

Araucaria OVERVIEW



OVERVIEW

HQPlantations (HQP) is the largest plantation owner in Queensland with plantation assets totalling over 201,000 plantable hectares (ha) (491,000 acres). It's plantation assets include native softwood Araucaria plantations over 41,200 hectares (ha) (101,800 acres) in the headwaters of the Brisbane River and Mary River catchments in south-east Queensland (SEQ).

LOCATION, GROWING ENVIRONMENT AND MANAGEMENT IMPLICATIONS

Map 1 is an overview of Araucaria HQP's estate in SEQ in relation to the broader regional landscape including HQP's Southern Pine plantations, public native forest production state forests, and other land tenures.

The climate where Araucaria is grown in SEQ is humid subtropical and largely frost-free, with average maximum temperatures ranging from 28°-30°C in the hottest months down to 18°C-20°C in the coldest months.

Average annual rainfall declines from Imbil in the east (1,186 mm) to Blackbutt in the west (816 mm), although it can vary widely from year to years (as high as 1,919 mm and as low as 386 mm).

Araucaria grows on a range of moderate to highly fertile free-draining soils including krasnozems, red earths and regosols.

The topography is undulating to steep, with approximately 20-30% of slopes greater than 25°.

RESOURCE, HARVESTING AND SALES

Figure 1 shows the SEQ Araucaria estate area by 5-year age classes. As at 30 June 2020, over 30% of the estate was over 45 years old, the nominal clearfall age. The current rate of harvest of around 550,000m³ will see a drop of clearfall age down to around 45 years (**Figure 2**). Based on existing stands, the long-term average Mean Annual Increment (MAI) ranges between 7.6 and 12.4 m³/ha/yr.

Average final crop harvest volumes range from 450 – 680 m³/ha with average stem volume of 1.29 m³. Due to generally good stem form and past pruning of butt logs, stems typically yield 86% sawlog, 4% plylog and 10% pulplog and residues. Notably, the 4% plylog contributes about 13% of Araucaria revenue.

The resource has traditionally been managed intensively for large diameter, long-length clearwood production via high pruning (5.4 to 6.0 m) of select trees and single (or, years ago, multiple) thinnings before clearfelling at around age 50 years. In the late 1990s, following the collapse of traditional markets for small-sized, low value, knotty logs from Araucaria thinnings, silviculture shifted to a 'direct' regime with the best 350 – 400 stems per hectare (sph) being high-pruned (5.4 – 6.0 m) and the remainder felled to waste at about the same time.

