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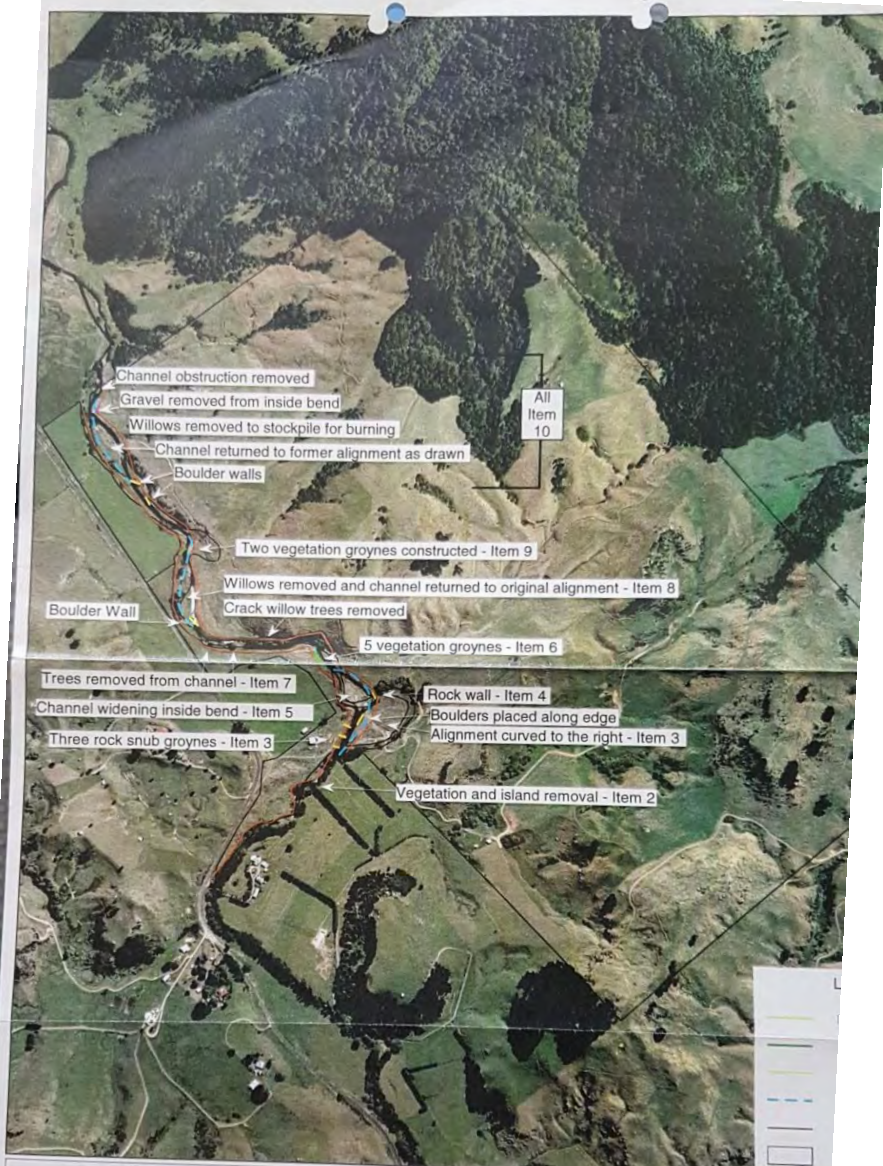




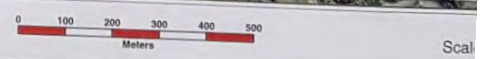








Stewart & Clements Properties  
Maungatutu River Works



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# Can we have faith in Overseer?

Alfred Harris expands on his view that Overseer is an 'out-dated nutrient balance model owned by those with vested interests'.

Think models and most Kivi males will think beautiful women, the one might stand, the stuff of the imagination. But there is also a song that goes: "If you wanna be happy for the rest of your life, never make a pretty woman your wife".

So has the Waikato Regional Council, in its desire to set regulatory standards for nutrient runoff from farms, gone after the pretty woman model? Will the regional councillors wake up on the morning after passing the Healthy Rivers/Wai Ora District Plan variation, which relies on the Overseer nutrient budget model, to find themselves in the High Court facing a legal challenge by farmers?

