



# Gold King Mine Spill Diné Exposure Project

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Diné College, Tó Bee  
Nihi Dził, & Fort Lewis  
College

## TÓŁÍTSO, THE WATER IS YELLOW:

*Investigating short term exposure and risk perception of Navajo Communities to the Gold King Mine Spill  
– Upper Fruitland; NM, Shiprock, NM; and Aneth, UT –*

**Aim 1: Determine exposure of Diné residents in these three communities to the Spill.**

**August 2016:** Navajo Community Health Representatives (CHRs) sampled drinking water, yard soil, and household dust in about 60 Diné homes to measure for lead and arsenic. They did a finger prick to measure lead in residents' blood using a 3-minute test machine. They collected a urine sample to measure for arsenic. They also asked people what they eat, how they use the river, and how the Spill impacted them.

**To Date:** In August 2017, Navajo CHRs reported results back to approximately 60 Diné homes for lead and arsenic.

**Aim 2: Measure lead and arsenic in river water, river sediment, agricultural soil, irrigation water, and irrigation sediment.**

**November 2015 – June 2016:** We took almost 1,000 samples of water and sediment from the river and irrigation canals and soil from fields.

**To Date:** All environmental water samples were tested for arsenic, lead, and manganese. The water samples met agricultural water standards for use. Laboratory processing of soil and sediment for lead and arsenic is in progress and are anticipated to be completed in late Fall 2017.

**Aim 3: Find out what people are concerned about when using the River after the Spill and find out the risk based on the samples and information collected for Aims 1 and 2 (left & middle columns).**

**May 13-22 & June 15-17:** We held 12 group discussions or “focus groups:” 4 in Upper Fruitland; 6 in Shiprock; and 2 in Aneth. 123 total people took part in these focus groups. We asked people how they used the river before the Spill; how the Spill impacted them; and what they think about the river's future.

**To Date:** 50 hours were translated from Diné'ke'jí to English and comments were written down. A codebook was developed to define themes and we are summarizing the focus groups.

**TRAINING STUDENTS IN ENVIRONMENTAL SCIENCES AND ENVIRONMENTAL HEALTH**

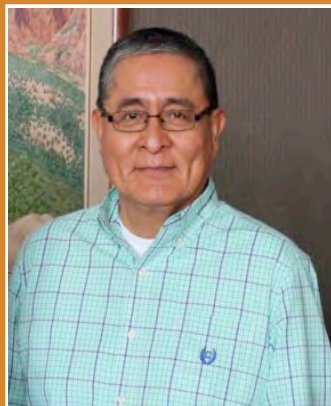


*Jenny Richards, Rachelle Begay, Yoshi Ornelas, Corinna Sabaque, Heidi Dugi, and Dr. Paloma Beamer at the MEZCOPH MPH Internship Conference.*

A key focus has been on building capacity for assessing environmental exposures through training of Diné students. To date, we have trained over 71 students from UA, NAU, Diné College, U. of AR, Ft. Lewis College, Navajo Technical University, Navajo Preparatory High School, New York University, Claremont McKenna, Tohono O’odham Community College. These students range from High School interns to PhD students. Corinna Sabaque (Diné) is originally from Shiprock, NM. Corinna’s internship focused on evaluating the environmental health training that the Navajo Community Health Representatives received, and assisting with focus group transcription. Corinna is currently working as a research specialist at the Mayo clinic in Rochester, Minnesota.

Heidi Dugi (Diné) completed her internship which focused on developing a codebook to be utilized during focus groups translations and transcriptions. Heidi is currently in the Pre-Medical Admission Pathway Program at the University of Arizona, where she will obtain a Master of Science degree in Cellular and Molecular Medicine and begin Medical school in Fall 2018. ‘During my graduate program internship, I worked with the Gold King Mine Spill Diné Exposure Project which was a positive and rewarding experience. I gained many professional and research skills while collaborating with scientists, tribal leaders, and community members essential to fulfilling public health core competencies. Most importantly, it was an opportunity to help the Navajo people in seeking answers and restoring their trust in the river after the events of the Gold King Mine Spill’ -Heidi Dugi

**Navajo Science and Health Experts**



**Alfred Yazzie**

Alfred Yazzie (Diné) is a research consultant. Mr. Yazzie began working in research in 2012. His first project was advancing smoke-free policy adoption in public spaces on the Navajo Nation with Dr. Henderson. He currently assists researchers working on various health issues such as stomach cancer, and *H. pylori*. Mr. Yazzie is fluent in the Navajo language and works with Dr. Chief to translate scientific and health words into Navajo. He has helped translate many of the community Teach-ins hosted by Dr. Chief. Mr. Yazzie is committed to improving the health of communities.



