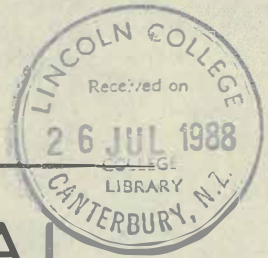


Lincoln College

CANTERBURY AGRICULTURAL COLLEGE



RURAL EDUCATION BULLETIN

Vol. 13, No. 10

November, 1958

	Page
CONIFERS - - - - -	166
LILIES - - - - -	181



UNIVERSITY OF NEW ZEALAND

CONIFERS

L. W. McCaskill

(Concluded.)

Abies. The firs

The wood of most of the species is soft, easily worked in reference to the tall, straight trunks of many species. *Abies* was the old Latin name for the silver fir. The members of this genus can readily be distinguished from all other conifers by the flat discs left on the twigs after the leaves fall and by the long, erect, candle-like cones which break up when the seeds are ripe. The cone scales are deciduous leaving the axis pointing up from the branches like pencils or fingers.

Young trees are pyramidal or cylindrical in outline with the branches in whorls, each whorl usually indicating one year of growth. In the open, the branches are retained right to the ground making the members of this genus popular as formal specimens for lawns in parks and large gardens. Young shoots usually have at the base the persistent bud-scales from the previous year. The winter buds are usually egg-shaped, always blunt and in threes at the ends of the branches.

The leaves are usually notched at the apex, flattened (occasionally four-angled) and marked on the under surface with two prominent bands of stomata. Bruised leaves in all species smell of turpentine. The leaves are long-lived, quite commonly lasting for seven years. The broad, rounded base indicates the size of the characteristic leaf-scar left when the leaf falls.

Male and female flowers are borne on the same tree. The pollen flowers consist of short catkins in the leaf axils on the lower side of the branchlets; when they drop they leave peculiar scars like galls. The female flowers are nearly always high up on the tree, upright, and composed of numerous bracts, each with a large scale having two ovules at the base. When ripe the long, slender pointed bract may extend beyond the scale and point downwards. The seeds have a broad wing about twice their length.

The wood of most of the species is soft, easily worked and suitable for joinery, interior finish in houses, and because of the absence of smell for all kinds of food containers. Treated with preservative, slender trees make good poles and piles. From the resin blisters on the bark an oleo-resin is obtained. Known usually as Canada balsam, it is used in high-class varnishes, for medicinal purposes and for mounting microscope specimens.

The true firs are not planted for timber in New Zealand but the following may be found in gardens.

1. *Abies balsamea*. Balsam fir.

The winter buds are completely coated with resin; the leaves are fragrant, especially when dried; the ripe cones are usually less than three inches long, with the bracts concealed by the cone scales. This tree is widely distributed in the United States and Canada. It is the main source of Canada balsam. This gum has long been used by American Indians and woodsmen as an air-tight and antiseptic cover for surface wounds. It was also used for caulking canoes. As Longfellow wrote:

"Give me your balm, O Fir Tree,
Of your balsam and your resin
So to close the seams together
That the water may not enter,
That the river may not wet me."

2. *A. cephalonica*. Greek fir.

The leaves are flattish, not usually at right angles to the branches, but pointing forwards. They are tipped with a pin-point prickle. Cones are up to seven inches long, with the protruding bracts small and reflexed. Its native home is the high country of Greece where it grows up to 5,700 feet. On Mount Enos in Cephalonia was a famous forest which gave the tree its specific name.

3. *A. concolor*. Colorado white fir.

The leaves are usually constricted and twisted at the base and more or less two-ranked. This is the common fir of the Rocky Mountains from Colorado south and of the Sierra Nevadas.

4. *A. firma*. Japanese fir.

The outermost twigs are grooved or wrinkled; the leaves are sharp-pointed and slightly split at the tip. The cones, up to five inches long, have the bracts protruding but small and not reflexed. Its rich glossy leaves make it attractive as a garden specimen. In Japan it is one of the principal woods used in making paper pulp.

5. *A. grandis*. Giant fir.

This tree has a wide range in north-west America. It was discovered by Douglas on the Columbia River in 1829. Specimens 300 feet in height are known. Leaves are up to an inch and a half long with the tips notched. Those on the top of the branchlets are much shorter.

6. *A. lasiocarpa* (hairy-fruited). Alpine fir.

This tree comes from the mountains of western North America. The leaves curl upwards around the branches and appear crowded at the top. The cones are downy; hence the specific name.

7. *A. magnifica*. Californian red fir.

The leaves have a slight ridge on both upper and lower surfaces. Those on the lower side of the shoot are arranged horizontally, those on the upper side curve upwards with their bases pressed against the shoot. They are greyish or glaucous-green. This tree comes from the mountains of California where it has been much used for bridge timbers, general construction and joinery.

The bark of fallen red firs is used for the fire-fall in Yosemite National Park in California. This is a bonfire which, when pushed off Glacier Point 3,000 feet above the valley floor, produces one of the most beautiful of man-made spectacles. Nightly in the summer, a pile of bark is lighted in the early evening. By nine o'clock it is reduced to a mass of red-hot flakes. These are pushed slowly over the edge of the cliff and flare up as they drop a thousand feet on to a ledge.

