Understanding how upgrading the Tomahawk Wastewater Treatment Facility will affect Indian Creek sources of impairment

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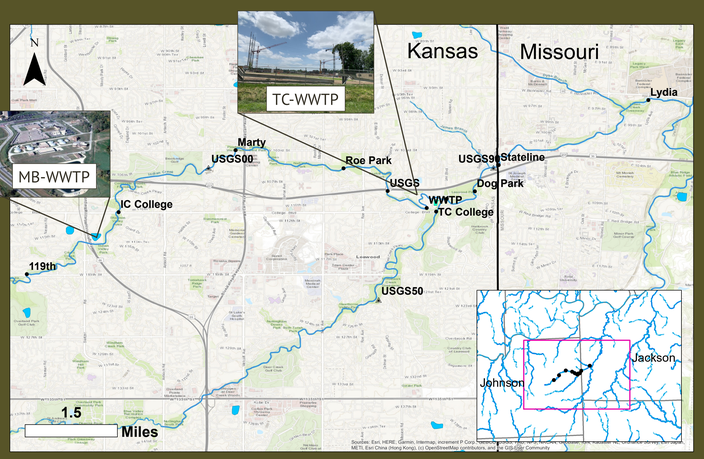
Overview

Indian Creek in Johnson Co is an urban stream impaired by chloride, total phosphorus, nitrate, and *E. coli* (KDHE Kansas 303d list of Impaired Waters, 2018).

Two waste water treatment plants, Middle Basin (MB-WWTP) and Tomahawk Creek (TC-WWTP) have been discharging treated effluent into the stream since the 1950s.

The TC-WWTP is currently offline (since March 2019) and will come online in ~2021. We collected water samples in Summer 2019 to help to understand how upgrades at TC-WWTP will affect the recovery of Indian Creek.



Research Questions

All sites were 3rd to 4th order streams

1. What are the characteristic nutrient loadings of Indian Creek after Tomahawk Creek WWTP went offline?
2. What were the stream conditions during 2019?
3. What is the relationship between downstream nutrient loadings and nutrient processing in water and hyporheic 'streamside' soil of this urban stream system?

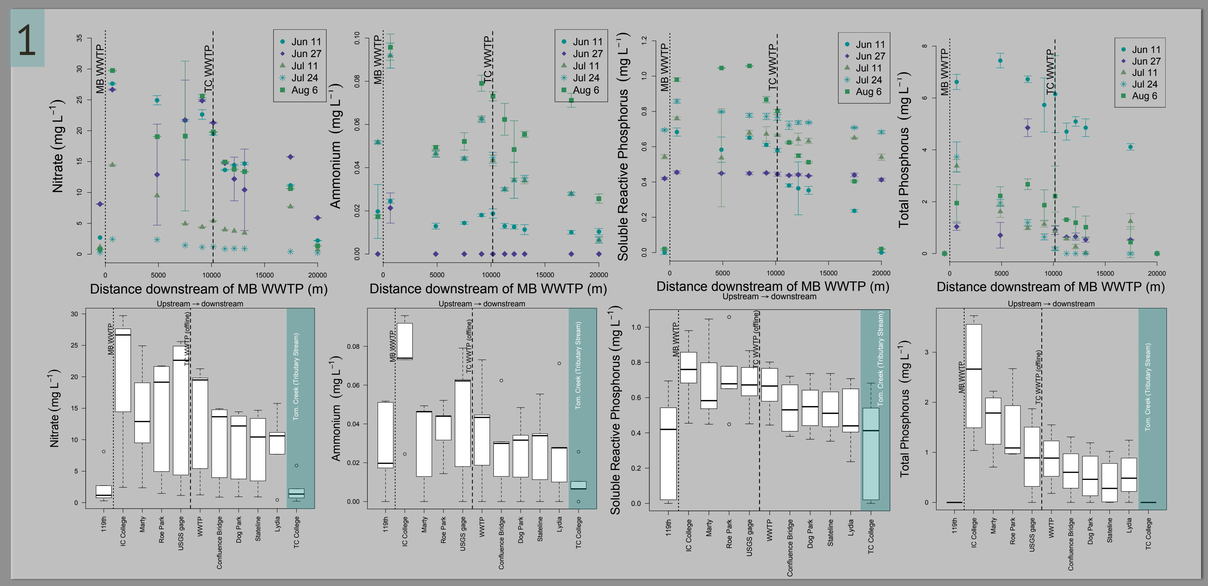
Take Home Messages

1.) Middle Basin WWTP yields the most prominent contribution of nutrient loadings to Indian Creek, affecting downstream stream water quality.

