Department of Primary Industries
Department of Regional NSW

Blue Carbon Demonstration at Duck Creek Farm

Summary

- Landholders on the lowest part of the coastal floodplain may be able to diversify their income through the first Blue Carbon Method approved by the Australian Government's Clean Energy Regulator in 2022.
- Registered and approved projects that follow this method to return tidal flows and restore blue carbon ecosystems may generate Australian Carbon Credit Units (ACCUs).
- All blue carbon projects provide opportunities to incorporate traditional ecological knowledge. Co-designing projects with local Aboriginal land managers and communities is important to deliver cultural values.
- The NSW Blue Carbon Strategy 2022-2027 aims to support those initiating blue carbon projects in NSW and increase participation in the emerging blue carbon market. This will help NSW move towards the state's net zero goal.
- The Blue Carbon Demonstration project at Duck Creek is a useful living case study for landholders and other interested stakeholders.
- The Duck Creek project will be registered under the Australian Government ACCU Scheme. The project will demonstrate one way blue carbon can generate income and form part of an enterprise mix that builds resilience to climate change for floodplain properties.

Where is the project taking place?

Duck Creek Research Station

Duck Creek Research Station is a 192 ha experimental farm located on the Richmond River coastal floodplain near Ballina, NSW. The site was chosen for an experimental farm in 1894 because the property was typical of most farms on the NSW coastal floodplains.

The site is predominantly covered by pasture grasses and is used for cattle grazing, feed production and DPI's Southern Multi Breed cattle genomics project.

Levees, bunds and floodgated drains were installed throughout the site over the last century to drain freshwater and block tidal flows. This was done because most of the property has a ground surface level below the elevation reached by the highest tides.

The extensive hydrological modification over the past century enabled the land to be converted from its prior natural state of intertidal wetland to its current use as dry land agriculture. Climate change and sea level rise is reducing the effectiveness of drainage and increasing the risk to traditional farming enterprises in the lowest parts of the coastal floodplain.

The Blue Carbon Demonstration at Duck Creek Farm is occurring on a 13 ha peninsular paddock, known as the Point Paddock. The paddock was isolated from tidal flows when a farm levee surrounding the paddock was installed in the 1950s and 1960s.

Figure 1. Comparison of the Point Paddock at the Duck Creek Experimental Farm in 1942 and 2020 illustrating the change in vegetation and land use due to the farm levee precluding tidal flows from the site. The farm levee surrounding the Point Paddock is highlighted in red. Source Crown Lands (left image) SixMaps (right image).

Figure 2. The 13 ha Point Paddock, Blue Carbon Demonstration site. (photographer: Daniel Cohen Photography).

