

VOYAGER ESTATE

MARGARET RIVER



CASE STUDY

VOYAGER ESTATE'S
REHABILITATION OF RIPARIAN ZONES
THROUGHOUT THE PROPERTY.



Revegetation of riparian zones within the Boodjidup catchment region with native plants to create habitat that will increase biodiversity of flora and fauna, prevent erosion of sensitive areas, and improve overall water quality entering and exiting the property.



VOYAGER ESTATE

M A R G A R E T R I V E R



WINERY PROFILE

Voyager Estate, established in 1978, has a long history of innovation with sustainability, environment, and soil health, essential drivers to all decisions made in and around its 100% estate grown, made, and bottled wines. A Sustainable Winegrowing Australia certified member (vineyard and winery) since 2010 Voyager Estate will be organic certified by 2023. Organic certification is a natural progression resulting from the continual improvement process set by the Sustainable Winegrowing Australia program, which captures this within the benchmarking metrics available to members, enabling them to demonstrate their sustainability stewardship against the national average. Voyager Estate became an Applicant Member of International Wineries for Climate Action (IWCA) in 2022, ambitiously working towards achieving net zero carbon emissions by 2050.

PROJECT

Over 15 years ago Voyager Estate recognised the sensitivity of the Boodjidup Brook catchment that runs through their properties and the need to establish an Environmental Action Plan to protect and improve its health, whilst also ensuring water security for their business. A report released in 2009 by Cape to Cape Catchments Group (CCCG), Boodjidup Brook Action Plan, graded all sections of the Boodjidup Brook catchment from class A, pristine, to class D, ditch (Figure 1), and provided clear priority actions for each category to protect and enhance the existing unique natural values and restore those that were significantly degraded (CCCG 2009).

Prioritising the best quality areas first, followed by those that can recover quickly and then focussing on the most degraded regions is considered the most effective management practice that addresses the needs of individual properties as well as the whole ecological system (CCCG 2009).

Priority actions (CCCG, 2009) include:

- Fencing to control stock access is considered the most important management tool, especially in class A and B grade areas of remnant bush and foreshores, to protect vegetation and represents best value for money with natural regeneration being the most cost effective.
- Weed management targeting declared and environmental weeds in or adjoining good quality remnant bush as a priority to reduce the impact on biodiversity.
- Maintain and enhance wildlife corridors.
- Restore and enhance vegetation buffers using local native species for revegetation projects.
- Erosion control, especially gully erosion by reducing speed of water flow and allowing vegetation to stabilise banks.
- Installation of low flow dam bypass systems maintaining environmental flows.
- Raising community awareness through engagement with local community groups such as schools.

Boodjidup Brook and its tributaries traverse many privately owned properties, exiting and entering Voyager Estate at multiple locations. This motivated the Wright family to ensure that water quality exiting their lands was better than that entering, with a rigorous water quality monitoring program implemented.

Classification of Boodjidup Brook and its tributaries on Voyager Estate, published in the Boodjidup Brook Action Plan (CCCG 2009) ranged from class A2 through to D3 (Figure 2). Voyager Estate used these guidelines and information to break the

project into stages with class A-B riparian zones given the highest priority. Since commencing fifteen years ago, more than 60,000 native trees and plants have been established and where livestock is grazed fencing has been used to exclude access to waterways, protecting new plantings and ensuring retention of remnant native vegetation. Where A-grade remnant bush had been identified, fencing was erected to prevent livestock grazing. Subsequent fencing focused on more degraded sections coinciding with native planting projects for riparian rehabilitation.

