8.0 Plantation issues of economic and social importance

Despite the positive benefits of plantation establishment in terms of generating manufacturing initiatives, replacement of commodities traditionally sourced from native forests and potential to improve farm health and diversify production, there are many serious environmental factors that need to be taken into account. Paramount of these issues in Tasmania is the conversion of native forests for plantation establishment, an issue covered earlier in **Section 3.6**. A few further issues are expanded upon below but in short the issues are:

- reduced stream flow and consumption of groundwater
- chemical contamination of waterways following pesticide application
- poisoning of wildlife with 1080 baits used in browsing control
- soil compaction and erosion caused by harvesting operations
- soil nutrient decline and acidification
- visual impact following clearfelling.

8.1 Use of poisons

The establishment of eucalypt plantations in Tasmania has become dependant upon the use of poisons to control mammal browsing, herbicides to control weeds, fungicides to control pathogens and insecticides to control insect attack. There has been ongoing controversy in Tasmania about the use of these poisons, particularly surrounding the use of 1080 because it inflicts such a painful, cruel death and impacts non-target species either through direct consumption or feeding on carcasses of poisoned animals. The use of forestry poisons has become increasingly controversial recently with claims that aerial spraying of plantations has had impacts downstream causing death of oysters and is linked to facial tumors in Tasmanian devils[76].

The target species for1080 poison are mammals that severely damage young growing seedlings such as the brushtail possum, Tasmanian pademelon, Bennett's wallaby, and European rabbit[77]. 1080 does not appear to directly affect Tasmanian devils[78]. Total 1080 use by Forestry Tasmania in 2001-02 was 9.6 kg at an average rate of 0.21 g/hectare[79].

Herbicides are used to control weeds, grasses and native shrubs that compete directly with the plantation shrubs for nutrients and light. To control these plants a range of herbicides is used together with a growth inhibitor called Terbacil. Herbicides used by Forestry Tasmania are listed in **Table 23** with other forestry chemicals listed in **Table 24**.

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[76] Scammell, M. (2004). Environmental problems – Georges Bay, Tasmania. Available from www.tfic.com.au
[77] Forestry Tasmania sustainable forest management report 2001-02, p41.
[78] Nick Mooney – Tasmanian Country 2/7/04 p7.
[79] Forestry Tasmania sustainable forest management report 2001-02, p42.

Table 23: Herbicides used by Forestry Tasmania

Product name	Herbicide	Poison schedule rating	WHO classification
Velpar	Hexazinone	5	Class 111 slightly hazardous
Velmac	Hexazinone	5	Class 111 slightly hazardous
Garlon, Grazon	Triclopyr	6	Class 111 slightly hazardous
Lontrel	Clopyralid	5	Unlikely to be hazardous
Roundup	Glyphosate	5	Unlikely to be hazardous
Eclipse	Metosulam	6	Unlikely to be hazardous
Brush-off	Metsulfuron - methyl	UC	Unlikely to be hazardous
Brushkiller	Metsulfuron - methyl	UC	Unlikely to be hazardous
Met 600	Metsulfuron - methyl	UC	Unlikely to be hazardous
Mako	Sulfometuron - methyl	5	Unlikely to be hazardous
Oust, Eucmix	Sulfometuron - methyl	5	Unlikely to be hazardous
Success	Spinosad	UC	Unlikely to be hazardous
Eucmix	Terbacil	5	Unlikely to be hazardous

In 2002-03 the following application of pesticides was used in plantations on State forest:

- **schedule 5 0.78 kg/ha**
- **schedule 6 0.002 kg/ha**

Data source: Forestry Tasmania sustainable forest management report 2002-03, p46-47.

Table 24: Summary of biocides reportedly used to protect plantations

Chemical	**Function**	**Solubility**	**Aquatic toxicity (**from Material Data Safety Sheet)	**Tumours***
Glyphosate	Herbicide	Soluble	11.1-21.6 mg/L	No
Sulfometuron - methyl	Herbicide	Soluble	>150 mg/L	No
Clopyralid triisopropanolamine	Herbicide	Soluble	Low toxicity	No
Atrazine	Herbicide	Low solubility	Low toxicity	Yes
Simazine	Herbicide	Low solubility	16-71 mg/L (fish)	Yes
Carbaryl	Insecticide	Soluble	6-10,000 µg/L	Unclear
Maldison	Insecticide	Partially	1-300 µg/L	No
Chlorpyrifos	Insecticide	Insoluble	3 µg/L (vertebrates)	No
Dimethoate	Insecticide	Low solubility	4.7-60 mg/L	No
Alphacypermethryn	Insecticide	Insoluble	0.004-3.6 µg/L	No
1080	Vertebrate pesticide	Unknown	Unknown	Unknown
Chlorothalonil	Fungicide	Soluble	44-62 µg/L (fish & invertebrates)	Yes
Terbacil (Paclobutrazol)	Growth regulator	Unknown	Unknown	Unknown

