



# Private native forest management

## Western Queensland

Private native forest (PNF) is natural forest or woodland that is privately owned and usually contains tree species with some commercial value for timber. These forests are typically dominated by hardwood eucalypt species.

The Western Queensland region extends from the New South Wales border in the south to Rockhampton in the north, from Toowoomba in the east and to Goondiwindi and Injune in the west. It includes the local government areas of Banana, Toowoomba, Southern Downs and part of Goondiwindi, Western Downs, Maranoa, Central Highlands and Rockhampton (Figure 1).

The region is defined by catchment boundaries and covers approximately 12 million hectares.

Private native forests are an important component of regional communities and contribute at least half of the log supply to the hardwood industry. In the Western Queensland region seven sawmills rely on a combination of private and state-sourced hardwood timber, with several more mills located in adjacent areas.

Some of the private native forests in this region are managed for timber and livestock grazing.

These forests also have important environmental values and support a diversity of plant and animal species.

This fact sheet series describes the extent, condition and management of private native forest.

Produced for the project: *Improving productivity of the sub-tropical private native forest resource.*

The series includes:

- South-eastern Queensland region
- Wide-Bay Burnett region of Queensland
- Western Queensland region
- North-eastern New South Wales region.

## Forest types

The most common types of private native forest in the region are open forests and woodlands dominated by spotted gum and ironbarks.

They also commonly include bloodwood species, other gum eucalypts and stringybark species.

Open forests and woodlands are distinguished by tree height, canopy cover and understorey structure (Table 1).

**Table 1.** Structure of open forests and woodlands

	Open, eucalypt forests	Open woodland
Mature stand height	10–30 m	15–25 m
Canopy cover	50–80%	20–50%
Understorey	Grassy with a sparse shrub layer	Grasses and herbs

Five forest types make up 89% of the area of potentially harvestable forests in the western region (Table 2).

The remaining 11% includes smaller areas of a mix of other, potentially harvestable forest types.

Figure 1. Potentially harvestable private native forest in western Queensland



Map based on Landsat Foliage Projective Cover, Queensland 2014. Remote Sensing Centre, Department of Science, Information Technology and Innovation.



**Table 2.** Areas of potentially harvestable forest types

Potentially harvestable forest type*	PNF area (hectares)	% **
Woodlands of narrow-leaved ironbark <sup>a</sup>	320,000	41.0
Woodlands usually dominated by ironbarks	175,700	22.5
Spotted gum <sup>b</sup> forests and woodlands	130,100	16.7
Eucalypt woodlands and open forests with a mix of species	34,700	4.4
Woodlands dominated by bloodwoods <sup>c</sup> and ironbarks	34,300	4.4
Other, mixed forest types (16)	85,800	11.0

<sup>a</sup>*Eucalyptus crebra*; <sup>b</sup>*Corymbia citriodora*; <sup>c</sup>*Corymbia species*  
 PNF: Private native forest.  
 \*Forest types are based on the Queensland Broad Vegetation Groupings<sup>1</sup> (1:1 million).  
 \*\* % PNF area that is potentially harvestable.

### Potentially harvestable forest

There are 780,600 hectares of potentially harvestable private native forest in the western Queensland region.

Mapped private native forest areas are based on regional ecosystems that are potentially harvestable under the Native Forest Code<sup>1</sup> (the Code). The areas are based on expert knowledge of harvestable forest types (Figure 1, Table 3).

The area is a minimum area, because it does not include more open woodlands. The mapped area does not reflect the area currently managed for timber production.

Most private native forest occurs in areas mapped as remnant forest (Table 3). Timber production is permitted in both remnant and regrowth forest, according to the Code.

Areas mapped as woody, non-remnant forest do not need to be managed with reference to the Code.

*Note that mapped, potentially harvestable private native forest may include some areas that have little or no commercial timber value.*

**Potentially harvestable forest:** Forest types on freehold land where harvesting is allowed under the Native Forest Practice Code.




**Remnant forest:** Native forest where the canopy is >50% of the undisturbed, predominant canopy; averages >70% undisturbed canopy height; contains characteristic species of the undisturbed, predominant canopy.

**Regrowth forest:** Native forest growing on previously cleared land that is considered 'high-value', which reflects the age of the forest since clearing. It includes potentially harvestable regional ecosystems under the Code that are either areas not cleared since December 1989 or areas shown on a Queensland Government regrowth vegetation map.