8. *A. nobilis*. Noble fir.

The leaves have a narrow but clearly-defined groove on the upper surface and a ridge on the under surface. The bracts between the cone scales are large and conspicuous.

9. *A. nordmanniana*. Caucasian fir.

The leaves on the lower side of the shoots are arranged horizontally, spreading obliquely forward, with those above shorter, directed forward and densely covering the shoot. The stomatal bands on the lower side are very conspicuous. The cones, which may be six inches long, are covered with resin; the bracts protrude slightly and have the long points reflexed.

10. *A. pindrow*. Himalayan fir.

This tree is easily identified by the large, resinous buds and the irregular arrangement of the bright-green, shining foliage. Its natural home is the 7,000-12,000 foot belt in the Himalayas, from Afghanistan to Nepal.

11. *A. pinsapo*. Spanish fir.

The leaves are thick, radiating out very nearly at right angles to the branches. The cones are up to five inches long with the bracts concealed by the scales. It grows naturally only in southern Spain and thrives on limestone soils.

Picea. The spruces

The name *Picea* comes from *pix*, pitch, in reference to the resin in the leaves and stems. Spruce comes from the German *sprossen*, a sprout, in allusion to the numerous short branchlets that are a characteristic of the tree. Spruces, like firs, tend to be symmetrical trees, with the main branches in circles around a mast-like bole.

Spruce cones are not erect, as are fir cones, but hang down from the tips of the branches. Young spruces, with-

out cones, are often confused with firs. A simple means of identification lies in the way the leaves are attached to the twigs. Spruce leaves are jointed to small "pegs" which project from the checkered bark of the twigs; when the leaves fall the pegs remain, giving a rough look and feel to the old twigs.

Spruce leaves are normally four-angled and sharp-pointed when compared with the flat, blunt leaves of firs. The thin bark of young spruces becomes scaly and rough and at no time does it show the conspicuous resin pockets which blister the pale, smooth bark of young firs.

The cones of spruces ripen during the first autumn. The scales are persistent and the cones remain hanging on the trees long after the seeds have been liberated. Bracts are present but are very small.

Spruce wood is soft, slightly resinous, easily worked and takes a satiny finish. It has been used for all kinds of carpentry, aircraft construction, pit props, sounding boards for violins and similar musical instruments, matches, fruit punnets and wood wool.

Trees of all species do not succeed in hot, dry climates or in the vicinity of smoky towns. In New Zealand, most spruces in the lowland areas die out because of the attacks of the spruce aphid and the generally unfavourable conditions. They do much better at high altitudes, especially where the rainfall is fairly high and well spread.

The following spruces are likely to be found in old plantations or in gardens.

1. *Picea excelsa* (lofty). Norway spruce. Common spruce.

The young shoots are a rich-tan in colour. The leaves on the upper side overlap and point forwards; those on the lower side spread right and left exposing the shoot. They end in a blunt, horny point. The pendulous cones may be six inches long. The margins of the cone scales are toothed at the tip.

Norway spruce is a native of Europe where it is widely distributed from east to west, and north to south. It has been cultivated in Britain since 1550.

Burgundy pitch is the purified resin from this tree and Swiss turpentine is distilled from the branchlets and leaves. In parts of Europe, spruce beer is a fermented liquor made from an extract of the leaves mixed with treacle. Young plants provide the traditional Christmas tree in all parts of Europe.

2. *P. pungens* (prickly). Colorado blue spruce.

Originally discovered on Pikes Peak in 1862, this is a native of Colorado, Utah, and New Mexico, which has

become a most popular garden tree. It may have to be sprayed to control aphid. The leaves are prickly, bluish or silvery-white, occasionally green. They are four-sided with a number of stomatal lines on each side. Only the glaucous type should be sold for garden purposes.

3. *P. sitchensis*. Sitka spruce. Tideland spruce.

This tree is a native of the coast of western North America and Alaska. It may reach a height of 200 feet. It may be distinguished by its flat leaves (unusual in spruces) with a blue-green colour, and the strong keel on the under surface. The cone scales have the margins slightly toothed as if they have been gnawed by a mouse. This wood is the most valuable of all the spruces and in the 1914-18 war provided most of the timber used in the construction of British aeroplanes.

4. *P. smithiana*. Himalayan spruce.

The leaves are very slender, incurved, pointing forwards, spreading quite evenly round the branchlets, which are pendulous. It grows in association with *Abies pindrow* in the Himalayas where it is in demand for matches and for paper pulp.

Its weeping habit makes it a handsome specimen tree for large gardens.

Tsuga. Hemlock or hemlock spruce

Tsuga, pronounced soonga, is the Japanese name for the species native to that country.

The airy, lacy gracefulness of hemlocks places them among the loveliest of conifers for ornamental planting. The combination of brown "pegs" and green petioles and the small, papery cones most readily distinguishes them from firs, spruces, and Douglas fir. Although there are ten species from America, Japan, China, Formosa, and the Himalayas, only two American species are grown in New Zealand and then only in parks or large gardens. They are trees which could be used more widely for shelter and ornament.

