

RESTÓRE

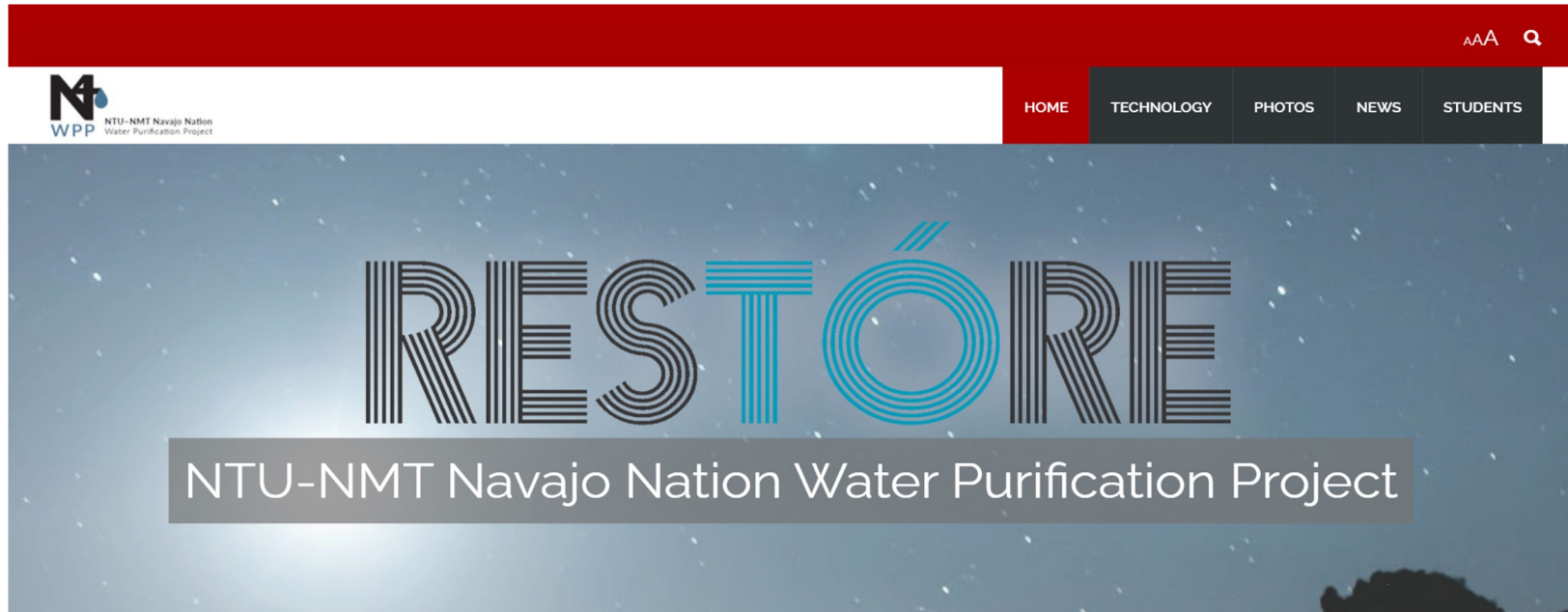
Restoring vital water on the Navajo Nation.



NTU-NMT Navajo Nation
Water Purification Project



www.navajotech.edu/Restore



NTU-NMT Navajo Nation Water Purification Project (N⁴WPP)

