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Evaluation and Monitoring of Glen Helen Water Quality Fall 2014

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Evaluation and Monitoring of Glen Helen Water Quality Fall 2014

Nathaniel Brackett, Brannon Dunn, Robert Magley, Saagar Patel, Jennifer Purvis, Sarah Steele, Jonathan Tumey, Katie Watson, James Waweru, Benjamin Wick, Scott Atkinson, Prof. Audrey McGowin, PhD



Chemical/Biological Inputs to Glen Helen

- Wastewater Treatment Plant (WWTP) Effluent *Treated Sewage (OEPA NPDES Permit OH0028215)
- Nitrate and Phosphate, *E. Coli*, drugs and household chemicals
- Runoff (non-point source) from fertilizer, cattle, domestic animals, streets, lawns
- Nitrate, *E. Coli*, pesticides, oil, detergents, phosphate
- Overflow from the lift station * Untreated Sewage
- Nitrate and Phosphate, *E. Coli*, drugs and household chemicals, biodegradable chemicals
- Waste Pond Overflow from Morris Bean & Co (OEPA NPDES Permit OH0040576)

Anions Measured: fluoride, chloride, nitrite, bromide, nitrate, phosphate, sulfate (EPA Method 300.1)

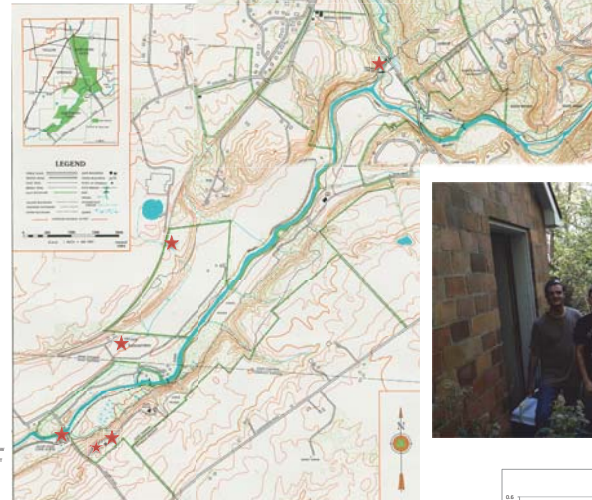
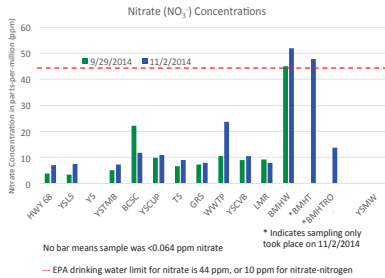
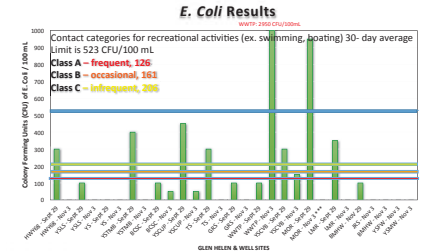
Metals Measured: aluminum, arsenic, cadmium, chromium, copper, iron, manganese, lead, nickel, strontium, zinc (EPA Method 200.7)

Description	GPS Location
HWYM	Yellow Springs Creek, north entry into Glen Helen 39° 48' 11" N, 83° 53' 08" W
YSL5	Yellow Springs Creek, above crossing by lift station 39° 48' 30" N, 83° 53' 05" W
YS	The Yellow Spring 39° 48' 14" N, 83° 53' 00" W
YSMB	Yellow Springs Creek, bridge below Traskade Museum 39° 48' 13" N, 83° 53' 21" W
BCSC	Binch Creek, above crossing below Traskade Museum 39° 48' 03" N, 83° 52' 50" W
YSCUP	Yellow Springs Creek, upstream from WWTP 39° 47' 30" N, 83° 52' 48" W
TS	Traveler's Spring 39° 47' 52" N, 83° 52' 52" W
GRS	Grinnell Road Spring, The "Clary Spring" 39° 47' 39" N, 83° 52' 58" W
WWTP	Yellow Springs Water Reclamation Facility Outfall 39° 47' 28" N, 83° 53' 19" W
YSCVB	Covered bridge downstream from WWTP 39° 47' 06" N, 83° 53' 45" W
MOR	Foundry waste settling pond effluent 39° 46' 11" N, 83° 53' 40" W
LMR	Little Miami River at Jacoby Road Launch 39° 45' 50" N, 83° 54' 05" W
BMHW	Binch Manor House Well, Jacoby Road 39° 45' 56" N, 83° 53' 40" W
BMHT	Binch Manor House Tap 39° 45' 57" N, 83° 53' 49" W
YSMW	Yellow Springs Municipal Well #2 39° 46' 11" N, 83° 53' 54" W

