NZARM BROADSHEET

Newsletter of the New Zealand Association of Resource Management

nzarm.org.nz

ISSUE 33 – OCTOBER 2019

IN THIS ISSUE

EDITORIAL – RETHINKING "THE SHEET"

Its been a while so apologies to those of you who look forward to your issue of Broadsheet arriving in your inbox. Sometimes though life gets in the way and voluntary things keep getting dropped off the list! So on the basis of not being able to deliver a broadsheet issue in almost a year, and a very full schedule, my 5 year tenure as editor comes to an end.

Its been an interesting time and a great way of keeping connected with what members are thinking and doing, learning and sharing stories from the very wise, hugely experienced, slightly ageing pioneers of soil conservation in New Zealand. I've also taken the opportunity to deepen the discussion, refresh the format and introduce a range of articles from within and outside of our traditional membership base. It will be fantastic to see where "the sheet" can head from here under a different helmsman.

Ultimately though the success or otherwise of this publication relies on members writing. In our world of 140, usually derisive characters, Facebook feeds, memes, tik toks and snapchats, its been a pretty hard road squeezing an issue of any substance out at all, let alone three or four times a year, so perhaps the time has come for a complete transition into the digital world of publishing quick and often reflecting our changing organisation and membership needs. We could then revert to the much more traditional form for the sheet where one issue a year is published as a membership magazine, to cherish and savour and to ensure our rich history is recorded in a written "Annual".

Given its mental health awareness week, I thought I'd put in a shameless plug for New Zealand farmers. Those guys and girls, kids, grandparents, Iwi, artists, writers, lawyers, engineers, "retired" business owners, multi-generational farmers who day to day wake up with the goal of caring for their animals and their land. It's a bloody tough job sometimes and largely they are doing a fantastic job. I have no doubt we have one of the most sustainable profitable farming sytems in the world. Our friend Jacinda topped the agenda at the climate summit this week with the opening line "we want to be the most sustainable food producer in the world". We already top the world for animal welfare. We probably do for the occurrence, management and protection of Biodiversity, despite our threatened species standing, in my view, we've done incredibly well to hold on to what we have. Our products are sold to more than 140 countries and in high demand for their incredible attributes. Aside from the questionable sustainability of flying in millions of people to see our country,

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NZARM

The New Zealand Association of Resource Management (NZARM) is an incorporated society that provides support and focus for people who share a professional interest in the sustainable management of New Zealand's natural resources.

NZARM's purpose is to champion the resource management cause, to promote professionalism, and to maintain a strong community spirit of meeting, sharing, and generally having a good time. Members receive benefit through an annual conference, regional workshops, a Broadsheet newsletter three times each year, and the opportunity to become a recognised professional and accredited practitioner of resource management.

Further information, including membership registration details, can be obtained from the NZARM website (**www.nzarm.org.nz**) or by contacting the secretary:

The Secretary
C/- NZARM
PO Box 4315
Hamilton East
HAMILTON 3247

BROADSHEET

BROADSHEET is the newsletter of the New Zealand Association of Resource Management. It is now published three times per year.

The Editor welcomes correspondence, reviews of recent publications, interim reports of current research or resource management issues, news items, other articles, and lighter items about members activities and career movements. An invitation to make submissions to Broadsheet is sent out 2 – 4 weeks prior to the publication date. However, SUBMISSIONS CAN BE MADE TO THE EDITOR AT ANY TIME. Generally submissions are sent to NZARM regional coordinators or directly to the Editor.
Copy sent by Email is preferred, Items can be sent to: **nzarmbroadsheet@gmail.com**

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every year our farmers allow us the lifestyle we all enjoy. While we might take it for granted, driving through hundreds of kilometres of lush green pasture, dotted with 24% of New Zealand's native vegetation, for some it's a privilege and a marvel. Yes, farmers can do better in continuing to improve what they do, lessening the effect of earning export dollars on our natural resources, but they are acutely aware of that. Yet we keep expecting more of them and for some that pressure is too much. Our suicide rate among rural males in particular, is atrocious. There are some outstanding people and organisations working incredibly hard every day to turn that around, and I herald that but it wont change until we all play a role in being supportive, remembering we are all just people doing our thing, with our own thoughts, vision, challenges, dreams, loves, lives and hope.

I want to leave you with a recent Facebook post from Al Brown ... if we had at least one in three New Zealanders putting this kind of stuff on social media once a week we might just be able to turn some of those mental health statistics around...

Farmers I salute you...I was lucky enough to spend the weekend in and around rural Raglan.

Our trip from the city on Friday was slow and deliberate, driving mostly on secondary back roads so we could take in the extraordinary beauty of the NZ countryside at this time of the year. Farm after farm in beautiful condition..... we witnessed many new plantings of native trees, fenced off waterways and blocks of old established bush breaking up the pastural land and providing ample shade for the stock. Not surprisingly we spied Kereru, Tui, Pheasants, Rosella Parakeets, Hawks, and a bunch of turkey on the way

We had two afternoons waiting for the push of the tide as we fished a small low lying crystal clear rocky stream for whitebait. And while we got 'enough for a feed' we certainly did our bit for conservation, with many shoals eluding our rookie attempts to fool this wily native delicacy.