**Woody, non-remnant forest:** Woody vegetation cover that is not mapped as either remnant or regrowth.

**Regional ecosystems:** Vegetation communities in an area (bioregion) that are consistently associated with a particular combination of geology, landform and soil.

**Table 3.** Area (hectares) covered by three categories of harvestable forest in the western Queensland region

	Remnant forest	656,100 hectares
	Regrowth forest	37,600 hectares
	Woody, non-remnant forest	86,900 hectares



Ironbark forest in western Queensland

# Grazing and timber production

## Grazing

Most privately owned native forest in the region is grazed by cattle. Grazing is concentrated on established pastures, largely cleared of trees, and usually in valleys and on the lower slopes where soils are more productive.

Grazing under native forests is less productive than on open pastures because trees compete with pasture growth. In addition, private native forests often occur on steeper slopes and ridges, on less fertile soils with low water holding capacity. This means that grazing under forests occurs at lower stocking rates (i.e. number of cattle per hectare). However, because forests cover an extensive area in the region, they remain an important grazing resource.

Prescribed fire is often used to control woody understorey species (e.g. lantana) and to encourage grass growth in these forests. Management practices such as fire and thinning determine the relative proportions of tree and grass cover.

Actively managing the native forests on a property has the potential to return multiple benefits to the landholder, particularly in the form of a dual income stream and improved environmental outcomes.



Native forest managed for timber in western Queensland



Cattle grazing, western Queensland

## Timber

Private native forests offer benefits in timber production, particularly when the forest has been managed to promote the growth of merchantable trees. A range of timber products may be harvested, including sawlogs, poles, piles, girders, fencing and landscaping materials.

Private native forests typically contain a mix of tree sizes and ages. Harvesting commercial-size trees usually involves selective tree removal. This creates minimal disturbance and the additional space promotes growth of the remaining trees.

**Merchantable trees:** trees with potential timber value such as sawlogs and power poles.

**Unmerchantable trees:** trees with no commercial value and small or damaged trees.

**Silvicultural treatment:** thinning a stand to remove unmerchantable trees to increase the growth of remaining merchantable trees.

**DBH:** tree diameter (cm) at breast height (1.3 m above ground level).

## Forest productivity

Forest productivity refers to the stand's capacity to produce wood products of commercial value. Generally, well managed forests contain a higher proportion of merchantable stems.

Many private native forests are not in an optimum state for timber production because they have a history of poor management.

In many cases, all the trees with potential value are removed at a single harvest, leaving a high proportion of non-commercial (unmerchantable) trees in the stand and reducing the forest's productive value. This practice is referred to as 'high-grading'; it results in an increase in the proportion of unmerchantable trees over time.



**Forest productivity is low** in dense, regrowth stands and when high-grading leaves only unmerchantable trees.

**Productivity is regained** by silvicultural thinning to remove competition and promote growth in commercial stems.

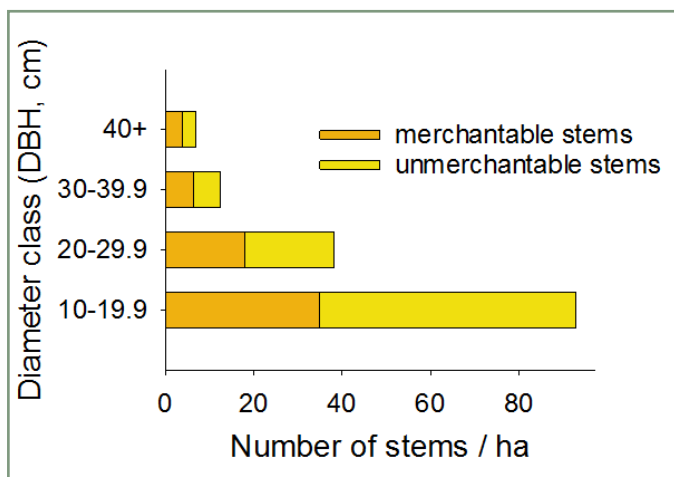
In addition, many private native forests are regrowth forests with a high number of small trees. Intense competition between the trees reduces growth.

Silvicultural treatment, or thinning the forest, reduces the number of small trees, which encourages growth of the remaining, higher value stems and merchantable volume.

Thinning is also used to remove non-commercial species, stems that are too close together, stems with poor form (i.e. not straight) and stems with defects such as large fire scars. Thinning results in a higher proportion of merchantable trees left in the stand.

