Arctic stream resiliency and nutrient uptake dynamics across a wildfire chronosequence

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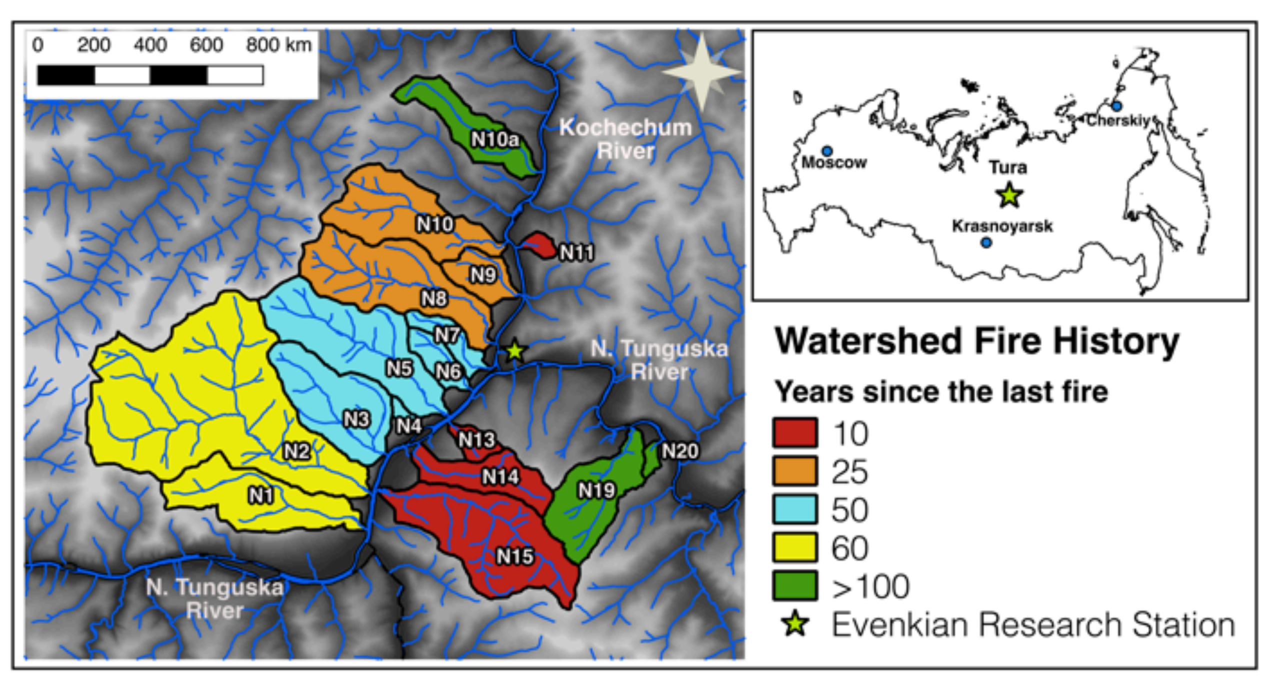
Background

- Fires are increasing in frequency in Arctic and boreal regions
- Fires alter nutrients and DOC concentrations in streams
- Nutrient uptake and export after fires is unclear
- **What is the resiliency of stream chemistry after wildfires?**
- **How do fires influence NO_3 and NH_4 uptake in streams?**



Nutrient pulse additions:

Uptake velocity (V_f) of NO_3 and NH_4 in streams across a burn gradient from 3 to >100 years since the last fire (YSF)

