



## 10<sup>th</sup> Anniversary Event

**WALKER SWAMP: Saturday 30<sup>th</sup> April & Sunday 1<sup>st</sup> May 2022**



### **Welcome to the Walker Swamp Restoration Reserve in NGT's 10<sup>th</sup> Anniversary Year!**

It has been four years since the Walker Swamp Restoration Reserve was created and launched, as a private nature reserve on the Wannon River floodplain, adjacent to the Grampians National Park. The material in this handout describes the progress of the project over that time, forming an accompaniment to the guided tour of the site as presented by NGT ecologists.

We wish to acknowledge the traditional custodians of the land that includes the Walker Swamp Restoration Reserve, the Djab Wurrung people, and pay our respects to elders past, present and emerging. The lunette banks around these wetlands are home to considerable evidence of past Aboriginal occupation, as they are across all of western Victoria, and remind us of the deep and ongoing connection of First Nations people to this land. We look forward to future site visits with representatives from the Eastern Maar Aboriginal Corporation, so that one day – in addition to the ecological recovery underway – we might also see the return of living Indigenous culture to this special place.

We hope you enjoy learning about the site over this 10<sup>th</sup> Anniversary weekend, and will continue to walk along-side and learn with us, as we embark on the ongoing restoration journey ahead.

*Mark Bachmann, Managing Director and Founder*

As well as an incredible level of community and volunteer support throughout, the project activities presented in this summary have been made possible thanks to partnerships or direct grant funding support from a range of organisations and programs:



## Stop 1: Waterbugs and Native Fish

*Dr Lauren Brown, Aquatic Ecologist*



The wetting and drying regime of Walker Swamp has changed dramatically following restoration works. In its drained state, the wetland would only inundate temporarily and dry out quickly as the artificial drain was cut to its bed level. The aquatic fauna very much reflected this sporadic pulse, being mainly represented by microcrustaceans e.g. shield shrimp, fairy shrimp and ostracods. These species could survive as dormant eggs for long periods when the wetland was dry. Since the more recent re-establishment of a deeper and prolonged inundation regime, the representation of active swimmers e.g. damselfly larvae, water beetles, water boatmen and backswimmers, has increased.

In its original state, it seems that Walker Swamp was hydrologically disconnected from the Wannon River most of the time, except for during flood events, and so its value as a refuge site for native freshwater fish between floods is now unclear. Before the artificial drain was completely backfilled to fully restore the wetland in 2019, fish species (Southern Pygmy Perch and the nationally threatened Little Galaxias) were recorded in the deeper sections of the partially restored wetland (between 2014 and 2018) as a result of annual connectivity of drain flows with the river, despite the wetland also fully drying out each year. Following restoration and subsequent expansion of aquatic habitat, numbers of fish initially increased. More recent fish surveys however, have failed to detect these two species, although they were recorded moving over the outlet spillway when it overflowed in 2020. These species may still occur at Walker Swamp in small numbers, but have remained hard to detect in what is now a much larger and more permanent waterbody.

The wetland supports other key aquatic species, including populations of the endangered Western Swamp Crayfish (*Gramastacus insolitus*) and endangered Growling Grass Frog (*Litoria raniformis*). The maintenance of water at Walker Swamp beyond spring and through the summer is particularly key for species such as Growling Grass Frogs which breed later in the year, as temperatures rise and shallower wetlands are typically drying out. A fantastic chorus of 'growlers' can be heard during spring to early summer. A number of Long-necked Turtles (including juveniles) have also been recorded during our surveys. The continued recovery of aquatic vegetation in the wetland will only improve habitat for these key aquatic species.





## Stop 2: Volunteers & the Community

*Lisa McIntyre, Community Coordinator*

Volunteers play an incredibly important role in achieving great outcomes for Walker Swamp. They were pivotal in the early establishment and restoration phase of the property, and continue to assist with on-going maintenance, on-ground works and monitoring.

Specific funding from the Victorian Government through the 2021 Community Volunteer Action Grants is assisting us in creating more opportunities for people to connect with nature and get involved in volunteering. In doing so, we are establishing a local network of volunteers and creating a calendar of volunteering events at NGT's Southern Grampians Reserves at Walker Swamp and Long Point. Examples of past and present volunteer activities include:

- Help with the constructing the first trial structure in 2014, and permanent spillway in 2019 (below);
- Assembly of the bird observation tower (right);
- Flora and fauna monitoring, e.g. birds, fish and frogs, annual red gum assessments;
- Tree planting and installing guards;
- Fencing works, maintenance and repair.