The leaves are abruptly narrowed at the base into a green petiole jointed to a brown, beadlike peg. They are short (less than one inch long), somewhat flattened, and with a blunt tip. The branches grow out from the trunk at irregular intervals and are usually slender and gracefully drooping. The cones are solitary, small and pendulous, ripening in the first year but remaining on the tree for another year after the seeds have dropped. The two species listed are identified by the fact that, in the first, the cones have a short stalk, in the second they are stalkless.

1. *Tsuga canadensis*. Eastern hemlock.

This is a native of eastern Canada and the United States and was first introduced to Europe in 1736. Since then it has been widely planted there as an ornamental tree. The wood is soft and is used for poles, sleepers, building, boxes and paper pulp.

This is the tree referred to by Longfellow in *Evangeline*.

2. *T. heterophylla*. Western hemlock.

This is a native of Western America from Oregon to Alaska. It is a tall, stately tree of pyramidal habit, growing in good conditions to a height of 250 feet.

The wood is hard, tough, durable and widely used for carpentry, shingles, building, railway sleepers and paper pulp. The ease with which western hemlock reproduces on cut-over lands kept free of fire together with the rapid growth are making the tree the most important one in the Pacific north-west, for paper pulp. The bark is very rich in tannin and this tree supplies most of the needs of the tanning industry in America. An unusual use of the inner bark was a kind of "bread" made by the Indians in times of food scarcity. The roots are so tough that they were used to make fish hooks.

Pseudotsuga. Douglas firs

The name really means false tsuga, and that is false hemlock, but the six species known are usually grouped under the name of Douglas fir. Unfortunately the name fir is a misnomer as they are quite different from the true firs. Only one species is grown in New Zealand.

1. *Pseudotsuga taxifolia* (yew-leaved). Douglas "fir."
Oregon "pine."

This tree was first discovered by Dr. Archibald Menzies in 1791, on the west coast of Vancouver Island. It was later rediscovered by the Scottish traveller, David Douglas, who introduced it to Britain in 1827. To commemorate the work for America of this explorer-botanist, the United States Forest Service recognise only the one common name, Douglas fir. This tree covers vast areas in the coastal regions of British Columbia, Washington, Oregon, and northern California. The finest trees occur where there is a well-drained soil and a rainfall of 50 to 60 inches.

The typical form of young trees is a broad, sharp pyramid; the lower branches are straight or drooping and the middle and upper ones tend to grow upwards. All of the branches have numerous hanging side-branchlets which make the tree so efficient for shelter. Young trees have smooth, ashy-brown bark dotted with resin blisters. If

punctured these exude a clear, pleasant-smelling gum. In older trees the bark thickens and becomes rough with deep, wide furrows and ridges.

The soft, flattened, slightly-pointed needles are half an inch to an inch and a half long and grow round the branch in several rows. They are grooved on the upper side and have two stomatal bands below. They are fragrant if crushed. When pulled off they leave an oval scar on top of a little projection. Leaves normally remain on the trees for five to eight years. The resin contained in them is claimed to make an excellent tonic for lambs. The tip bud is an important identification character; it is dark orange-red, pointed, and up to half an inch long. Side buds are only half that length.

Female flowers are conical, composed of numerous, overlapping, rounded scales; they are upright. After fertilisation the cones bend gradually and hang downwards. The most striking point about the cone is the three-pointed bract which protrudes from between the ordinary cone-scales. There are two seeds on each scale, winged and dull russet-brown in colour with patches of white.

Excepting the Sequoias, Douglas fir is the largest conifer. The greatest height recorded is 380 feet which equals that of the redwood, while trees have produced as much as 60,000 board feet of timber. One tree reached a diameter of 17 feet. Most of the world's biggest flagpoles are made of Douglas fir. The one at the San Francisco Exposition in 1939 measured 299 feet 7 inches. (Even the Americans could not stretch it the extra five inches). The flagpole in Kew Gardens in London is 214 feet high, 2 feet 9 inches through at the base and 12 inches through at the top.

The wood varies with the age of the tree and the rate of growth. It is usually yellowish to light-red with a narrow band of white sapwood. It is fairly light and easy to work. No other timber is so much used for the production of long beams for structural purposes such as wide roofs. It is much used in America for wooden tanks, silos, and pipes. Timber from old trees is ideal for flooring, walls, doors and furniture. During the 1914-18 war when ships had to be built in hundreds to replace those lost by submarine attack, Douglas fir saved the day. At the same time when spruce was in short supply, Douglas fir proved useful in aeroplane construction.

Where the rainfall is 30 inches or more, Douglas fir will thrive in New Zealand, except on the lightest soils. It will prove satisfactory as a lawn specimen, as shelter

or as a plantation tree in the farm wood-lot. In fact with reasonable conditions it is the best evergreen tree yet introduced into New Zealand for shelter and timber.

ARAUCARIACEAE

Araucaria. The monkey-puzzles

The word *Araucaria* comes from *Araucanos* the name of a tribe of Indians in Chile in the area where the monkey puzzle grows naturally. All members of the family are natives of the Southern Hemisphere, Chile, Australia, New Guinea, New Caledonia and Norfolk Island.