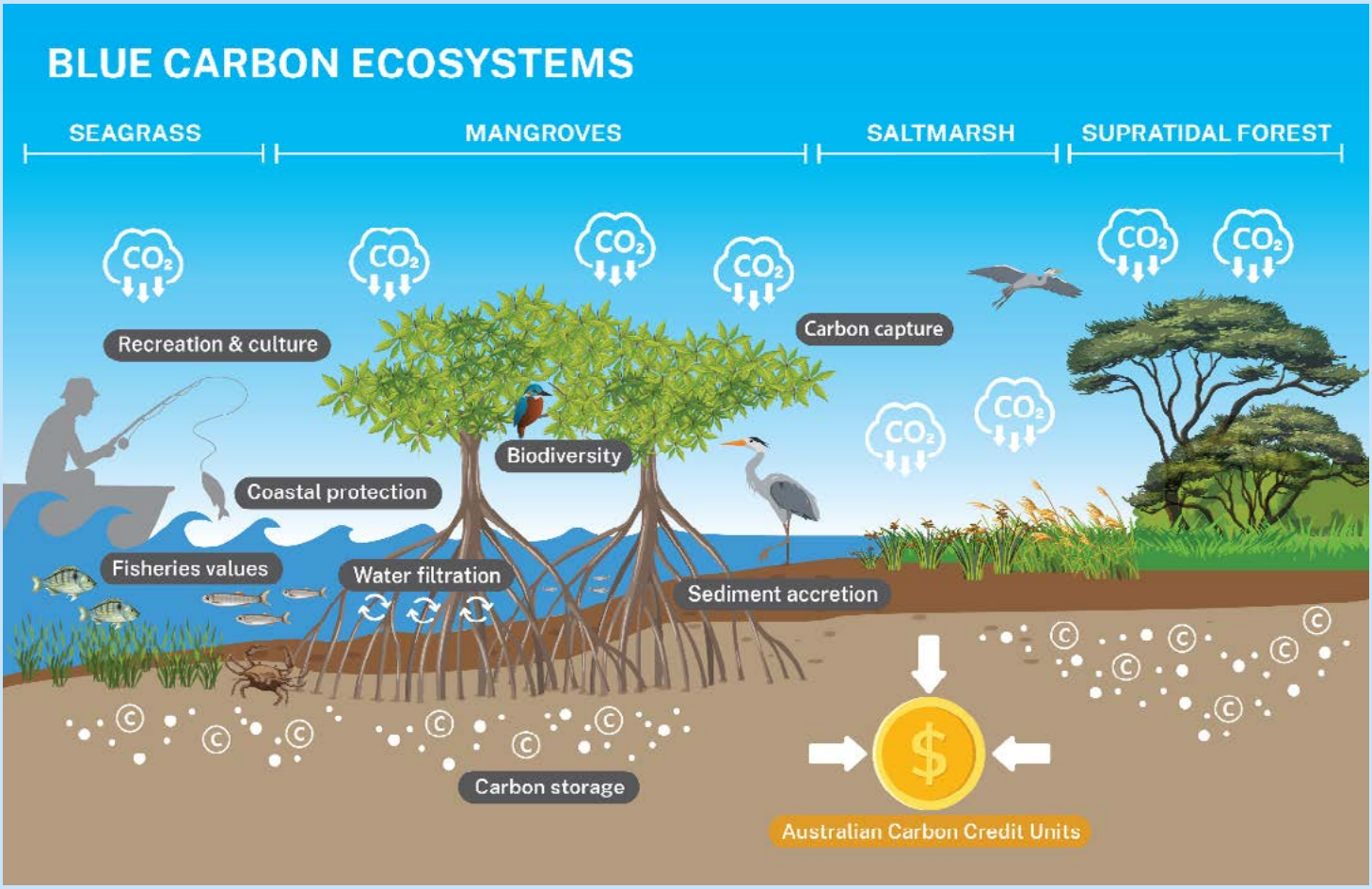

Figure 3. The environmental, social, cultural and economic services intertidal blue carbon systems provide.

What will the project involve?

The project will first need to be registered with the Australian Carbon Credit Unit Scheme under the Tidal Restoration of Blue Carbon Ecosystems method. The core part of the project, removing the perimeter farm levee, can then commence. This will allow the tide to return, and inundation of the paddock will result in natural regeneration of mangrove and saltmarsh (blue carbon ecosystems) over time.

No planting of mangroves or saltmarsh will be undertaken because of the abundance of mangrove propagules that are available in the Richmond River estuary and immediately surrounding the Point Paddock.

Carbon storage will be monitored by sampling and comparing the amount of carbon stored in the soil via soil cores prior to restoration, and at several intervals post restoration.

A boardwalk will be constructed to facilitate access to the site as the blue carbon system re-establishes. This will aid researchers to undertake monitoring and allow stakeholders to visit the site, experience its transformation and learn about blue carbon.

Monitoring Co-benefits

In addition to carbon capture and storage, blue carbon projects can provide a range of other environmental and social services. Many of these co-benefits will be monitored and reported on as part of the demonstration project.

Fisheries value

Mangroves and saltmarshes are well known as key fish habitat and nursery grounds as the plants' structure provides shelter from larger fish and other predators. The organic matter from these plants is an important food source for many smaller species such as worms, shrimp and crabs that live on and within the sea floor. These animals are in turn food for fish.

Researchers investigating the value of mangrove and saltmarsh systems in the Richmond estuary determined that these plants, and the tiny animals that graze on their organic matter, were the dominant nutritional input for many fish species important for fishers (Janes et al 2021).

How will it be monitored?

- Fish Sampling
- Benthic Invertebrate Sampling

Foreshore protection (sediment accretion)

Mangroves and saltmarshes act as a buffer between the land and sea. They absorb wind and wave energy, and their organic matter accumulates in the soil, building up the ground surface elevation protecting the land from erosion and extreme weather. When the levee is first removed, however, some initial lowering of the ground surface is anticipated until mangrove and saltmarsh systems establish.

How will it be monitored?

Light Detection & Ranging (LiDAR) remote sensing will determine changes in ground surface across the site.

Rod Surface Elevation Tables (RSETs) will precisely measure tiny changes in surface elevation following removal of the levee. Control RSETs will also be installed in other parts of the property to best understand the changes from returning tidal flows.

Water quality

Mangroves and saltmarshes can improve water quality by trapping sediments and pollutants, and filtering nutrients. Also, the re-introduction of estuarine waters neutralises acid sulfate soils and can reduce acidic discharges.

