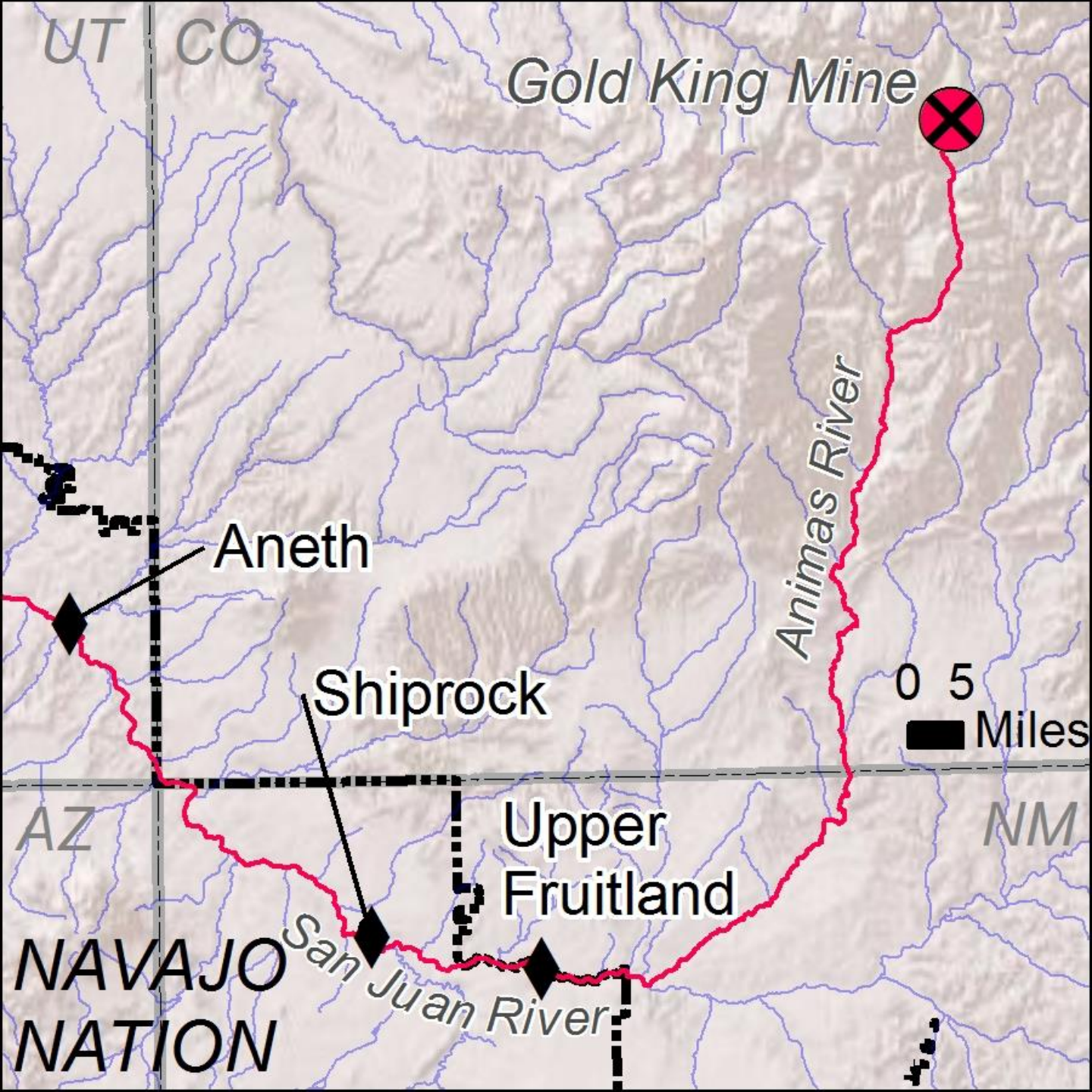




Risk Communication with Navajo citizens following the Gold King Mine Spill

By Karletta Chief, Assoc. Professor
Dept. of Environmental Science

J. Ingram, D. Billheimer, N. Teufel-Shone,
M.G. Begay, P. Charley, M. Begay, R.
Clausen, J. Yazzie, and P. Beamer



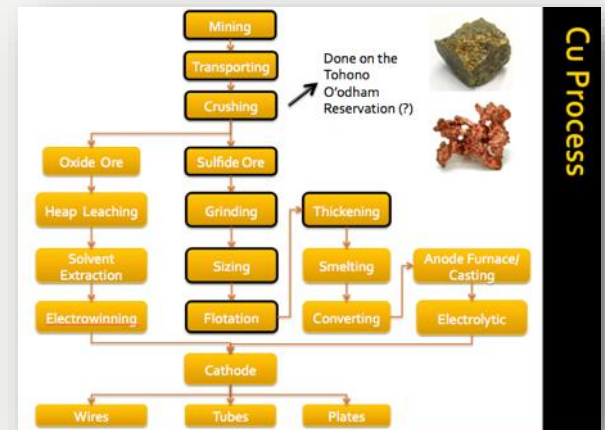
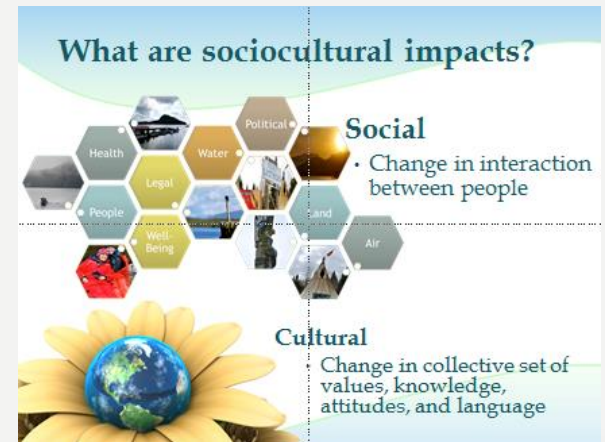
SRP CEC TRIBAL OUTREACH

