

Unmanaged Litter and its Effects on Living Beings



Mary Rayner
Stormwater Shepherds

Stormwater Shepherds are a global environmental charity. We are committed to restoring inland waterway environments by stopping plastic litter and urban pollution at the source – the home, the business and the stormwater drain.

Our goals are to -

1. Provide solutions to decision-makers on how to fund and manage stormwater correctly
2. Share our knowledge to encourage community members to be more aware of their contributions to increased stormwater quantity and decreased water quality.

Impacts from Litter

Plastic litter causes decreased water quality and -

1. Impacts on the health of animals and plants.
2. Threats to human health through eating contaminated seafood and swimming in polluted creeks & rivers
3. Creates negative economic impacts
4. Impairs recreational uses
5. Increases potential for lawsuits

The UN has noted that lawsuits are increasing against governments and private companies for fundamental human rights, including clean water, and safe food. Climate science is supporting these lawsuits that could help save the planet.

Nearly every piece of plastic manufactured on this planet is still here with us today, in some form. Annually 400 million tonnes of plastic are manufactured across the planet and by 2040 this is projected to increase to 800 million tonnes.

Each year [8 million tonnes](#) of plastic litter enter our waterways and oceans, and stormwater is the major transporter. We know 80% of ocean

litter comes from the land, and the other 20% is from ships and platforms. At this current rate ocean plastic litter will triple by 2040—reaching about an outrageous 29 million tonnes of marine plastic per year.

Stormwater is rainwater that falls on impervious or hard surfaces, carrying all types of pollution into stormwater networks. Hard surfaces are usually human-made.

Land-based plastics are tossed away and litter our streets, regularly ending up in storm drains or nearby waterways. Wind can carry litter from garbage trucks and open landfill sites into the environment. Plastic litter that ends in stormwater is particularly problematic as these waterways flow into creeks, rivers, bays harbours and our oceans. Recently, scientists have learned that 80% of ocean-bound plastic waste comes from [1,000 rivers worldwide](#).



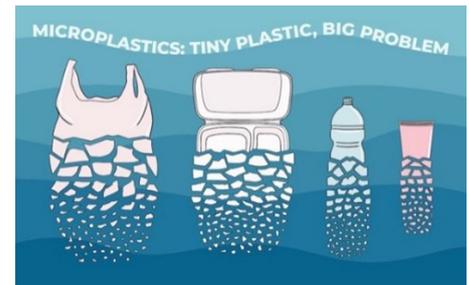
Taret River flows into Uru Uru Lake Oruro, Bolivia - Thursday, March 25, 2021

When exposed to sun and heat, plastic litter immediately starts to emit greenhouse gases – methane and ethylene. Methane, CH₄, is a huge worry as its warming effects are 80 times more powerful than carbon dioxide in the first 20 years of reaching our atmosphere.

Microplastics

All plastic litter breaks up into little pieces when exposed to natural elements (e.g., waves, water, winds, sunlight). These small pieces are known as micro and nanoplastics.

Microplastics are any piece of plastic with a length [less than 5 millimetres](#) or smaller than the size of a sesame seed. Nanoplastics are less than 1 micron in size.



Single-use plastic breaking up into microplastics

Both macroplastics and microplastics cause irreparable damage to the planet's natural ecosystems that we depend on for our existence. We are now learning they are also a health threat to humans.

Microplastics have been found in soil from wastewater sludge and stormwater. Research from Italy has even found microplastics in the fruit and vegetables that we eat.



Microplastic fragments are less than the size of a sesame seed.

Litter Case Study Blackbutt Creek, Ku-ring-gai

Blackbutt Creek is a stormwater network in Pymble and flows into Lane Cove River and then Sydney Harbour. Powerful owls, echidnas and wallabies frequent the area.

The creek flows through my property, and I have been the creek's keeper for the last 10 years.

Unmanaged Litter and its Effects on Living Beings



Mary Rayner
Stormwater Shepherds



Plastic pollution in Blackbutt Creek.

An unfinished development has increased water quantity to the creek and is depositing litter higher up creek banks and in bushes from heavy rains. Creek banks are becoming severely eroded.



Increased water is causing bank erosion.

Sediment is also being flushed from the unfinished development into Blackbutt Creek.



