

## SEANA – Southern Grampians Wetland Restoration Tour – with NGT

Saturday 17<sup>th</sup> April & Sunday 18<sup>th</sup> April 2021

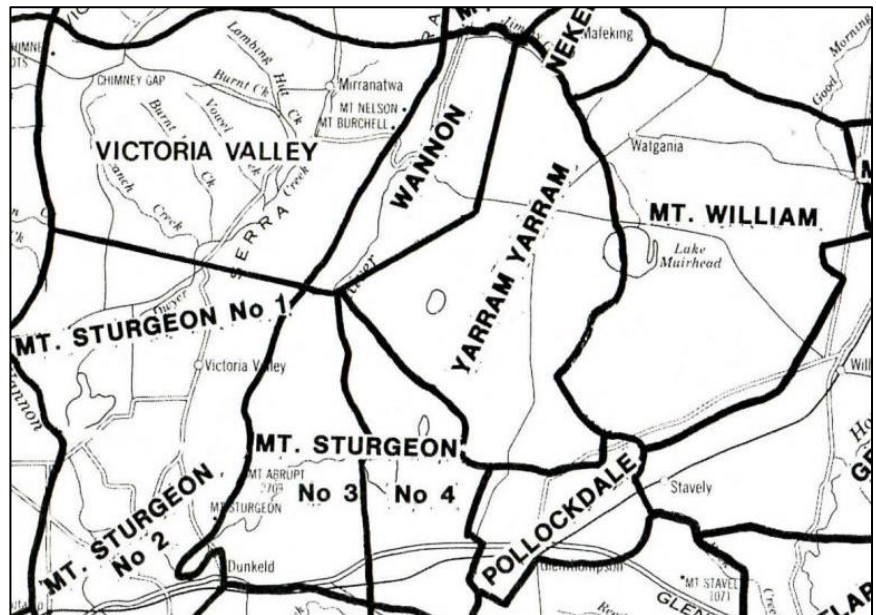
Mark Bachmann and Greg Kerr - Nature Glennelg Trust (NGT)

### Site 1 - Green Swamp Restoration Reserve

#### Background

Pollockdale was the original pastoral run established around present day Glenthompson in 1845. This 16,000 acre run was named after the first – but it also seems brief – unlicensed occupier (i.e. squatter), Captain Pollock.

As the 1800s continued, the original pastoral runs across Victoria were progressively resumed by the State Government, subdivided into smaller allotments and sold – to both raise revenue and facilitate development. As with all the original pastoral runs in this area,



this process of closer settlement triggered a gradual conversion in land use from pastoral (grazing the native vegetation on the land in its natural condition) to agricultural (clearing and sowing introduced pasture and crops, associated with higher stocking rates and fencing the land into smaller paddocks). Being naturally a very wet run, the closer settlement of Pollockdale eventually led to a whole series of comprehensive drainage works – already visible in the earliest aerial photography in the 1940s – which continue to influence the area today. While the current Pollockdale property is smaller than the original pastoral run of the same name, it has a direct link to this fascinating past, being at the heart of the former pastoral run. Not surprisingly, water continues to be a key consideration in property management, and that is where NGT's involvement comes in.

#### Restoration Plans Emerge

Back in late 2012, when we were approached by Warrebool Pastoral Co, the current owners of Pollockdale, the goal was to have a fresh look at the property through a water management “lens”, and suggest options for them to consider at the same time that they were actively investing in the renewal of farm infrastructure. The ‘blank slate’ that this provided us with was a unique opportunity to investigate the possibilities for the property with a more open mind and less constraints than is usually the case. As a result of that exercise, which was led by NGT's Lachlan Farrington, a whole series of recommendations were made and – although not all the possibilities we discussed were economically viable for the owners to adopt – it did result in improved protection and management of a number of the important wetlands across the property, across a range of wetland types.

As a result of that process, the absolute stand-out wetland that both parties immediately agreed needed to be at the top of the list for restoration was Green Swamp, which is something of a centrepiece for the property as a whole. But Green Swamp was not the wetland it used to be.



*The deepest portion of Green Swamp in October 2012 – still holding some water despite past attempts at artificial drainage.*

When it comes to drainage impacts, every site is different and in this case, historic drainage activities had actually increased the run-off available to Green Swamp (through upstream drainage into the wetland), while also simultaneously decreasing its capacity to hold water (as a result of modification to its outlet sill level – i.e. maximum retention height). Additionally, in the early 2000s, the outlet from Green Swamp was significantly deepened again, further reducing its ability to hold water, and increasing downstream flooding risk.

After carefully assessing the options, and weighing up the implications of those options with the owner, we agreed to a compromise solution for Green Swamp, whereby the original full-supply level of the wetland would be reinstated, but only by regulating the Green Swamp outlet drain at the most convenient location for farm management. This necessitated the inclusion of a minor levee bank into our design, which included a fixed-level concrete spillway to enable management of outflows once the swamp was full. Crucially, by adopting this approach, we were still able to achieve our preferred wetland restoration design criteria of building a ‘set and forget’ solution, where maintaining minimum water levels in the wetland does not require any further ongoing management intervention after works. Along with other wetland restoration activities on the property, this outlet regulation work was completed by NGT in 2014 via grant funding we received from the Australian Government (i.e. NGT’s Wetland Restoration Program 2012-2017).

### **The rains arrived and the site responded!**

Although it took a couple of years for it to happen, when the September 2016 flood event did eventually hit, we finally got to see what this country looks like when it gets properly wet – and it was worth the wait!

The image to the right is looking east over Green Swamp from the outlet spillway. The restored wetland was full to the brim on the 9<sup>th</sup> of September 2016.



It wasn’t long, and the ecological impacts of restoration started – and still continue today – to emerge. Detection of key populations of Growling Grass Frog and Western Swamp Crayfish, as well as increasing records of a number significant waterbird species, including regular use of the site by Brolga (now a restored flocking site), were all the evidence we needed to know that this was an outstanding example of wetland restoration in practice. Even now we are still detecting new species of birds utilising the recovering wetland.

### **A novel approach to permanent protection as an NGT Reserve**

Over the subsequent couple of years, as well as sharing the exciting new records coming in from surveys at Green Swamp, our conversation with the property owners started to take a bigger picture view. Anyone who works across Victoria in water management will be aware that there are many challenges of working in this space, and rural drainage activities are especially complex. The one thing that emerged from our conversations

at that time was that the owners knew that they didn't want to see their good work easily undone – now that Green Swamp had once again become the centrepiece of Pollockdale. But no-one lasts forever, and property ownership of farm land will always inevitably change at some point, so we needed to determine how best to set the site up to be permanently protected and actively managed for conservation purposes in the very long term. At the same time, we were also conscious of removing the ability and /or incentive (of, for example, any future owner of the Pollockdale farm who may not be conservation minded) to interfere with the restored wetland down the track. In this context, it is worth considering that the informal loss of wetlands across rural Victoria through new artificial drainage activities and land use change is a very real threat and is ongoing.



