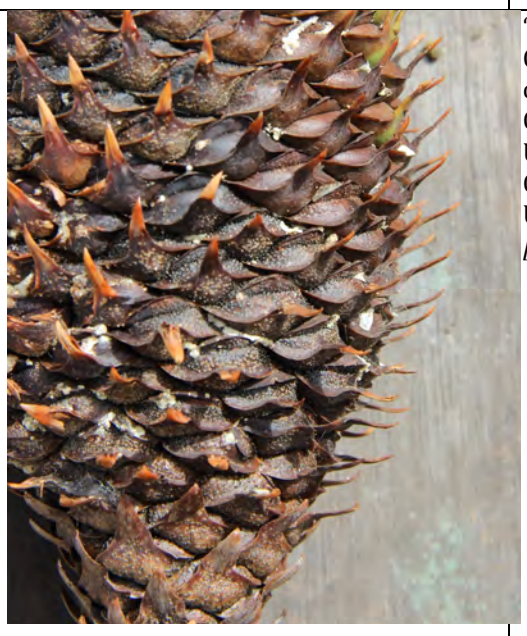
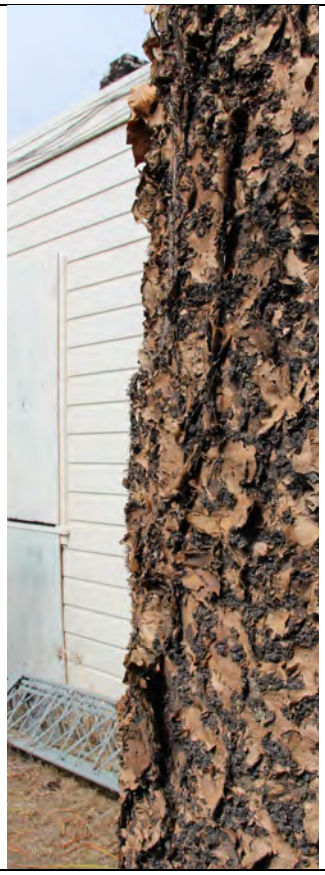
Attributes Confirming 46A Cook St. Cook Pine Species:

	Attribute	**Cook Pine** (Araucaria Columnaris)	**Norfolk Island Pine** (Araucaria Heterophylla)	**46A Cook St. Pine**	**Source**
A.	**Cone Shape**	Ovoid to Ellipsoid *(Ovoid: egg-shaped Ellipsoid: Plane sections are ellipses)*	Subglobose *(Subglobose: almost spherical or having a globular form)*		"Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada", Cornell University, pg. 98 *[See Exhibit A]*
B.	**Mucro at Tip of the Scale** *(Mucro: A short, sharp, abrupt spur or spiny tip)*	Elongated and Recurved *(Recurved: curved downward or backward)*	Short and Not Recurved		"Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada", Cornell University, pg. 98 *[See Exhibit A]*

