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# Tree of the Year: *Araucaria bidwillii* Hook.

syn. *Columbea bidwillii* Hook. Carrière, *Marywildea bidwillii* Hook.

A.V. Bobrov & Melikyan

ALISTAIR WATT writes about the Bunya-pine, a native of Queensland, Australia.

*‘Centuries old, towering 200 feet, their topmost branches massed  
with orchids and lichen, rise the huge russet-brown columns of the  
bunyas...100 feet without a limb’.*

George Essex Evans. Australian Poet. Ca. 1899.

The genus *Araucaria* is perhaps the most significant of all the ‘living fossil’ trees that exist today. No less than 20 species still grow across the southern hemisphere, two species in South America, and the others on the opposite side of the Pacific Ocean in Australia, New Guinea and New Caledonia.

We here in Australia are fortunate that three species, two on the mainland and one on the oceanic Norfolk Island, continue to flourish in the wild. These are *Araucaria bidwillii*, *A. cunninghamii* and *A. heterophylla* (syn. *A. excelsa*), the latter two being much used in public amenity horticulture. Unfortunately, the most architecturally dramatic of the Australian species has, because of its clear danger to public safety, become very much out of favour with those tasked with the planting of trees to green the spaces accessible to the public. *Araucaria bidwillii*, the Bunya-pine, however remains one of the great tree species to be encountered in the botanic gardens and parks of Australia.

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Much as the monkey puzzle, *Araucaria araucana*, is sometimes viewed as an out-of-place anachronism in British scenery, relic planting from the Victorian years, the same may be said about its tropical-growing counterpart here in the southern continent.

## Description

It would be far from being the only instance, but surely the scant formal description of this species, a handful of lines of stilted botanical latin published by William Hooker in 1843 in his *London Journal of Botany*, does absolutely nothing to convey the essence of this superb tree.

*‘Foliis patentibus ovatis pungenti-acuminatis demum bas  
insigniter dilatatis, amentis foemineis in ramulis propriss  
later-alibus brevibus erectis ovali-subglo bosis maximis,  
squamis laxis late alato dilatatis bi-labiatis labio inferiore  
seu apice acuminato reflexo, interiore acuto brevior’.*

There is no hint here at all that this is a plant which can reach up over 50 m in height and 1.5 m in diameter, it soars above the rainforest canopy, producing

photograph © Alister Watt



*Araucaria bidwillii* growing in Colac Botanic Gardens in south-west Victoria. Note the classic 'public-park' form of architecture with the domed top and denser new growth lower down.



Walter Fitch's plate which accompanied the original botanical description of the species. *London Journal of Botany* (1843).

solid cones as big as a person's head that can weigh a potentially murderous 10 kg. Nevertheless, the first-hand input by John Bidwill describing the tree in the wild, together with Hooker's accompanying notes and an exceptionally fine plate from the hand of Walter Fitch, did do the new *Araucaria bidwillii* some justice!

In most modern taxonomic treatments, the genus of extant *Araucaria* is considered to be represented by four sections based on morphological characteristics of the cone and the details of seed germination. The largest of these includes the 16 species incorporated in **Eutacta** from the south-west Pacific area, New Caledonia, New Guinea and Australia. Two species, *Araucaria araucana* and *A. angustifolia*, are South American and represent the section **Colombea** with a single species in the **Intermedia** section, *A. hunsteinii* from New Guinea. The section **Bunya** contains only the one living representative native to Queensland, Australia, *Araucaria bidwillii*. The large section of the **Eutacta** is considered to be a distinct monophyletic clade within the genus,

with the other four species, in three sections, constituting a separate group. Professor David de Laubenfels has proposed a significant revision of the *Araucaria* with all species in the section **Eutacta** being re-classified into the genus, *Eutassa*. Although there is some valid argument, this re-classification has not as yet been widely used in current literature, and is not presently incorporated in the 'Plant List' web-site.

These two clades are to all extents differentiated visually by the foliage morphology. The awl-like leaves of the **Eutacta** differs very much from the sharply-tipped arrowhead-shaped foliage of the other species in **Bunya**, **Columbea** and **Intermedia**. I would caution however, that the foliage of the two New Caledonian species in **Eutacta**, *Araucaria muelleri* and *A. goroensis* in the juvenile form at least are very similar to the that of *Araucaria hunsteinii* for example.

The Araucariaceae has a long paleobotanical history. As far back as the Jurassic era, the genus *Araucaria* was to be found in Britain as *A. brownii* in the **Bunya** section. With *Araucaria nipponensis* (**Columbea** section) in Japan and *A. haastii* (Section **Intermedia**) occurring in New Zealand during the Cretaceous period. It is generally considered that *Araucaria bidwilli*, the Bunya-pine, the subject of this 'Tree of the Year', is the remaining relic taxon of what is the oldest section with a lineage spanning back over 150 million years. As many of those well-presented TV documentaries reveal, it seems that the dinosaurs almost certainly did eat those conifers that looked like monkey puzzles or Bunya-pines! The ancient-looking, dramatic architecture of towering Bunyas emerging from the rainforest canopy in the aptly-named Bunya Mountains of

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Cone of the extinct *Araucaria mirabilis*.  
Palaeontological  
Museum, Munich.



Samples of juvenile foliage of various *Araucaria* species.

**Above,** *Araucaria bidwillii* (A), *Araucaria angustifolia* (B) *Araucaria muelleri* (C) and *Araucaria rulei* (D). The topmost specimen is the adult foliage of *Araucaria heterophylla* (E).

**Left,** *Araucaria bidwillii* mature foliage.

Specimens are all from the author's garden.

Queensland only reinforces that image.

It is fascinating to compare the fossil remains of the extinct *Araucaria mirabilis* from a 'Jurassic Park-like' Patagonia with the cones of its still existing relative, *A. bidwillii* and to realise that tens of millions of years ago, nature created something that would last out the age of the giant reptiles.

