

A Field Guide to
**BEAVERS IN THE
MD COASTAL PLAIN**

Impacts on Water Quality and Temperature



Castor canadensis

Q: What looks like a healthy stream to you?



Images from Mark Beardsley (2021)



Q: What looks like a healthy stream to you?



Images from Mark Beardsley (2021)



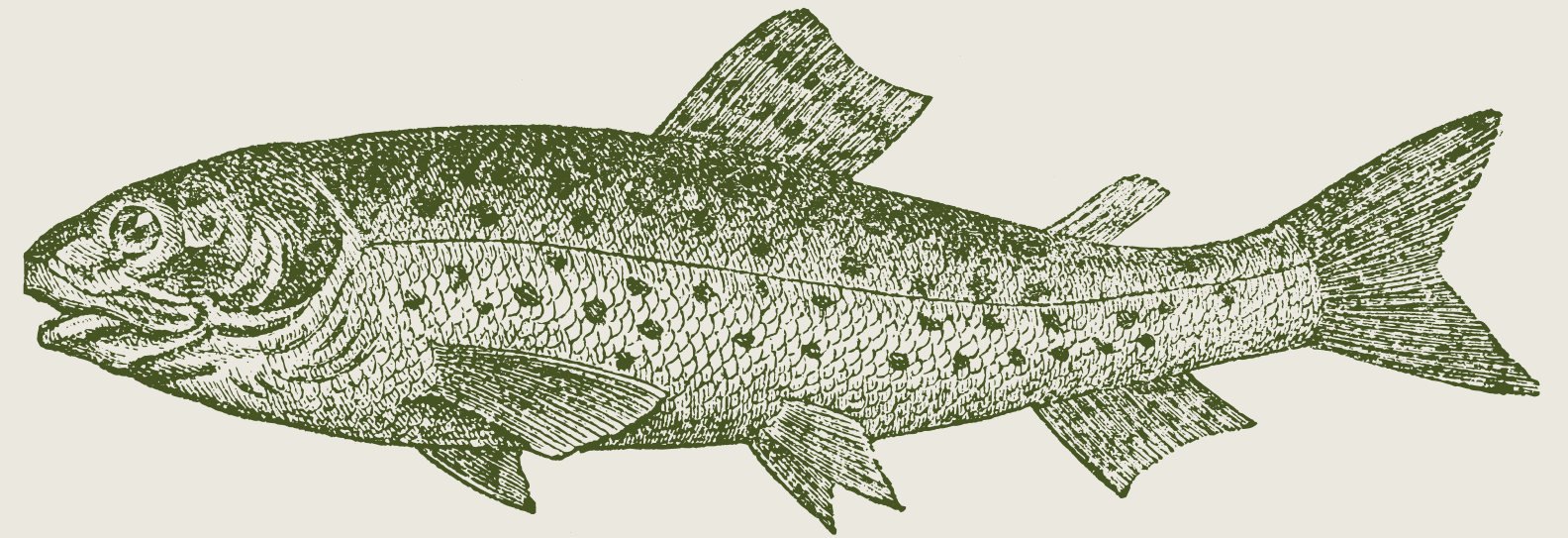
“It is notable that every
US state except Hawaii
includes at least one
Beaver Creek.”

~Wohl et al., (2021)





What is so special about **beavers** living in Severn Run, a tributary of the Severn River, in the Maryland Coastal Plain?



Jabez Branch, in the Severn Run, is the **only** historic native **brook trout** stream in the coastal plain of Maryland! Beaver and Trout evolved together in these streams! (Monahan, 2018).





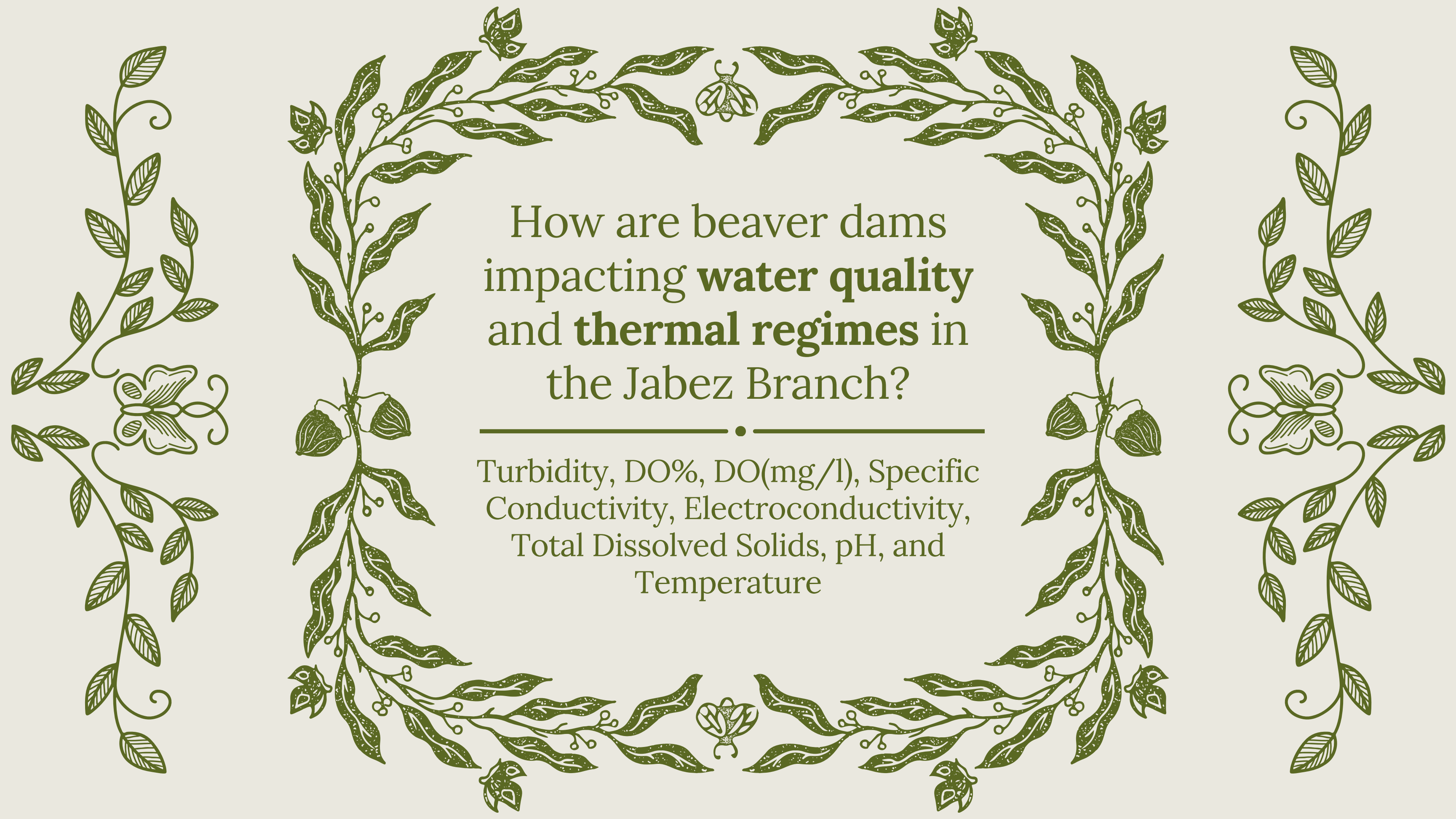
PREVIOUS STUDIES



In Anne Arundel County, we are dealing with urban & semi-urban streams, with **increased impervious** surface leading to a **flashy system**. Many streams are experiencing degradation through **undercutting** the streambed and **disconnection with groundwater**.

