



Day 5 (Site 1): Friday 6th October 2023

Long Swamp Restoration Project, Discovery Bay Coastal Park

1. Introduction to Discovery Bay wetlands

Discovery Bay, a vast stretch of mostly sandy coast that straddles the state border between Victoria and South Australia, is the place where the traditional lands of the Bunganditj and Gunditjmara meet. The Bay was given its European name by Thomas Mitchell after travelling down the Glenelg River in 1836.

The township of Nelson is situated at a key location within Discovery Bay. Not only does it mark the location where the Glenelg River meets the sea, but it is also the original confluence point for freshwater flows that used to enter the estuary, near the river mouth and from the coastal wetlands either side.

On the Victorian side, Eel Creek discharges into Oxbow Lake and is fed by rainfall and spring flows originating from as far as 15 km away at Lake Momboeng. On the South Australian side, high volume freshwater flows from Piccaninnie Ponds and the springs beyond (up to 12 km away), all converged into a single channel known as Freshwater Creek and permanently flowed into the river near its mouth.

Since European colonisation and development of the Discovery Bay coast, many changes have occurred, particularly to the way water flows. These changes have altered the character and condition of these waterways and the wetlands that feed them.



Discovery Bay wetlands from Green Point (1) to Lake Momboeng (3), intersected by the Glenelg River mouth (2) at Nelson, showing project sites at Pick Swamp (A), Piccaninnie Ponds (B) and Nobles Rocks in Long Swamp (C).

Thanks to strong local interest over the past 20 years and the crucial support of government agencies in both South Australia and Victoria, a number of projects have been initiated to improve water management and wetland condition in Discovery Bay.

This update for the *NGT Grand Tour of Ecological Restoration*, provides an overview of the project in Long Swamp, but more information on the wetland restoration works at Piccaninnie Ponds and Pick Swamp shown above is available upon request.

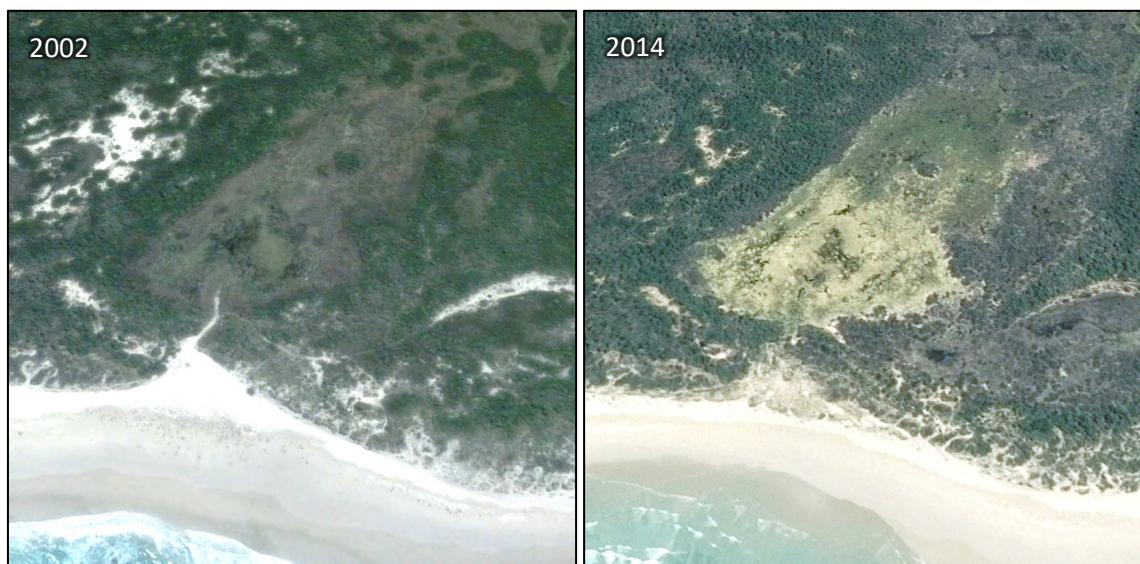
2. Explaining the Long Swamp Restoration Trial concept

Long Swamp is a 15 km long coastal freshwater wetland complex within Discovery Bay Coastal Park, located immediately behind the coastal dunes, east of Nelson, Victoria. The wetland system supports a diverse suite of nationally threatened species and was nominated under the Ramsar convention as a wetland of international importance in 2018.

Prior to this, and despite its size, reserved status and impressive biodiversity values, the local community in Nelson had expressed concern for many years about the impact that two artificial outlets to the ocean were having on wetland condition. The outlets were cut during an era when the swamp was grazed, many decades before being dedicated as a nature reserve by the Victorian Government in the 1970s.