1947 (pre-drainage)

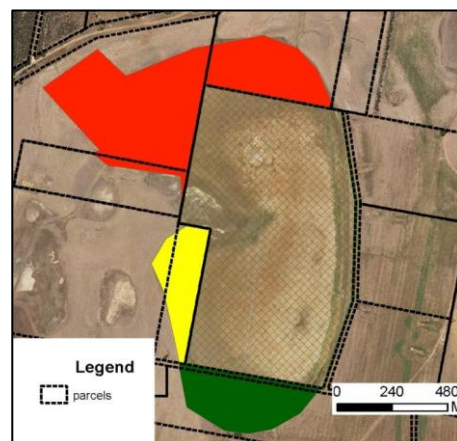
2012 (post-drainage)

2018 (post-restoration)

*The change in the extent of maximum sustained inundation at Green Swamp as a result of NGT works*

Over several years, we'd built a really strong relationship to fix Green Swamp, so we agreed to work towards a solution that we felt was the best fit in this particular situation, and would enable us to keep our partnership going. At that point, we agreed in principle to the private portion of Green Swamp becoming an NGT Reserve, to ensure the site would be permanently protected and to guarantee that the newly restored sill level on the outlet (which is on private land) can never be interfered with again in the future.

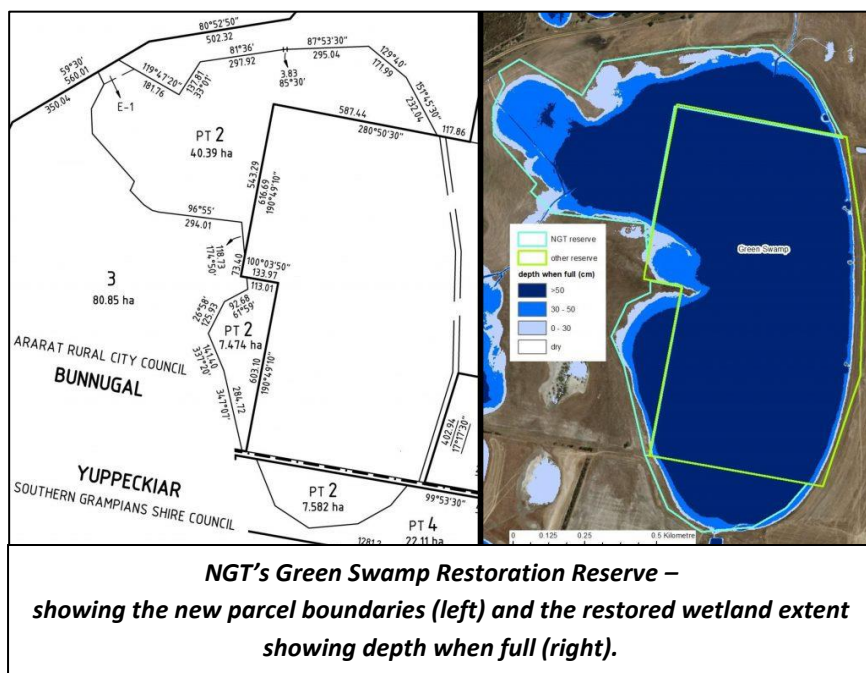
In agreeing to go down this path, we were very lucky that all of the private portions of Green Swamp were under a single ownership. This was important because it turned out that the restored private portion of the wetland actually straddled six parcels of land, on separate titles, that bore no resemblance to the physical shape of the wetland feature (see map right). Hence, we found ourselves in the unique and fortunate position of being able to seek to consolidate the boundaries of the private land around Green Swamp, to actually match the landform around the full extent of the wetland. In other places where we work, we have found that fragmented ownership of wetlands can be major obstacle to their effective conservation and management.



**NGT's Green Swamp Restoration Reserve is born.**

Fast forward to today and Lot 2, the private portion of the wetland which includes the restoration infrastructure that controls water levels across the entire site (including the inlying public land portion), is now owned by Nature Glenelg Trust – making Green Swamp our 7<sup>th</sup> Restoration Reserve.

Best of all, in terms of our working relationship with the owners of Pollockdale, nothing has really changed. The wetland has not gone anywhere, so it is still a magnificent in-lying centrepiece of their property. The only difference is that now the wetland will be permanently protected as an NGT Reserve, and benefit from dedicated conservation management and monitoring. Needless to say, we will continue to work cooperatively to ensure that conservation of this wetland operates seamlessly alongside the management of their surrounding farm, as this project would never have happened without their foresight and dedication to this fantastic outcome.



### How to access Green Swamp

Given the unusual (landlocked) configuration of the site, access to Green Swamp is only available by contacting Nature Glenelg Trust. We can arrange the relevant permissions, notify our neighbours prior to your visit, and provide instructions with detailed directions for our approved access point and how to reach the best monitoring vantage points.

We are especially inviting birdwatchers (individuals or groups) who are willing to visit the site with binoculars and quietly observe the bird populations at the wetland, to record and share their observations with us. This will help us track its ecological recovery, as it has very quickly become an important summer refuge habitat since restoration works were completed. You can also get in touch and provide us with your details if you wish to be notified when we have occasional volunteer activities occurring on site.

Your visit can be arranged by contacting NGT's property manager Dr Greg Kerr, on [greg.kerr@natureglenelg.org.au](mailto:greg.kerr@natureglenelg.org.au) or by calling him on 0418 846 993.

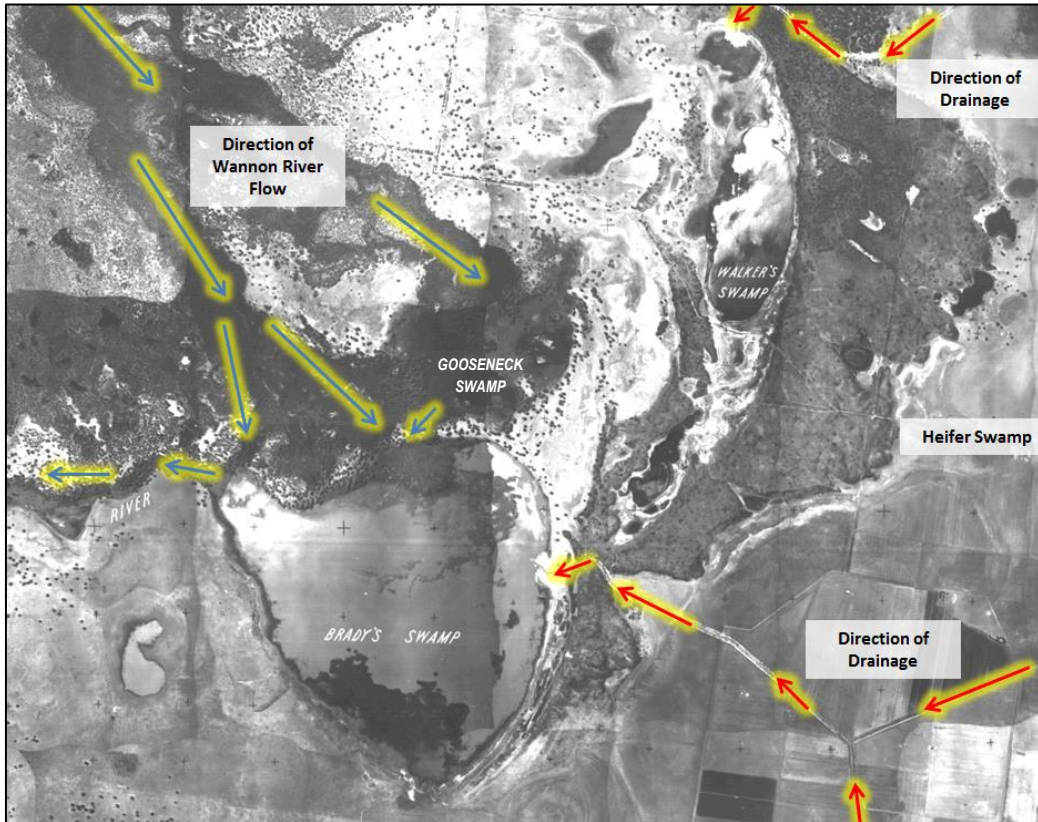
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## Site 2 - Walker, Gooseneck and Brady Swamps

