

REBUILDING AUSTRALIA'S LOST SHELLFISH REEF ECOSYSTEMS

CREATING CLEANER OCEANS, SAFER COASTLINES, MORE
FISH AND JOBS FOR METRO AND REGIONAL AUSTRALIA



The Nature Conservancy's (TNC's) shellfish reef building program is Australia's largest marine habitat restoration initiative. It aims to rebuild 60 shellfish reef ecosystems across Australia by 2030. This will see 30% of this lost habitat restored, bringing back an entire ecosystem from the brink of extinction and bolstering the resilience of our bays and estuaries for people and nature.

Remnant intertidal shellfish reefs, Hunter River, NSW @ Kirk Dahle, The Nature Conservancy.



We're well on our way to achieving that target, making Australia the first nation to recover a critically endangered marine ecosystem. We've restored reefs at 23 locations from Perth to Noosa and are now looking at our next phase of work to achieve our 2030 target. With your support, we can bring these ecosystems back and return nature's benefits to coastal communities, for generations to come.

SHELLFISH REEF ECOSYSTEMS

Shellfish reefs are natural solutions to some of our greatest conservation challenges. They have vast water filtering capacity, boost fish stocks, provide homes for abundant sea life and safeguard Australia's coastal communities and shorelines from erosion.

They also work in tandem with other coastal habitats, such as seagrass beds and kelp, generating vital ecological connections that strengthen natural coastal resilience.

Shellfish reefs are created when millions of oysters and mussels settle onto each other forming hard reef structures or beds in Australia's bays and estuaries. These vibrant reefs function just like their more colourful cousins, coral reefs, providing food and habitat for fish and other marine life.

Australia's southern coastlines once teemed with oyster and mussel reefs that covered huge areas across the intertidal and subtidal zones. Since the 1800s, these reefs have been largely decimated by overharvesting, sedimentation, water pollution and disease¹.

TODAY,
LESS THAN

10%



OF AUSTRALIA'S
NATURAL SHELLFISH
REEFS REMAIN

making them a critically endangered ecosystem¹.

Loss of these habitats has contributed to widespread decline in our coastal and estuarine water quality, fish stocks and biodiversity. Coastal communities are also exposed to greater risks through shoreline erosion and loss of livelihoods, lifestyle and connection to the coast.

Yet, scientific research and evidence shows that restoring these ecosystems at impactful scales is achievable, and within reach over the next decade².

TNC'S GOAL IS TO RESTORE

30% OF LOST SHELLFISH
REEF HABITAT

across 60 locations nationally and return them from the brink of extinction by 2030.



IN THIS UNITED NATIONS DECADE ON ECOSYSTEM RESTORATION (2021-2030), RALLYING FOR THE URGENT PREVENTION AND REVERSAL OF ECOSYSTEM DECLINE GLOBALLY,

there has never been a better time to make this goal a reality.



