

Water Quality on the Navajo Nation and how it has contributed to the spread of COVID-19

Presented by:

Steven Chischilly, Sr.
Associate Professor
Environmental Science and Natural Resources

&

Abhishek RoyChowdhury, PhD
Assistant Professor
Environmental Science and Natural Resources
Navajo Technical University



**Sustainable
Water Resources**
Complex Challenges. Integrated Solutions

Water Institute Symposium

February 22-23, 2022 | J. Wayne Reitz Union | Gainesville, FL

UF | Water Institute
UNIVERSITY OF FLORIDA



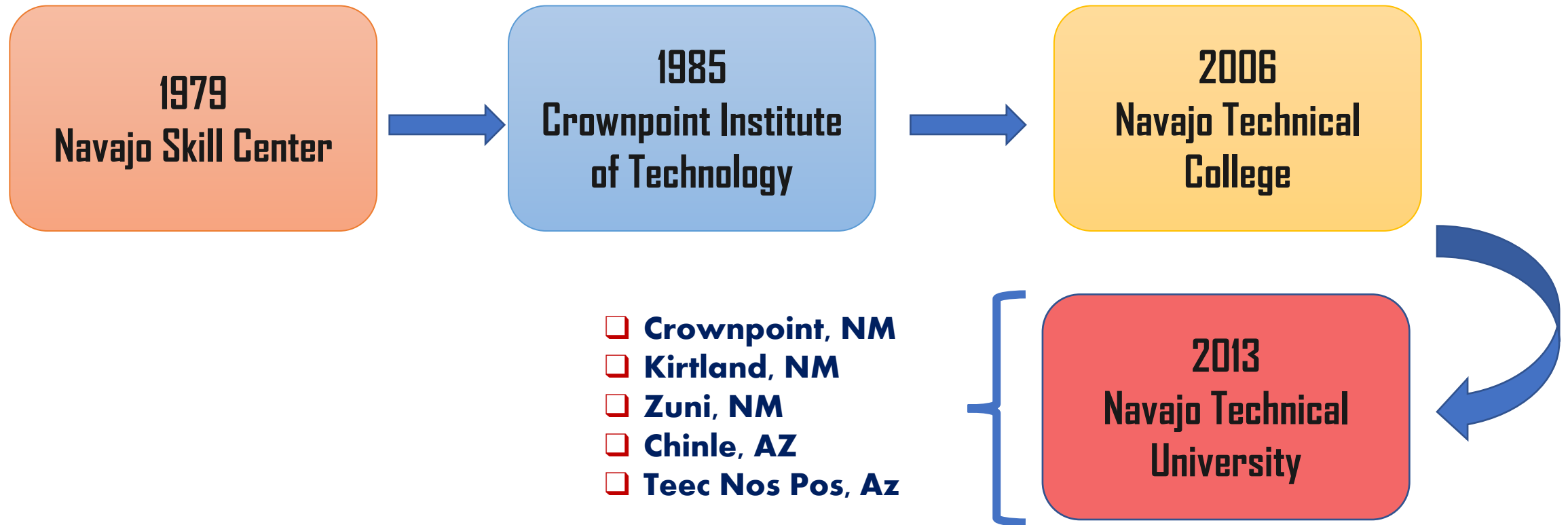
Learn more about the symposium at:
conference.ifas.ufl.edu/waterinstitute

Who we are?

Navajo Technical University (NTU) is one of the premier institutions of higher education in the nation, providing a unique balance between science and technology and between culture and tradition. Much of what guides NTU's success is our mission and our identity rooted in the Diné Philosophy of Education.



Our Journey



[The first university established on the Navajo Nation]

The Navajo Nation

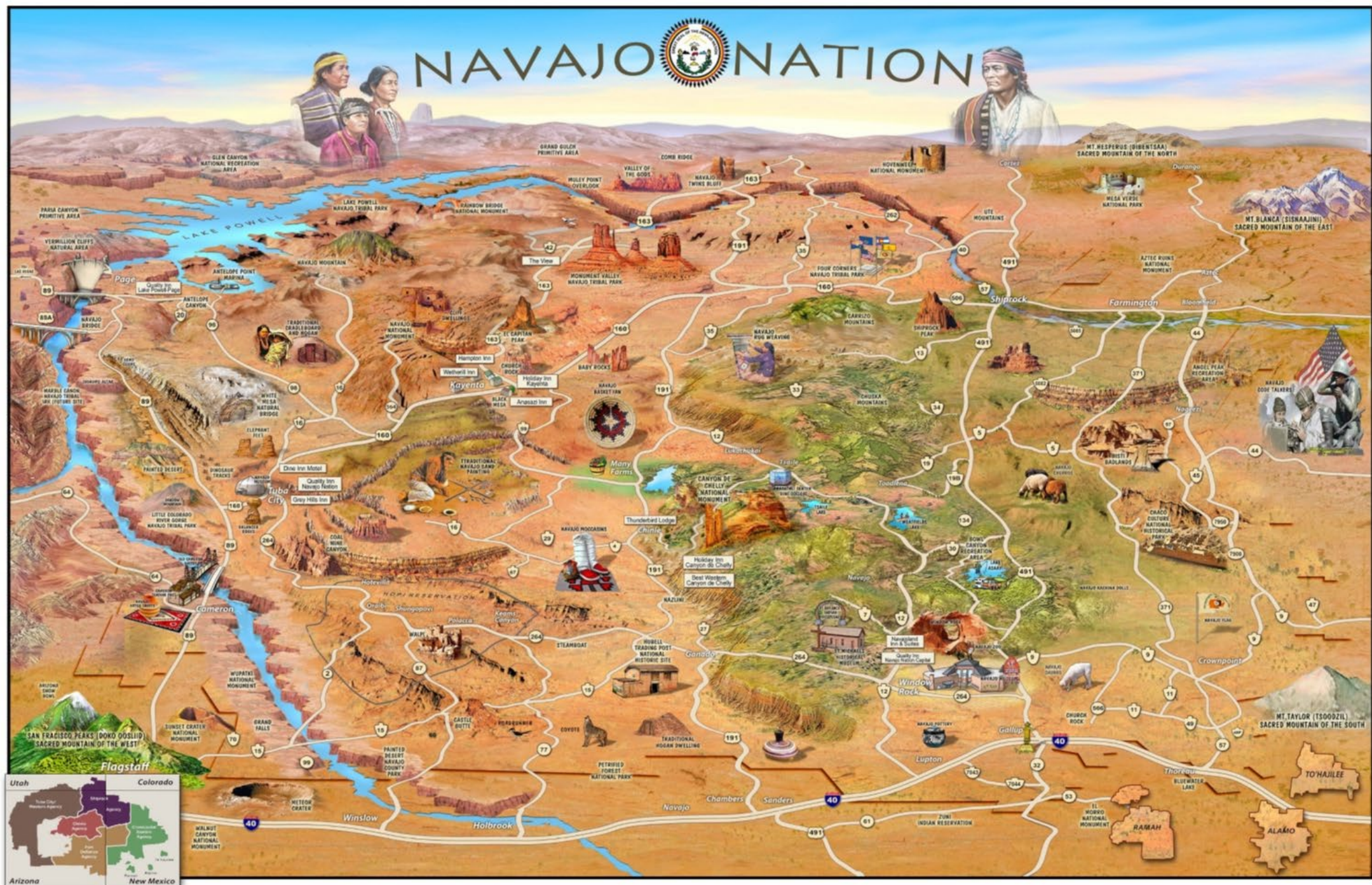


- ❖ The largest Native American Tribe in the U.S.
- ❖ 27,000 square miles of unparalleled beauty.
- ❖ Diné Bikéyah, or Navajoland, is larger than 10 of the 50 states in America.
- ❖ Rich History of the Navajoland
- ❖ The Navajo Code Talkers- WW II



