National Science Challenges
SUSTAINABLE SEAS
Ko ngā moana whakauka

What resources has the Challenge produced that can support active participation in assessing, monitoring and restoration of estuarine health?

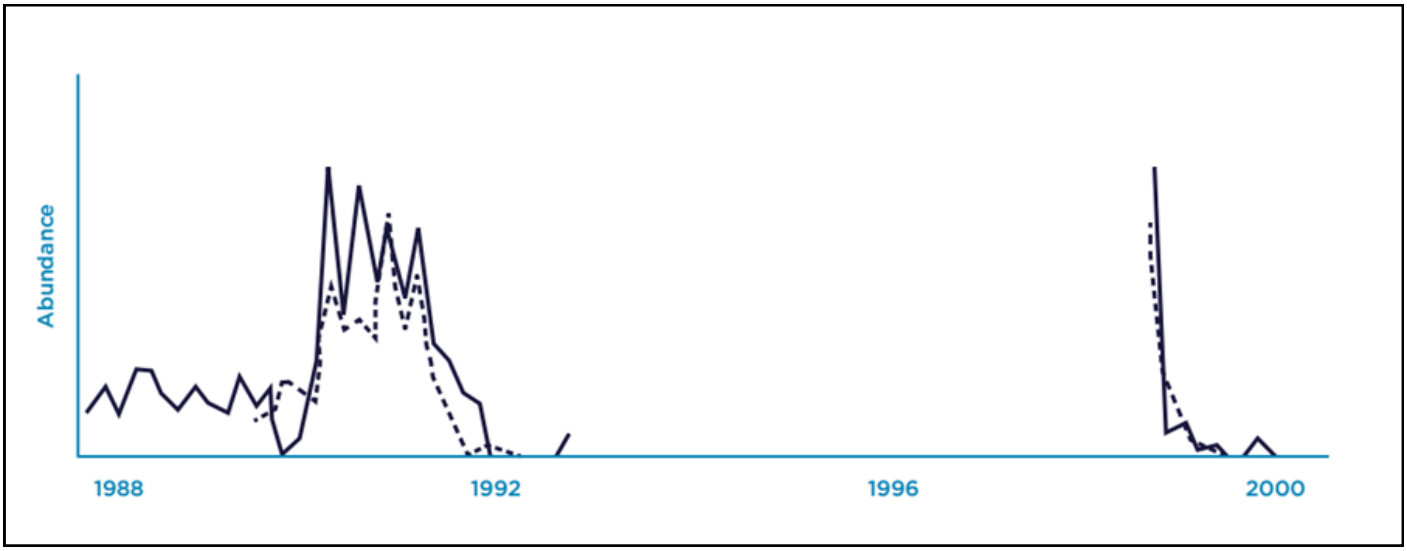
For iwi, communities, business and industry

Estuaries are important places for many of us in Aotearoa New Zealand, they are the kidneys of Papatūānuku – critical for cleansing before sediment and pollutants end up in our coastal marine spaces. Yet we see estuaries being increasingly degraded and often our existing management approaches inhibit our connection and regular interaction with them. Now we want to be involved in assessing the health, ongoing monitoring and aiding recovery of our estuaries to better support their mauri and their ability to support us.

Sustainable Seas has various guidance documents around assessing health, collecting data and monitoring. The following are directly relevant:

- Assessing present health is a document that gives a range of aspects that can be used for assessment and monitoring. It lists both simple and more technical measures and provides information on other indicators that are already being used around Aotearoa New Zealand.
- Designing long term monitoring programmes offers insights on designing marine monitoring programmes to detect environmental changes using long-term data from New Zealand's Manukau Harbour Ecological Monitoring Programme. It suggests ways that cost-effectiveness can be improved by monitoring multiple variables and using sites that have been monitored continuously to interpret changes at other less frequently monitored locations (eg Figure 1).
- Monitoring for marine tipping points provides strategies for monitoring marine ecosystem changes and detecting critical tipping points. It highlights the need for monitoring over at least 15 years to account for natural cyclic patterns like El Niño/El Niña. Furthermore, the guidance demonstrates how use of expert and local knowledge can compensate for data gaps.
- Drones can monitor coastal ecosystems. Guidance for using drones to monitor coastal ecosystems describes the use of drones for coastal ecology monitoring, emphasizing their advantages which range from being able to collect detailed data to the flexibility of looking at broad-scale changes.
- Pātaka Kōrero is a digital tool designed specifically for a set of iwi/hapū groups for storing and organising scientific and mātauranga derived information and data, usable in marine ecosystem management. The pātaka supports a vast range of content formats including documents, audiovisuals, and web-hosted links. The guidance describes the tool, how it can be used and its unique features. It provides an insight to the design process and can inform others wishing to look at undertaking a similar development (eg Figure 2).