While the wetland originally discharged into the ocean via Oxbow Lake and the Glenelg River mouth at Nelson, these changes to hydrology caused an interruption of flows, contributing to a long-term drying trend within the wetland complex. However, within publicly reserved land, native vegetation change and migration can rapidly mask the degree and extent of modification that has occurred or may be underway, unlike modified wetlands on cleared farmland. As a result of becoming drier, open water aquatic habitats are initially replaced by dense stands of reeds and sedges, and with sufficient drying can even transition to being invaded by encroaching shrubs. The wetland margin is invaded and sometimes totally displaced by true terrestrial (or dryland) species, such as coastal wattle and coast bearded heath, as all the communities move 'downslope' in response to the change. As a result of this gradual process, which accelerated after the exclusion of grazing, the site was the subject of a long-running community debate about water management.

In 2012, Nature Glenelg Trust became actively involved in Long Swamp, working closely with Parks Victoria, the Nelson Coast Care Group, and the Glenelg Hopkins CMA; initially to undertake a scientific review of the aquatic ecological values that might be impacted by the ecological shifts anecdotally observed to be underway. This early work identified that the more remote artificial outlet to the sea (White Sands) had in fact naturally closed c. 2005, when a primary dune reformed in front of the former channel during the Millennium Drought.



White Sands: LEFT, showing the artificial outlet in 2002, and RIGHT, the same area in 2014, years after natural closure

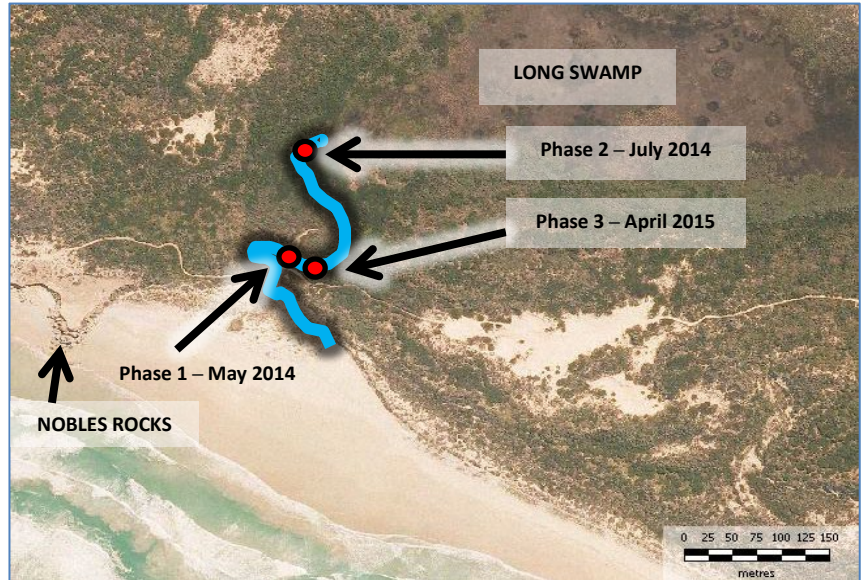
The ecological benefits observed from the natural closure of the artificial outlet at White Sands included the re-establishment of an area of aquatic habitat immediately upstream of the former outlet that is now seasonally home to a diverse native freshwater fish community, including two nationally threatened fish species, the Yarra Pygmy Perch (*Nannoperca obscura*) and Little Galaxias (*Galaxiella toourtkoourt*). This work and other investigations led to the planning of a restoration trial aimed at regulating or possibly blocking the second and final artificial outlet at Nobles Rocks.

3. Implementing the Long Swamp Restoration Trial

The objectives of this restoration project were to increase the availability, diversity and connectivity of aquatic habitats throughout Long Swamp to the Glenelg River estuary, in order to benefit a wide range of wetland dependant species. As well as undertaking basic monitoring across a broad range of taxonomic groups (birds, vegetation, frogs), the project has a particular emphasis on native freshwater fish populations (being a key conservation asset that is most sensitive to hydrological change) as a primary indicator of project success.

The restoration trial progressed in three stages in 2014 and 2015, enabling NGT to progressively record and measure the impacts of hydrological restoration in real time.

RIGHT: Aerial view of Nobles Rocks artificial outlet, detailing the location of the three trial sandbag structures.



