Gold King Mine Spill

Diné Exposure Project

ENVIRONMENTAL SAMPLING RESULTS: WATER

Partnerships:

Funded By: National Institute of Environmental Health Sciences

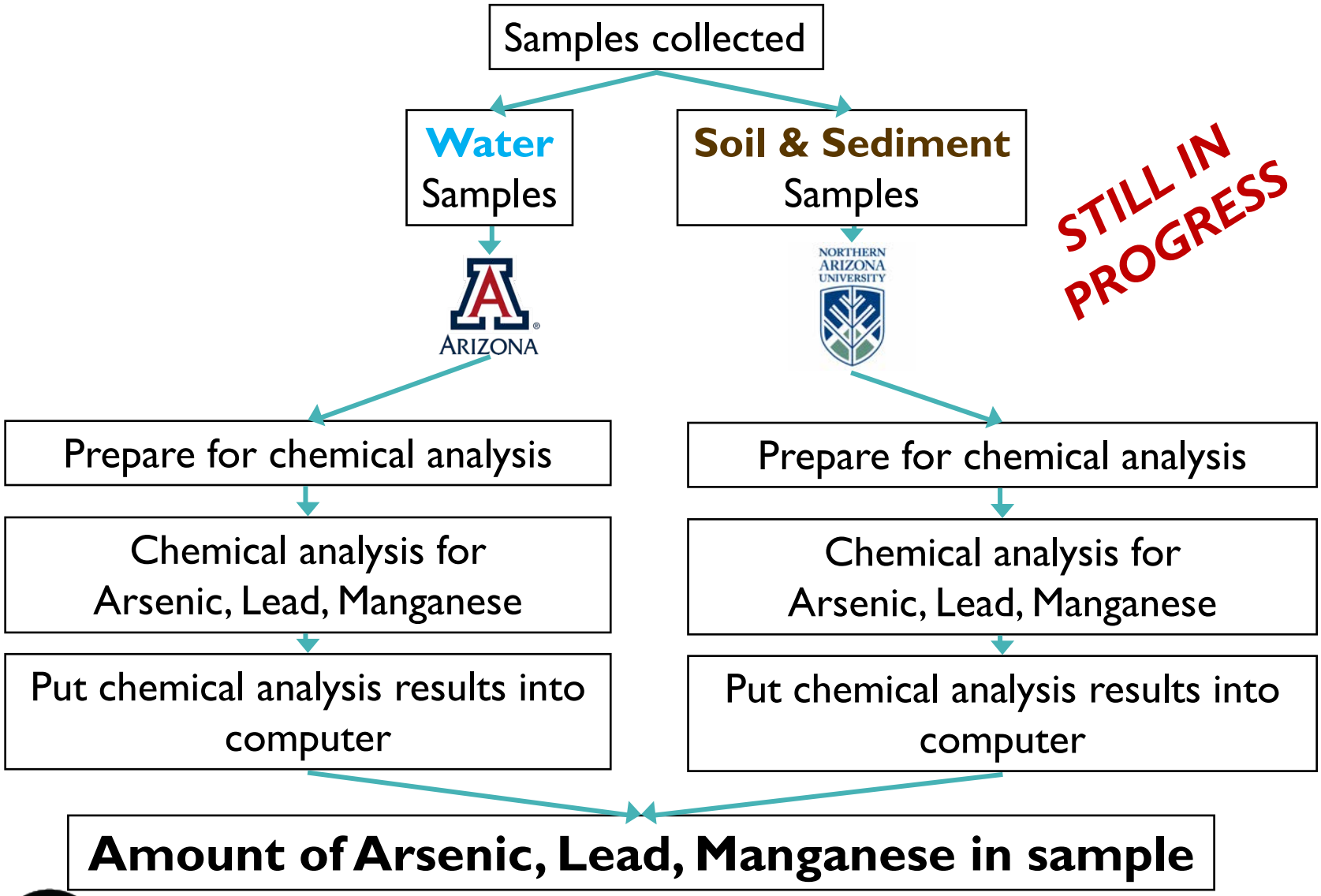
The University of Arizona Agnese Nelms Haury Program in Environment and Social Justice

ENVIRONMENTAL SAMPLES COLLECTED

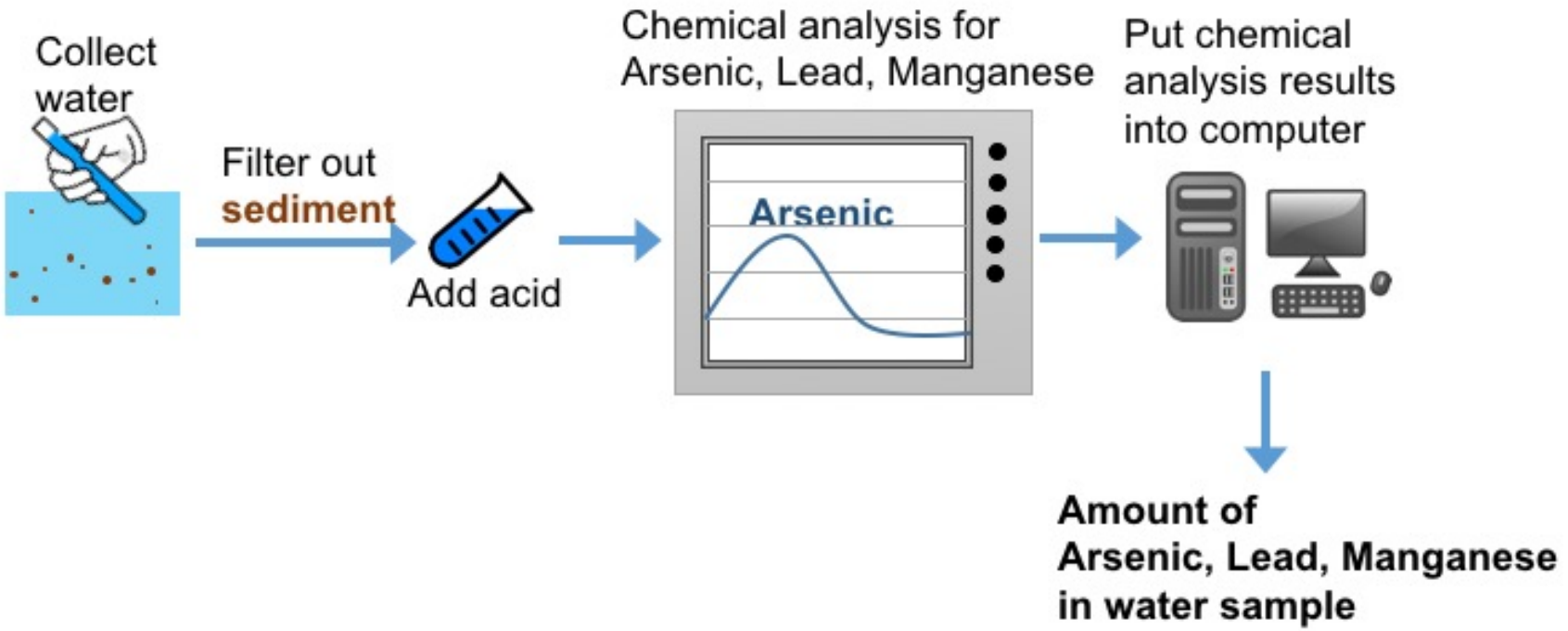
1. Nov 2015
   - 162 soil/sediment
   - 62 water
2. March 2016
   - 183 soil/sediment
   - 37 water
3. June 2016
   - 213 soil/sediment
   - 201 water

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

STEPS FOR WATER & SOIL/SEDIMENT



WATER


Collect water
Filter out sediment
Add acid
Chemical analysis for Arsenic, Lead, Manganese
Arsenic
Put chemical analysis results into computer
Amount of Arsenic, Lead, Manganese in water sample

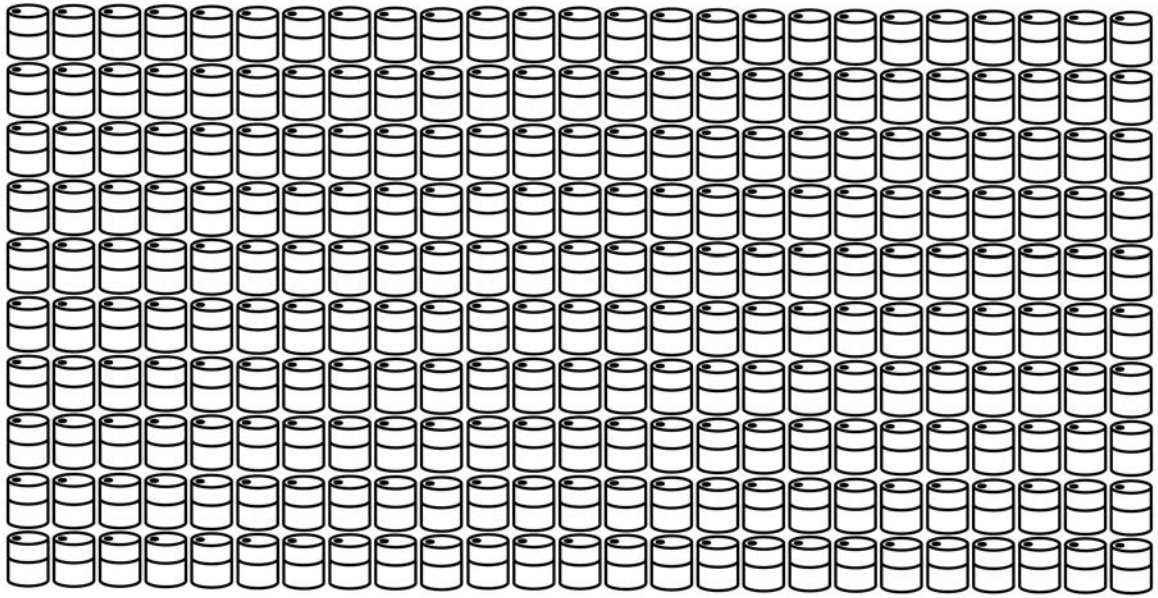
MEASURING THE AMOUNT OF A METAL IN WATER

- 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

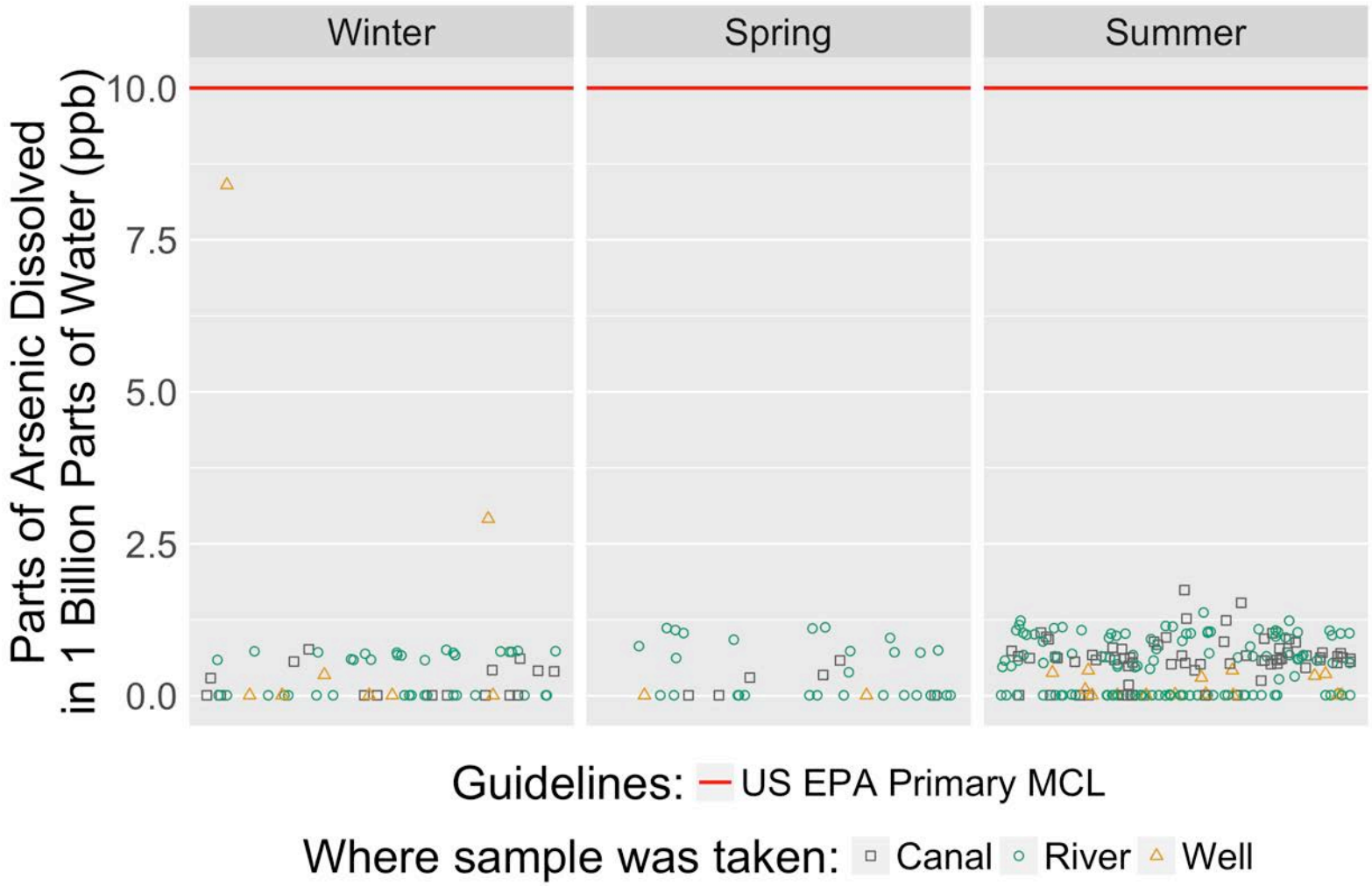
WHERE DO METALS COME FROM?

- 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



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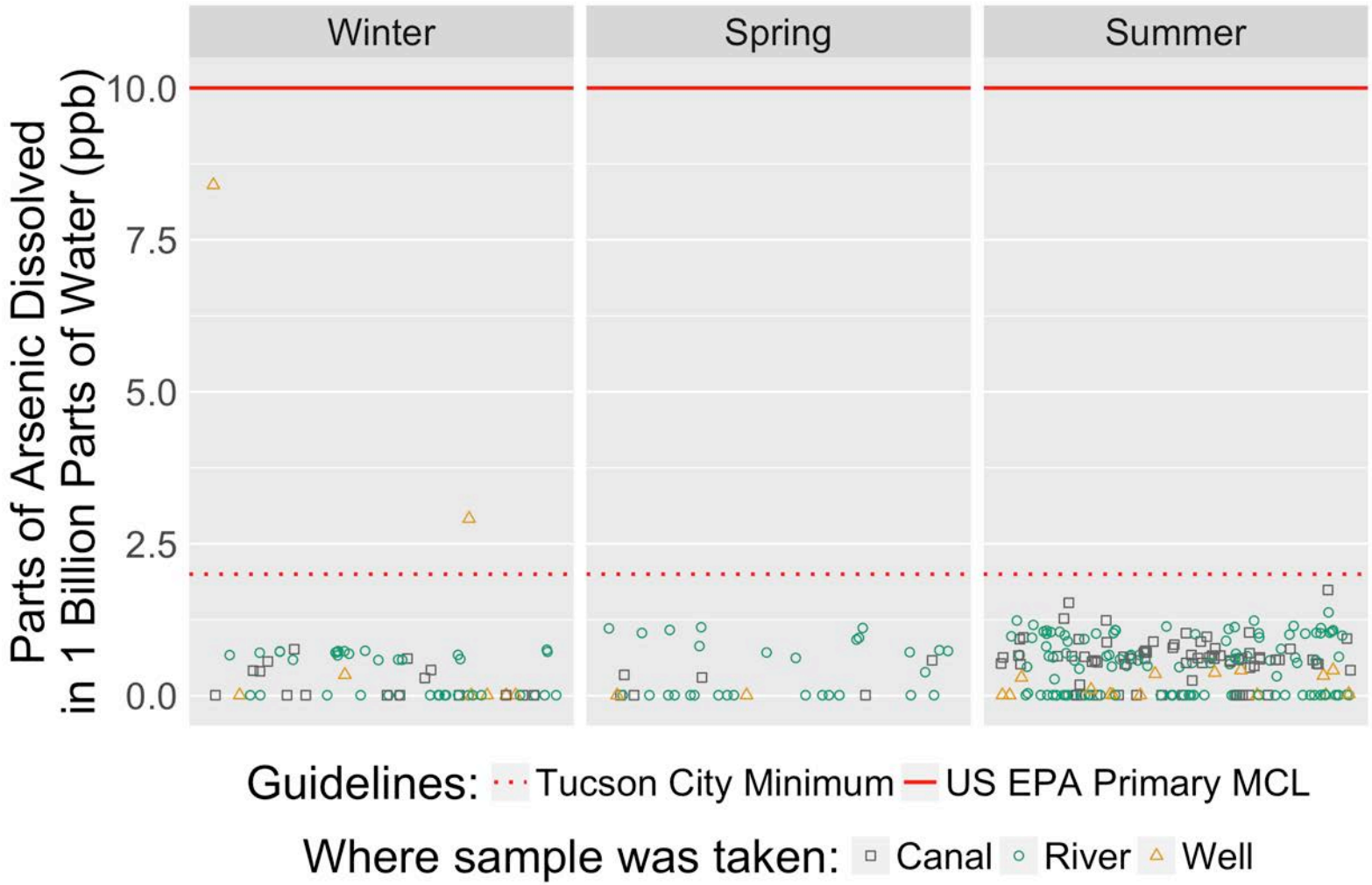