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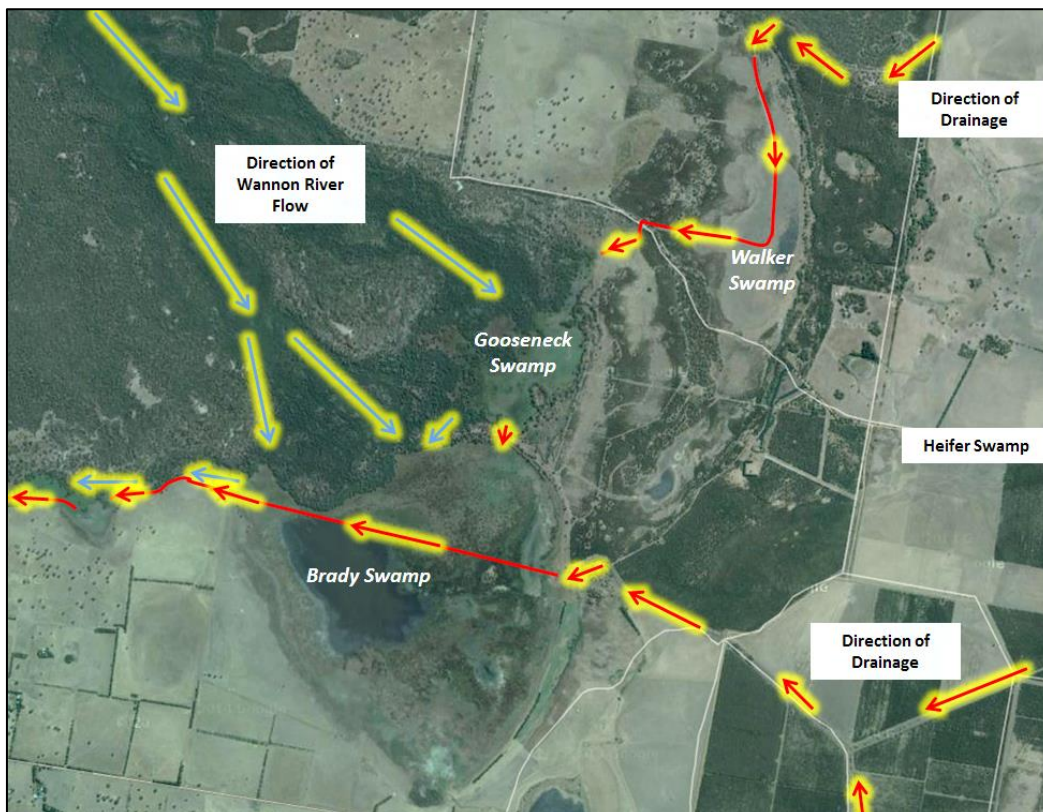
The Walker, Gooseneck and Brady Swamp complex of wetlands straddle public and private land at the far south-eastern corner of the Grampians National Park, near Dunkeld in Victoria's South West. The swamps are associated with a low-gradient reach of the Wannon River where it forms an inland delta, after it exits the valley between the Serra and Mt William Ranges within the Grampians.

The construction of artificial drains in what is now known as the Bunnugal Rural Drainage Area, from around 1900, created an additional catchment for these swamps. While this was initially limited to the extensive Heifer Swamp system to the east, with time additional private drains were connected into this catchment from as far away as Glenthompson (linked to the Bunnugal drain inflow into Brady Swamp) and also from further afield to the north-east (linked to the second drain inflow via Walker Swamp).



**Image from the late 1940s: showing Wannon River flows (blue arrows) and Heifer Swamp drainage inflows (red arrows) into Walker Swamp and Brady Swamp from 1900 – 1950s**

After a 50 year period of increased inflows due to discharges from the new Bunnugal Drainage Area catchment, the comprehensive drainage of Walker, Gooseneck and Brady Swamps was attempted in the 1950s. At that time all three swamps were privately owned and managed as grazing enterprises, during a period when private wetland drainage was occurring across the region at an increased rate.



**Image from the present day: showing the additional drains (red lines and additional arrows) constructed to more comprehensively drain Walker, Gooseneck and Brady Swamps, as it operated from the 1950s – 2013**

However, due to the size and reliability of the catchments that feed these swamps and the low-gradient in this section of the Wannon River, they all continued to effectively function as wetlands during periods with sufficient inflow. In fact, as a result of the environmental values they retained, and thanks to the efforts of people like Gavin Cerini (an officer with the Department of Fisheries and Wildlife at the time), all of Gooseneck Swamp and the northern portion of Brady Swamp were purchased by the government in the mid-1980s, for inclusion in Parks Victoria reserves (Grampians National Park and Brady Swamp Wildlife Reserve respectively).

However it still remained the case that, in all but the wettest periods, drainage had altered the depth and duration of inundation, with the sill level (natural retention height) of all three wetlands having been breached. In each case, the drains were cut to the bed level of the swamp, meaning that as soon as inflows ceased (or downstream constrictions in Wannon River flow eased), these wetlands could freely and more rapidly drain to near empty than would occur under natural conditions.

### Restoration trials commence

Local interest in restoring Gooseneck Swamp and Brady Swamp has been maintained by landholders and the local community, especially the Hamilton Field Naturalists Club, since the land was purchased by the government in the 1980s.

Eventually in 2013, after many years of work, modelling studies and biological investigations by a range of organisations, Nature Glenelg Trust began working towards a staged process of restoration at the site in partnership with the Glenelg Hopkins CMA, Parks Victoria and local landholders – starting with a proposal to construct a low cost and low risk trial sandbag weir structure in the Gooseneck Swamp artificial outlet drain (August 2013 – top right). The initial restoration trial was funded by a small Victorian Government Grant.

The success of the first trial in 2013 led to the construction of a further two trial structures on private land in 2014, at Brady Swamp (March 2014 – middle right) and Walker Swamp (August 2014 – bottom right).



### ***IMAGES: The Volunteer Sandbagging Crews***

***Top – Gooseneck Swamp (August 2013)***

***Middle – Brady Swamp (March 2014)***

***Bottom – Walker Swamp (August 2014)***

The following success of all three restoration trials then led NGT to work towards securing the long-term future hydrology of all three wetlands, albeit via vastly different pathways.

## Permanent restoration of Gooseneck and Brady Swamps

Positive further progress was swift, as NGT was immediately successful in gaining a Victorian Government grant to backfill the drain outlet cuttings from Gooseneck and Brady Swamps entirely.



*Before (2014)*



*After (2015)*

*The drain outlet cutting from Gooseneck Swamp*

At Gooseneck Swamp, the effect of restoration was subtle but significant. Every time the wetland fills, rather than immediately flowing down the drain and prematurely emptying the wetland, water levels rise to the natural sill level required to activate the natural flowpath around the end of the lunette bank, as shown below.



*Before restoration*



*After restoration*

*The natural flow path between Gooseneck Swamp and Brady Swamp, which – as a result of the outlet drain being backfilled – now activates in all flow events, rather than just during floods.*

At Brady Swamp, the challenge of reversing drainage was substantial, as we successfully engaged contractors to backfill 1.2 km of artificial channel that ran parallel to the Wannon River. This means that every time Brady Swamp fills, this section of river now flows again for the first time since the drain was dug in the 1950s.



