Western Region Sustainable Water Strategy

TECHNICAL REPORT 6

Managing adverse water resource impacts of land use changes:
Selecting areas for managing new forestry developments

This technical report supports actions in the Western Region and Gippsland Region sustainable water strategies (SWSs). It should be read in conjunction with these strategies (see Chapter 5 in the Western SWS and Chapter 3 in the Gippsland SWS) and the state-wide policy paper *Managing adverse water resource impacts of land use changes*.

1. Introduction

Large-scale changes in land use can affect water availability for existing water users and the environment by taking more water that would otherwise reach streams and/or extracting more water directly from shallow aquifers. These impacts are felt most keenly during dry years and in summer, and where water resources are already fully committed.

Many land use changes can affect water resources. However, in moderate to high rainfall areas plantation forestry generally uses more water per unit area than other land uses, and has been well studied. In south-west Victoria, the establishment of blue gum plantations began in 1991 and in 2009 covered 130,000 ha. This is a relatively small proportion of the region, but plantations are concentrated in some areas; for example, hardwood plantations cover 32 per cent of the Stokes River catchment\(^6\). Plantations covering about 7.7 per cent of the catchment are now estimated to intercept about 20 per cent of the flow in the Glenelg River, where flows have already been lowered by diversions to supply the Wimmera-Mallee area\(^1\). Combined with other pressures such as lower rainfall from 1997 to 2009, plantations caused some aquifers to decline and resulted in applications for new groundwater licences being rejected in some areas (for example, Hawkesdale).

Like other farming commodities, plantation forestry is strongly affected by market forces. The expansion of plantations slowed markedly following the collapse of many managed investment schemes, but a price on carbon may lead to a resurgence.

During the development of the Western and Gippsland SWSs, the community expressed concerns about land use change impacts on the reliability of supply for water users especially in dry times. The community also expressed support for a sound policy to protect water resources from the impact of rapid expansion of water-intensive land uses in the future.

2. The state-wide policy framework

The Western SWS sets out the policy framework for managing the adverse water resource impacts of land use change. This framework, which will apply state-wide, has three main elements:

- getting the best estimates of water use by vegetation and tracking changes over time;
- changing the *Water Act 1989* so that the Minister for Water can declare and manage ‘intensive management’ areas to protect other water users and the environment; and
- recognising the rights to existing use in declared areas but controlling expansion of new forestry developments covering at least 20 ha, or more than 10 per cent of a property, whichever is greater. Property refers to all the land owned by one person or company in a declared area.

Plantations are the most water-intensive land use on a unit area basis, and were identified by the National Water Initiative as an example of a water interception activity that should be regulated in water-stressed areas. Other land use changes such as perennial pasture systems and land forming...
are typically less water intensive but can affect water availability, particularly where large areas are involved, but the Government does not support regulating all land use changes. The need to regulate other land use changes can be considered in future reviews of SWSs, using evidence from monitoring and further research.

Declaring ‘intensive management’ areas will enable targeted management. In declared areas:

- Most landholders and government land managers will not be affected. They will be able to plant to forestry up to 20 ha or 10 percent of their property, whichever is greater, without restriction.
- The commercial forestry industry will have certainty that the water use of their existing plantations is protected, and this will continue as plantations are rotated. This approach will protect plantation asset values and jobs in harvesting and hauling timber.

This policy framework extends Victoria’s existing approach to water management, and is consistent with Victoria’s obligations under the National Water Initiative. It allows Victoria to manage plantations if required under the Murray-Darling Basin Plan, and to match South Australia’s approach of requiring permits for plantation water use in Victorian/South Australian border areas.

3. Selecting and declaring intensive management areas

The selection of areas to be managed more intensively to address the impacts of land use change occurs in two stages:

i) identification of areas to be considered for declaration in a 10-year review of a SWS or by the Minister for Water in response to a written request from a catchment management authority or water corporation; followed by

ii) assessment of each identified area by a regional committee which makes a recommendation to the Minister for Water.

Each of these processes takes into account similar criteria. However, the regional committee considers the issues in more detail.

**Initial identification of potential intensive management areas**

The Western and Gippsland SWSs are the result of a three year collaborative process involving government departments, independent experts, key industry stakeholders and the broader regional community. Potential intensive management areas were identified and selected in stages (see Figure 1).

