LOOKING FOR HOTSPOTS OF NITROGEN CYCLING IN AN ALPINE-SUBALPINE WATERSHED

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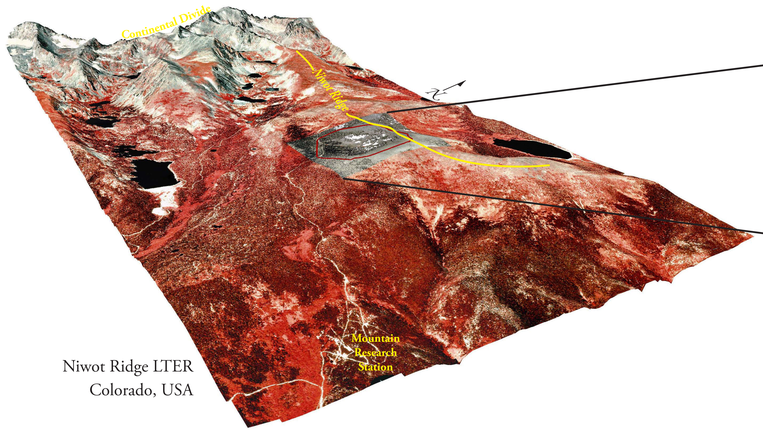
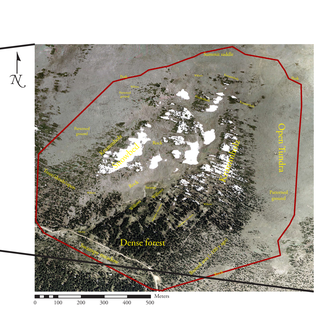
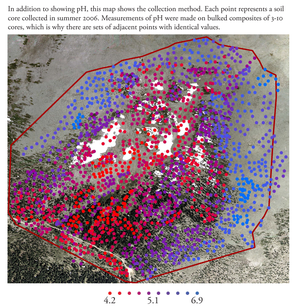