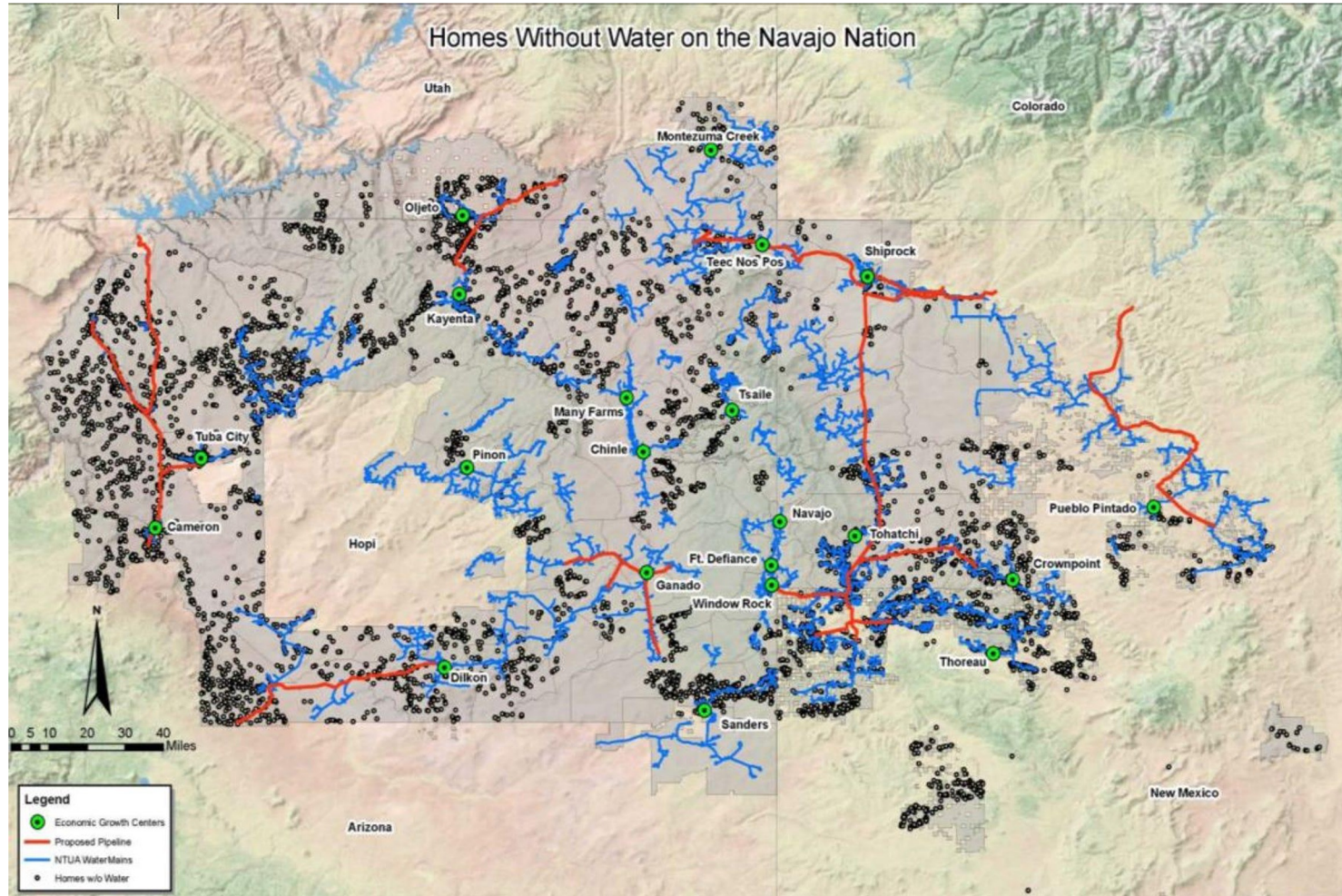
Abhishek RoyChowdhury, PhD
Navajo Technical University