![Figure 1 Identifying and selecting potential intensive management areas](image)

**Table 1**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Preparing draft Strategy</th>
<th>Public consultation</th>
<th>Finalise strategy</th>
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</thead>
</table>
| Inputs and decision processes | - Land use change technical working group – assessment of information about land use impacts and policy options  
- Consultative Committee – review and refinement of policy options | - Public submissions about issues and policies options presented in the Draft SWSs  
- Independent Panel – review of Draft SWSs  
- Public forums and stakeholder meetings – feedback about policy options | - Consultative Committee – determination of appropriate policies and actions  
- Land and water use data compilation for potential intensive management areas |
| Outcome | Priority areas nominated in Draft SWSs for public comment | Received public submissions and feedback | Identification of areas to be assessed by regional committees selected |
The Draft Western SWS indicated 11 areas where managing the water impacts of land use change were likely to be a higher priority (see Figure 2):

- the Glenelg Water Supply Protection Area;
- the Heywood and Hawkesdale groundwater management areas; and
- the catchments of Darlots Creek, Eumeralla Creek, Crawford River, Bryan Creek, Stokes River, lower Glenelg River, middle Glenelg River and Mosquito Creek.

This assessment was based on several information sources including measured data, the Water and Land Use Change study, and other computer modelling studies. Submissions on the Draft Strategy also raised concerns about parts of the West Wimmera, the Hopkins Basin, and the Otway Coast River Basin. Several submitters were concerned about the information the Government would use to make decisions about which areas to declare for more intensive management.

In finalising the Western and Gippsland SWSs, a more comprehensive compilation of land and water use data was undertaken in areas where intensive management was considered most likely to be needed. In the Western Region, these were the 11 areas identified in the Draft Western SWS, and the Salt Creek catchment upstream of Lake Bolac in the Hopkins Basin. Two areas in Gippsland were included in this assessment. These were the catchment of the Latrobe River upstream of the Thomson River, and the catchment of the Tarra River (see Figure 2).

The data compiled were based on the best information available. Estimates of evapotranspiration will inevitably change and improve over time as new technology becomes available. Getting the best estimates of water use by vegetation and tracking land use changes state-wide over time is the first step in the approach to managing this issue.

### Selection of potential intensive management areas

In Western Victoria (see Action 5.6 of the Western SWS), the highest priority areas for assessment by a regional committee(s) are all or parts of:

- the Crawford River catchment;
- the Stokes River catchment; and
- the Glenelg Water Supply Protection Area, particularly around Lake Mundi.

No areas in the Gippsland Region were selected for further assessment by regional committees. The main reason was that most of the plantations in Gippsland were established decades ago on previously forested land, so there would have been little increase in water use.

In northern Victoria, the management of adverse water impacts of land use change will be reviewed after the Murray-Darling Basin Plan has been finalised and the role of the Commonwealth in managing the impact of plantations on water availability in the Murray-Darling Basin has been confirmed (see Action 5.7 of the Western SWS).

The need to declare intensive management areas in central Victoria will be considered when the Central Region SWS is reviewed in the future.
Assessment of the three potential intensive management areas

The Government will appoint a regional committee to provide independent advice about whether all or part of the three areas in the Western Region should be declared to protect water users and the environment by controlling new plantation forestry developments.

Regional committees, comprising key water users, community leaders, environmental managers and technical experts, and supported by the relevant rural water corporation, will consider:

- the potential for future land use changes to reduce aquifer recharge and streamflow, and the relative contribution of plantation forestry;
- water-dependent economic, social and environmental values that would be affected by active management; and
- the degree of stress on water resources and its causes, and the ability to cater for future impacts.
Western Region Sustainable Water Strategy

The committee will provide advice to the Minister about:

- the need to declare the area, and how declaring the area would align with other relevant plans and strategies;
- the appropriate boundaries of the area for declaration; and
- issues to be considered in managing the declared area.

Based on this advice, the Minister will decide whether to declare the area. The Minister would not be bound by the committee’s recommendations. However, the Minister’s decision, and any reasons for not following the committee’s recommendations, will be tabled in Parliament and subject to disallowance.

4. Rationale for selecting the three potential intensive management areas

To complement and inform the deliberations of SWS consultative committees, the Department of Sustainability and Environment compiled land and water use information that allowed an initial assessment of the criteria above. An important part of this process was developing water balances for each of the 14 areas, using the most up to date and spatially consistent land and water information.

