

FLUORESCENT DISSOLVED ORGANIC MATTER

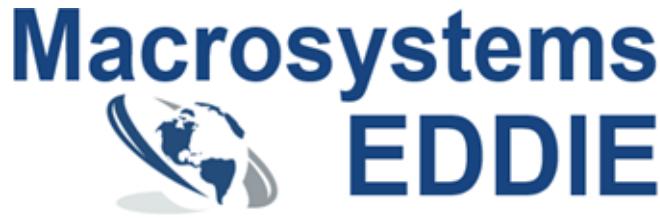
Lofton, M.E., Cooke, R.L., and Carey, C.C. 20 September 2025.

Macrosystems EDDIE: Exploring Tradeoffs in Water Quality Management Using Environmental Data.

Macrosystems EDDIE Module 10, Version 1.

https://serc.carleton.edu/eddie/teaching_materials/modules/module10.html

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*Environmental Data-Driven Inquiry & Exploration
in Macrosystems Ecology*



SERC the Science Education Resource Center at Carleton College



What is fDOM?

- **fDOM is fluorescent dissolved organic matter**
 - Derived from living things (such as tree leaves or phytoplankton) and contains carbon
 - Is not made of particles, but is dissolved in water
 - If light is transmitted through the water, fDOM molecules will absorb it and emit a different wavelength of light – this is the process of **fluorescence**



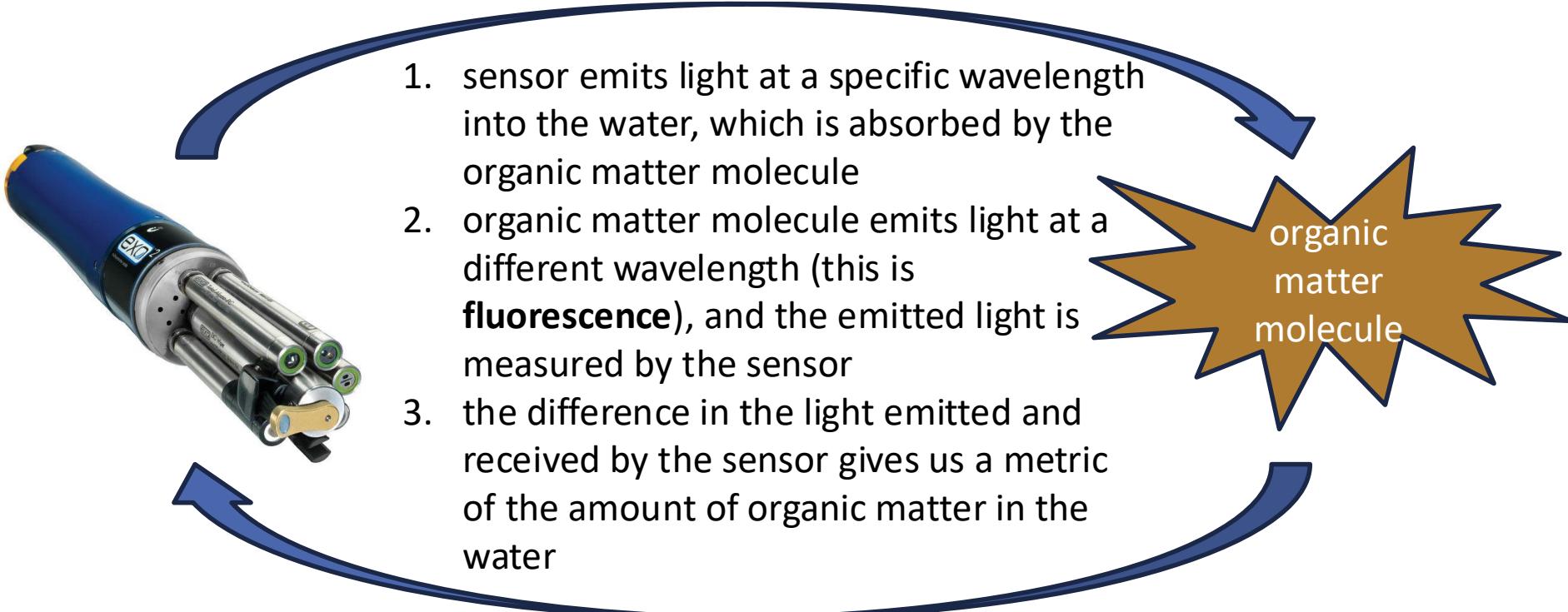
The color in coffee is an example of dissolved organic matter.

