



New Mexico Water Dialogue 28<sup>th</sup> Annual Meeting  
“An Unprecedented Water Crisis: A Time to Act”  
January 12 and 13, 2022

*Equity, Justice and Legislative Action  
in Times of Climate Change Panel:  
Climate Change Impacts to Tribal  
Waters*

By Karletta Chief

Associate Professor & Extension Specialist , Environmental Science  
Director, Indigenous Resilience Center

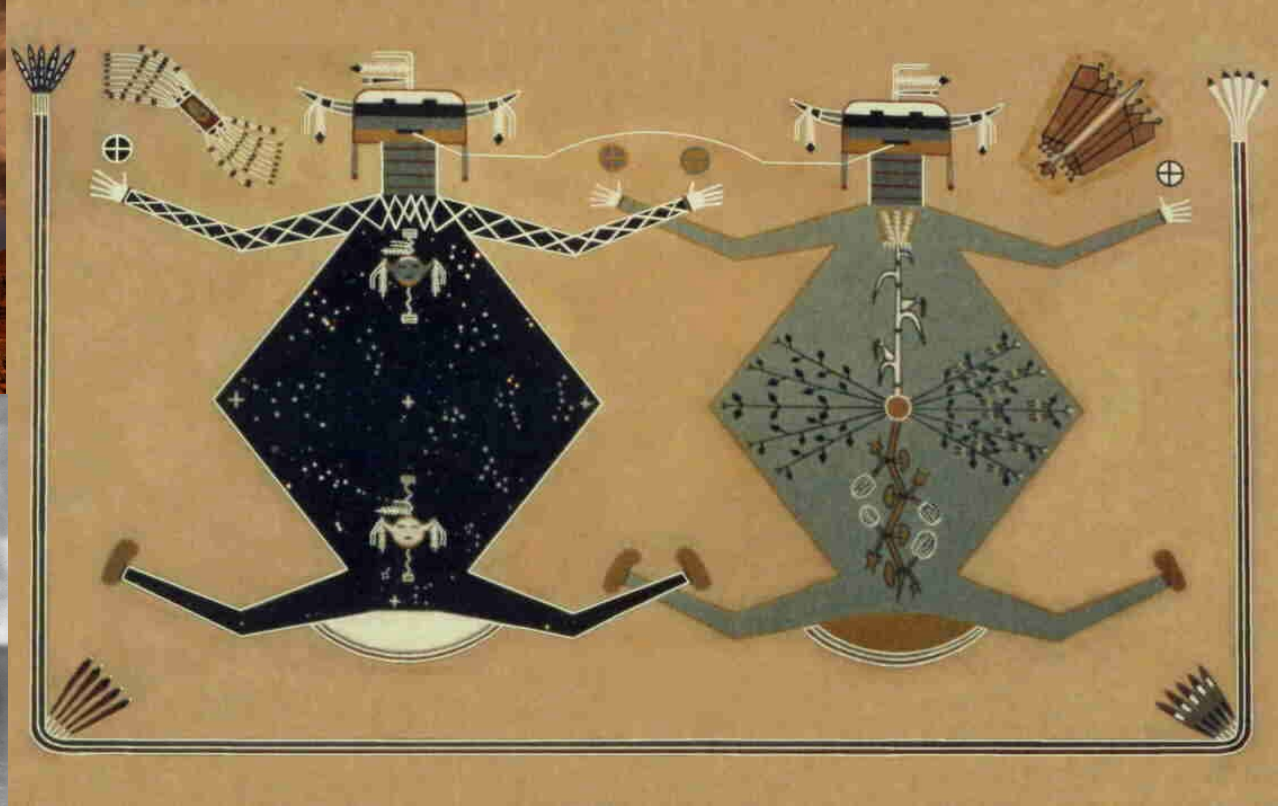