Beaver and their **stream-wetland complexes** can help heal incised streams, with the slowing of water and increase of sediment deposition leading to rising of the water table and reconnection of the **hyporheic zone** with the flood plain (Pollock et al., 2014; Jordan et al., 2018).

Thompson (2020), in his paper **Beaver Crediting 101**, calls for additional studies in Anne Arundel County, with quantifiable data leading to crediting of beaver dams on property as a **best management practice (BMP)**.

A decorative border made of green line art, featuring various leaves, small flowers, and butterflies. The border is symmetrical and frames the central text.

How are beaver dams impacting **water quality** and **thermal regimes** in the Jabez Branch?

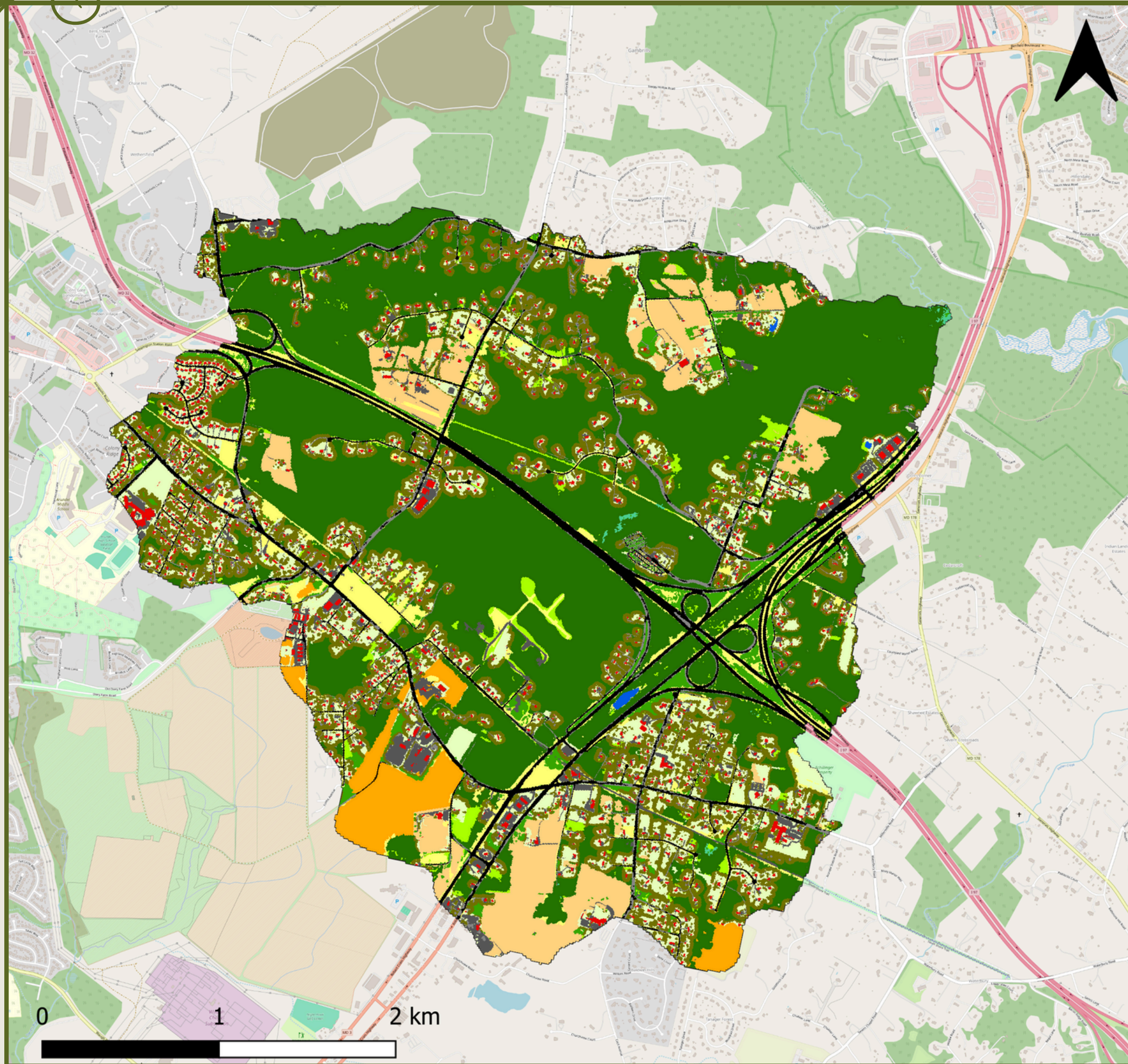
Turbidity, DO%, DO(mg/l), Specific
Conductivity, Electroconductivity,
Total Dissolved Solids, pH, and
Temperature

Hypothesis

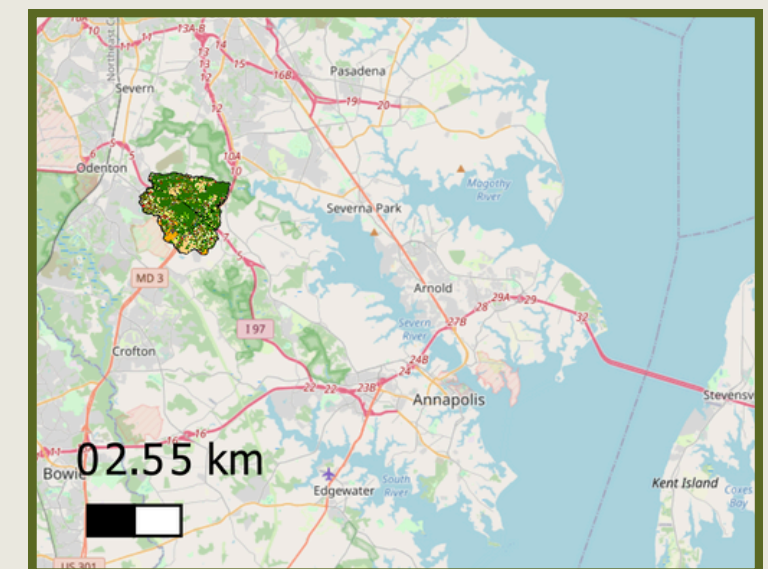
1. Beaver dams will **decrease turbidity** in the Jabez Branch by providing sediment retention in their pools.
2. Beaver dams will **decrease dissolved oxygen** in the Jabez Branch by slowing down water flow above ponds and creating inundated wetland conditions.
3. Beaver dams will **increase specific conductivity** in the Jabez Branch by increasing groundwater connectivity with the stream.
4. Beaver dams will **increase overall temperature** and **increase temperature variation** in the Jabez Branch because of the creation of water storage in ponds with higher surface area to absorb solar radiation and decreased canopy cover.