Figure 1: Example of a time series. Hewitt J & Thrush S (2009). Reconciling the influence of global climate phenomena on macrofaunal temporal dynamics at a variety of spatial scales. Global Change Biology 15:1911–1929.



Sustainable Seas also has guidance and practical examples around managing for recovery and restoration:

- Ngā tohu – Te Korowai examines Maramataka as a framework for managing coastal environments, emphasising restoration based on indigenous ecological knowledge and a structured research approach.
- Ōhiwa Harbour Case Study 16 million 'teenage' kuku (mussels) are now growing successfully in a traditional kuku bed in Ōhiwa Harbour following a mātauranga Māori-led research restoration project between Iwi, hapū, researchers, local councils and the Ōhiwa Harbour Implementation Forum. Collaboration with kaumatua was an integral part of the restoration.
- The Disturbance recovery dynamics inform seafloor management for recovery document details the species dynamics and external factors that influence successful restoration. In particular, it focuses on whether recovery can happen by "turning off the tap" of contaminants and how long natural recovery might take (eg Figure 2).
- The document Guidance and tools to help navigate marine restoration projects as part of ecosystem-based management in the top of the South Island summarises guidance and tools mapped to restoration goals identified by a group of stakeholders for marine ecosystems. It is the result of a collaboration with a "restoration by design" process facilitated by TNC New Zealand with Kotahitanga mō te Taiao Alliance.
- There are also three roadmaps to restoring health, with varying levels of detail. The document "*We're interested in recovering the health of an area — how do we go about it?*" is for communities wanting to start action. It moves through what the concerns are and what individuals think may need to be done, to help focus on what may need to be achieved. Conversely the "*We have 'recovery' highlighted in our plans — how do we go about it?*" details processes to determine what recovery outcomes are being sought, possible locations and what timeframes are acceptable.

Finally, there are a series of guides related to gaining funding for restoration and conducting blue economy practices. Blue economy activities are those that generate economic value while contributing positively to ecological, cultural, and social well-being. The Sustainable Seas Challenge Blue Economy principles include ***Regenerative:*** *Adopting practices that actively support and restore marine ecosystem health* and ***Inclusive:*** *Engaging with communities to achieve multiple benefits for people and the environment*.

- Encouraging restorative economies. Restorative economies meld environmental restoration with value-generating economic activities and environmental management responsibilities. They aim to attract innovative financing.
- He Pou Tuarongo – Aquatic cultivation practice and hapū based economy. Exploring an Ao Tūroa framework, this study redefines aquatic cultivation, focusing on mauri and intergenerational Māori wisdom.
- Maximising opportunities for Akaroa Salmon and Ōnuku Rūnanga. This document provides an analysis of leveraging indigenous values to maximise opportunities for Ōnuku Rūnanga in the global salmon market. The findings are likely to be similar for other aquaculture species.
- What makes a tourism operation marine ecotourism? Operators comment that marine ecotourism can be seen as a philosophy and a way of life centred around Taiao; extending beyond running a commercially viable business to giving back to people and place, and actively caring for marine environments. Ways that these values are expressed are by the sharing of knowledge and a passion for marine conservation by delivering inspiring experiences and running a low impact operation.

Table 1: Managers guide to species traits and implications for successful passive recovery. Hewitt J, Gladstone-Gallagher R, & Thrush S (2022). Disturbance-recovery dynamics inform seafloor management for recovery. Frontiers in Ecology and Environment. 20: 564-572.

Species characteristics	Recovery scale	Intervention
High sensitivity to local stressors	Different end community most likely	Active enhancement
Mobile adults and positive adult–juvenile interaction	Fast (reproductive timescales) at spatial scale of adult movement	*Passive*
Mobile adults and no adult–juvenile interaction	Moderate (reproductive timescales) at spatial scale of adult movement	*Passive*
Mobile adults and adults adversely affect juvenile recruitment	Slow (temporal scale of natural adult mortality) at spatial scale of adult movement	*Passive if time frames acceptable*
Juveniles are mobile, but adults required for establishment and growth	Delayed recovery or different end community	Active enhancement
Juveniles are mobile, but no need for adults	Slow–moderate (time to maturity at spatial scale of adult movement	*Passive if time frames acceptable*
No larval dispersal and high frequency reproduction	Different end community most likely	Active enhancement
Larval dispersal and high frequency reproduction, but adults required for establishment and growth	Delayed recovery or different end community	Active enhancement
Larval dispersal and high frequency reproduction, but no need for adults	Slow (time to maturity) at spatial scale of larval dispersal	*Passive if time frames acceptable*

Figure 2: Storage and security for the Pātaka Kōrero.