Results

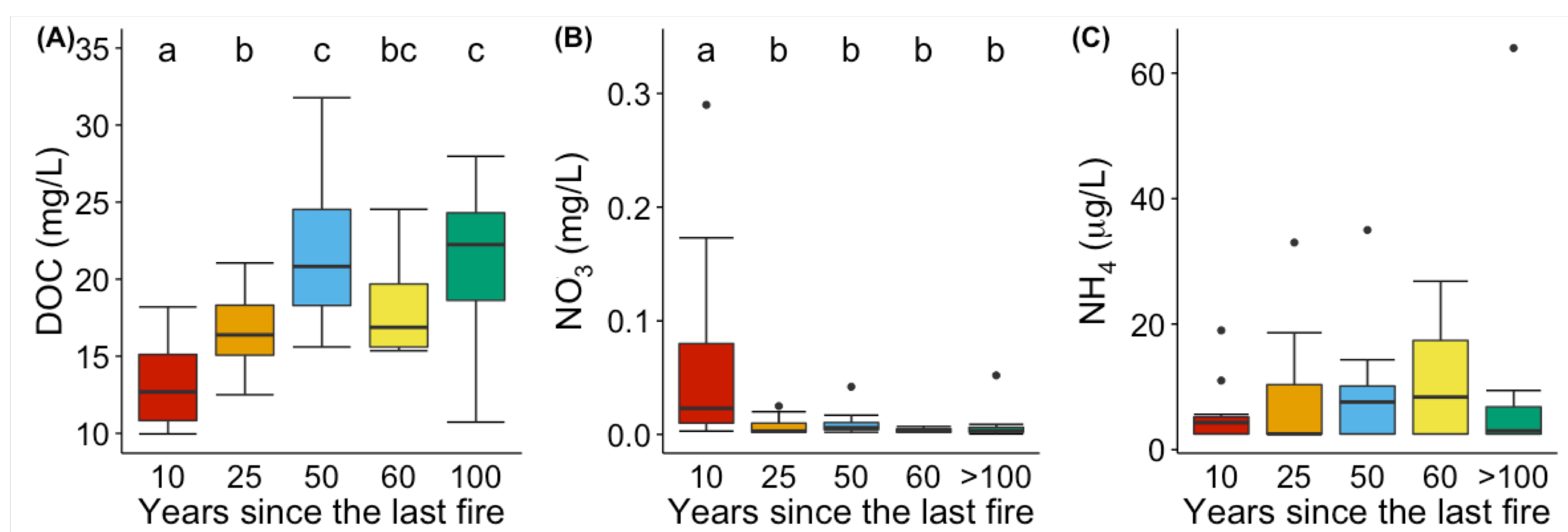


Fig 1. Boxplot panels represent (**A**) DOC, (**B**) NO_3, and (**C**) NH_4 concentrations across 17 streams sampled June 2011(Parham et al., 2013), 2013 (Diemer et al., 2015), and 2016 across the burn gradient. Lowercase letters denote significant differences (α=0.05).

