Effects of Landscape Position on Carbon Cycling in Siberian Arctic Tundra

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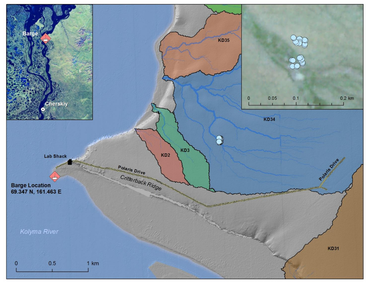
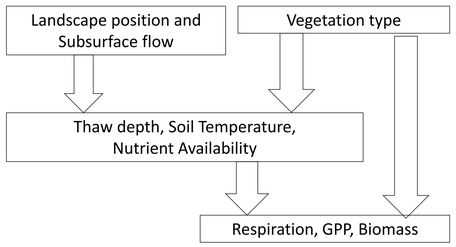
Introduction



- Tundra ecosystems are extremely nutrient limited (Shaver et al. 2014).
- Flowing subsurface water has the potential to increase the amounts of nutrients available to surface vegetation and effect soil microclimate (Shaver et al. 2001, Oberbauer et al. 1989, Hastings et al. 1989, Chapin et al. 1988, Shaver and Chapin 1980).
- Increased inputs of nutrients and microclimate effect aboveground vegetation composition and function (Shaver et al. 2014).
- Surface vegetation structure and function play an important role in determining CO_2 fluxes and litter decomposition rates (Shaver et al. 2006, Hobbie 1996, Oberbauer 1991, Oberbauer et al. 1989, Shaver and Chapin 1980)

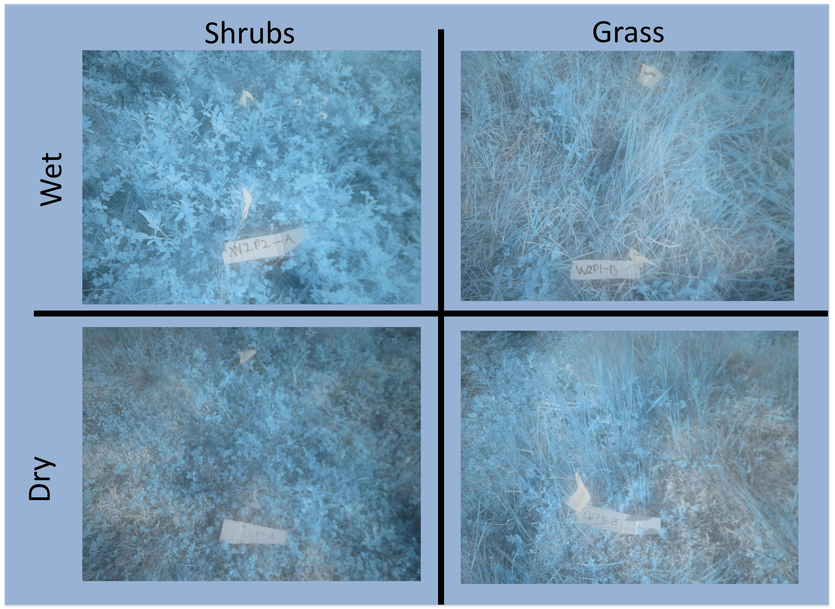


Objectives

- Investigate the effects of landscape position on soil moisture, soil microclimate and CO_2 flux.
- Investigate the variation in these effects in grass and shrubs ecosystems.

Methods

- Select 4 types of plots: Dry/Shrub, Wet/Shrub, Dry/Grass. Wet/Grass
- Measure environmental variables
- Measure dark and light CO_2 fluxes using LICOR 820.



