

Gold King Mine Spill **Diné Exposure Project**

ENVIRONMENTAL SAMPLING RESULTS: WATER







National Institute of Environmental Health Sciences



NORTHERN ARIZONA UNIVERSITY

> Agnese Nelms Haury Program in Environment and Social Justice

ENVIRONMENTAL SAMPLES COLLECTED

- I. 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

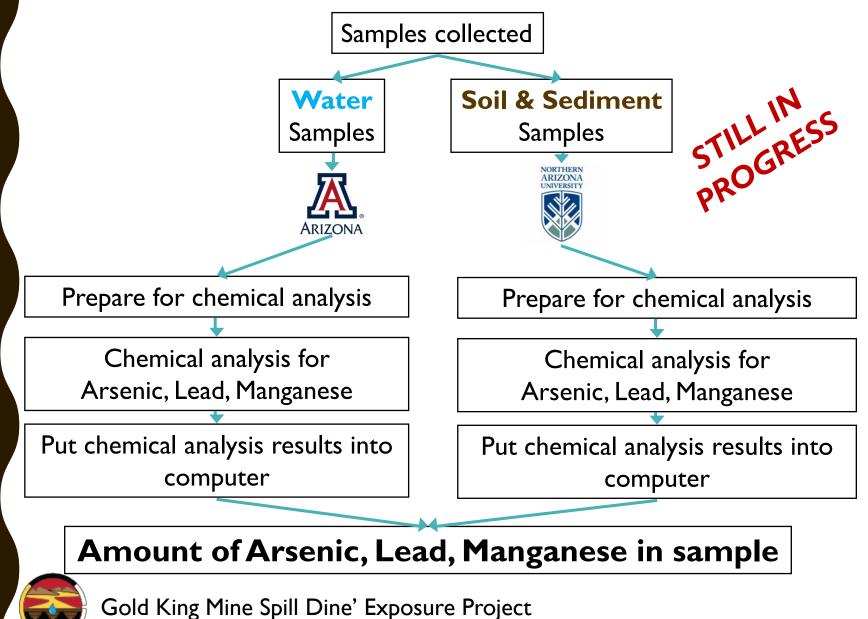




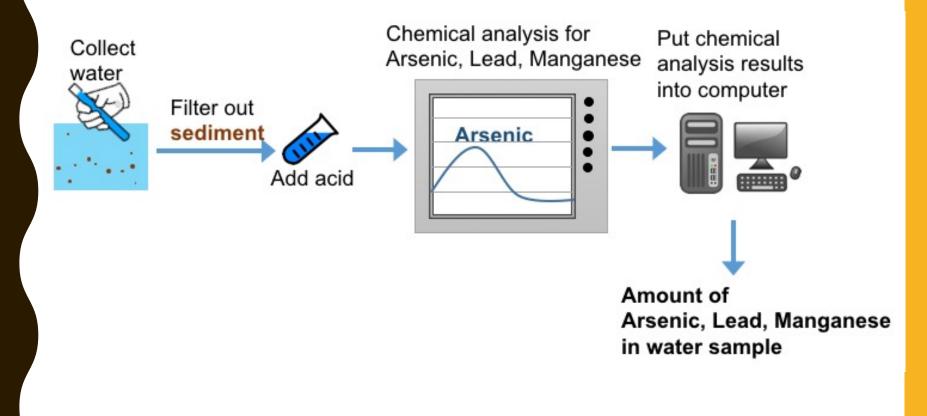




STEPS FOR WATER & SOIL/SEDIMENT



WATER





MEASURING THE AMOUNT OF A METAL IN WATER

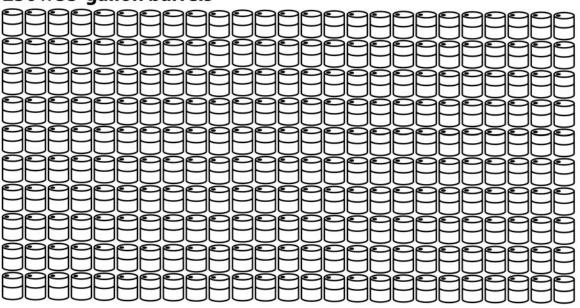
- We measure the amount of a metal **dissolved** in water
- We filter the water because pieces of dirt or sediment may harm the instrument that tells us the amount of metals in the water
- Very small pieces of dirt or sediment that might have a metal are filtered out
- Each sample is 'snapshot' in time
- You can never sample the same river or canal twice



SHOWING THE AMOUNT OF A METAL IN WATER

- ppb (parts per billion)
 - How many parts of a dissolved metal in a billion parts of water
 - Sometimes called micrograms per liter or µg/L

1 drop of ink in 250 x 55-gallon barrels





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



WHERE DO METALS COME FROM?

