

Salt in Nashoba Brook

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Chair, Green Acton Water Committee

Acton Conservation Commission

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Photo: Kim Kastens, Dec. 22, 2023

Jan. 17, 2024, I requested permission to
deploy a conductivity monitor in
Nashoba Brook Conservation land for 3
months in winter and 3 months in
summer

Yes, but...
... come back and tell us what you
learned.

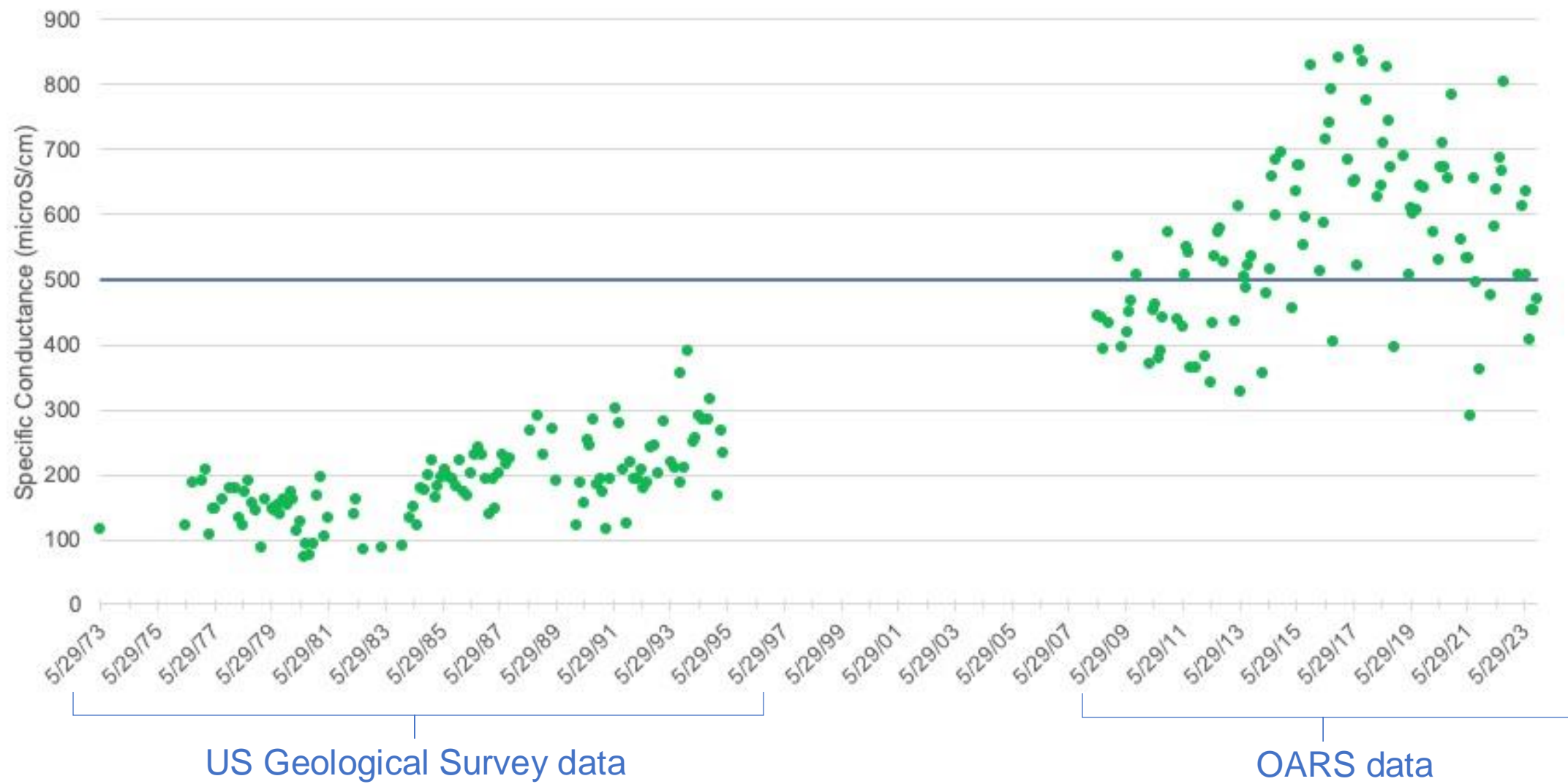


Plan

- Context: Salt distribution in space and time in Nashoba Brook and watershed
- What and how and when to measure
- New data: Salt concentration over time
- New data: Salt transport downstream
- Effect of elevated salt on aquatic ecosystems

Salt concentration in Acton surface waters has been on an upward trajectory for 50 years.

