EnviroTEACH

An environmental education resource for teachers

Term 4 – 2018

From the editor

Kia ora! Lately, the news and social media have been full of stories about rubbish in our oceans. We're hearing a lot about how plastic pollution is harming our environment and biodiversity. Scientists have estimated that there are over 150 million tonnes of plastic in the oceans already. If nothing changes, then by 2050, the plastic in our oceans could weigh more than the fish that live in them!

We're regularly confronted with statistics such as these and images of the effects of plastic pollution. But how does all of that plastic reach the sea and what can we do about it?

One of the pathways for plastic pollution is via our stormwater systems. This is a topic that a lot of people don't know very much about, so we've decided to focus this issue of Enviroteach on stormwater in Southland.

Read on to learn more about where stormwater comes from, how plastic and other pollutants get into it, and how it gets carried down to the sea. You'll find lots of ideas around things that individuals, schools and communities can do to keep our stormwater clean and help protect our oceans.

Contact Environment Southland for information and advice, or for assistance with teaching and learning about stormwater or any other environment-related topic.

Pat Hoffmann
Environmental education officer, Environment Southland

Pieces of plastic found on a beach at Mason Bay, Stewart Island

environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

What is stormwater?

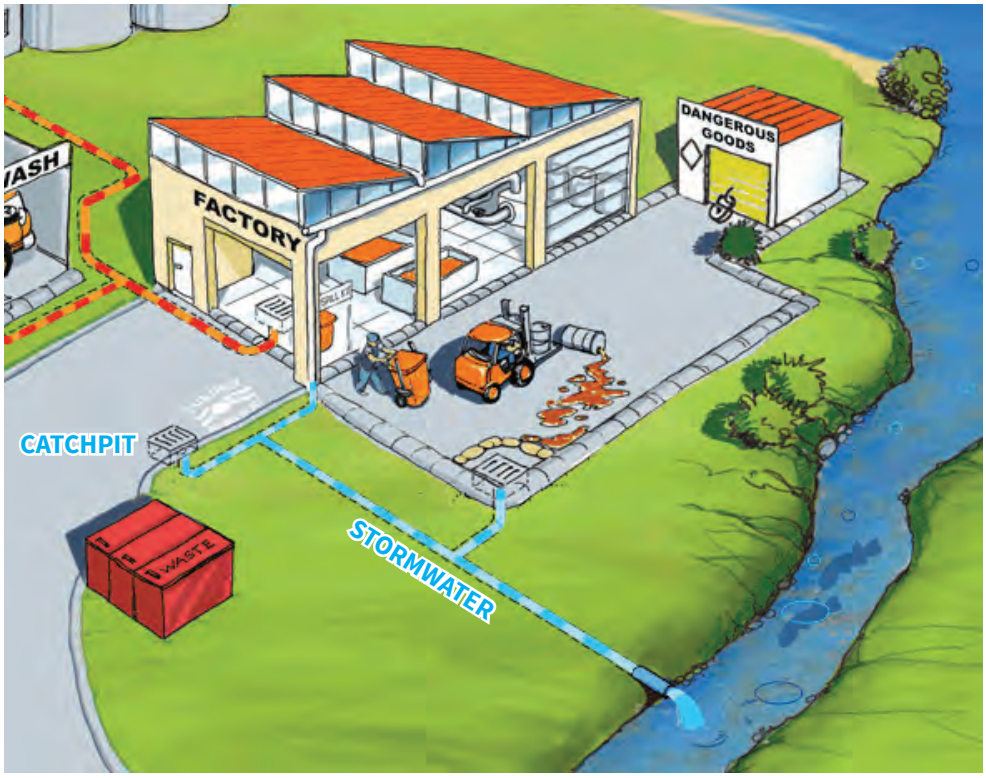
Permeable versus impermeable surfaces

When rain falls onto lawns and gardens, some of it soaks into the soil. This is because these surfaces are permeable, meaning water is able soak through them.

Can you think of any surfaces around your school or home that are permeable?

Impermeable surfaces are hard surfaces that don't allow water to soak in. Roofs, parking lots, driveways and streets are usually impermeable.

Can you think of any surfaces around your school or home that are impermeable?



What is stormwater?

When rain falls onto impermeable surfaces the rainwater is unable to soak in, so it runs off instead. It is directed along manmade gutters and drains into a network of underground pipes and open channels. This water is now called stormwater, and the pipes and channels are part of the stormwater network.

Eventually, stormwater is carried untreated into streams, rivers and estuaries which flow into the sea. The stormwater network is designed to quickly carry away rainwater to protect roads and properties from flooding. We've all seen what happens when a stormwater drain gets blocked with rubbish and leaves - the road floods! This can create a serious hazard for pedestrians and for people driving on the road.