Four Corners Energy Water Innovation Symposium
April 6, 2023

NAVAJO NATION



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

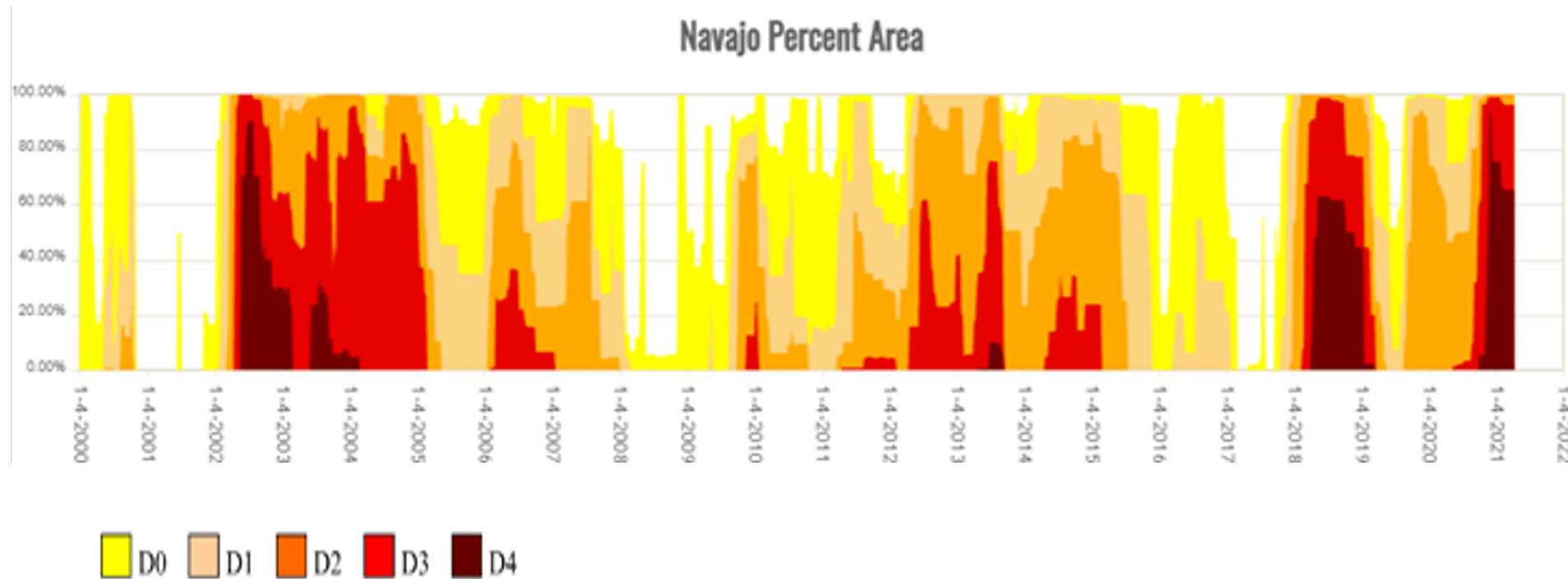


[Source: The Salt Lake Tribune. July 25, 2020]

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)