Wheeler Lane Nashoba Brook: NSH-047

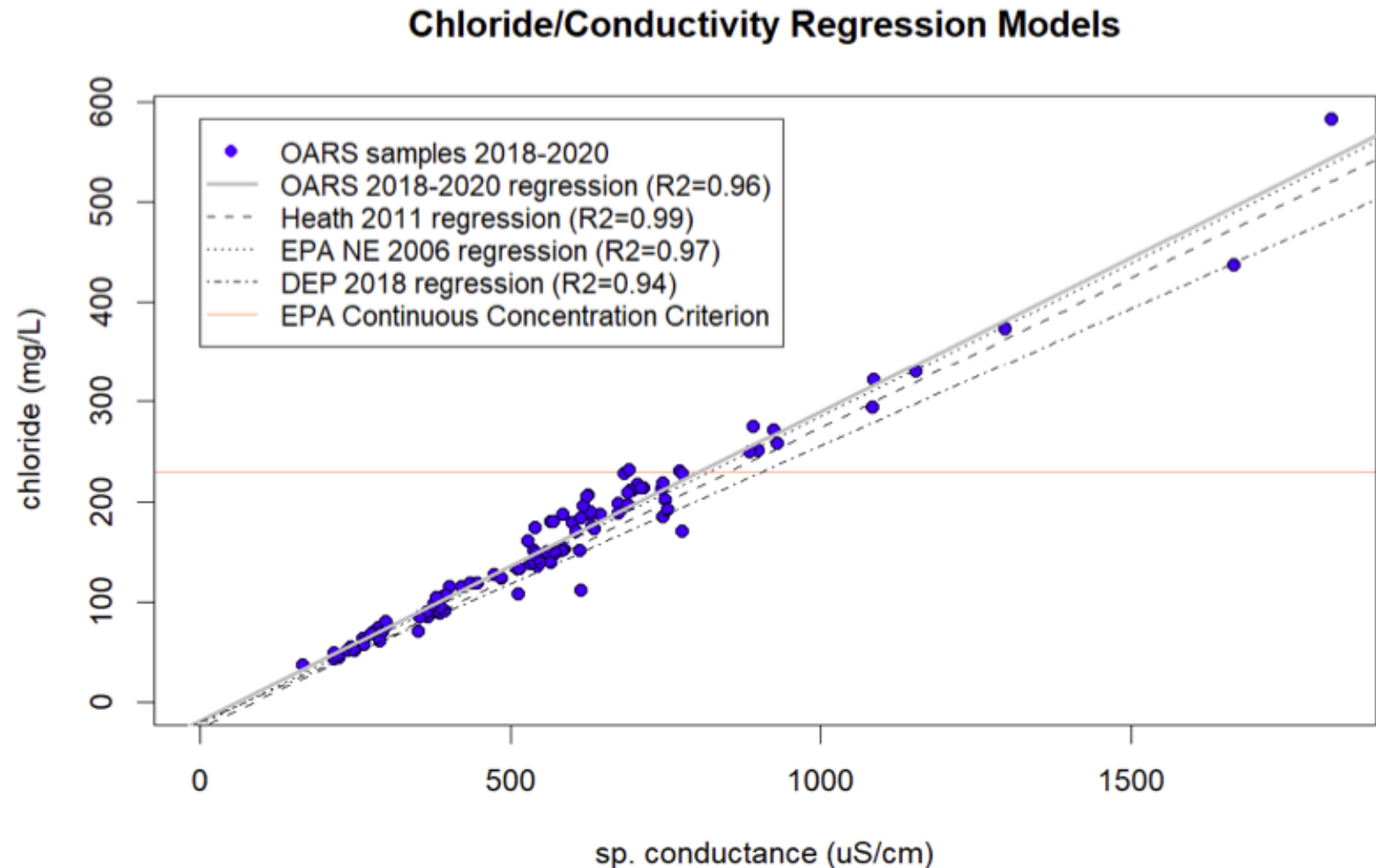


More detail, especially about cause of scatter in data, at: <https://greenacton.org/2024/09/07/nashoba-brook-has-been-growing-saltier-for-50-years/>

Specific conductance is cheap, easy, and quick to measure and is a good proxy for Cl^- content.



OARS training session, Photo: Kim Kastens.
Reprinted from [Acton Exchange](https://oars3rivers.org/wp-content/uploads/2024/05/OARS-Conductivity-Surveys.pdf)



