

Oyster Reef Restoration

A guide to help local government embed Oyster Reef Restoration into a Coastal Management Program

Marine Estate Management Authority

Oyster reef restoration – improves water quality, enhances habitat and helps to support healthy, vibrant coastal communities.

WHAT ARE OYSTER REEFS?

Oyster reefs are complex, intertidal or subtidal three dimensional living structures which are formed from clusters of living oysters and old shell. Oyster reefs occur on soft sediments or rocky areas; as low-profile beds or as high-profile reefs. Native reef-forming oyster species in NSW include Sydney rock oyster (*Saccostrea glomerata*), Angasi oyster (*Ostrea angasi*), Leaf oyster (*Isognomon ephippium*) and Pearl oyster (*Pinctada albina sugillata*).

WHY ARE OYSTER REEFS IMPORTANT?

Oyster reefs are a distinct ecological community which provide a wide range of ecosystem services to coastal communities. Oyster reefs provide complex structural habitat which supports many other marine species including other molluscs, crustaceans and fish species.

Oyster reefs protect shorelines by buffering wave energy and enhancing sediment deposition. Reefs create stable conditions which promote the growth of other marine habitats such as seagrass beds and saltmarshes.

Oyster reefs also provide critical water filtration services; improving water clarity which further encourages the growth of marine plants such as seagrass.



Image 1. A fringing Sydney rock oyster reef

WHERE HAVE OYSTER REEFS GONE?

Australia's coastal environments have changed considerably since European arrival. The cumulative effects of increasing urbanisation, industrialisation and landuse intensification coupled with outbreaks of oyster disease have decimated oyster reefs.

In Australia, it is estimated that 99% of natural oyster reefs are 'functionally extinct'. The loss of this significant ecosystem is not confined to Australian waters. Globally over 85% of reefs have been lost or severely degraded¹ making oyster reefs the world's most degraded marine ecosystem.

In NSW, small oyster populations still exist in most bays and estuaries but at very low densities compared to the pre-European period.

As identified in the state-wide Threat and Risk Assessment (TARA)² natural oyster reefs (see subtidal rocky reef environmental asset³) still face considerable pressure from a number of contemporary threats. These include climate

change impacts such as, sea temperature rise and ocean acidification; and impacts of landuse intensification such as urban stormwater discharge and agricultural diffuse source runoff.

The loss of natural oyster reefs and the ecosystems services they once provided continues to contribute to the decline in health of coastal waterways; reducing water quality and significantly impacting coastal and marine biodiversity.

‘Originally the oysters extended from Darling Harbour to the Flats in more or less quantities, but a few years back they became almost extinct from over-dredging’ Inspector of Oyster Beds, 1877

HOW CAN WE BRING OYSTER REEFS BACK?

Oyster reef restoration introduces hard substrate (sterile shells and/or rock such as limestone) to the estuary or nearshore floor, in an area of good natural settlement rates of oyster larvae.

Over time, given the right conditions, these juvenile oysters spat grow and reproduce, creating a self-sustaining complex ecosystem with all the attributes of a natural oyster reef.

Shellfish reef restoration has been successfully implemented overseas (USA, Germany, Netherlands, UK) and in other Australian states.

WHY RESTORE OYSTER REEFS?

Oyster reef restoration provides many benefits to an estuary and the coastal communities it supports, including:

- Enhanced biodiversity including key recreational and commercial fish species.
- Increased denitrification, removing nitrogen and reducing eutrophication.
- Improved water quality via an oyster’s natural filter-feeding activity.
- Enhanced estuary resilience through climate change mitigation and adaptation.
- Enhanced recreational and passive tourism opportunities.
- Increased jobs, boosting local economies.
- Positive community engagement and enhanced social licence.

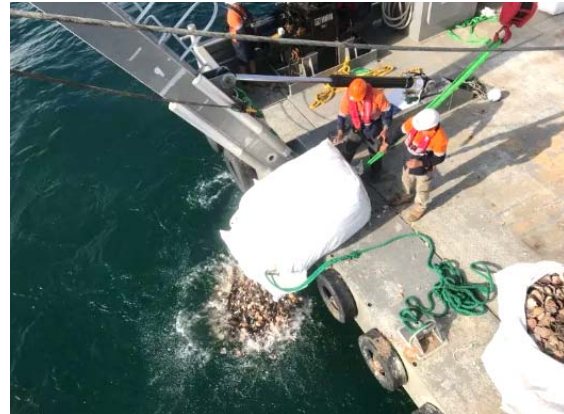


Image 2. Shellfish Reef Restoration, Port Phillip Bay, Victoria (The Nature Conservancy)

OYSTER REEF RESTORATION AND THE MARINE ESTATE MANAGEMENT STRATEGY

Water pollution was identified as the number one threat to the marine estate in the state-wide Threat and Risk Assessment (TARA)². A number of actions were recommended to address this threat. The strategic restoration of oyster reefs and their well-documented⁴ natural water filtration function and the added benefit of biodiversity enhancement is the focus of the first NSW Oyster Reef Restoration Project.