- **UA Superfund Tribal Educational Mining Modules**
 - Tohono O'odham Community College
 - Copper Mining and Processes
 - Reclamation
 - Environmental Impacts of Mining
 - Socio Cultural Impacts of Mining
 - Dine' College
 - Uranium Mining
- **Objectives**
 - Foster partnership with tribal college
 - Work closely with tribe to incorporate TEK, native ways of knowing, perspectives, and culture
 - Present to tribe and tribal college & pilot activities to refine educational modules

<https://www.superfund.arizona.edu>



Gold King Mine Spill Diné Exposure Project



ONGOING TRIBAL OUTREACH

- Shiprock Agriculture Days March 2015



<https://extension.arizona.edu>



Gold King Mine Spill Diné Exposure Project

INVITATION TO NAVAJO NATION

- Navajo Nation Council Executive Education Session in Nation-Building in the 21st Century August 7, 2015
- Navajo Nation EPA asks about Gold King Mine Spill and impact on Navajo Nation



Climate change impacts on Tribes and the Navajo Nation

By Dr. Karletta Chief

Normal

Assistant Professor & Extension Specialist

Department of Soil, Water, & Environmental Sciences

kchief@email.arizona.edu

*Contributions by Kathy Jacobs, Margaret Hiza Redsteer,
Michael Crimmins*

Navajo Nation Executive Branch Education Session

Friday August 7, 2015



THE UNIVERSITY OF ARIZONA.
TUCSON ARIZONA

Gold King Mine Spill Dine Exposure Project

UA INDIAN COOPERATIVE EXTENSION



Cooperative Extension

Search Site



- Indian Reservations

1. Colorado River Indian Tribes
2. Hualapai Nation
3. Navajo County - Hopi Tribe
4. Navajo Nation - Window Rock
5. Navajo Nation - Shiprock
6. Navajo Nation - Tuba City
7. San Carlos Apache Tribe

Tribal Extension

- **SWIAA Rural Business Development Grant Webinar**
- **Food Safety Training for Indian Country**
- **Coronavirus Food Assistance Program (CFAP)**

Agricultural extension agents help farms succeed. But in Indian Country, they're scarce.
High Country News



**Connect
with our
Specialist**

Trent Teegerstrom

Associate Director for
Tribal Extension
Programs

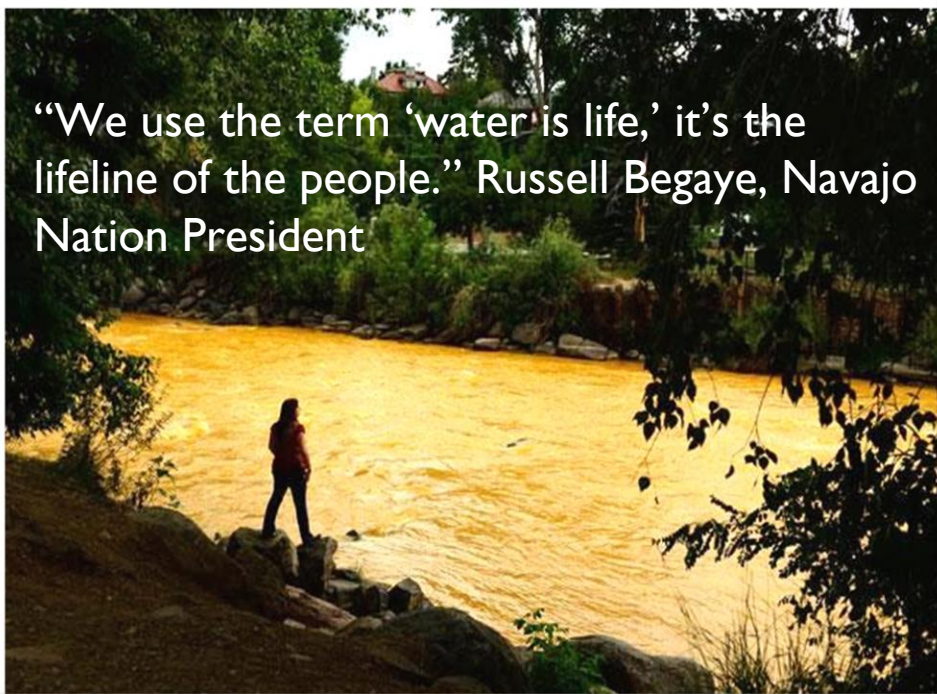
**520-621-6245
520-621-7201**

tteegers@cals.arizona.edu

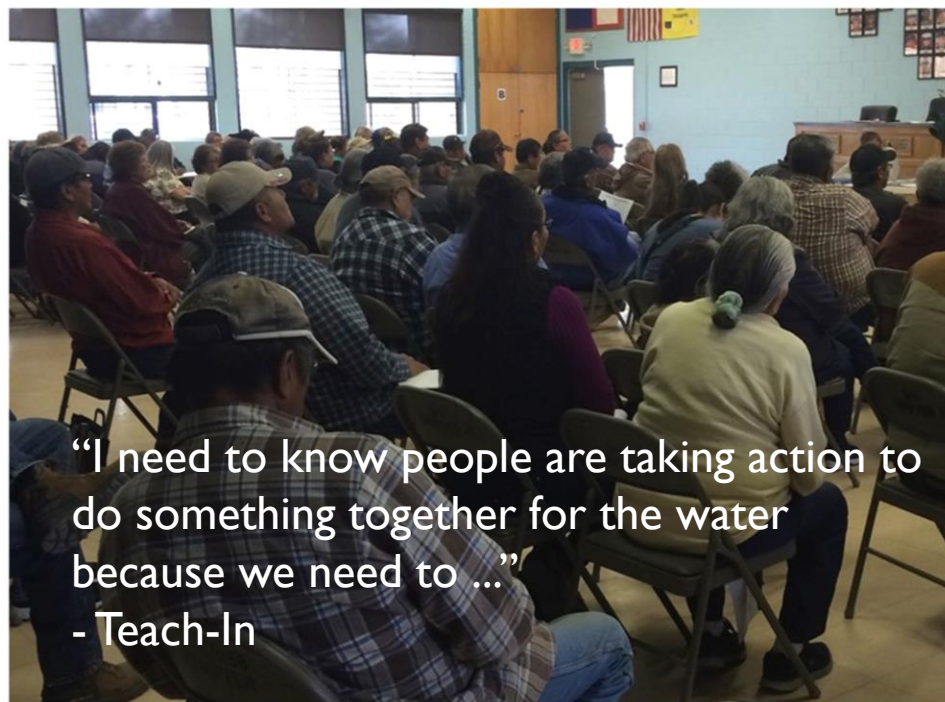
<https://extension.arizona.edu>



“We use the term ‘water is life,’ it’s the lifeline of the people.” Russell Begaye, Navajo Nation President



