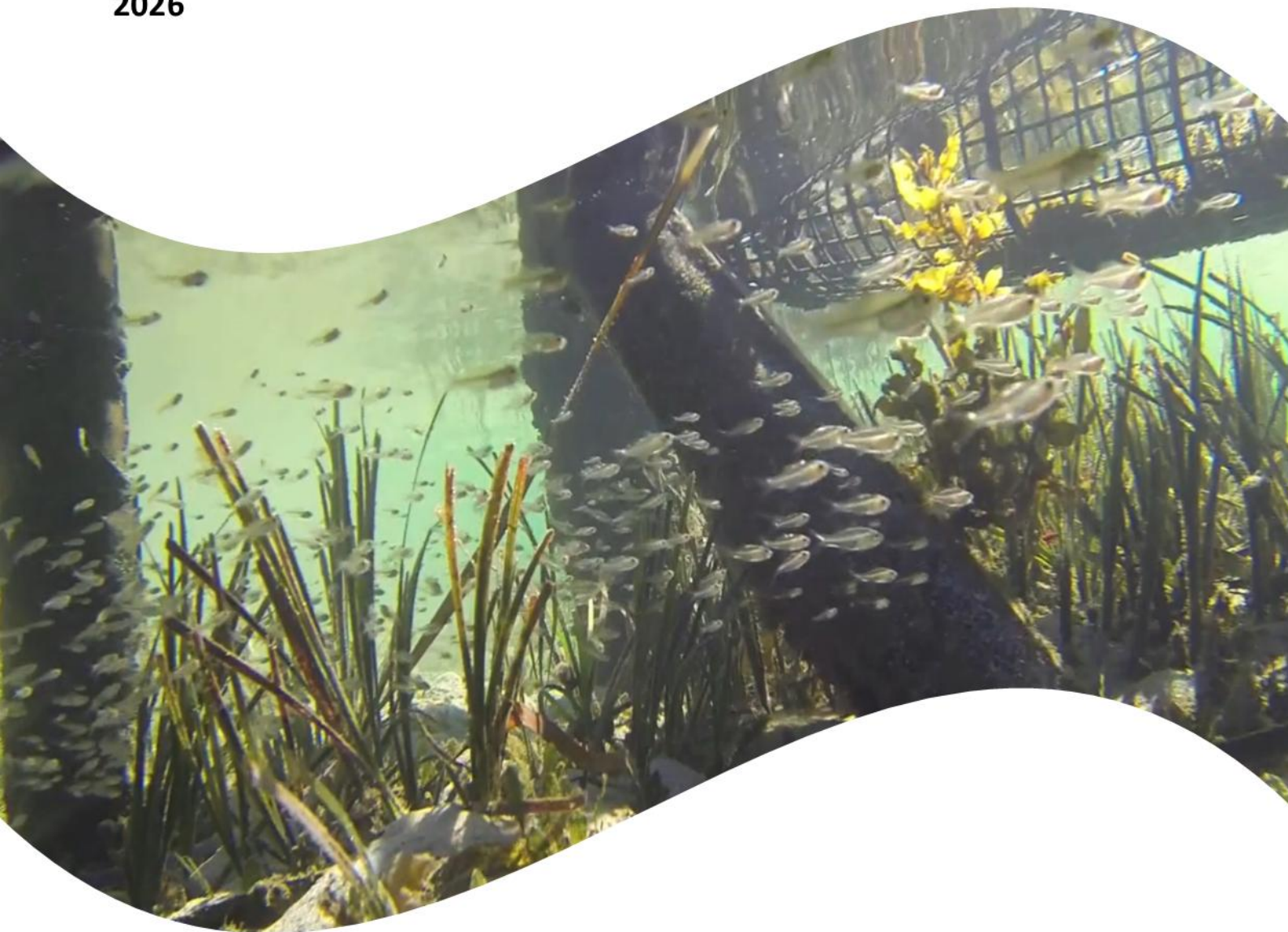


More Than Food, Beyond Sustainable

**The Environmental Case for Oyster Aquaculture in NSW:
An Evidence-Based Summary for Growers, Managers and the Community**

2026



About This Summary

This summary sets out, in plain language, the main environmental benefits of oyster farming in New South Wales, from cleaner water and healthier habitat to one of the lowest carbon footprints of any farmed food. It is written for growers, managers and the wider community as a short, readable overview rather than a technical document.

