Reducing Plastic Debris in the Los Angeles and San Gabriel River Watersheds

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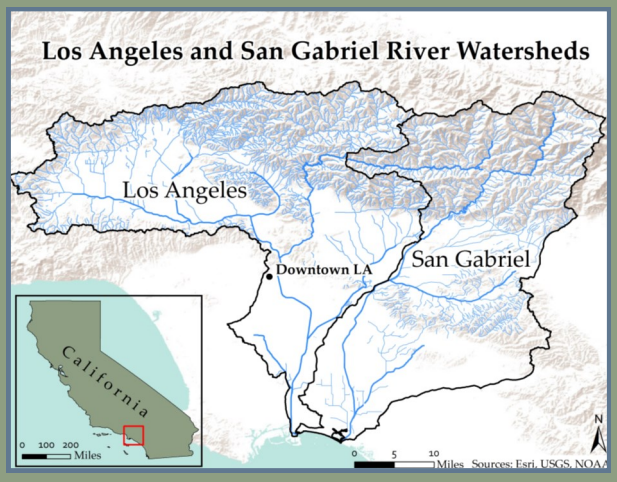
Bren Masters Project Brief

Purpose and Objectives

The overarching purpose of this project was to conduct an analysis of the sources and movement of plastic debris in the Los Angeles and San Gabriel River Watersheds, and to examine and recommend policies to reduce the amount that enters the waterways and thus has the potential to end up being discharged to the Pacific Ocean. To our knowledge, this is the first project of this type to focus locally on the source, impacts, and transport of plastic debris in a highly urbanized region.

Plastic debris has the potential to negatively impact marine and terrestrial ecosystems, and has social impacts through degraded beaches, declining real estate values, and detrimental health effects.

We conducted an analysis of the sources and movement of plastic debris in the Los Angeles and San Gabriel River Watersheds and recommend 16 action items, based on a qualitative assessment of feasibility and effectiveness, to reduce plastic debris. These action items have the potential to substantially reduce the flow of plastics to the ocean, beaches, and rivers, benefiting a wide range of local stakeholders, and setting a precedent for the application of this type of assessment and implementation in similar highly urbanized watersheds.



Methods

Given the broad scope of the project, multiple methods were used to collect and analyze information and data related to plastic debris. Interviews with more than 60 professionals with knowledge of plastic debris and/or policy were conducted, and an extensive literature review related to the current knowledge of the issue was completed. To complement this information, visits to both watersheds and a plastic production facility were used to enhance our understanding of plastic debris in the region. Data on plastic debris quantity and characterization was collected from government and nongovernment agencies. The data were then analyzed using various statistical methods. Finally, all of the previous research and findings were synthesized into policy recommendations, ranked by feasibility and effectiveness.

General Findings

Magnitude of the Plastic Debris Problem

- Plastic is ubiquitous on beaches, in rivers, on city streets, and in the ocean
- Plastic is transported by wind and water to the environment
- Plastic production has increased by ~5% per year for the past two decades
- The supply of new plastic products maintains a steady stream of plastic debris
- Population density is positively correlated with increased plastic debris levels

Land-Based Sources of Plastic Debris

- ~50% of the trash entering the ocean is from land-based sources
- ~50% of trash found in beach and river cleanups is plastic debris
- ~50% of that trash is plastic debris
- ~50% of all plastic debris is single-use packaging items
- Single-use plastic packaging is commonly littered

