

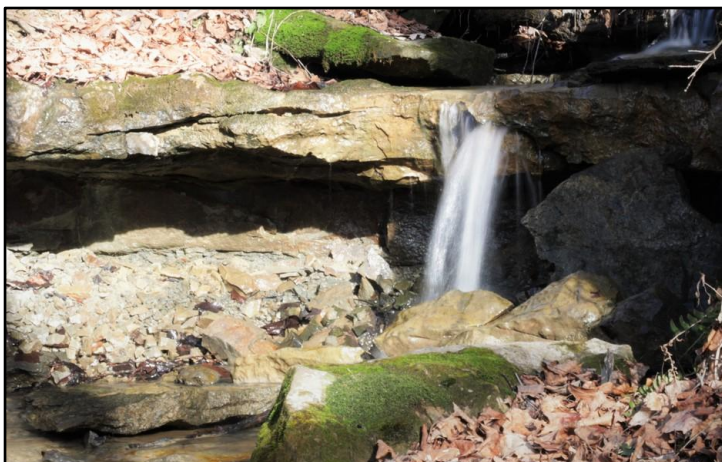
## Ohio: Captina Creek

### Project Description :

After years of 3RQ monitoring, trends of rising bromide and total dissolved solids (TDS) have been observed at the Captina Creek sample site. Captina Creek, in northeastern Ohio near the town of Armstrong Mills, OH, harbors a Murray Energy coal slurry impoundment that may be the cause of the high readings of both bromide and TDS. Communities from around this site have indicated that the impoundment is using this stream as a disposal site for frack water. The water being disposed of is suspected to be from shale drilling activities. Our partners at West Liberty University are investigating the legality of brine water disposal and the regulatory environment in the state of Ohio. The irregularities in bromide and TDS levels in Captina Creek are potentially harmful to both the water quality and the environment surrounding it. Together, 3RQ and Captina Conservancy are working hard continuing to monitor Captina Creek to help ensure better water quality.

### Sampling :

Captina Creek is within the 3RQ monthly routine monitoring area for the Ohio River sites. Sampling was done by our partners at Wheeling Jesuit University, but has been taken over by West Liberty University. This site is sampled using standard 3RQ protocol, which includes using a YSI probe to test the water for conductivity, temperature, pH, dissolved oxygen, and total dissolved solids (TDS).



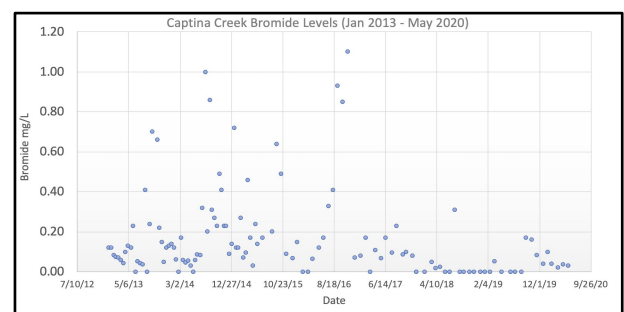
**Figure 1.** A waterfall on Captina Creek. Photo taken by Jonathan Burkhart. Accessed from <http://www.captina.org/> on 7/2/2020.

### Findings :

Working with Captina Conservancy we have conducted hot spot sampling that repeatedly shows high bromide levels originating in the vicinity of the impoundment. Hot spot sampling means selecting an area outside of routine monitoring due to it displaying an interest of study. Concentrations for bromide have shown to be on average approximately three times greater than those of the other Ohio sampling sites. TDS shows an average two times increase from other Ohio sampling sites. On seven different occasions Captina Creek has shown TDS concentrations above 600 mg/L, while only one other location has reached this mark (Connoquenessing Creek in February 2014).

### Results :

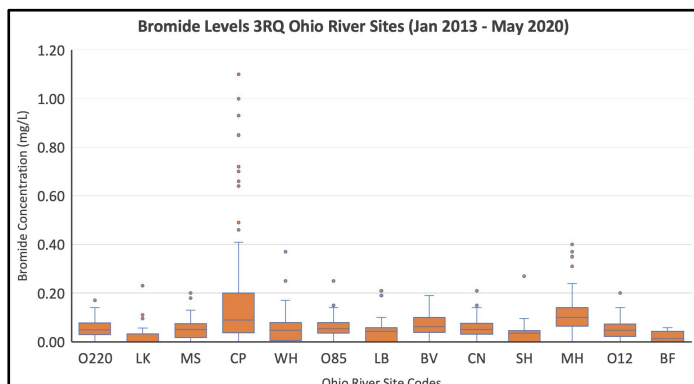
As shown in Figure 2, Captina Creek displays high levels of bromide in early years of 2012-2017. At the beginning of this study Captina Creek had average bromide concentrations of 0.08mg/L. Most notably are the exceptionally high seasonal bromide concentrations during summer and fall low-flow conditions from 2013-2017. Captina Creek has by far the highest recorded bromide concentrations of any of the 13 Ohio River sites. Bromide levels in Captina Creek were repeatedly found to exceed 0.40 mg/L 2013 to 2017, with ...