I just want to say thank you to our farmers of New Zealand. And while I know there maybe a few out there that are not particularly invested in looking after the environment, the majority of farmers (along with their wives and children) care more about their land and the welfare of their stock and animals that most people could possibly comprehend.

Instead of the urban key board warriors constantly throwing shade and shame our farmers way, how about hopping in a car and taking a look for yourself, there is a lot of good stuff happening out there. Let's get behind our honest hard working rural community and start applauding and supporting the huge effort and challenge that our rural folk take on each and everyday of the year. #giveitupforfarmers

Happy resource management good people, you do an incredible job, make sure you keep filling up that glass of life, work and play. Its been a pleasure.

Matt Harcombe

WHITEBAIT A VANISHING RESOURCE?

LEE WHILEY

Lee reflects on a visit to his old home town of Hoki and gives us some poet-lee and laughs along the way.

Management of the Whitebait resource is quite topical at the moment with all those greedy whitebaiters aparentlee fishing it out. I went back down home to see what all the fuss is about.

I have been fishing the Hokitika river and others further south and north on the west coast on and off over the last 50 years. Popular opinion is that there are too many fishermen/women catching too many and cleaning out the resource. I did a school project on the Gallaxids about 50 years ago. Talk of a reducing resource was rife then. My Dad Ebenezer Whiley refuted this suggestion, saying that fishermen only remembered the years of the big whitebait runs and that there were plenty of seasons when he was growing up when there were not many about at all. As soon as there was a poor season everyone jumped to the conclusion that they were being fished out. As for the assertion that there used to be so much that they put them in kerosene tins then dug them into the garden once they had eaten all they could. It is hardlee surprising considering that firstlee there were fewer people to feed them to and of course no refrigeration so you could not keep them for more than a day or two.

It is true that there are more fishermen and when they are running they keep catching them knowing that they can be cooled or frozen and kept for some time. Also our farmers have been clearing and draining swamps currently known as wetlands to farm more dairy cows over the years. All else being equal one would expect the resource to be reducing. However things are not equal. I have in fact been catching more bait as time goes on culminating in the biggest catch ever in 2018.

I can onlee put this down to environmental conditions of rainfall, temperature and other influences beyond our control being more influential than fishing. There has also been significant conservation measures brought in over the last couple of decades including a reduction in the season from three down to two months and exclusion of fishing from some creeks currently known as streams and their associated wetland breeding areas.

I can onlee presume that these measures are balancing the increased fishing. The creative juices were flowing well down on the Hoki river. The whitebaiting rivers and streams are full of old characters. Scoop net fishing is a very skilled art and the old guys have all the tricks and catch the most bait, Here is an account of my meeting with George the Whitebaiter whom I met north of Westport when I ventured up there. George is somewhat of a cross between Barry Crump and Billy T James. Everything here is true. Honestlee

George the Whitebaiter

Way up on the Mokihinui
Far from the madding crowd
George the whitebaiter stalks his bait
With nobody else around
I smell the bait he says to me
I know when it's on the move
I've caught heaps and they've got none

I've nothing else to prove
I've set me boy up just right there
And taught him all I know
I catch what he misses
Nobody else has a show.
Up at daybreak and fishing till dark
They give it quite a thrashing
George I think you and the boy
Have probablee caught your ration!

CONFERENCE

NZARM holds an annual conference to promote new learning, information sharing, networking, and a sense of community in the field of resource management. Venues alternate between the North and South Islands, and one of NZ's 16 regional authorities will usually host the conference itself. October-November is most favoured as the time.

MEMBERSHIP

NZARM welcomes new members, partic- ularly if you have an interest in sustainable resource management. Prospective members can apply anytime, by obtaining a registration form from the website (**www.nzarm.org.nz**) or from the NZARM secretary. Candidates are nominated by two existing members (contact the sec- retary if this would be a constraint).

Annual subscription is discounted to $70 if paid on or before 30th June each year. Late payments after that date are charged at the full subscription cost of $100. All subscription enquiries to:

The Secretary
C/- NZARM
PO Box 4315
Hamilton East
HAMILTON 3247

As a member of a registered association, members must inform the secretary in writing when they cancel or let their membership lapse. Otherwise the member will continue to be billed for the annual subscription.

PROFESSIONAL ACCREDITATION

The system that NZARM uses for professional accreditation has been reviewed recently. Please see the NZARM website for details.

nzarm.org.nz

PLANTAIN TARGETS REDUCED LEACHING

HELEN MOODIE

The Tararua Plantain Project has been initiated to tackle the challenges of meeting nitrogen leaching targets on Tararua dairy farms in the upper Manawatu, where a significant proportion of dairy farms are operating without consent for intensive farming activities. Farmers are faced with reducing N leaching by an average of 60 percent to meet targets outlined in the Horizons Regional Council *One Plan*. The current 'mitigation toolbox' isn't going to achieve this level of reduction, which is why plantain as an additional measure is targeted.