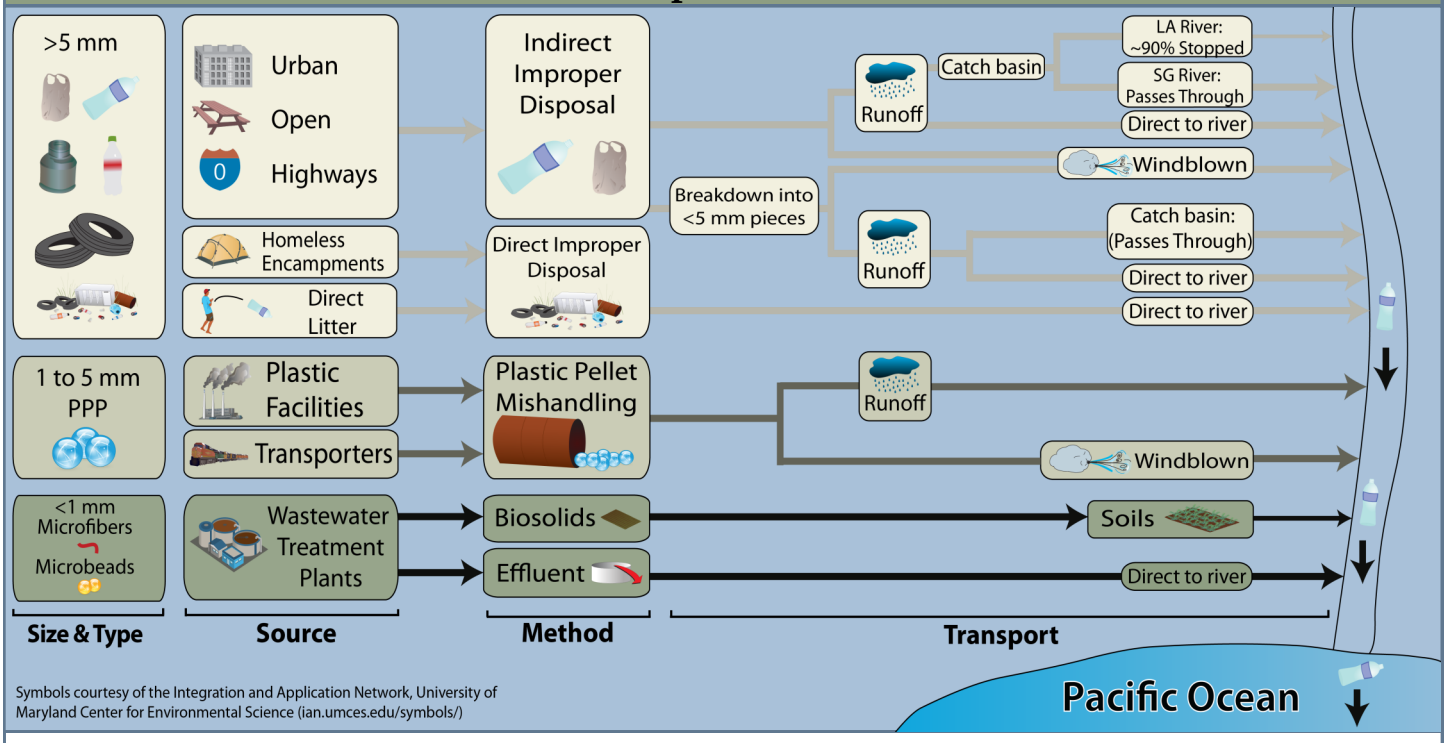
Impacts of Plastic Debris

- Plastic debris impacts wildlife through ingestion and entanglement
- Plastic debris persists in the environment for tens to hundreds of years
- Plastic debris transports invasive species
- Plastic pollution poses risks to human health
- Plastic pollution cleanup efforts have significant economic impacts

The Costs of Litter

In California, waterway and beach cleanups, street sweeping, storm drain cleaning and maintenance , manual cleanup, and anti-litter campaigns cost over $400 million per year.

Conceptual Model

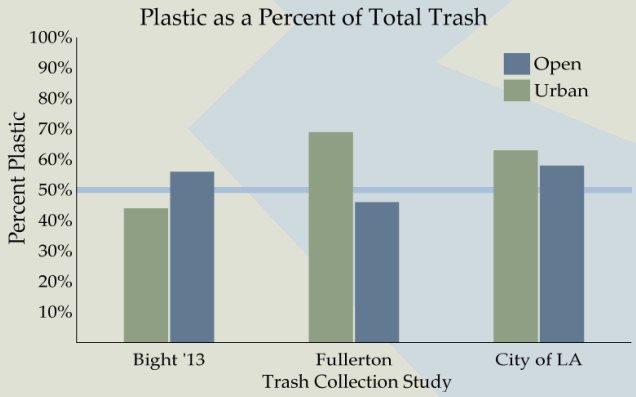


This model represents the flow of plastics from different sources into local waterways

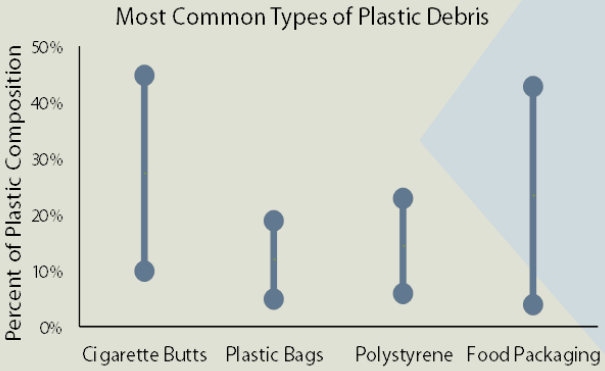
LOS ANGELES AND SAN GABRIEL RIVER WATERSHED FINDINGS

Dense urban landscapes are often associated with more impervious surfaces which increase runoff, a primary transport mechanism of plastic debris. This runoff may be stormwater from intense winter storms or from general water use during the dry season, such as landscaping, street cleaning, and car washing. Both types of runoff can transport plastic debris that has been collecting on city streets to the Los Angeles and San Gabriel Rivers through storm drains. Plastic debris can also be transported to the rivers via wind action and by people dumping trash directly into the rivers.

