National Science Challenges
SUSTAINABLE SEAS
Ko ngā moana whakauka

We have recovery highlighted in our plans – how do we go about it?

For regional council scientists and planners

Process to determine 'what is recovery', possible locations (including how large an area) and what time frames are acceptable.

While it is likely that councils will wish recovery outcomes to include meeting any available ecological health standards (eg DOC functional integrity index, coastal policy standards, estuarine trophic index, traits-based index, benthic health model values), other recovery outcomes and indicators are likely to be held by iwi, locals and other stakeholders.

- Any robust process for determining recovery outcomes should be very similar to the process detailed in Roadmap 9 *Deciding on robust locally-generated CMA targets* (see also below).
- It is particularly important to involve those holding mātauranga and other local knowledge as this information is likely to be needed within many of the more detailed tools and assessments of the likelihood of success listed in the process above.
- Governance issues should be raised and resolved and any locally relevant frameworks, tikanga and tohu for monitoring success should be identified.
- Expected time frames should be discussed.
- A list of possible locations should be chosen and the size of each of these assessed using the spatialscaling decision tree tool and its definition of likelihood of success.

Once these aspects have been discussed, and outcomes, locations and time frames have been defined, then the decision tree above can be worked through.

Robust process for determining recovery outcomes

Councils should set a requirement for a robust overall process to include:

- Co-production with iwi/hapū, which includes use of mātauranga to underpin definitions of success and working through the decision tree, selecting actions to aid recovery and determining tohu for monitoring progress. Sustainable Seas resources that can help include *Te Kete Kaitiakitanga (in particular the section E Toru Ngā Mea)* and *Empowering Māori knowledge in marine decision-making*.
- Early engagement between the co-producers (regional council and iwi/hapū) and the community to discuss recovery outcomes, including discussion of world views. Sustainable Seas resources that can help include the *Participatory processes ingredients tool*, guides two and four in the *Quick guides: Navigating risk and uncertainty in marine management* series, and *Roadmaps to EBM: How likely is it that the action we want will benefit others?*
- Workshops or other engagement with the community to collate existing information and ascertain who to engage with to get local information. Sustainable Seas resources that can help include the *Participatory processes ingredients tool* and *Enabling a broad knowledge base for marine management decisions.*

Further reading

Gladstone-Gallagher R, Hewitt J, Low J, Pilditch C, Stephenson F, Thrush S & Ellis J (2024). Coupling marine ecosystem state with environmental management and conservation: A risk-based approach. Biological Conservation 292: 110516

Sustainable Seas National Science Challenge (2020) Ingredients to catalyse participation in marine decision-making.

Sustainable Seas National Science Challenge (2023) Quick guides: Navigating risk and uncertainty in marine management.

Sustainable Seas National Science Challenge (2024) Enabling a broad knowledge base for marine management decisions.

Sustainable Seas National Science Challenge (2024) Roadmaps to ecosystem-based management.

Sustainable Seas National Science Challenge (2024) Te Kete Kaitiakitanga.

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Has 'what is recovery', possible locations and time frames already been defined?

no → begin with participatory processes around setting recovery targets

yes ↓

1a – have the activities/stressors that caused the need for recovery ceased?

no → 2b – use prioritising stressors for removal tool (see below), assess what is possible and then run through the questions from 2a assuming that the stressors are removed

yes ↓

2a – is the environment still appropriate for the recovery outcome (eg species, habitat, use)

no → 3b – can some action be taken to reverse the change in the environment (eg removing contaminated sediment, adding sand or shell, removing hydrodynamic barriers)

- **yes** → assess action costs and then assess likely recovery time frames for locations using the recovery prioritisation tool (ie begin again with question 3a)
- **no** → revisit 'what is recovery' process

yes ↓

3a – assess likely recovery time frames for locations using the recovery prioritisation tool (see below), particularly asking whether natural recovery is likely within acceptable time frames?

- **yes** → return answers to those involved in the original 'what is recovery' process
- **no** → assess likely success of enhancement efforts (eg transplanting, seeding) using recovery decision trees and return answers to those involved in the original 'what is recovery' process

