# Building Community Solutions to Marine Litter

## Case Study
## Salish Sea Watershed


### Communities targeted by the project:

- Metro Vancouver, British Columbia and Whatcom County, Washington
- 2.7 million people, 28 municipalities and several Tribes and First Nations

Marine litter and plastic are now found in every marine environment, from the polar regions to the deep ocean, and in all levels of marine life, from zooplankton to fish, seabirds, whales and even seafood. About 80% of all marine litter, most of which is single-use plastic, originates from land and enters the ocean through inadequate waste management, littering, or illegal dumping in communities located in coastal areas and inland watersheds. Litter can find its way to the ocean through various pathways, either directly from shorelines or indirectly via inland waterways. To put an end to marine litter, we need to engage locally with communities to reduce land-based litter and stop it from reaching waterways and the ocean.

Using a multi-stakeholder engagement process, stakeholders in the Salish Sea watershed designed and implemented local, low-cost and low-technology solutions to address local marine litter issues. Tackling marine litter involves many levels of government and diverse stakeholders, and can be most effectively addressed through collaborative action, especially when doing so in a transboundary watershed like the Salish Sea. This approach recognizes that local action is essential to solving marine litter, and can be replicated in all communities in North America.

## North American Cooperation on Marine Litter

In 2017, the Commission for Environmental Cooperation (CEC), through its lead agencies, Environment and Climate Change Canada, the Mexican Ministry of Environment and Natural Resources, and the United States Environmental Protection Agency, launched a project to build community solutions to marine litter in the Tijuana River and Salish Sea watersheds, two ecologically rich, economically important transboundary areas.

## The Salish Sea Watershed

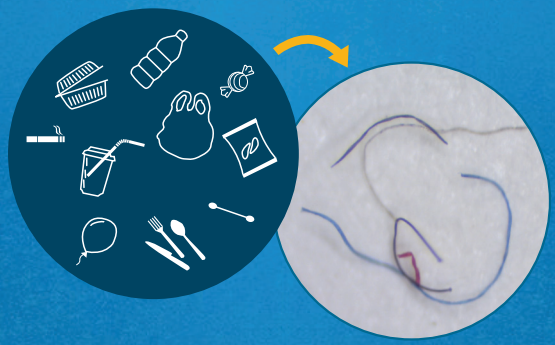
Over 7 million people live within the drainage basin of the Salish Sea, which spans 110,000 km$^2$ across the Canada-US border and includes the cities of Vancouver, Seattle, Victoria, Olympia, Nanaimo and Bellingham. The watershed is comprised of hundreds of rivers that flow into the straits of Georgia and Juan de Fuca before reaching the Pacific Ocean. These inland rivers carry with them litter that ends up as marine litter and microplastic in the Salish Sea.

## Getting Stakeholders Involved

In May 2018, stakeholders from Metro Vancouver and Whatcom County, including representatives from local, provincial, state and national governments, industry, nonprofit organizations, and youth groups, indigenous leaders and academics, were brought together to discuss sources of, and solutions to, marine litter in the Salish Sea watershed. After sharing information on litter of concern, such as single-use plastics, cigarette butts, microplastics from textiles, particles from tires and artificial turf fields, and litter from stormwater drains, the stakeholders identified 25 local actions, including six that were low-cost and low-technology.

## Low-cost and Low-technology Actions to Prevent Litter in the Salish Sea Watershed

- Create a "skip the line" system at coffee shops for those with a reusable mug.
- Promote the use of a recycling bin sorting game to improve sorting performance.
- Inform the public that cigarette butts contain plastic and harm the environment.
- Create cigarette butt-free zones with local partners.
- Educate the public about microfibers and on how to reduce their shedding from clothing.
- Conduct a characterization of litter in storm drains.



# The Marine Litter Problem

Every year about **8 million metric tons of plastic waste enters the ocean from land**[1]. Marine litter has significant impacts on ecosystems and economic activity. Plastic or other littered items can entangle or be ingested by wildlife, and affect the tourism and fishing industries, among others. Plastics are persistent and can break down into small pieces that accumulate in the environment and enter the food chain. Most marine litter comes from consumer products, often single-use items, reaching the ocean from the watershed.

