CRC for Water Sensitive Cities

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Protection and restoration of urban freshwater ecosystems: informing management and planning

Catchment land use influences on the distribution of carbon and nutrients in sand-bed streams

Introduction

Successful restoration of disturbed urban streams requires a good mechanistic understanding of stream functioning, including biogeochemical processes. The relative importance of catchment vs reach-scale processes on the quality & quantity of nutrients & organic matter & how they change seasonally is relatively understudied in sand bed streams. We sought to:

- investigate how quality & quantity of nutrients & organic matter in the water column & sediments vary with land use (catchment).
- investigate the distribution of nutrients & organic matter within a reach (para-fluvial & fluvial sediments, water column).

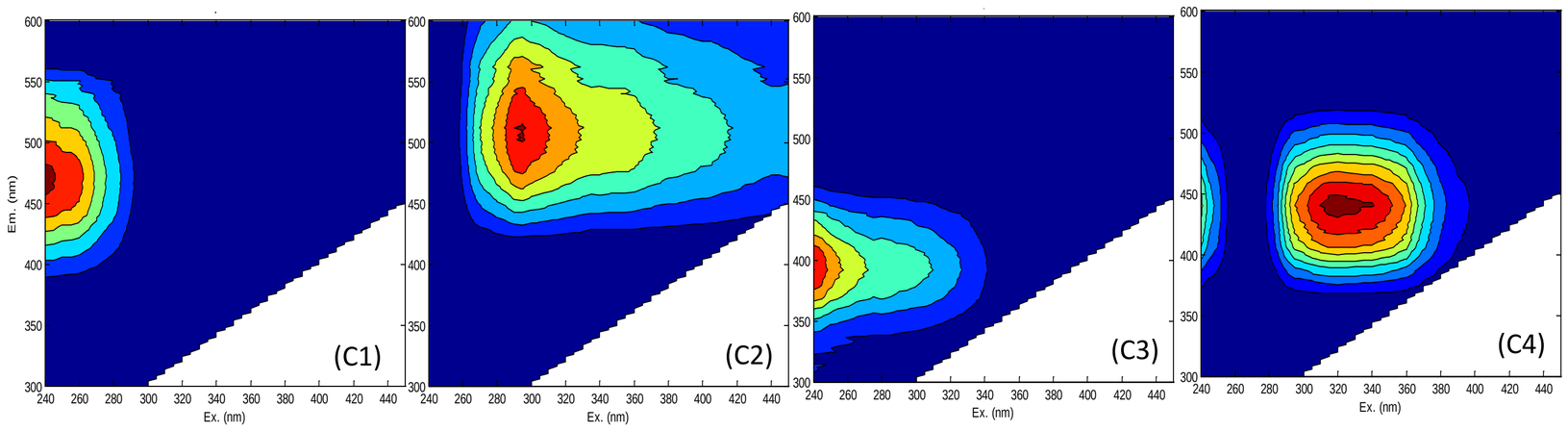


Fig 2. Split half analysis of four PARAFAC components. EEMs show the spectral characteristics of each component.

