WATERWATCH

Stormwater story (Years 3–4)

Introduction

This activity[2] explores the impact that stormwater has on creeks and rivers using the Yarra River as an example. Students consider the different pollutants that can enter a river along its journey and the cumulative impact they have on the health of the river and Port Phillip Bay. They will also discuss how everyone can take action to reduce the impacts of stormwater pollution.

While this activity targets students in Year 3 and 4, it can be adapted for (or by) students to Year 12. It can be used in Science, Geography and in English as a writing stimulus and is also useful for community presentations.

For younger years, refer to *The adventure of Puddles the platypus (F-2)*.
<https://www.melbournewater.com.au/media/8421/download>

Equipment

1. Plastic mat
2. Bowl (half full of water)
3. Wooden spoons
4. Laminated copy of *The stormwater story of the Yarra River* (Resource 1)
5. Laminated stormwater images (such as a drain, a stormwater outlet pipe, water rushing down the curb, water containing rubbish, leaves and debris entering a drain)
6. Net to remove waste at the end of the activity

Victorian Curriculum F–10[1] links:

Levels 3 and 4

Science

Science Understanding

Science as a human endeavour

Science knowledge helps people to understand the effects of their actions (VCSSU056)

Biological sciences

Different living things have different life cycles and depend on each other and the environment to survive (VCSSU058)

Earth and space sciences

Earth's surface changes over time as a result of natural processes and human activity (VCSSU062)

Geography

Geographical Knowledge

Diversity and significance of places and environments

Types of natural vegetation and the significance of vegetation to the environment, the importance of environments to animals and people, and different views on how they can be protected; the use and management of natural resources and waste, and different views on how to do this sustainably (VCGGK082)

Similarities and differences in individuals' and groups' feelings and perceptions about places, and how they influence views about the protection of these places (VCGGK083)

1 Victorian Curriculum and Assessment Authority (VCAA) <victoriancurriculum.vcaa.vic.edu.au/> 4 March 2019.

2 This activity is adapted from *Who Polluted the Potomac?* Alice Ferguson Foundation, USA.

7. Tub or box to store containers
8. 17 small labelled containers (with secure lids) with the following contents:
   - **Careless camper Carly**: toilet paper
   - **Party**: balloon
   - **Forgetful fisherman Frederik**: knotted fishing line
   - **Side-tracked swimmer Sam**: yellow food colouring (urine)
   - **Fertilising farmer Floyd**: rock salt (fertiliser)
   - **Bare riverbank**: dirt
   - **Deciduous trees**: autumn leaves
   - **Mowing Mr Markos**: grass clippings
   - **Dog**: mud plus water (dog poo)
   - **Busy builder Bo**: sand/gravel
   - **Sudsy Sarita**: some drops of detergent in water
   - **Factory**: a few drops of green food colouring in water
   - **People in poorly-maintained cars**: cooking oil plus dark food colouring (oil/petrol) in water
   - **People in their homes**: plastic bag
   - **City folk**: cigarette butts/cigarette filters
   - **Runner Ramini**: plastic bottled water (labelled separately)
   - **School kids**: hair ties

Preparation

Prepare 17 containers as per instructions above. If there are more than 17 students in the class, you can make multiples of the same container.

Set out plastic mat with bowl of water and spoon in the middle of the mat.

Activity steps

1. Ask students to sit around the bowl of water on the mat. Position a seat for yourself with the box/tub of containers and story outline.
2. Set the scene by asking questions:
   - Can anyone tell us what stormwater is? Explain that stormwater is water that flows off our streets and hard surfaces like footpaths and roofs. This water runs down the drains (called stormwater drains) on the side of the road. The stormwater drains lead to local waterways. Anything in the water will also end up in the waterway.
   - What is the nearest waterway (river/creek) to your school? Explain that stormwater runs off the hard surfaces at school and flow into drains that take the water into the local creek. Explain that this story follows the journey of the Yarra River as it starts as a small stream up in the mountains and flows down into the city and out into Port Phillip Bay. We are going to see what happens to it along its journey.

- Ask if anyone has seen the Yarra River or another river? Tell the students that in our story, this bowl of water represents our river. Ask: How does our water look now at the start of the river's journey?

