Expert Conference – Ecology

Topic: Proposed Southland Water and Land Plan – Southland Regional Council

Date of conference: 1 December 2021

Venue: Remote AVL

Facilitator: Anne Leijnen

Recorder: Isabelle Harding

Attendees

Name	Employed or engaged by	Signature
Dr Greg Burrell	Southland Regional Council	
Kate McArthur	Royal Forest and Bird Protection of New Zealand	
Jane Kitson	Nga Rūnanga	
Mark James	Meridian	
Emily Funnell	Director General Conservation	

Environment Court Practice Note

1 All participants confirm that they have read the Environment Court Consolidated Practice Note 2014 and in particular Section 7 (Code of Conduct, Duty to the Court and Evidence of an expert witness) and Appendix 3 – Protocol for Expert Witness Conferences and agree to abide by it.

2 Kathryn McArthur acknowledges that as a member of the New Zealand Freshwater Sciences Society, a constituent organisation of the Royal Society of New Zealand - Te Apārangi, she is also bound by the Royal Society of New Zealand Code of Professional Standards and Ethics in Science, Technology, and the Humanities

3 Dr Jane Kitson acknowledges that she is a member of Te Runange o Oraka-Aparima and also whakapapa to Te Runanga o Awarua and Waihopai Runaka. She notes that her expertise is partially derived from those cultural associations. She recognises that whilst she is of Ngāi Tahu descent, she is required to be impartial and unbiased in her professional opinions expressed. Jane is also a member of the New Zealand Freshwater Society so is also bound by the Royal Society of New Zealand Code of Professional Standards and Ethics in Science, Technology, and the Humanities.

Experts' qualifications and experience

4 These are set out in each experts' statement of evidence.

Purpose of expert conference

5 The purpose of the conference is to assist the Court by responding to a series of questions, agreed by the experts as the conference progressed, relating to Ecology, and associated issues that the court may wish to consider when determining the appeals. For each question, the experts state matters on which they agree and on which they do not agree, with reasons.

Participants

6 This JWS is limited to those Ecology experts that have an interest and took part in the discussion.

Attachments to this JWS

7 List of questions for the Ecology experts
8 Greer memo – attachment 1

Conference outcomes

9 The Planning conference identified a number of technical questions to form the basis of the agenda for the Ecology experts. An outcome of this Ecology conference is the answering of these questions. These are attached.

Attachment: Questions to Ecology Experts:

1. What are the potential adverse effects of sheep in and around natural wetlands and what risk to water quality and impacts on vegetation in natural wetlands do sheep present?

The extent of natural wetlands is greatly diminished in Southland. They are largely confined to national parks and reserves. The loss of wetland extent is ongoing in Southland. Wetlands are ecologically and culturally very important ecosystems. Therefore, the experts agree that risks of adverse effects on natural wetlands should be avoided wherever possible and where you cannot avoid, carefully managed through the plan provisions.

There are few studies into the environmental effects of livestock (including sheep) on wetlands, compared to studies on streams and rivers, so the magnitude of risk is poorly understood. The limited research available indicates that sheep can adversely affect wetlands in the following ways:

- grazing reduces the density and species richness of the seed bank and in turn changes the plant communities derived from the seed bank (Nicol *et al.* 2007);
- grazing has variable impacts on plant communities depending on their palatability to sheep.
- water quality, taxonomic groups, and trophic levels respond negatively to trampling and waste from sheep (Van den Broeck *et al.* 2019);
- impacts are greater at higher stocking rates (Li *et al.* 2021).
- Grazing in wetlands can affect wetland fauna as well, including birds, invertebrates and fish. Effects range from damage to nests, disturbance and damage to spawning sites and reduction in available habitat.
- E. coli contamination from sheep is known to affect a number of waterways in Southland, in some waterways sheep have been measured as the predominant source of E.coli and these include locations on the Waikawa River, Carran Creek (Waituna), Winton Stream, Waikaia and Mataura River. E. coli contamination of natural waterways from sheep faeces is generally via overland flow and may impact on human and cultural health values[1].

