A lab based experimental study of a bioretention system to remove selected pharmaceuticals in stormwater

Theme: Emerging Pollutants in Aquatic Ecosystems

UNESCO-IWRA ONLINE CONFERENCE 17-19 JANUARY 2023 3rd IN THE IWRA ONLINE CONFERENCE SERIES

Aim & Objectives

This study aims to improve the understanding of using bioretention systems in removing or eliminating the presence of pharmaceuticals in stormwater.

- Determine the concentration levels of pharmaceuticals found in the stormwater.
- Investigate the influence of retention time and stormwater volume on the removal efficiency of the selected pharmaceuticals.
- Assess the effectiveness of turfgrass, Pennisetum plants, and soil media in removing pharmaceuticals from stormwater.

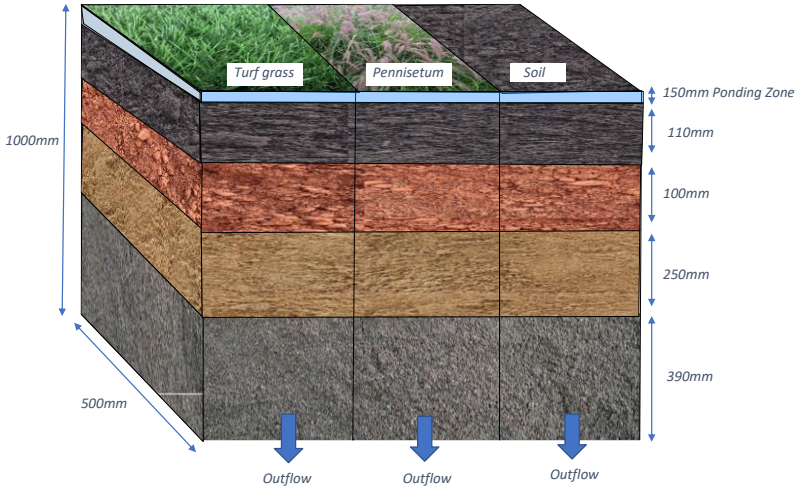


Fig 3. Schematic diagram of the bioretention system designed for this study

Study Area

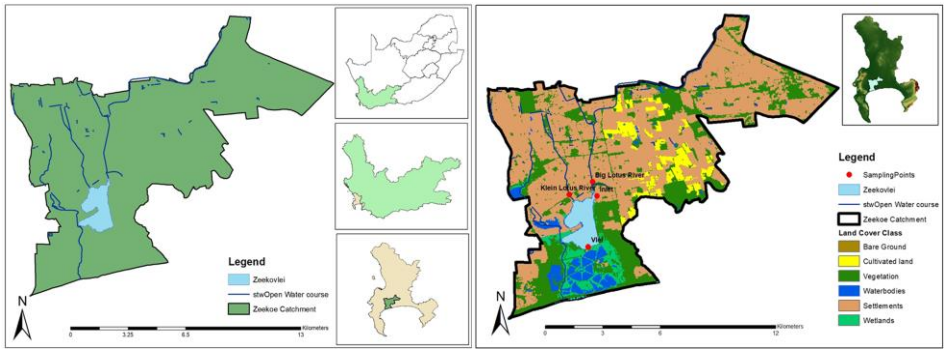
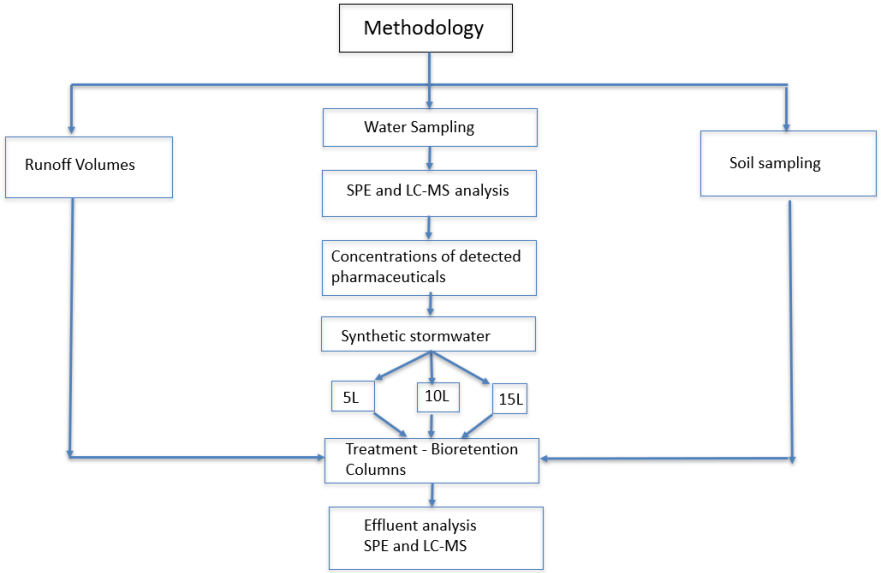