2.) Baseflow stream chemistry showed consistent spatial patterns.

3.) Denitrification enzyme activity (DEA) was far higher in soil compared to water, but showed no clear pattern with nitrate concentration.

1



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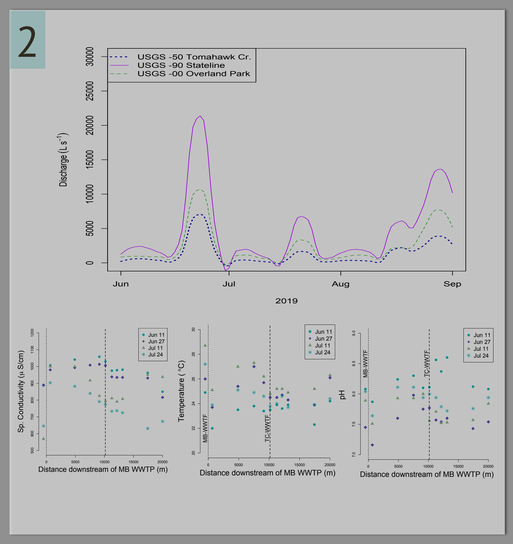

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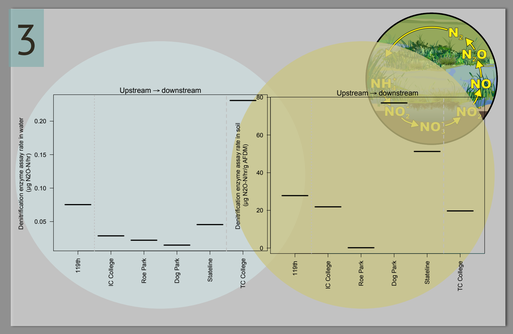
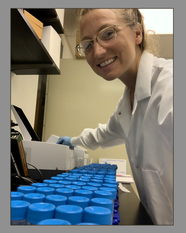


Methods

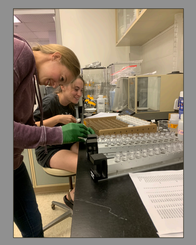
Analyte	Method
Nitrate	Dionex ICS-900 Ion Chromatograph
Total Phosphorus	Gen5 plate reader
Ammonium	Shimadzu UV-1280 UV-VIS Spectrophotometer
N_2O (Nitrous oxide)	Agilent 7890B Gas Chromatograph
Soluble Reactive Phosphorus	Smartchem 200 discrete analyzer



Conducting analysis via spec.

Measuring stream discharge

Collecting water samples



Sample prep for SRP analysis

Acknowledgements

We thank the University of Kansas and KDHE Kansas for their support with water and soil sample collections and lab analysis. We also thank the Burgin and Loecke labs for an adventuresome field crew equipped with field supplies and readied for long, hot Kansas summer field days. And lastly, to USGS for their continually awesome work that helps us to understand the water that flows through the U.S.

Resources

Graham, J. L., & Foster, G. M. (2014). *Effects of Wastewater Effluent Discharge on Stream Quality in Indian Creek, Johnson County, Kansas* (No. 2014-3100). US Geological Survey.

Foster, G. M., Graham, J. L., Williams, T. J., & King, L. R. (2016). *Spatiotemporal variability of inorganic nutrients during wastewater effluent dominated streamflow conditions in Indian Creek, Johnson County, Kansas, 2012–15* (No. 2016-5147). US Geological Survey.

KDHE Kansas 303d list of Impaired Waters, 2018