THE SHERRY RIVER –A SUCCESS STORY

J.W. Nagels[1], T. James[2], R.J. Davies-Colley[1], A. Fenemor[3], R. Merrilees[4], A Burton[2], B. Stuart[5], A. Parshotam[1]

[1]NIWA, P.O. Box 11-115, Hamilton 3251, New Zealand
[2]Tasman District Council, Private Bag 4 , Richmond 7031
[3]Landcare Research, Private Bag 6, Nelson 7042
[4]NIWA 217 Akersten Street, Port Nelson 7040
[5]NZ Landcare Trust, c/- Cable Bay Farm, Nelson
Email: j.nagels@niwa.co.nz

Background & Aims
Water quality monitoring in the initial phases of the Motueka Integrated Catchment Management (ICM) programme in 2000-2001 revealed mainly good water quality throughout this catchment, but the Sherry River was a 'hot spot' of rather poor water quality that was attributed to dairying. The high *E. coli* concentrations in this tributary, even under base-flow conditions, was linked to frequent dairy herd crossings to and from the twice-daily milking by a special study (Davies-Colley et al. 2004). Dairy farmers in the Catchment responded rapidly to the findings of this study by building bridges to eliminate crossings and consequent dairy cow access. Continuing monitoring at four sites in the Sherry River demonstrates that bridging has much improved microbial quality, although the water was still not suitable for swimming. The Sherry Catchment landowners wished to achieve contact recreational water quality and were assisted by the N.Z. LandCare Trust and other agencies (through the Motueka-ICM programme) with farm planning towards that goal. The water quality monitoring continued in order to document the expected further improvements in water quality as on-farm BMPs where progressively installed, is described and results summarized. With assistance of Envirolink funding, the monitoring was extended to include special storm-flow sampling in order to measure loads of diffuse pollution from this catchment and thus impacts on downstream waters – and so as to gauge future decreases in loads with improved land management.

Methods
Preventing stock access to waterways by bridging and culverting was the first phase of actions to improve water quality in the river, taking place between 2002 and 2005. In 2006 significant improvements in water quality were measured. However, the river waters were still not consistently meeting bathing water standards. With only half the job done, the catchment group said it was time to determine what were the other main sources of diffuse faecal pollution and where were they coming from. Concerns about the water quality of certain small tributaries were expressed by the landowners.

In 2007-08, with the cooperation of the Sherry Catchment Group, Tasman District Council (TDC) undertook sampling of seven of these tributary creeks in the catchment. The *E. coli* loading contributed by four of these tributaries was about 40% of that of the Blue Rock site at the bottom of the catchment. The relative loadings in each of these waterways was then used to prioritise further on-farm action. It was evident through the development of the farm plans in the Sherry River catchment that the biggest improvements would still come about from managing cattle access to waterways, rather than sheep, the other main stock type in the catchment. In order to consider actions in a more holistic way a farm plan was developed for each farm in the catchment.

