

Nitrogen Deposition and Plant Community Change in the Eastern Sierra Nevada

Nitrogen deposition in the Sierra Nevada

Nitrogen deposition has been increasing throughout the western U.S. with growth in transportation, agriculture, and industrial sectors. Because N is a limiting nutrient in many temperate ecosystems, increases in available N are generally accompanied by increases in productivity. However, plant species' responses to N may vary due to differences in co-limitations with other nutrients, plant life history, morphology, or biochemistry, leading to changes in species composition. Increased N deposition has facilitated exotic grass dominance in parts of California. The eastern Sierra Nevada receives an estimated 1 - 3 kg-N ha⁻¹ yr⁻¹, which is relatively low compared to other parts of California. However, effects on species composition may occur at rates as low as 3 - 8 kg-N ha⁻¹ in low-biomass arid and semi-arid ecosystems. We tested the impacts of elevated N deposition on plant composition and diversity over four years in the eastern Sierra Nevada sagebrush steppe.



Plant community response

Over four years, we found no evidence that increased nitrogen deposition would affect native plant diversity, species composition, or cheatgrass abundance in the Eastern Sierra.

However, cheatgrass abundance did increase during that time while native forb diversity decreased, suggesting that cheatgrass may be causing impacts to the plant community even though changes to the fire cycle have not yet occurred. Cheatgrass increases were most pronounced at sites that had a history of being burned and grazed. In fact, in the most disturbed areas, cheatgrass cover was approaching the threshold for increased fire risk. Areas of high disturbance should, therefore, be treated to reduce cheatgrass density so as to avoid initiation of a grass-fire cycle at high elevation.

We measured species composition for four years with and without additional nitrogen.



We found that cheatgrass (left) was associated with decreased diversity of native forbs.