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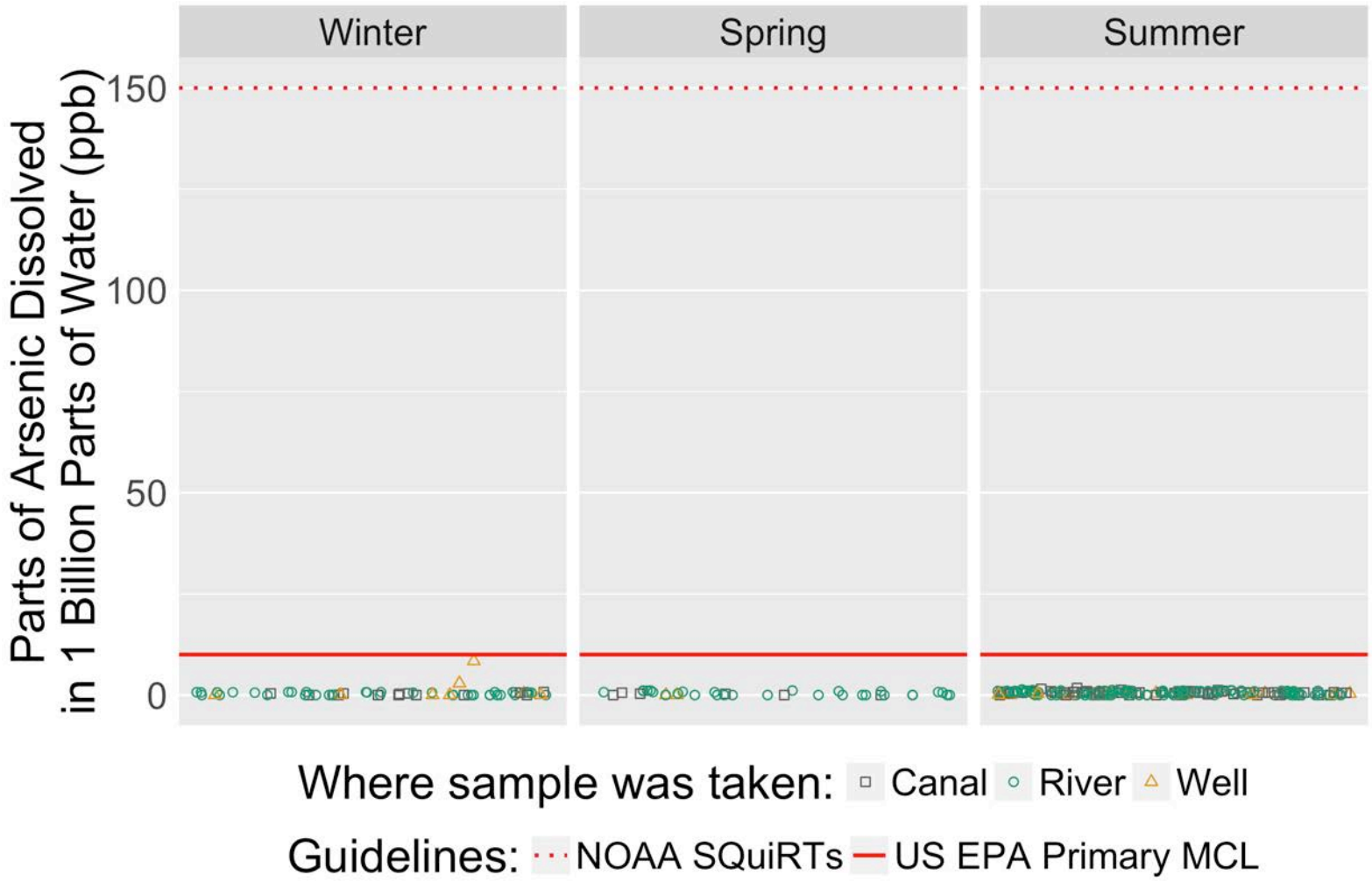
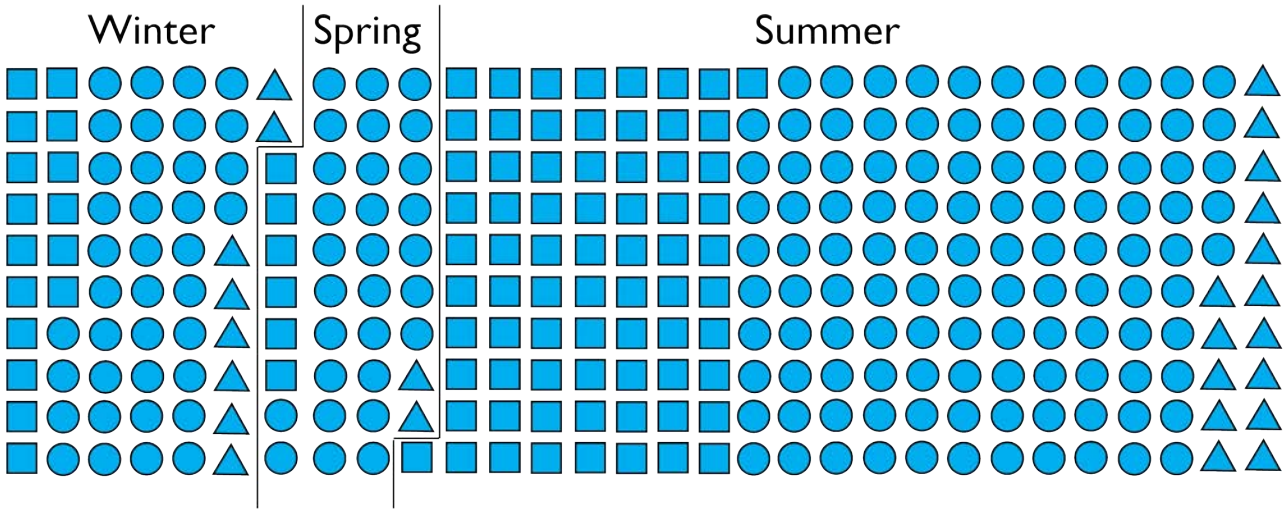


COMPARING AMOUNTS OF ARSENIC IN WATER TO GUIDELINES



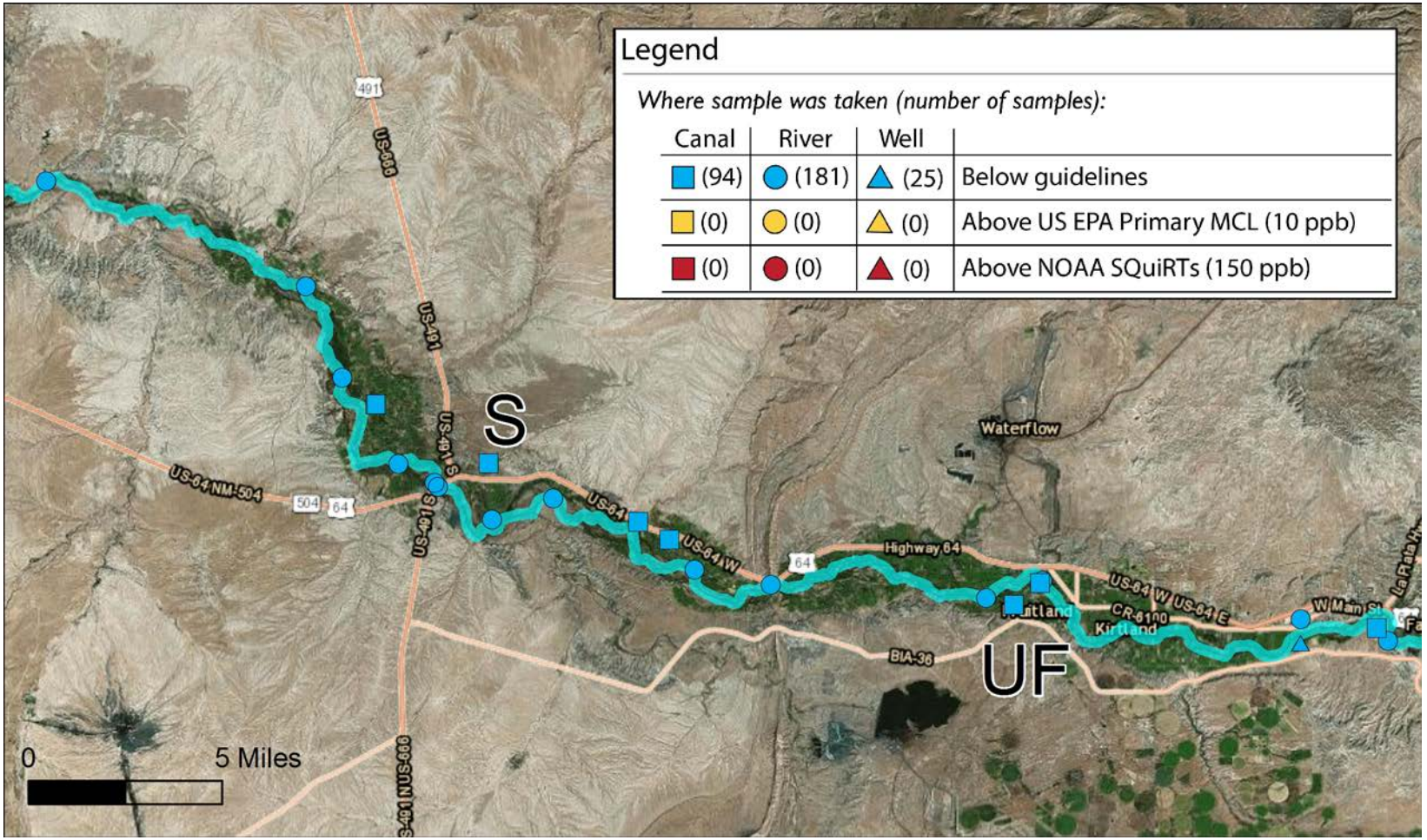
Legend

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)

COMPARING AMOUNTS OF ARSENIC IN WATER TO GUIDELINES

UPPER FRUITLAND & SHIPROCK WINTER 2015



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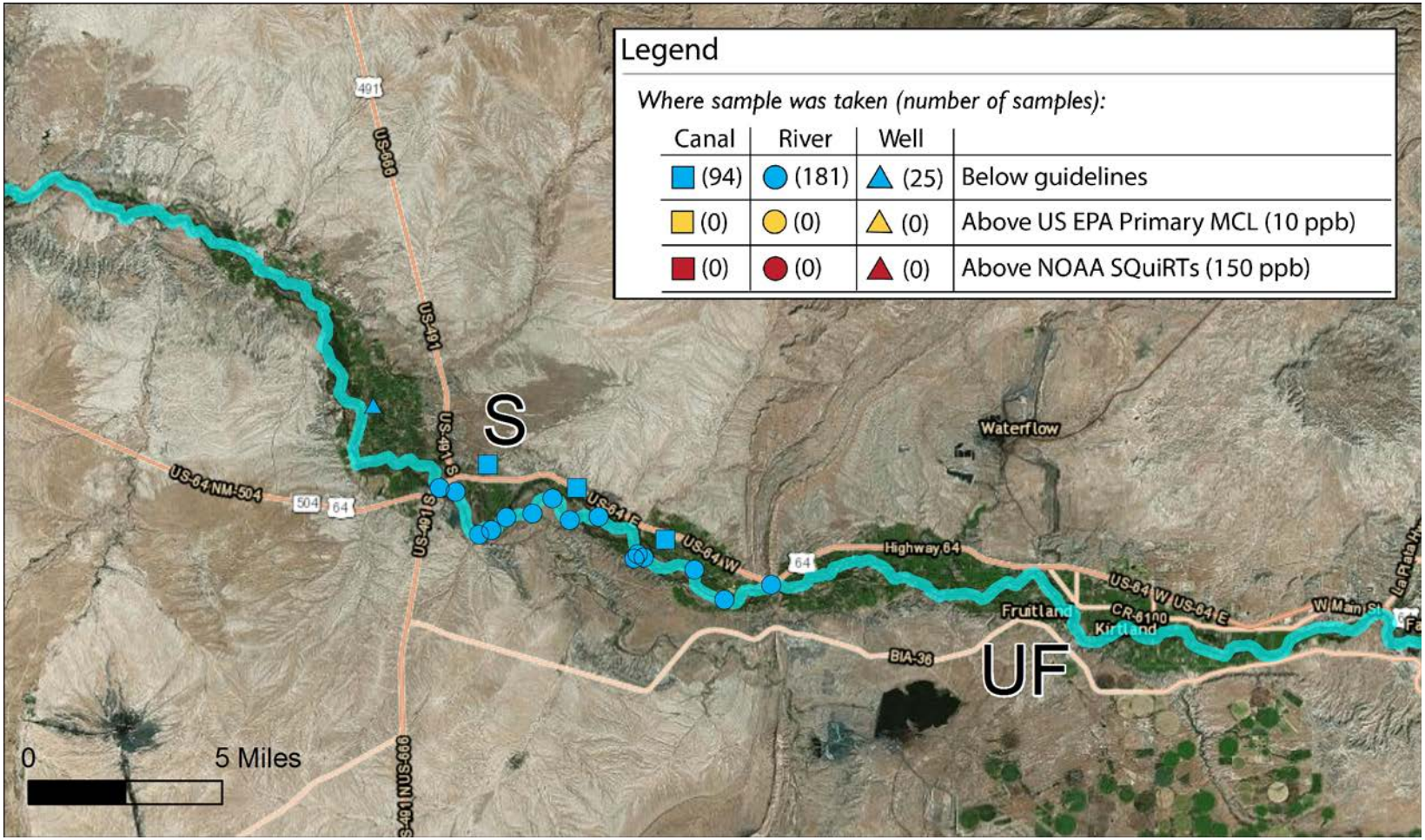
COMPARING AMOUNTS OF ARSENIC IN WATER TO GUIDELINES

UPPER FRUITLAND & SHIPROCK SPRING 2016



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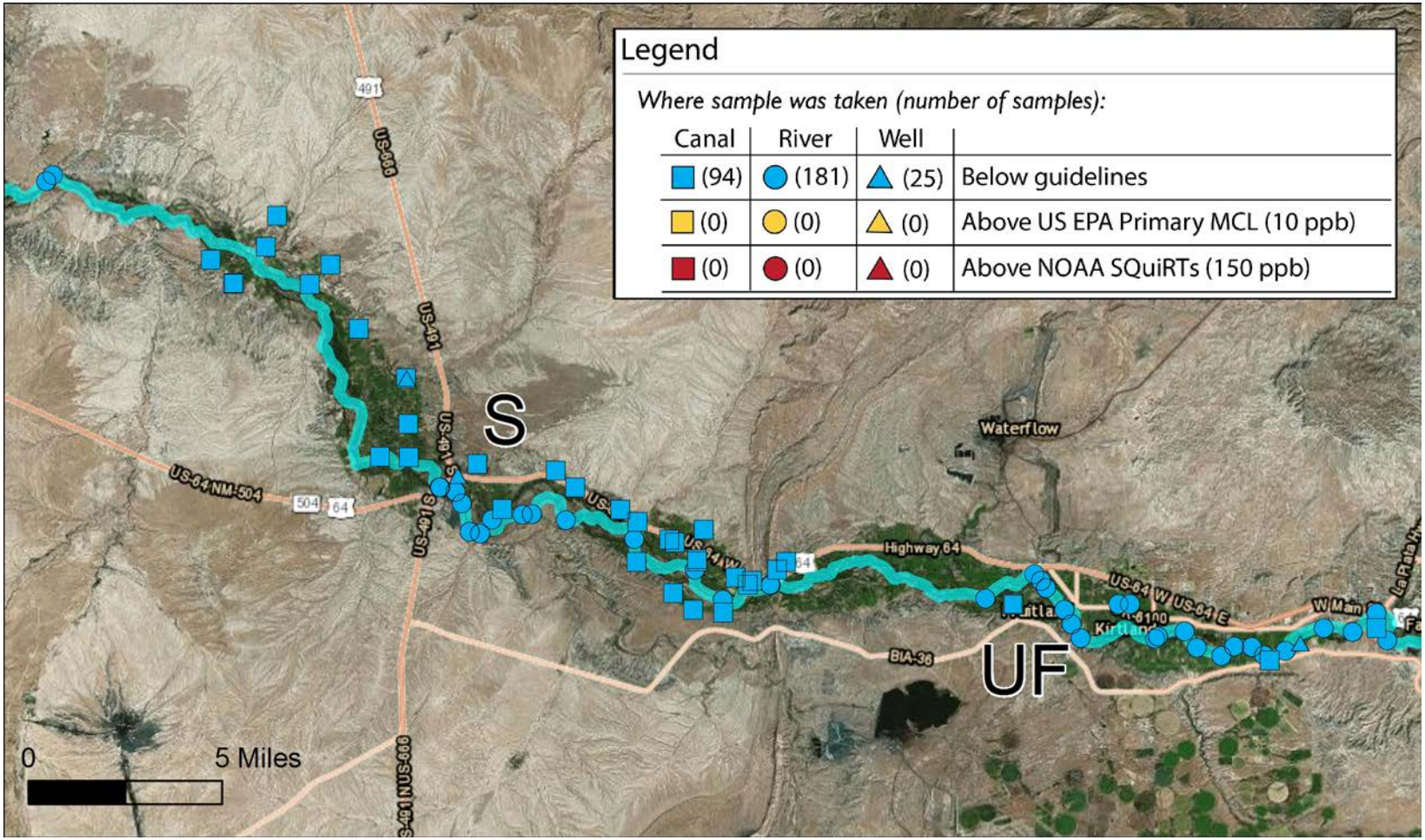