*Before (2014)*



*After (2015)*

*The drain outlet cutting from Brady Swamp, in the vicinity of the trial structure*

## The complexity of finding a solution for Walker Swamp

The pathway to further action at Walker Swamp was significantly more complex, as the land at the time was part of a privately owned commercial blue-gum forestry Managed Investment Scheme.

However, over the course of delivering the projects at Gooseneck and Brady Swamp, NGT also formed a positive working relationship with Macquarie Plantations. Thanks to their support, the restoration trial at Walker Swamp, consisting of a low-level temporary sandbag weir, was completed by NGT with community volunteer help on the 8th of August 2014. That first year, we managed to retain the tail end of a pulse of inflows that resulted from the rains in late July 2014, during an otherwise below average rainfall year.



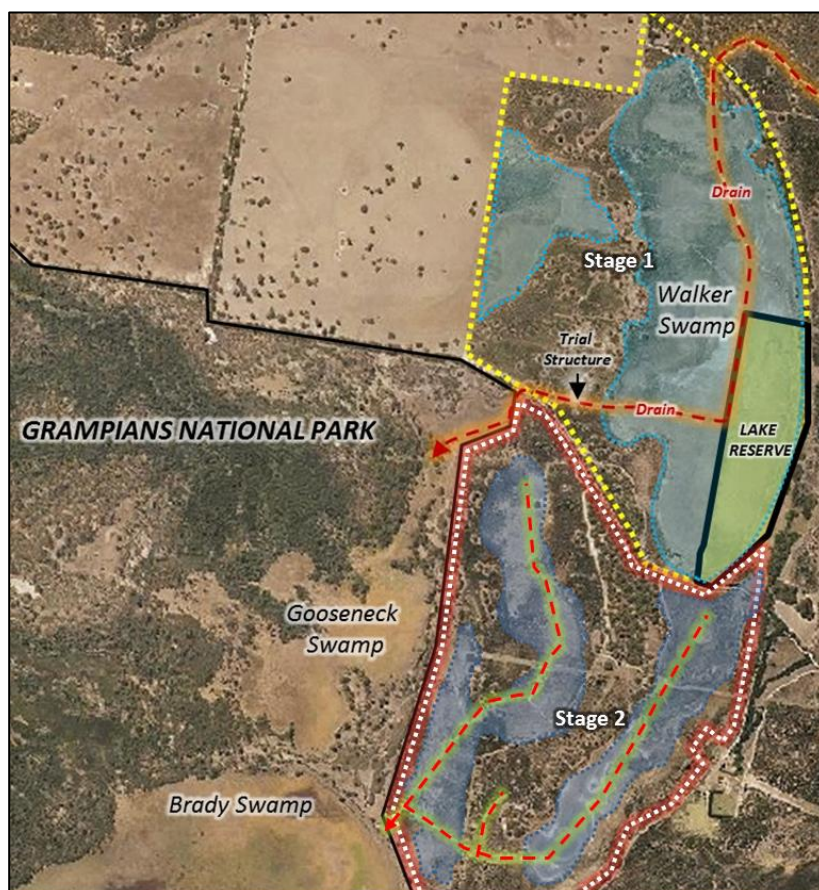
*Before (left) and after (right) the construction of the trial structure in 2014 - looking upstream towards Walker Swamp*

Over the four years that the trial structure was in place, it did a highly effective job of retaining water in the swamp, when in previous years it would have rapidly emptied (draining to bed level) once inflows ceased. However, despite its success, the trial structure was still set up 60-70 cm below the natural full supply level of the wetland, and it was clear that the surrounding floodplain, upon which the blue-gums were growing, had much larger-scale restoration potential.

Hence in 2015, when NGT became aware that the property would be sold at the end of the forestry investment scheme in 2017, the difficult task began of seeking sufficient finance to enable the property to be purchased for environmental restoration and permanent protection as a private, covenanted nature reserve.

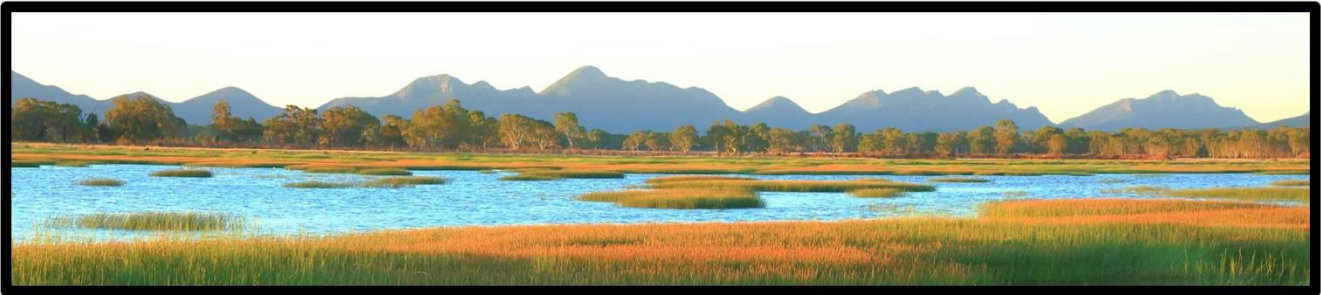
That process eventually resulted in a new partnership between Nature Glenelg Trust, the Glenelg Hopkins CMA and the Hamilton Field Naturalists Club. In the first instance, this enabled NGT to secure 200 hectares (500 acres) of the property surrounding the drained and isolated Walker Swamp Lake Reserve (Parks Victoria managed crown land), the “Stage 1” area, as shown right. The purchase of this area settled in March 2018.

However during negotiations, NGT was





also able to seize the rare opportunity to secure the rest of the Walker Swamp floodplain – a further 200 hectares (500 acres). As shown, this would enable full restoration of the presently drained floodplain to occur and physically connect the Stage 1 area with the restored wetlands in the Grampians National Park. In January 2020, thanks to incredible support from public donations, NGT paid off the last of the land purchase costs for the Walker Swamp Restoration Reserve.



**Welcomes you to the Walker Swamp Restoration Reserve!**

It has now been two and a half years since the 1000 acre Walker Swamp Restoration Reserve was announced, as a new private nature reserve on the Wannon River floodplain, adjacent to the Grampians National Park.

This time has been exceptionally busy, with a wide range of works and activities taking place to begin the ecological restoration process, and the first flow event to fill the eastern wetlands on the reserve to capacity occurred in October 2020.