- Arsenic, lead, and manganese are chemical elements that make up minerals
- Different minerals give rocks different colors and strength
- When rocks and soil contact water, the minerals and metals can naturally dissolve into in water
- Depending on the rocks and soil in the area, some areas may have higher amounts of arsenic, lead, and manganese in water than others
- Amounts of metals can be concentrated by different human activities
- It is hard to trace where a metal came from



WHERE DO METALS COME FROM?

- Arsenic, lead, and manganese are found naturally in all water in different amounts
- Depending on the rocks and soil in the area, some areas may have higher amounts of metals in water than others
- Amounts of metals can be concentrated by different human activities
- It is hard to trace where a metal came from

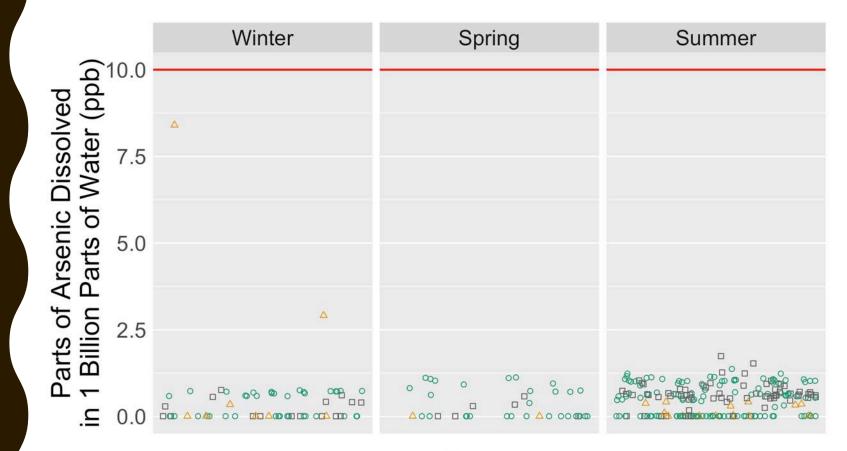


OUR MAIN FINDINGS

- 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



AMOUNT OF ARSENIC IN WATER

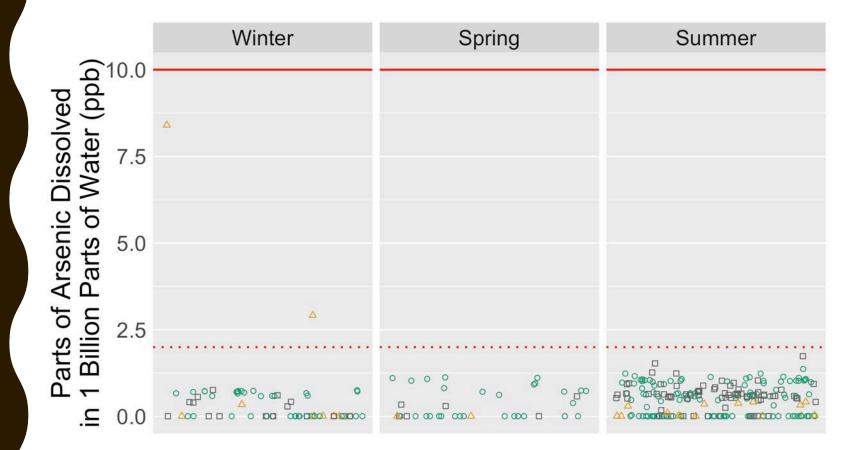


Guidelines: - US EPA Primary MCL

Where sample was taken:
Canal
River
Well



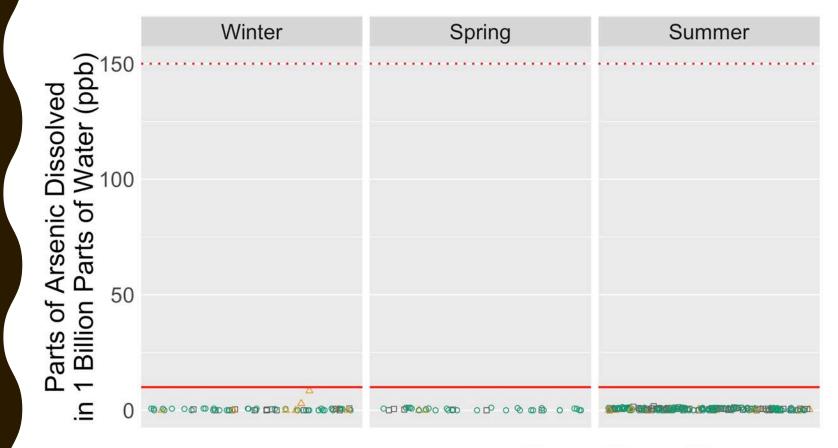
AMOUNT OF ARSENIC IN WATER



Guidelines: ••• Tucson City Minimum – US EPA Primary MCL Where sample was taken: •• Canal •• River •• Well



AMOUNT OF ARSENIC IN WATER



Where sample was taken: Canal River Well Guidelines: NOAA SQuiRTs – US EPA Primary MCL



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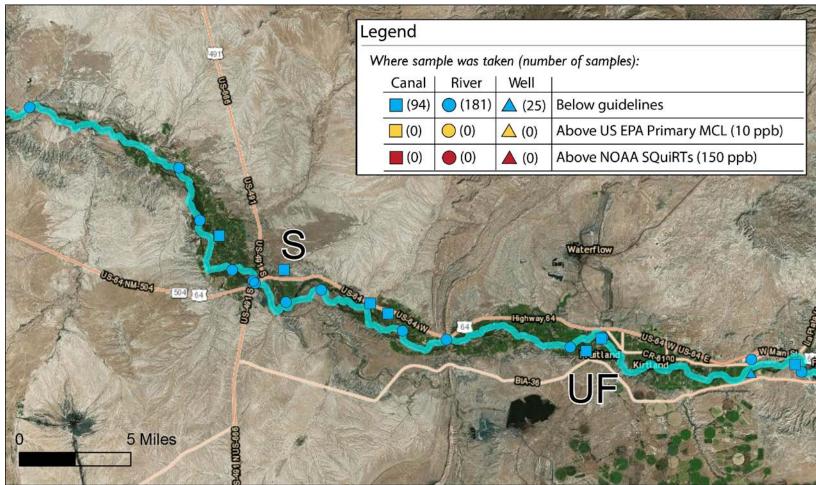
Legend

Where sample was taken (number of samples):

Canal	River	Well	
(94)	(181)	(25)	Below guidelines
(0)	(0)	(0)	Above US EPA Primary MCL (10 ppb)
(0)	(0)	(0)	Above NOAA SQuiRTs (150 ppb)