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COMPARING AMOUNTS OF ARSENIC IN WATER TO GUIDELINES

ANETH

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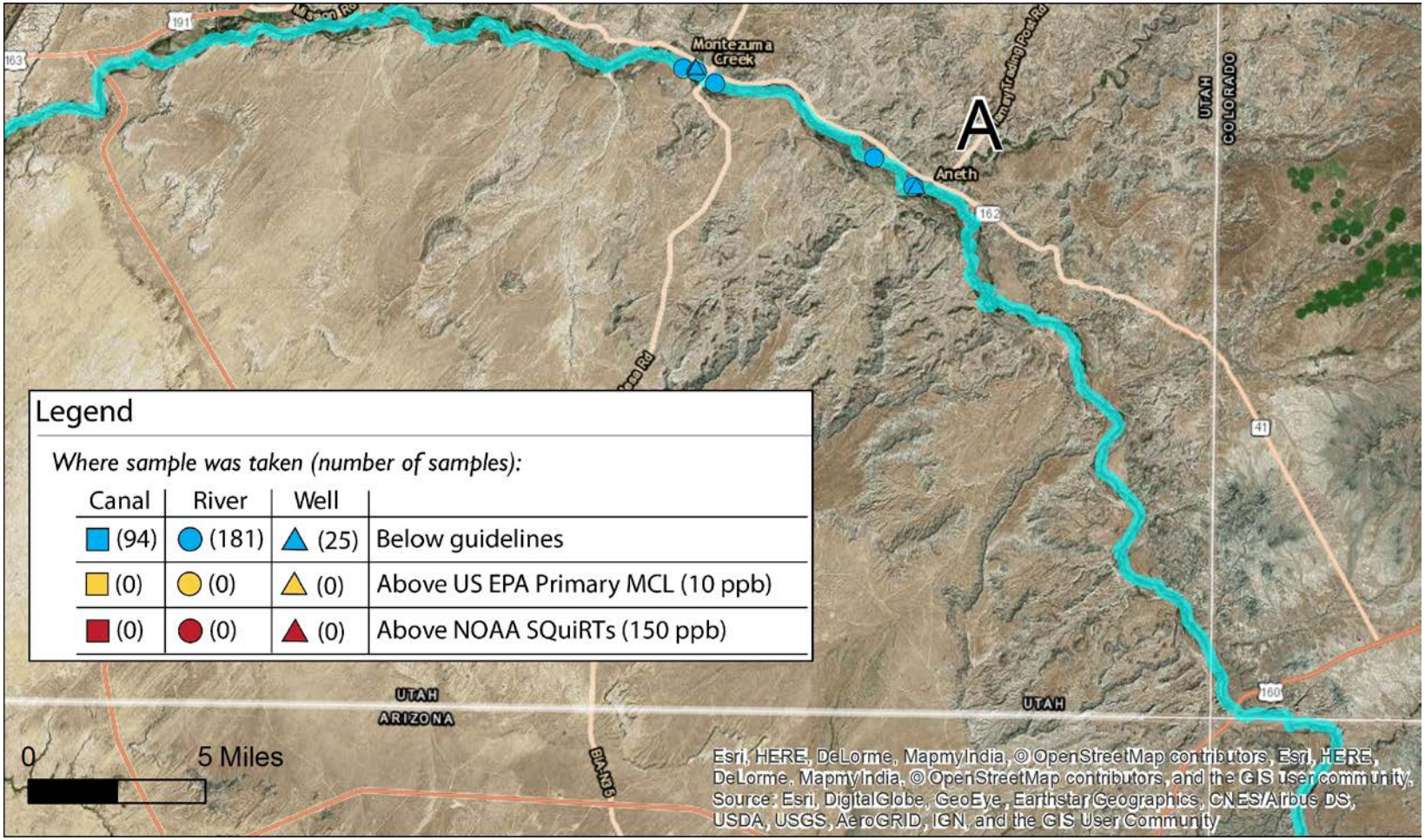

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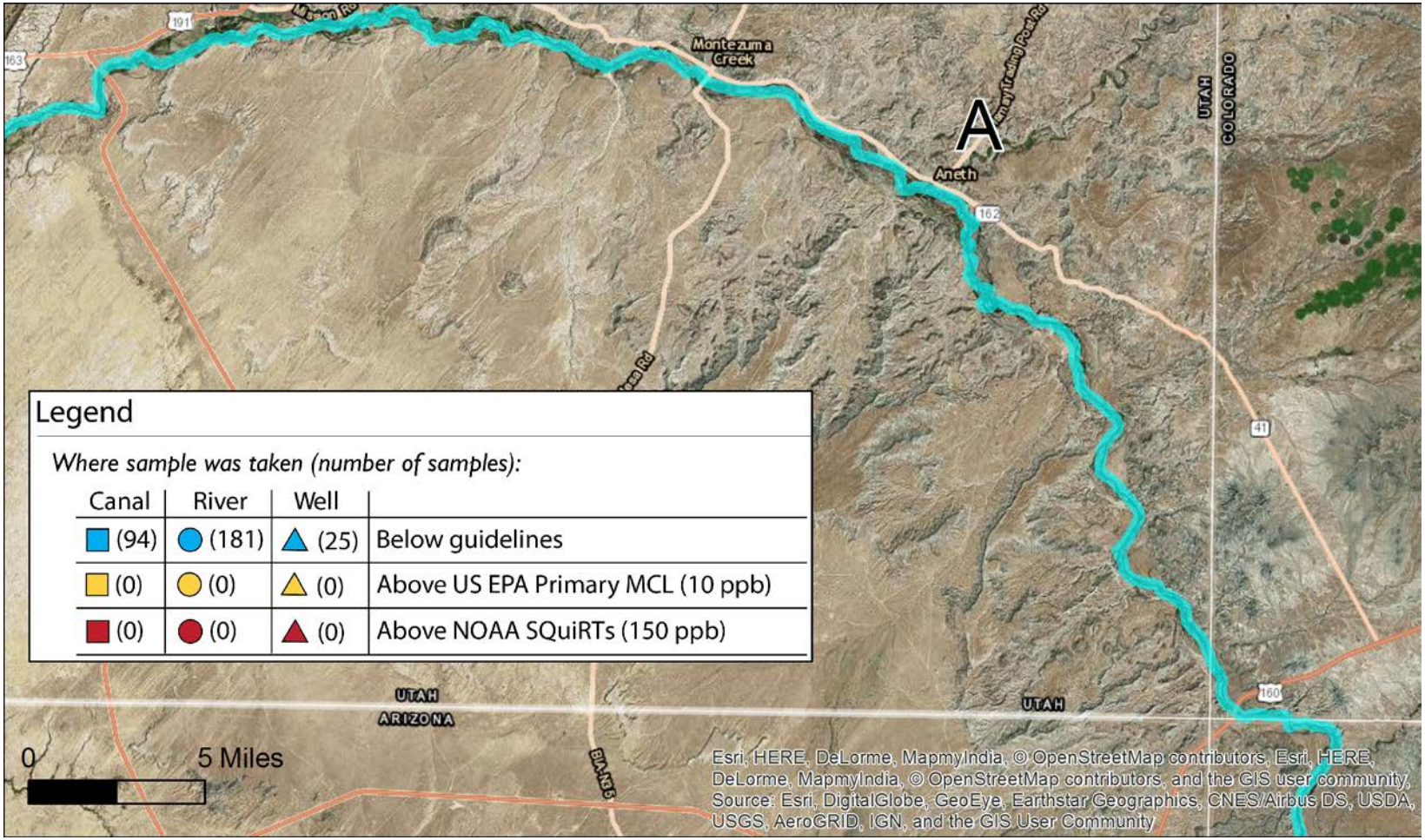

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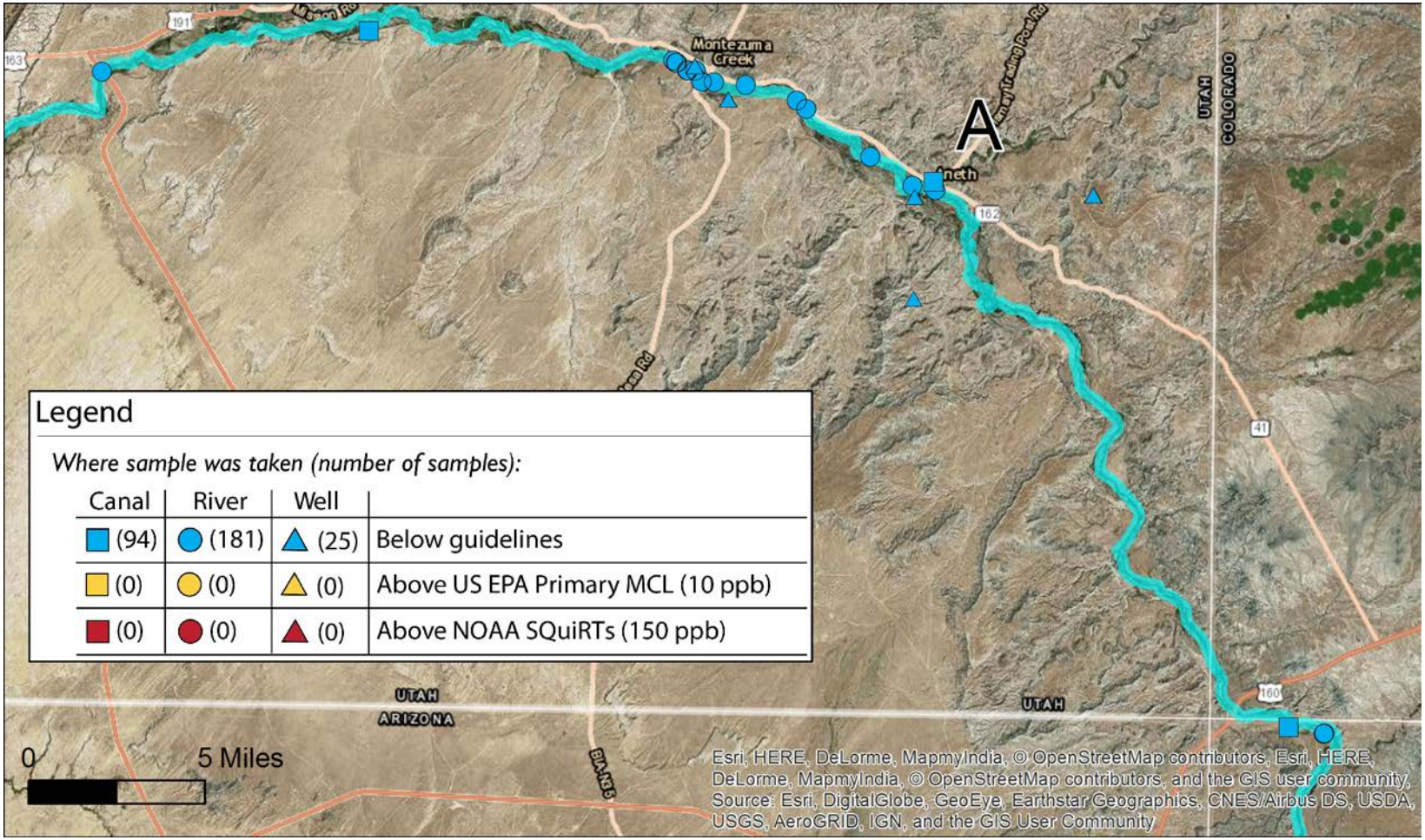

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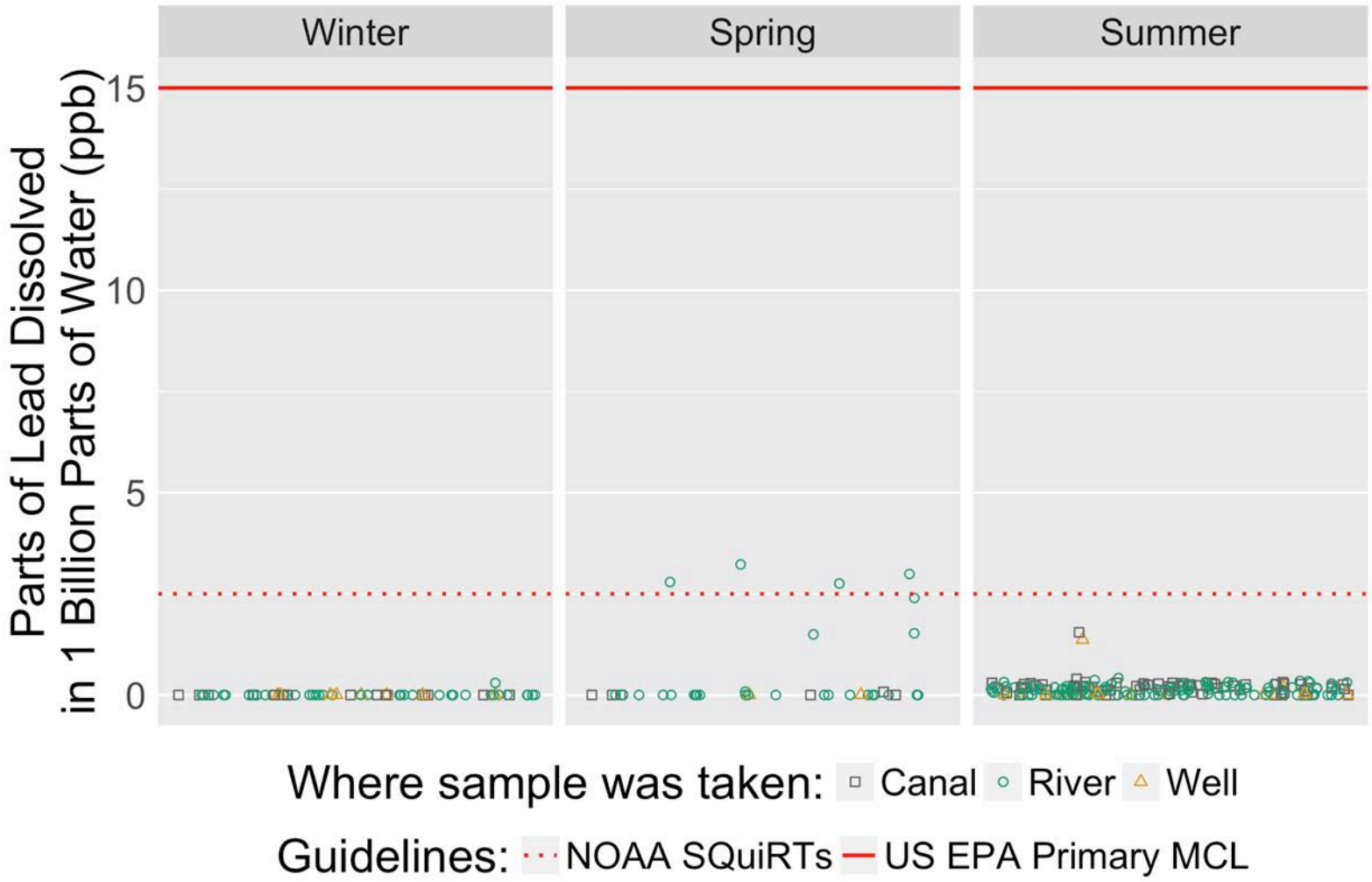
AMOUNT OF LEAD IN WATER



