



Rivers and lakes

- > *Macroplastics and microplastics have been found in all tested Swiss rivers and lakes.*
- > *Macroplastics enter waterways mainly as a result of littering. The main sources of microplastics in waterways are abrasion from tyres, fibres from synthetic textiles and beads in cosmetics.*
- > *Microplastics are also formed from the gradual decomposition of macroplastics.*
- > *There are no current indications that aquatic organisms are under threat from the concentrations of microplastics measured to date in Swiss waters. However, the level of microplastic pollution is underestimated, since analysis techniques to date could not detect smaller particles. Further research is therefore required.*

How plastics enter rivers and lakes

Plastics enter surface waters from residential areas, roadways, households, industry, commerce, the construction industry and agriculture. Tyre abrasion particles may also enter these waters through the air and via road runoff. The release of plastics into the environment is heavily reduced, but not entirely prevented, by the treatment of road runoff and waste water from households, industry and commerce in waste water treatment plants.

A model calculation¹ of the seven most used types of plastic in Switzerland estimates the annual input of plastics into surface waters as 110 tonnes (macro) and around 15 tonnes (micro). According to a follow-up study², a further 1,800 tonnes of tyre abrasion particles are introduced into surface waters.

Important sources of plastics in water

1. Roads: tyre abrasion, but also other sources such as abrasion of road markings; **2. Littering;** **3. Households:** textile fibres released when synthetic textiles are washed or worn and primary microplastics from cosmetics; **4. Residential areas:** wear and tear on artificial turf pitches; **5. Waste water treatment:** combined sewer overflows from waste water treatment plants during heavy rainfall events (e.g. cotton buds disposed of in toilets reach watercourses via waste water).



Behaviour and impact of plastics in rivers and lakes

Plastics barely degrade in water. Large plastic items degrade gradually into microplastics due to currents, waves, sunlight and other factors. However, the complete decomposition of microplastics is very slow, lasting several decades to centuries.

Microplastics have been found in all surface waters and sediments tested in Switzerland, even in remote locations. The majority of plastics in lakes and rivers is deposited in their sediments. A smaller portion remains in the water, is flushed onto the banks or carried away by rivers (see *"Oceans" factsheet*).

Small quantities of microplastics have also been found in the digestive systems of fish and birds. However, it is unlikely in Switzerland for animals to be killed by swallowing pieces of plastic or by being strangled by nets. There are no current indications that aquatic organisms are under threat from the concentrations of microplastics measured to date in Swiss waters. However, the level of microplastic pollution is underestimated, since analysis

techniques to date could not detect smaller particles. Further research is therefore required in order to estimate the risk to humans and animals more accurately (see *"Humans and animals" factsheet*).

On average, Swiss rivers and lakes contain levels of microplastic particles similar to those in European waters. However, there are areas outside Europe with such high levels of microplastic pollution that aquatic organisms are at risk from plastics. This is the case, for example, in countries without a functioning waste management system.

Possible measures to reduce plastic pollution

Measures are already being taken to reduce the levels of plastic entering Swiss waters. A large proportion of plastics can be collected and eliminated before it reaches the environment by cleaning public spaces (e.g. street cleaning) and treating waste water. However, for some pathways it is difficult to prevent pollution. In these cases, measures must be taken at source. The key measures are:

Sources and pathways for rivers and lakes	Measures to reduce input
Littering on banks and along watercourses	<ul style="list-style-type: none"> • Dispose of litter properly • Combat littering actively • Clean public spaces
Domestic, industrial and commercial waste water	<ul style="list-style-type: none"> • Treat in waste water treatment plants (removes a large proportion of microplastics) • Do not use toilets to dispose of personal hygiene products containing plastics (e.g. cotton buds)
Waste water from streets and residential areas	<ul style="list-style-type: none"> • Clean streets and roads • Treat street runoff and waste water from residential areas (e.g. in road runoff treatment plants or other treatment plants) • Avoid the direct discharge of polluted rainwater into watercourses, implement additional structural measures

1 Press release Empa, 12.07.2019: Model calculation of plastics in Switzerland

2 Press release Empa, 14.11.2019: Model calculation of tyre abrasion in Switzerland

Further information

- FOEN information for specialists on littering (in German, French and Italian)
- FOEN information for specialists on waste water treatment (in German, French and Italian)
- Study of microplastics in Swiss waters (press release in German, French and Italian)
- Study of microplastics in global waters (press release)