Jabez Branch Watershed



- JabezWatershed
- Band 1 (Gray)
 - Water
 - Natural Succession
 - Impervious Roads
 - Impervious Structures
 - Impervious Other
 - Tree Canopy over Impervious
 - Tree Canopy over Turf Grass
 - Turf Grass
 - Pervious Developed Other
 - Harvested Forest
 - Extractive
 - Forest
 - Tree Canopy Other
 - Wetlands Riverine Non-forested
 - Wetlands Terrene Non-forested
 - Cropland
 - Pasture/Hay
 - Wetlands Tidal Non-forested



Site Locations



Jabez Main Branch (JM) & Jabez Tributary 3 (J3)

Site Locations



beaver lodge



beaver dam 1



side ditch dam



beaver dam 2

Jabez Main Branch Beaver Dam Complex

Site Locations



beaver dam 1



beaver dam 2

Jabez Main Branch

Site Locations



beaver dam 1 ↗



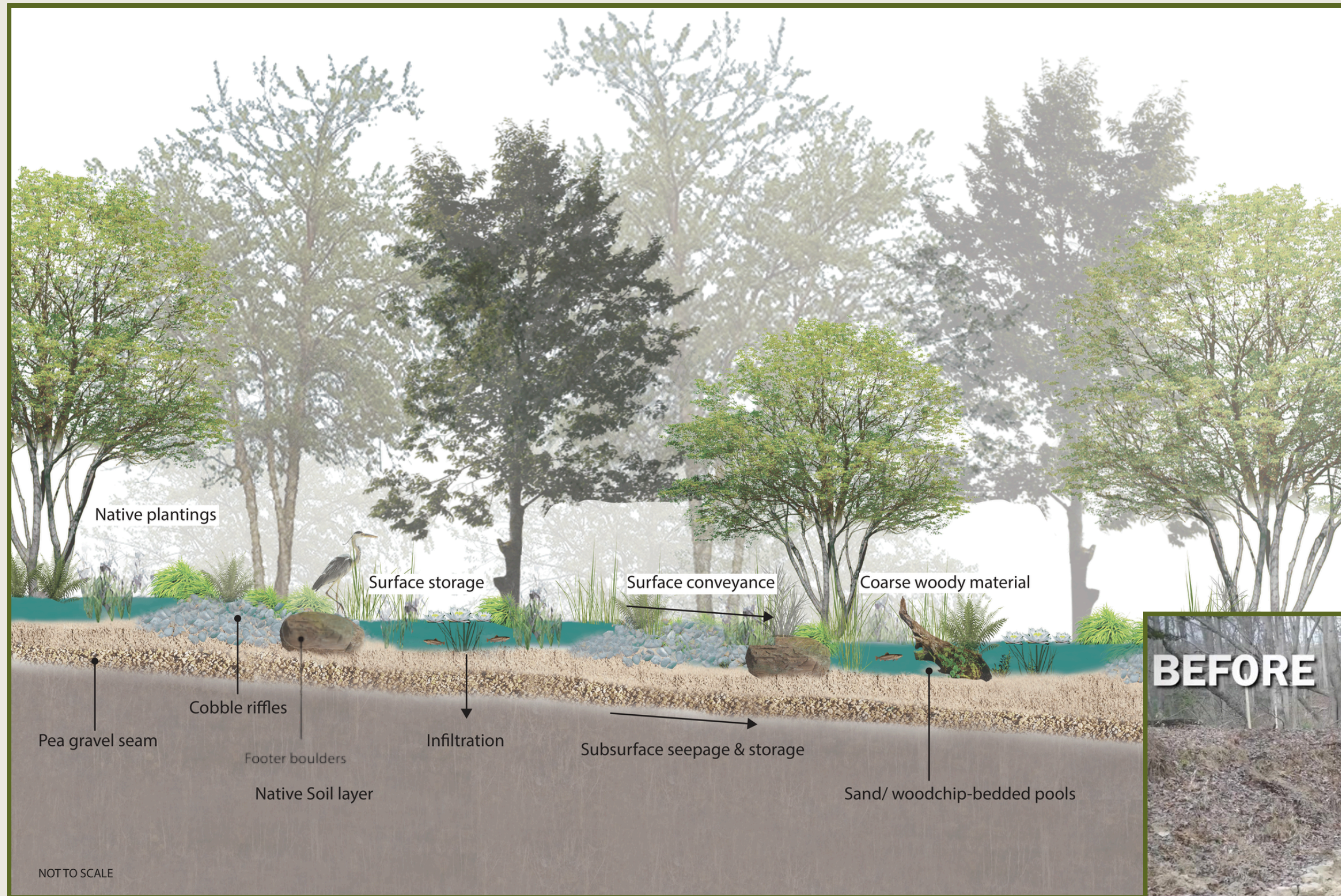
restoration ↗



↖ beaver dam 2 ↗



Jabez Trib 3 Beaver Dam Complex



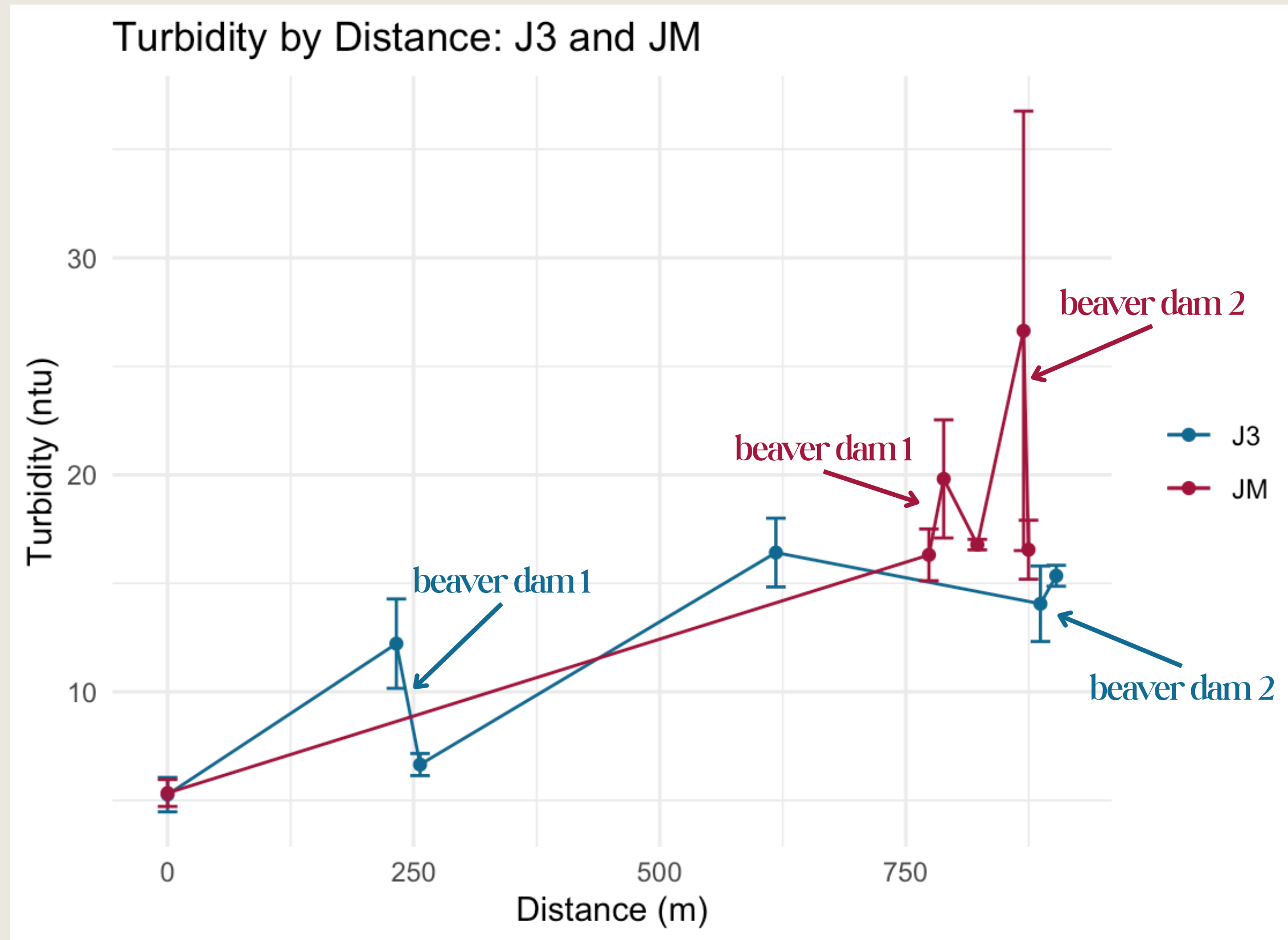
Regenerative Stream Channel

An RSC is a technique, patented by Underwood, that focuses on a nature-based approach to stream restoration. "Slow it down, spread it out, and soak it in!"

