BATHURST
REGIONAL
COUNCIL

Perthville Black Gum (*Eucalyptus aggregata*) Offset Site

Annual Condition Assessment Report

Bathurst Regional Council
September 2021

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Introduction

During August 2021, a condition assessment was carried out by Bathurst Regional Council (BRC) on 148 planted Black Gum's (*Eucalyptus aggregata*) at the Perthville Black Gum Offset Site, 8km south of Bathurst NSW.

The assessment is part of a twenty-year monitoring program as per the requirements of the *Environmental Planning & Assessment Act (NSW)* (EP&A Act) granted concurrence.

The assessment will allow BRC to determine existing vegetation condition twelve months on from initial planting in 2020 and assist BRC to understand how the trees are responding to planting treatment. The assessment will also clearly demonstrate that the project is achieving the primary objectives of the NSW Department of Planning, Industry & Environment (DPIE) endorsed Perthville Black Gum Offset Site Offset Management Plan (OMP) (Bathurst Regional Council, 2020).

As per the requirements of the EP&A Act granted concurrence and OMP, the results of monitoring will be submitted in an annual report to the DPIE and will be available online via the BRC website for view by the public.

Monitoring Method

A revegetation condition assessment methodology was used to score the health condition of each individual tree. Carried out by Council's environmental staff, each tree was assigned a condition score based on the criteria presented in **Table 1**.

Table 1 - Plant condition assessed using a point index assessment method.

Score	Description
3	Tree is alive and in a healthy condition. Tree is actively growing with no signs of significant stress or damage.
2	Tree is alive and in a moderately healthy condition. Tree is still actively growing but showing some evidence of stress.
1	Tree is alive but showing significant signs of stress that are impacting growth.
0	Tree is dead with no evidence of growth.

In addition to the above, it was noted if each individual tree exhibits any visual signs of the following:

- Browsing by herbivores and/or insects
- Frost damage
- Evidence of dehydration
- Evidence of vandalism (specific to people)
- Evidence of nutrient deficiency
- Evidence of damage by parasite

General observational notes were also taken to provide further information on the current condition of the offset site.

As per industry environmental monitoring guidelines, five (5) fixed photo monitoring points were established to provide baseline data on the ecological condition of the site prior to project commencement in February 2020. The projects first year of photo monitoring was conducted, almost twelve months on from the planting of the Black Gums in September 2020, to aid in assessing the impact of the environmental works over the life of the project and allow Council to make adaptive management measures, if required.

In addition to photo monitoring, weed mapping was undertaken to establish current site condition, to assess the effectiveness of weed management as well as the expected recovery of native vegetation following the removal of woody and herbaceous weeds. Although photo monitoring will provide a series of visual records of gross changes in vegetation it will not produce the quantitative records preferred for monitoring hence its use. Five (5) point quadrants using 10m line transects were located at respective photo monitoring points to ensure that different areas of the project site were sampled.

Surveys using indirect method of scat and track identification was conducted to determine the presence of vertebrate pests, livestock and macropods including kangaroo and/or wallaby.

Results

Revegetation

Overall condition ratings identified that 57.43% (85) of the trees surveyed received the highest health score of three (3) with trees alive and in healthy condition, and actively growing with no signs of significant stress or damage. 32.43% (48) of the trees surveyed received a health score of two (2) with trees alive, in a moderately healthy condition, and actively growing, however showing some evidence of stress. 4.73% (7) of trees surveyed received a health score of one (1) with trees alive but showing significant signs of stress that are impacting on growth. 5.41% (8) of the trees surveyed received the lowest health score of zero (0) as the trees were dead with no evidence of growth.

Of all trees surveyed 68.46% (102) exhibited the early stages of new growth.

Total survival rate of trees surveyed is 94.6% (140).

Weed Management

A total of five (5) monitoring points were surveyed with all monitoring points showing no evidence of target invasive weed species. The most prominent non-native grass species identified across the site was Prairie Grass (*Bromus sp.*) with a median occurrence rate of 46.7%, with Monitoring Point 3 having the highest occurrence rate of 63.3% and Monitoring Point 1 having the lowest occurrence rate of 0%. Dock (*Rumex sp.*), Clover (*Trifolium sp.*), Indian Mustard (*Rapistrum rogusum*) and Dandelion (*Taraxacum sp.*) were also identified across four of the five monitoring points with a median occurrence rate of 3.3%.

