VIC CATCHMENTS

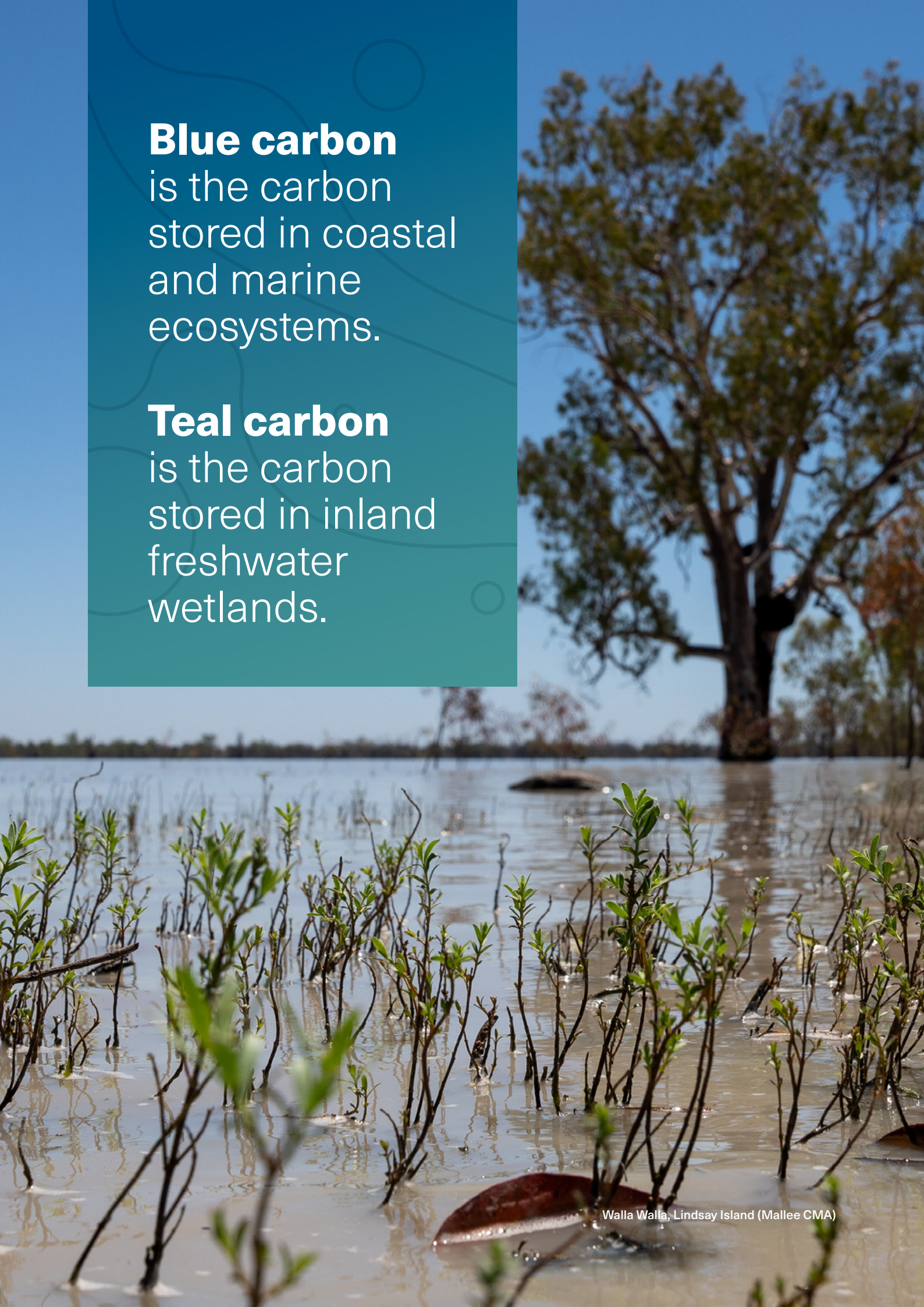
A Collaboration of CMAs

Blue and Teal Carbon Investment Opportunities in Victoria

Working with Victorian Catchment Management Authorities to protect and restore blue and teal carbon

Blue carbon is the carbon stored in coastal and marine ecosystems.

