Science and Technical Advisory Group Meeting

Minutes

Dates and Location: Thursday 24 January 2019 9.30am-4.00pm, Room 1C (Ahumairangi), Ministry for the Environment, 23 Kate Sheppard Place, Thorndon.

STAG Members present: Adam Canning, Bryce Cooper, Clive Howard-Williams, Bev Clarkson, Graham Sevicke-Jones, Jon Roygard, Ken Taylor, Mike Joy, Joanne Clapcott, Ra Smith. **MfE staff present:** Helli Ward, Jen Price, Jo Burton, Jo Mason, Carl Howarth, Lucy Bolton, Vicki Addison, Isaac Bain

Apologies: Russell Death, Marc Schallenberg, Jenny Webster-Brown, Ian Hawes, Dan Hikuroa, Jamie Ataria, Mahina-a-rangi Baker, Tanira Kingi, Chris Daughney

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Items:

1. Previous meeting minutes and actions arising, apologies, conflict of interest

The chair noted that extended timeframes mean we now have another 2 months. He reiterated the confidentiality requirements of some reports being provided to STAG, particularly those that are still in draft form.

The minutes of the 29 November meeting were discussed. MfE officials were asked to follow up on worked examples to aid understanding, particularly for sediment.

A point was raised in relation to targets for wetland extent (pg 11, bullet point 3): do we have a clear policy preventing wetland loss? The response was that the current policy is inadequate, but this is an area of current work. It was noted that time frames of different policy options are an important consideration.

The chair and MfE officials asked for completion of any outstanding conflict of interest forms at the meeting, which was done.

The group approved the minutes.

Maintain or Improve

The chair summarised the group's previous discussions: The provisions for "maintaining or improving" in the NPS-FM are not satisfactory from a technical standpoint, and the group needs to provide some technical advice on this topic. Options examined in a previous meeting were to have more bands, or have a more quantitative definition of maintain or improve. It would be helpful to form a sub-group to develop recommendations.

Discussion points included:

- An issue is that "maintain or improve" is a good communication and policy tool but difficult from a technical standpoint. Natural variability and climate signals complicate this. Even defining whether a water body is in a particular band is technically complicated particularly when natural variability is high.

- The group asked MfE to clarify if "maintain or improve" is a policy directive, or a performance measure for assessing Council's performance. The first is subjective. Clarity is needed from policy people on this. The public view is that the second would also be true.
- Clarity is also needed on whether maintain or improve applies to a particular measure at a particular site? How does it apply to a whole FMU? Can we measure across sites and variables?
- MfE officials clarified that "maintain or improve" applies to both policy setting and performance assessment. Councils need to evaluate the effectiveness of their plans. At the minimum it is by attribute. You can't trade one attribute against another or aggregate them. Councils have flexibility in how freshwater objectives are set, e.g. Environment Canterbury sets objectives by site. You could also set objectives for the main stem. Freshwater Management Units (FMUs) have to have at least one freshwater objective, but they can have multiple objectives for different sites within the FMU.
- The state of a waterbody (as measured by bands) can vary a lot across catchments and over time. How do we scale up and get the intent that everyone wants? People implementing policy need clarity on intent and meaning.
- How we define FMUs is also related - the FMU concept and flexibility with how it is applied will need to be considered in this discussion.

Actions	**To be completed by**
Follow up on worked examples for sediment	MfE
MfE to follow up with Adam, Mike, Ton, Clive, Jon, Bryce for further work on "maintain or improve" subgroup	MfE

Work programme update

The timeframes have been extended. Final policy decisions will now be made in April, rather than February.

MfE staff gave an update on the wider advisory group network. There is a joint advisory group on 30 January, the papers are available now.

The joint workshop in December had the following outcomes:

- There will be regular joint workshops
- Papers for the next joint workshop will be based on the revised time frame and key decision points will be presented.
- There was a lot of interest in the impact testing of proposals. There has been a workshop on 17 January discussing this among a subgroup of advisory group members, and there will be a report back on this at the joint workshop on 30 January.
- At the 30 January workshop there will be an opportunity for STAG to report back, especially on prioritising ecosystem health metrics.
- One of the topics will be the allocation principles discussion.