ACTIVITY

Do a simple experiment to test which surfaces are permeable and which ones are impermeable. Show the students a range of surfaces e.g. loose soil in the school garden, compacted soil next to a footpath, a gravel driveway, a patch of lawn, a wooden plank, a pile of stones and a concrete path.

Let them predict which surfaces will be permeable or impermeable and give reasons. Then test permeability by carefully pouring a cup of water onto each surface and observing whether the water soaks in or runs off. Also notice whether the water soaks through some surfaces more quickly than others.

You can test smaller items, e.g. a paper cup, filter paper, teabag, sponge, thick layer of leaves or compost, by placing them in a colander, sieve or funnel and observing whether water runs out the bottom. Afterwards, get the students to rank the surfaces from most permeable to least permeable.

ACTIVITY

Look at this picture. Do you think the soapy bubbles and litter will remain inside this catchpit or will they be carried away by the stormwater to enter the nearest stream? What about things like oil and petrol?

Stormwater contamination

Stormwater can often be contaminated by pollution. As water runs over rooftops and roads, carparks and industrial sites, it picks up things like soil, leaves, cigarette butts, pet waste, oil, plastic and hazardous substances and carries them down into the stormwater network.

Unlike sewage, (which is foulwater from toilets, sinks etc.), stormwater does not usually get cleaned at a wastewater treatment plant. It goes straight to the nearest waterbody. So anything that goes down the stormwater drain could end up in a waterway and get carried to the sea. These pollutants accumulate in our streams, rivers and estuaries where they can harm plant and animal life.

People can also pollute stormwater directly by pouring waste such as paint and oil down stormwater drains, or by washing their cars on the road or driveway which washes detergents and vehicle residue into stormwater.

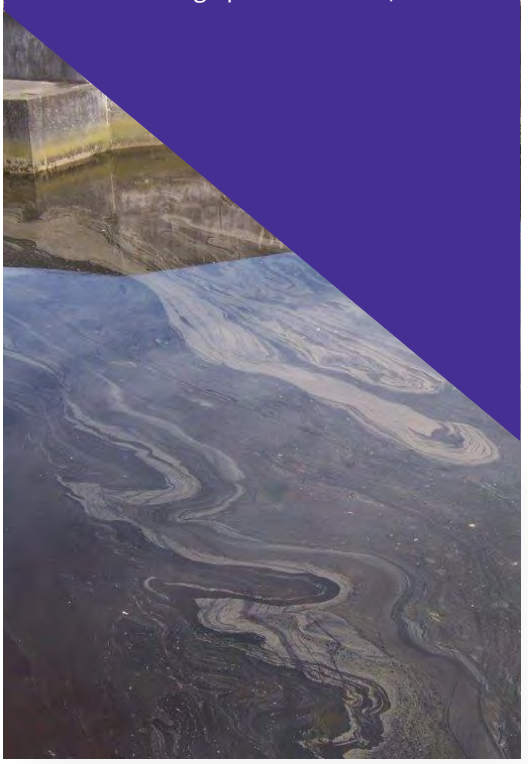
While most stormwater is not treated there are some exceptions, such as a subdivision in Te Anau that has a settling basin built into the stormwater system, which acts as a type of treatment.

▲ Soapy water flowing into the gutter...

▼ eventually ends up here.

Examples of contaminants in stormwater

- heavy metals e.g. lead, copper, zinc and oil which are shed from cars and industrial sites
- paint, ink and dyes
- sediment (tiny particles of sand, silt and clay)
- rubbish e.g. plastic bags, bottles and other street litter
- organic material e.g. leaves and lawn cuttings, faeces from dogs and cats
- pesticides, herbicides and garden fertilisers
- detergent from car washing
- illegal and accidental spills/ dumping into stormwater drains
- cement wash water (which has a high pH and is toxic)



ACTIVITY

Compare the different parts of town, e.g. the central business district, and the residential, industrial and recreational areas. Would you expect to find different kinds of pollution in different areas? Which areas do you think might have the most / least pollution?

How does contaminated stormwater affect the environment?

Pollution in our rivers, estuaries and oceans can affect plant and animal life, drinking water and some of the fun things we like to do, like swimming, kayaking, fishing and boating:

- If stormwater carries a lot of organic material into a waterbody, the material will rot and begin to deplete the oxygen in the water, causing aquatic animals to suffocate.
- If stormwater carries high levels of nutrients such as nitrogen and phosphorus into a waterbody, it can cause excessive growth of algae and aquatic weeds, which can crowd out other aquatic life and change water chemistry.
- Increased amounts of fine sediment in the water can make the water cloudy, creating an unhealthy habitat for fish and plants.
- Some pollutants can damage the eyes, gills and skin of fish.
- Some pollutants can affect the behaviour, growth or reproduction of fish and invertebrates, or even result in death.
- Pollution of swimming beaches and seafood can create a risk to human health.