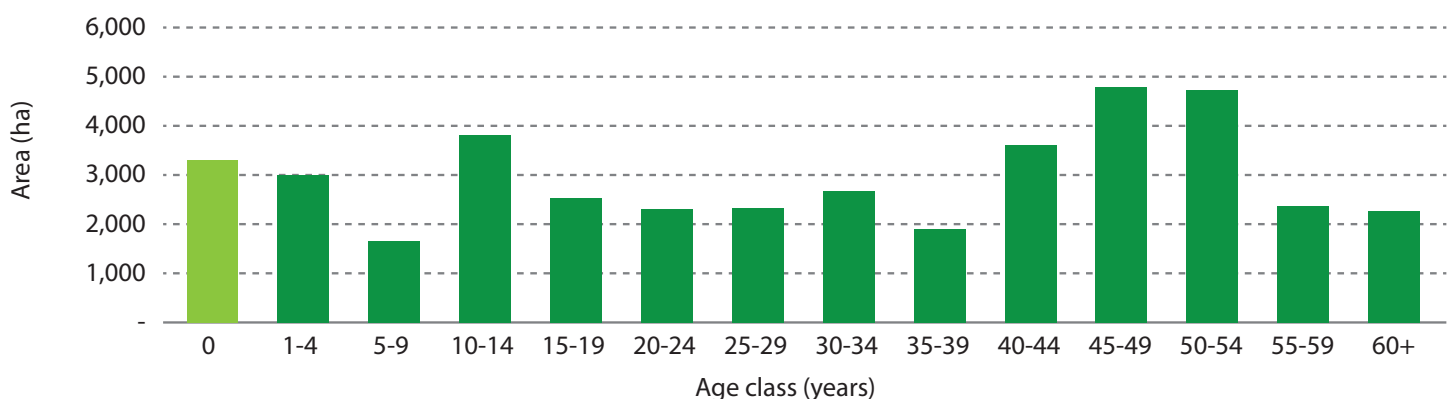


Figure 1. SEQ Araucaria estate area (ha) by 5 year age class as at 30 June 2020



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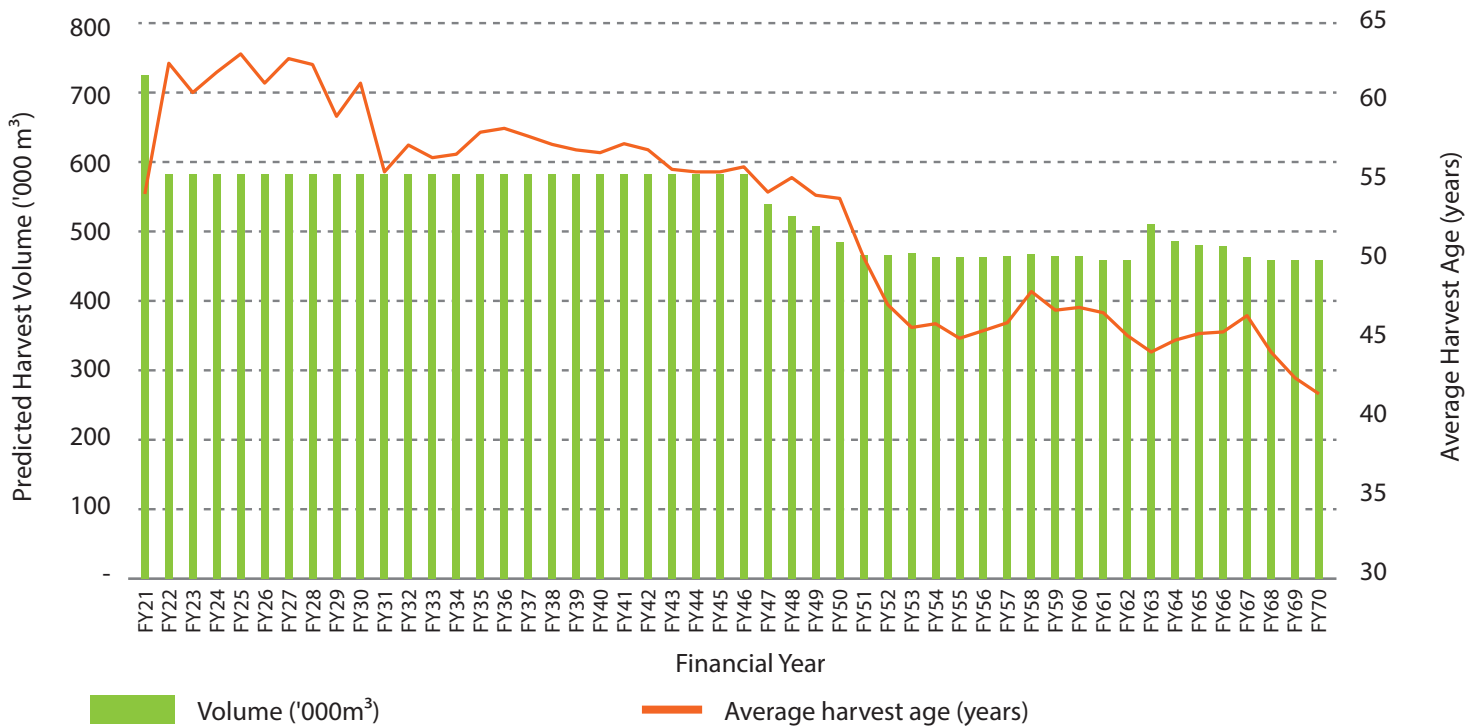


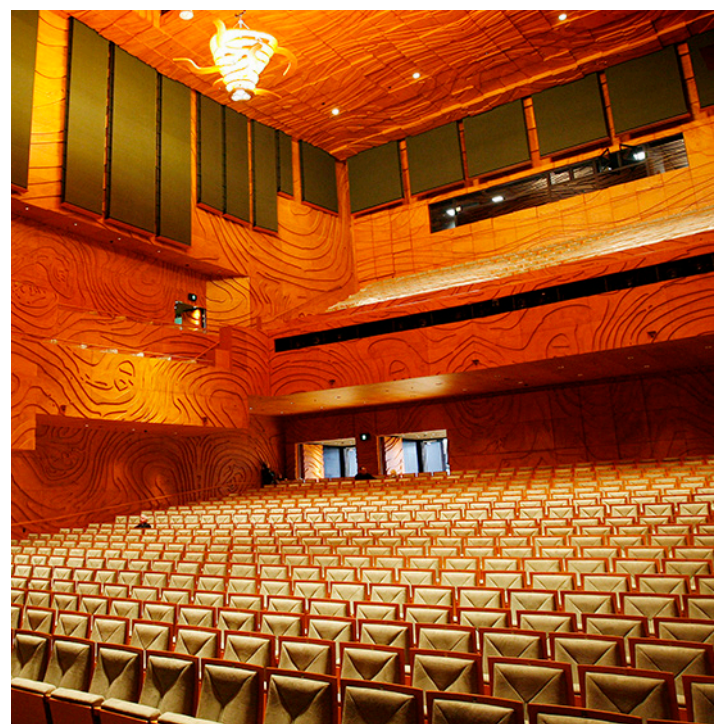
Figure 2. SEQ Araucaria predicted harvest volume ('000m³) and rotation age (years)