The species *Araucaria bidwillii* is undoubtedly a large tree, growing naturally as a tall emergent in a sub-tropical rainforest environment, with a lower canopy comprising a rich range of genera including Lauraceae (*Beilschmiedia*), Sterculiaceae (*Argyrodendron* and *Brachychiton*) Meliaceae (*Toona*, red-cedar) and Rutaceae (*Flindersia*, crows ash) etc. The oldest trees are estimated to be 500 to 600 years old.

The dark brown to dark grey trunk is most often bare for two thirds of the height in such situations with scars from trunk injuries or broken-off branches, weeping with a pink to yellow resin. Pyramidal in shape when young, it develops to show a huge dome-shaped crown when there is no wind damage. The branches are produced in distinct whorls around the trunk and where we are in the cool-temperate area on the southern coast of Victoria, only a



**Left**, the regular whorl of branches represents a year's growth in this 10 year-old specimen of *Araucaria bidwillii*.

**Below**, the trunk of a 150 year-old Bunya-pine in Colac Botanic Gardens, Victoria, Australia. Note the new epicormic shoots on the left which make for good cuttings.



single whorl is produced each year. The juvenile and adult leaves are distinctly different. The former when produced in sheltered, low-light conditions can be up to 5.5 cm long, light green, lanceolate and flattened in two rows, whereas in the mature condition they are more triangular-lanceolate, only 1 to 2.5 cm in

photograph © Alistair Watt



**Left,** resin helictites on the trunk of *Araucaria bidwillii*.

**Opposite,** one of Marianne North's paintings of the Bunya Mountains in Queensland.

length, dark green, spirally arranged around the branchlets, and very sharply pointed. The species, unlike most araucarias, is monoecious with both male and female organs produced on an individual tree. The mature cones, perhaps up to 30 cm in maximum diameter, take around 17 months or so to mature from pollination and are a rich, glossy dark green in colour. These huge cones, which contain 50 to 100 seeds, will fall naturally from the tree during

late summer, i.e. in the wet season months of January to March in its native environment, usually disintegrating on hitting the ground to release the 5 to 5.5 cm long, wingless seeds. It is presumed that such large seeds are dispersed by animals e.g. possums, parrots or bats, but also most likely including the actions of humans for many millenia.

### History and discovery

The Bunya-pine is without doubt one of the great trees of Australia, not just for its dramatic appearance but also for its long association with human beings. As did the Pehuenche Indians of Central Chile and Kaingang tribes of Brazil depend on the seeds of the monkey puzzle and parana-pine for sustenance, so also did the Australian Koori people from Southern Queensland. The Australian tree was much revered by the aboriginals of the localities where it was native for the edible nuts that it regularly produced.

Individual trees may have been 'managed' by a tribe or even an indi-

Old postcard showing hand and foot notches supposedly cut by aborigines into this Bunya trunk to aid climbing the otherwise bare bole.





vidual owner, in some cases with step-like notches cut into the trunk to allow for easy ascent and access to the cones borne in the high crowns. There is even evidence that in the bumper seed years, the triennial mast years, hundreds of tribespeople, from as far away as northern New South Wales or Fraser Island would have travelled great distances along the 'Bunya Tukka Tracks' to the inland Queensland Bunya-pine forests for great community feasts. It may even be that some outlying localities, where groups of old Bunyas are to be found today, such as at Byrrill Creek in Northern NSW, in fact represent sites where some seeds were deliberately planted as useful mementoes of someone's visit to a Bunya-pine gathering.

It was the Koori people who gave us the name of the Bunya-pine as used today, although it did appear to develop from several native dialects. Early settlers recorded the usage of Bunya Bunya, Bonyi, Bunnia, Bahnua, and Banua-tunya (Huth 2001). Of course these are strictly European transliterations of the native words used by different tribes, there was no written language. It can be concluded that it was one version of the local name of the tree that gave the name to the most well-known site where the conifer is found today, the Bunya Mountains National Park in south-east Queensland.

### European discovery

Unsurprisingly, with a tree species as uniquely distinct and imposing as the Bunya-pine, the accreditation to its original European discoverer has become a subject of debate over the last 170 years. For botanical history, the credit for its

introduction to science and the subsequent naming of the species is dedicated to John Carne Bidwill, an Englishman from Exeter, a plant collector who was associated with Sir William Hooker in the mid-nineteenth century. Not long after his arrival in the antipodes in September 1838, the 23-year-old Bidwill travelled to New Zealand where he remained several months travelling extensively, including Lake Taupo and Mt Tongariro, before returning to what was then the colony of New South Wales. Although he was essentially there on business for a private trading company, he gathered a great many botanical specimens which were sent to Kew. His name is well represented in the botany of New Zealand with a range of plant species bearing his name, including *Libocedrus bidwillii* and *Brachyglottis bidwillii* (*Senecio bidwillii*).

It is generally accepted that the first colonist to record his encounter with the Bunya-pine was a Scot, Andrew Petrie, who had emigrated from Fife in 1831. By the late 1830s he was employed as a building supervisor, architect etc. at the Queensland settlement of Moreton Bay (now Brisbane). A man of many talents, in a private capacity he was an active and dedicated bush explorer and in the course of his travels, in 1838 he was able to track down the source of the distinctive seed of this conifer, which was already known to settlers especially its usage by the local Koori people. On this particular journey, to the Glasshouse Mountains, his aboriginal guides took him to the forests of the Blackall Range situated some 90 km from Moreton Bay and it was Andrew Petrie's notes made at that time, together with a, now lost, sketch he made of the tree, that served to confirm this noble species' existence to the early European pioneers. Petrie apparently did gather some scant specimens, which he may or may not have shown to John Bidwill, but he was a busy man and did not pursue any formal claim to his successful find of the conifer which was so important as a tree crop to the aborigines over a large area of the hinterland, perhaps thus missing out on his due recognition at the time. Nevertheless, his find quickly became colloquially referred to as 'Petrie's pine' by the colonists.