I hope councillors see sense and heed the call of Federated Farmers for a paradigm shift at all levels of science and policy.

Overseer's owner, Overseer Ltd, represents some of the worst aspects of the old discredited model of taxpayer science funding and hides the potential conflicts of interest of the Overseer Ltd shareholders. The shares in Overseer Ltd are split 50:50 between AgResearch Ltd, which is effectively a state-owned enterprise, and the NZ Phosphate Company. The Companies Office records disclose that the NZ Phosphate Company trades as the Fertiliser Association of NZ. The shares in the NZ Phosphate Company are split 40:40:20 between Ballance Agri-Nutrients Ltd, Ravensdown Ltd and GreenGro Resources Ltd. GreenGro Resources Ltd has one shareholder, Ravensdown Ltd.

Has the Ministry for Primary Industries fallen prey to arguments presented by vested interests as good science? MPI says on its website that it is a major funder, user and generator of science. Where is the incentive for the AgResearch "business" generating income for the Government to raise fundamental scientific questions about the model being used for measuring nutrient runoff when half the shareholders of the "business" are fertiliser companies presumably with no interest in reducing the amount of fertiliser being sold? As a farmer mate of mine with a keen interest in science frequently asks me: "Whose science do I trust".

The Waikato Regional Council

and MPI are responsible if the decision about whose science we trust is made by the High Court and not from an independent taxpayer-funded critical analysis of the science that lies behind Overseer.

The regional councillors need to ask themselves two questions:

- Can I trust the science behind the Overseer nutrient budgeting model when the two largest fertiliser companies in NZ own 50 per cent of Overseer Ltd?

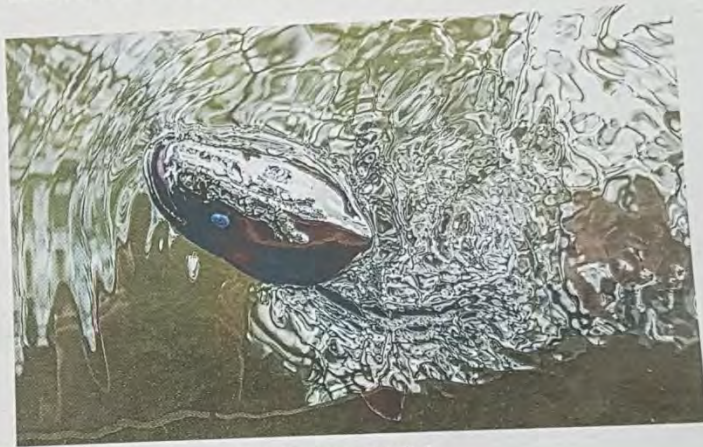
- Can I trust the company that owns Overseer which is 50 per cent owned by the two biggest fertiliser companies in NZ to rework their nutrient budget model in the light of research which suggests that simple changes in management practices and beneficial fungal associations with pasture plant roots can potentially reduce soluble fertiliser requirement?

Given that nutrient loss from land has a huge impact on freshwater quality, when will Overseer Ltd invest in research to incorporate in their nutrient software budgeting model the results of their own research on the plant and pasture plant accumulation and concentration of cadmium.

Research published this year by the Fertiliser & Lime Research Centre at Massey University shows that cadmium accumulation in chicory and plantain, two increasingly popular forage crops, is much, much higher on average than ryegrass or clover. Levels of accumulation of cadmium in chicory and plantain at the top end of the range are downright frightening.

Cadmium is vitally important in any consideration of healthy rivers. Cadmium continues to accumulate in the soil because the two big fertiliser companies continue to manufacture superphosphates from cheap rock phosphates high in cadmium.

This cadmium then washes through the soils and is concentrated through the food chains in freshwater ecosystems to much higher levels than in farmed animals. Species like eels at the top of the food chain are exposed to cadmium in the water, in the sediments and through accumulation in the food chain. Customary fishers eat a lot of wild eels, and large smoked eels are



How much cadmium accumulates in eels that live for many decades?

exported to Europe.

Given that the kidneys of sheep and cattle older than two years are deemed unsafe for human consumption, one wonders where and to what concentration cadmium accumulates in eels which live for many, many decades.

