

Lake Forsyth/Wairewa in serious condition

Notes from a public meeting held 7th December 2005, 7 pm at the Little River rugby clubrooms.

Approximately 40-50 people are in attendance from the Wairewa Community.

Eric Livingstone (meeting facilitator): It has been 4 months since the first community meeting in August followed by a meeting with all stakeholders at Hereford St in October. As a result of which they have called this meeting.

John Panirau said karakia (prayer).

Eric: Apologies from John Porter BPDC and Marc Farge from Kinloch, concerned about present low lake level.

Acknowledged the attendance of Stan from the Press and Esther from the Poranui Express.

Robin Wybrow:

Thanks for making effort to come out when cricket was on. Tonight we are here because we have a problem with the lake and to discuss possible solutions. Problem with solution is that it will need the strength of community backing. At the community meeting in August we agreed to meet again in February. However, after the meeting with stakeholders we heard some disturbing information that needed to be brought back to the community, and everybody needs to be on the same terms with that information.

About the same time a proposal was put on Robin's desk to test the feasibility of improving lake condition. Hope and despair ironically came together.

The runanga is very appreciative of the work of Dr Tim Davie from Landcare Research (Manaaki Whenua) who will talk tonight about the lake monitoring process.

Barbara Dolamore, Biochemist from CPIT will talk about her recent research findings re the effects of the algae on the tuna.

Charles Mitchell, a Biological Scientist will talk about testing the feasibility solution. Charles flew all the way from Raglan. Then Robin said something about getting on with the meeting to let us hear it from the "horse's mouth".

Eric: Its my pleasure to introduce Dr Tim Davie...

Dr Tim Davie:

Hey I'm not the horse!!

Results have come in the last week or two. He is based at Lincoln. He is a hydrologist and interested in catchment info.

To start thinking a bit about the lake itself...at Christmas last year the lake was even lower than it is now. It's not nice to see. This is during the start of the cyanobacterial bloom. See degradation around Catons Bay. But it's not all bad. Tim showed us a photo from Bossu Road looking up the lake, stunning pic, looks like Lake Wakatipu. Really is a beautiful part of the country. Highly productive lake and worth preserving. Tim's family had a bach at Wainui, he remembers always referring to Wairewa as "Lake dirty water", but he feels a strong affinity for the place and that's why he's involved.

Tonight he is covering a bit of an overview of the catchment. Cyanobacteria is the first thing, often referred to as algal bloom, but it's not actually an algae. Says we should be proud to have Cyanobacteria, which is one of the oldest organisms on earth, living in oceans and water to produce oxygen.

Cyanobacteria are an old organism, not an algae, somewhere in between algae and bacteria. They are nitrogen fixing organisms. They take nitrogen from the atmosphere. We will think of them as a plant. The limiting elements to plant growth are nitrogen, potassium and phosphorus.

Phosphorus is the main limiting element here because Nitrogen can be fixed from the air, which means that dissolved nitrogen levels don't really matter. That's why this work concentrates mainly on phosphorus. Where from?

1. Sewage from septic tanks 99.995% water. Huge amount of that involves detergents. That's where phosphate comes from and has become more prevalent over the years.
2. Phos occurs naturally in soil
3. Fertilizer input to improve production yields in farming.

Banks Peninsula is comprised mainly of Loess soils which are windblown deposits, what you see around the mined cliffs etc, deposited mostly during glacial periods, mostly greywacke coming from the alps.

In terms of the rock itself, naturally the volcanics here have higher phosphorus levels. The top horizon of soil is mainly of the Stewart" basalt type. The naturally basalt type soil has higher phosphorus, particularly around the lake.

Environment Canterbury has been monitoring the lake tributaries. Used to come out about once a month to take a sample. They found that the nitrogen concentrations are significantly lower than those for Waihora. Algae are unlikely to be a problem, but the dissolved reactive phosphorus is quite high. Naturally high phosphorus levels could be a problem.