Only a couple of years after this, probably in late 1840, Henry Stuart Russell, an early pastoralist in the area, was able to lead John Bidwill to a site near Kilcoy, around 75 km north-west of the colony at Moreton Bay, where the botanical explorer was able to collect incomplete specimens and seedlings. Some years later, Andrew Petrie stated that it was *he* who gave the fragmentary specimens to John Bidwill, however, this might have been an old man's attempt to reclaim some credit for his find, and undisputed *discovery*, of the Bunya-pine. Petrie's revelation was recognised as a magnificent species of tree but it was, unfortunately for him, named for another individual.

Some 170 years after the event we have no way to conclusively determine whether Bidwill actually did use Petrie's specimens as his own. The evidence to me suggests that he did not.

As early as 16 January 1841, John Bidwill noted his early encounter with Russell in a letter to Captain Phillip Parker King, a friend to several Australian

botanists including Allan Cunningham who had been botanist during King's survey of the Australian coast. In this personal letter to King, which is quoted directly by Joseph Maiden in 1908, Bidwill provided a detailed description of his travels around Moreton Bay (that is, in 1840), including making collections of various plant species such as *Dendrobium* orchids and the *Nymphaea* water-lily. He also reported meeting the 'intelligent' Mr Stuart Russell. Bidwill goes on to describe the Bunya in some detail and specifically indicates that: 'I have not yet seen a ripe cone... the largest tree I saw [author's italics] was about 120 ft high and 4½ ft in diameter'. (Joseph Maiden 1908). I find it difficult to believe that Bidwill, in such correspondence with a valuable friend, could and would make up a story about his own encounter with the Bunya-pine. John Bidwill was a plant collector in his own right by then and there should be little doubt that he would have obtained what specimens that were available at the time. On the other hand would he have risked misleading King, when a word from Russell could have destroyed his credibility?

It was Bidwill who immediately recognised the significance of his own observations of the Bunya and by 5 July 1841 (letter from Bidwill Sydney to Linnean Society, 5 July 1841) he had sent news of his botanical success, together

*Sale of Orchidaceous Plants, &c.*—At the recent sale of plants from Guatemala, Australia, and New Zealand, which took place at Messrs. Stevens's on the 18th, the following were the prices of the principal lots:—*Dendrobium Kingianum*, a new species, with pink flowers, sold for 4*l.* 10*s.*; several specimens of *Sobralia macrantha*, respectively, for 26*l.* 5*s.*, 8*l.* 10*s.*, 7*l.*, and 6*l.* 6*s.*; an *Evelyna*, for 6*l.*; and *Barkeria spectabilis*, for 6*l.* A fine specimen of *Cattleya Skinneri* realised 4*l.*; *Epidendrum macrochilum*, 5*l.* 5*s.*; *Lycaste Skinneri*, 4*l.*; and *Epidendrum Stamfordianum*, 4*l.* 10*s.* A new species of *Araucaria*, from New South Wales, was bought in for 20 guineas; as was also an extraordinary plant of *Acróstichum grande*, for 10 guineas. The new species of *Earina* sold for 2*l.* 8*s.*, and a new species of *Jasminum* for 1*l.* 18*s.* Of three species of *Clematis*, from New Zealand, one sold for 1*l.* 6*s.*, another for 1*l.* 2*s.*, and a third fetched 1*l.* 12*s.* The highest price given for *Dacrydium Mai*, the plants being very small, was 1*l.* 6*s.*

Advert from *Gardeners' Chronicle* 22 July 1843.

with a specimen of a 'male twig' off to London. Bidwill's initial report was read at a meeting of the Linnean Society on 21 December 1841 and in early 1842, a notice was subsequently published in the *Annals and Magazine of Natural History* entitled *On a new species of Araucaria from New South Wales...* By H. [sic] Bidwill'. This very brief note conveyed his own personal encounter with the new *Araucaria* and indicated that the tree was '100–200 feet high'. Although the article described the foliage it noted that: 'Neither cones nor male flowers seen'. Clearly this is not a valid description and no epithet for the new conifer was offered at that stage.

John Bidwill was nothing if not persistent and, after a return to Sydney when he sent the initial material to the Linnean Society, he revisited Brisbane and the Kilcoy area for a time and it was on this second occasion that he was successful in collecting both cones and male flowers as well as an additional quantity of seedlings. By July 1843, he had arrived in London with his spoils. One living plant he had brought to Britain was sold by Bidwill through the well-known natural history auctioneers, J. C. & S. Stevens, on 18 July. The latter was bought in for the fabulous sum of £20, around £1,700 in today's terms and later presented to Kew.

With suitable herbarium specimens now available, it fell to Sir William Hooker, the Director of Kew himself, to make the formal description of the new species *Araucaria bidwillii* in the *London Journal of Botany*. Such was the importance of this new conifer with its cones as large as a person's head, that the notice took up ten pages including a superb line-plate by Walter Fitch. The article also included a lengthy comparison of the new species with the already known *Araucaria heterophylla* and *A. cunninghamii*. Hooker incorporated extensive notes that he had received from Bidwill into the long description, and would understandably have felt some obligation to name it for John Bidwill, although the collector himself apparently requested that it be named for Sir William Macarthur, the wealthy grazier who owned the huge Camden Park station outside Sydney and was a most generous patron to Australian botany and gardening (Nelson).

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It has been suggested by some commentators that Petrie was unfortunate to have missed-out by his superb discovery not being given his eponymous epithet. Unfortunately the process of botanical nomenclature is not always fair and in this case it was the botanical collector who gathered the relevant diagnostic specimens for the Kew Director who was given this honour. Petrie does however, have another important Australian native tree, *Alphitonia petriei*, the white ash, named for him.