1. J. R. Jambeck, R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, K. L. Law. 2015. *Plastic waste inputs from land into the ocean*. Science, 347 (6223): 768

# Getting to Know Your Litter

To increase awareness and engage with the public, two citizen science events were organized at Jericho Beach Park, in Vancouver, British Columbia, and in Heritage Park, in Bellingham, Washington, to collect and characterize litter items using the Great Canadian Shoreline Cleanup methodology. During these events, cigarette butts, single-use plastics (e.g., food wrappers, bottle caps, and plastic bags) and tiny pieces of foam were among the most commonly found litter items. At both sites sampled within the study area, single-use plastics were the most common land-based litter; these items can easily end up in the ocean via streams, rivers and stormwater.

In addition to these two cleanups, micro (< 5 mm) and small macro (≥ 5 mm) plastic fragments were collected at Jericho Beach Park and analyzed in a laboratory to identify their polymer type and origin product. The study found that small plastic fragments of various types and sizes were present throughout the park, and could easily be carried from there by runoff or wind into the Salish Sea.

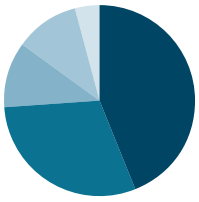
## Microplastics:

- Microplastic pieces (up to 68 per 50g of soil) were present in soil samples throughout the park in locations where there is potential for this litter to migrate into nearby waterways and the marine environment.
- 81% of the particles were fibers, and of these, polyester was the most common polymer, followed by polypropylene.
- Abundance of microplastics between different sites was not correlated to proximity to high traffic or litter areas. However, green fibers were collected adjacent to an artificial turf sports field, making it the likely source.


## Macroplastics:

- Small plastic fragments consisted of polyethylene, polypropylene, polyvinyl chloride, polyethylene terephthalate and polystyrene, of which most single-use products are made.
- The origin products of these fragments were identified as candy bar wrappers, straws, lids, cigarette filters, and thin plastic bags, among others.
- The composition of these fragments was similar to the litter items that were recorded at the park that same day, which suggests that littered plastic does not degrade completely and can fragment further on land in areas where it can then migrate to the Salish Sea watershed.

## Polymer types of microplastic particles found in Jericho Beach Park soil samples

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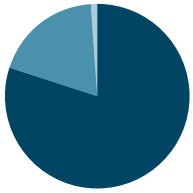
**Polyester:**
Synthetic textiles, curtains, furniture, carpet, ropes and netting

**Polyethylene:**
Tubs for yogurt, milk jugs, shopping bags, detergent and shampoo bottles, packaging film, food storage bags, and squeeze bottles

**Polypropylene:**
Chip bags, straws, insolated coolers, toys, cups, plates, cutlery, fruit and vegetable packaging, and bottle caps

**Acrylic:**
Synthetic textiles, and food packaging

## Shape of microplastic particles found in Jericho Beach Park soil samples

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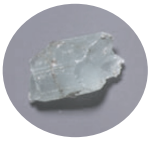
## Microplastic shapes: fiber, fragment and foam[2]

Fiber



Fragment

Foam

2. Wu, Chenxi, Zhang, Kai and Xiong, Xiong. 2018. Microplastic Pollution in Inland Waters Focusing on Asia, in Wagner, M. and Lambert, S. (eds.) 2018. Freshwater Microplastics: Emerging Environmental Contaminants? Springer, Charm. DOI: 10.1007/978-3-319-61615-5

