Landscape features impact microplastic and nutrient patterns during wet deposition events via stormwater runoff

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Introduction

- Microplastic (MPs; plastic particles < 5 mm) pollution is ubiquitous in our modern world and has implications for ecosystem and human health alike. Microplastic pollutants enter the environment from anthropogenic sources through several pathways, including wastewater effluent (household, industrial, agricultural, etc.) plastic littering, and atmospheric deposition [1,2].
- During rain events, MPs and nutrient pollution can directly enter aquatic ecosystems, such as streams, lakes, and oceans, through a variety of pathways [3,4].
  1) Wet deposition: pollutants suspended in the atmosphere are transported to land through rainfall [4,5].
  2) Stormwater runoff: rainfall travels across the landscape and collects debris and pollutants from landscape features such as rooftops and agriculture fields [6].
- Research on the pathways of MPs into waterways is lacking studies on the connections between landscape features (e.g., buildings, trees, parking lots) and MP and chemical deposition patterns in stormwater runoff and wet deposition.

Objectives and Hypotheses

Objective: To study 1) microplastic abundance and particle characteristics and 2) nutrient concentration in building stormwater runoff.

Predictions:
  - Anthropogenic microplastics (AP) patterns in building stormwater will:
    - Be similar across building sites since sites are geographically close to one another. With similar patterns for nutrient concentrations.
    - Represent a diverse range of color, sizes, and morphologies, with plastic microfibers the most common particle type.

Methods

Sites:
- Samples were collected opportunistically from stormwater drainpipes from three different buildings on the CSUB Bakersfield (CSUB) campus on March 10th and 23rd, 2021 during rain events.

Microplastic Sample Collection and Processing:

Figure 1. Water samples were (a) collected during rain events and brought to the lab and stored in a freezer for 96 hours. (b) microplastics were separated and dried under a microscope (E). (c) particles were identified using a colorimeter method [1].

Table 1. Table 1. Description of statistics of nutrient concentrations in mixed stormwater and wet deposition samples (n = 3 samples per site); NM = number of samples; SD = standard deviation; SAM = standard of the mean; Max = maximum; Min = minimum; Letters indicate significant differences between sites for each nutrient parameter.