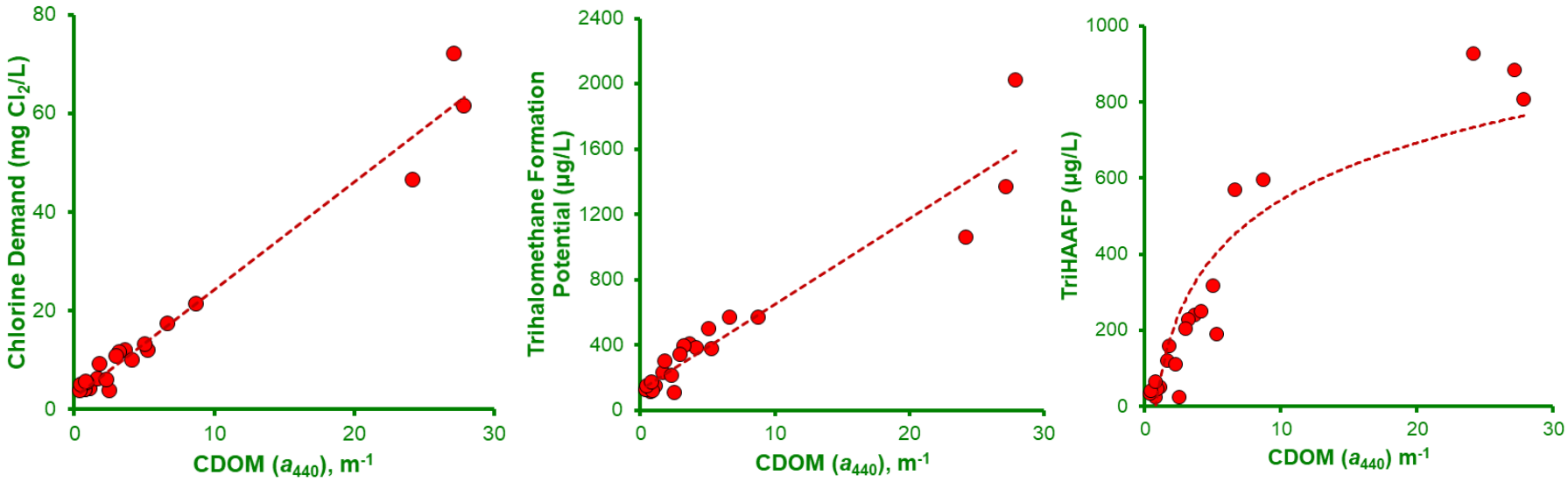
CDOM and Drinking Water Treatment

Although groundwater, which is low in dissolved organic matter (DOM), is the source of drinking water for most Minnesotans, surface waters serve as the water supplies for ~25% of the state's population. Its two largest cities, Minneapolis and St. Paul, both obtain their drinking water from the Mississippi River, which originates in and flows for several hundred miles through the highly forested and wetland-rich NLF ecoregion. The river consequently has moderate levels of DOM and CDOM that vary seasonally in response to precipitation and runoff conditions in its drainage basin (Brinkman and Hozalski 2011).

Naturally derived DOM in surface waters typically is not directly harmful to human health, but it can negatively affect the production of safe drinking water. DOM, and especially CDOM, increases the consumption of water treatment chemicals, such as coagulants used to remove it and suspended matter, and chlorine used for disinfection. DOM and CDOM stimulate bacterial growth and foul filtration membranes. Moreover, CDOM levels are directly related to the formation of potentially harmful disinfection byproducts, such as chloroform, other trihalomethanes (THMs), and haloacetic acids (HAAs), when water is chlorinated.

As part of our NSF-sponsored study* on CDOM, we evaluated the effects of CDOM on drinking water treatment processes. In summer of 2016, we collected large carboys of water from 24 large lakes and rivers of varying CDOM content around Minnesota, filtered the water and used it for laboratory studies on chemical usage (chlorine demand) and formation potential of disinfection byproducts (THMs and HAAs). Some results from these studies are illustrated below:



Chlorine demand and the formation potential for THMs (e.g., chloroform) are linearly related to CDOM levels, but the potential for formation of tri-HAA acids and di-HAA acids (data not shown but similar to that above for tri-HAA acids) is curvilinear and appears to reach an asymptote at CDOM levels above the test range. A manuscript providing more information on these results and other findings about CDOM effects on drinking water treatment processes has been submitted to an international journal. A link will be provided when it is accepted by the journal.

* National Science Foundation grant (CBET 1510332) from the Environmental Engineering Program.

Reference:

Brinkman, B. M. and R. M. Hozalski. 2011. Temporal variation of NOM and its effects on membrane treatment. *J. Amer. Water Wks. Assoc.* **103**(2): 98-106.