Sitting behind it is a comprehensive, evidence-based assessment that examines each of these benefits in detail, weighs the local and international research, and is deliberately clear about where the evidence is strong and where important questions remain. Anyone wanting the full picture, the science, the sources and the current knowledge gaps, is encouraged to read that report “*Restorative Aquaculture: An Evidence-Based Assessment of NSW Oyster Aquaculture*” (NSW Farmers 2026).

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Environmental benefits of NSW oyster aquaculture

● Well-evidenced benefits ○ Emerging or conditional

WATER QUALITY

- 1** **Filters & clears the water**
Oysters remove algae & fine sediment. A Sydney rock oyster filters 3 L/hr; a Pacific oyster 5-8 L/hr
- 2** **Curbs algal blooms**
Grazing phytoplankton keeps algal biomass and eutrophication in check
- 3** **Removes nutrients at harvest**
Sydney rock: 5.58 kg N + 0.69 kg P per tonne; Pacific: 4.46 kg N + 0.55 kg P per tonne
- 4** **May boost denitrification**
Seabed deposits help bacteria turn nitrogen into inert N₂ gas – likely, but not yet confirmed in NSW

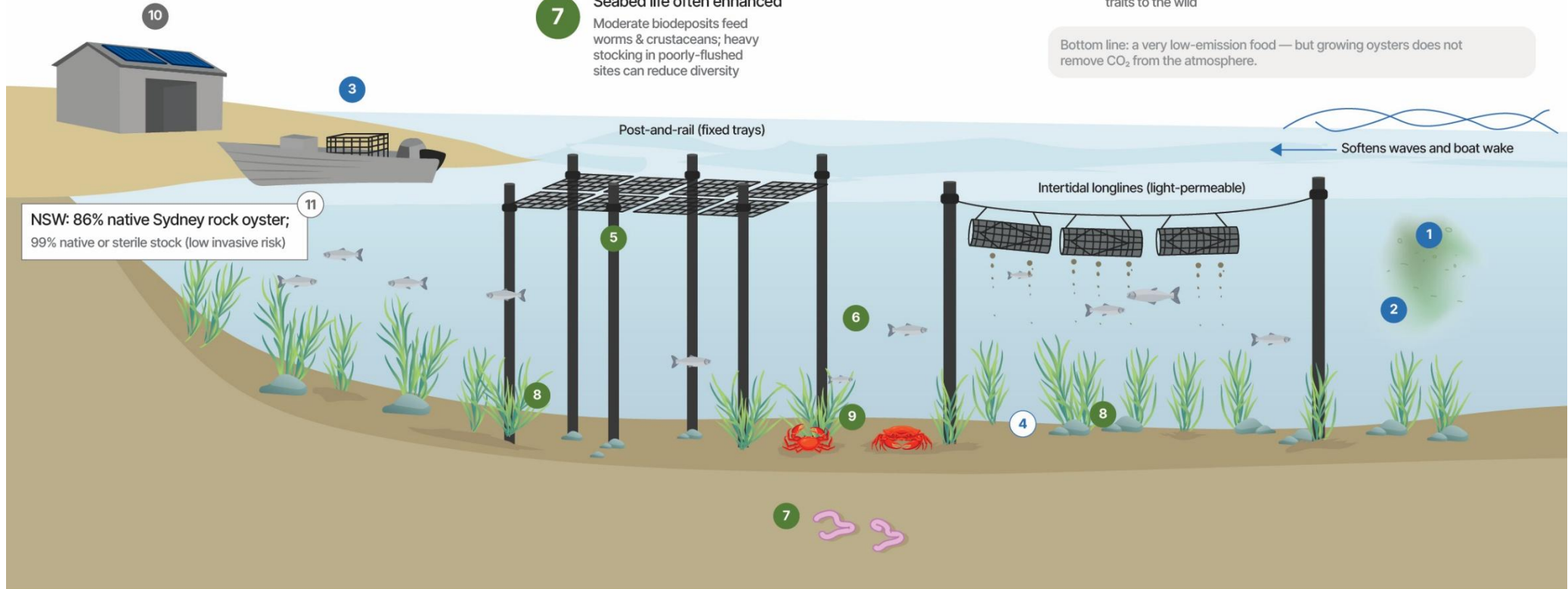
HABITAT & BIODIVERSITY

- 5** **Adds 3-D habitat**
Racks, posts & longlines add hard structure to bare estuaries, colonised by barnacles, mussels, sponges & algae, and used by 90 fish species on NSW leases
- 6** **More fish & invertebrates**
1.95x the abundance and 1.14x the richness of open sediment – fish and mobile invertebrates. ^
- 7** **Seabed life often enhanced**
Moderate biodeposits feed worms & crustaceans; heavy stocking in poorly-flushed sites can reduce diversity
- 8** **Seagrass shading is managed**
Only light-permeable longlines, designed to move with tides and currents, are permitted over seagrass
- 9** **May lower disease**
Oyster filtration cut blue crab infection by 32.7% in a US study ^

EMISSIONS & CLIMATE CHANGE

- 10** **Very low emissions**
3.75 kg CO₂e per 100 g of protein – among the lowest carbon footprints of any farmed protein. No feed, freshwater, fertilisers or chemicals used
- 11** **Breeding for a changing climate**