How will it be monitored?

Several Conductivity Temperature Depth (CTD) water loggers will be stationed on site capturing continuous data. Water flows from the site will be periodically monitored for pH which measures the acidity of the water.

Biodiversity

Mangroves and saltmarshes provide habitat and feeding grounds for birds and other native animals. Removal of livestock from the Point Paddock improves habitat opportunities for native animals.

How will it be monitored?

Two monitoring cameras will be stationed at the site providing 24/7 monitoring. The cameras provide 180 degree panoramic and thermal vision, which will assist to capture the presence and activity of wildlife. They will also enable remote checking that livestock have not encroached on the site.

Cultural values

All blue carbon projects provide opportunities to engage with Traditional knowledge holders and to work together to care for Country.

The Blue Carbon Demonstration at Duck Creek Farm has been designed in collaboration with the Jali Local Aboriginal Land Council.

The project seeks to develop community capacity, build transferable skills, increase opportunities for communities to access the site and share cultural practice. The project recognises and respects cultural knowledge and cultural lore.

Wider relevance

The Duck Creek Research Station was gazetted as an experimental farm in 1894 because the property had landscapes typical of most other farms on the NSW coastal floodplains.

Throughout the 20th century, major drainage works occurred at the Duck Creek Research Station and across large areas of the NSW coastal floodplains to allow for agricultural production to take place on land that was previously intertidal and coastal floodplain wetland.

Over the coming century the impacts of climate change, particularly sea level rise, will increase the level of financial risk of undertaking traditional farming enterprise mixes on the lowest parts of the coastal floodplain.

At Duck Creek the income from grazing The Point Paddock is expected to drop from $1,232/ha/yr in 2020 to $216/ha/yr in 2050 (McGrath 2023).

The most low-lying parts of the coastal floodplains are already experiencing impacts with drainage systems becoming less efficient as floodgate outlets are fully or partially submerged for longer and longer periods (Rayner et al 2023). Drainage is best achieved when floodgate outlets are not blocked by tidal waters.

Blue Carbon may offer an additional alternate income opportunity that is more resilient to impacts of flooding and sea level rise.

The Blue Carbon Demonstration site at Duck Creek and the investigations undertaken as part of this project provides a living case study for landholders and land managers across NSW coastal floodplains to learn from.

The boardwalk also provides a great opportunity for landholders and managers to see how their land would transform into a blue carbon system.

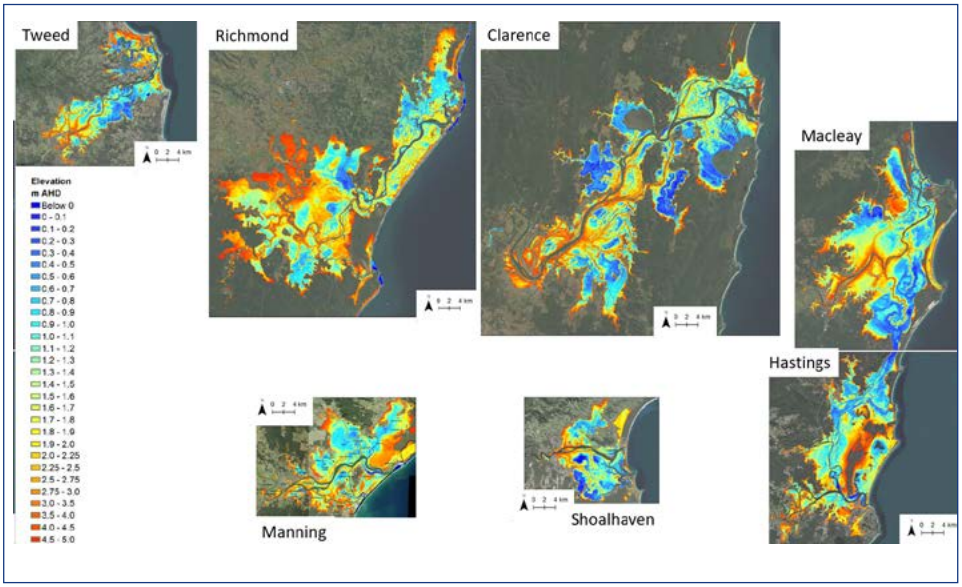

Figure 4. LiDAR images of seven large NSW coastal floodplains. The dark blue indicates areas at or below mean sea level and the same scale for all maps shows the extent of the various floodplains. Source: MEMS Coastal Floodplain Prioritisation Study.

References

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