Impact of CoVID-19 Stay-at-Home Orders on Urban Stream Quality in Denver Metro Area with Application for Future Urban Living Scenarios

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Introduction

The COVID-19 pandemic has created an opportunity to research how urban water quality can improve if traffic were significantly reduced during normal societal conditions. Due to stay-at-home orders, businesses, schools, and public spaces have closed resulting in less traffic and more open parking lot spaces than usual. The state of Colorado's mandates signify citizens should only leave their homes under essential circumstances, which will likely cause reduced amounts of water pollution in areas along roadways and popular shopping centers. Literature reviews suggest motorized vehicles are primarily responsible for specific heavy metals such as copper, lead, and zinc as well as other pollutants such as polycyclic aromatic hydrocarbons(PAH) and BTEX (i.e, benzene, toluene ethylbenzene, xylenes)(Han, Y.et al, 2006). Our hypothesis is urban water quality will be improved, where concentrations and pollutant fluxes will be reduced by an order or magnitude compared to historical and post-pandemic conditions.

Objectives and Methods

- The objective of this research is to collect for later comparisons, sensitive data on urban water quality during the period of reduced traffic by COVID-19 restrictions.
- Our methodization for analyzing the impacts of normal and reduced traffic conditions was by using historical data from the USGS, Colorado School of Mines water quality sampling, and CoAgMet(Colorado State University weather software)in the Denver Metropolitan Region and comparing it to post-pandemic water quality.

Figure 1. Front Range Urban Corridor in Denver Metro Area, Colorado indicating sampling sites

Data and Results

- The data for precipitation in the Denver metropolitan area was collected remotely using the CoAgMet weather software. There were 18 sites in which precipitation data corresponding with the sampling events were collected in 5-minute increments. This data were then graphed on stormwater hydrographs along with corresponding water flow data(Figure2).
- The graphs show precipitation and the following trend of water flow data to allow the team to be able to align their event sampling data including BTEX, PAH, and other pollutants in order to make analysis of water quality due to run-off. We hope to make stormwater hydrographs post-pandemic in order to compare them to traffic conditions and water quality during the pandemic.

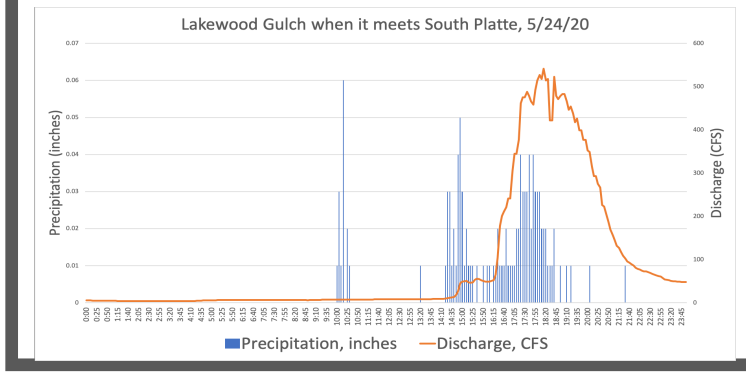

Figure 2. Storm hydrograph for Lakewood Gulch on 5/24/2020

Conclusions

Reducing pollutants can have significant benefits to our future sustainable living situations. The COVID-19 pandemic has the potential to accelerate the conditions of working from home, online learning, and increased online retail shopping. This information will be useful to urban planners in regard to infrastructure promoting healthier and more sustainable urban water systems.

Sources

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