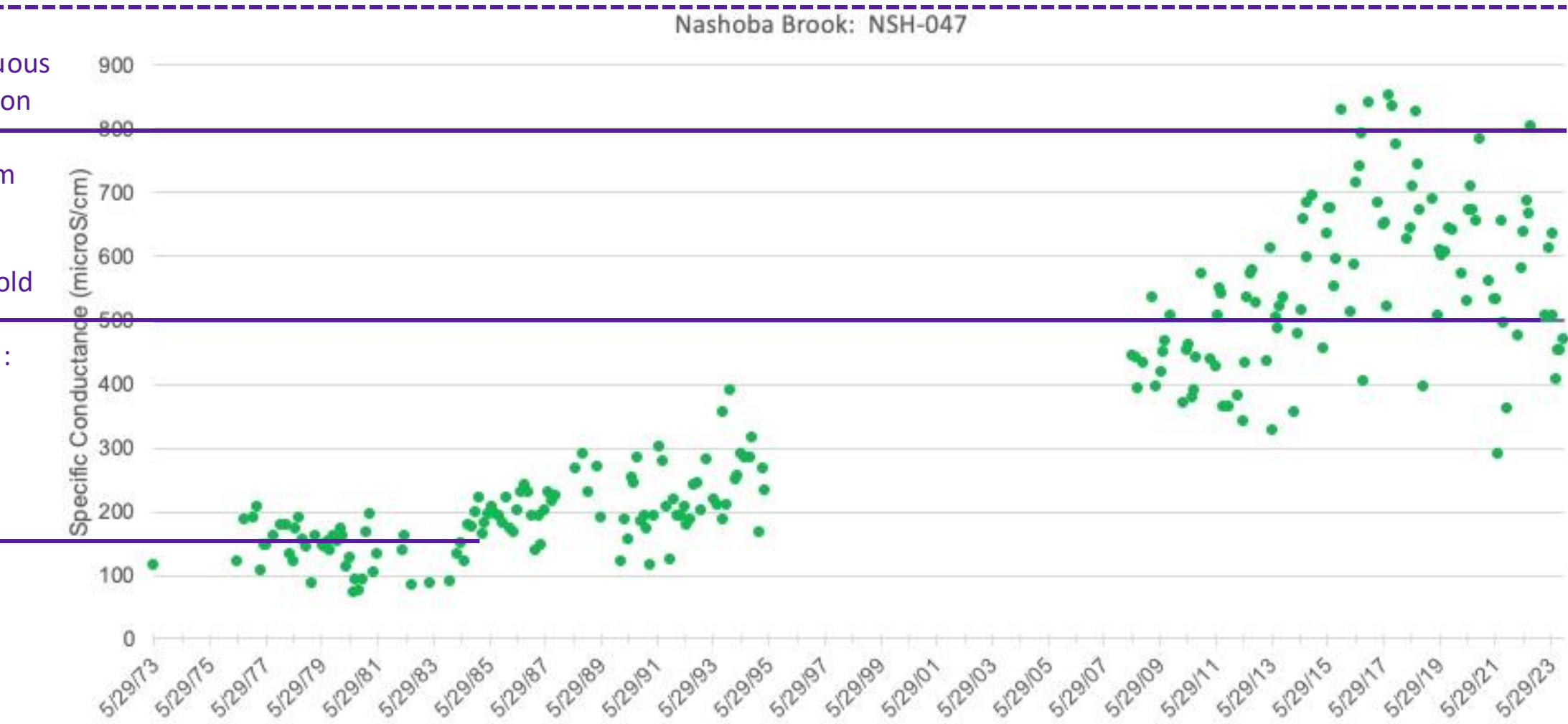
More detail at <https://oars3rivers.org/wp-content/uploads/2024/05/OARS-Conductivity-Surveys.pdf>

Drinking water tastes salty and
corrodes pipes:
~977 $\mu\text{S}/\text{cm}$
250 mg/L