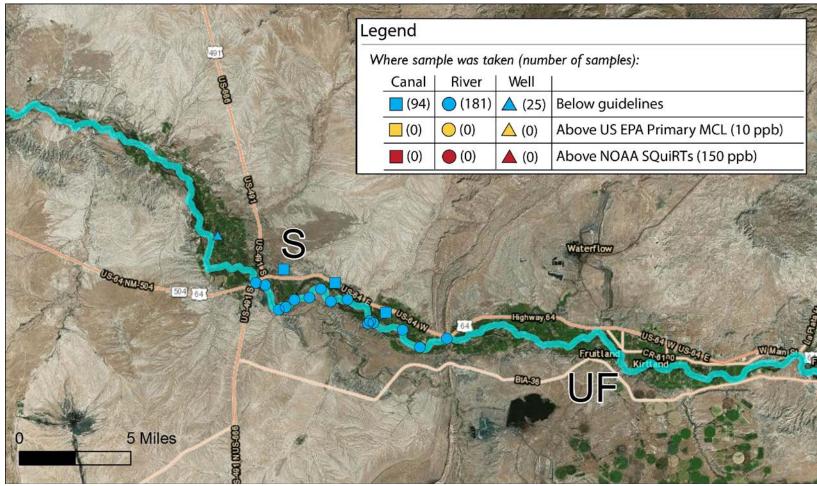


UPPER FRUITLAND & SHIPROCK WINTER 2015



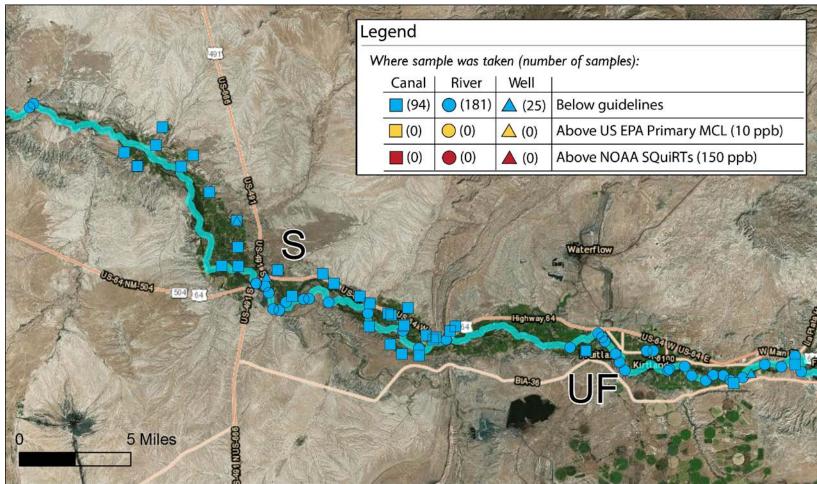


UPPER FRUITLAND & SHIPROCK SPRING 2016





UPPER FRUITLAND & SHIPROCK SUMMER 2016





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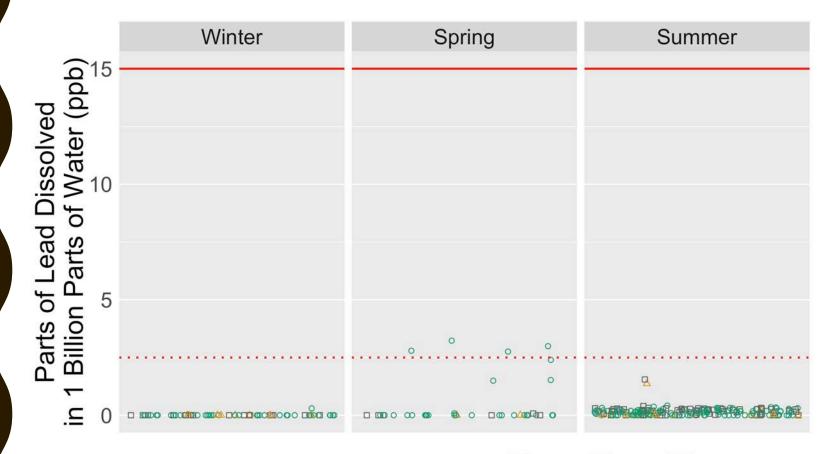


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AMOUNT OF LEAD IN WATER



Where sample was taken: Canal River Well Guidelines: NOAA SQuiRTs – US EPA Primary MCL



4 of 29 (14%) Spring river samples above the NOAA SQuiRTs guideline (plants and animals living in the water)

Winter Spring Summer

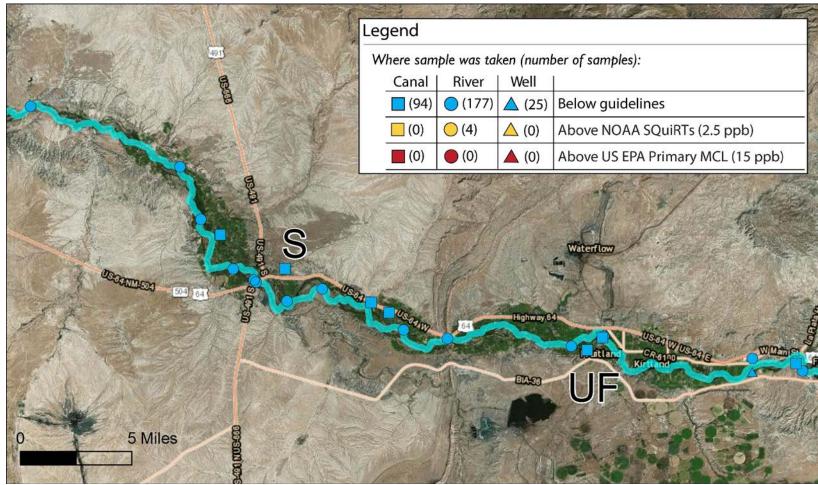
Legend

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)

