WATER QUALITY AND CLIMATE CHANGE

ORPHANAGE STREAM PILOT PROJECT

SUBMITTED TO

ROBIN RIGBY TRUST

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Landcare Research
Manaaki Whenua

Acknowledgements

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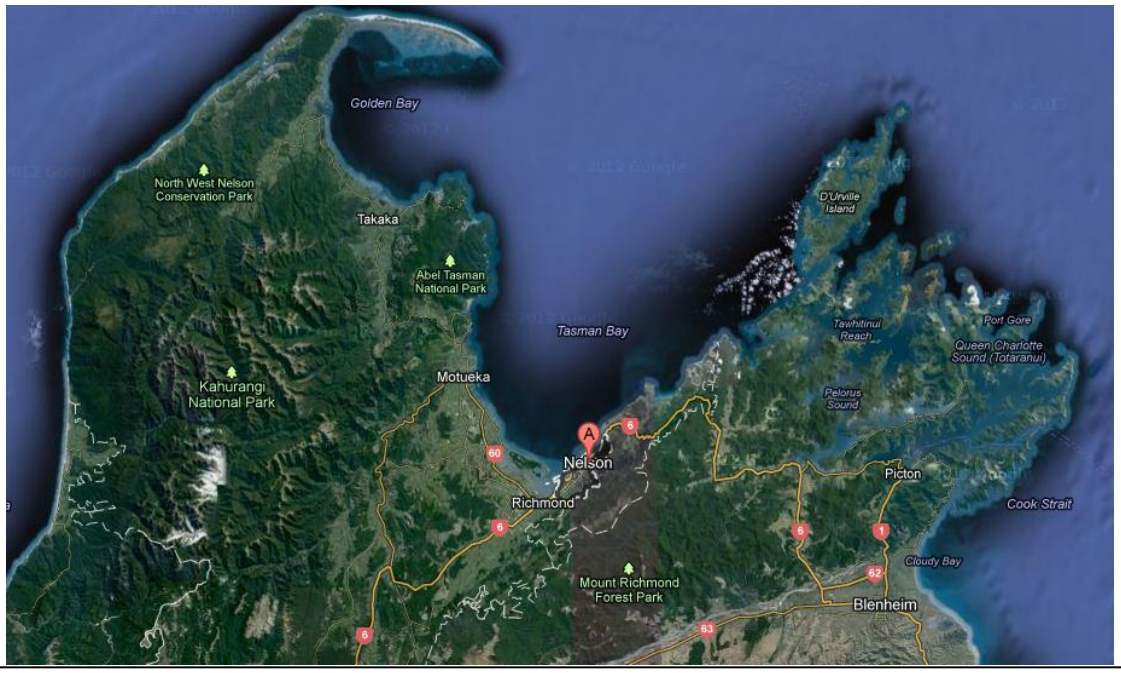
Purpose and Objectives

Understanding the vulnerability of freshwater and saline ecosystems to the impacts of climate change was the overarching theme of the research project. Specifically, the project was narrowed in scope to focus on issues affecting freshwater and estuarine ecosystems within one watershed in the Nelson City jurisdiction on the South Island of New Zealand.

Its geographical isolation and small island character make the country of New Zealand particularly vulnerable to the impacts of climate change. These impacts can affect water availability, water quality, sea-level rise, as well as a suite of other socio-economic effects. The staff and council at the city of Nelson on the South Island of New Zealand, the study site for this project, are beginning to grapple with some of these issues.

Left: New Zealand; Top: Nelson City; Bottom: Nelson, Tasman Bay and top of the South Island.



One area that the staff and council at City of Nelson was particularly interested in was the deteriorating state and condition of their urban streams and the impact on coastal receiving waters. Exacerbating the situation is the ongoing threat that the impacts of climate change have the potential to cause further degradation of urban streams. The staff and council in Nelson were interested in knowing the causes of water quality deterioration to better target solutions to protect these vulnerable and ecologically important ecosystems. This research was approached with a pilot study methodology that could be replicated for other urban streams in the city's jurisdiction in order to determine and address the causes of degradation in a systematic way.