The stormwater story

3. Assign each student a character and a corresponding container as outlined in *The stormwater story of the Yarra River* (Resource 1). If there are more than 17 students in the class, you can make multiples of the same container.

4. Read the story and when each student hears the name of their character mentioned in the story, they empty the contents of their containers into the bowl in the centre.

Debrief

5. Discuss the story. For instance, you could use the following 'head, heart, hands' format.

Place hands on your head and let's **think** – What happened to the river? Was it one big thing or several little things that caused the pollution? Did everyone know they were polluting the river? Think about impacts. Will we still see wildlife (e.g. waterbugs, birds, frogs, platypus) in the river? What happened to them? Think about impacts that the characters' actions had on other people. For example:

- fertilising farmer Floyd: Would you let your cows drink from this river?
- careless camper Chime: Would you camp next to this river?
- forgetful fisherman Frederik: Would you catch many fish from this river? If you did, would you eat them?
- side-tracked swimmer Sam: Would you swim in this river?
- school kids: what impact would the hair ties have on platypus living in the river?

Place hands on your 'heart' – How does it make you **feel** to know this is happening to our creeks/rivers/bay/ocean? Why?

Place your 'hands' out in front of you – What can we (our characters) **do** differently to stop this from happening (actions)?

6. Other questions include:

- What problems might some of these pollutants cause? Ask as a general question or select a couple of particular issues, such as:
    - > What impact would hair ties or rubber bands have on animals like the platypus? (They can become entangled in hair ties or rubber hands. Cut any hair ties or rubber bands you find before putting them in the bin.)
    - > What problems could balloons and their ties cause for animals in our waterways and oceans? (They don't break down and end up floating in our waterways and oceans or washed up on beaches. Birds and turtles think that they are food, eat them and die. Plastic takes hundreds of years to break down.)

> Why does it matter if excess fertiliser enters the river? What impact does this have further down the river and in the ocean? Will the water quality of the river be affected by excess fertiliser in just one place or will downstream be affected too? Will excess fertiliser have a cumulative effect if it enters the river from a number of sources? (Excess fertiliser adds nutrients to the waterway and can cause algal blooms.)

An **algal bloom** is a rapid growth of microscopic algae in water, often resulting in coloured scum on the surface.

> What effects does dog poo have on the surrounding environment? (The poo may contains nutrients, such as nitrogen, and also carry diseases that can be passed on to humans and native animals.)

> What impact does single-use plastic bottled water have on the environment? (It takes a lot of packaging and energy to produce bottled water and water bottles create a lot of rubbish that doesn't break down for a very long time. We can drink clean, safe water from our taps and bring a water bottle from home.)

- What impact will this polluted stormwater have on our rivers and beaches?
- What can we do to stop this pollution ending up in our rivers and oceans? Compile a class list on a board.

7. Read the *Looking after the Yarra River story* (Resource 2) and tick off the student ideas that appear on the class list as you read. While the story in Resource 1 can be the reality, there are many people doing the right thing to improve our waterways. This story provides a more hopeful scenario.

   Alternatively, the *Looking after the Yarra River story* could be read in conjunction with the *Stormwater story of the Yarra River* and demonstrated beside the stormwater story using a separate bowl. It could also be run as a separate activity. Students might like to 'clean' the polluted water of the *Stormwater story of the Yarra River* and this story could be used to do that. They could remove things like fishing line, balloons, hair ties and other solid items as the story progresses.

   Students could work individually or in groups to write their own 'clean water' story before they hear the Resource 2 story.

Extension activity

Students investigate developments in stormwater management and Water Sensitive Urban Design (WSUD) including:

- installing litter traps in rivers
- constructing wetlands and raingardens to filter stormwater before it enters rivers
- creating new housing developments that have swales and drains in centre of road (not concrete gutters at the sides).

Students design a campaign to keep stormwater clean. This could include signage on drains, posters, a brochure or presentation to the school or community.

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Students could research their catchment and create a story about their own waterway for their peers or for younger children using local images and information. Local infrastructure and land uses could be included.

Taking action

Students walk around the school grounds to see how many hair bands and/or rubber bands they can find. Design posters to stop hair bands and rubber bands from ending up on the ground.