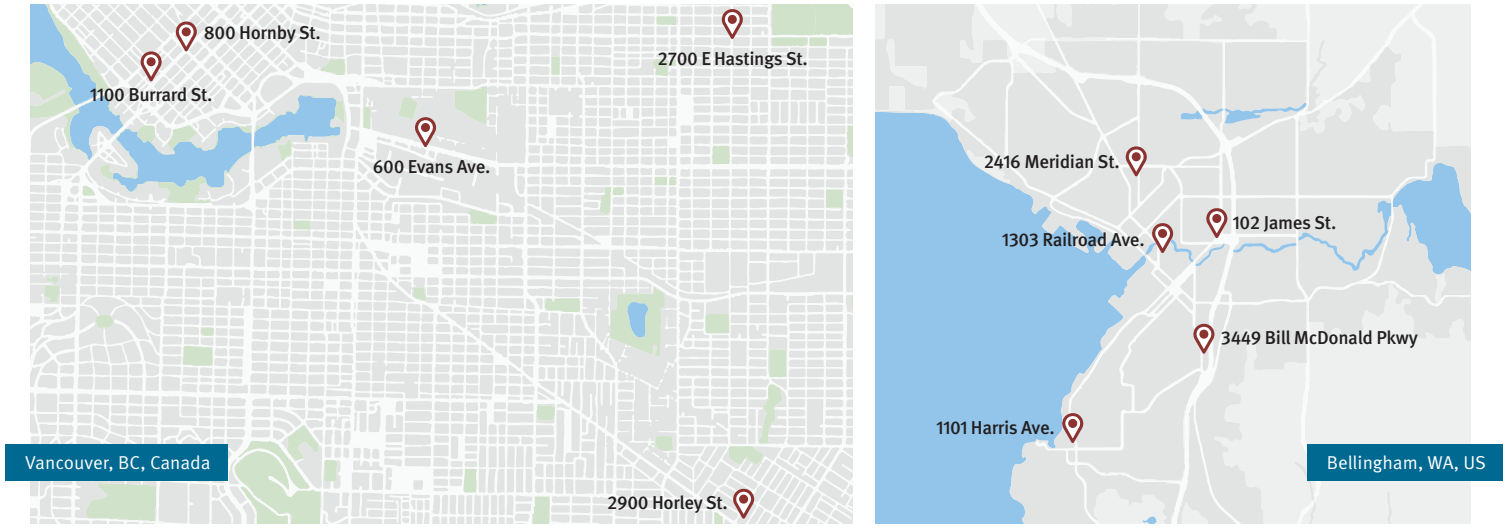
# Looking for Litter in Stormwater Drains

In close collaboration with city officials, a pilot study was conducted in Vancouver and Bellingham to gather information on the amount, types and sources of litter entering stormwater infrastructure. Litter in ten storm drains (5 in each city) was collected over a period of 2 weeks and categorized according to the Great Canadian Shoreline Cleanup data card. Cigarette butts were the most common type of litter found in both cities, followed by paper scraps and single-serving food packaging. Food-packaging litter was typically most prevalent in commercial areas near fast food restaurants and other businesses selling packaged food for takeout. Overall, more litter was found in Vancouver, with the most items captured after heavy rainfall and in commercial areas. This study shows that storm drains can act as pathways for land-based litter to enter the Salish Sea watershed.

## Storm Drain Catchment Devices

One way to intercept litter from entering stormwater drains is by installing catchment devices. For this study, the cities installed large filters[3] underneath the storm drain grates using straps. Although their permeable fabric and overflow ports were designed to let water through, some of the filters clogged or ripped due to the fine mesh size, or to large amounts of leaf and soil debris accumulated after heavy rainfall. In other cases, the straps securing the bag to the drain grates were a tripping hazard for pedestrians. Given that the study region receives high precipitation, a stacked device composed of robust filters, of varying pore size, may be more suited to studies of this type in the future.

## Location of storm drain filters in the City of Vancouver, BC, and Bellingham, WA




3. Filter model: woven nylon, 0.4 mm mesh, GEI Works, US

Find out more information at **<www.cec.org/marinelitter>**


### Commission for Environmental Cooperation

This brochure was prepared for the Commission for Environmental Cooperation (CEC) as part of the 2017–2018 project "Building Community Solutions for Marine Litter", implemented in partnership with Environment and Climate Change Canada, Mexico's *Secretaría de Medio Ambiente y Recursos Naturales* (Ministry of Environment and Natural Resources), and the U.S. Environmental Protection Agency. The CEC facilitates collaboration and public participation to foster conservation, protection and enhancement of the North American environment for the benefit of present and future generations, in the context of increasing economic, trade, and social links among Canada, Mexico, and the United States. To date, the CEC has published over 400 reports, maps, tools and resources related to the North American environment, all accessible at **www.cec.org**.

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