Stormwater conveyed plastic litter into Blackbutt Creek collected after Sydney's March 2021

Effects of Untreated Litter

Scientists have yet to understand the full extent of plastic litter's consequences on environmental and human health. However, what we do know is enough cause for alarm and—more importantly—change.

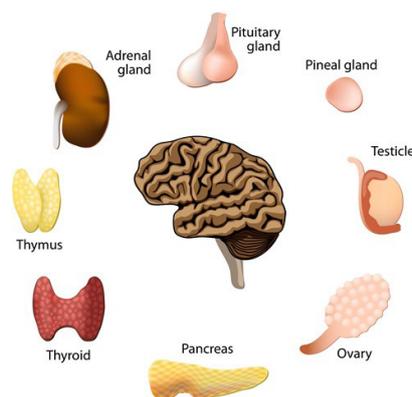
Research has identified that Western

societies ingest up to 5 grams a week of microplastics (the weight of a credit card) or up to 250 grams of plastic each year. Most microplastics go straight through the body, but some lodge in our organs, including our brain, glands, and our blood. Microplastics have been found in a baby's faeces and tragically in the mothers' placenta and fetus.

Disposable cups, for example, are often lined with plastic, making them non-biodegradable and usually non-recyclable. Each cup can produce up to 25,000 toxic microplastics, and leach dangerous chemicals and heavy metals - iron, chromium, and cadmium - into our hot drinks.

Microplastics leach toxic chemicals such as endocrine disruptors that affect our endocrine system - a network of glands and organs that produce, store, and secrete hormones. They are generational, increasing in intensity from generation to generation.

ENDOCRINE SYSTEM



Affected pancreas, ovaries, testicles, thyroid, thymus, adrenal, pituitary, and pineal glands are causing severe health issues in humans and aquatic animals -

- Male and female reproductive issues
- Reduction in sperm quality and fertility and abnormalities in male sex organs
- Increased cancers in thyroid, breast, and prostate
- Adrenal and thyroid disorders
- Neurodevelopmental issues in children, such as ADHD, autism & learning disabilities
- Disrupted immune function
- Sleeping difficulties from altered melatonin
- Altered nervous system function, anxiety
- Diabetes, obesity, cardiovascular problems and more.

We also ingest microplastics from the seafood we eat. Called bioaccumulation –[microplastics and their toxins can move up the food chain](#). Small animals and organisms (the primary producers in food chains) ingest these minute plastic particles which then become food for larger animals, and so their impacts bioaccumulate. When we eat certain kinds of seafood, we will also absorb the harmful effects of microplastics.

Shellfish, such as oysters, continually filter water, and as they filter water, they ingest microplastics. A study from Exeter University and the University of Queensland found 0.04 milligrams (mg) per gram of tissue in squid, 0.07mg in prawns, 0.1mg in oysters, 0.3mg in crabs and 2.9mg in sardines. A further study conducted in Belgium mussels identified that approximately 300 plastic particles (or 1.5 µg) would be consumed in a 300 g serving of mussels.

Now that we know the effects of endocrine-disrupting chemicals (DCs), we know these are mirrored in

Unmanaged Litter and its Effects on Living Beings



Mary Rayner
Stormwater Shepherds

aquatic lifeforms. Although, it is much harder to gauge the effects of EDCs on aquatic biota. We know toxins and EDCs are suppressing species populations, they are less healthy, and many populations are diminishing in size. But research is limited on the health of a waterbody's sediment.

A Swedish literature review Microplastics from Tyre and Road Wear, cited reduced growth or growth inhibition, reduced number of offspring, delayed development, deformity, and death. This was confirmed by toxicity studies on tyre tread and road wear particles ingested by marine and aquatic sediment-dwelling organisms - mainly small crustaceans and fish, algae, and tadpoles. The laboratory studies centred around the toxicity released from chemicals in different leaching conditions.



Aquatic life is greatly impacted by plastic pollution.

Every year over 100,000 marine mammals and 1 million waterbirds die from ingesting plastic litter and entanglement by plastics

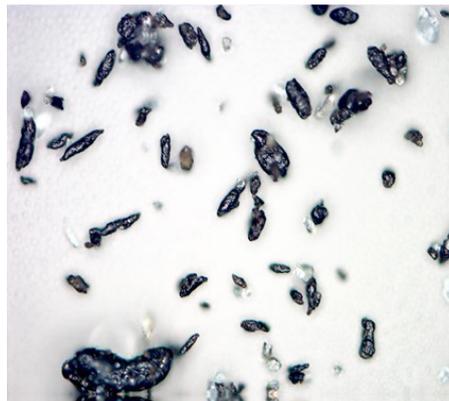
Entanglement causes -

- Suffocation
- Bacterial infections
- Limb amputation
- Intestinal rupture from sharp pieces of plastic



A Grey Seal is entangled by a piece of plastic rope.

