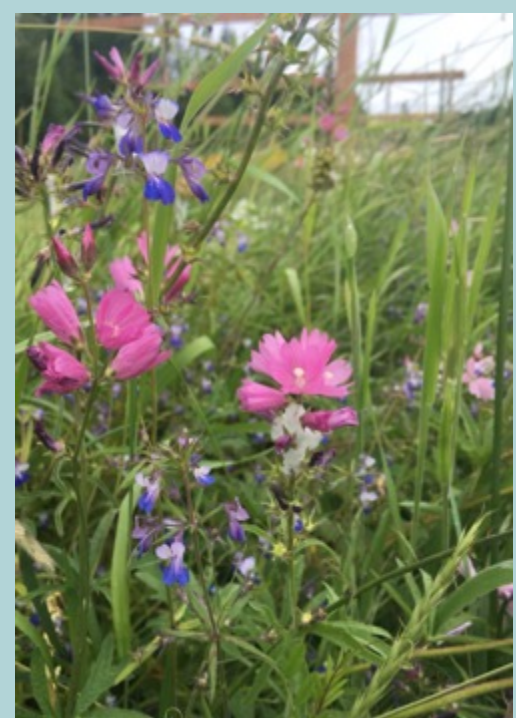


Seasonal Effects of Experimental Warming on Soil Asymbiotic N₂ fixation and Plant Functional Diversity in Pacific Northwest Prairies



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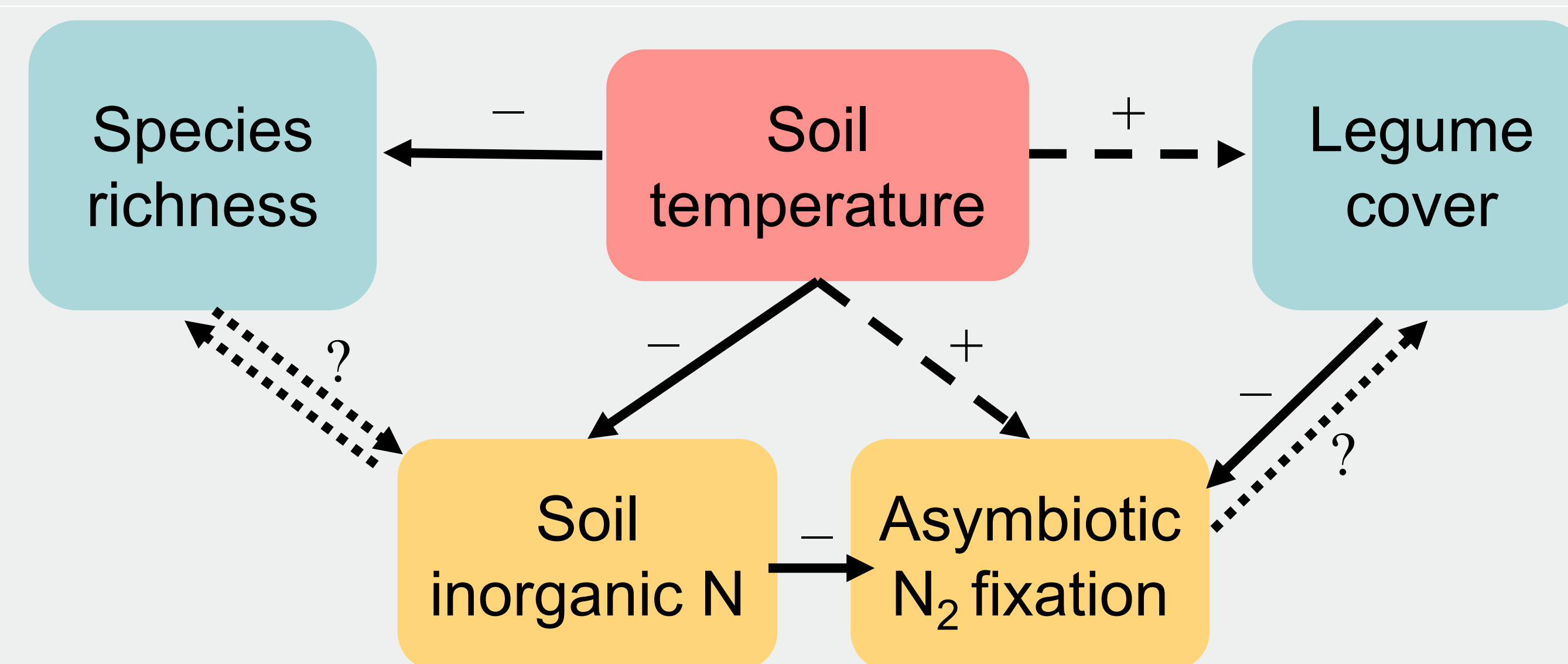