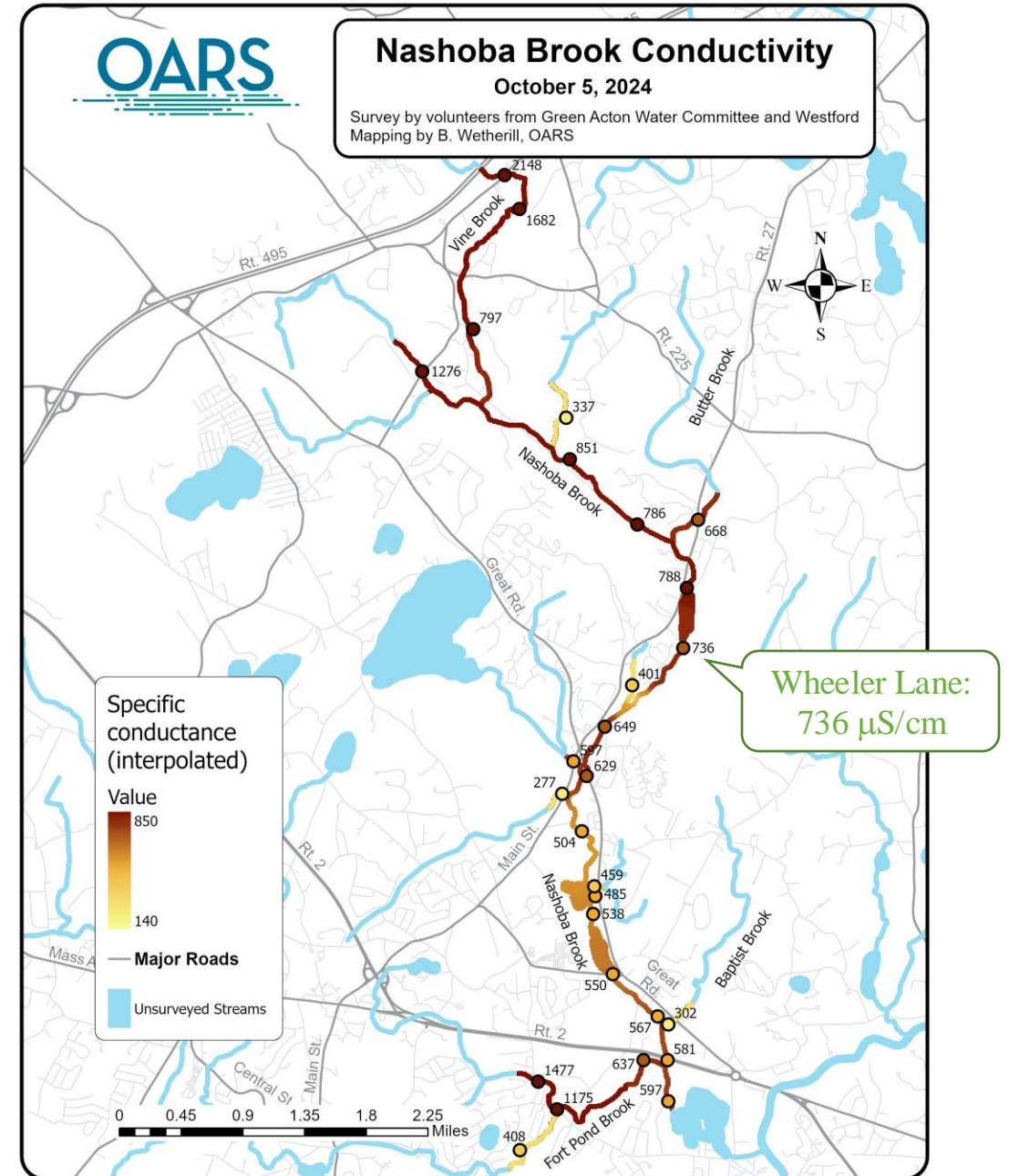
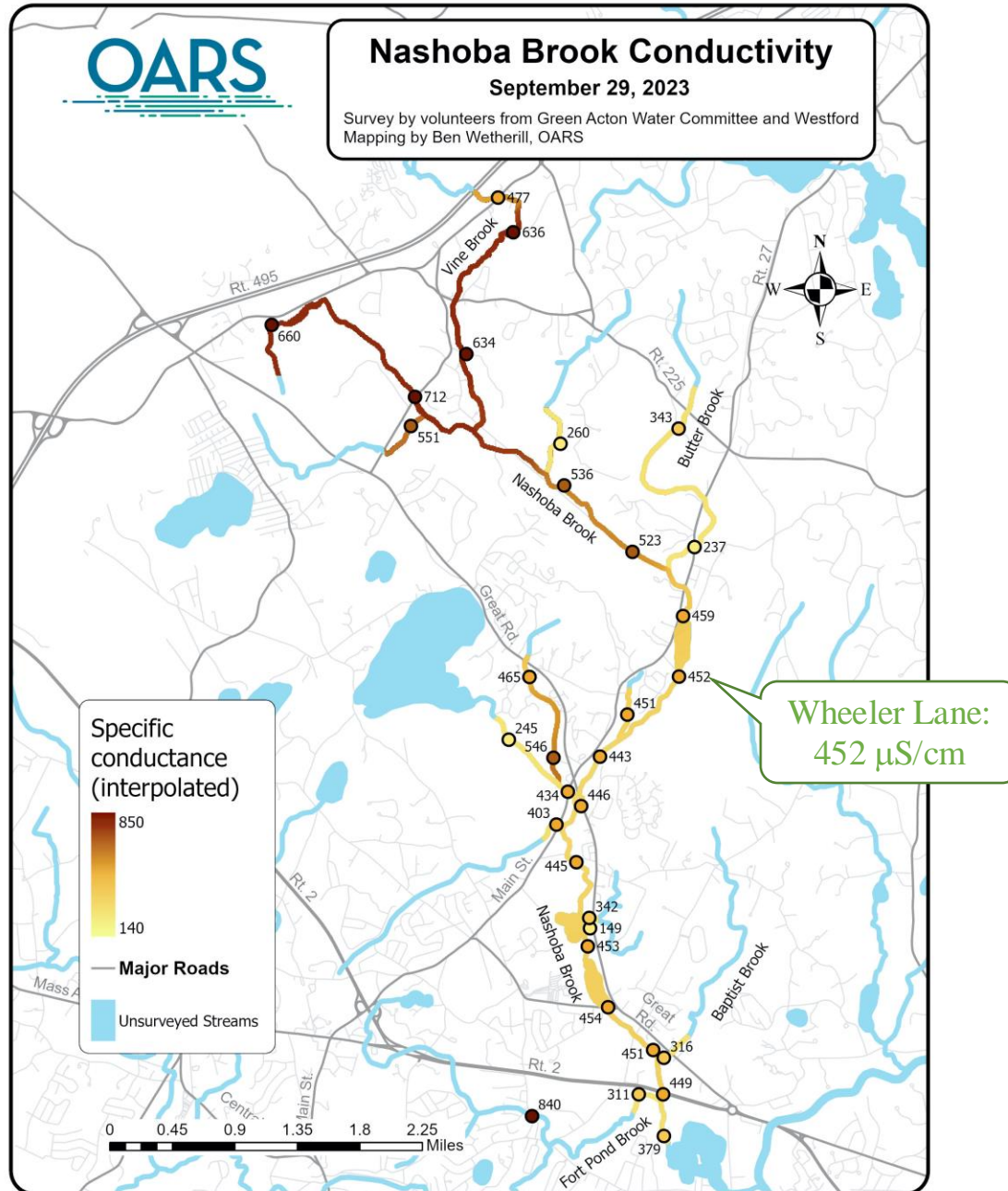
EPA continuous
concentration
criterion
~ 800 $\mu\text{S}/\text{cm}$
230 mg/L