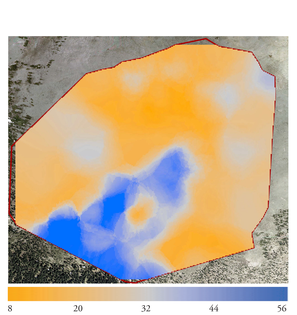
Niwot Ridge LTER
Colorado, USA



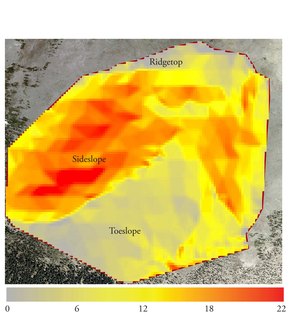
Aerial photograph



pH



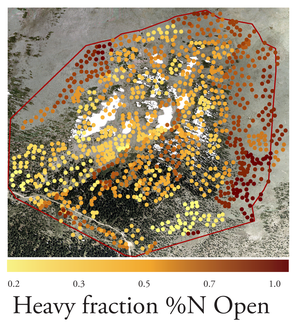
Late season moisture, %



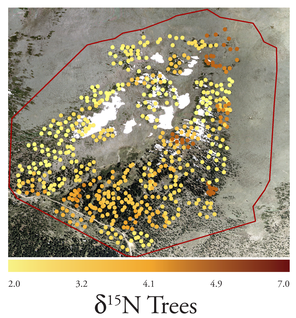
Slope, °

Ground photograph

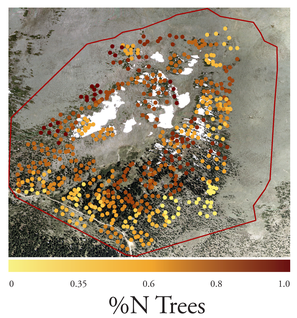
Well-defined patterns



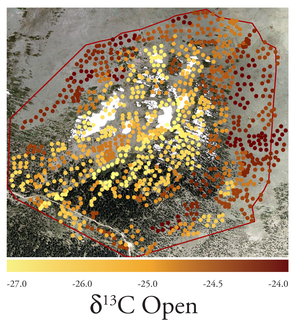
Heavy fraction %N Open



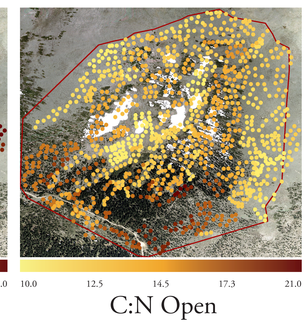
δ^{15}N Trees



%N Trees

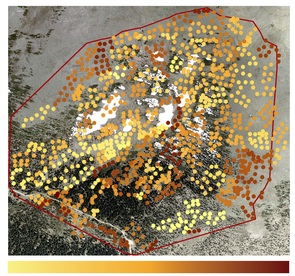


δ^{13}C Open

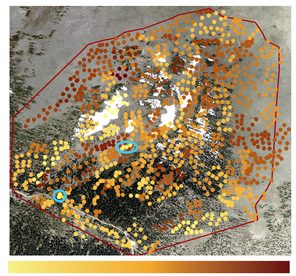


C:N Open

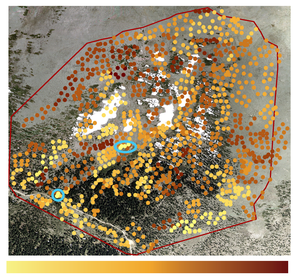
Less defined patterns



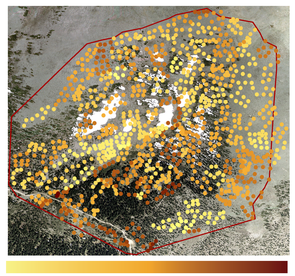
Total %N Open



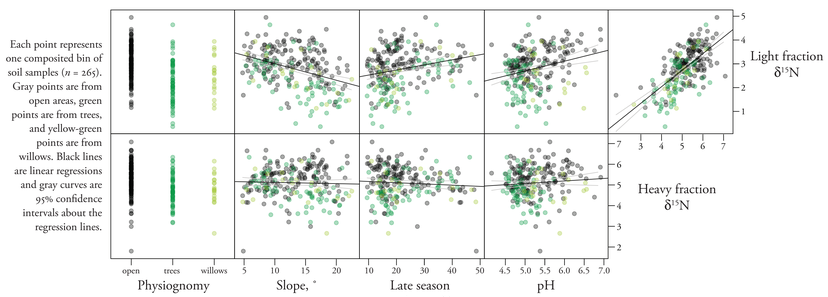
δ^{15}N Open



Heavy fraction δ^{15}N Open



%C Open



METHODS

I collected soil cores within a 0.89 km^2 alpine-subalpine catchment within the Niwot Ridge LTER site (see maps above). In total, 1,939 soil cores were collected and these were composited into 265 bins for analysis (see pH map for sampling design). Soil cores were composited only within areas of similiar physiognomy (open or trees). On these soil samples, I measured temperature, pH, soil moisture, ratio of heavy to light soil fractions, and within those two fractions, percent carbon, percent nitrogen, carbon isotope ratios and nitrogen isotope ratios. Although these data describe ecosystem conditions while only hinting at cycling rates, I am also currently collecting data on net mineralization and net nitrification (buried bag technique) and inorganic nitrogen availability (resin bags).

Landscape heterogeneity is one of the major obstacles to understanding the terrestrial nitrogen cycle. In order to understand nitrogen cycling across a heterogeneous landscape, we must understand how the different horizontal components within the landscape – components varying in land cover, vegetation type, and geomorphology – interact to process nitrogen. While some landscape components may be relatively unimportant, others may be hotspots of nitrogen cycling activity. Since there is little quantitative information on the location of hotspots, this project was designed to identify hotspots and develop testable hypotheses about their function.

DISCUSSION

The well-defined gradients in the %N data from the heavy soil fraction suggest that nitrogen moves more slowly through the dry meadows of the alpine tundra above tree line. However, the lack of pattern in the δ^{15}N data suggest that rates of N cycling in the open areas may still depend on the plant species identity. This hypothesis is supported by the fact that there are more visible gradients in the δ^{15}N data under the species-poor patches of trees. The anomalous δ^{15}N values in the swampy areas at the base of the steep sideslope (blue circles) suggest that these may be hotspots of nitrogen transport or processing. ■

ACKNOWLEDGEMENTS

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