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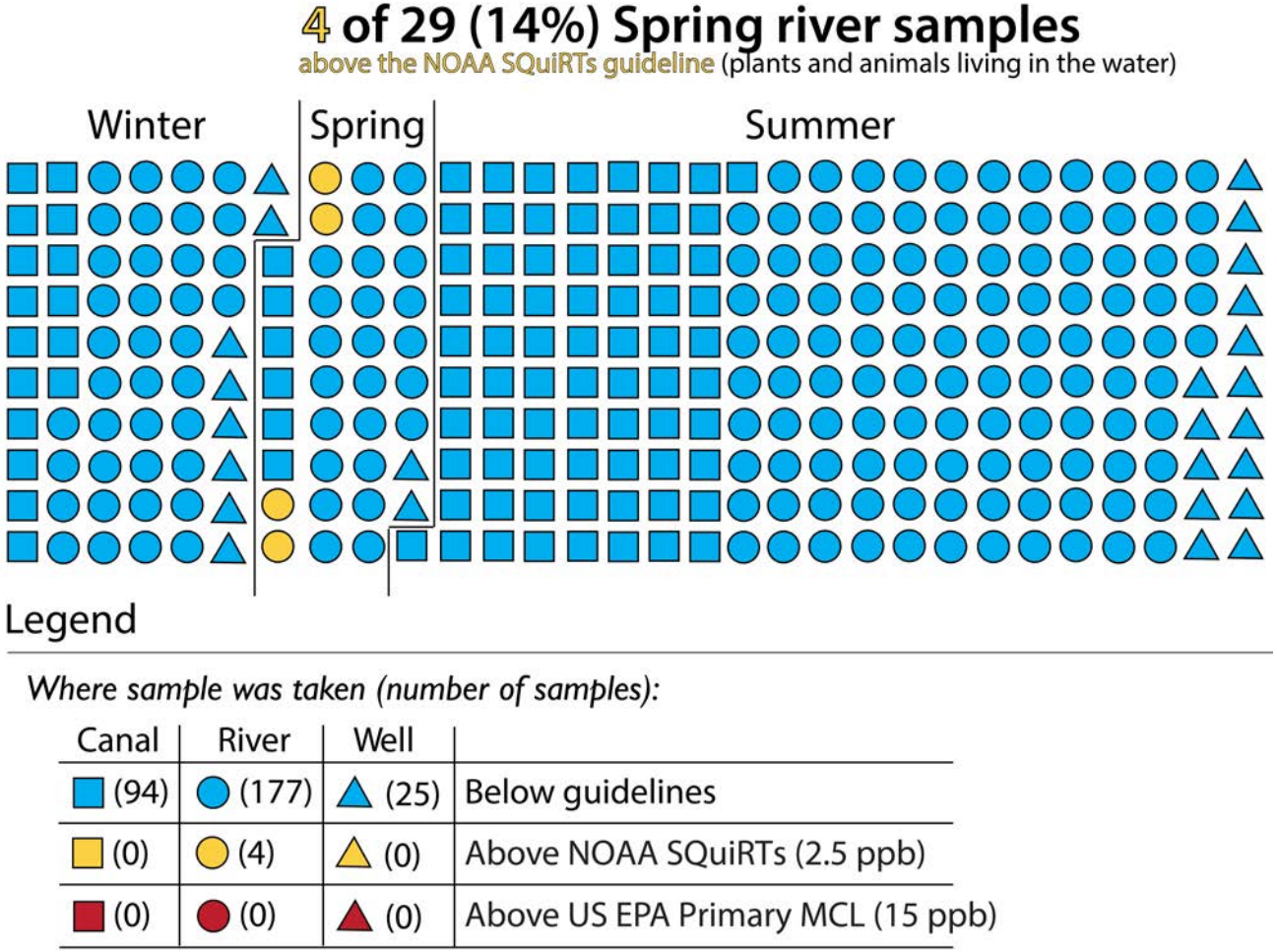

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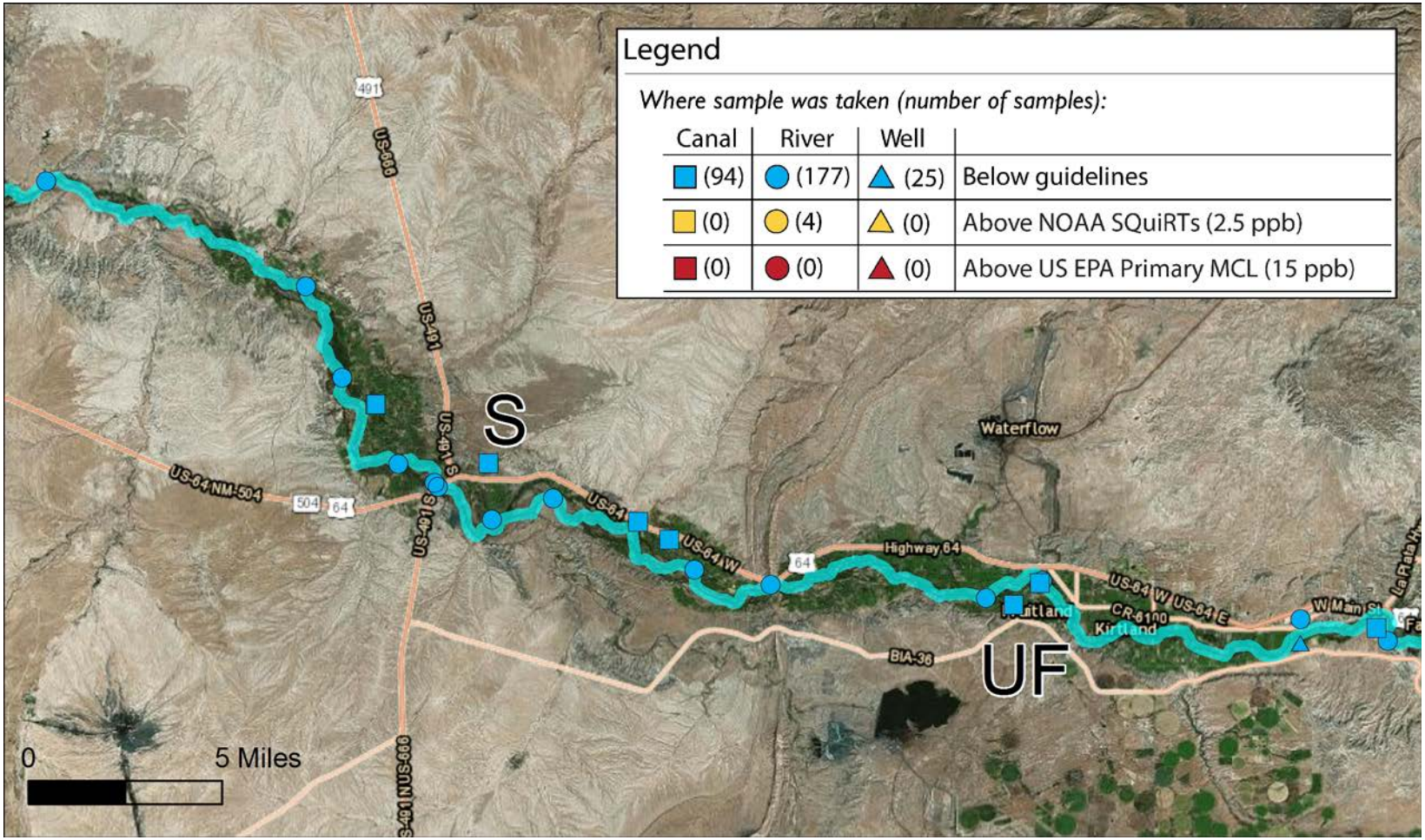

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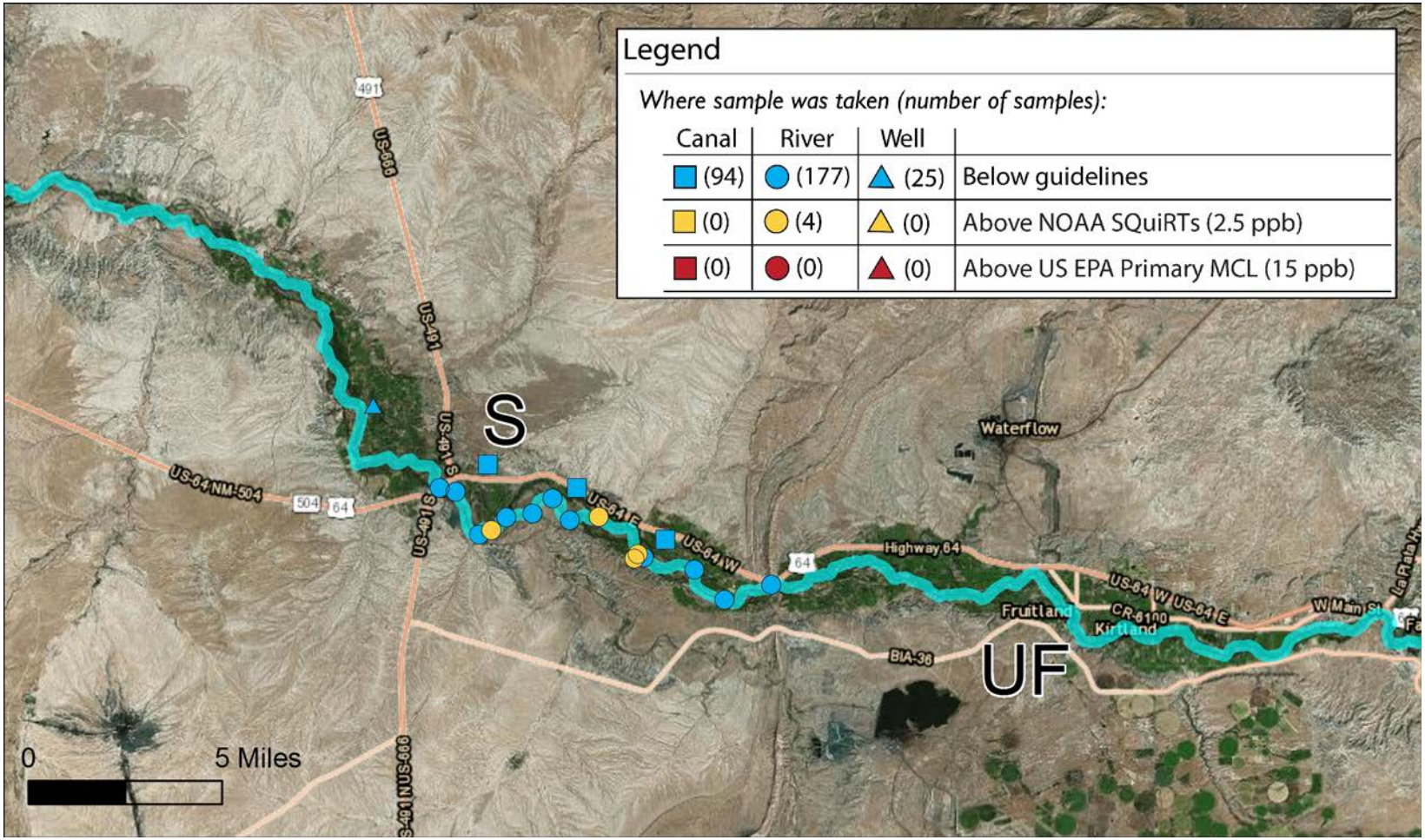

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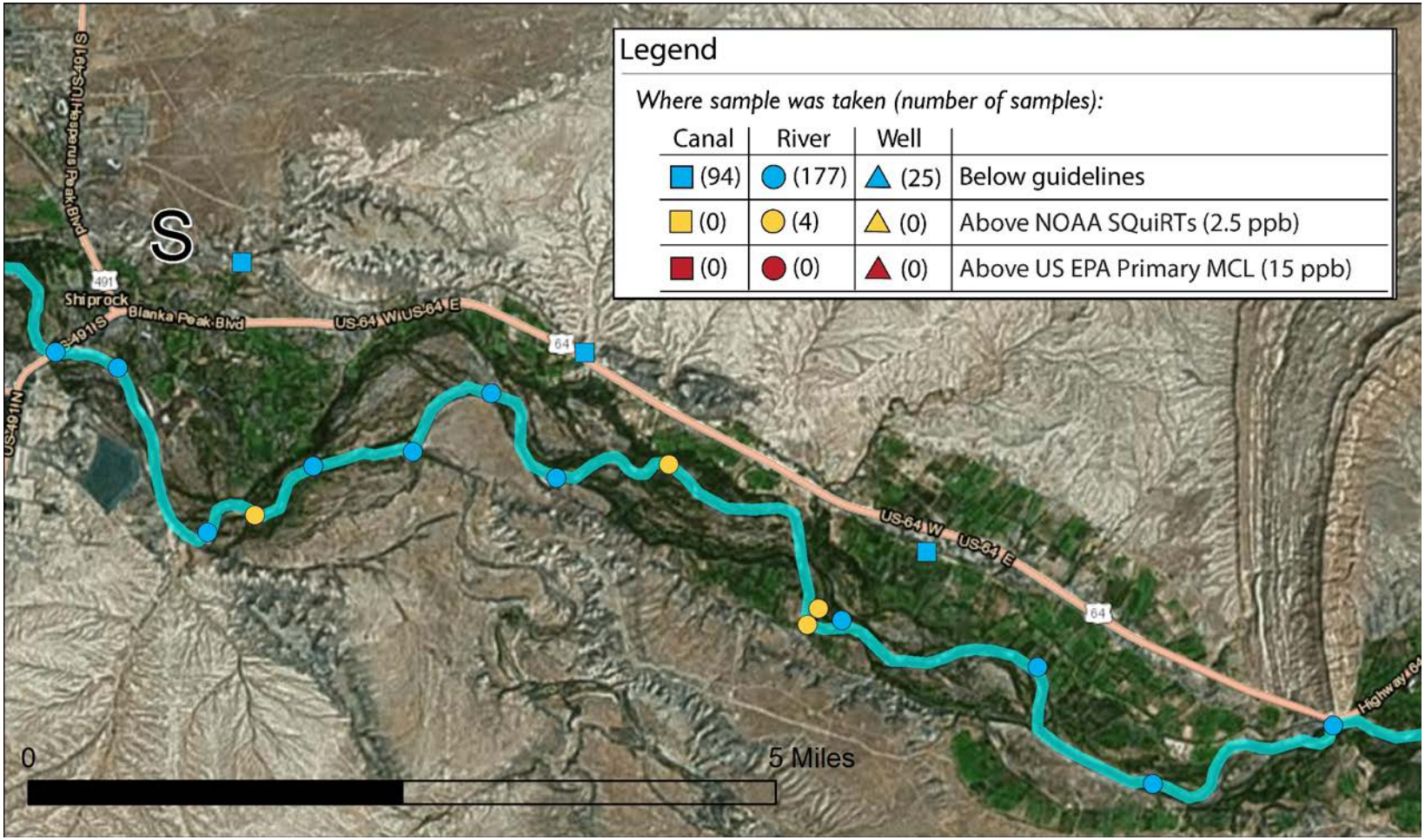

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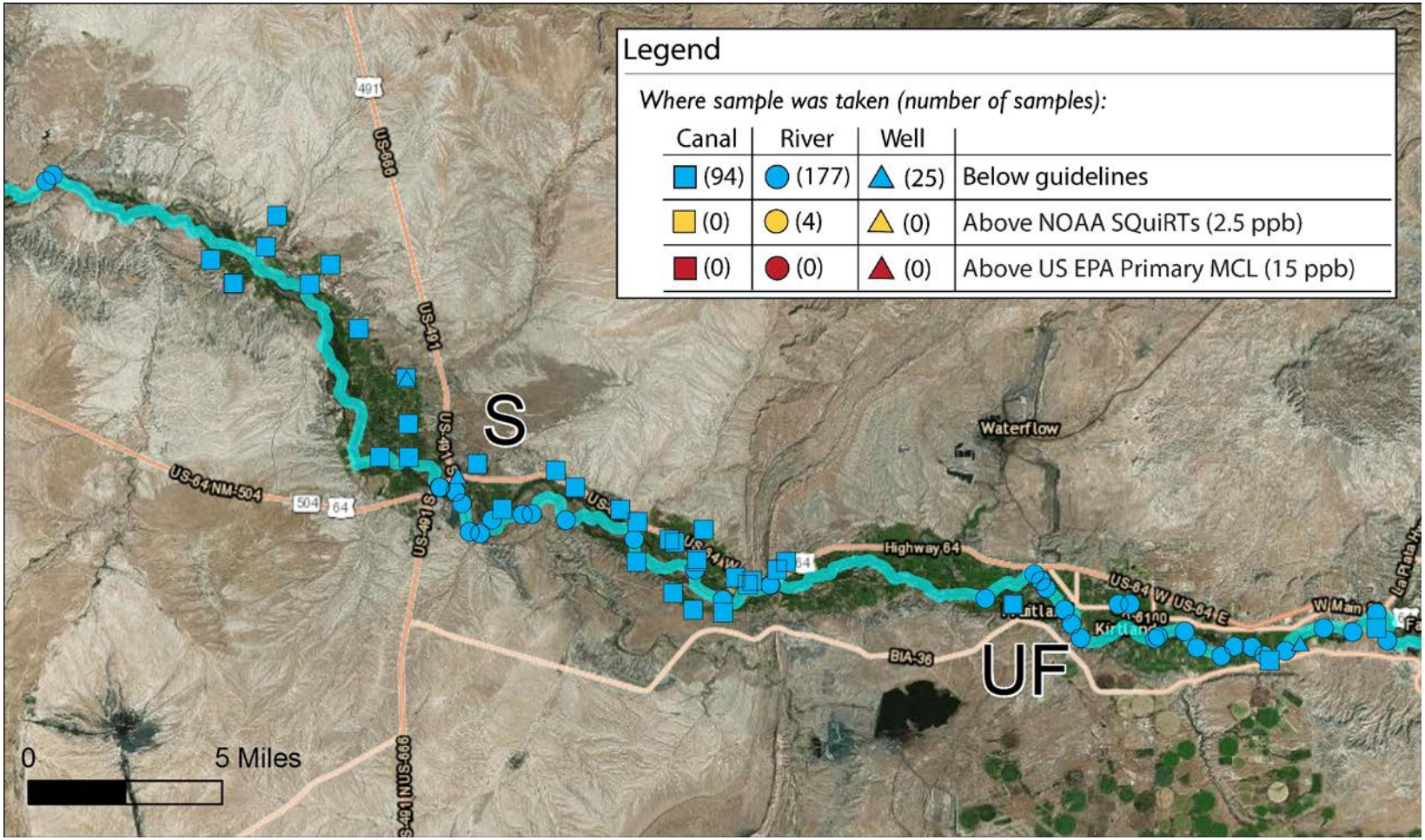