Source: Scammel, M (2004) Environmental problems Georges Bay – www.tfic.com.au

***At least three of the chemicals used to protect plantations have been associated with tumour development in life time exposure studies with rodents.**

The insecticide at the centre of the controversy over aerial spraying in the Georges Bay catchment is Alpha-cypermethryn which is potentially toxic at considerably lower concentrations than can be measured. Alpha-cypermethryn is toxic to some organisms at 4 parts per trillion and the lowest concentration that can be measured is 50 parts per trillion in water[80]. Testing for environmental residues of the chemical is made more difficult as it rapidly degrades in the environment and in organisms it is rapidly metabolised and depurated[81].

The current controversy in the Georges Bay catchment, and the significant implications for mortality or tumors in aquatic fauna, has lead to calls for a moratorium on the use of plantation chemicals under a precautionary approach until the chemicals are deemed safe to use. The Australian Medical Association's Tasmanian president Michael Aizen called for the Government to act immediately in the interests of public health and ban aerial spraying.

The primary method of applying plantation chemicals is by aerial spraying which allows quick treatment of large areas. The chemicals are usually applied as a cocktail to enhance their effectiveness and presumably to decrease costs[82]. There is significant risk associated with mixing chemicals as it may lead to unknown reactions and increase toxicity or environmental persistence.

Key questions arising:

- Who is liable in terms of potential human health effects from use of chemicals in catchments that are also used for water supply and food?
- Is the ongoing reliance on plantations sustainable if use of current chemicals and aerial spraying is banned?
- Is 'restoration forestry' now a realistic option to restore plantation areas back to diverse native forest systems that have more checks and balances against predator attack?

8.2 Water yield impacts

The afforestation of agricultural and pastoral areas, if conducted on a sufficiently broad scale, will profoundly influence the hydrology of catchments, particularly in respect to reducing water yields and groundwater recharge[83]. Changes in the seasonal distribution of runoff, the timing and magnitude of peak flows, and the persistence of low flows can also be expected.

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[80] Scammell, M. (2004). Environmental problems – Georges Bay, Tasmania. Available from www.tfic.com.au, p8.
[81] Ibid
[82] Scammell, M. (2004). Environmental problems – Georges Bay, Tasmania. Available from www.tfic.com.au
[83] Vertessey, R. (2000). Impacts of plantation forestry on catchment runoff. In Proceedings of the National workshop - plantations, farm forestry & water, Melbourne July 2000.

Evapotranspiration rates are higher in native forests and plantations than in pastures and crops[84]. For areas with 800 mm mean annual rainfall, mean annual runoff may decline by up to 165 mm under eucalypts and up to 210 mm under pines. For areas with a mean annual rainfall of 1,200 mm, the mean annual runoff reductions may be 265 and 350 mm[85]. Depending upon the plantation productivity, their extent of cover and the management regime, the effects may be less.

It has been stated that catchments with less than 20% area planted exhibit little effect on water yield. There is strong scientific evidence that the magnitude of catchment response is proportional to the percentage of the catchment planted. This relationship is less certain where only small proportions of catchments are planted. In catchments under 1,000 ha, where less than 20% is planted to forest plantations and there is no rainfall gradient within that area, it is difficult to measure a statistically significant effect on catchment yield. In larger catchments, the proportional relationship breaks down for a number of reasons, particularly the variation in annual rainfall across the catchment[86].

Only two Tasmanian river catchments contain plantation areas at greater than 20%: the Cam and Emu River catchments in the north of the State which have plantations at 26.9% and 29.5% of the catchment area respectively. Other catchment plantation areas are given in **Section 3.9.2**.

Water yield impacts of plantations are relatively low until canopy closure. Water yield reductions tend to peak at about 10 –20 years, possibly later in drier environments. It will also fluctuate over time depending on the forest management regime e.g. thinning. Where a plantation is re-established on an existing plantation forest site there will be a net increase in water yield until the plantation closes canopy[87].