Source: Discover Navajo: The Official Navajo Nation Visitor Guide. <http://www.discovernavajo.com>





Source:
David
Rumsey
Historical
Map
Collection,
2012
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Jean-Louis
Rheault

Navajo Nation- Family Values



Source:
<https://www.visitarizona.com>

Source: NIH, 2019

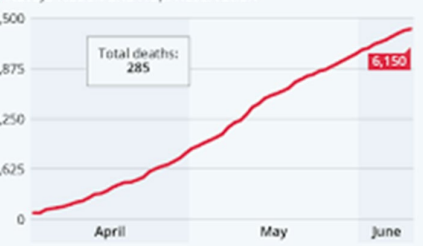


Source: prosperitynow.org



**Native Americans
Hit Hard by COVID-19**

Number of COVID-19 cases across
Navajo Nation and Hopi Reservation



Data for some dates unavailable
Source: Navajo Times

statista



**CORONAVIRUS
PANDEMIC**

GLOBALLY

TOTAL CASES

4,775,000

DEATHS

317,515

IN THE UNITED STATES

TOTAL CASES

1,500,753

DEATHS

90,312

SOURCE: JOHNS HOPKINS UNIVERSITY

CORONAVIRUS PANDEMIC

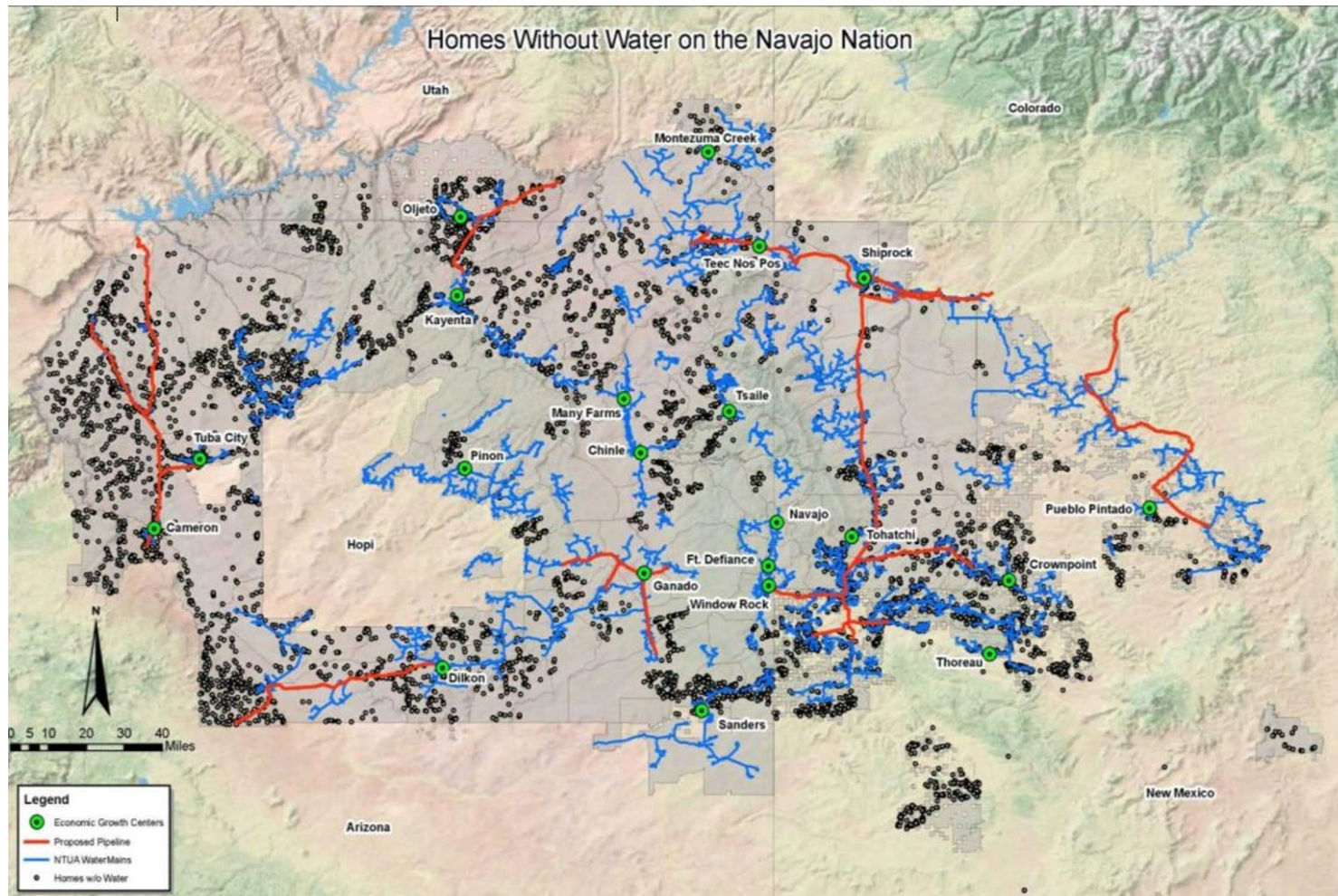
NAVAJO NATION HAS HIGHEST INFECTION RATE PER CAPITA IN THE U.S.



1:55 PM PT

THE LEAD



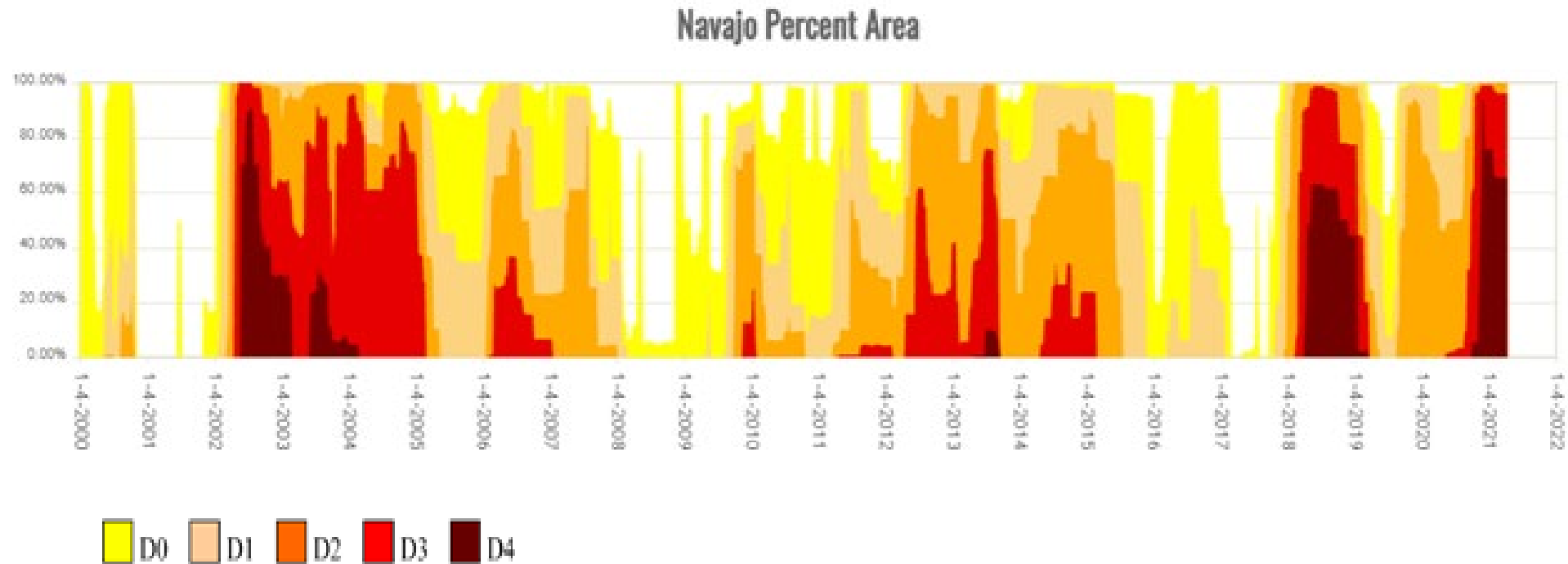


[Source: The Salt Lake Tribune. July 25, 2020]

