EnviroTEACH

An environmental education resource for teachers

Term 4 – 2017

Students and a parent from Rimu School identifying freshwater invertebrates caught in the Waihopai River.

Inside this issue

From the editor

Kia ora! This issue of Enviroteach focuses on the health and quality of Southland's freshwater ecosystems. It's packed with ideas to help teachers create opportunities for students to learn about water, practise thinking and working as scientists, and investigate the health of local streams.

Did you know that Environment Southland offers expert assistance to schools wanting to learn more about freshwater? We've compiled a resource called Stream Connections which contains information for teachers about freshwater and water quality in Southland. It includes classroom activities, curriculum links and step-by-step instructions for field trips.

Download the Stream Connections resources from our website: www.es.govt.nz/for-schools/educational-resources/stream-studies.

Our environmental education officers, Pat Hoffmann and Mark Oster, are teacher-trained and able to assist you with your water-focused learning programmes. We can help you with your planning, give a talk to your class, do some activities at your school, or accompany you on a field trip to a stream. We have all the equipment needed to carry out a fun, science-based stream study with your class. We also run professional development sessions to deepen your knowledge about freshwater issues, develop your understanding of the science of water quality and encourage you to use the Stream Connections resource in your classroom and on field trips.

These services are available to all schools in Southland, free of charge. Contact us on 0800 76 88 45 or education@es.govt.nz.

All the best for term 4.

Pat Hoffmann

Environmental education officer, Environment Southland

environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

Southland's water quality is a mixed bag

Access to clean water is vital for the social, cultural and economic wellbeing of our communities. We use water for a variety of purposes, including domestic and municipal uses, and agricultural, industrial, irrigation and forestry operations. However, the environment needs clean water too – so our use of, and impact on water needs to be balanced against what is needed for the health of our ecosystems.

Environment Southland keeps an eye on the quality of our water and the health of our ecosystems by monitoring sites across Southland. Every month our staff assess growth of algae and collect water samples for testing. We monitor macroinvertebrates during summer. When the results from the water quality monitoring and ecosystem health monitoring are combined, they give us an indication of the overall health of a stream.

Environment Southland environmental technical officer Alice Woodward collecting samples of algae in the Dipton Stream.

Environment Southland environmental technical officer Nathan Hughes collecting macroinvertebrates in the Dipton Stream.

Recent water quality information on Southland's rivers, lakes and groundwater shows that while some areas of the region have good water quality, improvements need to be made in other areas:

- *E.coli*: Our rivers, streams and lakes are generally clean enough for wading and boating, but six out of the 55 river sites that Environment Southland monitors have *E.coli* levels that do not meet the national standard for wading and boating. The river swimming sites that we monitor, with the exception of the Mararoa River, are worse than the national standards for swimming, most of the time. Our lakes are mostly clean enough for swimming, with the exception of Waituna Lagoon.
- Nitrogen: All sites that we monitor have nitrogen levels that meet national bottom lines for fish toxicity. However the majority of these sites have nitrogen levels that do not meet the more conservative national guideline for ecosystem health.
- Phosphorus: Phosphorus is also showing some signs of improvement. Phosphorus is a concern in our rivers as excessive amounts can lead to increased algae and plant growth. Since 2000, nine of our monitoring sites have shown improvement, while the other 12 sites have not shown any trend.

Source: www.es.govt.nz/council/news-and-notices

Otatara School students step up as water experts

Written by Ashlee Nieborg and Tracey Maclennan, Year 6 teachers at Otatara School

The Year 6 students at Otatara School began learning about water science at the start of the year as a part of a school-wide environmental initiative 'Environment Otatara' to care for our local environment and take action to look after it for the future. The school has been using a 'mantle of the expert' approach (www.mantleoftheexpert.co.nz) to have our students working as 'scientists'.

'Hydrologists Otatara' is the Year 6 branch of 'Environment Otatara' developed to preserve and protect our local waterways and the water quality in our area. The students have been observing closely, gathering, collecting and analysing data and using scientific equipment for testing water quality.

The students have refined their water quality testing skills using the Otatara Scenic Reserve stream that runs behind our school and into the reserve. We, as teachers, have noticed that the students have developed their organisation, time management, observation and data collection skills, as well as being highly engaged in their learning.

We then decided to take our skills further afield and carried out a wide range of tests including more specialised water quality tests such as nitrates, phosphates, dissolved oxygen and faecal coliforms. We were interested in finding out what the quality of our waste water was from storm water drains that lead to local rivers and the estuary. The students have presented their findings for the NZAS Southland Science and Technology Fair and are planning to do further testing and investigations.

The 'mantle of the expert' approach has allowed us to integrate our water science into all areas of our learning and we have found this invaluable in embedding the nature of science into our programme.

HYDROLOGISTS OTATARA

is the Year 6 branch of 'Environment Otatara' developed to preserve and protect our local waterways and the water quality in our area.

Year 6 students from Otatara School with their science project which won a silver award at the NZAS Southland Science and Technology Fair

Hands-on science with Stream Connections

The following pages illustrate some of the hands-on science activities that students can do during a typical Stream Connections field trip with Environment Southland's education team. The methods and schedule for the field trip can be adapted to suit your particular interests.

Clarity

Students and a parent from Rimu School measuring water clarity at the Waihopai River.

Temperature

Teachers learning how to measure water temperature in the Oreti River as part of an Environment Southland workshop and field trip for teachers earlier this year.

pH

Students and a parent from Rimu School testing the pH of the water in the Waihopai River with help from environmental education officer Pat Hoffmann.

Velocity

Students from Rimu School measuring the velocity of the Waihopai River.