Photo credit: Wikipedia

Using fDOM to assess water quality

fDOM sensors measure the amount of **fluorescence** emitted by organic matter

How fluorescence is measured

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1. sensor emits light at a specific wavelength into the water, which is absorbed by the organic matter molecule
 2. organic matter molecule emits light at a different wavelength (this is **fluorescence**), and the emitted light is measured by the sensor
 3. the difference in the light emitted and received by the sensor gives us a metric of the amount of organic matter in the water

Using fDOM to assess water quality

- fDOM is measured in **quinine sulfate units (QSU)**
- **QSU** is an indirect measure that compares the amount of fluorescence emitted by organic matter in water to the amount of fluorescence emitted by a known quantity of quinine sulfate in a laboratory setting
- sensors are calibrated using QSU to ensure consistent readings across sensors and reservoirs
- QSU ranges from



YSI EXO sensor that measures fDOM

Using fDOM to assess water quality

- **Fluorescent dissolved organic matter (fDOM)** is a measurement of naturally-occurring organic matter.
- As we have learned, excessive naturally-occurring organic matter can lead to DBP formation during water treatment
- fDOM does not measure all organic matter, but it can be an indicator of the presence of potential DBP precursors



*Water colored with organic matter
Canning River, Perth, Australia*

Photo credit: Mary Lofton

DBPs are monitored using TOC

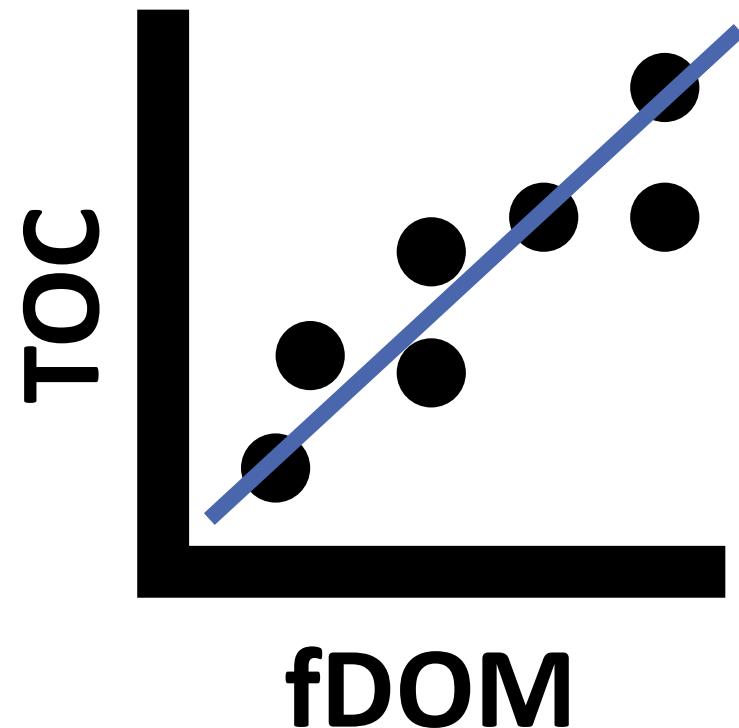
- Raw and filtered water are tested once a month for **Total Organic Carbon (TOC)**
- High TOC levels can indicate the presence of DBP precursors which may form DBPs during treatment



*Water samples from Falling Creek Reservoir, Vinton, VA
Photo credit: Bethany Bookout*

Relating fDOM to total organic carbon (TOC)

