Gold King Mine Spill
Diné Exposure Project

TÓ'ŁÍTSO, THE WATER IS YELLOW: WATER, AGRICULTURAL, AND SEDIMENT QUALITY RESULTS OF THE SAN JUAN RIVER ON THE NAVAJO NATION ONE YEAR AFTER THE GOLD KING MINE SPILL

Partnerships:

Funded By:

NIH National Institute of Environmental Health Sciences

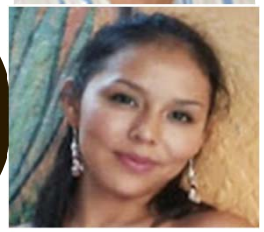
THE UNIVERSITY OF ARIZONA Agnese Nelms Haury Program in Environment and Social Justice

WHO WE ARE

UNIVERSITY OF AZ

- Karletta Chief
  - Hydrology Professor

- Paloma Beamer
  - Environmental Health Professor
- Dean Billheimer
  - Biostatistics Professor

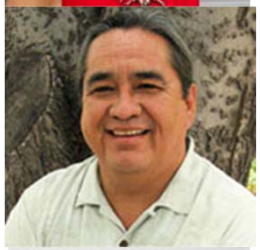


TÓ BEE NIHI DZIIL

- Janene Yazzie
  - Community Organizer

NORTHERN AZ UNIV

- Jani Ingram
  - Chemistry Professor



- Manley Begay
  - Indigenous Studies Professor

- Nicolette Teufel-Shone
  - Health Promotion Professor

NAVAJO CHR

- Mae-Gilene Begay
  - CHR Director

DINÉ COLLEGE

- Perry Charley
  - Director, Diné Environmental Institute

FORT LEWIS COLLEGE

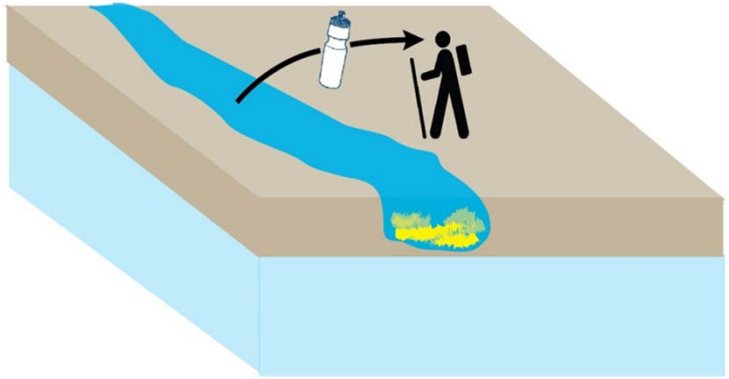
- Becky Clausen
  - Sociology Professor

The Problem

- EPA released 3 million gallons of acid mine drainage into the Animas and San Juan Rivers, which flow through the Navajo Nation
- EPA hauled in water contaminated with oil for crop irrigation and live stock
- The result?
  - Very high community concern about human exposures, but also their crops, livestock and the wildlife for which there is a strong connection
  - Much community debate about using the river water again. Many are still without water and have lost their crops.
  - Very high perception of risk
  - Very high lack of trust in outside entities

