RESOURCE MANAGEMENT NEW ZEALAND

NZARM BROADSHEET ISSUE 43 - MAY 2023

75 YEARS OF NZLRI

SILVOPASTORAL SYSTEM DESIGNS

MINISTERIAL INQUIRY INTO LAND USES ASSOCIATED WITH THE MOBILISATION OF SILT AND WOODY DEBRIS

SHEEP WINTER GRAZING

A NEW TOOL FOR FRESHWATER FARM PLANNING

CONSTRUCTED WETLANDS TO REDUCE CONTAMINANTS

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NEW ZEALAND ASSOCIATION OF RESOURCE MANAGEMENT

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WELCOME TO THE MAY 2023 ISSUE OF THE BROADSHEET

Peter Manson – Interim President

Greetings and welcome to the May edition of Broadsheet.

I have stepped into the role of Interim President with big shoes to fill. My background is in soil conservation for the Hawkes Bay Regional Council for many years, followed by a short stint with MPI and now AgFirst Consultants.

Over many years, this organisation has enabled myself and many others to meet peers, learn and contribute. The ambitions of the NZARM executive team over several years have put the association in a strong position to serve our members well into the future. I am proud to be part of a dedicated team working towards ongoing improvement. All of this is a result of the leadership in recent times (and before); however, NZARM owes Nicola McHaffie, immediate past president, a huge thank you for her focus on the wellbeing of the association and particularly her part in developing new initiatives that are already showing results for members. The funded capacity and capability project is just one example. Thank you, Nicola.

Congratulations for taking the time to read the snappy articles full of good solid information highly relevant to our work and the day's issues. It's important to keep up with policy developments as much as it is with on-ground techniques, hear our peers' thoughts, and debate the possibilities. The seeds of those things are sown in this organisation, and Broadsheet is a great medium of learning and sharing.

In this issue, we have some great reading. The ultimate silvopastoral system is the dream of any soil conservator or land management adviser working in the hill country. Manaaki Whenua has been working on this for some time, and a second article on their work appears here. In our last issue, the use of LiDAR to investigate single-tree scale effects on erosion control was mentioned. This issue provides the next chapter in that important work, which aims to improve water quality in the hill country and reduce the loss of productive soils. The endless number of tree species available and the need for research to improve techniques may keep the industry busy for decades to come, and every new piece of the puzzle gives us more options in the field.

WELCOME TO OUR NEW NZARM MEMBERS

Danielle Castle
Eliza Burt-Priddy
Madison Clark-Taylor
Sylvia McAslan
Jacquie Pallard
Tracey Burgess-Jones
Rachel Russell
Kayla Birch
Katelyn Simpson
Reef Townsend
Lucy Burkitt
Findal Proebst

If you have explored the depths of council archives, you may have come across some ancient-looking farm-scale LUC maps that have been hand coloured. Sadly I didn't get to use coloured pencils due to improved technology and having a real draftsman in the office! The field skills of the best Land Use capability surveyors have provided critical information for farm planners and farmers serious about sustainable options. These skills are even more useful today than ever. Here we read about where it all started.

Our most recent life member Stan Braaksma has shared his submission to the ministerial inquiry into woody debris (including forestry slash) and sediment in Tairāwhiti/Gisborne and Wairoa. Stan's thoughts on these issues follow a long career in the Wairarapa hills and a deep involvement in farm forestry. So you can be sure to learn something from this snippet of wisdom.

Finally, think about the conference which will be held in Christchurch this year. The value of this event was highlighted last year with the amount of networking, quality presentations and enthusiastic engagement in workshop sessions.

Enjoy a good read!

Nga mihi
Peter Manson

NZARM CAPABILITY BUILDER - PRESS RELEASE

We have the privilege of announcing that NZARM is receiving $1.3 million in government funding from the Essential Freshwater Fund (EFF) to build capability and capacity in New Zealand's freshwater management.

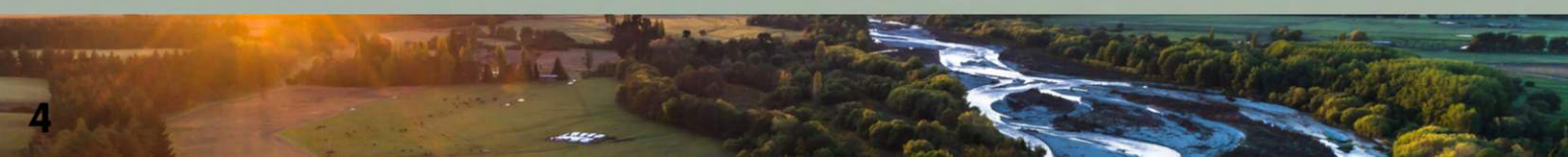
As part of the Jobs for Nature programme, EFF supports the implementation of the Essential Freshwater reforms by investing in capability and capacity across the spectrum of roles associated with the freshwater management system.

Kicking off the NZARM three-year capability-building programme, we've canvassed councils and industry to understand where the knowledge gaps are currently and then started implementing new learning opportunities in the key areas identified.

Increasing in value and impact over 2023, 2024 and 2025, we're matching resource management professionals with new training opportunities, building a new knowledge hub, and ultimately linking farmers and growers with the freshwater management expertise they need.

To find out more, visit the NZARM website at NZARM Capability Project

Find the Ministry for the Environment | Manatū mō te Taiao press release here



THE NEW ZEALAND LAND RESOURCE INVENTORY – 75 YEARS ON

Garth Eyles

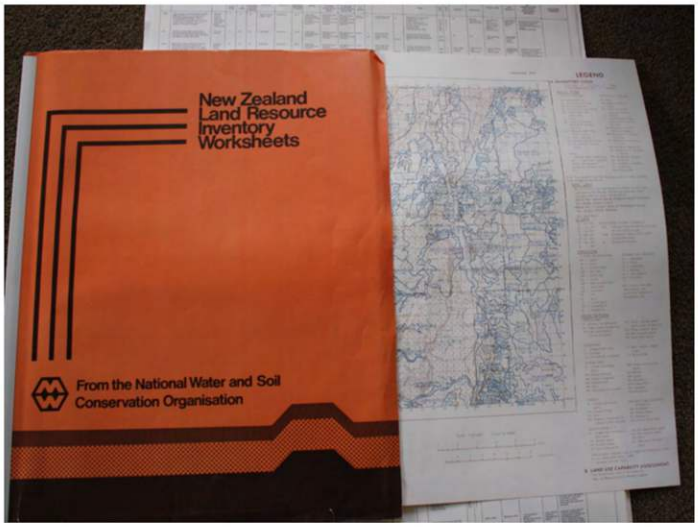
It is now 75 years since the New Zealand Land Resource Inventory was initiated. Amazingly it is still operational and is still the basis for much of our rural planning. This is despite continuing efforts to discredit it and its lack of updating.

It is probably appropriate for me to dig down through my memory cells and give a summary of the reasons why we developed the NZLRI and how we started the process. I have 10 years to summarise progress and its completion – plenty of time - so I will only deal with the start! Early on, I was mainly involved with the North Island mapping team, so my staff comments will be restricted.

In 1972 the National Water and Soil Conservation Authority (NWASCA) provided a new direction for land use capability mapping. The Department's mapping teams would be responsible for mile-to-the-inch and smaller-scale mapping, while Catchment Boards would be responsible for large-scale mapping, i.e., farm planning. The department's mapping teams were required to produce three map series at a 1: 250,000 scale.