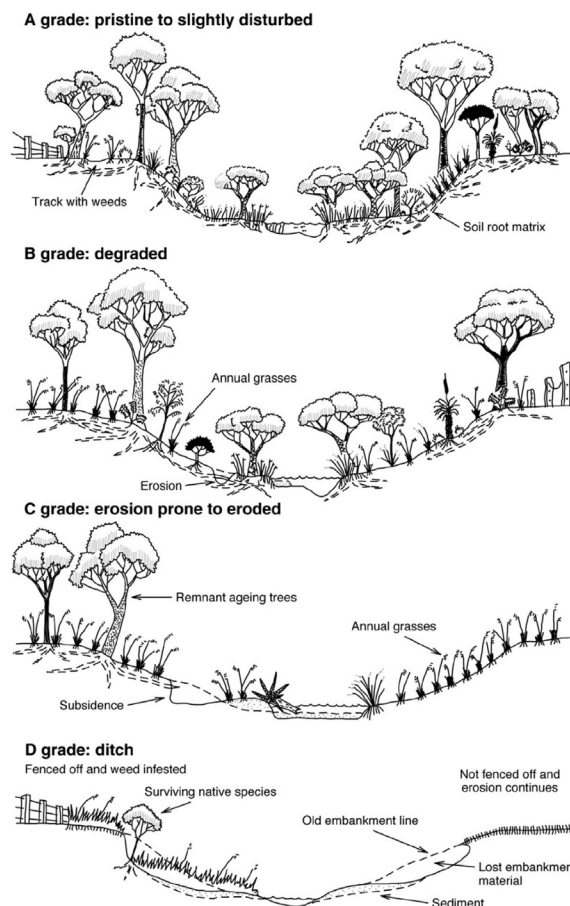


Figure 1. Four grades, A, B, C, and D of river foreshore condition based on the Pen-Scott method of riparian assessment of waterway health in the south-west of Western Australia. Each grade was divided into 3 subsets (1, 2, and 3), for full explanation refer to the Boodjidup Brook Action Plan (CCCG 2009).

Table 1. Voyager Estate revegetation register commencing in 2007. Refer to Figure 2 for location references.

When	Number trees planted	Location	Location reference (Figure 2)
June – October 2007	3000	Ullinger's between U8 & U9	B
June – September 2008	3000	Ullinger's between U8 & U9	B
September 2008	2500	Broadvale near maintenance shed	
September 2009	1600	Weightmans Dam – stage 1 north end	C
June 2010	6000	Weightmans Dam – stage 2 middle	C
July 2010	2000	Wastewater area	
June 2011	7000	Weightmans Dam – stage 3 south end	C
June 2011	3000	Weightmans Dam stage 1 fill planting by Cape to Cape Catchments	C
September 2012	1500	Weightmans Dam stage 3 fill planting	C
June 2013	4700	Ullinger's winter creek near new vineyard compound	A
September 2014	3000	Ullinger's winter creek in fill planting	A
September 2017	20000	Weightmans Dam	C
October 2019	2500	Broadvale little bridge	
2021	2000	Weightmans ex – home farm	C – north

Table 2. Selection of plants used in 2013 and 2014 for rehabilitation of the Ullinger's winter creek line.

Plant Species	Favoured conditions	Common name/growing habit
Acacia alata	Damp	
Acacia pulchella	Drier	Prickly Moses
Acacia urophylla	Anywhere	Wattle
Agonis flexuosa	Dry 10m apart	Peppy tree
Anigozanthos flavidus	Damp	Kangaroo paw
Astartea fascicularis	Edge of watercourse	
Banksia grandis	Dry, 10m apart	Banksia
Baumea juncea	Wet	
Billardiera fusiformis	Anywhere	Bluebell creeper
Calistachys lanceolata	Damp	Native willo
Carex apressa	Damp	Sedge
Chlorilaena quercifolia	5m apart	Karri shrub
Corymbia calophylla	Dry, 10m apart	Marri
Eucalyptus patens	Dry, 10m apart	Blackbutt
Ficinia nodosa	Damp	Sedge
Juncus palidus	Damp/swampy	Rush like
Juncus pauciflorus	Shady moist area	Rush like
Meeboldina scariosa	Wet	Rush like
Melaleuca incana	Damp/swampy	
Paraserianthes lapantha	Anywhere 5m apart	Cape Leeuwin wattle
Taxandria linearfolia	Damp 5m apart	Swamp peppy
Taxandria parviceps	Marginally damp	
Thomasia paniculate	Creek edge	
Trymalium floribundum	Anywhere 5m apart	
Lepidosperma tetraquetrum	Damp/wet	Sedge
Meeboldina scariosa	Wet	Rush like
Baumea juncea	Wet	

Projects were completed by staff and ranged between 1000 – 3000 plants at a time depending on the sensitivity of the site (Table 1).