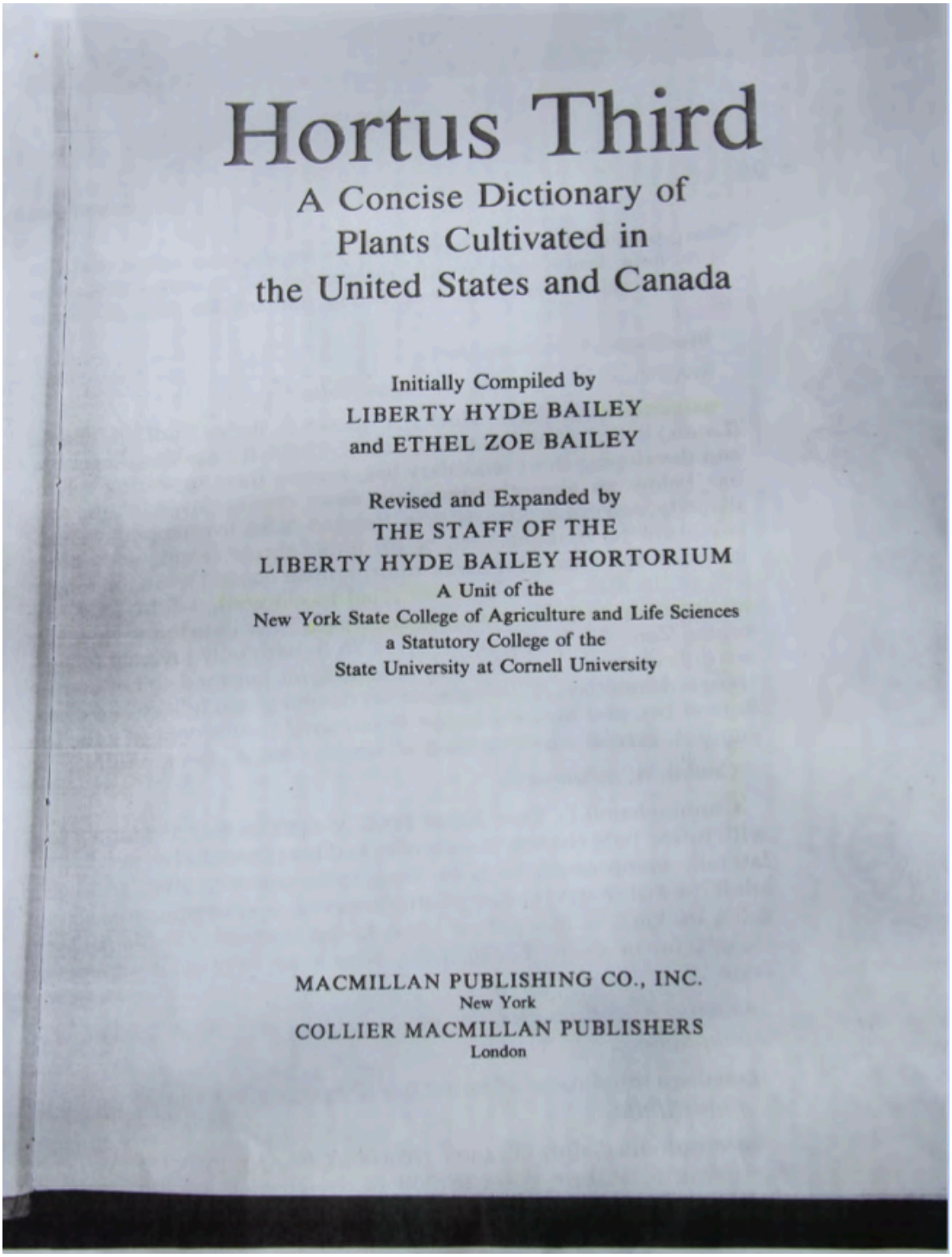
C.	**Trunk**	Characteristic Lean	Straight and Upright		Pacific Horticulture Society http://www.pacifichorticulture.org/articles/the-araucaria-family-past-present/ "A Tropical Garden Flora" *[See Exhibit B]* National Register of Big Trees, AU http://www.nationalregisterofbigtrees.com.au/listing/52.pdf
D.	**Branch Direction**	Slope down	Straight out or slightly sloped up		National Register of Big Trees, AU http://www.nationalregisterofbigtrees.com.au/listing/52.pdf

E.	**Bark**	Flaky sheets, Peals off	Slight flake only			National Register of Big Trees, AU http://www.nationalregisterofbigtrees.com.au/listing/52.pdf

"One popular theory holds that many "Norfolk Island" pines in the Hawaiian Islands are of hybrid origin, but pollen of the two species is shed six months apart, making hybridization unlikely; these purported hybrid trees are virtually all Cook pines."