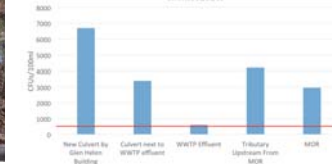


Other Water Parameters Measured: Dissolved oxygen, pH, specific conductance, temperature, and ammonia were measured with a YSI Multimeter. Turbidity was measured using a transparency tube and *E. coli* enumerated using 3M Petri Plates.

Dissolved oxygen, pH, specific conductance, temperature, and ammonia were all within normal, expected limits. Turbidity was higher on September 9 at the Highway 68 (HWY68) and Lift Station (YSL5) sites where Yellow Springs Creek enters Glen Helen.

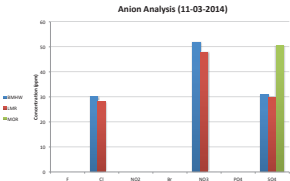
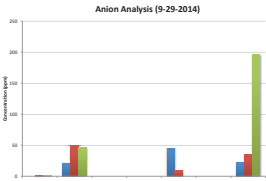


E. coli in Stormwater Runoff



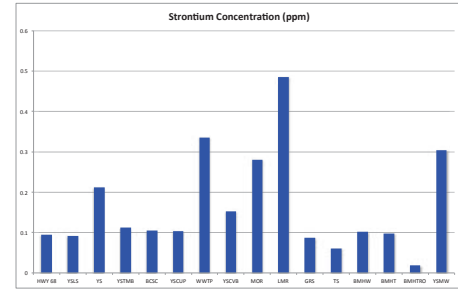
E. Coli in Glen Helen

- E. coli* levels were determined at all of the sites
- E. coli* is a microorganism that comes from human and animal feces
- E. coli* can cause diarrhea, abdominal cramping and vomiting
- No amount of *E. coli* in drinking water is considered safe
- Several sites were above Ohio EPA use limits
 - The maximum recreational limit for *E. coli* is 523 CFUs/100 mL
- The Yellow Spring was found to be free of *E. coli*
- The Grinnell Road spring contained 100 CFUs/100 mL
- The Traveler's spring contained 300 CFUs/100mL
- Samples taken during a rainstorm showed exceedingly high levels of *E. coli* in runoff waters entering Glen Helen
- Water from these sources should not be consumed



Anion Results: Nitrate concentrations in the south glen well were above EPA limits for drinking water (BMHW and BMHT) of 43 ppm (parts-per-million) nitrate or 10 ppm as nitrate-nitrogen. Installation of a reverse-osmosis purification system brought nitrate down below EPA limits (BMHTRO). The high sulfate concentration at the foundry (MOR) was still below the EPA limit of 250 ppm. All other anions were at expected low concentration levels or below the limits of detection.

Metals Results: Iron concentration in The Yellow Spring was 1.16 parts-per-million (ppm). All other sites were significantly lower. Iron in the groundwater comes to the surface and forms rust giving The Yellow Spring sediment its orange color. Arsenic concentrations were right around the EPA drinking water limit of 10 parts-per-billion (ppb), which is normal for this area. Strontium concentrations vary greatly in the area. Strontium (Sr) occurs naturally in some limestone formations. Sr is higher in well and ground waters (YS, YSMW) and waste waters (WWTP, MOR), yet the Little Miami River (LMR) is the highest. The reasons for these concentration variations are not yet clear.



November 3, 2014



Foundry Effluent into Glen Helen (MOR). Wastewater should be flowing from this outlet under the bike path and into Glen Helen.

The class reported to the Ohio EPA that the effluent pipe from the foundry wastewater pond (MOR) was dry. OEPA confirmed that the runoff from the foundry waste pond was going down a sinkhole and directly into groundwater. No effluent was seen on either sampling date. This is a recurring issue and has the potential to contaminate groundwater directly.