What happens during a storm? This information is not yet captured by Environment Canterbury, therefore it is probably not monitored. Need to see how much is still coming into the lake and what can we do about it. The majority of sediment comes from bank erosion rather than off the slopes.

There haven't been many floods, but there was one in August, 2nd another in October which had both the Okuti and Okana running.

Phosphorus binds with clay particles really well and comes down as a suspended sediment (such as the October storm). The automatic sample was triggered by the flow level. Dissolved phosphorus was high and constant. A fair amount is coming from septic tanks.

In the long term from average samples taken after a storm, it appears that the total phosphorus drops away. Are the storms still contributing phosphorus to the lake? Yes, but is not necessarily the only thing driving it (i.e. Okana).

Okuti has slightly lower levels of dissolved phosphorus. Naturally higher levels are coming out of the rock, but after storms this is lowered. These results are 'hot off the press'

Conclusions:

- These results are provisional only.
- The naturally high phosphorus is likely to be driving the cyanobacteria bloom
- Majority of the phosphorus is coming through in storm flows
- Management options include:
 - septic tanks
 - riparian management to minimise bank input.

Rivers have a large amount of sediment that can be reworked in a storm. Vegetation can help stabilise to a certain extent. We do need to be thinking about riparian vegetation around the streams. Huge amount of sediment already sitting in the lake, but in time there can be a reduction.

Back to Eric. Any questions? No.

Dr Barbara Dolamore from the Christchurch polytechnic Institute of Technology:

Has always been interested in area. Is from Granity on the West Coast, and when she moved to Chch and Birdlings Flat is kind of like that place for her. She realised there were issues with the lake, more recently watching eeling and more recently took up a research project through work, focused on biotoxins. The following results have been put together with the assistance of the local community.

The Nodularia blooms study over last couple of years has produced new findings on tuna. The Lake is looking a little lower this year. The shallow lake is ideal for the bloom. Shallow, well-mixed salty water promotes the blooms (during summer to late autumn). The Blue colour is a pigment from the algae, when you see this you know you are looking at cyanobacteria. They like the wind at Catons Bay, the blooms rise to the surface, they go up and down in the water column and the wind blows them to the shore.

Barbara shows slides of yukky looking green gooey stuff. The substance has been shared with lots of other colleagues, the last bloom was a particularly virulent crop. It looks like a colony. Nodularia spumigena is its correct name. They have specialised

cells which trap nitrogen. Don't mind low nitrogen levels because they are self-sufficient. OK like this but when it degrades it becomes toxic. Kills cattle and sheep and possibly dogs. Would like to hear the experiences of locals.

Biochemist pics. Very toxic. About 4000 micrograms would kill an 80 kg person if ingested.

Effects of Exposure: damages liver and causes massive haemorrhaging, coma, sometimes death. Could cause an increase in liver tumours. But would need to be infected every day like in the drinking water.

Barb collected eels on the 2004 and 2005 migration while there was a bloom on. Got some resident tuna in 2004 but no bloom. But no one was allowed on the lake (said NIWA), also collected lake water then measured nodularia.

Eels are fascinating, they are very long lived, up to 60 years for a female.

Residents don't have to swim the 2000 odd km to the breeding grounds. Barbara found that levels of nodularia were quite high in the livers, contamination was relatively lower in the muscles. 147 highest toxin in liver and in some muscle she was unable to detect any. With resident eels when there was no bloom on the liver levels are quite low, but the muscle levels are much higher in a range of 2 to 30.

Conclusions:

Migratory eels have lower muscle toxins and higher liver toxins. Toxins clear out of muscle tissue fast, which is good news for people who eat migratory eels. But the resident eels have a much higher content of toxins in the muscles when the bloom was not even on!

Daily tolerable intake: Not a lot of research has been done. Best not to eat more than 3.2 ug. Would have to eat about 500 kg of eel to get an acute dose.

