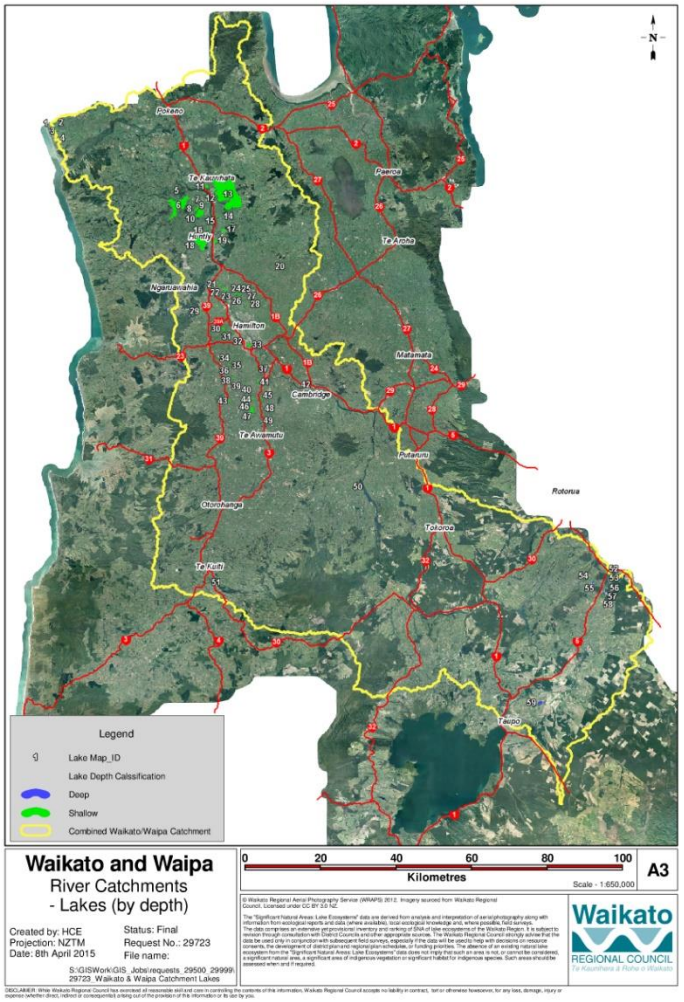
Shallow Lake Management & Restoration

A WRC Management Perspective

Presentation to CSG Meeting #11

Waikato/Waipa River Catchment

- 59 natural lakes in Waikato/Waipa River catchment
  - 30 peat
  - 17 riverine
  - 4 dune
  - 7 volcanic
  - 1 geothermal
- 54 of 59 are shallow lakes
- 13 lakes currently monitored



Peat Lakes

Dune Lakes

Riverine Lakes

Volcanic

Shallow Lakes - Values

- Indigenous fauna and flora;
- Wildlife & game
- Commercial & traditional fisheries;
- Culturally & recreationally significant;
- Ecosystem processes (incl. nutrient cycling)
- Economic benefits (e.g. water supply & flood control)
- Intrinsic values

Shallow Lakes - Pressures

- Hydrological modification & drainage
- Habitat modification (esp. wetland loss)
- Invasive (plant & animal) species;
- Diffuse & direct catchment inputs (stored up over long periods & re-suspended)

Shallow lakes are vulnerable to "flipping" & experiencing algal blooms

Shallow Lakes Management Plan

Part I: Shallow Lakes Management Plan

- High level – focus on WRC role, 10 year term
- Identifies 9 objectives, and associated strategies & actions within 3 areas
  - Policy & Planning
  - Information & Monitoring
  - Lake Restoration & Rehabilitation

Part 2: Resource Statement

- Summarises available information about each lake and their relative priorities
- Identifies management options & recommendations for future WRC work

Inter-Agency Agreements

- Non-statutory Agreements
- Recognise the values of the lakes and wetlands in the Waipa and Waikato Districts
- Promotes improved collaboration and co-ordination of effort between DOC, Fish & Game, Iwi, District Council, and WRC

Other Parties

Industry, Iwi, NGOs (Landcare Trust), Researchers, Landowners, Caregroups

Resources & Best Practice Available

Lake Restoration Interventions

- Usually undertaken to improve specific **lake attributes** and/or **uses**
  Lake & outcome specific

- Have typically involved:
  - Improved access (recreation& management)
  - Restoration/protection of lake levels & hydrology;
  - Fencing & riparian retirement;
  - Enhancement of marginal habitat, including re-vegetation and weed control;
  - Control of pest fish and weeds;
  - Reduction of nutrient and sediment inputs;
  - Catchment Management Planning (including Farm Plans)