The SEQ Araucaria estate currently supplies around twelve local customers directly. Harvest and haul capacity is by a small number of contractors with all Araucaria logs sold on a delivered to roadside or mill door basis.

The SEQ Araucaria supports a diverse processing sector. Products include plywood, structural, landscape and fencing timbers, flooring, furniture componentry, doors, window frames, joinery, fine turnery and musical instruments. Araucaria plywood and sawn wood is also exported. Araucaria is one of the few timbers in the world that can be used with foodstuffs, due to it being tasteless, odourless and extremely fine grained.



Araucaria are planted in areas of undulating to steep topography



The Melbourne Recital Centre is a 1000 seat \$75 M auditorium designed to be acoustically perfect. The walls and ceilings are lined with Austral Plywoods "A" grade Araucaria plywood, specifically chosen for its acoustic and aesthetic properties.

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PLANTATION SPECIES, GENETIC IMPROVEMENT, SEED AND NURSERY PRODUCTION

The Araucaria plantation estate in SEQ, derived from the indigenous rainforest emergent *Araucaria cunninghamii*, is a unique resource, and the largest area of its kind in the world.



Debarking Araucaria logs in the early 1900s

Araucaria has been of major importance in Queensland for timber production since the early 1800's. A plantation program was initiated in the early 1900's to replace the declining reserves of natural Araucaria, with the first commercial plantings established in 1920–21 at Imbil and then at Yarraman in 1925. Conversions of native forest areas to Araucaria plantations ceased in 1988.

Araucaria is one of the few subtropical tree species that has been the subject of genetic improvement for more than half a century. Genetically improved seed from seed orchards now provides all of HQP's plantation requirements.

Araucaria containerised seedlings are produced at HQP's Toolara Nursery with different genetic batches deployed to different sites as follows:

- Open pollinated family seedlots selected for high volume, excellent straightness, low spiral grain and average internode length are planted on the highest quality third of the estate. These 'premium' stands will be managed as a lower stocked, direct regime with all final crop trees pruned to 4.8 metres to yield around 50,500 m³ of Long Clears (mainly high value ply logs) per annum, and a further 45,000 m³ per annum of Short Clears from above the pruned section;
- Open-pollinated, family seedlots from clones with above average internode length and acceptable volume and straightness are planted on the medium quality third of the estate. These 'Long Internode' stands will be managed as a higher stocked, unthinned, unpruned regime to yield around 75,000 m³ of Short Clears per annum. The higher stocking aims to suppress branch development, especially in the lower butt log; and

- The poorest site quality third of the estate is established with average volume, average internode length seedlings managed as lower stocked (~720sph), unthinned and unpruned regime.



Araucaria seedlings at the Toolara nursery

HARVEST AND RE-ESTABLISHMENT

The annual re-establishment planting program is around 750-850 ha depending on harvest activity. Planning of harvesting and re-establishment are closely coordinated to maximise operational efficiency and minimise cost, given that there are seasonal constraints to harvesting, site preparation and planting. A typical plantation harvest and re-establishment sequence is as follows:

Tactical plan (3 year horizon): Identify the quantities, qualities and location of harvest areas to supply various customers. Identify and respond to broad-scale planning issues, required road network and bridge upgrades, catchment runoff and water quality, haul route approvals, staged harvesting around high conservation value forest areas.

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Operations Plan – harvesting: An Operations Plan is prepared for each activity-by-contractor combination. These help to manage risks and are designed to identify, consider and respond to site-specific issues relating to:

- safety (e.g. site access, operating procedures, haul route, powerlines, communications);
- environment (e.g. water course protection, endangered species);
- stakeholders (e.g. neighbours, operating hours, cultural heritage);
- operations (e.g. research trials or other exclusions, order of operations, wet weather operations); and
- specifications relating to the operations being performed.

