

Predictive Modeling of Geosmin, a Taste and Odor Compound, in Northern Colorado Water Supplies

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Abstract. Algal blooms and release of algal metabolites are a growing concern in America, Europe, South Africa and Australia. The metabolites include compounds such as geosmin (an off-odor compound), microcystin-LR (a harmful toxin), and other organics (which may lead to production of disinfection by-products in finished water). In Northern Colorado, the most common issue is with the release of geosmin. Geosmin is an earthy smelling compound that can be detected at 2-5 ng/L in drinking water. Several utilities in Northern Colorado handle consumer complaints and alter their treatment to remove it from their finished water during summer and fall months. The City of Fort Collins, for example, has altered between water sources numerous times in the past decade due to geosmin breakouts in both Horsetooth Reservoir and the Poudre River, and eventually started powdered activated treatment. Utilities across the nation are spending billions of dollars to produce palatable drinking water. Algal blooms and off-flavors will continue to be a growing concern because more and more municipalities are relying on reservoirs to maintain a reliable source of water. These reservoirs age and experience eutrophication due to climate change, increased fertilization in the agriculture industry, treated sewage discharge, low river flows and droughts. Geosmin is not readily removed using conventional water treatment methods. Effective Geosmin removal requires advanced methods, such as, ozonation, activated carbon, biofilm filtration, reverse osmosis or nano-filtration. Hence it would be beneficial to understand and predict the algal bloom patterns, relationship between the climatological and water quality parameters in geosmin production. Predictive statistical models maybe used to identify the causes of geosmin production and by managing the source water, utilities can prevent taste-and-odor episodes. This project aimed to understand the correlation between the geosmin production and, elevation, nutrients, weather patterns, and plankton in the surface waters at 40 different locations in Northern Colorado using statistical models including; regression, CCA, PCA, and ANOVA. Abiotic and biotic samples were collected at the selected locations over summer and fall months for two consecutive years with very different weather patterns. The findings will indicate whether monitoring of basic water quality parameters and weather patterns will predict geosmin production and will enable the utilities to properly manage their source waters and be ready for the enhanced treatment methods.