



ARGOS RESEARCH NOTE: NUMBER 27, NOVEMBER 2006

## Monitoring stream health on farms

### Why is ARGOS studying streams?

One of the most important issues surrounding agriculture is the impact of agricultural production on water resources. Poor agricultural practice reduces water quality and degrades ecological communities in farm streams. Fencing to exclude stock, retention of grassy buffer strips to stop sediment entering the stream, planting of riparian vegetation to increase shading and reduce sediment and nutrient entry, and the careful management of livestock wastes are all ways to protect stream health. These remedies can be impractical, expensive and time consuming to establish in some places, so ARGOS is applying ecological science to recommend best professional practices for difficult spots.

We have established stream health monitoring partly as a way to track whether environmental health is slipping or improving on the study farms, partly to evaluate inexpensive but scientifically reliable survey techniques that the farmers themselves could apply, and partly to assist farmers to find cost-effective 'stream care' strategies that integrate successfully with all the daily challenges to economic, social and environmental sustainability of sheep/beef farming. Our stream surveys in 2005 found a number of farm streams in good health supporting abundant and diverse native fish populations. Based on lessons learned from these streams, we will work with farmers to restore fish populations in additional streams as well. Interestingly, we also

discovered that farm ditches can be important refuges for native fish because low levels of dissolved oxygen excludes predatory trout – signalling that even modified waterways can be important for conservation and are worthy of care. We will be checking out this hypothesis in coming years and make appropriate recommendations for farm ditch management.



Figure 1. Sampling water quality and stream conditions on one of the ARGOS sheep/beef farms. Suzanne holds the water clarity tube, used to measure the amount of sediment in the water. This stream has an excellent buffer zone of dense vegetation to help prevent nutrients and sediment getting in to the water, but lacks shading, a potentially important screen that keeps water cooler and allows more fish to survive in the stream.

By demonstrating best farming practices to protect waterways, ARGOS farms aim to safeguard market access and premium prices for New Zealand's farm products in overseas markets.

## The start of a long journey

Our initial study of stream health was conducted in summer 2005/06 and had two immediate aims: (1) Provide baseline data on waterway quality on sheep/beef farms; and (2) Evaluate a stream health monitoring protocol designed for farmers to allow us to choose a reliable but cost effective method to monitor trends in stream health for years to come.

Once annual surveys have been repeated often enough to be sure of patterns, we hope to achieve two further aims: (1) Develop customized stream care management strategies for each farm; (2) Identify the relative impacts of organic, Integrated Management, & conventional farming systems on stream health

## Study farms

We measured stream characteristics, nutrient and sediment levels, and algae and aquatic insect communities in streams on 35 South Island sheep/beef and 24 North Island dairy properties in summer 2005/2006. Sheep and beef farms are organized in 12 clusters of three neighbouring farms including an organic, Integrated Management, and conventional farm. Dairy farm clusters contain matched pairs of one conventional farm and a neighbour recently converted to organic. Stream health monitoring is also proceeding on ARGOS High Country properties this year. Eventually stream monitoring will be done on He Whenua Whakatipu (Ngāi Tahu) properties and Kiwifruit orchards involved with ARGOS.

## Stream health indicators

We mainly used the Stream Health Monitoring and Assessment Kit (SHMAK), a tool developed for use by farmers and landholders. We supplemented this with additional measures of water chemistry and sediment loads to cross-check the sensitivity of the SHMAK indices.

The first year of monitoring provides a clear “snap shot” of stream health on individual ARGOS farms. The first survey assessed the percent change of each variable across each farm to discover how stream health

changes and what factors are most important to that change. After several years of monitoring, ARGOS will be able to compare stream health between farms, farming systems and farm sectors by using Geographic Information Systems (GIS) to account for differences in land use and management on participating farms and to “factor out” the effects of land use and management on neighbouring properties upstream.

First we chose and mapped the longest stream on the farm as a ‘focal stream’ for repeated sampling. We positioned a SHMAK sampling site at the point where this stream first enters the farm, and another at the point where it leaves the farm. Comparing the indicators at the two sites allows us to relate changes to land use and farm inputs on the study farm. The SHMAK protocol also applies a rapid inventory system for scoring the riparian (stream margin) vegetation for its nutrient and sediment filtering functions, so we applied this method down the full length of the focal stream in each property. In the long-term we will monitor trends in riparian habitat management and relate it to stream care strategies adopted by the farmers. We will monitor changes in stream health over the next four years to see how organic, Integrated Management and conventional farms affect stream health, and offer lessons that can be applied across all farming sectors.

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*See ARGOS RESEARCH NOTE 28 for some stream indicator results for the baseline survey on dairy and sheep/beef farms.*

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