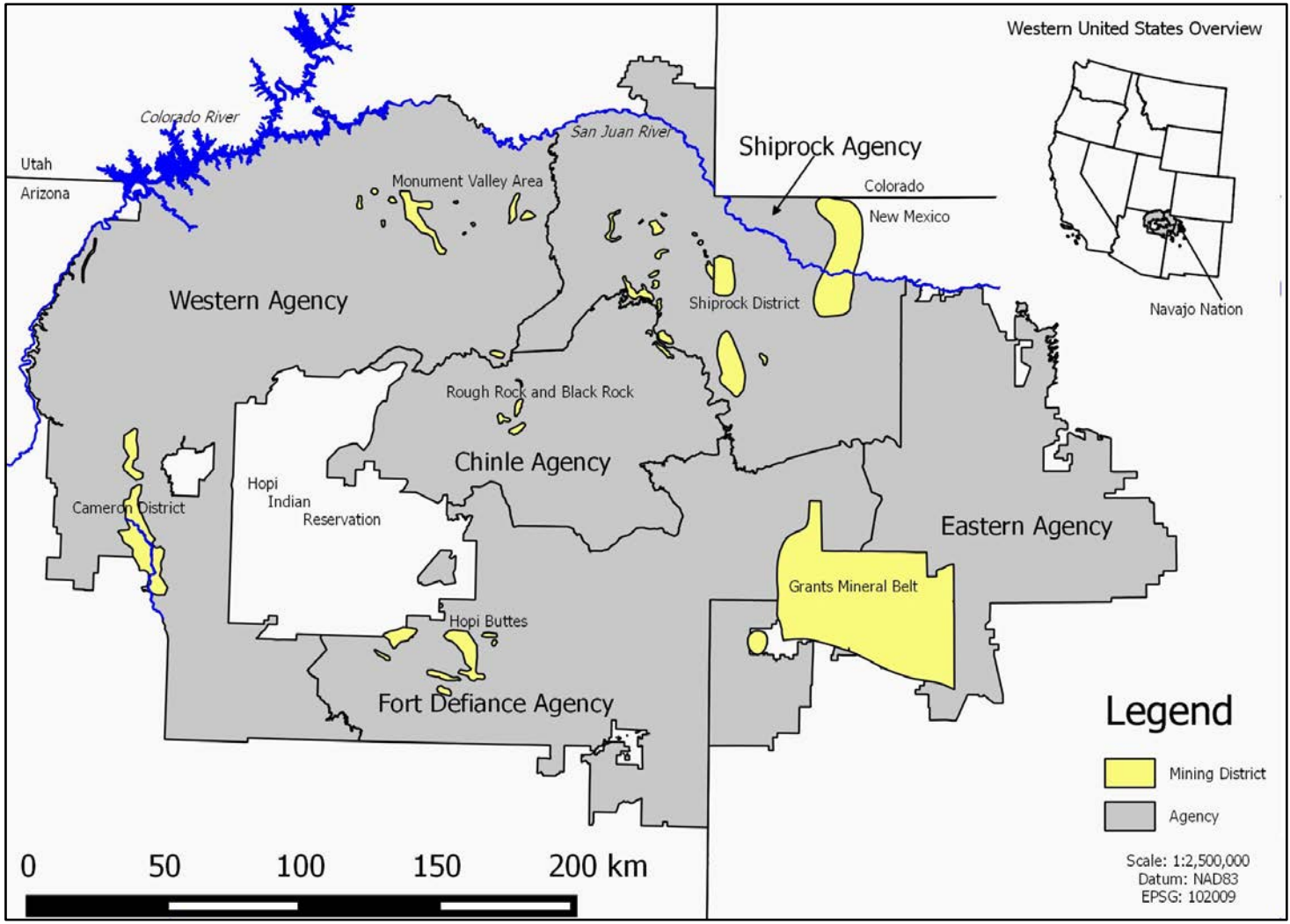
DEI
DINÉ ENVIRONMENTAL INSTITUTE

Navajo Nation Environmental Protection Agency

USGS
science for a changing world
U.S. Geological Survey

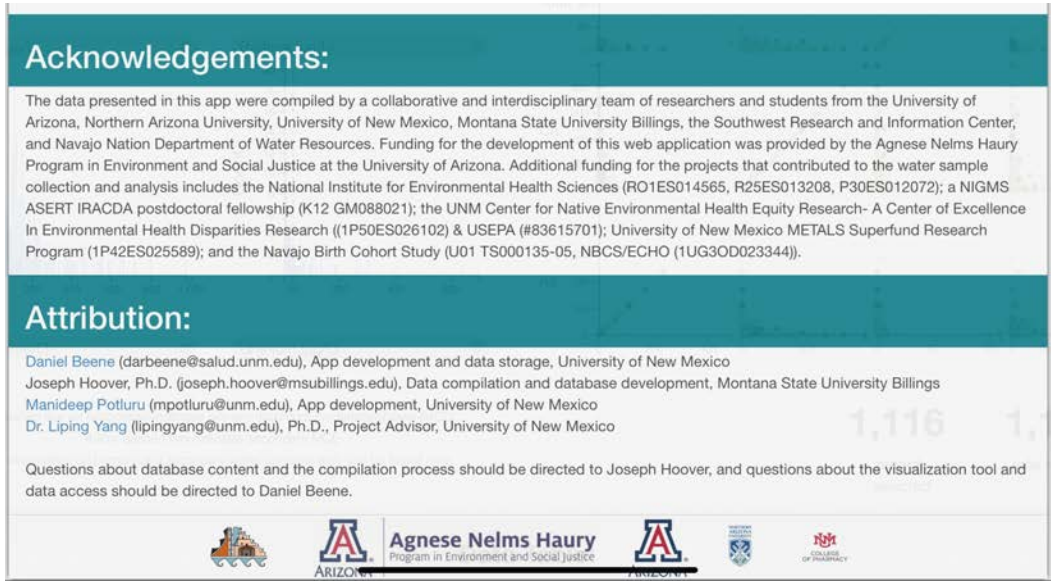
SOUTHWEST RESEARCH AND INFORMATION CENTER

CDC
Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™



Result: >70,000 chemical observations for 1,000+ UWSs, including quality control data for most

Developed a webGIS to provide data access and visualization



Acknowledgements:

The data presented in this app were compiled by a collaborative and interdisciplinary team of researchers and students from the University of Arizona, Northern Arizona University, University of New Mexico, Montana State University Billings, the Southwest Research and Information Center, and Navajo Nation Department of Water Resources. Funding for the development of this web application was provided by the Agnese Nelms Haury Program in Environment and Social Justice at the University of Arizona. Additional funding for the projects that contributed to the water sample collection and analysis includes the National Institute for Environmental Health Sciences (RO1ES014565, R25ES013208, P30ES012072); a NIGMS ASERT IRACDA postdoctoral fellowship (K12 GM088021); the UNM Center for Native Environmental Health Equity Research- A Center of Excellence In Environmental Health Disparities Research ((1P50ES026102) & USEPA (#83615701); University of New Mexico METALS Superfund Research Program (1P42ES025589); and the Navajo Birth Cohort Study (U01 TS000135-05, NBCS/ECHO (1UG3OD023344)).