Canadian threshold
& OARS healthy
fishery threshold:
500 $\mu\text{S}/\text{cm}$
~ 130 mg/L

Pre-road salt:
~150 $\mu\text{S}/\text{cm}$
~ 30 mg/L



Resurvey in 2024, low flow year



Nashoba Brook specific conductance installation

Thanks to Community Conservation Specialist Ian Bergemann and Land Steward Dale Chayes for the installation.

HOBO Fresh Water
Conductivity Data Logger



<https://www.onsetcomp.com/products/data-loggers/u24-001>

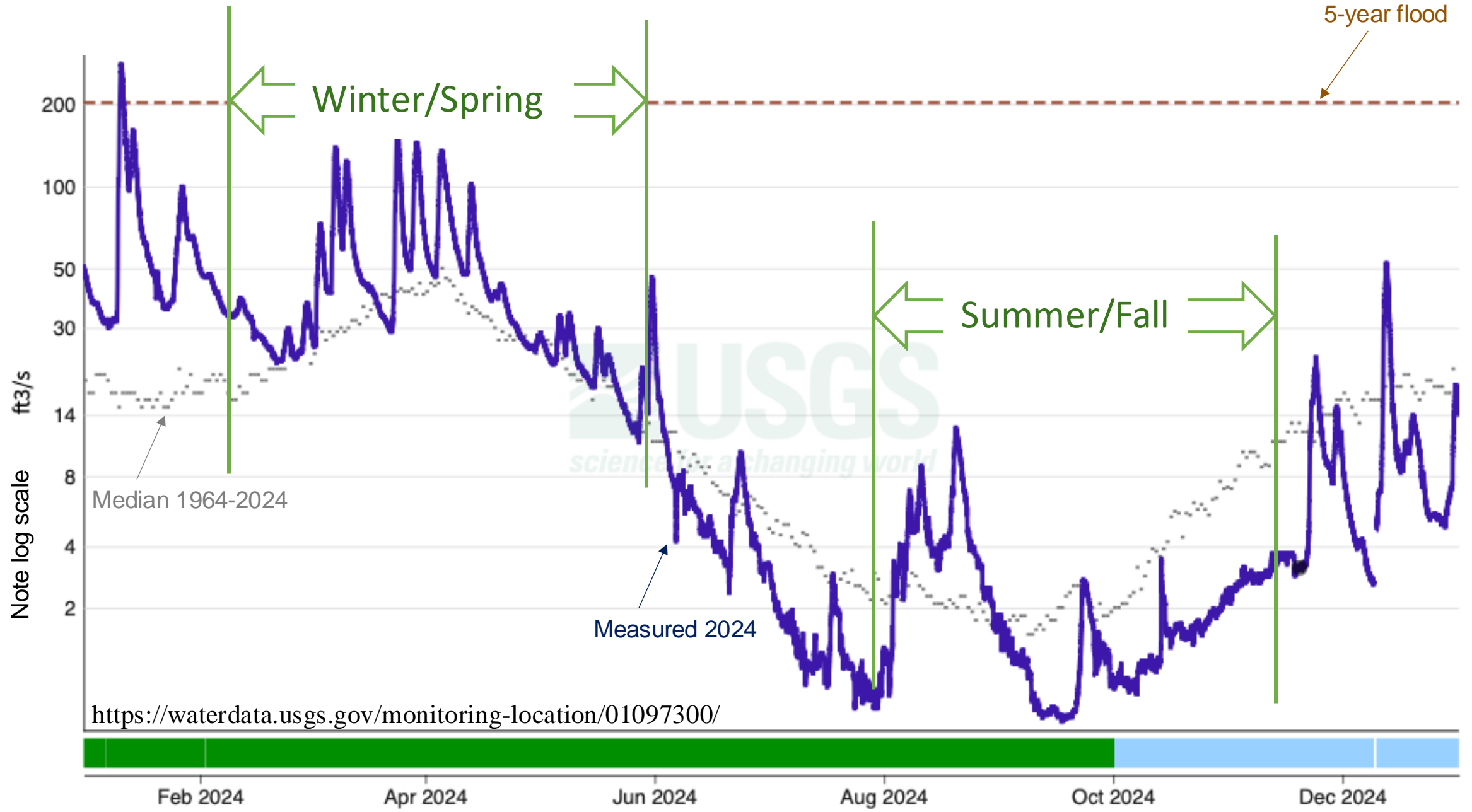
Thanks to OARS for the loan of the sensor, data transporter, and software, and help with installation.