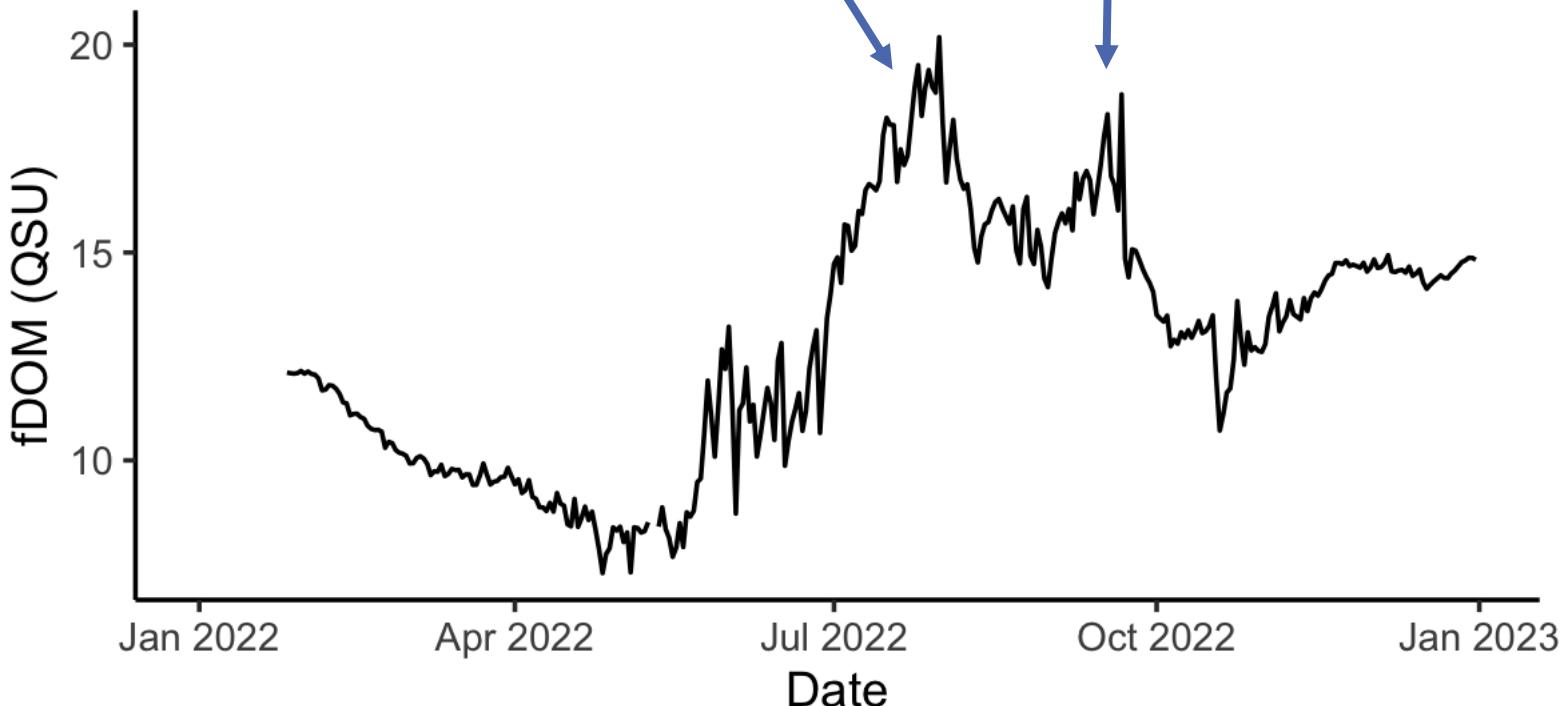
- While **fDOM** and **TOC** are not exactly the same, we can use statistics to make a relationship that converts fDOM (in quinine sulfate units) to TOC (in milligrams per liter)
- With this relationship, fDOM data can help us detect the presence of potential DBP precursors and assess DBP formation risk



Using fDOM to assess DBP risk

- A reservoir may be at risk of experiencing water quality degradation due to DBP formation when fDOM is elevated.

Elevated fDOM = Elevated risk
of DBP formation



End of slideshow – please proceed with module activities!



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Exploring tradeoffs in water quality management using environmental data