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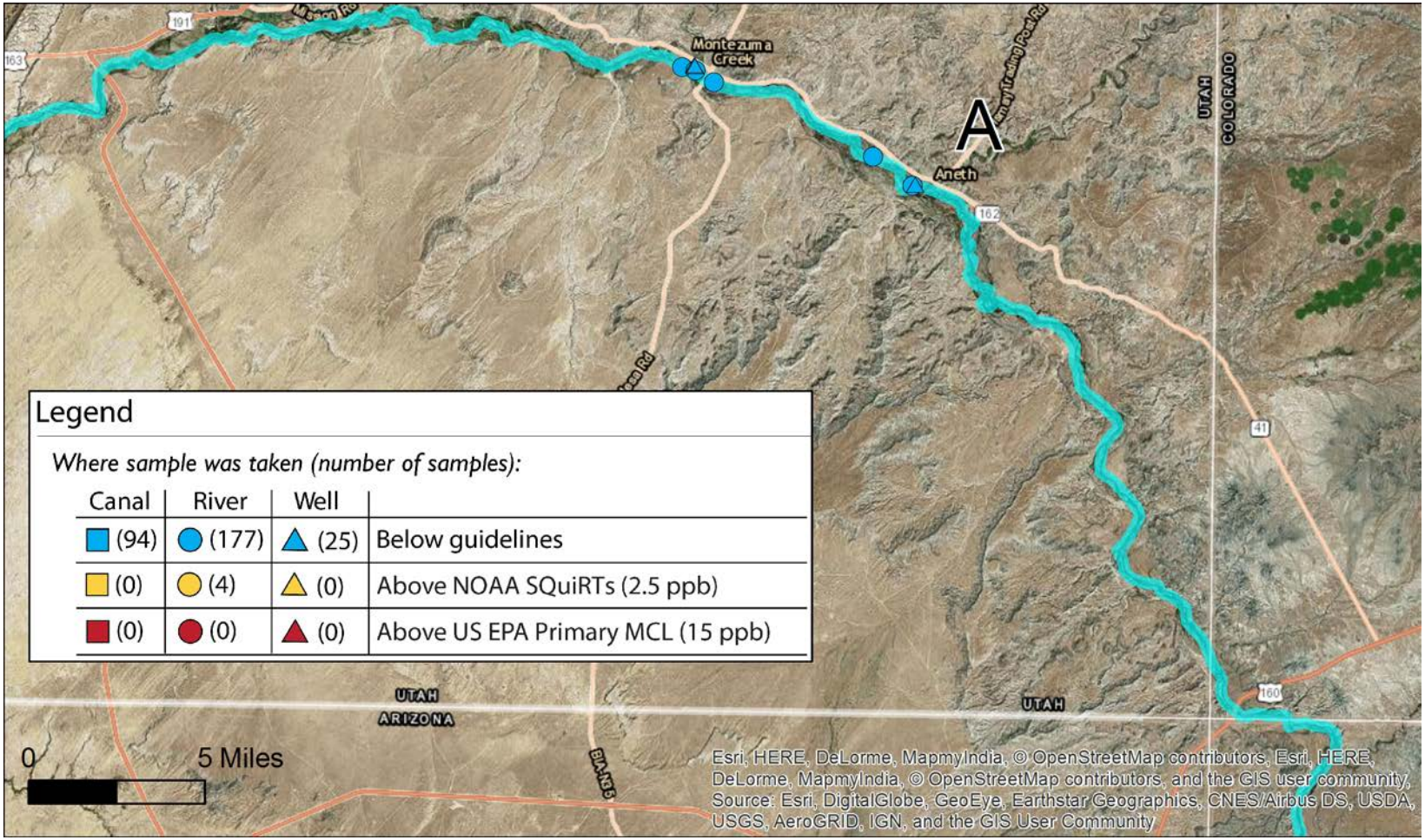

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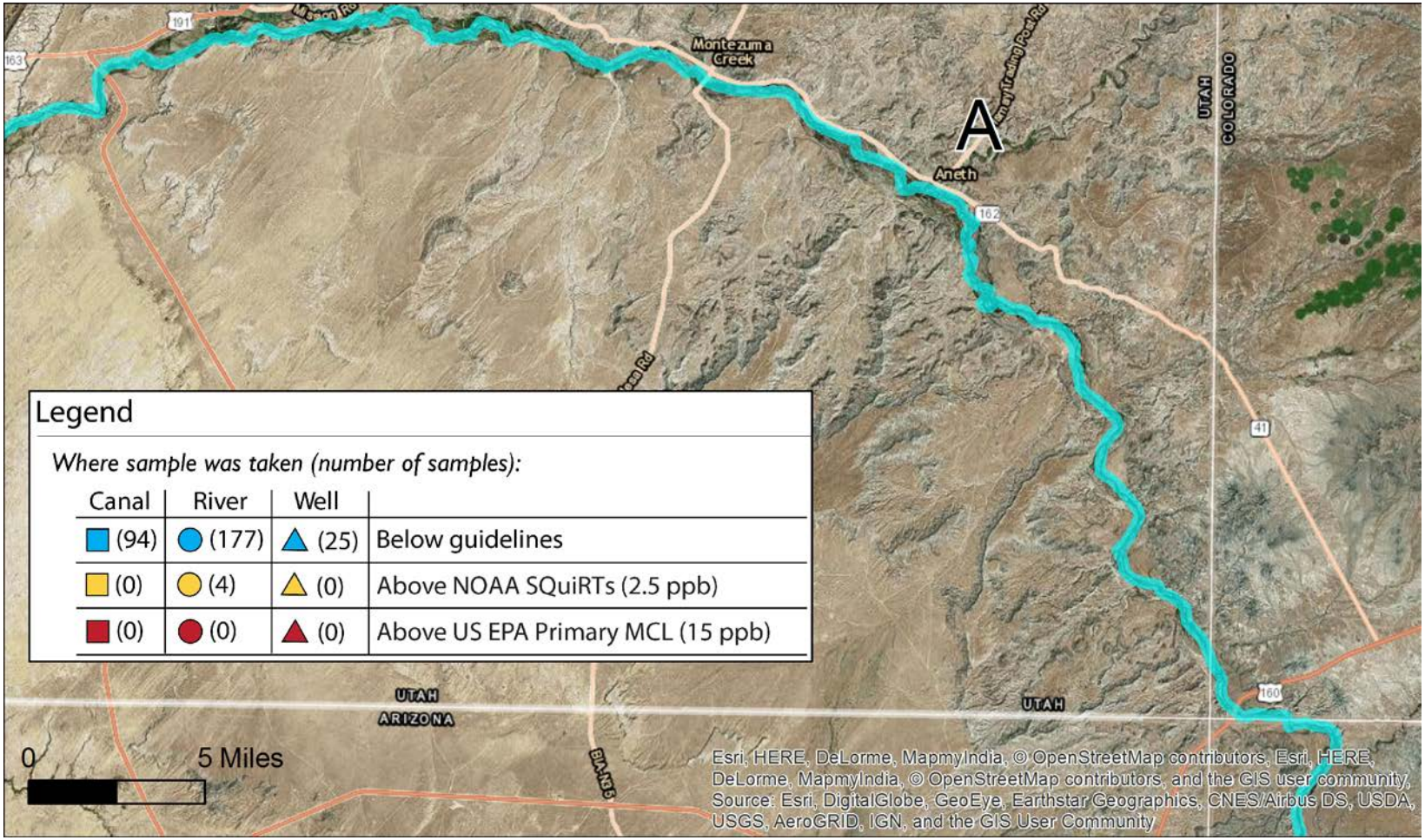

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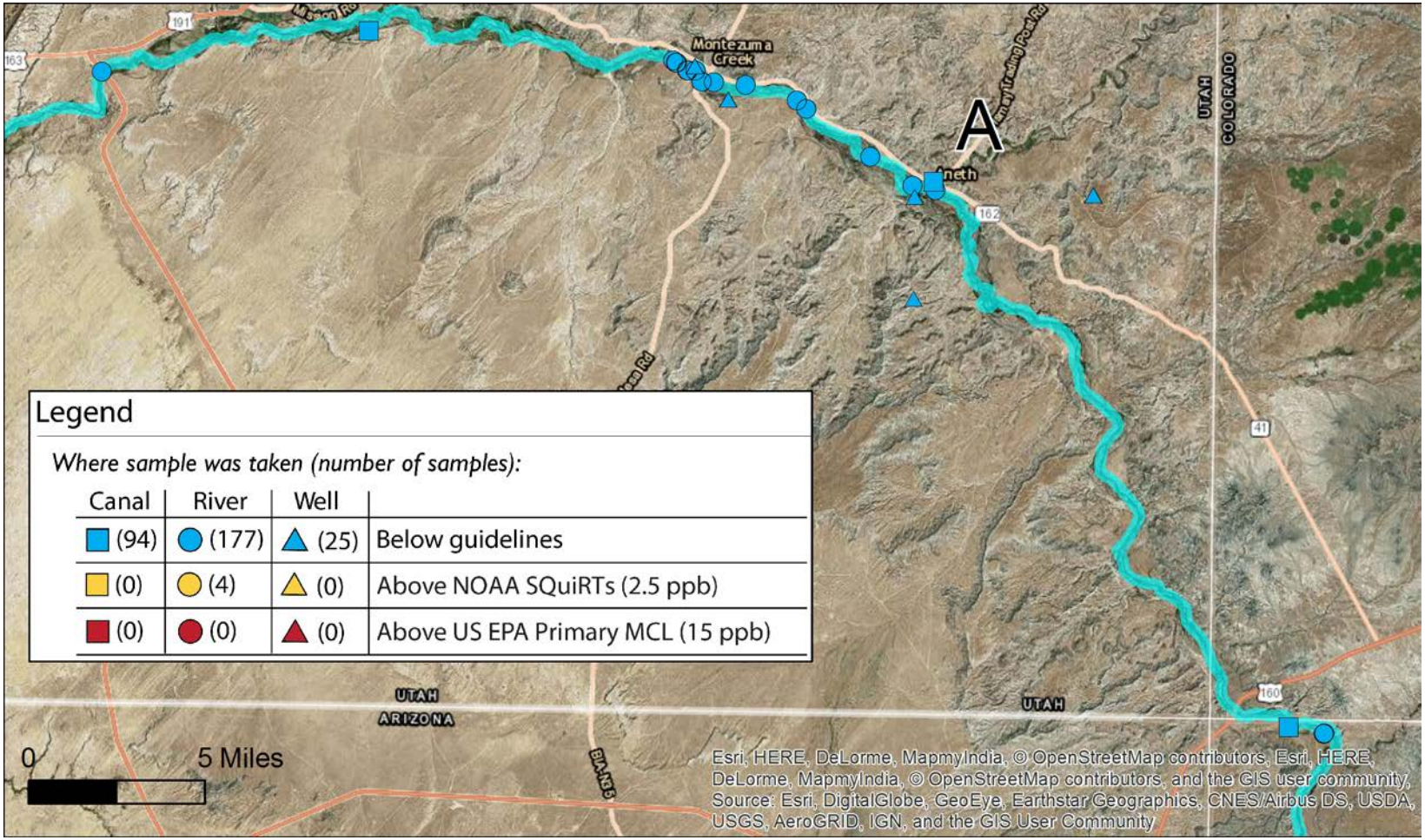

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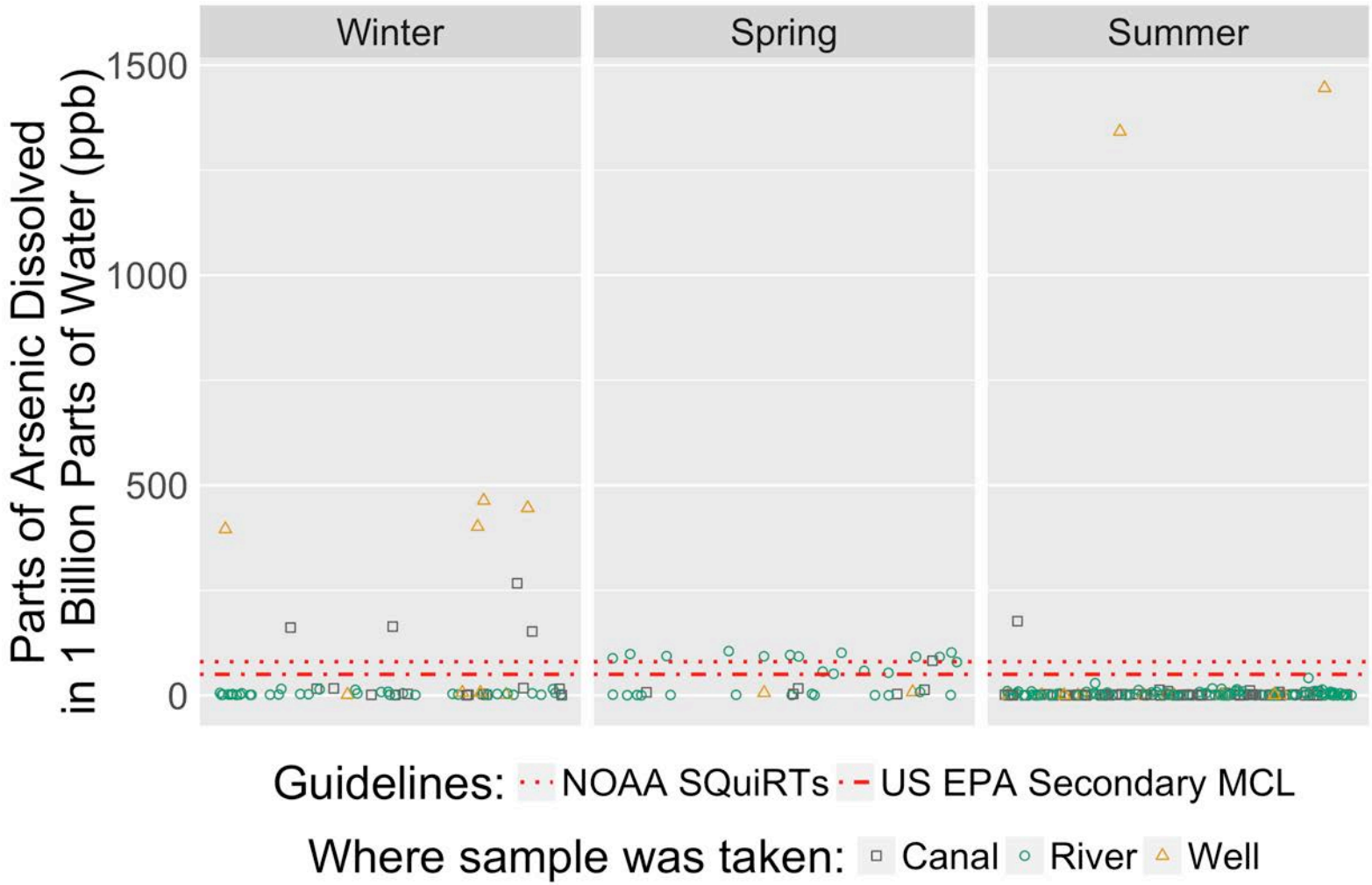