AN INTERESTING result was got the other day that this material she managed to get tested is running about 2000 ug per gram of dried toxic material. Quite bad. If someone fell in the water and managed to gulp in a cup of this it would be an acute dose. Half a cup for a child would be an acute dose.

Once when Barbara was carefully collecting specimens in all her protective gear it was in front of a group of campers and she felt really awful about doing this in front of them and spoiling their idea of a clean green paradise.

Further work:

- Investigate nodularia levels of the resident eels during bloom periods – this summer perhaps (2005/06) ?
- Survey other species (trout, flounder) this summer.
- Analyse lake water samples from 2005 bloom for correlation of nodularin with cyanobacterial photopigments (stored frozen).
- Investigate factors which may affect bloom development, nodularin build-up and degradation in lake.

Questions from audience:

Has there been any research done on the spores? Barbara says this is a good point, good idea to do a study.

Does it stay stable in laboratory conditions? Needs further research.

Is there such a thing such as a natural phosphorus sink? Best left to bioengineers.

How can the phosphorus be from septic tanks during a storm?

Tim: In a flood event there is a lot of groundwater going down the river into the lake. This is surprising, but many studies show that the majority of water in a flood has been resident in the ground for some time. Septic tanks maintain high dissolved reactive phosphorus levels in the groundwater immediately adjacent to their soakage areas. It is unlikely to be a large amount in total but cannot be discounted as a source

Are Nodularia levels salinity-dependent? Barbara says Nodularia is a very robust organism, about 3% salinity dependent.

When talking about toxicity levels how much of a teaspoon? – A thousandth.

What can it be compared to? Not much, tried to import a very similar one, had to pay heaps (\$900 ish) for a tiny amount. Treated like a lethal substance, yet our lake is full of toxins.

Eels body naturally removes toxin from itself. Clearance rate of toxin, a few weeks for a one-off dose. Muscle toxin levels quite low. Metabolised, not excreted.

Eric asked for a mandate for more research, 90-% show of hands.

Barbara would like for people to register their interest to help hands on, about 9 hands.

Warning signs

Yes it is there from last year. Not really telling you what its like now. At least the fire rating has gone from medium to high.

Testing place is an issue. May need a toxicity meter, like the fire one. Where should it be placed. Someone suggested Caton's bay and another at the other end of the lake.

The issue is how do we predict the blooms and how do we send the right sort of messages to the public? For 6 months of the year the lake is OK. Mixed signals. Another sign is needed at the Poranui Beach end. The post office displays notices of the lakes condition.

Gizmo monitors lake level, and salinity level.

Expensive to analyse for nodularia. It has a strong affiliation with chlorophyll.

What happens when it gets blown around the pastures? Barbara says we need to have more research, like more frequent sampling.

Possible bioengineering solutions.

Charles Mitchell – self-confessed fish maniac.

A fishery scientist with MAF, consultant, plus also has his own fish farm. Was approached to see if he could help with his wisdom. Has experience with managing lake levels. Particularly interested in old lake outlet, which was more stable than the present one. Showed a picture at the cliffs, where lake used to drain, right where the rocks are. There's a mixture of geological circumstances, shingle build up, lake level etc.

If you could use the energy of the waves near the cliff end, it may be possible to move some material down the beach where they could make a good heavy pile of stones, let wave action slamming into cliff etc start carrying gravel away. Try to approach the solution from the beach end. May be able to restore the old channel.

Robin Wybrow: *What about the natural food chain?* Charles says that the lake certainly accumulates phosphate. If we could mobilise or lock the phosphate up, anything live floats away, and all that's left is the phosphate, all paid for by the farmers. If it got out to sea it wouldn't matter. Perhaps push the nodularia out to sea....

Barbara says it wouldn't survive, Charles says to feed it to something, something would surely eat it!!