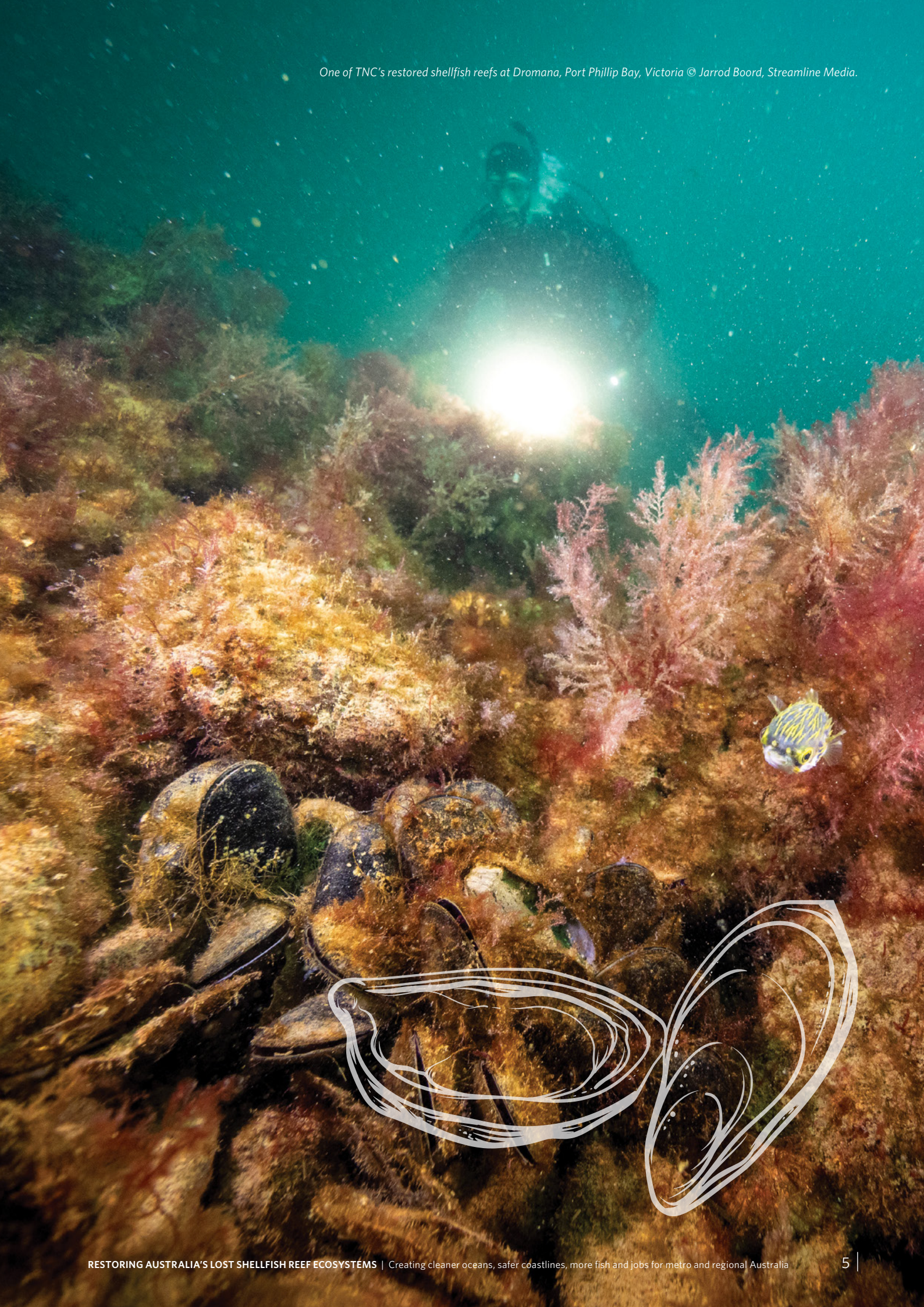
In line with UN Sustainable Development Goal 14 (Life Below Water) and Target 14.2, our shellfish reef restoration strives for gold standard ecological restoration for southern Australia's coastlines^{3,4}.

1 Gillies, C.L., McLeod, I.M., Alleway, H.K., Cook, P., Crawford, C., Creighton, D., Diggles, B., Ford, J., Hamer, P., Heller-Wagner, G., Lebrault, E., Le Port, A., Russell, K., Sheaves, W., Warnock, B. (2018). Australian shellfish ecosystems: Past distribution, current status and future direction. PLoS ONE 13(2): e0190914. <https://doi.org/10.1371/journal.pone.0190914>

2 Duarte, C.M., Agusti, S., Barbier, E., Britten, G.L., Castilla, J. C., Gattuso, J.P., et al. (2020). Rebuilding marine life. Nature 580 (7801), 39-51. doi: 10.1038/s41586-020-2146-7

3 Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, J.G., Eisenberg, C., Guariguata M.R., Liu J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decler, K., Dixon, K.W. (2019). International Principles and Standards for the Practice of Ecological Restoration. Second edition. Society for Ecological Restoration, Wiley Periodicals, Inc.

4 Fitzsimons, J., Branigan, S., Brumbaugh, R., McDonald, T., zu Ermgassen, P. (Eds.). (2019). Restoration Guidelines for Shellfish Reefs. The Nature Conservancy, Arlington VA, USA.