We are also currently working with students from Good Shepherd College and Parklands Special Development School in Hamilton. Students from as young as 8, all the way up to 18 years, have been working together in groups to develop a wetland discovery guide that will accompany a walking trail at Walker Swamp (below). A group of volunteers have been acting as 'buddies' in the field to assist students and share their incredible environmental knowledge. We have seen wonderful friendships and community connections emerge from this project, with all involved finding it a rewarding and positive experience.



*Photos by NGT volunteer: Kylie Rose*

A remote monitoring project occurring across Walker Swamp and Green Swamp, is similarly focused on providing flexible and inclusive environmental volunteering opportunities. AudioMoths (acoustic recorders) and field cameras have been deployed to capture frogs and cryptic birds (see over the page). Volunteers can assist by working through audio and visual data in their own time, recording the presence of different species.



It has been fantastic to see a diverse range of people enjoying Walker Swamp and contributing to its restoration story. The growing list includes landholders, students and teachers from Good Shepherd College, Hamilton Parklands, Monivae College, The Hamilton and Alexandra College, Baimbridge College, Deakin University students, and other passionate community members. The extensive redevelopment of curriculum being undertaken in these district secondary schools to incorporate the history, ecology, management and restoration of Walker Swamp into their Science, Geography and Environmental Science programs at all levels is fundamental to the long-term success of restoring and maintaining Walker Swamp, through improving environmental literacy and awareness of the next generation and the wider community. We would also like to acknowledge two local environmental community groups that we work closely with; the Friends of the Forgotten Woodlands, and the Hamilton Field Naturalists Club. We greatly value their support, their knowledge, ideas, skills and friendship.

If you would like to learn more about volunteering opportunities at our Grampians reserves, please chat with Lisa McIntyre (0428 749 235) or Lauren Brown (0439 034 390).

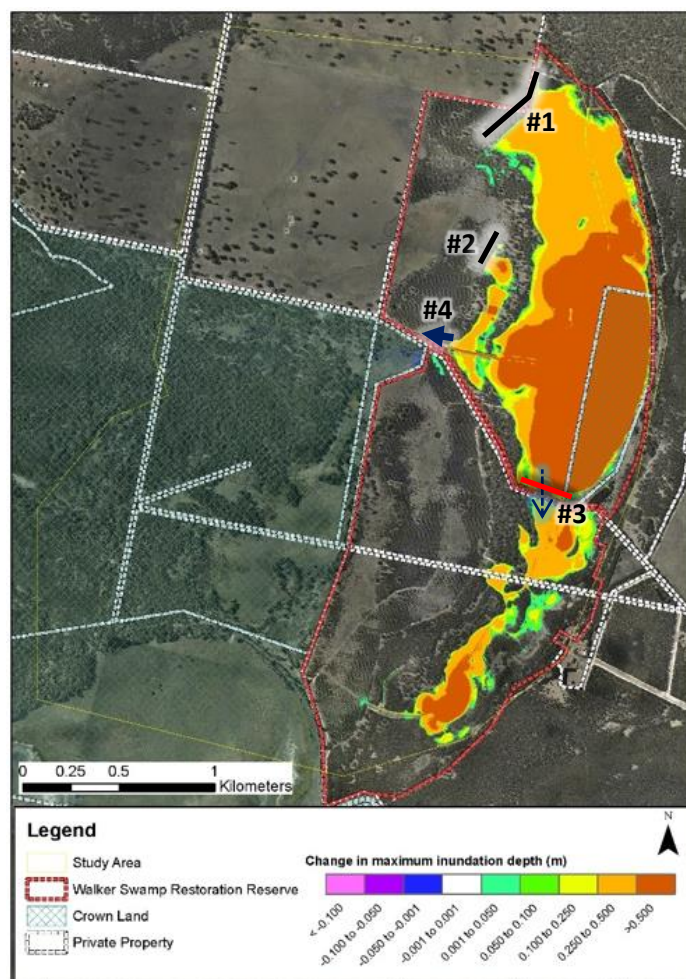


### Stop 3: Hydrology

*Dr Lachlan Farrington, Principal Ecologist*

Prior to the commencement of any earthworks, a hydrological investigation, commissioned by the Glenelg Hopkins CMA, was undertaken by NGT to enable the impact of backfilling artificial drains across the property to be understood, and to inform the design, implementation and permit approvals for those works. The hydrological study allowed us to predict how drainage inflows into a restored Walker Swamp could be managed on the eastern floodplain portion of the property and, in turn highlighted key locations where additional remedial works would be required to facilitate restoration. This included:

- reinforcement of existing levee banks (black lines marked #1 and #2 on the map),
- upgrading the road (red line at #3) and culverts (thin arrow at #3) to allow flows to reach the full wetland extent to the south, and
- constructing a new spillway, set to the natural sill level (thick blue arrow at #4), to enable flows to be conveyed down the existing artificial channel to the west when the swamp is full.