Wayne Alexander: Bed rock, saw tooth action of shingle all up the south island, Poranui end of the south island beaches. Not sure where it goes from here. If we could use the piece of bedrock, the shingle might be able to create a reef off there. If the sea starts to erode the shingle out we may have a chance. Must have had a substantial volume of water through there at one time. No chance of a boxed culvert, nothing will work there short of opening the original channel. Spend the least money. Need a couple of locals during the low cycle to move rocks. Need community to be behind this to get resource consent. Only a small area, needs to be expanded by a hundred metres or so. Would have no effect on the status quo, we will be all a lot wiser after next winter to attack the following summer.

Steve Lowndes: *This is obviously an experiment. What about a more permanent solution? What sort of structure would you imagine? The sea there would move any pile of rocks.*

Wayne: About two tonnes should hold.

Brian Morgan: *How many years would that buy us?*

Wayne: it depends on the power. Use hydrology to hold volume of water. All the old beaches end here.

Steve: If it worked, what sort of lake level would be established.

Wayne: Depends on fishing etc., need to find a cheap proof of concept.

Bob Parker: *We all share a desire to clean the lake. The nodularia shows a potential health risk, needs cleaning up. The other goal is opening the lake differently to how its done now. Bob needs to define outcomes? Constant lake level? Permanent interchange? Seem to be several different issues. But are there some other ways that we can achieve the same outcome?*

Wayne: Its really a management issue.

Bob: The issues as I see it are: Temperature and phosphorus. There has to be some logic to this.

Wayne: Have to identify where the chain is broken, back to the whales etc.

Robin: When lake is opened all the good water flows out, and the yuk water stays on the bottom of lake.

Tim: The answer is that lots of things could happen from this but we don't really know and it would take a lot of work to work out how. No point unless a permit is granted to try the above. If that's possible, then now we do some more work on some other structure.

Bob: Struggles with the idea of the opening to the sea, lowering the level close to sea level.

Tim: not necessarily. Essentially talking about a barrier that would come in extremely high tide and pushing back through. Not dropping the lake to sea level, it will possibly be higher. But no point unless you can get a permit.

All the 1950's experiment did was breach through a non-permeable bar. The breach is now exchanging all the time.

There was a proposal for a tunnel in 1936-7. War got in the way etc, some didn't want it, but in 1888 when old channel closed it became an issue. But it never happened.

Eric: Its been a fascinating evening. Wants to know of support under the current consent, who would be in favour of tests this summer? A simple test of moving some huge boulders and seeing if scouring action would happen there. About 9 people have some equipment to volunteer. Mary and Ross Millar's bulldozer.

Stuart Wright-Stow: thinks its just a joke to get a few people to move a few boulders.

Stuart Millar: thinks it's beyond domestic equipment. Need heavy equipment.

Wayne: Yes

Bob: Need to comply with resource consents. Does this become a notified process.

Robin: Everything seems OK (according to BPDC and ECan) as long as most of community is behind it. Need to check with community, put a proper consent together with the team. Thinks the danger is losing a year, if we can't start soon.

Bob: need to talk to ECan.

George Skipper: *Confirms proposal for revival of old channel. Says Mother Nature will shut it up on us. Says don't forget the power of the sea coming from the south and congregating at the cliff face of Poranui. Why is this being done as an experiment?*

Wayne: When the water hits the cliff, the wave energy is enough to drag the shingle out and create a channel??

Tim: the idea is to do an experiment to see if there is a potential solution there.

Bob: Have any other alternatives been considered?

Wayne: an honest look at the boxed culvert, a tunnel, most things known to us would not work. Not one working that he knows of. Only suggesting the above because there was a natural channel there.

Robin: Is there World Health Organisation guidelines available.

Barb: in summer it exceeds it. The dog stays in the car. Kid stays away from the water too.

Bob: at what point do we erect a sign and at what level do we justify the non-use of the lake, because lots of local businesses are affected.

Brian: haven't we got water in the lake that can kill you.

Robin: Cycleway opening next year, more and more people each year. Can't afford to wait.

Bob: Just need to be very clear about parameters. The sign needs to be controlled by an authority. It also need to be secure.

Wayne: The less that's man made about the solution the better chance it has of working.