- Warming (+ 2.5–3.0°C) effect on soil asymbiotic N₂ fixation in Fall and Spring varied across a climate gradient of Pacific Northwest prairies.
- Soil inorganic nitrogen pools were minimally affected by warming in all sites, except for Fall nitrate pool in the Northern site.
- Warming had positive effect on prairie legume cover but the magnitude of change varied across the climate gradient.

Motivation and Research Questions

This project aims to quantify the resiliency of U.S. Pacific Northwest (PNW) prairies, which are critically endangered ecosystems, to climate change. We quantified the effect of warming (+ 2.5–3.0°C) on soil asymbiotic N₂ fixation (ANF) and major biogeochemical controls in Fall and Spring across a climate gradient of PNW prairies, and related those with plant species richness and functional diversity.

- Does warming affect plant species richness and legume cover in prairies along the U.S. Mediterranean drought severity gradient?
- Does warming affect soil ANF? If so, does the effect vary among Fall and Spring seasons?
- Do biogeochemical controls (i.e. soil inorganic N pools) on ANF respond to warming?



Study Sites and Experimental Design

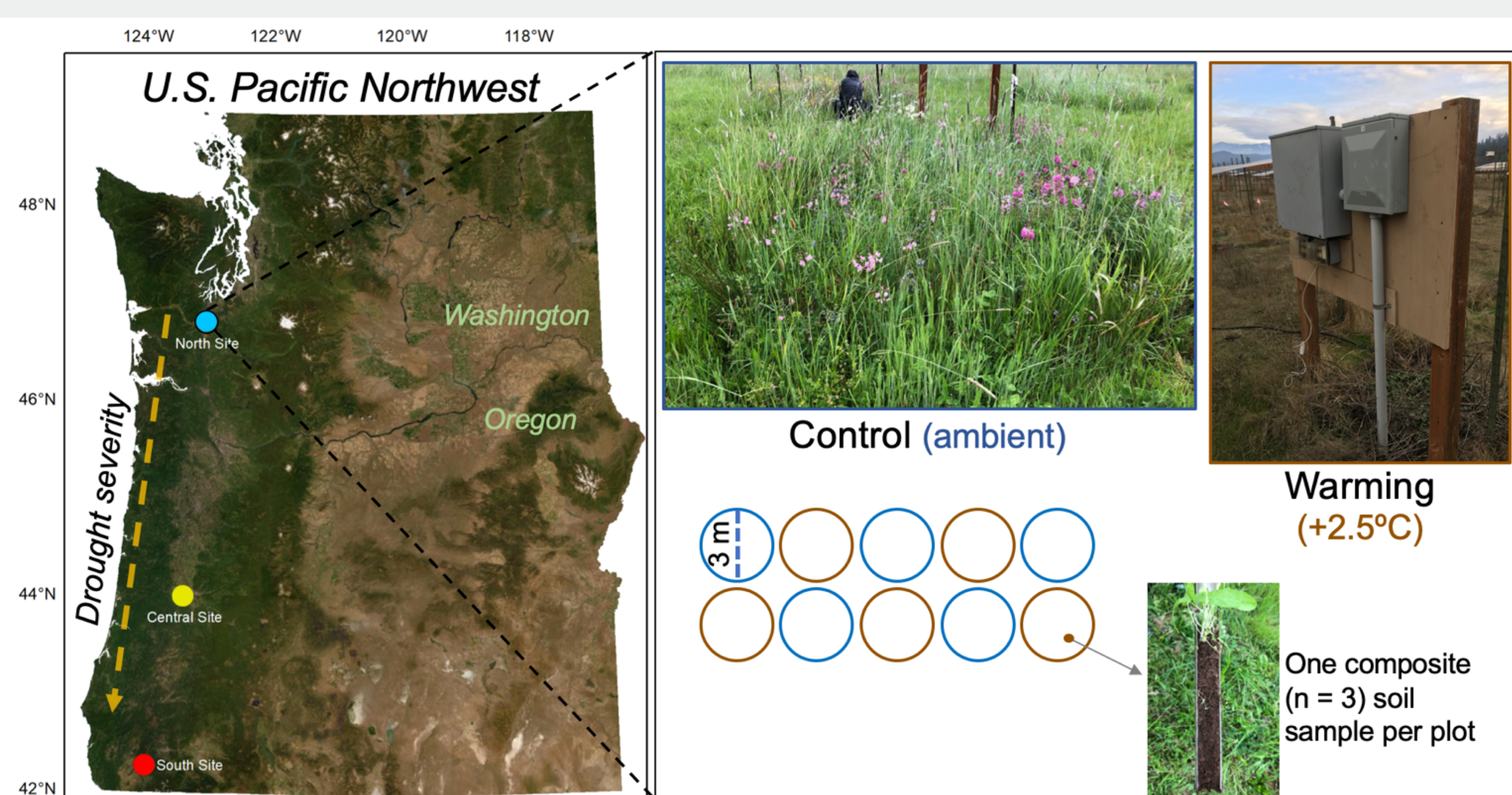


Fig. 1 Location of study sites (North, Central, South) along the U.S. Mediterranean drought severity gradient. At each site, composite soil samples were collected in Fall and Spring seasons from five prairie plots under warming (six 2000-watt infrared heaters designed to heat the canopy by + 2.5–3.0°C) and five under control (ambient temperature with ‘dummy heaters’ to mitigate any shading effect the heaters may produce) conditions.