-"A Tropical Garden Flora", Staples and Herbst, pg. 58 [See Exhibit B]

Exhibit A



Hortus Third

A Concise Dictionary of Plants Cultivated in the United States and Canada

Initially Compiled by
LIBERTY HYDE BAILEY
and ETHEL ZOE BAILEY

Revised and Expanded by
THE STAFF OF THE
LIBERTY HYDE BAILEY HORTORIUM
A Unit of the
New York State College of Agriculture and Life Sciences
a Statutory College of the
State University at Cornell University

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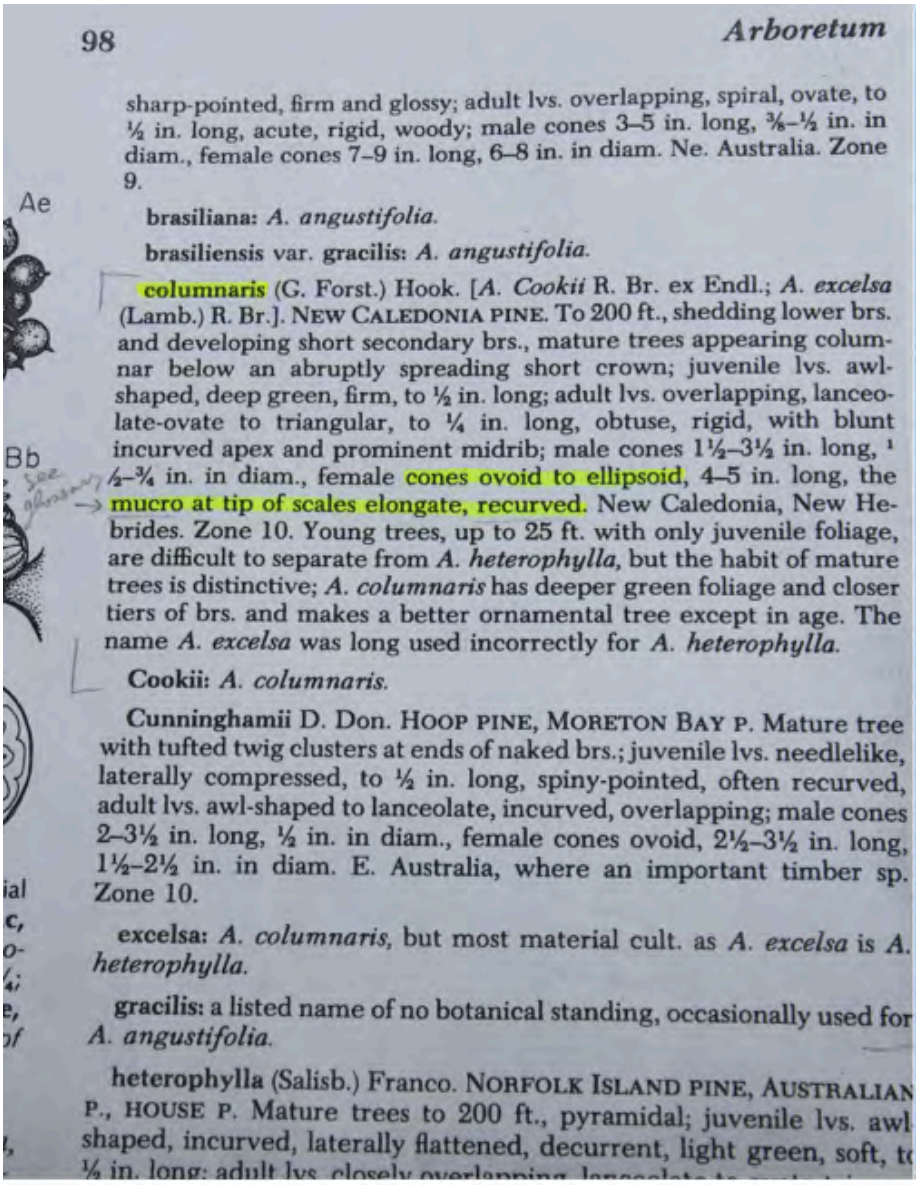
Exhibit A (cont)



sharp-pointed, firm and glossy; adult lvs. overlapping, spiral, ovate, to ½ in. long, acute, rigid, woody; male cones 3–5 in. long, ⅜–½ in. in diam., female cones 7–9 in. long, 6–8 in. in diam. Ne. Australia. Zone 9.