The group asked about the sequencing of decisions and which agenda items would be included in the first tranche of policy decisions and advice to Ministers. MfE clarified that the process of seeking advice from STAG is iterative and all items are plausible for inclusion in the first tranche at the moment.

Allocation principles

MfE officials gave an outline of the allocation work:

- At the joint workshop on 17 December there was a discussion on principles for nutrient allocation. Kahui Wai Māori provided principles that were discussed at the meeting.
- Notes from the meeting have been used to draft allocation objectives. These are now on the portal for group members to look at and discuss at the next joint workshop on 30 Jan.
- MfE officials asked the group to get in touch with any comments, gaps or questions. The objectives are not completely fixed, but will be used in further discussions.
- Questions were raised by the group about how the principles and objectives would be implemented, particularly in relation to Māori rights and interests. STAG has not had the opportunity to discuss allocation yet. MfE officials noted that there are overarching Treaty of Waitangi and Te Mana o te Wai principles guiding the objectives. KWM has provided other principles. There will be the opportunity to discuss this matter further in the future and the KWM members on STAG will also provide linkages.

2. Confirmation of plan for February discussion on nutrients

The chair outlined the key points to cover in the discussion at the next meeting:

- What the regulation says now and what it covers
- Is what's there at the moment adequate?
- Overview of different approaches suggested by others
- Why this work is needed
- Consideration of human and ecosystem health issues

A comment from a group members was that more work is required based on Cathy Kilroy's work to derive numbers. We need to be clear about how far do reports take us, and what further work is required?

MfE officials noted that this is a really important issue for this group to resolve to give advice to Ministers and also to provide advice to the other advisory groups.

Actions	To be completed by
Documents to go on portal ASAP	MfE

3. Ecological flows and levels

MfE staff gave a summary of current issues with the way the NPS-FM directs councils to set objectives and limits for water quantity, and a suggested narrative attribute table to clarify objective and limit setting. The table is intended to provide an attribute table to help guide objective setting in the same way water quality attributes do.

The chair noted that the narrative attribute table presented in the paper assumes a certain approach. There was discussion of the narrative attributes suggested in relation to the National Environmental Standard for Environmental Flows that was previously drafted but not fully implemented. Key points included:

- The NES was informative and Regional Councils have said that it was useful in its current form as guidance.
- Group members noted the usefulness of the quantitative approach as set out in the NES, but also noted that it was not suitable for all rivers, e.g. small, flashy rivers.
- The existing legislation in the RMA requires Councils to set minimum flows for habitat requirements.

- Councils need to consider habitat, variability, and surety of supply. Around the country there are different methods for flow allocation incorporating other values as well as ecosystem health. How would this table improve the situation and add value?
- Councils are currently using quantitative objectives that are related to the amount of habitat provided for certain fish species. These are often based on extensive field studies. What would the narrative attribute add to this?
- Group members expressed a preference for progressing a numeric approach rather than a narrative approach.
- The table is confusing because it talks about flows in the first section, then the habitat components that flow provides for later on. Species requirements are mentioned. It's not clear what the table is trying to achieve.
- How would modifications such as flood protection works be taken into account in flow objective setting?
- Adopting the natural flow regime as the "A" state would have implications and might be counterintuitive to species flow requirements.
- This table assumes that setting flow allocation is only ecosystem based, but social, cultural and economic dimensions are also used to make allocation decisions. Looking purely at the ecosystem health dimension might leave out important considerations. There are knowledge gaps in social and cultural flow requirements.
- There is existing work on how the NES could be improved[1]. The default values in the NES are based on maintaining a proportion of the low flow, which is based on maintaining habitat. Flows can be calculated that will maintain a given amount of habitat. One way to make the NES clearer would be to do this. Because hydrology is variable, the outcomes provided by rules of thumb will vary. This shouldn't be the case – it would make more sense to have a consistent objective then work out the flows required to achieve those (these flow objectives would vary spatially)
- Important considerations are: the amount of habitat at minimum flow, when is habitat reduced, and reliability of flow. These can all be calculated. The sensitivity of rivers to reductions in flow is dependent on the size of the river. If you set an objective based on habitat for trout, you can reduce flow in large rivers a large amount – but this might reduce habitat for other species, therefore it becomes complicated to set flow limits.
- Addressing the narrative attribute table proposed in the paper: Sometimes a narrative is waiting for a number, sometimes numbers are waiting for a narrative. Overseer is an example of this, where a narrative wasn't provided to explain the numbers. Narratives can bring numbers together. Numbers don't bring communities along with us, and narratives do.
- The NES provided numbers without considering what the objective was. We need to know the objectives, then give scientists the job to work out the numbers.
- There is support for the description of the "A" state, but describing it in terms of habitat is not enough.
- There are rivers that are running dry. The narrative table might help for these cases.