These were:

- Land Use Capability Map of New Zealand
- Potential Erosion Map of New Zealand
- Recommended Land Use Map of New Zealand



Field mapping was to be at 1:63,360 scale, with the final maps at 1:250,000 scale. Why this scale reduction? This was the process that Soil Bureau used, and, as our manager, Charlie Harris, was ex-Soil Bureau, we followed the experts. (The first area we mapped was the Gisborne East Coast which had been mapped at 2 miles the inch by Charlie Harris and Noel O'Burne in 1965. This map provided the blue line behind which erosion control and protection forestry were subsidised by the government (now very topical)). The 1973 re-map at 1:63,360 scale was to update and further define these areas. We had a new research director, Dr Ken Mitchell, to whom we showed these worksheets and explained how we reduced them for publication, and he asked why? The only reason we could give was that's what the experts did. He couldn't see the logic in that, so thereafter the maps were published at 1 mile to 1-inch scale – hence they were called worksheets.

Back to the story - **why did NWASCA want this national survey?**

Graham Howard, at MWD head office, had for a number of years been trying to persuade the hierarchy that a national survey was needed for consistency and standards. One of the problems they had in Wellington was that soil conservation grants were based on erosion severity and LUC Class, so every Catchment Board in New Zealand had the worst erosion! We were told to provide national consistency; the LUC Mappers Handbook was the blueprint for mapping but consistent standards were needed in each area. It was also a time when national and regional planning was becoming important and there were no nationally consistent data sets upon which to base policy. We also had competition from the Department of Lands and Survey Land Information series.

That Department thought they were the national data collection organisation and should be responsible for land planning - so there was a degree of competition! (I remember seeing drawers full of the single factor land inventory maps in the Dept Survey office waiting to be drafted and thinking it would take years to get them printed.)

Why didn't we use Catchment Board plans?

In the early 1970s land capability and inventory mapping was not consistent throughout the Catchment Boards. Initially we had thought that, because of the number of farm plans, we would be able to collate their data to save field mappings. We visited the Otago Catchment Board, who had more than 300 farm plans and a reputation for efficiency, only to find that each farm plan had its own unique LUC classification!! And the inventories did not always conform with the handbook. Northland, with Bob Cathcart, had a really good LUC classification system based on rock type and degree of soil weathering but we could not extend it nationally. (However, NWASCA did buy the regional data set off the Northland Catchment Commission and we modified it to suit our national standards (probably much to Bob Cathcart's disgust.) We very quickly decided it was more efficient to completely re-map than it was to try and pull together this huge diversity of styles, techniques, and qualities from each catchment board.

While these investigations were going on we had a mapping team trialling mapping at 1:250, 000 scale in the Wanganui area. It didn't work!

So, in Jan 1973 I was sent to Head Office to work under Graham Howard to get the system working. This entailed developing national inventory classifications, the LUC classifications, map layouts, printing procedures, the mapping programme for both the NZLRI and the Erosion Map series. (And the Recommended Land Use Series.) I won't deal with these other two Map Series here.

MWD Head Office was a bit of a culture shock. Being on the fourth floor of the Vogel building in a room with seven design engineers where the Dominion was passed around (taking half a day to be read by the seven) most of them went off for lunchtime runs through the Botanical Gardens, coming back at 1 o'clock to eat their lunch while I had these deadlines to meet. Still, it was a great social environment to be in.

Why did we choose the 1 mile to 1 inch (1:63,360) topographic map series as a base?

The NZMS 1 series was the largest-scale topographic map series with national coverage. The maps themselves comprised a number of separate layers - roading and rail infrastructure, contours and shading, which, when run through the printing press, formed the map. These topo maps were too complicated to have another layer of data so we removed contours, shading and other extraneous layers. We had a contract to print a set number of sheets every three months so the pressure was on the mapping teams to perform.

Preparing the inventory classifications was not easy as the terms had to be nationally meaningful but understandable by planners, farmers and other non-professionals. We ensured the classifications were developed within the mapping team and experienced practical soil conservators using common usage terms. An example was the rock type classification. This was different to any published geological classification as we were concerned only with those rock types that affected the surface land use and stability. We came up with a simple grouping that was readily identifiable in the field. These inventory classifications were published separately with photos and text to enable users to understand them.

Why did we use the multifactor mapping system (map unit areas)?

This is the traditional soil conservation mapping system. Land management units were identified and then the dominant physical factors within each of these map units were recorded. When any one factor (rock, soil, slope. erosion. land cover) changed significantly a new map unit was delineated. This system is fundamentally different to single factor mapping. Single-factor maps should not be extracted from this mapping system and to do so shows a lack of understanding.

Why did we have nine regional classifications in the North Island and one classification for the South Island?

In the South Island we had an experienced mapper (Rod Prickett) who was willing to prepare an island wide classification. In the North Island we had no team member experienced enough to do the same. At the same time, we were contracted to provide a certain number of maps to the government printer within set times. So, unless we broke the North Island into areas, each with their own regional classification, we would not have been able to supply maps until we had sufficient Island coverage to prepare a whole island classification.

Our solution was to have regional classifications. Head Office required us to have no more than 70 LUC units in a classification for simplicity's sake. Initially we did this, but we found the landscapes too complex so eventually we ignored the requirements. These issues were going to be reviewed with second edition mapping of the North Island at which stage we would have developed an island classification with new LUC units added as needed. Sadly, this was not to be.

How were the worksheets prepared?

We allocated 6 weeks per sheet with 2 weeks field work, 2 weeks office compilation, one week field checking and one week completing. We endeavoured to view all land, either from the road, from vantage points or from the air with boundaries identified through stereoscopic analysis of aerial photographs. This way we viewed virtually every piece of land in the country. The aerial photographs were either obtained from the catchment boards or from the Department of Lands and Survey.

The 1987 North Island NZLRI team. Standing L to R: Terry Crippen (deceased) Mike Page, Peter Newsome. Pam Woodruffe, Keith Carr, Garth Eyles, Wendy Tunnicliffe, Garth Harmsworth. Seated: Kathy Noble, Murray Jessen (deceased), Ross Fletcher.

We designed provisional LUC legends for a region until we were sufficiently confident that we had covered all the variants at which stage we finalised the legend and this was then used on all the worksheets in that region.

A clean compilation sheet was given to the drafting assistant who copied the boundaries onto stable acetate and stencilled all the inventory and LUC data into (or by) each map unit using stencils - an amazing job by an amazing group of ladies. Once checked the acetates were sent to Head Office for batch printing.

Who were the mappers?

When we started the comments from DSIR were "you couldn't do it in that time" and then "it must be rubbish". Following a complaint from the Minister (from Soil Bureau) about inaccuracies in our Northland mapping I was sent there to check whether the complaint was valid. I also visited the Soil Bureau where I was told the original soil map had been overlain over a worksheet and where the boundaries differed, we were wrong. My field check indicated there were far more mistakes in the soil map than in our map (we had very few). I reported this and heard no more. There was a lot of politics at Head Office level but luckily at the field level we had nothing but cooperation.

We employed recent graduates who didn't know it wasn't possible. They proceeded to thoroughly enjoy the freedom, being given training, a vehicle, the responsibility of organising their own mapping programme, to stay in motels etc. All this enabled them to be highly productive. The basic requirements were they had to be able to read a landscape - this was critical - to be independent, and have the ability to rapidly absorb and interpret information. It was a great training ground for soil conservation. We made sure that in most areas we worked with soil conservators from the catchment boards. This was a symbiotic arrangement - we learnt a lot from them and they did from us. The big advantage was that they had then confidence in the completed datasets.