Site preparation commenced with removal of weeds. Surveyed weeds typical along all regions of the Boodjidup Brook and tributaries include arum lily, gladiolus, kikuyu, perennial and pasture grasses, fleabane, nightshade, thistle, fruit trees, blackberry, bridal creeper, introduced reeds and rushes such as *Juncus microcephalus* and *Isolepis prolifera*, lotus, poplars, non-local acacia, callistemon, and eucalypts species to name a few (CCCG 2009).

Weed control was done manually by staff in sensitive zones; herbicide free in waterways and adjacent to riparian areas. During early stages of projects Voyager Estate used targeted herbicide treatments to help prepare ground for replanting, however since working towards organic certification they have moved to targeting smaller areas, manually removing weeds, and using machinery to create mounds. Weed

control was followed directly with revegetation using appropriate native plants at greater densities, factoring in a 10-20% natural attrition rate, to increase competition with weeds and prevent erosion of bare soil. When selecting appropriate planting material there are many resources and suppliers available to help with selection including Cape to Cape Catchment Group publications (CCCG 2004, 2006 and 2009), as well as local Natural Resource Management groups such as Nature Conservation, GeoCatch and Lower Blackwood LCDC. An example of native species used by Voyage Estate during revegetation of the Ullinger's winter creek line (Figure 2, reference A) is shown in Table 2.

In waterways classed as C and D fencing was installed to exclude livestock, weeds removed, and riparian zones were replanted. Importantly erosion control was further managed by strategically placing rocks within the water channel (Figure 3), creating rock pitches, to slow water flow through these areas allowing vegetation to establish itself, stabilising banks.

Installation of a dam at Weightmans' property, for water security, was located in a paddock with significant erosion and on a section of creek line classed D1-D3. A staged revegetation program between 2009 and 2017 involved more than 39,000 plants, with 20,000 native trees, sedges, and rushes being the largest undertaken in one season, to create an aquatic habitat to control flow and stabilise the natural environment.

Following fencing and revegetation programs each area is monitored with some in-fill planting being carried out, the last being in 2014. The majority of maintenance now involves ongoing stock exclusion and weed control as the main forms of management, relying on natural regeneration of established areas. The implementation of higher planting densities initially, combined with a 'light-no touch' approach, has resulted in significant natural ecological regeneration.



Figure 3. Rock pitching was used to decrease and direct the flow of winter catchment in watercourse B (refer to Figure 2); image A was taken prior to the rock pitches being installed, while image B highlights the extent to which the pitching has controlled water flow, preventing flooding of the paddock.

WATER QUALITY AND BIODIVERSITY OUTCOMES

Water quality in the Boodjidup Brook catchment has not been routinely monitored however in 2001 and 2002 the Augusta Margaret River Shire, Water and Rivers Commission (now Department of Water) and Lower Blackwood LCDC, undertook a survey of catchments within the Cape to Cape region, including the Boodjidup Brook (CCCG 2009). A key finding of this survey, when compared to Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines (ANZECC 2000), was nitrate levels exceeding environmental trigger values that could detrimentally impact waterways.

Voyager Estate has been monitoring water quality throughout their property since 2007. Measurements have been taken annually at the Weightmans dam, even prior to it being constructed, providing insight into the potential impact revegetation has had on water quality, in particular nitrate levels at this location (Table 3).

Water quality testing has not always occurred at the same time of year and types of tests have changed over time, making it difficult to draw comparisons between seasons; what is evident is in 2009 nitrate levels were very high and while the significant decrease seen in 2011 onwards may not be attributed solely to the revegetation program implemented, as there are many factors that will impact this, the levels have stabilised significantly. At Weightmans dam pH has also increased to within the ANZECC guidelines (ANZECC 2000).