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:



**Australian Government**



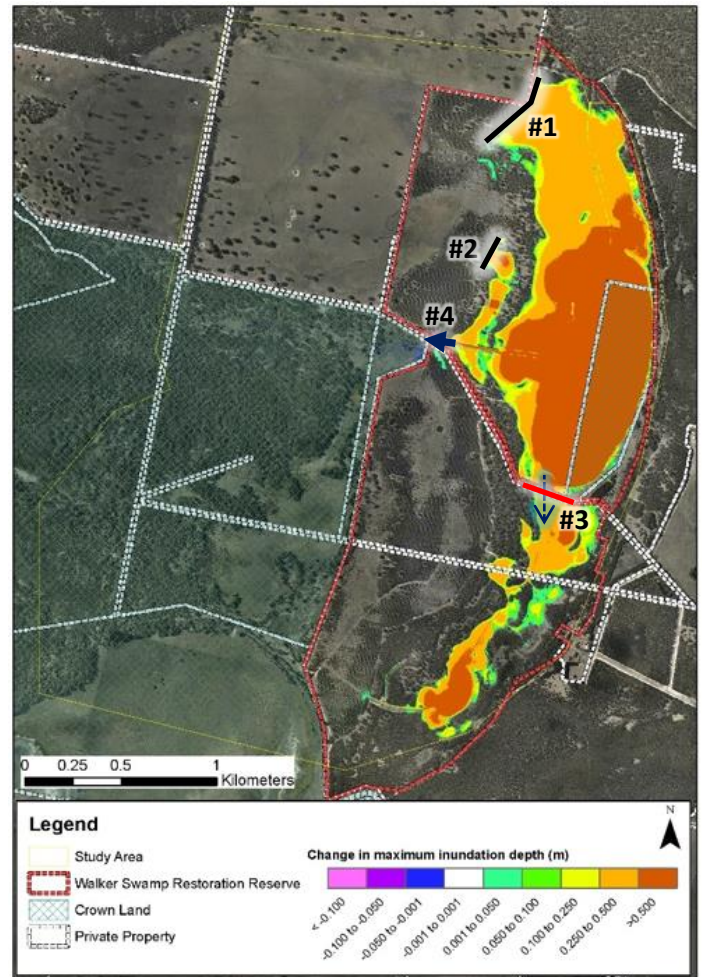
**Ararat Rural City**

## Hydrological Study

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, as shown right (note that the floodplain wetlands on the western portion of the property are not highlighted on this map).

This in turn highlighted key locations on the property where additional remedial works would be required to facilitate restoration, such as:

- 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.



## Levee Bank Reinforcement

The two northern levee banks on the property (see #1 and #2 on map above) are artefacts of the era when the artificial drains were constructed, and were designed to ensure that drainage inflows coming into Walker Swamp from the north-east were contained on the eastern portion of the property and prevented from spilling west during major rainfall events. After such events, even in its drained state Walker Swamp would temporarily inundate (acting as an equalisation basin), only to disappear again within days or weeks as the major channel through Walker Swamp would rapidly carry away the excess water, as soon as inflows dropped below the outflow capacity of the drain. This water would discharge towards Gooseneck Swamp via the main artificial outlet and under Lynchs Crossing Road, near the corner of the Grampians National Park.

With Walker Swamp restored, these now reinforced (approximately 50 cm high) levee banks will continue to be of strategic value for water management, allowing NGT to hold the eastern wetlands (including Walker Swamp) to their full supply level whenever drainage inflows permit. The levee banks allow us to confidently do this without negatively impacting our neighbours, and to continue to manage a single exit point for outflows off the property, via the new spillway (#4), and down the short remaining section of artificial drain.

Because the eastern wetlands on the Walker Swamp Restoration Reserve have an artificially supplemented catchment (via the northern Bunnugal Drain, which is capable of delivering high volume, flashy flows from the north-east), it was vitally important that NGT demonstrate how those drainage flows were going to be effectively managed in conjunction with our approach to restoration works. The reinforced levee banks have been integral to this approach to future water management.

We had the first opportunity to demonstrate the function of the newly reinforced levee banks in October 2020, when drainage inflows filled Waller Swamp to capacity for the first time since restoration.



*Looking south, along the northern levee bank (#1 on previous map) on 25 Oct 2020. Walker Swamp is to the left (east), the NGT Reserve boundary is the fence on the right, and beyond that to the west is our neighbour's farmland.*

### Walker Swamp Outlet Spillway

The single exit point chosen for conveying flows from Walker Swamp and the wetlands on the eastern portion of the property (see #4, on page 9 map) presented the following design challenges. On the upstream side, as discussed in the previous section, the goal was to completely backfill all the artificial drains through Walker Swamp, and to use the finished height of the spillway itself at natural surface to set the restored full supply level of the wetland. However, on the downstream side we were planning to keep a short existing section of drain operational in order to have a means of managing outflows in major events under Lynchs Crossing Rd, using existing drainage infrastructure. That meant establishing a spillway capable of resisting erosion and conveying flows over an approximate 1.5m drop from the restored natural surface level upstream into the base of the artificial channel downstream, noting that this drain is now not expected to carry flows very often, due to the immense increase in water storage capacity within Walker Swamp and adjacent eastern floodplain wetlands.

After weighing up the options, rather than using concrete, we decided to adapt an inexpensive and more flexible construction method we have previously employed in trials, by building the spillway out of an interlocking structure of 2500 geo-fabric sandbags. After surveying the site and setting the levels in January 2019, over 2 days in March 2019 a team of volunteers helped us get the job done in quick time – as shown right (images from Jan, March, May, Aug).

After lining the whole structure with fabric, backfilling the drain upstream and capping the spillway with donated rock, the job was done...



The structure then got its first serious test in October 2020 and passed with flying colours.



*The Walker Swamp outlet spillway on the 17<sup>th</sup> of October 2020*

### **Lynchs Crossing Road Upgrade**

Lifting water levels in Walker Swamp meant that Lynchs Crossing Road was going to be at risk of regularly inundating in the future as a result of our restoration works. We also needed to make sure that any upgrade works to the road then didn't inadvertently isolate the important chain of wetlands south of the road, which we had earmarked for restoration, from their water source.

The solution (see right) was to build up Lynchs Crossing Rd by approximately 50 cm, and to install additional culverts with sufficient capacity to carry flows (which will occur when Walker Swamp is full enough to spill southward, as happened for the first time in spring 2020) through to the southern wetland chain, maintaining connectivity and ensuring the road remains all-weather accessible. Ararat Rural City generously provided a significant contribution to this component of the project, as well as incredibly helpful design and technical assistance.



*Looking west down Lynchs Crossing Road, passing through a full Walker Swamp in October 2020.*