TO DATE, WE HAVE LED THE RESTORATION OF

62 ha

OF SHELLFISH REEFS AT **23 LOCATIONS** ACROSS SOUTHERN AUSTRALIA

SINCE 2021, THE **REEF BUILDER** PROGRAM HAS ALSO GENERATED



457 DIRECT JOBS,

EMPLOYED



81 LOCAL SMALL-TO-MEDIUM ENTERPRISES, AND



ENGAGED

277 VOLUNTEERS

2015

Port Phillip Bay, VIC:
experimental reef trial

2017

Port Phillip Bay, VIC: < 1 ha
Windara Reef, SA: 4 ha

2018

Port Phillip Bay, VIC: 2 ha
Windara Reef, SA: 16 ha

OUR JOURNEY TOWARDS RESTORATION

What we've achieved so far

Pilot reefs to national-scale restoration

In 2014, TNC began an Australian-first program to restore shellfish reefs where people need them most - the densely populated bays and estuaries across southern Australia. Starting with pilot-scale trial reefs (less than 1 hectare in size) in Victoria, we then spread to new locations in South Australia and Western Australia, adapting our methods to suit local conditions and progressing to multi-hectare reef arrays up to 20 ha in size. We also built diverse partnerships across government, industry, academia and community that underpin restoration success.

Following seven years of learning and building on success, we launched the first national shellfish reef restoration initiative, *Reef Builder* (2021-2023), in partnership with the Australian Government and local groups.

This \$20 million program has allowed us to take bold steps towards our national target, supporting the restoration of shellfish reefs from Perth, WA, to Noosa, QLD.

Our next phase of restoration

From 2024 to 2030, our focus is set not only on (i) restoring shellfish reefs at 60 locations nationally and rerouting their trajectory from extinction to recovery, but also on (ii) building the capacity of partner organisations to help achieve this target, and (iii) expanding the portfolio of nature's benefits by co-restoring shellfish reefs with other foundation habitats across the coastal interface.

Restoring 60 reefs

Building on the momentum of the 23 locations restored to date, potential sites for the remaining 37 reef locations have now been scoped (see map on p8-9). These indicative areas will be further refined with key partners to prioritise restoration impact and success.

Shellfish reef restoration under construction in Wagonga Inlet NSW. @ KirkDahle/TNC.

2019

Oyster Harbour, WA:
< 1 ha

2020

Port Phillip Bay, VIC: 3.5 ha
Glenelg, SA: 2 ha

2021

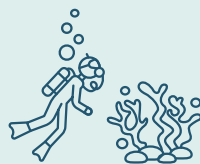
Reef Builder commences

2023

62 ha reef at
23 locations nationally

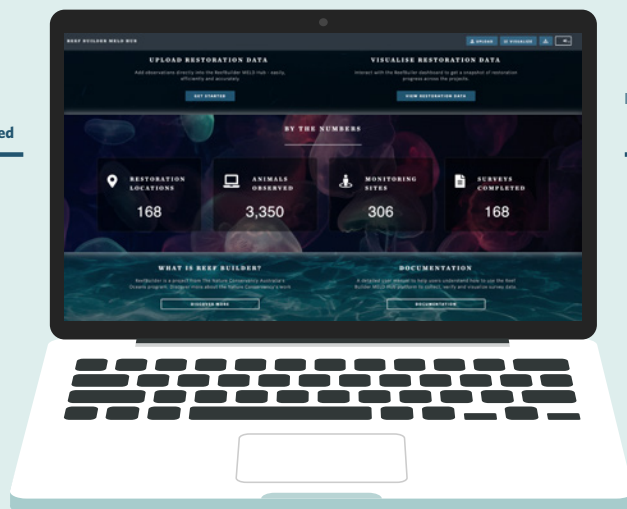
Monitoring, Evaluation and Learning Data Hub

Developed as a foundational part of Reef Builder, the Monitoring, Evaluation and Learning Data Hub (MELD Hub) is a world-leading online platform for collating, visualising and reporting restoration monitoring data. The MELD Hub collates information collected by divers and citizen scientists to understand how restored reefs are improving habitat for fish, marine invertebrates and species targeted for restoration. Users can then access this information to visualise how restored reefs are performing through time, through curated dashboards, images and video. It empowers TNC and partners to make informed decisions on future restoration actions and share stories of impact and success.