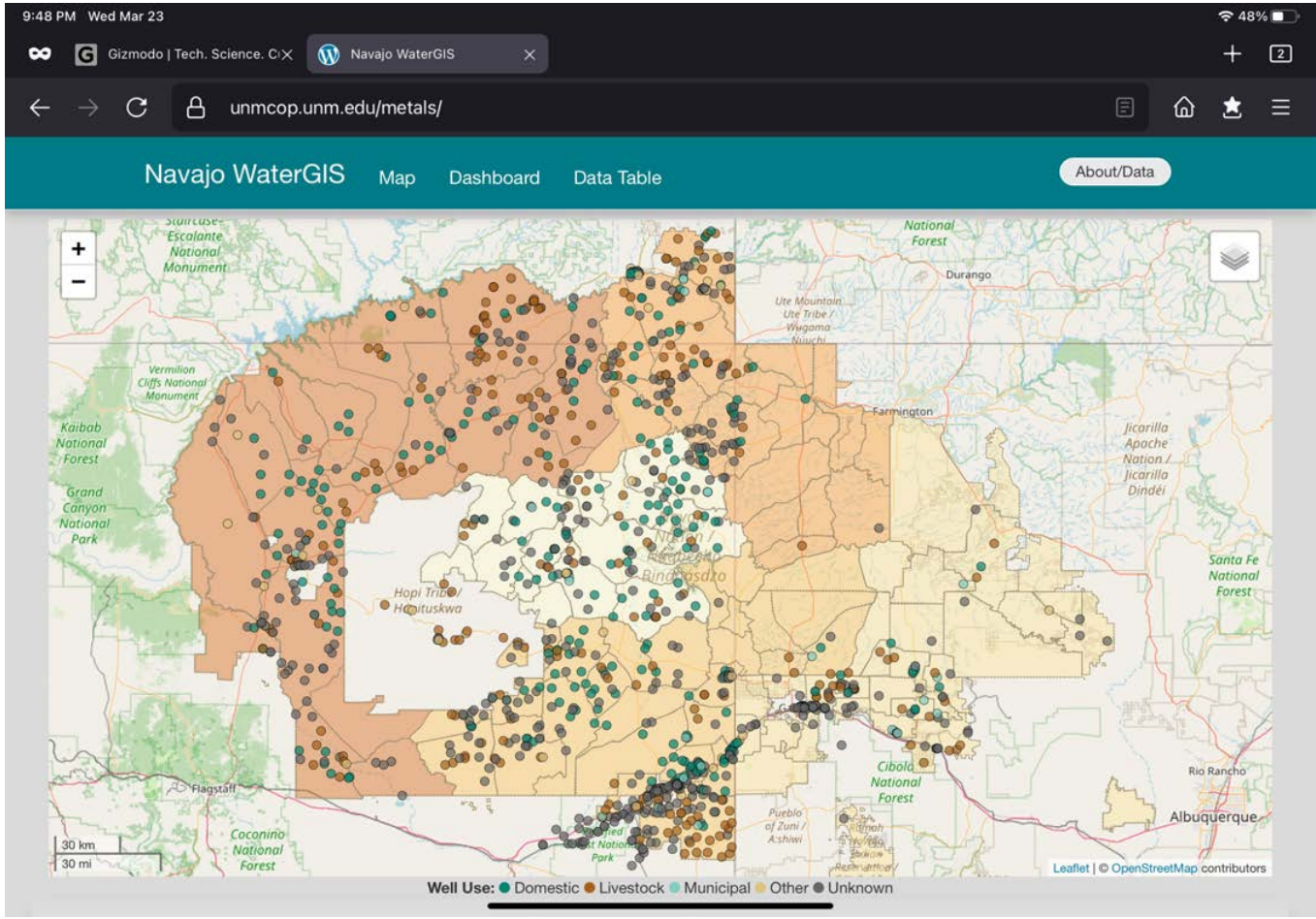
Attribution:

Daniel Beene (darbeene@salud.unm.edu), App development and data storage, University of New Mexico
Joseph Hoover, Ph.D. (joseph.hoover@msubillings.edu), Data compilation and database development, Montana State University Billings
Manideep Potluru (mpotluru@unm.edu), App development, University of New Mexico
Dr. Liping Yang (lipingyang@unm.edu), Ph.D., Project Advisor, University of New Mexico

Questions about database content and the compilation process should be directed to Joseph Hoover, and questions about the visualization tool and data access should be directed to Daniel Beene.