brasiliana: *A. angustifolia.*

brasiliensis var. **gracilis:** *A. angustifolia.*

columnaris (G. Forst.) Hook. [*A. Cookii* R. Br. ex Endl.; *A. excelsa* (Lamb.) R. Br.]. NEW CALEDONIA PINE. To 200 ft., shedding lower brs. and developing short secondary brs., mature trees appearing columnar below an abruptly spreading short crown; juvenile lvs. awl-shaped, deep green, firm, to ½ in. long; adult lvs. overlapping, lanceolate-ovate to triangular, to ¼ in. long, obtuse, rigid, with blunt incurved apex and prominent midrib; male cones 1½–3½ in. long, ½–¾ in. in diam., female cones ovoid to ellipsoid, 4–5 in. long, the mucro at tip of scales elongate, recurved. New Caledonia, New Hebrides. Zone 10. Young trees, up to 25 ft. with only juvenile foliage, are difficult to separate from *A. heterophylla,* but the habit of mature trees is distinctive; *A. columnaris* has deeper green foliage and closer tiers of brs. and makes a better ornamental tree except in age. The name *A. excelsa* was long used incorrectly for *A. heterophylla.*

Cookii: *A. columnaris.*

Cunninghamii D. Don. HOOP PINE, MORETON BAY P. Mature tree with tufted twig clusters at ends of naked brs.; juvenile lvs. needlelike, laterally compressed, to ½ in. long, spiny-pointed, often recurved, adult lvs. awl-shaped to lanceolate, incurved, overlapping; male cones 2–3½ in. long, ½ in. in diam., female cones ovoid, 2½–3½ in. long, 1½–2½ in. in diam. E. Australia, where an important timber sp. Zone 10.

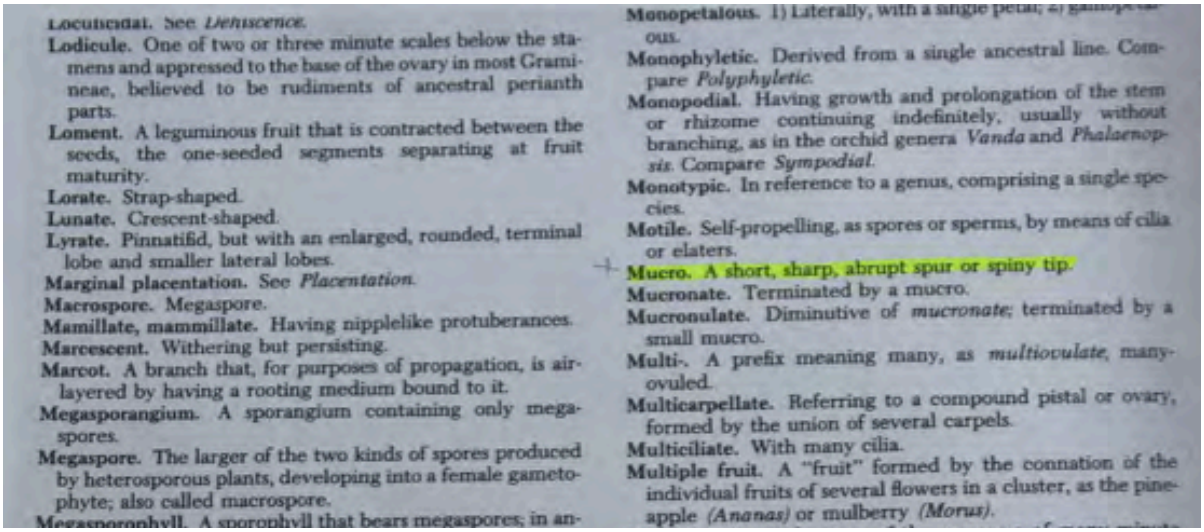
excelsa: *A. columnaris,* but most material cult. as *A. excelsa* is *A. heterophylla.*

gracilis: a listed name of no botanical standing, occasionally used for *A. angustifolia.*