Why does the Waikato Regional Council not routinely measure the cadmium concentrations in eels and other food species like trout? Modelling is essentially about mathematics. Like any model, Overseer reduces to mathematical equations (algorithms) the complexities of different soil types, pasture plants, root depths, and rotation lengths. Modelling begins with things as simple as averages.

According to the OECD world river database's mean annual data the Waikato River is one of the cleanest rivers in the world. Pristine though the Waikato may be at its source in the mountain streams that run into Taupo, the same cannot be said of the lower reaches after the river has passed through towns, industry, and farmland.

All science is the simplification of uncertainty. Mathematics represents the greatest simplification of that uncertainty. The greater the simplification of the uncertainty the greater the doubt politicians should have about the ability of mathematical models to predict the real world.

Modellers, as distinct from the people who use models, know that

models have limited value and they see them primarily as tools contributing to open discussion and debate. Models help identify gaps in research, flaws in the mathematical equations, and how to account properly for the experience of farmers.

As I am sure modellers would agree there is a huge level of risk in using models to predict the future. They have grave concerns about models taking on lives of their own when used for regulatory purposes by regional councils.

In an important paper on the Guidelines for the Admissibility of Farm and Catchment Models in the New Zealand Environment Courts one of New Zealand's leading modellers, Dr Aroon Parshotam, suggests that courts could apply the following criteria to the regulatory use of models such as Overseer

- Have the theories used to design the model been scientifically scrutinised?
- Has the model been published and have other scientists had the opportunity to review the science?
- What is the inherent error involved in the modelling process?
- What are the standards and controls used in the operation of such a model and how are they maintained?

How is the model used regarded by other professional modellers?

It is Parshotam's view that many catchment or farm systems models (such as Overseer used in

New Zealand would not pass such a test.

Waikato Regional Councillors would be well advised to listen carefully to Federated Farmers when they advocate the use of science and innovation to underpin resilient, profitable farming systems.

Federated Farmers suggests that politicians re-engage the ingenuity, innovation and pragmatism of farmers and scientists to capitalise on the productivity of the land-water interface, including ways to integrate aquaculture and agriculture in inland waterways and estuaries. The use of out-dated nutrient balance models owned by those with vested interests does not support the far-sighted vision of Federated Farmers.

In linking the innovation, energy and practical experience of farmers with the innovation of taxpayer-funded scientists, New Zealand can once again lead the world with pastoral farming systems that not only mitigate greenhouse gas emissions but regenerate rural economies, communities and environments.

**Alfred Harris has a first class honours degree in cytogenetics and spent much his research life using electron microscopes and X-ray analysers to study soils, composts and biocarbons. Now the research manager Pacific Biocarbon.**



# Nutrient software queried

Independent soil scientist Samuel Dennis has become increasingly disenchanted with the way the Overseer programme is being used. **Tony Benny** reports.

Samuel Dennis grew up on his parents' sheep and beef farm at Glenroy, in the foothills that rise from Canterbury Plain, inland from Christchurch, and today he and wife Sarah live with their six children on a corner of family property.

Until two years ago he worked in AgResearch's farm systems department. He studied soil science at Lincoln University, graduating with an honours degree and completing a PhD.

"When I was at school I had a very strong interest in science and I was studying things from a creation perspective at home and from an evolution perspective at school," Dennis, a committed Christian, says.

"That tension caused me to have to think critically and critically thinking is essential for science so that ended up leading me into a science career."

But the 10 hours a week spent committing to Lincoln became too much for Dennis. "Our fifth child was on the way at the time and I realised I was just not getting enough time with the kids."

"We were wanting to home school and I thought, 'I'll go out on my own and make it work,'" he laughs. "So that's what I did and I'm still here."

Since striking out on his own Dennis has done contract science work for large organisations like Lamb NZ, as well as for individual farmers, doing Overseer nutrient budgets for environmental regulation compliance.

But he's become increasingly disenchanted with the way the computer modelling programme is being used.

"I'm really trying to pull back from Overseer modelling for individual farmers because the more I look into it and the more different ways of farming I see, I realise I just can't trust the numbers."