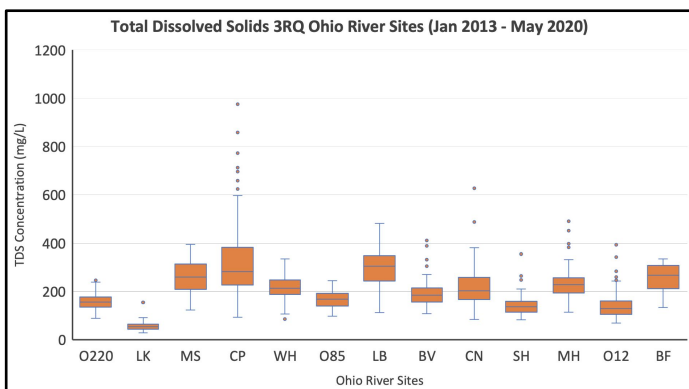
**Figure 2.** Bromide concentrations (mg/L) in Captina Creek, OH have fluctuated greatly, with sharp increases from 2013 to 2017, and declining rates in recent years (2017-2020) .

... multiple samples over 0.8 mg/L. However, Bromide concentrations have not been found to exceed 0.20 mg/L since fall 2018, potentially a sign of changes in brine water disposal practices and improving water quality in Captina Creek. Trends over a seven-year period of 2013-2020 for all Ohio 3RQ sites can be seen in Figures 3 and 4 below.

## Results :



**Figure 3.** Comparison of bromide concentration in Ohio River 3RQ sampling sites over a seven-year period, January 2013- May 2020 . Median lines inside boxes. Blue points are outliers.



**Figure 4.** Comparison of total dissolved solids (TDS) in Ohio River 3RQ sites sample over a seven-year period, January 2013- May 2020. Median lines inside boxes. Blue points are outliers.

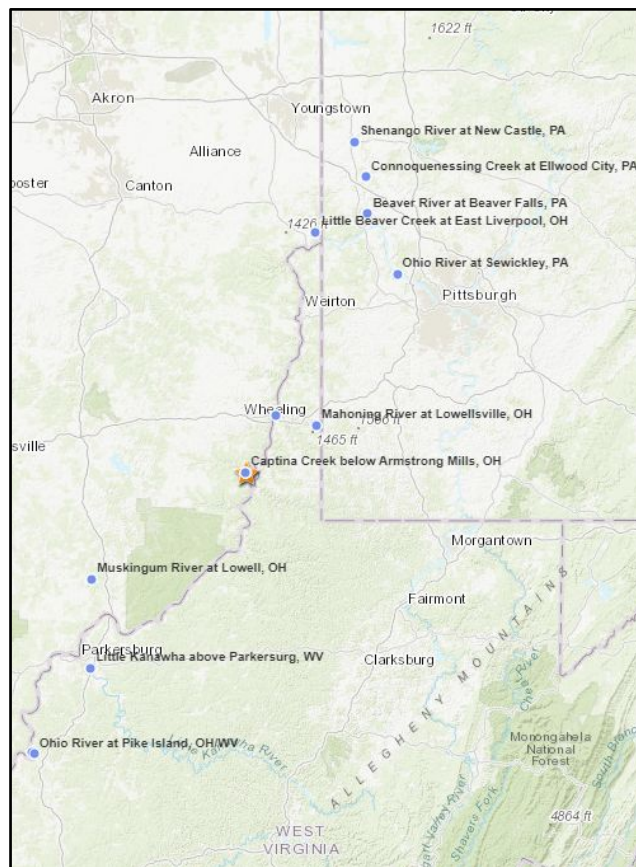
## Site Codes:

- O220:** Ohio River at Ravenswood
- LK:** Little Kanawha
- MS:** Muskingum River
- CP:** Captina Creek
- WH:** Wheeling Creek
- O85:** Ohio River at Pike Island
- LB:** Little Beaver Creek

- BV:** Beaver River
- CN:** Connoquenessing Creek
- SH:** Shenango River
- MH:** Mahoning River
- O12:** Ohio River at Sewickley
- BF:** Buffalo Creek

## Current Research :

3RQ continues to monitor this site in their monthly sampling data for Ohio. With the help of Captina Conservancy, we are able to closely monitor this site and share data that expands our understanding of changes in the water quality in Captina Creek.



**Figure 5.** Map of 3RQ Ohio River sampling sites in blue. Captina Creek is highlighted with the orange star.

## Additional Information :

This study was made possible with the help of Captina Conservancy, a nonprofit land trust with a focus on conserving and protecting the Captina Creek Watershed. Visit their site at <http://www.captina.org/> to learn about more information and current news.

3RQ monthly data for this site and other sites along the Ohio River can be found on the 3RQ website at <https://3riversquest.wvu.edu/home> under the data tab.