EPA Perception

Diné Reality



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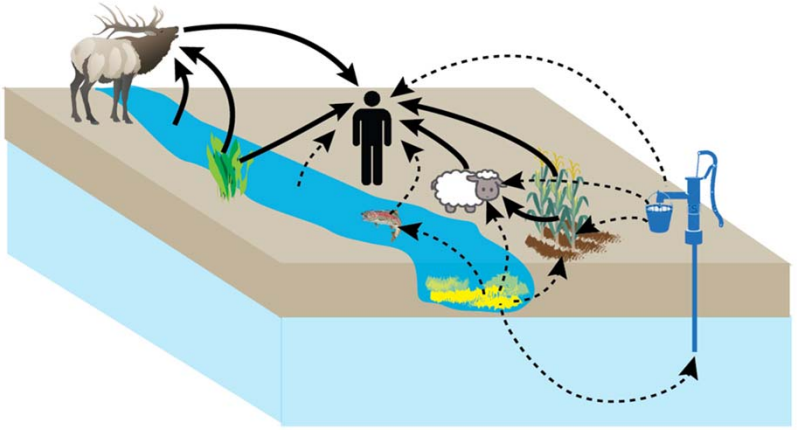
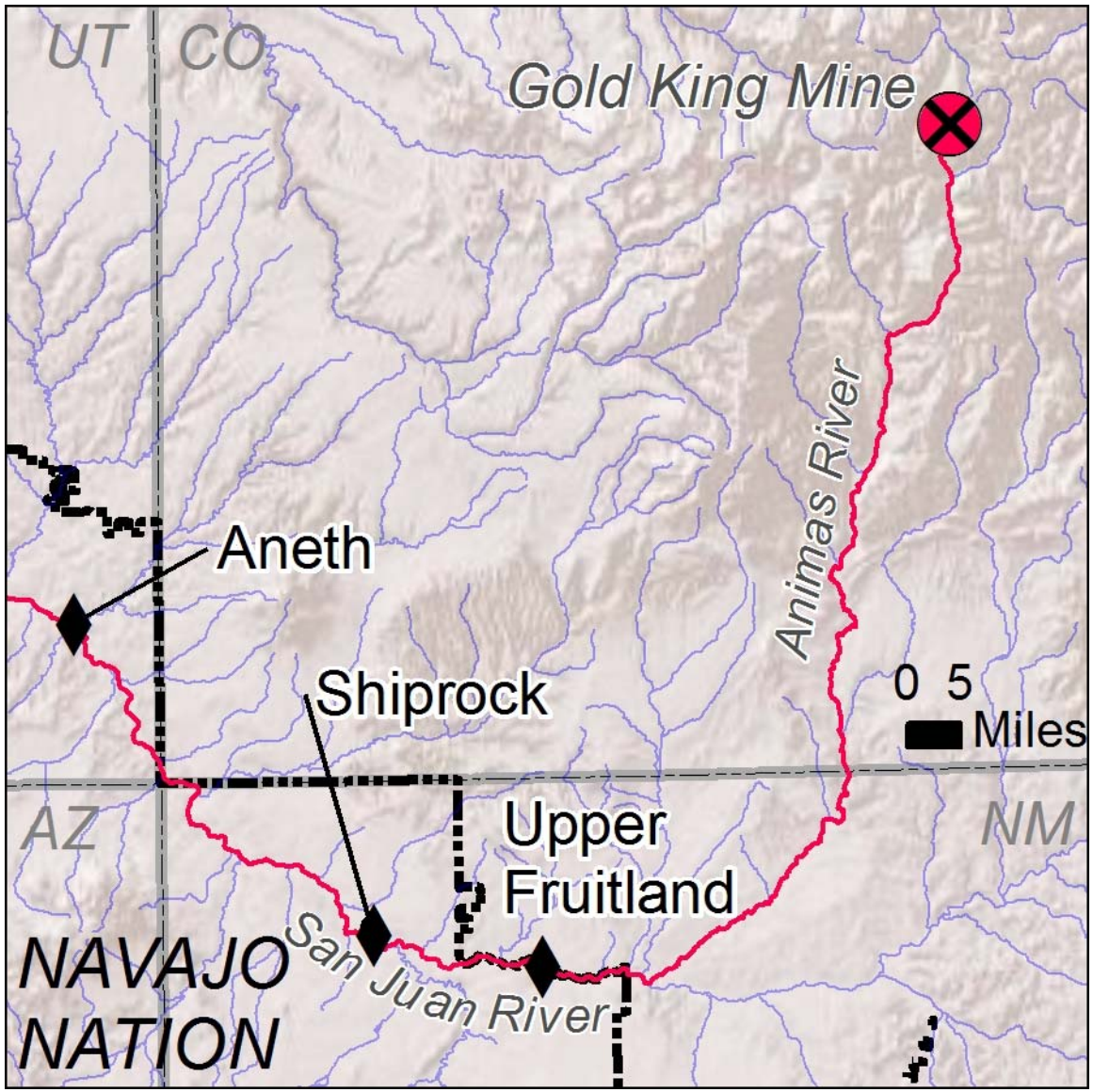