Teal carbon is the carbon stored in inland freshwater wetlands.



Walla Walla, Lindsay Island (Mallee CMA)

Blue and teal carbon in Victoria

Victoria's blue and teal carbon ecosystems are important places for carbon sequestration, biodiversity and ecosystem services. These ecosystems can offer potential benefits for organisations and governments seeking to offset carbon emissions, biodiversity certificates or achieve Environmental, Social and Governance (ESG) goals.

Restoration of these ecosystems provides protection from coastal storm surges and inland flooding and helps to mitigate erosion. They provide habitat for a range of mature and juvenile marine, estuarine and freshwater species including migratory bird and commercially important fish species and contribute towards water quality and nutrient cycling.

These ecosystems are also highly valued for recreation and tourism. Organisations, landholders and the community seeking to reduce their carbon footprint can participate in carbon and biodiversity markets to help restore blue and teal ecosystems.

For more than 25 years Victoria's Catchment Management Authorities (CMAs) have been the key natural resource management bodies in Victoria with a proven record of delivering quality restoration projects. CMAs are in a unique place to deliver restoration projects whilst working with local communities, Traditional Owners, landholders and researchers.

Victoria's CMAs are looking to partner with investors for protection, restoration and research projects in blue and teal carbon ecosystems. This document is a concise overview of critical issues and opportunities to partner with CMAs in blue and teal carbon ecosystem protection and restoration. Pursuing these opportunities will increase the confidence of entities who stand to benefit from the existing and expanding carbon market and the emerging biodiversity market.

Tchum Lake (Mallee CMA)

Corner Inlet (West Gippsland CMA)

Blue carbon

Blue carbon ecosystems include seagrass, saltmarsh and mangrove ecosystems. They can sequester carbon 30 – 50 times faster than terrestrial forests with most carbon stored below ground in the soil, sediments and detritus. Australia is estimated to hold 5 – 11% of global blue carbon stocks with Victoria having approximately 42,800 ha of seagrasses, 13,200 ha of saltmarshes and 2,300ha of mangroves. The Victorian government has mapped the location and condition of blue carbon ecosystems in Victoria. For details see Mapping Blue Carbon and CoastKit Victoria.

The mapping was conducted in collaboration with Deakin University's Blue Carbon Lab. This partnership enabled the Victorian government to assess ecosystem condition, identify areas for potential restoration and estimate ecosystem services made available through restoration.

Teal carbon

Teal carbon is the carbon stored in freshwater wetland plants, microbial biomass and in particulate and dissolved organic carbon. Freshwater wetlands that sequester carbon extend over approximately 530,000 ha in Victoria and vary in potential carbon stocks and sequestration rates based on wetland type. Based on a statewide wetland inventory for teal carbon, the existing carbon stocks were assessed and estimated at a value of approximately $3 billion (Carnell et al., 2018)[1].

The capability of freshwater wetlands to store or emit greenhouse gases can change with wetting and drying cycles, however deep understanding of these processes in different types of wetlands does not exist and is in a much earlier phase than blue carbon. Several Victorian freshwater wetlands are managed to receive water (environmental water) for ecological benefit. They provide excellent baseline information on wetting and drying cycles and consequent ecological change. Measuring greenhouse gas emissions or sequestration at these sites provides an opportunity to understand and improve the management of freshwater wetlands for carbon benefits using altered hydrological regimes.

Farm dams are traditionally considered a source of methane and other greenhouse gases due to run off from fertilisers and manure. Research indicates fencing farm dams to exclude livestock may minimise greenhouse gas emissions and improve water quality (Malerba et al., 2022)[2]. The exclusion of livestock also improves soil and vegetation condition and cover around the dam, which may assist with minimising emissions and reducing evaporation. Management options for farm dams could be further investigated to help reduce emissions and assist landholder participation in emerging carbon and biodiversity markets through emissions reduction mechanisms.