Entangled animals are prevented from moving freely and searching for food or surfacing for air which can result in drowning. Bacterial infections can also result from infected wounds.



Rubber tyre fragments are sticky, they catch other contaminants in stormwater.

Tyre wear pollution, including toxic micro and nanoplastics, is a much bigger problem than we realise. Emissions Analytics, a UK-based independent global testing and data specialist, reports that vehicle tyre wear is entirely unregulated across the world and pollution from these tyres is possibly 1,000 times worse than the pollution from a car's exhaust. The situation intensifies with a vehicle's weight – trucks, SUVs, and even electric vehicles due to their heavy batteries.

Microplastics also cause harm. When ingested, they can clog fish gills (passive ingestion). When mistaken as food, they clog an animal's stomach

(active ingestion), making animals feel full while their bodies may be starving from malnutrition. A slow death is a common outcome.

Plastic film is an excellent transporter of pathogens. Scientists have discovered that plastics can serve as breeding grounds for disease-carrying bacteria. With the increase of marine plastic litter, there is also rising concern over their potential to carry pathogens and infect coral reefs.



Polluted plastic film wrap can contaminate living coral.

It is worth noting that even before plastic becomes litter, the other phase of its lifecycle also has a significant environmental impact. Plastic production is a very carbon-intensive activity and several of the chemical additives in plastic production are hazardous to humans and animals.

What Can We Do to Help End Plastic Litter?

When it comes to resolving our plastic crisis, the question is whether we need all this plastic?

It seems the more plastic produced, the more we consume. Plastic is certainly convenient, but its effects are only now being realised and its dire consequences for our planet and all lifeforms. We need a change in mindset, a paradigm shift, and that means curbing our plastic consumption and encouraging our friends, family, and neighbours to do the same. To prevent more plastic waste from entering waterways and

Unmanaged Litter and its Effects on Living Beings



Mary Rayner
Stormwater Shepherds

oceans, we also need to prioritise correct stormwater management within our communities.

Switching to non-plastic alternatives is necessary wherever possible. We can easily replace many plastic items with non-plastic reusable alternatives. There are already alternatives for everyday single-use plastic items. Sustainable products can also replace other plastic items like toothbrushes, shampoo bottles, and dish sponges.

Recycled plastic still contains toxic chemicals and should also be eliminated from our daily lives.



Zero waste or bulk-buy stores

Although difficult to avoid, we need to reduce plastic packaging consumption. We can support zero-waste or bulk buy shops. These include refill-based grocers where we can use our own reusable containers.

Where we cannot eliminate plastic, we need to practice recycling. Recycling includes using deposit-return schemes found in most Australian states, particularly for glass and plastic bottles. Recycling also prevents littering.

Volunteering for community clean-ups doesn't just help divert street litter from entering stormwater and waterways, they are also a great way to raise public awareness and encourage other people to be more mindful of their plastic polluting habits.



A river clean-up

We can support government initiatives for better waste management and advocate for correctly treated stormwater with councils and members of government.

A [user-pay model \(i.e. stormwater utility charge\)](#) used in the USA, Canada and Germany provides the funds to correctly maintain stormwater networks. It also provides substantial job creation. An increase in public awareness about the importance of stormwater can help reduce litter, pollutants, and hard, impervious areas. We can install rain gardens and harvest water using SMART water tanks.



Allocating stormwater utility charges for developments.

Supporting responsible brands that strive to reduce their plastic packaging and usage can help influence other brands to follow suit.

Plastic litter is a huge problem, and the numbers and facts are overwhelming. But there is so much we can immediately do to reduce our consumption. It is the collective action of individuals worldwide that is critical in resolving our plastic crisis.

You can start today by joining our journey with our free [Zero Pollution Ambassador Program](#) and visiting our [plastic-free shop](#) for plastic alternatives.



Visit us to learn more
stormwatersheperds.org.au