**Arnold Clifford**

Arnold Clifford is a field botanist and geologist and is Diné (Navajo) from Beclahbito, NM. Mr. Clifford has worked as a field botanist and consultant on various environmentally related projects throughout the Southwest, conducting floristic surveys of the Carson National Forest, southeastern Utah, the Navajo Nation, hanging garden communities in southern Utah and Four Corners region. Mr. Clifford has worked with Dr. Chief for over 10 years through her work at Diné College focusing on environmental science instruction of tribal college students. Mr. Clifford is fluent in the Navajo language and has translated numerous scientific words into Navajo. He has over 30 years of experience working with the Navajo community and is a Navajo traditionalist.

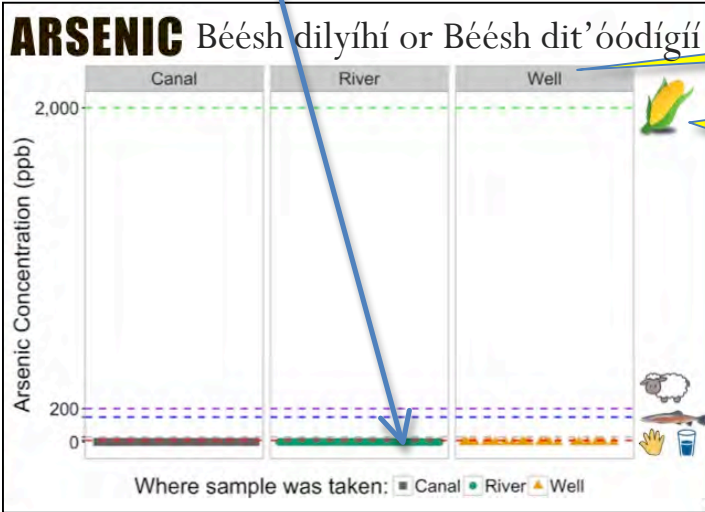
# SHIPROCK AGRICULTURAL DAYS

On March 28th, Dr. Karletta Chief presented water results at Shiprock Ag Days. **Arsenic and lead were very low in water samples and met agricultural standards.**

**Arsenic** - 288 water samples for canal, river, and well samples had very low levels of arsenic (most were around 1 ppb) and met the agricultural standard of 2000 ppb for arsenic.



Dr. Chief, Chili Yazzie, & NM Chief Dennis McQuillan.