Each Operations Plan is reviewed and signed off with the contractor before operations commence.

Harvesting: There is extensive use of low ground pressure machinery and integrated harvesting systems (mechanical falling, processing, forwarding, loading and hauling) to minimise site disturbance and maximize operational flexibility. Clearfall harvesting is achieved by whole-stem harvesting with roadside processing at some sites and cut-to-length processing at stump with forwarder extraction to ramps on others. On the steepest sites, hand felling and skyline extraction is employed.

A high level of resource utilisation maximises recoverable yields and facilitates low-cost re-establishment operations, characterised by on-site retention of nutrient-rich needles and smaller branches to benefit the growth of future crops and reduce erosion risk.



Skyline (or cable) harvesting on a site with steep slopes

Site Preparation: In recent years, with full-tree extraction and increasing pulp sales, the amount of woody debris retained on site has reduced. This has facilitated the expansion of a 'direct plant' establishment regime (i.e. no site preparation) that has helped to reduce costs. Where debris levels remain high, site preparation is completed by re-aligning or modifying debris to facilitate safe and efficient access for planting and subsequent operations. Debris is retained on site with fine material remaining in the planting zone. Debris retention acts to minimise the loss of nutrients and reduce erosion risk. Compacted sites are deep-ripped to promote root development and subsequent crop growth.



Direct plant regime has reduced establishment costs

Pre-Plant Weed Control: Knockdown herbicides are applied via aerial or ground-based sprayers once or sometimes twice before planting, depending on the weed spectrum and time between harvest and planting.

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Planting and Nutrition: Araucaria is hand planted using a mattock or planting spike between Spring and Autumn (September to April), following the onset of soaking rain. Planting rows in site-prepared areas generally follow the contour to reduce erosion risk. Planting is on a grid pattern where direct establishment techniques are employed. Planting spacing depends on site quality and genetics. On high productivity sites, seedlings from high-volume control-pollinated family seedlots are planted at 720 stems per hectare (sph), with a view to pruning these stands to produce large, clearwood butt logs. On other sites where pruning is not planned, long-internode stock are planted at a higher stocking (918 sph) to suppress branch size and increase volume yields on a per hectare basis. Stocking on low productivity sites is at 720.

With the exception of isolated compacted areas, such as old ramp sites or low productivity areas, seedlings are generally not fertilised.



Hand-planting of containerised seedlings

Post-Plant Weed Control: Various weed control techniques and herbicides are employed to manage weed competition early in the rotation. In recent years, over-the-top aerial herbicide applications have been adopted, particularly in difficult terrain.

Persistent inter-row weeds such as lantana, tobacco bush, wattle, eucalypt regrowth and some aggressive vines are controlled during the establishment phase by various techniques (cut stump, basal spray, trampling and aerial spraying) to prevent over-topping of the developing crop trees by other plants.



Pre- and post-plant weed control is usually via heli-spraying

Pruning: Pruning of higher site index plantations is required to ensure the availability of timber suitable for plywood and other clearwood products. Pruning is completed during the winter months when sap flow is low to minimise the risk of damage to pruned stubs by the hoop pine bark weevil (*Aesiotus notabilis*).



Pruning is carried out in a single or 2 variable height lifts between the ages of 8 and 12, to produce a total pruned height of 4.8m.

Fire Management: Araucaria is sensitive to fire, and the plantations and adjacent native forests are managed to exclude fire from plantation areas. Plantations are largely surrounded by buffers of fire-suppressing rainforest vegetation. These are complemented by a network of fire breaks and fire trails. Prescribed burning is carried out on a regular basis in adjacent eucalypt forest to reduce fuel loads. Historically, fire detection has relied on observers in fire towers. These are progressively being replaced or supplemented with cameras that can be remotely controlled and monitored from the office or over the internet.

