ecosure

Black Gully Vegetation Management Plan

Report
August 2018

Armidale Regional Council

ecology / vegetation / wildlife / aquatic ecology / GIS

Executive summary

Flying-foxes arrived in Armidale in October 2017, occupying both Council and freehold land along Black Gully. The Black Gully camp contained grey-headed flying-fox (*Pteropus poliocephalus*) and little red flying-fox (*P. alecto*). Flying-foxes and their habitats are protected under New South Wales legislation. Grey-headed flying-fox is also listed as Vulnerable under Commonwealth legislation, affording it additional protection.

This Vegetation Management Plan has been developed for proposed works associated with the Black Gully Flying-fox Camp Management Plan to address flying-fox welfare and any other necessary consents. The Vegetation Management Plan comprises a two staged management approach, tree management (stage 1) and weed management (stage 2). While the camp is unoccupied, vegetation management by a qualified arborist is intended to provide residents with reprieve from the impacts of flying-foxes should they return to the site.

A flora survey was undertaken in stage 1 management area within eight allotments to assess species and approximate area for tree management, and within stage 2 management area to identify species and prioritise weed control works.

Stage 1 tree management has been calculated to occur within 2,610 m^2 of the total buffer area of 2,920 m^2. Based on this, stage 1 works are predicted to have only a minimal impact on the flying-fox camp should they return to the site with a low probability of camp splintering.

Following the implementation of stage 1, stage 2 works should then commence to facilitate the control of weeds through the Murray Avenue road reserve to improve the quality of the native vegetation and assist in preventing further weed dispersal.

Acknowledgements

Ecosure would like to acknowledge Richard Morsley (Armidale Regional Council) for his local knowledge and botanical advice provided in the development of this report.

Glossary, acronyms and abbreviations

ABLV	Australian Bat Lyssa Virus
CMP	Camp Management Plan
Council	Armidale Regional Council
GHFF	Grey-headed flying-fox
LRFF	Little red flying-fox
OEH	NSW Office of Environment and Heritage
NSW	New South Wales
VMP	Vegetation Management Plan
buffer zone	15 metre area from residents' roof eaves
tree removal	removal of an entire tree
tree trimming	branches are pruned to branch collar, tree remains
tree management	tree removal and tree trimming

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1 Introduction

Armidale Regional Council (Council) engaged Ecosure Pty Ltd (Ecosure) to develop a Vegetation Management Plan (VMP) for Black Gully flying-fox camp, Armidale. Proposed works associated with the Black Gully Flying-fox Camp Management Plan (the CMP) (Ecosure 2018) require that a VMP be prepared to address necessary consents, approvals or licences as recommended by New South Wales (NSW) Office of Environment and Heritage (OEH).

1.1 Background

Flying-foxes were first recorded in Armidale in 2008, roosting temporarily behind the New England Regional Art Museum (OEH 2018). Most recently, flying-foxes arrived in Black Gully in October 2017, occupying both Council and freehold land. The Black Gully camp contained grey-headed flying-fox (*Pteropus poliocephalus*) (GHFF) and little red flying-fox (*P. alecto*) (LRFF). Flying-foxes and their habitats are protected under the *Biodiversity Conservation Act 2016* (BC Act) (NSW). GHFF is also listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) affording it additional protection.

Flying-fox numbers peaked around 30,000-40,000 in December 2017, impacting some residents due to noise, odour, faecal drop and damage to vegetation. The maximum known camp extent at this time was 2.38 ha (Figure 1) (Ecosure 2018). Residents surrounding the camp were consulted during the development of the CMP (Ecosure 2018) and were in favour of vegetation management to help reduce impacts associated with flying-foxes.

While the camp is unoccupied, Council wishes to facilitate vegetative management by a qualified arborist in order that residents receive some reprieve from the impacts of flying-foxes should they return to the site.

1.2 Proposed works

This VMP describes how much vegetation can be removed per allotment in a way that minimises the risk of escalating issues or splintering the camp to other potentially problematic locations in Armidale. Tree management within the 15 m buffer includes:

- tree removal: entire tree to be removed
- tree trimming: where branches are pruned to the branch collar and the tree remains.