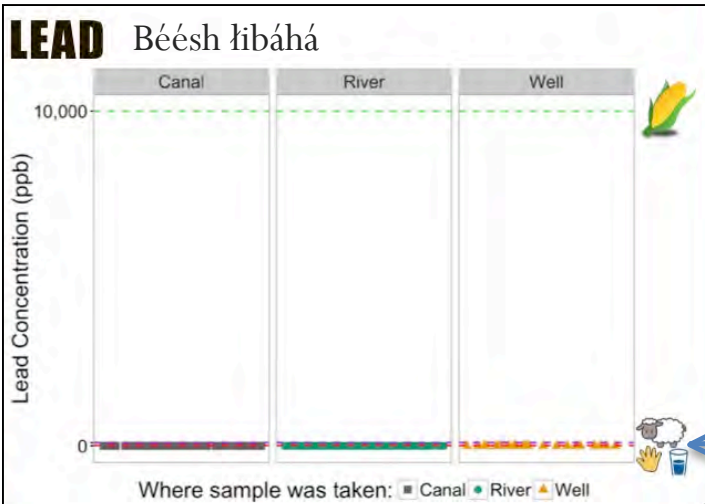


Sample types

Agricultural Standard of 2000 ppb



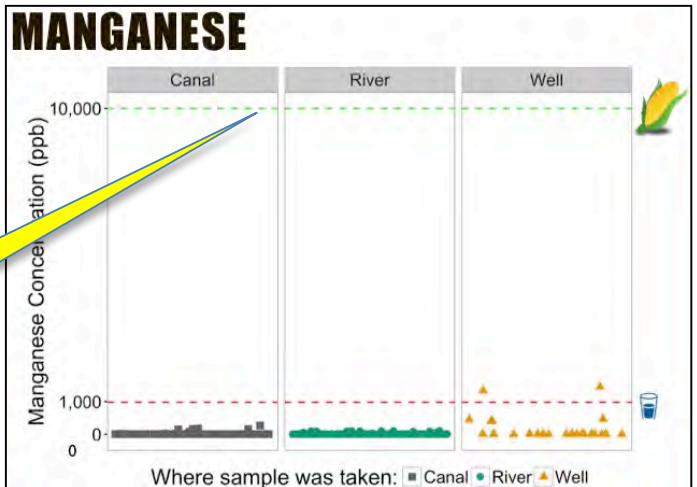
Nearly 100 community members attended Shiprock Ag Days.



**Lead** - 288 water samples very low lead levels (around 0 ppb) and met the agricultural standard of 10,000 ppb.

During spring runoff, 4 river water samples had lead levels above 2.5 ppb for guidelines for plants and animals living in water, however, they lead levels were still very low (below 15 ppb for drinking) & met ag standard for use.

**Manganese** - 288 water samples met agricultural standards of 10,000 ppb for manganese. Two well samples were above 980 ppb for Navajo drinking water standards and 80 ppb for plants and animals living in water in Spring 2016.



Agricultural Standard of 10,000 ppb

## HOUSEHOLD BIOMONITORING REPORT BACK

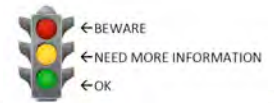
The UA trained Navajo Nation Department of Health Community Health Representatives (CHRs) on how to report biomonitoring results back to approximately 60 homes. The training was held on August 22, 2017 at the Upper Fruitland Chapter House. The training consisted of understanding the CHR flip book which included a background on the Gold King Mine Spill, environmental health terms, project goals, and individual personal results. During the training, CHRs practiced giving individual results back and reviewed Navajo health terms. The flip book was developed in partnership with CHR Program Director Mae-Gilene Begay; Crownpoint CHR Supervisor Brenette Pine; and Shiprock CHR Supervisor Verna Begay. A total of 11 CHRs were trained and CHRs received certificates of completion. Al Yazzie assisted and provided Navajo language translation support.



*UA and Navajo Nation CHRs during results report back training on August 22<sup>nd</sup>, 2017 at Upper Fruitland.*

*Top row: Dr. Paloma Beamer, Maggie Johnson, Brenette Pine, Mabel Charley, Priscilla Yellowman, Seraphina Redhouse, and Jonathan Abeita. Bottom row: Rietta Wagoner, Sue Emerson, Berlinda Dickson, Maxine Tsosie, Mae-Gilene*

The next 3 days were dedicated to reporting results back to participants in three communities whose homes had been sampled one year ago in August 8-11, 2016 for dust, water, and soil and tested for arsenic and lead.



### OVERALL HOUSEHOLD STUDY RESULTS

	Main Finding for <b>Arsenic (Béesh fibáhá)</b>	Main Finding for <b>Lead (Béesh dilyíhí)</b>	Compared to:
<b>Blood</b>	<i>Not tested</i>	Almost all (85 out of 87) met guideline except for 2	CDC Action Level
<b>Urine</b>	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 <sup>th</sup> Percentile (2 out of 100 people in the US are over this level)
<b>Drinking Water</b>	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
<b>Yard Soil</b>	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
<b>House Dust</b>	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

**NOTES:**

- Our methods are designed for research purposes, and cannot serve as the basis for healthcare decisions or environmental cleanup action.
- NHANES 98<sup>th</sup> percentile value is the level above which 2 people of 100 people would have values above this level in the US.
- Acronyms: CDC (Centers for Disease Control), NHANES (National Health and Nutrition Examination Survey), EPA (US Environmental Protection Agency), HUD (Housing and Urban Development).
- If you have questions, please contact Dr. Karletta Chief, 505-652-4563, goldkingproject@gmail.com. If you can't call or email, tell your Community Health Representative or visit your chapter house to call.