Fig 1. A) Location of the Zeekoe Catchment in Cape Town, in the Western Cape Province of South Africa. B) The locations of sampling points in the Zeekoe catchment.



Results & Discussion

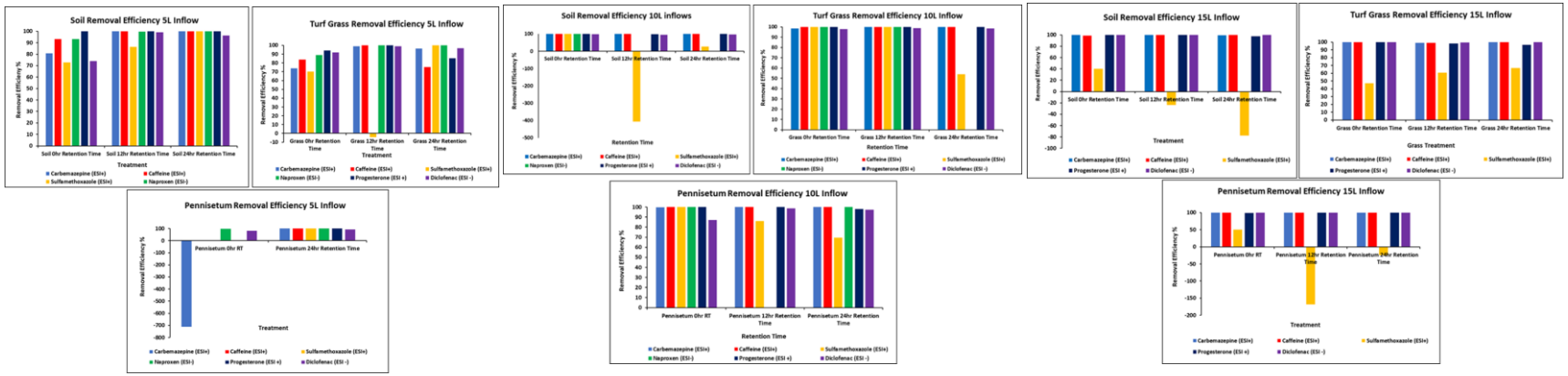


Fig 4: Removal efficiencies of pharmaceuticals by a soil and two planted lab-based bioretention column with three different retention times (5L influent: 0hr ,12hr and 24hrs RT).

- Results showed that the removal efficiencies of the selected pharmaceuticals followed the order of progesterone > naproxen > caffeine > diclofenac > carbamazepine > sulfamethoxazole with average removal efficiencies of 98.7%, 98.4%, 98.1%, 92.1%, 60.4% and 23.8%, respectively.
- Carb and Sulf - high resistance to breakdown and accumulate in soil. The results of the study demonstrated that bioretention systems containing different media such as soil and plants have the potential to provide a combined effect to enhance the removal of pharmaceuticals for stormwater reuse.
- It is suggested that the use of the bioretention approach is a promising technology in stormwater remediation and hence it needs upscaling in various areas.

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