Homes Without Water on the Navajo Nation

- 30% of the homes on the Navajo Nation have no direct access to public water systems
- The households haul water long distances to provide water for their families
- Navajo households are 19 times more likely than white households to be without running water

Water scarcity on Navajo Nation- Natural Causes



The U.S. Drought Monitor (USDM) data showing drought conditions in the Navajo Nation since 2000. Where D0: Abnormally Dry; D1: Moderate Drought; D2: Severe Drought; D3: Extreme Drought; and D4: Exceptional Drought.

(Source: The National Drought Mitigation Center, University of Nebraska-Lincoln, 2021)

Water scarcity on Navajo Nation - Anthropogenic Causes

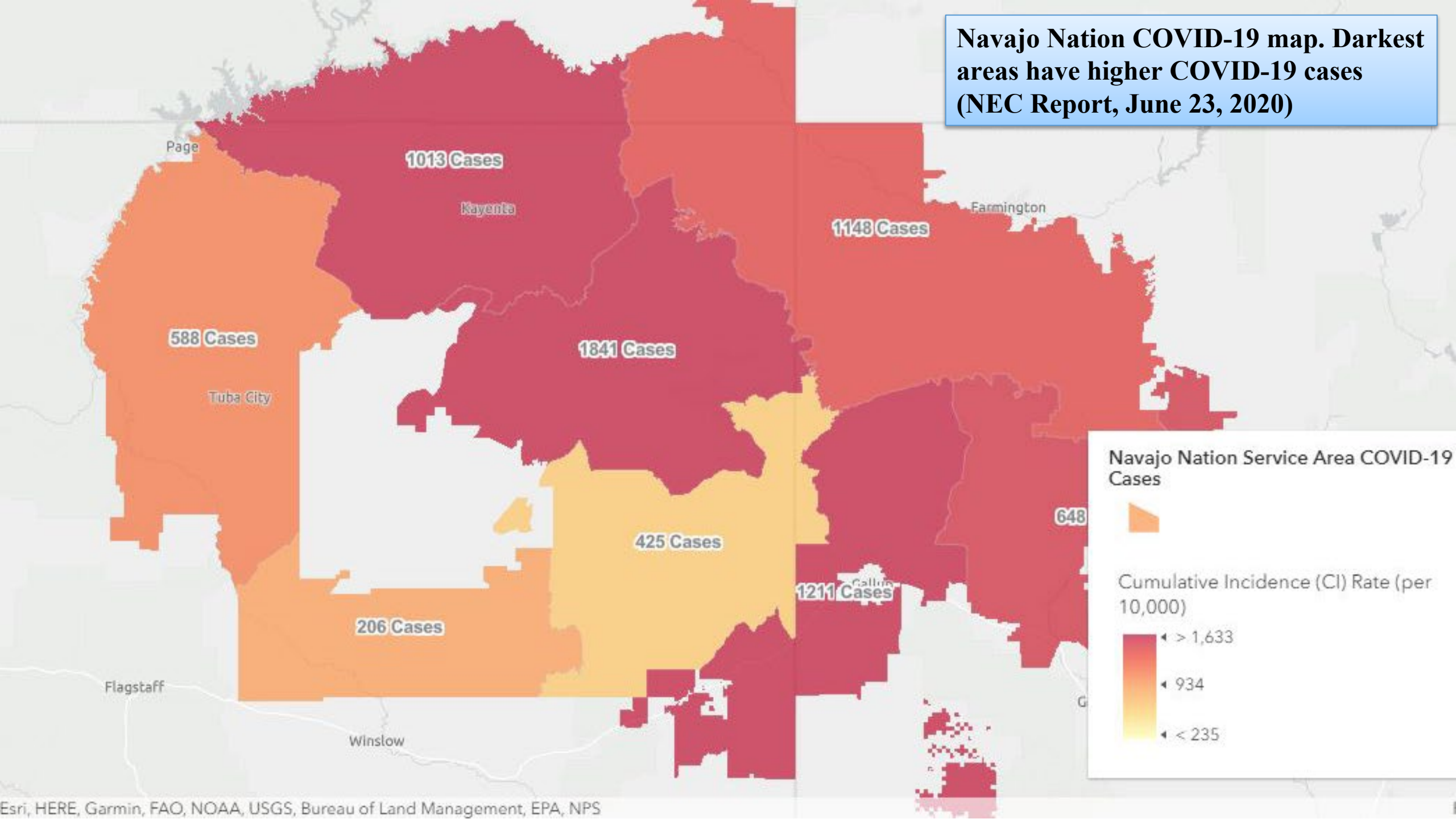
- Long history of mining on the Navajo Nation:
 - Gold, Copper, Lead, and Silver since the mid-1800s
 - Uranium since the early 1900s
 - Coal since the 1960s
- Elevated levels of metals resulted from these mining activities in groundwater and surface water
- Unregulated wells and springs are contaminated with high levels of metals.