The chair's summary was that group members were uncomfortable with the proposal to include a narrative table for ecological flows. This group has concerns about inconsistencies in purpose and lack of clarity around what problem this table is trying to solve. The group wants to know more about context, reasons for looking at this, as well as how this fits in with social and cultural considerations.

Actions	**To be completed by**

[1] Snelder, T., Booker, D., & Lamouroux, N. (2011). A Method to Assess and Define Environmental Flow Rules for Large Jurisdictional Regions 1. JAWRA Journal of the American Water Resources Association, 47(4), 828-840.

Circulate Ton Snelder's paper	MfE

4. Threatened Species value

MfE staff summarised the paper, which proposes adding an optional Threatened Species value.

Discussion points included:

- This conversation needs to be broader than the NPS-FM. There are other work streams that are also addressing threatened species. For example, the NPS for Indigenous Biodiversity deals with threatened species, but it does not apply to freshwater. This leaves a gap that the NPS-FM needs to address.
- Wetlands are managed by the NPS-FM and NPS-IB, the two documents will complement each other.
- The value needs to define what is meant by "threatened" – e.g. DOC's Threatened Species Classifications.
- National direction and focus is needed to manage threatened species.
- Existing information on this topic includes: a national GIS layer of threatened species (compiled by Mike Joy); information in regional plans, Our Fresh Water 2017
- It may be worth making explicit that the value applies to all threatened aquatic species (i.e., wider than threatened fish, includes threatened native plants and invertebrates).
- The terminology "necessary requirements" needs to be defined to avoid legal arguments. This relates to habitat requirements for species, as well as population numbers.

The chair's summary was that there is agreement among the group that the value is appropriate and that we need a threatened species value. The group also raised a question: what is the national level of protection for freshwater threatened species?

Actions	To be completed by
Amend value to incorporate suggestions as above	MfE

5. Dissolved oxygen

MfE staff summarised the paper outlining recent work on dissolved oxygen and how it is managed in the NPS-FM at the moment. A summary was provided of work that was proposed in 2016 but never went ahead, and the group was asked if this work was still required.

The chair suggested re-framing question 1(b) as: should, from a technical point of view, management of dissolved oxygen be mandated?

Discussion points included:

- Dissolved oxygen (DO) is a fundamental and critical measure of ecosystem health and the attribute should apply to all rivers. There was agreement among group members on this.
- The attribute was originally applied to point sources as there is a direct and obvious cause-effect relationship and knowledge of how to manage them, which fits with the NPS-FM thinking at the time.
- A question was posed whether we need to clarify drivers to fit DO into an NPS structure. We know the drivers (e.g., periphyton and macrophytes in unshaded rivers) – so do we need to commission work to quantify the relative importance of drivers?
- Previously we've operated under the assumption that we need to be able to recommend management actions to achieve the required attribute band status – is this still the case?

