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Mapping and Modeling the Biogeochemical Cycling of Turf Grasses in the United States

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Abstract

Turf grasses are ubiquitous in the urban landscape of the United States and are often associated with various types of environmental impacts, especially on water resources, yet there have been limited efforts to quantify their total surface and ecosystem functioning, such as their total impact on the continental water budget and potential net ecosystem exchange (NEE). In this study, relating turf grass area to an estimate of fractional impervious surface area, it was calculated that potentially 163,800 km^2 (± 35,850 km^2) of land are cultivated with turf grasses in the continental United States, an area three times larger than that of any irrigated crop. Using the Biome-BGC ecosystem process model, the growth of warm-season and cool-season turf grasses was modeled at a number of sites across the 48 conterminous states under different management scenarios, simulating potential carbon and water fluxes as if the entire turf surface was to be managed like a well-maintained lawn. The results indicate that well-watered and fertilized turf grasses act as a carbon sink. The potential NEE that could derive from the total surface potentially under turf (up to 17 Tg C/yr with the simulated scenarios) would require up to 695 to 900 liters of water per person per day, depending on the modeled water irrigation

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Keywords

Turf grasses BIOME-BGC Impervious surface area Carbon budget Carbon sequestration potential Water use

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Notes

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