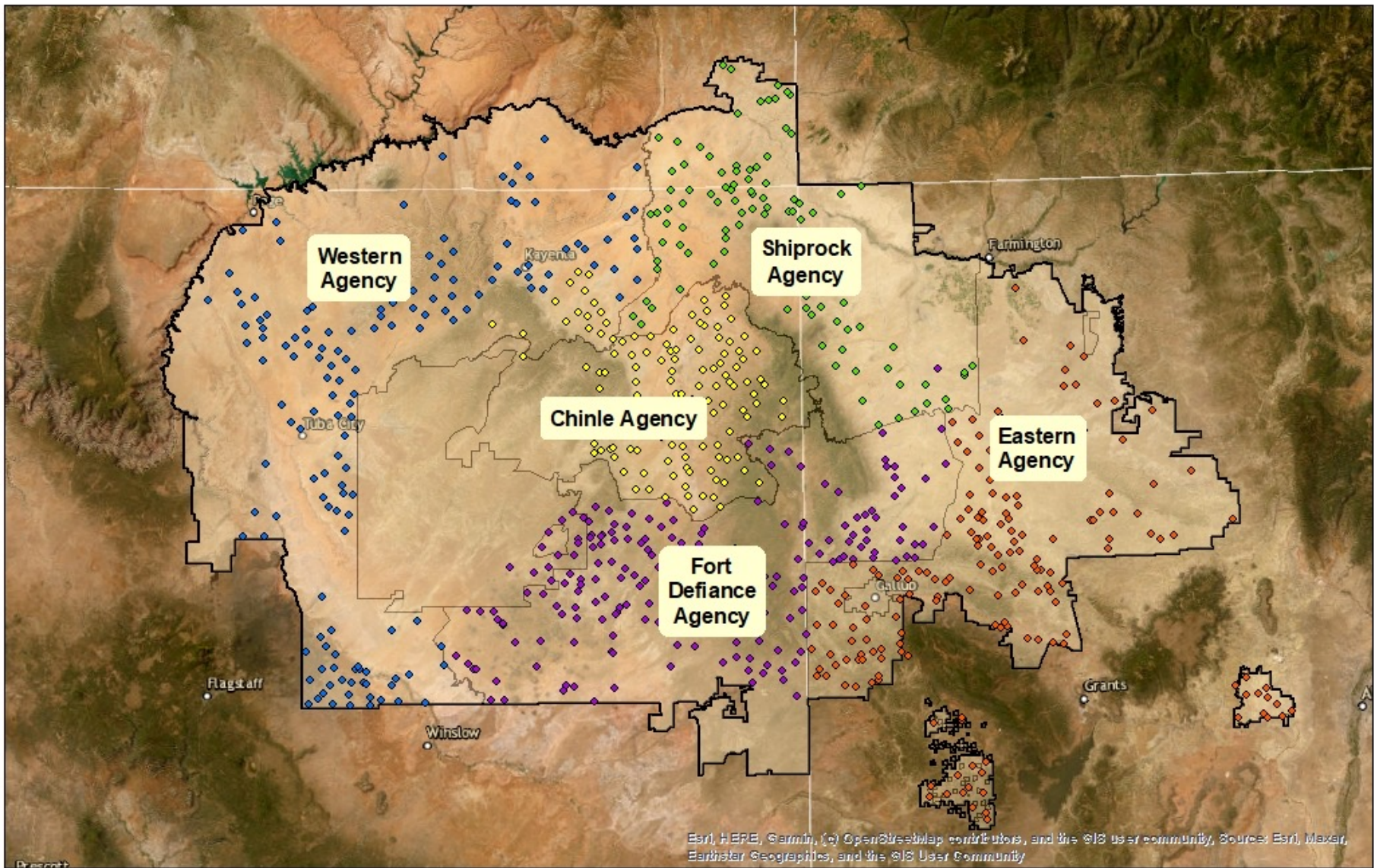
Water scarcity on Navajo Nation - Anthropogenic Causes

- 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





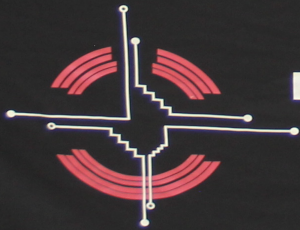
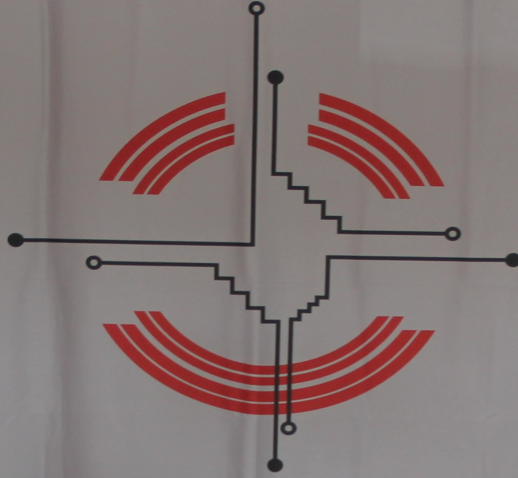
- ◆ Chinle Agency LSW
- ◆ Eastern Agency LSW
- ◆ Fort Defiance Agency LSW
- ◆ Shiprock Agency LSW
- ◆ Western Agency LSW
- agency polygon
- NN polygon

Navajo Nation Agency Livestock Wells (LSW)

0 25 50 100 Miles



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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.