Upon further consultation with the staff from the Land Management Branch it was decided that that an analysis of the biophysical parameters of water quality and ecosystem integrity from existing studies of the pilot catchment was needed. With a better understanding of stream dynamics and environmental impacts it was possible to address the causes of water quality degradation, and provide recommendations for improvement.

Once stream reaches were assessed for water quality impacts meetings were held with land developers in the catchment, property owners bordering the stream, and a public display was mounted for an environmental festival and at the local community centre to better inform residents of the watershed of the environmental impacts on the stream and the coastal receiving water body. A final report was a prepared for Landcare Research and the Nelson City Council at the end of the study. Presentation and educational materials were left with Nelson City Council upon termination of the project.

Left: Fish-friendly dam with fish alley, rocks deflect current to provide lower velocity resting areas.

Right: Duck pond upstream of fish-friendly dam.

Project Outcomes and Impact

The research project took a five-stage approach. The first few weeks in Nelson served as a further orientation to the work of Landcare Research and the role of the various partner groups in the region, including Nelson City Council, the Cawthron Institute, Fish and Game and the Department of Conservation. This phase was important to prevent duplication of work and to assess research needs. Each of these entities have an ongoing interest in climate change impacts, water quality, stormwater management and urban water management. Meetings were held with staff from these various organizations to more closely examine research needs and refine the project outcomes. Given the twelve-month time-frame for the project, realistic deliverables and project outcomes were set within the time available.

These outcomes, organized based on the five-stages included:

1) Selection of a pilot watershed: Orphanage stream
2) Review of monitoring information available from various studies for the Orphanage stream watershed
3) Analysis and assessment of water quality impacts in the Orphanage stream watershed
4) Meetings with property owners adjacent to the stream and sharing information with them on land management techniques, and
5) Writing of final report and development of a public display of the research.

The time allotted for the project was sufficient to accomplish the objectives. Another field season could have allowed the researcher to continue to work with property owners to follow through on implementation of stormwater management and land management practices to improve stream health, where further follow up was needed. Additional time could have also allowed for the replication of the project on another pilot watershed. Given that such additional time was not available Nelson City Council was in agreement to continue these initiatives in future years. Establishing a project baseline was effective for them to have a plan that could be implemented in future years.

The relationship between the researcher and the supporting and host organizations was beneficial for the researcher. Landcare Research provided a work facility and access to resources and information, yet Nelson City Council was the main beneficiary of the research outcomes. The timing of the project did not coincide particularly well with catchment management projects at Landcare Research. In fact they had just finished a 10-year study on the Motueka River, situated in the greater Nelson region. Findings from their project were useful and impactful for this research but unfortunately the reverse was not true. Though Landcare Research is interested in improving stormwater management, water quality in urban streams and coastal receiving waters they could not take a direct interest in this study due to staff limitations. The research did prove useful for providing a stronger linkage between Landcare Research and

Nelson City Council as well as between land owners in the pilot watershed and Nelson City Council.

Mountains to the Sea: Photos from Orphanage Stream, pilot site

A & B: Upper delineation of the catchment area. Pine plantations are present in the mountains and cattle grazing at lower elevation. Some native vegetation but invasive gorse is also present.

C & D: Middle reaches of the stream, much of it bordering on private properties with limited vegetation.

E & F: Lower reaches of the stream, with longer channelled sections where it flows through residential and commercial property.

G & H: The stream as it approaches the estuary and salt marshes

Replication and Modification

This project is ideally suited to be replicated in other parts of the region where data is available. It was the intention of Nelson City Council to replicate the study because of their interest in water quality and stream health in their urban streams and raising awareness about the impacts of climate change on coastal communities and ecosystems. The project proved particularly timely for Nelson City Council because they will be reviewing stormwater management policies with the goal of improving water quality and enhancing the resiliency of coastal ecosystems and communities.

In retrospect I would recommend changes to the implementation of the project. This would include a greater focus and analysis of coastal receiving waters and potential for climate change impacts. The project largely focused on upstream approaches to manage stormwater and land-use practices so as to improve downstream and coastal impacts. The coastal receiving body, the Waimea Inlet, is important for recreational, commercial, tourism, cultural and spiritual values for the community. If I had the chance to do the project over again, I would devote more time to addressing issues of concern in the estuary and coastal environment. Another change I would suggest would be to spend more time near the end of the project to disseminate results to the community, to stakeholders, community-based organizations, students and other interested parties. Unfortunately the arc of the research project did not allow sufficient time for public dissemination.