heterophylla (Salisb.) Franco. NORFOLK ISLAND PINE, AUSTRALIAN P., HOUSE P. Mature trees to 200 ft., pyramidal; juvenile lvs. awl-shaped, incurved, laterally flattened, decurrent, light green, soft, to ½ in. long; adult lvs. closely overlapping, lanceolate to ovate-triangular with blunt incurved apex and obscure midrib; male cones 1½–2 in. long, female cones subglobose, 3–5 in. long, 3½–6 in. in diam., the mucro at tip of scales short, not recurved. Norfolk Is. Zone 10. Long known incorrectly as *A. excelsa.* The usual sp. grown by florists for indoor pot plants. Prop. by cuttings of vigorous, erect shoot tips.

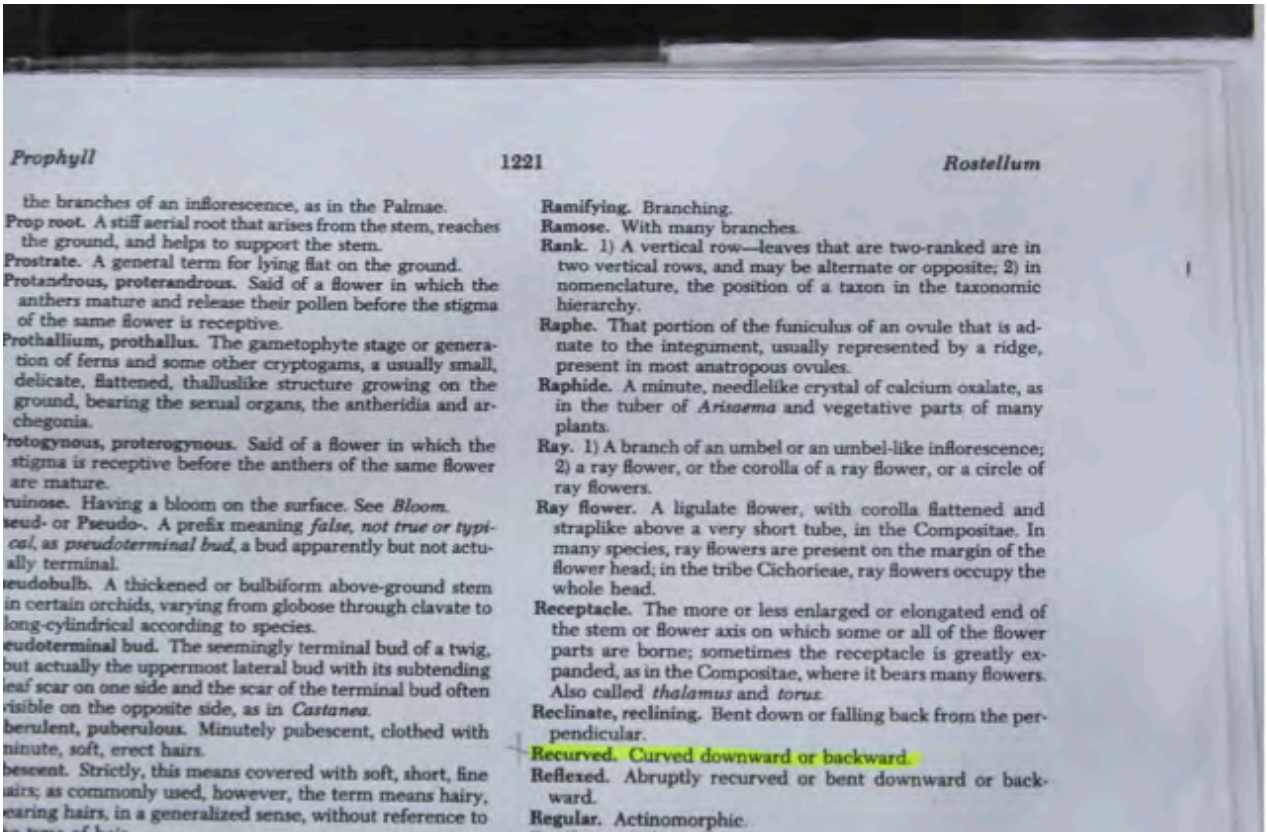
imbricata: *A. araucana.*

Exhibit A (cont)