PROJECT AREA



ENVIRONMENTAL SAMPLES COLLECTED

1. Nov 2015
   - 162 soil/sediment
   - 62 water
2. March 2016
   - 183 soil/sediment
   - 37 water
3. June 2016
   - 213 soil/sediment
   - 201 water

- UA, NAU, & Diné College
- 858 samples total

WATER RESULTS

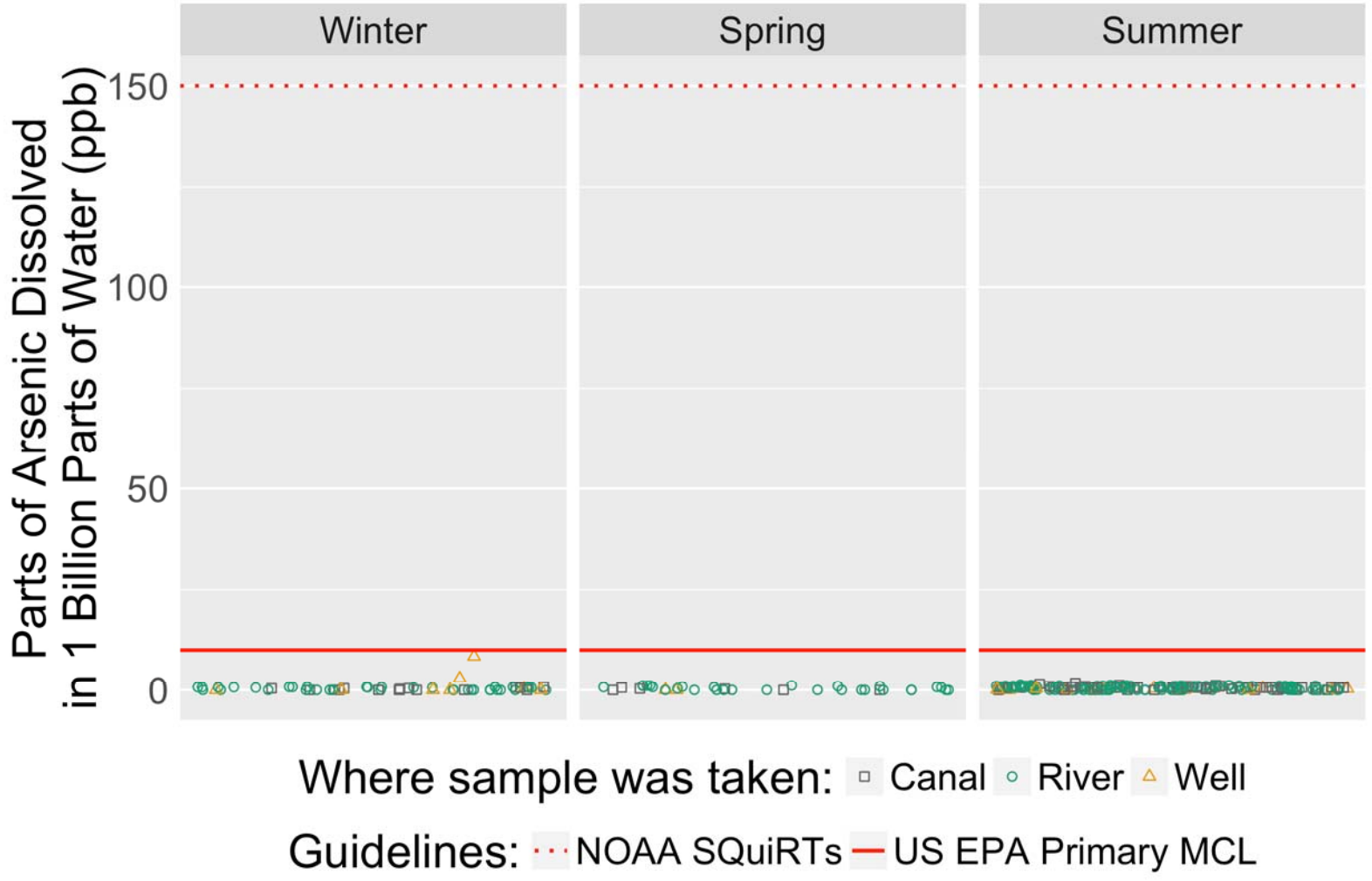
WATER GUIDELINES: DRINKING WATER FOR PEOPLE