Nutrient

Of the 148 Black Gums surveyed, 77.70% (115) showed signs of possible phosphorus (*P*) deficiency characterised by the appearance of small purple interveinal blotches on mature leaves with the centre of the blotch necrotic.

Pest Management

Of all trees surveyed 66.89% (99) were impacted by insect pest species with 2.7% (4) of trees showing signs of damage from sawfly and 1.35% (2) of trees showing signs of damage from aphids. 4.05% (6) of trees surveyed showed signs of damage from browsing by either kangaroos or other unidentified vertebrate species.

Discussion

Revegetation over the first year of the project has achieved a high survival rate of 94.6% (140) with only eight (8) trees dying. This is well above the minimum required survival rate of 80% identified in the Perthville Black Gum Offset Site OMP TARP. Tree mortality was most prominent in the area that runs parallel with

the North Street flood levee, an area that has been subject to significant earth works as part of the Perthville floodwater mitigation works, and neighbouring grazing properties that undergo regular weed control and pasture and soil improvement. Tree mortalities could be attributed to several factors including nutrient toxicity from reclamation and excavation works within that part of the site, compaction around the trees from vehicle movement, or pesticide drift from the neighbouring grazing properties.

A total of 89.86% of trees surveyed received a moderate to high health score with 57.43% (85) of trees receiving the highest health score of three (3) with trees in a healthy condition, and 32.43% (48) of the trees receiving a health score of two (2) with trees in a moderately healthy condition. These high health scores appear to correlate with drought-breaking above-average rainfall during 2020 and 2021, and milder temperatures during Summer 2020 in comparison to the previous summers record breaking high temperatures. Such conditions tend to promote or assist a climate conducive to healthy vegetation and high survival rates of revegetation.

Figure 1: Black Gum (*Eucalyptus aggregata*) leaves showing signs of potential nutrient deficiency or toxicity.

Regular weed control works carried out across the site has made a significant contribution to nil (0%) target weed species notably Willow (*Salix sp.*), Blackberry (*Rubus fruticosus sp.*) and Poplar (*Populus sp.*) being present at the site. Although surveys conducted via the point quadrant method identified Prairie Grass (*Bromus sp.*) as a dominant non-invasive weed species with a median occurrence rate of 46.7%, regular slashing between plantings during the growing season will ensure minimal competition with the Black Gums, and minimize seed set of the grass and other perennial and herbaceous weed species across the site.

During the assessment for nutrient deficiency, it was noted that 77.7% (115) of trees surveyed showed signs similar to that of phosphorus (*P*) deficiency with a characteristic appearance of small purple interveinal blotches on mature leaves with the centre of the blotch necrotic (Dell, et al., 2001). Of trees surveyed that exhibited new growth (68.46%/102), phosphorus (*P*) deficiency or nutrient toxicity was not present. It is possible that the phosphorus (*P*) deficiency identified in these trees is historical in nature however regular monitoring of the trees for nutrient deficiency or toxicity is required as per the OMP's Trigger Action Response Plan (TARP). In addition, to determine if it is in fact nutrient deficiency and not nutrient toxicities or non-nutritional causes such as pathogens and environmental factors, leaf analysis is recommended.

As nutrient deficiency is not identified as a risk in the Perthville Black Gum Offset Site OMP, the plan will be reviewed to include nutrient deficiency and/or toxicity controls with accompanying contingency measures in the OMP's TARP.

Following planting of the trees in 2020 and observed as part of regular monitoring by contractors, unidentified insects were sighted on several of the trees resulting in significant leaf browsing, and the development of cylindrical cocoons. Images of the insects were sent to the Australian Museum where they were identified as a leafhopper of the *Membracoidea* super family. Advice on treatment was sought from a specialist horticultural and arboricultural pest controller, where a trial treatment program using Azamax, an organic insecticide, was established on five (5) recently planted Black Gums in neighbouring Brian Booth Recreation Ground (Figure 2). The trial determined that Azamax had no effect on the Black Gums however it did control leafhopper reducing leaf browsing and the development of cylindrical cocoons that are created during the pupa stage of the insects lifecycle. Based on the outcomes of the trials, Azamax was applied to all 148 Black Gums at the North Street offset site with a 100% success rate.