Students conduct a rubbish audit around the school ground and/or local waterway. Group the collected items together (e.g. plastic bottles, soft plastic, cans etc.) and graph the results. Discuss how the different items can affect the health of the waterway and particularly the animals within it. What can we do to help?

Teacher background

Some potential impacts of stormwater runoff are:

- Many waterbugs living in rivers and streams may die or their population may decrease. Many are sensitive to oxygen, pH, nutrient levels and turbidity etc. Oil on the surface of the water can prevent some waterbugs from breathing and chemicals such as pesticides can kill them.
- Fish, frogs, platypus and other animals feeding on waterbugs may not be able to find enough food and they may die or their population may decrease too. Animals can become entangled in fishing line, plastic bags or hair ties.
- Trees and vegetation protect the banks of waterways. If livestock are allowed to drink from waterways, the vegetation is damaged and the banks erode. Off-stream watering points for livestock can prevent this.
- Surrounding areas can be flooded if drains or waterways get blocked.
- Waterways can be contaminated by human pathogens and pollutants from stormwater. After periods of heavy rain, sewage pipes filled with extra rainwater can overflow into local creeks that are already flooded with contaminated stormwater. People should avoid swimming in rivers or at the beach immediately after flooding rains for at least 48 hours. See also sewer spills video: <https://www.melbournewater.com.au/media/2391>.
- Riverbanks and beaches look less attractive covered in litter and spoil the experience of visiting them.
- Pollutants may enter the food chain – including the food that people eat.
- Marine animals may accidentally choke on litter (e.g. a plastic bag may look like a jellyfish) or get litter (such as hair ties) stuck around their necks, limbs and bills. Snipping circular litter (plastic bottle rings, six pack drink can holders, rubber bands and hair ties) can reduce the incidence of this.
- Increased nutrient levels in a waterway (eutrophication) can cause algal blooms (overgrowth of plants and algae that blocks light and removes oxygen from water).

With older students, you can mention that studies have shown that when cigarette butts enter waterways, chemicals such as nicotine can be released into water and have been found to be harmful to aquatic life even in small quantities.

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Key messages

- Stormwater typically reaches waterways through stormwater drainage systems.
- Clean stormwater improves the amenity of local waterway areas that we like to visit.
- Litter and pollution from stormwater runoff affects waterway and bay health. It affects the animals, such as platypus, that live in it. Everyone can help reduce the impact of litter by putting rubbish in bins, snipping circular litter and picking up after dogs.

Useful resources

River health and monitoring
<www.melbournewater.com.au/water/health-and-monitoring/river-health-and-monitoring>
Melbourne Water monitors rivers and creeks so they know if their condition changes or if the improvement programs need adjusting. Learn how Melbourne Water assess river health and view current data.
Other information includes: indicators of river health, the health of Melbourne's waterways, and key waterway values.

PlatypusSPOT
<www.platypusspot.org/>
PlatypusSPOT is a citizen science program that asks people to submit their platypus sightings. Using the PlatypusSPOT app, the general public can contribute to the ongoing conservation and research of the platypus. The website also offers information about platypus biology, conservation and threats to its survival.
Know your river booklets
Know your river - Werribee River
Know your river - Yarra River
Know your river - Maribyrnong River
Know your river - Dandenong Creek
Know your river - Bass River
The booklets provide valuable teacher background information about the history, geography and wildlife of the Werribee River, Yarra River, Maribyrnong River, Dandenong Creek and Bass River.

River Detectives – Story of a River
This activity is a longer version of Story of a River and contains positive and negative actions in the one story.
www.riverdetectives.net.au/wp-content/uploads/2017/03/RD-Manual-Story-of-a-River-Teachers-Section-APPROVED.pdf

Drainage story of the wetland video [2:43]
<www.youtube.com/watch?v=U0J3OrL8Nqc&feature=youtu.be>
This video describes the history of the Edithvale and Seaford wetlands and explains what we can do to maintain the health of the wetlands.

Stormwater management
<www.melbournewater.com.au/planning-and-building/stormwater-management>
Managing stormwater helps prevent flooding, improve water quality and protects our waterways. This page give practical advice on using water sensitive urban design in developments.