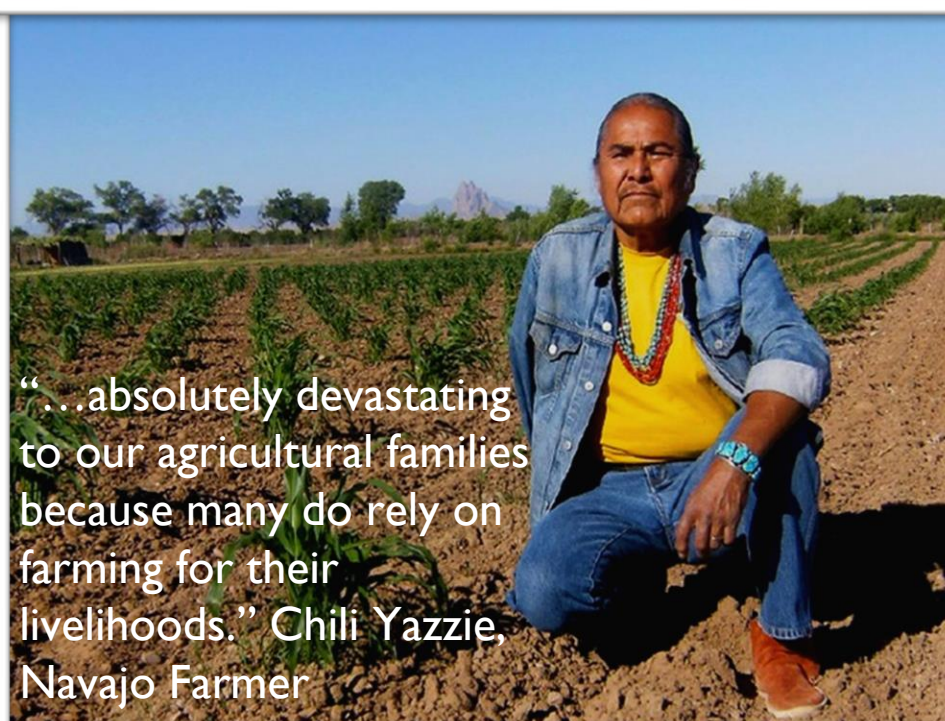
“I need to know people are taking action to do something together for the water because we need to ...”
- Teach-In



“We don’t want to lose the corn.” What will be the generational effects to my great great grandkids?”
-Aneth Chapter, Listening Session



“...absolutely devastating to our agricultural families because many do rely on farming for their livelihoods.” Chili Yazzie, Navajo Farmer



GOLD KING MINE INTERVIEW

<https://www.superfund.arizona.edu>



Home

UA SRP Responds to Gold King Mine Spill

In the wake of the Gold King Mine spill that occurred on August 5, 2015 near Silverton, CO, the University of Arizona Superfund Research Program (UA SRP) has responded to calls for mining and exposure expertise.

Tribal community members along the impacted waterways have special concerns about the safety of using the contaminated water for personal use as well as for watering crops and livestock. In response to such questions and concerns, UA SRP investigators and Cooperative Extension partnered

to create a bulletin, "Understanding the Gold King Mine Spill." A PDF of the bulletin can be found on our [Water Booklets and Videos](#) webpage, or accessed directly accessed by [clicking here](#). (11/15: this document has



Maier and Chief appeared on AZ Public Media's Arizona Week.

Gold King Mine Spill Diné Exposure Project

UA SRP GOLD KING MINE SPILL FAQ SHEET

Understanding the Gold King Mine Spill

Karletta Chief, Janick F. Artiola, Sarah T. Wilkinson, Paloma Beamer, and Raina M. Maier

On Wednesday August 5, 2015, during a United States Environmental Protection Agency (US EPA) mine site investigation of the abandoned Gold King Mine near Silverton, Colorado, heavy equipment disturbed loose material around a soil “plug” at the mine entrance. Acid mine drainage had built up behind the plug, which unexpectedly gave way due to water pressure in the tunnel, and a torrent of water gushed out (Figure 1). This accident resulted in the release of approximately 3 million gallons of acid mine drainage into Cement Creek, a tributary of the Animas River, which in turn flows into the San Juan River and ultimately into the Colorado River. The water contained a number of heavy metals such as lead and arsenic.



Figure 1: The mining tunnel from which the spill occurred [US EPA via Flickr, 2015].

To date, surface water and sediment concentrations along the affected waterways have returned to pre-spill levels. The risk of short-term effects is expected to be minimal, but long-term impacts to the surrounding environment are not yet known. (US EPAa, 2015; CDPHEa, 2015)

The Gold King Mine spill occurred in the Colorado River Basin (Figure 2 shows the San Juan River portion closest to the spill). This watershed includes six US states (Colorado, Utah, New Mexico, Arizona, Nevada, and California), and 12 Native American tribes live along the tributaries. The Southern Ute Indian Tribe, the Navajo Nation, the Ute Mountain Ute Indian Tribe, and the Jicarilla Apache Tribe are tribes nearest to the spill. Community meetings have been held to provide updates and minimize acute exposure, but many people still have questions.

