



Whakaora Te Waihora

Science/engineering work streams

Tim Davie

Environment Canterbury

Work stream overview

1. Trial establishment of macrophyte beds and artificial habitat creation
2. Mechanisms that drive in-lake nutrient processing
3. Fish restocking/recruitment including a review of fisheries management
4. Lake opening sites and the feasibility of deepening in-lake channels
5. Possibilities for an engineered lake level
6. Mahinga kai bio health investigation

Trial establishment of macrophyte beds and artificial habitat creation

- NIWA project led by Mary de Winton
 - University of Canterbury partner
- First step is establishing wave barrier
- Second is a macrophyte nursery (tanks on land)
- Trial plantings
- Detailed study of macrophyte health during growth periods and impacts of macrophytes on water quality and habitat



Timber Yard Point

Johnstons Rd

Within this area – to be surveyed - depth 1.2 m at level of 0.8 m a.s.l.

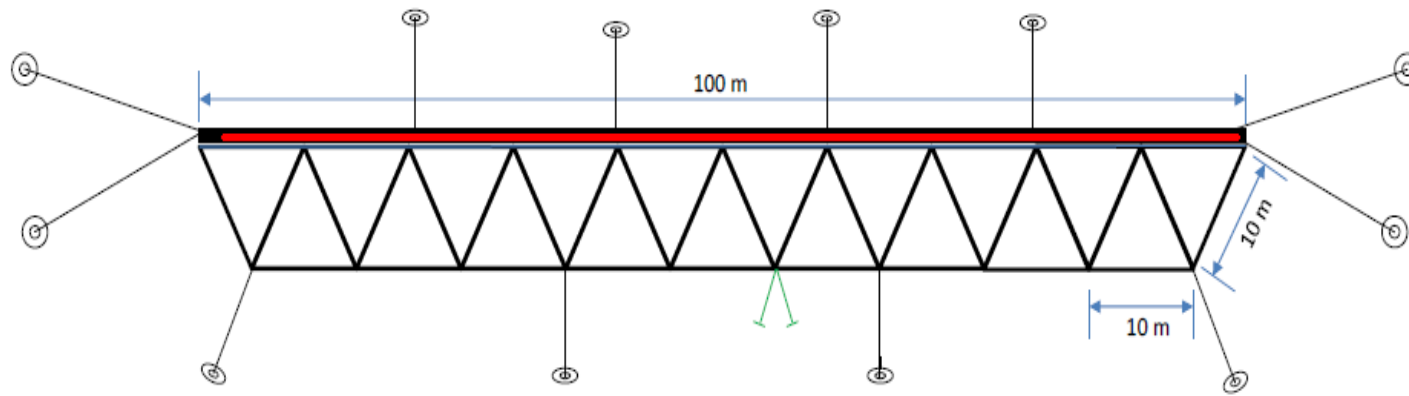
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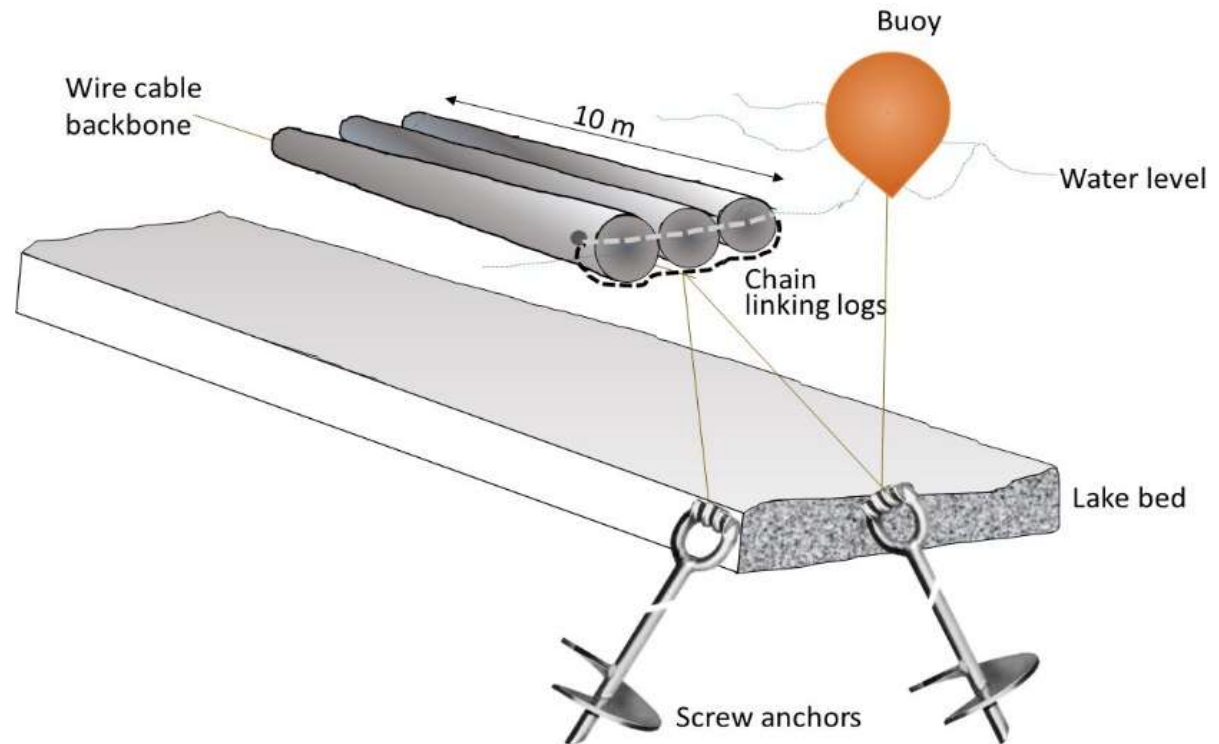
43°43'25.85" S 172°22'35.00" E elev: 0 m