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Raingardens
<www.melbournewater.com.au/community-and-education/help-protect-environment/raingardens>
Raingardens are self-watering, low-maintenance gardens designed to protect our rivers and creeks, by capturing stormwater that runs off hard surfaces when it rains. This page contains resources to build a raingarden and provides examples of raingardens across Melbourne.

Stormwater fact sheet
<www.riverdetectives.net.au/wp-content/uploads/2017/03/RD-Manual-Stormwater-Teachers-Section-APPROVED.pdf>
Teacher notes and general information about stormwater.

Old Bernie's pond
<www.scootle.edu.au/ec/viewing/L27/index.html>
An interactive game that asks students to take action to clean up a pond. Requires Adobe Flash Player.

WATERWATCH Stormwater story (Years 3–4)

Resource 1: Stormwater story of the Yarra River

We begin our story high up in the hills of the Yarra Ranges: out in the country past Healesville. This is where the Yarra River sets off on its long journey. The river starts as a little stream high up in the mountains gradually becoming bigger as it flows down through Melbourne and eventually empties out into Port Phillip Bay.

It was a beautiful autumn morning and the little stream was glistening in the morning sunlight as it bubbled over stones and pebbles and passed through the forest. The lush green forest was alive with bird calls as lyrebirds darted in amongst the tree ferns. The stream was crystal clear and often platypus were seen swimming around in it. Many other animals lived in the stream too – frogs, fish and millions of tiny waterbugs.

Because it was such a beautiful peaceful spot, many people came to visit the forest. Some people loved it so much that they would stay overnight, setting up tents in the camping ground.

On the morning of our story, the Smith family was sleeping in their tent which was not far from the little stream. They were celebrating their daughter's eighth birthday. One of the children woke up needing to go the toilet. She grabbed some toilet paper and went to the toilet behind a tree away from the tent. She forgot to bury her toilet paper after she'd finished with it. Soon it started to rain and **careless camper Carly** used toilet paper was washed into the nearby stream.

As she returned to the tent, she bumped into the bunch of balloons tied to a tree. One balloon came loose and floated along the bank of the stream until it popped on a submerged stick. The busted **party** balloon floated along in the water. Plastic takes hundreds of years to break down, polluting the habitat of platypus, frogs, fish and waterbugs.

The stream continued to flow past the campground through the forest. Soon it reached a man who was sitting on the banks of the stream trying to catch a trout. The fish weren't biting and the rain was getting heavy. He packed up his gear and decided to head home. But he forgot to pick up a bundle of fishing line sitting on a rock next to the water's edge and so, sure enough, **forgetful fisherman Frederik**'s fishing line was soon washed into the little stream by the rain. Animals like platypus and turtles can easily become entangled in fishing line.

Then the little stream flowed into a lake where a group of daredevil kids were swimming – even though it was raining! But one of the kids was suddenly busting to go to the toilet. **Side-tracked swimmer Sam** was having too much fun swimming and didn't want to get out of the water, so she thought 'who cares' and went right there in the lake!

The little stream continued on through some farmland. At Strawberry Hills farm, a farmer was spraying fertiliser on his crops to make them grow better. **Fertilising farmer Floyd** thought 'more was better'. He didn't realise that the rain washed some of the fertiliser into the little stream. Fertiliser can add nutrients to the stream, creating algal blooms.

Along the banks of the little stream here on Strawberry Hills farm, somebody chopped down all the big trees and removed all the bushes and shrubs, so the soil on the edge of the banks had no tree roots to cling onto. So what do you think happened when the rains came? The force of the water on the **bare riverbank** meant that heaps of dislodged dirt washed into the little stream.

The little stream soon passed through the farmland areas. Although it was looking a little bit dirty now, there were still lots of little bugs and fish living in it but not many platypus. The little stream soon reached the outer suburbs of Melbourne, where there were lots of houses. At least there were some trees planted along the banks so that the animals in the stream could have some shade.

Unfortunately, they weren't evergreen native Australian trees like Eucalyptus trees. These trees were introduced from overseas and are very different to Australian trees because something special happens to them in autumn as the weather gets cooler… Can you guess what that is? Because it was autumn, these **deciduous trees** were losing their leaves**.** Lots of loose leaves dropped into the little stream. The leaves covered the surface of the water and oxygen couldn't get in.