Information collected by divers

Information reported & collated



Information visualised through dashboards, images and video



Restoration monitoring data accessed by user to understand how restored reefs are improving habitats and performing through time

Rebuilding and protecting shellfish reefs at 60 locations across Australia will:

RESTORE

300 ha

OF REEF HABITAT, OR **30%**
OF WHAT HAS BEEN LOST



PRODUCE

100,000 kg

OF FISH **EACH YEAR**



● Current locations ● Potential locations



THERE IS ALSO POTENTIAL TO **RESTORE** SHELLFISH REEFS AT OTHER LOCATIONS IN **NORTHERN AUSTRALIA**, BUT FURTHER SURVEY WORK IS REQUIRED



FILTER

600 Billion

LITRES OF SEAWATER **EACH YEAR**,
EQUIVALENT TO THE WASTE WATER
GENERATED BY 6.3 MILLION AUSTRALIANS



REMOVE

67,500 kg

OF NUTRIENT POLLUTION
EACH YEAR



PRODUCE

2,700 direct jobs

IN MARITIME CONSTRUCTION,
AQUACULTURE AND SCIENCE AND PRODUCE
ONGOING ECONOMIC BENEFITS FOR FISHING
AND ECOTOURISM INDUSTRIES



Mussel farm @ shutterstock



COASTAL PROTECTION

Buffering shores and infrastructure from erosion and flooding



CARBON SEQUESTRATION

From blue-carbon storing habitats such as mangroves, saltmarsh and seagrass



WATER QUALITY IMPROVEMENTS

From the filtration power of shellfish reefs and nutrient cycling capacity of reefs and plants



FISH PRODUCTIVITY

From nursery and resident habitats across the coastal interface



COMMERCIAL AND RECREATIONAL OPPORTUNITIES

Fishing, diving, wildlife watching



CULTURAL AND SOCIAL

Connection to place

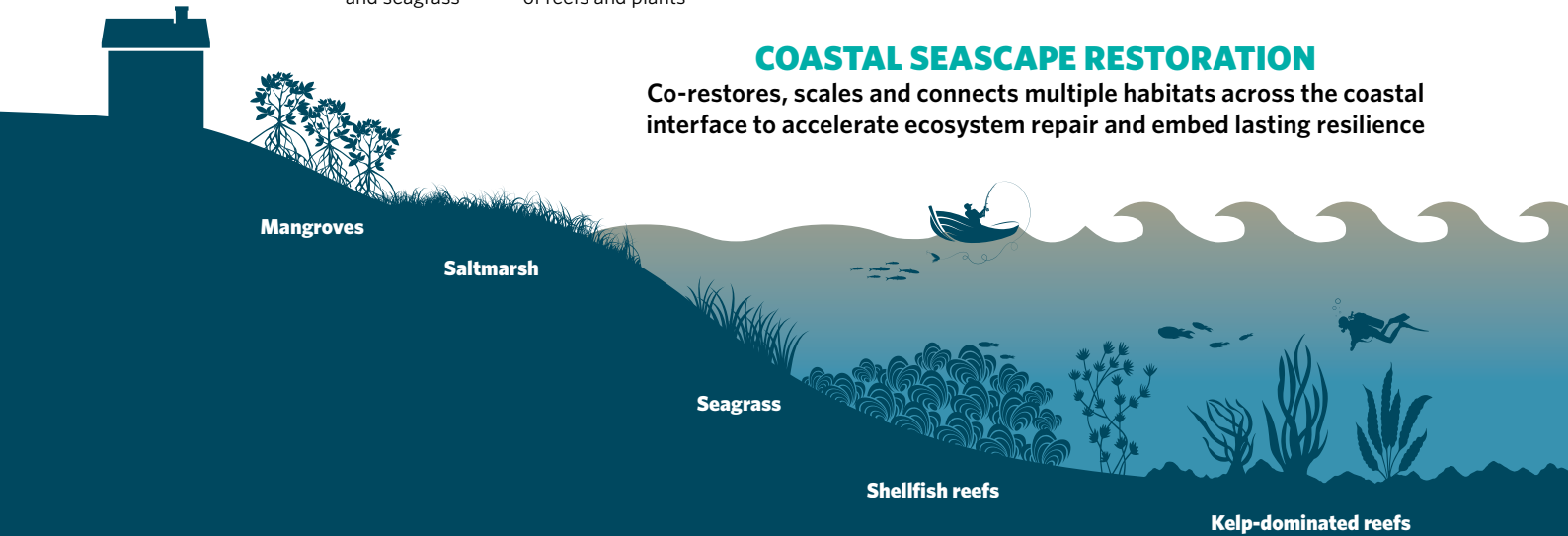


ENHANCED BIODIVERSITY

From complex and interconnected habitats

COASTAL SEASCAPE RESTORATION

Co-restores, scales and connects multiple habitats across the coastal interface to accelerate ecosystem repair and embed lasting resilience