One advantage we had over other government departments was we belonged to a government construction organisation where money seemed not to be limited. I cannot remember a time when work was limited by a lack of money!

Over the 10 years of mapping we had many mappers. There were many characters but only a few happenings can be repeated. Steve Walsh was the only person I know who could demolish a 2L container of ice cream and a packet of swiss cream biscuits for lunch. He was also the only person in the team to have a head on collision with another vehicle on a one-way bridge. Our boss employed a Dutch soils expert whom we found had never driven on a gravel road so Peter Stephens gave him lessons on how to slide and recover a MWD Belmont on a country road (amazingly we had no complaints). Hans became a schoolteacher after he pressed the accelerator instead of the brake on a farm track and we had to lift the Land Rover out of a gorge with a helicopter. We found one mapper had no stereo vision and his field sheets comprised an amazing density of slope symbols which apparently allowed him to draw map unit boundaries – he went to work in Head Office. While in Palmerston North I had a visitation from the drug squad. They were staking out a plot east of Rotorua and found one of our mappers frequenting the area, sufficiently frequently for them to follow it up. It was amazingly difficult to get them to accept that this person was there purely and simply to map!

Completion

Too much for one article so wait with baited breath for the next exciting episode!! After all, the NZLRI internationally was the most detailed digital national resource survey when completed!

Manaaki Whenua
Landcare Research

Wood you believe it?

Tree mapping and alternatives to large tree plantations are just two of the issues our scientists will be on hand to discuss at Fieldays in June.

Manaaki Whenua is the leading research institute dedicated to our land environment and biodiversity.

Our stand will focus on:

- mapping trees through remote-sensing methods
- alternatives to blanket tree-planting
- S-map Online
- soil erosion

Visit us on stand PD30 alongside AgResearch and NIWA and speak to our scientists about ways to mitigate the pressing issues in your region.

See you at Mystery Creek.

AN INTEGRATIVE APPROACH TO SILVOPASTORAL SYSTEM DESIGNS

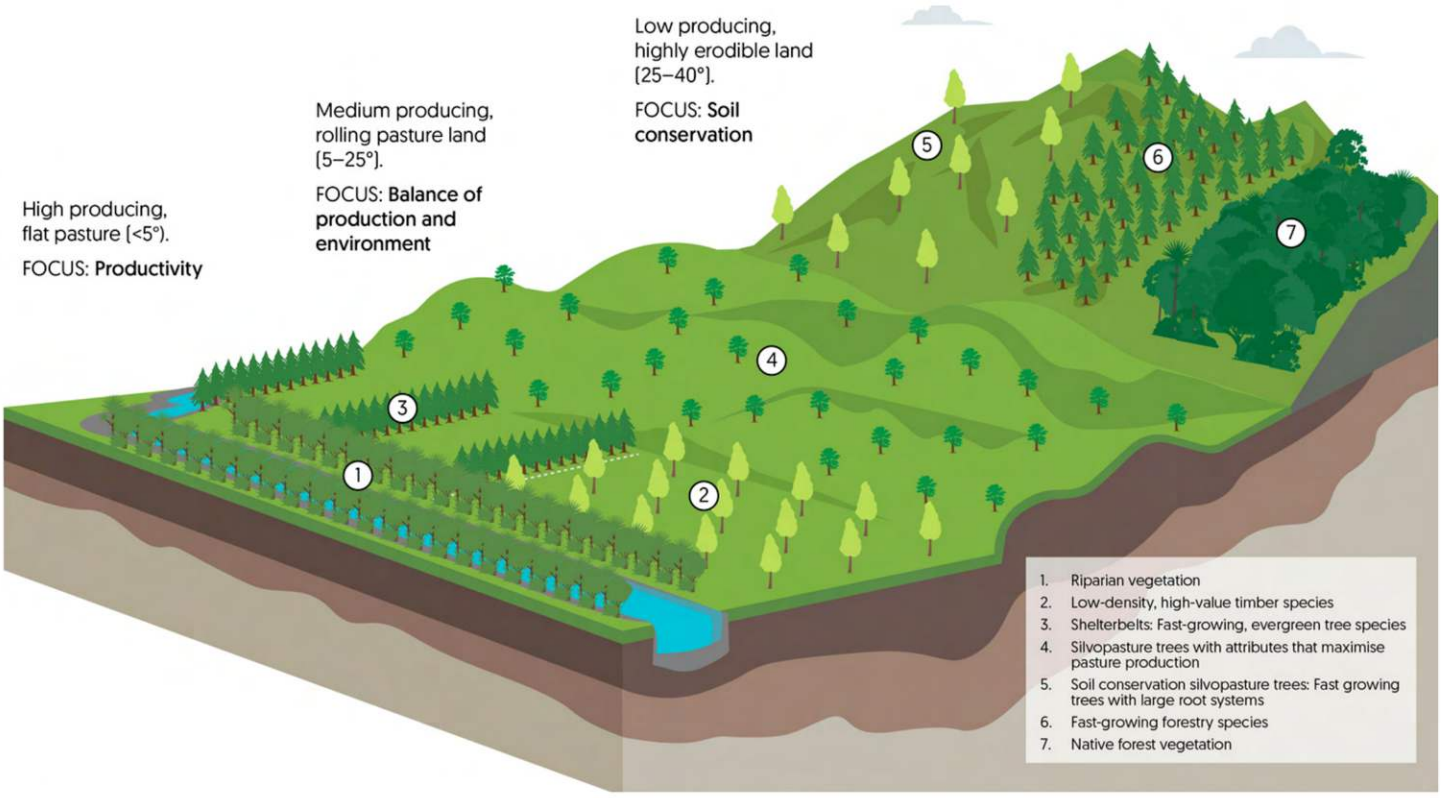
Manaaki Whenua – Landcare Research

Poplars and willows can provide a practical solution for slope stability, but is this the only benefit of low-density tree-pasture systems on farms?
That's the premise behind new research into silvopastoral system design – or what happens when you combine "space-planted" trees (trees planted at low density) with the production of livestock.

"At the moment there is a very one-dimensional approach to planting trees," says Dr Thomas Mackay-Smith, a Massey University researcher.

"Poplar and willow are easily planted, survive grazing livestock and perform well in terms of soil erosion, but there could be other tree species out there that provide additional value to farmers. The challenge is selecting the right tree species to provide a holistic suite of benefits. "In New Zealand, there has been little formalised research comparing the impact of different tree characteristics – or 'functional traits' – on farm outcomes, or the processes that govern these interactions."

Manaaki Whenua's Raphael Spiekermann agrees. He says while traditionally trees have been removed from the landscape to allow farming to happen, and are now planted for soil conservation, it is challenging to predict the outcomes of planting new trees due to the complexity of the relationships within a silvopastoral system.



Silvopasture – a graphic representation of an ideal landscape.

"We undertook a review of ecological research from around the world to find evidence for the influence of key tree attributes and processes on silvopastoral outcomes."

The evidence showed livestock can have overriding influences on the silvopastoral environment, and livestock activity needs to be an essential consideration when comparing outcomes between systems. "More work is required to measure livestock preferences for different tree species, in what situations livestock preferences exist, and how the impact of livestock activity as a process compares to direct tree processes like litter decomposition or competition for water," says Thomas.