Adaptive Management Approach

Lake Level Setting

Lake Level Setting Programme - “to determine appropriate minimum water and/or bed levels for the purpose of promoting the sustainable management of significant peat lakes and wetlands in the Region”

Process

- Vulnerable peat lakes in WRP
- Establish minimum summer level
- Install a structure in the lake outlet, or survey existing control level
- Incorporate new levels in WRP

Riparian Restoration & Enhancement

- Riparian fencing, weed control and planting has been a key activity on lakes
- Riparian margin extension has also been a key activity
- Lakes are priority sites for funding incentives from WRC (35%) for fencing, planting and weed control
- Stock exclusion also a requirement under the Dairy Accord for (certain sized) streams, lakes and wetlands
- Obtained external funding for larger fencing, weed control and planting programmes at high priority lakes

Funding : WCEET, DOC BCF, WRA Clean Up Trust,

Sites: Maratoto, Mangahia, Ngaroto, Mangakaware, Areare, Harihari

Lake Mangahia 2008 - 2013

Improvement to habitat/biodiversity & amenity values

Pest Fish - Koi Carp

- Koi, catfish and goldfish contribute to sediment & nutrient resuspension through benthic feeding habits
- Testing of traps and gates to manage pest fish at specific lakes (Lakes Waikare & Ohinewai) – in conjunction with Waikato University

Invasive Fish Management

- DOC rudd control programme at Lake Serpentine to protect native submerged plant communities

- Fish barriers are increasingly being considered for lakes that don't contain pest fish

Experimental pest fish control on a lake-by-lake basis


J. Gumbley, DOC


J. Gumbley, DOC

In-Lake Nutrient Management

- Options for Waikato peat lakes assessed:
  - Sediment capping & flocculation to reduce P availability
  - Dredging/sediment removal
  - Pest fish removal
  - Hypolimnetic treatments

Trials of flocculants/dredging not warranted **until external nutrient loads are substantially reduced (>50%)** and as part of **integrated restoration programme**


Andy Bruere, EBOP

Sediment & Nutrient Mitigation

- Monitoring sediment and nutrient inflows to peat lakes
- Installation of constructed wetlands and silt traps to reduce nutrient and sediment inputs into lakes
- Working with individual landowners in small peat lake catchments to reduce sediment and nutrient losses (farm plans)
- Catchment Management Plans (e.g. Waipa CMP and proposed CMP for Lake Waikare & Whangamarino)

Farm Planning

- Farm planning undertaken at several lakes (Kaituna, Tunawhakaheke/Lake E, Serpentine, Rotomanuka, Mangakaware, Ngaroto)
- Farm planning approach promoted for more lakes in future (e.g. Waipa CP)
- Promote:
  - More efficient use of fertiliser and effluent
  - Improved stock management to increase overall production
  - Best practice for peat soil management
  - Management of waterways and lake margins

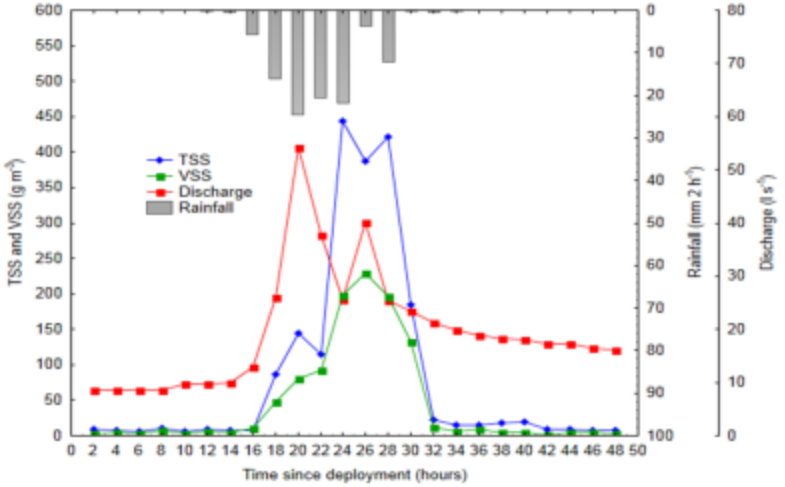
Scope for Nutrient Reductions through Land Use Improvements

Desktop assessment of potential nutrient reductions achievable for 44 lakes through land use practices in their catchments (Jenkins & Vant 2006)