Leading dairy farmers have initiated the project which is being actioned by DairyNZ, with the goal of gaining full plantain adoption on 125 dairy farms in the district; while meeting three objectives:

- Increased farm business resilience
- Increased community resilience and
- Quantified gains in water quality.

The project aims to capitalise on research findings from the DairyNZ-led Forages for Reduced Nitrate Leaching (FRNL) programme. FRNL established that New Zealand-bred plantain cultivars reduce soil N concentration under cows' urine patches. This allows plants to take up a greater proportion of N, reducing N leaching (estimated to be between five and 30 percent, depending on soil type and the proportion of plantain in the cows' diet). Note: more research is needed to quantify and optimise the N-loss benefits of plantain.

The Tararua Plantain Project rollout sees research scientists working with Tararua farmers in a co-development approach to fast track further research, operating simultaneously locally and on research farms. Paddock-scale research has begun on six Tararua farms and the findings will be shared with other farmers in the area.

Locally, the first question to answer is what does 'full plantain adoption' look like in a Tararua dairy farm system? Is this pure sward plantain crops, combination crops, plantain within a pasture sward, or even plantain as an imported supplement feed? We know from the complexity of farm systems that the answer will not be a 'one size fits all' scenario, but rather a combination optimising these options. Keeping it local will ensure the focus will remain on operating a low-cost production system. On this basis, a working group has been formed of Tararua dairy farmers and leading plantain research scientists (including experts from DairyNZ, Massey University, AgResearch, and Agricom).

Adam Duker; Mark Diamond; Blair Castles; Brad McNaughton discussing the plantain trials on Brad McNaughton's dairy farm.

Early adopters

Currently there are 21 dairy farmers on the working group, and we hear from three of them on their initial impressions of the Tararua Plantain Project:

BLAIR CASTLES

Blair has been using plantain, along with chicory, for about six years. He's looking at taking out chicory and lifting the rate of plantain. At present plantain is about 10 percent of his pasture sward. Blair plants plantain in autumn, after the summer turnip crop has been lifted. "Farmers in the area are being proactive and working with the scientists has to be a good thing. I'm all for it," says Blair.

BRAD MCNAUGHTON

Brad has already completed a few farm trials of his own and is including chicory and plantain in his pastures as part of his regular regrassing programme. Through the project Brad is doing three trials direct drilling plantain at rates of 4kg/ha, 2kg/ha and none. "Sharing information through the trial will be good for everyone. Herbs are just another species in the paddock and, if the trials work, we'll aim to gradually increase plantain in our pastures until we reach 30 percent."

MARK DIAMOND

Mark has been using plantain for three years. In a 10ha trial, he's sown 2kg plantain/ha as part of a mixed sward with ryegrass and clover, following the summer turnip crop. "The project has just started, and I think there is merit in it, but we'll have more information in 12 months' time. I'm hoping it's a 'goer'."

MASSEY BACKS SOIL CONSERVATION

Lucy Burkett outlines a return to putting Soil Conservation back on the education agenda as the first couple of intakes of students graduate from Massey University's new Advanced Soil Conservation course.

In May 2018, Massey University launched its first Advanced Soil Conservation professional development short course. This course provides a highly relevant qualification for professionals interested in both land and water management and in undertaking farm environment plans. The course focusses on soil erosion and nutrient loss processes, and the influence of land use, rock type, geomorphology, climate, hydrology, soil physical properties, effects of past and present land use, and soil fertility, on these processes. Students will develop the skills to identify options for erosion and nutrient loss mitigation, and be capable of demonstrating the integration of these strategies into land and water management plans at the farm scale.

This course is a revamped version of the popular course Mike Tuohy taught to Massey post-graduate students for many years. It is also intended to support and provide longevity to the popular Soil Conservation workshops that were delivered by Garth Eyles and Norm Ngapo in the Waikato region. The revamped course is offered as three separate, but sequential, 5-credit modules and offered through online distance learning, with a compulsory field trip at the end of Module 1. The topics covered in the three modules are:

- Module 1-Introduction to Nutrient and Sediment Loss and Mitigation Strategies
- Module 2-Soil and Nutrient Loss Processes
- Module 3-Land and Water Management Farm Plan

The module system is intended to provide a flexible learning approach, particularly for employed professionals. The course is suited to students or professionals holding a Bachelor's degree, preferably with qualifications in soil science and with an interest in land and water management. Assessment is via assignments.

Manawatu Field trip.

STUDENT PROFILE

Adrian Brocksopp

Principal Consultant, Ravensdown
(recently completed Module 1)

WHY DID YOU ENROL IN THIS COURSE?

"It is likely to be a requirement for Regional councils to be able to advise farmers and I wanted to learn more about appropriate mitigations and prioritising these strategies in order to give good advice to farmers. It was also an opportunity to check out the course and content to assess future incorporation in team development for our organisation."

WHAT SKILLS HAVE YOU GAINED FROM THE COURSE?