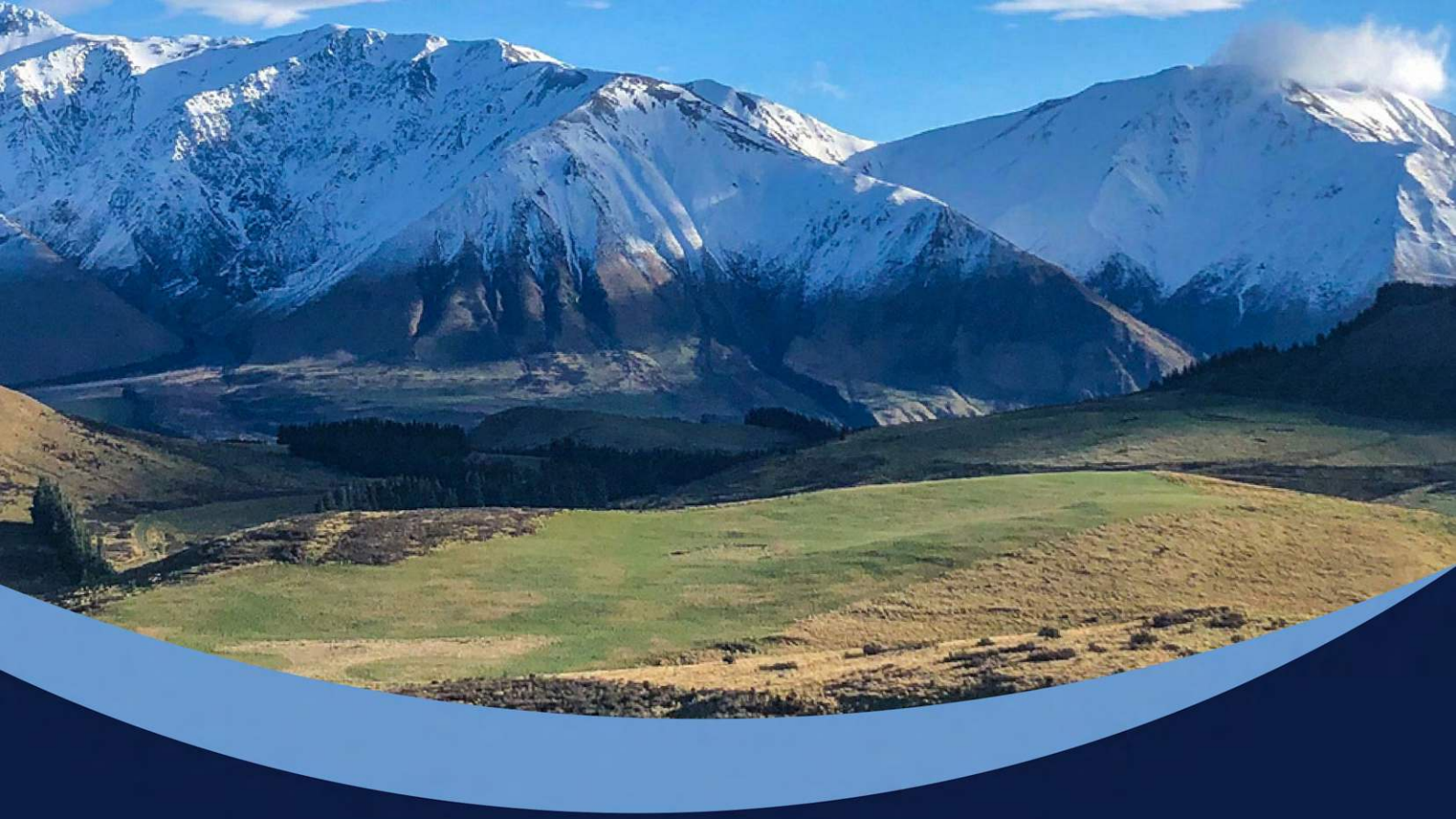
Participants at a workshop held as part of the silvopastoral system design research

The researchers held a successful workshop with around 35 farmers as part of the study. Poplar (Populus spp.), followed by willow (Salix spp.) and eucalyptus (Eucalyptus spp.) trees, were the most common silvopastoral trees planted, but other species were also planted such as tagasaste (Cytisus proliferus), cork oak (Quercus suber), acacia (Acacia spp.), chestnut (Castanea spp.), Tasmanian blackwood (Acacia melanoxylon), maple (Acer spp.), radiata pine (Pinus radiata), ginkgo (Ginkgo biloba) and mānuka (Leptospermum scoparium).

"We found landowners already had considerable knowledge of the future potential of silvopastoral systems," says Raphael. "But there are barriers to the future adoption of these systems."

These barriers include the regulatory environment for New Zealand's Emissions Trading Scheme, timescale issues such as the time lag until the trees become effective, difficulties protecting seedlings, and the costs involved with planting and management.

"There is great promise for silvopastoral trees to provide a range of benefits to farms," says Thomas. "While many farmers are already planting trees in their paddocks, it is important future research covers a broader range of tree species to increase our knowledge as to which trees will be important for different functions on the farm."



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31 OCTOBER - 2 NOVEMBER

MINISTERIAL INQUIRY INTO LAND USES ASSOCIATED WITH THE MOBILISATION OF SILT AND WOODY DEBRIS.

Submitter: Stan Braaksma

Identification of Risk Factors

If sheep and beef and dairy farms are required to undertake Farm and Environmental Plans at presumably 1:10,000 scale then forestry should be required to do the same. Mapping at the above scale would identify areas of potential risk prior to planting, and with consultation and advice, allow more informed decisions on appropriate treatment. This mapping would also identify areas for protection planting or consolidation of native regeneration. LUC classes already have Dry Matter pasture production tables.

Sednet developed annual sediment yields of silt/sand attributable to LRI Units. I'm sure this could more usefully be applied to 1:10,000 LUC map units and highlight more accurately the areas of extreme sediment loss on a property.

LRI units also developed a guide of site index figures for *P.radiata*, but LUC tables could be developed for Site Index, Mean Annual Increment, and perhaps even Carbon fixation/annum.

Modern imagery has offered much improved clarity, including infrared to accentuate colour differentiation of different tree species. Oblique imagery can now also allow interpretation of height and diameter of individual stems, allowing remote sensing of volume timber / carbon gains. Lidar techniques provide a clear view of the underlying topography, allowing for early identification of at-risk landscapes with a bit of ground proofing. A major risk to tree establishment and growth is animal pests. Deer, wild cattle, pigs, goats, possums and hares require a deliberate programme of culling or removal, perhaps total removal by 2050. Continuing browsing takes a heavy toll on native regeneration and understory species. Major exotic weed species also should be controlled or minimized of which wilding pines, blackberry, Old Man's Beard, Pampas and Woolly Nightshade come to mind.

Planted tree cover species must remain in a healthy and effective state. To this end P.*radiata* should be managed either under a pruning (Intensive) regime, or at least a thinning (Framing) regime to allow greater space between trees with improved tree form selections, piece size and greater individual rooting stability. Thinning operations allow this lesser diameter material to rapidly disintegrate within the forest floor. Untended forests invariably produce smaller piece size, more defect log and much higher percentages of reject log slash left on site post-harvest. These blocks also carry a poorer health status, with a higher potential to promote diseases allowing spread to well managed *P.radiata* timber crops.

Right Tree in the Right Place for the Right Reason

I recently presented a powerpoint master class to NZARM conference, with workshop sessions labelled "The Right Tree in the Right Place for the Right Reason". This is due to be posted on the NZARM website. Here I challenged the participants, about the discussions and background to selecting appropriate species for the job.