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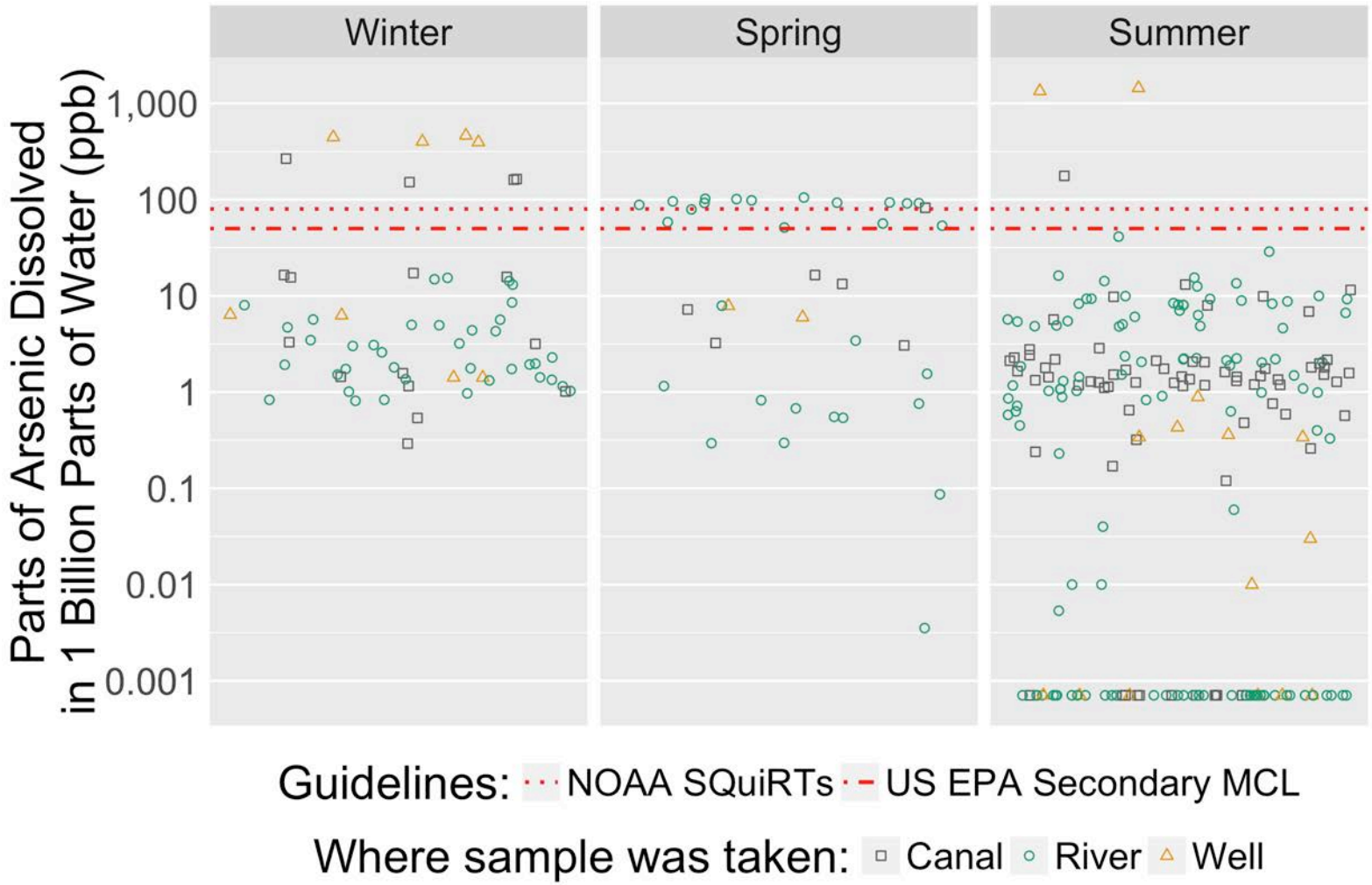

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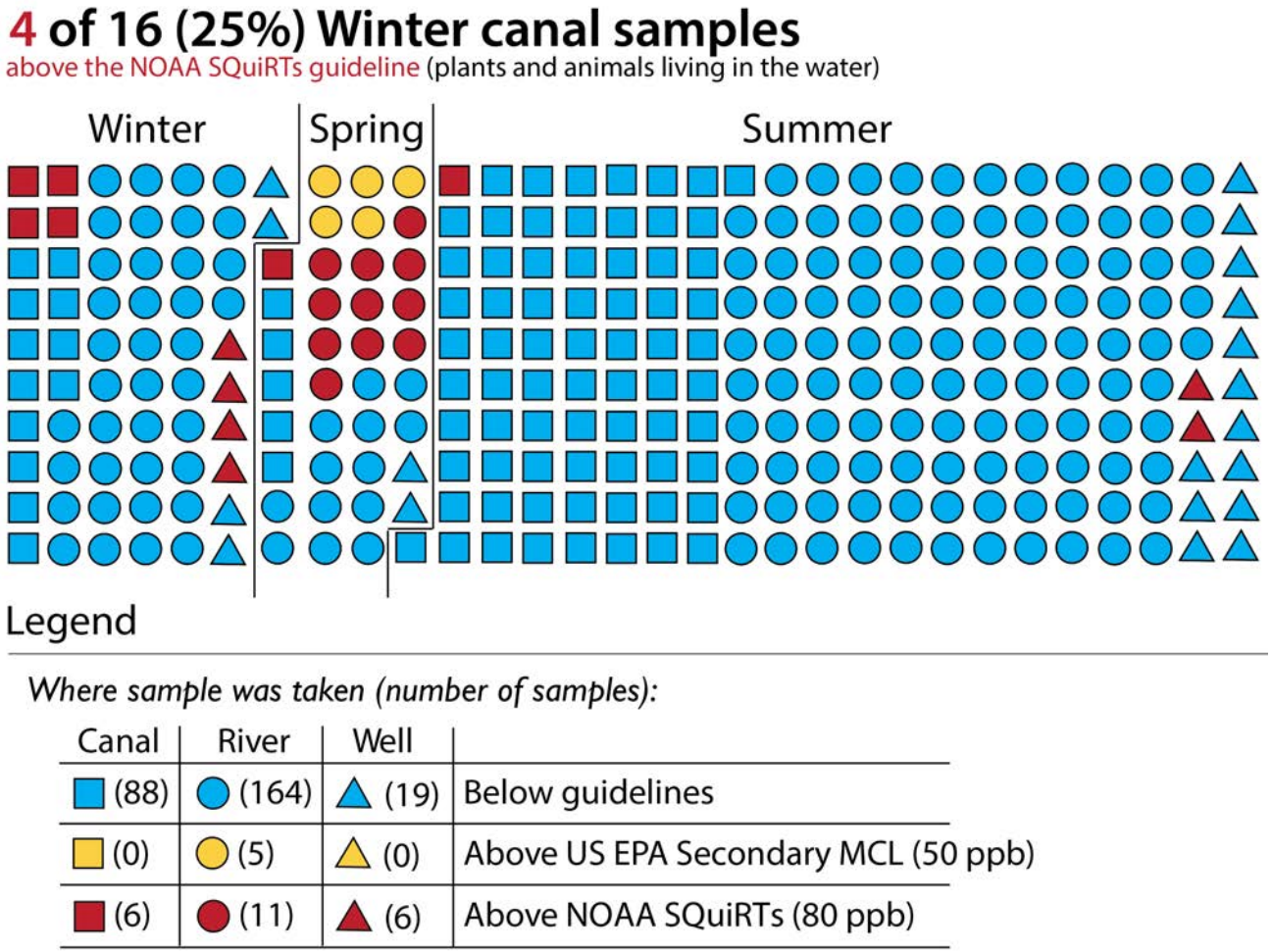

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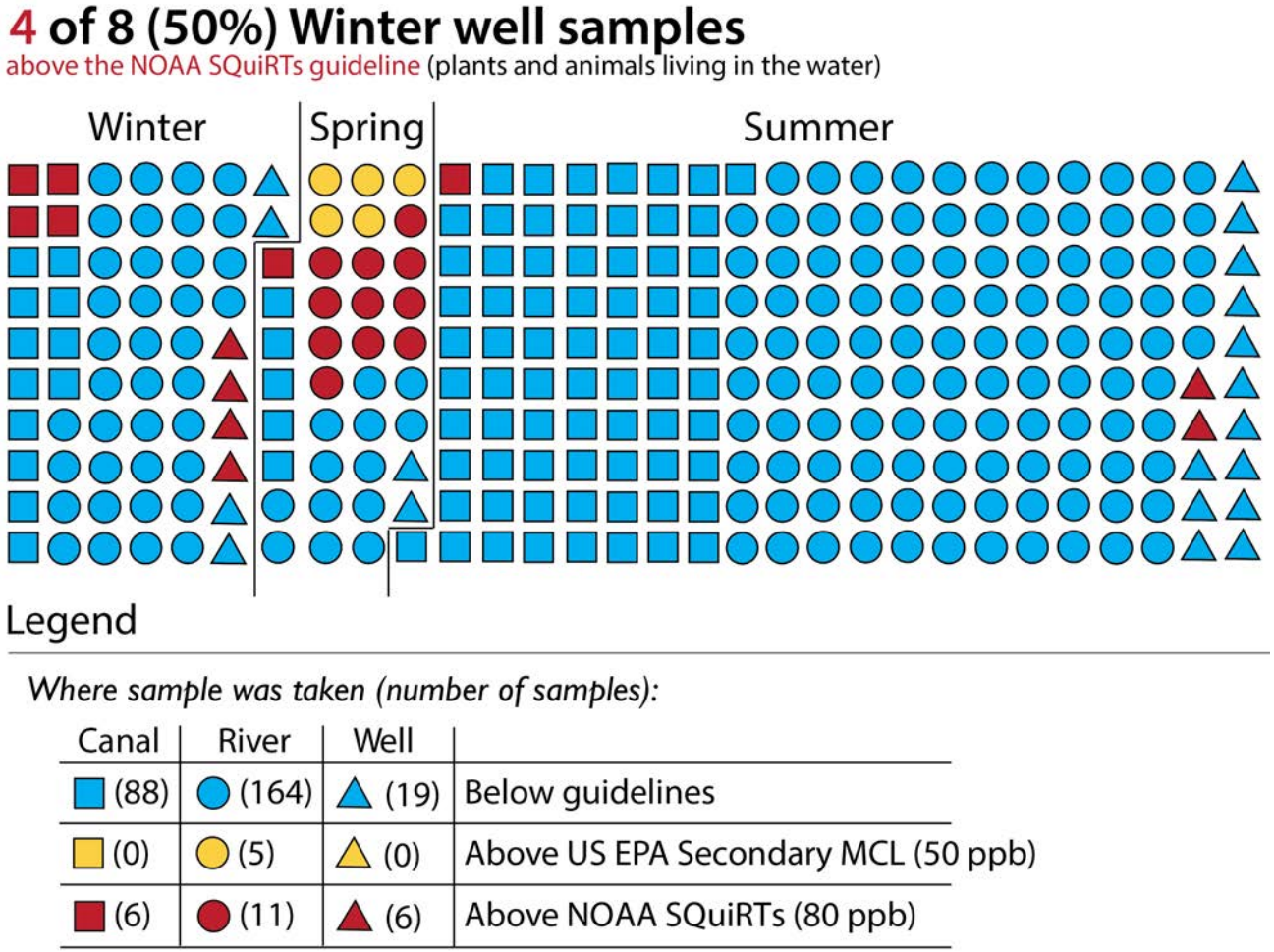

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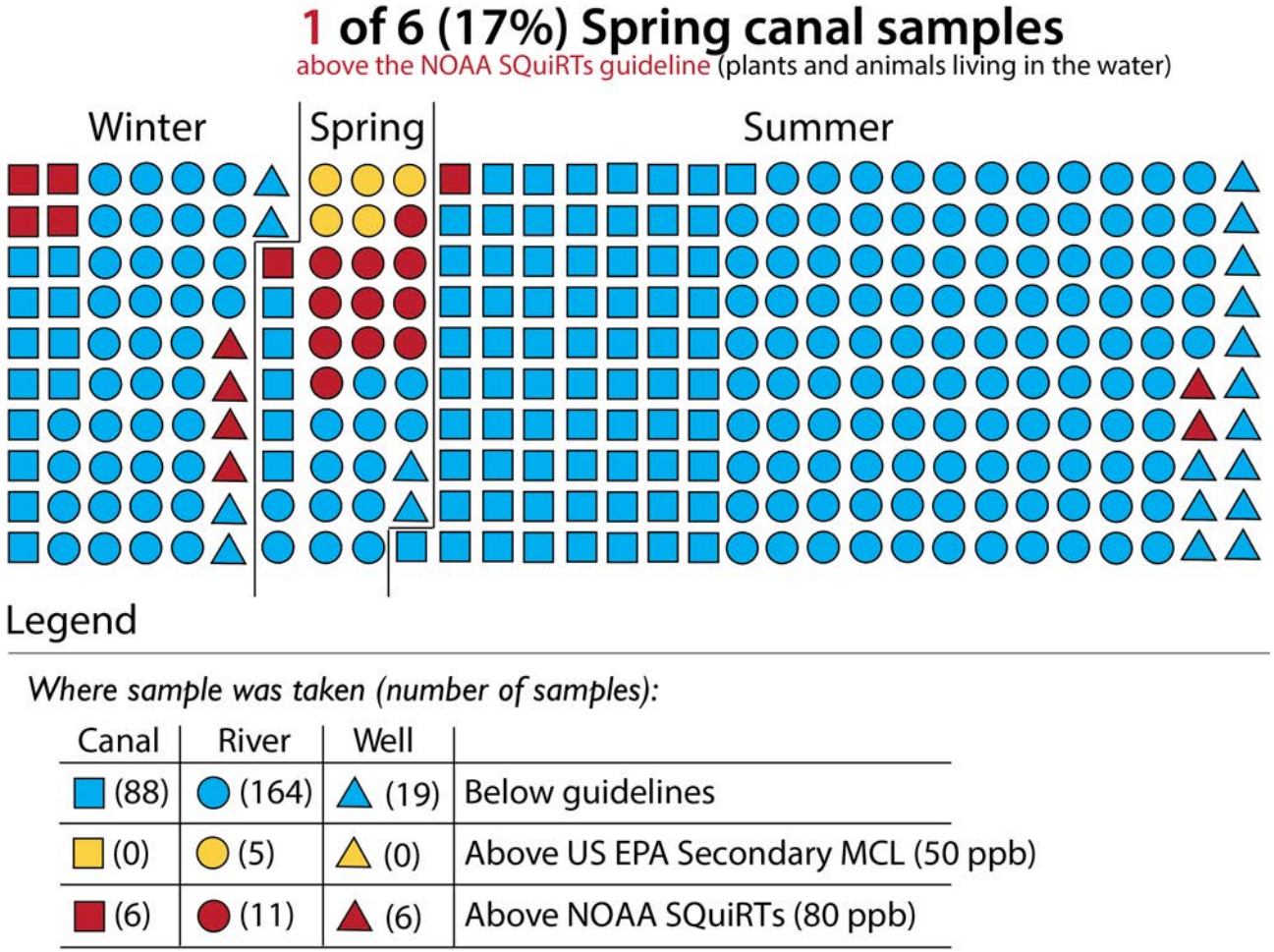

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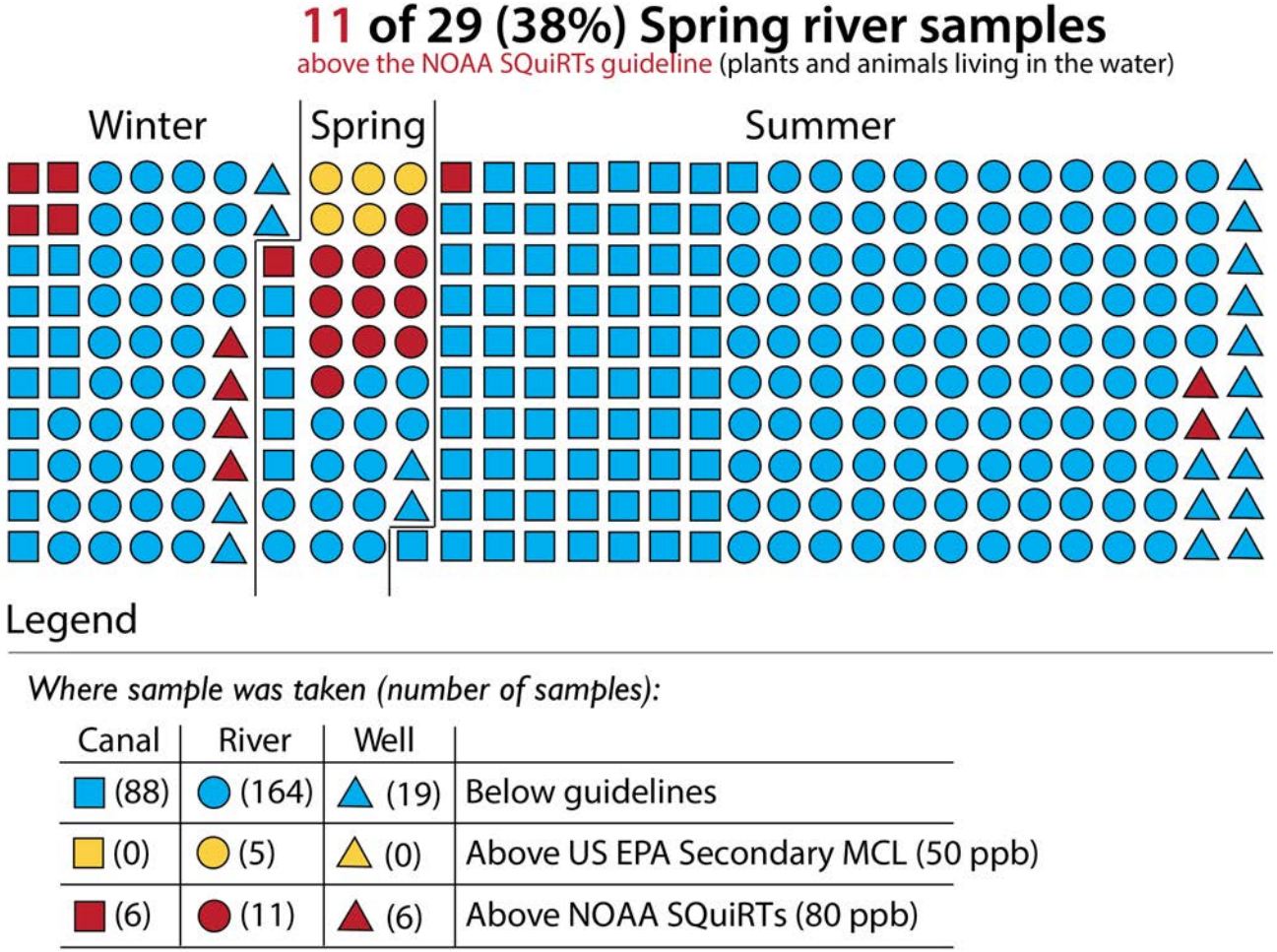