The bark is resinous and ridged with the bases of old leaves or in some cases peeling off in papery scales. Branches are horizontal, usually in whorls which give some idea of the age of a tree. The leaves which persist almost indefinitely are spirally arranged. They clasp the stem and overlap but may, by twisting at the base, be thrown into two ranks. They are wide and flat, up to two inches long, leathery, and sharp-pointed; or awl-shaped and four-angled or triangular, varying in size and shape on different branches of the same tree.

The cones take two or three years to ripen, are large, and consist of woody, closely-overlapping scales which fall when the seeds are mature. The seeds are one on each scale and adhere to it.

1. *Araucaria araucana* (Previously *A. imbricata*).
Monkey puzzle.

The leaves are lance-shaped, varying little in length, stiffly and closely spiralled around the snake-like branches. The branchlets are opposite to each other with the pairs spaced far apart.

This tree grows naturally in Chile, Tierra del Fuego and Patagonia; in no case are there monkeys living in the wild state, so the common name is quite imaginative.

It was introduced to Britain about 1800 by Dr. Menzies. The seeds are large and tasty and are eaten at dinners in Chile as we eat nuts. It is said that Dr. Menzies, while being entertained to dinner by the Viceroy of Chile, slipped a few seeds down his shirt front. Dr. Menzies germinated the seeds on the ship and landed home with living plants. The first tree planted at Kew lived until 1892. This tree has been widely used for garden planting even in New Zealand, but is a most unsuitable plant for all but the largest gardens. In Chile the timber is highly valued for masts, indoor carpentry, boxes and paper pulp.

2. *A. excelsa* (lofty). Norfolk Island pine.

This tree is found naturally only on Norfolk Island where it may reach a height of 200 feet. The leaves are

of two kinds. In the juveniles they are soft, awl-like, incurved, and bright green, up to half an inch long; on older shoots they are shorter, dense and overlapping. This tree is ideal for ornamental, coastal planting in New Zealand where frosts are not severe.

3. *A. bidwillii*. Bunya-bunya.

This is a native of the coastal areas of Queensland and is occasionally grown in parks in New Zealand. The leaves are lance-shaped and flat and vary in length from half an inch to three inches. The branchlets are gracefully crowded around the branches, especially towards the outer ends. The ripe cones are as large as a man's head and as spiny as a pineapple. The large seeds are edible, very nutritious, and an important article of diet of Australian aborigines who have had a large forest in Queensland specially reserved for their use.

Agathis. The kauris

The name is from the Greek *agathis*, a ball of thread, in reference to the shape of the cones.

These are tall, evergreen, resinous trees with massive columnar trunks, natives of New Zealand, Australia, New Caledonia, Fiji, Phillipine Islands and Malaya. The common name of members of the genus comes from the one New Zealand species.

Agathis australis (southern). Kauri.

The discovery of the kauri was due to the expedition of Marion du Fresne. In 1772 he entered the Bay of Islands to get some new spars for one of his vessels. When looking for suitable timber he discovered "a kind of cedar with the leaves of an olive and with elastic wood, making it very suitable for ship's masts". (The sequel to his establishment of a shipyard at the Bay was the massacre of du Fresne and 25 men and the destruction of the local Maori pa by Lieutenant Crozet).

Like so many New Zealand trees, the kauri in the young stage differs markedly from the adult. It has a narrow, conical outline. As the tree grows, the lower branches, which are arranged symmetrically round the trunk, are cast off; but it is only by very slow degrees that the bushy-topped, bare trunk of the adult is developed. The leaves of the young plant are longer and narrower than those of the adult, but otherwise are somewhat similar. The male or pollen flowers are produced in the axils of the leaves; the female or cone flowers develop at the end of short branchlets. When ripe, the scales to which are appressed the single, winged seeds fall off. The whole cone just falls to pieces liberating the seeds in the process.

Every part of the kauri is filled with a transparent turpentine which flows freely from the slightest wound and hardens in the air. In the forks of big trees, large lumps of this fresh gum are collected by expert climbers. The main kauri gum, which was formerly an important article of commerce, was dug out of the ground. It was found buried at various depths on the sites of forests which existed thousands of years ago.

In spite of the destruction of most of the kauri forests, there are still a few reserves in north Auckland where we can see them in all their magnificence. Massive boles, usually from three to eight feet in diameter, rear their scarcely-tapering steel-grey columns 60 to 80 feet without a branch. Then the great branches, gnarled and far-spreading, bear aloft the mighty crowns which form the forest roof. If, after seeing this, we visited an area after the mill had been through we could appreciate Colenso's remark:

"There are few sights more impressive of grandeur than an untouched forest of this stately tree; few more impressive of misery and devastation than a worked out and abandoned one."

The largest known kauri was one at Mercury Bay. Make a circle 24 feet in diameter and imagine a column rising up from that circle 80 feet to the first branch. That tree was too large for any mill to handle and was unfortunately burned by gum-diggers clearing the surrounding country for digging.

The durability of the kauri timber exceeds that of most conifers. As a building material it stands unrivalled among timbers. It is clean, fine and straight in the grain and planes well, often with a satiny finish. It will also take a good polish. For interior fittings and all classes of joinery no better wood is known but it is now becoming so scarce that it is used only for special purposes.