Sydney rock oysters are bred for tolerance to warming & acidification; fertile stock may spread traits to the wild
- **A carbon store, not CO₂ removal**
Oyster shell is a sink for carbon, but does not result in atmospheric CO₂ reduction
- **Ecosystem carbon-capture unproven**
One study claiming oysters store carbon by driving the biological pump has been formally challenged

Bottom line: a very low-emission food — but growing oysters does not remove CO₂ from the atmosphere.



AT A GLANCE — across the whole NSW industry, each year

- Filters ~2 trillion litres of estuary water. Like emptying & cleaning Sydney Harbour four times over.
- Removes ~15.8 tonnes of nitrogen & ~2.0 tonnes of phosphorus. A nutrient removal service valued at \$1.8m-\$9.5m.
- Produces ~66 million oysters (2,900 tonnes). Well under the 7,500 tonne estimated sustainable level.
- Total emissions 2,640 t CO₂e. The cost to offset would be 1.5 cents per dozen.

For more information see NSW Farmers (2026). Restorative Aquaculture: An Evidence-Based Assessment of the NSW Oyster Industry. FRDC Project 2024-057.

^ Global / Proxy data.

The NSW Oyster Industry

Oyster farming is NSW's oldest and most valuable aquaculture industry, with a history of more than 150 years. Around 230 farming businesses operate across 36 estuaries, growing and harvesting ~66 million oysters each year. In 2024–25, the industry generated a farm-gate value of \$76.4 million, accounting for 71% of NSW aquaculture production by value. The native Sydney rock oyster remains the industry's signature species, representing 86% of production ^[1].

More than food, a working oyster lease delivers measurable ecosystem services. Oysters are filter-feeding bivalves, and because the growing infrastructure stays in the estuary year-round, oyster farming influences water quality, provides structured habitat, and produces protein at a very low greenhouse-gas intensity. This summary sets out those benefits with their supporting evidence and quantitative values, distinguishing NSW-specific data from results transferred from comparable systems elsewhere, and noting where the evidence remains incomplete.

