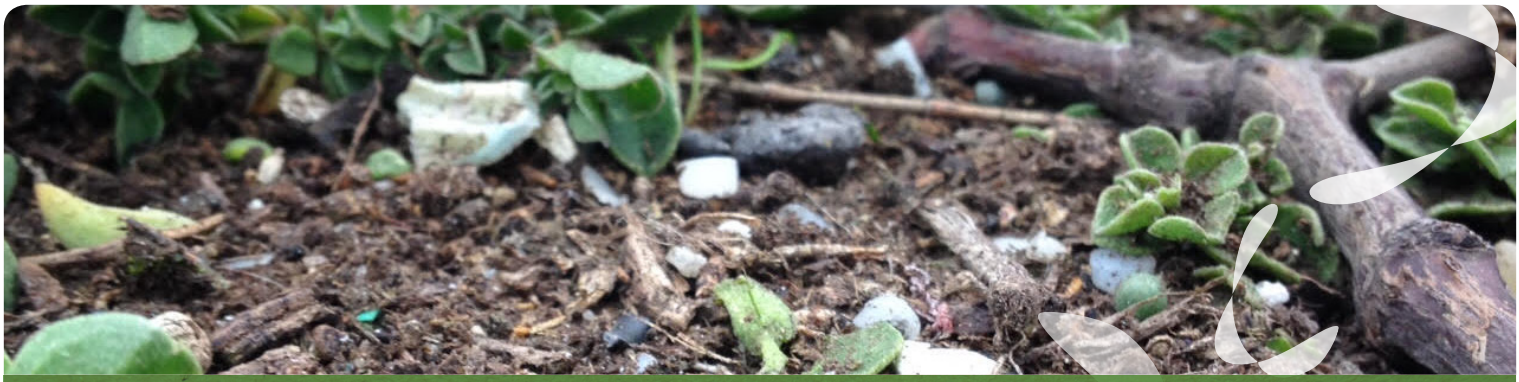


Marine Impacts of Microplastics

Small plastics are a big problem in waterways

Why?

Microplastics include plastic resin pellets (PRPs or nurdles), polystyrene beads, styrofoam or other plastic fragments smaller than five millimeters which can be easily swallowed by wildlife. When marine species mistake them for food they can cause intestinal obstruction, ulcerations, malnutrition and death.

The Litter Hotspots Program, funded by the Victorian Government and delivered by MWRRG, has assisted groups including Tangaroa Blue and Port Phillip EcoCentre to research microplastics influx to Port Philip Bay; and to run programs to counter microplastics.

Tangaroa Blue works closely with industry (see separate Case Study 'Engaging Industry') and Port Phillip EcoCentre assisted their project. Port Phillip EcoCentre, as part of its Litter Hotspots 'Turn off the Tap' project, worked with Yarra Riverkeeper to conduct trawls to measure levels of microplastics in the Yarra and Maribyrnong Rivers. Port Phillip EcoCentre and other volunteers also conducted regular audits at beach, river and drain sites with the aim of creating informed local strategies to address the microplastics problem.

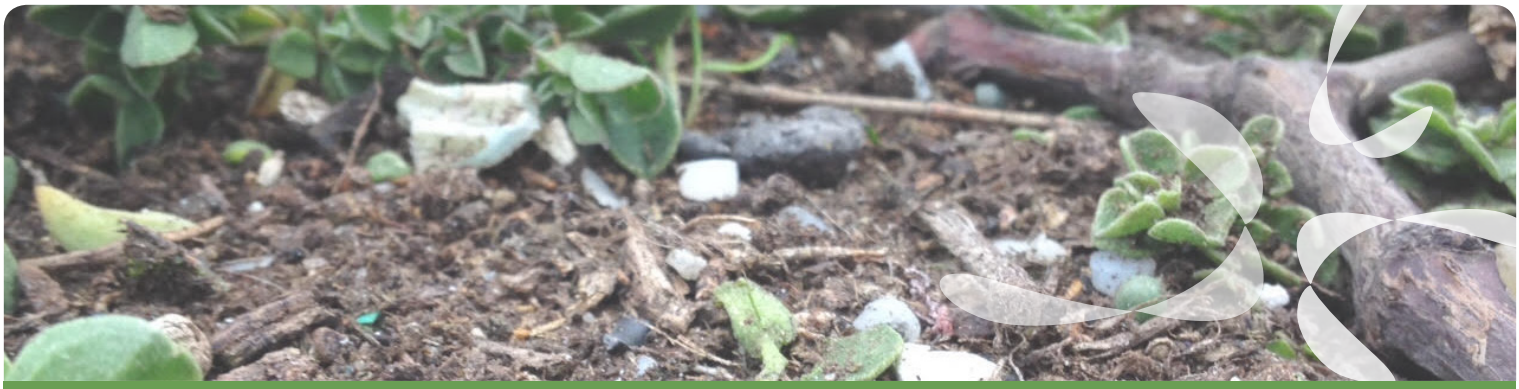
How?