Impacts by invertebrate pest species continue to present challenges in the management of the Black Gums with inspect pest species observed on 66.89% (99) of trees surveyed, 2.7% (4) of trees showing signs of damage from sawfly and 1.35% (2) of trees showing signs of damage from aphids. Again, above-average rainfall during 2020 and 2021, and milder conditions during Summer 2020 in comparison to the previous summers record breaking high temperatures tend to promote an environment conducive to increased invertebrate pest activity. It is anticipated that with the establishment and maturity of the Black Gums that potential impacts by invertebrate pest species would be negligible.

As invertebrate pest species are not identified as a risk in the Perthville Black Gum Offset Site OMP, the plan will be reviewed to include invertebrate pest species control with accompanying contingency measures in the OMP's TARP.

Figure 2: Azamax treatment trial on Black Gum's (*Eucalyptus aggregata*) at neighbouring Brian Booth Recreation Ground.

During surveying it was noted that 4.05% (6) of trees surveyed showed signs of damage from browsing by either kangaroos or other unidentified vertebrate species. These trees were isolated to the far eastern corner of the site that runs parallel with the North Street flood levee, and neighbouring grazing properties. Browsing was also restricted to leaves that were growing through failure points on the mesh tree guards. Again, it is anticipated that with the establishment and maturity of the Black Gums that potential impacts by vertebrate pest species such as kangaroo and/or domestic livestock would be negligible.

Target invertebrate pest species European Rabbit (*Oryctolagus cuniculus*) were observed in the northern area of the site and rabbit diggings at the base of one (1) tree was recorded in the eastern area of the site however there was no visible signs of burrows and/or scat piles identified during surveying.

Recommendations

1. Dead trees replaced with Black Gums or Box-Gum Grassy Woodland PCT species as per OMP TARP.
2. Repair or replace damaged mesh tree guards as per OMP TARP.
3. Increase slashing of groundcover across site during growing season to reduce competition by perennial and annual non-native grasses.
4. Re-installment of gate and repair of fencing along North Street upon completion of Perthville Flood Mitigation Works to reduce browsing by vertebrates.
5. Resources permitting, collect leaf samples and send to NSW Department of Primary Industries (DPI) for analysis to determine plant disease, nutrient deficiencies and/or toxicities.
6. Continue to monitor trees for leafhopper, sawfly and aphids and implement control program as per updated OMP TARP.
7. Update OMP TARP to include nutrient deficiency and/or toxicity controls with accompanying contingency measures.
8. Update OMP TARP to include invertebrate pest species control with accompanying contingency measures.

Reference

Bathurst Regional Council, 2020. *Perthville Black Gum Offset Site Offset Management Plan,* Bathurst NSW Australia: Bathurst Regional Council.

Dell, B., Malajczuk, N., Xu, D. & Grove, T., 2001. *Nutrient Disorders in Plantation Eucalypts. 2nd edition.,* Canberra: Research, Australian Centre for International Agricultural.