Accelerating nature's benefits

Our next phase of reef building work will also prioritise opportunities to co-restore other coastal habitats, including kelp, seagrass, saltmarsh and mangroves. While shellfish reefs alone produce a raft of ecosystem benefits for people and nature, these benefits vastly amplify when shellfish reefs interact with other foundation habitats across the coastal interface^{5,6,7,8}. This more integrated, 'seascape' approach to restoration accelerates ecosystem repair, leading to far more resilient coastlines that can better sustain environmental impacts, adapt to change and produce more benefits for coastal communities. When inclusive of blue-carbon storing habitats such as mangroves, saltmarsh and seagrass, these benefits also extend to mitigating further climate change.

Building local capacity

Local partner and community support is a major pillar of our restoration success. We're indebted to these contributions, from sharing deep knowledge and experience, to volunteering thousands of hours to support reef building and 'shellfish gardening', to backing and growing our *Shuck don't Chuck* shell recycling program. Some examples of our partnerships include:

- Noongar Rangers and local schools in the Peel Harvey Estuary, WA, in one of our Shellfish Gardening projects natureaustralia.org.au/peelharvey
- B-Alternative and Greater Melbourne restaurants collecting shells for our *Shuck Don't Chuck* shell recycling projects natureaustralia.org.au/shellrecycling
- Bribie Island Research Facility in Queensland, growing millions of Sydney Rock Oysters to seed our Noosa River shellfish reefs natureaustralia.org.au/noosa

We are committed to continuing to build local partnerships and capacity in reef restoration across Australia through co-design of new reefs, two-way knowledge and skills transfer, expanding volunteer opportunities, and sharing practical know-how for leading major reef construction projects.

5 Amend to: Thomsen, M.S., Altieri, A.H., Angelini, C., Bishop, M.J., Bulleri, F., Farhan, R., Frühling, V.M.M., Gribben, P.E., Harrison, S.B., He, Q., Klinghardt, M., Langeneck, J., Lanham, B.S., Mondardini, L., Mulders, Y., Oleksyn, S., Ramus, A.P., Schiel, D.R., Schneider, T., Siciliano, A., Siciliano, B.R., Smale, D.A., South, P.M., Wernberg, T., Zhang, S., Zott, G. (2022). Heterogeneity within and among co-occurring foundation species increases biodiversity. *Nat. Commun.* 13, 1-9. doi:10.1038/s41467-022-28194-y

6 Silliman, B.R., Schrack, E., He, Q., Cope, R., Santoni, A., Van Der Heide, T., Jacobi, R., Jacobi, M., van de Koppel, J. (2015). Facilitation shifts paradigms and can amplify coastal restoration efforts. *Proc. Natl. Acad. Sci. U.S.A.* 112, 14295-14300. doi:10.1073/pnas.151529711

7 Reeves, S.E., Renzi, J.J., Fobert, E.K., Silliman, B.R., Hancock, B., Gillies, C.L. (2020). Facilitating Better Outcomes: How Positive Species Interactions Can Improve Oyster Reef Restoration. *Front. Mar. Sci.* 7:656. doi:10.3389/fmars.2020.00656

8 McAfee D., Reis-Santos P., Jones A.R., Gillanders B.M., Mellin C., Nagelkerken I., Nursey-Bray M.J., Baring R., da Silva G.M., Tanner J.E., Connell S.D. (2022). Multi-habitat seascape restoration: optimising marine restoration for coastal repair and social benefit. *Front. Mar. Sci.* 9:910467. doi:10.3389/fmars.2022.910467



Shellebration, Noosa © Klaus



JOIN US

To find out more and get involved in The Nature Conservancy's *Rebuilding Australia's Lost Shellfish Reef* initiative, visit natureaustralia.org.au/reefbuilder

The Nature Conservancy was founded in 1951 and now works in **76 countries** with a staff of nearly **4,000 people**, including over **400 scientists**.

TNC Australia was formed in 2002, collaborating with partners including local communities, governments, Indigenous groups, businesses and other conservation organisations.

TNC Australia has supported conservation efforts across more than 126 million hectares. Our focus is to address the most pressing conservation threats at the largest scale through our scientific and collaborative approach.

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