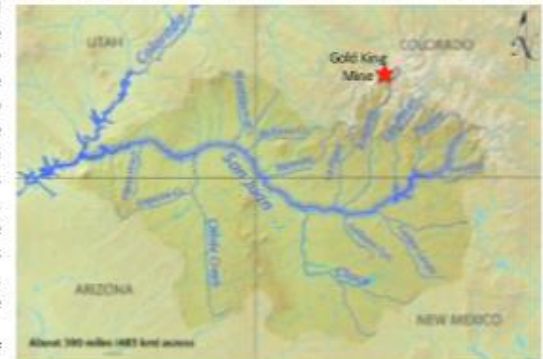


Figure 2: The San Juan River portion of the Colorado River Basin. The red star indicates the site of Gold King Mine spill. (Adapted from “SanJuanRivermap” by Shannon via [Wikimedia Commons](https://commons.wikimedia.org/wiki/File:SanJuanRivermap).)

For an interactive map of water and sediment sampling locations from the mine site down to Lake Powell, including results for arsenic, cadmium, lead and mercury, visit the Arizona Geological Survey Gold King Mine Spill Water and Sediment Sample Locations Map at: <http://maps.azgs.az.gov/gold-king-mine-spill/index.html>.



Department of Soil, Water and Environmental Science
College of Agriculture and Life Sciences

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October 23, 2015

Donald Benn, PhD
Director of Navajo EPA
PO Box 9000
Window Rock, AZ 85615

Bitah Becker, J.D.
Director of Natural Resources Division
PO Box 9000
Window Rock, AZ 85615

Dear Dr. Benn and Ms. Becker,

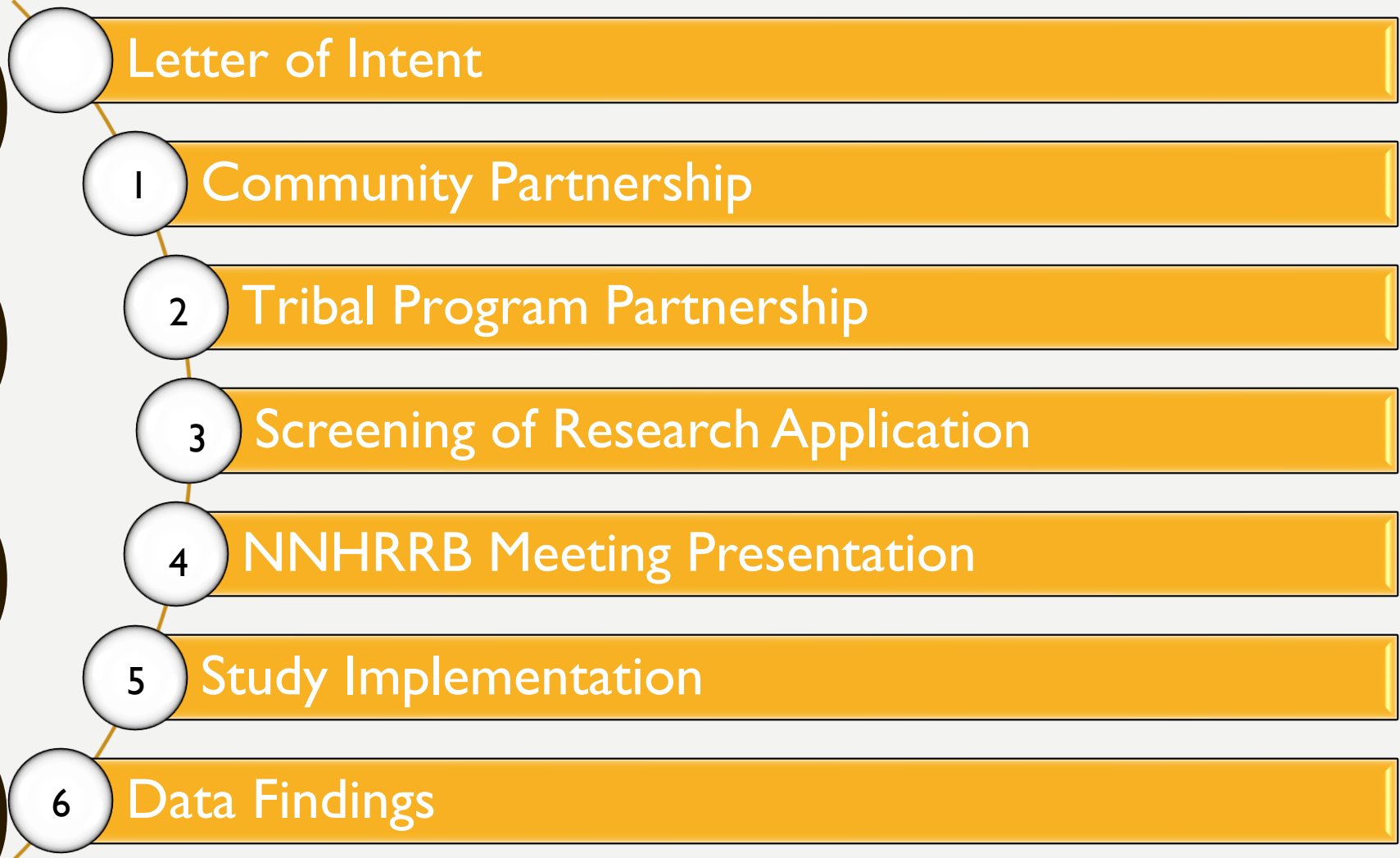
I am following up on my phone conversation with Dr. Benn on October 22 regarding my request as the University of Arizona (UA) Superfund Research Program (SRP) to partner to submit a proposal to the National Science Foundation (NSF). The UA SRP currently has an intensive and interdisciplinary program investigating human and environmental impacts of select Superfund sites in Arizona.

As you requested, I am attaching a one-page description outlining the objectives for a proposal entitled *Temporal and Spatial Distribution and Remobilization Conditions of As and Pb in sediments in the San Juan River as a result of the Gold King Mine Spill* to investigate and assess environmental impacts of the Gold King Mine spill in the San Juan River on the Navajo Nation.