Although in a natural state, kauri grows only north of a line from Kawhia to Tauranga, it is quite amenable to cultivation and is growing in gardens in the far south of New Zealand. Where frosts are severe, young plants should have the crowns protected in the winter for the first year or two.

TAXODIACEAE

The Redwood family

This is only a small family but it has some very important members in the eight genera, none of them having more than three species. The leaves are arranged spirally

around the branches but sometimes they spread to left and right in two ranks because of a twist at the base of the leaf. In all cases the base of the leaf extends down the twig and becomes a green part of it; it hugs it so tightly, in fact, that the leaf rarely parts from the twig. When the twigs, which are eventually deciduous fall, they carry with them all their leaves, dead and brown. The leaves on permanent branches finally wear off.

For trees that grow so large, the cones are absurdly small. The scales of the cones, always more than 14, are arranged in a close spiral. (Certain cones suggest cypress cones because the scales are somewhat mushroom-shaped, but cypress cone-scales are never more than 14 in number and are always opposite each other).

Taxodium. Swamp "cypresses"

1. *Taxodium distichum*. Swamp cypress.

The leaves together with the short, side branchlets are deciduous in autumn. They are soft and feathery, usually less than one inch long and light green on both surfaces. The bark of the trunk is grey or cinnamon-brown, thin and shreddy. The ripe cones are almost globular with only two seeds to each scale. Its native habitat is the swamps of southern United States where it develops characteristic "knees" arising from the roots and projecting above the water. It is being increasingly planted in New Zealand on the margins of ponds and streams as an ornamental tree, valued for its soft, green foliage in the spring, gradually yellowing during the summer and turning to a rich brown before leaf fall in late autumn. This tree was described further in Rural Education Bulletin, Vol 13, No. 4, May, 1958.

Cryptomeria. Japanese "cedar"

The word comes from *kruptos*, hidden and *meris*, part; the structure of all the parts of the flower are not readily seen.

1. *Cryptomeria japonica* (Japanese). Japanese cedar.

There are many garden forms but the type, which grows to a large tree, is identified by the reddish-brown bark peeling off in long shreds, and by the distinctive leaves which are spirally arranged in five ranks, directed forwards and curved inwards, and laterally compressed. The cones, which are not quite round, persist long after the seeds are shed. The numerous cone-scales are wedge-shaped, enlarging above into a disc with a recurved spike in the middle and from three to five rigid processes on the upper margin. The growing shoot is sometimes prolonged from the apex of the cone.

This tree is a native of China and of Japan. It is one of the most important timbers in Japan being used for building, panelling, joinery and boxes. The bark is carefully stripped from milled trees and used in roofing buildings. It forms 30 per cent. of all the Japanese forests, but is probably best known to travellers by the world's grandest tree memorial. This is an avenue forty miles long, planted at the beginning of the seventeenth century by a poor peasant so that visitors to a tomb should be protected from the heat of the sun. The avenue is kept intact by replacing any trees that fall.

2. *C. j. var. elegans.*

This is widely grown in gardens under the botanical name of *Cryptomeria elegans*. The juvenile foliage is retained permanently. It is very soft, bright green in summer, changing to reddish-bronze in the autumn and back to green again in the spring. Cones are rarely produced and it is propagated by cuttings.

Sequoia. The big trees

The word comes from Sequoyah, the name of a half-breed French-Cherokee Indian who put his native language to writing in an alphabet of 86 characters.

These trees reach gigantic proportions both in height and thickness. Both species are commonly grown in New Zealand.

1. *Sequoia gigantea.* Big tree. Sierra redwood. Wellingtonia. (An alternative botanical name is *Sequoia wellingtonia*, after the Duke of Wellington, who was Prime Minister of England when the tree was discovered).

This tree inhabits the western slopes of the Sierra Nevada in California at altitudes of 4,300 to 8,000 feet. Some of the largest trees are believed to be 4,000 years old.

The bark in old trees is up to two feet thick, deeply-furrowed, fibrous, soft and rich brown in colour. The leaves are spirally arranged, lance-shaped, the flat base adhering to the branch, the tip long and sharp-pointed with stomata on both surfaces. The cones develop on the tips of the branchlets. They are up to three inches long and half that in width, egg-shaped, with 35 to 40 scales and numerous flat, thin seeds with a narrow wing on the margin.

The cone appears to be absurdly small for such a great trunk and yet in each minute seed is the embryo of a tree which may grow into another General Sherman, the name of a giant tree in the national park of that name. It has a base diameter of 36 feet, a height of 272 feet and a volume of 600,000 board feet, sufficient to build 40 houses or a box large enough to enclose the Queen Elizabeth.

The wood of a big tree is light and very durable and would have many uses if undamaged timber could be obtained. When a big tree falls, the weight is so great and the wood is so brittle that much of the trunk is shattered to pieces. For this reason milling has ceased in California and most of the remaining trees are reserved in parks. Good timber has been grown in New Zealand; because of the smaller size when they are cut there have been no milling difficulties. The main use of the tree in New Zealand is as lawn specimens in parks and gardens.

2. *S. sempervirens* (everliving). Redwood. Coast redwood.