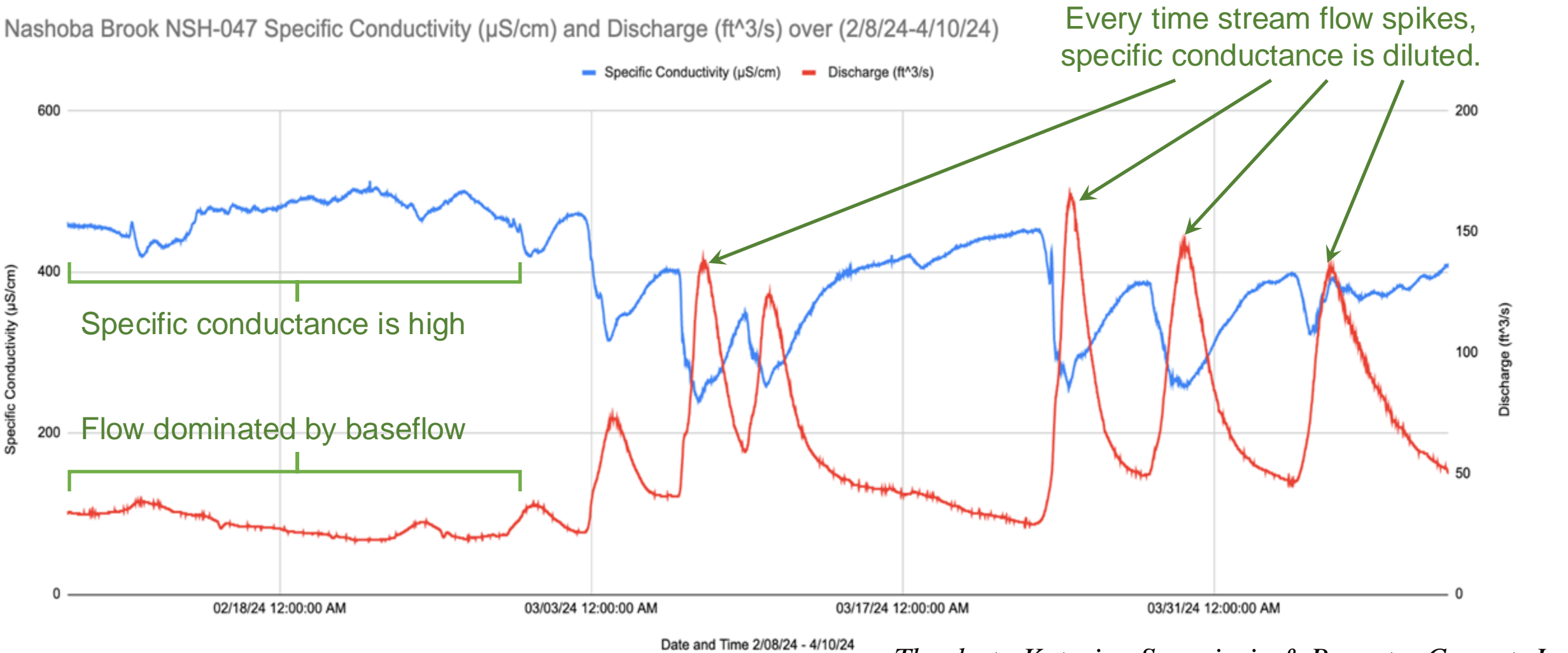
When to sample?