The Voyager Estate property registered with Sustainable Winegrowing comprises 278 Ha of which 112 Ha is under vine. A further 105 Ha on the adjacent Cordis Farm property, with 15.3 Ha of biodiversity area makes up the land holdings by Voyager Estate in the Boodjidup Brook catchment. Biodiversity is a key indicator of Sustainable Winegrowing Australia and forms a critical part of the Sustainability Action Plan within the standards. Since becoming a certified member of Sustainable Winegrowing Voyager

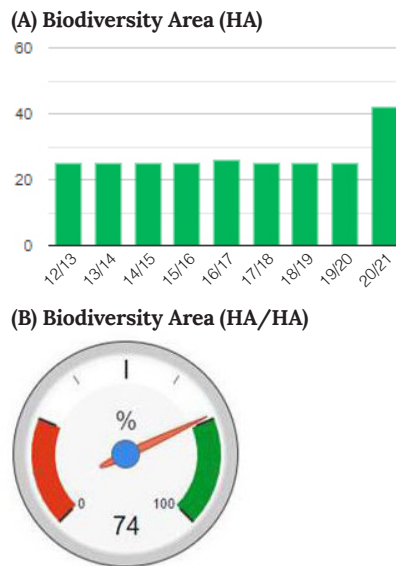


Figure 4. Voyager Estate's Sustainable Winegrowing biodiversity area metrics (A) and business indicator metrics (B). From 2012/13 to 2020/21 reporting periods. From 2012 to 2020 the area is approximately 25 Ha; in 2020-21 reporting period it increased to 42 Ha. Sustainable Winegrowing Business indicator metrics show Voyager Estate is in the top 26% of all members in relation to the area of their property under biodiverse land, which includes riparian zones, watercourse and remnant bush. Estate has been submitting the total biodiversity area metrics, defined as remnant bush/vegetation and revegetated areas, to Sustainable Winegrowing (Figure 4). The significant jump in biodiversity area recorded from 2019-20 (25 Ha) reporting period to 2020-21 (42 Ha) is due to a change in how the area was calculated. Prior to 2020 the area had been estimated internally and based on maps that were not current.

Given the extensive revegetation programs undertaken between 2009 and 2017 Voyager Estate had the biodiversity area assessed externally resulting in a 68% increase compared to prior best estimates. This is a remarkable outcome, positioning them in the top 26% of Sustainable Winegrowing members, and while they may have underestimated prior records there is no doubt that the area of biodiversity on Voyager Estate has increased. Any significant rehabilitation works should be reviewed every five to ten years to understand the return on investment both ecologically and financially.

When considering biodiversity area, it is not only important to note the overall area but also the increase in quality of that area (Figure 1). Revegetation at Weightmans dam has created an ecological wetland system that has seen increased birds, arthropods, and amphibian activity.

The site was originally classed as D1 to D3 (eroded ditches), with no native vegetation present, this can be seen from an old aerial image in Figure 5A, before the dam was constructed and then in Figure 5B following construction but prior to significant plantings becoming established. Since completing planting programs around Weightmans dam the area has increased in quality (Figure 6) and a formal assessment could potentially have it classed as high as B grade foreshore, which is defined as native species are dominant however weeds remain present and form a significant component of the understorey (CCCG 2009).

Table 3. Water quality monitoring at Voyager Estate

Test	Trigger Value (ANZECC 2000)	Boodjidup Survey (CCCG 2009)	Weightmans Dam				
			Jul 09	Nov 11	Jul 14	Jul 16	Jul 21
Location			1	1	1	1	1
EC* mS/m	0.12-0.3	0.04-0.1	57.3	67	46	57.4	56.6
pH	6.5-8.0	7.0 - 7.5	6.1	6.1	6.3	7.5	7.2
Salinity (salt) mg/L	-	-	236	370	250	320	310
Sodium Adsorption Ratio			NR ¹	NR ¹	NR ¹	NR ¹	2.9
Nitrate mg/L	>0.15	0.2 - 1.7	6.5	0.17	1.2	0.77	NR ¹

* Electrical Conductivity
¹ NR - not recorded, SAR not recorded between 2009 to 2016; Nitrate not recorded in 2021.