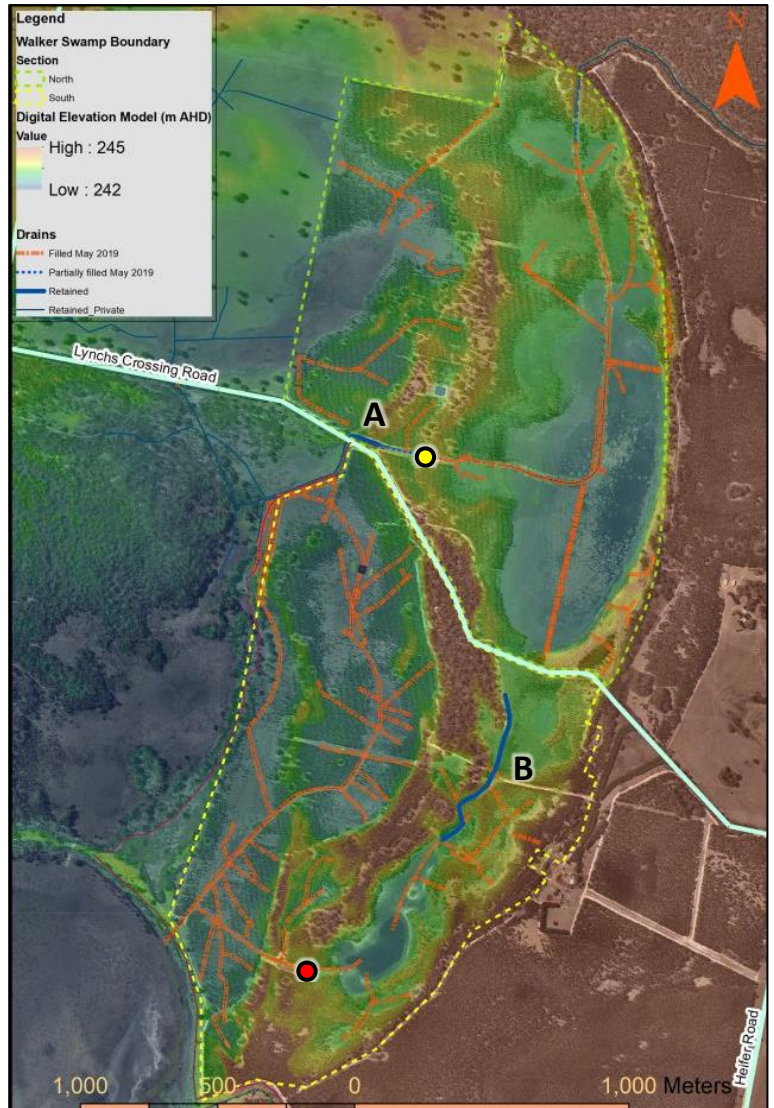
## Backfilling Drains on the Property

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, most of these artificial drains have now been fully backfilled, resulting in the restoration of natural inundation patterns across the property in 2019 for the first time in several decades.

The remediated former drains are marked in orange on the map right (see example before and after images below).

On the map, you will notice that only two drains (blue lines) remain:

- The one marked A is the short section of the major deep drain that is being kept to convey occasional flows downstream of the Walker Swamp outlet spillway.
- The one marked B is a shallow connecting channel that helps deliver water to the southern-most wetlands in the chain of swamps on the eastern side of the property. Because it is only a minor channel, future works (if required) will be simple and inexpensive.



**Looking east at the former 2014 trial location on the main drain out of Walker Swamp. (See yellow dot on map above)**

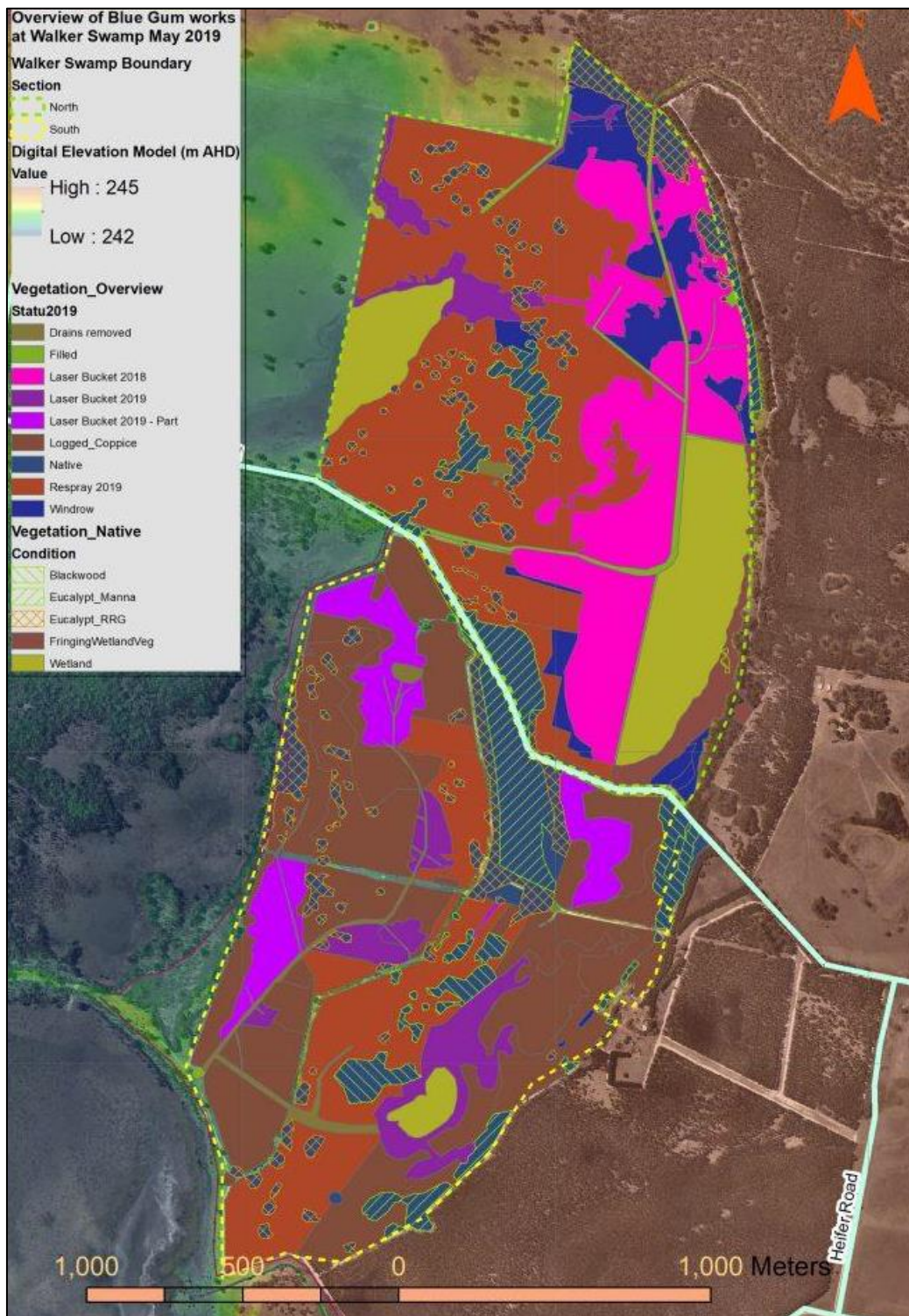


**Looking west at the now completely backfilled southern outlet drain through the lunette. (Red dot on map above)**

## Addressing the Legacy of Blue Gum Plantations

Outside of artificial drainage, which dates to the development of the property from the 1950s-1990s for livestock grazing purposes, 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 mix of current and former plantation areas. These could be broadly categorised as follows: (1) recently harvested areas that were coppicing, (2) standing plantations that the previous plantation manager deemed uneconomic to harvest and (3) areas that were still subject to temporary inundation where the plantations had failed to establish.

This major change in land use and management history had a series of impacts that we have begun to manage and will continue to address for many years to come, as shown below, and 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.



### 2. Removal of Standing Plantations

Small leftover areas of plantation in the northern part of the property (see dark blue areas on p. 14 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. 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 indeed generate a modest income stream. That income will help us cover the cost of coppice spraying as these areas reshoot over the next two years.