Sheep tend to impact soil to lesser extent than cattle as they weigh less and sheep are less likely to enter water. Avoiding the risk of sheep impacting wetlands will still require careful management.

We understand that examples from other regions (e.g. Greater Wellington) have addressed these concerns through permitting sheep access to wetlands only where a management plan is in place that addresses the risk of adverse effects. The experts note however that management plans are only effective if they are well conceived, implemented, monitored for compliance and enforced.

[1] The experts note that more recent faecal source tracking information is available as part of Environment Southland's Freshwater Planning Process but that they have not had the opportunity to read and take account of the outcomes of that research.

References

Li, L., Zhang, J., He, X. Z., and Hou, F. (2021). Sheep Trampling Modifies Soil and Plant C:N:P Stoichiometry in a Typical Steppe of the Loess Plateau. *Rangeland Ecology & Management* **76**, 100–108. doi:https://doi.org/10.1016/j.rama.2021.02.008

Nicol, J., Muston, S., D'Santos, P., McCarthy, B., and Zukowski, S. (2007). Impact of sheep grazing on the soil seed bank of a managed ephemeral wetland: implications for management. *Australian Journal of Botany* **55**, 103–109. Available at: https://doi.org/10.1071/BT04137

Van den Broeck, M., Rhazi, L., Waterkeyn, A., El Madihi, M., Grillas, P., Kneitel, J. M., and Brendonck, L. (2019). Livestock disturbances in Mediterranean temporary ponds: A mesocosm experiment with sheep manure and simulated trampling. *Freshwater Biology* **64**, 856–869. doi:https://doi.org/10.1111/fwb.13268

Moriarty E. (date unknown) Sheep as a Potential Source of Faecal Pollution in Southland Waterways. Report prepared for Environment Southland by ESR. Client Report: CSC17002. Pp. 23.

Rule 78 – Weed and sediment removal for drainage maintenance:
2. Are the proposed permitted conditions sufficient to avoid or minimise effects on indigenous species? If not, why not?

No. The permitted activity rule still allows for high levels of disturbance to waterways that are inhabited by indigenous species. The drainage network affected by this rule is extensive across Southland and includes the habitats of most of Southland's freshwater indigenous species.

Mitigation in Rule 78 (Council relief version) are limited to:

- avoiding the loss of gravels (a)(ii),
- bed levels not to be lowered below previously modified levels (a)(iii),
- not impeding fish passage (a)(iv),
- reasonable steps taken by operator to return fish to water upstream of the activity (a)(v),
- no disturbance to trout spawning between June and October (a)(vi),
- not habitat of threatened non-diadromous galaxiids (a)(xiv).
- From the beginning of November until the end of May, there is no disturbance of whitebait spawning habitat (Rule 55a(l)).

The current mitigation outlined in the rule is insufficient to protect the values of taonga freshwater species and will not meet Objective 15 and Policy 3 provisions (recognising, providing for and avoiding adverse effects on taonga species).

For freshwater indigenous species, a higher level of protection is required. Effects on threatened species should be avoided. The memorandum by Dr Michael Greer notes in section 3.5 that the most effective method of minimising the effects of weed and sediment

removal is to reduce the frequency and extent of the activity. He concludes that the activity is destructive, and the adverse effects on threatened species and non-diadromous galaxiids is likely to be significant.

The effects of drainage maintenance on indigenous species includes;

- increased turbidity
- after drain clearing, even small increases in flow give rise to sharp increases in turbidity,
- fish and invertebrate stranding and mortality,
- increased suspended sediment,
- changes to stream morphology,
- damage to bank vegetation and structure,
- habitat loss,
- fish spawning,
- Egg and larval removal and crushing.

The permitted activity rule does not address many of these effects.

Citation: Greer, M (2021) Proposed Southland Water and Land Plan: Technical advice for mediation.

3. Are there additional or alternative best practice water course maintenance measures that can be applied across the modified rivers in Southland that avoid or minimise the effects on indigenous species and their habitat? What are they? How easy are these to be applied by those undertaking the works or do they require relevant experts onsite during the works?