## NAVAJO COMMUNITY HEALTH REPRESENTATIVES ATTEND AZCHOW

On June 15<sup>th</sup>-16<sup>th</sup>, 2017 Maxine Tsosie (Diné) a Community Health Representative from Kayenta, AZ and Jonathan Abeita (Diné) a Community Health Representative from Crownpoint, NM attended the Arizona Community Health Workers (CHW) Association 14<sup>th</sup> annual conference held in Tucson, AZ. The goals of the conference were to increase knowledge of current health issues affecting Arizona. Facilitate collaboration among CHWs and CHW organizations addressing chronic diseases/conditions in their communities. The Gold King Mine Spill Diné Exposure Project is committed to strengthening our work with the Community Health Representatives.



*Maxine Tsosie and Jonathan Abeita receiving their training certificates by Dr. Paloma Beamer on August 22<sup>nd</sup>, 2017*

## TEACH-INS

*Monthly community gatherings to hear latest results, ask questions, and discuss Post-Gold King Mine Spill monitoring efforts, impacts, and make plans for next steps.*

Since the first Teach-In in March 2016, 5 Teach-ins have been held including Wednesday, May 24<sup>th</sup>, 2017 and July 19<sup>th</sup>, 2017 at Shiprock Chapter House Auditorium and Tuesday August 22<sup>nd</sup>, Upper Fruitland Chapter House on August 23<sup>rd</sup>, and Aneth Chapter House on August 24<sup>th</sup>, 2017. Tó Bei Nihi Dziil hosts and facilitates the Teach-Ins and attendees learn about what testing has been done, by who, and what results are publicly available. Teach-Ins are advertised through local newspapers, radios, flyers, Facebook, and an email listserve. Like our facebook page or subscribe to our email listserve to hear about upcoming events!

### Teach-In Presenters include:

- Arnold Clifford, Navajo Geologist
- The New Mexico Citizen's Advisory Committee
- Kevin Lombard, Gaurav Jha and Brandon Francis, New Mexico State Univ.
- Steve Austin, Navajo EPA
- Dr. Karletta Chief & Dr. Paloma Beamer, University of Arizona



*Janene Yazzie of Tó Bei Nihi Dziil hleading roundtable discussions during Teach-In*



### UNDERSTANDING EFFECTIVE WAYS TO REPORT RESULTS BACK

Jennifer Richards held Navajo community focus groups in July 2017 to ask people how they would like to see results reported back to them. Jennifer Richards, MPH (Diné/Lakota/Taos) is a PhD graduate student in Public Health at the University of Arizona Zuckerman College of Public Health. She is originally from Tuba City, Arizona.

**Community Teach-Ins on Household results upcoming in Oct or Nov!**

**Navajo IRB Conference Oct 18-19 in Window Rock where we will present!**

# GOLD KING MINE SPILL EXPOSURE AND RISK PERCEPTION STUDY



## SEEKING DONATIONS of SHEEP & CORN

### Who are we?

A team of researchers and Navajo Community Health Representatives with expertise in hydrology, exposure, health, and indigenous studies from the University of Arizona and Northern Arizona University.

### What we are studying?

The short-term exposure, risk perception, and long-term health risks of Navajo people living in Upper Fruitland, Shiprock, Aneth Chapters, and across the Navajo Nation who have been impacted by the Gold King Mine Spill.

### What does participation entail?

We are seeking donations of **sheep organs (specifically heart, lung, kidney, stomach lining, and leg (meat & bone))**. We are also look for donations of **corn (specifically three ears of corn from the same crop)**.

**FOR MORE  
INFORMATION  
CONTACT:**

**Jani Ingram**  
**(505) 652-4563**  
**goldkingproject@gmail.com**



## DO YOU WANT TO BE INVOLVED?

We are looking for community members to serve on The Gold King Mine Spill Dine' Exposure Project Community Advisory Board to meet regularly and to provide input on the project and plan next steps. Contact Dr. Karletta Chief at [goldkingproject@gmail.com](mailto:goldkingproject@gmail.com).