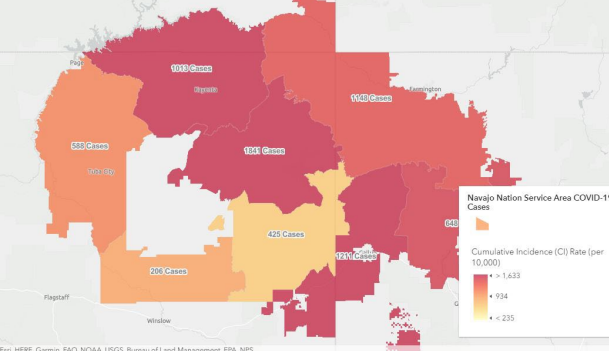


Water Scarcity on Navajo Nation

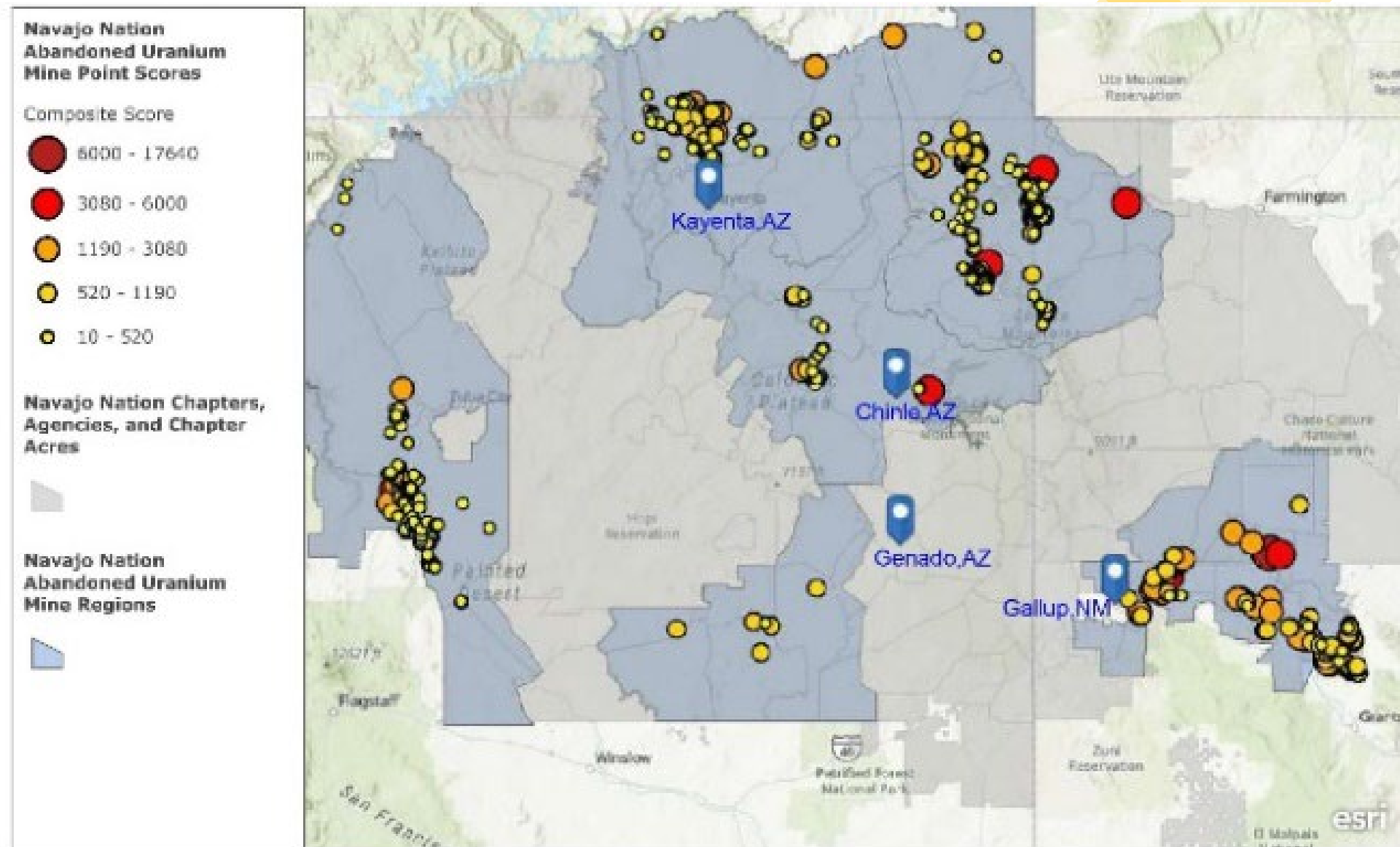


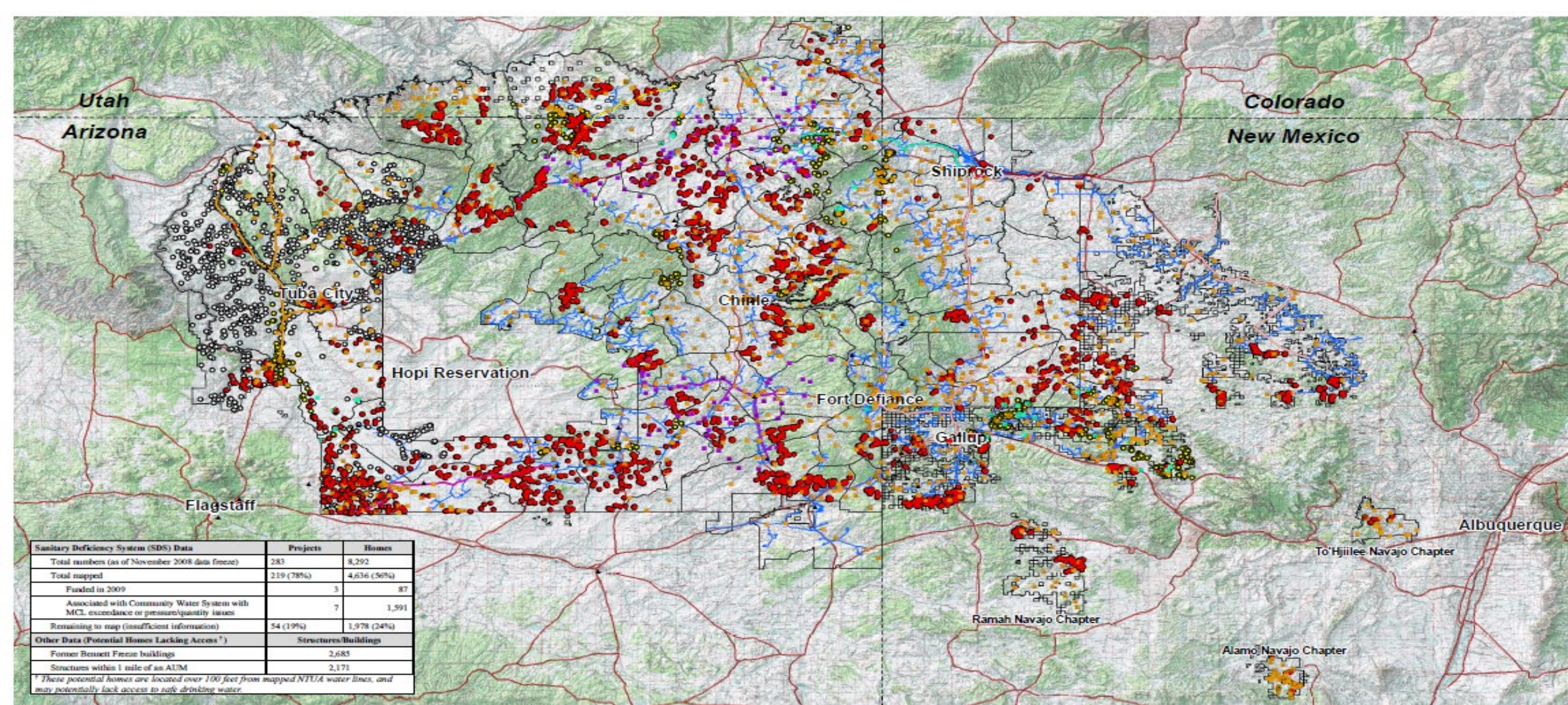
Navajo Nation COVID-19 map. Darkest areas have higher COVID-19 cases (NEC Report, June 23, 2020)





Abandoned Uranium Mines (AUM) in Navajo Nation with U.S. EPA Hazard Ranking System Composite Scores.