Learn more about the restoration at Jabez!

1. Grab Samples



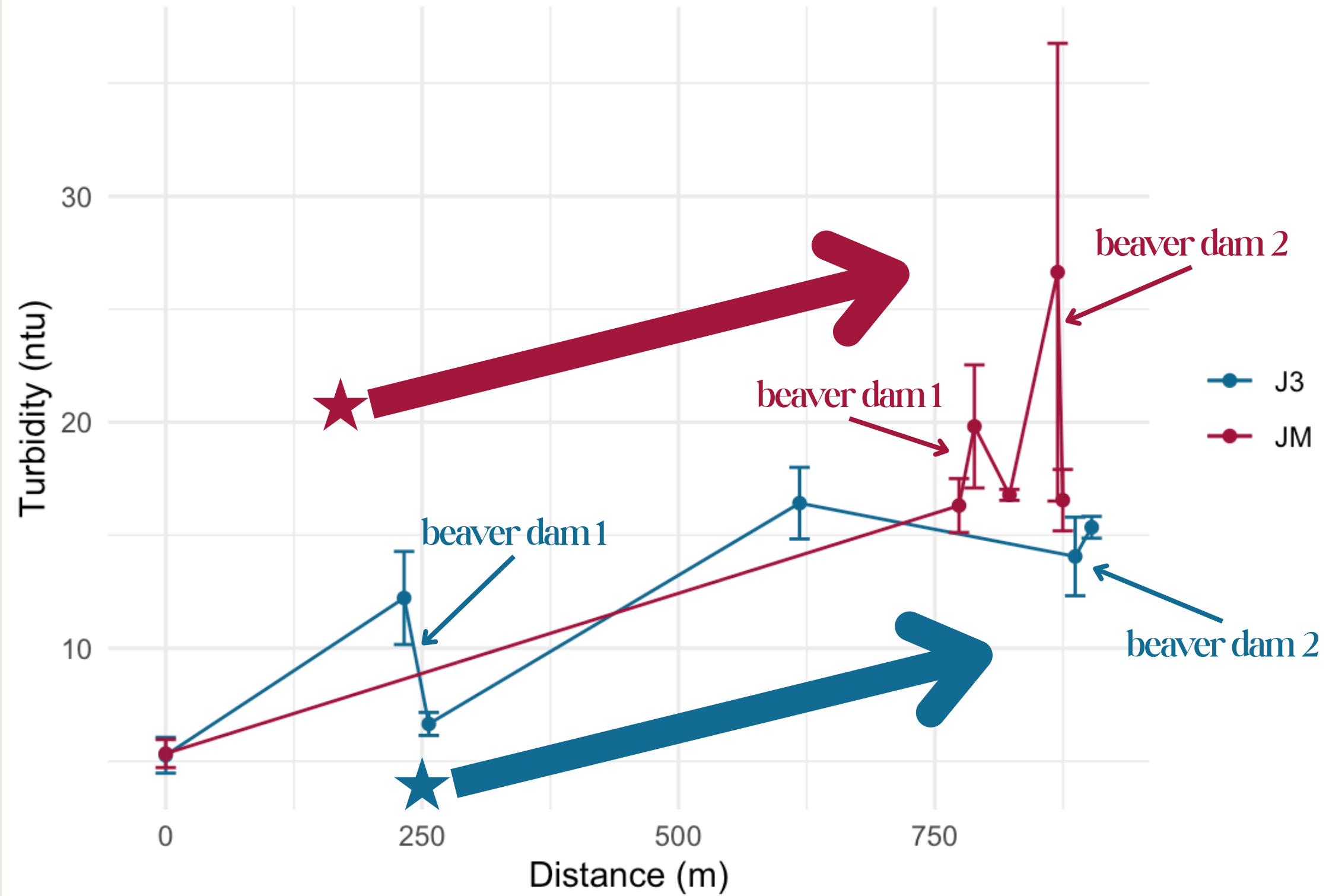


Turbidity

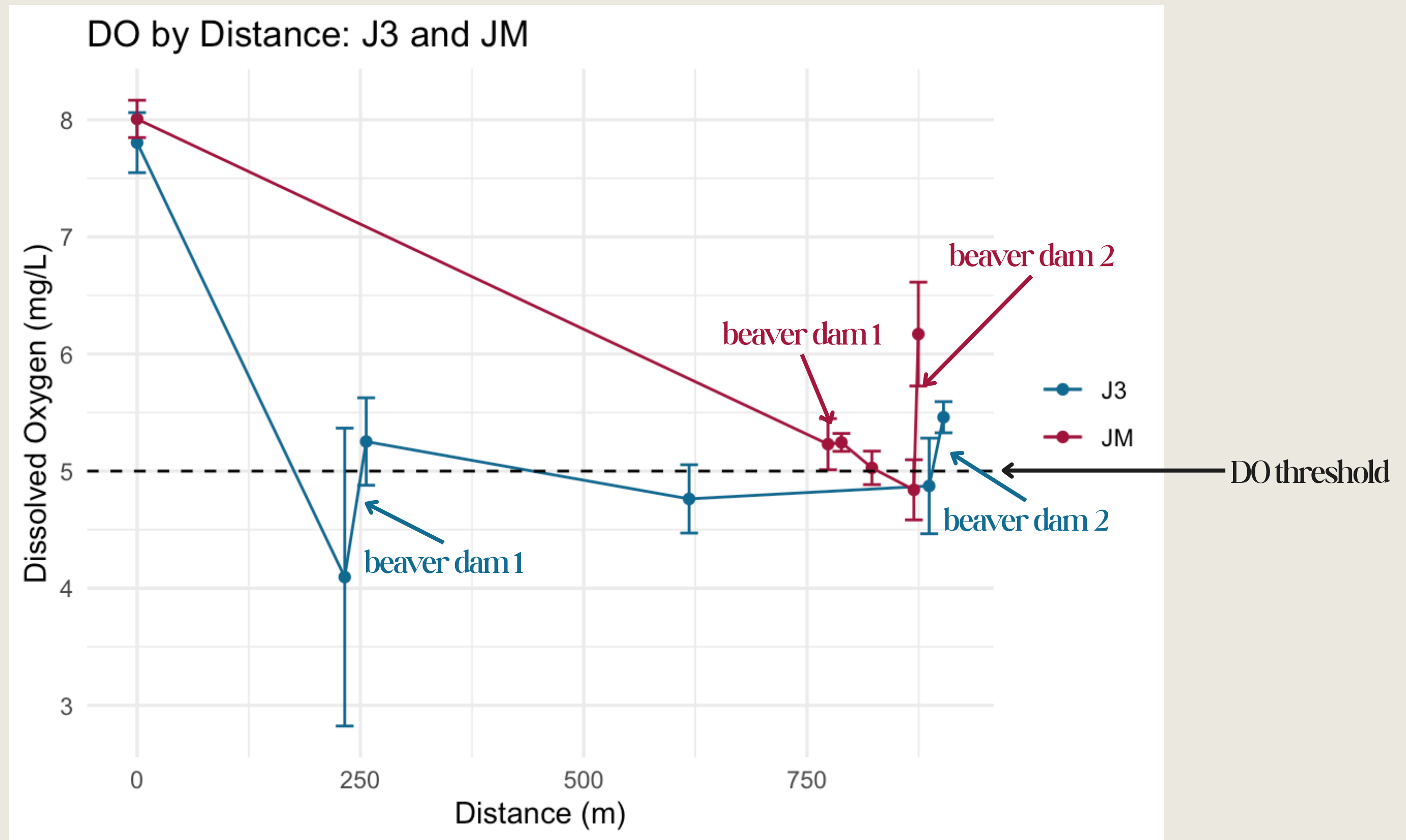
Turbidity is a measurement of the clarity of water that reflects the amount of suspended particles in water.