The water balances enabled consistent comparisons between catchments, greater understanding of the conditions in each catchment, and hence a basis for selecting areas for further assessment by a regional committee.

Developing water balances for each area

The water balances comprised rainfall, water consumption, evapotranspiration, surface runoff and recharge, deep aquifer recharge and unaccounted water, which was the volume remaining when the other components were balanced. Rainfall and water consumption were based on measured data, and the remaining components were modelled. The modelling, which used the Soilflux computer model, was based on data about land use, soil type and geology, climate and depth to groundwater.3,6

Land and water use information from these water balances is summarised in Figure 3 and Table 1. Figure 3 shows the contribution of each of 12 major land use types to total evapotranspiration for each of the 14 assessed areas. As most of the areas are agricultural catchments, pasture is an extensive land cover and contributes most to evapotranspiration. The contribution of plantation forestry is greatest in the Glenelg catchments (the Glenelg WSPA overlaps the Lower and Middle Glenelg catchments as shown in Figure 2) and the Crawford and Stokes River catchments. Since blue gum plantations have been planted in these catchments over the past two decades, and generally over pasture, they would have increased ET and hence decreased surface runoff and aquifer recharge. Softwood plantations, on the other hand, were generally established several decades ago, replacing native forest, and hence would have had relatively less impact on the water balance.
Figure 3 Summary of modeled evapotranspiration for 2008/09 land use and long term historical climate conditions

Key findings of the initial assessment

Table 1 summarises some of the information most relevant to whether new forestry developments need to be more intensively managed in each area.

The following rationale was used in choosing the Crawford, Stokes and Glenelg WSPA areas for further assessment by a regional committee:

- Plantation forestry now covers about one-third of all three catchments after substantial expansion over the past two decades, and has changed the water balance. Older softwood plantings often replaced native forest, but newer blue gum plantings generally replaced pasture. Once recently established blue gums in the Crawford River catchment reach full canopy cover, combined long-term mean annual stream flow and groundwater recharge in this catchment will be an estimated 35 per cent lower than before plantation forestry was established.

- Surface water in the Glenelg catchment, which includes the Crawford and Stokes rivers, is already highly committed and competition for water is likely to increase. Land use changes that increase water use will increase this competition, especially in dry times.

- The Lower Glenelg River has especially high social and recreational values that could be affected by further decreases in streamflow, and it and the Stokes and Crawford rivers are high conservation value aquatic ecosystems. They support several species listed under the Environmental Protection and Biodiversity Conservation Act 1999 and Flora and Fauna Guarantee Act 1988, such as the Glenelg freshwater mussel and Glenelg spiny crayfish, which have been identified as threatened by the impacts of plantations.

- In some locations in the Glenelg Water Supply Protection Area, such as around Lake Mundi, long term declines in groundwater levels due to climate and plantation forestry may affect groundwater users.

- Water users and environmental values, such as native fish in the Crawford River, may be negatively affected if the duration of cease-to-flow periods become longer due to lower groundwater levels and less water reaching streams in summer as a result of higher water use.
### Table 1: Summary of water and land use information