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Eye alt: 3.39 km



- 10 m long logs in a modular construction to form a 100 m long structure.
- A leading edge of three logs chained together will be linked to single diagonal logs arranged in a 'sawtooth grid' to maximise wave deflection



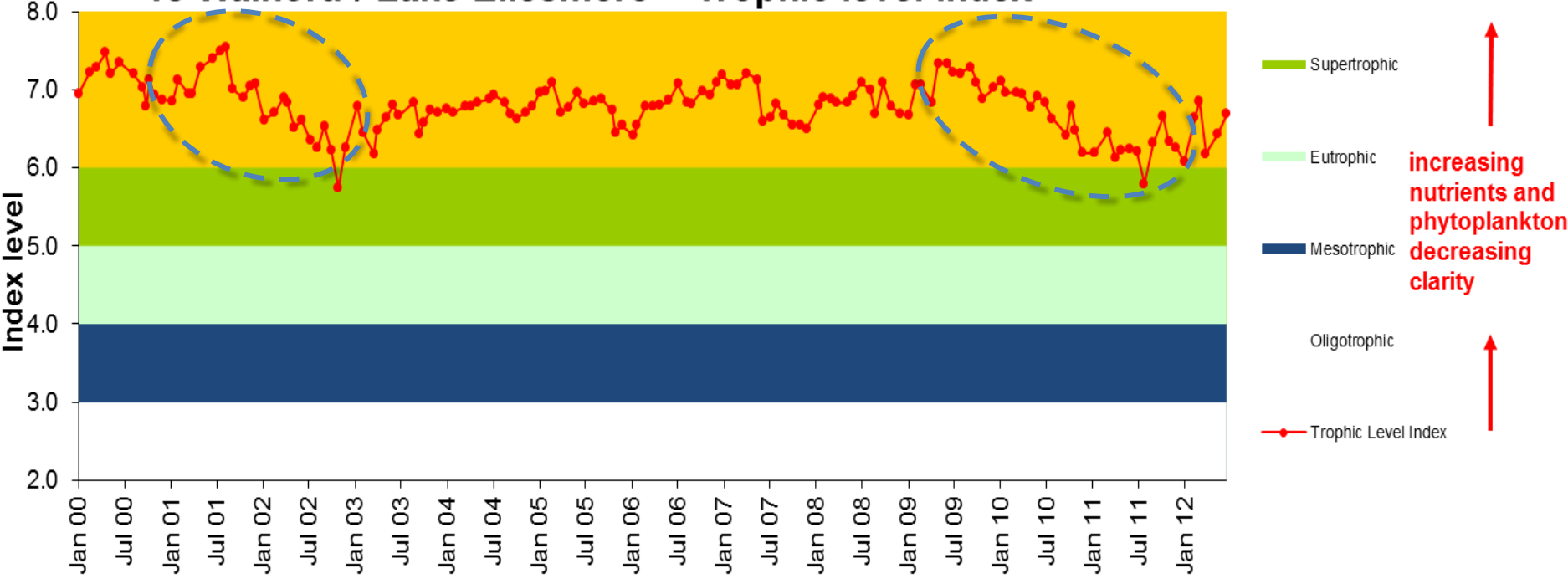
Trial establishment of macrophyte beds and artificial habitat creation

- Currently working through consent application for wave barriers
- Ready to go on-land, waiting for consent and improved lake level
- Due for completion early 2017

Mechanisms that drive in-lake nutrient processing

- University of Otago led (Marc Schallenberg)
 - Also Cawthron Institute, University of Waikato, Keith Hamill
- First major piece of work is detailed investigation of TLI improvement periods

Te Waihora / Lake Ellesmere - Trophic level index



Mechanisms that drive in-lake nutrient processing

- University of Otago led (Marc Schallenberg)
 - Also Cawthron Institute, University of Waikato, Keith Hamill
- First major piece of work is detailed investigation of TLI improvement periods
 - Completed report going through final review process
 - Can't say definitively what caused declines
 - Shows a decrease in TLI, TN & TP (since 2000)
 - Decrease in DRP in tributaries but not in DIN

