

## **Southern pines**

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## Southern pines

Several species of pines (genus *Pinus*) occur in the southern and south-eastern regions of the United States and are together known as 'southern pines'. Among these species the principal commercial pines are loblolly pine (*P. taeda*), longleaf pine (*P. palustris*), shortleaf pine (*P. echinata*) and slash pine (the typical variety being *P. elliottii* var. *elliottii*; var. *densa* is mentioned briefly below). All these species and some other pines were introduced for testing in Queensland, beginning with loblolly pine in 1917. The aim was to determine the most suitable species for establishing a commercial forestry plantation program in the south-eastern coastal lowlands on soils of low nutritional status supporting relatively low-grade eucalypt forest (Rogers 1957). These plantations were to supplement those of the preferred native hoop pine (*Araucaria cunninghamii*) already being planted on ex-rainforest sites of more limited extent further inland. Loblolly and slash pines were chosen for commercial plantation establishment which began in the 1930s. However, loblolly pine (**Fig 1**) was dropped from the program in the early 1950s because of its preference for deeper, loamy soils and its higher nutritional needs than slash pine; conditions that could not be readily met as the plantation fronts moved on to the poorer, sandy podsol soils of the coastal region. In northern New South Wales, significant areas of loblolly pine plantations are managed. Slash and loblolly pines are also important species in commercial plantations in southern China, southern Africa and southern South America.



Figure 1. A 30-year-old stand of loblolly pine in a part of the Amamoor, Queensland plantation. Periodic tree deaths have occurred due to drought. Photo courtesy of HQPlantations.

Typical slash pine extends over the coastal plain from central South Carolina to central Florida and west to Louisiana. Commercial introductions of seed to Queensland, which were mainly from the north eastern Florida – south-eastern Georgia region, rather than central to south Florida, comprised seedlots obtained over a number of years in the 1920s and early 1930s and are considered to have sampled large numbers of trees of the better provenances of var. *elliottii*. This, along with the now-known inferiority of South Florida slash pine (*P. elliottii* var. *densa*) in plantation productivity in Queensland and the good progress in genetic improvement of var. *elliottii*, together indicate that the initial base established in Queensland plantations that gave the superior trees selected for breeding described below, was satisfactory.

Initial tree genetic improvement of both loblolly and slash pines began in Queensland in the mid-1930s using bulked seed from the best local trees. By the late 1940s there was evidence of the efficacy of intensive phenotypic selection, especially when combined with controlled pollination (**Fig 2 a,b**). This led to staged establishment of the first pine clonal seed orchard in Australia, with first grafts of slash pine being planted in Queensland seed orchard 1 in 1953. Local self-sufficiency in orchard seed was achieved in 1967. A belief in and commitment to tree breeding has been sustained, with Queensland forestry having a history of continuous implementation of genetic improvement practices (Nikles 1996) now in place for more than 70 years.



Figure 2 a, b. The Queensland slash pine land race of the 1950s aged 13 years (a, left) and an adjacent plot of a second-generation family bred for uniformity of good trunk straightness, fine branching and superior growth (b, right) illustrating genetic gains made in these traits. Photos courtesy of the then Queensland Department of Forestry.

In the late 1940s, Caribbean pine (*P. caribaea* var. *hondurensis*) of Central America was introduced in Queensland from the then British Honduras (Belize). It exhibited faster growth and more evenly-textured wood, though poorer trunk straightness and wind-firmness, than slash pine. Genetic improvement of Caribbean pine began in Queensland in the 1950s leading to the development of both a superior pure breed for ongoing plantation establishment in the tropics (self-sufficiency in orchard seed was achieved in 1978); and to an inter-specific hybrid breed with slash pine (**Fig 3**) which, since the mid-1980s, has gradually replaced the latter in southern Queensland (**Fig 4**), and on poorly-drained sites in coastal central Queensland (Nikles 2000). It is also planted in northern New South Wales. The first-generation ( $F_1$ ) hybrid was difficult to mass-produce but the second-generation ( $F_2$ ) hybrid was both easy to produce commercially and grew as well in plantations (Nikles 2000; Dieters and Brawnner 2007). Sufficiency of hybrid planting stock was achieved in 1995. The hybrid combines the best attributes of both species, including slash pine's better straightness, relatively greater wind firmness, higher wood density and greater tolerance of wetter sites, and Caribbean pine's excellent growth, better branching and more evenly textured wood. Intensive breeding of the slash x Caribbean pine hybrid has continued unabated in Queensland. Third-generation ( $F_3$ ) hybrid families are being tested as part of the strategy to develop a stable, advanced-generation hybrid base population and overcome the current need to maintain base populations of both slash and Caribbean pines, a key expectation being the incorporation of greater wind firmness by breeding from extant hybrid individuals combining this trait with the other desired qualities mentioned (Kain et al. 2016).

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Figure 3. An un-thinned commercial stand of a high-performing clone of the slash x Caribbean pine second generation ( $F_2$ ) hybrid aged 8.75 y in the Toolara forest east of Gympie, Queensland. It is among several clones selected for superior growth, form, branching and wood property traits. Photo courtesy of Rodger Peters and Grant White of the then Forestry Plantations Queensland.

Research in Queensland in the 1960s also led to the production of F<sub>2</sub> hybrids of slash and loblolly pines (Nikles et al. 1999). However, the superiority of Caribbean pine and the slash x Caribbean pine hybrids precluded their development commercially.

While slash x Caribbean pine hybrids are in commercial use in several other countries including Argentina, Brazil, China and South Africa, and *P. rigida* x *P. taeda* hybrids in South Korea, the research and commercial plantation establishment with the former hybrid in Queensland are of the greatest longevity and the most intensive and extensive.

The area of plantations of southern pines and hybrids in Queensland (largest area) and New South Wales exceeds 150,000 ha, 15% of Australia's coniferous plantation estate (ABARES 2016). These plantations are managed sustainably and support major processing industries with local and export markets. Products include house framing, flooring, mouldings, beams, posts, poles, plywood, medium density fibreboard, paper and landscaping materials.

Garth Nikles. 24 July 2017



*Figure 4. An aerial view of part of the extensive southern pine hybrid plantations in the Beerburum forest in south-eastern Queensland with the Glasshouse Mountains as part of the background. Patches of recent clear felling of pine forest are evident; these have been or will soon be replanted with an improved F<sub>2</sub> hybrid breed. Photo courtesy of Nick Rains of Nick Rains Imaging.*

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