Fundamentally, drains are the residue of wetland habitats, which are a critically threatened habitat in New Zealand. Improved protection of indigenous freshwater species includes improving the way drains are managed, which includes restoring them towards something like the way they used to be. This includes swaying the balance further in the direction of ecological and cultural health, where the balance is firmly seated in the direction of drainage. It would be helpful if regional planning documents took a longer-term view than simply relying on best management practices to reduce impacts.

Taking a longer-term view might include working towards a situation where less drain maintenance activities need to occur (i.e., reinstating resilience and natural processes). This would involve addressing sources of sediment and nutrients from the land, increasing shade from riparian vegetation to prevent nuisance plant growth, and naturalising channel form. This would include a toolbox of mitigation measures to address excessive sedimentation, nutrient enrichment and plant growth.

There is a tension between ecology and the Southland Flood Control and Drainage Management Bylaw 2020 for example, regulation 5.1 (d) of the bylaw requires prior permission from the Council before planting vegetation within 7.5 metres of flood control works, which includes drains.

In terms of sustainable drainage management, we consider there is a hierarchy of actions that can be taken. The first order of priorities should be preventing the issue of weed and sediment accumulation, and the second order of priority is mitigation.

Various guidance documents recommend the use of the mitigation measures similar to those listed in Table 1. These mitigation measures would be best incorporated into the plan via reference to the requirement to adhere to a drainage best practice code, as done for other regions (e.g. Canterbury and Greater Wellington). This best practice code might give direction to both sustainable drainage management (prevention of weed and sediment accumulation) and mitigation measures. As noted above, these mitigation measures should generally be considered a second order priority after prevention and restoration. Prevention of the need for "drain maintenance" and the restoration of modified waterbodies is more consistent with Te Mana o Te Wai hierarchy than mitigating individual effects, i.e., first priority to the health and wellbeing of the waterbody.

Table 1. Examples of additional or alternative best practice water course maintenance measures that could be applied across the modified watercourses in Southland to avoid or reduce effects on indigenous species and their habitat.

Effect	Mitigation	Comment	Implementation
Frequency of activity (cumulative effects)	Only carrying out drain clearing when there is an obvious need (e.g., surface flooding during small rain events, submerged tile drain outlets, raised water table etc.) Avoid clearing in the growing season when plants are likely to rapidly re-establish Extend the time between clearings through other methods Progressively reduce plant growth and sedimentation through land and riparian management practices that decrease the amount of sediment, nutrients and light reaching the water		This would require Environment Southland to develop a decision matrix for when and how often weed and sediment removal is to occur. Evidence based approach as opposed to on a rotational basis. ORC has developed a decision matrix.
Indigenous species stranding, damaging and mortality	Conduct fish recovery Use a weed rake in hard bottomed drains Leave the bucket submerged at the end of each scoop Distribute spoil so that eels can return to water	These methods are useful and should be carried out. However, carrying out fish recovery is challenging (fish can be buried in the spoil and hard to find). Small fish are usually missed. On hot days fish die quickly and eels can bake in the sun before reaching water. To be effective, a team of people are required to complete multiple passes of spoil	Requires a team of people and appropriate equipment to carryout fish recovery. Can't be done by just the operator