This tree grows only in the coastal regions of California. The tallest standing tree there is the famous "Founder's Tree" in Humboldt County. It is 364 feet high and 15 feet in diameter at the base.

The sharply-pointed, flat, deep yellow-green leaves of the lower branches and saplings stand out stiffly on opposite sides of the twigs and vary from one third of an inch to an inch in length. Tiny male and female flowers occur on different branchlets of the same tree. The flower buds form in the autumn near the ends of the previous year's shoots. The cones are dull purplish-brown, up to an inch long and half as broad with 14 to 24 cone scales. Under each cone scale are four or five small russet-brown seeds, each with a small marginal wing. Bark on old trees may be up to 12 inches thick and deeply furrowed. It is a dull red in colour and is extremely difficult to burn.

Redwood is named for the soft straight-grained, moderately strong heartwood, which varies in colour from a light cherry to a dark mahogany. The sapwood is almost white. The timber is easy to work, shrinks and swells very little, takes paint well and is very resistant to decay and to the attacks of insects. The timber is cut into all classes of timber for houses and general construction. As many as 22 five-roomed houses have been built from one tree. It is also used for railway sleepers, bridge timber, tanks, flumes, silos, beehives, street paving, posts, shingles and furniture. The millions of stakes used annually for grapevines in California are mainly of redwood.

Redwood is being grown successfully for timber in New Zealand. It should have a free subsoil, some shelter from strong winds, and a rainfall of at least 30 inches. Specimen trees in this country have reached a height of 100 feet and a girth of nine feet in less than 50 years.

Redwood is unique among conifers in its prolific reproduction by stump sprouts and root suckers. The original tree may be felled but for years the stump will continue

to send out suckers which make very rapid growth. Living trees in a lawn may also send up these shoots which may be used in propagating.

Metasequoia. The dawn redwood

In addition to the two species of *Sequoia* mentioned above, there have been other species described from fossil material found in North America and Asia. Further material and additional study showed that the fossils were really very different from *Sequoia* and in 1941 a Japanese botanist founded the fossil genus *Metasequoia* to accommodate them. Only four years after the genus was founded, living trees were found in China.

1. *Metasequoia glyptostroboides*. Dawn redwood.

The specific name is coined from *Glyptostrobus* a genus of conifers with similar leafy branchlets and *oides*, like.

This exciting new discovery was made by Mr T. Wang in 1945 in north-eastern Szechuan, very close to the Hupeh border in China. Originally only a few trees were found but subsequent expeditions found more than a thousand specimens of the new plant. The valley where most of the trees grow takes its name from the local name of the tree, Shui-sa, from shui, water and sa, fir or spruce. It grows best beside streams or elsewhere in moist soil, rarely above 4,000 feet. Seed was sent to the Arnold Arboretum at Boston, U.S.A. in 1948 and germinated well. Most of the trees in cultivation have descended from these plants by cuttings.

This new "living fossil" (*Ginkgo* is the old one), was a common tree 130,000,000 years ago. It reaches a height of at least 115 feet with a diameter of about eight feet. Like *Larix*, larch; *Pseudo-larix*, false-larch; and *Taxodium*, swamp cypress, all previously described, the leaves are deciduous in autumn and the tree is leafless during the winter. In the winter it looks something like a swamp cypress; in the summer the leaves suggest both California redwood and swamp cypress.

Dawn redwood is now available from nurserymen in New Zealand. It grows very rapidly in gardens and is quite the fastest of all our conifers.

CONIFERS FOR GARDENS

(Chosen for small stature or decorative value in young stages.
 Strong — need ample space or replacing in five to six years.
 Moderate — will grow too big in 15 to 20 years.
 Slow — small enough to be left to reach maturity).

Name	Common Name	Growth	Garden value
<i>Chamaecyparis lawsoniana</i> var. <i>allumii</i>	Lawson's cypress	Mod/strong	Erect, bright green

var. <i>ellwoodii</i>		Slow/mod.	Erect, compact, dark green
„ <i>fletcheri</i>		Moderate	Erect, blue-green “fluffy” foliage
„ <i>lutea</i>		Mod/strong	Conical, yellow- gold
„ <i>minima</i>		Slow	Rounded, dwarf, dark green
„ <i>pottenii</i>		Moderate	Columnar
„ <i>stewartii</i>		Mod/strong	Conical, golden
„ <i>Triomphe de Boskoop</i>		Mod/strong	Open, conical, blue
<i>Chamaecyparis obtusa</i>	Hinoki cypress		
var. <i>crippsii</i>		Moderate	Golden
„ <i>nana</i>		Slow/mod.	Dark green
„ <i>nana aurea</i>		Slow/mod.	Golden tips
<i>Chamaecyparis pisifera</i>	Sawara cypress		
var. <i>filifera</i>		Slow/mod.	Broadly conical, weeping, thread-like branchlets
„ <i>filifera aurea</i>		Slow/mod.	Golden Bronzy-green fluffy foliage
„ <i>plumosa</i>	Retinospora	Moderate	Young growth golden
„ <i>plumosa aurea</i>		Moderate	
„ <i>squarrosa sulphurea</i>		Slow/mod.	Golden-green, fluffy foliage
<i>Cryptomeria japonica</i>	Japanese cedar		
var. <i>elegans</i>		Mod/strong	Green to bronze in summer reddish-brown in winter
<i>Cupressus sempervirens</i>	Italian cypress		
var. <i>stricta</i>		Mod/strong	Columnar, dark green
<i>Juniperus chinensis</i>	Chinese juniper		
var. <i>aurea</i>		Slow	Prostrate, golden
<i>Juniperus communis</i>	Common juniper		
var. <i>compressa</i>		Very slow	Columnar, com- pact
„ <i>horizontalis</i>		Slow	Prostrate, grey- green
<i>Juniperus recurva</i>	Drooping juniper		
var. <i>coxii</i>		Moderate	Weeping, grass- green
<i>Juniperus sabina</i>	Savin		
var. <i>tamarisci- folia</i>		Slow/mod.	Wider than tall, dark green
<i>Juniperus squamata</i>	Scaly-leaved juniper		
var. <i>meyeri</i>	Blue juniper	Slow/mod.	Wider than tall, blue