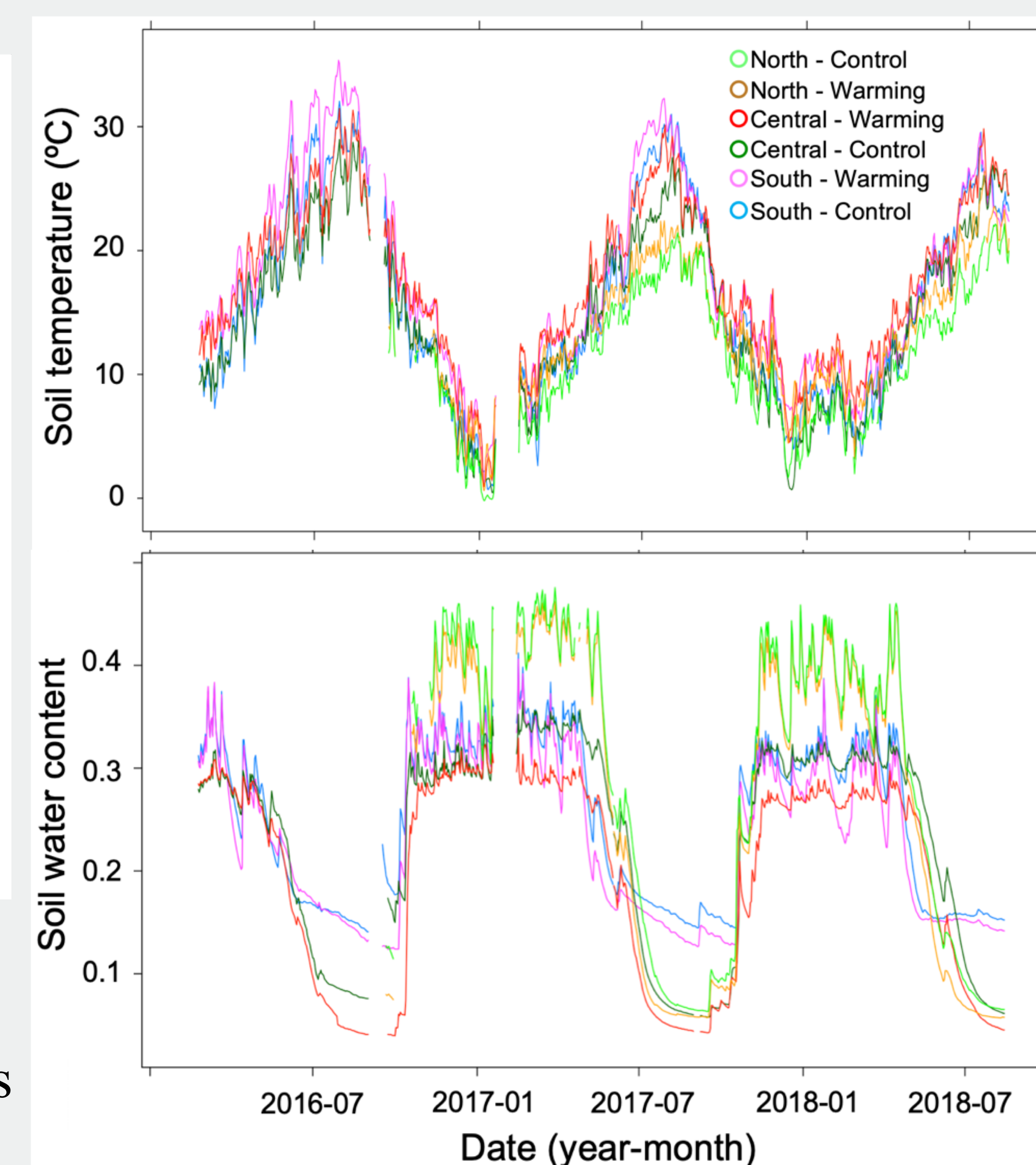
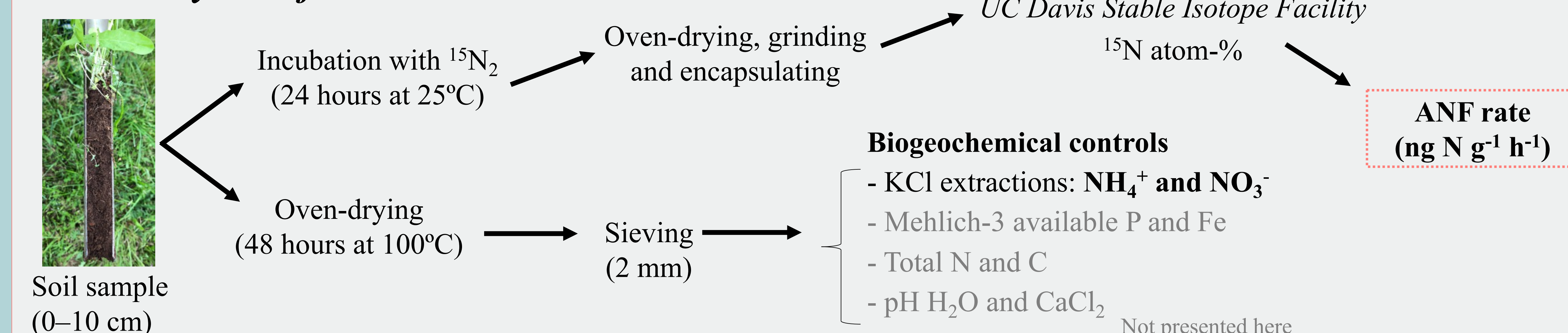


Fig. 2 Daily average soil temperature and water content in control and warming plots across sites between Jan-2016 and Aug-2018.

