



Private native forest management

North-eastern New South Wales

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 north-eastern NSW region extends from the Queensland border in the north to just south of Coffs Harbour in the south and Glenn Innes in the west. It includes the local government areas of Tenterfield, Glenn Innes, Tweed, Kyogle, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour and part of Armidale (Figure 1).

The region covers approximately 3.9 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 north-eastern NSW region 23 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 forests and woodlands in north-eastern NSW

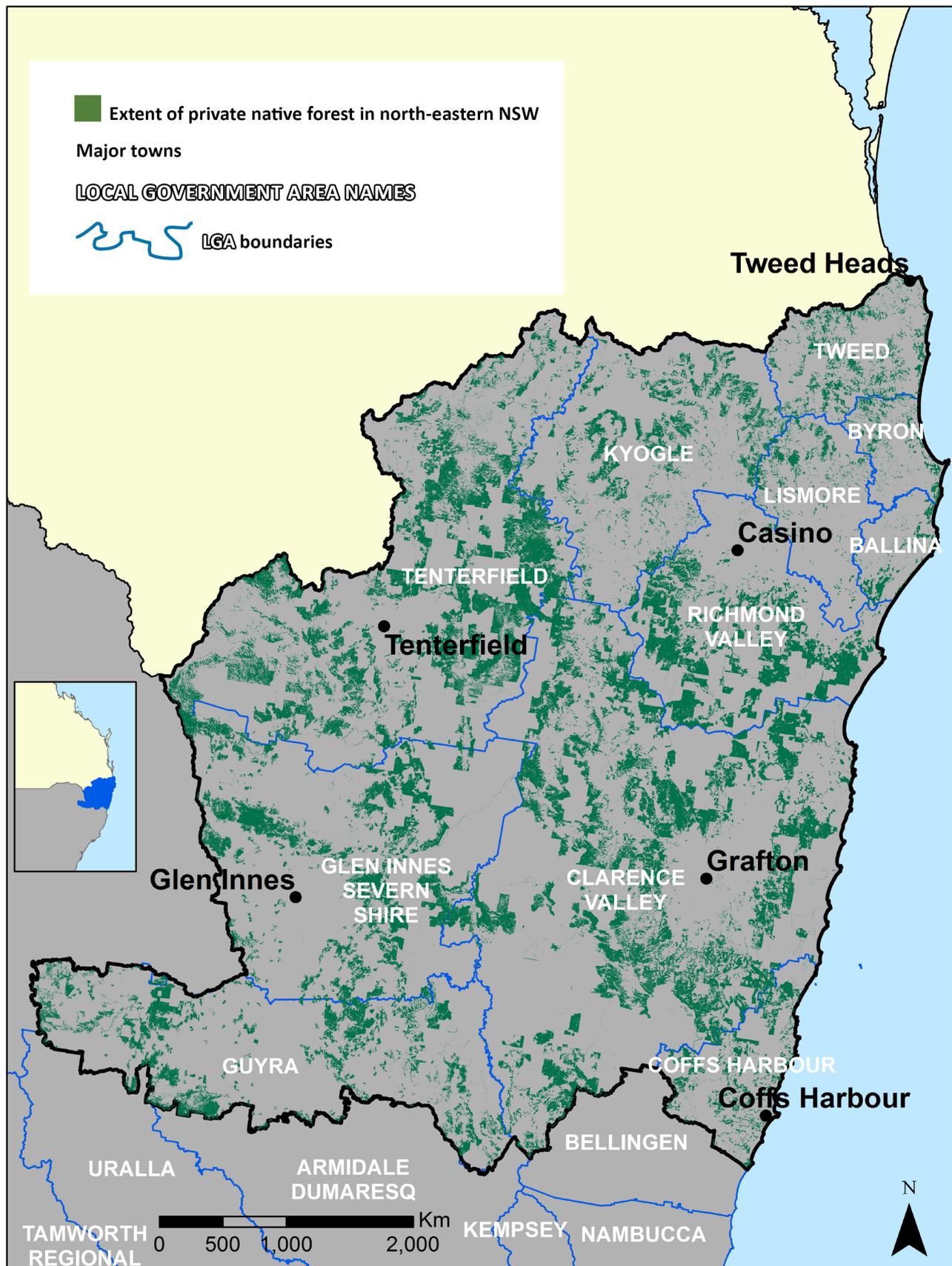
| | Open, eucalypt forests ⁱ | Tall, open forests ⁱⁱ | Open woodland ⁱⁱⁱ |
|---------------------|-------------------------------------|--|------------------------------|
| Mature stand height | 20–30 m | > 30 m | 15–25 m |
| Canopy cover | 50–80% | 50–80% | 20–50% |
| Understorey | Grassy with a sparse shrub layer | Rainforest species or grassy with a sparse shrub layer | Grasses and herbs |