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1 *Carnell, P. E., Windecker, S. M., Brenker, M., Baldock, J., Masque, P., Brunt, K., & Macreadie, P. I. (2018). Carbon stocks, sequestration, and emissions of wetlands in south eastern Australia.*

2 *Malerba, M. E., Friess, D. A., Peacock, M., Grinham, A., Taillardat, P., Rosentreter, J. A., Webb, J., Iram, N., Al-Haj, A. N., & Macreadie, P. I. (2022). Methane and nitrous oxide emissions complicate the climate benefits of teal and blue carbon wetlands.*

Catfish Lagoon, (Mallee CMA)

Gaynor Swamp (Goulburn Broken CMA)

Restoration activities for blue and teal carbon ecosystems

The optimal and most immediate way to manage carbon emissions and nature repair is by protecting existing blue and teal carbon ecosystems. Restoration actions can also provide opportunities for climate change mitigation and adaptation.

These may include:

- Re-establishment of saltmarsh and mangroves for coastal protection
- Establishment of vegetation structure and connectivity to support blue and teal carbon environments
- Removal of pest species that impact plant growth and ecosystem function (e.g. carp)
- Conservation covenants on private land
- Livestock exclusion and alternate watering works
- Hydrological restoration
- Removing seawalls and levees to restore tidal inundation.

Researchers at Deakin University's Blue Carbon Lab are currently trialling the use of degradable structures along coastlines to slow water, drop out sediment and encourage soil accumulation. Some freshwater wetlands are currently monitored for ecological change in response to wetting and drying cycles and will assist with understanding carbon sequestration options.

Saltmarsh in Swan Bay (Corangamite CMA)

Opportunities for investment with Victorian CMAs in blue and teal carbon ecosystems

A range of opportunities exist for investors to partner with Victorian CMAs in the restoration of blue and teal carbon ecosystems and the development of carbon accounting methods. Established for over 25 years, the ten Victorian CMAs (including Melbourne Water) are resourced with staff well-known in local communities. CMA staff provide scientific input, coordinate key partners and help plan, manage and deliver a range of natural resource activities in collaboration with Traditional Owner groups, local communities and other partners. Victorian CMAs implement and lead programs focused on restoring coastal saltmarsh, mangroves, seagrass and freshwater wetland ecosystems. For example, West Gippsland CMA has worked with private landholders and the Trust for Nature for more than ten years to control weeds and protect and enhance the saltmarshes of Corner Inlet.

North Central CMA worked with Deakin University, expert ecologists and a landholder to reconstruct a wetland (Wirra-Lo) in the lower Lodden catchment on land previously farmed. The ongoing restoration of this site involves reinstating vegetation and water for biodiversity benefit. This site has also been monitored for greenhouse gas emissions.

Future blue and teal carbon ecosystem restoration has the potential to assist Victoria and Australia in managing greenhouse gas emissions, reach net zero targets, provide benefits for Traditional Owner groups and simultaneously achieve social, recreational and economic benefits. Potential opportunities for investment with CMAs are detailed below, however are not limited to this list.

Blue Carbon	Teal Carbon
Establish demonstration sites to test restoration methods and carbon accounting methods and costs.	Improve the understanding of teal carbon processes through researching the carbon sequestration potential of different freshwater wetland types in response to artificial wetting and drying.
Undertake local scale mapping of blue carbon areas for restoration activities.	Research the impacts of different management practices (e.g. livestock exclusion vs crash grazing) on freshwater wetlands and farm dams and associated carbon sequestration potential.
Improve understanding of restoration methods and sequestration. Contribute to the development of additional blue carbon methods to generate carbon credits.	Contribute to development of a method to account for co-benefits from carbon management actions in freshwater wetlands.
Support the improvement of permitting and approvals in the coastal wetland space.	Contribute to development of teal carbon accounting methods.
Partner with Traditional Owner led protection and restoration of blue and teal carbon ecosystems.	
Understand the effects of climate change on blue and teal carbon ecosystems.	
Identify barriers to the uptake of blue and teal carbon restoration projects.	