The location and planting design of trees may increase or decrease water yield in catchments. In certain circumstances plantations established close to drainage lines will use proportionally more water than those established further away. Plantations established in contour banded configurations may also use more water than the same area of plantations established in blocks or perpendicular to the contour[88].

It may be argued that the establishment of plantations on cleared land is simply restoring deep-rooted perennials to a portion of the landscape and therefore restoring the hydrological balance that existed prior to land clearance.

There is no universal formula for summarising the relationship between trees and catchment hydrology.

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[84] Ibid
[85] Ibid
[86] Bureau of Rural Sciences, Proceedings of a meeting held on Friday 24/10/03 - the impact of forest plantations on water yield - a statement clarifying key scientific issues.
[87] Bureau of Rural Sciences, Proceedings of a meeting held on Friday 24/10/03 - the impact of forest plantations on water yield - a statement clarifying key scientific issues.
[88] Ibid

8.3 Carbon

The potential to use plantations as a means of storing carbon to meet targets set under the Kyoto Protocol, and thus creating a tradable carbon credit, has raised the interest of a new set of potential investors in plantation establishment[89]. Companies likely to incur a significant carbon debt are evaluating the potential of plantations as a means of reducing their liability.

However, there are significant doubts about the reality of carbon storage in plantation crops and their products. Often large scale tree plantations replace forests and are hence a direct cause of deforestation. Before they become a temporary carbon sink, plantations release large amounts of carbon previously stored in the forest and forest soils they replace. Forest soils and the organic matter stored in them typically contain three to four times as much carbon as the vegetation above. When ground is cleared for forest planting, rotting organic matter in the soil releases a surge of CO_2 into the air. This release will exceed the CO_2 absorbed by growing trees for at least the first 10 years[90] old forests actually accumulate more carbon than young plantations.

Most of the timber produced by plantations is converted into pulp, the production and transport of which emits large amounts of CO_2. Most of the resulting paper has a short lifespan and the CO_2 it stores returns to the atmosphere relatively rapidly as do ultimately all products of plantations.

In short, it appears that industrial monoculture tree plantations are not a plausible candidate as carbon sinks.

APPENDIX 1 – Plantations by river catchments

Appendix - Plantation area by catchments, 2002

Catchment name	area (ha)	plantation	area (ha)	% catchment
Arthur	250,542	hardwood	15,562	6.2
		softwood	1,070	0.4
		Arthur Total	**16,632**	**6.6**
Black-Detention	64,616	hardwood	2,023	3.1
		softwood	133	0.2
		Black-Detention Total	**2,156**	**3.3**
Blythe	37,718	hardwood	2,650	7.0
		softwood	379	1.0
		Blythe Total	**3,029**	**8.0**
Boobyalla-Tomahawk	65,219	hardwood	485	0.7
		softwood	2,343	3.6

[89] Stanton, R. (2000) An overview of timber plantation development in Australia – drivers, trends & prospects. In Proceedings of the National workshop - plantations, farm forestry & water, Melbourne July 2000.
[90] New Scientist 28/10/02.

		Boobyalla-Tomahawk Total	**2,828**	**4.3**
Brumbys-Lake	150,855	hardwood	262	0.2
		softwood	47	0.0
		Brumbys-Lake Total	**309**	**0.2**
Cam	28,859	hardwood	6,199	21.5
		softwood	1,571	5.4
		Cam Total	**7,770**	**26.9**
Clyde	111,752	hardwood	9	0.0
		softwood	605	0.5
		Clyde Total	**614**	**0.5**
Derwent Est-Bruny	109,149	hardwood	0	0.0
		softwood	540	0.5
		Derwent Est-Bruny Total	**540**	**0.5**
Duck	55,242	hardwood	2,533	4.6
		softwood	23	0.0
		Duck Total	**2,556**	**4.6**
Emu	25,462	hardwood	6,127	24.1
		softwood	1,396	5.5
		Emu Total	**7,523**	**29.5**
Forth-Wilmot	117,961	hardwood	4,417	3.7
		softwood	1,828	1.5
		Forth-Wilmot Total	**6,244**	**5.3**
Furneaux	188,791	softwood	252	0.1
		Furneaux Total	**252**	**0.1**
George	61,500	hardwood	2,537	4.1
		softwood	37	0.1
		George Total	**2,574**	**4.2**
Gordon-Franklin	589,357	hardwood	29	0.0
		Gordon-Franklin Total	**29**	**0.0**
Great Forester-Brid	78,301	hardwood	2,464	3.1
		softwood	7,669	9.8
		Great Forester-Brid Total	**10,133**	**12.9**
Huon	380,790	hardwood	5,971	1.6
		softwood	1,230	0.3
		Huon Total	**7,201**	**1.9**
Inglis	61,570	hardwood	5,958	9.7
		softwood	3,848	6.2
		Inglis Total	**9,806**	**15.9**
Jordan	125,325	hardwood	274	0.2
		softwood	456	0.4
		Jordan Total	**730**	**0.6**
King-Henty	179,271	hardwood	407	0.2
		softwood	1,178	0.7
		King-Henty Total	**1,585**	**0.9**
King Island	426,091	hardwood	286	0.1
		softwood	188	0.0
		King Island Total	**474**	**0.1**
Leven	72,740	hardwood	7,658	10.5
		softwood	1,999	2.7