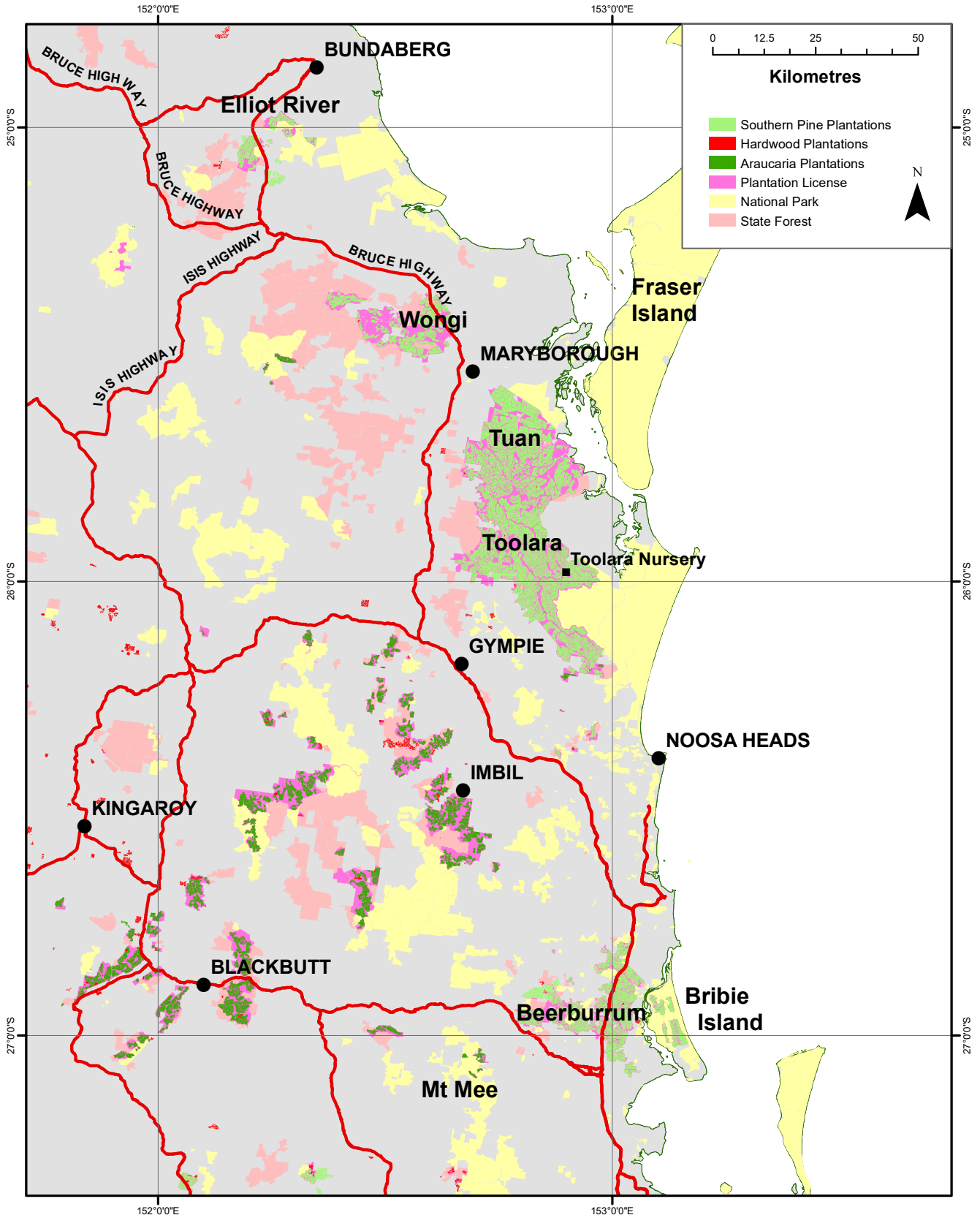


The Sandy Fire Tower near Blackbutt has been fitted with a camera that can be remotely controlled and monitored

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Map 1



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STEWARDSHIP

HQPlantations is committed to sustainable forest management and its operations are independently audited on a regular basis against internationally recognised forest management standards supported by the Forest Stewardship Council (FSC) and the Responsible Wood (RW).

The domestication of Araucaria in Queensland is one of few examples where an indigenous rainforest tree has been successfully introduced into commercial plantations within its own natural environment. The plantations are well-adapted to their environment and local wildlife is well-adapted to the matrix of (relatively long rotation) plantations and adjoining network of rainforest remnants (scrub breaks) that were deliberately retained when the plantation estate was developed several decades ago.

Some of the surrounding rainforest is listed as an endangered ecosystem under federal legislation and contains species of endangered and vulnerable plants and animals listed under State and/or federal regulations. High Conservation Value Forest areas adjoining the Araucaria estate are managed in accordance with site-specific plans.

FURTHER INFORMATION

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Mosaic of Araucaria plantations surrounded by rainforest 'scrub' breaks