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# Water is Sacred



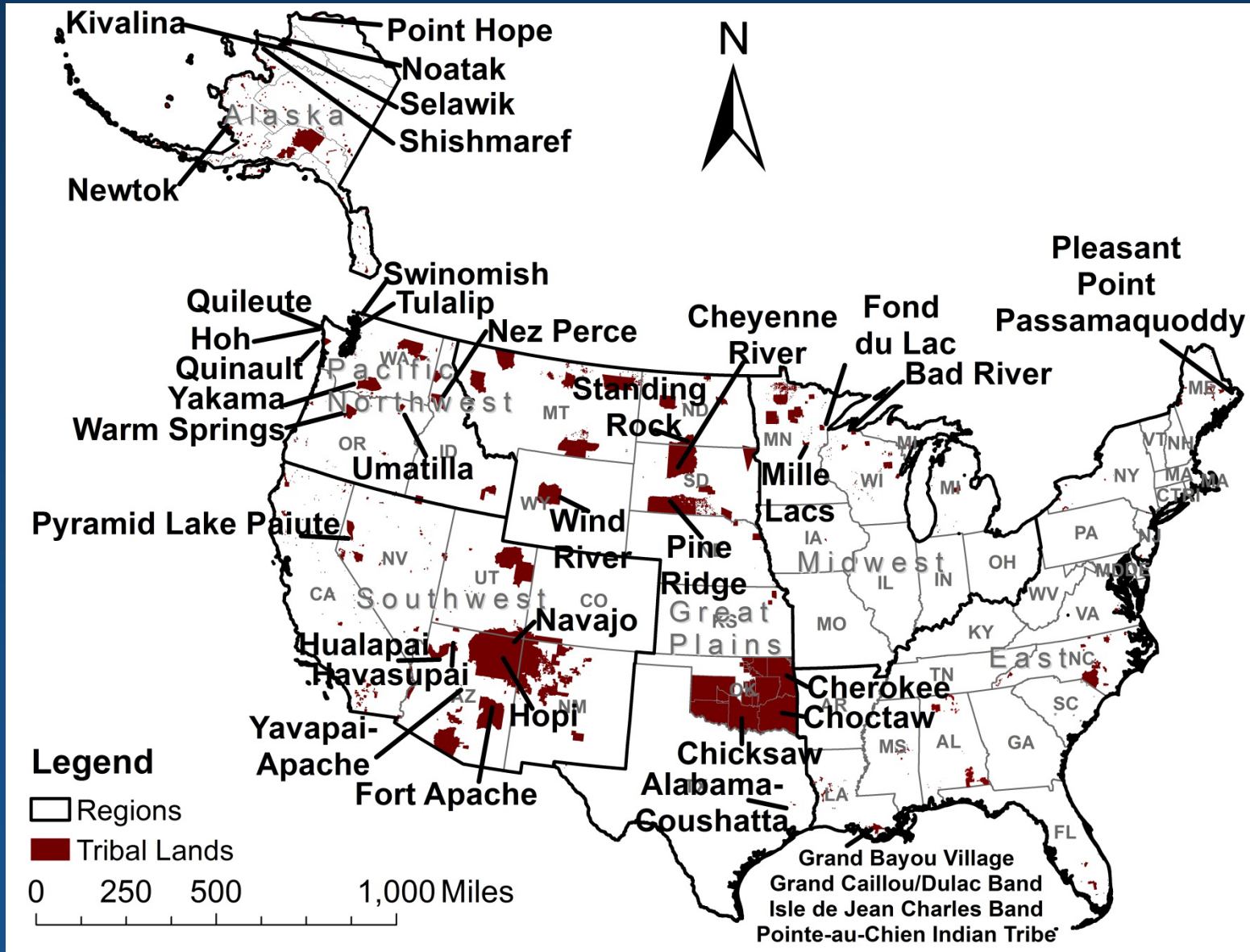
© 2008 Hightower Photography



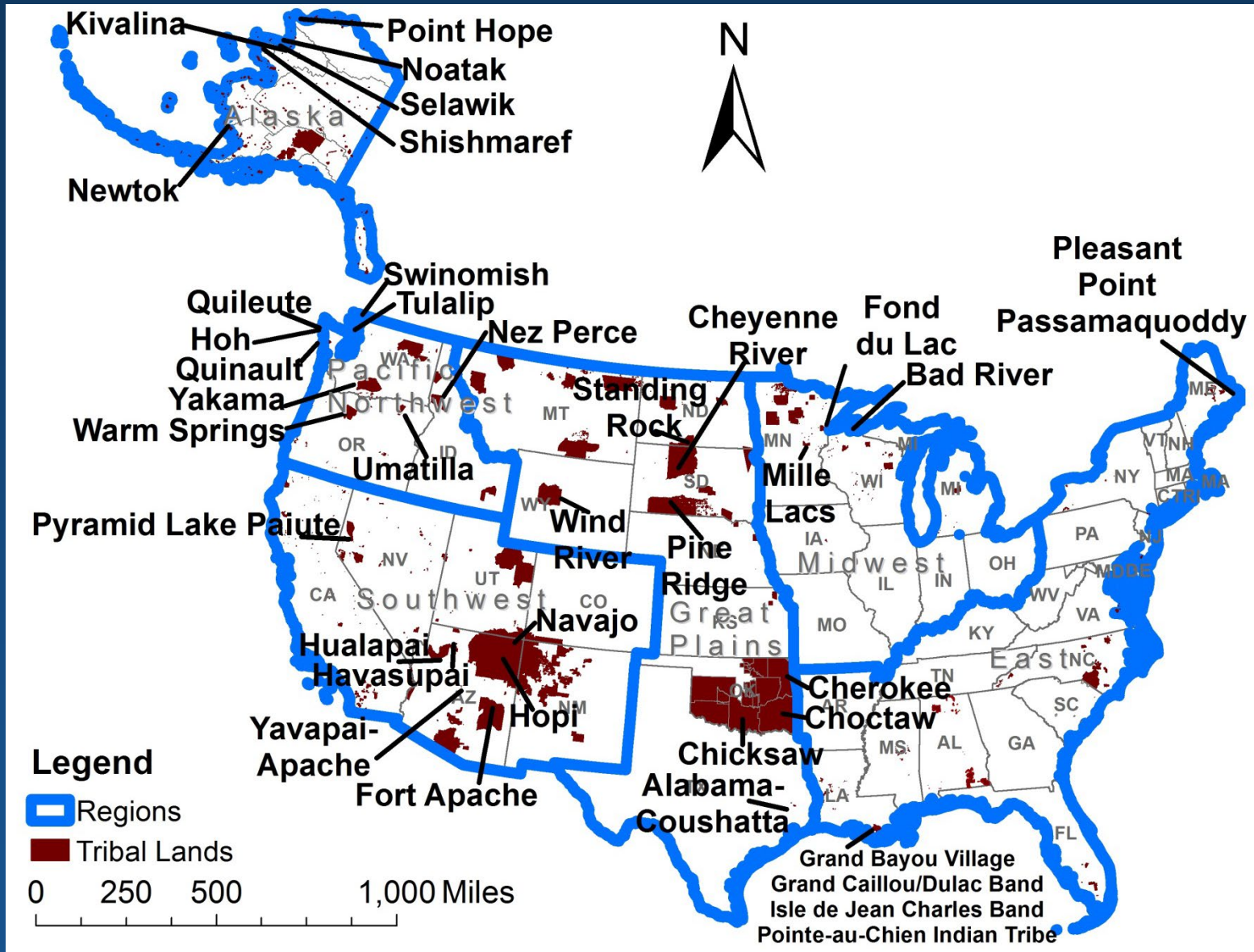
# Climate, hydrologic, & ecosystem changes