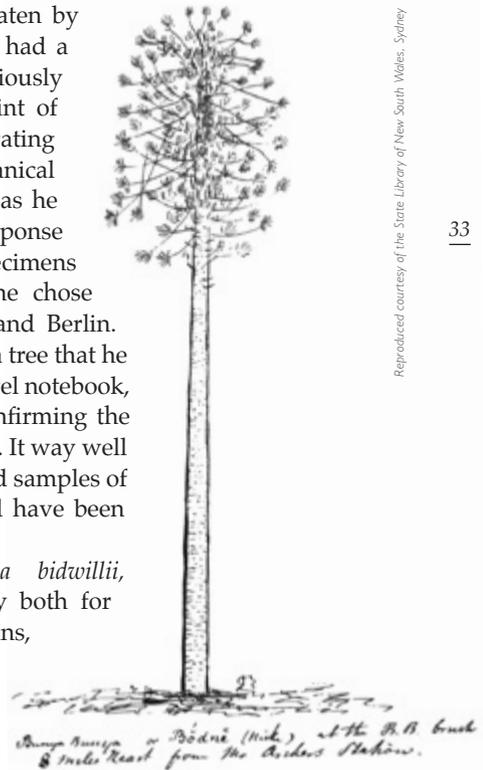
Bidwill was to return to Australia in 1844, and after a botanising and business visit to Tahiti for a year, he had a very brief and controversial period as Director of the Sydney Botanic Gardens. Through no fault of his own he was forced out of the job as a result of colonial politics and a mix-up regarding who was responsible for allocating the latter position. The new incumbent was a well-qualified émigré from Britain, Charles Moore, who went on to remain the respected head of the Sydney Gardens until 1896. The colony's Governor was sympathetic to Bidwill's situation and in 1848 had him appointed, as a deserved consolation, the Commissioner of Crown Lands at Wide Bay, Queensland, on a salary of £500 per annum.

There he continued his botanical collections for Kew, and also for the Sydney Gardens, developing an extensive private garden, before dying in March 1853 of kidney problems caused by extreme dehydration after becoming lost for many days while exploring in the bush.

Those interested in reading about this hardworking and successful botanist, who was running private businesses during all the years of botanical exploration, as well as indulging himself in his long-term 'hobby' of plant hybridising, could well enjoy reading IDS member David Mabberley's article, 'Bidwill of the Bunya-Bunya' in *Curtis's Botanical Magazine*, Vol. 18, pt 1: 31-46.

Curiously, a much more famous explorer of Australia may also have been close to claiming the scientific honours of the discovery of this superb conifer. He was the German migrant, Ludwig Leichhardt, a man with a passionate desire for combining exploration with botany. Shortly after arriving in the British colony, in the summer of 1842, he made a solo horseback journey out of Moreton Bay as far as what he referred to as the 'Bunya Bunya' district, although maps in his journal indicate that this was not the geographical Bunya Mountains of today. In a letter to his mother dated 27 August 1843, he described the 'fir-like' tree and how the kernels were eaten by the Koori clans. Leichhardt definitely had a strong botanical interest having previously visited Kew Gardens and made a point of meeting Hooker (senior) before emigrating to Australia in 1842. He collected botanical material and samples of local timbers as he travelled, but having received no response or acknowledgement of herbarium specimens that he sent previously to Hooker, he chose to send his later collections to Paris and Berlin. Leichhardt left a useful small sketch of a tree that he saw near to Mt Archer Station in his travel notebook, perhaps the first identifiable image confirming the dramatic architecture of the Bunya-pine. It may well be that Ludwig Leichhardt also obtained samples of the new *Araucaria* species which could have been sent to the European herbaria.

The Bunya-pine, now *Araucaria bidwillii*, continued to gain a positive notoriety both for itself, and also for the Bunya Mountains, the ranges to the north-west of Toowoomba, where perhaps it was at its most spectacular. A very prominent visitor was the famous painter of



The first known sketch of a Bunya-pine as illustrated in the field notebook of Ludwig Leichhardt 1842. Leichhardt's caption reads 'Bunya Bunya or Bodne (Nicke) at the B. B. [Bunya Bunya?] brush 8 miles N east from Mr Archers Station.'

plants and flowers, Marianne North. She visited the Bunya Mountains in 1880 in the company of the Moffat family from Cumkillenbah Homestead, Dalby, on the Darling Downs and made several exquisite paintings of the iconic conifers, which are now held in her dedicated collection of works at Kew Gardens. Marianne describes her adventures in the area in her autobiographical book, *Recollections of a Happy Life*. She had been taken to see the tree growing in the rainforest by local settlers and summed up what she saw most succinctly: ‘these grand green domes covered one hundred miles of hill-tops and towered over all the other trees of these forests’.

### Distribution and ecology

The species occurs over an extended area in the wild, but in what is essentially a limited distribution. The largest stands are in the south-east of Queensland, in the area in which historically it was first discovered, that is in the sites to the east of the Australian Divide towards the coast. These include the Blackall Range, not far inland from the Sunshine Coast and at the Upper Mary River a little further north near Gympie. On the divide about 150 km inland from the seaboard, the principal site is of course the Bunya Mountains (Koori name, Booburrigan Ngmmunge, Swan. 2017), which rise above the Darling Downs to a maximum altitude of 1,100 m a.s.l. Another significant population occurs near Blackbutt on the slopes towards the coastal plain. However, in what makes for an unusual distribution map, two further sites lie some 1,200 km or so to the north in the far Wet Tropical north of Queensland in the hinterland behind Cairns (see distribution map, opposite).

This would suggest that *Araucaria bidwillii* once had a much greater range which has been much reduced, probably by the long term climate change as the continent of Australia moved northwards resulting in an increase in aridity. Such an effect was perhaps also exacerbated by the inability of the species to maintain its association with its natural dispersal vectors.

A further station is recorded for the Byrrell Creek area just over the State border into New South Wales, although Huth suggests that these are the result of deliberate dispersal by the important two-legged vector—humans.