Results

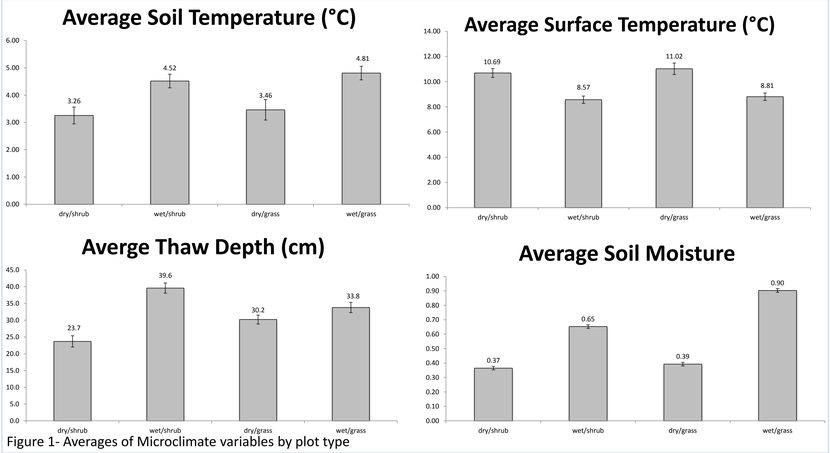


Figure 1- Averages of Microclimate variables by plot type

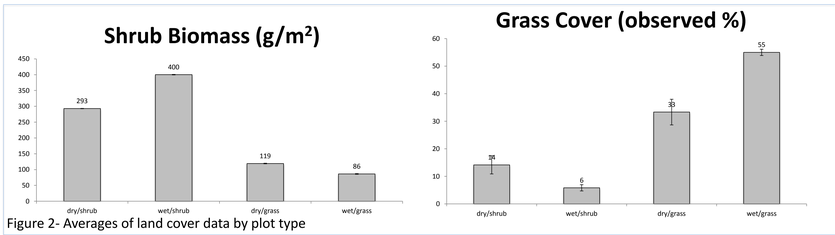


Figure 2- Averages of land cover data by plot type

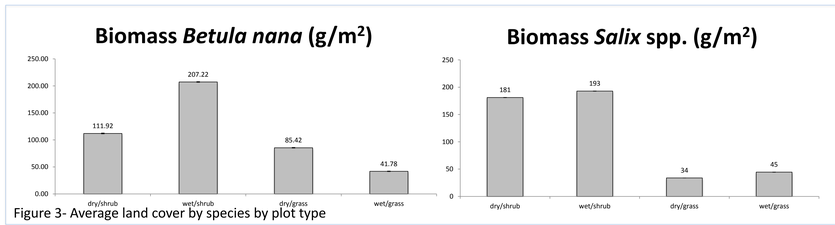
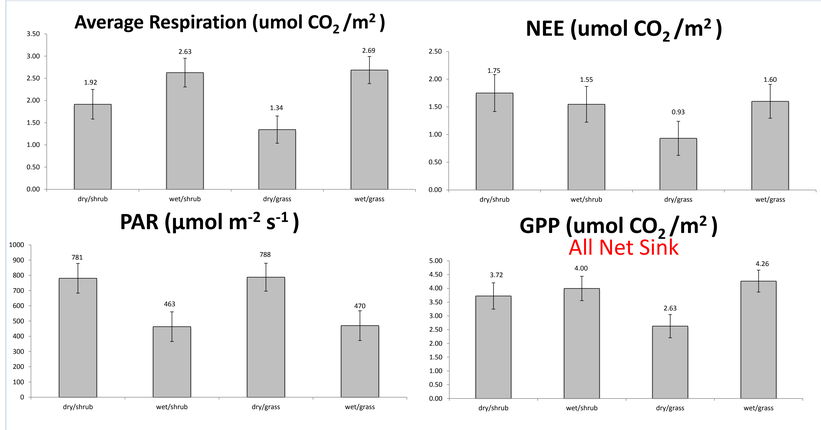


Figure 3- Average land cover by species by plot type



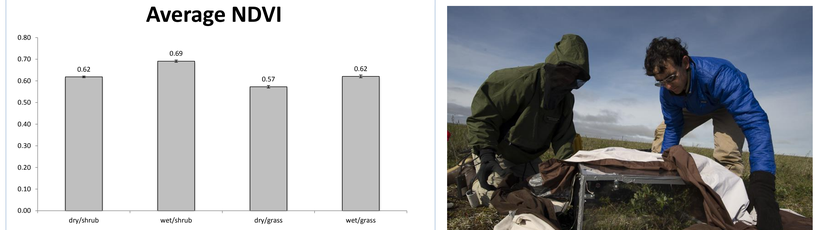


Figure 3- Average Respiration, GPP, PAR and NDVI by plot type

Conclusions and Discussion

- Increased soil temperature and decreased surface temperature are the result of thermal conductivity changes and increased latent heat flux respectively, leading to deeper thaw depths (Figure 1).
- Increased soil moisture, temperature, and/or thaw depth results in increased shrub biomass —especially *B. nana*— and observed grass cover, possibly due to increased nutrient cycling (Figure 2) (Harms et al. 2014, 2012, Oberbauer et al. 1989, Hastings et al. 1989, Chapin et al. 1988).
- Increased soil moisture increases GPP in grasses but not in shrubs due to shifts in resource allocation away from nonstructural biomass and towards woody growth in *B. nana* (Figure 3) (Oberbauer et al. 1989, Shaver and Chapin 1980).
- Increases in recalcitrant *B. nana* and other shrub litter results in decreased decomposition rates (Shaver et al 2006, Oberbauer 1991).

Acknowledgements

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