Wildfires influence N processing and enhance DOM and N coupling in arctic streams

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Introduction

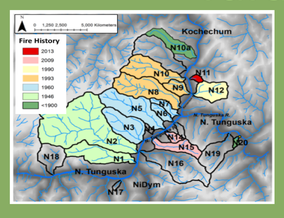
- Fires becoming pervasive in the Arctic
- Alter nutrients and DOM concentrations in streams
- N processing and export after fires is unclear
- **How do fires influence NO_3^- and NH_4^+ processing in streams?**

Study Sites and Methods

Yukon-Kuskokwim River Delta Southwest AK – (YKD)

2 Unburned streams
2 Burned streams

Central Siberian Plateau Tura, Russia – (CSP)



2 Unburned streams
3 Burned streams

Nutrient pulse additions
Uptake parameters (V_f) of NO_3^- and NH_4^+ in streams in YKD & CSP

Microcosm Incubations
Burn and unburned stream sediment + DOM comp gradient (acetate and soil leachates) + DIN; YKD only

10 mg C/L & 300 µg N/L
15 g sediment

Results

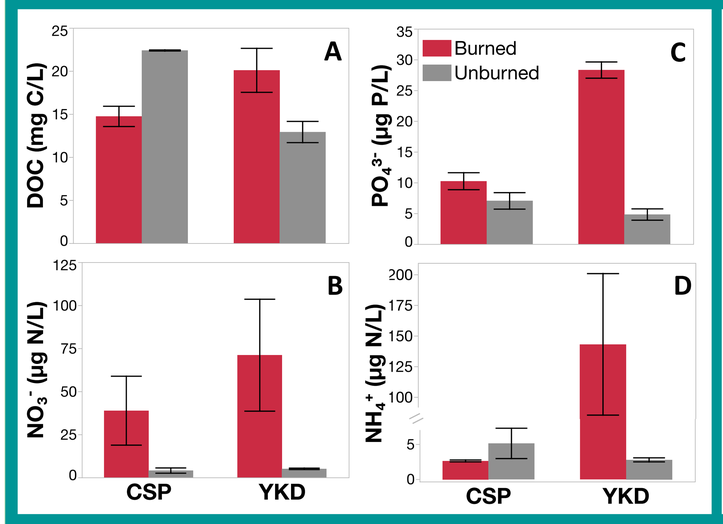


Figure 1. Mean concentrations of (**A**) DOC, (**B**) NO_3^-, (**C**) PO_4^{3-}, and (**D**) NH_4^+ from burned (red) and unburned (grey) streams in the YK-Delta (YKD) and Central Siberian Plateau (CSP). Error bars represent standard error. Note axis for NH_4^+ concentrations.