		throughout the day. Physical removal of low mobility species can't be avoided with these methods. The effectiveness of fish recovery in terms of protecting fish and other fauna is very poorly understood in New Zealand. Studies overseas have shown significant mortality of relocated fish mussels and other fauna.	
Increased suspended sediment	Place spoil away from waterway but enable fish recovery Minimise downstream sediment transport Use a conventional bucket in heavily silted drains Recover distressed fish in the waterway Do not remove vegetation from dry banks and re-stabilise exposed soil	Reduction of released sediment in waterbodies is mitigation that is required for all species.	Can be implemented by operator. However, fish recovery may require specialised equipment and be carried out as part of fish recovery by a dedicated team.
Habitat loss	leave some vegetation to provide cover Installing artificial fish refuges Avoid clearing all waterways on a property at once Do not alter the width or depth of a channel Preserve specific habitats Avoid removing stony substrates (greater than 2mm) Maintain variability in streambed profile	There are limitations to these methods for reducing habitat loss and reducing disturbance to fish. The best method is to reduce the frequency of the activity. Installation of artificial fish refuges is a last resort. Other methods to maintain habitat should be used in preference. Avoiding the removal of gravel is a component of the proposed Rule 78.	The preservation of specific habitats will require specialist input to identify specific habitat features.
Disturbance to Freshwater species spawning habitat	Avoid fish spawning/migration periods when scheduling aquatic plant removal. Consult spawning and migration calendars for relevant local dates. Work should avoid inanga spawning habitat year round	Whilst you might avoid fish spawning during migration periods, the habitat can be disturbed during any time of the year. Without habitat, spawning will not occur.	May be difficult to implement if considering spawning and migration period of all species. However, could be used to minimise effects on threatened and taonga species most of concern.

		Note – whitebait habitat isn't mapped as part of Rule 55a(l).	Identification of spawning habitat requires specialist knowledge. This does not apply to species such as kanakana that are utilising spawning habitat year-round.

4. Can species, particularly taonga species, be protected by best practice conditions alone or should some species and habitats be specifically mapped so site specific management occurs?

No, not using the types of best practice conditions that are used the pSLWP or other regional plans throughout the country. That is because the key activities being undertaken that adversely affect aquatic life, including taonga species, are disturbance and removal of aquatic vegetation and sediment. Best management practices do not protect aquatic species from these key activities. It would only work if the mapping resulted in a fundamentally different way of drainage management in those mapped areas. That might include adherence to sustainable drainage goals.

For example, most best practice activities rely on mobility of species i.e., they can escape the bucket or return to the watercourse independently (e.g., eels). Species such as waikakahi, eggs, and larval fish are vulnerable to crushing and removal. In addition, best practice activities can not completely avoid the disturbance to species and the loss of habitat. Mitigation can be used to avoid critical periods such as spawning and migration for some species. However, for species like kanakana and waikakahi this cannot be done as they are vulnerable year-round (larval kanakana are in the sediment for 3 to 4 years).

As per response to question 2, mitigation and habitat mapping is secondary to prevention and restoration.

5. Is mapping required to provide for some/all aquatic taonga species and if not, what are the risks of not providing for these habitats?

Mapping could be undertaken for taonga species vulnerable to weed and sediment removal such as threatened species, species of low mobility, and where effects of the activity can't be avoided through identification of critical time periods. The species in Southland that this could apply to include non-diadromous galaxiids (already a provision in the draft rule), giant kokopu, kanakana and waikakahi. Mapping of the known distribution of species such as Giant kokopu, kanakana, waikakahi and waikoura would afford a higher level of protection than the permitted activity rule currently provides. However, this does not detract from the fact that unmapped habitat will be at risk from this activity.

Where we have confidence that surveys have been undertaken for the purposes of mapping the extent of species distributions, mapping is of value in providing protection to those species in those places. However, it is difficult to map species such as kanakana and waikakahi as both species are rarely detected using standard freshwater survey methods.

The experts have identified that for instance in the Waituna catchment, extensive surveys mean we can have more confidence in mapping areas which should be excluded from the rule. Mapping could include incorporation of Matauranga Maori to identify mahinga kai areas that could identify habitat. Customary protection areas such as mataitai will also clearly identify catchments with habitat of certain mahinga kai species e.g. Mataura and Waikawa for kanakana and tuna. Outside of those areas our knowledge is patchy and risks excluding important habitats from protection.

The risks of not providing for habitats include,

- Ongoing degraded state of taonga species and their habitats,
- Localised species extinctions,
- Effect on national populations, particularly where national populations are dependent on Southland's populations e.g. kanakana.
- Impact on Mahinga kai,
- Loss of ecological function, community structure, diversity.

The experts agree that for all the reasons outlined above, This rule will not protect taonga species.