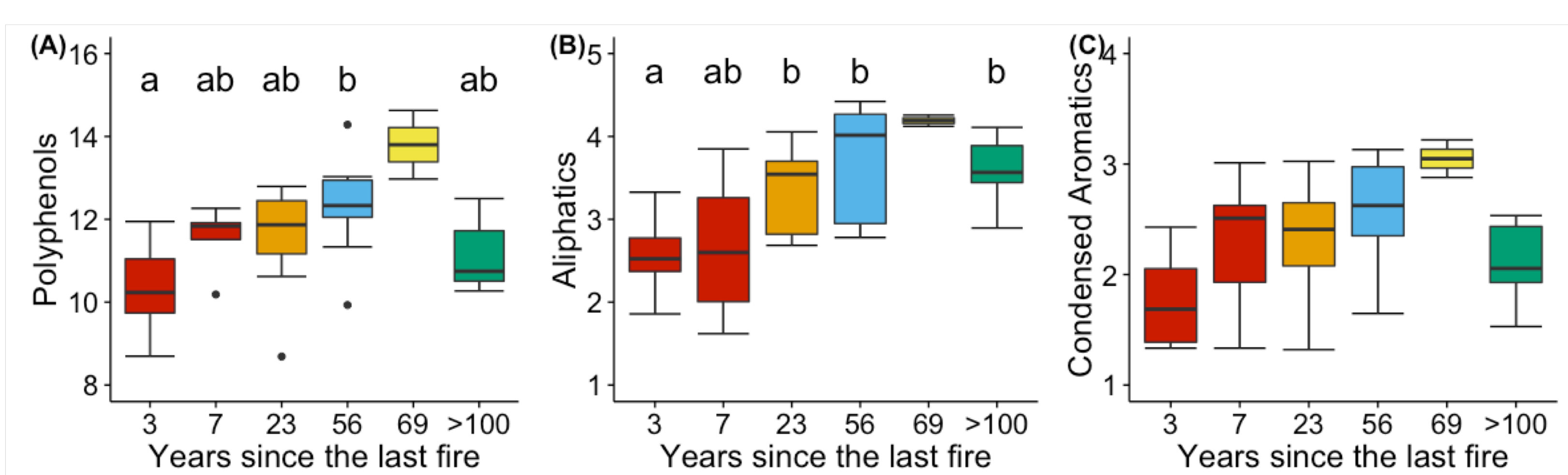


Fig 2. Boxplot panels represent (**A**) relative abundance of polyphenols, (**B**) relative abundance of combined aliphatics and peptides, and (**C**) relative abundance of condensed aromatics across the burn gradient. Streams burned 69 years ago were excluded from statistical analyses due to low n (n=2). Lowercase letters denote significant differences (α=0.05). Only samples from June 2016 are presented here.

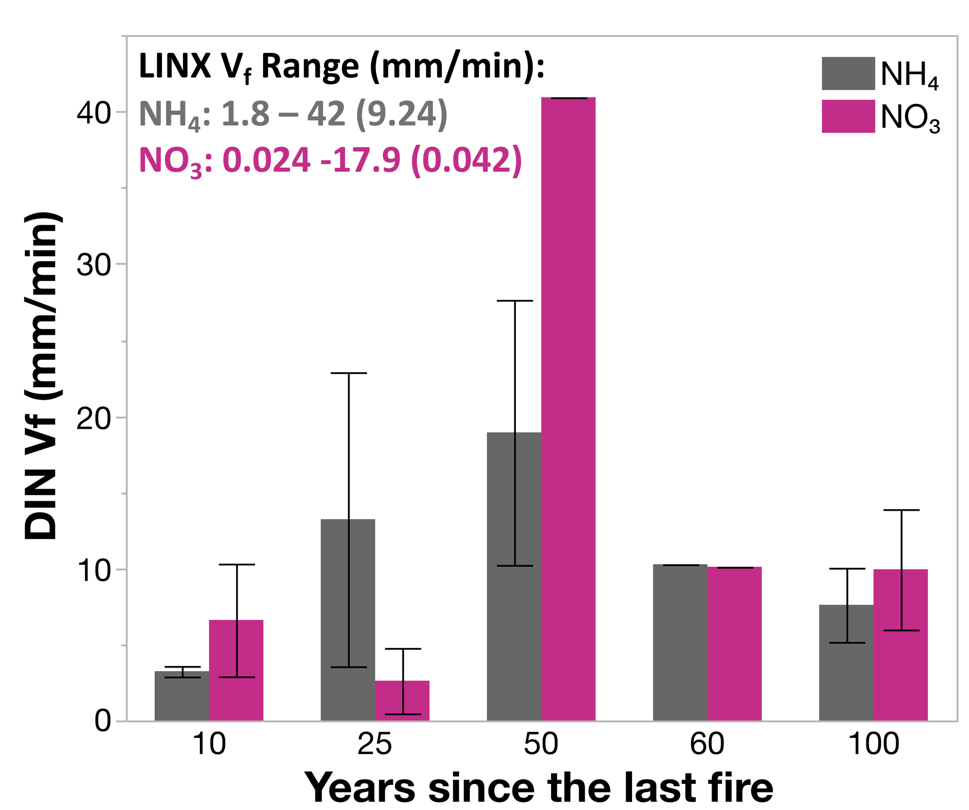
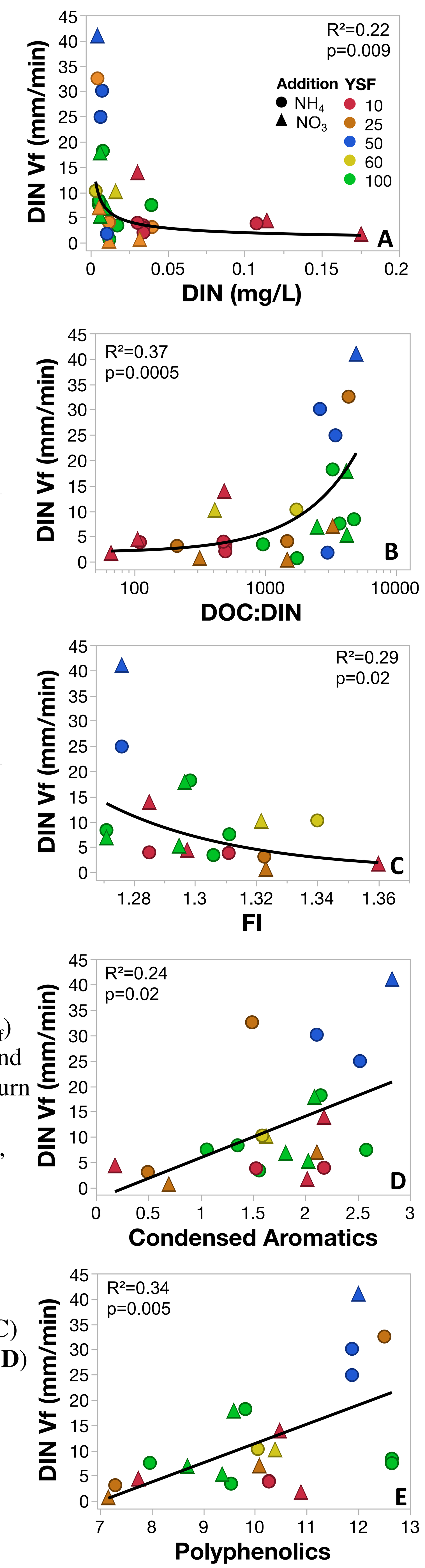