		Leven Total	**9,657**	**13.3**
Little Forester	35,356	hardwood	4,097	11.6
		softwood	2,519	7.1
		Little Forester Total	**6,616**	**18.7**
Little Swanport	87,892	hardwood	192	0.2
		softwood	306	0.3
		Little Swanport Total	**497**	**0.6**
Lower Derwent	160,374	hardwood	2,157	1.3
		softwood	12,007	7.5
		Lower Derwent Total	**14,164**	**8.8**
Macquarie	273,244	softwood	6	0.0
		Macquarie Total	**6**	**0.0**
Meander	156,863	hardwood	7,909	5.0
		softwood	452	0.3
		Meander Total	**8,360**	**5.3**
Mersey	190,891	hardwood	6,296	3.3
		softwood	4,802	2.5
		Mersey Total	**11,098**	**5.8**
Montagu	47,607	hardwood	2,101	4.4
		Montagu Total	**2,101**	**4.4**
Musselroe-Ansons	97,209	hardwood	813	0.8
		softwood	1,144	1.2
		Musselroe-Ansons Total	**1,957**	**2.0**
Nelson Bay	86,755	hardwood	869	1.0
		softwood	3	0.0
		Nelson Bay Total	**872**	**1.0**
North Esk	106,550	hardwood	9,564	9.0
		softwood	542	0.5
		North Esk Total	**10,107**	**9.5**
Ouse	148,238	hardwood	61	0.0
		softwood	210	0.1
		Ouse Total	**270**	**0.2**
Pieman	414,893	hardwood	1,278	0.3
		softwood	24	0.0
		Pieman Total	**1,302**	**0.3**
Pipers	75,370	hardwood	3,203	4.3
		softwood	2,494	3.3
		Pipers Total	**5,697**	**7.6**
Pitt Water-Coal	91,977	hardwood	312	0.3
		softwood	1,261	1.4
		Pitt Water-Coal Total	**1,572**	**1.7**
Prosser	114,850	hardwood	409	0.4
		softwood	175	0.2
		Prosser Total	**584**	**0.5**
Ringarooma	98,284	hardwood	3,971	4.0
		softwood	2,700	2.7
		Ringarooma Total	**6,670**	**6.8**
Rubicon	71,755	hardwood	3,211	4.5
		softwood	4,233	5.9

		Rubicon Total	**7,444**	**10.4**
Scamander-Douglas	68,656	hardwood	1,257	1.8
		softwood	2,299	3.3
		Scamander-Douglas Total	**3,557**	**5.2**
South Esk	334,951	hardwood	2,640	0.8
		softwood	9,119	2.7
		South Esk Total	**11,759**	**3.5**
Swan-Aspley	136,032	hardwood	155	0.1
		Swan-Aspley Total	**155**	**0.1**
Tamar Estuary	107,439	hardwood	3,417	3.2
		softwood	96	0.1
		Tamar Estuary Total	**3,513**	**3.3**
Tasman	92,706	hardwood	809	0.9
		softwood	1,338	1.4
		Tasman Total	**2,147**	**2.3**
Upper Derwent	354,134	hardwood	3,684	1.0
		softwood	5,558	1.6
		Upper Derwent Total	**9,242**	**2.6**
Welcome	67,480	hardwood	1,976	2.9
		softwood	1	0.0
		Welcome Total	**1,977**	**2.9**