January 1, 2024 - December 31, 2024

Discharge, cubic feet per second



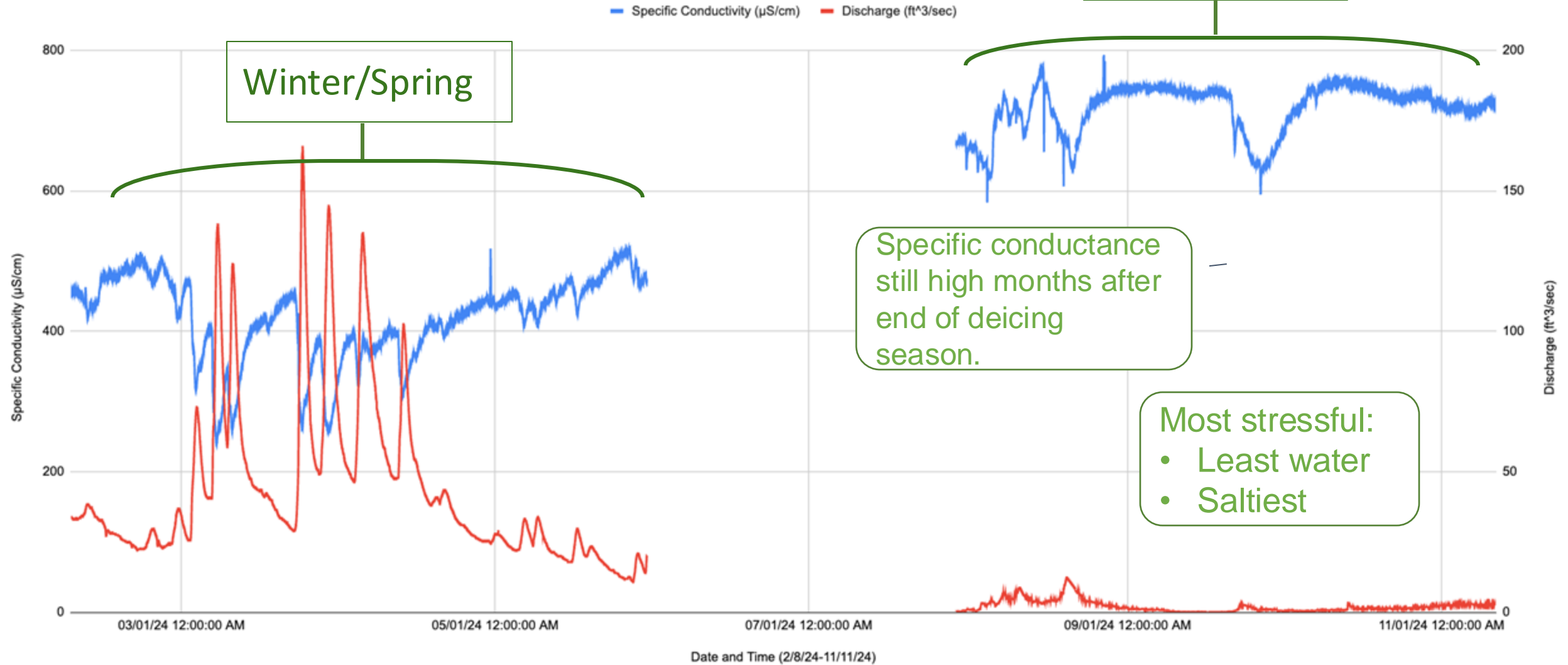
Winter/spring deployment



Thanks to Katarina Spasojevic & Brewster Conant, Jr.

Both deployments

Nashoba Brook NSH-047 Specific Conductivity ($\mu\text{S}/\text{cm}$) and Discharge (ft^3/s) over (2/8/24-11/11/24)

