

Ecosystem Service Delivery by Urban Prairie Patches



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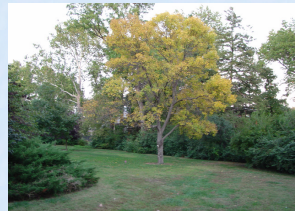
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Introduction

- Ecosystem services are defined as any positive benefit that wildlife or ecosystems provide to people.
- Native landscaping can provide many ecosystem services such as the regulation of runoff water, sequestering carbon and enhancing biodiversity.
- Urban prairie patches are sections of native prairie species implemented into urban settings serving as an alternative to non-native systems.
- Urban prairie patches can serve as a way to promote an individual's unique ideological, social, physiological, and sociocultural norm to conform to the aesthetics of a more natural system.
- Both restoration and management practices will play a key role in promoting prairie conservation in North America.

Objectives

- What roles are assumed by prairie patches?
 - Biodiversity
 - Nutrient Cycling
 - Microclimate
 - Carbon Sequestration
 - Societal well-being
- What factors contribute to implementing native vs. non-native grasses into urban settings?
 - Human perceptions and opinions
 - Promotion of Education
 - Ecosystem sustainability
 - Restoration and management



Turf grass, non-native system



Native Prairie System
Photos provided by Lee Skabelund

Ecosystem Services Provided by Prairie Patches

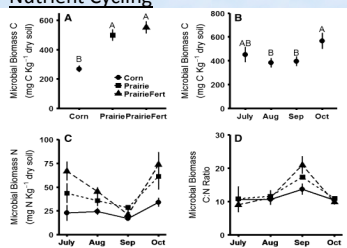
- Regulation of major biogeochemical cycles
- Invertebrates provide the foundation for nutrient cycling
- Regulation of plant and animal populations
- Retention and delivery of nutrients to plants
- Generation and renewal of soil and sediment structure and soil fertility
- Provision of clean drinking water
- Modification of the hydrological cycle
- Regulation of atmospheric trace gases
- Modification of anthropogenic driven global change (e.g. carbon sequestration)
- Efficient cooling to environments yielded by native trees
- Provides cultural well-being
- Contribution to landscape sustainability and stability
- Aesthetics of a more natural habitat
- Promotion of education and awareness

Biodiversity

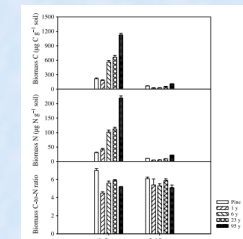
- Biodiversity is defined as the variability among living organisms including genetic, species, functional group, and ecosystem diversity.
- The prairie is dominated by native prairie grasses, and it encompasses an array of plants ranging from trees or shrubs, to herbaceous vegetation.
- A prairie ecosystem is known for its fertile soil, microbial decomposition, pollinator interactions, and abundance of biological diversity.
- The primary pollinators in a prairie ecosystem include pollinators such as beetles, butterflies, moths, bugs, flies, and leafhoppers.
- The loss and fragmentation of grasslands is causing the extinction of uncouneted populations and species, changes in structure and function of ecosystems, depletion of environmental services, and decline in human well-being.

Regulating Services

Nutrient Cycling

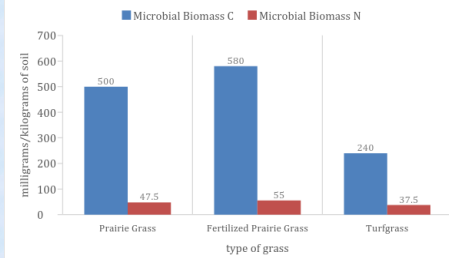


Microbial biomass in Prairie Grass systems varying by season. This illustrates the potential of prairie grass systems to perform nutrient cycling.
Source: (Bach, 422).



Microbial biomass in four different ages of Turfgrass areas and one native pine area. This illustrates the potential of Turfgrass to cycle nutrients increasing with age.
Source: (Shi, 315)

Regulating Services comparison



Side by side comparison of Prairie vs. Turfgrass microbial activity. Fertilized prairie more than doubles the nutrient cycling potential of turfgrass.
Source: (Bach & Shi)

Microclimate

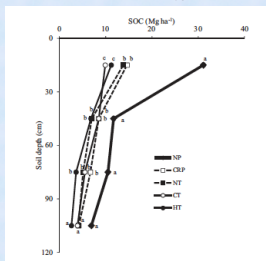
- The climate of a local area that is different from the surrounding area.
- Native landscapes provide a greater cooling effect in urban environments.
- Native green-roofs can cool a dense urban environment.

Soil Carbon Sequestration

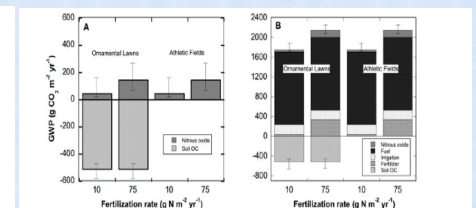
- A natural process of transferring carbon dioxide from the atmosphere into the soil through landscape residue.
- Microbial activity is heavily tied to the decomposition rates in the soil. Plant productivity and microbial decomposition are the primary sources of controlling soil carbon storage in ecosystems and native landscapes have a healthier and more productive soil which increases the soil carbon storage.

Hurisso, J. Norton, U. Norton, pg. 184, 2013.

Townsend-Small, Czirmzik, pg.4, 2010.



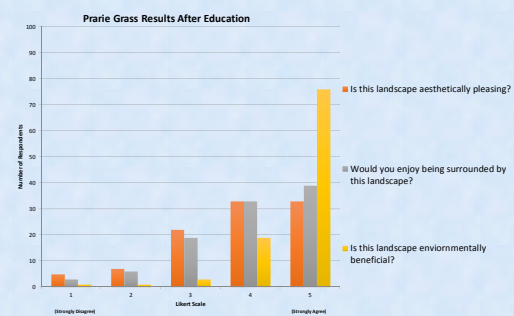
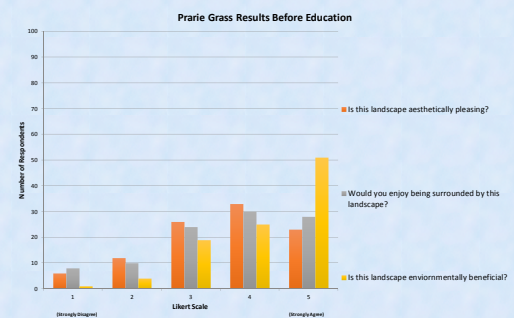
Higher soil carbon storage in native prairie systems.
NP represents native prairie.



The global warming potential, fuel emissions, soil organic carbon sequestration and nitrous oxide emissions of commercial turfgrass systems.

Societal Perceptions and Implications

Student Body reaction and opinion



Conclusion

- Prairie grass systems have the potential to sequester more carbon and lower urban heat island temperatures.
- Urban prairie patches can serve as a refuge for pollinators, native biota, and native plant species.
- Prairie grass systems provide more regulating services than turfgrass systems.
- Support for native landscaping within urban settings is highly dependent upon cultural upbringing, education, aesthetic appeal, restoration, and management practices.