Interestingly, in a major PhD thesis study of the North Queensland sites, Picone (2015) states that there are some genetic and morphological differences between these populations and those from the south of the state. Given the extraordinary spread in locations, this could warrant further taxonomic study. Picone additionally indicates that on the Mt Lewis site the Bunya grows in more open-structured forest and is even associated with the *Eucalyptus* species, *E. grandis* i.e. not strictly in a rainforest environment.

The discrete distribution of *Araucaria bidwillii* would suggest that inherently it is extremely sensitive to environmental constraints. In fact, this is far from the case. Huth (2001) indicates that the Bunya-pines occurs naturally on basaltic-origin soils and where the yearly rainfall is excess of 1 m. Given the ability of

## Distribution of the main remaining native populations of *Araucaria bidwillii* in Queensland.



the species to flourish in situations vastly distant and differing from its native habitat, it is difficult to determine what exactly are the principal factors which control the present limited distribution of *Araucaria bidwillii*.

What we can say is that this tree species does require an adequate supply of rainfall at a time when the germination of the seeds and seedling growth is dependant on the disturbance of the forest canopy. The species will also withstand some amount of frost, in its highest altitude station in the Bunya Mountains it would certainly experience temperatures as low as minus 8 °C, but this would be in the sunny and dry winter months (June-August) where a morning frost would rapidly warm to a warm to mild day. The summer days in this part of Queensland can be hot with maximum temperatures in the wet season of up to 40 °C in December for example, but this is accompanied with a mean rainfall for the month of 95 mm.

### The Bunya-pine in cultivation.

This majestic conifer was very quickly introduced into cultivation once its attributes became generally known. Much like its generic stablemate, the

photograph © Alistair Watt



**Left**, a small cone, this example is only 20 cm in length, of the Bunya in comparison with that of *Pinus coulteri* (right). From the author's garden. Large cones of *Araucaria bidwillii* can be 30 cm in length.

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monkey puzzle, *Araucaria araucana*, became a rage for the Victorian gardeners of Britain so also did the Bunya-pine in Australia. However, the potential size of the latter as it grew in its native forest was perhaps more easily grasped, and here it was certainly not as frequently planted in such unsuitable sites as a humble front-yard garden. Rather, *Araucaria bidwillii* was to be mainly used as a magnificent specimen tree for public parks, and it became almost *de rigueur* for the gentleman farmer or grazier to plant one or two in the inevitable new country garden being developed around his new rural homestead.

The Bunya was planted at the Rouse Hill station, now enveloped in suburban Sydney, by 1850 where 170 years later they still dominate the skyline. About that same time, specimens were planted as far away as Hobart in Tasmania where some old trees still survive although there was some controversy in April 1917 when one of these rare examples, although still healthy, was felled because of the perceived danger from falling cones.

In the second half of the nineteenth century, the Bunya-pine was seemingly planted everywhere around the Australia continent except in total desert conditions. As the squatters moved inland from the nascent capital cities and the coast, it was planted beside their new mansions. The species would have been featured in almost every nursery plant list. During his visit to Australia in 1864–66, the nurseryman John Gould Veitch visited the business of Baptist and Son in Sydney and noted in his article in the *Gardener's Chronicle* that *Araucaria bidwillii* was being sold as potted specimens, with the finest planted specimen he saw growing at the Camden Park estate of Sir William MacArthur. The latter was already 12 m high and 11 m across. (GC 20 /27 Jan 1866 p. 53). After some months travelling in Australia, Veitch was able to write; '*Araucaria bidwillii* is one of the very finest of Australian trees'. (GC 10 Feb 1866). We also have, for example, an 1877 catalogue from Marriner's Fulham Nursery in Colac, a small country town about 100 km west of Melbourne, that advertised potted specimens of *Araucaria bidwillii* for sale at 2 to 3 shillings per plant.

Interestingly, in the same catalogue similar plants of *Araucaria rulei* from New Caledonia were 5 to 10 shillings each and *Araucaria araucana* sold for 3s. to 7s. 6d. Evidently the Bunya was cheap and easy to produce.

As one drives through country Victoria today, a Bunya-pine or two can be seen growing beside many Victorian-era homesteads, or at least as a relic specimen indicating where such a property had once stood, their dark ever-green foliage contrasting starkly with the sun-roasted grass paddocks of an Australian summer.

*Araucaria bidwillii* is unambiguously not a tree for a suburban situation. Where it survives, it will slowly and surely reach epic proportions. When it is young, to me it is an ugly prickly duckling and not a particularly attractive thing to have in the garden. The glossy-green cones admittedly are rather eye-catching, and certainly a talking point, but it can take years until a tree reaches maturity. For me, here in the Otway Ranges at 470 m altitude and on the very southernmost tip of mainland Australia, it took my specimen some 44 years before it produced its first two cones on a plant about 12 m in height! Mind you, with such a waiting time, the average private gardener does not have to worry too much about the hazards or liability of the falling monsters.

I have not attempted to overstate the latter objective danger. A solid, spiky weight falling 20 m or more can easily be deadly. Although I can actually find no historical report of a death caused by a falling cone in our newspapers of Australia, there are certainly fatalities worldwide as a result of (albeit far more frequently falling) coconuts, a similar dangerous object. Nevertheless, there are definite reports involving the Bunya-pine of injuries received from these descending cones, such as an incident in Wellington, New Zealand, when a couple were both hospitalised with severe bruising after being struck by a 'pumpkin-sized' cone. [<http://www.stuff.co.nz/nelson-mail/news/6738347/Giant-pine-cone-crashes-on-couple>]. Similarly in 2015, a San Francisco man, dozing under a Bunya-pine received a brain injury when hit on the head by a 7 kg cone. In the later case, this resulted in the US National Park Service being sued for \$5M in damages.

[[https://www.upi.com/Odd\\_News/2015/10/13/Man-injured-by-16-pound-pine-cone-suing-for-5-million/3621444757783/](https://www.upi.com/Odd_News/2015/10/13/Man-injured-by-16-pound-pine-cone-suing-for-5-million/3621444757783/)]. Needless to say public authorities sadly appear to be culling even heritage trees whenever any risk of legal liability is raised. Perhaps, more awareness promotion would be preferable.