- US EPA Primary Maximum Contaminant Level (MCL)
  - The maximum amount of a contaminant allowed in drinking water so that it is still safe for people to drink over many years
- US EPA *Secondary* MCL
  - The *suggested* maximum amount of a contaminant in drinking water so the water does not have bad taste, smell, or color
  - **Not related to human health or safety**
- Both set by the US Environmental Protection Agency

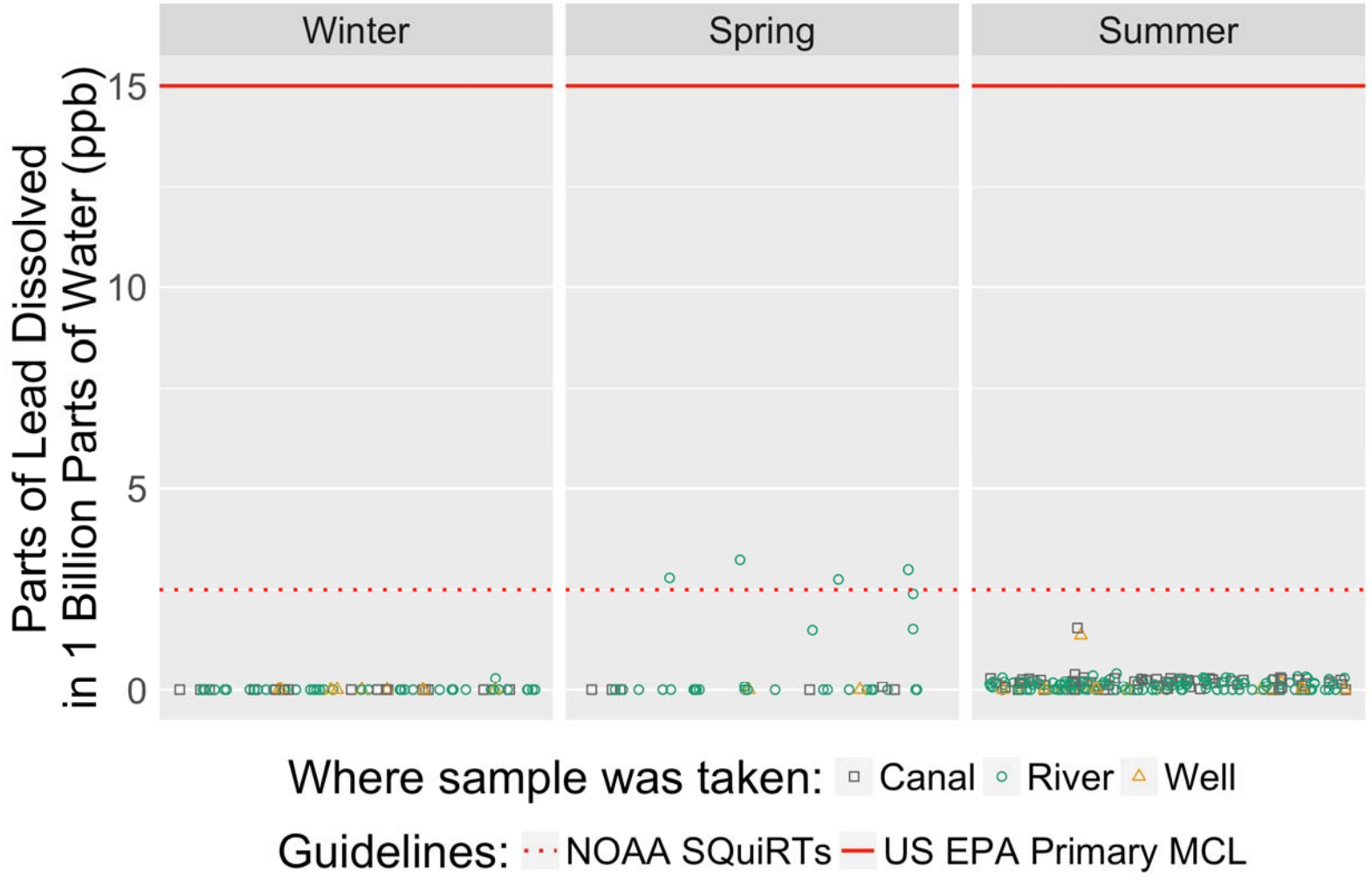
WATER GUIDELINES: PLANTS AND ANIMALS IN WATER

