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A Study of Urban Drool: Dry Weather Runoff

Abstract

Much research has been done concerning stormwater contaminants and much effort has been made to control the fate of this type of wastewater. However, in the western United States, urban environments are confronted with another issue. Dry weather runoff, or what we have termed "urban drool," is a potential topic of concern and is something we must understand in order to determine if it is a possible threat to the environment. Regions in the west experience little rainfall but moisture is still observed in and around storm drains. Runoff can be seen trickling down the side of the road or sometimes large culverts emptying into streams have an observed flow. One must ask, where does this come from?

The main objective of this research project is to determine what constituents make up urban drool and to measure the concentrations in various water samples to determine if this runoff is a cause for concern. We hypothesize that we will discover traces of pesticides, pharmaceuticals, PAHs (polycyclic aromatic hydrocarbons), heavy metals, and nutrients. Because this water is most likely caused by the overwatering of lawns, driveway car washes, and other miscellaneous sources, it seems plausible that pesticides will be detected as well as metals and PAHs from car exhaust. It is important to do a nutrient analysis as well, so that the results can be compared to typical values for total nitrogen, nitrate, nitrite, phosphorus, and ammonia in surface water and groundwater.

The sampling region was narrowed down to a small area in Golden, Colorado including the Colorado School of Mines campus as well as Sloan Lake in Edgewater, Colorado. Sources ranged from a plastic pipe emptying into Sloan Lake, a concrete culvert on the bank of Clear Creek, and water flowing down the curb of various streets. Samples were collected using a plastic syringe and depending on what test the sample was used for, a filter was used. The samples were stored in various vials including, 125 mL amber glass bottles, 8 mL amber glass vials with 0.008 g of sodium azide used as a preservative, 1 L amber glass bottles, and 50 mL plastic Falcon tubes. The samples were stored on ice as the time of sampling occurred in the afternoon and it was very hot and dry. Dissolved oxygen, pH, and conductivity readings were taken in the field using the appropriate probes and GPS coordinates were recorded.

Tests were then completed using Hach tests for total nitrogen, nitrate, nitrite, phosphorus, and ammonia. An indicator bacteria test was completed as well. The samples were prepared for total organic carbon, metal, and pharmaceutical testing and submitted for analysis. Pesticide testing will not occur until after I have finished my REU. The results of these tests were briefly analyzed, however, more testing must be done in order to confirm trends and reduce error.

The results of the nutrient tests were somewhat surprising. Nutrient levels varied significantly between the samples. This may be due to the type of source. Sample 1 was taken from a concrete culvert near Clear Creek which is near large athletic fields. Sample 2 was taken from runoff in a residential area. Sample 3 was taken from a pipe emptying into Sloan Lake,

however, this source is questionable because the water was not flowing like the other sources and may have been stagnant for a long period of time. The total nitrogen test had very unlikely results so there must have been significant error in the test and the results were omitted. Negative values were obtained in some of the Hach tests which seem questionable and may be a result of some error. The values were obtained by averaging the results of the triplicate test.

In conclusion, the results of the preliminary sampling of urban drool prove to be interesting and more testing must be completed in order to obtain meaningful results. If trends are observed, then perhaps we can move forward with the project and look at ways to harvest and treat urban drool. It was also interesting to consider different sources of error and how to mitigate them in the future. Many lab techniques were utilized and several data sets were analyzed, therefore, giving me a broad sense of the research experience.