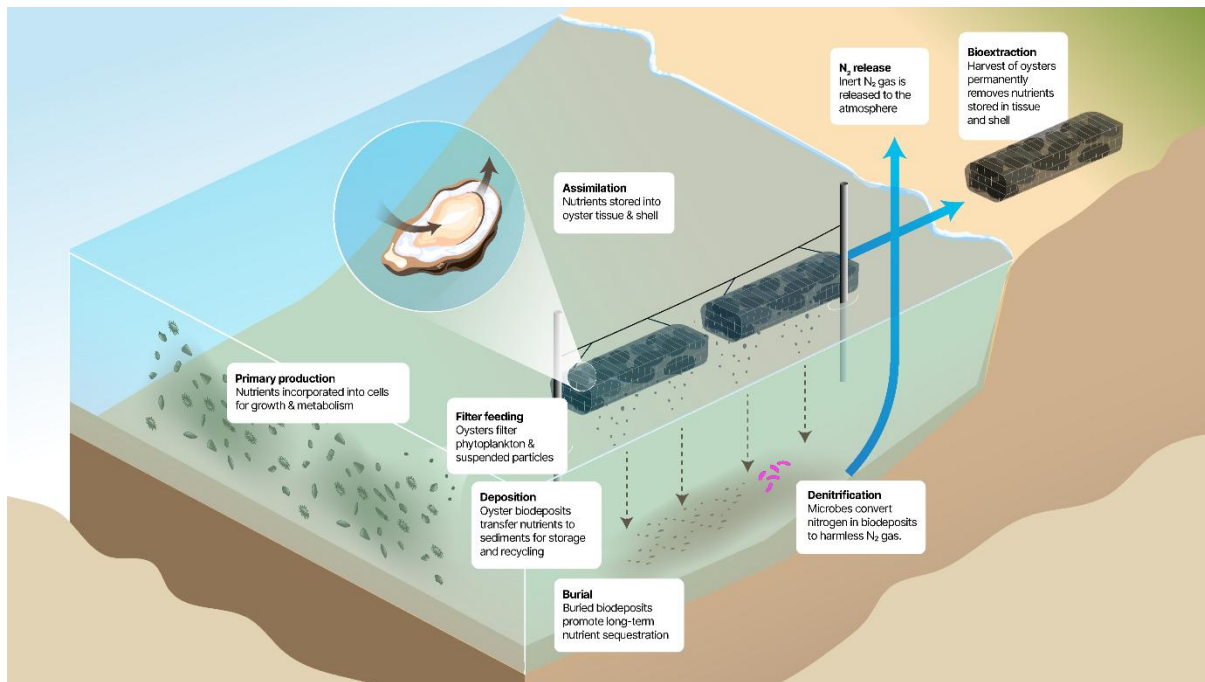
1. Water Quality: Filtration & Nutrient Removal

Oysters feed by drawing water across their gills and removing suspended particles. An adult Sydney rock oyster (*Saccostrea glomerata*) filters ~3 litres per hour ^[2], and a Pacific oyster (*Magallana gigas*) 5 - 8 litres per hour ^[3].

This clearance removes phytoplankton, organic detritus and fine sediment. As a result, water clarity improves, light penetration increases, and phytoplankton biomass is regulated. These functions are directly relevant to NSW estuaries, where nutrient run-off from catchments and the resulting eutrophication, algal blooms, and hypoxia are among the highest-priority threats identified in the NSW Government's Marine Estate Threat and Risk Assessment ^[4]. Scaled across the whole industry, the oysters harvested each year filter roughly 2 trillion litres of water, equivalent to emptying and cleaning Sydney Harbour four times over, and this is before counting the 200-million-plus juvenile oysters growing on for future harvests.

Filter feeding also drives nutrient bioextraction. Nitrogen (N) and phosphorus (P) assimilated from phytoplankton are incorporated into oyster tissue and shell and permanently exported from the estuary at harvest. Using NSW-specific composition factors, each tonne of Sydney rock oysters harvested removes 5.58 kg N and 0.69 kg P ^[5]. Scaled across the industry, annual harvest removes on average 15.8 tonnes of N and 2.0 tonnes of P from NSW estuaries, based on production across three years (22/23, 23/24, 24/25). This nutrient removal service is valued at between \$1.8 – 9.5 million per year, depending on the valuation method used ^[5,7].

Oysters can also support a further removal process. The waste they drop to the seabed (i.e. biodeposits) feeds bacteria that can turn nitrogen into harmless N₂ gas. The net contribution of this process, denitrification, is still unresolved in NSW, with the only local study (in Wallis Lake) finding that most nitrogen was actually recycled back into the system rather than being removed ^[6]. Denitrification is therefore best treated as a likely additional benefit rather than a confirmed one.



Nutrient removal by oyster aquaculture

Scale dependence. The water-quality benefit of bioextraction is scale-dependent. In large, river-dominated estuaries, catchment nutrient loads are generally too high for oyster harvest to meaningfully offset system-wide inputs. In smaller, well-flushed, low-nutrient-export estuaries, harvest operates on a scale comparable to the nutrient pool and the effect becomes material. In Merimbula Lake, a small, low-nutrient far-south-coast estuary, oyster harvest is estimated to remove around 11% of the catchment's annual nitrogen and phosphorus load, and likely more given production growth since nutrient loads were last modelled in 2006. At this scale, oyster aquaculture is ecologically meaningful relative to total nutrient inputs ^[7].