Establishment of demonstration sites

CMAs can advance knowledge and carbon accounting methodologies by trialling different restoration methods in coastal and inland areas. Investors partnering with CMAs can support demonstration sites that restore ecosystems and improve understanding of the scientific and practical implementation issues and costs associated with managing these systems for carbon storage and/or sequestration. CMAs are highly experienced in developing and maintaining relationships with landholders to maximise opportunities for demonstration site selection and will work with investors to identify potential sites at coastal and freshwater locations.

Greenhouse gas analyser (North Central CMA)

Improve understanding of teal carbon processes

Improved knowledge of how freshwater wetlands and farm dams sequester carbon whilst minimising their greenhouse gas emissions (methane and nitrous oxide) is required to develop an agreed carbon accounting method under the Australian Carbon Credit Unit (ACCU) scheme.

Restoration actions such as livestock exclusion, continuous grazing or crash grazing may impact carbon storage and emissions and can potentially be researched for method development. Other restoration activities such as climate smart revegetation, removing stock and fencing wetlands are likely to increase carbon sequestration and simultaneously provide additional biodiversity and natural capital benefits in the biodiversity or carbon markets.

Improved understanding of the emission and sequestration rates of natural freshwater wetlands compared to constructed wetlands would also benefit from further research. Constructed wetlands may be present in urban developments or under management by water corporations. As Victorian water corporations look to reduce their greenhouse gas emissions there may be opportunity to use treated wastewater in freshwater wetlands for emissions reduction. Investors in this research can collaborate with Victorian water corporations and CMAs.

Mangroves and saltmarshes at Corner Inlet (West Gippsland CMA)

Melissa Wartman (Blue Carbon Lab)

Creating opportunity – **Case study**

Remove the Hooves

Deakin University's Blue Carbon Lab is working with Greening Australia and Traditional Owner groups to restore an area of coastal saltmarsh at part of the Gippsland Lakes near Lake Victoria, in eastern Victoria. The project received funding through BHP, community grants and not-for-profit organisations.

Restoration activities will initially focus on the removal of livestock and grazing pressure by fencing several paddocks. Once livestock is removed the site will be revegetated with saltmarsh and supratidal forest species. Ultimately, the full or partial removal of a bund and reintroduction of tidal flows may occur if hydrological assessments indicate this is a valuable restoration approach.

These actions will demonstrate activities at a Victorian site that contribute towards restoration methods for blue carbon ecosystems and potential accreditation with the ACCU scheme.

Further information on this case study can be found at Remove the Hooves: How fencing off a paddock to exclude sheep in the Gippsland Lakes will lead to blue carbon gains.