ⁱDry, sclerophyll forests; ⁱⁱSemi-moist and taller, dry eucalypt forest and moist, coastal forests; ⁱⁱⁱDry eucalypt woodlands

Five forest types make up 79% of the area of potentially harvestable forests in the north-eastern NSW region (Table 2).

The remaining 21% includes smaller areas of a mix of other, potentially harvestable forest types.

Figure 1. Potentially harvestable private native forest in the north-eastern region of NSW.



Map based on layers provided by the NSW Department of Primary Industries.

Table 2. Areas of potentially harvestable forest types

| Potentially harvestable forest type* | PNF area (hectares) | % ** |
|--|---------------------|------|
| Dry eucalypt forest and woodland | 104,500 | 19.9 |
| Semi-moist and tall dry eucalypt forest | 109,800 | 20.9 |
| Dry eucalypt forest and woodland on the tablelands | 90,300 | 17.2 |
| Dry spotted gum ^a forest and woodland | 64,800 | 12.3 |
| Semi-moist eucalypt forest on the tablelands | 46,900 | 8.9 |
| Other, mixed forest types (6) | 109,300 | 20.8 |

^a*Corymbia citriodora* subsp. *variegata*;
 PNF: Private native forest.
 *Forest types are based on Yield Association Groups².
 ** % PNF area that is potentially harvestable.

Potentially harvestable forest

There are 525,600 hectares of potentially harvestable private native forest in the north-eastern NSW region.

Regulatory and planning exclusions include those detailed in the Private Native Forestry Code of Practice for Northern NSW¹. Forest types (Yield Association Groups²) were mapped by the NSW Department of Primary Industries.

The area excludes rainforest vegetation and areas considered to be non-commercial, with negligible productive value.

The mapped area does not reflect the area currently managed for timber production.

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 Private Native Forestry Code of Practice for Northern NSW.



Spotted gum open forest stand in north-eastern NSW



Spotted gum-dominated forest with a history of timber and grazing management in north-eastern NSW

Grazing and timber production

Grazing

Most privately owned native forest in the north-eastern NSW region is grazed by cattle. A recent survey of forest landholders³ found that grazing is most common on the tablelands, where 81% of the native forest area is grazed. Nearer the coast, 60% of the native forest is grazed. 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.



Spotted gum and grey gum stand managed for timber production in north-eastern NSW



Native forest managed for timber and grazing in the north-eastern region of NSW

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.

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.

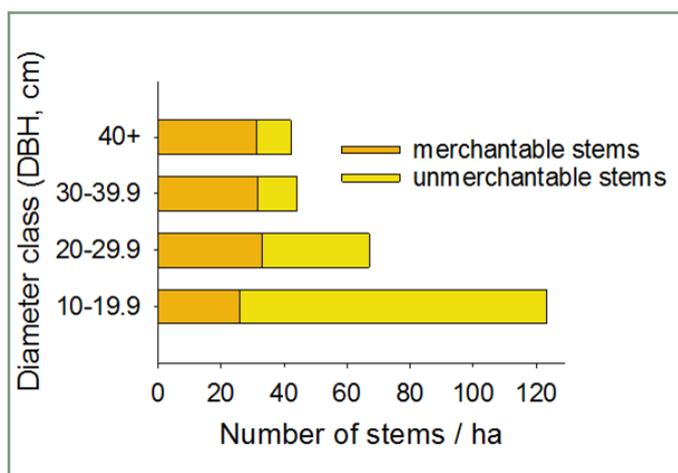


Figure 2. Size class distribution of stems in the north-eastern NSW region, showing the average number of merchantable and unmerchantable stems per hectare.