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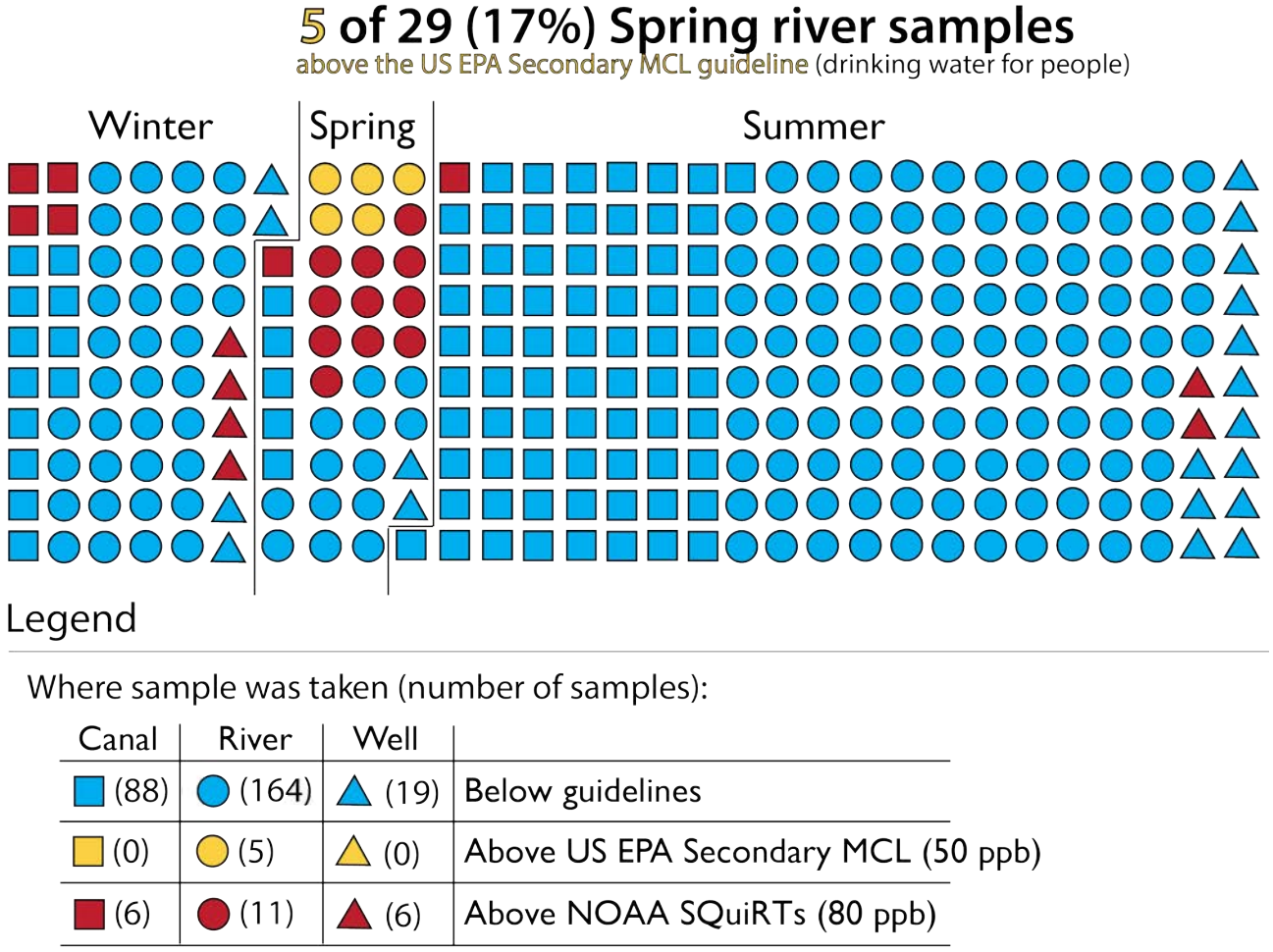

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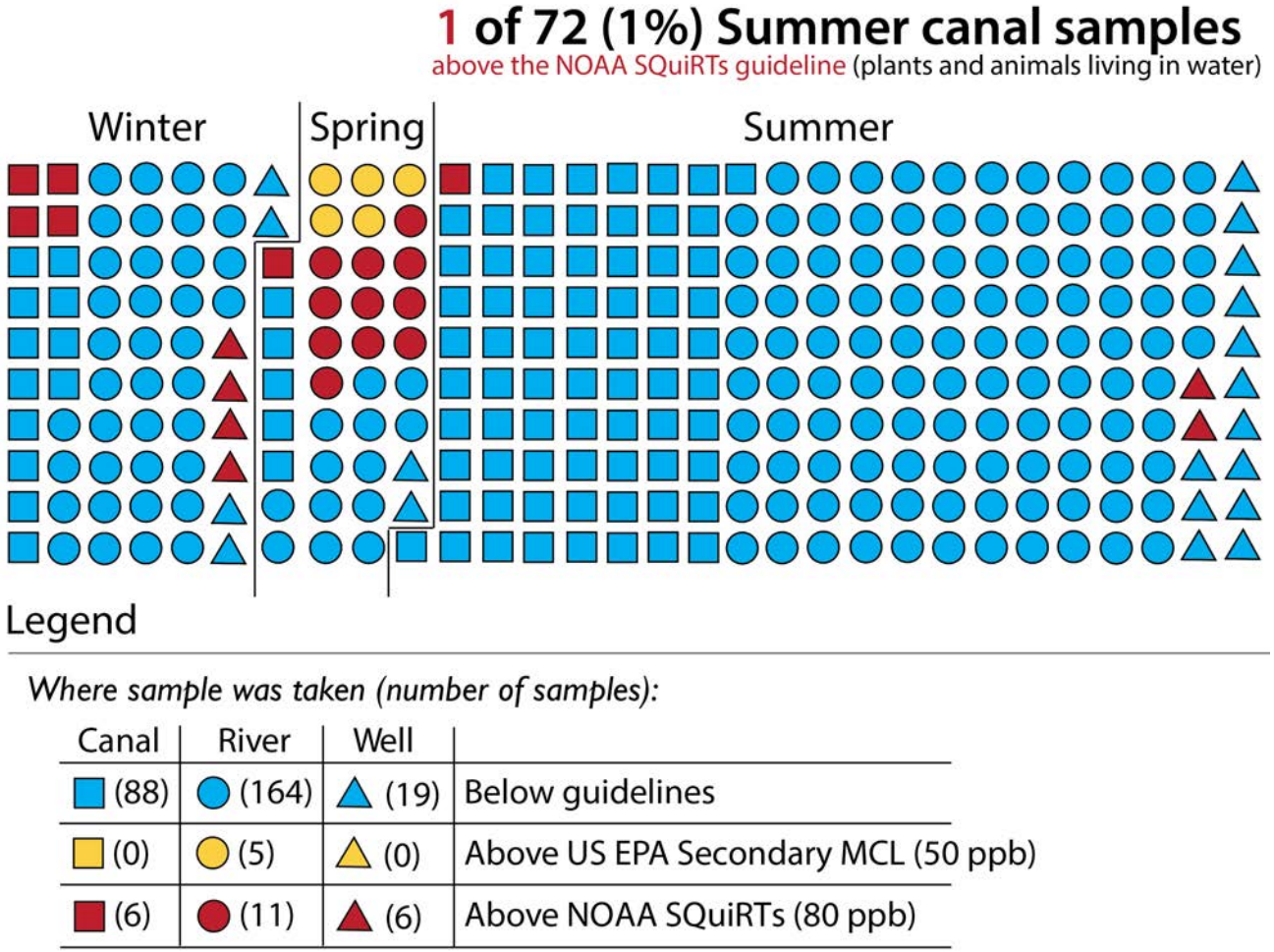

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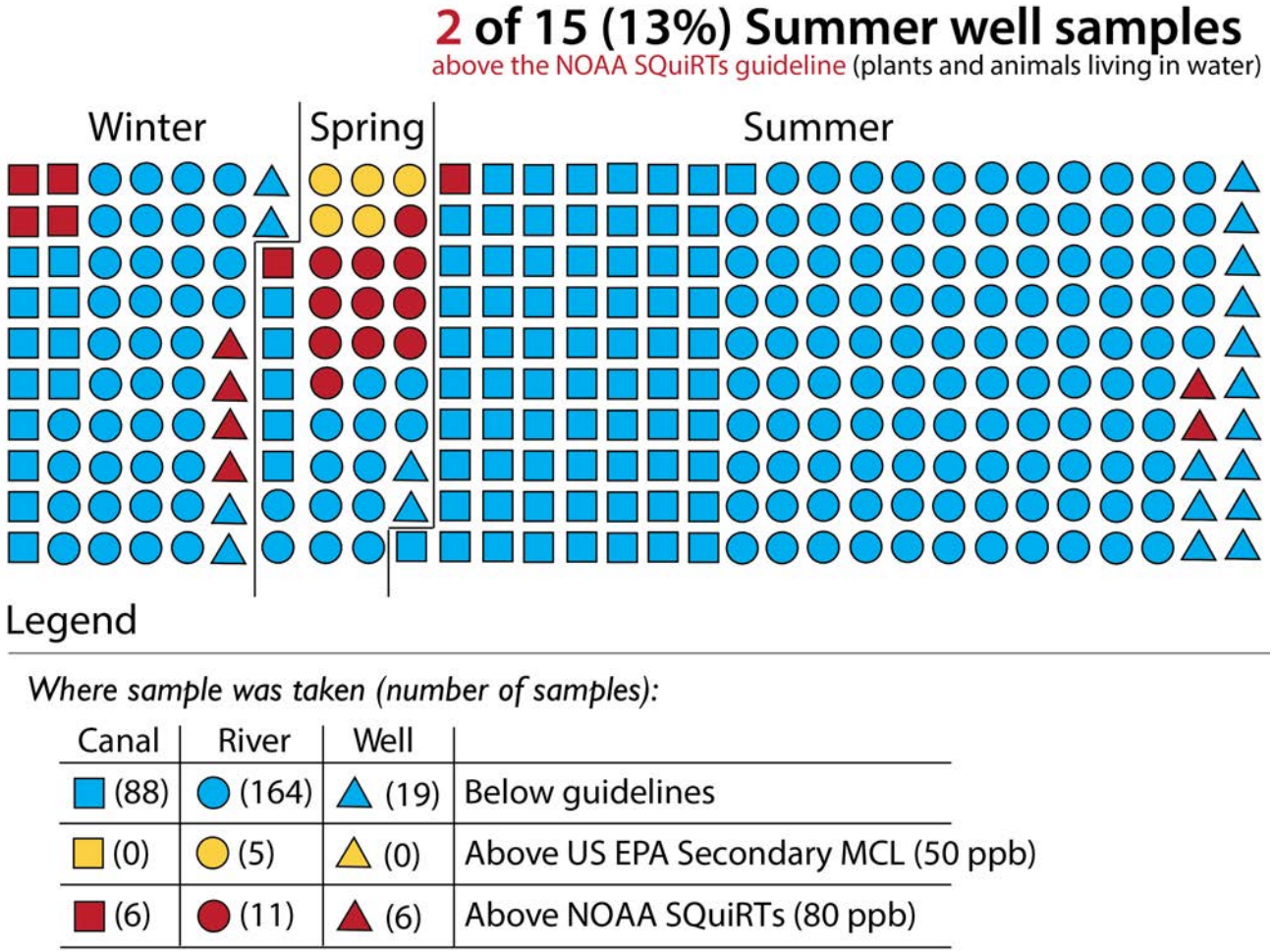

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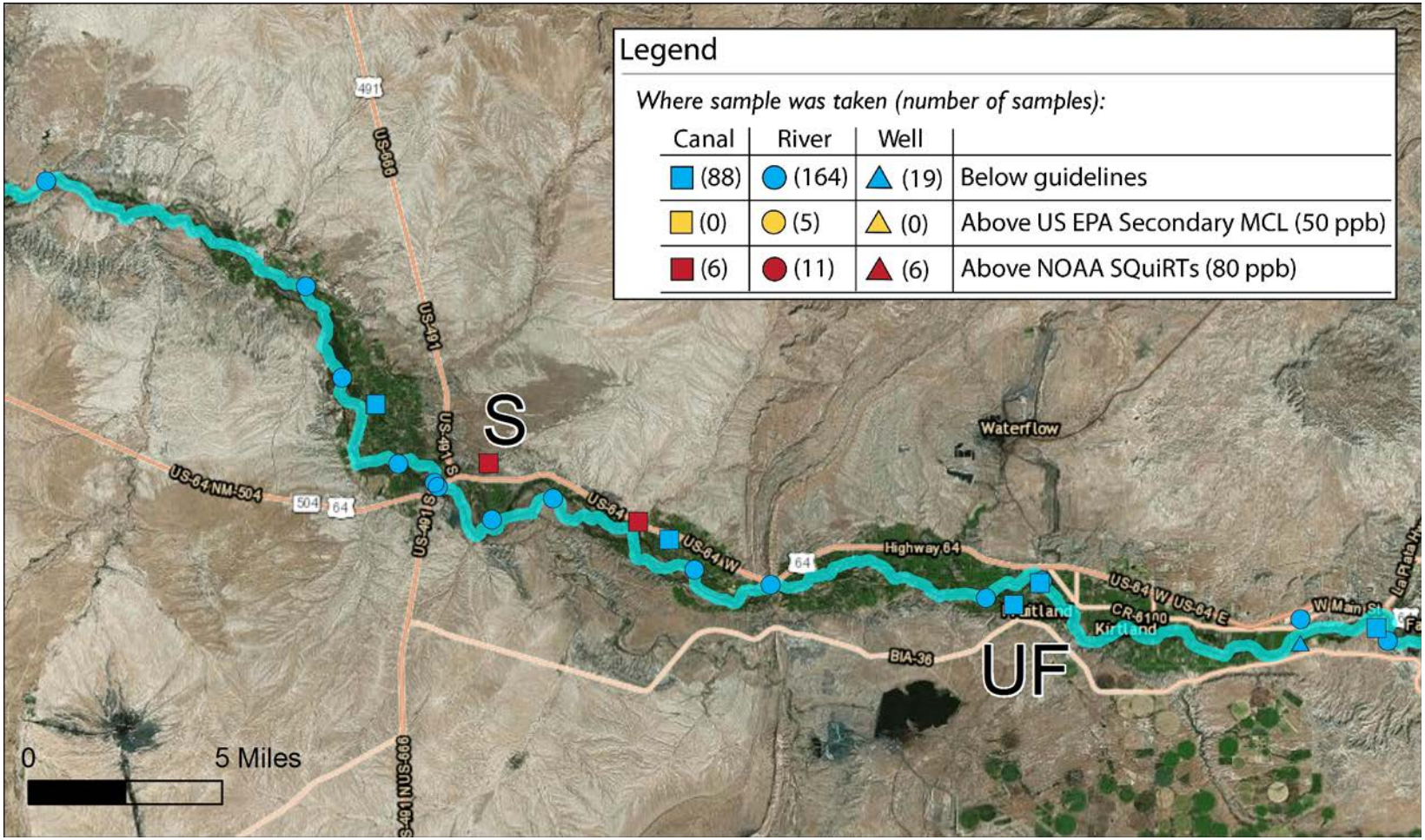
UPPER FRUITLAND & SHIPROCK WINTER 2015