### 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.



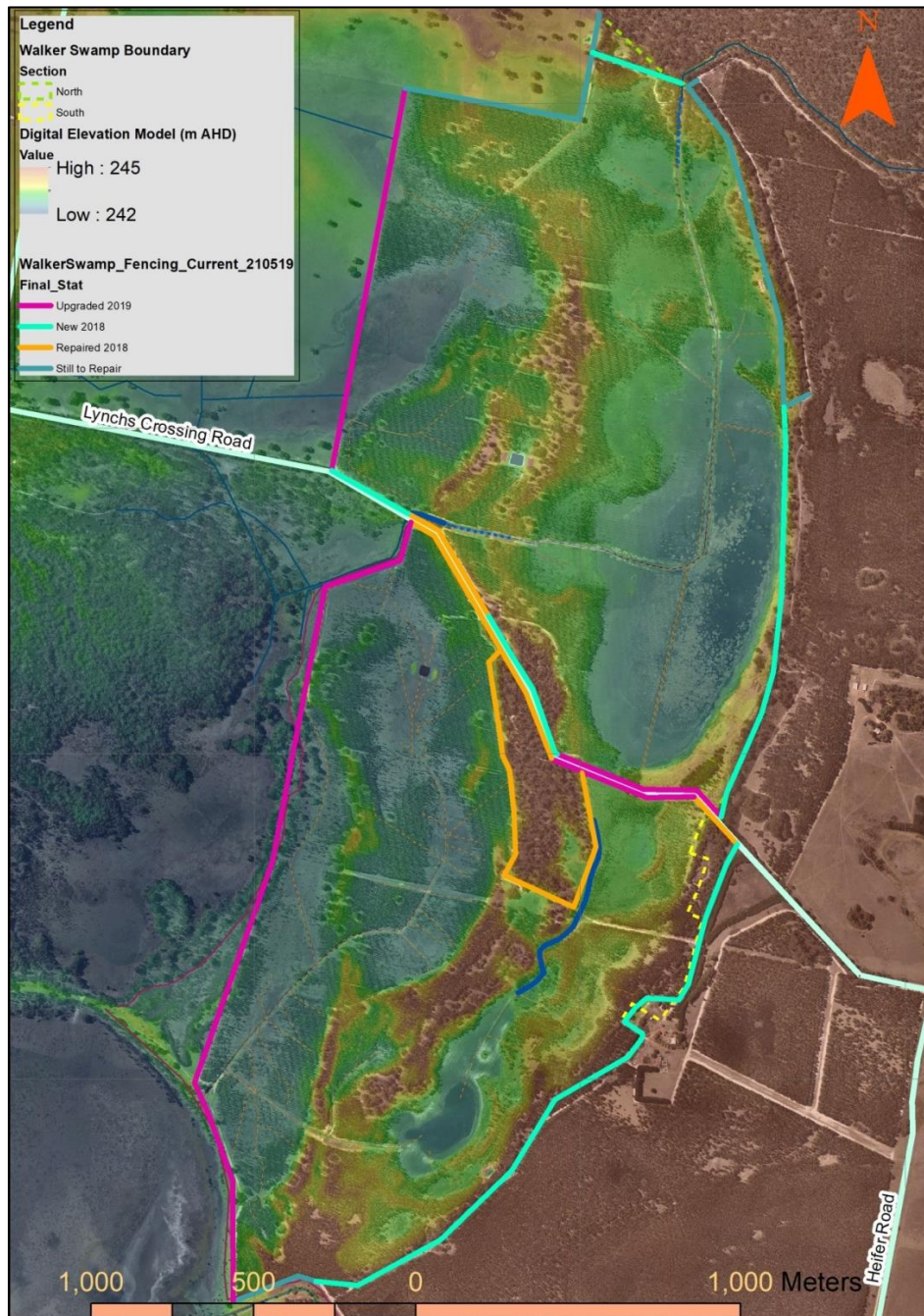
After progressively remediating the ground over two seasons in all the failed areas of plantation in those deepest wetland beds (right), these areas are now rapidly and spectacularly recovering with native wetland plants, establishing in the right zones within and around each wetland.



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, and so will continue to evaluate our future management options while we wait for that to occur.

## 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 National Park. It also provides us with maximum future management flexibility, including options that might allow us to implement experimental research at the site to test strategies for managing biomass and a population of overabundant kangaroos. Thanks to contractors, our volunteers and the Landmate program, the Reserve is now fully fenced.



## Aboriginal Heritage

An Aboriginal cultural heritage survey has been undertaken across the property. Like other wetlands in western Victoria, the lunette banks around the wetlands are home to considerable evidence of past Aboriginal occupation. Things are still at an early stage, but subsequent site visits with representatives from Eastern Maar have commenced and we genuinely hope this will lead to positive outcomes for Traditional Owners and the recovery of living indigenous culture at this site.

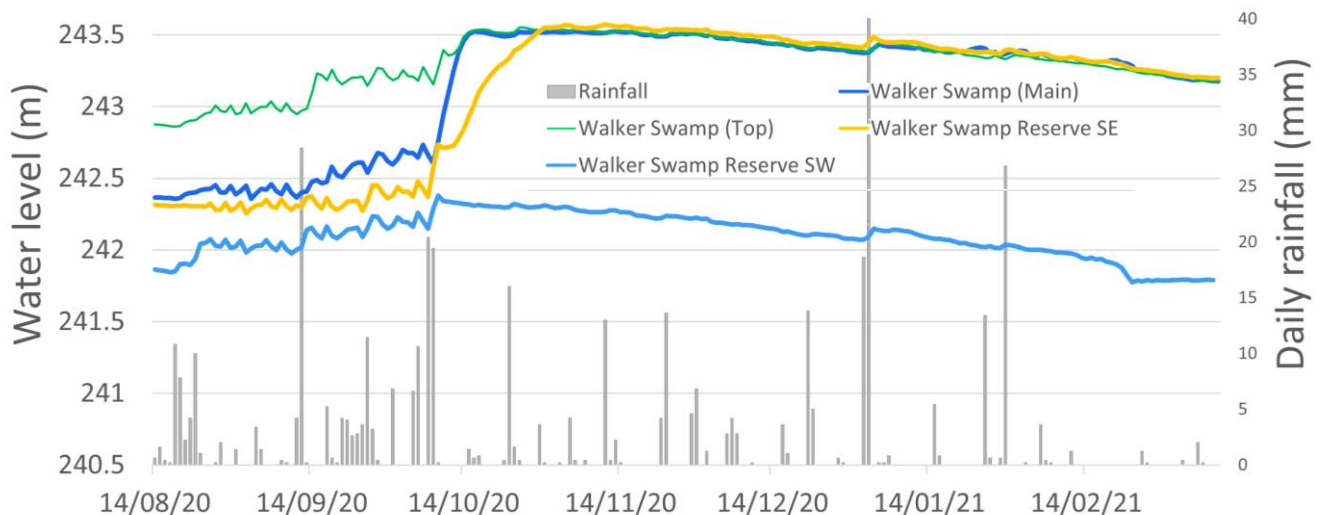


## Weather Station, Water Level and Flow Monitoring

We have a complementary network of data loggers in place across the property, including the weather station (see right – also note the areas of treated Blue Gum coppice in the image). This is allowing us to record temperature, wind speed, gust speed, wind direction, rainfall, relative humidity, solar radiation, dew point and atmospheric pressure around the clock, via a system that can be remotely accessed via the internet. Our water level monitoring data loggers are placed in five wetland zones of the property.



Hence by combining these data sources, we are now able to more accurately chart and predict how the site and its wider catchment respond to rainfall events. The example shown in the graph below, put together by NGT's Lachlan Farrington, illustrates and explains the dynamics of the 2020 flow event.



This chart clearly shows the run of wet weather that primed the catchment in September 2020, and the two 20mm rainfall events in successive days that drove a surge of catchment inflows in October 2020.

By analysing this information, it is possible to see the moment that all the eastern wetlands equalised in level, and how long it took for the eastern wetlands, including Walker Swamp to reach capacity.

## Bird Observation Tower, Site Interpretation and Signage

The observation tower that was donated in 2018 was relocated earlier in the year to its new permanent home, set up behind brush fence screening (to minimise disturbance to birds), and situated a short walk from our nearby visitor carpark. Interpretative signage along the path helps to give visitors a glimpse into the fascinating history of the site. The viewing deck has now been fully enclosed to offer protection from the elements, and the site is already proving its value for bird counts and educational activities.