This proposal builds upon the National Institute of Environmental Health Sciences proposal that was submitted in October 2015, which focused on exposure and risk perception of three Navajo communities in the Gold King Mine Spill. **This NSF proposal will primarily focus on the environmental physical and chemical contamination to assess extent of metal(oids) upstream and downstream in the water and sediment through time and conditions under which metals could be remobilized.** This proposal will include a collection of independent data to the Navajo Nation.

CONCEPT PROPOSALS INVITE

NAVAJO NATION HUMAN RESEARCH REVIEW BOARD



PROJECT GOALS

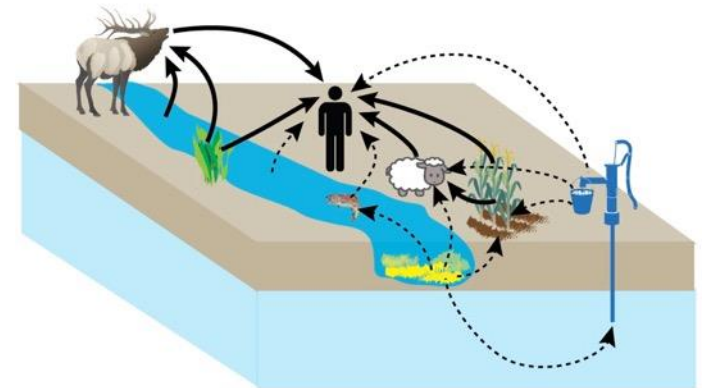


1. Understand Human Exposure to the Spill
2. Find out levels of Arsenic & Lead in Environmental Samples from 3 Chapters for one year
3. Survey what people think about risk from the Spill and report back measured risks

Regulatory Perception



Diné Reality



COMMUNITY PRESENTATIONS



- Are there Private Wells located within one mile from the River that should be tested?
- What are sites of most concern to you as community members?
- What are your concerns about how the spill may impact your land, crops, home, health, livestock, etc?
- How would you like to be informed about any updates, reports or other relevant information regarding the study and the spill?



LISTENING SESSIONS



A woman with dark hair, wearing an orange t-shirt and blue jeans, stands in a field of tall, green grass. She is looking down at something in her hands. In the background, a calm river flows, bordered by a grassy hill on the right and a line of trees on the left. The sky is blue with a few white clouds.

***“We need our own
data to communicate
to the world our own
perspective on our
own crises and
trauma.”***

- Teach-In

OVERALL HOUSEHOLD RESULTS



← BEWARE

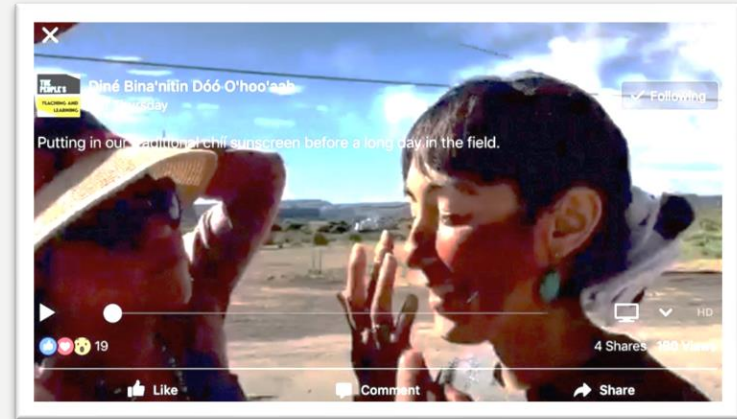
← NEED MORE INFORMATION

← OK

	Main Finding for Arsenic (Béésh libáhá)	Main Finding for Lead (Béésh dilyíhí)	Compared to:
Blood	<i>Not tested</i>	Almost all (85 out of 87) met guideline except for 2	CDC Action Level
Urine	Slightly more exposed to arsenic than other people in the US (about 5 out of 100 people are over the level)	<i>Not tested</i>	NHANES 98 th Percentile (2 out of 100 people in the US are over this level)
Drinking Water	Almost all (60 out of 62) met regulation (except 2 water samples in Aneth, UT hauled from Bluff Water Works)	All 62 samples met regulation	EPA Maximum Contaminant Level
Yard Soil	Almost all (46 out of 48) samples met regulation (except for 1 in Shiprock, NM and 1 in Upper Fruitland, NM)	All 48 samples met regulation	NM Soil Screening Level
House Dust	All 49 samples met guideline	Almost all (48 out of 49) met guideline (except for 1 in Upper Fruitland, NM)	Arsenic: HUD Minimum Lead: HUD Lead Dust Hazard Action Level – Interior Floors

ACTIVITIES IN QUESTIONNAIRE

Activity Categories	Number
Cultural & Spiritual	14
Recreational	12
Livelihood	9
Arts & Crafts	7
Total	42



DINE' COLLEGE TCUP "STEM 2020"

"Environmental Methods & Monitoring" 10-week REU-model



Gold King Mine Spill Diné Exposure Project

NAVAJO GKMS TERMS

Term	Navajo
Acid mine drainage	Ha'agééd bits'áádéé' béesh al'aan áát'eel hólónígíí éí t'óó ahayóí ba'át'e' dahóló hóló.
Arsenic	Béesh Łibáhí Ba'át'e' hólónígíí
Biomonitoring	Nihookáá' Dine'é dóó Naaldlooshii bidil dóó bits'íis bee bil hahodít'éigo yee hinánígíí Bee Naalkaahígíí
Blood samples	Dił Aaahaakaah
Exposure	T'áá haashíí yit'éigo doo yá'át'éehii Ats'íis Bitah yileehgo
Focus Group	Díkwíida yilt'éigo naanish álnééh nayik'íyálti'ígíí
Food Recall	Nida'iiniihgóó ch'iíyáán doo yá'át'ééhgóó bee baa' ayahoolniihgo nát'áá' náwókeedgo
Household Questionnaire	Hooghan haz'áádóó na'idíkid naaltsoos bee hadilnéhéígíí
Gold King Mine	Dibéntsaa Keyah haz'á biyidóó Óola haagéédígíí
Urine Samples	Łizh naalkaah
Water Quality	Tó Niltólí