"Assessing risk on farm, how to work through what is an appropriate mitigation according to risk. The science or why we get erosion and how farming activities increase or decrease risk."

DID THE ONLINE DELIVERY MODEL FIT IN WELL WITH WORKING FULL TIME?

"There was a good range of learning material to help and the delivery method suited all types of learning and time constraints."

WOULD YOU RECOMMEND THE COURSE TO OTHER INDUSTRY PROFESSIONALS?

"Understanding the 'why' is going to be important skill that Rural Professionals will need to convey understanding to farmers. This will improve engagement and will facilitate discussion to help farmers find and implement the right solutions. Knowledge gained from this course will give Rural Professionals more confidence to advise farmers and will reinforce what they already know and fill in any knowledge gaps."

ANYTHING ELSE YOU'D LIKE TO COMMENT ON?

"Great interactive field trip, really cemented what we were learning. Looking out the car window and the countryside has taken on new meaning!"

For course information, please see www.massey.ac.nz/~flrc/courses and for course enrolments or further information please contact Fiona Bardell. F.M.Bardell@massey.ac.nz

NEW MEMBERS

SEPTEMBER 2018
Christina Finlayson

OCTOBER 2018
Caleb Higham
Phillip Schofield
Terri Payne
Mark Gasquoine

JANUARY 2019
Ross Bishop
David Boone

FEBRUARY 2019
Heather Miller
Rebecca Begg

APRIL 2019
Anthony Mourits
Jenny Gillanders

MAY 2019
Tom Stephens
Peter Nowell
John Ballinger
Ian Hanmore
Katja Huls
Sarah Nolan
Libby Caldwell
Shelley Hackett
Dean Walker

JUNE 2019
Andrew Gray
Jason Evered
Emma Davison

COMMUNITY COLLABORATION IN HINDS

Anne Spicer continues her series of articles outlining happenings around Canterbury, this time diving into the collaborative approach to working in the Hinds catchment

Environment Canterbury has placed a lot of emphasis on collaborative processes when developing regional plans. The Hinds area, located between the Rangitata and Ashburton Rivers, is an example of how this approach has resulted in a high level of involvement by the community in resolving environmental issues.

In the biodiversity area, Environment Canterbury staff aim to have farmers include aquatic and land-based ecological care as a normal part of farm planning. "Start small and tailor it to their situation", Sarah Heddell, Land Management & Biodiversity Advisor for Environment Canterbury in the Hinds/Ashburton area, advises, "and once the farmer (or group) gets a taste of what they can achieve and the associated benefits, they own it and really get into it". These small projects, particularly biodiversity ones, then often turn into long-term ones that continue to expand in size.

"I am very conscious", Sarah adds, "that sometimes time, money or knowledge can be a constraining factor. If I am out on a farm visit, I take the chance to talk about biodiversity and encourage the landowner to protect or enhance the biodiversity they have. If that venture is successful, the initial barriers often disappear". The majority of people that Sarah has talked to in the last 2 years, have implemented a biodiversity project of some kind at a cost to themselves. Sarah credits this to making sure that roll out of the project is financially viable, meets the area's ecological needs and works as part of their farm system. Farmer feedback also suggests Sarah's farming knowledge and experience helps.

Outside of the biodiversity area, on-farm changes in Canterbury are often aimed at reducing nitrogen discharges. In the Hinds region, water is over-allocated and, in some areas, nitrates in the groundwater are above the national drinking water standard. Farmers in this catchment are required to implement Good Management Practice and to have Farm Environment Plans that show how they will reduce their nitrogen discharges by up to 36% by 2035.

Sarah supports these planning requirements by helping to run drop in sessions for farmers wanting to upskill in Good Management Practice and find out about their consenting requirements. As well as providing support and advice to individual famers and schemes where needed. This is in conjunction with providing regular updates to rural professionals. She also liaises with Dr Brett Painter on managed aquifer recharge (MAR) projects which are injecting clean water into the aquifers below the Hinds catchment to dilute nitrate concentrations and improve groundwater flows. Sarah and Brett organised a community opening for the second MAR infrastructure site in the district in the Upper Hinds. This involved Sarah co-ordinating the planting plan for the site, including farmers in preparations for the event and liaising with contractors to ensure a successful day.

In keeping with the collaborative nature of the Canterbury Water Management Strategy, community groups (Fish and Game, Forest and Bird, the Te Runanga o Arowhenua, farmers, irrigation companies) are heavily involved with governance, implementation and monitoring. For example, some of the irrigation companies have contributed financially towards the trial, local Fish and Game staff have undertaken water sampling as part of the trial monitoring programme and the rural community were involved in identifying appropriate monitoring sites. There are still three – four years to go before decisions about the success of the trials can be made but those involved are optimistic that the involvement of community groups from the project outset will contribute positively to scaling up the trials to cover the whole catchment, if it is decided that that is the appropriate course of action.

