



# Plantations and Water Facts

Competition for water in many catchments is becoming a major issue raised by the traditional agricultural sector and rural communities. Attention has turned to the plantation sector and the implications of plantation expansion on water supplies.

## Key messages

- Commercial plantations occupy 0.2% of land across Australia, and in most cases only cover a few percent of catchments.
- The hydrology of agricultural catchments has been extensively modified by clearing, earthworks and other activities, leading to the patterns and levels of water availability that are regarded as 'normal' today.
- Climate change, groundwater extraction, farm dams and fire have all been identified as much greater threats to future stream flows in the Murray Darling Basin than predicted levels of plantation expansion.
- While the establishment of plantations on cleared agricultural land can lead to reductions in water availability, the impacts are likely to be negligible in most areas.
- Plantations may place extra demands on groundwater in some locations. Plantations can be used strategically to lower the water table and combat salinity.

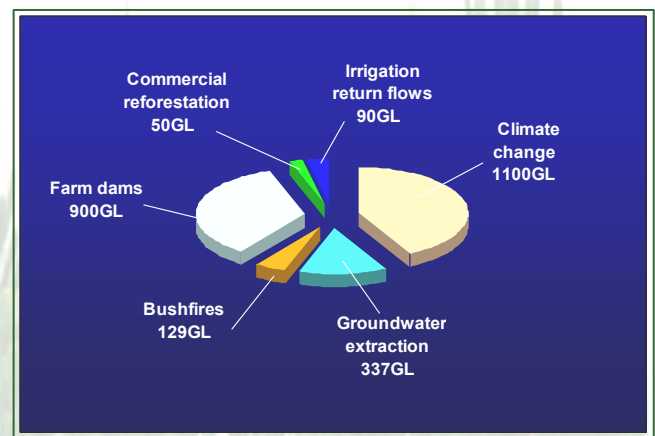
## Are plantations a major stream flow threat?

Not according to recent work carried out in the Murray-Darling Basin (Fig 1). This is supported by a study in the Murrumbidgee catchment, showing an additional 30,000 ha of plantations in high impact water yield areas has minimal impacts on reservoir volumes and irrigation allocations.

Australia's plantation estate has reached 1.8 million hectares, moving toward the Plantation 2020 Vision target of trebling of the area by 2020. Yet, plantations represent just 0.2% of all land uses, still minor compared to grazing and cropping which occupy 61% of Australia's total land area.

The expansion plans of plantation investment firms in the Basin and predicted run-off reductions under plantations of 1ML/ha, reveal that climate change, farm dams, groundwater extraction and bushfire are much larger threats to water supplies.

Figure 1 – Threats to stream flows in the Murray-Darling Basin over the next 20 years



Source: MDBC (2006)

## How do trees impact on water?

Through two main processes:

1. Transpiration - the uptake of water from soil or ground water by tree roots. Much of this water is returned to the atmosphere as it evaporates through the pores in the leaves.
2. Interception - leaves and branches intercept rainfall so the water is ultimately evaporated back into the atmosphere.

## Agricultural systems are more 'leaky' than trees

Domination of many agricultural landscapes by annual plants was not always the case. Large areas of forest were permanently cleared and perennial native plants replaced with annuals, leading to significant change in catchment hydrology.



Annual crops and pastures generate greater rainfall runoff, leading to increased stream flow and a higher proportion of water passing the plant root zone and entering groundwater storage. Actively growing annual crops often have higher transpiration rates than trees, but their short growing cycle and fallow periods means overall water use is lower (Nisbet 2005). In short, traditional agricultural production systems which are dominated by annual plants are more 'leaky', leading to the stream flow patterns and groundwater availability that underpin present day agriculture.

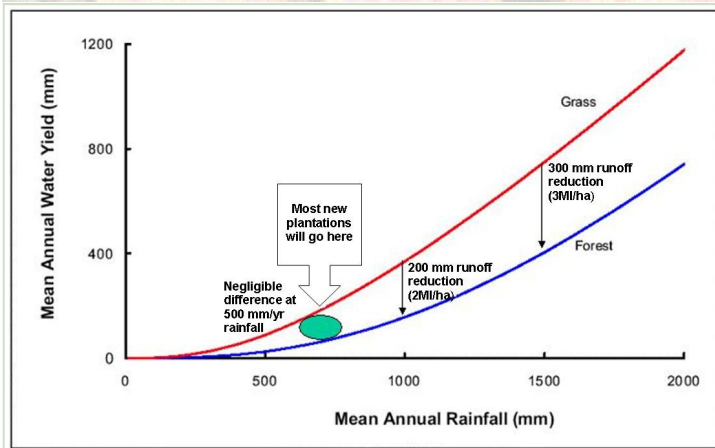
### How much water do plantations use?

Tree water use varies with species, soil type, rainfall and location. Studies in Western Australia show that total water use for a range of tree species and soil types averaged 663mm per year, or 6.63ML per hectare.

In all cases, this level of water use is entirely supplied by rainfall, soil moisture or, in some cases where the water table is shallow enough, from groundwater uptake. Virtually no commercial plantations are irrigated in Australia.

Most new plantations will be established in areas with an annual rainfall of 600-800mm. Here, the impacts on runoff is a reduction of 100-150 mm per year, or 1.0-1.5 ML/ha (Fig 2), relative to catchments which are predominantly grass.

Figure 2 - Water Yield From Grassed and Forested Catchments



Source: BRS (2007)

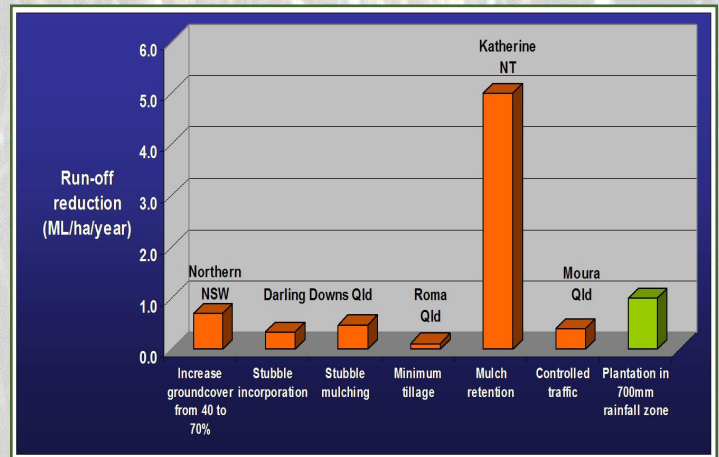
### Catchment impacts of plantations

In small catchments, reduction in runoff and stream flow caused by tree planting is difficult to detect unless more than 15-20% of the catchment is re-planted to trees. The threshold will be lower in larger catchments.

### What about other land use changes?

Australian rural landscapes undergo continual change. During the decade of Landcare, agricultural production systems have changed significantly in the pursuit of better environmental management. Many of these changes intentionally impact on the amount of water retained in soils on farms and thus run-off into streams (Fig 3).

Figure 3 - Land Use Management and Run-off Reduction



### Groundwater

Situations where tree roots can access ground water are likely to be limited as it requires groundwater to be close to the surface with no impeding layers of rock etc. In many such situations, use of groundwater by trees may be desirable to lower water tables and to remove salt from the upper soil profile.

Where plantations can access groundwater, they may extract 3-4 ML/ha per year. If that groundwater is an important resource, water entitlements for plantations may be required

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