- It was noted that a key management action to improve dissolved oxygen concentrations is to increase shading to decrease growths of nuisance periphyton and macrophytes.
- If the attribute was more widely applied it would be important to provide guidance on DO measurement protocols and assessing whether sites meet the attribute band thresholds. Does this apply to sites or entire catchments?
- We need more data on natural variation, this doesn't have to be a massively complicated analysis. It would be more helpful to do work on management actions that could be taken to improve the DO status of rivers
- Would ecosystem respiration and gross primary productivity also be included? This is a matter for further discussion. There is existing work by Roger Young from Cawthron on this.

Actions	To be completed by
Investigate inclusion of third column in attribute table for mean dissolved oxygen	MfE
Circulate papers on ecosystem respiration and gross primary productivity – to be discussed at future meeting	MfE

6. At-Risk Catchments update

MfE staff gave a Powerpoint presentation summarising progress to date on the At Risk Catchment project and proposed work streams incorporating Matauranga Māori, biophysical science and social science. Two main goals of the project are to identify exemplar catchments for initial focus, as well as compiling national level data to complete a risk assessment and prioritise further work. The final paper will be released in late April for public consultation.

Questions from group members included:

- This project includes social and biophysical science in two work streams – do they come together enough to be considered one knowledge base? MfE staff responded that to move forward, we need to structure our conversations to find where things fit.
- Was the goal to prioritise catchments for quick action, or is this for longer term work? Oscar responded that both outcomes may be possible, and the key is to ensure a robust and defensible process is followed to inform outcomes.
- What is the purpose and goal of the project? MfE staff responded that we need to get an understanding of all catchments in NZ and their current state. The exemplar catchments will be case studies of how different restoration actions and regulations can be applied. The catchments will have a representative range of issues. The national level data can be used for policy decisions and prioritising funding.
- As background information: feedback from Councils has been that the NPS drives change slowly through the planning process, but how can we achieve things quickly? The Minister asked the Land and Water Forum how the Government could demonstrate change quickly. The At-Risk Catchments philosophy came from this. The idea is to come up with examples where we could demonstrate rapid change. It's a wider range of interventions than just regulation.
- A question was raised about whether there is an appetite for wider change, and whether this would be a truly collaborative process? MfE staff responded that this process involves trying a new model, and we are looking for collaboration rather than peer review.

The chair indicated that group members may also be willing to help in future when there are specific tasks to be completed.

Actions	To be completed by
Project team to follow up with group for further work	MfE

7. Sediment

MfE staff gave a summary of the sediment paper.

There was a discussion on the lack of correlation between measures of deposited sediment and clarity. Key points included:

- It's strange that there is a lack of correlation between and deposited sediment and clarity. Is this a measurement problem rather than a real lack of correlation? Deposited sediment is a more integrated measure over time than suspended sediment, which is typically a snapshot.
- Knowledge of suspended sediment is needed to assess impacts on downstream ecosystems, particularly lakes and estuaries.
- Suspended sediment measurements are a function of supply from the catchment. Deposited sediment also depends on storage capacity. Systems that have high suspended sediment wouldn't always have high deposited sediment.
- The standardised method for assessing deposited sediment looks at a run, which may not always be a depositional environment.
- The maps for deposited sediment and turbidity look similar on a national scale, so doesn't that mean there must be a relationship between deposited and suspended sediment over a national scale over a long time period?
- Not necessarily - It may be that places with low clarity (high turbidity) might be places that have low deposited sediment. If you coloured the maps by the reference state values, they may not correlate. At the beginning of the study we did work on the relationship between environmental state variables (ESVs - such as deposited sediment and clarity) and sediment supply. We can derive good empirical relationships between catchment load of sediment and median clarity and suspended solid concentration. But there were poor relationships between sediment supply and deposited sediment, even with explanatory values such as slope included. Places that have high sediment supply often have very clean coarse substrates. Christoph Mattei has done work on what happens with deposited sediment: particularly in lowland situations, freshes clean out sediment. On the receding limb of the hydrograph, sediment deposits out. So deposited sediment is independent of what the catchment load is. Lateral inflows influence this and we don't understand this very well. We can characterise patterns in deposited sediment but we don't understand the mechanisms causing deposited sediment, or what the mitigations would be. Gross sediment load is strongly related to ESV state – median clarity and turbidity/SSC. There is therefore a clear intervention logic for directing mitigations for suspended sediment. In summary- the ways you would manage for deposited and suspended sediment would likely be different.