▲ **Volunteers collecting rubbish at Mason Bay, Stewart Island.**

ACTIVITY

Take your class on a field trip to investigate the health of your river or coastal area. There are lots of great activities and education resources available, including Stream Connections and Marine Metre Squared. Contact Environment Southland's education team if you would like some assistance.

ACTIVITY

Take your class on a field trip to the beach or show them an image of marine pollution, and ask them to identify the specific kinds of rubbish they can see:

- Where do these items come from? (place of origin, intended purpose)
- Why were they discarded?
- How did they get here? What was their pathway to the sea?
- What could have been done before they ended up here? E.g. refuse, reduce, reuse, recycle, repurpose
- Looking to the future, what can be done to prevent this from happening?

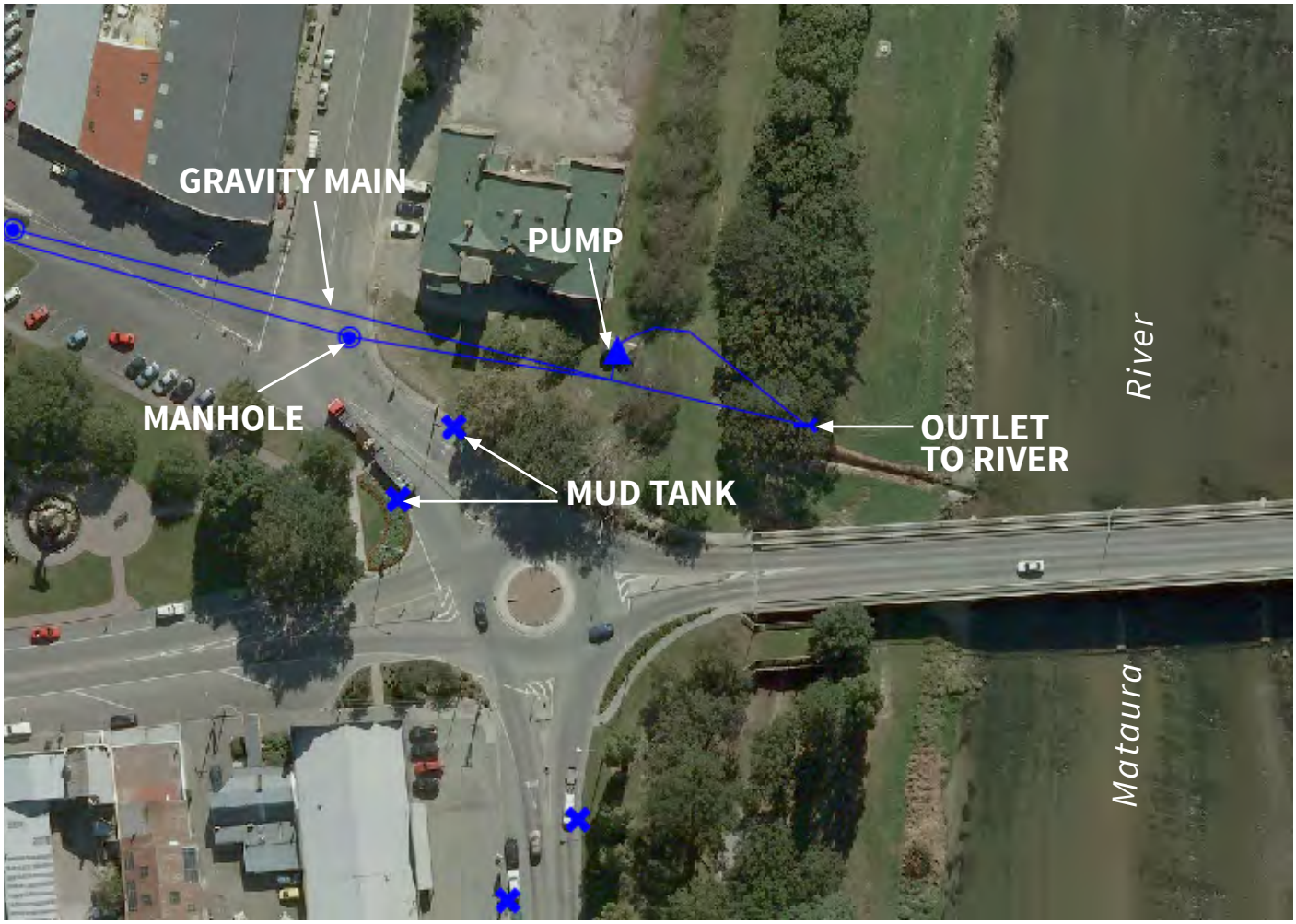
Stormwater services in your neighbourhood

Your local council has maps of the stormwater services in your district. You can either view a map online or ask your council for a paper copy.