"I'm just not professionally comfortable with reporting numbers based on Overseer knowing they will be used to assess regulatory compliance, because it's just wrong in many cases."

Dennis says Overseer works well for what it was designed for, working out farm fertiliser recommendations, but not as a regulatory tool.

"Overseer was developed to work out fertiliser recommendations and in order to do that, it has to work out how much nutrient is being lost. You need that to work out how much fertiliser you're going to have to apply to replace it so it's an important number and on a statistical average basis, it's good enough."

"If you get your fertiliser recommendations slightly wrong, it doesn't matter because you're going to pick it up in your fertiliser tests a few years later and you'll correct it. There's no regulatory consequences of it."



Independent soil scientist Samuel Dennis with his farmer father Chris on the family farm at Glenroy, Canterbury.

There are definitely opportunities opening up with new technologies that aren't available yet and that's what I'm trying to work on.

**SAMUEL DENNIS**

But real farms are far more complicated than allowed for in Overseer, Dennis says.

"It can only account for the few things that have actually been researched in sufficient detail to put into a model. There's far more that's not in the model that's happening on a real farm than is in the model."

Dennis says one paddock can have several soil types but that, along with topography, variable pasture composition and tree lines, is among many factors that affect nutrient loss but for which Overseer isn't flexible enough.

"Most critically, changes in soil organic matter over time are almost completely ignored."

"Most of the research has been done in flat highly productive pastures, very little has been done in the high country. When you get up into the hills, when you get into higher rainfalls, anything on different soil types, anything that's away from the standard conditions that you tested, the model's accuracy is going to rapidly fall away."

On top of his doubts about the accuracy of the figures Overseer produces, Dennis finds the whole farm environment plan process frustrating.

"The farmer's only called you up because the council told him he had to and it takes a fair bit of time to do the work so you end up having to invoice them a fair amount of money."



Chris Dennis uses "time-controlled grazing", also known as holistic farming, grazing stock together in large mobs in small paddocks and shifting them daily.

"It's the most depressing thing to invoice someone for something they never actually wanted to do in the first place and doesn't actually deliver any real value to them whatsoever."

Dennis believes rather than computer modelling a far better way to assess farm nutrient loss would be by actual measurement, something until now deemed unaffordable and impractical but which emerging technology should make possible.

"There are definitely opportunities opening up with new technologies that aren't available yet and that's what I'm trying to work on. There are technological solutions in other industries that I can repurpose, put it that way."

Wary of saying too much in case his ideas are stolen, Dennis believes there's potential in a number of different approaches.

"There's a couple of different methods that I'm in the process of designing and getting under way."

"I'll be looking for clients who have complex situations they believe aren't being accounted for who would be happy using experimental approaches to try to work out what their situation is while I refine the technology that I'm working on."

Meanwhile at home Samuel's father Chris has adopted holistic farming techniques, another of the variations not accounted for in Overseer, Samuel says. He prefers to call the system "time-controlled grazing", whereby large mobs are rotated through small paddocks with daily shifts and long recovery times, trampling down long pasture as they go and building up soil organic matter.

"You've got a lot more trash left behind and all of their urine and dung is going on top of this sur-

face litter layer which is much deeper than your regular pastoral situation. A certain amount of the nitrogen is going to be used just in the litter layer before it even hits the soil."

Under time-controlled grazing, pasture should develop bigger root systems and these should pick up more nitrogen before it can leach out, he argues, adding that urine is more evenly distributed and international research shows phosphate run off is reduced in this type of grazing management.

"But that's not accounted for in Overseer. It's an extreme example of a farm system where you can see all of these different things that just aren't accounted for in the model."

"On a different scale, a lot of that's true for any farm - there's a lot of stuff that any farmer would be doing that's not properly accounted for in the model."





approach of drawn-out planning processes, mandatory requirements on all farmers, auditing etc.

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New Zealand's environmental legislation which require councils to identify where the water quality issues are, what are the main causes and what planning framework is the most effective and efficient in addressing the issues. A blanket licence to operate is also contrary to the legal parameter that regulatory requirements on people should be commensurate to the degree of impact of their activity.