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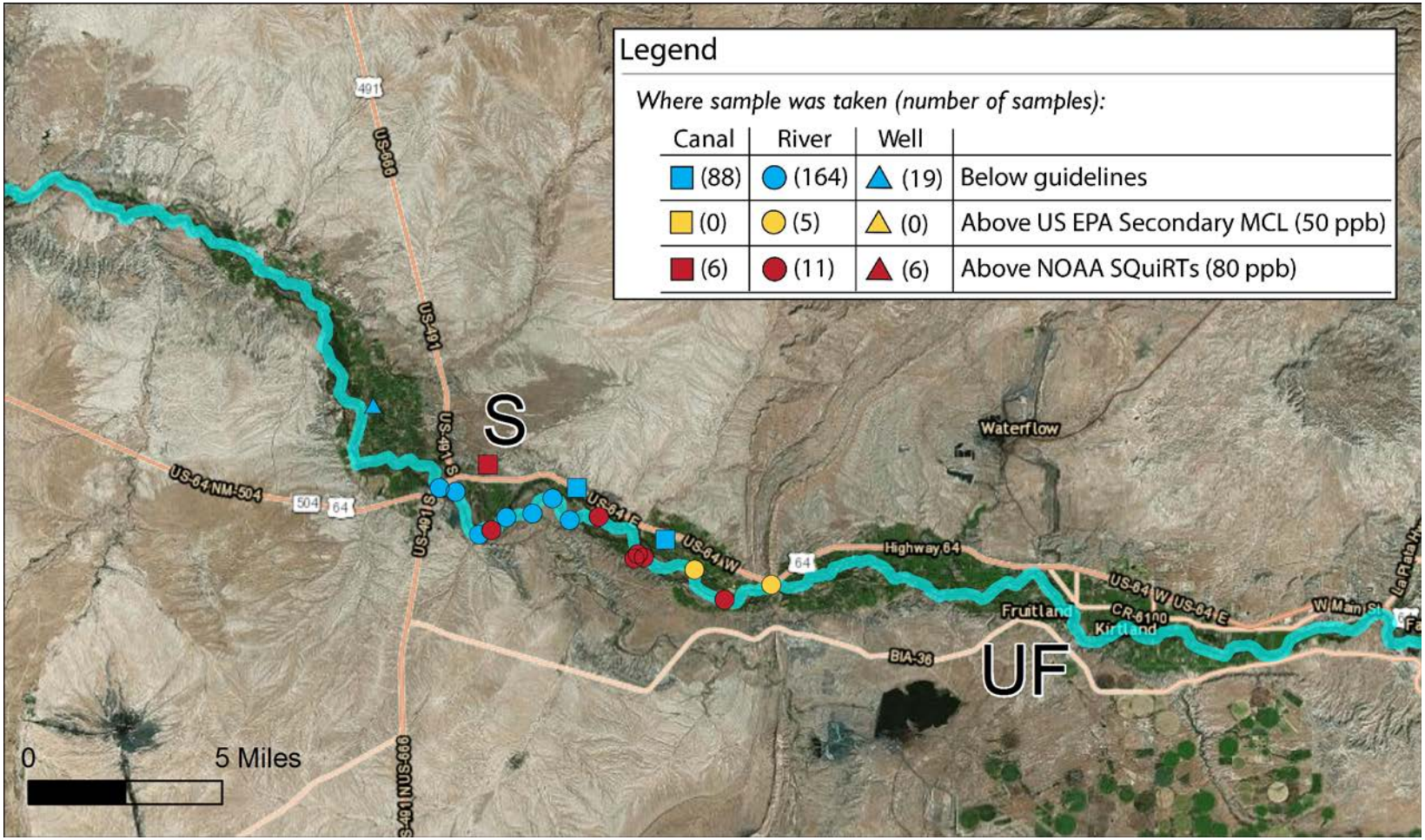

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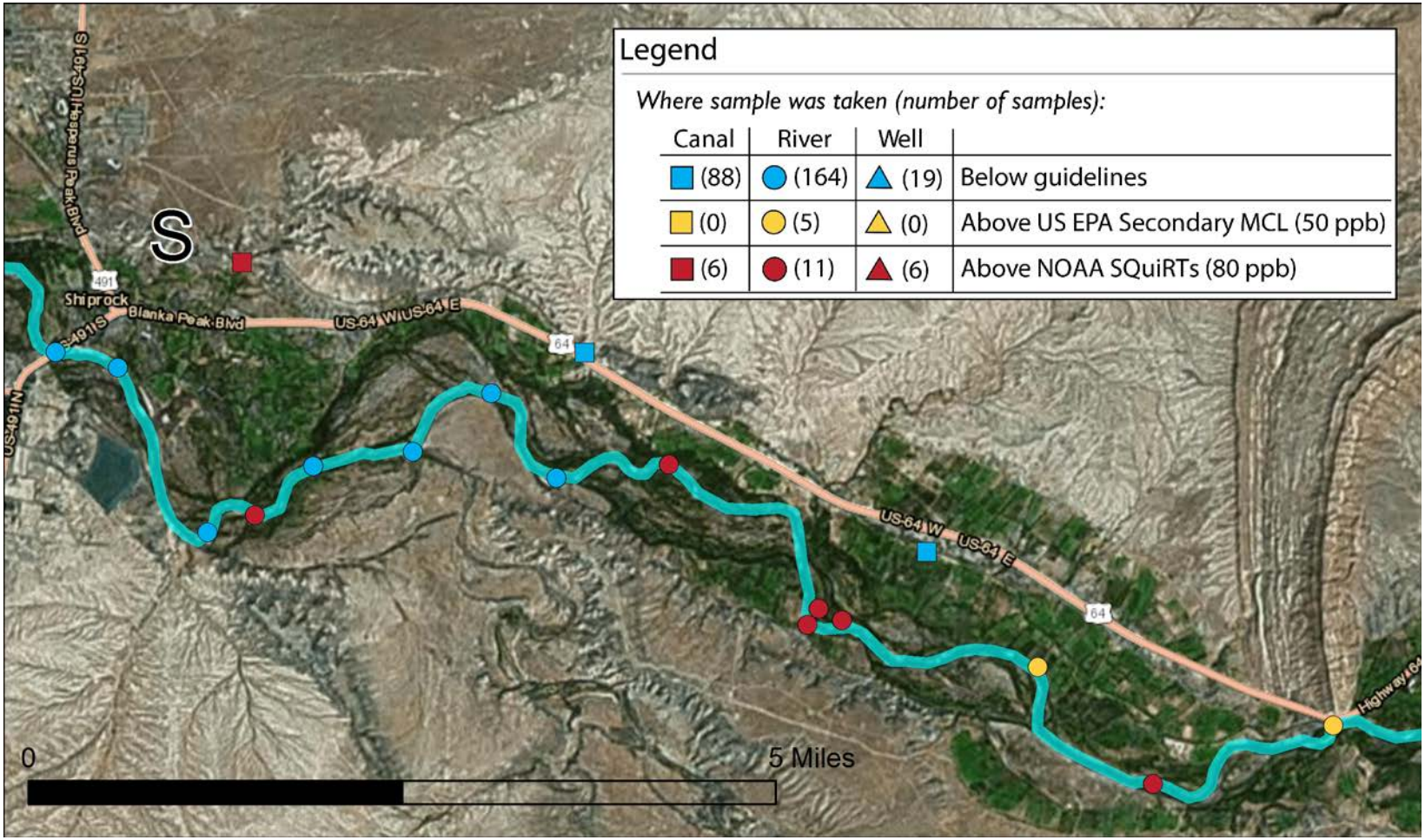

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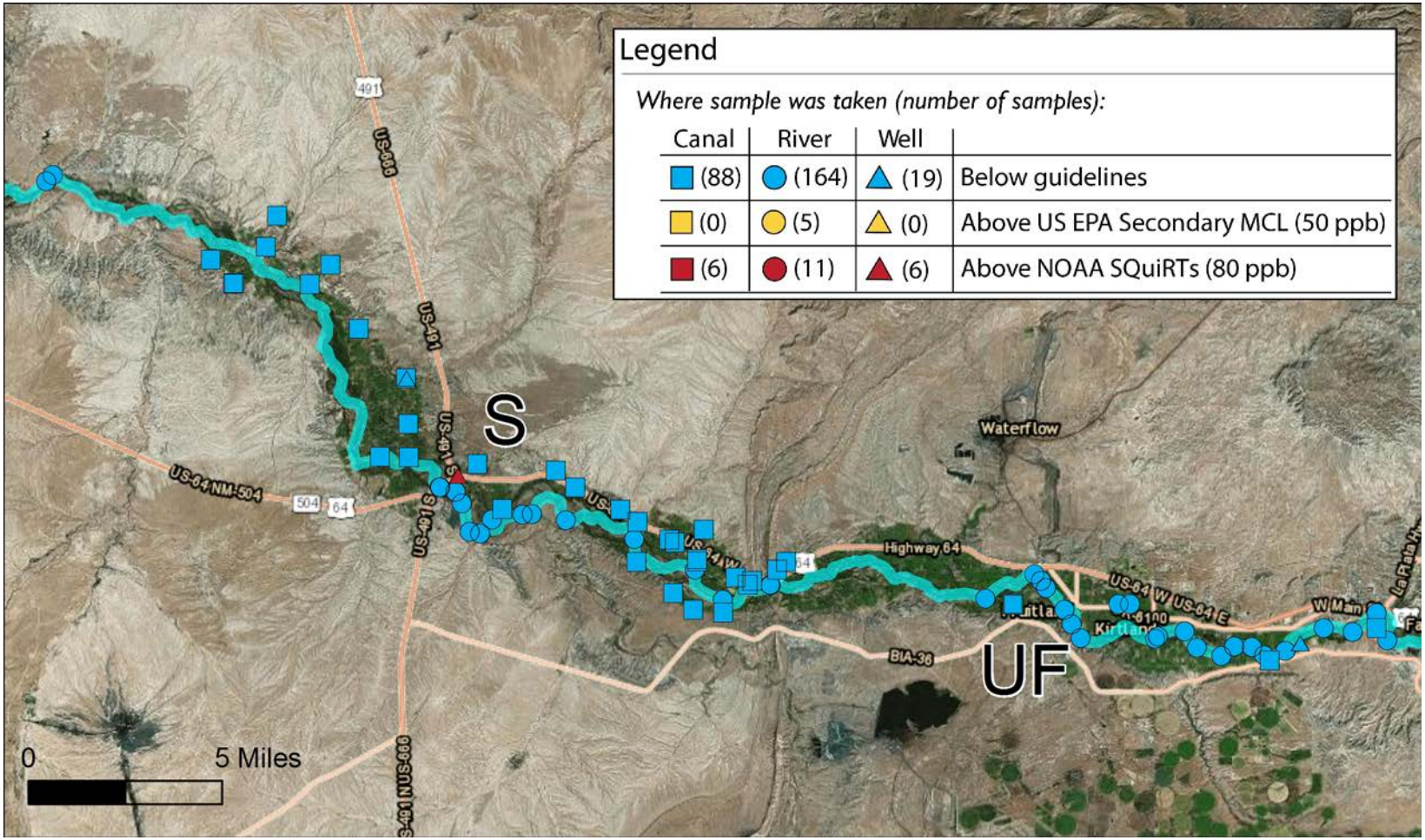

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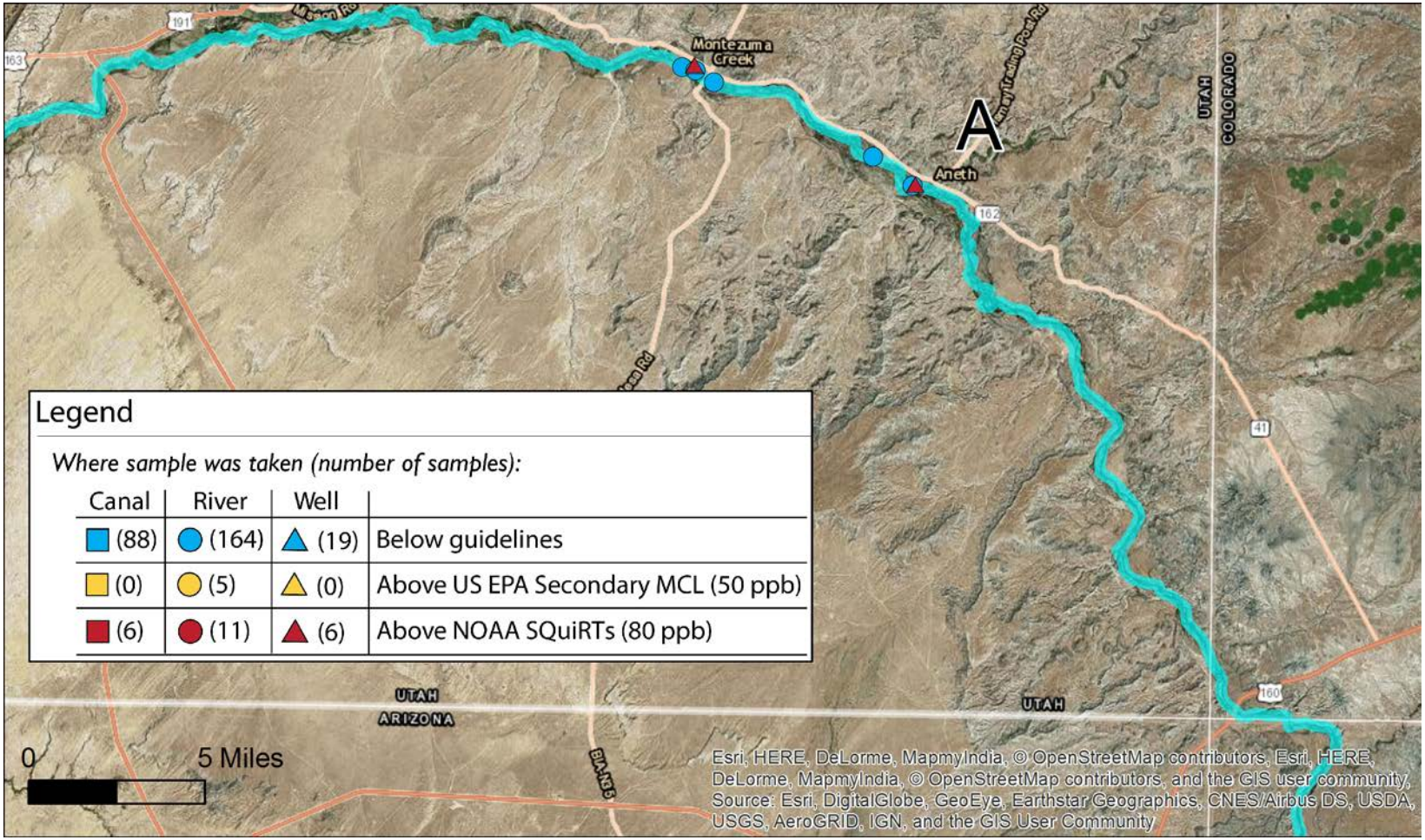

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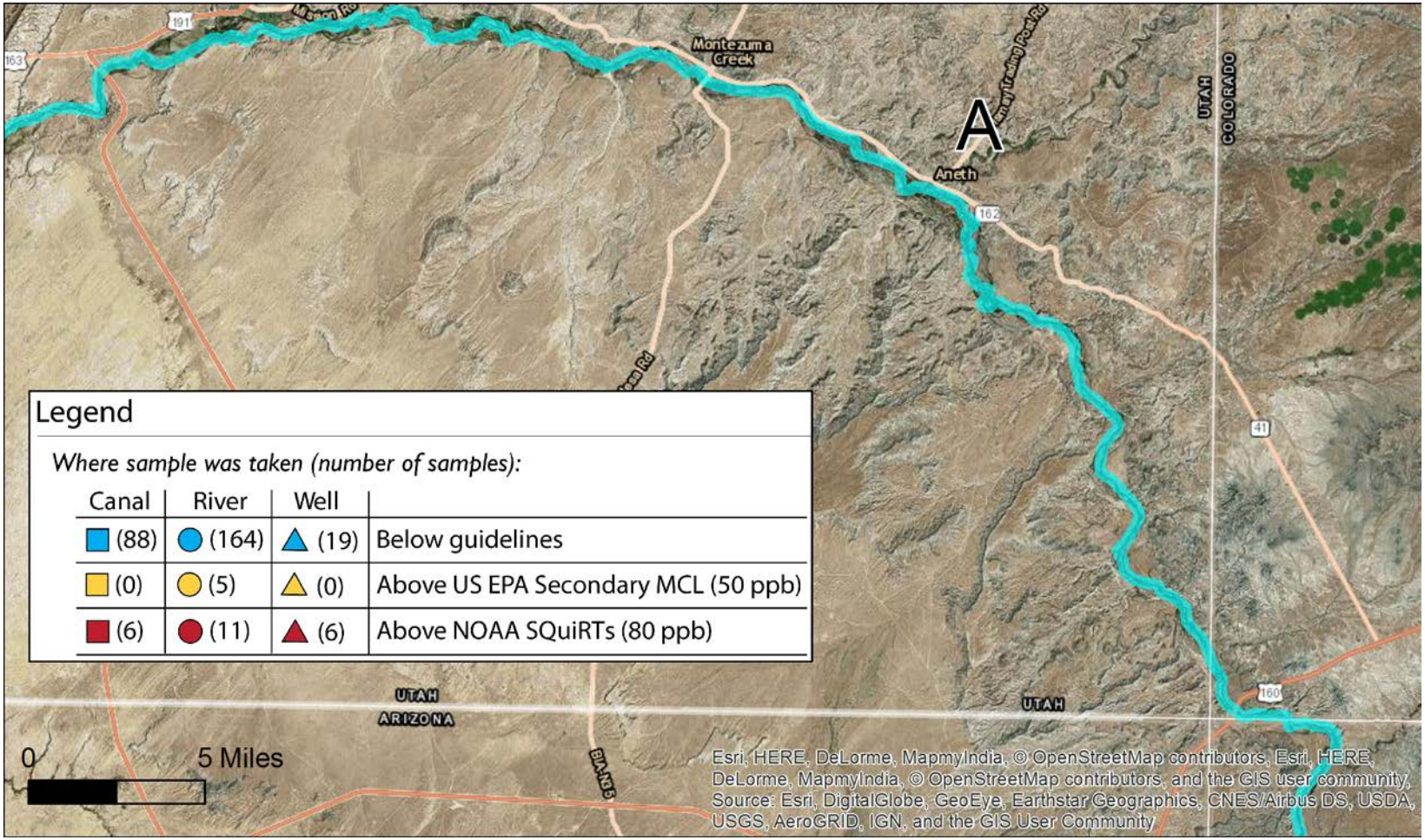

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SUMMER 2016