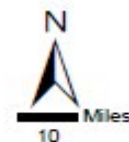


Legend

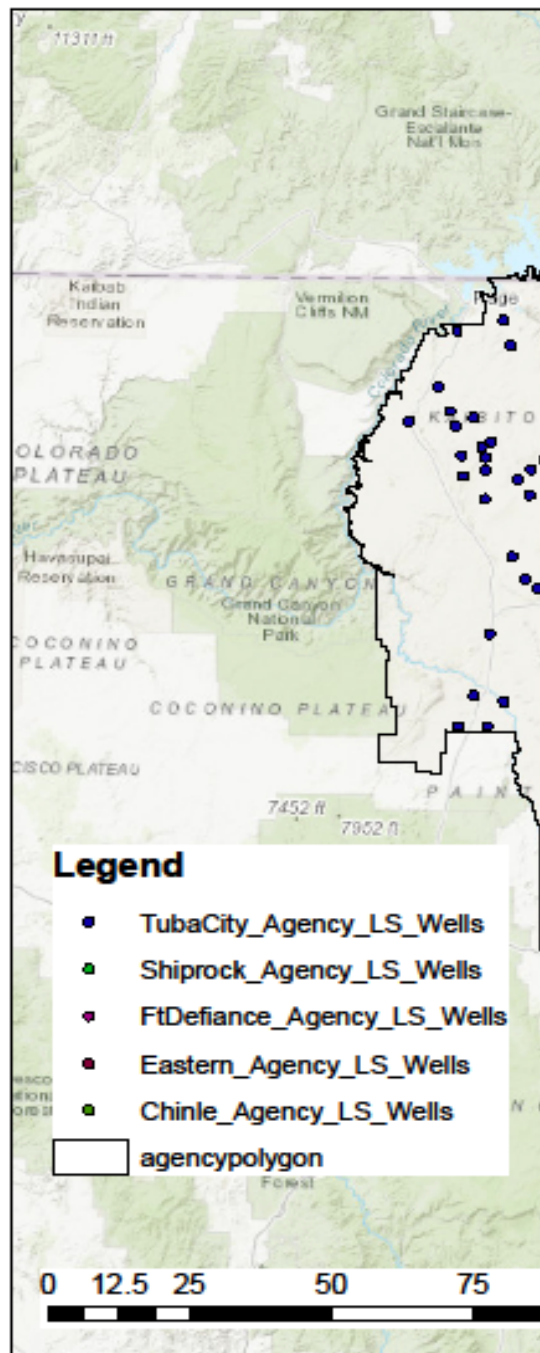
- State Line
- Navajo Chapter
- Major Roadway
- Home without Access to Safe Drinking Water and/or Basic Sanitation *
- Former Bennett Freeze Home Potentially not Connected to a Public Water System (PWS) **
- Structure within 1 Mile of Abandoned Uranium Mines (potential homes without connection to a PWS) **
- EPA Sampled Well
- CDC Sampled Well
- Regulated Safe Drinking Water Hauling Point
- Unregulated Livestock Watering Point
- Navajo Tribal Utility Authority Existing Pressurized Water Main
- Proposed Western Navajo Pipeline Project
- Proposed Navajo-Gallup Water Supply Project

- Proposed Utah Water Supply Project
- Proposed Leupp-Dillon Water Supply Project
- Proposed Ganado Groundwater Supply Project
- Proposed Farmington-Shiprock Water Supply Project
- Proposed Shiprock to Sweetwater Pipeline Project

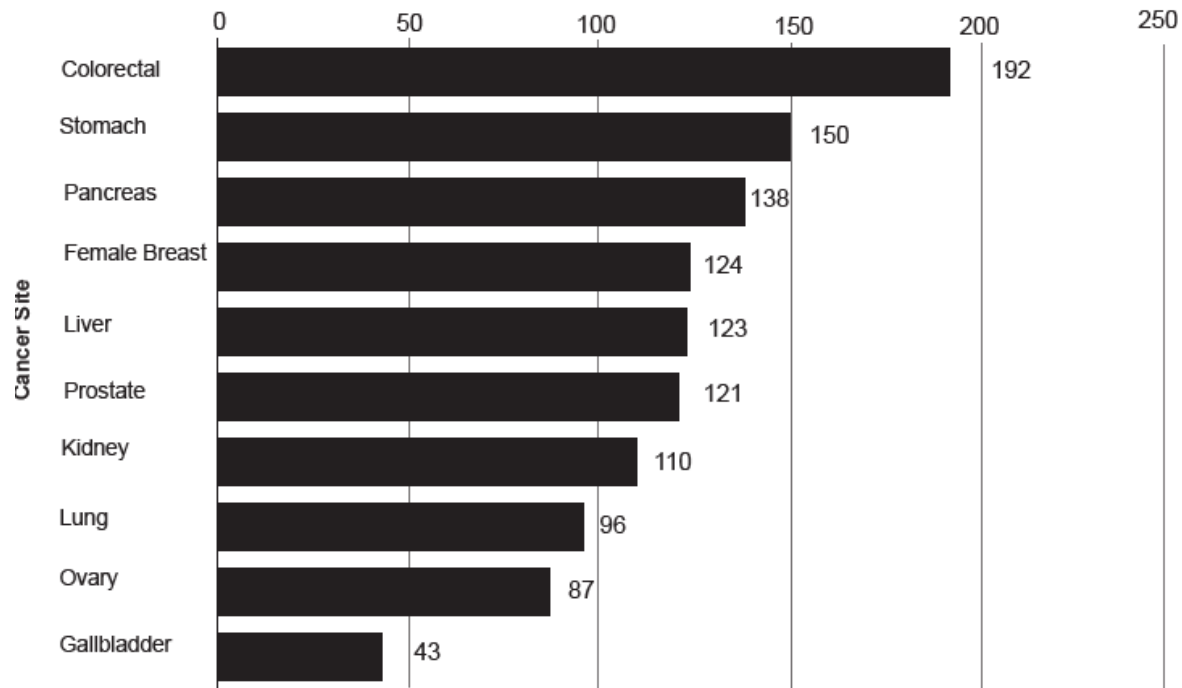
* This map does not represent all the known homes lacking access to safe drinking water or basic sanitation in the IHS database. These are only those that had sufficient information to be mapped at the time of this study.
 ** Former Bennett Freeze homes, and Structures within 1 mile of Abandoned Uranium Mines were sorted to identify potential homes without access to safe drinking water and/or basic sanitation.