The chair asked the group if they are comfortable defining some kind of numeric threshold for sediment in its two forms (suspended and deposited). The group was comfortable with this.

There was discussion about the importance of both suspended and deposited sediment – there are good reasons to manage both. A key point is that we know how to manage suspended sediment better than deposited sediment. However, members raised points that the policy levers are the same for both types, and sediment fingerprinting can be used to track the source of deposited sediment.

It was reiterated that the group would like to see a comparison of continuous monitoring of suspended sediment/turbidity and spot measurements. It's important in any introduced attribute to define how measurements should be taken.

There was further discussion about methods of the study. Key points included:

- What data from the NZFFDB did you use, were old and new data used and could this have affected the results? Response: the initial step would have used all data, reference conditions came in to the later steps. Reference conditions were calculated based on land cover, this is very stable over time.
- To what extent would changing the ways of measuring dissimilarity change the clustering results? Response: this can have quite a strong influence on results. But the REC class groupings from the clustering analysis make sense.
- The options are to have 2, 4, 8 or 12 classes – when you measure deposited sediment there is high variability in the measurements. How do you reconcile having a large number of classes with such a variable measurement? Response: the next step in the process will incorporate the ecological response across classes. If there are similar responses, the classes can be aggregated.
- It was noted that having more classes helps the policy to be more realistic and precise.
- What is the error around the reference state condition? What are the implications for bands? Response: the error can be seen in Figure AX12 (in the technical appendix provided). The 95% confidence interval shows there can be quite a lot of uncertainty. AX13 compares the estimated reference condition using the linear regression method (and its uncertainty), with the mean turbidity (and its interquartile range) within the lowest decile of heavy pasture coverage. That's compared on each panel, and on the right hand side is the observed range across all sites irrespective of how impacted they were. You can see that the estimated reference condition is consistent with the observed relatively low-impact sites. In general, the range across all impact levels in the class is more than the range in reference condition. This is the best that can be done with the data available.
- The ecological impact work currently being finalised by Cawthron will be helpful for understanding how to proceed.
- The chair posed the questions: Does anyone see any bad holes in the approach? The response from the group was that they had no major reservations, but wanted to see the ecological response information and analysis of continuous data. It was suggested that given the measurement error, it may be more valid to just have a bottom line, rather than attribute bands.

Actions	**To be completed by**
Provide a comparison of continuous vs. spot monitoring	MfE
Provide further work on ecological responses when complete	MfE

8. Ecosystem Health: definition, prioritising metrics

Definition

MfE staff summarised the paper which proposes minor changes to the definition of Ecosystem Health in the NPS-FM.

Key discussion points included:

- It was questioned whether resilience was needed in the definition, as some natural systems are sensitive to external stressors and not resilient at all.

- We need to be clear about what the definition of resilience is, and what ecosystems are resilient to. One possible definition would be that resilience is the ability of a system to maintain its life supporting capacity over time.
- It should be made clear that systems need to be resilient to adverse human impacts, as not all human impacts are bad.
- The phrase "high sediment levels" – needs to change because high sediment levels might be natural. A qualifier is needed, e.g. "excessive sediment"
- The first sentence after the definition has stressors – it would be helpful to describe these as aspects to be managed etc. instead of "matters to take into account"

The group agreed we should update the definition of Ecosystem Health.

Actions	To be completed by
Draft a new definition for group to approve	MfE and STAG

Prioritising metrics

Three groups were formed to workshop and prioritise the indicators in Appendix 1, guided by the criteria of: (1) urgency (magnitude of the associated problem) and (2) representativeness (whether the five components of ecosystem health are represented).