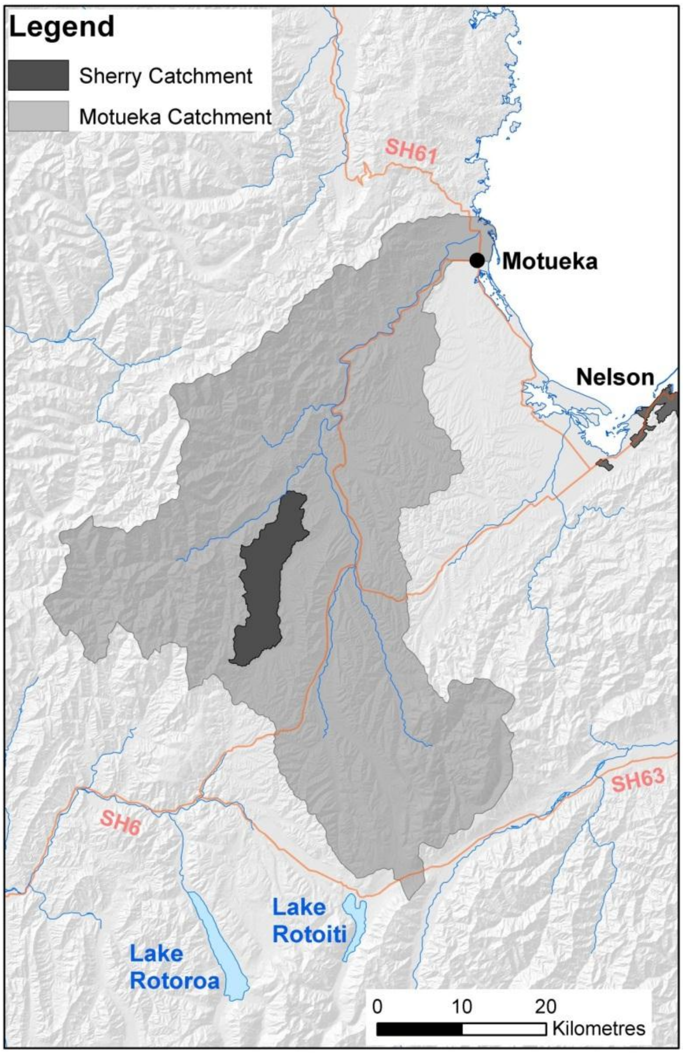

Figure 1. Location of Sherry River in the Motueka catchment.

Farm plans were seem as a critical tool to prioritize works looking forward over a 5 year period, recognizing that any expenditure needs to be in tune with overall farm budgets. These plans were completed in early 2008 and landowners have been actively implementing them since. Between 2008 and 2011, TDC has assisted financially with approximately 4.2 km of riparian fencing, with additional riparian fencing erected and funded by the landowners. Associated with some of the fencing there has been some riparian planting with native species. This has been carried out as both individual owner and community projects. Native bush blocks joining waterways and wetland areas have been fenced and this would also have reduced impacts on surface water quality. Good on-farm effluent management was also recognized as very important, in particular the need for reasonable storage and low rate application to land. In mid-2010, one of the dairy farms with the most out-dated effluent system upgraded, allowing for three months storage and employing a weeping wall system.

It is evident that landowners have a greater understanding of the cause and effect of their farm management practise on surface water quality. This is leading to some small, but significant changes in grazing management and raceway maintenance. Additional culverts for stock and vehicle crossings are being used and more reticulated stock water systems are being installed. There are still more actions left to do on the list in the farm plans, but the community is almost at the final goal of having the main river swimmable for the vast majority of the time.

A model for storm-event transport and die-off dynamics of the faecal indicator bacteria, *E. coli* to the Motueka River, and its microbiologically-contaminated tributary, the Sherry River was applied by Wilkinson et al. (2010).

For the monthly data (collected from May 2003 to March 2011), at Blue rock, the last sampling point before the Sherry River joins with the Whangapeka River, we applied the seasonal Kendal analysis with flow adjustment, to the *E. coli* measurements

Results and Findings

The impact of bridging the river at two sites is shown in Figure 2, and has had the effect of halving the E. coli loads of the River, as measured at the downstream Blue Rock site.