A higher turbidity means more particles and less clarity.

Turbidity by Distance: J3 and JM

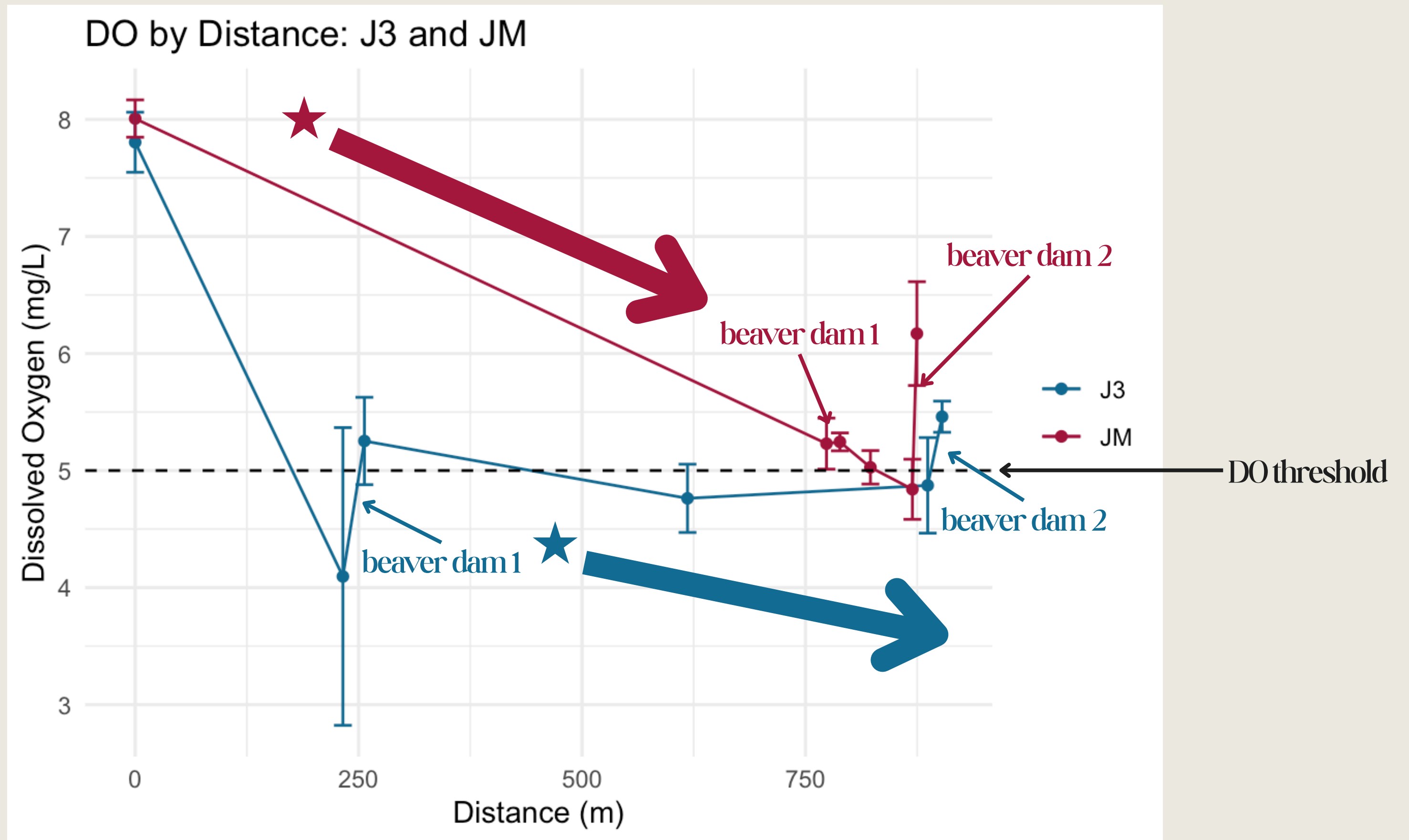


Turbidity

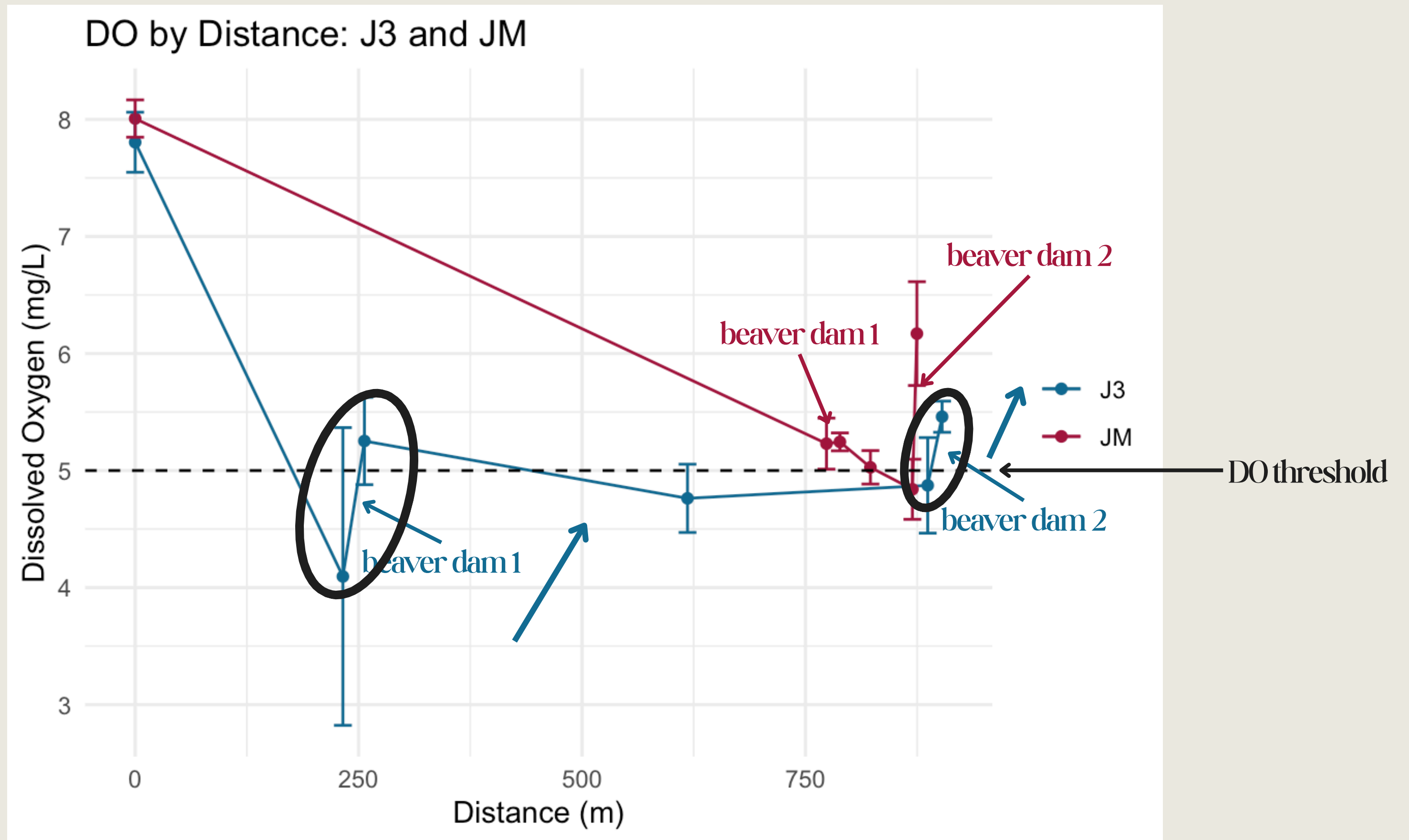


Dissolved Oxygen (mg/l)

It is a strong indicator of stream health with the 5 mg/l threshold marks the minimum DO needed by many aquatic organisms, like most fish and macroinvertebrates, to survive.