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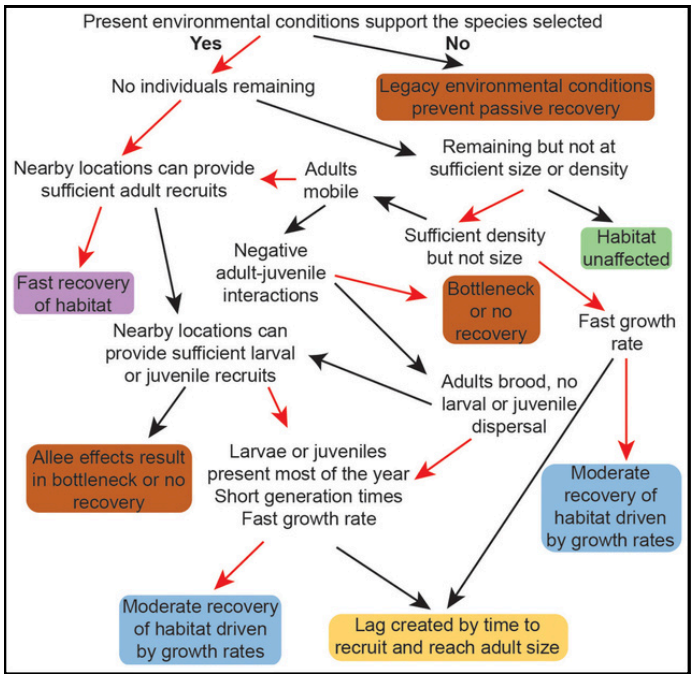
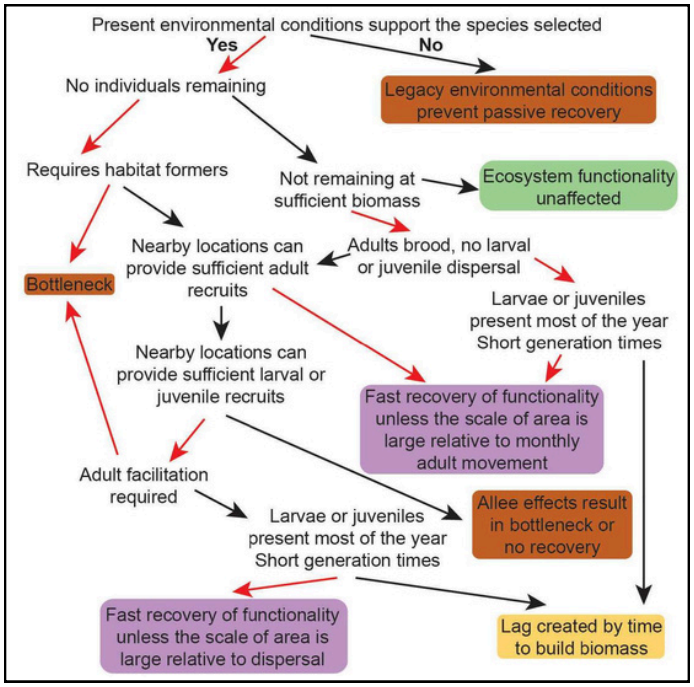
Supporting information

Recovery if stressor(s) removed

This decision tree is derived from a series of questions about species traits (mobility of different life stages, reproduction traits, juvenile-adult interactions and interactions with other species), distance to nearby patches of the species/habitat and surrounding landscape patterns in community composition and biodiversity.

The top figure highlights the length of time that recovery of a habitat forming species may take (Figure 4, Hewitt et al 2022) and the bottom figure highlights the length of time that a functionally important species may take to recover (supplemental figure from Hewitt et al 2022).





Stressor removal, relative importance and likelihood of success

This decision-making guidance uses stressors' characteristics to determine which stressor may control any recovery process, given local information on stressors in place. It can be paired with local information on habitat requirements, how much the habitat has changed, and how long the stressor will stay in the system to give in-place predictions on which stressor(s) to target and whether stressor legacies are likely to prevent recovery. The stressor characteristics (labelled S1-S6) are those given in Gladstone-Gallagher et al (2024).

Which stressors to reduce?

Councils should set a requirement for a robust overall process to include:

Largest gain

- Any stressor that impacts on more than one point of the ecosystem network (S5), especially if it is accumulating (that is, the stressor leaves behind an environmental legacy such as mud content from terrestrial sediment S2). This stressor should be targeted even if the levels are only moderate at present (S5 without S2) or low (S5 with S2).

  Then stressors that are high and cover a large area (S6).

Moderate gain

- Stressors that are low to moderate but are accumulating (S2) and cover a large area (S6).

  Then stressors that are moderate and cover a large area (S6).

Lowest gain

- Stressors with unimodal responses that are only at low levels (S3) and not accumulating (S2).

References

Above: Gladstone-Gallagher R, Hewitt J, Low J, Pilditch C, Stephenson F, Thrush S & Ellis J (2024). Coupling marine ecosystem state with environmental management and conservation: A risk-based approach. Biological Conservation 292:110516.

Left: Hewitt J, Gladstone-Gallagher R & Thrush S (2022). Disturbance–recovery dynamics inform seafloor management for recovery, Frontiers in Ecology and the Environment, 20:10