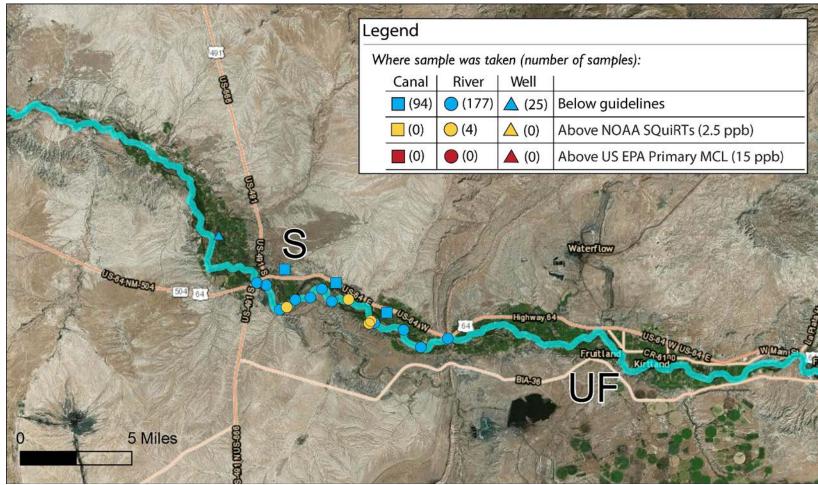


UPPER FRUITLAND & SHIPROCK WINTER 2015



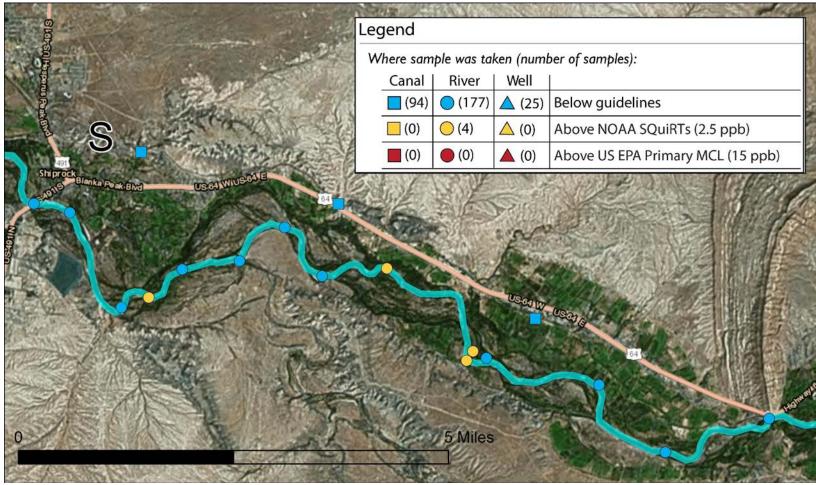


UPPER FRUITLAND & Shiprock Spring 2016



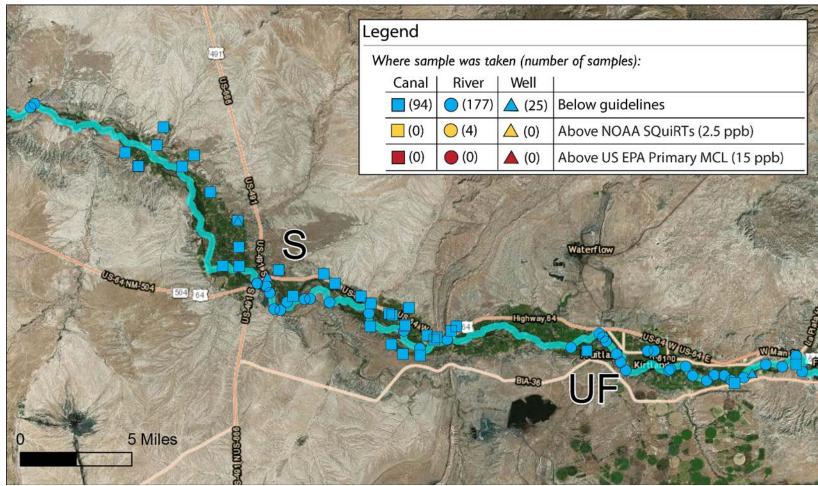


UPPER FRUITLAND & Shiprock Spring 2016





UPPER FRUITLAND & SHIPROCK SUMMER 2016





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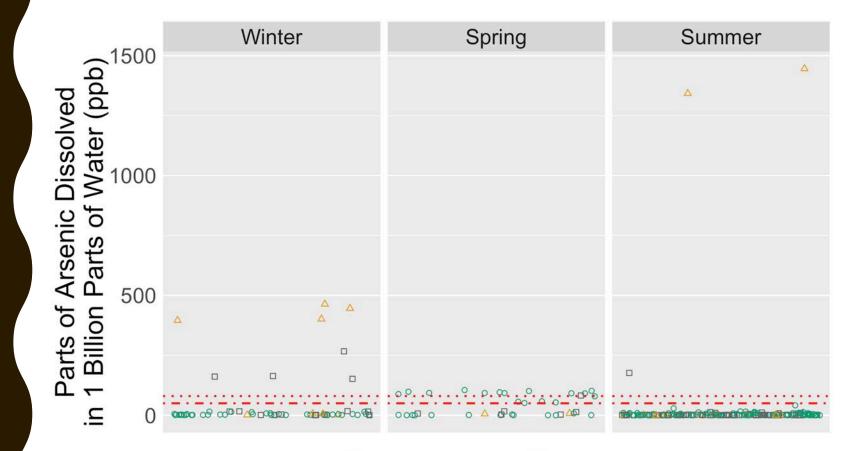


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AMOUNT OF MANGANESE IN WATER

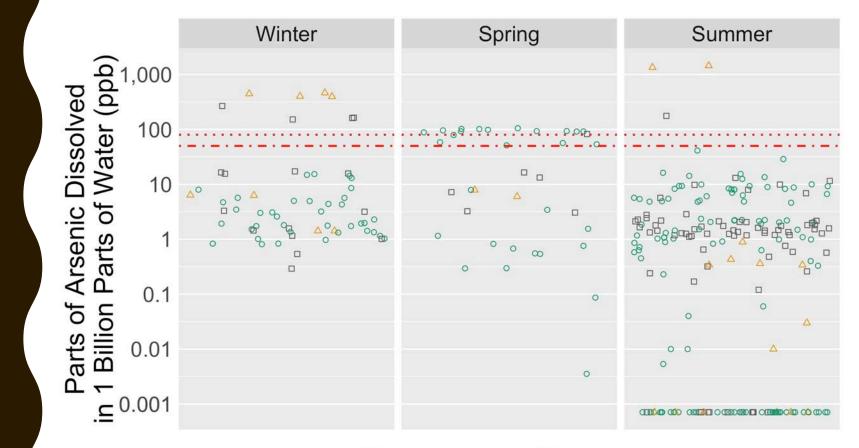


Guidelines: ···· NOAA SQuiRTs ·- US EPA Secondary MCL

Where sample was taken:
Canal
River
Well



AMOUNT OF MANGANESE IN WATER

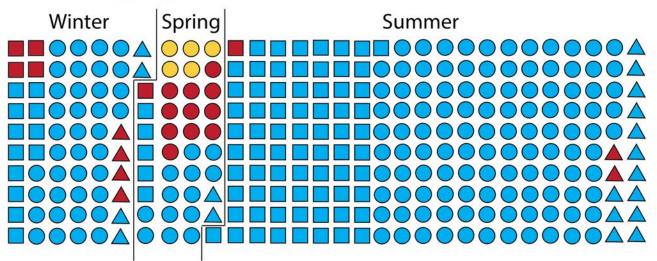


Guidelines: ···· NOAA SQuiRTs ·- US EPA Secondary MCL

Where sample was taken:
Canal