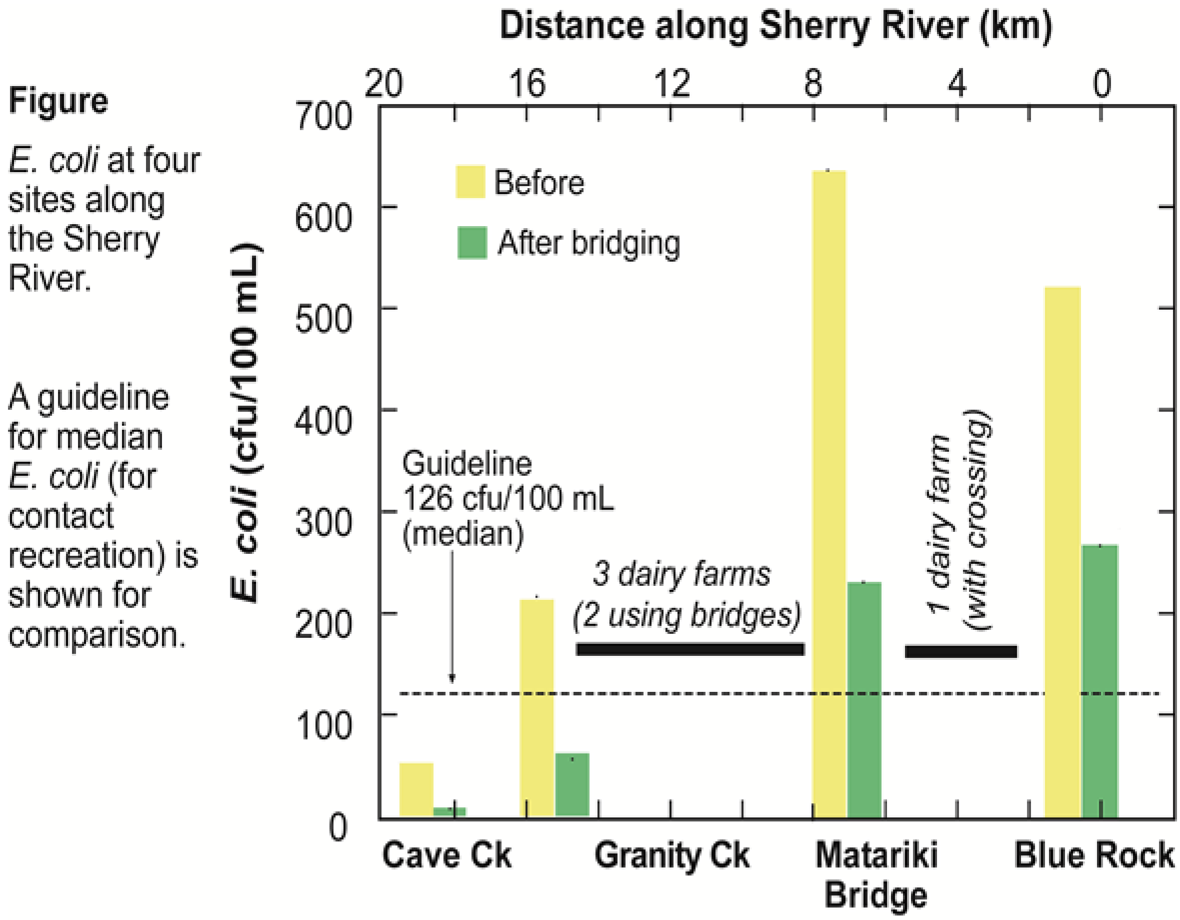

Figure 2. *E. coli* at four sites along the Sherry River, before and after bridging.

Good model precision was achieved for storm-event transport and die-off dynamics at the scale of the comparatively large (2047 km^2) Motueka Catchment and somewhat less precision in the much smaller (78.4 km^2) Sherry sub-catchment. Storm-event responses differ strongly at these two scales, with *E. coli* pulses in the Sherry River having a shorter duration, and much steeper rise and fall than in the Motueka River. The ability to simulate faecal bacterial dynamics at two very different scales confers extra confidence in the structure of the model and prediction of the faecal pollution injected by river flood plumes into Tasman Bay, Wilkinson et al. (2010).