The following summaries are from the groups:

Group 1

Overall messages:

Rivers and aquatic life were the highest priority water body and ecosystem health components respectively – but we need a mix of outcomes and stressors. Water quantity wasn't seen as a priority issue at the national scale, but could be locally important e.g. in Canterbury [relevant to flows work]. The group ranked indicators in order of priority – as indicated below. Less priority was placed on existing attributes as they are already being managed now.

Rivers

Aquatic life: fish and invertebrates most important **(1, 2)** (it's the ecosystem health outcome we want), water birds are transitory and issues exist locally so are a lower priority. Physical habitat is a major driver of decline and the next most important indicator at all scales (reach and catchment) – this could be managed through site-scale Rapid Habitat Assessment **(3)**, and consider the Habitat Quality Index for broader scale (Death et al.) including connectivity (both floodplain and fish passage) **(5)**. Dissolved oxygen **(4)** is also important (given work on nutrients and dissolved oxygen is underway). If doing oxygen, work should also proceed on temperature and Biogeochemical Processes (e.g. gross primary productivity [GPP]) as well, as these would not require much more work and are important. Biotic interactions are too difficult/insufficient measures are available.

It was felt that Water Quantity, while important in some areas, isn't such a significant national issue to warrant top priority over the above.

Lakes

This group considered that developing new NOF attributes for lakes was not as urgent as for rivers. Exotic (pest) fish and plants are key stressors **(6)**, and their presence can make a lake resistant to improvement. Given nutrients are managed already through inclusion in the NOF **(9)**, other priority

gaps are substrate (deposited sediment) **(7)**, dissolved oxygen **(8)** and indigenous fish **(9)**. Thought a lake fish index of biotic integrity (IBI) may be required (this does not exist yet). Some councils (e.g. Horizons) do fish surveys of lakes.

Wetlands

Wetland extent is the most important indicator **(10)**

Groundwater

Nutrients are important, because of the link with surface water. Surface and groundwater need to be managed as one hydrological system, not as separate components.

We lack detailed understanding of the ecology of aquatic life (invertebrates and microbes) in groundwater systems and therefore do not fully understand their biodiversity value or role in ecosystem processes. This should be a priority for research as current human activities could be having a significant impact on these forms of aquatic life.

Group 2

This group indicated ten priorities for rivers, groundwater and lakes but didn't rank them. Wetlands weren't addressed due to lack of time.

Overall messages:

In ten years' time, we want to be able to understand ecosystem health better. Incorporating measures of aquatic life are a high priority due to the previous focus on water quality and quantity. This should include fish and macroinvertebrates as a priority, also incorporating pest species. Habitat loss is the most significant issue facing streams, and riparian areas are of importance for understanding this, though the importance of riparian vegetation is greater in smaller streams. There are key knowledge gaps in groundwater ecotoxicology and emerging contaminants.

Rivers

In rivers, plants, invertebrates, fish, connectivity, riparian, dissolved oxygen, temperature, nutrients, emerging contaminants, hydrological variability, extent, and biogeochemical processes were identified as priorities. Pest species are important in certain places.

Incorporating measures of aquatic life are a high priority due to the previous focus on water quality and quantity. Fish and invertebrates can indicate whether the rest of the ecosystem is functioning. However, we need measures of all ecosystem components. For example, if fish and invertebrate populations aren't healthy – this is when other measures of water quality become really important to help diagnose the cause.

For the general public, periphyton and fish are important indicators because they are the most visible.

Macroinvertebrate indicators for rivers require further work so that we can understand the drivers of species change. The work underway on stressor-specific macroinvertebrate metrics helps our understanding here.

Riparian areas are a priority and their importance for river health is greater in smaller rivers. The most significant issue facing streams is habitat loss.

Groundwater

Priority areas for this group were microbes, invertebrates, extent, dissolved oxygen, nutrients, toxicants, and biogeochemical processes.

Populations of microbes and invertebrates are heavily interlinked with biogeochemical processes, dissolved oxygen and nutrients in groundwater. We lack knowledge to effectively manage ecosystem health in groundwater and there is research needed in this area. Contaminants are also a priority for further work as once in the groundwater, some contaminants can persist longer term. We need basic ecotoxicology work for groundwater species to find the effects of key contaminants. Groundwater extent is also an important indicator as this needs to be managed with respect to water abstraction and recharge rates.