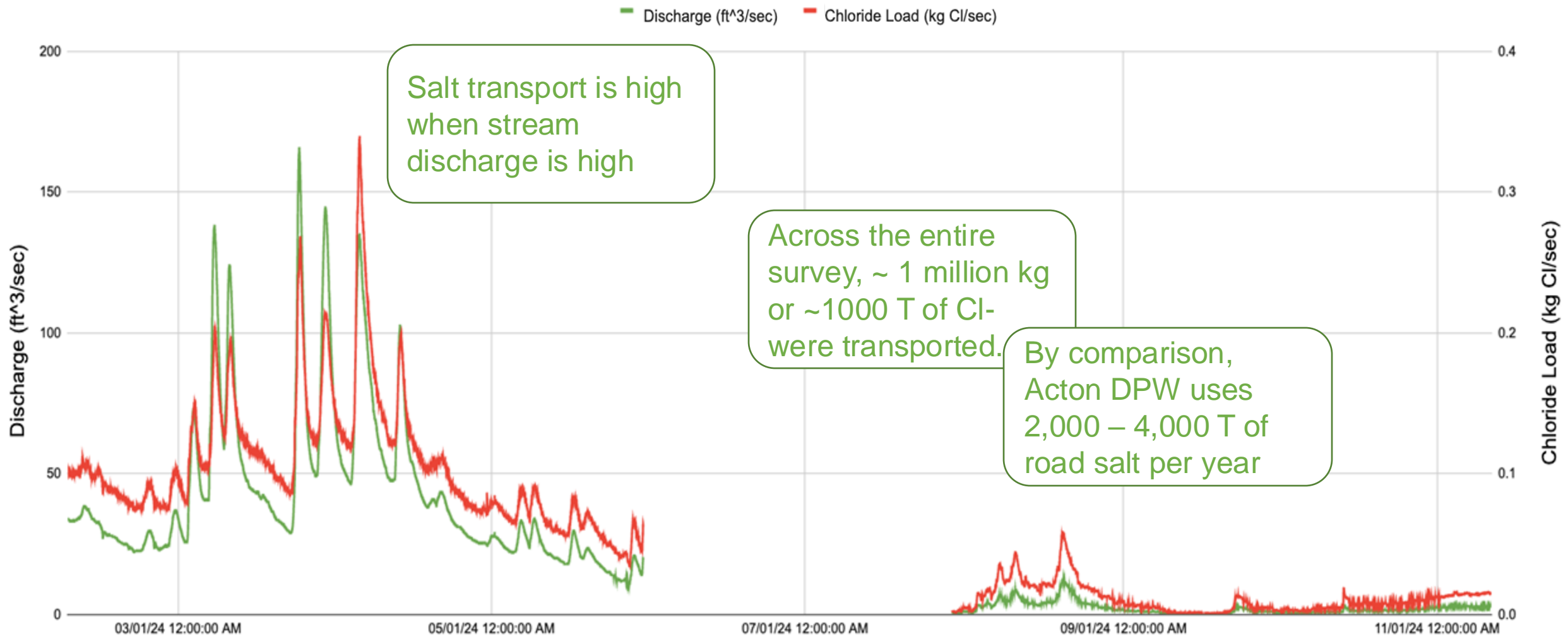


Thanks to Katarina Spasojevic & Brewster Conant, Jr.

How much salt is being transported by Nashoba Brook?

From the calibration curve: Specific Conductance \rightarrow Cl^- concentration

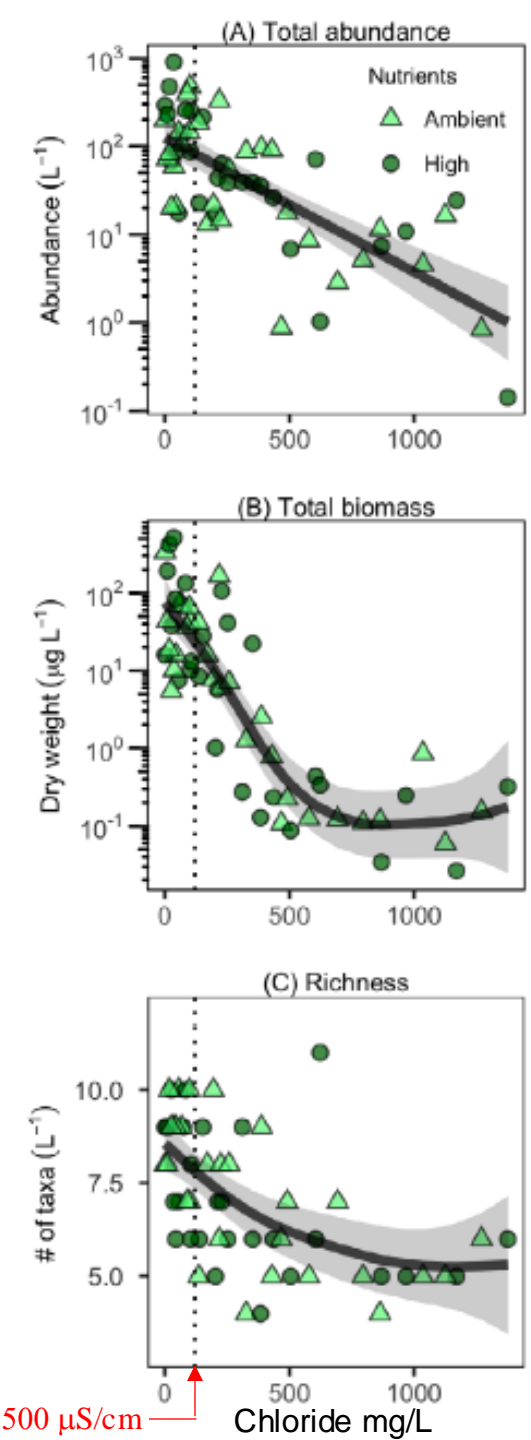
Then: Cl^- concentration * Discharge \rightarrow Chloride load



Thanks to Katarina Spasojevic & Brewster Conant, Jr.

What is the impact on aquatic ecosystems?

- Basic problem: osmotic regulation inside/outside cells
- Plants: not well-studied, seem resilient
- Best studied and most alarming: zooplankton
- Others...
 - Loss of spotted salamanders and wood frogs
 - Change of sex ratio in tadpoles
 - Algal blooms



Data from: Greco, D., et al. (2021). "Effects of chloride and nutrients on freshwater plankton communities." Limnology and Oceanography **8**: 48-55.

Thanks to Peter Severance, River Merrimack

Conclusions

1. Salt concentration in Acton surface waters has been on an upward trajectory for 50 years.
2. Major source of salt in Nashoba watershed is in headwaters, near I-495.
3. Salt concentration in surface waters is primarily coming from groundwater, not from overland flow following discrete incidents of deicer application.
4. Salt concentration remains high all year round. This means that ecosystem exposure is chronic, not episodic.
5. Quantity of salt being transported downstream is in the tons.
6. Salt concentrations are getting high enough to impact aquatic ecosystems, especially middle of food chain zooplankton.