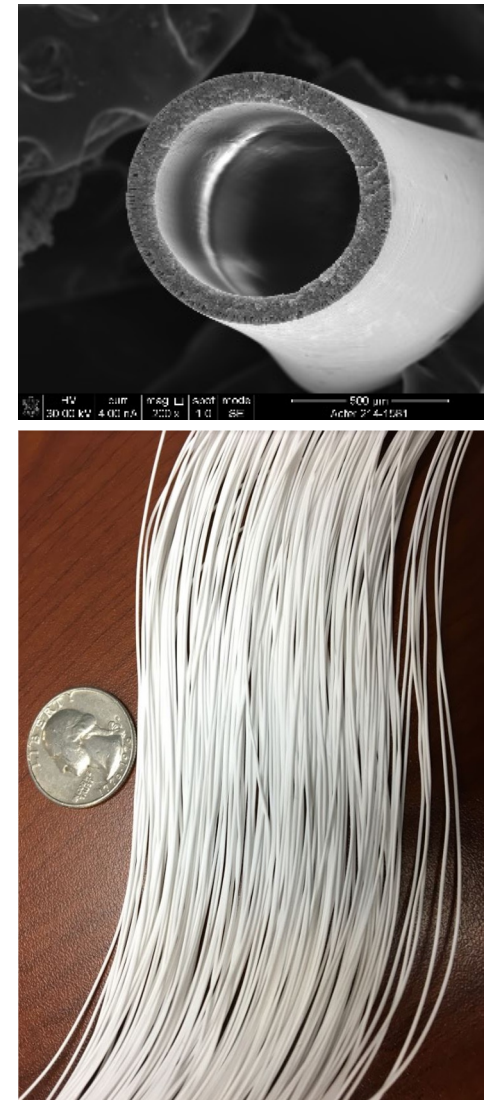


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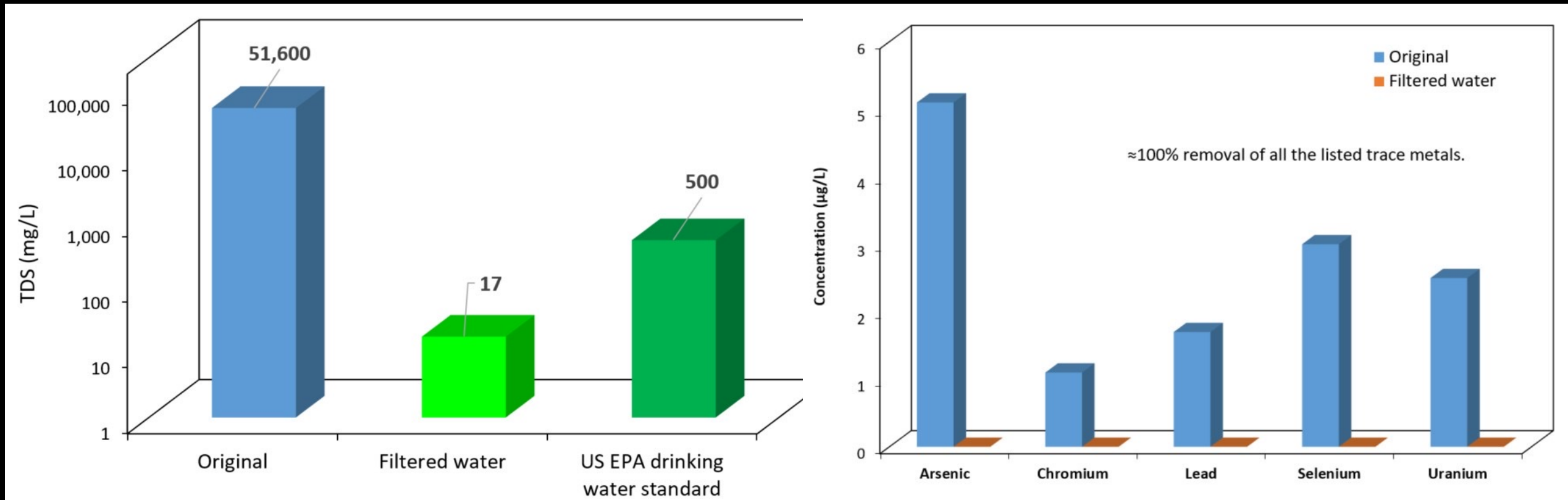
The Water Purification Technology