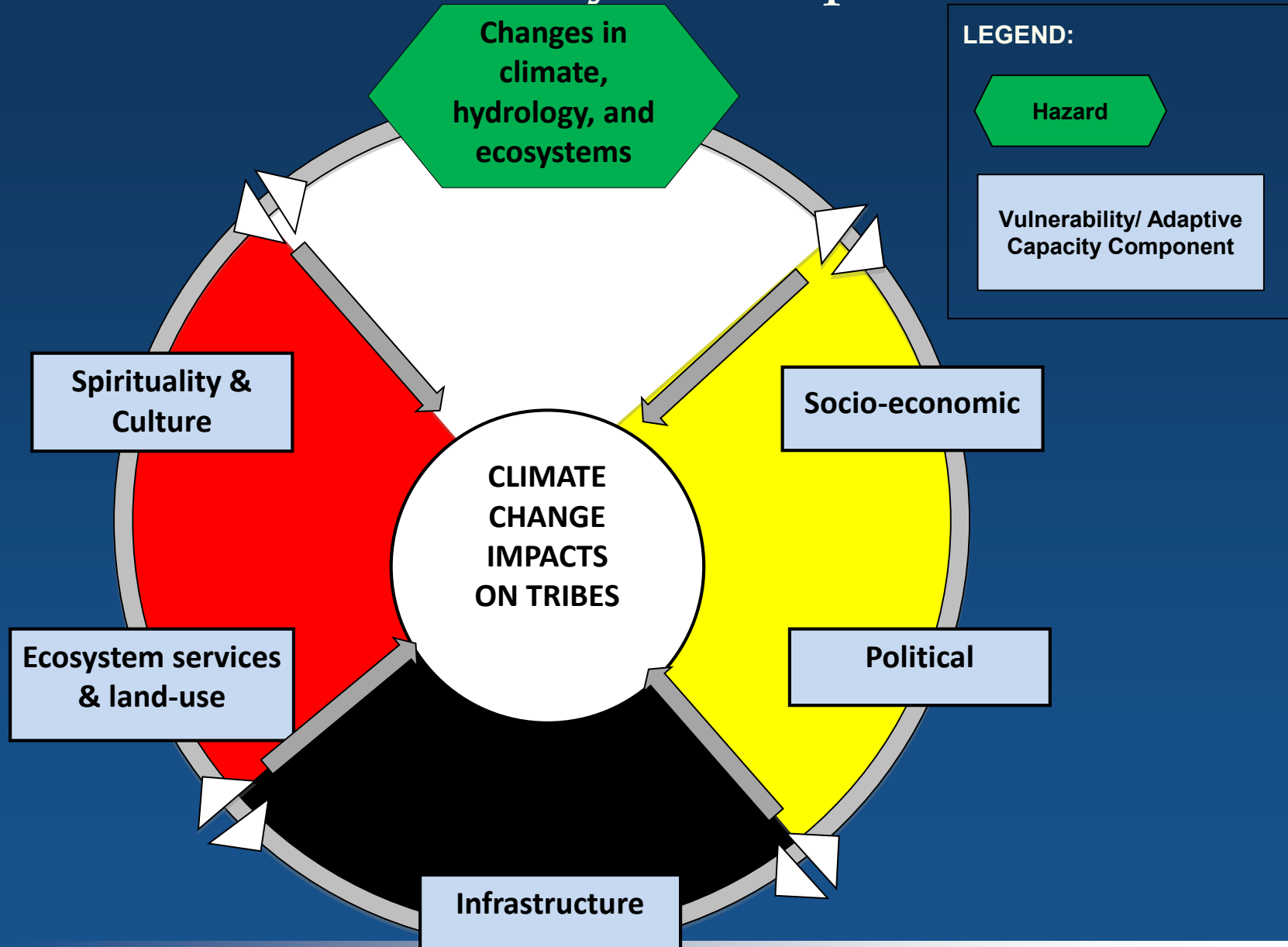
# Impacted Tribes



# Impacted Tribes



# Hazard & Vulnerability Conceptual Model



# Socio-economic Factors

- 69% of AIAN communities >2,000 people and 78% in rural
- higher water supply costs because of greater transportation costs and smaller economies of scale
- 15 % unemployment is nearly double U.S.
- Household income is \$33,379 or 36 % below U.S.
- 29% live below poverty
- Economic conditions affect management of tribal water resources