- NOAA SQuiRTs (Screening Quick Reference Tables)
  - The maximum amount of a contaminant allowed in water so it is safe for plants and animals to live in over many years
  - Used by the National Oceanic and Atmospheric Administration (NOAA)
  - Based on levels set by the US EPA and other organizations

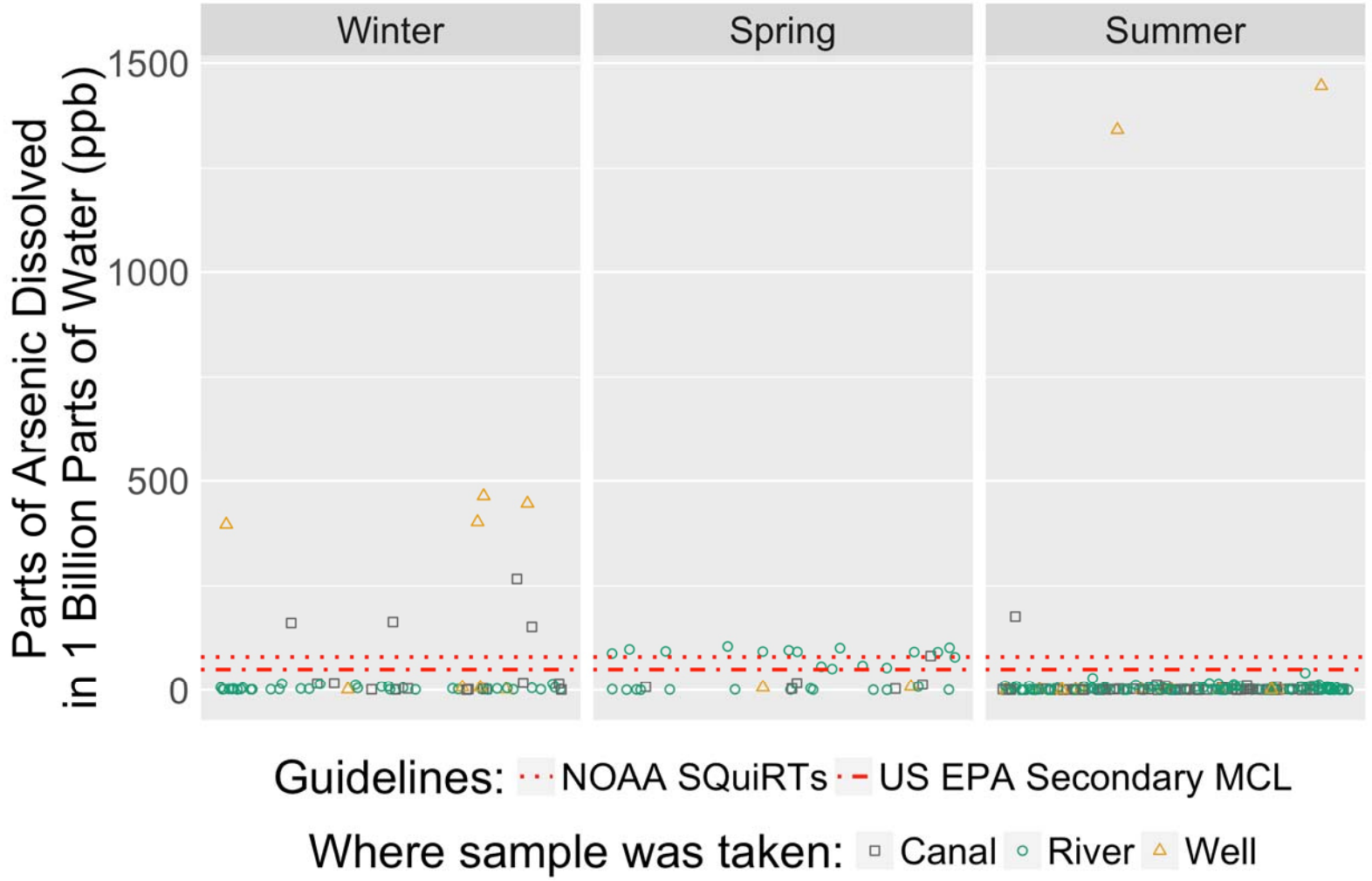
AMOUNT OF ARSENIC IN WATER



AMOUNT OF LEAD IN WATER



AMOUNT OF MANGANESE IN WATER



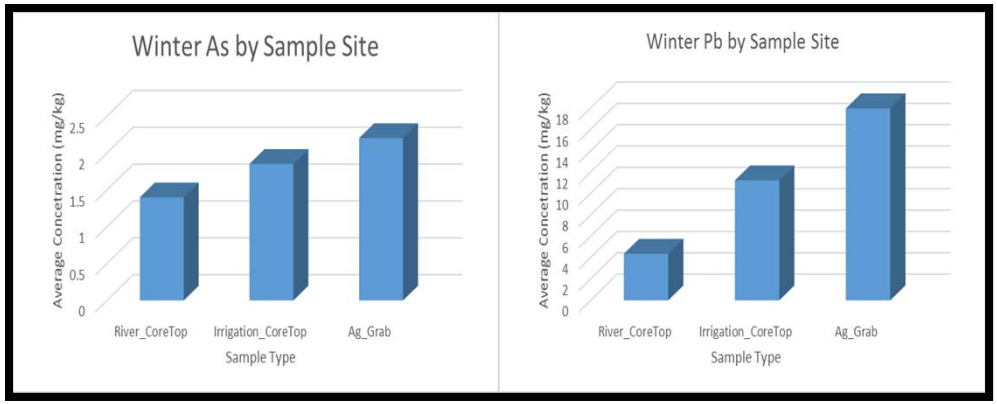
SOIL AND SEDIMENT RESULTS

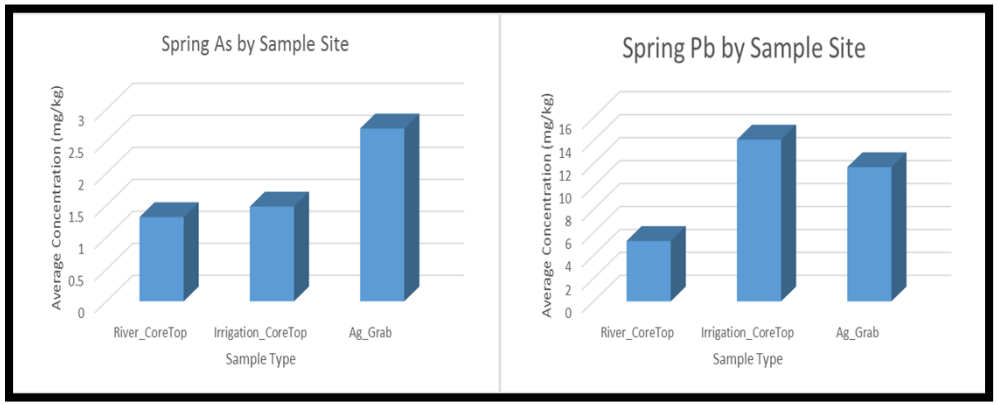