Dissolved Oxygen (mg/l)

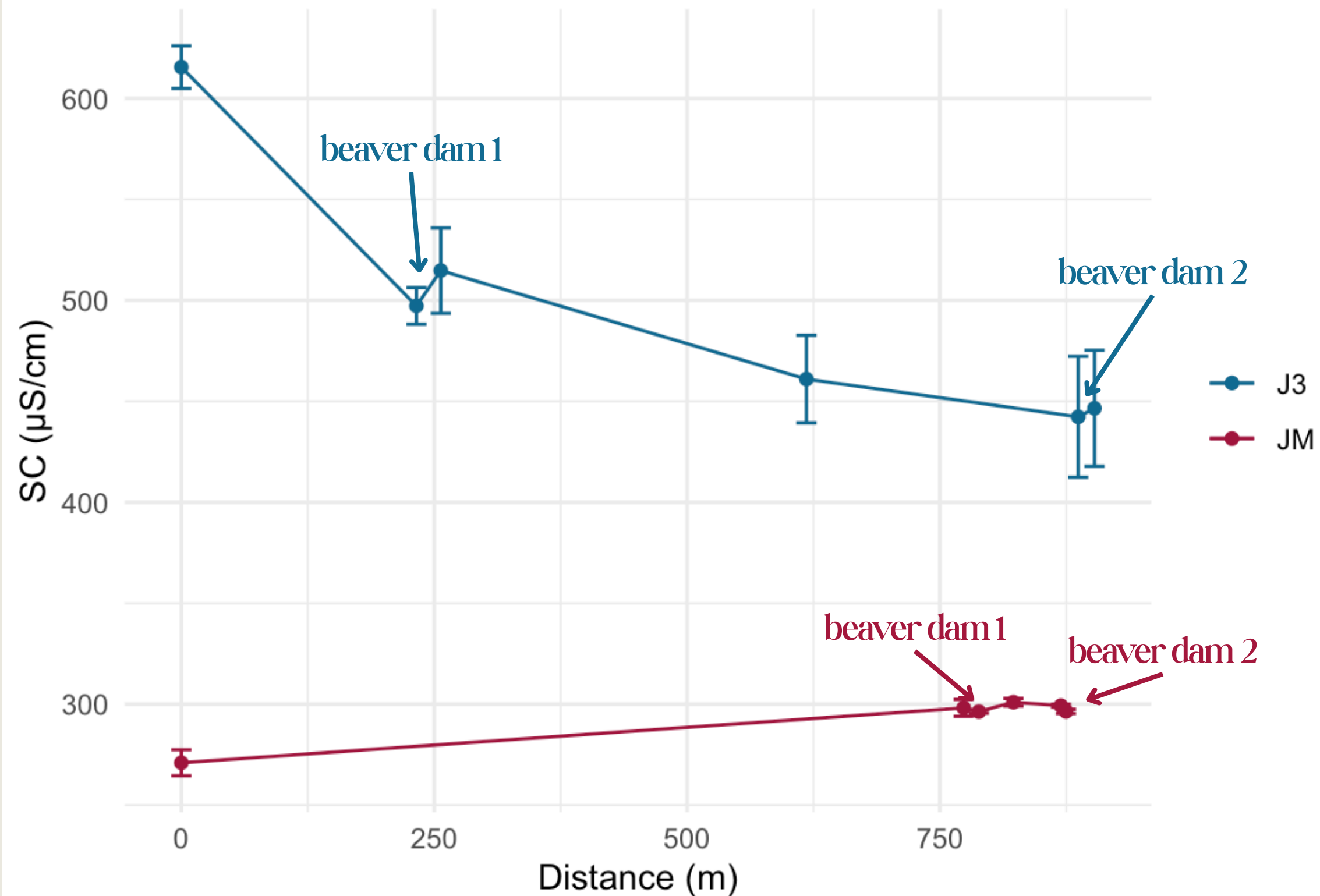


Dissolved Oxygen (mg/l)



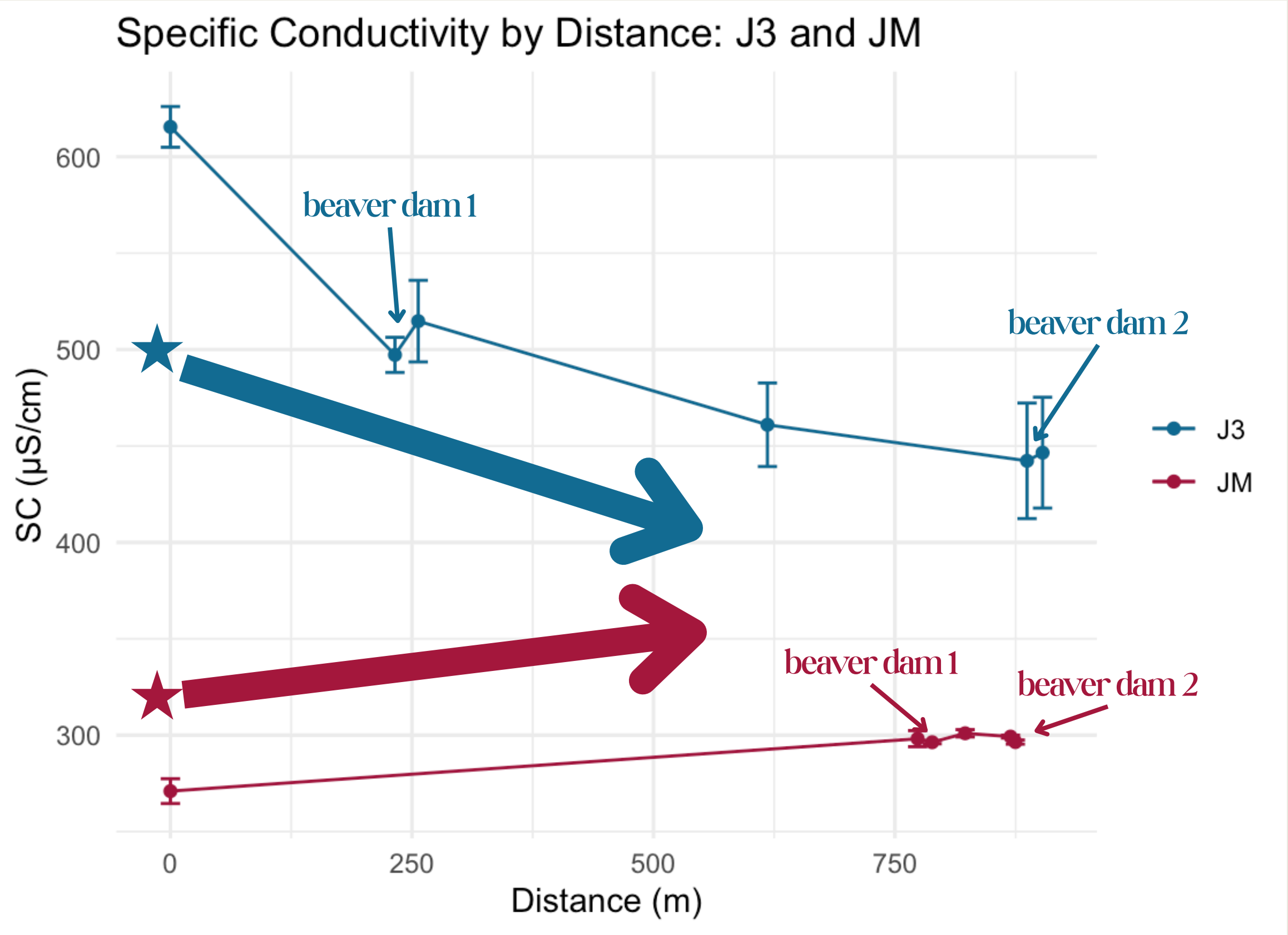
Dissolved Oxygen (mg/l)