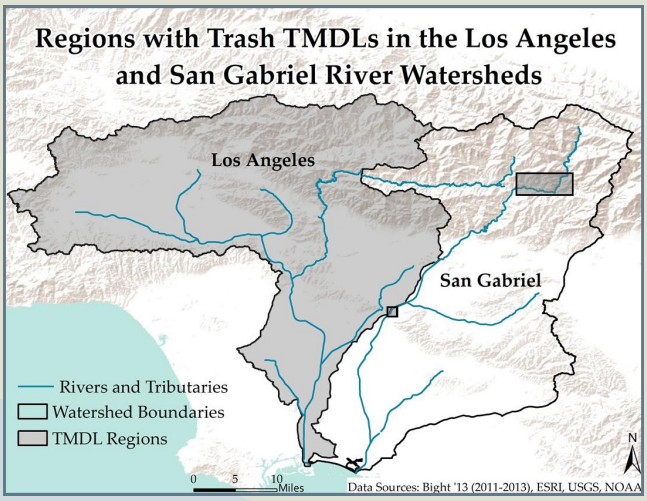
Littering is one of the largest sources of plastic debris. While millions of littering events occur every year in the Los Angeles region, only an estimated ~7,000 citations are issued. Plastic debris makes up ~50% of all littered trash in the watersheds.



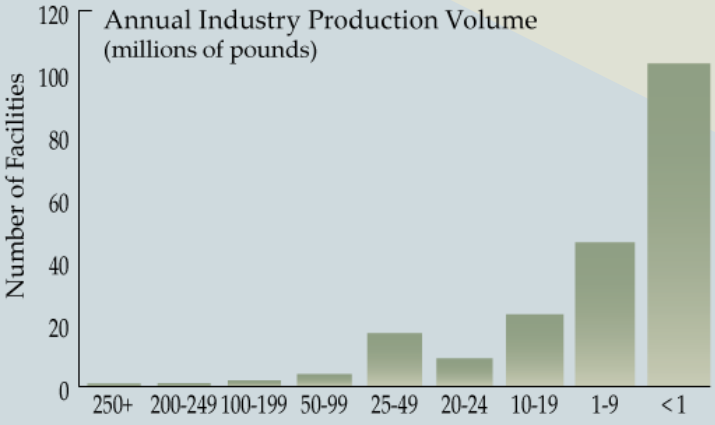
The four most common types of plastic debris were found to be **cigarette butts, polystyrene, food packaging, and plastic bags**. These items all share the same characteristic of being single-use items.



The Los Angeles region attempts to address the plastic debris problem through Trash **Total Maximum Daily Loads** (TMDLs), but the San Gabriel region has only two regions covered under such trash load limits.



Another source of plastic are preproduction plastics. Preproduction plastic **spills are common within the industry** and the high volume of small producers makes monitoring and enforcement.



Microplastics such as microbeads (used in cosmetics) and microfibers (used in clothing) are an emerging type of plastic debris. We estimated that approximately one billion microplastics have the potential to be discharged annually into the Los Angeles and San Gabriel River Watersheds from wastewater treatment plants.

Recommendations

This project culminated in a suite of 16 recommended action items, ranked through a qualitative assessment of feasibility and effectiveness based on our findings. The recommendations were placed into three tiers. For feasibility, political and economic criteria were used. Effectiveness was based on an assessment of the likely impact on reducing plastic debris.

TIER 1 ACTION ITEMS

1. **Increase litter law enforcement, outreach, and education** using a civil administrative approach, continuance of the "Erase the Waste" campaign to ensure ongoing anti-littering messaging, and expansion of K-12 environmental education.
2. **Ban single-use plastic grocery bags and polystyrene containers (e.g., Styrofoam™)** which are common litter items; bans have already been successfully enacted in numerous cities throughout California.
3. **Implement a comprehensive San Gabriel River Watershed Trash Total Maximum Daily Load** that addresses trash that is smaller than 5 mm in size, includes open space recreational areas, and mandatory monitoring.
4. **Reduce single-use plastic items** through point-of-sale fees, expansion of the California Redemption Value program, and container exchange programs.
5. **Collect information to better track plastic facilities** by adding a checkbox on business license forms to identify preproduction plastic facilities to compile a shared database to better track these facilities.

TIER 2 ACTION ITEMS

6. **Amend the Los Angeles River Watershed Trash Total Maximum Daily Load**
7. **Collect better data and standardize protocols**
8. **Advance extended producer responsibility programs**
9. **Increase recycling efforts**
10. **Improve participation and establish metrics for the Operation Clean Sweep industry program**

TIER 3 ACTION ITEMS

11. **Incentivize plastic packaging innovations**
12. **Address litter from homeless encampments through data collection and outreach**
13. **Enact comprehensive statewide plastic debris legislation**
14. **Improve the Long Beach trash boom and add additional trash booms**
15. **Declare plastic as a hazardous substance**
16. **Develop marine biodegradable plastic materials**

Acknowledgements

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