## Watching the design come to life

After weighing up the options for managing outflows once Walker Swamp filled to capacity, we landed on an inexpensive and more flexible construction method we have previously employed in trials; building the outlet spillway out of an interlocking structure of 2500 geo-fabric sandbags. After surveying the site and setting levels in January 2019, over 2 days in March 2019 a team of volunteers helped us get the job done in quick time.

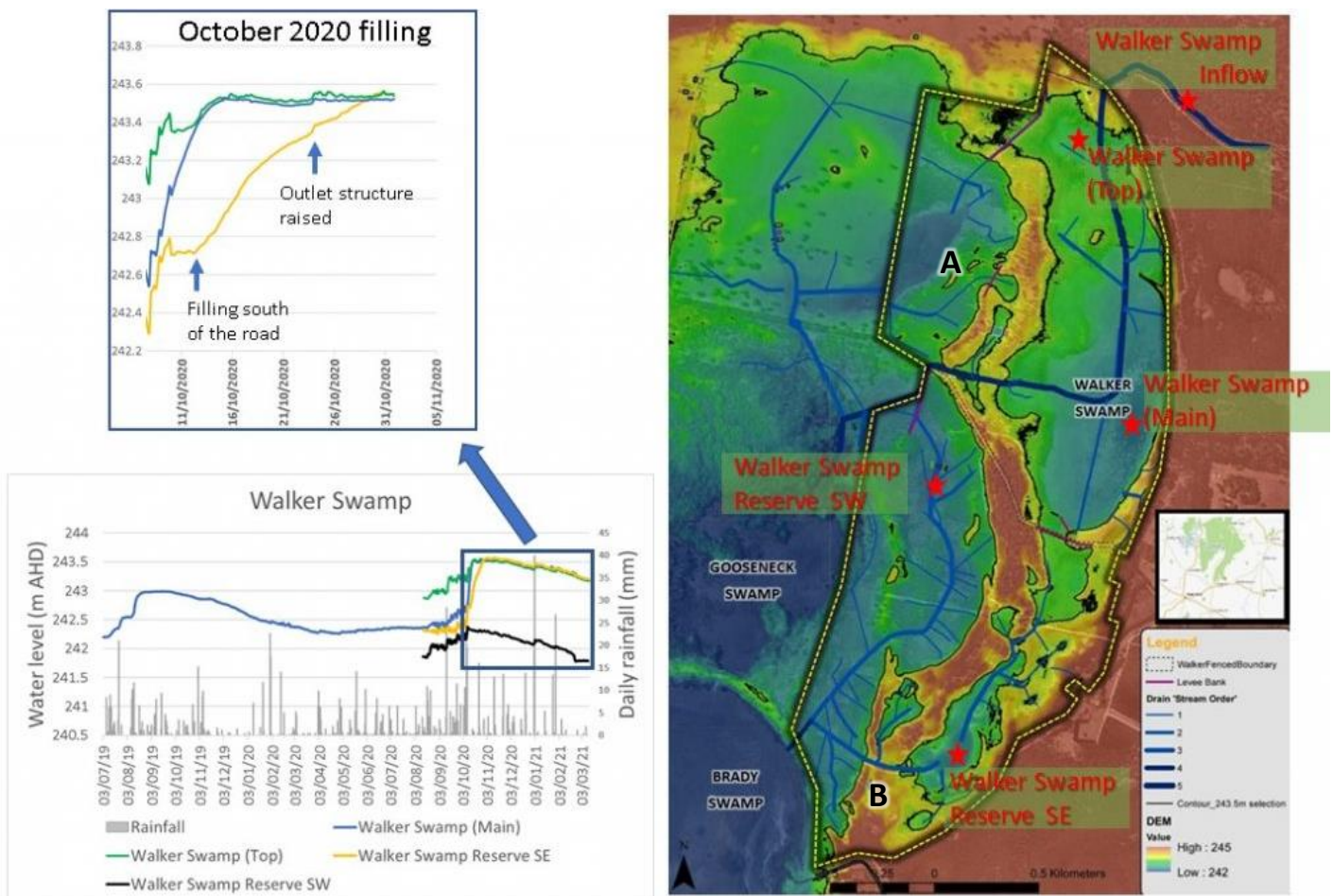
One key aspect of the restoration design was including the capacity for flows to travel southward (under what is now Lynchs Crossing Road) and mimic what occurred historically. This was achieved by raising the road surface and incorporating additional culverts. The ability to manually adjust the full supply level of the wetland at the main outlet (spillway) was critical in optimising the function of this design, as we initially set the structure conservatively to allow us to observe how the design functioned in real time.