This innovative project is being delivered in Stage 1 of the Marine Estate Management Strategy (MEMS): Management Action 1.3 under Initiative 1 (Improving water quality and reducing litter for the benefit of marine habitats, wildlife and the community).

Key aims of project are:

- Increase awareness of oyster reefs and support for future restoration projects in the coastal community and key stakeholders.
- Identify current and historical reef sites via a GIS mapping program.
- Identify future restoration sites across the coast considering all social, environmental, cultural and economic factors.
- Identify a restoration regulatory pathway including biosecurity, compliance, permission, maintenance and navigation.
- Identify restoration methods specific to NSW via strategic research collaborations.
- Deliver the first large-scale oyster reef restoration project in Port Stephens.
- Monitor to measure restoration success.

Stage 1's success will establish a complete framework to efficiently deliver future oyster reef restoration projects across the marine estate.

Port Stephens Pilot - sited in a remote area of the estuary where derelict aquaculture lease infrastructure continues to recruit spat; the introduction of shell and rock will create the first large-scale restored reef in NSW waters.

HOW CAN OYSTER REEF RESTORATION BE EMBEDDED IN A COASTAL MANAGEMENT PROGRAM?

Council Coastal Management Programs (CMPs) are strongly aligned with improving outcomes for the marine estate. Oyster Reef Restoration can assist with improving water quality and other key threats including loss of habitat, decreases in abundance and distribution of marine species (including fish) and foreshore erosion.

Aligning relevant CMP actions (such as addressing water quality, enhancing estuarine health, improving biodiversity and enhancing resilience to climate change) with this innovative restoration action may assist in its future implementation.

The following ideas may assist local government to embed oyster reef restoration into a CMP at each preparation stage, where relevant:



Stage 1: Identify the scope of a CMP

- Recognise water pollution (identified in the TARA), habitat loss and decreases in marine species as key threats to the coastal environment area in your region.
- Consider including oyster reef restoration as an innovative activity to enhance water quality, restore habitat and boost estuary productivity.
- Include a member of the NSW Oyster Reef Restoration project team and local oyster reef stakeholders (e.g. oyster farmers, Aboriginal communities) in your engagement strategy.
- Consider community connection to oysters including the spiritual connection of local Aboriginal communities.

- Refer to NSW DPI oyster reef mapping data and oyster industry survey results to determine spatial extent of oyster reefs and/or loss to inform or identify knowledge gaps.
- Link with the Port Stephens Pilot project and other related interstate projects.



Stage 2: Determine risks, vulnerabilities and opportunities

- Adopt products from the NSW DPI oyster reef restoration engagement program to engage with the community and key stakeholders.
- Consult and collaborate with NSW DPI, and project partners to identify future opportunities and shared goals.
- Identify scenarios where oyster reef restoration can support local social and economic change through enhanced water quality and fish production.
- Identify appropriate timing of oyster reef restoration e.g. optimum spat fall season.



Stage 3: Identify and evaluate options

- Refer to the wealth of scientific literature on the socio-economic benefits of oyster reef restoration (available from NSW DPI).
- Identify potential funding sources e.g. Coast and Estuary Grants, Environmental Trust, Flagship Habitat Action Grants or other environmental restoration programs. Noting that MEMS Stage 1 is not a grants program and local councils cannot apply directly for funding. There may be collaborative opportunities under MEMS Stage 2.
- Consider the feasibility, viability and acceptability of oyster reef restoration using the prioritisation process established by NSW DPI and partners.
- Consider the legislative pathway identified for the Pilot Project and engage relevant public authorities to determine its application to your coastal area.
- Refer to NSW DPI stakeholder engagement outcomes for relevant information.

- Consult with NSW DPI regarding Pilot Project outcomes and other members of the Shellfish Reef Restoration Network (www.shellfishrestoration.org.au/) for related studies.



Stage 4: Prepare, exhibit, finalise, certify and adopt the CMP

- Document partnerships with NSW DPI project team and other key stakeholders and keep them informed of the CMPs progress.



Stage 5: Implement, monitor, evaluate and report

- Adopt the oyster reef restoration planning and implementation process developed by NSW DPI.
- Engage with key stakeholders to participate and assist in project delivery.
- Consider the monitoring program established for the Pilot Project site and collaborative research programs.
- Inform stakeholders and the broader community of the outcomes of oyster reef restoration.

WHO CAN I CONTACT FOR MORE INFORMATION?

The table below provides details of key contacts from the Oyster Reef Restoration Team for each region.

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¹ Gillies C, McLeod I, Alleway H, Cook P, Crawford C, Creighton C, Diggles B, Ford J, Hamer P, Heller-Wagner G, Lebrault E, Le Port A, Russell K, Sheaves M and Warnock B. (2018) Australian shellfish ecosystems: Past distribution, current status and future direction

² NSW Marine Estate Threat and Risk Assessment Report 2016, WBN BMT for MEMA

³ NSW Marine Estate Threat and Risk Assessment – background environmental information, 2017, NSW Department of Primary Industries

⁴ Ehrich M. K., and Harris, L. A. (2015) A review of existing eastern oyster filtration rate models. Ecological Modelling 297, 201-212

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