

Geologic Assessment of Arsenic in Groundwater

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Problem Statement

Arsenic (As), a naturally-occurring known carcinogen, was detected in monitoring wells in Cache Valley.

This research was conducted to:

- Identify where As is most concentrated within groundwater system and what the potential sources may be
- Analyze and compare groundwater As levels between fall and spring in order to understand dynamics of As behavior
- Gain understanding of geochemical mechanisms that may release As into groundwater, allowing it to mobilize

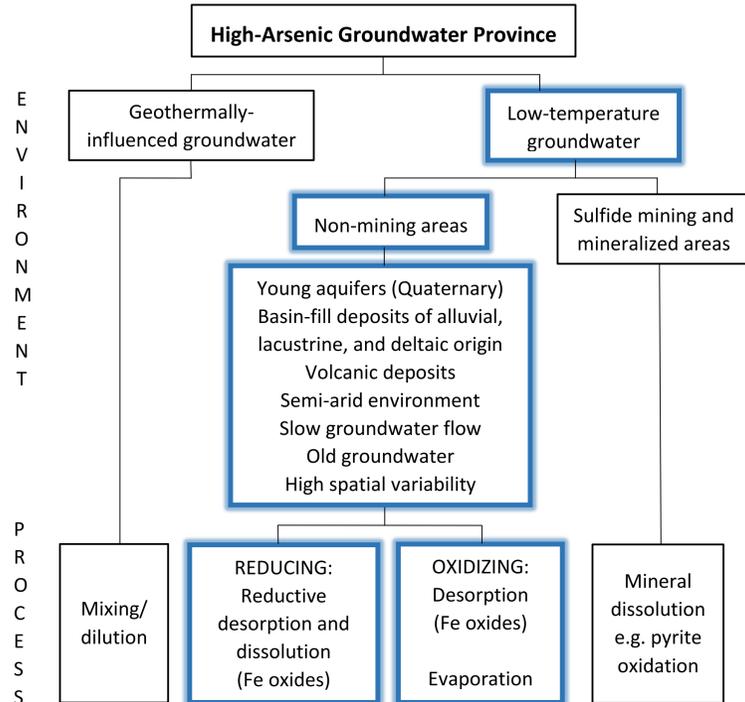


Fig. 1 – Classification of groundwater environments prone to As problems, highlighting local processes (modified from Smedley, 2001).

Research Methods

Evaluation of Previous Work:

- Assess potential As contribution from anthropogenic and natural sources
- Compile available geologic and groundwater data to understand aquifer system and correlate findings

Sampling:

- In Fall 2014, 20 private wells in Cache Valley were sampled for baseline analysis
- In Spring 2015, 7 of original wells were re-sampled

Analysis:

- Field and lab analysis for pH, DO, As (III), As (V), Fe (II), Sulfide, Anions, Total Metals, and Organic Carbon
- Evaluate connection between geologic setting and water chemistry

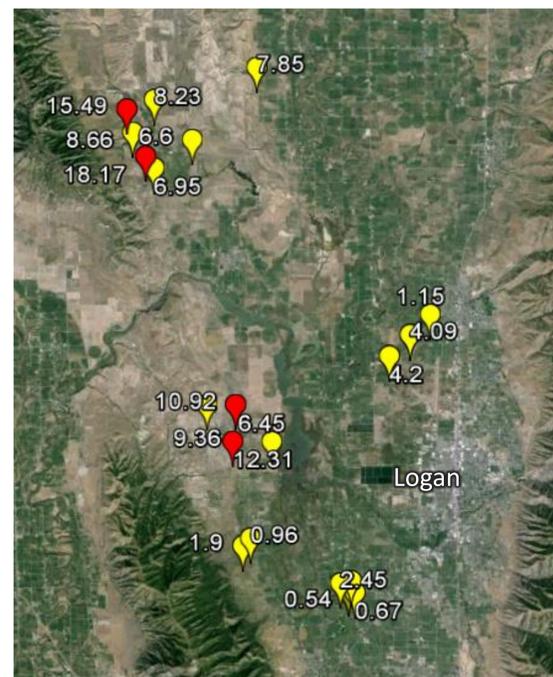


Fig. 2 – Cache Valley wells and As concentrations; red >10 µg/L

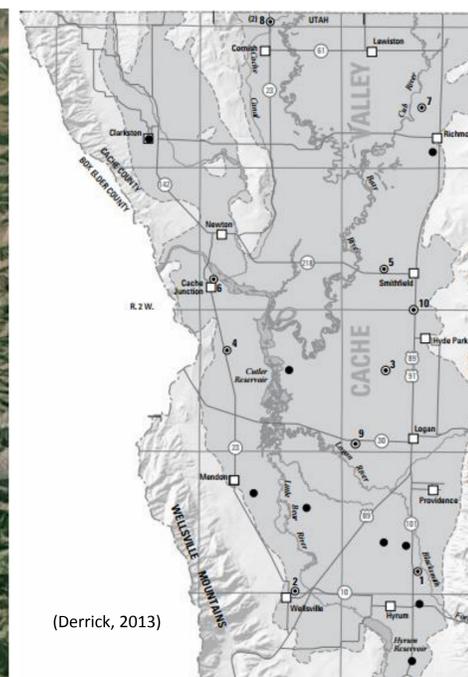


Fig. 3 – Cache Valley basin-fill with volcanic formation along margin (Derrick, 2013)

Results

- As contamination is natural; positive correlation between volcanic deposits and areas of high As (Fig 2 & 3)
- Spring Arsenic declined from Fall (Fig 4)
- Possible mechanisms: changes in redox conditions, dilution, and microbial activity (Fig 1)

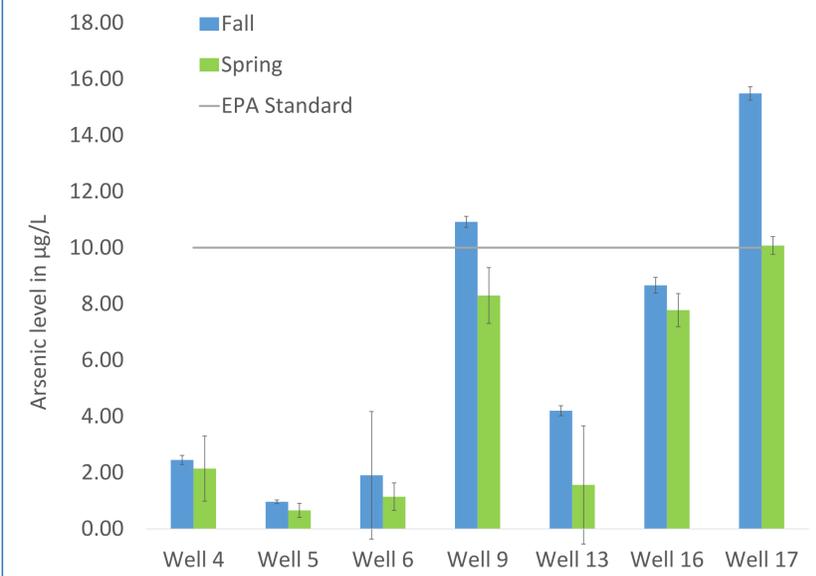


Fig. 4 – Arsenic Levels: Fall 2014 vs. Spring 2015; Error bars indicate 95% C.I.

Impact

- This study relates previous As research to specific conditions in Cache Valley.
- Well owners in the valley should monitor well water regularly.
- Further research on As in soils is needed to describe surface processes.



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