A typical warning board as seen in Australian public parks and gardens.

As well as on private estates, the Bunya-pine was eventually planted in public gardens and parks all over Australia from Tasmania in the south, to Perth in Western Australia and to the far tropical north at Cairns. In Canberra, the Australian Capital, some 600 specimens of *Araucaria bidwillii* were planted in 2009 as a block at the new national Arboretum. These, as well as a large specimen planted in 1870, survive a range of temperature from minus 10 °C in winter up to 30–35 °C over the summer months.

One particularly shabby tree of the Bunya that I have seen was a 25 year-old specimen growing in the inland city of Mildura, basically on the edge of the Australian desert. The rainfall here is only 290 mm per annum i.e. less than 12 in., and the soil is essentially wind-blown sand. This sad plant was kept on life-support by drip-irrigation, but it really did not like the runs of searing 40 °C- plus days experienced in that part of the country. However, the most depressing example I have ever seen though was at a bonsai show, whereby the unfortunate plant had been turned on its side and the leader and half the branchlets shorn off, all in an attempt to make a multi-stem 'Bunya miniforest'!

### ***Araucaria bidwillii* in overseas cultivation**

With its dramatic appearance the Bunya-pine was soon appreciated across the warmer regions of the world as a novelty specimen tree for amenity planting where its eventual size could be accommodated, and the climate was amenable.

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In Britain, the initial introduction of the conifer in 1843 was much regarded, and the original specimen spent its decades of life inside Kew's great 'Winter Garden' greenhouse where it eventually produced its huge first new cones in 1873. The largest example known to have existed in the past in the British Isles and Ireland was an 11 m high specimen at Glendurgan in Cornwall (Grimshaw, *New Trees*). However, the present contender is reputed to be a small tree of only 6 m height in the lower garden at Earlscliffe near Dublin. IDS member Martin Gardner of the RBG Edinburgh indicated to me that he was unaware of any specimens being grown out of doors in the UK adding; 'if they are then they are probably not very big and waiting for the next frost to come along'!

It would seem that those enthusiasts in Britain would perhaps be better-off persisting with *Araucaria araucana*, a tree with similar aspect and incidentally a species that is almost impossible to grow here in mainland Australia because of drought, accompanied by excessively high temperatures.

Despite the climatic conditions preventing the successful cultivation of the Bunya in Northern Europe, this superb species can be seen, and often in full mature glory, in the Mediterranean countries where it has been planted for over a century. For example, there is a classic specimen of a 30 m high Bunya-pine, looking as good as any in Australia, flourishing in Reggia Park at Caserta in Campania, Italy. Another dramatic individual at Valle de Canas, Centro, Portugal was measured in 2017 to be a stunning 49.4 m in height. For those dendrologists interested in such things, and seeing some great photographs



A postcard, circa 1920 of a Bunya-pine in the Luther Burbank garden in Santa Rosa.

Photograph © Alistair Watt



A surviving *Araucaria bidwillii*, about 20 m high, in a forestry plantation, Nandarivatu, Fiji, in 2010.

of this conifer species, I would recommend a visit to the website of the 'Monumental Trees' group. [<https://www.monumentaltrees.com/en/trees/araucariabidwillii/records/>]. A caveat though, whereas I would not query the dimensional measurements given on the site, some of the age estimations, e.g. plantings supposedly going back to 1800, are very clearly incorrect.

Another superb specimen, planted in 1880 and now one of the tallest trees there, grows at the fabulous Les Cèdres garden, at Saint-Jean-Cap-Ferrat on the French Riviera.

With their mild climate, the US states of Hawaii and California, as well as further south in some parts of Mexico, were also favoured situations where the Bunya-pine would grow well.

By the beginning of the twentieth century quite large trees were flourishing in southern California. I have a postcard (see p. 39) of what is almost certainly the garden of Luther Burbank, the great American botanist and pioneer plant breeder, at Santa Rosa, California, depicting a Bunya-pine, which from its height and number of branch whorls, must have then been around 40 years of age. The champion tree on the US mainland today seems to be the 38 m tall specimen at the State Capitol Museum in Sacramento reputedly planted in 1887. The species *Araucaria bidwillii* has also been planted in Hawaii, both as an ornamental and as a trial forestry crop. It is referenced in the *Flora of Hawaii* as an introduced plant, but there is no significant naturalised population such as that for the New Caledonian species, *Araucaria columnaris*, on Lanai Island.

A multiple trunk tree has attained a height of over 30 m in the grounds of the Museo de las Artes Guillermo Ceniceros in Durango in Mexico and although the estimated planting date of 1833 is clearly an error, it would be fascinating to know more about the provenience of this specimen. I also have seen photographs of superb specimens from as far away as Argentina and Zimbabwe, again offering what must be interesting histories.

New Zealand appears to be a natural overseas home of the Bunya-pine with very many magnificent examples of the plant. The gardeners in that country always seemed to have had the desire to grow exotic trees, they still do, and the Bunya was much planted in the nineteenth century from about 1860 onwards. Most of the grandest specimens are located around the coast of the North Island and there is a wonderful grove of these trees in the Domain Park in the centre of Auckland where it has become naturalised. The New Zealand champion at 38.4 m tall is to be found at Tauranga on the east coast. However, it is most surprising to see that significant examples of *Araucaria bidwillii* are noted as growing in much more marginal conditions than would be expected such as the 21 m high specimen, planted ca. 1860, at Hamilton in the inland of the North Island with winter weather perhaps similar to my own here in Lavers Hill i.e. a few frosts each year. The most surprising for me would certainly be the 17 m high tree from Dunedin Botanic Garden on the very southernmost tip of South Island at nearly latitude 46 °S. [<https://>

register.notabletrees.org.nz/tree/search/].