Locuticidal. See *Dehiscence.*
Lodicule. One of two or three minute scales below the stamens and appressed to the base of the ovary in most Gramineae, believed to be rudiments of ancestral perianth parts.
Loment. A leguminous fruit that is contracted between the seeds, the one-seeded segments separating at fruit maturity.
Lorate. Strap-shaped.
Lunate. Crescent-shaped.
Lyrate. Pinnatifid, but with an enlarged, rounded, terminal lobe and smaller lateral lobes.
Marginal placentation. See *Placentation.*
Macrospore. Megaspore.
Mamillate, mammillate. Having nipplelike protuberances.
Marcescent. Withering but persisting.
Marcot. A branch that, for purposes of propagation, is air-layered by having a rooting medium bound to it.
Megasporangium. A sporangium containing only megaspores.
Megaspore. The larger of the two kinds of spores produced by heterosporous plants, developing into a female gametophyte; also called macrospore.
Megasporophyll. A sporophyll that bears megaspores; in an-

Monopetalous. 1) Literally, with a single petal; 2) gamopetalous.
Monophyletic. Derived from a single ancestral line. Compare *Polyphyletic.*
Monopodial. Having growth and prolongation of the stem or rhizome continuing indefinitely, usually without branching, as in the orchid genera *Vanda* and *Phalaenopsis.* Compare *Sympodial.*
Monotypic. In reference to a genus, comprising a single species.
Motile. Self-propelling, as spores or sperms, by means of cilia or elaters.
Mucro. A short, sharp, abrupt spur or spiny tip.
Mucronate. Terminated by a mucro.
Mucronulate. Diminutive of *mucronate;* terminated by a small mucro.
Multi-. A prefix meaning many, as *multiovulate,* many-ovuled.
Multicarpellate. Referring to a compound pistal or ovary, formed by the union of several carpels.
Multiciliate. With many cilia.
Multiple fruit. A "fruit" formed by the connation of the individual fruits of several flowers in a cluster, as the pineapple *(Ananas)* or mulberry *(Morus).*



the branches of an inflorescence, as in the Palmae.
Prop root. A stiff aerial root that arises from the stem, reaches the ground, and helps to support the stem.
Prostrate. A general term for lying flat on the ground.
Protandrous, proterandrous. Said of a flower in which the anthers mature and release their pollen before the stigma of the same flower is receptive.
Prothallium, prothallus. The gametophyte stage or generation of ferns and some other cryptogams, a usually small, delicate, flattened, thalluslike structure growing on the ground, bearing the sexual organs, the antheridia and archegonia.
Protogynous, proterogynous. Said of a flower in which the stigma is receptive before the anthers of the same flower are mature.
Pruinose. Having a bloom on the surface. See *Bloom.*
Pseud- or **Pseudo-.** A prefix meaning *false, not true or typical,* as *pseudoterminal bud,* a bud apparently but not actually terminal.
Pseudobulb. A thickened or bulbiform above-ground stem in certain orchids, varying from globose through clavate to long-cylindrical according to species.
Pseudoterminal bud. The seemingly terminal bud of a twig, but actually the uppermost lateral bud with its subtending leaf scar on one side and the scar of the terminal bud often visible on the opposite side, as in *Castanea.*
Pubérulent, puberulous. Minutely pubescent, clothed with minute, soft, erect hairs.
Pubescent. Strictly, this means covered with soft, short, fine hairs; as commonly used, however, the term means hairy, bearing hairs, in a generalized sense, without reference to