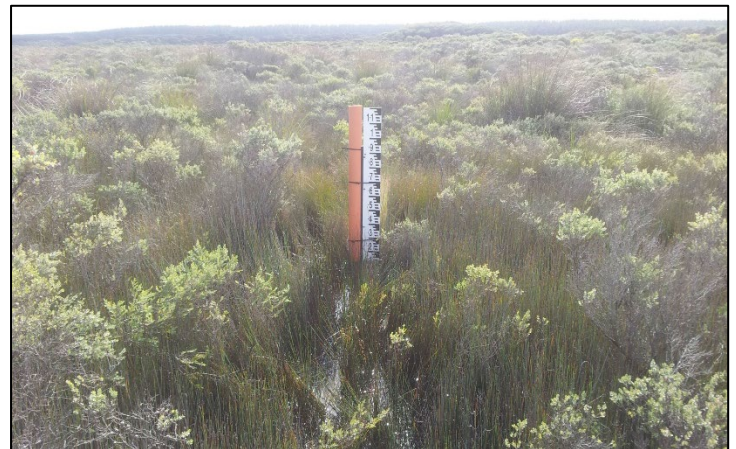
A series of gauge boards with water depth data loggers were also placed at key locations in the outlet channel and upstream into Long Swamp proper, to monitor the change in water levels throughout each stage.

On the 27th April 2015, the third and final structure was completed, following two days of preparation and nine days of sandbagging (using about 6,600 sandbags), which were put in place with the dedicated help of over 30 volunteers (many of whom attended over several days). To achieve our target operating height, the structure was raised by a further 30 cm in August 2015, using a further 400 sandbags, meaning a grand total of 7000 were used in phase 3!

Water levels in the swamp immediately upstream of the final structure increased rapidly, in the deepest portion of Long Swamp, from 34 cm (in April 2015) to 116 cm (in early Sept 2015).

Further inland, in a shallower zone more representative of the impact on wider portions of Long Swamp, levels increased from being dry in April 2015, 14 cm deep in May 2015, and has since sustained prolonged inundation of up to 57 cm deep, as shown right two years later in 2017.

This is a zone where the shrub invasion typical of the drying trend being observed in Long Swamp was rapidly reversed.



Wetland habitat transitions in Long Swamp between 2015 and 2017 are shown above, in the swamp inland of the trial structure after the Phase 3 structure was complete.

4. How the landscape responded to the Long Swamp Restoration Trial

The success of the project, ultimately led to NGT seeking and securing funding for the conversion of the trial structure to a permanent solution in 2019, by reinstating a sand dune over the top of the geo-fabric structure. Today the evidence of the artificial outlet is rapidly disappearing as nature reclaims this area, as shown.



The project has resulted in the return of Bully Lake immediately upstream of the restoration site, a waterbody first mapped in 1850, and seen the return of threatened species including native freshwater fish, including a now nationally significant population of Yarra Pygmy Perch and birds like the Australasian Bittern and Magpie Goose. We have also reinstated reliable longitudinal flows to the Glenelg River Estuary from throughout the length of Long Swamp for the first time since the 1930s, improving the ecological condition of the 11km of wetlands situated between Nobles Rocks and the River mouth to the west. Finally, we are also witnessing the natural reformation of sand dunes across the location of the former outlet, as shown below.



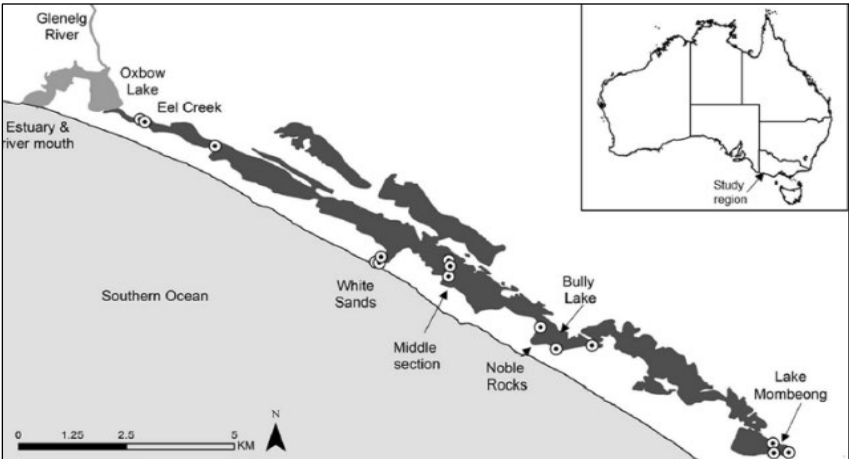
Nobles Rocks outlet from Long Swamp, when flowing and eroding in 2014, before the restoration trial commenced (above), and the same view in April 2021 (below), with a new foredune building and consolidating under vegetation cover where the artificial channel used to flow freely to the sea.

5. The native fish story – one example of a long and lasting biodiversity response

The hydrological restoration of Long Swamp provides a practical demonstration on the application of landscape-scale restoration of wetland hydrology, leading to rehabilitation of aquatic habitat and improved connectivity to benefit freshwater fishes (see right for examples of species recorded and below for sites and areas surveyed).