Hopi Village



Newtok Alaskan Village

# Political Factors



## Crow Tribe Water Settlement 2010





# Infrastructure Factors



# Ecosystem services & Land-use Factors



# Spiritual and cultural factors



# Southwest

- 170 tribes
- Small and large lands
- Urban and rural
- Diverse ecosystems and climatic regions



Increasing aridity, longer severe drought



Migrating sand dunes inundating homes; Wind Erosion



Hualapai sold 500 cattle



Wildfires, invasive species, wildlife diseases

Loss of wetlands, habitats, & Species; Flooding



# FEWS insecurities amplified



Photo: ABC News

Navajo Nation a Food Desert.

Cost of hauling water: \$13.3/100 gal (NNDWR, 2011) vs \$0.40/100 in Flagstaff, AZ



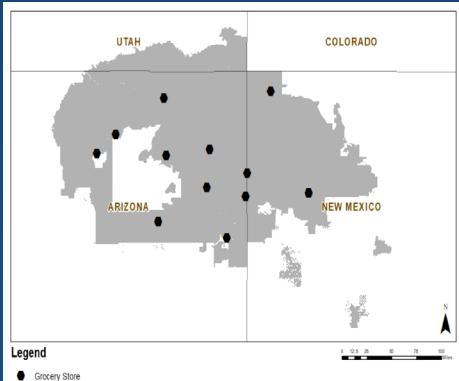
Photo: Navajo Nation



30% lack running water  
40% lack electricity



Photo: ABC News



# NSF NRT: Indige-FEWSS

## Indigenous food, energy, water security & Sovereignty



Inter-cultural awareness

FEWS expertise

Develop Diverse Workforce

Water & Food Security

FEWS Tech

38 trainees (15 PhDs, 11 MS)  
31% Native American  
54% Minorities  
62% Female



<https://energy.arizona.edu/indigefewss>



# NSF NRT: Indigenous food, energy, water security & Sovereignty

Development of novel and sustainable solutions for off-grid production of safe drinking water, brine management operations, and controlled environment agriculture systems.



**Figure 7: Indigi-FEWSS research efforts concentrating on water, energy, and food systems.**

# NN Water Access Coordination Group

## The Water Access Coordination Group



THE UNIVERSITY OF ARIZONA  
**Agnes Nelms Haury**  
 Program in Environment and Social Justice

COLLEGE OF AGRICULTURE AND LIFE SCIENCES  
 COOPERATIVE EXTENSION

NBCS  
 Navajo  
 Birth Cohort Study



ECHO  
 Environmental Influences  
 on Child Health Outcomes  
 A program supported by the NIH

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## MISSION:

To identify, acquire, prioritize, and use available resources to increase access to quality water for tribal homes. The WACG is using available data to identify and design interventions to guide the mission.

## Navajo Safe Water: Protecting You and Your Family's Health



<http://navajosafewater.org>



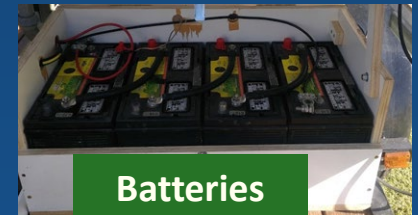
# Off-Grid Mobile Solar-Nanofiltration System