As stated *P.radiata* is an extreme risk species when placed into severe gully and earthflow erosion sites. It is also a suspect performer in high fertility alluvial wet flats. Elsewhere it has proven to be highly suitable for erosion control of hill country catchments. I maintain that it is a species that needs management for best sustainable land stability and timber production. New Zealand is a major player on the world softwood market, our temperate climate zone presents a huge advantage in the annual volume gains/ha/annum. *P.radiata* is also an extremely versatile wood product suitable for a wide range of building and wood use solutions.

There is room to establish a reasonable resource of alternative species, again spreading the risk against promotion of a single species softwood timber resource. Considerable research and trialling suggests potential for Acacia, Eucalyptus, Douglas Fir, Redwood, Cypress and Poplar. Initiatives in native species in Kauri, Totara, Rimu and Beech come to mind.

Part of this is understanding the mode of growth. Is it a primary invasion species such as *P.radiata*, Gorse, Tree Lucerne or a species, as is common with many natives, which successfully follow the primary invaders in their establishment.

A standout is in the bred-for-purpose hybrid tree willow, developed from *Salix alba x matsudana* parent crosses. Willows offer a fast growing root establishment with a high % of adventitious roots superior to all other species for binding fine sediments, especially in situations where there are strong erosive water flows on fine unconsolidated, or eroding soft hill weathered surfaces. Further Salix species crosses have been achieved.

Two willows introduced by previous settlers are Crack "*Salix fragilus*" and Grey "*Salix caprea*" willow have presented problems in lower alluvial flats and wetlands due to the amount of broken limb material that re-establishes in accumulating sediments. The soil conservation willows (bred-for-purpose species) have very low or no regenerative ability downstream.

On highly erodible soils rapid tree establishment and growth is needed to arrest the rate of erosion. Species selected may have an element of persistence or weediness, in features such as regrowth on toppling or washout, nitrogen fixing (raw sub soils), ability to sucker and or coppice, or have an element of seeding ability. Any vegetation that establishes can also become a protected cover for regenerating native species.

Poplar also possesses potential as a timber resource. Its origins for NZ use have been uniquely as an easy to establish soil conservation species to mitigate moderate slip, earthflow, gully and streambank erosion.

They can be established direct into sheep and beef grazing pasture lands without the need to destock the area. Poplars generally display erosion site control within five years of establishment. Of note is the recorded root strength which is up to three times that of *P.radiata* roots. While selections have been made for soil conservation purposes, many clones have been selected for vigour, form (straightness) and non-brittleness. Straight log form on poplars offers potential for timber production.

There is a vocal element within NZ population which favours native species for erosion control. Sadly, natives are generally slow growing, with poor root soil binding ability in our soft rock types, and which struggle to establish in continuous soil degradation sites. Best results are to create a nurse crop which achieves a more stable platform for native seedling regeneration. This slow process is also an opportunity for fast establishing exotic weed species.

Best Management Practices

As stated *P.radiata* is deemed to be an inappropriate species for severe gully, and earthflow erosion areas.

P.radiata is best established as a managed tree species, with a potential economic return from carbon, and timber, while achieving erosion control and catchment protection. Recognised are the Intensive (pruning and thinning) and the Framing (thinning) regimes. Under LUC mapping deeper soils on easier slopes (good farmland) present the opportunity to grow good tree volumes related to growing larger diameter pruned logs. Thin skeletal soils are a higher risk for tree stability and generally produce reduced height and diameter increments/annum.

Managed forests upon harvest present less % of waste material left post harvest than unmanaged stands. Lower volumes and lesser quality log material present a greater challenge to produce high harvest volume runs /day. Invariably these lower quality and volume logs are produced on very steep marginal hill country which carries higher risk to slash stability.

Many blocks and total property plantings are carried out as one age group. This means the whole area arrives at harvest all at once. A smart NZ should introduce split age plantings and achieve no more than 15 – 20% of a catchment exposed to harvest at any stage. 80% of a catchment area cover should be in Age 5 – 30 year.

In new projects there is a chance to mandate or teach the forest establishers that high risk areas may need a different treatment such as protection planting of buffer or riparian areas, setbacks for *P.radiata* and removal of browsing animal pests. For original blanket *P. radiata* planted areas just harvested, there's a chance for a reset planting programme.

Second time round may require implementation of a programme of active control of wilding pine if it establishes in riparian buffer zones.

Alternative species can offer carbon and timber opportunities on a much longer rotation. *Eucalyptus fastigata* and *Sequoia sempervirens* are two long-lived species, running for 80-120 + years, with the potential to store more carbon /ha than *P.radiata. P.radiata* is restricted by maximum woodlot basal areas of around 90 m2/ha with the current GF 19 seed stock. Redwood has basal areas recorded at 400m2/ha at 80 years of age. Both these species present a selective harvest option, with eucalyptus seedling regeneration and redwood re-coppicing on the stump both capable of restocking the forest population.

Windows of Opportunity

While the *P.radiata* industry has taken a battering, not least from the media, NZ is a lead country by international standards for producing fast grown high quality softwood conifer timber. *P. radiata* timber is versatile, suitable for a multiple range of uses from structural building, cross lattice wood components, clear wood flooring and furniture timber. A number of recent timber treatment developments may remove the stigma of requiring CCA treatments.

Waste slash left on harvest sites could be chipped and pelletised on site as a new coal, this at least will be realised as a renewable energy source. Any extra cost in producing this material could be subsidised by the on-going coal or fossil fuel burners in NZ

Government has recognised that our timber industry is strongly aligned with the one *P.radiata* species. There is recognition that under climate change we are vulnerable to new pest and disease risks. As a production forest syndicate manager, I have seen the impact of red needle cast on forest health. With a warming climate *dothistroma* sits as a constant threat to forests in the Wairarapa and further south in NZ.

Under the new industry transformation plan, there is a desire to move to have 20% of forest area in alternative species. Hopefully we will see increased investment to support the breeding, selection and management of these.

I see a large potential for poplar planting river berms on floodplains, where lines of clean pruned stems collect and trap river debris and driftwood along the river berms and buffer strips. You only have to observe how well shelterbelts achieve filtering flood waters, with these areas also encouraging silt deposition. These techniques could be targeted to flood plain valleys such as in the Esk Catchment and are also strongly applicable to the abraided Canterbury River buffer systems.

The much underated and under-utilised tree willow is the only plant for the first line of defence and protection against eroding gullies and waterways. It is extremely versatile, growing in alpine gravels and also used for protection on lowland alluvial river banks.

Even regions active in crack willow removal have failed to reinstate judicious replanting of river banks with bred-for-purpose good willow species. This is a vital component of future catchment protection works.

UNDERSTANDING THE IMPACTS OF SHEEP WINTER GRAZING

A Research Overview

The NZLT Sheep Wintering project is a research project based in Otago. The research (undertaken by AgResearch), aims to understand the significance of contaminant losses and the effectiveness of good management practices for sheep wintering to enable farmers to make evidenced-based land management decisions. This project is funded by the Ministry for Primary Industries with sponsorship from Beef and Lamb NZ, Ballance Agrinutrients, Horizons Regional Council, Greater Wellington Regional Council, Otago Regional Council and Environment Southland.

This three year research project sought to understand the significance of contaminant losses and the effectiveness of good management practices for sheep winter grazing to enable farmers to make evidence-based land management decisions.

Winter grazing is known to make a significant contribution to total losses of contaminants transported from dairy farms to water. However, very little information is available that documents losses when sheep are used to graze these crops.