River
Well



4 of 16 (25%) Winter canal samples above the NOAA SQuiRTs guideline (plants and animals living in the water)



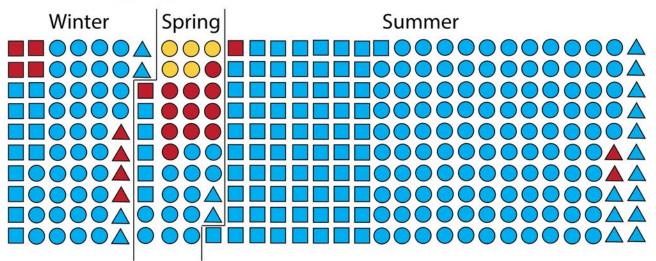
Legend

Where sample was taken (number of samples):

Canal	River	Well	
(88)	(164)	🛕 (19)	Below guidelines
(0)	(5)	(0)	Above US EPA Secondary MCL (50 ppb)
(6)	(11)	(6)	Above NOAA SQuiRTs (80 ppb)



4 of 8 (50%) Winter well samples above the NOAA SQuiRTs guideline (plants and animals living in the water)



Legend

Where sample was taken (number of samples):

Canal	River	Well	
(88)	(164)	🛕 (19)	Below guidelines
(0)	(5)	(0)	Above US EPA Secondary MCL (50 ppb)
(6)	(11)	(6)	Above NOAA SQuiRTs (80 ppb)



1 of 6 (17%) Spring canal samples above the NOAA SQuiRTs guideline (plants and animals living in the water)