<i>Taxus</i>	Yew		
<i>baccata</i>			
var. <i>aurea</i>	Golden yew	Moderate	Rounded, golden
„ <i>fastigiata</i>	Irish yew	Moderate	Erect, dark green
„ <i>fastigiata</i>			
<i>aurea</i>	Golden Irish yew	Moderate	Golden yellow
<i>Thuja</i>	American		
<i>occidentalis</i>	arbor-vitae		
var. <i>rheingold</i>		Slow/mod.	Rounded, bronzy-golden “fan” foliage
<i>Thuja</i>	Chinese		
<i>orientalis</i>	arbor-vitae		
var. <i>aurea</i>		Moderate	Erect, golden, fan-foliage

WHAT IS A LILY?

S. Challenger, Lecturer in Horticulture

Lilies are amongst the most beautiful flowers in the world, their beauty being almost a byword. Was it not said of them that “Solomon in all his glory was not arrayed like one of these”? There is small wonder, then, that the name “Lily” has been applied to many plants whose beauty was to be emphasized, even though they were strictly not entitled to the name.

True lilies may be quite easily distinguished from other plants but all their distinguishing features must be present for a plant to be a true lily. Many plants have one or other of the lily features if they are taken individually.

True lilies are bulbous, but the bulb consists of scales which overlap like the slates on a roof, and thus is easily distinguished from other bulbous plants such as Daffodil which have a single enveloping coat. The flower stem which arises each year from the perennial bulb is leafy, and basal leaves are usually absent so that all the leaves are carried on the flower stem. The leaves are parallel veined and are flat, not rolled when young. A terminal flower or an inflorescence of flowers is borne on the flower stem, each flower having an individual stalk joining it to the main stem. The flower parts are in threes—six flower segments, six stamens with large anthers, the filaments often loosely attached to the segments, and a three-celled superior ovary, with six vertical rows of seeds. The flowers may be upward facing, horizontal or nodding, and the botanical division of the *Lilium* genus is based upon this characteristic. The ovary develops into a capsule which splits when ripe into the three carpels from which it was formed, releasing the thin, papery seeds.

True lilies occur wild only in Europe, Asia and North America, but most of the species grown in New Zealand come from Europe and Eastern Asia, especially China, Japan and Korea. The North American species are very difficult to cultivate successfully. There are at least ninety species and hundreds of hybrids, however, so that a selection of reliable species may be readily made. The New Zealand climate is very suited to lily cultivation. Reliable species, which may be planted with every expectation of flower for several years at least include the following, all reasonably cheap to purchase.

The Trumpet group, with horizontal flowers and a trumpet shape are usually white or white with pink to reddish markings and include *L. candidum* — the Madonna lily, which is one of the oldest lilies in cultivation, *L. regale*, one of the most recently introduced species, only discovered in Western China in 1903, *L. longiflorum*, and *L. formosianum*. They flower in sequence as listed, starting in December and finishing with *L. formosianum*, the latest of all lilies, in March.

The Upright-flowered group, which are very suitable for planting towards the front of a shrub border or amongst herbaceous plants are short, with flowers that look at you, and usually orange or reddish in colour, and black spotted. The typical group of hybrids, *L. x umbellatum*, are good garden plants, flowering in November.

The Turkscap group, with nodding flowers and reflexed segments is a large group, usually taller in habit, and again usually with orange or reddish flowers. The European *L. martagon* has white, red and purple variants. The other recommended species are all asiatic, and stem-rooting—i.e., they form roots from the stem above the bulb, and should therefore be more deeply planted. *L. davidi*, and its variety *willmottiae*, *L. x 'Maxwill'*, *L. tigrinum*—the common Tiger lily, which next to *L. candidum* has probably been longest in cultivation, and *L. henryi* are all excellent plants, and they flower in order as given, from December with *L. martagon* to late February with *L. henryi*.

The Auratum group, including *L. auratum* and *L. speciosum*, have rather flat, horizontally-placed flowers, and are not quite so easy to cultivate, being less persistent in the garden. Nevertheless, they have most beautiful flowers. *L. auratum*, the "Golden-ray lily" of Japan has been much crossed with *L. speciosum* to give some fine hybrids, some with dark cherry-red marking on a white base.