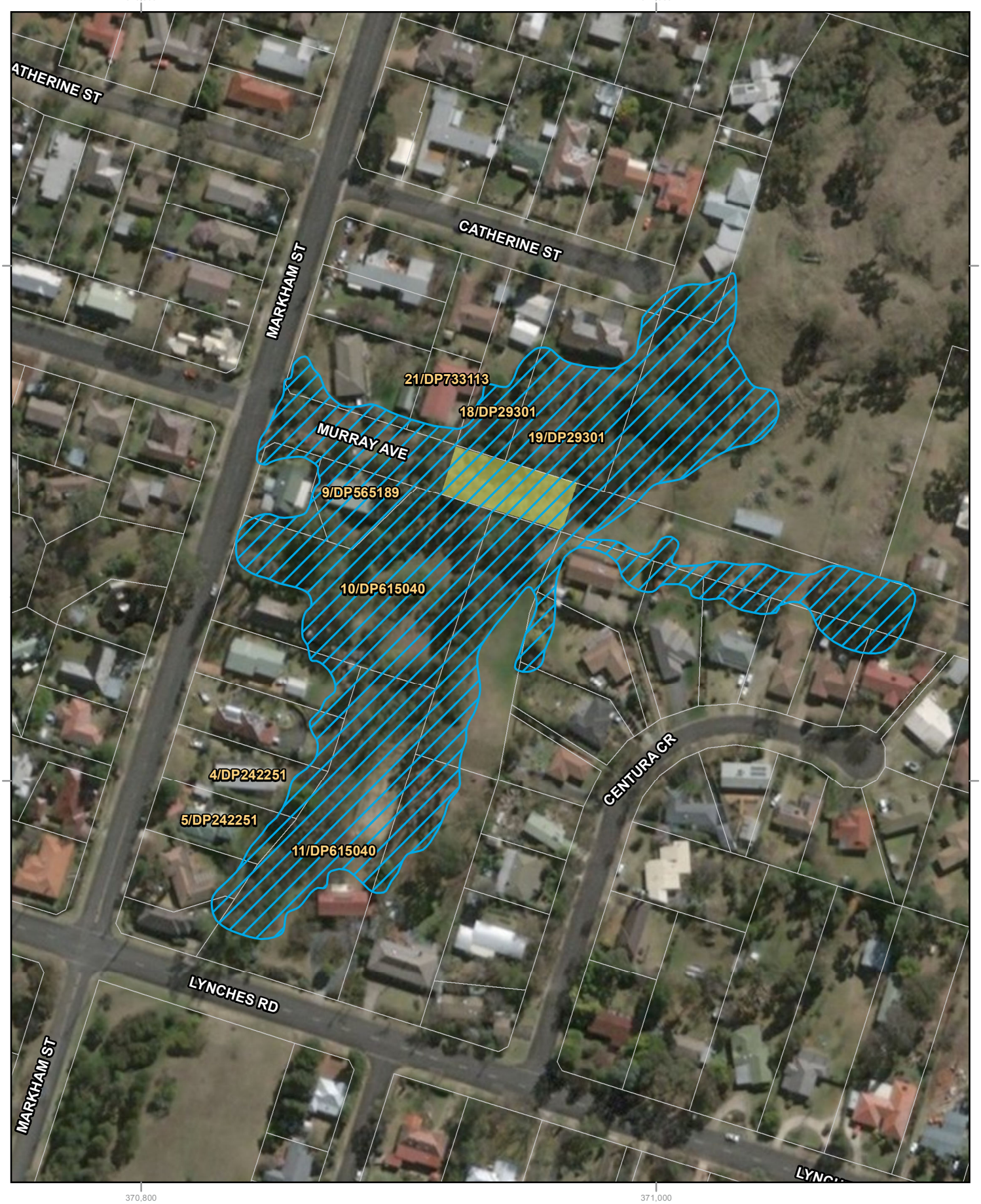

Figure 1: Maximum camp extent

Armidale Regional Council

Flying-fox camp management plan

- Camp extent (December 2017)
- Murray Avenue road reserve weed control
- Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 30/07/2018

0 25 50 100
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

PR3232_MP1_CampExtent_June2018
A4

1.3 Consents and approvals

1.3.1 Vegetation works

The Armidale Dumaresq Development Control Plan 2012 provides provisions within Chapter 2.2 on preserving and managing existing tree plantings including the removal and pruning approval process under the Local Environment Plan 2012. Council also follows the Australian Standard for Pruning of Amenity Trees (AS4373-2007).

1.3.2 Actions around a camp

Biodiversity Conservation Licence (Threatened Species)

A Threatened Species licence under the BC Act will be required as actions within this VMP may be likely to result in damage to a habitat of a threatened species or ecological community. To meet this requirement, a licence application was lodged by Council in July 2018.

Draft Code of Practice Authorising Flying-fox Camp Management Actions

OEH has prepared a draft Code of Practice under the Biodiversity Conservation Regulation 2017 authorising camp management actions on public land. The code defines standards for effective and humane management of flying-fox camps. The public exhibition period for the draft code of practice ended 7 June 2018.

The objective of the code is to enable camp managers to act quickly if flying-fox camps are causing a concern on public land only. If camp management actions are consistent with the code, a Biodiversity Conservation licence will not be required.

2 Site assessment methods

Ecosure's Senior Restoration Ecologist completed a flora survey on 3rd and 4th July 2018 for the two staged management approach recommended for Black Gully.

As part of the stage 1 works, the following properties were assessed:

- Lot 9/DP565189
- Lot 19/DP29301
- Lot 11/DP615040
- Lot 18/DP29301
- Lot 10/DP615040
- Lot 4/DP242251
- Lot 21/DP733113
- Lot 5/DP242251.

Trees identified for management, in consultation with residents within the 15 m buffer zone, were assessed for species and approximate area.

To calculate the removal of camp extent within the buffer zone, approximate areas of tree canopies were measured on ground i.e. the radius of a tree's canopy was measured from the trunk to the edge of the drip line to calculate an approximate area. If the trunk was within the 15 m buffer zone but branches were extending beyond the buffer, these branches have been included in the calculations. No allowances have been made for overlap between adjacent drip lines.

Residents from all identified properties were engaged with three exceptions:

- residents of Lot 21/DP733113 were away and tree management within the buffer zone of this residence were on adjoining properties and this had been communicated with the neighbour who identified the requested works
- the son of residents of Lot 19/DP29301 was contacted and was aware of the requested works and trees for removal on this property had been tagged
- residents of Lot 5/DP242251 were away and tree management within the buffer zone of this residence was communicated through Council.

Where the residents were uncertain if they would remove or trim the tree (based on cost), the removal option was calculated as this would have the greatest impact on the area.

Where branches were across property boundaries and had been identified for trimming, but the tree itself was requested for removal by the property holder, rather than dividing the area between the properties, in was assigned to the property where the tree was growing.