<table>
<thead>
<tr>
<th>Area</th>
<th>Proportion hardwood plantation cover</th>
<th>Proportion softwood plantation cover</th>
<th>Estimated reduction in streamflow and aquifer recharge due to hardwood plantations (ML/yr)²</th>
<th>How much competition is there for water resources?</th>
<th>Area available for future expansion?</th>
<th>Values that may drive change in management?</th>
<th>Conclusion about implications of land use change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Region</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Bryan Creek</td>
<td>12%</td>
<td>-</td>
<td>9,000</td>
<td>1,973 ML compared to SDL of 889 ML². Farm dams are major use. The Western SWS capped the Glenelg Basin (which includes Bryan Creek) at the current level of extraction.</td>
<td>70%</td>
<td>14%</td>
<td>Mainly dryland grazing area – most important values of water likely to be economic and social values of farm dams. Effects of forestry likely to be local impacts on farm dams and possibly Bryan Creek and the Wannon River. Plantation forestry is the second largest source of ET in the catchment. If there is no clear immediate driver for introducing controls on new forestry developments, track changes in land and water use.</td>
</tr>
<tr>
<td>Crawford River</td>
<td>27%</td>
<td>3 %</td>
<td>33,000</td>
<td>The Western SWS capped the Glenelg Basin (which includes the Crawford River) at the current level of extraction.</td>
<td>25%</td>
<td>17%</td>
<td>The Crawford and Lower Glenelg Rivers are high conservation value aquatic ecosystems. The Lower Glenelg River has especially high social and recreational water dependent values. Increases in the duration of cease to flow periods negatively affect these values. Highly forested catchment (about 54 % covered by plantations, native forest and woodland) that has experienced significant change over past two decades. Plantation forestry is the largest source of ET in the catchment. High water dependent social and environmental values downstream. Of the 14 areas considered, this has the highest proportion of total evapotranspiration due hardwood plantations (see Figure 2). High priority for assessment by regional committee.</td>
</tr>
<tr>
<td>Darlots Creek</td>
<td>8%</td>
<td>-</td>
<td>11,000</td>
<td>The Western SWS set a precautionary cap of 2,500 ML of remaining unallocated water in the Fitzroy River/Darlots Creek catchment.</td>
<td>55%</td>
<td>19%</td>
<td>This catchment has unallocated water and is one area where economic development requiring small volumes of surface water (eg, dryland dairying) can expand most easily. Lake Condah has high social and cultural values, and the lower Fitzroy River has high environmental values. Plantation forestry is the fourth largest source of ET in the catchment. The catchment has high values that could be affected in future. Track changes in land and water use.</td>
</tr>
<tr>
<td>Eumeralla River</td>
<td>11%</td>
<td>-</td>
<td>20,000</td>
<td>The Western SWS set a precautionary cap of 500 ML of remaining unallocated water in the Eumeralla River catchment.</td>
<td>70%</td>
<td>7%</td>
<td>Main water dependent social and economic values are related to agricultural water use, maintaining equity between water users, and ensuring some users do not affect supply reliability for others. Agricultural restricted by waterlogging in some areas – it is unclear if water interception could counteract impacts of waterlogging. Plantation forestry is the second largest source of ET in the catchment. The catchment has high values that could be affected in future. Track changes in land and water use.</td>
</tr>
<tr>
<td>Glenelg – lower</td>
<td>11%</td>
<td>26 %</td>
<td>31,000</td>
<td>Water use from the Glenelg River is 61,000 ML over the SDL at the base of catchment. The Western SWS capped the Glenelg Basin at the current level of extraction.</td>
<td>29%</td>
<td>2%</td>
<td>High conservation value aquatic ecosystem, especially high social and recreational water dependent values. The catchment has high values and flows impacted by regulation upstream. High priority for assessment by regional committee.</td>
</tr>
<tr>
<td>Glenelg – middle</td>
<td>12%</td>
<td>17 %</td>
<td>28,000</td>
<td>Surface diversions are capped at the SDL. Recent VCAT case confirmed as is sustainable level of extraction and plantation expansion is a major threat to groundwater availability.²</td>
<td>34%</td>
<td>3%</td>
<td>High conservation value aquatic ecosystems, with especially high social and recreational water dependent values. ‘Gaining’ stream so could be affected by lower groundwater levels. The catchment has high values and highly over-committed water resource. High priority for assessment by regional committee.</td>
</tr>
<tr>
<td>Glenelg WSPA</td>
<td>12%</td>
<td>20 %</td>
<td>75,000</td>
<td>An embargo on new licences and permanent transfers has been in place since July 2008.</td>
<td>58%</td>
<td>3%</td>
<td>Long term declines in groundwater levels that may affect groundwater users eg around Lake Mundi – issue is equity in allocation (lost production, lower value of licences) and how big an impact can allow before stepping in. Other issues include SA border groundwater use issues, and effects on the Glenelg River. The Glenelg WSPA is a large area – at least parts of which are high priority for assessment by regional committee. About 60 % of the catchment is covered by plantation forestry, native forests and woodlands. The main objective is to ensure new water users do not reduce the reliability for existing water users. Southern Rural Water has recommended reducing the PCV to the existing level of entitlements to protect this reliability. Track changes in land and water use.</td>
</tr>
<tr>
<td>Hawkesdale GMA</td>
<td>7%</td>
<td></td>
<td>21,000</td>
<td>Surface diversions are capped at the SDL. Recent VCAT case confirmed as is sustainable level of extraction and plantation expansion is a major threat to groundwater availability.²</td>
<td>77%</td>
<td>4%</td>
<td>Main water dependent social and economic values are related to agricultural water use, maintaining equity between water users, and ensuring some users do not affect supply reliability for others. The main objective is to ensure new water users do not reduce the reliability for existing water users. Southern Rural Water has recommended reducing the PCV to the existing level of entitlements to protect this reliability. Track changes in land and water use.</td>
</tr>
<tr>
<td>Heywood GMA</td>
<td>7%</td>
<td>&lt; 1 %</td>
<td>24,000</td>
<td>Surface water use doesn’t appear to be issue. Groundwater use much less than entitlement.</td>
<td>58%</td>
<td>3%</td>
<td>This area underlies Darlots Creek catchment. Main social and economic values are related to agricultural water use, maintaining equity between water users, and ensuring some users do not affect supply reliability for others. No clear immediate driver for introducing controls on new forestry developments that intercept groundwater. Track changes in land and water use.</td>
</tr>
<tr>
<td>Mosquito Creek</td>
<td>2%</td>
<td>3 %</td>
<td>4,000</td>
<td>Catchment split between Vic and SA. Little consumptive water use in Vic. Much higher groundwater use in SA.</td>
<td>25%</td>
<td>59%</td>
<td>Catchment has relatively scarce water resources. Anecdotal reports suggest impacts of land use changes on streams. There are many wetlands in this catchment. Much of this catchment is Ramsar-listed wetland. It is not clear that land use impacts in Victoria are a major driver of the water balance there. No clear immediate driver for introducing controls on new forestry developments. Track changes in land and water use.</td>
</tr>
</tbody>
</table>