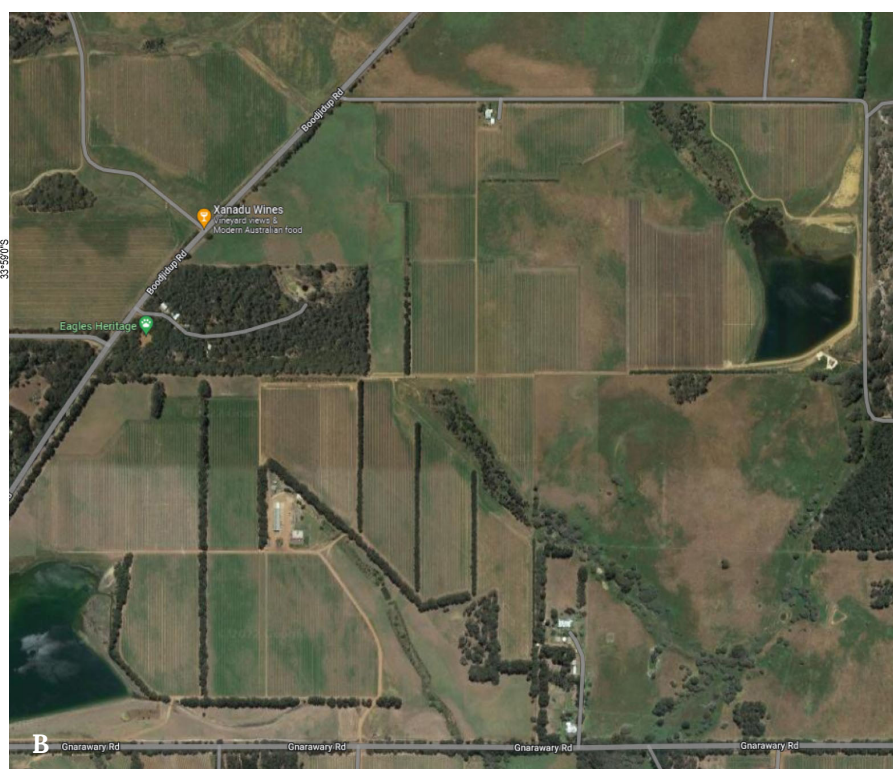


Figure 5. Comparison of revegetation over time. Image A is prior to 2009 and sourced from Boodjidup Brook Action Plan (CCCG 2009). Weightman Dam had not been constructed yet and is a bare paddock with the watercourse graded as class D3, heavily eroded. Image B is sourced from Google Maps, circa 2013–2017, the revegetation program at Weightman Dam (Figure 2, location C) had not commenced with riparian revegetation to Ullinger’s Creek line, (Figure 2, location A) newly established.



Figure 6. Weightmans dam revegetation; A and B southwest spillway area of dam that was previously bare land, now has multiple storeys of vegetation; C and D are to the northwest of the dam with wetland areas well established and surrounded by larger trees supporting a biodiverse multi-layered ecological system.



Figure 7. Riparian revegetation of watercourse B (refer to Figure 2), graded class D3, commenced over two seasons in 2007 and 2008 with 3000 trees planted each time between June and October. Image A was taken prior to commencement of plantings, showing rock pitches that had been installed the previous season; image B is 12 months later showing good growth of young trees and rushes; image C taken four years after planting in 2011; and image D, taken in 2022, shows strong establishment of trees with understorey, an improvement in foreshore condition from D to possibly B class.



Figure 8. A-grade remnant bush protected from livestock grazing showing the natural re-establishment of understorey with self-seeded saplings and other native species.