THE RESEARCH

The field site was located on a property in Waitahuna, Otago. Two catchments on the property were selected, critical source areas were identified and in-field measuring equipment was installed. Brassica crops were planted and samples captured over each winter/spring period.

KEY RESEARCH OBJECTIVES

- Benchmark losses of phosphorus, sediment, and E. coli in overland flow from winter forage crops grazed by sheep.
- Assess the full impacts of leaving critical source areas in grass and ungrazed versus sowing these areas in crop and strategically grazing.

What are the contaminants?	What is good management practice (GMP)?	What is a critical source area (CSA)?
Phosphorous Sediment *E. coli*	On-farm practices to manage farm resources while minimising environmental risk eg: • Grass CSA protection • Grazing direction • Back fencing • Reticulated water	Catchment areas at high risk for generating surface runoff and transporting pollutants (e.g. high soil moisture zones, steep slopes, farm tracks and lanes).

agresearch
āta mātai, mātai whetū

NZ LANDCARE TRUST
NGĀ MATAPOPORE WHENUA

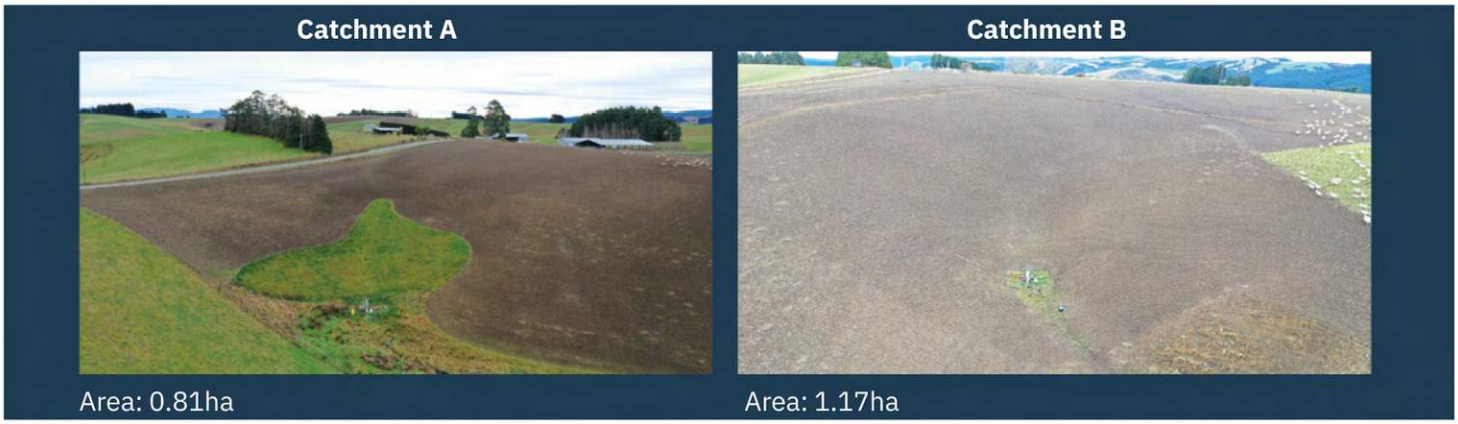
Ministry for Primary Industries
Manatū Ahu Matua

RESEARCH OVERVIEW

The field monitoring began in May 2020 and concluded in December 2022. Surface water samples were taken during each runoff event and analysed. The management treatments for each catchment are detailed in the table below:

	Crop	Catchment A	Catchment B
Year 1 Winter (2020)	Swede	Standard practice (control): CSA sown in crop	Standard practice (control): CSA sown in crop
Year 2 Winter (2021)	Kale	CSA sown in grass	CSA sown in crop
Year 3 Winter (2022)	Kale	CSA sown in crop	CSA sown in grass

FINDINGS



Critical source areas of each research catchment in June 2021 showing catchment A remaining in grass and catchment B being grazed as conditions allowed.

1. Grazing and treading pressures on the soil were low, allowing most of the rainfall to infiltrate.
2. Contaminant losses reduced considerably compared to standard grazing practice, with phosphorus, sediment and *E.coli* reductions of approximately 50%.
3. These combined effects meant that contaminant losses in surface runoff were low relative to those measured at other (cattle-grazed) sites.

Samples collected after a rain event in July 2021 show the clarity of surface water runoff when the CSA was left in grass and ungrazed (left) versus when the CSA was cropped and grazed (right), demonstrating the benefit of retaining CSAs in grass. These visual clarity observations were confirmed with laboratory analysis.

For further information:

Take Home Message:

Buffers provided by CSAs and un-grazed crop reduce the potential impacts of intensive winter grazing activities on water quality.

ACKNOWLEDGEMENTS

Thank you to the Alderton family for hosting the research field site.

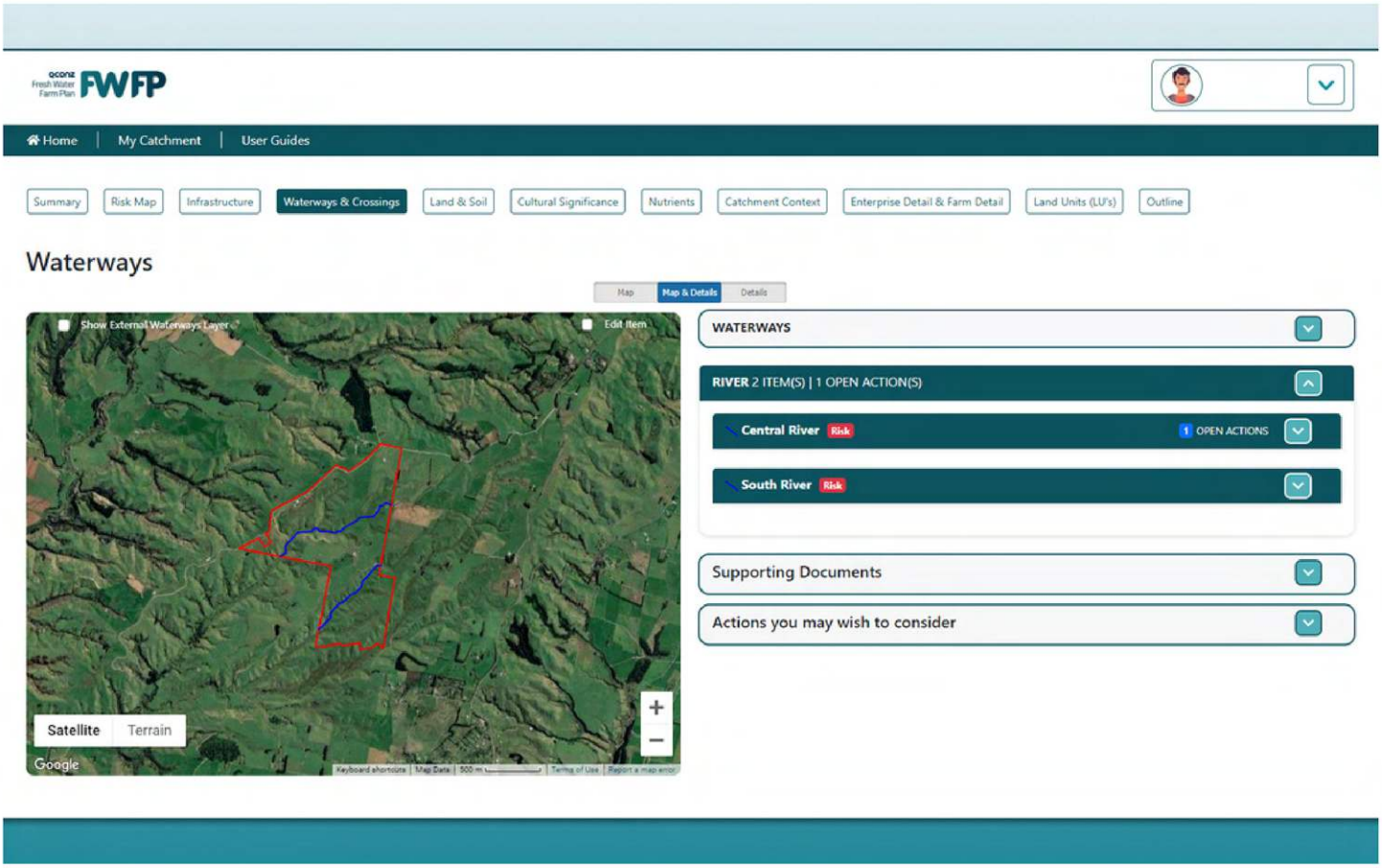
A DIGITAL TOOL FOR FRESHWATER FARM PLANNING