SOIL BACKGROUND: LEAD

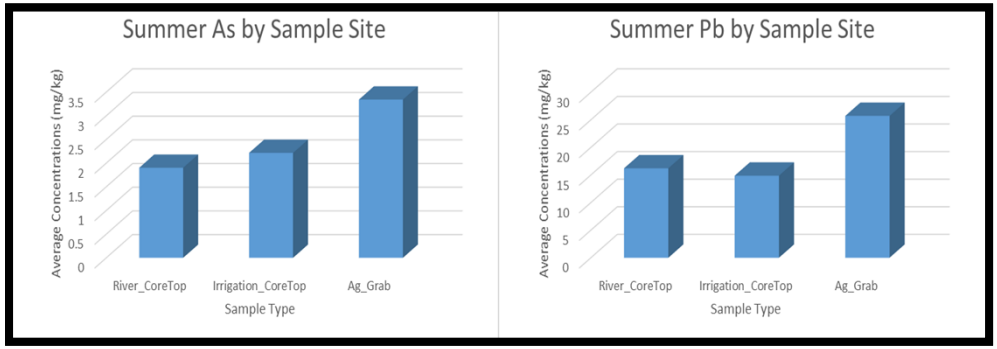
- Natural background concentrations of lead that occur naturally in surface agricultural soils in the United States range from 7 to 20 ppm
- Standards and Regulations
  - EPA (residential soil) – 400 ppm (play areas) 1200 ppm (non-play areas)

ARSENIC

- Natural background concentrations of arsenic that occur naturally in soils in the United States range from 7 to 40 ppm
- Standards and Regulations
  - EPA (residential soil) – 11 ppm (depending on source)