Bank erosion

Students from Rimu School measuring how much of the river bank is eroded.

Freshwater invertebrates

Students and a parent from Rimu School identifying freshwater invertebrates caught in the Waihopai River.

Other ways to test water

A range of water testing resources are available to groups that are ready to move beyond the fairly basic Stream Connections methods and do more advanced water testing and reporting. Here are some examples:

NIWA's Stream Health Monitoring and Assessment Kit (SHMAK)

The SHMAK kit includes a manual with monitoring forms, instructions and background information; coloured identification guides for bugs and slime, a set of monitoring equipment including: water clarity measuring tube, conductivity meter, pH papers, thermometer, sample containers, magnifier and more. Visit the NIWA website for more information: www.niwa.co.nz/freshwater/management-tools/water-quality-tools/stream-health-monitoring-and-assessment-kit

LaMotte education kits

LaMotte is a company in the USA that manufactures a large range of test kits and educational resources for schools. Refer to the catalogue on their website: www.lamotte.com/en/education. LaMotte products are distributed in New Zealand by a company called WaterTest Products. Website: www.watertest.co.nz/products/education/kits.

LaMotte's Low Cost Water Monitoring Kit enables students to analyse water samples for eight different test factors: ten tests per factor for pH, dissolved oxygen, biochemical oxygen demand, temperature, turbidity, nitrate, phosphate, and three tests for coliform bacteria www.lamotte.com/en/education/water-monitoring/3-5886.html.

Read the story on page 3 to see how Otatara School used LaMotte's Low Cost Water Monitoring Kit to analyse water in the stormwater drains around Otatara.

Year 6 students from Otatara School talk to junior students about their stormwater investigation.

The EarthEcho Water Challenge

The EarthEcho Water Challenge (formerly called the World Water Monitoring Challenge) is an international programme that runs from 22 March (World Water Day) through to December each year. Participants test water quality in their community using LaMotte's Low Cost Water Monitoring Kit (see page 6) then share their data, stories and photos online. The Earth Echo website provides guidance on how to understand the results and how to begin to take action to protect their water resources. Website: www.monitorwater.org.

The Global Learning and Observations to Benefit the Environment (GLOBE) Programme

GLOBE is an international science and education programme in which students test water samples using recommended methods and then submit their data to the GLOBE database via the Internet. Students can then view data from other members of the GLOBE community in the form of maps, graphs and tables of data. GLOBE offers educational materials for teachers such as classroom and field activities, and provides a forum for students to communicate with scientists and peers around the world. Since its launch in 1994, the international GLOBE network has grown to include over 20,000 schools across 117 countries. Website: www.globe.gov/about/overview.

Test kits

Here are a few things to think about before purchasing a water test kit:

- Can the tests in the kit give you the level of accuracy and precision you require?
- Can the kit test for the correct range (e.g. pH)?
- What are the expiry dates of the reagents?
- Always read the Material Safety Data Sheets and follow the instructions.
- Storage of chemicals:
  - Store the reagents in a cool, dark, dry place with a stable temperature.
  - Make sure all lids are secure.
  - Remember to clean your test tubes after use and before the next use.

Sending water samples to a laboratory

You can send a water sample you have collected to a laboratory for testing, for example, the Invercargill City Council's Clifton Laboratory or the Watercare laboratory in Esk St. These labs are able to test a range of factors including nutrients (e.g. nitrates and phosphates), dissolved oxygen, biochemical oxygen demand, *E.coli*, turbidity, pH and conductivity. Contact the laboratory to tell them what you want to test. They can supply you with suitable sample bottles.

You'll need to collect the water sample yourself and return it to the laboratory as quickly as possible. Contact them directly for more information about the tests they can do and the costs (approximately $15 to $40 per test.) From time to time they may allow individual students to visit the laboratory and have a go at doing the tests themselves, e.g. for Science Fair projects.

Setting up long term monitoring programmes

From time to time, schools approach us with requests to help them set up citizen science projects or longer term water quality monitoring programmes. We're very excited about the community's growing interest in doing their own science and we're keen to help. Contact us if you want to discuss this further.

How to access information about water quality in Southland

It can be challenging to find reliable information about your local river or stream. We recommend using Environment Southland's online mapping service, Beacon, or the LAWA website. Here are some examples of the kinds of information you can find on these sites:

Beacon

Go to Environment Southland's website and click on the Beacon link:

- Select "Water Quality (NOF)" to view a map of water quality across Southland.
- Click on the Basemap icon and select Topo View. Find your school and zoom in.
- To find out which river catchment your school is in, go to the Maps tab and select Consents. Deselect Current Resource Consents to clear the map, then check the box called Catchment Boundaries.
- To find out about nitrate levels in your area, check the box called Regional Nitrate Levels.

- ABOVE: Each of our monitoring sites is represented by a circle on the map. Each quarter represents what we are measuring and the colour of the quarter represents the current water quality.
- RIGHT: Summary of the state of water quality in Southland and trends over time.

LAWA

Go to Environment Southland's website and click on the LAWA link:

- Select "River Quality" to find out about the health of rivers and lakes in your area.
- Click on the National Picture tab for information about the overall condition of New Zealand's rivers.
- Select "Can I swim here" to see the results of council's weekly monitoring of bacteria levels at popular swimming spots.
- Select "Water Quantity" to view data on river flow, rainfall and groundwater levels or find out how much water is being used and for what.

Environment Southland has environmental monitoring sites all over the region. You can access data from these sites, e.g. air quality, rainfall, river flow, river level, soil moisture and soil temperature, by visiting www.es.govt.nz/rivers-and-rainfall/.