While these types of systems will not be appropriate for all areas in NZ with water quality and quantity problems, they (in conjunction with farm practice controls) may provide a viable alternative to large scale land-use change as a way of resolving environmental problems associated with pastoral and arable farming. However, along with achieving improvements in rural biodiversity, community engagement and commitment is an important component of success.

THE HEKEAO / HINDS MANAGED AQUIFER RECHARGE (MAR) PROJECT

The MAR pilot project is located at Lagmhor, not far from Ashburton. The five-year trial aims to test whether the natural seepage of surface water into groundwater and aquifers can be safely augmented. Such seepage is needed because groundwater in the area is reducing, the Hekeao/Hinds River has dry stretches in summer and some lowland streams and springs have ceased to flow. In addition, the nitrate level of shallow groundwater in some areas is higher than is allowed for in drinking water (i.e. higher than 11.3mg/L).

Water reduction and high nitrate levels are the result of years of intensive pastoral and arable farming as well as the result of recent changes in irrigation methods. Thus, it is hoped that the MAR will be a method by which water reserves can be replenished and nitrates currently in groundwater be diluted, and so, in conjunction with limits on farm nitrate discharges, assist in reducing shallow groundwater nitrates to below 6.9mg/L.

While aquifer recharging is new to New Zealand, there are over 1000 in operation overseas. An experienced US hydrologist, Bob Bower, is the technical lead for the Hinds project, along with Dr Brett Painter, from the Environment Canterbury Infrastructure Team. There is also a governance group which is chaired by a local farmer and which is made up of stakeholders, including Ngāi Tahu, local businesses and Central South Island Fish and Game.

In this trial, water from the Rangitata River is brought to the Lagmhor site via a water race. The water is directed into a settling pond to remove sediment and is then sent into the main infiltration basin, which is nearly a hectare in size. Here 'clam shells' of 6 meters in depth have been dug into the floor of the basin and filled with rocks. Water seeps through these into the shallow groundwater and, over a few years, may recharge aquifers, streams and springs. In 2017/18, 16 more 'clam shell' sites were established across the catchment.

The pilot has been going for two years now and the results to date are encouraging. Over 4 million cubic meters of low-nitrate river water (half a meter per day) has been filtered through the clam shells resulting in a plume of groundwater around the site which, on the seaward side, is at least 7 km long. Lincoln Agritech, at a site one kilometre downgradient of the trial, have measured a rise in shallow groundwater of 18m and a reduction in nitrates to 2mg/L.

Controls outside of the trial area showed no changes in groundwater levels and a slight rise in nitrate levels. Further, despite moderate levels of E. coli in the source water from time to time, no E. coli have been detected in the recharged groundwater.

The trial, however, has not been problem free. Sediment accumulation reduced infiltration from the settling pond in the second year and high rainfall (and so high groundwater levels) reduced recharge flow rates from time to time. Further, heavy rain events caused the diversion of river water to be shut down for up to a day and the presence of soil layers of lower permeability material are thought to have negatively affected seepage into deep groundwater. A bore of around 18m has recently been drilled in a corner of the infiltration pond to assist seepage through these layers. Last, it has yet to be established whether increased groundwater levels as a result of MAR will contribute to flooding in some local towns and coastal drains. Final results are expected at the end of five years (in 2021), when a decision about whether to proceed with groundwater recharge for the whole catchment needs to be made. Who pays, and where sufficient clean water can be sourced from, are issues that will have to be resolved by that point.

To date the trial has been funded by MPI, some local irrigation companies, and Environment Canterbury with significant assistance from Fish and Game and individual farmers. A recharge system for all of the Hinds catchment has not been fully costed but the benefits to ecological systems, cultural values (see next article) and to farming appear compelling at this stage of the trial.

NEAR RIVER RECHARGE ON THE HEKEAO/HINDS RIVER

Another method of recharging waterways is to divert water to a soakage site close to (but not directly contacting) a targeted waterway. The Hekeao/Hinds River Project, established in spring 2018, uses this method with the aim of improving water levels, cultural values and recreation opportunities in the Hekeao/Hinds River. The project is particularly important to Te Rūnanga o Arowhenua because it enables Māori concerns about directly mixing water from unrelated sources to be addressed, as well as restoring eel (and lizard) habitat and assisting with the regeneration of indigenous vegetation.

Water from the Rangitata River is delivered to a natural flood plain located on the South Branch of the Hekeao/Hinds River in the upper catchment. The source water percolates through the gravelly soil adjacent to the Hekeao/Hinds River and so recharges the shallow groundwater. This, in turn, augments river flows as well as connected groundwater. A bund has been constructed along the river edge, along with a second overflow-recharge area, to ensure that the waters of the Rangitata and Hekeao/Hinds Rivers are unlikely to intermingle directly. Instead they are isolated from each other by soil (which filters the water) and by shallow groundwater.

The trial site has been designed with eel, and other native fish, habitat and migrations in mind. In the area between the two recharge zones a natural wetland has been enhanced which, once river flows become more reliable, will allow eels and lamprey in particular to establish and thrive.