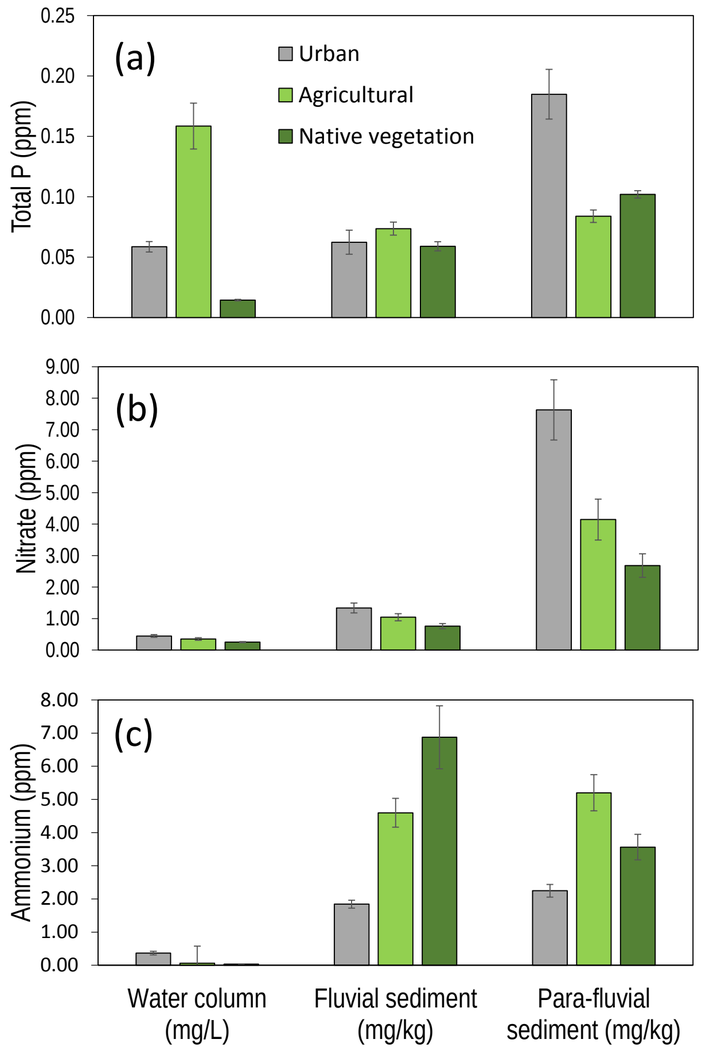
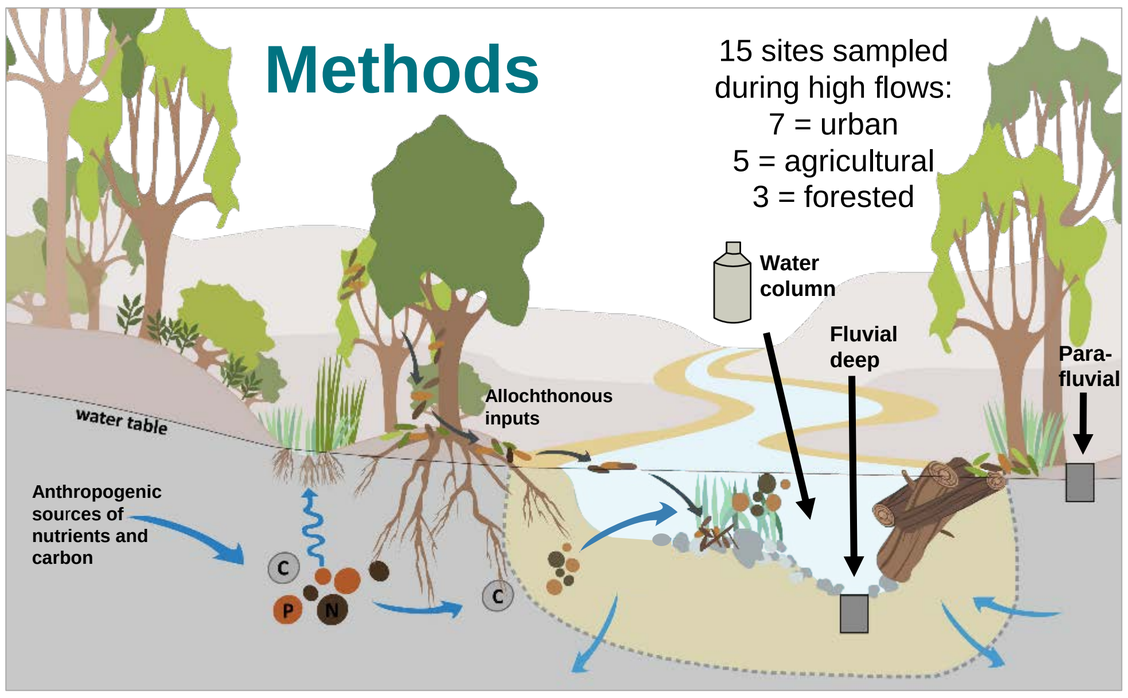


Fig 1. Distribution of nutrients (a) Pt, (b) NO_3^- & (c) NH_4^+ in the water column & sediments across land use types. Values presented are means (±SE).

Methods



Results

Site water & sediment biochemistry varies with land use type, although there is some overlap. Spatial allocation of nutrients is variable among land uses.

Urban sites display higher sediment phosphorous & nitrate. Agricultural sites display higher phosphorous & carbon in their water column (Fig 1). Total phosphorus is dominant in urban para-fluvial sediment & in the water column for agricultural catchments – likely due to fertiliser use. Nitrate and ammonium are dominant in sediments for all land uses but concentrations vary between fluvial & para-fluvial.

Organic matter is derived from allochthonous (terrestrial) sources across all land use types.

All components identified are humic-like. C1 & C4 are UVC humic-like, and C2 is UVA humic-like. All are aromatic & usually highest in wetlands & forested environments. C3 is also humic-like but less aromatic & common in wastewater & agricultural catchments (Fig 2). Low dissolved organic carbon in forested catchments - likely due to being locked up in particulates (i.e. leaf litter, branches, roots).

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