Thinning results in a high proportion of merchantable trees in the stand. Thinning practices should follow the Private Native Forestry Code of Practice for Northern NSW, ensuring that the appropriate number of habitat trees are retained.

Successful regeneration of the moister forest types requires a reliable seed source and a seed bed free of competition from a woody understorey. Prescribed burning is an important management tool that encourages regeneration and can help control understorey competition. It also 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.

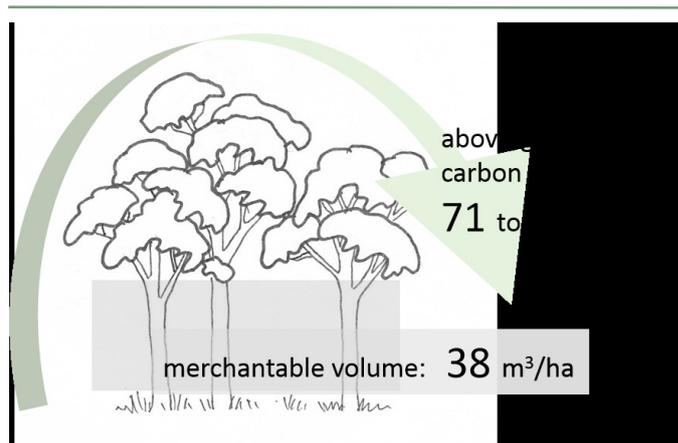


Figure 3 shows:

- 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 north-eastern region of NSW.

The figures are from surveys of 6 properties.

Merchantable volume: the volume (m^3) 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^3 /year) or stand (m^3 /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 3) show that:

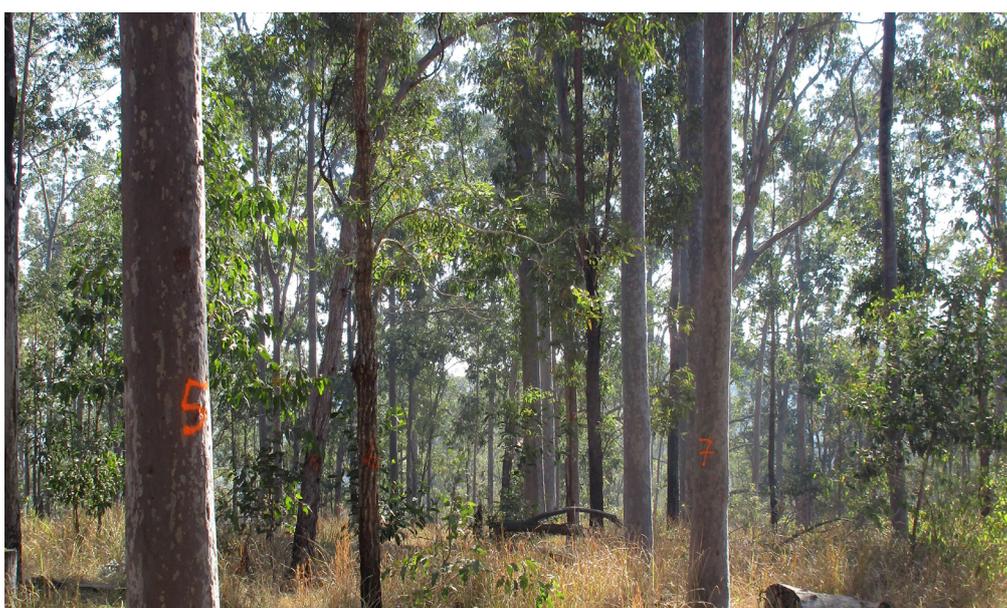
- Untreated stands have a higher density of stems because they have not been thinned.
- The proportion of merchantable trees is higher in treated stands than in untreated stands.
- The rate of DBH and merchantable volume growth is also greater in treated stands.