Ramifying. Branching.
Ramose. With many branches.
Rank. 1) A vertical row—leaves that are two-ranked are in two vertical rows, and may be alternate or opposite; 2) in nomenclature, the position of a taxon in the taxonomic hierarchy.
Raphe. That portion of the funiculus of an ovule that is adnate to the integument, usually represented by a ridge, present in most anatropous ovules.
Raphide. A minute, needlelike crystal of calcium oxalate, as in the tuber of *Arisaema* and vegetative parts of many plants.
Ray. 1) A branch of an umbel or an umbel-like inflorescence; 2) a ray flower, or the corolla of a ray flower, or a circle of ray flowers.
Ray flower. A ligulate flower, with corolla flattened and straplike above a very short tube, in the Compositae. In many species, ray flowers are present on the margin of the flower head; in the tribe Cichorieae, ray flowers occupy the whole head.
Receptacle. The more or less enlarged or elongated end of the stem or flower axis on which some or all of the flower parts are borne; sometimes the receptacle is greatly expanded, as in the Compositae, where it bears many flowers. Also called *thalamus* and *torus.*
Reclinate, reclining. Bent down or falling back from the perpendicular.
Recurved. Curved downward or backward.
Reflexed. Abruptly recurved or bent downward or backward.
Regular. Actinomorphic.

Exhibit B

A TROPICAL GARDEN FLORA

PLANTS CULTIVATED IN THE HAWAIIAN ISLANDS AND OTHER TROPICAL PLACES

GEORGE W. STAPLES
DERRAL R. HERBST

assisted by Clyde T. Imada, Katie Anderson, and collaborators
botanical illustrations by Anna Stone

BISHOP MUSEUM
PRESS
Honolulu, Hawai'i
2005

Exhibit B (cont)

Key to *Araucaria*

1. Lvs broad (usu 0.3–0.6") and flat at all stages (2). ..... *A. bidwillii*
1. Lvs <0.3" wide, needle-shaped at juvenile stages, becoming flat later (3). ..... *A. angustifolia*
2(1). Lvs strongly variable in size by cycles; seed cone scale with expanded lateral wings ..... *A. columnaris*
2. Lvs not variable in size; seed cone scale without lateral wings ..... *A. cunninghamii*
3(1). Adult lvs nearly as wide as long, to at least 0.2" wide ..... *A. heterophylla*
3. Adult lvs more than 2× as long as wide, ca 0.05–0.1" wide (4).
4(3). Adult lvs sharply 4-angled, lanceolate, ending in needlelike point
4. Adult lvs broader than thick, linear-lanceolate, bluntly acute

Araucaria bidwillii J. D. Hooker, BUNYA-BUNYA

Tree 100–150' tall; mature **crown broad, rounded**, bran long, sweeping, apex bearing crowded, drooping branchlets. **Lvs all flat; juvenile lvs** scalelike to ovate-lanceolate on same bran, largest lvs usu 0.7–2" × 0.2–0.6", **apex needle-tipped; adult lvs** all alike on bran, triangular, **ca 0.6" long**, 0.4" wide, stiff. Pollen cone axillary, cylindrical, 2.4–8" × 0.4–0.6", scale apex a thickened, triangular process, usu >0.1" long and wide. **Seed cone** globose to ovoid, **10–12" × 8–11", sharp-spurred all over, seed scales** rounded, shieldlike, 4" × 3", **laterally winged**, apical spur linear, 0.6" long. Seeds ovoid, ca 2" × 1".

Araucaria bidwilli is native to coastal Queensland, Australia, where it grows in disturbed rainforest habitats; in addition, it is widely cultivated in tropical and warmer subtropical regions of the world. The edible seeds—the largest seeds of any conifer—are intensely appreciated by those who know them; they are shed from their supporting seed scales, unlike those of other araucarias, and mature in their third year. The massive seed cones may weigh as much as 10 pounds and can be a real hazard if they fall before breaking up.

It takes many years for a bunya-bunya to develop its broad, rounded, mature crown. The lower branches are eventually shed and replaced (if the tree is growing in the open) by a second set of shorter branches, which serve to form a "skirt" below the crown. The branchlets on younger trees and the lower branches of mature trees have reduced, almost scalelike leaves at their base and apex, and the leaves in the middle of the branchlet are larger, 2-ranked, and twisted to a horizontal plane. In contrast, the leaves on fertile shoots and on higher branches of mature trees have uniform leaves along the length of the branchlet.