As part of stage 2 works, weed species and priorities were assessed within the Murray Avenue road reserve. This area was assessed to identify the weed species present and priorities for control.

Limitations encountered during the survey were due to the time of year and use of the area. Many of the deciduous species lacked foliage which meant areas to be removed were slightly reduced compared to when the trees were actively growing as well as making identification difficult. Similarly, the full suite of groundcovers, grasses and herbs may not have been observed due to the time of year. Manicured garden areas also made the identification of planted / cultivated *Eucalyptus* species problematic where flower buds / fruit could not be found.

3 Results

3.1 Black Gully camp properties

The Black Gully camp is situated 990 m above sea level, along a class two (2) stream order, on Council and private land in the south west of Armidale. Although vegetation within the camp is mapped in Bioregional mapping (OEH 2016) as an Endangered Ecological Community Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion, it is highly modified and very few associated species remain.

The site is highly modified, with several ribbon gum (*Eucalyptus viminalis*) occurring amongst primarily exotics including willow (*Salix babylonica*), liquidambar (*Liquidambar styraciflua*) and claret ash (*Fraxinus* sp.) forming an open canopy. Midstorey and understorey structure varied considerably from maintained lawn and exotic shrubs on private properties to a dense midstorey of exotic species including large-leaf privet (*Ligustrum lucidum*), small leaf privet (*L. sinense*), cotoneaster (*Cotoneaster pannosus*) and honeysuckle (*Lonicera* sp.) with blackberry (*Rubus ulmifolius*), English ivy (*Hedera helix*), setaria (*Setaria pumila*) and common couch (*Cynodon dactylon*) present in the understorey on the Murray Avenue road reserve as shown in Plate 1.

Upstream of the Murray Avenue road reserve, the riparian area was dominated by willow and claret ash along private property. Downstream towards Galloway Street road reserve, ribbon gums again become the dominant canopy species (Plate 2). This downstream area appeared more intact with a ribbon gum open forest over a predominately grassy understorey. Access to this private property was not available for further investigation.

Plate 1 Dense infestation of weeds though the understorey and midstorey of Murray Ave road reserve

Plate 2 Downstream from Murray Ave road reserve

3.2 Requested works by tenure buffer zone

Council consulted with eight property owners and identified trees within the designated buffer zone for management. Table 1 summarises the properties within the camp maximum extent, their estimated available buffer area (Ecosure 2018), as well as the calculated buffer area from the site assessment.

Table 1 Property buffer areas (Source: Black Gully Camp Management Plan Ecosure 2018)

Property	Camp area within property (m^2)	Estimated buffer area (m^2) within property	Calculated buffer area (m^2)
9/DP565189	819.4	819.4	774.9
19/DP29301	1964.9	610.6	474.0
11/DP615040	3415.5	578.2	182.2
18/DP29301	565.8	357.3	0
10/DP615040	4268.7	240.5	201.1
4/DP242251	174.4	152.4	234.1
21/DP733113	97.4	97.4	589.8
5/DP242251	144.92	64.4	153.9
Total		**2,920.2**	**2,610.0**

Differences that arose between the estimate and calculated buffer areas have occurred as:

- The calculated buffer area for lot 18/DP29301 and lot 21/DP733113 vary considerably from the estimated buffer areas. This is because:
  - the calculated buffer area for lot 21/DP733113 has increased substantially as the buffer area for lot 21/DP733113 extends into lot 18/DP29301, and the residents have come to an agreement for the management of these trees
  - the calculated buffer area for lot 18/DP29301 is 0 as trees for management occur within the surrounding properties buffer zones
- Lot 4/DP242251 and lot 5/DP242251 are also higher than estimated due to the overlap between the trees being treated (lot 4 only) and the location of the trunk to be removed near the edge of the buffer zone (both lot 4 and lot 5) i.e. while the trunk of the tree is within the buffer zone, many branches beyond the buffer zone will also be removed resulting in the increased area.

3.2.1 Lot 9/DP565189

Table 2 provides a list of species and allocated areas for removal and trimming.

Table 2 Lot 9/DP565189 tree management

Species	Area (m^2)	Removal	Trimming
river oak (*Casuarina cunninghamiana*)	78.6	✓	
river oak (*Casuarina cunninghamiana*) group of 2	25.2	✓	
ribbon gum (*Eucalyptus viminalis*)	380.1	✓	
river oak (*Casuarina cunninghamiana*)	38.5	✓ Murray Ave road reserve	
silky oak (*Grevillea robusta*)	50.3	✓ Murray Ave road reserve	
blackwood (*Acacia melanoxylon*)	50.3	✓ Murray Ave road reserve	
yellow box (*Eucalyptus melliodora*)	78.4	✓ Murray Ave road reserve	
river oak (*Casuarina cunninghamiana*)	17.5		✓ 10/DP615040
willow (*Salix babylonica*)	24.0		✓ 10/DP615040
claret ash (*Fraxinus angustifolia*)	12.0		✓ 10/DP615040
Himalayan cedar (*Cedrus deodara*)	20.0		✓ 10/DP615040
Total	**774.9**		

Figure 2: Lot 9/DP565189 tree management

Armidale Regional Council

Flying-fox camp management plan

Trees to be removed

- Blackwood
- Ribbon gum
- River oak
- Silky oak
- Yellow box

Trees to be trimmed

- Claret ash and river oak
- Himalayan cedar
- Willow

- Stage 1 - Buffer (15 m from dwelling)
- Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 17/07/2018

0 2.5 5 10
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

3.2.2 Lot 19/DP29301

Table 3 provides a list of species and allocated areas for removal and trimming.