Translation Contributions:

Karletta Chief, UA SWES

Roger Begay, Bicultural Training Manager-Peacemaking Program

Perry Charley, Dine' College Environmental Scientist

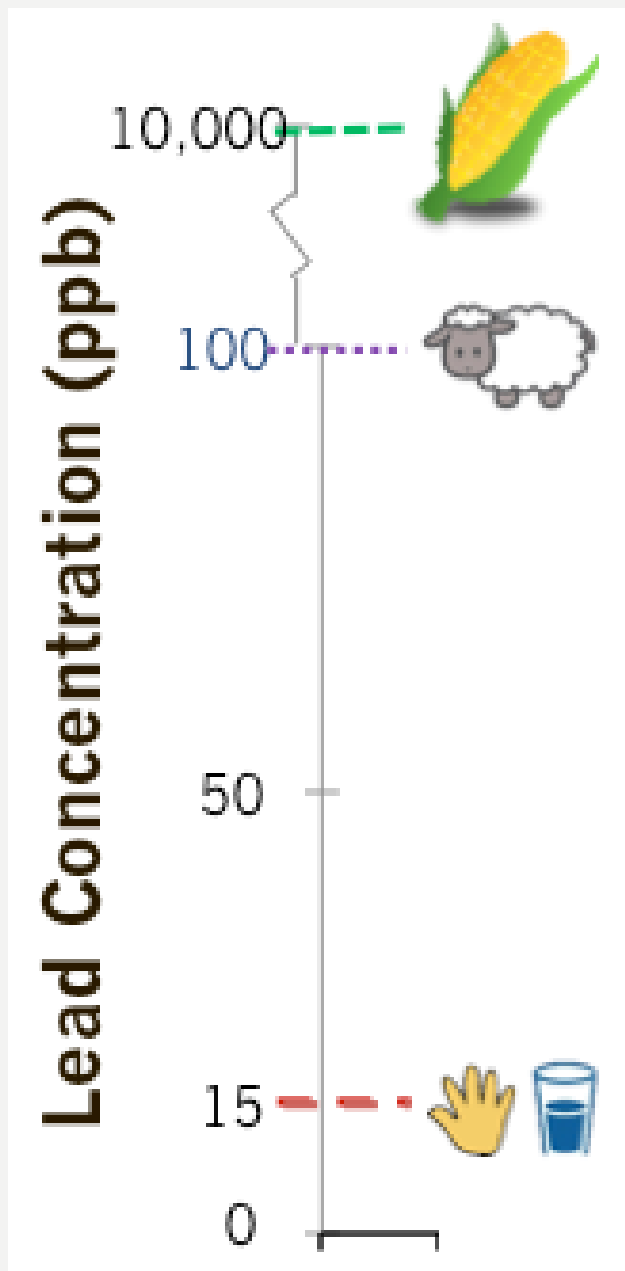
PPB = 1 DROP IN 250 WATER BARRELS



250

water barrels

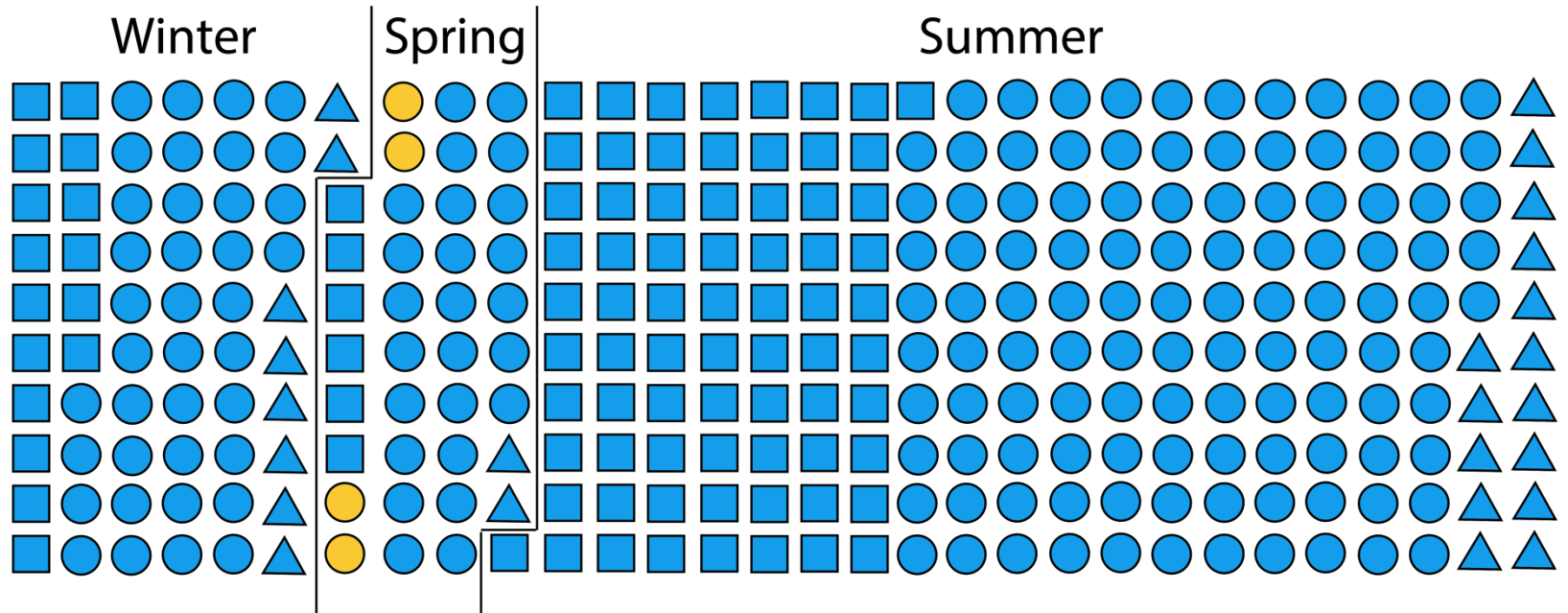
NAVAJO LEAD REGULATIONS



ENVIRONMENTAL PICTOGRAPHS

4 of 29 (14%) Spring river samples

above the NOAA SQuIRTs guideline (plants and animals living in the water)