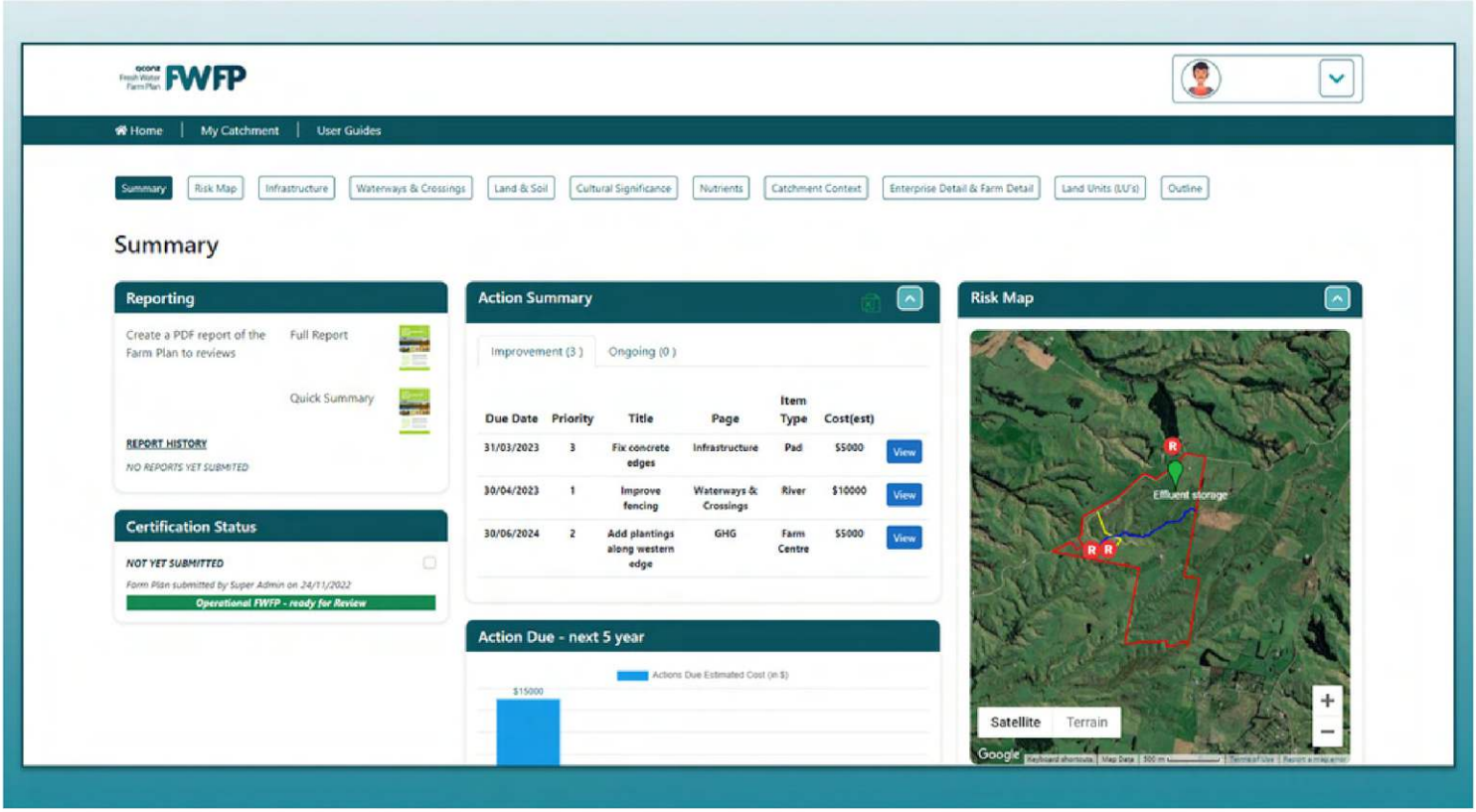
Josh Wheeler COO QCONZ

Over the last 5 years QCONZ has been busy developing its people and IT solutions to support our clients with the increased focus around Freshwater quality.

Our core business is auditing and we are now positioning ourselves to provide audit services for FWFP's. Recently we have been appointed as the Nationwide Auditing body for the New Zealand Farm Assurance Program (NZFAP) for the Meat and Wool Industry. When this work is considered alongside our existing auditing work for the dairy industry, we will now be delivering audit services on over 20,000 farms nationally. We see a real opportunity for our nationwide team to delivery FWFP audits alongside our other audit programmes, ensuring cost effective delivery and reduced audit burden. Our audit team digital solutions will make this a seamless process for the Farmers, Growers and Councils.

To build our capability in the FWFP space we have been upskilling our audit team in all aspects of farming, sustainability, and freshwater farm plans. This continual upskilling of our team is a key focus at QCONZ. We have also looked to enhance our capability in this field through several projects where we have provided staff to support farmers to create their FWFP's. This work has also been integral to helping us develop digital solutions in the freshwater space.





At QCONZ we have an IT development team that is dedicated to developing IT solutions for our team and our customers. This team has in the last 2 years developed bespoke FWFP software solutions for Open Country Dairy and Dairy Goat Co-op. More recently we are building a FWFP software solution for Zespri to pilot. We have capitalised on this experience and built a FWFP software programme that is designed for use by sheep, beef and horticulture farmers and growers. We have looked to align our FWFP solution with the Freshwater regulations and this alignment will be maintained into the future.

The benefit of our FWFP software is that it enables farmers and growers to develop their FWFP, either by themselves, or with the support of a consultant. With the use of open-source mapping software we have been able to bring to the market a digital solution, that includes mapping, at a very competitive price point. You can see more information on our FWFP system at the following website address www.freshwaterfarmplan.co.nz .

We are excited to support farmers and growers with our FWFP solution and give them the ability to take full control of their FWFP. Farmer and Grower engagement will be essential to achieve the water quality improvements we are targeting. With farmers and growers actively engaged in the development of their FWFP's they will be the ones delivering on the actions in their plans.

CONSTRUCTED WETLAND PLANNED TO REDUCE CONTAMINANTS AND INCREASE ECOSYSTEM RESILIENCE

Living Water (Department of Conservation & Fonterra)

Living Water, the 10-year partnership between the Department of Conservation and Fonterra plans to construct a three-hectare wetland in the Waituna catchment, specifically for the removal of nitrogen.