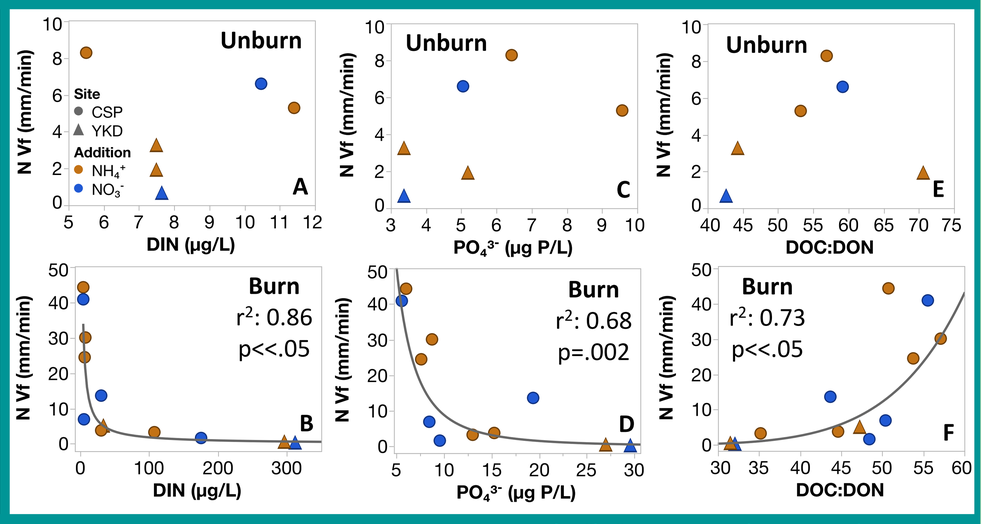
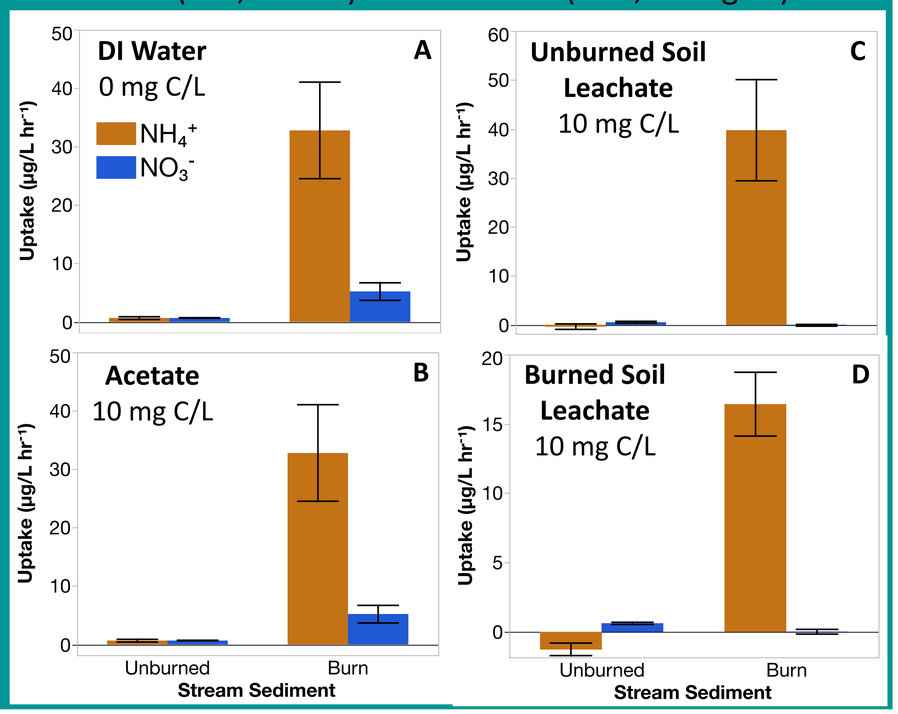


Figure 2. Nitrogen uptake velocities (Vf) for NH_4^+ (orange) and NO_3^- (blue) vs ambient DIN concentrations in (**A**) unburned and (**B**) burned streams; Vf vs ambient PO_4^{3-} concentrations for (**C**) unburned and (**D**) burned streams; and Vf vs molar DOC:DON ratios for (**E**) unburned and (**F**) burned streams in the Central Siberian Plateau (CSP, circles) and YK-Delta (YKD, triangles).

Figure 3. Microcosm average uptake rates for NH_4^+ (orange) and NO_3^- (blue) from each jar with sediments from an unburned or burned stream. Every single jar was amended with (**A**) DI water, (**B**) Acetate, (**C**) Unburned soil leachate, and (**D**) burned soil leachate. Uptake represents added and ambient (from stream sediment and soil leachate) NO_3^- and NH_4^+. Positive values represent uptake and negative values represent production. Error bars represent standard error. These data are ***YK-Delta only.***



Conclusions

- N uptake low in unburned streams (Fig 2,3); no clear predictors (Fig 2)
- Greater N demand in burned streams but saturate in DIN ~50 (µg/L) (Fig 2)
- Low nutrients and higher DOC:DON ratios enhance N removal (Fig 2, 3)
- Streams can switch from N sinks to sources (Fig 2, 3)

Acknowledgements

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