At least one Pacific Island country associated with Australia has experimented with the Bunya-pine as a tropical crop tree. Some time after World War II, several experimental trial plots were planted at the forestry research station at Nandarivatu in the central highlands of Viti Levu, the main island of Fiji. Due to neglect I guess, nothing much has appeared to come out of this work. However, a number of trees which formed part of the trials have survived, despite being now rapidly overwhelmed by regenerating bush, and include very nicely shaped individuals of *Araucaria bidwillii*, as well as what I identify as the tropical *Eucalyptus* species, *E. deglupta*, from the Philippines.

### Growing the Bunya-pine

Although the species can be propagated vegetatively, either by cuttings or by grafting and by in-vitro processing, if available, growing from seeds makes the task much easier.

I have seen a reasonably successful method of directly propagating araucarias from a single, and perhaps rare plant. The leader, of a potted specimen, say about 90 cm (3 ft) high, is decapitated immediately above the top whorl, hopefully this promotes a few further orthotropic shoots to sprout from the axilla of the branchlets. After a season or so of growth, these 'scions', except for the required new leader left on the original specimen, can be removed and grafted onto other suitable araucaria seedlings. Alternatively, cuttings from the epicormic growth at the bottom of a trunk can offer very satisfactory results if those with a definite apical growth habit are selected.

Technically, the seeds of the Bunya are considered to be 'recalcitrant'. From the cone they have high moisture content of around 40–45%, as this water content reduces the viability of the seeds falls away quickly. Sowing fresh seeds will always bring *some* germination in my own experience and with a temperature of at least 15 °C, this can take place in only six to eight weeks. When immediate sowing is not possible a number of precautions should be taken to improve results. Storing the seeds at room temperature will reduce the moisture/viability, on the other hand there is a risk that with a high humidity seeds can germinate prematurely or succumb to fungal rotting. The method of storage that I now find to give best results is to store the seeds in the kind of plastic bags used to keep vegetables and fruit fresh and at a temperature approaching but not below, 0 °C. This method is explained in Carillo et al in the IDS-published: *Proceedings of the Araucariaceae Symposium* (2009).

Germination in this species of *Araucaria* is cryptocoeal, i.e. with the cotyledons remaining in the seed, it produces an initial short root which 'draws' the seed underground, followed by the development of a 'tuber-like' swelling from which the green shoot eventually grows through to the surface of the soil. This unconventional system allows the plant to germinate when conditions are humid, but allows some flexibility when a seasonal dry period follows.



The Bunya-pine as often seen in cultivation. Summer in the paddocks at Coragulac Homestead near Colac in the Western District of Victoria. *Araucaria bidwillii* at centre left and on right, above the house. Also in view as specimen trees are; *Jubaea chilensis*, *Araucaria cunninghamii* and *Araucaria rulei*. The large trees here were all probably planted by the Robertson family, the original landowners, in the mid-1870s and most likely came from nearby Marriner's Nursery.

The 'tuber' in effect can store water and nutrients for at least 12 months until conditions for plant growth become more optimal, a useful adaption where coning may well occur only every three years. To avoid risk of rotting, use a well-drained soil with frequent light watering. I prefer to put about a quarter of the seed, the pointed end, into the soil mix just to start the emerging root in the right direction.

Unlike many Australian native trees the Bunya-pine seedlings respond well to Osmacote-type slow release fertilizers and will grow reasonably quickly if not allowed to dry out and half-shade is provided.

From plastic pots, planting in the ground can be undertaken when the seedling is around 60 cm (2 ft) in height. Until the plant gets to about 1.2 m high, it is recommended that some protection from the elements, be it frost, wind or a direct hot sun, be provided as essentially the species is a rainforest plant that requires shelter in its young growth stage.

For gardeners in higher, cold latitudes, including the UK, I am afraid that success is in the lap of the gods! The gardens at Logan have a small example planted in the ground in late 2018 so it will be interesting to see how this grows and if climate change provides any hope of survival. I would however, mention an experiment that I conducted some years ago relating to the ability

of Gondwanan conifers to withstand the months of winter darkness when the Australian continent lay at around 75° south of the equator. Two different *Araucaria* species, *A. araucana* and *A. rulei*, both survived seven weeks of *totally dark* conditions with an ambient temperature of 4–10 °C and constantly humid conditions. In this case, the extreme light regime was phased in and out over a month period in order to simulate a predicted natural autumn-winter-spring cycle. This is not much different to overwintering citrus fruit trees in an orangery and could protect a young tree. Grimshaw gives *Araucaria bidwillii* a USDA hardiness rating 9–10 but I suggest if the plant can be given winter shelter when young for a few years, an 8–9 zone may be okay.

However, for those with a different climatic challenge, I can offer some good news. Here in Victoria in southern Australia, we find summer temperatures frequently reach over 35 °C at a period when there may likely be no rainfall for a month or so. With very many large and neglected specimens of *Araucaria bidwillii* surviving well on old, abandoned homestead sites, it is evident that once the tree is established they are pretty drought resistant.

### **Destruction and conservation**

As settlement expanded out of the Moreton Bay area, at first the relationship between the Europeans and the Koori, as it affected the Bunya, was relatively benign. The first land clearances for agriculture were not making many serious depredations into the populations of the conifer. Old photographs of original homesteads show that large specimens were often left standing to add a dramatic affect to the landscape.

It is a sad indictment that the British occupation of Australia commenced with a rort, the false concept of Terra Nullius. This was the basic premise that was adopted to disenfranchise the native inhabitants. British law declared that the continent belonged to no-one, the Koori people had no legal entitlement to prior land ownership. The Crown could effectively grant any land to whom it wished or had paid for it. However, now there was a difficulty, individual tribes, indeed individual aboriginals, claimed historical *ownership* of the groves of Bunya-pine. It had always been for them a very major food source and one that could in fact be stored for future consumption in times of famine. If the timber getters were allowed to proceed it was inevitable that there was going to be much bloodshed between them and the aborigines fighting to protect their ‘property’.