Specific Conductivity by Distance: J3 and JM



Specific Conductivity

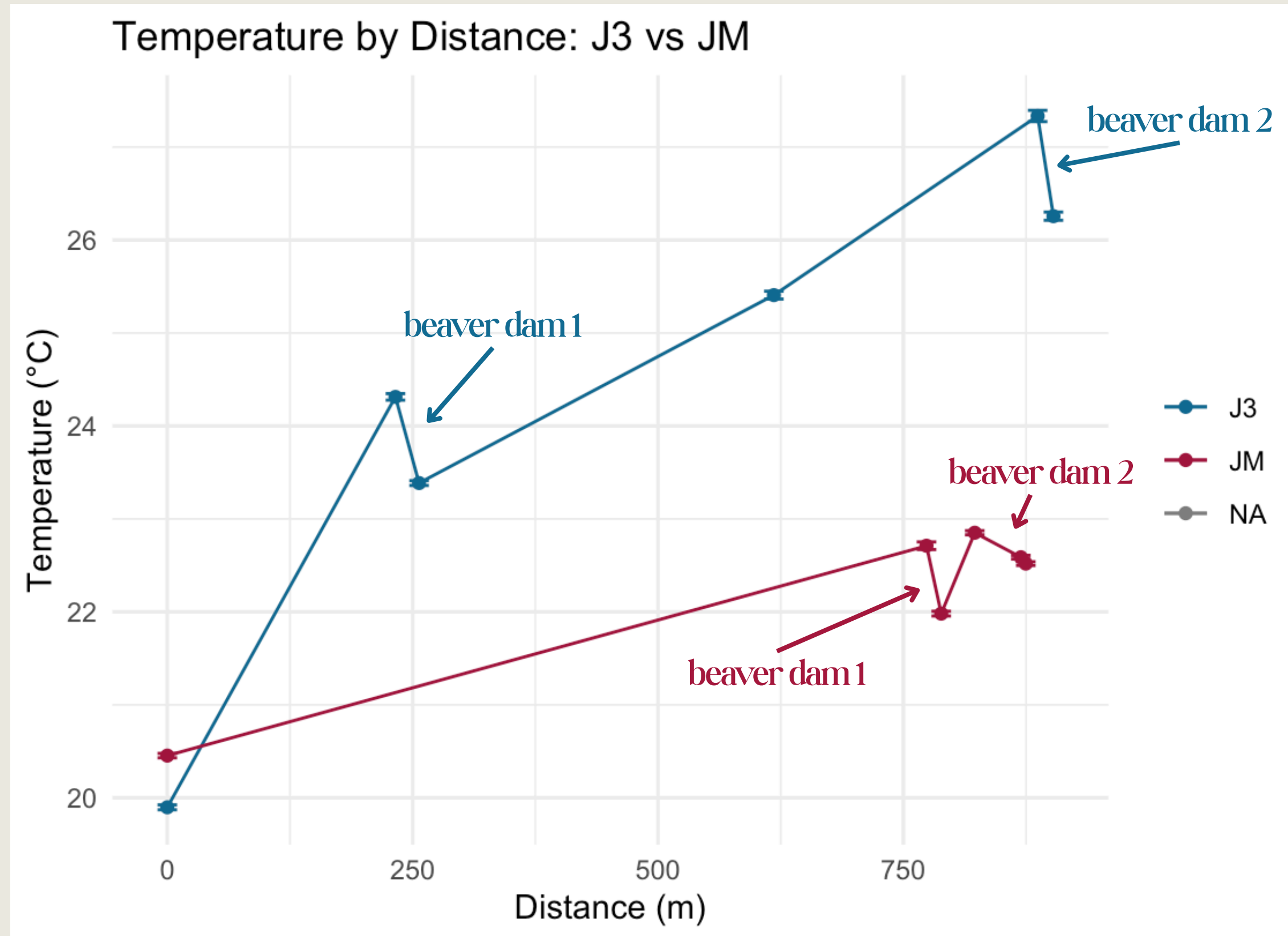
Specific conductivity is a measure of water's ability to conduct an electrical current. It reflects the concentration of dissolved ions (like salts, minerals, and metals) in the water.