Lakes

In lakes, plants (including pest plants), fish (including pest fish), nutrients, and biotic interactions (e.g. relating to pest species) were identified as priorities. Of these, nutrients and pest species were flagged as being particularly important. Nutrients are important as key drivers of other process in lakes.

We need indicators that address both the littoral (near-shore) zone as well as the pelagic (open water) zone. LakeSPI is a good example of a metric that addresses plant community composition in the littoral zone and also incorporates measures of pest species.

Group 3

Overall messages:

Wetlands are the highest priority for management as the current management focusses on rivers and lakes. It was felt if the rivers and wetlands had good ecosystem health then this would lead to good lake ecosystem health.

There needs to be a measure of cumulative effects – what is the effect of one indicator with another, and multiple stressors over time, e.g. correlate the sediment and plant indicators.

The top 10 indicators were:

1. Extent of wetlands – compared to original state. Highly correlated to ecosystem health and easiest to determine
2. Wetland hydrological regime e.g. intactness
3. Wetland plants – and species occupancy compared to the natural state, including pest plants
4. Dissolved oxygen in rivers
5. Nutrients for rivers
6. Fish for rivers – this was important to communities and due to the fact there are many threatened fish
7. Lakes - the cumulative effects of a number of indicators including biogeochemical processes – this was a reflection of mauri ora
8. Substrate for lakes (e.g. deposited sediment)
9. Suspended sediment in rivers. This can have a large impact on rivers and downstream environments (estuaries and lakes).
10. Nutrients in wetlands as this would give an indication of the capacity for restoration

Other comments:

Riparian buffers were important – there were already tools and methods established to measure these

Physical habitat, including form and connectivity of rivers was also important- including lateral connectivity.

The biogeochemical processes indicator was linked to dissolved oxygen, as well as gross primary productivity (GPP) and ecosystem respiration (ER)

Indicators that were not required for wetlands: microbes, DO, temperature, clarity and suspended sediment, toxicants.

Biogeochemical processes and biotic interactions were too hard to determine for wetlands but that peat condition was an important indicator that could be used for ecological processes.

Discussion among whole group:

Following the small group discussions, the following topics were discussed by the whole group:

- There are several habitat assessment tools available that operate at different scales. There may be opportunities to harmonise these. Group members flagged this as an area where the Water Taskforce should work together with Environmental Reporting.
- In relation to the Ecosystem Health definition: Ecosystem Health is made up of five components – all are affected by combinations of stressors. We need to measure a combination of indicators and stressors.
- There are parallels with the way we talk about mental health – often we talk about illness rather than wellness. Can we talk about environmental wellness instead of environmental illness?
- Is the NPS-FM the best way to manage aspects influencing ecosystem health such as pests? More broadly, are the policy mechanisms in the NPS-FM the right way to tackle ecosystem health? For example, addressing habitat needs to be done collectively. Limiting resource use (the current underlying philosophy of the NPS-FM) is not going to fix habitat.
- Green economics provides a way of looking at this problem, as it doesn't ask about limiting resource use but asks how the activity gives back to the system.
- We need to look at the catchment holistically and take collective action. This is an approach that involves both biophysical and social sciences.
- The approach in the NPS-FM of managing single stressors from individual resource users (e.g. nitrogen discharge allowances) is necessary but not sufficient. We've provided the technical framework for this approach to happen. How can we present the framework in a way that facilitates a different approach?
- The group talked about flipping the old approach by also looking at the desired outcome, as well as the stressors.
- It's not enough to put enabling processes into policy and hope that people will do the right thing. There are other mechanisms that sit outside the RMA. It's always been acknowledged that a range of changes are required, not just the NPS.

Actions	**To be completed by**
MfE to provide a list of regulatory and non-regulatory approaches to improving ecosystem health	MfE
Present results of ecosystem health prioritisation at joint workshop on 30 January	STAG representative, assisted by MfE