2. Habitat & Biodiversity

The widespread loss of structurally complex habitat, including natural oyster reefs, seagrass meadows and saltmarshes, has simplified many NSW estuaries, leaving large areas of bare sediment that support comparatively low levels of estuarine biodiversity. Oyster aquaculture infrastructure (racks, posts, longlines, bags and baskets) restores structural complexity by providing hard, three-dimensional habitat within the water column. As farms retain multiple overlapping crops of oysters to sustain annual production, this habitat persists across seasons and remains available during critical nursery periods for juvenile fish.

NSW data from Port Stephens found that commercial oyster leases supported 90 fish species, with species richness comparable to seagrass, mangrove and remnant reef habitats and higher than bare sediment ^[8]. Consistent with this, a global meta-analysis of 65 studies found that bivalve aquaculture supports, on average, 1.95 times the mobile-fauna abundance and 1.14 times the species richness of reference sites ^[9].



Oyster leases as fish habitat (Martinez-Baena, 2022).

Disease regulation. Filter feeding may also support faunal health by reducing waterborne pathogen transmission. In paired field and laboratory experiments in the US, Eastern oysters (*Crassostrea virginica*) removed the free-swimming infective stages of the parasitic dinoflagellate *Hematodinium perezii*, reducing infection probability in juvenile blue crabs by 32.7% ^[10]. While this is proxy evidence (a US oyster–crab–parasite system), the mechanism is general to filter-feeding bivalves and biologically plausible for oysters in NSW.

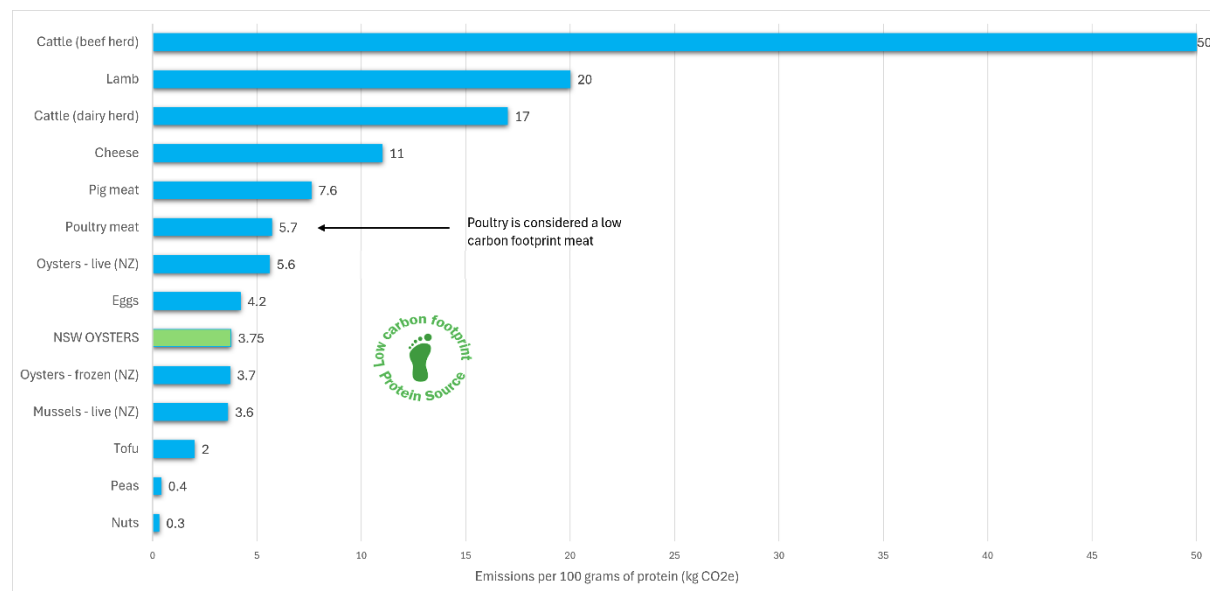
Attraction versus production. The evidence demonstrates that leases provide shelter and food and elevate local abundance and richness. What remains unresolved is the magnitude of net production; whether elevated abundance reflects a redistribution (attraction) of existing animals in the estuary, or newly produced biomass.