The Yarra Riverkeeper patrol boat conducted monthly 30-minute trawls in both the Maribyrnong and Yarra Rivers between January 2015 and May 2017. Sites close to the lower reaches of each river were chosen because they are indicative of each catchment's total litter load.

An internationally accepted net was used, designed to capture items on or just below the water's surface. Due to the net's small size and the limited number of trawls, the data collected is an indicative sample of microplastics in the rivers.

As rainfall carries increased amounts of microplastics from streets to waterways and the trawls did not coincide with rain events, it was understood the data represents background levels of microplastics. Trawl samples were analysed with the naked eye and litter items separated from organic matter with tweezers. Litter was then sorted by type, and diameters measured if needed.

Tangaroa Blue's initial finding of nurdles on Port Phillip Bay beaches in 2010 led them to the internationally successful 'Operation Clean Sweep' protocol, which outlines simple steps for industry to prevent nurdles escaping to waterways. The MWRRG administered Litter Hotspots Program has enabled Tangaroa Blue to work with local industry to adopt this protocol (see separate Case Study).



During the ‘Turn off the Tap’ project, Port Phillip EcoCentre and other volunteers (including school students) collected microplastics from Port Phillip Bay locations. Sampling sessions usually lasted between 15 minutes and an hour, and any major weather events were noted.

Port Phillip EcoCentre also delivered promotional and educational activities to limit litter as part of its ‘Turn off the Tap’ project. These included schools and public screenings of Baykeepers (a local documentary on action to keep Port Phillip Bay clean), hired The Connies for community events, and assisted MC Guttermouth, MOOP Patrol to record (and video) a song, ‘A Little Bit of Litter Doesn’t Matter’; and school appearances by Captain Trash .

What were the results?

Between January 2015 and March 2017, 3762 litter items were collected in Yarra trawls, with an average of 145 items collected monthly. The most frequently captured litter item in the Yarra were hard plastic remnants <2mm in width (1689 pieces) and styrofoam beads (690). In the Maribyrnong, 2678 litter items were collected in trawls with an average of 112 items collected monthly. Hard plastic remnants <2mm in width (972 pieces) and cellophane fragments (368 fragments) were most frequently captured. Microplastics comprised up to 12% of captured content mass. Because the rivers’ widths are more than 150 times wider than the net, the actual volume of plastics in both rivers is astounding.

In regard to beach, river and drain site audits, more than 5.8 tonnes of waste were collected between 31 January 2015 and 30 May 2017. Of these items, 40,000 PRPs were collected, with the highest number in one session being more than 5,000 on St Kilda West Beach.

A spike in the number of PRPs was usually found in the high-tide line a few days after extreme weather events that included rain and/or strong winds, but none were found during prolonged dry spells.

Recommendations for the future

Two volunteers were involved in sorting samples from the trawls and their methodology was consistent. Microplastics terminology, collection and sorting methods can vary greatly between individuals and organisations, so it is important to standardise them to improve data robustness and reusability.

Likewise it is important to standardise beach, river and drain site audit collection methods to accurately quantify litter content and volume; and to track microplastics to their source. With these issues in mind, Port Phillip EcoCentre has developed microplastics audit methods for beaches, river and creek banks, and streets, using the same terminology as Tangaroa Blues National Marine Debris Initiative database.

There are large numbers of PRPs in Port Phillip Bay and the audits consistently found them in all colours and sizes, indicating that their presence is ongoing and not the result of a one-off incident. The only way to stop PRPs and other microplastics from damaging wildlife is to stop them at the source. While a small percentage of microlastics in the Bay may come from shipping, most enter the Bay via waterways and drains from the Greater Metropolitan Melbourne region.

Ongoing monitoring is vital to evaluate the impacts of initiatives aimed at reducing microplastics in waterways, including Tangaroa Blue’s Operation Clean Sweep.