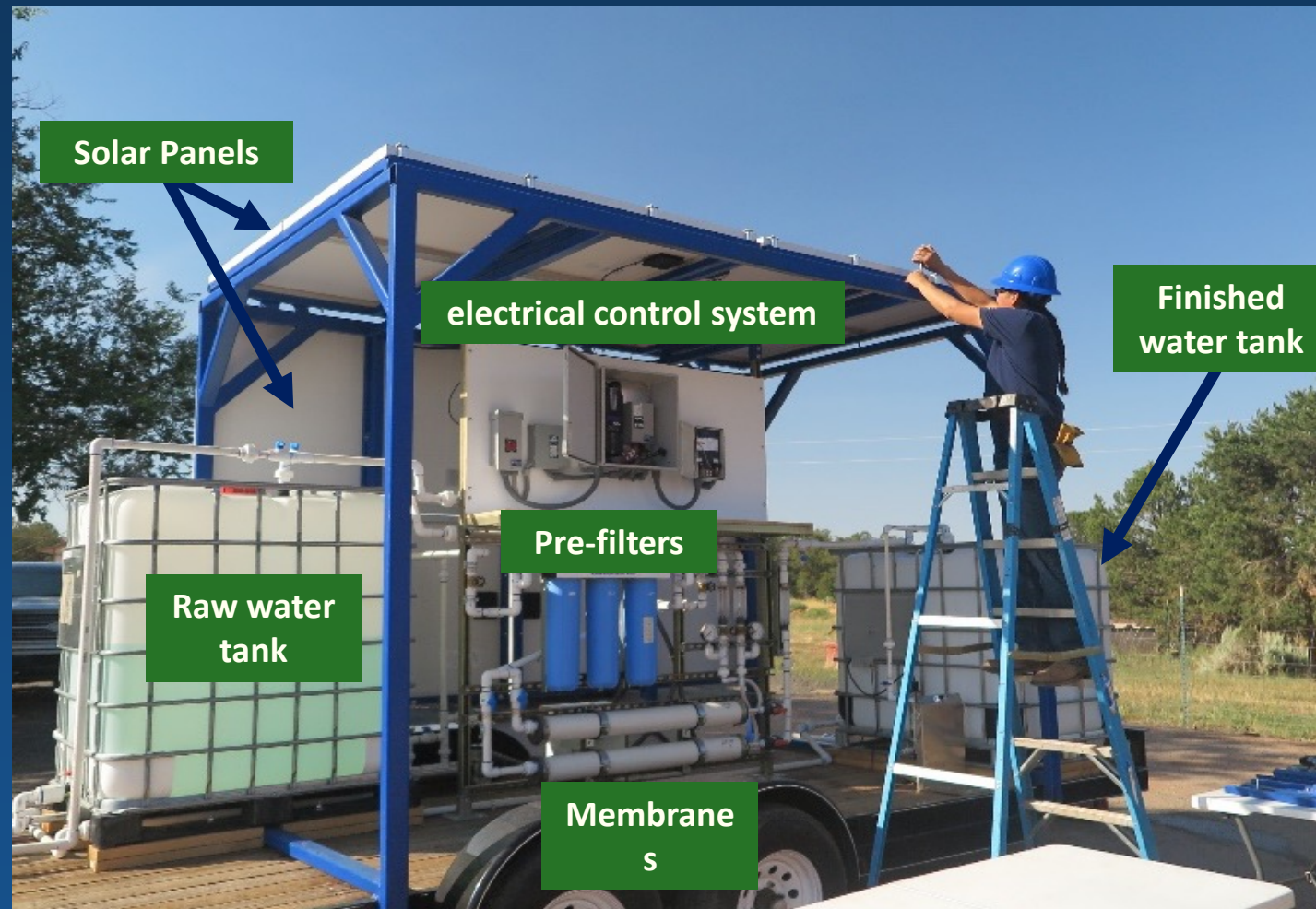
Non visible components



DC pump



Batteries



Solar Panels

electrical control system

Finished water tank

Pre-filters

Raw water tank

Membrane  
s

# Conclusions

- Tribes have urgent need to **prepare for and respond** to climate change impacts that considers culture.
- **Uncertainties** exist because of uncertainty in model projections, lack of community-specific climate and water resources data, and unpredictable interactions.
- Adaptation strategies most effective if **integrated** into broader sustainability plan rather than stand-alone.
- For tribes , who have often been left out of discussions, it is also important that adaptation planning be **participatory and transparent**.