Table 3. 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 | |
|---|------------|---|-----------------|--|
|  | 154 | Total stems with DBH ≥ 10 cm/hectare | 350 |  |
| | 80 | Merchantable stems (%) | 23 | |
| | 20 | Unmerchantable stems (%) | 77 | |
| | 0.8 | DBH growth on all stems (cm/year) | 0.2 | |

The large area of private native forest in the north-eastern region of NSW 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.



Dry eucalypt forest dominated by spotted gum in north-eastern NSW

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 manual³) are used to calculate an ecological condition score based on benchmark values for relevant forest types (Table 4).

Table 4. Ecological attributes of private native forest in the north-eastern region of NSW.

|  | Ecological attributes | Native forest north-eastern NSW | Benchmark north-eastern NSW* |
|---|------------------------------------|---------------------------------|------------------------------|
| | Large trees / hectare | 28 | 33 |
| | Tree cover (%) | 67 | 59 |
| | Regeneration of canopy species (%) | 87 | 100 |
| | Shrub cover (%) | 14 | 10 |
| | Grass cover (%) | 16 | 20 |
| | Weed cover (%) | 5 | 0 |
| | Litter cover (%) | 80 | 50 |
| | Woody debris (linear metres) | 714 | 372 |

* Benchmarks in north-eastern NSW were derived from similar ecosystems in south-east Queensland.



Spotted gum and ironbark open forest in north-eastern NSW

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. Benchmark ecosystems are not available for NSW, so an equivalent ecosystem benchmark for south-eastern Queensland was used.

Scores for private native forest in the north-eastern region of NSW are calculated for forests dominated by spotted gum with a mix of several other species.

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

38% of the north-eastern NSW region scores are in the Class 1 range and the average score is 82 (Figure 4). The remaining sites have scores in Class 2, so are in good condition.

BioCondition: A condition assessment framework for terrestrial biodiversity in Queensland⁴.

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.

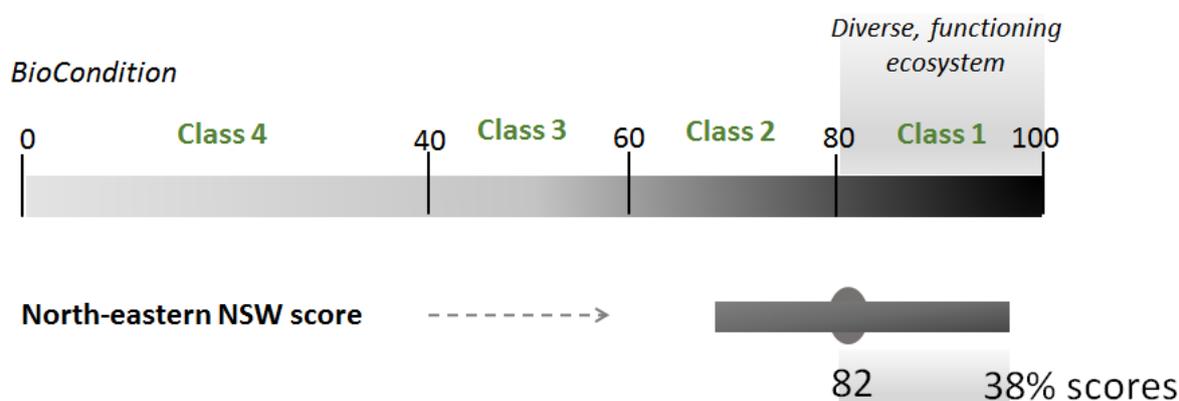


Figure 4. BioCondition scores for private native forest in the north-eastern region of NSW.

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

¹Private Native Forestry Code of Practice for Northern NSW. Environment Protection Authority. State of NSW, 2013. <http://www.epa.nsw.gov.au/your-environment/native-forestry/about-private-native-forestry/private-native-forestry-code-practice/northern-nsw-code>

²Yield Association Groups. NSW Department of Primary Industries

³Dare L, Shirmer J, Mylek M (2017) Private native forest owner attitudinal survey - Northern NSW. Understanding forest owners' value and use of their private forest resource. Unpublished report prepared for NSW Department of Primary Industries, University of Canberra.

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

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