Laboratory workflow



Results

i) Warming effects on species richness and legume cover varied across the gradient

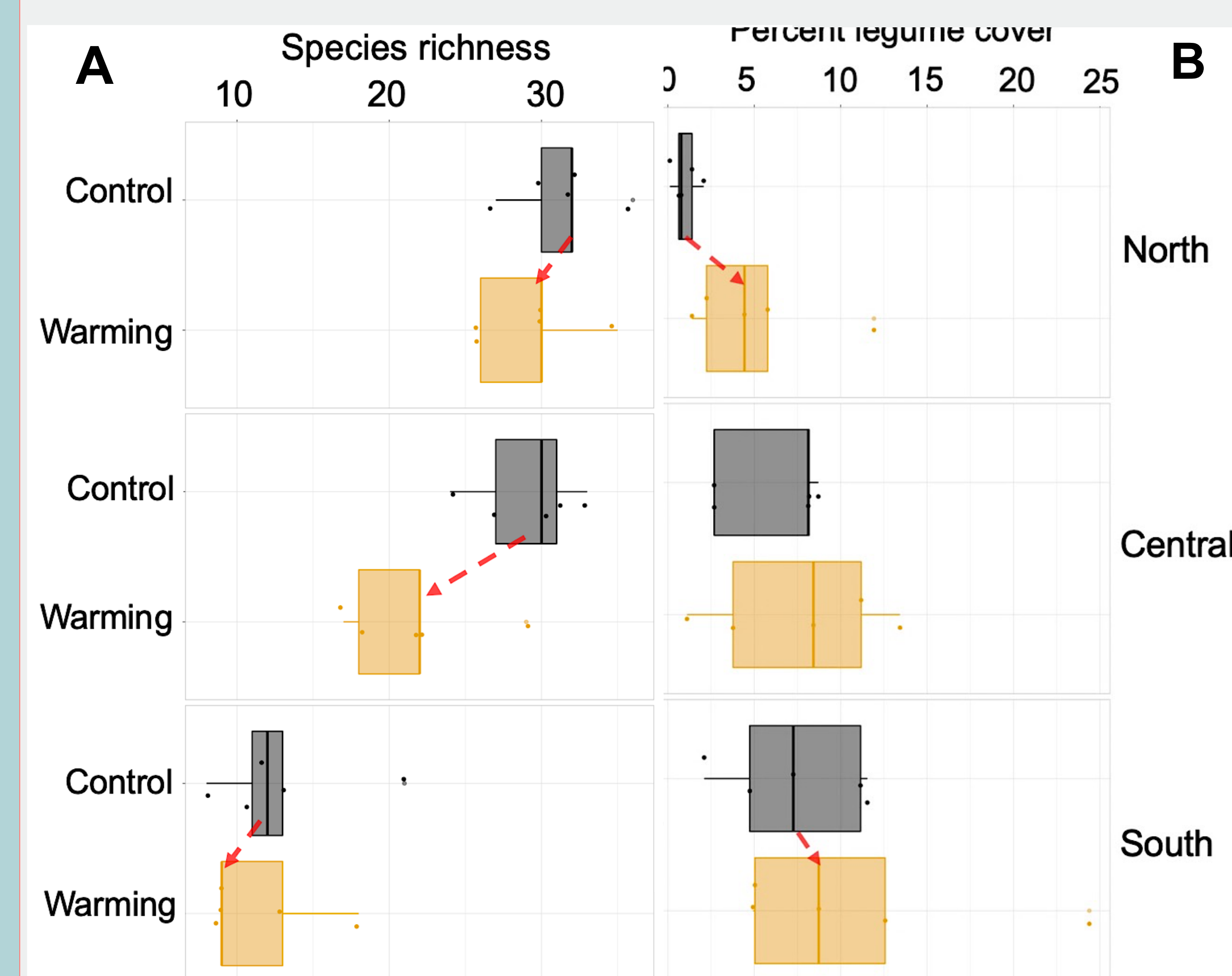


Fig. 3 (A) Species richness and **(B)** percent legume cover (members of the Fabaceae family) in control and warming plots in each study site. Measurement of plant cover by species using the point intercept method was done in Spring 2018 (Pfeifer-Meister et al. 2012, 2016).