Legend

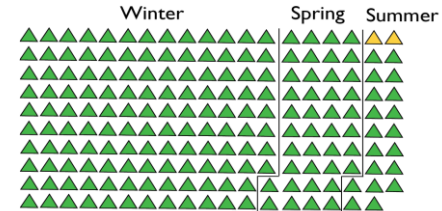
Where sample was taken (number of samples):

Canal	River	Well	
■ (94)	● (177)	▲ (25)	Below guidelines
■ (0)	● (4)	▲ (0)	Above NOAA SQuIRTs (2.5 ppb)
■ (0)	● (0)	▲ (0)	Above US EPA Primary MCL (15 ppb)

SHIPROCK AG DAYS



ARSENIC IN AGRICULTURAL SOIL



Legend

Types of Samples (number of samples):

Grab	
▲ (0)	Above Canadian Agricultural Soil Quality Guideline (12 ppm)
▲ (2)	Above NMED RSL Guideline (7.07 ppm)
▲ (187)	Below Guidelines



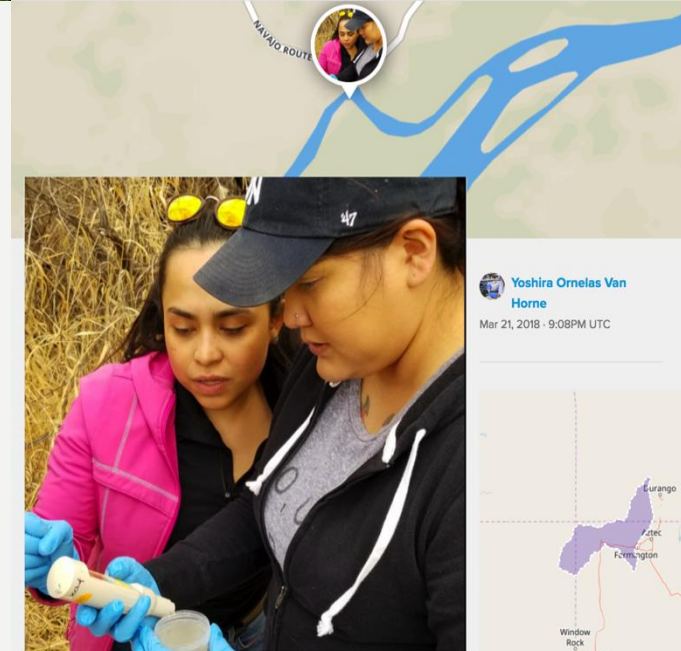
Gold King Mine Spill Diné Expo

FARMING IS LIFE

- Dá'ák'eh Bee liná: Seed to Harvest Program
- Partnerships with 10 Diné Farmers to monitor their corn, water, and soil on their farms for from seed to harvest for Spring-to-Fall Season 2018.



Gold King Mine Spill Diné Exposure Project

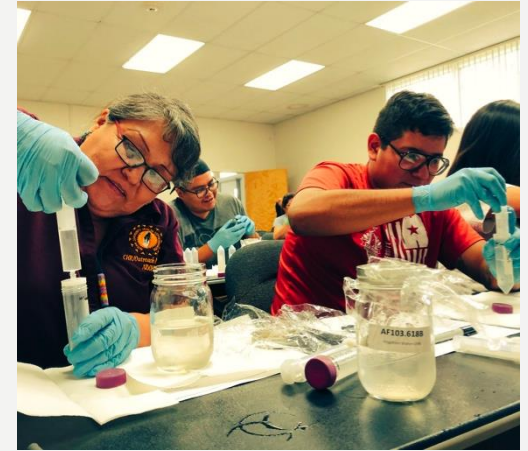


Training Diné college interns on how to collect samples from the San Juan River #GKMS #location501

Middle San Juan Watershed
Get directions to this location

DINE' COLLEGE STUDENTS LEARN FROM NAVAJO CHRS

- Navajo Community Health Representatives (CHRs) shared their experiences with 14 Dine' College Students in how they responded to the Gold King Mine Spill days after the accident and how they informed Navajo residents of the spill and how to protect themselves.
- CHRs explained emergency response courses they took. UA and Navajo CHRs trained students how to sample, filter, and process water samples. Dine' College students entered water quality data in the Water Reporter and analyzed the data together.



NAVAJO EMERGENCY RESPONSE EXECUTIVE SESSION

1. Report Results
2. Review of case studies
3. Synthesize
4. Recommendations
 - Report to Heath Committee
 - Include in 5 yr Strategic Plan
 - FEMA Training for All Employees
 - Train the Trainer
 - COOP at Chapter Level



SHARING STORIES ACROSS THE WATERSHED



Gold King Mine Spill Diné Exposure Project

KTNN RADIO FORUM

- Tuesday, March 20, 2018 at 6 - 8 PM MDT on KTNN (AM 660 & FM 101.5) & KWRK (FM 96.1).
- Panelists discussed how they were involved in the monitoring and research activities on the Navajo Nation after the Gold King Mine Spill, what results they found, and answered questions from radio listeners.
- Panelists engaged in a dialogue with each other and radio listeners about their experience, their involvement, lessons learned, & goals for the future.



Dr. Paloma Beamer (UA), Chili Yazzie (Shiprock Chapter), Dr. Kevin Lombard (NMSU), Steve Austin (Navajo EPA), Mae-Glene Begay (Navajo CHR), and Janene Yazzie (TBND).