Eventually, the rain stopped for a while so the person who lived beside the stream decided to mow his lawn. When he finished he put all his grass clippings in a big pile at the back of his garden because he didn't know what else to do with them. Just as he sat down in front of the TV to watch the footy, the rain started again. **Mowing Mr Markos**' grass clippings were washed over the ground and into the little stream.

The little stream then passed through a big park. Because it was such a lovely park, lots of people liked to walk there and many of them brought their **dogs** with them. Unfortunately some of these people were not very responsible dog owners and there was disgusting dog poo all over the ground. And where do you think the dog poo went on a rainy day like today? Into the little stream.

Down the road from the park, a man was building a brand new house. He was mixing up some cement. Usually, it was his favourite job. But today it was not much fun because the rain just wouldn't stop and he was getting soaked! What **busy builder Bo** didn't realise was that the rain was also washing his cement powder and gravel down the front driveway, into the gutter on the side of the road, down the drain and into the little stream nearby.

Then the rain stopped again – you know what Melbourne weather is like! – so a girl decided to wash her Dad's car to earn her week's pocket money. She hated this job but really wanted the money because she was saving up for a new mobile phone. Using tank water and detergent she washed her Dad's car parked in their driveway. As she watched the soapy detergent suds flow down the driveway and into the stormwater drain on the side of the road, **sudsy Sarita** wondered where the soapy suds were going – the detergent was flowing into the little stream near her house.

The little stream was getting close to the city now and here it widened so it was no longer a little stream, but a grown-up Yarra River. Soon it passed an industrial area. Unfortunately, this morning there was an accident at the **factory** when a pipe burst, so now nasty noxious chemicals were spilling out into the river.

Once the river reached the city it was not too healthy (as you can see). But here in the city, still more pollution was finding its way into the river! **People in poorly-maintained cars** didn't know that the petrol and oil in their cars was sometimes leaking onto the road where the rain washed it down the stormwater drains and into the river.

Other people put their bins out on the street on bin night. Unfortunately, if the bins weren't well-covered, the wind would blow the newspaper, plastic bags and other rubbish from **people in their homes** out of their bins and down the street. So when it rained, guess what

happened? The rain washed all the random roaming rubbish down the drains and into the river.

City folk smoking in public as they walked along the street on their way to work dropped their cigarette butts on the ground, thinking butts were too small to cause any problems. But animals mistake cigarette butts for food and eat them.

Runner Ramini put her bottled water in the bin as she ran along the path but the wind blew it out and it landed in the drain.

Some **school kids** waiting at a bus stop had hair ties around their wrists. One of the kids flicked her hair tie up into the sky and couldn't find it again. So what happened to the cigarette butts, plastic bottle and hair ties? The rain washed the deliberately-dropped debris into the stormwater drains, which flowed out into the river! Platypus can become entangled in hair ties and rubber bands, meaning they can't move freely, forage for food or breed.

The Yarra River, now looking very sick, finally reached Port Phillip Bay. And all of the pollution carried in the river ended up in the ocean.

Resource 2: Looking after the Yarra River story

We begin our story high up in the hills of the Yarra Ranges: out in the country past Healesville. This is where the Yarra River sets off on its long journey. The river starts as a little stream high up in the mountains gradually becoming bigger as it flows down through Melbourne and eventually empties out into Port Phillip Bay.

It was a beautiful autumn morning and the little stream was glistening in the morning sunlight as it bubbled over stones and pebbles and passed through the forest. The lush green forest was alive with bird calls as lyrebirds darted in amongst the tree ferns. The stream was crystal clear and often platypus were seen swimming around in it. Many other animals lived in the stream too – frogs, fish and millions of tiny waterbugs.

Because it was such a beautiful peaceful spot, many people came to visit the forest. Some people loved it so much that they would stay overnight, setting up tents in the camping ground.

On the morning of our story, the Smith family was sleeping in their tent which was not far from the little stream. They were celebrating their daughter's eighth birthday. One of the children woke up needing to go the toilet. She grabbed some toilet paper and went to the toilet far away from the stream. She buried her toilet paper in the hole they had dug the day before. The used toilet paper stayed in the hole and wasn't washed into the nearby stream.

As she returned to the tent, she bumped into the bunch of balloons tied to a tree. She noticed that they were coming loose so she untied them and put them in the rubbish bag (they would take the rubbish home with them). She didn't want the balloons to end up in the water as she knew animals might mistake the plastic balloons for food.