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Attachments

Perthville Black Gum Offset Site - Site Map and Monitoring Points

Perthville Black Gum Offset Site Photo Point Monitoring Datasheets PP1-PP5

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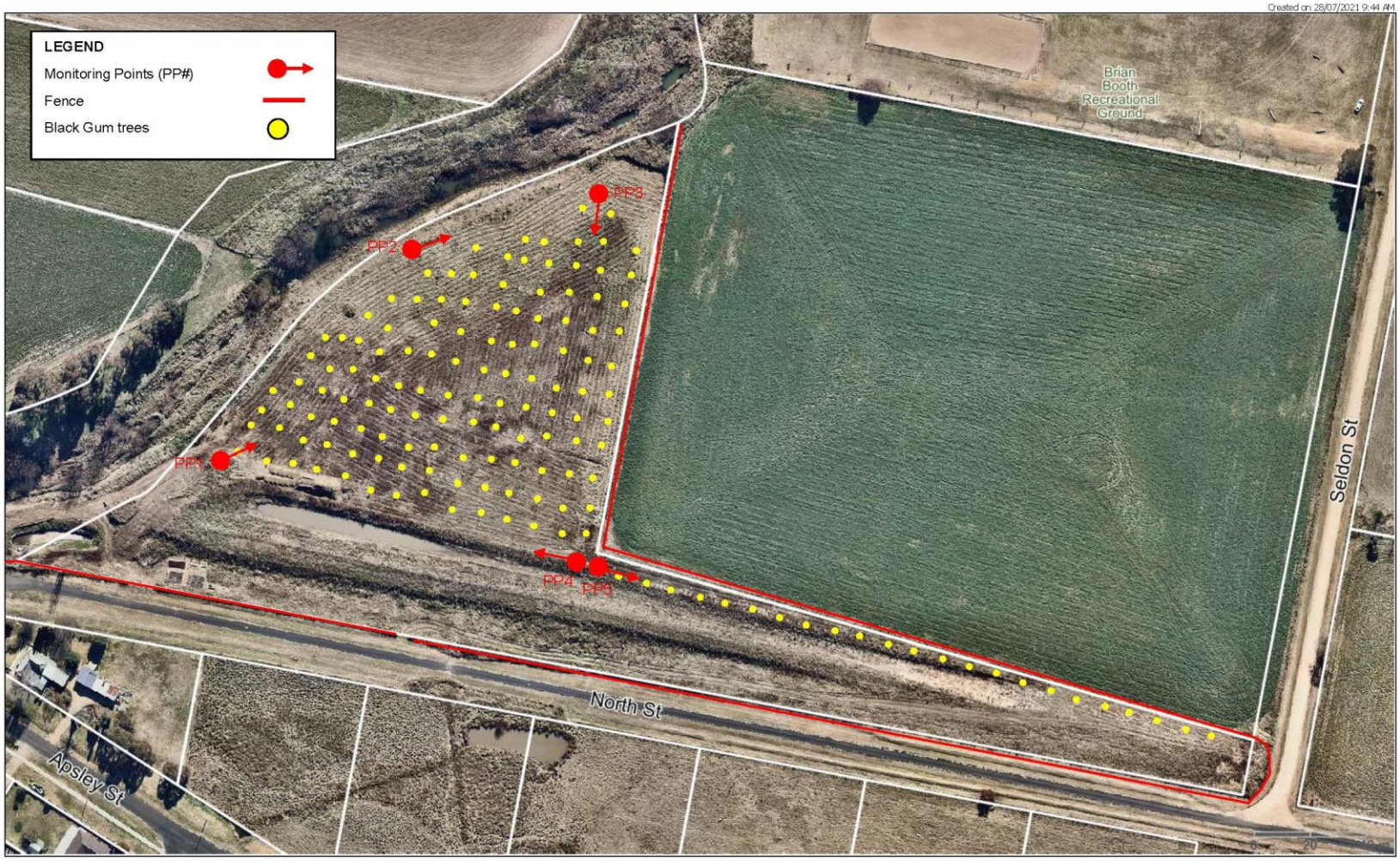

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Important Notice!
This map is not a precise survey document. Accurate locations can only be determined by a survey on the ground.

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Drawn By: Kristie Kearney
Date: 28/07/2021
Projection: GDA94 / MGA zone 55
Map Scale: 1:1792 @ A4

Perthville Black Gum Offset Site
Site Map & Monitoring Points

Perthville Black Gum Offset Site Photo Point Monitoring PP1

Photo Point ID	Site	Bearing	Longitude	Latitude
PP1	North Street, Perthville	72°	149.551453	-33.486819

Baseline (before works)	End of Year 1	End of Year 2	End of Year 3
Date	**Date**	**Date**	**Date**
7 February 2020	27 August 2021		
Description	**Description**	**Description**	**Description**
Baseline photo prior to site preparation, weed control and planting of Black Gum	12 months after planting of Black Gums, 4 months after slashing of grass between plantings.		
			
Comments	**Comments**	**Comments**	**Comments**
Floodplain between North Street flood levee and Queen Charlotte Vale Creek with stockpiled soil and road base from flood levee mitigation works. Ground highly compacted due to heavy machinery used on site.	Evidence of soil compaction from heavy machinery, and unauthorised storage of concrete form work from flood levee mitigation works. 57% of 10m line transect comprising of dead grass species, 30% bare earth, 10% unidentified grass species and 3% Clover. 0% target weed species were identified along the 10m line transect.		

Perthville Black Gum Offset Site Photo Point Monitoring PP2

Photo Point ID	Site	Bearing	Longitude	Latitude
PP2	North Street, Perthville	71°	149.552308	-33.486112

Baseline (before works)	End of Year 1	End of Year 2	End of Year 3
Date	**Date**	**Date**	**Date**
7 February 2020	27 August 2021		
Description	**Description**	**Description**	**Description**
Baseline photo prior to site preparation, weed control and planting of Black Gum	12 months after planting of Black Gums and ongoing monthly maintenance, 4 months after slashing of grass between plantings.		
			