ii) Warming effect on soil ANF varied by site and season

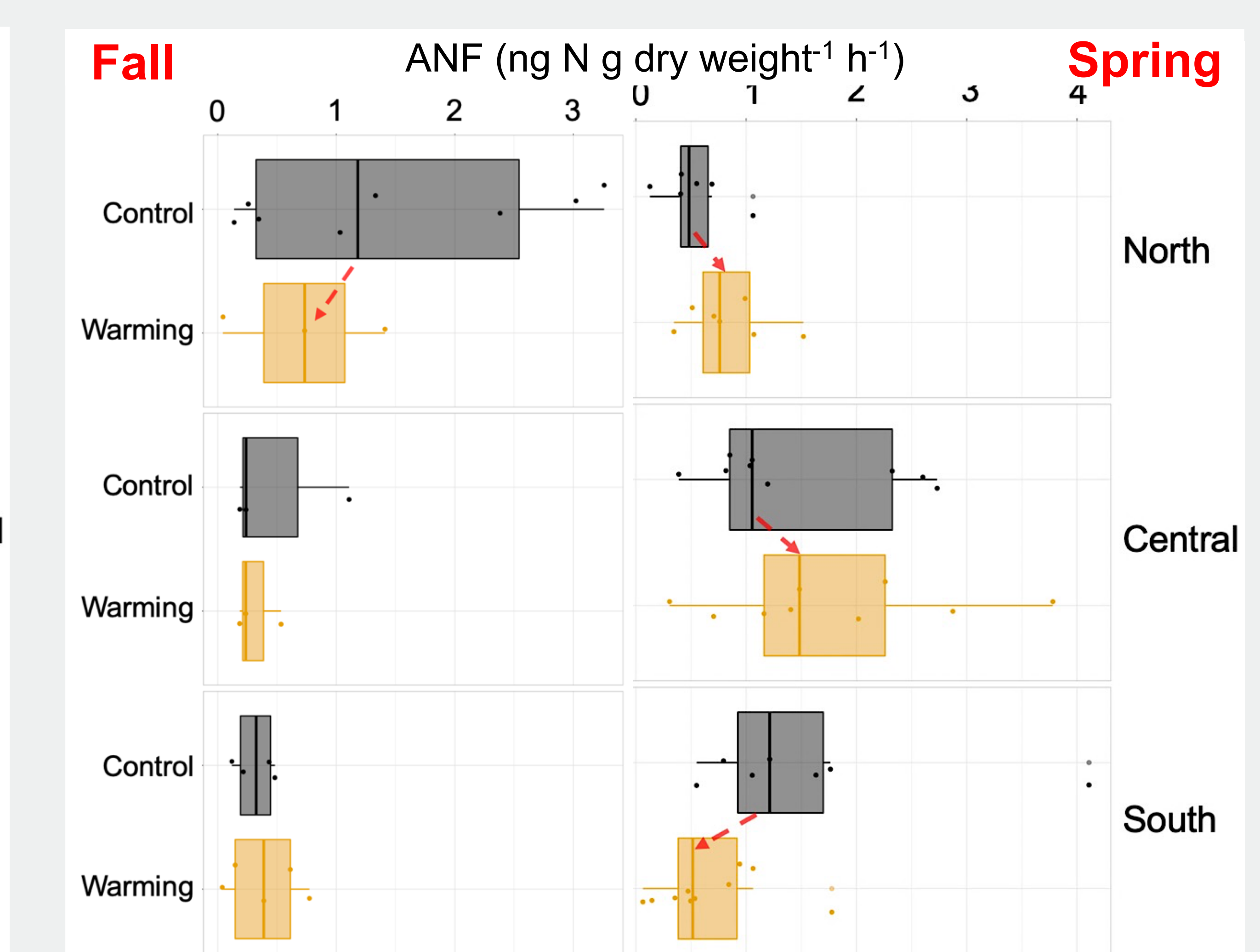


Fig. 4 Mean ANF rates of soils under control and warming conditions in sites representing a climate gradient of Mediterranean prairies. Sampling done in Fall 2018 (Nov/Dec) and Spring 2019 (April/May).