Although this project has only recently been established, a community planting day has already been held and a monitoring programme (of both water quantity and native aquatic and land-based fauna) has been established. The trial will run for five years.

Further Information:

www.ecan.govt.nz/hinds-MAR

NITROGEN AND GREENHOUSE GASES - A DUAL OPPORTUNITY

The following is an abstract of an article from Terry Parminter and others exploring the co-benefits of adopting mitigations to reduce N loss have for reducing GHG emissions from farms – very topical given the current mix of climate proposals from this Government – if you are interested in reading the full article please contact Terry terry.parminter@kapag.nz

A sample of 126 dairy farms came from a relatively high rainfall area (1000-2000mm/yr) and mixed soil types (mostly brown and allophanic soils). In 2012-13, the annual losses of nitrogen to water averaged 40 kgN/ha (ranging from 24-60kgN/ha). The annual GHG emissions averaged 11.2 t/ha (ranging from 10-15 t/ha). There was a very poor relationship between individual farm nitrogen losses to water and their GHG emissions.

To model the effect of management practices that reduce nitrogen losses to water, the farms were placed into five groups using cluster analysis. Five clusters of farms were modelled in Overseer®, to represent all the dairy farms in the catchment.

Management mitigations were introduced sequentially to each cluster farm and the nitrogen losses to water calculated over an expected 20 year timeframe. When the changes in GHG emissions were compared with the expected reductions in nitrogen losses, a possible co-benefit became apparent. Across the representative dairy farms in the catchment, after introducing the management mitigations for improving water quality, the GHG percentage reductions were estimated to be around 64% of the percentage reductions in nitrogen losses to water.

Overall the catchment might be considered a relatively high rainfall catchment with mixed soil types of moderately 'leaky' soils. Farm sizes are a little smaller than the national average and dairy cow stocking rates are similar.

The overall expected change in nitrogen losses from the soil profile is a reduction of 38% across all the area of dairy farmed land in the catchment. The reduction in GHG is a total of 24% across the whole of the catchment. The variation in results is considerable. The farm representing the 3rd cluster has a small increase in GHG because although the number of cows stayed very similar over the 20 years, their production has gone up. Unlike the other farms, the enterprises represented by this farm have farming systems that initially already achieved the nitrogen caps.

Dairy farms in the Tararua District are making considerable changes to their farming systems in order to comply with the nitrogen cap in the One Plan. The changes modelled in this study will reduce their nitrogen discharges by about 38%. The One Plan does not require dairy farmers to change their management in order to reduce their GHG emissions. However, at the catchment scale and from the results modelled here, such reductions will occur concomitantly with reductions in nitrogen losses.

It is estimated that in the Tararua District, dairy farmers compliant with the One Plan will reduce their GHG emissions in the catchment by 24%. That is a reduction of 0.64% for every 1% reduction in nitrogen losses. The mitigations selected for mitigating nitrogen losses are matched to the catchment outcomes required in the One Plan. The mitigations include making operational changes such as reducing nitrogen fertiliser applications and system changes such as wintering dry cows off-farm, and displacing other livestock.

Applying the results from the Tararua District more generally may indicate that even in the absence of a policy intervention by central government, the dairy industry in this region are already making substantive changes to their farming practices. Changes that will contribute towards reducing their GHG between now and 2050. This suggests that before GHG-agricultural policies are finalised perhaps detailed discussions are needed between central government, regional government and the agricultural industries.

HOW TO GROW A MANGROVE FOREST: A RECIPE FOR LOSING BEACHES AND FILLING IN ESTUARIES

BY CLARE FEENEY, THE SUSTAINABILITY STRATEGIST

Ingredients

Take:

- 1 sheltered coastal water body in any tropical to temperate zone
- a rolling to steepish surrounding catchment (1 metric catchment = 1 imperial watershed)

Add:

- a large quantity of forest clearance
- quite a bit of farming
- a few areas of forest, ideally on the steepest land
- a concentrated area of urban development
- several major roads and causeways

Method

Start by removing the original forest – this gives you a good start by releasing a pulse of sediment into your estuary or embayment before you add your farmers.

Add your farmers. For best results, use cropland farmers – this will give you a steady supply of sediment from the land into the water (this is where you want your mangroves) that can equate to around 200 times the rate from the original forest. Grassland is fine if you can't get crops, but in many places, will only yield about 10 times more sediment than the forest.

Once the farmers are settled in, sprinkle your forestry up in the steeper areas to maximise runoff. While the sediment yield is only intermittent, it's not bad at around 500 times more sediment than we started with, so this will make a good contribution to your mangroves.

Now, add your urban development. Each new subdivision will only expose the soil for a short time, but you can have two bites of this cherry: firstly, make sure the major construction works expose as much soil to rain as possible and don't add too much in the way of erosion and sediment controls. This should yield quite a decent dose of sediment to your waterway that could get up to around 2,000 times the rate from the original forest (which of course we have already carefully removed). While this will tail off as the area is grassed down and the individual lots go on sale, you will get another quite good dose of sediment once the builders come in and open up each site for house foundations, driveways and services.