Comments	**Comments**	**Comments**	**Comments**
Riparian zone along Queen Charlotte Vale Creek. Significant weed growth including *Brassica sp. Rumex sp*. *Foeniculum sp.* and *Rubus fruticosus*. Ground highly compacted due to heavy machinery use on site. Erosion control barrier from flood levee mitigation works visible however not functioning proper due to damage.	Riparian area of Queen Charlotte Vale Creek. Grass understorey short due to previous slashing of grass and dormancy of perennial grasses. 70% of 10m line transect comprising of dead grass species, and 30% Prairie Grass (*Bromus sp.*). 0% target weed species were identified along the 10m line transect.		

Perthville Black Gum Offset Site Photo Point Monitoring PP3

Photo Point ID	Site	Bearing	Longitude	Latitude
PP3	North Street, Perthville		149.552833	-33.485959

Baseline (before works)	End of Year 1	End of Year 2	End of Year 3
Date	**Date**	**Date**	**Date**
7 February 2020	27 August 2021		
Description	**Description**	**Description**	**Description**
Baseline photo prior to site preparation, weed control and planting of Black Gum	12 months after planting of Black Gums and ongoing monthly maintenance, 4 months after slashing of grass between plantings.		
			
Comments	**Comments**	**Comments**	**Comments**
Looking south toward North Street. Confluence of Queen Charlotte Vale Creek and drainage channel behind. Stockpiled soil and road base from flood levee mitigation works. Significant weed growth including *Brassica sp. Rumex sp*. *Foeniculum sp.* and *Rubus fruticosus*. Ground highly compacted due to heavy machinery use on site.	Grass understorey short due to previous slashing of grass and dormancy of perennial grasses. 63.3% of 10m line transect comprising Prairie Grass (*Bromus sp.*), 30% dead grass species, 3.3% bare earth and 3.3% Dock (*Rumex sp.*). 0% target weed species were identified along the 10m line transect. Sightings of Rabbit within the vicinity however no visible signs of scats, diggings or burrows.		

Perthville Black Gum Offset Site Photo Point Monitoring PP4

Photo Point ID	Site	Bearing	Longitude	Latitude
PP4	North Street, Perthville	312°	149.552871	-33.487148

Baseline (before works)	End of Year 1	End of Year 2	End of Year 3
Date	**Date**	**Date**	**Date**
7 February 2020	27 August 2021		
Description	**Description**	**Description**	**Description**
Baseline photo prior to site preparation, weed control and planting of Black Gum	12 months after planting of Black Gums, 4 months after slashing of grass between plantings.		
			
Comments	**Comments**	**Comments**	**Comments**
Floodplain between North Street flood levee and Queen Charlotte Vale Creek with stockpiled soil and road base from flood levee mitigation works. Ground highly compacted due to heavy machinery used on site.	Floodplain between North Street flood levee and Queen Charlotte Vale Creek. Grass understorey short due to previous slashing of grass and dormancy of perennial grasses. 50% of 10m line transect comprised of Prairie Grass (*Bromus sp.*), 46.7% dead grass species, and 3.3% Dandelion (*Taraxacum sp.*). 0% target weed species were identified along the 10m line transect.		

Perthville Black Gum Offset Site Photo Point Monitoring PP5

Photo Point ID	Site	Bearing	Longitude	Latitude
PP5	North Street, Perthville		149.552911	-33.487168

Baseline (before works)	End of Year 1	End of Year 2	End of Year 3
Date	**Date**	**Date**	**Date**
7 February 2020	27 August 2021		
Description	**Description**	**Description**	**Description**
Baseline photo prior to site preparation, weed control and planting of Black Gum	12 months after planting of Black Gums, 4 months after slashing of grass between plantings.		
			
Comments	**Comments**	**Comments**	**Comments**
Recently installed bank of the Perthville flood levee looking east southeast and running parallel with North Street. Ground highly compacted due to heavy machinery used on site. New fencing installed along northern boundary.	Grass understorey short due to previous slashing of grass and dormancy of perennial grasses. 46.7% of 10m line transect comprised of Prairie Grass (*Bromus sp.*), 46.7% dead grass species, 3.3% Dock (*Rumex sp.*) and 3.3% Indian Mustard (*Rapistrum rogusum*). 0% target weed species were identified along the 10m line transect. Presence of rabbits digging at the base of one (1) tree only.		