When the main wetland spilled at the regulation structure in 2020 (left), our perimeter checks indicated that the wetland still had some capacity and, despite water moving under the road, the rate of flow was below what the culverts were capable of delivering. With a quick bit of manual adjustment, we slightly raised the height of the spillway, backing off the outflows at this location

and allowing more water to flow into the wetlands south of the road. All of this was captured using our network of water level loggers, as described in the figure over the page.

The water level data for the southern wetland (Walker Swamp Reserve SE – yellow line) shows the level rising once the main wetland had reached 242.7 m AHD but the rate of rise starting to taper.



The date where we manually adjusted the outlet level is apparent in the water level data for all loggers across the wetland system, but is particularly pronounced for the southern wetland where level rise picked up again until the whole system equilibrated at 243.5 m AHD. It is worth noting that this was our originally modelled and envisaged maximum full supply level. The entire process from design through to implementation and operation was a great example of how the incorporation of geo-fabric textile sandbags can be used to provide not only a robust structure, but allow fine tuning alongside ground-truthed observations. This turned what started as a computer model into an active on-site demonstration of water management in real time.

### ***Backfilling Drains on the Property***

Aside from managing water levels, the backfilling of drains has been another key design feature across the entire Walker Swamp Restoration Reserve. With 26 km of artificial drains situated across the property, addressing this legacy of past land use was one of the most important issues we have tackled. Using a combination of machinery, including an excavator, laser bucket and grader, almost all of these artificial drains were fully backfilled, resulting in the restoration of natural inundation patterns across the property in 2019 for the first time in several decades. In 2021, we undertook additional remediation work to backfill channels on the north-western section of the property (marked A on map above).



*Looking west at the now completely backfilled southern outlet drain through the lunette. (Marked B on map above)*

## **Stop 4: Ecological Monitoring**

*Dr Greg Kerr, Senior Ecologist*

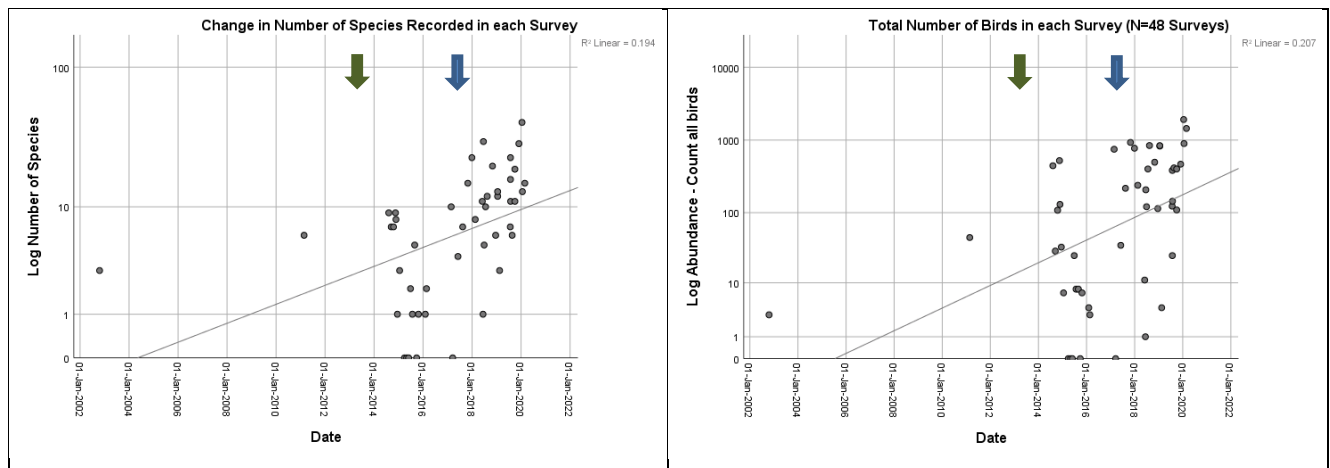
Between 2018 and 2020 NGT collected baseline data at the Reserve to allow:

- monitoring of changes in extent, condition and composition of Ecological Vegetation Classes of vegetation,
- associated diversity and abundance of bird species in both aquatic and terrestrial habitats at the site,
- associated fish, crustacean and frog diversity / abundance,
- aquatic macroinvertebrate diversity,
- terrestrial vertebrate and selected invertebrate diversity and abundance,
- annual assessment of river red gum condition, and
- annual assessment of aquatic physical and chemical factors in the wetlands.