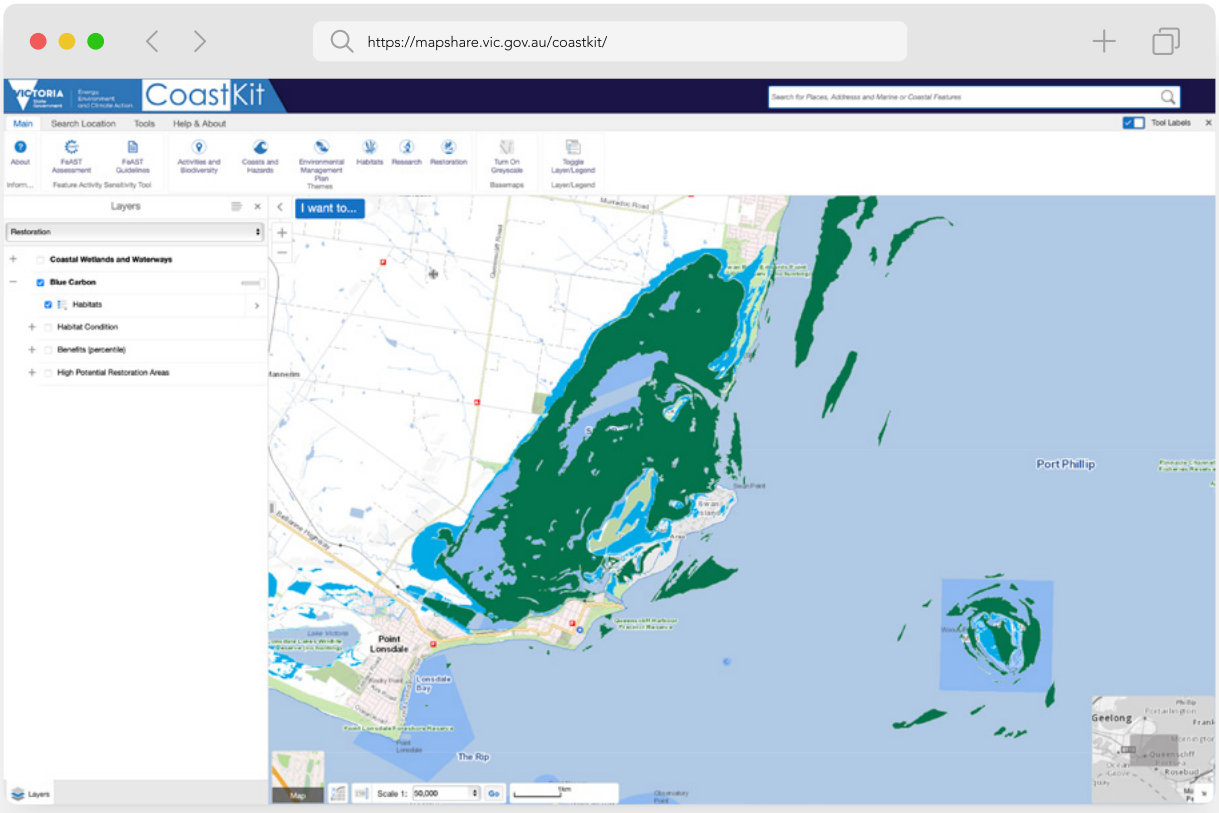
Conduct local mapping

The Victorian Government has mapped blue carbon habitats across the state. This mapping is at a broad scale. Mapping at a local scale would improve understanding of blue carbon habitat types and their species composition, assist to determine suitable physical features for protection, restoration and carbon abatement and identify the most appropriate restoration actions at each site.

The ability of each site to store or remove carbon depends on a range of biophysical factors such as temperature, hydrology, sediment type, geomorphology, topography and vegetation type. Continued advances in remote sensing techniques or satellite imagery and computer modelling may be appropriate to gather this information more efficiently in the future.

Freshwater wetlands have also been mapped throughout Victoria with wetland condition assessments based on the biological, hydrological and physical components of the wetland ecosystems. Improved understanding of the carbon stocks and the potential of different wetland types to sequester carbon will improve the mapping and prioritisation of wetlands based on their future ability to reduce greenhouse gas emissions.

Victorian wetland information can be accessed via the Victorian Wetland Inventory Edit tool developed by the Department of Energy, Environment and Climate Action (DEECA). This tool provides information about a site's dominant vegetation, water source and classification and shows all mapped wetlands within Victoria. Condition assessments of wetlands can be found at Victorian Wetland Inventory (Current) - Dataset - Victorian Government Data Directory.



Habitat mapping of blue carbon ecosystems by the Victorian Government available on CoastKit

Doctors Swamp (Goulburn Broken CMA)

Improved understanding of restoration methods and sequestration

There is currently only one approved blue carbon method which can generate carbon credits under the ACCU scheme BlueCAM – tidal barrier removal Tidal Restoration of Blue Carbon Ecosystems method. CMAs could support research to explore opportunities for method development in blue carbon ecosystem protection and restoration and the benefits of a blue carbon market. Deakin University's Blue Carbon Lab is currently evaluating stock exclusion as a viable method for inclusion in the carbon market. Other restoration methods may be approved for carbon credits. These may include restoration works that store carbon in soils, avoidance of erosion in blue carbon ecosystems and managed retreat and restoration of tidal inundation in areas where existing ecosystems are in a reasonable condition.

Understanding the effects of climate change on carbon ecosystems

The impacts of climate change and sea level rise need to be considered when developing management actions or carbon accounting methods for blue carbon ecosystems. Sea level rise has the potential to change the extent of these ecosystems e.g. coastal freshwater wetlands will be flooded more frequently and become more saline resulting in altered vegetation structure, composition and function. Victoria has information on projected sea level rise (CoastKit Victoria) and the costs and benefits of restoration activities, but predictions of projected spatial changes of coastal habitats is lacking. There is an opportunity to refine combined sea level and habitat change modelling and conduct vulnerability assessments.