## Ecological Monitoring

Since the Reserve was established, NGT has started collecting 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 invertebrate diversity/abundance;
- annual assessment of river red gum condition; and,
- assessment of water quality.



## The Role of Volunteers and the Community

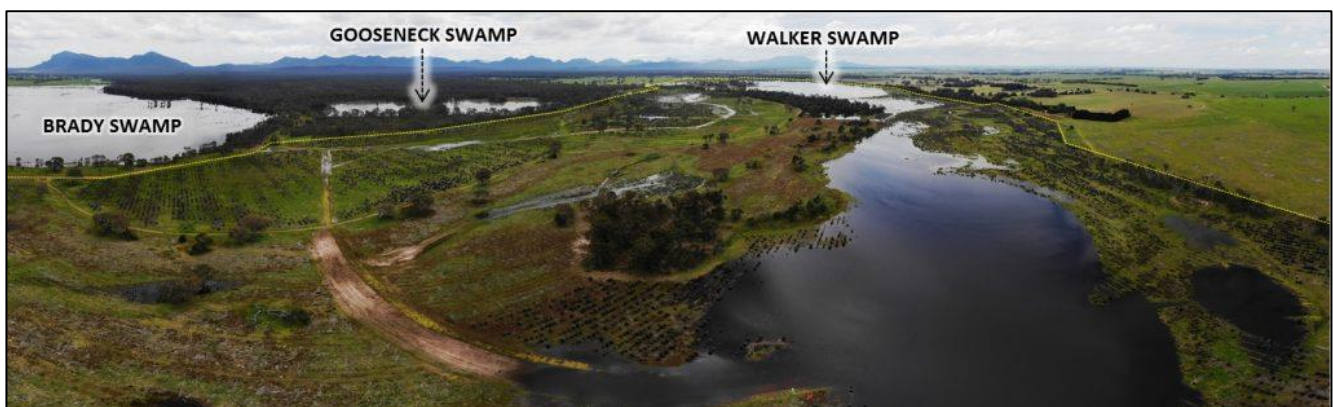
Volunteers have played an incredibly important role during the establishment phase for the property. A small sample of some of the volunteer activities includes:

- Avian monitoring by the Hamilton Field Naturalists Club
- Assembly of the bird observation tower (right).
- Fencing works, maintenance and repair.
- Assistance with the construction of the first trial structure in 2014, and the permanent spillway in 2019 (below).

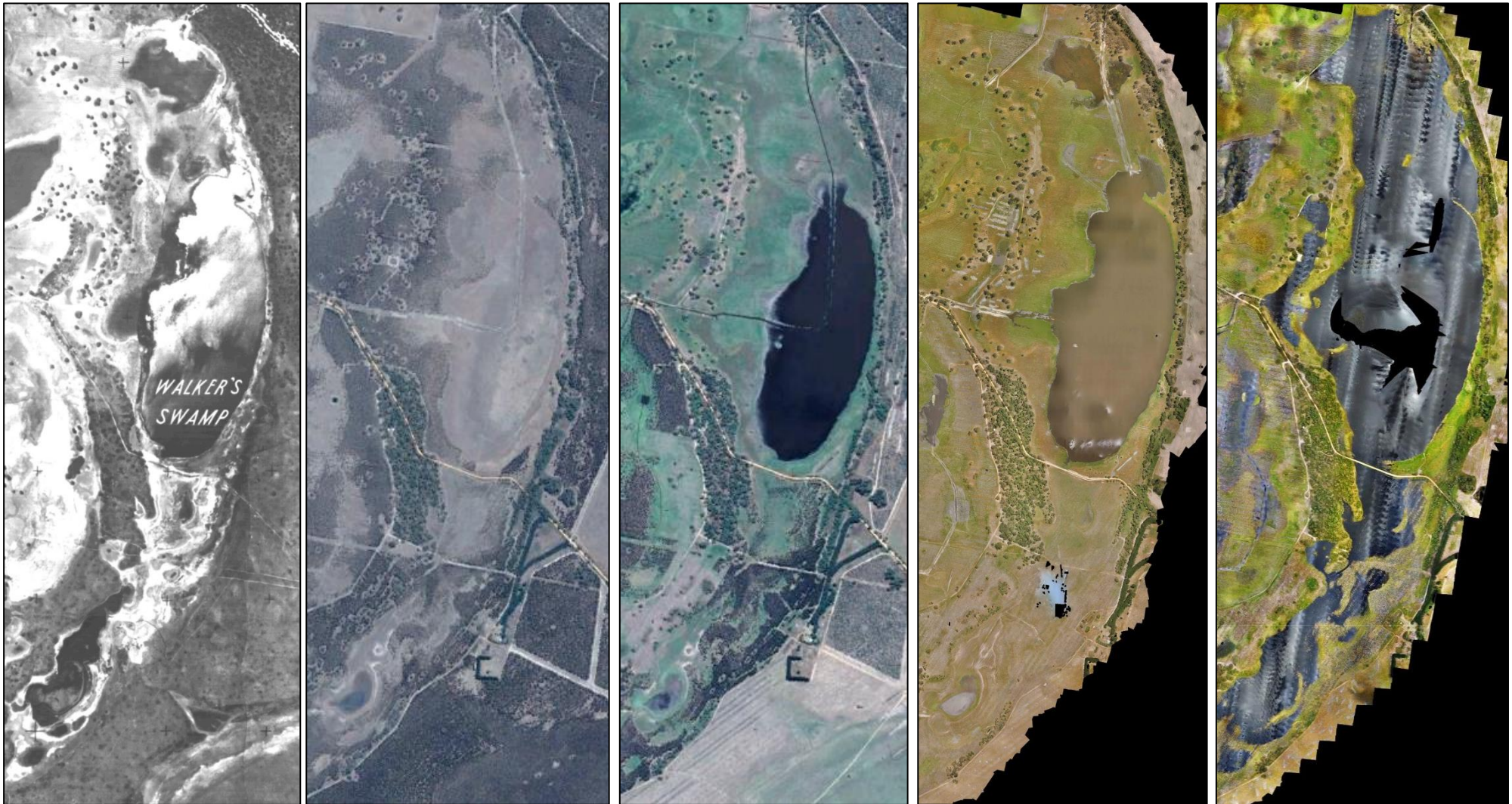


In spring 2018, and again in 2021, Greg has been hosting ten week birdwatching and identification courses in the Grampians. We are also excited about the future possibilities for education activities involving local schools in the site, and integrating it into their science curriculum, having started this process with a number of schools in Hamilton.

For more information about the project, please visit the NGT website: [www.natureglenelg.org.au](http://www.natureglenelg.org.au), or contact us by calling 08 8797 8596, or emailing [info@natureglenelg.org.au](mailto:info@natureglenelg.org.au).



*View over the Walker Swamp project area on the 21st of October 2020, showing its proximity to Brady and Gooseneck Swamps. The newly reinundated southern wetland basin is in the foreground. Photo by Dale Bachmann*



1947\* (pre-drainage)

2014 (post-drainage)

2014-2018 (trial phase)

2019 (post full restoration)

2020\* (first filling event)

**The dramatic change in the extent of maximum sustained inundation at Walker Swamp as a result of NGT restoration works**

**Notes:**

\* 1947 image does not show full extent of inundation due to time of year image taken. Lighter coloured areas are all floodplain subject to inundation.

\* 2020 image has reflecting cloud over the waterbody obscuring the image a little, but the extent of inundation is accurate.