² Western SWS set a precautionary cap of surface water use.
<table>
<thead>
<tr>
<th>Area</th>
<th>History of plantation forestry in catchment?</th>
<th>How much competition is there for water resources?</th>
<th>Area available for future expansion?</th>
<th>Values that may drive change in management?</th>
<th>Conclusion about implications of land use change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt/Flary Creek</td>
<td>1% softwood plantation cover</td>
<td>3,000 SDL exceeded $^a$</td>
<td>58%</td>
<td>34%</td>
<td>No clear immediate driver for introducing controls on new forestry developments. Track changes in land and water use.</td>
</tr>
<tr>
<td>Stokes River</td>
<td>32% softwood plantation cover</td>
<td>The Western SWS capped the Glenelg Basin (which includes the Stokes River) at the current level of extraction.</td>
<td>11%</td>
<td>4%</td>
<td>Highly forested catchment (about 78% is covered by plantation forestry, native forests, and woodlands) with high water dependent social and environmental values downstream. A significant proportion of total evapotranspiration is from hardwood plantations (see Figure 2). High priority for assessment by regional committee.</td>
</tr>
<tr>
<td>Latrobe River</td>
<td>2% softwood plantation cover</td>
<td>Surface diversions are capped at the SDL $^b$.</td>
<td>33%</td>
<td>23%</td>
<td>No clear immediate driver for introducing controls on new forestry developments. Track changes in land and water use.</td>
</tr>
<tr>
<td>Tarra River</td>
<td>1% softwood plantation cover</td>
<td>Gippsland SWS capped the Tarra River at the current level of extraction. Groundwater and baseflow have been declining over long term.</td>
<td>25%</td>
<td>22%</td>
<td>No clear immediate driver for introducing controls on new forestry developments. Track changes in land and water use.</td>
</tr>
</tbody>
</table>

Footnotes:

$^a$ ET = evapotranspiration. Areas of plantation forestry based on interpretation of Victorian Land use Information System (DPI, 2010) and plantation industry data. Reduction in streamflow and groundwater recharge calculated with Soilflux model.

$^b$ The sustainable diversion limit (SDL) determines the upper limit on winterfill diversions, and is used to assess the capacity to trade or transfer winter-fill licences between unregulated sub-catchments. The allocated volumes date from 2003, when the SDLs were calculated.

$^c$ Source is SKM (2011). Landuse data is from Victorian Land use Information System. Groundwater levels are interpreted from the Groundwater Pollution Risk Map project.
References