

From grasslands to wetlands: herbaceous communities in a human-dominated world

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The Martina Lab at Texas State University integrates field experiments, greenhouse studies, and ecological modeling to examine how global change affects wetland and grassland ecosystems, with a focus on the persistent pressures wetlands face from drivers like invasive species, nutrient enrichment, and hydrological changes. One key research area is the impact of water level fluctuations, partially driven by climate change, and nutrient inputs on coastal wetlands in the Great Lakes, which could shift these systems from nutrient sinks to sources, destabilizing nearshore aquatic ecosystems. In a greenhouse study on *Arundo donax*, an invasive grass species in Texas, growth was maximized under high light and moisture, but nutrient addition mainly altered resource allocation rather than boosting overall growth. This suggests that while the species is adaptable, its spread may be limited in areas dominated by trees. Additionally, the lab contributes to large-scale projects like NutNet and DRAGNet, which analyze how nutrient inputs and disturbances affect grassland biomass production and community composition globally. Results show that warmer, wetter regions are experiencing increased biomass, while arid, species-poor areas are seeing declines, with implications for food security, biodiversity, and carbon storage. Finally, our collaborative work highlights the link between plant diversity and soil carbon sequestration, especially in warm, arid climates, reinforcing the importance of restoring plant diversity to enhance ecosystem resilience in the face of global change. This research highlights the complex effects of global change on wetland and grassland ecosystems, emphasizing the critical influence of factors like nutrient inputs, water levels, and invasive species. Through experimental and modeling approaches, the lab offers key insights for enhancing land management strategies and building ecosystem resilience, particularly in the face of climate change and biodiversity loss