This research project was an invaluable opportunity to forge linkages with coastal managers and environmental researchers in New Zealand. As part of the study I had the opportunity to meet many researchers working for Landcare Research at the various offices such as Auckland, Wellington and Christchurch. I was able to visit sites of special interest to the study, such as the recently redesigned harbourside park in Wellington with impressive stormwater capture and management aspects. I was able to work with various organizations and understand the important coastal resource management work taking place in New Zealand. These linkages were valuable for me as a young researcher to better understand the field and diversity of interests in the geographical region and beyond.

The work that was conducted in New Zealand has proved enormously useful for my freshwater program at the Ecology Action Centre. In that capacity I was able to learn a lot about the forefront of stormwater management that is taking place in New Zealand and Australia. I could see further collaboration with Landcare Research on some of these research areas. One significant drawback is the difference in climate in New Zealand as compared to Eastern Canada. The approaches for stormwater management may be different but the intention is the same.

Educational Booth at Nelson EcoFest August 2011

The informational booth at the Nelson EcoFest had a large poster showing through pictures and images the impacts of land use practices on stream health. There was also posters that were created to discuss the impact on coastal ecosystems and their vulnerability to climate change.

This part of the display discussed the efforts to improve water quality and some of the predicted impacts of climate change on the coast. It also provided a description of the Waimea Inlet, the coastal receiving waters for the pilot study and the fascinating biophysical features of the Inlet.

We estimated that approximately 400 people visited the display over the two day EcoFest in Nelson. Children were especially attracted to the fish tank. After the Ecofest display the education materials were mounted at a local community centre near the Orphanage stream pilot site.

Riparian planting of native vegetation along eroding stream banks of the Orphanage stream.

Additional information

While working at Landcare Research I also had the opportunity to collaborate on a research project led by Will Allen and Andrew Fenemor. This work encompassed a broad-based literature review of evidence-based policy as could be used for environmental decision-making. The context for the work was the development of a decision-making framework for community irrigation development in New Zealand. My contribution was toward a larger pilot project for a proposed irrigation development for the Wairarapa region in the North Island of New Zealand.

This was a pertinent and interesting study to be a part of. The timeliness was notable based on the development of irrigation schemes in parts of New Zealand that are becoming increasingly water-stressed. Evidence-based decision making is an area of study that I was quite unfamiliar with prior to beginning the research but I was able to gather relevant documentation to inform the larger research.

Conclusion

In summary, this was a project that benefited from strong organizational connections in the Nelson region. The lead researcher had aspirations of conducting both freshwater and coastal data and policy analysis though this proved to be more complex then originally expected. Resources were more readily available for land-use planning and stormwater management directed toward freshwater environments, thereby explaining the stronger focus in that area. Decisions on project direction needed to be made relatively quickly while on site in order to meet the needs of the various partner organizations. The project was able to deliver a measurable outcome for Nelson City Council and Landcare Research, with which they were both satisfied. It is intended that the project will be replicated in other catchment areas within the Nelson City jurisdiction.

Further research work of this nature could be conducted at this site or in concert with other Landcare Research projects in New Zealand. As I researcher I drew enormous benefit from the project and very much enjoyed my time in Nelson. It was an invaluable experience for which I am very grateful.

Financial Reporting

Item		**Explanation**	**Rigby Trust ($)**	**Canadian Water Network ($)**	**In Kind Contribution ($)**
Travel	Round-trip Flight (Halifax – Christchurch)	2 x 1,400$	2,800		
	Transportation in New Zealand (site visits, meetings, research)	Rental car (50$/day) 4 x 50$	200		
Coastal Water Researcher	Salary		6,440	3,800	
Research Expenses	Office space	12 x 400$/month			4,800
	Supervision and Coordination	12 x 4 hrs/month x 25$/hr			1,200
	Supplies and equipment (printing, postage, photocopy, misc.)			200	
	Educational materials (poster printing, booth rental space)			1,000	400
Other	Work visa		160		
	Health insurance		400		
Total			**10,000$**	**5,000$**	**6,400$**