Invercargill City's stormwater network consists of over 400 km of pipes within the Invercargill urban area, Otatara and Bluff. Stormwater is discharged to several waterbodies including the Waikiwi Stream, Waihopai River, Kingswell Creek, Clifton Channel, Otepuni Stream, New River Estuary and Bluff Harbour. In addition, there are approximately 15 km of open drains, mostly situated in Otatara.

Find out about stormwater services in your neighbourhood

- Contact the **Invercargill City Council** if you want a map of your property showing features such as water pipes, stormwater and sewer services.
- To view a map online of the stormwater network in the **Southland district**, go to www.southlanddc.govt.nz/my-southland/maps. The website has an instructional video explaining how you can search for a specific address and select features such as water pipes, stormwater and sewer services.
- To view a map online of the stormwater network in the **Gore district**, go to www.goredc.govt.nz , click on Online Maps, then Intramaps. Select the Utilities module then check the layers you wish to see.



An example of the stormwater features you will see if you select the stormwater layer on the Gore District Council website.

Do a stormwater survey

ACTIVITY

Take a walk around your school property and identify all the stormwater drains. Refer to the stormwater map (see page 5) and see if you can trace your stormwater drains all the way from the school property to the place where they enter a waterway.

- What is the name of the waterway that receives your stormwater?
- Where does it start?
- Where does it enter the sea?
- How many other properties in your neighbourhood are connected to the same stormwater system?

ACTIVITY

Design an investigation in your neighbourhood to find out what kinds of pollutants might be getting into the stormwater. Questions you could consider include:

- How and where do people wash their cars, mowers, wheelbarrows and spades?
- Do people maintain their cars at home (e.g. do they change the oil themselves)? How and where do they dispose of the car maintenance fluids?
- Do people clean their driveways? How?
- When people take their dogs for walks, what do they do with the dog poos?
- If your school has a swimming pool, find out where the water goes when it's drained.

Stormwater entering the Waihopai River at Thomsons Bush, Invercargill.

Refuse, reduce, reuse, repurpose and recycle

During this year's Coastal Cleanup, volunteers collected 65 fadges of rubbish from the beaches around Mason Bay, Stewart Island.

ACTIVITY

Refuse, reduce, reuse, repurpose, recycle

How do you think refusing plastic might differ from reducing plastic? Can you think of any examples of how you could reuse plastic, or repurpose plastic at school or at home?

Write or print out these five words on strips of paper and hand them out to students. Invite them to work in small groups and put the words in a sequence that makes sense to them. Ask them to explain why they chose that particular sequence.

Many people think that recycling should be the last resort and that we should always try to refuse, reduce, reuse or repurpose before recycling. Give your students an opportunity to discuss and debate this.

ACTIVITY

Do a waste audit at your school to assess and measure what kinds of waste your school generates, how it is generated and where it ends up. This will help you to identify areas where you can take action.

Contact Wastenet Southland for assistance (www.wastenet.org.nz).

How can your school make a difference?

ACTIVITY

Ask your class to think about things that individuals, schools and communities can do to keep stormwater clean and help protect our oceans. Here are some ideas to get you started:

- Minimise your use of plastic at school by refusing, reducing, reusing and repurposing
- Identify and promote substitutes for plastic, e.g. in students' lunchboxes
- Encourage classes to dispose of rubbish and recycling correctly
- Investigate whether you can install litter traps in school stormwater drains
- Encourage teachers and families to wash their cars at a car wash or on the grass, instead of on driveways or roads
- Use compost instead of chemical fertiliser in your school garden
- Encourage families to pick up after their pets
- Reduce soil erosion by planting vegetation to protect soil
- Spraypaint pictures of fish on drains to create awareness of stormwater
- Organise a street clean-up
- Organise an estuary or beach clean-up
- Keep your school stormwater drains clean by picking up plastic before it washes down the drain
- Write to the city or district council to ask what is being done to improve stormwater
- Can you think of any other ideas?

▲ Many schools and businesses have painted signs on drains to remind people that stormwater drains carry water directly to our rivers and streams.

Suggested resources

- **Environment Canterbury's Stormwater Education Resource:** www.ecan.govt.nz/get-involved/youth-engagement-and-education/education-programmes/programmes/
- **Environment Southland factsheets on pollution and waste:** www.es.govt.nz/document-library/factsheets/Pages/Pollution-prevention-factsheets
- **Glossary of stormwater terms:** www.aucklandcouncil.govt.nz/environment/stormwater/maintenance-stormwater-infrastructure/Documents/glossaryofstormwaterterms.pdf
- **Science Learning Hub:** www.sciencelearn.org.nz