This trial is the first of its kind in Aotearoa New Zealand's rural waterway network. The constructed wetland integrates with the existing Waituna Mahinga Kai Pā and the vision of Te Rūnanga o Awarua, to establish water polishing ponds (wetlands) in and around the Mahinga kai Pā site.
Waituna Lagoon and its tributaries are under stress and the lagoon is at risk of shifting from a clear-water, aquatic plant-dominated state to a turbid, algal-dominated state due to excessive contaminants entering the lagoon.

Several organisations, including Living Water, are working towards solutions for the catchment as part of Whakamana Te Waituna. One of the over-arching objectives of the project is to reduce the amount of sediment and nutrients originating from on-farm activities. Living Water has contributed by co-deigning a catchment-wide nutrient and sediment reduction programme, with the main goals of reducing nutrient and sediment loads to the lagoon and improving the quality of instream fish habitat within Waituna Creek. The plan is in the preliminary stages of being implemented.

The Initial focus has been on on-farm interventions like peak run-off control structures, nitrogen and phosphorus filters, fencing and planting waterways and completing Farm Environment Plans on all farms in the catchment. While these interventions are important, these on-farm mitigations won't go far enough to reach the recommended 50% reduction in contaminants entering the Lagoon.

Living Water commissioned Aqualinc to look at ways to further reduce nutrients.

The report highlighted individual landowners could achieve significant reductions, but the costs of reducing contaminants are high and could impact the viability of farming operations and the community. The best and most cost-effective results will come from a combination of individual and collective approaches, with a focus on nature-based solutions. The greatest gains are likely to be made with one or two large scale (50-200ha) wetlands. These will need to be supported by small-scale interventions on individual farms that are included in Farm Environment Plans.

An investigation was undertaken to identify suitable wetland sites in the Waituna Creek Catchment, based on factors such as location, ownership, and wetland potential. The options were narrowed down, and landowners were consulted. However, securing a site in the Waituna Creek Catchment was not successful. Therefore, efforts were redirected towards developing a wetland on the land already owned by the Whakamana te Waituna partners in the Carran Creek Catchment.

Although the Carran Creek catchment contributes significantly less contaminants to the Lagoon, it provides an opportunity to trial the construction of a lowland wetland in a low gradient, deeply incised waterway environment. This environment is typical of many intensively farmed areas, and the lessons learned from this project could be applied across New Zealand.

A feasibility study has been completed and the consent process is underway for a 3ha site to the north of Waituna Lagoon Road. The site, while smaller than initially envisaged, is still significant in a New Zealand constructed wetland context. It reflects the overall construction budget for the project and revised objectives centred on trialling construction techniques, plant species, maintenance, and performance efficiency. Sections of Carran Creek and associated tributaries are planned to be diverted through the wetland. Construction is anticipated for early 2024.

The 3ha wetland trial is a major step towards understanding the viability of large-scale wetland restoration/creation on the western side of the Waituna Catchment and in lowland areas of New Zealand.

Waituna Creek is the main tributary to the Lagoon, on the western side of the catchment where 90% of the contaminants come from.

There are long-term aspirations for the construction of a large-scale, community wetland in the area, built on the learnings from the current Carran Creek wetland trial. Achieving this vision will require additional land, community buy in and funding.

An initial step was the recent purchase of 16.5ha of land in the lower Waituna Creek area.

Two large constructed wetlands in the Waituna Creek catchment combined with medium scale on-farm mitigations could reduce nitrogen loadings to Waituna Lagoon by up to 50% and sediment by up to 70%. Combined with the resilience, ecological vales, eco-tourism and biodiversity created by the wetlands, this could be an impressive outcome for the future of farming and freshwater.

Learn more about the project: https://bit.ly/3oU79qM

OBITUARY - JOHN ALLEN WHALE (1952-2023)

John Whale, known to close friends as Hone Fale, died on 31st January 2023 in Whakatane, after a battle with bowel cancer.

John was born and raised in Marton. His parents were farmers and John studied Ag. Science at Massey University in 1970 – 1971, before travelling to Canada, then on to Europe. He arrived back in New Zealand in the late 1970's, with his wife, Sue, who he had met in Germany. They travelled through Austria, Italy, Greece, Turkey, Iran, Afghanistan, Pakistan, India, Nepal, Thailand, Malaysia and Singapore in a VW combi van (which died in India) on their way back to New Zealand. John then returned to Massey to complete a degree in Resource Planning, before getting a job at the Marlborough Catchment Board in the early 1980s.

John Allen Whale (1952-2023)

Following the local / regional Government shake-up of the late 80's, John initially worked for the Nelson – Marlborough Regional Council, as a water resources officer / planner. After 3 years, the Regional Council was disestablished, and it's powers were transferred to the Marlborough District Council, Nelson City Council, Tasman District Council and Canterbury Regional Council. Following the changes, John found himself out of a job. Co-incidentally, he had been the staff advocate during the disestablishment process, and was not wanted by the new hierarchy. John and his family then moved to Whakatane in 1993, to work for the Bay of Plenty Regional Council initially as a Resource Planner. He had been offered a job at Hawkes Bay, but chose Whakatane because of the outrageously true fishing stories circulated by the Environment BOP staff. Before long, John was appointed Manager of Environmental Planning, working closely with Paul Dell. During this time he was involved with the development of a number of Regional Plans in the Bay of Plenty.This included addressing septic tank issues, the Tarawera River catchment, Rotorua Lakes (including the geothermal issues), Air Pollution, and Coastal issues. In 2010, when the Council decided to move the head office and senior staff from Whakatane to Tauranga, John chose not to move and left the Council to work for himself as a Resource Planning Consultant. He continued working as a planning consultant until his retirement in 2018.

John was a keen member of NZARM and was the Chairman of the Organising Committee for the 2003 Annual Conference held in Rotorua. In 2007, he was the Regional Co-ordinator for the BOP, having been co-opted to the Exec in 2006. John became secretary for NZARM from 2008 until 2012. He also worked as National Regional Co-ordinator. Along with other members of the BOP team; Norm Ngapo, Glen Sutton, Paul Dell, Bridget Robson and John Douglas, John helped organise a number of Regional Meetings in the Bay of Plenty during that period, looking at a range of topical issues.When he stepped down from his work with NZARM, John was presented with a glass Koru in recognition of his contribution to the Association.

John had a vast repertoire of stories from his travels, which he took great pleasure in recounting, often over a beer or two. He was a keen fisherman, loved gadgets, fixing things, as well as being a bit of a foodie. He enjoyed campervanning and attended a number of NZARM conferences (from Invercargill to Bay of Islands) as part of his travelling experiences in his campervan. He was also an avid environmentalist, being a long serving volunteer member and secretary/treasurer of the Manawahe Kokako Trust. In both his work life and outside interests, John was very good at building long lasting relationships with people from widely different backgrounds.

John is survived by his wife Sue, daughter Rebeka, son Josh and daughter-in-law Claire, and his grandson, Luka.

Fittingly, John's ashes were scattered at sunrise on 4th April 2023 at the eastern end of Motuhora – Whale Island (6 kilometres off Whakatane Heads).
John was always keen to share his thoughts on important matters such as "the more sport you watch on TV, the fitter you get...." Apart from being an experienced and professional resource planner, he was a great mate, and will be missed.

Haere, haere, haere atu ra e hoa.

Norm Ngapo

NZARM BROADSHEET
May 2023

NEW ZEALAND
ASSOCIATION OF
RESOURCE
MANAGEMENT