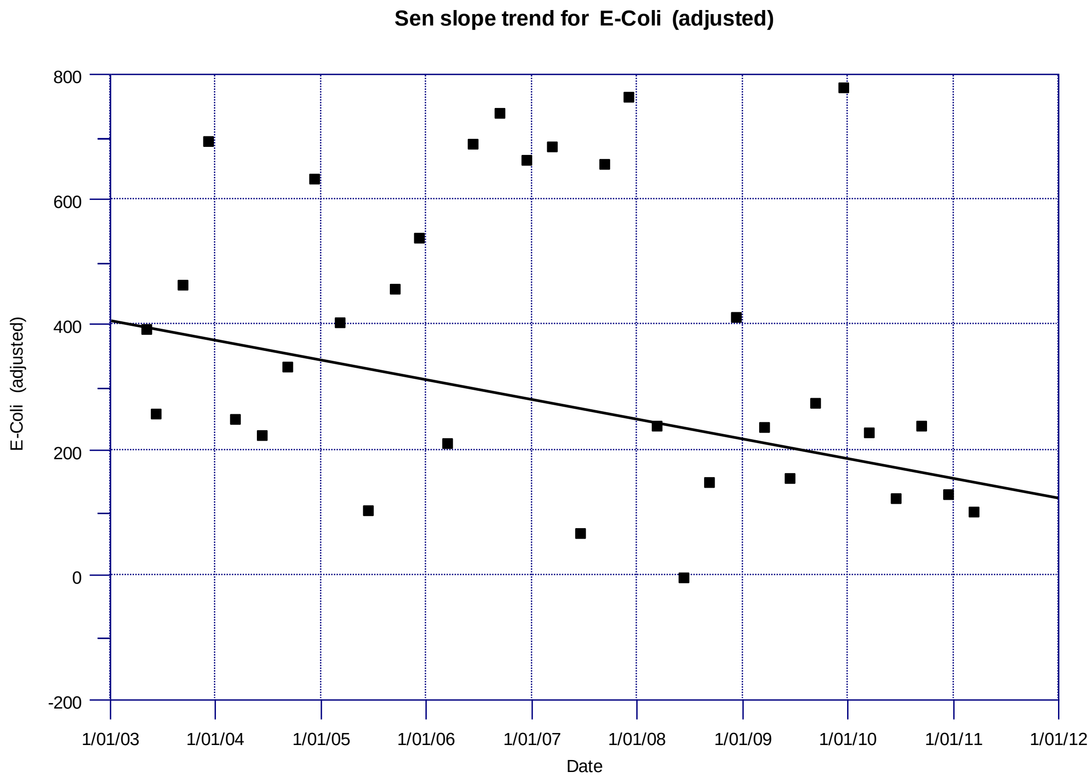

Figure 3: Time Trends seasonal Kendal model (with flow adjustment) of *E. coli*, monthly data from May 2003–March 2011 for the Sherry River at Blue Rock, with *p* value of 0.02%.

The seasonal Kendal analysis with flow adjustment of *E. coli* monthly data from May 2003–March 2011 for the Sherry River at Blue Rock (Fig, 3), gave a trend line indicating a reduction in *E. coli* to levels consistently meeting contact recreational / bathing water standards (as of March 2011), showing that on-farm BMP's can be effective in reducing bacterial loads to rivers.

References

Davies-Colley R,J,. Nagels J,W,. Smith R,A,. Young R,G,. and C, J, Phillips C. (2004).Water quality impact of a dairy cow herd crossing a stream. *New Zealand Journal of Marine and Freshwater Research* 38:569-576.

Fenemor A,D,. Allen W,J,. Stuart B. (2011). Evaluation of landowner responses to the Sherry Catchment water quality improvement initiative. Landcare Research report for NZ Landcare Trust and stakeholders of the Motueka ICM programme.

Nagels, John., Rob Davies-Colley and Rob Merrilees. (2008). Monitoring to document improving water quality in the Sherry River. *Proceedings NZ Fresh Water Sciences Society Annual conference, Taranaki, 24-27 November 2008.*

NZ Landcare Trust (2010). *The Sherry River story – Improving water quality through whole catchment planning*. Compiled by Barbara Stuart for the Sherry River Catchment Group. 40pp.

Young, R. G., Quarterman, A. J., Eyles, R. F., Smith, R. A., Bowden, W. B.(2005). Water quality and thermal regime of the Motueka River: influences of land cover, geology and position in the catchment. *New Zealand Journal of Marine and Freshwater Research* 39: 803-825.

Fenemor, A., Young, R., Phillips, C., Davies-Colley, R., Stuart, B., Allen, W., and T James. (2011). Facilitating voluntary action to reduce rural land use impacts in the Motueka River catchment, New Zealand. *Proceedings: IWA DIPCON 2011, Rotorua N.Z.* 18-23 Sept 2011.

Wilkinson R. J., McKergow, L. A., Davies-Colley R. J., Ballantine D. J., Young R. G. (2010). Modelling *E. coli* in the Motueka and Sherry Rivers in the South Island, New Zealand. *New Zealand Journal of Marine and Freshwater Research 45*: 369-393.