Over this time, gradually put in your highways all the way around your waterway, and make sure to put causeways across your estuarine inlets – they are just great for keeping in all that lovely sediment we've just added.

Let stand for some time. You will see results within two or three years as mangrove seedlings start springing up on the areas where your fine sediments have settled out on the intertidal flats. However, the best results are obtained over a hundred or more years, by which time you could have a mangrove forest that has crept over your sandy beaches and extended well out into your harbour and over the shellfish beds further out.

Extra for experts

This recipe is simple enough for all to use. Advanced chefs – more tips below!

Farmers

Farm tracks are a great sediment source. Widen them periodically and don't put too much aggregate on them: runoff will pick up more sediment if they are bare. Races are pretty good sources, too – and if you keep long grass well away from the downhill side, especially at the lowest point, sediment will be able to get straight into the stream where it can head off down to the harbour very quickly.

Croppers –regularly cultivate your soil to a great depth – this will dry it out and break up larger clods, making it easier for runoff to mobilise soil particles and get them down to the harbour for your mangroves. And wherever you can, run your machinery downslope so runoff can speed up.

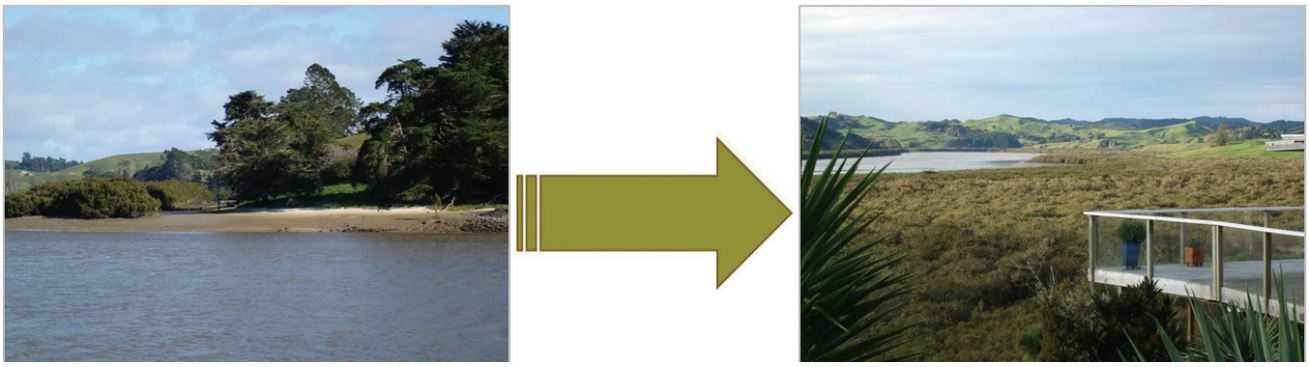
Pastoral farmers – the simplest way to get good sediment runoff is to get your stock into your waterways – on no account should you fence them off or plant the stream banks. A good bit of overgrazing will also help, especially when grass growth is poor over winter or in dry weather.

Foresters

While you may only fell every 20-30 years, you can still make a great contribution if you use minimal erosion and sediment controls on your roads, haul routes, skidders and platforms, especially if you don't use cables on your steep land, fell right to stream edges and put your machinery through them.

Urban developers

As indicated in the main recipe, you have two chances to maximise sediment runoff from your developments. However further variations are possible by sticking to the good old-fashioned methods of land development with major land recontouring and cut to fill. Try to avoid the new trend for water sensitive urban design and low impact development – it just doesn't give the yield we want.



Roading engineers

Opt for long causeways around your harbour wherever you can: they are not only cheaper than bridges, they will restrict the tidal flow much more, creating sheltered areas where sediment runoff from the whole catchment can more easily settle. Take a look at an air photo to see the difference they can make. Rural roads in particular are also great sources of sediment when you don't re-gravel them too often. Avoid armouring or putting check dams in your roadside drains, so that the water can build up speed: this helps it erode out more soil and transport it more rapidly into the harbour.

Seriously, though –

Estuaries are vital coastal ecosystems that support significant inshore and offshore commercial, customary and recreational fisheries. In the temperate to tropical waters where they are found, mangroves play an invaluable role, providing shelter in a nutrient-rich environment for many species of fish, including **residents** that spend all their life there, **mobile** fish that come and go between ocean and estuary, **transitory** fish that enter them for short periods of feeding or breeding and **migratory** fish passing out to sea from streams or up to streams from the sea.

But this is little consolation to people who live on or use estuaries and who over time have seen the loss of sandy or shelly beaches and offshore shellfish banks as fine sediment smothers them, enabling the mangroves to establish. It is even less consolation to know that the spread of mangroves is our own fault, the result of poor land use practices arising from past ignorance and the drive for development.

Environmental regulators are becoming more receptive to community desires to halt mangrove spread or remove them to restore swimming beaches – but locals, picking up seedlings is very different from picking up a chainsaw: do get the approvals you need before doing anything major.