- 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

Preliminary Results- Lab Study



Ongoing Work Plan

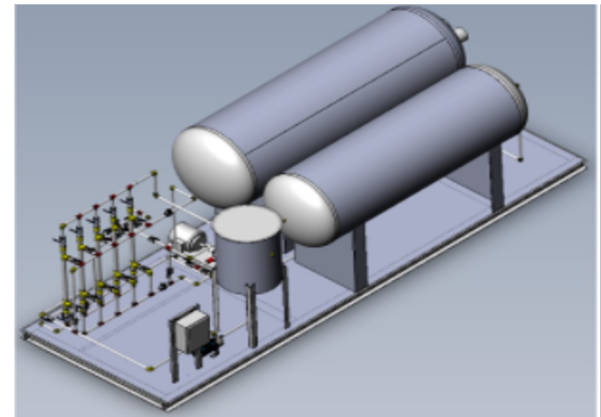
I) Site selection:

- 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.



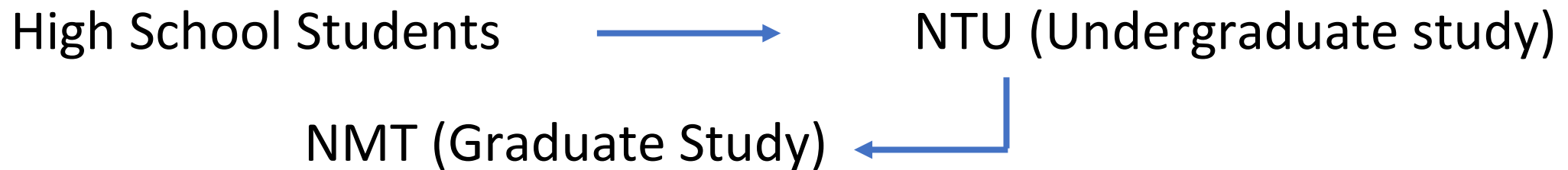
Proposed Work Plan

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 & NMT students are receiving hands-on training

Students are getting trained on public outreach



AISES, 2021



N⁴WPP Water Symposium, 2022

Water Filtration Unit Ready for Operational Testing



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 and other public outreach campaigns.
- Educate members about water quality, the filtration system, system maintenance and simple repairs.
- Foster the importance of **Tó éí ííná** (Water is Life).

N4WPP Water Symposium



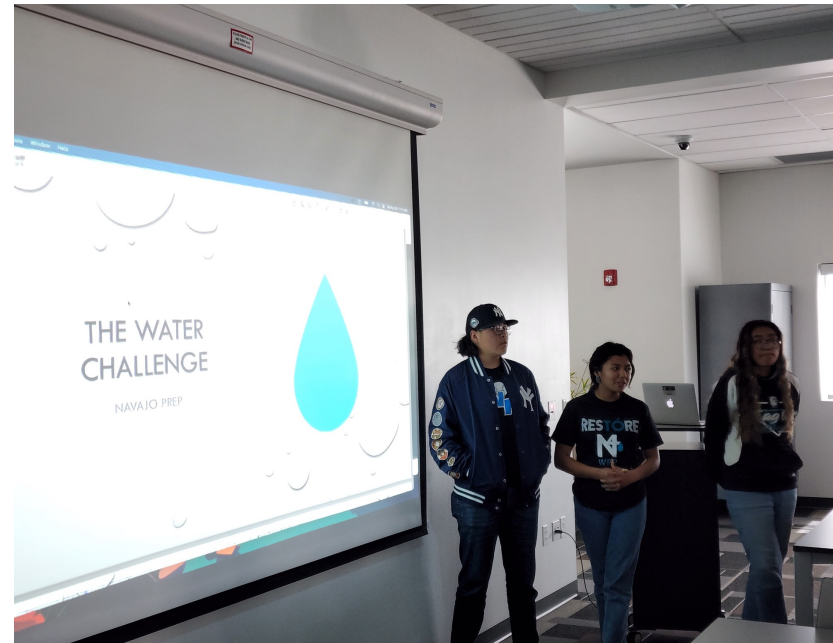
Announcing the 2022 N⁴WPP Water Symposium