Spring Summer Winter

Legend

Where sample was taken (number of samples):

Canal	River	Well	
(88)	(164)	🛕 (19)	Below guidelines
(0)	(5)	(0)	Above US EPA Secondary MCL (50 ppb)
(6)	🔴 (11)	(6)	Above NOAA SQuiRTs (80 ppb)



11 of 29 (38%) Spring river samples above the NOAA SQuiRTs guideline (plants and animals living in the water)

Spring Summer Winter

Legend

Where sample was taken (number of samples):

Canal	River	Well	
(88)	(164)	🛕 (19)	Below guidelines
(0)	(5)	(0)	Above US EPA Secondary MCL (50 ppb)
(6)	🔴 (11)	(6)	Above NOAA SQuiRTs (80 ppb)



5 of 29 (17%) Spring river samples above the US EPA Secondary MCL guideline (drinking water for people)

Winter Spring Summer

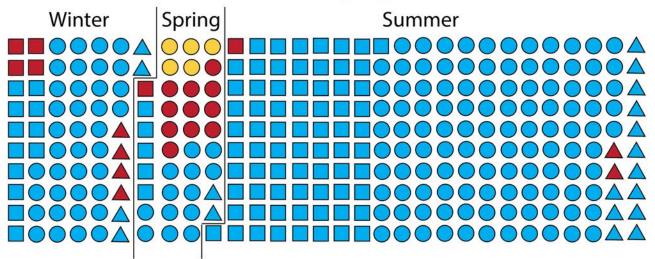
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Where sample was taken (number of samples):

Canal	River	Well	
(88)	(164)	(19)	Below guidelines
(0)	(5)	(0)	Above US EPA Secondary MCL (50 ppb)
(6)	🔴 (11)	(6)	Above NOAA SQuiRTs (80 ppb)



1 of 72 (1%) Summer canal samples above the NOAA SQuiRTs guideline (plants and animals living in water)



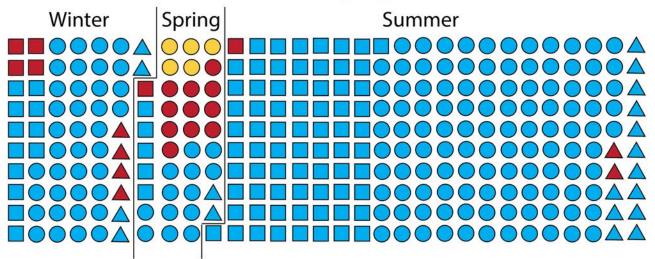
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Where sample was taken (number of samples):

Canal	River	Well	
(88)	(164)	🛕 (19)	Below guidelines
(0)	(5)	(0)	Above US EPA Secondary MCL (50 ppb)
(6)	🔴 (11)	(6)	Above NOAA SQuiRTs (80 ppb)



2 of 15 (13%) Summer well samples above the NOAA SQuiRTs guideline (plants and animals living in water)



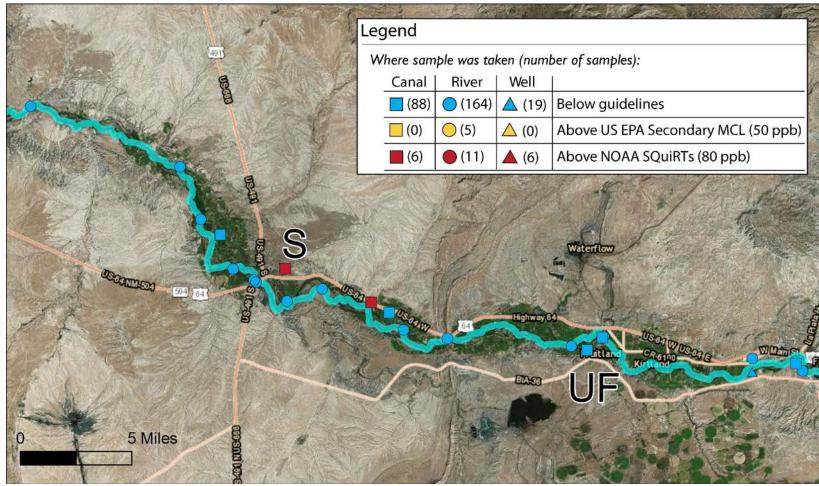
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Where sample was taken (number of samples):

Canal	River	Well	
(88)	(164)	🛕 (19)	Below guidelines
(0)	(5)	(0)	Above US EPA Secondary MCL (50 ppb)
(6)	(11)	(6)	Above NOAA SQuiRTs (80 ppb)