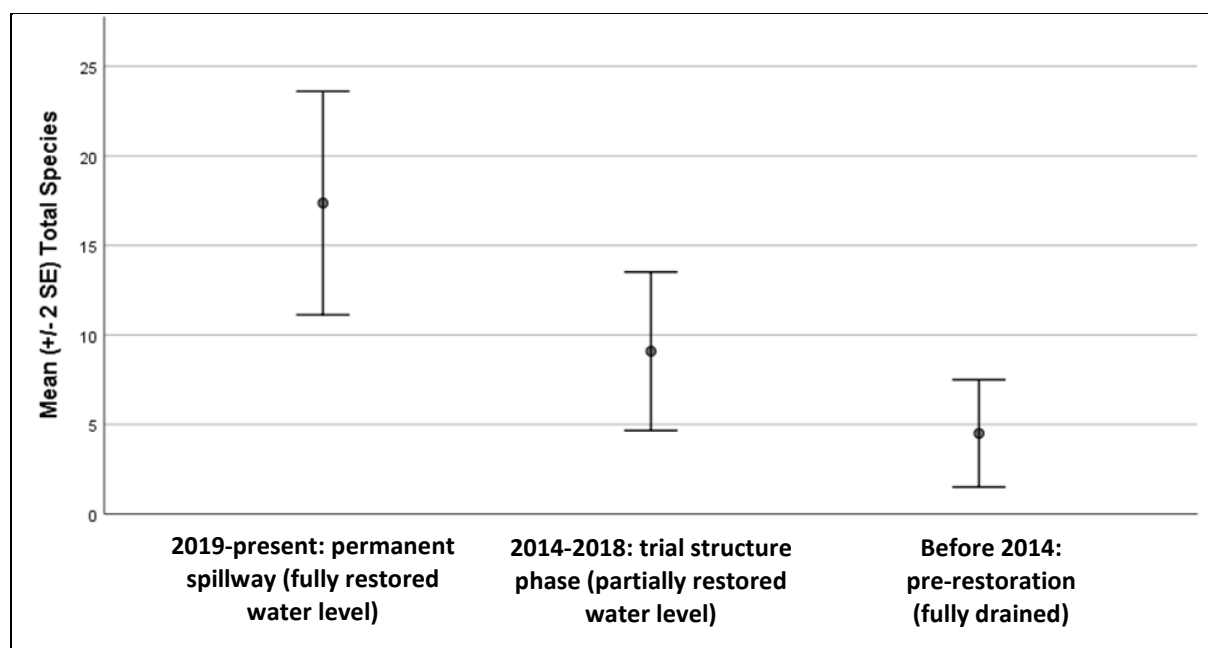


### ***Waterbirds***

Initial results, after full restoration of water levels, indicate that both waterbird abundance and diversity have increased markedly in response to the increased duration and extent of water and associated changes to the diversity and abundance of wetland plants, and increased habitat and food-web complexity in Walker Swamp.



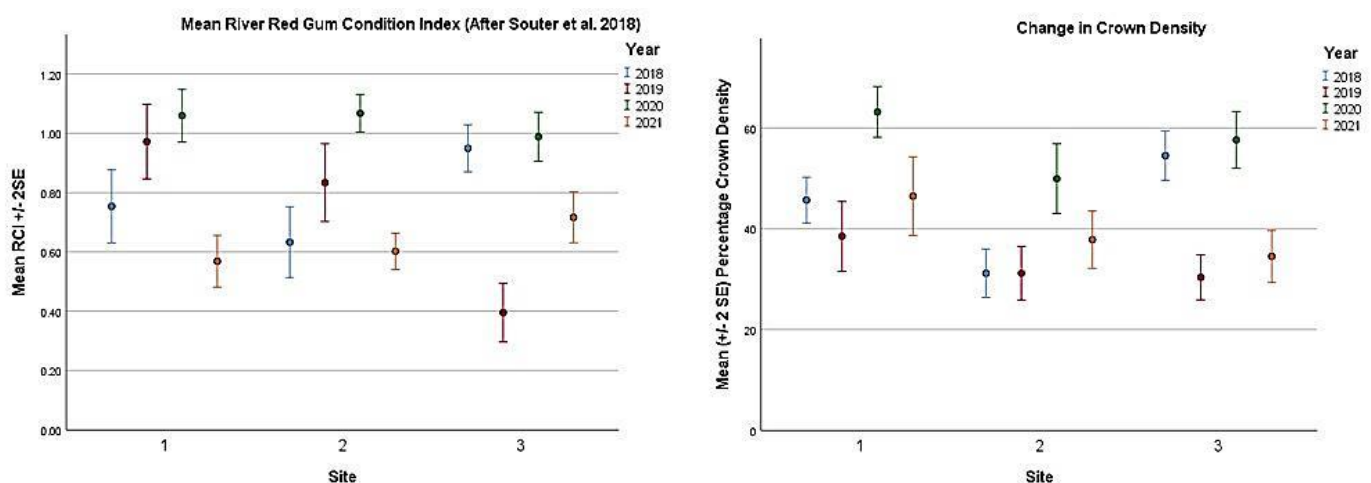
**Change in A. number of waterbird species ( $R^2=0.194$ ) and B. total abundance of waterbirds ( $R^2=0.207$ ) for each survey between 2002 to 2020 at Walker Swamp. N=48 surveys. Green arrows show timing of temporary regulator construction in 2014. Blue arrows show timing of permanent spillway construction and full drain remediation.**