In remnant forest, thinning should follow the Code to ensure an appropriate number of 'habitat trees' are retained.

Currently, silvicultural thinning is rarely practiced in the region and many private native forests have a high number of smaller-sized trees (Figure 2). More than 55% are unmerchantable trees that could be thinned.



**Figure 2.** Size class distribution of stems in the western region, showing the average number of merchantable and unmerchantable stems per hectare.

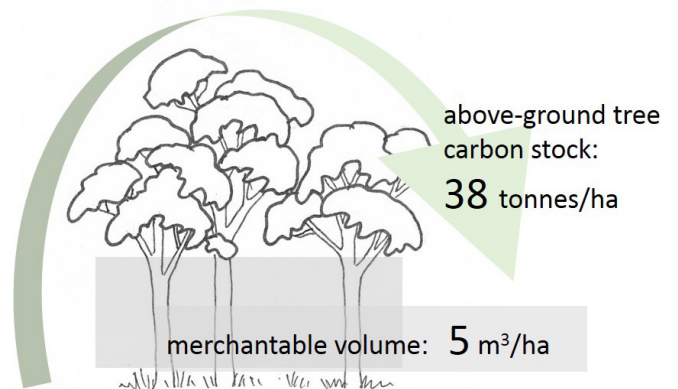
Prescribed burning is also an important management tool that encourages or controls regeneration, maintains forest health and protects valuable timber resources.

## Merchantable volume and carbon stocks

The site productivity of a stand determines the rate of biomass accumulation and the amount of biomass and carbon that can be stored (Figure 3).

Sound forest management practices (e.g. with thinning) will maximise carbon sequestration and volume growth on merchantable trees.

Carbon sequestered in the forest can be stored in manufactured wood products that go into service.



**Figure 3** shows:

- the average **merchantable volume** (calculated for trees with DBH of at least 30 cm) and
- the amount of **above-ground tree carbon** stored in forest stands in the western region of Queensland.

*The figures are from surveys of nine properties.*

**Merchantable volume:** the volume (m<sup>3</sup>) of wood in the bole of the tree that would be removed during a harvest.

**Above-ground tree carbon stock:** carbon stored in all the above-ground parts of the tree (both the bole of the tree and the canopy).

**Merchantable volume growth:** the rate of wood volume accumulation in a tree (m<sup>3</sup>/year) or stand (m<sup>3</sup>/ha/year) over a period of time.

**Treated stand:** a stand that has been thinned to encourage higher growth rates on remaining stems.

**Untreated stand:** a forest stand that has not been thinned.



## Improving forest productivity

Landholders can improve the productivity of their forest by investing in silvicultural treatment to reduce the number of small, unproductive stems.

Data comparing treated and untreated stands (Table 4) show that:

- Untreated stands have a higher density of stems because they have not been thinned.
- The proportion of merchantable trees is higher in treated stands than in untreated stands.
- The rate of DBH and merchantable volume growth is also greater in treated stands.

**Table 4.** Productivity compared between treated and untreated stands: Trial plot data assessed over time and averaged to determine the influence of thinning treatments.

Treated stand			Untreated stand	
	<b>154</b>	Total stems with DBH $\geq 10$ cm/hectare	<b>350</b>	
	<b>80</b>	Merchantable stems (%)	<b>23</b>	
	<b>20</b>	Unmerchantable stems (%)	<b>77</b>	
	<b>0.8</b>	DBH growth on all stems (cm/year)	<b>0.2</b>	

The large area of private native forest in the western region has great potential for improving forest productivity through silvicultural treatment.

Improving forest productivity will increase the proportion of merchantable stems in a stand that are available for future harvests to supply the timber industry.



A managed stand of remnant forest, western Queensland



## Ecological benefits and condition

Private native forests provide many ecological benefits including valuable habitat for native plant and animal species. They provide connectivity across the landscape and help to protect examples of some ecosystem types under-represented in conservation reserves.

Indicators of ecosystem function or health measured in these forests contribute to an understanding of their ecological condition.


Attributes such as the number of large trees, tree and shrub cover and regeneration, perennial grass cover and woody debris were scored against benchmarks for specific ecosystems in the region.