### PRESENTATIONS & OUTREACH

One of our overarching goals is to raise the level of awareness on the unique impacts that the Diné Communities face and experience as a result of the Gold King Mine Spill. Below are presentations and outreach the Team has done in the past few months.

- Dr. Karletta Chief presented at the New Mexico's Gold King Mine Spill Citizens' Advisory Committee, **May 22, 2017**, San Juan College, Farmington, NM.
- Dr. Karletta Chief co-taught a short summer course called “Arizona Indigenous Communities, Environment, Education and Science on Indigenous Communities” along with Professors K. Gunckel, J. Garcia and V. Shirley. Six UA students took an 8-day field trip to Northern Arizona to visit three Indigenous communities and learn about environmental issues that affect these communities. The course focused on the role that education and science play in the causes of, impacts from, and community responses to these issues. On **May 23, 2017**, the students visited the farms of Dr. Larry Emerson, Chili Yazzie. They received an overview of the San Juan Irrigation system by Marlin Saggboy, Navajo Irrigation Manager. They visited the New Mexico State University Extension Office with Dr. Kevin Lombard, and attended a Shiprock Teach-In.
- Dr. Karletta Chief convened a panel on the Gold King Mine Spill and Impacts at the University Council on Water Resources (UCOWR) Annual Conference, **June 13, 2017**, Fort Collins, CO. She invited Dr. Kevin Lombard, New Mexico State University; Dr. Rebecca Clausen, Fort Lewis College; and Dr. Lucia Rodriguez Freire, University of New Mexico; and Patrick McLee, University of New Mexico to share their research on post-spill impacts.
- Dr. Karletta Chief was the Invited Lunch Keynote Speaker at the New Mexico Water Resources Research Institute Conference, Environmental Conditions of the Animas and San Juan River Watersheds with Emphasis on Gold King Mine and Other Mine Waste Issues, **June 21, 2017**, San Juan College, Henderson Fine arts Center, Farmington, NM.
- Dr. Karletta Chief was on a panel entitled “Making the Community Whole Again” at the New Mexico Water Resources Research Institute Conference, Environmental Conditions of the Animas and San Juan River Watersheds with Emphasis on Gold King Mine and Other Mine Waste Issues, **June 21, 2017**, San Juan College, Henderson Fine arts Center, Farmington, NM.
- Dr. Karletta Chief will be doing a plenary speech at the International Society of Exposure Science (ISES) in **October 2017** and Dr. Paloma Beamer and Yoshi Ornelas will be presenting posters and oral presentations.



AHE'HEE!!

We gratefully acknowledge our many research partners, volunteer students, advisory board members, and funding sources. This research effort is enhanced immensely by their enthusiastic support.



National Institute of Environmental Health Sciences

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MEL & ENID ZUCKERMAN COLLEGE OF PUBLIC HEALTH  
Center for Indigenous Environmental Health Research (CIEHR)  
5P50ES026089-02



Agnese Nelms Haury Program  
in Environment and Social Justice



IP20MD006872



Superfund Research Program  
The University of Arizona  
P42ES04940



SOUTHWEST ENVIRONMENTAL HEALTH SCIENCES CENTER  
P30ES006694



Left: Dr. Karletta Chief with Navajo CHRs at Aneth Chapter. Right: UA Team preparing household sampling kits.

Fact Sheet

Chief, K., J.F. Artiola, P. Beamer, S. Wilkinson, R.M Maier, C. Rock, and C. Sanchez. 2015. Understanding the Gold King Mine Spill. Fact Sheet. University of Arizona, Tucson, AZ. ([http://www.superfund.pharmacy.arizona.edu/sites/default/files/u43/gold\\_king\\_mine\\_spill.pdf](http://www.superfund.pharmacy.arizona.edu/sites/default/files/u43/gold_king_mine_spill.pdf))

News Article

Beamer, P., K. Chief, N. Borrero, and B. Rivera. 2016. Water Is Our Life: How a Mining Disaster Affected the Navajo Nation. Truth Out, April



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