**Recovery of waterbird species diversity in Walker Swamp over recent years.**

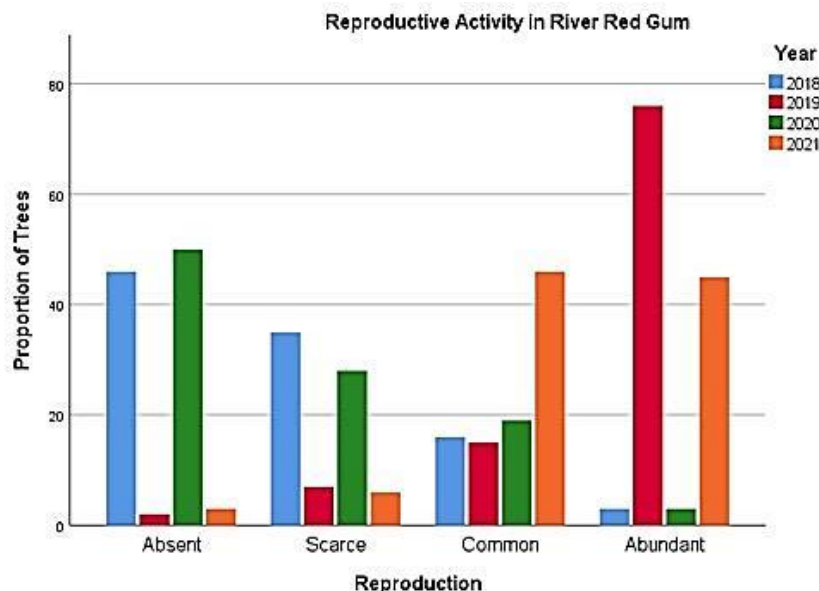
### River Red Gum Condition

Annual monitoring of the condition of 100 river red gums over the last four years is showing that the condition of the trees varies markedly between years in response to a combination of factors. After three years of gradual improvement at most sites, the average condition of the trees dropped markedly in 2021.





This decline in overall condition was mainly driven by a loss of leaves in the tree crown across all sites with high levels of insect attack. However, despite the elevated level of canopy damage and leaf loss, there was a very high level of reproductive activity in the river red gums in 2021 (see right), with 91 of the 100 trees having buds, flowers, and/or fruit throughout the canopy. For over half of these trees the reproductive effort dominated the canopy.



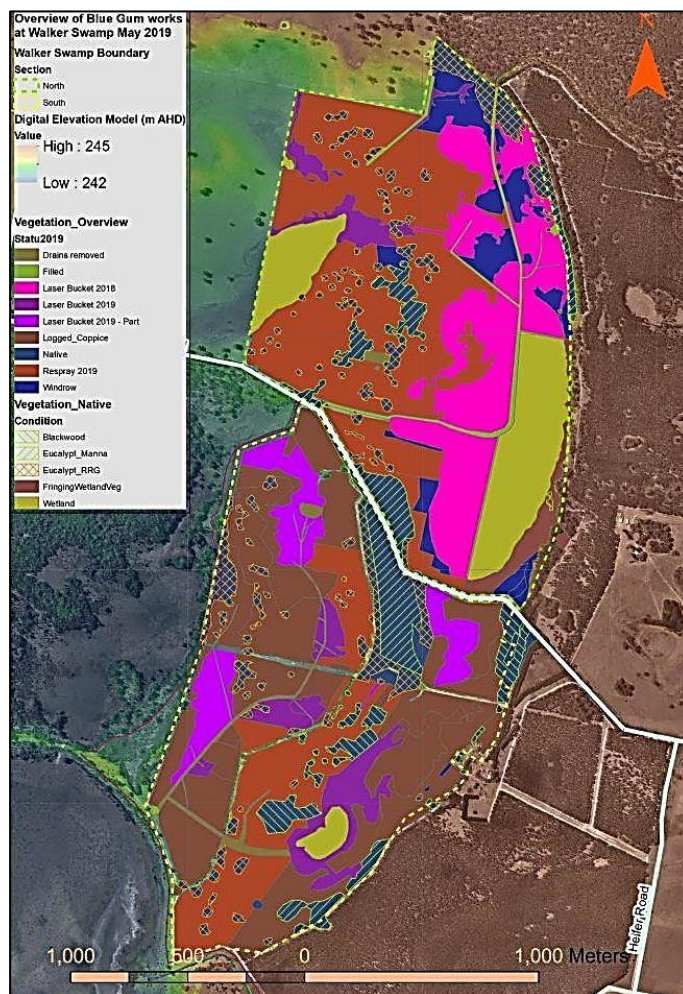
The extremely high level of reproductive effort across most trees repeats that observed in 2019, but it contrasts with the very low level, or absence, of reproduction seen in both 2018 and 2020. Importantly, there may be a link between the condition of crown in the previous year and the reproductive effort in the following year. It may be that the river red gums are showing a postulated biennial cycle of flowering (Souter et al. 2009). If this is the case, the relatively low level of flowering and fruiting seen in both 2018 and 2020 may be due to the trees being in a low reproductive year, in a landscape-scale biennial flowering cycle. This raises many questions: is this cycle just coincidental and driven by climate or other environmental factors or is it a coordinated effort? If it is coordinated, how do they do it – and why? These are interesting questions worthy of further investigation.