The stream continued to flow past the campground through the forest. Soon it reached a man who was sitting on the banks of the stream trying to catch a trout. The fish weren't biting this morning and the rain was starting to get heavy. He packed up his gear and decided to head home. He looked around him before he left and noticed a bundle of fishing line sitting on a rock next to the water's edge so he picked it up and took it with him. He was worried the fishing line would entangle fish, platypus and turtles that lived in the stream.

Then the little stream flowed into a lake where a group of kids were swimming in the summer rain. One of the kids was suddenly busting to go to the toilet. She jumped out and ran to the toilet block in the car park. She didn't want to wee in the lake! The pristine water was one of the reasons they loved this lake so much and she didn't want to wreck that.

The little stream continued on through some farmland. At Strawberry Hills farm, a farmer looked outside and realised that it was about to rain. He decided not to spray fertiliser on his crops that day because the excess fertiliser might be washed into the river. The rain would help his plants grow anyway.

Along the banks of the little stream here on Strawberry Hills farm, large native trees, bushes and shrubs grew. Their leaves and flowers occasionally floated off into the river. They attracted insects and birds who were part of the food web of the river. The vegetation along the banks shaded the water and kept it cool in the hot summers.

The little stream had lots of little bugs and fish living in it. It soon reached the outer suburbs of Melbourne, where there were lots of houses. More and more trees were being planted along

the banks by friends of the parks groups. This made the banks stable and sediment runoff was kept to a minimum.

Eventually, the rain stopped for a while so a person who lived beside the stream decided to mow her lawn. She put all of her grass clippings in her green waste bin to be sent to a composting facility. She didn't want her garden waste to end up in the stormwater drain to pollute the homes of platypus, fish and waterbugs.

The little stream then passed through a big park. Because it was such a lovely park, lots of people liked to walk there and many of them brought their dogs with them. That day, they all used the bags provided for dog poo and all put their waste in the bin. They were responsible pet owners who didn't want the poo to end up in the stream.

Down the road from the park, a man was building a brand new house. He was meant to mix up the cement today. Usually, it was his favourite job. But today it was not much fun because the rain just wouldn't stop and he was getting soaked! He packed up his cement mixer and put away the bags of concrete powder. He noticed some gravel washing down the front driveway so shovelled it up before it went down the drain.

Then the rain stopped again – you know what Melbourne weather is like! – so a girl decided to wash her Dad's car to earn her week's pocket money. She hated this job but really wanted the money because she was saving up for a new mobile phone. Using tank water and detergent she washed her Dad's car parked on the front lawn. She learnt at school that soapy suds harm animals in the waterways and that the drain out the front of her house went straight into the stream.

The little stream was getting close to the city now and here it widened so it was no longer a little stream, but a grown-up Yarra River. Soon it passed an industrial area. The factory owners had signed an agreement that made sure no chemicals went into the river. The waste chemicals were sent to a special processing facility.

Once the river reached the city, the surrounding area was much more built up but the river was still relatively healthy. Here in the city, more people rode bikes and caught public transport. As well as creating air pollution, they knew that, especially on rainy days, cars could leak oil that would end up in the river.

Other people put their bins out on the street on bin night. In most of the streets, the bins weren't overfilled and the rubbish was separated into landfill and recycling bins. Bin lids stayed down and if the wind blew rubbish around, the people picked it up before it blew into the drains.

City folk smoking in public as they walked along the street on their way to work used bins or cigarette trays to stub out their cigarettes. They knew that animals could mistake cigarette butts for food and they didn't want to create a problem.

A runner filled up her reusable bottle of water at a drinking fountain. She used her bottle every day as she didn't want to waste money on bottled water. She knew that a lot of the waste in landfill was single-use plastic bottles and she wanted to keep her waste to a minimum.

Some school kids walking to school saw rubber bands and hair ties lying on the footpath. They had a competition to see who could collect the most. They had seen a documentary at school about hair ties being caught around platypus' bills. They snipped all the rubber bands and hair ties when they got to school and threw them in the bin.

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The Yarra River, still looking natural and clean, finally reached Port Phillip Bay and flowed healthily into the ocean.