Erosion control of waterways in conjunction with riparian revegetation, as seen in Figure 7, which shows rock pitches installed prior to planting (Figure 7A) on a watercourse classed as D3, and then one year after planting (Figure 7B), four years after planting (Figure 7C) and current growth in 2022 (Figure 7D), with fencing protecting the rehabilitated area, has resulted in a significant increase in biodiversity area with natural habitats for birds, arthropods and aquatic life, especially frogs. The rehabilitated native areas adjacent to vineyards provide

overwintering habitats for beneficial arthropods, a critical component when implementing integrated pest management. A reassessment of the foreshore condition of this area would see it graded significantly higher than D3, with well-established native second storey vegetation and a mix of predominantly native species in the understorey.

Exclusion of stock through the use of fencing around an area of A-grade remnant bush, followed up by weed removal, predominantly arum lily, has seen the natural re-establishment of

the understorey with young saplings and a range of other native species (Figure 8). Prior to fencing there was no understorey. This has proven to be one of the most cost effective and low maintenance projects at Voyager Estate.

The sum of all the parts has created a complex patchwork of native vegetation corridors across Voyager Estate with significant increases in the biodiversity of those areas, stabilising watercourses and creating natural habitats for a diverse range of beneficial arthropods, amphibians, birds, and animals (Figure 9).



Figure 9. Looking east across Ullinger's winter creek revegetation adjacent to vineyards, over rehabilitated remnant bush, through to Weightmans dam in the top left corner.

CONSULTATION, RESOURCES AND GRANTS

The Margaret River Wine region is fortunate to have a pro-active group of government, Natural Resource Management organisations and private businesses (biodiversity assessment and rehabilitation services and nurseries) capable of providing excellent advice, services, and materials.

Voyager Estate has collaborated with and sort advice from many over the past 15

years. Involvement with the Cape to Cape Catchments Group's Winewatch Program played a key role during initial stages of the revegetation project, and while Voyager Estate has invested significant amounts of resources and funds over a 15 year period, they have regularly utilised grant funding opportunities to enable and accelerate projects, particularly larger ones.

A key to Voyager Estate's successful rehabilitation of riparian and remnant bush areas has been to develop a revegetation action plan (which forms part of their Sustainability Action Plan), with staged projects, taking into consideration the availability of resources and focussing on protecting the best quality areas first.

BIBLIOGRAPHY AND REFERENCES

Australian and New Zealand Environment and Conservation Council (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Volume 1. ANZECC, Canberra, Australia.

Cape to Cape Catchments Group (2004) *Cape to Cape Landcare Companion*.

Cape to Cape Catchments Group (2006) *Wilyabrup Brook Action Plan*.

Cape to Cape Catchments Group (2009) *Boodjidup Brook Action Plan*.

Google Maps (<https://www.google.com/maps/place/Voyager+Estate/@-33.985286,115.061884,1948m/data=!3m1!1e3!4m5!3m4!1s0x2a2fad10df89377:0xc7972844a5a3ddb1a8m2!3d-33.9967472!4d115.0540857>) retrieved 8 July 2022

Water and Rivers Commission (1999) *Planning and Management: Foreshore condition assessment in farming areas of south-west Western Australia*. Waters and Rivers Commission River Restoration Report No. RR3



CURRENT RESOURCES AND GRANT OPPORTUNITIES

Landholders keen to take advantage of a wide range of support should contact their local government, natural resource management groups and state government agencies. The list below is not extensive but indicates a starting point.

- Augusta Margaret River Shire
- City of Busselton
- Nature Conservation (For Nature)
- South West Catchment Council
- GeoCatch
- Lower Blackwood Catchment LCDC
- Dept. Primary Industries and Regional Development
- Dept. of Water and Environmental Regulation

The Cape to Cape Catchments Group publications listed in the bibliography are an excellent reference for anyone wanting to implement a revegetation program on their property, especially those located within specific catchments. They include appendices with recommendations for plants species to use, local native plant suppliers, native species associated with specific catchments amongst other resources. Updated information would be available directly from your local natural resource management group.

ACKNOWLEDGEMENTS

Margaret River Wine Association wishes to thank Voyager Estate, in particular Alex Miller, for providing full access to their revegetation program's data and sites in order to complete this case study.



This project is supported by the Department of Agriculture, Water and the Environment, through funding from Australian Government's National Landcare Program.