Table 3 Lot 19/DP29301 tree management

Species	Area (m^2)	Removal	Trimming
cypress (*Cupressus torulosa*) group of 4	251.2	✓	
liquidambar (*Liquidambar styraciflua*)	30.0		✓
oak (*Quercus robur*)	78.5	✓	
box elder (*Acer negundo*)	50.3	✓	
ribbon gum (*Eucalyptus viminalis*)	64.0		✓ 2/DP655832
Total	**474.0**		

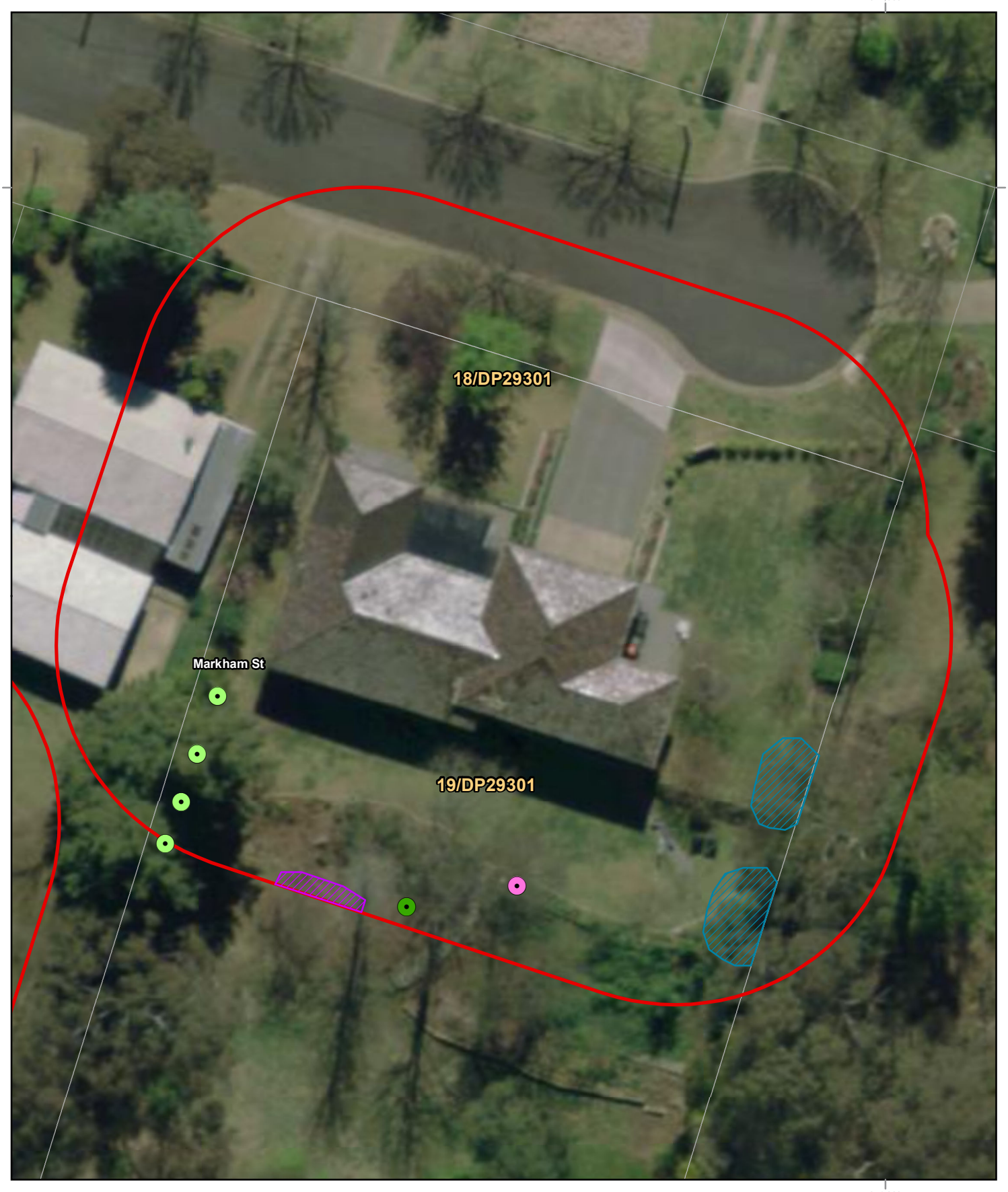

Figure 3: Lot 19/DP29301 tree management

Armidale Regional Council

Flying-fox camp management plan

Trees to be removed
- Box elder
- Cypress
- Oak

Trees to be trimmed
- Liquidambar
- Ribbon gum

- Stage 1 - Buffer (15 m from dwelling)
- Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 17/07/2018

0 2.5 5 10
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

3.2.3 Lot 11/DP615040

Table 4 provides a list of species and allocated areas for removal and trimming.

Table 4 Lot 11/DP615040 tree management

Species	Area (m^2)	Removal	Trimming
oak (*Quercus robur*)	153.9	✓	
box elder (*Acer negundo*)	28.3	✓	
Total	**182.2**		

Additionally, within this lot, four willows are scheduled to be removed as separate works. These trees have an approved Development Application from Armidale Council from 2011.

Figure 4: Lot 11/DP615040 tree management

Armidale Regional Council

Flying-fox camp management plan

Trees to be removed

- Box elder
- Oak

- Stage 1 - Buffer (15 m from dwelling)
- Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 16/07/2018

0 2.5 5 10
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

3.2.4 Lot 18/DP29301

Tree management within this lot is covered by works to be completed on the surrounding properties i.e. within the 15 m buffer zone of this residence, trees will be removed on the adjacent property that will address the requested works.

3.2.5 Lot 10/DP615040

Table 5 provides a list of species and allocated areas for removal and trimming.

Table 5 Lot 10/DP615040 tree management

Species	Area (m^2)	Removal	Trimming
ribbon gum (*Eucalyptus viminalis*)	201.1	✓ *	
Total	**201.1**		

* resident has indicated option for trimming depending on cost of removal

Figure 5: Lot 10/DP615040 tree management

Armidale Regional Council

Flying-fox camp management plan

Trees to be removed

- Ribbon gum
- Stage 1 - Buffer (15 m from dwelling)
- Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 17/07/2018

0 2.5 5 10
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

3.2.6 Lot 4/DP242251

Table 6 provides a list of species and their areas for removal and trimming.

Table 6 Lot 4/DP242251 tree management

Species	Area (m^2)	Removal	Trimming
claret ash (*Fraxinus angustifolia*)	201.1	✓*	
claret ash (*Fraxinus angustifolia*)	33.0		✓
Total	**234.1**		

* resident has indicated option for trimming depending on cost of removal

Figure 6: Lot 4/DP242251 tree management

Armidale Regional Council

Flying-fox camp management plan

Trees to be removed

- Claret ash
- Oak

Trees to be trimmed

- Claret ash

- Stage 1 - Buffer (15 m from dwelling)
- Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 16/07/2018

0 2.5 5 10
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

3.2.7 Lot 21/DP733113

Table 7 provides a list of species and their areas for removal and trimming.

Table 7 Lot 21/DP733113 tree management

Species	Area (m^2)	Removal	Trimming
ribbon gum (*Eucalyptus viminalis*)	201.1	✓ Murray Ave road reserve	
claret ash (*Fraxinus angustifolia*)	201.1	✓ 18/DP29301	
liquidambar (*Liquidambar styraciflua*)	19.6	✓ 18/DP29301	
stringy bark *(Eucalyptus* sp.*)*	19.6	✓ 18/DP29301	
ironbark (*Eucalyptus* sp.)	19.6	✓ 18/DP29301	
cypress (*Cupressus torulosa*)	50.3	✓ 18/DP29301	
ribbon gum (*Eucalyptus viminalis*)	78.5	✓ 18/DP29301	
Total	**589.8**		

Figure 7: Lot 21/DP733113 tree management

Armidale Regional Council

Flying-fox camp management plan

Trees to be removed

- Blackwood
- Claret ash
- Cypress
- Ironbark
- Liquidambar
- Ribbon gum
- River oak
- Stringybark
- Yellow box

Stage 1 - Buffer (15 m from dwelling)

Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 16/07/2018

0 2.5 5 10
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

3.2.8 Lot 5/DP242251

Table 8 provides a list of species and their areas for removal and trimming.

Table 8 Lot 5/DP242251 tree management

Species	Area (m^2)	Removal	Trimming
willow (*Salix babylonica*)	153.9	✓	
Total	**153.9**		

Figure 8: Lot 5/DP242251 tree management

Armidale Regional Council

Flying-fox camp management plan

Trees to be removed

- Willow
- Stage 1 - Buffer (15 m from dwelling)
- Property boundary

ecosure

Job number: PR3606
Revision: 0
Author: KF
Date: 31/07/2018

0 2.5 5 10
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

4 Staged work plan

4.1 Stage 1: tree management

Table 9 summarises the requested tree management within individual buffer zones based on property tenure. This first stage of works will be undertaken by a qualified arborist, in consultation with Council and residents.

Table 9 Stage 1 tree management

Lot	Tree species	Action	Notes
9/DP565189	river oak (*Casuarina cunninghamiana*)	Removal	
	river oak (*Casuarina cunninghamiana*) group of 2	Removal	
	ribbon gum (*Eucalyptus viminalis*)	Removal	
	willow (*Salix babylonica*)	Trimming	Trunk on neighbouring property
	claret ash (*Fraxinus angustifolia*)	Trimming	Trunk on neighbouring property
	river oak (*Casuarina cunninghamiana*)	Trimming	Trunk on neighbouring property
	Himalayan cedar (*Cedrus deodara*)	Trimming	Trunk on neighbouring property
19/DP29301	cypress (*Cupressus torulosa*) group of 4	Removal	
	liquidambar (*Liquidambar styraciflua*)	Trimming	
	oak (*Quercus robur*)	Removal	
	box elder (*Acer negundo*)	Removal	
	ribbon gum (*Eucalyptus viminalis*)	Trimming	Trunk on neighbouring property
11/DP615040	oak (*Quercus robur*)	Removal	
	box elder (*Acer negundo*)	Removal	
18/DP29301	claret ash (*Fraxinus angustifolia*)	Removal	Within 21/DP733113 buffer zone
	liquidambar (*Liquidambar styraciflua*)	Removal	Within 21/DP733113 buffer zone
	stringy bark *(Eucalyptus* sp.*)*	Removal	Within 21/DP733113 buffer zone
	ironbark (*Eucalyptus* sp.)	Removal	Within 21/DP733113 buffer zone
	cypress (*Cupressus torulosa*)	Removal	Within 21/DP733113 buffer zone
	ribbon gum (*Eucalyptus viminalis*)	Removal	Within 21/DP733113 buffer zone
10/DP615040	ribbon gum (*Eucalyptus viminalis*)	Removal	
4/DP242251	claret ash (*Fraxinus angustifolia*)	Removal	
	claret ash (*Fraxinus angustifolia*)	Trimming	

Lot	Tree species	Action	Notes
5/DP242251	willow (*Salix babylonica*)	Removal	
Murray Ave road reserve	ribbon gum (*Eucalyptus viminalis*)	Removal	Within 21/DP733113 buffer zone
	river oak (*Casuarina cunninghamiana*)	Removal	Within 9/DP565189 buffer zone
	silky oak (*Grevillea robusta*)	Removal	Within 9/DP565189 buffer zone
	blackwood (*Acacia melanoxylon*)	Removal	Within 9/DP565189 buffer zone
	yellow box (*Eucalyptus melliodora*)	Removal	Within 9/DP565189 buffer zone

4.2 Stage 2: priorities for weed management

Following stage 1 tree management, stage 2 weed management will commence within the Murray Avenue road reserve as shown in Figure 1. The preferred timing of stage 2 works will be dependent upon flying-fox presence in the camp.

The Murray Avenue road reserve vegetation through Black Gully is approximately 1,000 m^2 in size. Dense weed infestations are present through all strata. To facilitate the recovery of the area, assisted regeneration should be applied to control exotic species and restore native species to the system. The extent of control works and the boundary between natural areas and parkland will be directed by Council.

A guiding principle of good assisted regeneration is that timely follow up weed control is applied to ensure weeds do not out-compete natives as areas are disturbed post primary weed control. Disturbance provides increased availability of resources (e.g. light, moisture, space, nutrient levels) and results in the germination of both native and exotic species from the soil seed bank. Well-timed, systematic control of weeds by experienced operators is essential to ensuring native plant germination and growth is supported and weed species do not once again establish and deplete the native seed bank.

Assisted regeneration is to be applied systematically across the area in the control of weeds. Assisted regeneration and weed control techniques should include the following:

- Woody weeds such as large leaf privet, small leaf privet, box elder, willow, claret ash, pepper tree (*Schinus mole* var. *areira*), hawthorn and common cotoneaster will need to be controlled via cut, scrape and paint. Larger specimens may also be stem injected, however as this leaves the tree *in situ* as it decomposes, the application of this approach will need to be assessed dependent on the tree's location as to not create a hazard for park users. See Appendix 1 for more detail on how to carry out both techniques.
- Exotic vines such as honeysuckle, English ivy and blackberry that are climbing amongst natives are to be cut, scraped and painted. Smaller vines are to be brought to the ground to be spot sprayed. Exotic vines climbing amongst low-growing woody weeds can be spot sprayed.
- Exotic groundcovers and annuals such as purple top (*Verbena bonariensis*), white clover (*Trifolium repens*), oyster plant (*Acanthus mollis*), flat weed (*Hypochaeris*

radicata) and spear thistle (*Cirsium vulgare*) are best controlled using spot spraying during primary, follow up and maintenance runs. Some taller annuals next to natives may need to be hand pulled to ensure no off-target damage occurs. Any taller weeds will need to be trod down to assist accuracy.

- Exotic vines sprawling along the ground and seedlings of woody weeds will be controlled during spot spray treatments. Teams are to be experienced and knowledgeable in the identification of plants to ensure native plant germination and growth is supported.
- Exotic grasses such as prairie grass (*Bromus catharticus*), pale pigeon grass (*Setaria pumila*), common couch and paspalum (*Paspalum dilatatum*) adjacent to the track edges and in the greater reserve area will be regularly mown as per Council's maintenance plan. Spot spraying should be used to control the expansion of these exotic grasses.
- Follow up weed control and maintenance will need to be timely and systematic to prevent weeds from re-establishing and again outcompeting native plants that may have germinated. Native plants germinating and being out-competed may result in the depletion of the native seed bank, which over time, will reduce the resilience of the site. Follow up weed control and maintenance will be critical as mature large leaf privet can produce up to 10 million seeds in a growing season, with the seeds able to survive in the soil for up to 2.5 years (Queensland Government 2018).
- Additionally, regular, ongoing maintenance will be required to prevent weeds re-establishing as weed incursions continue from neighbouring private property.
- The details of how to carry out each weed control technique recommended in this plan are in included in Appendix 1 while the rates of control for all weeds observed on site are listed in Appendix 2.
- Works performed should be documented and records should be retained and regularly referred to. Information captured will be as per Council's Pesticide Notification Plan requirements and include items such as:
    - personnel working on site
    - weather conditions including prevailing winds
    - area / zone worked including a site map showing the locations / actions of works undertaken
    - herbicide used to include type, rates and additives as well as the weeds treated and techniques applied
    - observations including flora, fauna and results of works
    - challenges and opportunities
    - workplace safety issues.

It is also recommended that weed control works be undertaken both upstream and downstream where possible to further improve the system, limit locations of weed sources and reduce the likelihood of ongoing weed incursions.

5 Recommendations

5.1 Personnel risk management

Flying-foxes may carry pathogens that have the potential to cause disease in humans. Under no circumstances should any personnel working in or around the camp attempt to touch or handle a flying-fox.

5.2 Flying-fox welfare considerations

To reduce the risk of inadvertent dispersal of the camp, stage 1 tree works should be scheduled for when the camp is unoccupied. If flying-foxes return to site and are in low numbers, works should be undertaken at night or from the furthest end of the camp to allow flying-foxes to habituate to noise and disturbance.

No roost tree may be destroyed or modified when there are flying-foxes in a tree or when flying-foxes are near a tree and likely to be harmed as a result of tree management. Based on this, if works are able to be undertaken, it is recommended for instance that chainsaws are started away from camp and carried into the location to allow the flying-foxes to adjust.

Regarding stage 2 weed management, low maintenance activities that do not cause significant disturbance to flying-foxes is permissible (i.e. no motorised equipment under or near the camp). Flying-foxes will habituate to some disturbance and are likely accustomed to pedestrians and pets traversing under the camp. Hand weeding will most likely have the least disturbance to flying-foxes if they are present.

If flying-foxes are in the camp it is recommended to have a suitably qualified (and ABLV vaccinated) wildlife carer present to attend to stressed or injured animals and to advise if works should temporarily stop or cease. If a flying-fox has been injured or dies as a result of management actions under the VMP, then works should cease until a suitably qualified ecologist (with flying-fox knowledge) has completed an assessment and recommends works to proceed.

For further information regarding mitigation measures for activities within or immediately adjacent to a camp, refer to Appendix 7 Black Gully CMP (Ecosure 2018).

5.3 Ongoing restoration works

It is recommended that consideration be given to the continued restoration of the riparian area. For instance, downstream from the Murray Avenue road reserve there are fewer weed incursions, however, there are some significant gaps in the midstorey native vegetation. This adjoining lard parcel, Lot 2/DP655832, is zoned as RE1 Public Recreation which allows for environmental protection works (NSW Government 2018). Restoration works, either assisted regeneration or revegetation, could be applied to provide an opportunity to further link and consolidate the area between the Murray Avenue and Galloway Street road reserves. This would not only improve the quality of the native vegetation, but over time would also provide additional and suitable habitat for flying-foxes, away from residents' backyards.

6 Conclusion

The calculated buffer area for tree management totals 2,610.0 m^2 for the stage 1 works. This is less than the total buffer area of 2,920.2 m^2 and approximately 10% of the maximum camp extent. The tree removal and trimming works should provide residents in the area with some reprieve from the impacts of flying-foxes should they return to the site. Suitable vegetation is connected to the camp downstream along Black Gully and in Galloway Street road reserve to help compensate for the small area of roosting space lost through vegetation management within buffers around homes. Although the nearby Mike O'Keefe Memorial Woodland provides suitable habitat for flying-foxes, there is no assurance that the flying-foxes would choose to utilise the reserve in the near future.

Stage 2 works for the control of weeds within the Murray Avenue road reserve should commence in 2019. Should flying-foxes continue to return to the Black Gully camp, it is recommended that restoration works continue along Black Gully Creek to improve the connectivity in the area and provide additional habitat.

References

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Queensland Government 2018, *Broad-leaf privet*, viewed 9 July 2018, https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pestsweeds-diseases/weeds-diseases/invasive-plants/restricted/broad-leaf-privet

Appendix 1 Weed treatment methods

Specific techniques recommended for each weed species identified at the site is provided including modifications to a technique to ensure success. The rates of control for each technique and weed are provided in Appendix 2.

Cut-scrape-paint method (CS&P)

This method applies to all woody shrubs, trees and some vines.

1. Cut plant low to the ground (approx. 1–2 cm above soil level) and level so herbicide does not run off, and cut stems are less hazardous to workers who may kneel on the ground.
2. Apply herbicide immediately at the suitable rate with a paintbrush approximately 1.5 cm wide.
3. Scrape 3-4 sides of the remaining stump to reveal green tissue and immediately apply the herbicide to the scraped area.
4. Take care that the brush is not contaminated with soil.

Larger trunks, stems or tubers should be scraped and painted in sections as cells quickly shut down once exposed preventing the translocation of herbicide.

Stem Injection method

This method applies to all woody trees and shrubs with a diameter of 6-10 cm or greater.

1. With a hatchet make a cut the width of the blade at an angle of about 45º into the trunk.
2. Apply herbicide at recommended rate immediately into the cut using a tree injecting device.
3. Repeat this procedure in a brickwork pattern around the circumference of the tree as close to the ground as possible over lapping cuts, not joining cuts. Where the presence of a crotch angle makes this difficult make a cut above it. Ensure cuts are also made on the inside of forks. This may need to be done with a drill or hand saw to get the appropriate angle. Note two rows of cuts will be sufficient for trees with trunks of 6-10 cm. Larger trunk diameters will need correspondingly more.
4. Treat all visible lateral roots as per 1 and 2.

Note stem injection can also be carried out using a drill. Holes can be inserted approximately 10 cm apart and filled with the appropriate herbicide. Lateral roots should also be drilled and filled with the appropriate herbicide.

Spot spraying method

This is carried out using a 15 L backpack spray unit with a modified spray nozzle that gives an accurate and easily adjustable spray pattern e.g. Rega®. It is advised to fill the backpack to 10 L only, to avoid back strain, particularly where spraying for extended periods. All rates of control listed in Appendix 2 are for a 10 L amount. Glyphosate and metsulfuron methyl are the main herbicides used with the addition of a marker dye. A surfactant such as Pulse® is added in some treatments to assist the transfer of the herbicide through the surface tissue – particularly plants with waxy leaves, such as English ivy. The addition of Pulse also assists providing a greater weight to the solution and it sticking to the leaf which further assists the transfer of herbicide through the plant.

Appendix 2 Control methods and rates for weed species

Ratios for application of herbicide

Dilution ratios for the application of herbicide are provided in the table below. Always read and follow the directions on the product label and obtain a Safety Data Sheet (previously known as a Material safety data sheet) for each chemical and additive.

For some weeds a combination of glyphosate and metsulfuron-methyl (such as Associate®) is recommended, permitted under APVMA off-label permit numbers **PER 11463.**

A surfactant such as Pulse® is added in some treatments to assist the transfer of the herbicide through the surface tissue – particularly plants with waxy leaves, such as English ivy.

Treatments should only be applied when the plant appears healthy and actively growing.

Abbreviations

CS&P	Cut, Scrape and Paint	Usually with a mixture of Glyphosate and water at 1:1 or 1:1.5.
S&P	Scrape and Paint	Usually with straight Glyphosate.
C&P	Cut and Paint	Usually with a mixture of Glyphosate and water at 1:1 or 1:1.5.
Gly	Glyphosate	e.g. Weedmaster Duo®, Roundup Biactive®
MM	Metsulfuron methyl	e.g. Associate®, Brushoff ®, Brushkiller®
S	Surfactant	e.g. Pulse®, LI700®, Prosil®
A	Spray adjuvant	e.g. Agral®, Protec®, Codacide®,
dye	Colour Marking Dye	e.g. Herbi Liquid Dye®

1:1.5	1 part chemical to one and a half parts water (eg.100ml chemical to 150ml water)
1:50	1 part chemical to 50 parts water (e.g. 200ml chemical to 10 litres water)
1:100	1 part chemical to 100 parts water (e.g. 100ml chemical to 10litres water)
1.5g:10L	1.5gram (usually MM) to 10 litres water

Scientific name	Common name	Control methods
Herbs, ferns, grasses and groundcovers		
Acanthus molle	oyster plant	Spray **1:100 Gly + 1gMM:10Lwater + S + dye**. Can hand pull but need to ensure all root nodes are removed, then bag and dispose.
Conyza spp.	fleabane	Hand pull or spray **1:100 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**.
Bromus catharticus	prairie grass	Spray **1:100 Gly + A + dye**. Can be hand weeded and left *in-situ*.
Cirsium vulgare	black thistle	Spray **1:100 Gly + A + dye.**
Cynodon dactylon	common couch	Spray **1:100 Gly + A + dye**. Can be hand weeded and left *in-situ*.
Hypochaeris spp.	flat weed	Spray **1:100 Gly + dye** or **1g MM:10Lwater + A + dye**. Can be hand weeded.

Scientific name	Common name	Control methods
Lolium perenne	rye grass	Spray **1:100 Gly + A + dye**. Can be hand weeded and left *in-situ*.
Paspalum dilatatum	paspalum	Spray **1:100 Gly + A + dye**. Can be hand weeded and left *in-situ*.
Setaria pumila	pale pigeon grass	Spray **1:100 Gly + A + dye**. Can be hand weeded and left *in-situ*.
Trifolium repens	white clover	Spray **1:100 Gly + dye** or **1g MM:10Lwater + A + dye**. Can be hand weeded.
Verbena bonariensis	purple top	Spray **1:100 Gly + A + dye**. Can be hand weeded and left *in-situ*.
Trees and shrubs		
Acer negundo	box elder	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P s**aplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Cotoneaster pannosus	common cotoneaster	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P s**aplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Crataegus monogyna	hawthorn	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P s**aplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Fraxinus angustifolia	claret ash	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P s**aplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Ligustrum lucidum	large leaf privet	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P** saplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Ligustrum sinense	small leaf privet	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P s**aplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Liquidambar styraciflua	liquidambar	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P s**aplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Prunus spp.	peach	Seedlings hand pull or spray **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. Saplings **CS&P** or **SI** trees at **1:1 Gly**.
Salix spp.	willow	Spray seedlings **1:50 Gly + A + dye** or **1.5g MM:10Lwater + A + dye**. **CS&P s**aplings **1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Schinus molle	pepper tree	Hand pull or spray seedlings **1:50 Gly + A + dye** or **1:50 Gly + 1.5g MM:10Lwater + A + dye**. **CS&P 1:1 Gly**. Larger specimens **SI** at **1:1 Gly**.
Vines and scramblers		
Hendra helix	English ivy	**CS&P Gly undiluted**. Spot spray regrowth/seedlings **1:50 Gly + S + 1.5g MM:10Lwater + dye**.
Lonicera spp.	honeysuckle	Hand pull seedlings or spray **1:100 Gly + S + dye**. Large climbing vines cut at head height and off native plants and treat the base by **CS&P 1:1 Gly**.
Rubus ulmifolius	blackberry	**CS&P 1:1 Gly.** Spot spray **1:50 Gly + S + 1.5g MM:10Lwater + dye**.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed and Approved by
00	18/07/2018	Black Gully Vegetation Management Plan	Emily Hatfield, Senior Wildlife Biologist and Ian Roberts, Senior Restoration Ecologist	Dave Fleming, Manager - SEQ
01	2/08/2018	Black Gully Vegetation Management Plan	Emily Hatfield, Senior Wildlife Biologist and Ian Roberts, Senior Restoration Ecologist	Julie Whelan, Senior Environmental Scientist

Distribution List

Copy #	Date	Type	Issued to	Name
1	2/08/2018	Electronic	Armidale Regional Council	Richard Morsley
2	2/08/2018	Electronic	Ecosure	Administration

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