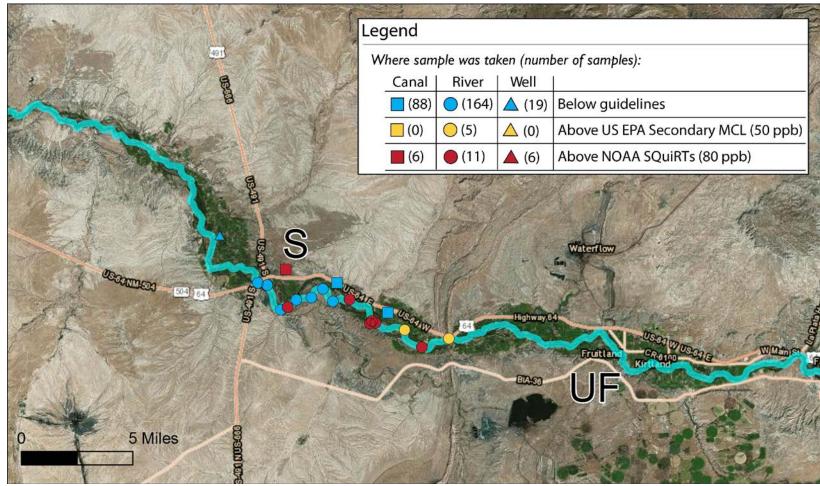


UPPER FRUITLAND & SHIPROCK WINTER 2015



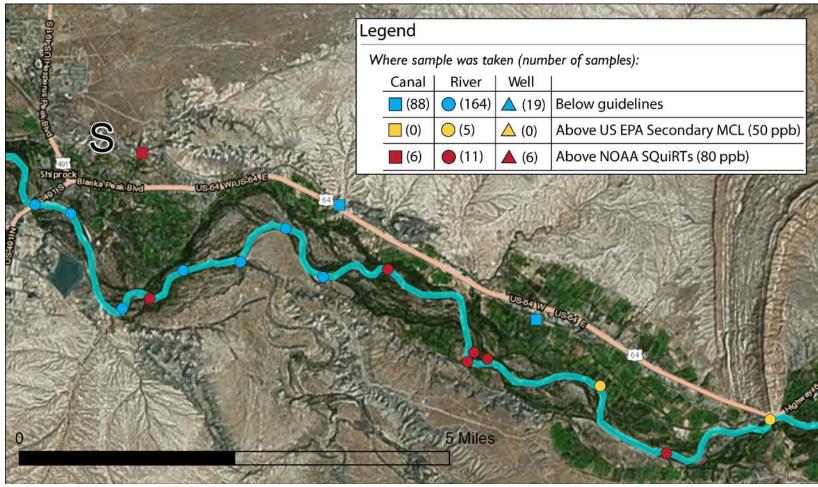


UPPER FRUITLAND & SHIPROCK SPRING 2016



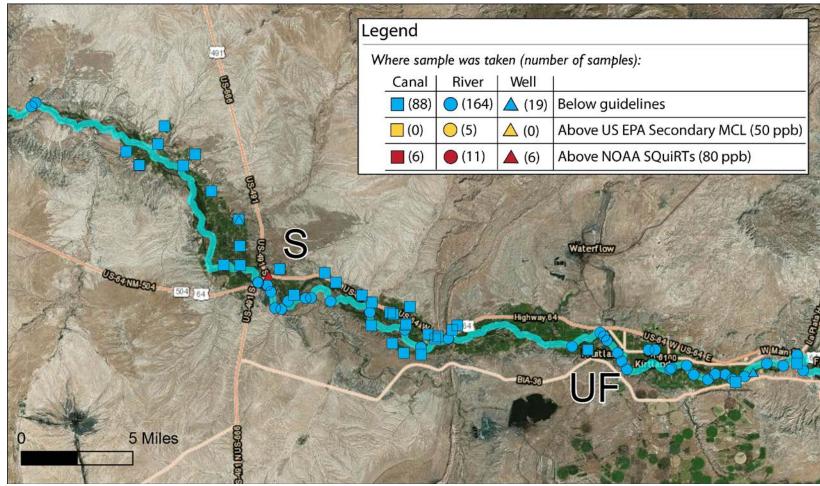


UPPER FRUITLAND & SHIPROCK SPRING 2016





UPPER FRUITLAND & SHIPROCK SUMMER 2016





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