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The fallacy of Dr Read's thinking is being laid bare in Canterbury as many are starting to realise that the millions of dollars being sucked up by the licence-to-farm approach of drawn-out planning processes, mandatory requirements on all farmers, auditing etc is unsustainable. There is also increasing recognition that we already have an excellent model in the catchment board system still used in regions like Taranaki. It operates at a fraction of the cost, works in partnership with farmers and delivers so much more on the ground. And it is in this sort of voluntary system that tools like Overseer and farm plans can be very useful.

Jamie McFadden  
 Cheviot

### Overseer's limits

In light of the controversy caused by recent comments of mine regarding Overseer, I would like to bring the discussion back to the science and clarify a few matters.

Overseer is a good model, developed by good scientists, many of whom I have worked with personally. However, it is limited in ways that severely affect how it should be used.

A computer model is just a complicated mathematical equation. The model only "knows" what people have put into it. To give a very simple example, Overseer "knows" about livestock stocking rates, fertiliser type, and slope, which may affect P loss. It does not "know" about whether a forage crop is grazed up or down slope, pasture post-grazing residual, or dung beetles, which may also affect P loss (according to AgResearch, the USDA, and Landcare Research respectively).

Overseer can be used to answer the question "to reduce P loss, is it more effective to reduce stocking rate or to switch from superphosphate to slow-release RPR fertiliser?"

Overseer cannot be used to answer the question "if different post-grazing residuals are used, how may this alter P loss?", because Overseer has not been programmed to understand post-grazing residual.

Since Overseer does not understand the effect of grazing strategy (post-grazing residual, grazing direction), yet both certainly vary between farms and may alter P loss, Overseer is not able to accurately estimate total P losses from a property (this is just one of many reasons).

Farms are very complicated,

and although the model is improved every year it will never be able to account for all relevant factors. This is not about so-called "holistic" practices, these issues affect all properties. However, alternative management introduces even more factors that are inadequately researched and thus not in the model, making this issue particularly pertinent to such properties.

Overseer cannot accurately estimate actual N and P loss, as anybody who has seen their numbers change with Overseer updates as it is progressively improved knows well. However while the absolute numbers jump around between updates, the general trends stay the same (superphosphate still causes more P loss than RPR). The trends are sound and reliable, the absolute numbers are not.

It is therefore inappropriate for a council to estimate actual leaching losses from farms using Overseer, to compare against regulatory limits. However, where real environmental losses have been physically measured in receiving waters, and are understood to originate from a particular farm, Overseer can indicate which of those strategies that are recognised by the model may be most effective in reducing these losses. Overseer can inform management decisions, but not accurately assess compliance with regulatory limits.

Dr Samuel Dennis  
[www.grounded.co.nz](http://www.grounded.co.nz)



# ng's damaging 'acts of



Logs and forestry rubbish was washed down the Walkakaho Valley Marlborough after flooding late last year.

against a background of hills covered in pines. The message was clear, forestry is saving and protecting our creeks, rivers and water, not to mention the biodiversity including we humans

But at the turn of the century it all began to change. Large-scale logging began on the hills and with it wholesale collateral damage downstream. Modern logging techniques with their

It would be fair to ask that the NZ Forest Owners Association returns, after the area has been logged, to that little creek which featured in their advertisement of last year. Much of the native vegetation will be gone. The logged, stripped, deeply gouged and highly vulnerable hills will be littered with slash and logging debris.

left exposed and deeply gouged hillsides and tremendous amounts of slash and under par logs just waiting to be washed downstream with the first heavy rain.

The vulnerable erodible East Coast hills simply fell to pieces. One big rain event could and did reverse 30 years of environmental benefits.

We experienced several such events. Our beautiful little river was transformed in high flood into brown sludge carrying not just slash but a continuous flow of short-end logs. And not always short, one such flood left a 20-metre pine log draped over our cattlestop. All this logging debris was carried in a thick slurry of precious topsoil and biomass.

Downstream the damage continued. Low lying flats could be covered in logging debris – and often were. Tidal rivers and estuaries critical to many fish and shellfish species have become clogged with debris and silt. This has badly affected our inshore fisheries.

In early October 2015 the Gisborne Herald carried a story and a picture of the lovely clean town beaches and commenting how good it was that unlike previous years there was a minimum of logging debris. The writer spoke too soon. The following week, after a good spring rain, the same beaches