## Stop 5: Initiating vegetation recovery

*Jonathan Tuck, Senior Ecologist*

Outside of artificial drainage, which were the result of efforts to more intensively develop the property for livestock grazing purposes from the 1950s-1990s, by far the most substantial other impact on the property was its almost complete conversion to Tasmanian Blue Gum Plantations in the early 2000s. Hence when NGT came along, we inherited a property with a complex mixture of current and former plantation areas (right). These could be broadly categorised as follows: (1) recently harvested areas that were coppicing (light brown), (2) standing plantations that the previous plantation manager deemed uneconomic to harvest (dark blue and dark brown) and (3) areas that were still subject to temporary inundation where the plantations had failed to fully establish (pink).

This major change in land use and management history had a series of impacts that we are managing and will continue to address for many years to come, as explained over the page.





## 1. Recently Harvested Areas and Coppice Spraying

The plantation areas that had been recently logged prior to NGT taking possession of the property were at various stages of regrowth, due to coppicing from the stumps. These areas were located across the northern part of the property, west of Walker Swamp, and in a central strip through the southern portion of the property. The coppice was sprayed by contractors in autumn 2018 and repeated (thanks to Ararat Prison via the Landmate Environment Program) in autumn 2019, leaving these areas requiring only minor follow-up. These areas have been left to spontaneously regenerate and we are seeing a variety of sedges and rushes re-emerge, along with redgum and blackwood seedlings.



## 2. Removal of Standing Plantations

Small leftover areas of plantation in the northern part of the property (see dark blue areas on map) remained uneconomic, so NGT contracted an excavator to remove and stack these trees (roots and all) for burning, avoiding the need for any further treatment (right).



However large areas of the southern portion of the property retained standing trees (see dark brown on map). We were fortunate that based on extra growth since the property changed hands, and improved woodchip market conditions in early 2019, we were able to negotiate their harvest at no cost to NGT (right) and also generate a modest income stream. Some of this money has been used for follow up spraying of coppice in 2021 and again in 2022.



## 3. Failed Plantations and Wetland Bed Remediation

The vast majority of the 1000 acre (420 ha) property was mounded to prepare for plantation establishment, including Walker Swamp (right) and almost all other wetlands across the site. As a result of the plantations not surviving in the deepest areas of those wetlands (which still temporarily inundated each winter despite the artificial drains), the mounds and furrows still remained in these heavy wetland soils. As well as interfering with natural inundation patterns and water movement, the elevated ridges of the mounds were also harbouring weeds in areas that would otherwise be too wet for them to grow, and negatively impacting on the natural zonation and recovery of native wetland plants.