Specific Conductivity

2. Continuous Temperature Sensors



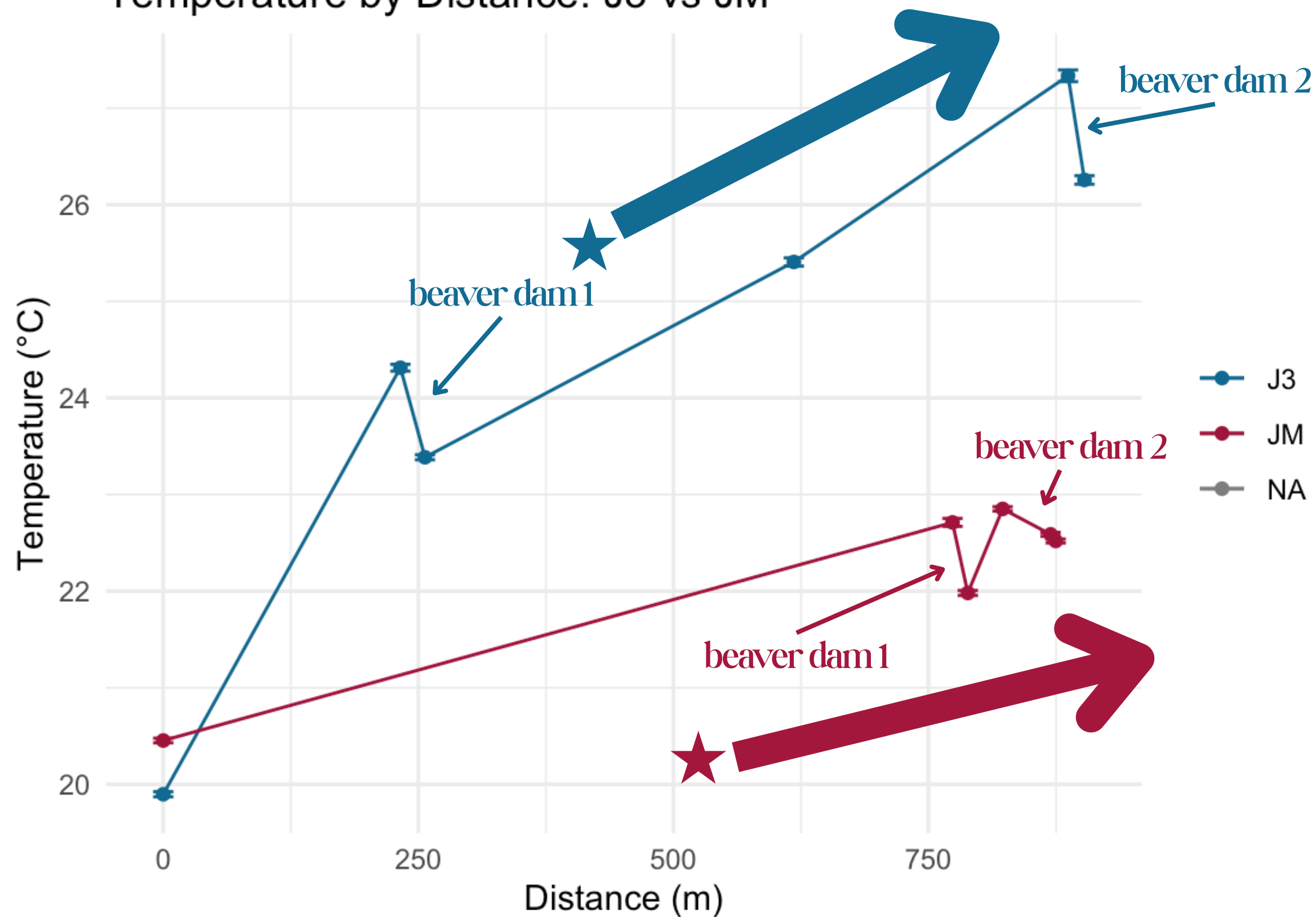


Water Temperature

Temperature affects nearly every physical, chemical, and biological process in a stream.

Jabez Branch is a cold-water stream, unique in the coastal plain.

Temperature by Distance: J3 vs JM



Water Temperature

Summary

1. Beaver dams will **decrease turbidity** in the Jabez Branch by providing sediment retention in their pools.
2. Beaver dams will **decrease dissolved oxygen** in the Jabez Branch by slowing down water flow above ponds and creating inundated wetland conditions.
3. Beaver dams will **increase specific conductivity** in the Jabez Branch by increasing groundwater connectivity with the stream.
4. Beaver dams will **increase overall temperature** and **increase temperature variation** in the Jabez Branch because of the creation of water storage in ponds with higher surface area to absorb solar radiation and decreased canopy cover.



Future Research Questions

What seasonal temperature patterns are observed in beaver ponds in Anne Arundel County, and are there notable differences during the winter versus the summer?

Are trends in Anne Arundel County the same as trends in the Coastal Plain of the Eastern Shore? (non cold-water streams in the same physiographic province)



To what extent do beaver dams in Anne Arundel County help reduce nitrogen, phosphorus, and other nutrient loads from streams to downstream ecosystems?

What effects do beaver dams have on floodplain vegetation, and do they facilitate the establishment of native plant species?

How will water quality change in Jabez as the restoration ages?



CONCLUSION



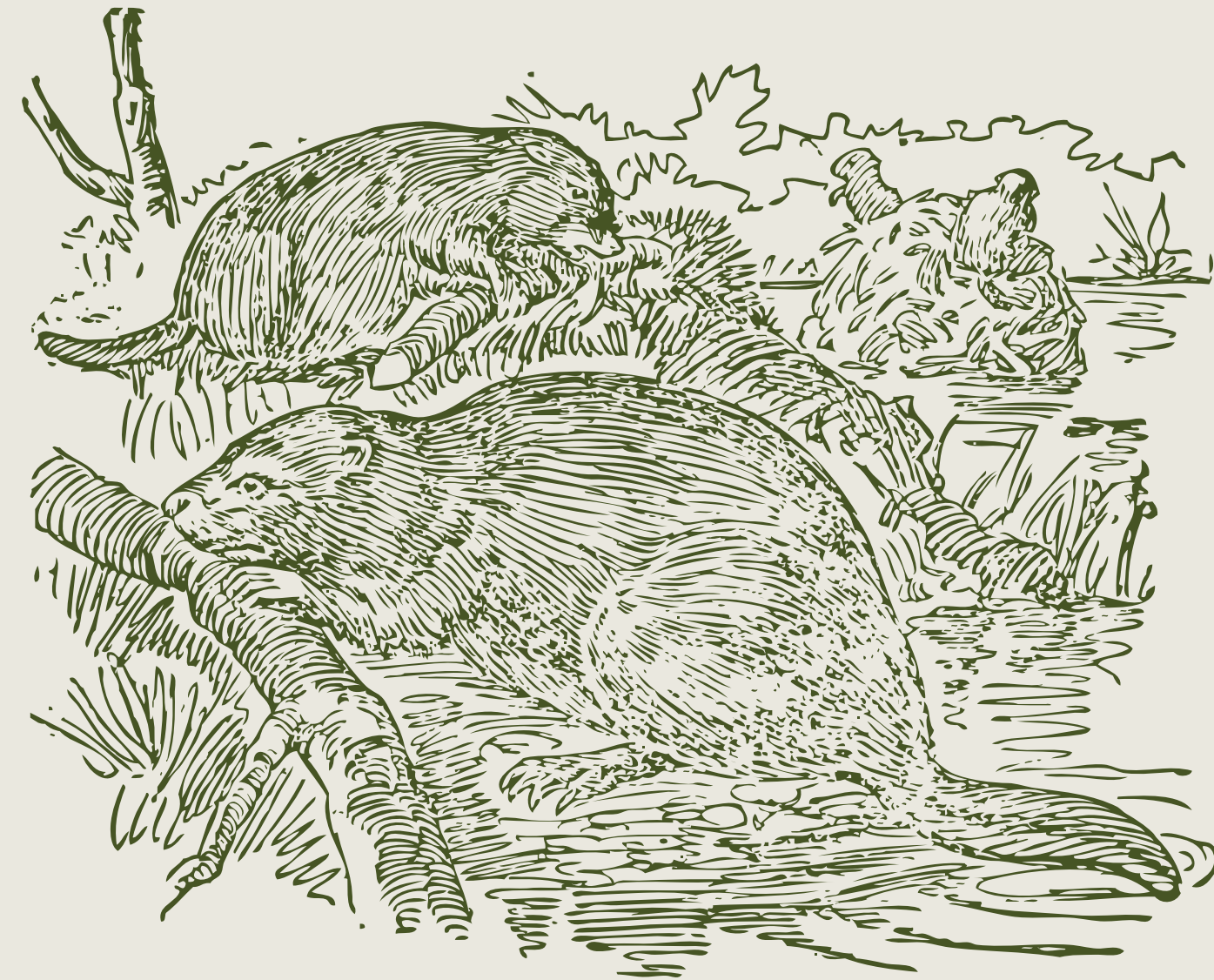
Beaver-impacted streams are complex!
Every stream has different characteristics
that mean beavers will alter water quality
metrics in different ways.

Beavers are essential to the future of
stream health! Support beavers!

THANK YOU!

A massive thank you to Donna Zimmerman, Richard Seitz, RJ Ugiansky, and Underwood & Associates for providing access to these amazing beaver dams!

Thank you to Vivian for being the best co-intern and project partner! Lastly, thank you to Camille Calure & Nita Settina for providing the best guidance and support this summer!





QUESTIONS?