As early as 14 April 1842, the Governor of the colony, Sir George Gipps made the farsighted and humane decision that the aboriginals of Queensland were to have sole use of the resource and that no Bunya-pine timber-cutting licences were to be issued. Furthermore, all European settlers in the Bunya country were to be removed. This initial protection order was unfortunately withdrawn in 1878, and logging of the species commenced.

By 1883 things had gone too far and after blood was spilt, at least one

protected parcel of land was set aside in the Blackall area as a reserve to ensure a food supply for the native population. Nevertheless, when the 'Great Bunya Sawmill' opened during that same year on the southern side of the Bunya Mountains, the destruction of the great stands of the previously protected bunya trees began in earnest. A major breakthrough in the conservation of *Araucaria bidwillii* finally came about in July 1908, when 9,100 ha of the eponymous Bunya Mountains were gazetted as the second National Park of what was now the State of Queensland. At the time, the Inspector of Forests, a Mr G. Board, summed the decision; 'it would be a disgrace to allow this beautiful spot to be alienated or otherwise lost to the public'.

In 2018, the IUCN conservation status of *Araucaria bidwillii* was considered to be Lc (least concern) i.e. the population of the species was determined to be stable. However, Picone, in a detailed discussion of the two populations in the far north of Queensland, has suggested that the Mt Lewis cluster, at least, be afforded a 'vulnerable' status, as the genetically-distinct taxon from that site may be under threat from the present proscribed fire-management regime; rather ironic as the Mt Lewis and Cannabullen Falls populations may represent refugia from where natural bushfires have been long absent.

These days the felling of the Bunya across the State is tightly controlled, but the Queensland forestry department now has several hundred hectares of the species in plantations, which together with private agroforestry enthusiasts, allows for a future timber supply and provides a source of the edible seeds into a growing market. Both the whole 'nut' and milled flour are now available to buy in Australia. For example the nuts can be ordered as a frozen product from eBay.

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## Recipes

The Bunya seed, with its increasing commercial availability as a speciality product, should not be seen as yet another 'fad' food. It has a high nutritional value with a low fat content, c.f. 40% water, 40% complex carbohydrates, 9% protein, 2% fat, 0.2% potassium, 0.06% magnesium. They are gluten free and have a good glycaemic index (GI) rating of 50–75. By contrast, other tree nuts generally have 50–75% fat and under 20% carbohydrates. Even people outside Australia who are lucky enough to have access to the cones are beginning to explore their use.

The raw nuts can be treated in the same way as sweet chestnuts; gently smacking the seed with a hammer and manually removing the kernel, roasting until the shell splits open, or boiling in water for up to ½ hour until the shell softens enough such that it can be peeled off. I have also seen a note whereby garden loppers were used to simply cut across the nut. The kernels can be eaten raw but taste 'nuttier' when cooked.

As far as I can see, the kernels can be used as are chestnuts, in baking, stir fried dishes, cooked in stews, or boiled and used in salads etc.

**Steamed Bunya nut pudding** Mix one cup plain flour, one cup cooked minced Bunya nuts (or purchased Bunya flour), four tablespoons redcurrants, four tablespoons sultanas and four tablespoons sugar in a bowl.

Dissolve one teaspoon bicarbonate of soda in a small cup of milk. Melt three tablespoons of butter. Then alternately add butter and milk to dry ingredients (use extra milk if too dry). Tie mixture in a floured cloth and steam for three hours. Serve with brandy custard sauce or honey ice cream.

**Bunya and mountain pepperberry pesto** 100 g Bunya nuts, shelled; one bunch basil; 50 g Parmesan cheese; one clove garlic (finely chopped); 250 ml Macadamia nut oil; two teaspoons ground mountain pepperberry (*Tasmania lanceolata*).

Gently heat the pepperberry in 100 ml of the Macadamia nut oil. Finely chop Bunya nuts and mix with the garlic and 100 ml of the Macadamia nut oil. Roughly chop basil in a food processor or blender with the 50 ml of the Macadamia nut oil. Process for one minute, and then add the Bunya nut mix and the pepperberry mix. This works best if the oils are poured in a steady stream. The pesto should keep in the refrigerator for a week.

It is also possible to make one's own Bunya-pine-nut flour or buy the product in vacuum sealed packs e.g. on eBay. The flour can be used to make galettes, biscuits and cakes.

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I might add, as the Queensland aborigines did not have access to freezers, the availability of this vital food was extended by burying the seeds in muddy creeks for a few months. Apparently the results, not surprisingly, would develop a very offensive rancid smell, but then again many people eat the tropical durians, a fruit which is valued for its flavour despite a terrible aroma.

## Conclusion

The Bunya-pine, *Araucaria bidwillii*, has had a long and useful association with humans in Australia and even in the early days of European settlement its dramatic aspect was much appreciated. If the hazard of its enormously heavy cones can be handled it makes for a superb architectural tree. We are also very fortunate that the tree has been reasonably well protected in the wild for over a century, and in places such as the eponymously-named Bunya Mountains, it can be readily seen in its original rainforest environment.

For those dendrologists who attempt to grow the Bunya, in a reasonably low-frost Mediterranean-type climate, a good and easy reward can be anticipated. From about a dozen years of age onwards, the trees will begin to look worth the effort put in, and by 30 years those fantastic green cones may well be being produced, offering a supplementary culinary treat. In places where the species can be grown as an agroforestry crop, the tree could have an assured future for the food value of its seeds.

It is a species to be planted, cherished and enjoyed.

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### Tree of the Year 2019

For 2019, the chosen taxon is *Torreya nucifera*, one of four species in the genus, a member of the Taxaceae. It is an important tree in Japan where large specimens can be seen near temples and its nuts are harvested for oil and fresh eating. Please send your comments, photographs and any other information (in any language) to Eric Hsu: erichsu03@gmail.com, or address any correspondence to: Chanticleer Foundation, 786 Church Road, Wayne, PA 19087 USA.