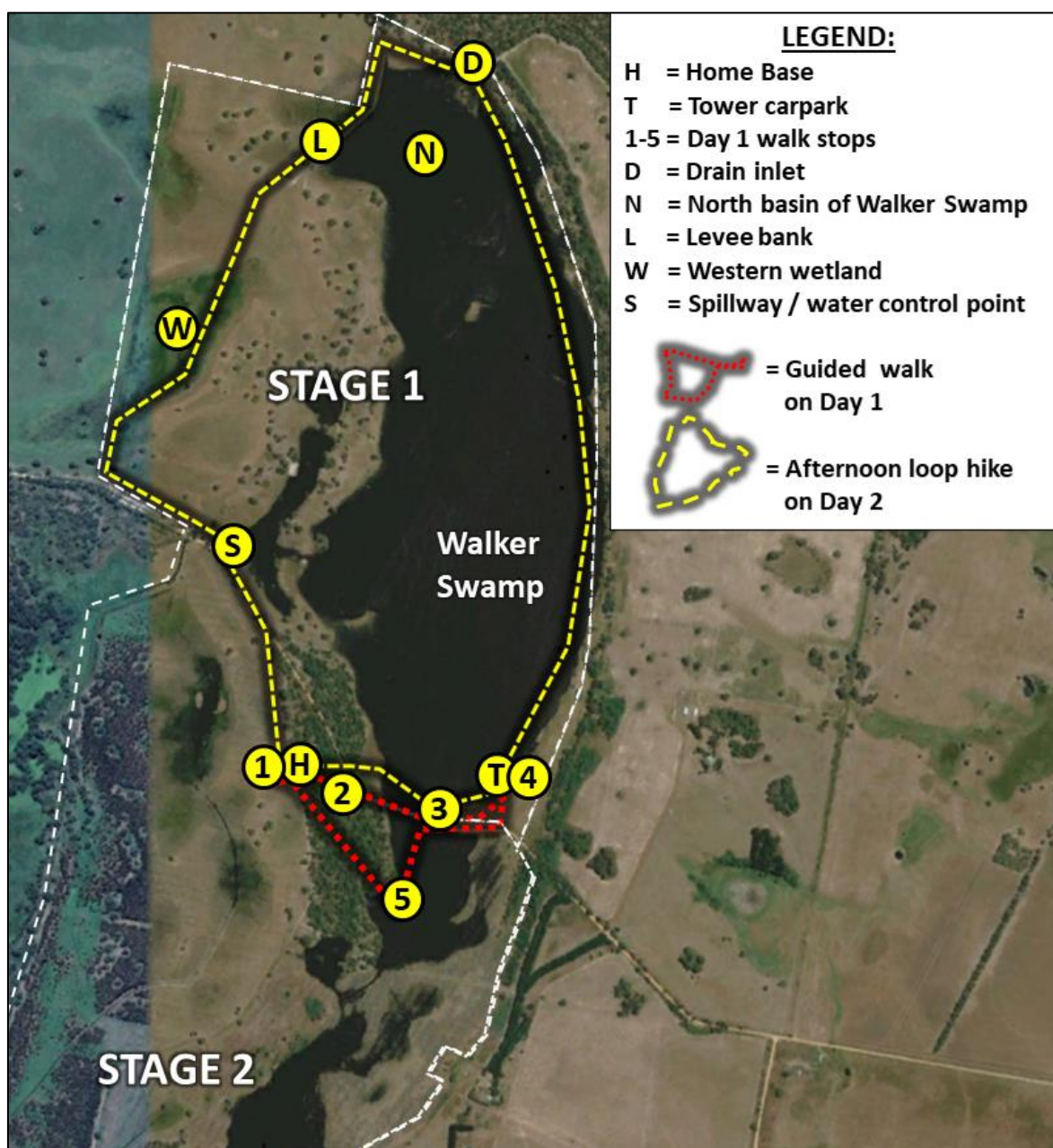


After progressively remediating the ground over two seasons in all the failed areas of plantation in those deepest wetland beds (right), these areas are now rapidly and spectacularly recovering with native wetland plants, establishing in the right zones within and around each wetland. The future challenge is to deal with more of the upslope wetland areas and across the wider floodplain (amongst the Red Gums) where plantations successfully established. In these areas where the mounding remains, we are unable to undertake remediation works until the Blue Gum stumps rot. As part of drain backfilling on the north-western corner we trialled a bulldozer fitted with a V-shaft. This proved effective at scalping the mounds and bluegum stumps back to bed level but in other areas, it makes sense to wait for the stumps to rot.

## Fencing

Maintaining our boundary fence is an important part of managing the property as it allows us to prevent unauthorised access to the site, with issues like unauthorised firewood cutting, rubbish dumping, hunting and trail bike riding occurring in the adjacent areas of publicly accessible National Park. Thanks to contractors, our volunteers and the Landmate program, the Reserve is now fully fenced. Boundary checks remain an ongoing management requirement and we are currently establishing a small internal fenced area along the western bank of Walker Swamp to exclude kangaroos, so that we can undertake a larger-scale revegetation project. We have taken up an offer of free seedlings from the School of Ecosystems and Forest Sciences at the University of Melbourne. Ella Plumanns Pouton, a PhD candidate at Melbourne University, is investigating the influence of fire regimes, climate, and other environmental drivers on plant diversity in native heathlands within the adjacent Grampians National and the seedlings are being donated to NGT as a result of her seedbank studies.

***Map of site activities (note: base aerial image is from late 2020, showing the first time Walker Swamp filled to capacity after 2019 restoration remedial works were completed)***



For more information about the project or to donate to Nature Glenelg Trust, please visit the NGT website: [www.natureglenelg.org.au](http://www.natureglenelg.org.au), or call 08 8797 8596, or email [info@natureglenelg.org.au](mailto:info@natureglenelg.org.au).