Climate change will also impact teal carbon environments. Some freshwater wetlands may dry more often and for longer periods which may change the vegetation communities and the potential to store carbon. Increased research into climate change impacts on the hydrology of freshwater wetlands and the subsequent ecological response will improve understanding of the system's ability to store and sequester carbon in a changing climate.

Swan Bay saltmarsh (Corangamite CMA)

Creating opportunity – **Case study**

Swan Bay Corangamite CMA

Victorian coastal sites have been assessed for potential blue carbon ecosystem restoration. In conjunction with Deakin University and the Victorian government, Corangamite CMA used modelling and ground truthing to assess the restoration potential for existing saltmarshes at Swan Bay.

Options showed that by using two methods of management (grazing control and removal of bund walls) 83 hectares could be restored. Using models of future projections for sea level rise and land use change it was estimated an extra 480 hectares of saltmarsh could be restored by 2040 and another 84 hectares by 2070.

An increase in habitat protection and restoration will also benefit the critically endangered Orange-bellied Parrot. Many potential sites for restoration are on private land and initial contact with landholders suggest interest in rehabilitating these areas. Further investment will allow deeper engagement with landholders to progress options for restoration.

Details of this case study can be found in the Blue Carbon Lab report for Corangamite CMA by Carnell et al., (2002)[3].

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3 Carnell, P., Costa, M., Chipperfield, B., & Bursic, J. (2022). Opportunities for saltmarsh restoration & migration with sea level rise in Swan Bay, Victoria. A report submitted to Corangamite CMA. Deakin University, Australia.

Environmental water delivery at Sandilong Creek (Mallee CMA)

Identification of barriers to the uptake of ecosystem restoration

All projects implemented under the BlueCAM method must meet certain criteria including: the need to be a new project, the project is not likely to be carried out through another government scheme and the project is not required by law. Additionally, information required for project submission may need technical expertise such as hydrology assessments of flood impacts on adjacent land which may prove a barrier for managers and landholders to participate in the carbon market. Research has shown there can be land manager hesitancy to undertake blue carbon projects (Macreadie et al., 2022)[4].

An opportunity exists to increase uptake of blue carbon restoration by investing in research with CMAs to help understand perceived barriers and risks to landholders, managers and communities when implementing blue and teal carbon restoration activities.

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4 Macreadie, P. I., Robertson, A. I., Spinks, B., Adams, M. P., Atchison, J. M., Bell-James, J., Bryan, B. A., Chu, L., Filbee-Dexter, K., Drake, L., Duarte, C. M., Friess, D. A., Gonzalez, F., Grafton, R. Q., Helmstedt, K. J., Kaebernick, M., Kelleway, J., Kendrick, G. A., Kennedy, H., ... Rogers, K. (2022). Operationalizing marketable blue carbon.

Working with Traditional Owners

Collaboration with Traditional Owner groups in carbon offsetting projects is of high importance, as blue and teal carbon ecosystems often have cultural significance. CMAs and Traditional Owner groups share strong relationships and work together to manage freshwater wetlands, waterways and coastal regions. Consultation with each Traditional Owner group in Victoria occurs on an annual basis regarding water deliveries to freshwater waterways. CMAs use Aboriginal Waterway Assessments to provide baseline ecological and cultural data for the purpose of achieving multiple benefits from teal carbon restoration.

Throughout Victoria, CMAs have a fundamental role in planning, coordinating and managing land, water and biodiversity assets. CMAs share positive relationships with Traditional Owner groups and communities and with more than 25 years' experience in the natural resource management space, are well placed to partner with investors for protection, restoration and research projects in blue and teal carbon ecosystems.

Moodie Swamp (Goulburn Broken CMA)

For further information and contact details for CMAs visit

viccatchments.com.au

Saltmarsh in Westernport (Blue Carbon Lab)

Front cover: Restored freshwater wetlands near Kerang (Blue Carbon Lab)