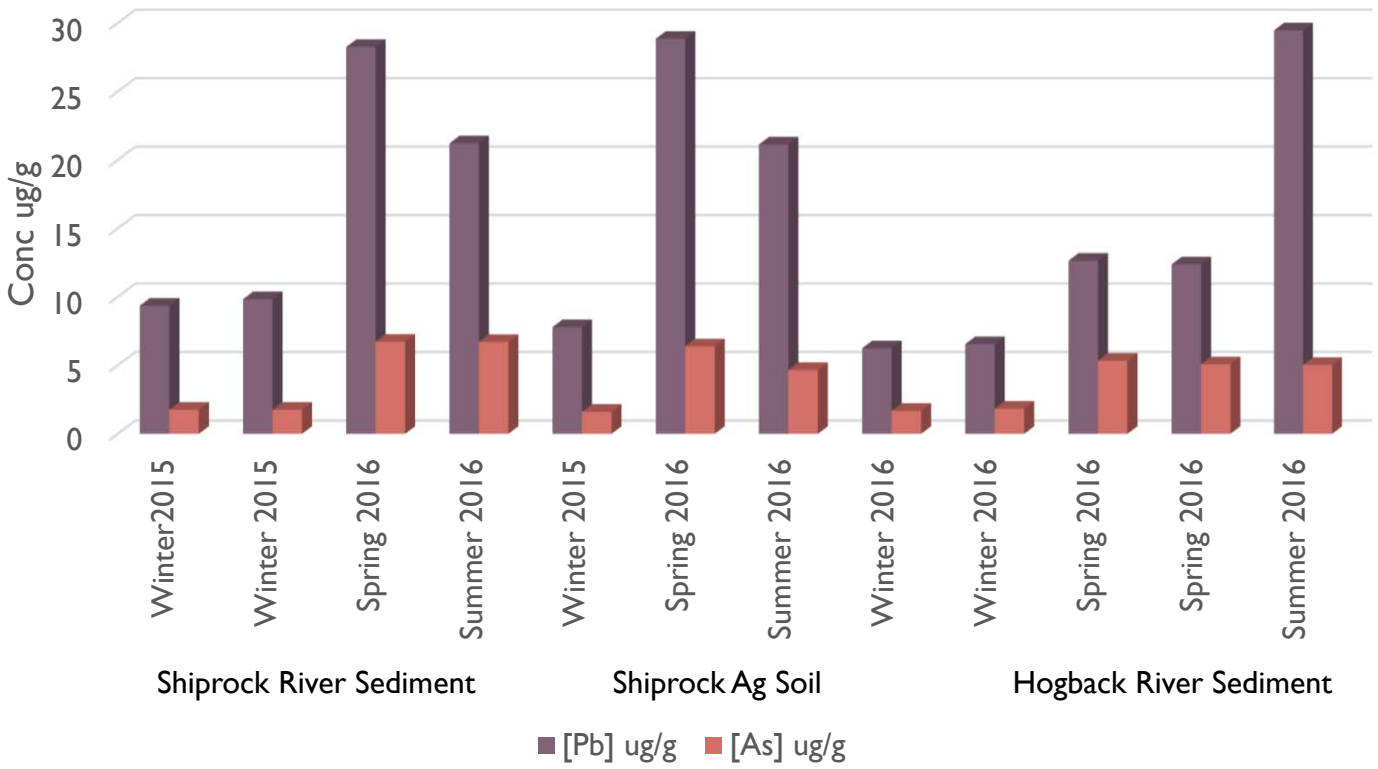






Gold King Mine Spill Dine' Exposure Project

Deposition of Lead and Arsenic Over Time



Gold King Mine Spill Dine' Exposure Project

OUR MAIN FINDINGS

- Amounts of **arsenic** in water were below the guidelines for drinking water for people and for plants and animals living in water
- Amount of **lead** in 4 river samples was above the water guideline for plants and animals living in water in Spring 2016
- Amounts of **manganese** were above both guidelines in Spring 2016 more than Winter 2015 and Summer 2016
- Amounts of metals in the San Juan River and canal water were generally higher in Spring 2016 compared to Winter 2015 and Summer 2016
- Amounts of arsenic in the river sediment and agricultural soils for Winter 2015, Spring 2016, and Summer 2016 are all at or below background levels.
- Amounts of lead somewhat increases going from river sediment to canal sediment to agricultural soils but are near background levels and do not exceed EPA regulatory levels.
- Manganese analyses are not yet complete

SHEEP & CORN SAMPLES

- 7 corn samples have been collected from families in the Shiprock and Upper Fruitland Chapters
- 2 corn samples have been collected from the Navajo Agricultural Products Industry (NAPI) – these samples were not exposed to contaminants from the spill so they will be used for comparison to the samples collected in Shiprock and Upper Fruitland
- Sample preparation methods were developed to enable trace element analysis of the corn
- Analyses for lead, arsenic, and manganese in process
- Additional corn plants, water and agricultural soil collected fall 2017 – analyses underway
- No sheep samples have been collected – issues with sheep grazing in various locations during different seasons. Some of these areas were not affected by the Spill.

DISSEMINATION

- 3 listening sessions
- 12 focus groups
- 8 teach-ins
- Navajo Pres & VP and Community Partners visit UA & participate in a panel

STUDENT TRAINING

- Trained 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
- Students from many levels:
  - Middle School (1), High School (2), Associate (4), Bachelor (45), Masters (5), Doctoral (12)
- Students from many ethnic backgrounds:
  - Diné, Tohono O'odham, Hopi, Cherokee, Hispanic Caucasian, Asian, African American.

ACKNOWLEDGMENTS

Navajo Nation Western Agency
Shiprock, Upper Fruitland, and Aneth Chapters
Navajo Nation EPA

Navajo Nation Human Research Review Board

National Institute of Environmental Health Sciences

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Superfund Research Program
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University Libraries

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CAIR Center for American Indian Resilience

Mel & Enid Zuckerman College of Public Health
Center for Indigenous Environmental Health Research (CIEHR)

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QUESTIONS