

Introduction

Fresh, clean water is the key to life.

When the quality of our water declines, so too does the quality of human life. Throughout history we haven't treated our limited resources of available fresh water with the care and respect they deserve. Polluted waterways around the world are a reminder of our failure to act as guardians of our environment.

At first glance, New Zealand seems to be relatively well off for fresh water. Our country is sparsely populated and its position - isolated in the middle of the ocean - means frequent rain. As well, New Zealand's landforms and active geological past has formed many lakes which store large amounts of fresh water.

But *this is not the case*. The uneven spread of people and the enormous number of farm animals puts considerable pressure on the quality of our water.

"In 1995, the faeces from New Zealand's 9.3 million cattle, 4.9 million sheep and farm goats, and 1.2 million deer produced a waste load equivalent to a human population of 153 million people.

Urban stormwater causes serious problems in some areas (e.g., Auckland), polluting estuaries and harbours with sediment and toxic substances (e.g., heavy metals and hydrocarbons derived from motor vehicles) and in some cases, infiltrating and flooding sewerage systems. Stormwater quality is often similar to that of secondary treated sewage."

The State of New Zealand's Environment, 1997

The Stream Sense programme focuses on relationships between the land and water. This doesn't mean that we are only looking for water pollution. Biodiversity and healthy, resilient catchments also rely on keeping suitable, quality habitat beside and within our waterways. Damage to habitat is widespread:

"The natural character and habitat quality of many (streams and rivers)... has been lost or degraded by drainage, construction of flood control channels and stopbanks, development, removal of riparian vegetation, waste disposal, urban stormwater and agricultural run-off."

The State of New Zealand's Environment, 1997

The Stream Sense programme came from a growing awareness of the serious effect of human activities on the health of our streams and rivers. It is part of a trend where communities are starting to take responsibility for their local waterways.

What Is Stream Sense?

Throughout New Zealand, streams and rivers are giving us vital clues about how well we are caring for our catchments. Designed specifically for school groups in Years 9-13, Stream Sense aims to give ordinary people the skills needed to make sense of these clues.

Students can use the Stream Sense programme to look after their local waterways and to get good information for planning and taking action.

Although the framework of the programme, and the supporting resources in this manual, have been developed to encourage secondary school teachers and their students to undertake the Stream Sense programme, the programme is flexible and will also suit the needs of community monitoring groups.

Overseas experience has shown that the divisions between school and community projects soon disappear, and joint efforts take over where similar programmes operate.

Stream Sense is potentially one player in whole communities contributing to the protection and improvement of their local natural and physical resources.

What Can Be Achieved?

Stream Sense is not just about monitoring. Taking the plunge is only the first step.

Using your results to plan practical action to restore, enhance or protect our precious fresh water resources is the aim of the Stream Sense programme.

Action plans can range from cleaning up rubbish around your stream to replanting trees that restore habitat quality. You could make a video, survey the local community about their knowledge of their waterways, or network with other Stream Sense groups, telling them about your group and your activities. The opportunities are endless!

By acting on your results, you will gain social action skills and become an integral part of the decision-making process.



What Are The Aims Of The Stream Sense Programme?

The **aims** of the Stream Sense programme are:

- To develop community awareness and ownership of problems associated with the management of natural and physical resources, especially water quality issues.
- To encourage and help communities to take positive actions and, in so doing, gain a better understanding of the connections between ecosystems and the importance of sustainable use of natural resources.
- To provide links between existing monitoring programmes and communities within catchments (both rural and urban) as well as across the country to allow an exchange of information and ideas.
- To encourage the community to become involved with related programmes, such as Trees for Survival.
- To further enhance the role of local government in conserving the natural environment.

In particular, water monitoring groups set out to:

- Survey streams and water sources to assess their present condition.
- Identify areas where there is pollution and identify the causes or sources.
- Provide a comprehensive database to analyse trends in the ability of waterways and water bodies to sustain life.
- Indicate areas where habitat and water quality needs improvement, and decide how this can be achieved.

To achieve these aims, the Stream Sense programme has chosen stream habitat and macroinvertebrate surveys to monitor the biological health of streams and surrounding land. The physical and chemical conditions of the water can be monitored using stream flow, turbidity, temperature, pH, dissolved oxygen, nitrates and phosphorus tests. Just which chemical and physical conditions are measured may vary between catchments and the goal of the monitoring programme.