Young bunya-bunya specimens are indistinguishable from *A. hunsteinii* K. Schumann, the klinki-pine of New Guinea, and older plants resemble the Chilean *A. araucana* (Molina) K. Koch, monkey-puzzle or Chilean-pine, both reported to be growing in Hawai'i. However, the leaves of klinki-pine later become long and uniform in size with an incurved tip, Chilean-pine never possesses irregularly twisted leaves, and both species have smaller seeds and other differences in the reproductive structures.

Araucaria bidwillii was introduced to the Hawaiian Islands in 1851 as part of a shipment of plants from the Botanic Gardens at Sydney, Australia, to the "King of the Sandwich Islands."[1010,1093] The seedlings were disseminated throughout the Islands; one of them, now a sizable tree, still grows in Foster Botanical Garden, Honolulu.[1093] Other exceptional specimens are located on the grounds of Kāne'ohe Ranch in windward O'ahu and at 'Ulupalakua Ranch, Maui.[1094] Large specimens can also be seen in many older estates, parks, and similar spacious areas. Seedlings of *A. bidwillii* are sometimes used as container plants to take advantage of their unusual foliage.

Araucaria columnaris (G. Forster) J. D. Hooker
[Syn.: *A. cookii* Endlicher, *A. excelsa* (Lambert) R. Brown; Misapplied: *A. heterophylla*], COLUMNAR-PINE, COOK-PINE

Columnar tree 100–200' tall, **often leaning. Juvenile lvs needle-shaped, spreading**, upward-curving, to 0.3" long, gradually broadening as tree grows; **adult lvs triangular, overlapping**, 0.2–0.3" long, **0.2–0.25" wide**, apex incurved, acute (not needle-tipped). Pollen cone terminal, cylindrical, ±tapering toward apex, 2–4" × 0.6–0.9", flexible; pollen scales widening to triangular apical portion 0.3–0.4" × 0.2". **Seed cone** globose or ovoid, 4–6" × 3–4", **spurs bent flat** against cone, seed scales 1.2–1.4" long, lateral wings broad, membranous, apical spur 0.3" long.

Cook-pine is native to the southern coasts of New Caledonia, the Loyalty Islands to the east (where it is the dominant tree), and the Isle of Pines. Dense colonies grow on raised coral reefs, resembling rock formations of columnar basalt when viewed from a distance. It is so widely planted by natives of New Caledonia—as often as the coconut—that it has become the "trademark" of that island. It does not naturalize away from the coastal coral, so isolated trees reliably mark abandoned settlements. Cook-pines do not thrive where frosts occur.

Young Cook-pines have a formal growth habit, with their primary branches arranged in whorls and clothed with 2 crowded rows of secondary branchlets toward their ends. Older trees eventually shed their lower branches and replace them with shorter ones, so the crown may take on the form of a wider cap atop a narrow cone, or, if the primary branches persist longer, of one cone superposed atop another. Seedlings are grown as container plants both indoors and out, and trees are planted in gardens where a bold, formal symmetry is desired. Rows of Cook-pines line many country roads in the Hawaiian Islands,[1094] and they make spectacular avenue plantings unless wind damage has broken branches off, resulting in a "telephone pole" effect that may last a few years until replacement branches grow back.[855] Single or multiple rows of trees are planted as windbreaks for macadamia nut orchards or vegetable and fruit crops.[1326]

Cook-pine is by far the most commonly planted araucaria in Hawai'i, but because young trees are indistinguishable from Norfolk Island-pine it has led to endless confusion in identification. Cook-pine is not familiar in cultivation outside Hawai'i, and even in Hawai'i young plants are usually mistaken for Norfolk Island-pine. Because of the lack of windstorms here, trees grown in Hawai'i tend not to shed their lower branches as they do in their native habitat, and the characteristic crown shape of wild trees—a dense green column widening abruptly near the apex of a narrow crown—does not develop here. One popular theory holds that many "Norfolk Island" pines in the Hawaiian Islands are of hybrid origin, but pollen of the two species is shed six months apart, making hybridization unlikely;[855] these purported hybrid trees are virtually all Cook-pines.