Data source: Private Forests Tasmania 2002, Forest Group Data v.2, Private Forests Tasmania, Burnie, www.privateforests.tas.gov.au

APPENDIX 2 – Profiles of selected plantation products

Medium Density Fibreboard (MDF)

MDF is a wood based composite material that draws on the usage of wood fibres, rather than particles or veneers to produce board or sheet products. It is typically made as a board type product, though it's use in mouldings and increasing use as a structural product will see beam type products proliferate. It is replacing the use of particleboard in uses such as furniture manufacture, cabinet making, joinery, craft work and flooring. Its advantages include high strengths, ease of machining, good weathering properties, and the ability to be made from a wide variety of fibrous products.

MDF is a wood based composite. The primary constituant is a softwood that has been broken down into wood fibres; that is the very cells (tracheids, vessels, fibres and fibre-tracheids), which are far smaller entities than those used in particleboard. In Australia the main species used in the production of MDF is plantation grown radiata pine, but a wide variety of softwood species will constitute a suitable base for MDF production, though if too many species are used too great a variation in the properties of the finished MDF will result.

MDF was originally developed exclusively for furniture. But it's weight strength and aesthetics have seen its proliferation to many uses. It is used extensively in kitchens and for mouldings, and in bathroom environments. It's use as an exterior cladding for housing has successfully been trialed, and structural applications are increasing. The Fire resistance of MDF is also better than that of timber

Laminated Veneer Lumber (LVL) Laminated Strand Lumber (LSL)

LVL and LSL are an engineered structural materials that are manufactured by bonding wood strands or veneers that are rotary peeled together with a structural adhesive to form a solid member of end sections and length limited only by manufacturing, transport and handling capabilities. The grain direction of each veneer or strand is usually orientated parallel to the length of the piece but may be cross-banded for specialty applications. Because of its laminated structure, dispersing strength reducing characteristics more evenly, LVL and LSL have higher bending strength and stiffness than the equivalent solid timber section of the same species. LVL and LSL are produced in the seasoned condition. Design Ideas and Structural Form LVL and LSL products are used predominantly for residential and industrial structural building applications such as floor joists, lintels, purlins, roof truss components, etc. The ability to cut different shapes from productions “billets” allows for structural innovation using angular and curved shapes. While it’s unfinished, manufactured appearance may limit its use for high quality appearance applications, the use of opaque finishes will facilitate the use of LVL or LSL in creating visually exciting structural forms.

Waste is minimised with LVL production and up to 70% of the tree can be converted to finished product.

Engineered strand lumber (ESL)

Lignor is a Research and Development Company established in 1999. It has patented technology to produce very strong engineered strand lumber, ESL. This technology is German in origin where it is used to downstream softwoods and is known there as long strand lumber, LSL. Since most of the world’s softwoods are held by multi-national companies, Lignor decided to develop the technology to use on eucalypts, especially blue gums. It identified Western Australia as having the most advanced plantation resource at this time and has opted for a plant at Albany. Lignor considered Tasmania but the initial response from industry was not encouraging and on paper decided that the concentration of blue gums was patchy and there was not sufficient resource with a diameter between 150-400 currently available.

- The technology can be used on plantations planted and managed for pulpwood as it uses the same age trees and rotation and same management regime.
- The technology converts 70% of the tree to finished product and the remaining 30% is used for biomass fuel for drying in the plant.
- The lumber product is equivalent in strength to a 90 year old tree.
- The product is a construction timber engineered for structural purposes.
- The plant can produce any product between 6mm and 90 mm thick, up to 2.7 metres wide and up to 15 metres long. It can, for example, produce bracing board at 6mm or flooring at 15-16 mm or a beam at 90 mm thick.
- The plant uses 450,000 tonnes of timber per year.
- It will employ 150 directly in the plant and another 50 in the field.

- The investment is for $170 million.
- The products will be Engineered Strand Lumber and Engineered Strand Board.
- The market is established.
- It generates $1,500 per cubic metre compared with $140-$150 for woodchip.

Environmentally it is a dry process and so there is no wet waste. There will be atmospheric emissions from combustion of wood waste and evaporation from water in wood. The resin when it reacts with wood is benign. It is not a toxic resin.
The WA government and opposition support the project
The only government support that has been requested is for site infrastructure assistance.