Navajo Nation:
Homes without Access
to Basic Sanitation Facilities

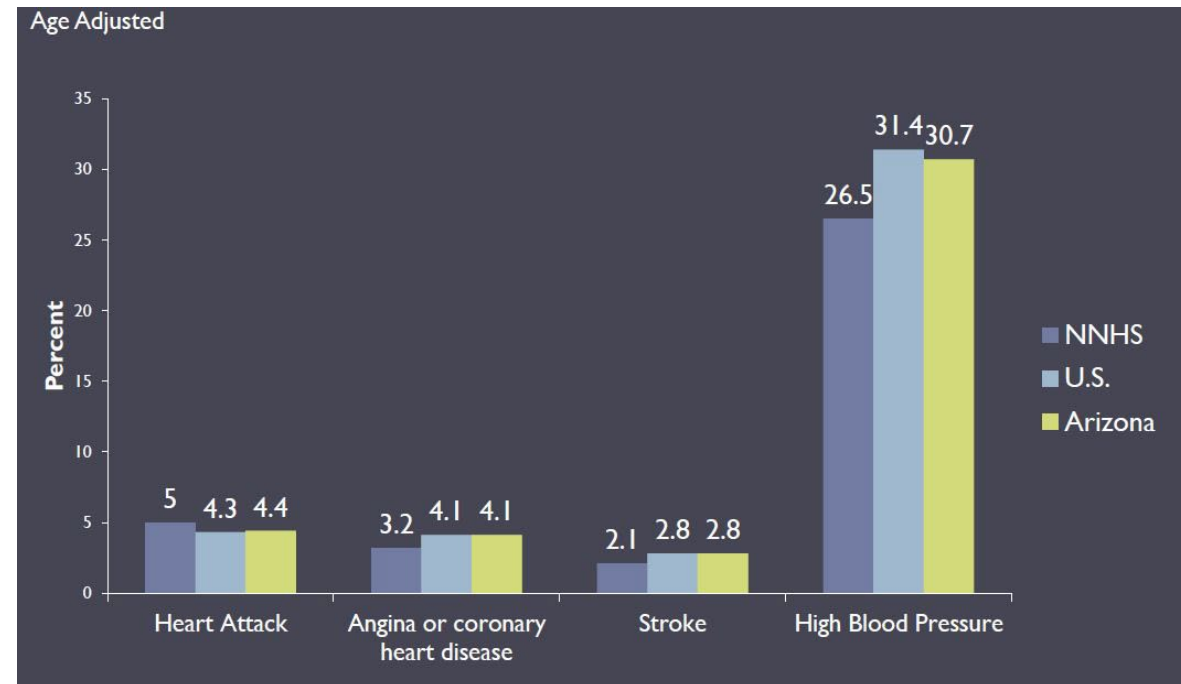
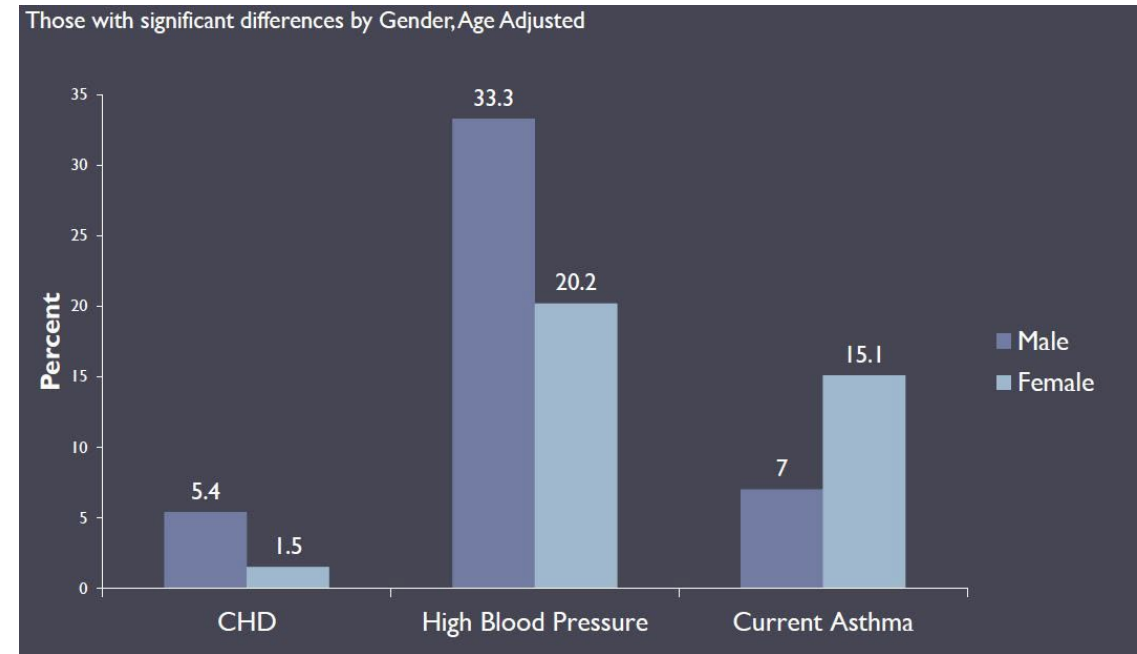


Navajo Population: Pre-existing Health Issues



Leading causes of death by cancer site among the Navajo,
counts of deaths 2005-2013, all ages

Source: The Navajo Epidemiology Center



COVID-19 and Pre-existing Health Conditions

- ❖ While the estimated risk of death from COVID-19 is 1.4% in the general population, the risk is much higher in patients with comorbidities (WHO, 2020).
 - ❑ **Cardiovascular disease (13.2%)**
 - ❑ **Diabetes (9.2%)**
 - ❑ **Respiratory disease (8.0%)**
- ❖ In a study of COVID-19 hospitalized patients in New York, comorbidities included **hypertension (56.6%), obesity (41.7%), diabetes (33.8%), asthma (9%) and COPD (5.4%)** (Richards et al. 2020).

RESTÓRE

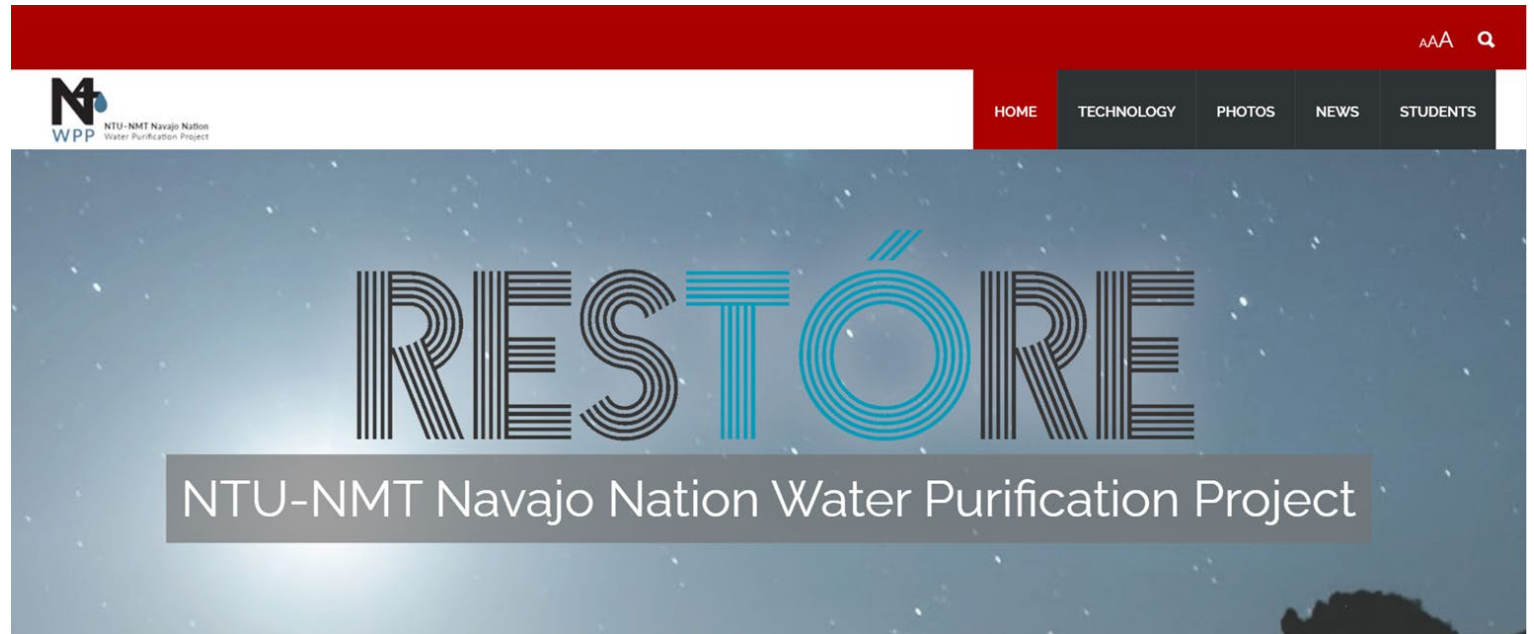
Restoring vital water on the Navajo Nation.



NTU-NMT Navajo Nation
Water Purification Project



www.navajotech.edu/Restore



NTU-NMT Navajo Nation Water Purification Project (N⁴WPP)

www.navajotech.edu/restore

Overview

The N⁴WPP is a joint endeavor to install water filtration equipment testing facilities on the Navajo Nation. These sites will be used to train students to test water quality and maintain filtration units to provide sustainable long-term water resources suitable for agriculture and livestock use, cleaning, and eventually clean drinking water.