Call to action for communities and catchment managers

There is no point removing mangrove seedlings or trees unless we also cut off the artificially elevated supply of sediment that allows them to establish. The work starts from the ridge tops down, and it is the role of every land user to keep soil on the land where it belongs. Every catchment management plan needs to set up or beef up soil conservation and erosion control programmes in the watershed to progressively reduce the loads of sediment to the harbours, to support the community's removal efforts.

Find out more:

Auckland Regional Council (2007) The New Zealand mangrove: review of the current state of knowledge. TP *(Technical Publication)* 325 http://www.nzpcn.org.nz/publications/ARC-325%20Mangrove-review.pdf

Lundquist, C., Carter, K., Hailes, S., Bulmer, R. (2017) Guidelines for Managing Mangroves (Mānawa) Expansion in New Zealand. *NIWA Information Series* No. 85. National Institute of Water & Atmospheric Research Ltd. https://www.niwa.co.nz/freshwater-and-estuaries/management-tools/managing-mangrove-expansion

Northland Regional Council School Information Pack: https://www.nrc.govt.nz/For-Schools/School-information-packs/Mangroves/

Stokes, DJ (2010) The physical and ecological impacts of mangrove expansion and mangrove removal: Tauranga Harbour, New Zealand. A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy at The University of Waikato. https://researchcommons.waikato.ac.nz/bitstream/handle/10289/4902/thesis.pdf

ON THE OTHER SIDE OF THE FENCE

John Douglas returns to the broadsheet after a long absence and explains what a change in tack has taught him since his early days in soil conservation.

I have been absent from the NZARM road show scene for a few years now. It is by choice but I think I have a very good excuse. I work hard to make a living and a few things fall off the radar when you are in that position.

10 years practicing forestry and 25 years soil and water conservation means there is a lot of work out there. Learning from the best in the business and my machine operators has provided me with a with a huge array of tools.

As young soil conservators we were provided with overarching management and a can do approach. We did a lot with the best learning experience coming as a result of the mistakes we made. We smugly contend that the mistakes were calculated.

There is so much fear out there that some of these young people are limited in their opportunities to make mistakes and therefore a learning opportunity. Still today I am dreaming up solutions based on observation and experience. The latest ideas are to assist forest managers in their pursuit to clean up the liquid wall of wood that hit Tologa Bay. The most important job will be reducing the risk of that type of occurrence in the future. Each forest manager I work with is keen to make a change in this area but is a little cautious that they might make a mistake.

You can't do worse than what already happens so learn from the experience and trust your instincts. Bring in experts and I mean the ones who carry out the work by asking their opinion and draw on their experience. I was praised for the work I did which was largely due to some excellent excavator

operators I used and I always told them that you make me look good 30 years on and we still work together. I reckon they should be paid as much as flash engineers are paid when providing advice.

I miss a few things but I don't miss the endless meetings. When I meet with clients now making multi million dollar
decisions it is usually at the site and we stand up or drive around. Generally if you inspire confidence you have the job, however you need to make sure you deliver. That is your KPI and there is no under perform or over achieve standards. When you get paid you tick off that the KPI has been satisfied.

I am not on the NZARM circuit so much any more but certainly working hard for all of our shared outcomes and I still love it!

PRESIDENT'S UPDATE

Kerry Hudson reflects on a recent trip to Switzerland and highlights some nice local projects with some national relevance.

Hard to believe how far through 2019 we are, lots happening in the NZARM space and more unfolding.

I have been on an unbelievable adventure overseas- a seventeen day tramp from the Austrian- Swiss border to Lake Geneva and the French-Swiss border. Fine weather throughout and how different to New Zealand. Switzerland is booming with infrastructure being built all over the place. Dairy cattle in small herds of about 25 cows right up near the snowline, animals in wonderful condition, plenty of feed (although in a very short growing season) and no apparent effects on the waterways. While this appears to be very sustainable it is hard to see how this is economically viable. Pockets of forest harvesting on small areas of land-no clear fell harvesting as such and very little effects from earthworks, slash migration and soil erosion. Once again the economics of forestry, when you see the size of the wood harvested, is significantly different to us.

Back to New Zealand and a positive funding approval for an iwi group on the East Coast in the Waiapu Catchment. This includes installation of debris dams for gully and waterway control, expansion of nurseries for riverbank planting and investigation into protecting the banks of the river. This is really positive for our local community.

On a regional basis we are trying to progress the One Billion Trees Programme, we are looking at how we may assist landowners with direct applications to MPI for funding and investigating how partnership approaches may be developed. Be interested to discuss this with everyone in October.

Last week saw the Action for Healthy Waterways discussion document released. Plenty to think about in this and Duncan Kervell raises an innovative idea to providing a submission reflecting a combined regional council approach and the executive will raise this matter at this week's teleconference call and perhaps look at an NZARM submission. A process such as this waterways discussion is an ideal opportunity for NZARM to be involved.

Northland are putting in a huge effort to this year's conference and its looking great for the full crowd that have registered. Look forward to seeing you all in the Bay of Islands next month.

Lake Geneva

nzarm.org.nz