Agnese Nelms Haury
Program in Environment and Social Justice

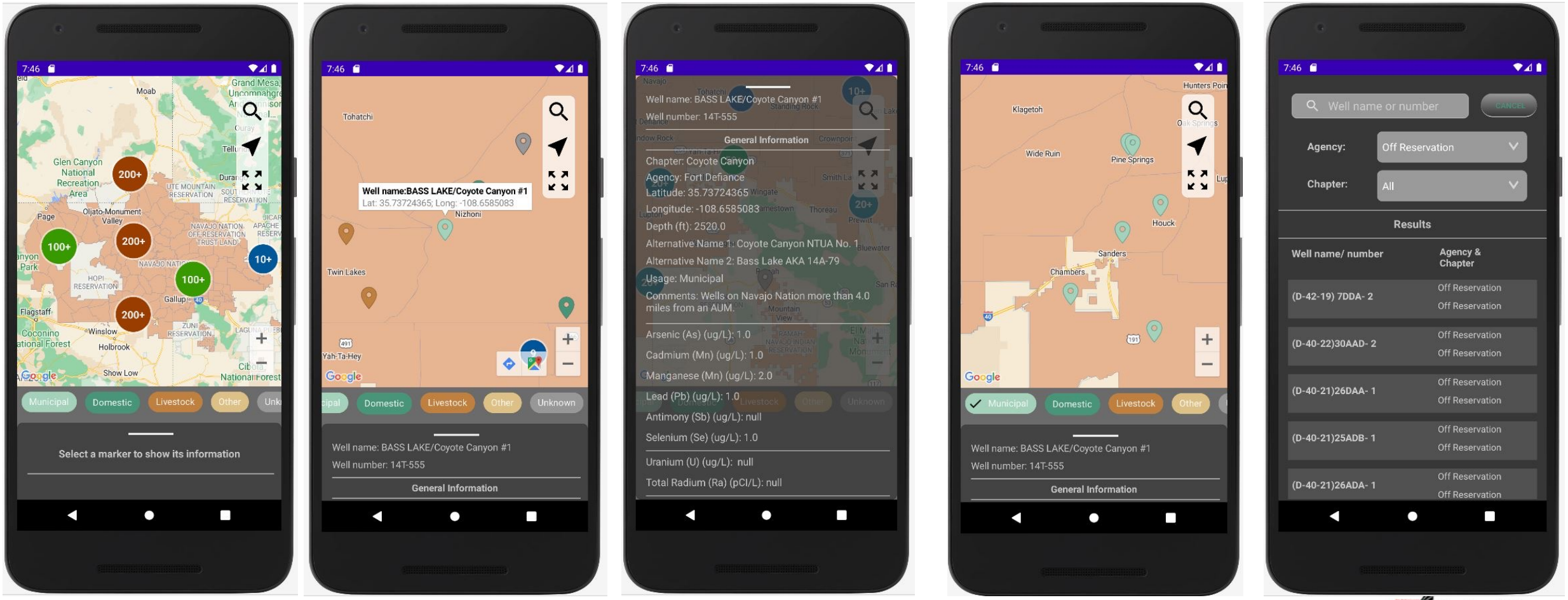
https://unmcop.unm.edu/metals/



Key Features

- WebGIS application with spatial representation of tested UWSs
- Summary statistics for all available analytes per UWS
- Data repository - https://doi.org/10.6073/pasta/061a105b3ebb79d9e4d53192f070b97f

We are creating a mobile application for these water quality data



Bunker Hill Community College
imagine the possibilities

Next Steps

- Continue developing these tools and deploy
- Conduct evaluation of tool effectiveness and impact on environmental health literacy for a variety of end users
- Track utility of the compiled dataset and use it to develop new community-based projects

Thank you!

Funding supporting this work includes National Institutes of Health ((NIMHD and NIEHS) 9P50MD015706-06) and Agnese Nelms Haury Foundation, University of Arizona