The Navajo Tech-New Mexico Tech Navajo Nation Water Purification Project (N⁴WPP) is excited to invite you to the 2022 Water Symposium. Four Corners area high school students are invited to help solve some of the most important water challenges in New Mexico and across the Navajo Nation. Students will have the opportunity to hear from leading water conservation experts, talk to college students presenting their research in a poster session, and get hands on experience with the problem by participating in the Water Challenge. Prizes and awards include cash and scholarships.

When: April 23, 2022

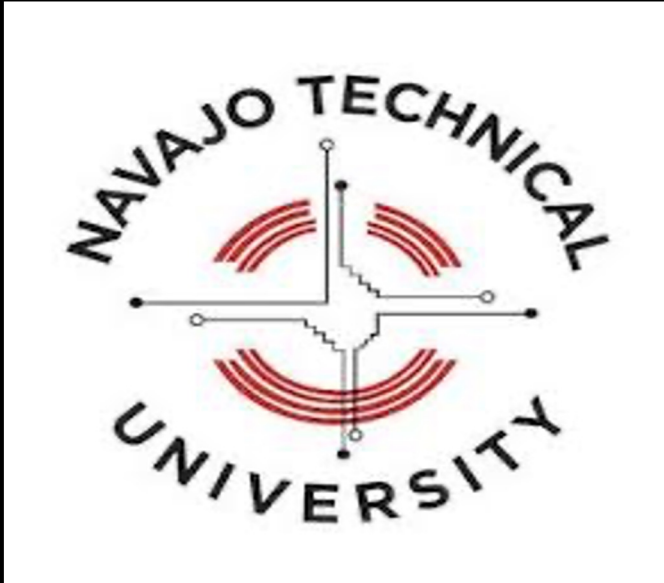
Where: Farmington High School - Farmington, NM

N⁴WPP Water Symposium





Database Management Platform



- ❑ A collaborative effort is ongoing to develop a secure database management platform at NTU to store water data.



- ❑ We are following Navajo Nation's data sovereignty policies.