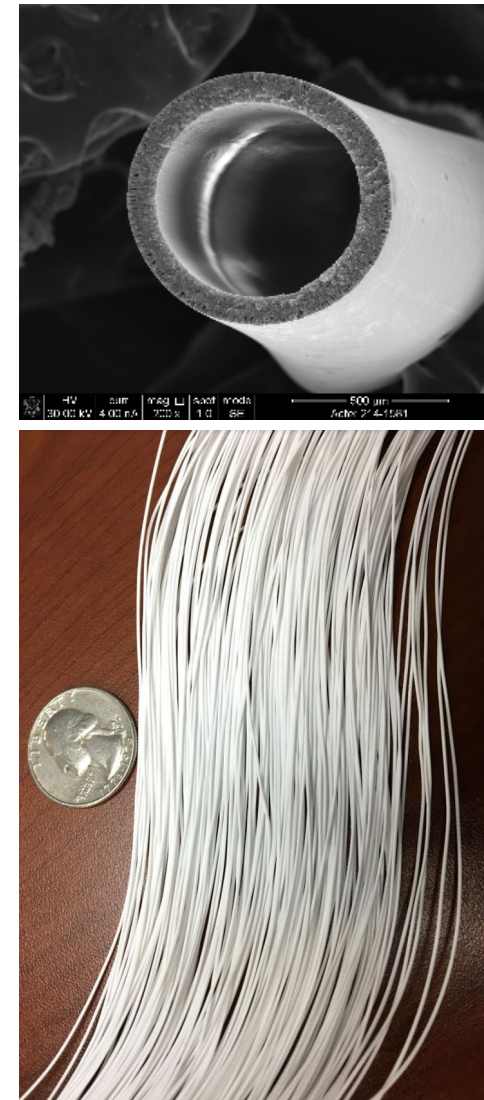


NTU-NMT Navajo Nation
Water Purification Project



The Water Purification Technology

- The filtration technology to be used was developed by research scientists at the Petroleum Recovery Research Center (PRRC) at New Mexico Tech (NMT).
- It involves the application of a hollow fiber membrane-based direct contact membrane distillation (DCMD) process.
- Unusable water will be channeled through the bundles of hollow fiber membrane to filter out salt, phosphates, nitrates, and metals.
- Previous studies showed the efficiency of this process for desalinization.

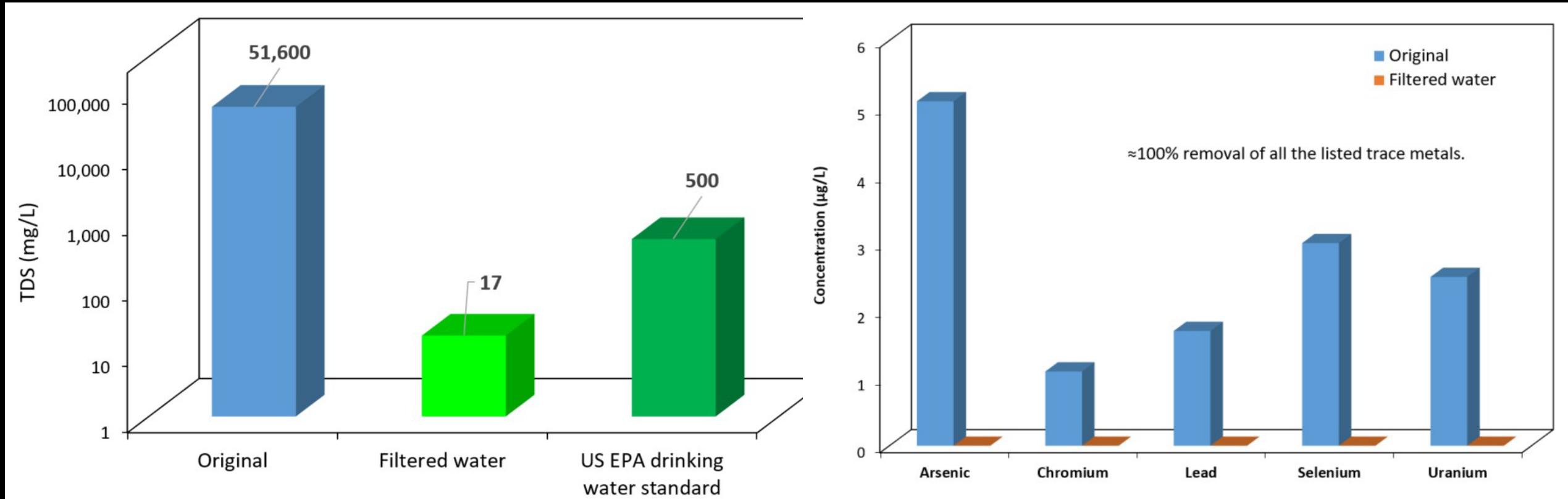


The hollow fiber membrane



The filtration unit

Preliminary Results- Lab Study



Proposed Work Plan

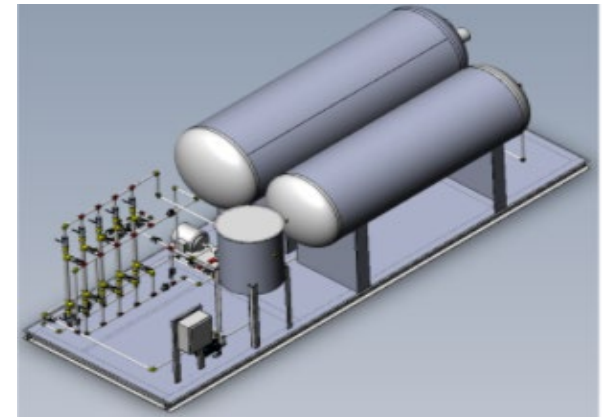
I) Site selection:

- NTU students are working with the N⁴WPP team members.
- Initially, water at windmills, tanks and wells are being collected and analyzed at New Mexico Bureau of Geology and Mineral Resources at NMT.
- We are proposing to install 10 filtration units across the Navajo Nation.

Proposed Work Plan

II) Installation of the filtration unit(s):

- Obtaining required permits.
- Unit installation and continuous monitoring.
- Students are involved in all aspects of permitting, installation, operation, maintenance, and monitoring.



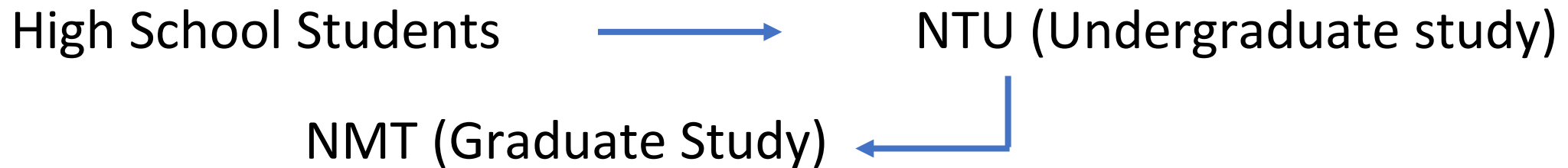
Proposed Work Plan

III) Long-term Goals:

- Educating members of the community about water quality, the filtration system, system maintenance, and simple repairs for long-term use.
- Install similar filtration units across the Navajo Nation.
- Transfer the ownership of the units to the community.
- Train a workforce with the knowledge to guide decisions and long-term water planning as well as the skills to operate and maintain these systems

Educational Component

- Local workforce building: Local students are being trained in database management, water sampling and analysis techniques, unit operations, and data analysis.
- Classroom learning are being augmented with field sampling, planning, critical thinking, and communication skills.
- NTU and NMT is in the process of making an education model:



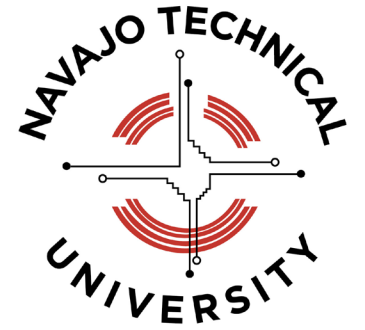


NTU students are receiving hands-on training

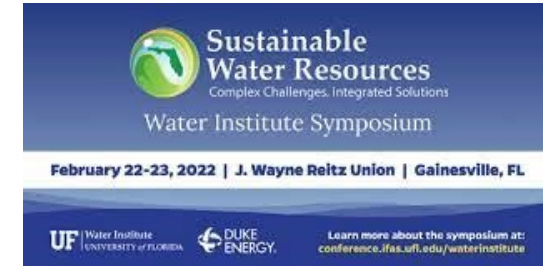
Public Outreach Component

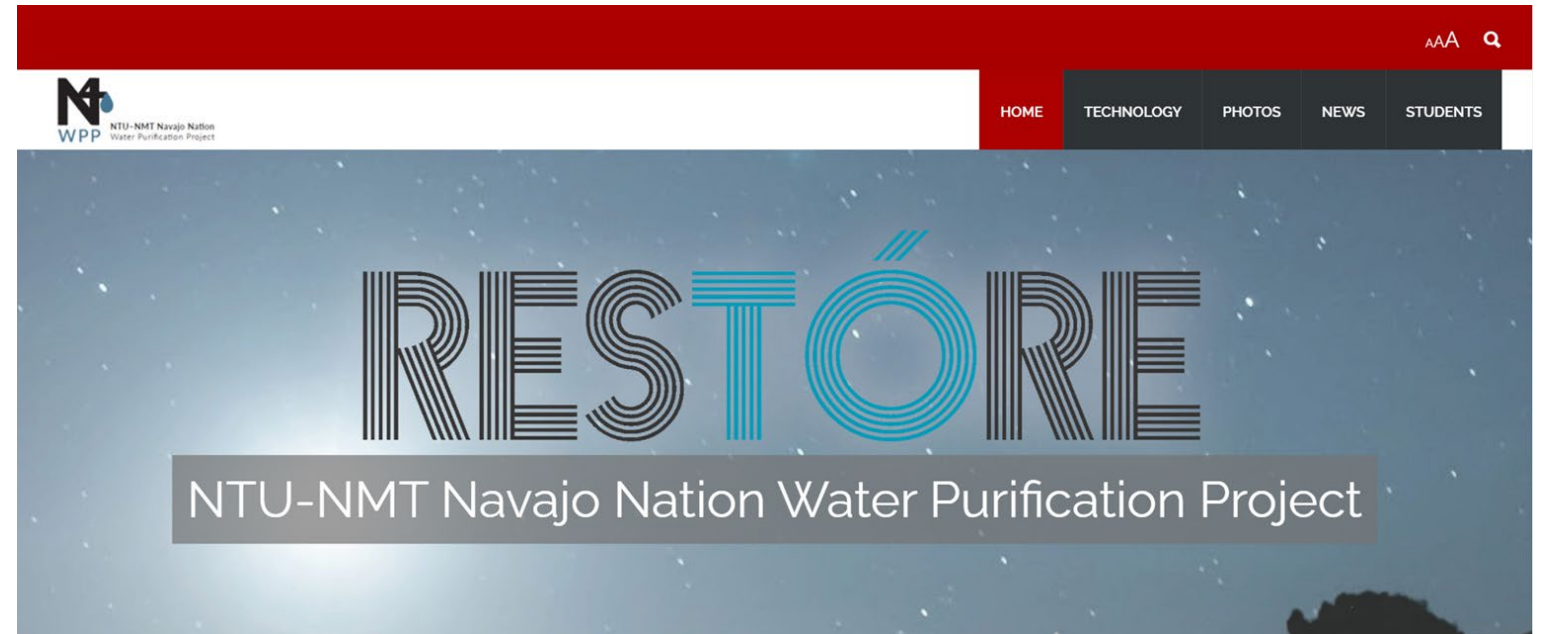
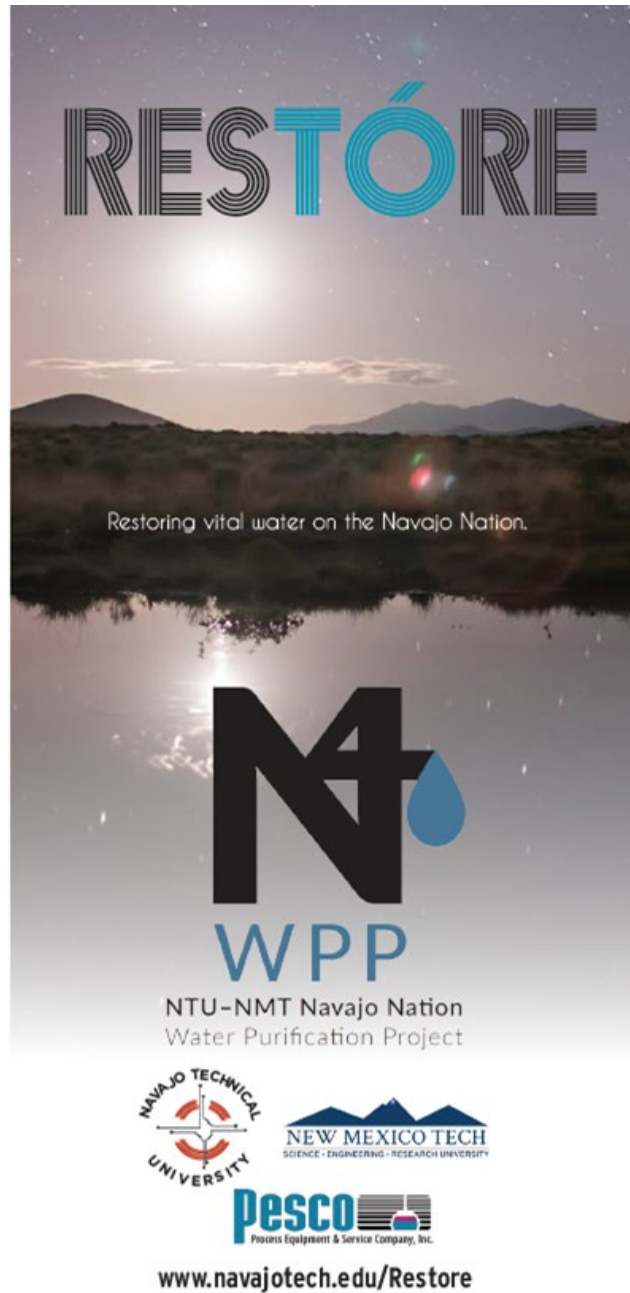
- Students are participating in outreach activities to Navajo Nation communities
- The team is attending local Chapter House meetings and is organizing water symposiums (April 23, 2022) and other public outreach campaigns.
- Educate members about water quality, the filtration system, system maintenance and simple repairs.
- Build capacity among community members to maintain the systems long-term.
- Foster the importance of **Tó éí ííná** (Water is Life).

Acknowledgement



- ❖ University of Florida Water Institute
- ❖ Dr. Perry R. James
- ❖ Felicia Chischilly and Clifford Anderson (Film making and drone footage)
- ❖ N⁴WPP Team
- ❖ Our Students
- ❖ Our Sponsors: USDOl-BIA, USDOl-OSMRE, NMOGA, Intera, Alfred P. Sloan Foundation





Questions?

schischilly@navajotech.edu; aroychowdhury@navajotech.edu

Thank You

Please visit: <http://www.navajotech.edu/restore/>