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GIS

2015 GIS Term Project Proposal

The EPA is currently re-evaluating the MCL for fluoride in drinking water, and there is a strong chance that they will reduce the limit from the current 4mg/L to 2mg/L. For some small treatment plants around the US with high background concentrations of fluoride, a reduced regulation could prove problematic. My research centers on the removal of fluoride from drinking water using enhanced alum coagulation. My research group and I investigate the interrelationships between fluoride, natural organic matter (NOM), and aluminum during removal. Using natural and synthetic waters, we look at the chemical processes governing removal and also look into the feasibility of real-world application. For future work, we will be investigating how additional inorganic contaminants such as arsenic, chromium, and manganese impact the removal processes.

Previously, two drinking water treatment plants with high background levels of fluoride were identified; Manitou Springs, CO and Lake Mackenzie in Silverton, TX. We are currently searching for water bodies with elevated levels of fluoride along with arsenic, chromium, and manganese to aid the next portion of our research. For my term project, I propose to use GIS to help identify regions that are most likely to have elevated levels of the specified contaminants.

High levels of fluoride are likely to be found in areas of high groundwater drawdown and near fluoride-rich geologic deposits. Additionally, fluoride and arsenic are commonly found together. There is a USGS dataset "arsenic map" mapping the arsenic concentrations in groundwater in the United States. There are also multiple water-table contour datasets that can be used. I hope to use datasets to highlight water-scarce areas with high potential for elevated arsenic and fluoride. I will also look into mapping geologic fluoride deposits. Chromium and manganese are not commonly found at high levels naturally, and may require manually entered data from chemical spills or leaks.

To narrow my scope, I want to focus my research on Colorado. I will incorporate existing geological and hydrological data sets as well as manually create data sets on chemical events in order to outline areas of high risk for contamination. Finally, in the areas of highest risk, I will identify nearby drinking water treatment facilities. I hope to synthesize all of the information to pinpoint a manageable selection of high-risk water facilities to look into for sampling.