Fig 3. Mean uptake velocity (V_f) for both NO_3 (purple) and NH_4 (grey) across the burn gradient from summer 2016 and 2018. Error bars represent standard error. Only one value for NO_3 V_f in 50 and 60 YSF and one NH_4 V_f for 60 YSF. Ranges of NH_4 and NO_3 V_f from LINX I and II are provided with the median values in parenthesis.

Fig 4. Uptake velocity (V_f) for both NO_3 (triangles) and NH_4 (circles) across the burn gradient (10 YSF red, 25 YSF orange, 50 YSF blue, 60 YSF yellow, and >100 YSF green) from summer 2016 and 2018 related to ambient (**A**) DIN concentrations, (**B**) DOC:DIN molar ratios, (**C**) Fluorescence Index (FI), (**D**) relative abundance of condensed aromatics, and (**F**) relative abundance of polyphenolics for each addition.



Conclusions

Effects of fire and stream resiliency:

- Fires decrease DOM and increase NO_3 while no clear pattern in NH_4 concentration (Fig 1)
- DOC recovery after 50 yrs (Fig 1A)
- NO_3 recovery after 25 yrs (Fig 1B)
- Stream water DOM reflects watershed recovery (Fig 2)

NO_3 and NH_4 Uptake:

- Switch between NO_3 and NH_4 in recently burned sites but similar demand for DIN in older burned sites (Fig 3)
- Watersheds saturated in DIN especially recently burned sites exporting greater DIN (Fig 4A)
- DIN uptake increases with more DOC and aromatic DOM (Fig 4)

Acknowledgements

Thanks to WQAL members for help analyzing samples and Roman Kolosov for help in the field. This work was supported by the NSF ICER 14-45246, Crossing the boundaries of Critical Zone science with a virtual institute (SAVI); DEB-1556603; RFBR #14-05-00420; RSF #14-24-00113; DMR-1157490 and the State of Florida.