Gold King Mine Spill Diné Exposure Project

DE-COLONIZED APPROACH

Developing a framework to
minimize impacts &
respond to Future Spills

**Critical Thinking
(Nitsáhákees)**

Understand Spill &
responding to Future
Spills

**Reflection (Siih
hasin)**

Revise framework
& adapt

**Diné
Fundamental
Philosophy**

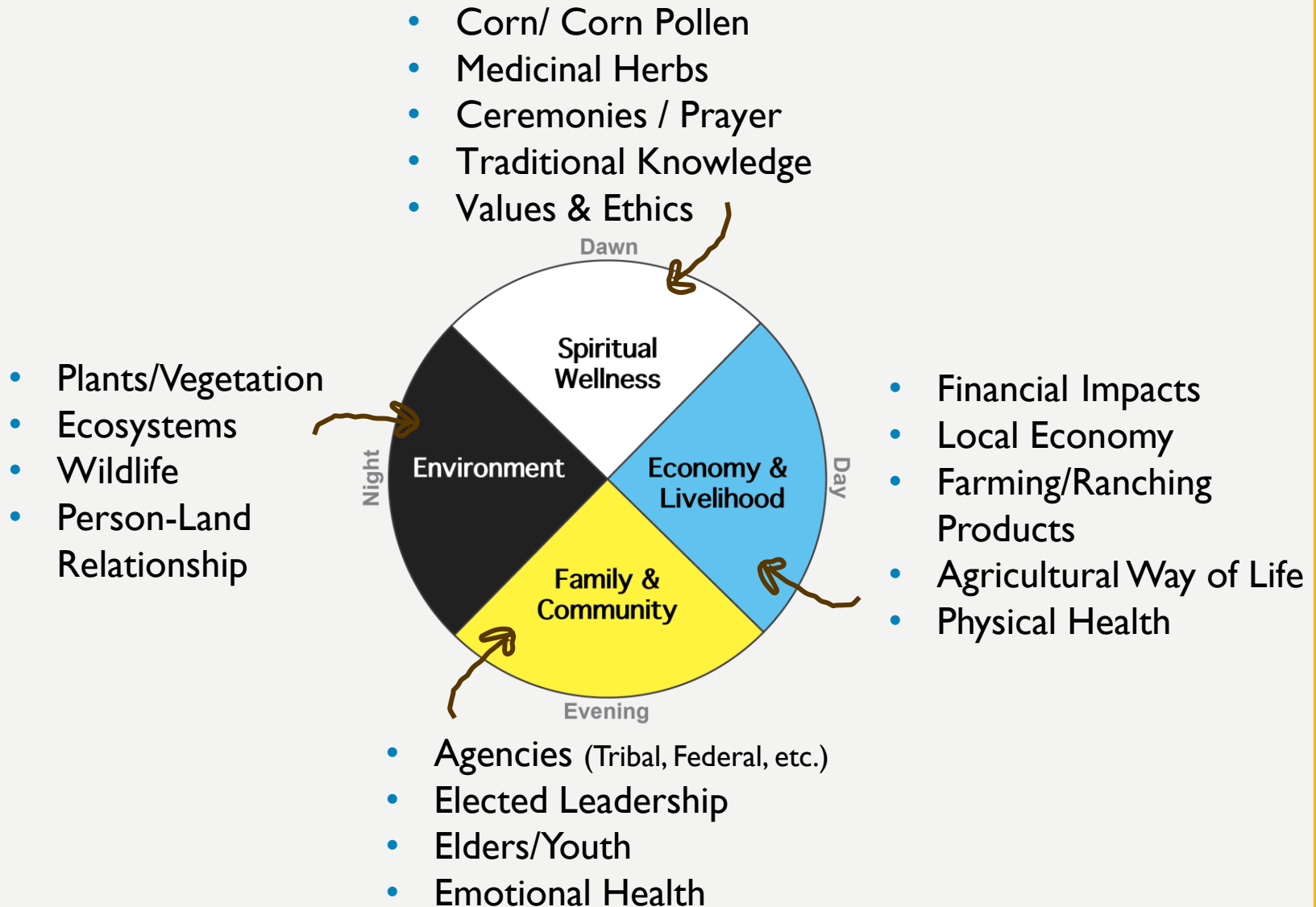
Implementation (liná)

Emergency Response
Goals

Planning (Nahat'a)

Develop sustainable
solutions while increasing
tribal capacity

Using a Diné Health Model as a Guide



Spiritual Wellness

Negative Impacts to Ceremonial Practices

- **Unsafe** natural materials & herbs
- **Limited access** to river

Uncertain Future of Diné culture for youth

- **Lacking/Losing** Traditional Knowledge

Economy & Livelihood

Negative Impacts to Quality of Life (i.e. activities that depend on water)

- **Disruption, Loss & Diminishment**

Revenue **Loss** & Financial **Hardship** for Farmers

- Consumer distrust crops / not buying

Unsure about safety of agricultural food sources

- **Reliance on commercial store food**

Long-term **harm** to health (youth & future generations)

Family & Community

Distrust

- Agencies
- **Water Testing**

Leadership is **not present**

- Who is advocating on our behalf?

Poor communication about spill & response efforts

- Navajo and non-Navajo agencies

Experienced **negative** impacts to Mental Wellness

- **Worry**
- **Fear**
- **Depression**
- **Stress**
- **Historical Trauma**

Environment

Negative Feelings toward the River

- **Unsafe** for use?
- **Harm** to cultural practices
- **Hesitant** to have contact with river

Less Use and **Loss** of Traditional Plants & Herbs

Damaged relationship w/ river & land

Silence in the environment

Distrust of Water Quality Testing



BILATERAL COMMUNICATION

12
Focus
Groups

24
Teach-
Ins

Navajo
Pres &
VP visit
UA

33
Navajo
IRB

Testimony

3
Listening
Sessions

CHR
Training

3 Radio
Forums

Community
Sampling

Household
Report
back

Citizen
Science

4
Shiprock
Ag Days





“We can’t be biased and place blame, we all have to come together. It’s going to take many generations to fix these issues.”

-Teach In

FUNDING ACKNOWLEDGEMENT



National Institute of
Environmental Health Sciences

1R21ES026948-01



Superfund Research Program
The University of Arizona



Agnese Nelms Haury Program
in Environment and Social Justice



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Center for
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Environmental Health
Research (CIEHR)**

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