Mechanisms that drive in-lake nutrient processing

- University of Otago led (Marc Schallenberg)
 - Also Cawthron Institute, University of Waikato, Keith Hamill
- Investigation of TLI improvement periods
- Sediment samples taken from around lake
 - Examined for Sediment oxygen demand (biological and chemical)
 - Sediment denitrification potential
 - Assay of sediment microbial diversity (physiological)
- Deeper sites showing denitrification
- Lab assays on sediment samples just starting

Mechanisms that drive in-lake nutrient processing

- Future work
 - More intensive work on denitrification hotspots (lab and in-lake)
 - Develop benthic oxygen supply and balance model
 - Update DYRESM/CAEDYM model for Waihora
- Due for completion April 2015

Fish restocking/recruitment

- NIWA project led by Shannan Crow
- First output achieved
 - Compilation of data and summary of existing data on freshwater fish in Te Waihora
- Continuing work on:
 - Monitoring recruitment for two seasons
 - Comparison of fish growth rates around lake (assessing kohanga)
 - Correlate habitat and growth rates
 - Assess influence of macrophytes on fish populations
- Due for completion June 2016

Lake opening sites and the feasibility of deepening in-lake channels

- NIWA project led by Richard Measures
 - In conjunction with University of Canterbury
- Use a hydraulic model of lake opening area to investigate an alternative opening site (at end of Te Kōrua) and effect of deepened channels in lake
 - Model built
 - Investigation of deepened channels (bathymetric survey for model) couldn't find any particular evidence of channels
- Final work due by early 2014

Possibilities for an engineered lake level

- University of Canterbury project led by Tom Cochrane and Brian Caruso
 - In conjunction with NIWA
- Compilation of information on historic proposals to open lake
 - <http://www.hydroeco.net/tewaihora/>

Mechanical opening – 1868 to 1930 (Horse drawn scoops)

Year proposed

1868

Status

Implemented for a defined

Location description

Taumutu

Description of option

The manual opening of the lake at Taumutu at least annually using horse scoops.

Opening, closing, and lake level control description

Between 1913 and 1947 there were an average of 1.6 openings/year to lower lake levels.

Maximum discharge

above 300 cumecs

- **Mechanical**
 - Current option
 - **Horse drawn scoop**
 - Opening pre-1868
 - Opening 1931–1946
- **Structural**
 - **Structural – culverts/weirs/siphon**
 - **Structural – channel**
 - **Combined options**
 - **Other options**

Picture



Siphon

Year proposed

1970

Status

Not implemented

Location description

It could be placed at various locations along the spit between the lake and the sea.

Description of option

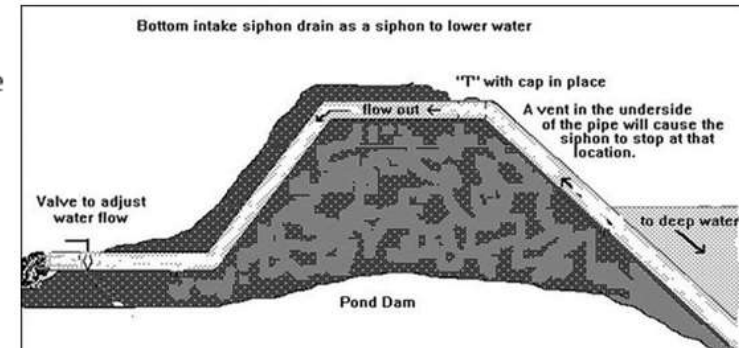
The siphon was proposed as an option which would be continuously running with minimal energy inputs. However, it would require priming to start, gases could condense and accumulate at the crest, there could be a cavitation potential, and the behaviour of the siphon is unknown in the surf zone.

Opening, closing, and lake level control description

Continuous low flows and good opening & closing control but less than ideal lake level control (unless many used). Ends of pipes must always be submerged to operate.

Maximum discharge

- Mechanical
- Structural
- Structural – culverts/weirs/siphon
 - Siphon
 - Five culverts w/ weir control
 - Pannett's culvert
 - Dobson's culvert
 - Cast iron siphons
 - Sheet piling wall on lakeside
- Structural – channel
- Combined options
- Other options



Possibilities for an engineered lake level

- Compilation of information on historic proposals to open lake
- Developed an assessment matrix for all proposals
 - Cost, impact on different values etc.
- Future work:
 - Workshop in late November to narrow down to 2 options for detailed assessment of cost, feasibility, impact on values
 - Assess those 2 options against present configuration
 - Due for completion by early 2014

Mahinga kai bio health investigation

- NIWA project led by Michael Stewart
- Based on template of successful Arowhenua study
 - Survey mahinga kai species and sediment in and around Te Waihora (Lake Ellesmere)
 - Determine mahinga kai harvest behaviours and consumption patterns in Te Waihora catchment
 - Measure the levels of heavy metals and organic contaminants in mahinga kai and sediment samples
 - Carry out a risk assessment on mahinga kai species
 - Develop mahinga kai consumption guidelines and remediation strategies for gathering and consuming mahinga kai
- Completed first two and working on 3rd
- Due for completion by May 2014

Overall summary

- Six projects are going very well
- Mixture of timescales
- Good interaction between projects