Lilies may be raised from seed fairly readily, although only species will come true of course. Seed sown as soon

as ripe will germinate the following spring and usually flower in two to three years. They like a cool, moist soil with plenty of leaf-mould to obtain the best results.

"Scaling" is also a method easily practised. The outer scales are removed from the bulb just as the flower fades. Replant the parent bulb at once. The scales are placed in a seed box and covered with compost, kept moist (not wet), and warm. Each parent scale will produce one or two bulbs fit to transplant to nursery rows by the following spring.

"LILIES" WHICH ARE NOT TRUE LILIES

N.Z. NATIVES:

Common Name	Genus	Family
Palm Lily	<i>Cordyline</i>	Liliaceae
Cabbage Tree Lily	"	"
N.Z. Flax Lily	<i>Phormium</i>	"
Grass Lily	<i>Herpolirion</i>	"
Swamp Lily	<i>Bulbinella</i>	"
Rock Lily	<i>Arthropodium</i>	"
Renga Lily	"	"
Flax Lily	<i>Dianella</i>	"
Chatham Island Lily	<i>Myosotidium</i>	Boraginaceae
Mountain Lily	<i>Ranunculus lyallii</i>	Ranunculaceae
Shepherd's Lily	"	"
Mount Cook Lily	"	"

OTHERS:

Lily of the Valley	<i>Convallaria</i>	Liliaceae
African Blue Lily	<i>Agapanthus</i>	"
St. Bernard's Lily	<i>Anthericum</i>	"
Brodie's Lily	<i>Brodiaea</i>	"
Torch Lily	<i>Kniphofia</i>	"
Corfu Lily	<i>Hosta</i>	"
Plantain Lily	"	"
Cuban Lily	<i>Scilla peruviana</i>	"
Day Lily	<i>Hemerocallis</i>	"
Spire Lily	<i>Galtonia</i>	"
Climbing Lily	<i>Gloriosa</i>	"
Toad Lily	<i>Tricyrtis</i>	"
Leopard Lily	<i>Lachenalia</i>	"
St. Bruno's Lily.	<i>Paradisea</i>	"
Persian Lily	<i>Fritillaria persica</i>	"
Wood Lily	<i>Trillium</i>	"
Wand Lily	<i>Chamaelirium</i>	"
Trout Lily	<i>Erythronium</i>	"
Herb Lily	<i>Alstroemeria</i>	Amaryllidaceae
Belladonna Lily	<i>Amaryllis</i>	"

Amazon Lily	<i>Eucharis</i>	Amaryllidaceae	
Barbados Lily	<i>Hippeastrum</i>	"	
Knights Star Lily	"	"	
Mexican Lily	"	"	
Moreton Bay Lily	<i>Eurycles</i>	"	
Brisbane Lily	"	"	
Cape Lily	<i>Crinum longifolium</i>	"	
Chinese Sacred Lily	<i>Narcissus tazetta</i>	"	
Natal Lily	<i>Clivia</i>	"	
Kaffir Lily	"	"	
Thong Lily	"	"	
Golden Spider Lily	<i>Lycoris</i>	"	
Guernsey Lily	<i>Nerine</i>	"	
Ixia Lily	<i>Ixiolirion</i>	"	
Jacobean Lily	<i>Sprekelia</i>	"	
Mediterranean Lily	<i>Pancreatium</i>	"	
Mexican Lily	<i>Furcraea</i>	"	
Lent Lily	<i>Narcissus</i>	"	
Atamasco Lily	<i>Zephyranthes</i>	"	
Queen Lily	<i>Phaedranassa</i>	"	
Royal Brunswick Lily	<i>Brunsvigia</i>	"	
Scarborough Lily	<i>Valotta</i>	"	
Australian Giant Lily	<i>Doryanthes</i>	"	
Spear Lily	"	"	
Bugle Lily	<i>Watsonia</i>	Iridaceae	
Kaffir Lily	<i>Schizostylis</i>	"	
Sward Lily	<i>Gladiolus</i>	"	
African Corn Lily	<i>Ixia</i>	"	
Toad-cup Lily	<i>Neomarica</i>	"	
Rush Lily	<i>Sisyrinchium</i>	"	
Arum Lily	<i>Zantedeschia</i>	Araceae	
Calla Lily	"	"	
Egyptian Lily	"	"	
Lily of the Nile	"	"	
Water Lily	{ <i>Nelumbium</i>	Nymphaeaceae	
			<i>Nuphar</i>
			<i>Victoria</i>
			<i>Nymphaea</i>
Lily Tree	<i>Magnolia denudata</i>	Magnoliaceae	
Lily Thorn	<i>Catesbaea</i>	Rubiaceae	
Fairy Water Lily	<i>Limnanthemum</i>	Gentianaceae	

The Bulletin is issued on the first of each month from February to November. The annual subscription is five shillings, post free, or four shillings for two or more copies. Correspondence should be addressed to: The Editor, Rural Education Bulletin, Lincoln College, Christchurch. Cheques and other Orders should be made payable to Canterbury Agricultural College.