3. Shoreline Protection

NSW oyster farming may also provide shoreline protection benefits by reducing wave energy within estuaries. While most research has focused on oyster reefs rather than commercial farms, studies have found that oyster reef structures can reduce wave heights by around 77–85% under favourable conditions ^[11,12]. This is relevant to NSW because much of the state's oyster farming infrastructure is either floating or intertidal, creating physical barriers that can slow water movement and dissipate wind waves and boat wake. As most NSW oyster production occurs in sheltered estuaries where these locally generated waves are the primary drivers of foreshore erosion, farm structures are likely to provide wave attenuation. Although this benefit has not yet been directly quantified at commercial NSW oyster leases, the existing evidence suggests oyster farming can contribute to coastal resilience while delivering food production and environmental benefits.

4. Emissions Footprint

Oyster culture requires no formulated feed, freshwater, fertiliser or antibiotics, giving it a very low carbon footprint. Industry emissions have been calculated as equating to ~0.93 kg CO₂ equivalent per kg of product and ~3.75 kg CO₂ equivalent per 100 g of protein ^[5]. This is well below most farmed animal proteins and comparable to mussels and oysters farmed in New Zealand. Offsetting the entire industry's annual emissions would cost under \$100,000, equivalent to around 1.5 cents per dozen oysters harvested.



Carbon emissions per 100g of protein across common farmed foods ^[5].

Do oyster shells store carbon? Oyster shells are mostly calcium carbonate, so they do contain carbon, and across the whole industry that adds up to a meaningful amount on paper. But storing carbon in shell is not the same as taking carbon dioxide out of the atmosphere. Making shell actually releases some CO₂ as a by-product, and recent analysis suggests only about 6% of the raw material oysters use to build shell comes from recent, human-generated CO₂. The

rest has been locked in rock and sediment for tens of thousands of years. On that basis, shell formation is not a genuine way of removing CO₂ from the atmosphere ^[13].

Some researchers have suggested oyster farms might help the ocean store carbon in other ways, for example by filtering phytoplankton and shifting carbon into biodeposits and seabed sediments. One tank experiment estimated this could capture more than twice the carbon held in the shells themselves ^[14]. However, this is a single, short, laboratory-scale study that hasn't been confirmed in the field and has since been formally challenged by other scientists, so the idea that oyster farming actively removes atmospheric carbon remains unproven and is not yet widely accepted.

In short, oyster shell is a store of carbon but claiming it as a carbon sink would be premature until the science settles. This is exactly why the NSW industry's carbon footprint estimate ^[5] deliberately leaves shell carbon out of its headline figure.

5. Responsible by Design

Around 99% of NSW oyster production comes from either native Sydney rock oysters or non-breeding (triploid) Pacific oysters. By relying on native and sterile stock, the industry keeps the risk of introducing invasive species and disrupting estuarine ecosystems extremely low.

The industry also operates well within environmental limits. Annual production of around 2,900 tonnes is significantly below the estimated 7,500 tonnes that NSW estuaries could sustainably support, according to NSW Government assessments ^[15]. This provides scope for the industry to grow, and deliver even greater environmental benefits, without placing undue pressure on estuarine systems.

Oyster growers also have a strong incentive to be good environmental stewards. Their businesses depend on clean, healthy waterways, with oyster health, productivity and market access all directly linked to the condition of the estuaries in which they operate.

The Bottom Line

Collectively, the evidence indicates that NSW oyster aquaculture extracts nitrogen and phosphorus and improves water quality; provides persistent, year-round structured habitat supporting fish and mobile invertebrate communities at densities comparable to natural biogenic habitats; can help protect the shoreline from wind-waves and boat wash; may reduce waterborne disease transmission to associated fauna; and produces a native seafood at one of the lowest greenhouse-gas intensities of any farmed protein.

Critically, these benefits are complementary rather than competing. A native, unfed, low-density, filter-feeding species cultured below estuarine carrying capacity delivers water-quality, habitat and climate co-benefits simultaneously; a strong basis for recognising NSW oyster aquaculture as restorative, not merely sustainable.

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Photo credit: Australia's Oyster Coast



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