- Nitrogen 7- 36% reduction
- Phosphorus 18-39% reduction

Monitoring Inputs to Peat Lakes

Two years of baseflow & storm-sampling monitoring at 2 Waipa Peat lakes undertaken by University of Waikato



Large amounts of material transported during storm/flow events.

e.g. In 24 hrs at Rotopiko South

- 4 tonnes 'additional sediment'
- 11 kg 'additional P'
- 110 kg 'additional N'

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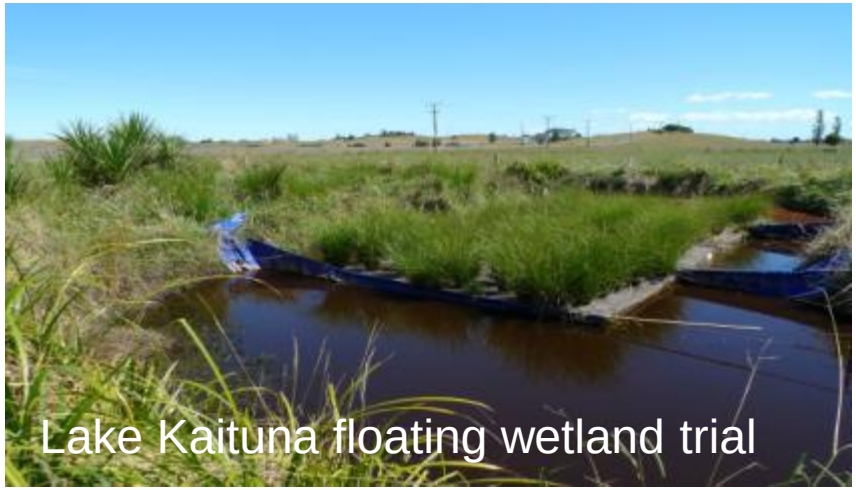
Constructed Wetlands & Silt Traps



Practical issues:

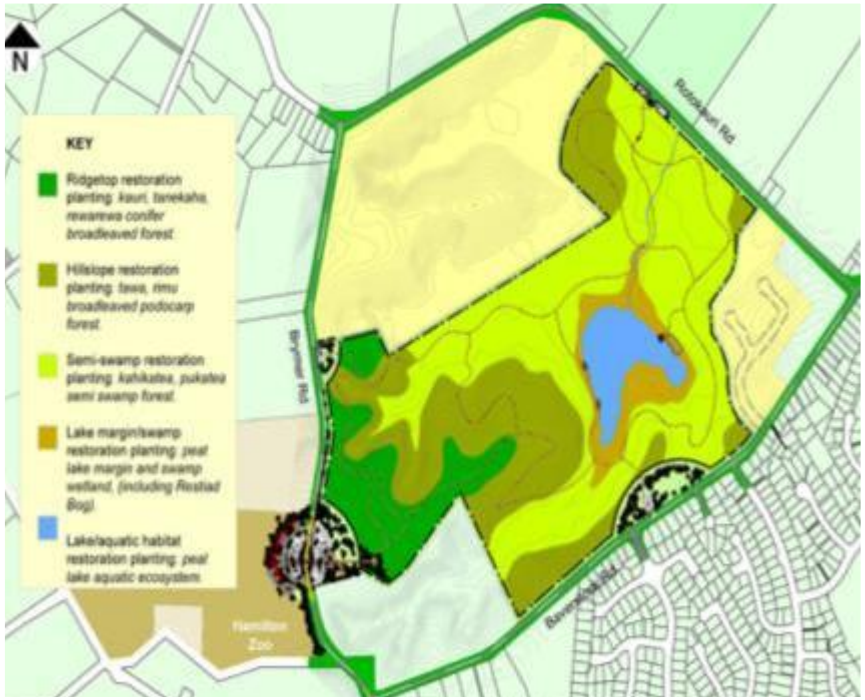
- Size to accomodate peak flows
- Area to locate the traps
- Cost for landowners & care groups (e.g. resource consents)
- Design for site

Catchment Retirement

- 76% of lake catchment is being retired & revegetated at Lake Waiwhakareke

- Duggan (2012) modelled nutrient budgets for the lake and concluded that it could return to a mesotrophic state

  - 10-15 yr timeframe to reach new P equilibrium



Conclusions

- Dealing with legacies of catchment management (nutrient sinks & sources)
- Range of scales for issues and actions
- Lake by lake approach
- Adaptive management approach
- Costs and uncertainties
- Need for long-term interventions & monitoring
- Realistic about timescales for improvements

But opportunities to build on existing work and make a long term difference!