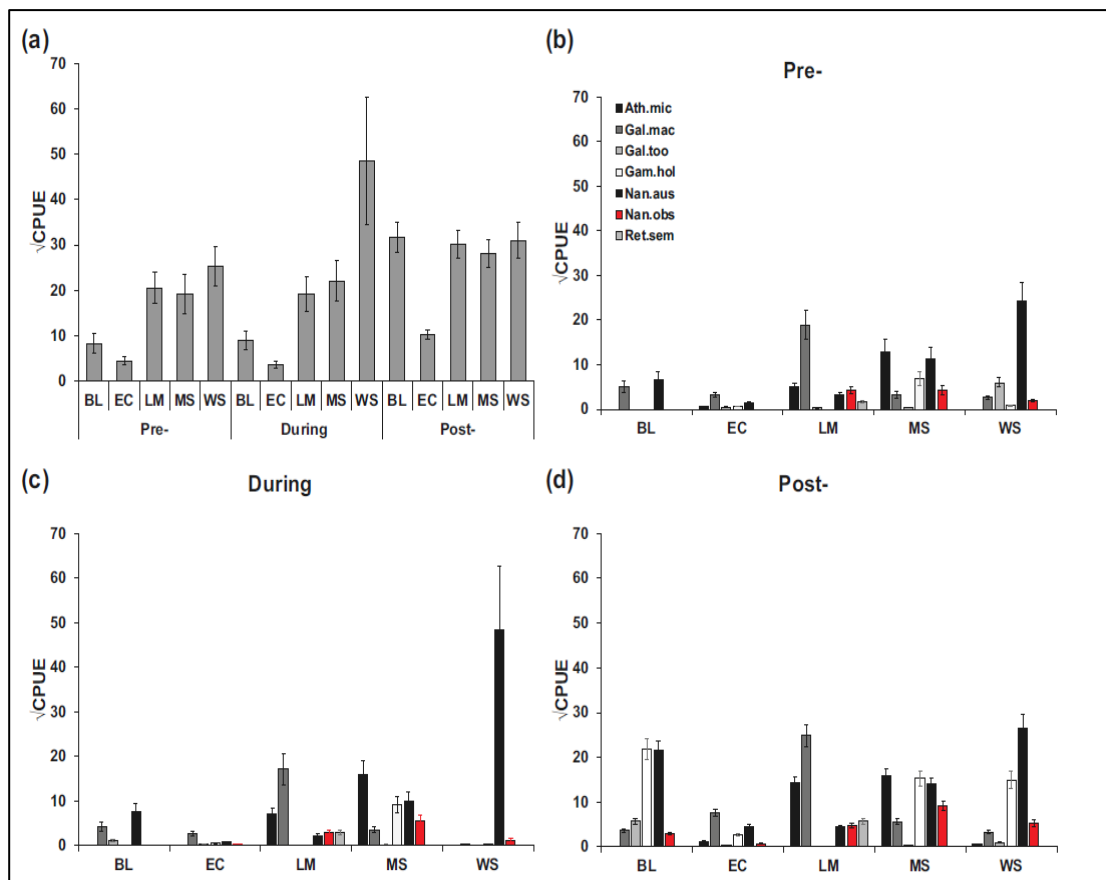
Above: Example of fish detected in Long Swamp, clockwise from top left: Tupong, Little Galaxias, Yarra Pygmy Perch, mixed catch of Common Galaxias, Southern Pygmy Perch and



Left: Location of 15 sampling sites and five areas for fish surveys across the Long Swamp wetland complex.

A comparison of fish communities sampled from different areas prior to, during and following restoration works provides evidence that the diversity and abundance of native fish has increased (see right). In particular, the number of fish has increased in Bully Lake and the Middle Section of Long Swamp, the two zones most influenced by reactivation of flows. The nationally threatened Yarra Pygmy Perch (*Nan. obs* - marked red in the figure below) has reflected this trend, most notably at Bully Lake where the species did not occur prior to restoration works and has shown a strong trajectory of increase following works.

Right: Difference in Catch per Unit Effort across five study zones sampled pre, during and post- restoration (a), and differences in abundance of most abundance species across the study zones before (b), during (c) and following (d) restoration.



Conclusion

Although the hydrological restoration of Long Swamp was led by Nature Glenelg Trust, this project provides an excellent example of how government agencies, non-government organisations and community groups can overcome challenges, work effectively together and complement each other's skills, to achieve lasting and positive ecological outcomes on Public Land. This project, together with the work previously completed at the nearby Piccaninnie Ponds Karst Wetlands Ramsar site, has now set the wetlands of Discovery Bay on a long-term trajectory of ecological recovery.

For more information on the future progress of the Long Swamp Project or our other work, please visit the NGT website: www.natureglenelg.org.au, or contact us by emailing info@natureglenelg.org.au.

Major partners in the restoration work presented in this summary:

