



Murray Region Forestry Hub Assessment of Costs imposed by Blackberry Infestation | Report

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Introduction

Weed infestation is recognised as a major problem for agriculture throughout Australia, in terms of:

- the costs imposed via control measures, and
- loss of production from weed-infested land.

It has been estimated (McLeod, 2018) that weeds could impose an average annual cost of nearly \$5 billion for the agricultural sector across Australia. More recent research (NSW NRC, 2024) suggests that the total annual financial cost of invasive species in NSW in 2020/21 was around \$1.35 billion. This figure was drawn from recent work drawing on landholder responses to a survey (ABARES, 2023). Weeds were assessed as contributing nearly 83% of this total, indicating that **costs imposed by weeds in NSW could be around \$1.2 billion annually.**

The prevalence of blackberries in southern NSW and north-east Victoria has been recognised as a major weed problem affecting forestry, grazing activities, and management of conservation areas for many years. In July 2014, an MOU (MOU, 2014) was established to support a co-operative approach to better control of blackberries in the 'Riverina Highland Region'. The Murray Region Forestry Hub (MRFH) has commissioned work to:

- identify all parties involved with and concerned about the blackberry problem within the MRFH area
- provide some estimate of the likely economic costs of blackberry infestation in this area, as a pilot study to indicate average costs that could apply nationally
- bring stakeholders together to discuss these costs and develop action plans to control blackberries and thus reduce the costs of the blackberry problem.

This report presents the findings of the second component of this overall blackberry project –using the MRFH area as a pilot study of the impacts of blackberries - and consists of two parts:

- Part 1 - a quantified assessment of the economic impacts of blackberries in the plantations of this region
- Part 2 - a qualitative consideration of indicative costs imposed by blackberries on areas of land used for grazing, and for conservation purposes, within this region.

Part 1 – Economic Impact on Plantation areas of the MRFH

For plantation forestry, costs resulting from blackberry infestation has long been recognised as a major problem. In the area of land represented by the MRFH, nearly 50,000 ha of pine plantation were lost due to the widespread bushfires of late 2019 and early 2020. These fires have had (and will continue to have for up to 30 years) a hugely negative impact on the timber and wood processing sector of this region. However, one outcome of these fires was the initial removal of large areas of existing blackberry infestation (canes and runners) throughout the pine plantations. Areas of plantation that were thickly covered with blackberries before the fires, were, *temporarily*, left with a clear forest floor after the fires had passed through.

However, the blackberries are recovering strongly and are already impeding access to the plantations for replanting efforts. The presence of blackberries will also continue to cause production losses from the plantations. Blackberry plants not only cause physical problems by impeding access to plantations for ongoing management activities such as planting, thinning (and resultant delivery of fibre for pulp processing) and fire trail maintenance, but also create competition with the pine trees for access to nutrients and water. It has also been noted (*pers.com.*) that there is a pseudo symbiotic relationship between blackberry and pine - pine has an allelopathic effect in its litter to the ground underneath the trees preventing the growth of most plants, including in some cases pine itself. However, the ground conditions created are ideal for blackberry development due to the lack of competition and the readily available source of seed from birds that roost in the development of young trees where underneath there is little competition and good ground with a soil structure perfect for blackberry growth.

Competition from blackberries can significantly reduce the annual growth rate of the pines in areas heavily infested with this weed. This in turn reduces the volume of timber that is available to be harvested from the plantation. Attempts to physically reduce blackberry density (via spraying with herbicidal chemicals) involves significant cost.

This analysis provides an estimate of the total value of costs imposed on the plantation sector of the MRFH area. These results are intended to provide some background to industry-wide discussion on the need to invest in long-term control measures, by indicating the scale of the cost impacts resulting from blackberry infestation.

Case Study

Rubus fruticosus agg. (blackberry) is a perennial, scrambling, prickly shrub that often form large clumps 1–7 metres high. Blackberry is a prolific seed producer with a single plant producing between 170,000–400,000 seeds/year and thickets producing 7,000–13,000 seeds/square metre (CRC AWM, 2006). These seeds are dispersed widely by birds and foxes. Blackberry is highly invasive and covers large areas with a dense canopy, which completely dominates all vegetation in an area in a very short time. It reduces natural diversity of vegetation in natural ecosystems and subsequently reduces recreational values of public land. It affects wildlife habitats and provides an important food source for undesirable exotic, as well as native, birds, restricts access to land and water, harbours pest animals and poses a serious fire hazard. As already noted, blackberries cause access and competition problems in forestry operations.

Blackberries are recognized as a weed of national significance over all land tenures – not only pine plantations, but also agricultural land, National Parks, and other private and public areas. An MOU (MOU, 2014) developed to implement better control of blackberries in the study area noted that blackberry was “one of the worst and most costly weeds in terms of impacts on natural ecosystems, forest plantations, and perennial pastures”. However, although the importance of this weed is recognized, all expense associated with attempts to control it is left to the property manager.

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The costs imposed by blackberries on the plantations within the MRFH area have been assessed in two areas:

- Costs associated with attempts to control this weed
- Production losses caused by reduced growth rates for pines, as a result of competition for nutrients, light, and water, and from loss of plantable area for subsequent rotations.

Each of these cost elements has been examined separately, and then the average annual costs have been assessed over one rotation. To obtain a quantified estimate of the impact of blackberries, the resultant cash flow is then reduced to a single present value (PV) via use of specified discount rates. Sensitivities to key assumptions are then tested.

In addition, some comment is made of the possible wider economic costs imposed by production losses from the plantations, in terms of impacts further along the value chain. Such impacts include loss of the value-added output from processing activities, and also loss of the flow-on impact of this value-adding to levels of economic activity in the region. Comment on further impacts on levels of housing availability is also included in this narrative.

1. Weed Control Costs

Chemicals are applied for the purposes of controlling weeds on sites before planting, and again after planting. The thick growth of blackberries between trees impedes subsequent access for spraying in any areas other than along roads and tracks (including fire trails) and boundary areas, which are then sprayed almost annually. The efficacy of these subsequent treatments can vary with weed load levels and effectiveness of chemicals and application. Estimates of costs (chemicals plus application), and of treatment regimes, have been provided by growers.

¹ Blackberry infestation

For the purposes of this exercise, an annual cost figure (\$/ha) has been assumed, based on 12% of the total plantation area being treated in any one year, made up of:

- 5% (area of plantation represented by roads, etc.), being treated annually,
- 3.5% (area replanted annually if 100% replanted over a 28-year rotation) being sprayed twice per rotation - once before planting and again after planting.

Based on publicly available data, and supported by industry sources, assumptions have been made as to the likely dimensions of costs involved in weed control. These assumptions are set out in Appendix 1 to this report.

Using these assumptions, it is estimated that the costs of weed control for this study area could be in the order of an annual average of \$30.36/ha, considering complete spraying of replanting sites twice in a rotation, and annual treatment of 5% of the total area for spraying of roads and boundary areas.

Over the entire study area, the cost of control of blackberry weeds in the MRFH plantation area is estimated at \$5.16 million per year. Details of the assumptions made in the estimation are set out in Appendix 1.

2. Productivity Losses

Blackberries as weeds are vigorous plants which can establish quickly in suitable sites. These weeds can effectively compete for nutrients, light, and water, and act to suppress growth of the plantation pines. Studies (DPI/FCNSW, 2017) have indicated that the suppression impacts are more significant when infestations occur post planting, when the pine seedlings are smaller, with infestations that occur pre-thinning have less impact on pine tree growth. Observed impacts of blackberry infestations in NE Victoria (HVP, 2016) suggest that growth rates (in terms of cubic metres/ha/yr) can be up to 22% higher when herbicides are used to reduce blackberry infestations after thinning. Anecdotal evidence is that overall productivity (MAI) can be reduced by up to 3 cu.m/ha/yr. (i.e. from 20 to 17 MAI in this analysis) as a result of competition from blackberries for nutrients and water, and for actual land on which to plant pine seedlings.

Based on the assumptions used in this analysis (as set out in Appendix 1), it is likely that at the end of a rotation the value of wood provided from each ha could be reduced by just under \$6,000. Assuming a 28 year rotation, this equates to an average annual loss per ha of \$213.10/ha.

Over the entire study area, the cost of reduced timber production resulting from blackberry infestation in the MRFH plantation area is estimated at \$36.23 million per year. Details of the assumptions made in the estimation are set out in Appendix 1.

3. Indication of wider costs to the regional economy

Any direct loss of output from the plantations of the region would result in lower volumes of wood being available for the regional processing sector. As a result (and assuming no alternative resource is available) the value of processed output would also be reduced, adding further costs to the regional economy. The total cost imposed by blackberries for the plantation industry would be larger than the direct productivity losses, because of the reduction in processing activity which adds value to the plantation products, thus stimulating the regional economy.

If total regional output losses were considered, then (based on multiplier and sectoral contributions estimated for the region (U Can., 2020)), **total economic activity in the region could be reduced by around \$306 million per year as a result of blackberry infestation.**

The calculation of the reduction of total economic activity is as follows:

Data from 2020 Hub s/e impact study (\$ mill.)	
Direct Sales forest growers	\$ 305.30
Total output impact of industry	\$ 2,579.70
Contribution of sector to total regional output	11.83%
Direct output impact from MAI reduction (av./yr.)	\$ 36.23
Impact on regional economy for MRFH area	\$ 306.1

The decreased yields resulting from blackberry infestation can therefore be seen to have much wider impacts on the regional economy than simply the lost value of log production. Not only will overall levels of economic activity in the region be suppressed, but other markets using the products from the processing mills will suffer a loss of supply.

For example, structural timber produced from sawlogs is used to provide trusses and frames in the construction sector (particularly the housing sector). It is estimated that the weighted average amount of timber used in house construction (1 and 2 storeys) is 14.58 m³ (data from FWPA website, www.fwpa.com.au). Based on calculations (see Appendix 3), the loss of sawlogs resulting from blackberry infestation in the plantations of the MRFH area could **deprive the construction sector of the timber required to build around 1,960 houses each year.** The current climate of housing shortages, particularly in regional areas, is acting to restrict development as potential new arrivals (with needed skills) cannot find accommodation and so do not move. A lack of structural timber will only exacerbate this problem.

4. Overall Costs of Blackberry Infestation

Based on the assumptions made for this case study, it has been estimated that the total **direct** costs of blackberries in the MRFH area could be in the order of :

Weed control costs	\$5.16 million/yr.
Value of production lost	\$36.23 million/yr.

Total average annual costs	\$41.93 million/yr.
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The large majority of this total cost relates to the loss of timber production – 88% of the total costs.

While these estimates relate to the direct costs, the overall regional impacts should also be considered. As outlined above, decreased timber supplies will impact on overall levels of economic activity in the region, and also potentially reduce the number of houses constructed as a result of reduced supplies of structural timber. However, these wider economic costs have not been considered in this case study analysis of the impacts of blackberry infestation.

5. Sensitivity Testing

This figure of \$41.93 million for the total economic impact of blackberries on the case study region is based on estimates of component costs. In order to test the sensitivity of results to changes in some key assumptions, a model has been constructed to provide:

- an annual cash flow stream over an assumed rotation. The cost impacts over this period can then be converted to a present value (PV) figure, using a range of discount rates.
- the estimated annual impact over the study region – namely, the figure of \$41.93 million, made up of \$5.16 million of weed control costs, and \$36.23 million of production losses.

Over 28 years, the total blackberry costs (estimated at \$41.39 million per year), is \$1.16 billion over one rotation. At specified discount rates, this figure becomes:

At 5% discount rate	\$616.6 million
At 10% discount rate	\$385.2 million

a) Sensitivity to MAI reduction assumption

Making different assumptions regarding possible MAI reductions resulting from blackberry impacts will cause significant changes in the estimated total costs. Data provided for a range of MAI reductions is set out in Table 1.

Table 1: Total costs at different MAI reductions (m³/ha/year).

		Production	Control	Total
Base Case	1	12.08	5.16	17.24
	2	24.15	5.16	29.31
	3	36.23	5.16	41.39
	4	48.30	5.16	53.46
	5	60.38	5.16	65.54

With the base assumption being for MAI to decrease by 3 cu.m./ha/yr (i.e. a change from 20 to 17 MAI), it is clear that any change in this estimate will have a major impact on total costs of blackberries. For example, assuming that MAI will only decrease by 1 (cu.m./ha/yr) will reduce total cost to just **\$17.24 million**.

This sensitivity testing indicates that the total cost assessed for blackberry infestation in the study area **is extremely sensitive to the assumption made regarding MAI decrease**.

b) Sensitivity to weed control cost assumption

A similar sensitivity test can be run for weed control cost assumptions. The base case has assumed an estimate of \$30.36 as an average annual cost per ha. The derivation of this figure has been described above in the section relating to weed control costs involved in blackberry treatment. Data provided for a range of weed control cost assumptions is set out in Table 2.

Table 2: Total costs at different weed control costs (\$/year).

		Production	Control	Total
	15.00	36.23	2.55	38.78
	20.00	36.23	3.40	39.63
	25.00	36.23	4.25	40.48
Base Case	30.357	36.23	5.16	41.39
	35.00	36.23	5.95	42.18

These figures suggest that the overall cost imposed by blackberries is not particularly sensitive to costs assumed for weed control treatments. This is to be expected, given that this component of costs accounts for only 12% of the overall cost impact of blackberries.

c) Sensitivity to weed control cost and MAI assumptions

The sensitivity of results to both of these assumptions changing together confirms that results are far more sensitive to assumptions made regarding production losses than those relating to weed control costs. Table 3 indicates the results delivered by changing both these key variables together.

Table 3: Total costs at different MAI (m³/ha/year) and weed control costs (\$/year).

		MAI decrease				
	41.39	1	2	3	4	5
Weed control (\$/ha./yr.)	15.00	14.63	26.70	38.78	50.85	62.93
	20.00	15.48	27.55	39.63	51.70	63.78
	25.00	16.33	28.40	40.48	52.55	64.63
	30.357	17.24	29.31	41.39	53.46	65.54
	35.00	18.03	30.10	42.18	54.25	66.33

The base case estimate of \$41.39 million annual costs for the study area would reduce to just \$14.63 million if annual weed control costs were just \$15/ha, and MAI were reduced by only 1 m³/ha/year. Conversely, if MAI reduced by 5, and weed control costs were \$35/ha, then annual losses would be around \$66.33 million.

d) Sensitivity to plantation area estimates

The 'base case' figure of an annual cost of blackberries is based on the assumption that the total area of plantations within the study region is 170,000 ha. The following Table 4 indicates the results produced at different area assumptions.

Table 4: Total costs at different plantation areas (ha.)

		Production	Control	Total
Area (ha)	130000	27.70	3.95	31.65
	140000	29.83	4.25	34.08
	150000	31.96	4.55	36.52
	160000	34.10	4.86	38.95
	170000	36.23	5.16	41.39
	180000	38.36	5.46	43.82

This sensitivity testing indicates that results are fairly robust to changed plantation area assumptions – an annual cost of blackberry infestation would still be a significant \$31.65 million if the total area were just 130,000 ha.

6. Conclusions

Blackberries have long been recognized as a major problem for pine plantations and all other forms of land tenure and usage. A case study has been analysed, based on the plantations of the MRFH area.

This analysis has been intended to provide background to support an informed discussion of options for developing effective controls. The analysis has indicated that average annual costs resulting from blackberry infestation in the softwood plantations of the MRFH area could be in the order of **\$41 million**.

If the potential impacts on downstream processors, reliant on the supply of resource from these plantations is added, then a further average annual cost of \$306 million could be included. Further costs could be considered if the impact on reducing home construction as a result of a shortage of structural timber were to be added.

This case study provides estimates only, but the main conclusions from the analysis conducted are:

- There are significant costs associated with blackberry infestation, mainly related to productivity losses (lower growth and loss of plantable area in heavily infested second rotation areas).
- There are wider regional economic impacts resulting from these production losses, as a result of the 'flow-on' effect from timber production.

Part 2 - Qualitative Assessment of the Impact of Blackberries on grazing and conservation lands in NSW

Introduction

While this analysis has used the plantations within the MRFH area as a case study, it is recognized that the problem of blackberries is not unique to forestry. The MOU (*op cit*) stated that “it is critical that the investment of land managers is recognised and supported by long term funding for further management of blackberry” and that “given the huge burden that blackberry infestations place on the community and the environment, the option of no control is not acceptable”.

This Part 1 case study relates to plantation forestry, but the problems (and costs) resulting from blackberry infestation are experienced across all land tenures.

Blackberries are estimated to reduce the yield of desired vegetation by up to 50% (NSW DPI, 2021e), and production of timber from plantations is also reduced. There is a high degree of reduction in the quality of products, diversity or services available from all land uses affected by blackberries (NSW DPI, 2021e).

Significant costs are also imposed on agricultural and conservation land tenures within the same region. It is recognised that infestation of blackberries is a weed problem on all land tenures. While the previous part of this report has provided a quantified assessment of the likely economic impacts of blackberries within the plantation areas of the MRFH area, some indication of the dimensions of the blackberry problem across areas used for agriculture (grazing enterprises) and conservation is also made. This takes the form of a description of impacts at a regional level (for grazing) and at a State level (for conservation uses). Some estimates of possible impacts on conservation lands at the same regional level is also made.

The following report presents a qualitative discussion of the possible dimensions of the impact of blackberry infestations on land within the Murray Region Forestry Hub area that is used for grazing and conservation.

The Murray Region Forestry Hub area covers the plantation areas located from Gundagai (NSW) in the north to Mt Buller (Vic) in the south – an area of about 3.5 million hectares. Within that area, there are approximately 170,000 ha of softwood plantations. The area under grazing within the region is approximately 1.07 million ha, and the area for conservation lands (including publicly managed lands for National Parks, Crown Lands, reserves) is approximately 95,000 ha. (PF Olsen, 2023).

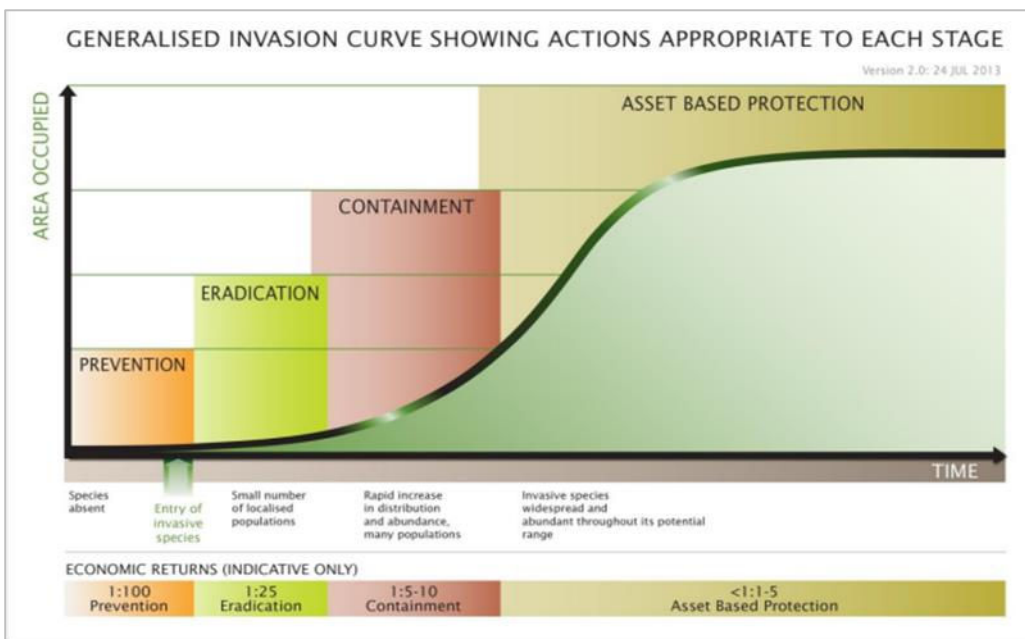
Blackberry (*Rubus fruticosus* agg.) is found in areas with greater than 700 mm annual rainfall and it is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts in cool to warm temperate to sub-tropical area. (Weeds Australia, 2021). It is listed as a Weed of National Significance, although in regional and state invasive weeds management plans, it is considered as a widespread weed abundant through its potential range and therefore, using the generalised invasion curve, control actions are based around Asset Based protection.

Figure 1 indicates the various stages of weed infestation. Infestations of blackberries are now so widespread that actions to control this weed are now at the ‘asset-based protection’ level. Returns from this level of action are limited, with benefits being at most around 50% higher than the costs of such control. This compares with prevention actions undertaken when a weed is only just becoming noticeable, when returns can be 100 times higher than the costs involved.

This suggests that control measures (at whatever cost might be involved) are unlikely to generate high returns and are therefore only used to protect areas considered to represent important assets – such as areas of particularly high conservation value within National Parks. Similarly, in certain areas of grazing land where infestation is not yet so widespread blackberry control might still be at the eradication or containment level. In these areas returns from controls applied will be higher, and activities to control blackberries are more likely to be undertaken.

Without a detailed assessment of the actual areas involved in each of these stages of blackberry invasion, it is not possible to provide a quantified estimate of the costs imposed by blackberries in areas used for grazing and conservation.

Figure 1: Generalised Invasion Curve



ABARES surveys land managers to understand pest animals and weed management and has conducted this survey in 2016, 2019, and 2022. In 2024, a customised report was provided to the NSW Natural Resources Commission with tailored results for NSW. In 2022, more NSW land managers reported either major or minor problems with Blackberry (reported by 29% of respondents) compared to any other weed. (In 2019, it was 31% of landholders). (NSW Natural Resources Commission, 2024).

It can therefore be reliably stated that blackberries are a significant weed in areas involved in land tenures other than plantations.

1. Indicative estimates of Blackberry impacts on grazing land in the MRFH area

Blackberries have an impact on grazing land, particularly around creek lines, waterways, steeper country and more marginal land. They reduce grazing land availability and productivity.

The impacts include:

- Reduced grazing areas: Blackberry thickets encroach on pastures, reducing the available area for grazing. This directly affects the carrying capacity of the land, limiting the number of livestock it can support.

- Impeded livestock movement and access to water: The dense and thorny nature of blackberry bushes hinders the free movement of livestock. Blackberries grow densely along watercourses, blocking access.
- Pest harbour: Blackberries provide a refuge for pests such as rabbits, foxes and wild dogs, which can prey on young livestock and spread diseases. The presence of these pest animals can also mean increased management efforts and resources for animal pest control.
- Management and maintenance costs: The efforts required to control blackberry infestations involve labour and financial costs. These include the costs of mechanical removal, chemical treatments, and ongoing maintenance to prevent re-infestation.
- Fire risk: The dry, dense canes of blackberry thickets can easily catch fire, posing a serious risk, increasing fuel load and fire spread.

Blackberries typically infest marginal lands where management costs can exceed the financial returns from grazing. Highly productive lands, in contrast, often see diligent annual management practices that prevent severe infestations but at an annual cost. Marginal lands, often underutilised for agriculture, become breeding grounds for blackberries when the financial returns do not justify the cost of their control. This has impacts as the infestations increase, and implications for neighbouring lands including forestry and conservation lands.

There is a demographic issue emerging. Aging farmers may have less access to finance and physical resources for the control of blackberries. Blackberry control is ongoing requiring annual programs to manage and mitigate growth effectively. Blackberries exhibit a very high tolerance to average weed management practices in the landscape (95%+ weeds survive common management) (DPI). Costs will also vary with topography - the costs and efforts required for blackberry control vary significantly with the land's topography, with steep or inaccessible areas demanding more resources and longer follow-up treatments.

To estimate the impacts of blackberries on grazing activities within the MRFH area, the following assumptions have been made:

- Areas of >700 mm of rainfall are most affected. In these areas, blackberries reduce grazing availability and land use and have an impact on production. Relevant area in the MRFH area could be around 75% of the total 1.07 million ha listed as being used for grazing.
- Weeds contribute to an estimated 5% productivity loss in grazing enterprises (Sinden et al, 2004). McLeod (2019) estimates beef related weed costs are around 10% of total costs.
- The predominant grazing use in the likely affected areas is beef grazing. Using the Victorian Farm Monitor Program (2022-23) the Gross Margin (GM) available from such activity could be up to \$621/ha. Information from a regionally based agricultural economist (pers. comm), suggests an average GM of around \$400/ha. For this report, a GM figure of \$386/ha has been used (NSW DPI Budgets, 2022).
- Using figures from NSW DPI and Local Land Services, costs for management of blackberries could be around \$600 (chemical costs \$100 + labour costs \$500). The labour costs assume use of contractors, and use of machinery and equipment.)

The complete list of assumptions made for this estimation is listed in Appendix 2.

Based on these indicative numbers, the economic cost of blackberry infestation within the MRFH area can be substantial, with an annual loss (productivity losses plus control costs) based on these assumptions possibly exceeding **\$27.5 million**.

2. An indicative scenario of the costs of blackberry infestation on conservation land in the MRFH area

Blackberries are an acknowledged problem on conservation lands throughout the State of NSW, including the MRFH region. They are ubiquitous, require heavy amounts of resources to manage, and have significant impacts on natural habitats and ecosystems.

The impacts include:

- Habitat degradation:
 - Blackberries severely degrade natural habitats, negatively affecting flora and fauna, and can lead to species loss. Blackberry causes substantial displacement of native plants with a greater than 50% reduction (DPI, 2021)
 - Blackberry forms dense thickets that exclude native species, leading to its complete dominance of the vegetation understorey and eventually the canopy, significantly altering fire regimes and dominating the landscape.
 - Blackberries threaten biodiversity by smothering native plant species and providing a habitat for feral animal pests, which can lead to reduced native biodiversity and altered ecological dynamics.
 - The thickets provide shelter for vermin, which can impact native species by predation or competition, further destabilising local ecosystems.
- Bushfire hazard: The dense growth of blackberries and the resulting dry canes increase the risk of bushfires, presenting a serious threat during dry conditions.
- Threat to adjacent lands: They pose a risk to nearby productive areas and regions of high biodiversity, disrupting ecological balance and creating neighbour tensions.
- Access limitations: Blackberry thickets restrict access to land and waterways, complicating management activities like maintaining fire trails and recreational uses such as bushwalking and fishing leading to restricted access for the public.

Current management regimes across conservation lands are targeted at protecting high value ecological communities and assets including fire trails and significant cultural assets.

Whilst the economic impacts are primarily the costs of control of high value assets within conservation areas, the largest impacts are from environmental (habitat) loss and species loss. Only the costs of control have been considered in this narrative. Other costs could include decreased tourism visitation levels, but no estimate has been made of this impact.

The NSW Natural Resources Commission released its Preliminary Report: *“Reducing Risk, Securing the Future NSW Invasive Species Management Review”* in August 2024. In that report it was noted that different agencies spend different amounts on invasive species management (which includes blackberries but covers a wider range of species). These levels of expenditure (all at a State level, in 2022-23) are listed as:

NPWS	Total: \$47.18 million [includes \$26.8 million staff] Area managed: 7 million ha
FCNSW	(State forest and Crown-timber land) Total: \$3.86 million Area managed: 2.1 million ha
Crown Lands	(Crown reserves managed directly) Total: \$3.8 million Area managed: 1 million ha

The financial impact on conservation lands for controlling blackberries, assuming targeted management of the most vulnerable areas, is an estimate only. The costs reflect the need for ongoing efforts to mitigate the ecological damage caused by blackberries, which threaten biodiversity and disrupt ecosystem functions. Using the same costs of control as per grazing lands [\$600 (Chemical costs \$100 + labour costs \$500)], and assuming asset protection measures target only 5% of the conservation area annually, a possible estimate of costs for blackberry control within the MFFH area could be in the order of **\$2.85 million**.

Conclusion

The pervasive nature of blackberry infestations in the Murray Region Forestry Hub necessitates significant financial resources for effective management on both grazing and conservation lands. This analysis highlights the extensive economic losses incurred from reduced agricultural productivity, control measures undertaken on areas used for grazing, and increased conservation management costs.

Indicative costs imposed on areas used grazing and conservation within this pilot region could be in the order of :

- Grazing \$27.5 million/year
- Conservation \$2.85 million/year

A total of **over \$30 million** in costs could be imposed on grazing and conservation uses within the MRFH area, each year. These findings underscore the importance of strategic resource allocation and effective management strategies to mitigate the impact of this invasive species on the region's economy and environment.

Overall conclusions from Parts 1 and 2

The prevalence of blackberries on land areas imposes various costs – mainly control costs, and loss of productivity as a result of competition for nutrients and water, and restrictions on available space for that production. Blackberries are recognized as a Weed of National Significance, but this plant is now so widespread that prevention, eradication, and containment are no longer considered possible – with asset-based protection (involving the use of chemicals as the main method) being the only control used.

This analysis has indicated that the costs imposed by blackberries are significant. Using the MRFH area as a case study (some 170,000 ha where the main land uses are softwood plantations, livestock grazing, and conservation), it has been demonstrated that the average costs for the plantation sector are in the order of **\$41 million per year**. This total is made up of annual control costs of around \$5 million, and losses in production of around \$36 million.

A more qualitative assessment has examined costs for grazing and conservation land uses, which has suggested that costs could be in the order of \$27.5 million for grazing (control and productivity losses) and nearly \$3 million for conservation (control in high value areas only). A total of just **over \$30 million** could therefore be considered to represent the annual costs imposed by blackberries in relevant areas within the MRFH area.

Examination of the MRFH area, as a case study, has indicated that the costs imposed by blackberry impacts are tenure-blind. Infestation by blackberries is a shared problem across all land areas, and research into finding a cost-effective solution that will treat all areas could be warranted.

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Appendices

Appendix 1

Data Assumptions Used in Economic Impact Analysis

1 Basic dimensions

Area of softwood plantations in pilot study area

NSW	125,000	ha
NE Vic	45,000	ha
Total	170,000	

2 Weed control costs

Cost (chemical plus application)	250	\$/ha.
Frequency of application	1	yrs.
Effective cost per ha/yr	250	\$
Area of plantation covered by weed control	10%	
- tracks and roads (annual spray)	5%	
- 200% pre and post planting per rotation	7%	
- total effective area	12%	
Effective cost for study area per yr.	5,160,714	\$
Effective cost/ha/yr	30.357	\$

3 Productivity losses caused by blackberries

Average MAI in study area	20	cu.m./ha/yr.		
Rotation length	28	yrs		
Total yield	560	cu.m./ha.		
- made up of:				
	Pulp	233	t./ha	
	Small sawlog	55		
	Med. Sawlogs	136		
	Large sawlog	136		
		560		
- prices received (ALPI Dec 23) - \$/cu.m.	Av.		Min.	Max.
	Pulp	24.54	2.67	43.24
	Small sawlog	47.76	37.58	73.00
	Med. Sawlogs	115.11	72.68	129.68
	Large sawlog	116.02	76.77	163.37

Appendix 2

Data Assumptions Used in Qualitative Assessment of impact of blackberries on grazing and conservation land uses within the MRFH area

Grazing

GM	386	\$/ha
Loss	5	%
Loss/ha	19.3	\$/ha
Area	1.07	mill ha.
Grazing use	75	%
Tot loss	15.49	\$ mill.

Grazing weed control

Control cost	600	\$/ha
Area	802,500	ha
Annual area	2.5	%
Tot cost	12.04	\$ mill.

Conservation

Control cost	600	\$/ha
Area	95,000	ha
Annual area	5	%
Tot loss	2.85	\$ mill.

Est. regional costs	30.38	\$ mill./yr.
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Appendix 3

Data Assumptions Used to assess yield of structural timber from sawlogs

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Loss of house frames

Large sawlogs	136	m ³ /ha.
with black loss	116	m ³ /ha.
- loss	20	m ³ /ha.
Area of plantations	170,000	ha.
Rotation length	28	years
Loss over area	121,429	m ³ /year
Convert log to sawn	60%	
Recovery in dry mill	70%	
Recovery to finished	70%	
Structural product	80%	
Struct. timber lost	28,560	m ³ /year
Req per house	14.58	m ³
No houses	1959	

² Source: Information from industry