iii) Warming had small effect on soil ammonium and nitrate in both seasons

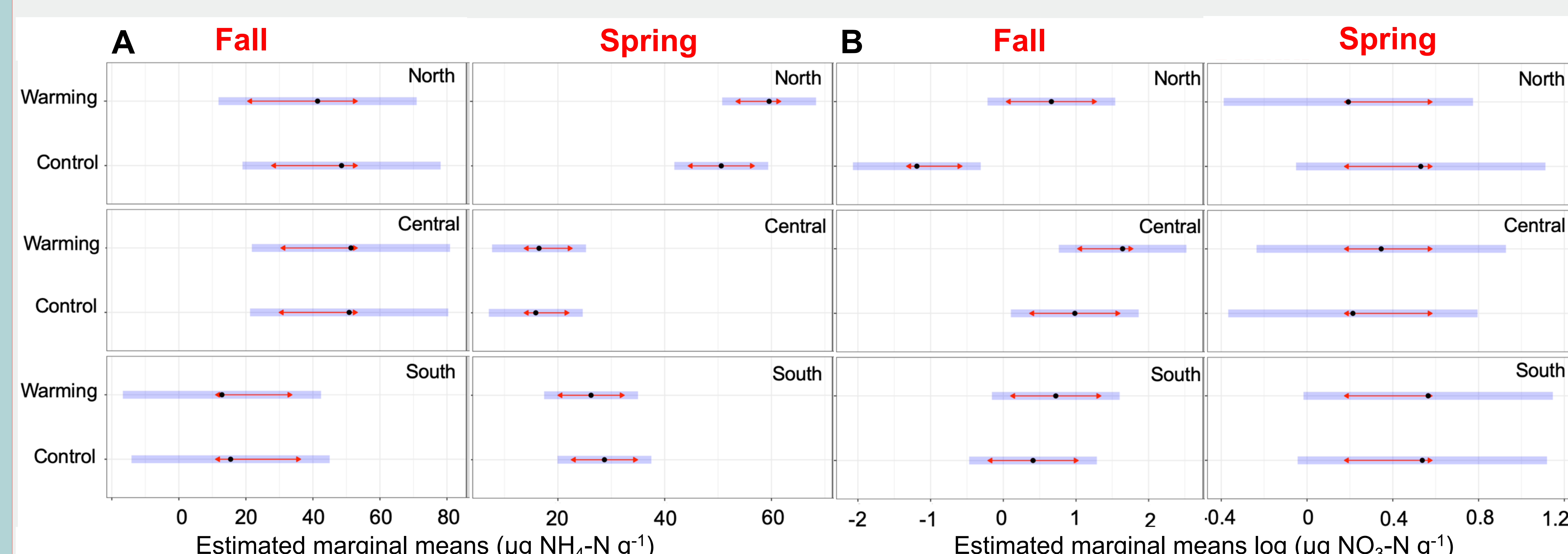


Fig. 5 Comparisons of soil ammonium **(A)** and nitrate **(B)** means in control and warming treatments in Fall and Spring.

Acknowledgements

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