To help build an understanding of the whole catchment and to better understand the data collected by these tests, monitoring groups can share results as well as use data collected by water monitoring agencies.

Other Water Monitoring Programmes

Stream Sense is not the only water monitoring programme to be developed for use by 'ordinary' people. Similar programmes have been operating in Australia (e.g. Streamwatch, Waterwatch and Ribbons of Blue) and USA (e.g. Streamkeepers, Global Rivers Environmental Education Network, Save Our Streams) for several years. The Stream Sense programme has been designed around the basic ingredients that have proven successful for these different groups.

- **Flexibility to develop your own monitoring programme.** This manual can be used as a 'menu' for selecting the approach and procedures that suit the goals of your programme.
- **Focus on action rather than testing.** Testing leads to action.
- **Working in your own backyard.** A project in your own area will directly benefit your community and be more likely to attract a wider range of supporters.
- **Support for the programme.** This is the key to developing successful, long-term projects. The programme should be supported at the 'grassroots' level by local and regional councils. The experience, knowledge and involvement of Council staff is important for the practical part of project implementation, and for the validation of your test results. Sponsors are often keen to become involved, providing funds for equipment and the materials needed for local projects.
- **Quality of data.** You need to do the testing and sample analysis properly. The value of the programme, and the credibility of data, will be open to criticism if you don't stick to standard procedures. Make sure you receive adequate training and backup before taking the plunge. A website will soon be available, allowing groups to share information and experience. This link will also provide a way for groups to enter and store data.

Stream Sense was developed alongside two other waterway assessment programmes for New Zealanders. The **Stream Health Monitoring and Assessment Kit (SHMAK)** and the **Waterway Self Assessment** programme were developed by NIWA and AgResearch respectively, to help farmers monitor the health of the streams that flow across their land.



Although these programmes were developed for the needs of their specific target groups, there are many overlaps. SHMAK, in particular, uses equipment and procedures that will let both programmes operate side-by-side. SHMAK procedures are quick and simple to use, and the equipment cheap to purchase and easy to maintain. This is an effective way to monitor the effect of land use on water quality.

Information collected through the Stream Sense programme can be used to get SHMAK scores but it is not intended as a substitute for that programme. Where both programmes are being used in the same area you can share information. However, it is not recommended that data generated by each are merged. It is better to record the origin of data and store these different data sets separately.

Structure Of This Manual

This Stream Sense manual has been designed by teachers, for teachers throughout New Zealand. The main focus of this resource is to encourage schools to take the first steps towards becoming involved in monitoring the health of their local stream or river and to take action to initiate improvement.

This resource manual is divided into 12 sections:

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| 1. Introduction | Information about the Stream Sense programme and the teaching resource manual. |
| 2. The Curriculum | Teachers' notes about curriculum linkages for Stream Sense, including achievement objectives, possible learning experiences and links to unit standards. |
| 3. Getting Started | Developing a Stream Sense plan, and the five steps in designing your stream monitoring programme. |
| 4. Understanding Your Catchment | Explanation of catchments, and creating your own catchment map and catchment inventory assessment sheet. |
| 5. The Stream Reach | Describing your stream reach, and drawing a stream reach map. |
| 6. Habitat Assessment | Assessing and recording stream habitat features along your stream reach. |
| 7. Chemical/Physical Factors: The Tests | Methods for conducting chemical and physical tests in your stream reach. |
| 8. Chemical/Physical Factors: The Fact Sheets | Background information on the various chemical and physical tests. |
| 9. Biological Surveys | Methods for sampling aquatic life in your stream reach. |
| 10. Data Interpretation & Information Management | Managing your results and storing, presenting and interpreting your data. |

11. From Results to Action

A five-step process for identifying problem areas and taking action. Includes two Stream Sense action plan scenarios.

12. Appendices

Includes glossary, references and list of useful contacts.

Teachers may photocopy material in this resource for use in teaching programmes. In particular, the field sheets are designed to be used by each group of students working on the Stream Sense programme.

Teachers and students are referred to the various publications on freshwater life to identify the macroinvertebrate life in their stream reach (see References in the Appendices).

A video demonstrating the various stream health monitoring techniques also accompanies this manual.