CANADIAN WILDLIFE HEALTH COOPERATIVE

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WILDLIFE INGESTION OF MICROPLASTICS

CAUSE

Plastics include a broad range of synthetic or semi-synthetic organic compounds typically made from petrochemicals. Since mass production of plastic began in the 1950's, human reliance on the affordability and versatility of these products has never diminished. Plastic offers a seemingly endless opportunity of use, due to different polymer compositions, that can be optimally modified through chemical additives and plasticizers. Global demand for plastic products continues to increase, amassing to million of tonnes being produced every year. However, the durability of plastic products ensures longevity after their intended use. In Canada, approximately 1% of plastic waste enters aquatic and terrestrial environments, amassing to 29,000 tonnes in 2016 (Government of Canada, 2020). The advanced polymer compositions and additives give plastic products extended longevity, leading to their persistence in natural ecosystems. Targeted solutions addressing plastic pollution are difficult due to our heavy reliance for everyday use. Additionally, the problem with plastic extends to include the emergence of microplastics and their interactions with the environment and biotic organisms. Plastic products are prone to break down into smaller plastic particles over time, through mechanical and chemical degradation, eventually leading to the creation of these microplastics. Due to their small size, microplastics are ingested by wildlife both intentionally as mistaken food sources, and unintentionally through trophic transfer and accidental ingestion.

WHAT ARE MICROPLASTICS?

Larger plastics can entangle wildlife and cause mortality, but recent investigations have looked into smaller plastic fragments called microplastics, and their impact on wildlife health. Microplastics are small, plastic fragments that are less than 5mm in size. Further classification of microplastics stems from their sources. Microplastics can be classified by their origin, as primary or secondary microplastics. Primary microplastics are specifically designed, small plastics intended for commercial use, such as cosmetics in the form of exfoliative beads. Secondary microplastics result from the fragmentation of larger plastic products, through physical environmental weathering factors such as erosion from water movement and chemical factors like UV light.

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Microplastics can also be classified by their function, as user plastics, industrial plastic pellets or microbeads. User plastics are all non-industrial remains of plastic products and can be further divided into subtypes such as sheet plastic, threadlike plastic, hard fragments and foams. Industrial plastic pellets are small, typically cylindrical shaped microplastics that are used to create plastic products. Microbeads are a manufactured, solid plastic that are used in a variety of toiletries and cosmetics such as skin cleansers and toothpaste.

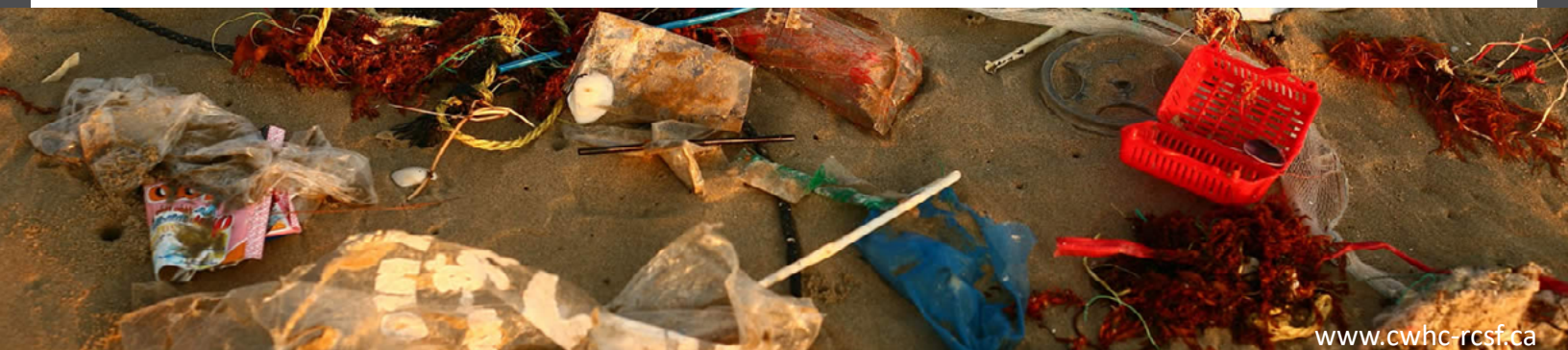
HOW DO MICROPLASTICS ENTER THE ECOSYSTEM?

Plastic debris has been found in a variety of different ecosystems, from the Arctic to the deep ocean. Concentration of plastic litter is greater in densely populated, urban centers but can still accumulate in remote areas such as oceanic gyres. Plastic pollution has been extensively studied in the Earth's oceans, but freshwater and terrestrial environments still contain abundant plastic particles. The fate of macro- and microplastics is heavily dependent on the nature and location of their source as well as environmental factors such as wind patterns and water currents.

Another influencing factor in their detection is their polymer composition. Common polymers include polyethylene, polypropylene and polystyrene. The density of these polymers, along with any chemical additives, dictate the buoyancy of plastic particles in aquatic systems, an important element in their environmental distribution. Low density polymers allow microplastic particles to be suspended in the water column and float on surface water while higher density polymers cause microplastics to sink into sediments and sand. Microplastics are the least likely to be collected in clean-up efforts due to their small size, perpetuating their presence in the environment. Additionally, microplastics can pass through wastewater treatment facilities which are not designed to retain them.

HEALTH AND WELFARE IMPACTS

Large plastic products cause obvious negative health and welfare issues through entanglement and ingestion. However, the impact of microplastics on wildlife is more difficult to assess and is a relatively new research area. Microplastics that are ingested can block the gastrointestinal (GI) tract of small birds and fish and can also cause physical damage internally such as lacerations or irritation to sensitive GI tissues. Microplastics do not provide any nutrition to wildlife and when ingested can lead to a false feeling of satiety. By infiltrating an animal's diet,



microplastics can cause a decrease in physical condition, resulting in increased morbidity and mortality. This can also impact reproductive success, impacting population dynamics.

Microplastics act as both a source and sink for toxic agents that harm wildlife. Chemical additives and heavy metals pollute the environment by leaching out of plastics as they become fragmented. Chemicals and heavy metals can also be adsorbed from the environment into microplastic particles, which can then be transferred to organisms. Wildlife may be exposed through direct ingestion (mistaking microplastic as prey or food), indirect ingestion (trophic transfer of microplastics) and through dermal exposure. This can result in bioaccumulation and biomagnification of these toxins, perpetuating the impact of microplastics within the food chain.

WHAT CAN YOU DO?

- Reduce your personal use of single-use plastics and properly dispose of plastics
- Report illegal dumping of plastics to the appropriate authority
- Participate in the Great Canadian Shore Line Cleanup for your local area

REFERENCES AND SUGGESTED READING

- Environment and Climate Change Canada. (2020). Science Assessment of Plastic Pollution. Government of Canada. **https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/science-assessment-plastic-pollution.html**.
- Canada's Plastics Science Agenda: **https://www.canada.ca/en/environment-climate-change/services/science-technology/canada-science-plastic-agenda.html**
- Plastic Pollution – Information Sheet: **https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/chemicals-glance/plastic-pollution.html**
- Ocean Plastics Charter: **https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html**