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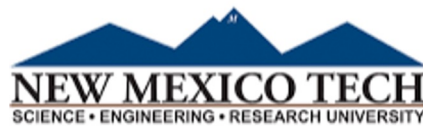
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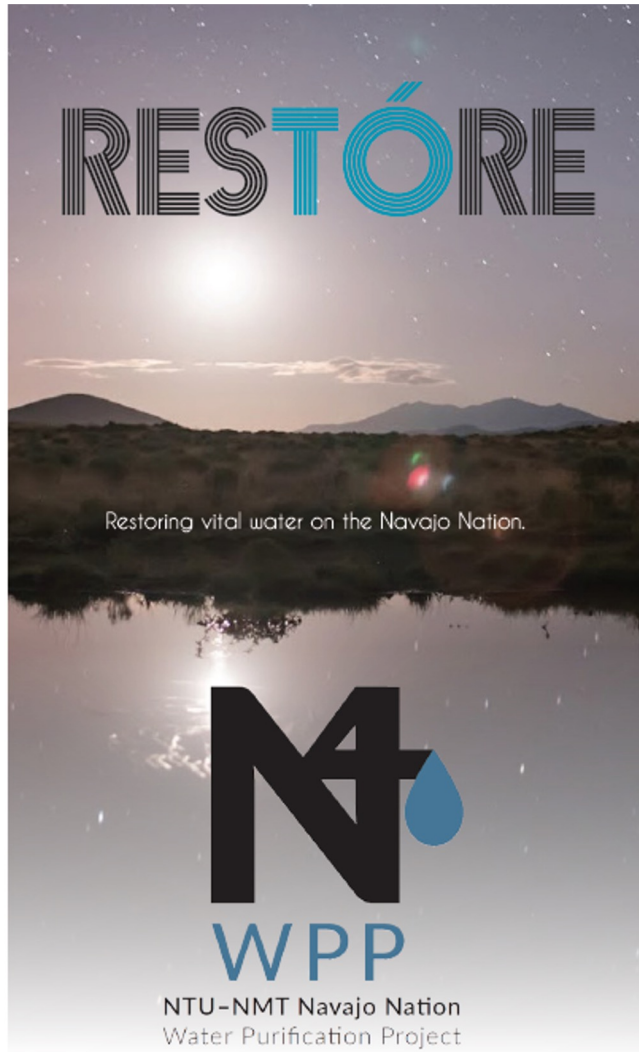
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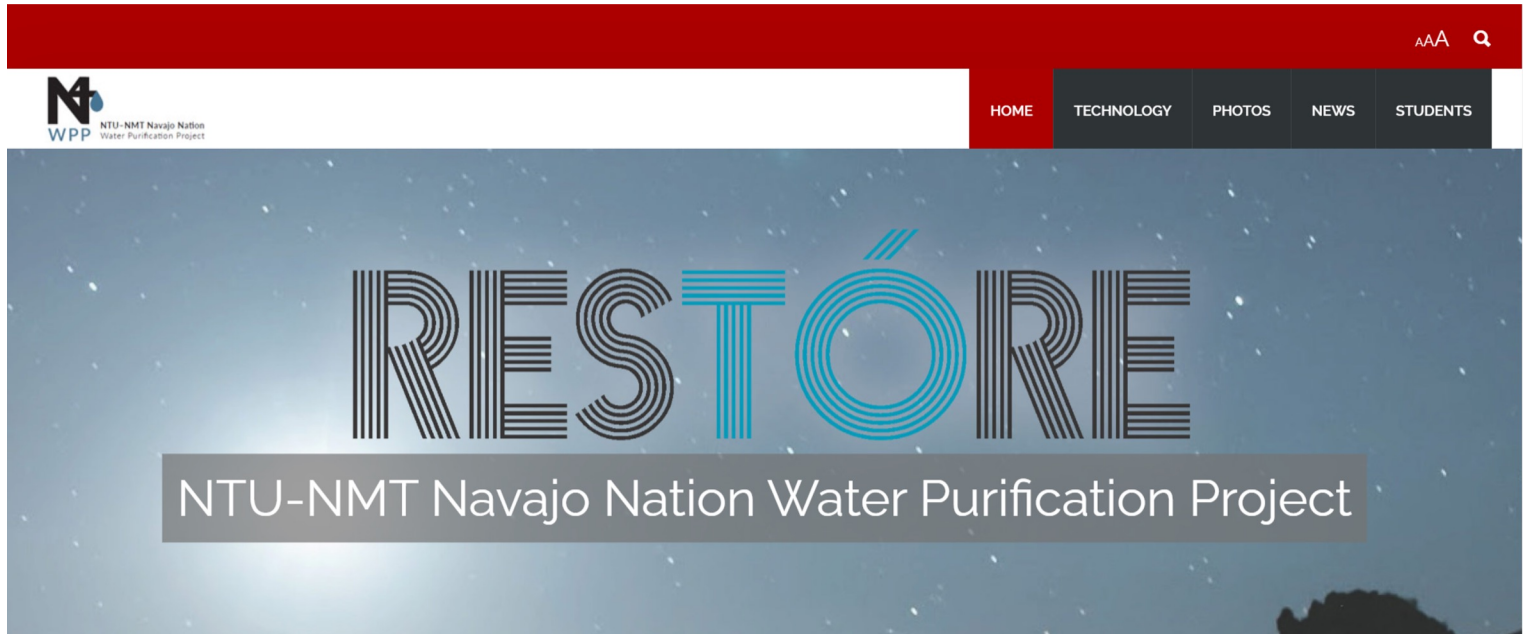


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Questions?

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Thank You

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