### Ecological attributes of forests

- Large trees and woody debris for animal habitat
- Good regeneration of canopy tree species
- Good ground-cover, including perennial grasses and litter

These attributes (defined in the BioCondition manual<sup>3</sup>) are used to calculate an ecological condition score based on benchmark values for relevant forest types (Table 5).

**Table 5.** Ecological attributes of private native forest in western Queensland

	Ecological attributes	Native forest western Queensland	Benchmark western Queensland
	Large trees / hectare	11	20
	Tree cover (%)	46	29
	Regeneration of canopy species (%)	91	100
	Shrub cover (%)	10	9
	Grass cover (%)	15	25
	Weed cover (%)	3	0
	Litter cover (%)	52	44
	Woody debris (linear metres)	590	236



A stand of spotted gum forest in western Queensland

## Ecological condition score

The score for private native forest ecological condition is calculated using the BioCondition benchmarks relevant to forest types in this region.

When scoring BioCondition, 'condition' refers to the degree to which the attributes of a patch of forest differ from the attributes of the same forest in its reference state or benchmark.

Scores for private native forest in western Queensland represent regrowth and remnant forest. In general, remnant forests have a higher score (often >80) than regrowth forests.

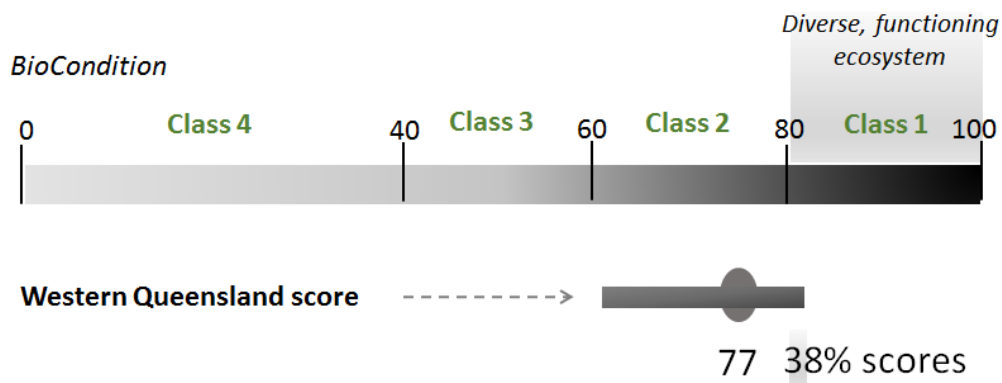
A diverse and functioning ecosystem has scores between 80 and 100.

38% of the western Queensland scores are in the Class 1 range and the average score is 77 (Figure 4). The remaining sites have scores in Class 2, so are in good condition.

**BioCondition:** A condition assessment framework for terrestrial biodiversity in Queensland<sup>4</sup>.

BioCondition is a measure of how well a forest is functioning for biodiversity values. It is a site-based, quantitative and repeatable assessment procedure that can be used in any vegetative state. It provides a numeric score that can be summarised as a condition rating (class) of 1, 2, 3 or 4, where Class 1 represents the most diverse, functioning ecosystem.

The reference states, or benchmarks, differ for each ecosystem type. Quantitative values for condition are derived from reference sites of each ecosystem. BioCondition scores for private native forest sites are determined by comparing them with the benchmark values.



**Figure 4.** BioCondition scores for private native forest in western Queensland.

Cleared areas tend to have very low BioCondition scores, so most private native forests in this region have ecological benefits not found in the adjacent, cleared areas. As regrowth forests mature, they contain more 'large trees', which will improve the BioCondition score at some sites.

Managing forests for timber production, with silvicultural treatment for example, will improve the growth of larger trees. It may also encourage perennial grass cover, which should improve the BioCondition score over time.

### More information

<sup>1</sup>The Vegetation of Queensland. Descriptions of Broad Vegetation Groups, Department of Science, Information Technology and Innovation

<sup>2</sup>Managing a native forest practice: A self-assessable vegetation clearing code. Department of Natural Resources and Mines. State of Queensland, 2014. <https://publications.qld.gov.au/dataset/self-assessable-vegetation-clearing-codes/resource/a73f5b44-008c-4f92-8644-f92e6caf6592>

<sup>3</sup>About regional ecosystems. Queensland Government. <https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/about>

<sup>4</sup>BioCondition. A condition assessment framework for terrestrial biodiversity in Queensland. <https://www.qld.gov.au/environment/plants-animals/biodiversity/biocondition>

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