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CALENDAR OF FORTHCOMING EVENTS

Deadline for next issue: July 26, 2006

2006

May 16 Tue * General Meeting (Joe Sherrard - the Ord Irrigation Area)
 July 4 Tue Executive Committee Meeting
 Aug 15 Tue * WANATCA General Meeting
 Aug 29-31 * Dowerin Field Days
 Nov 21 Tue * WANATCA General Meeting

*General Meetings are held starting at 7:30 pm. Venue: *As noted in each case.*
 These meetings usually include a display of current world tree-crop magazines offered free.
 • Event with WANATCA participation; § Refer to news item in this issue of Quandong.
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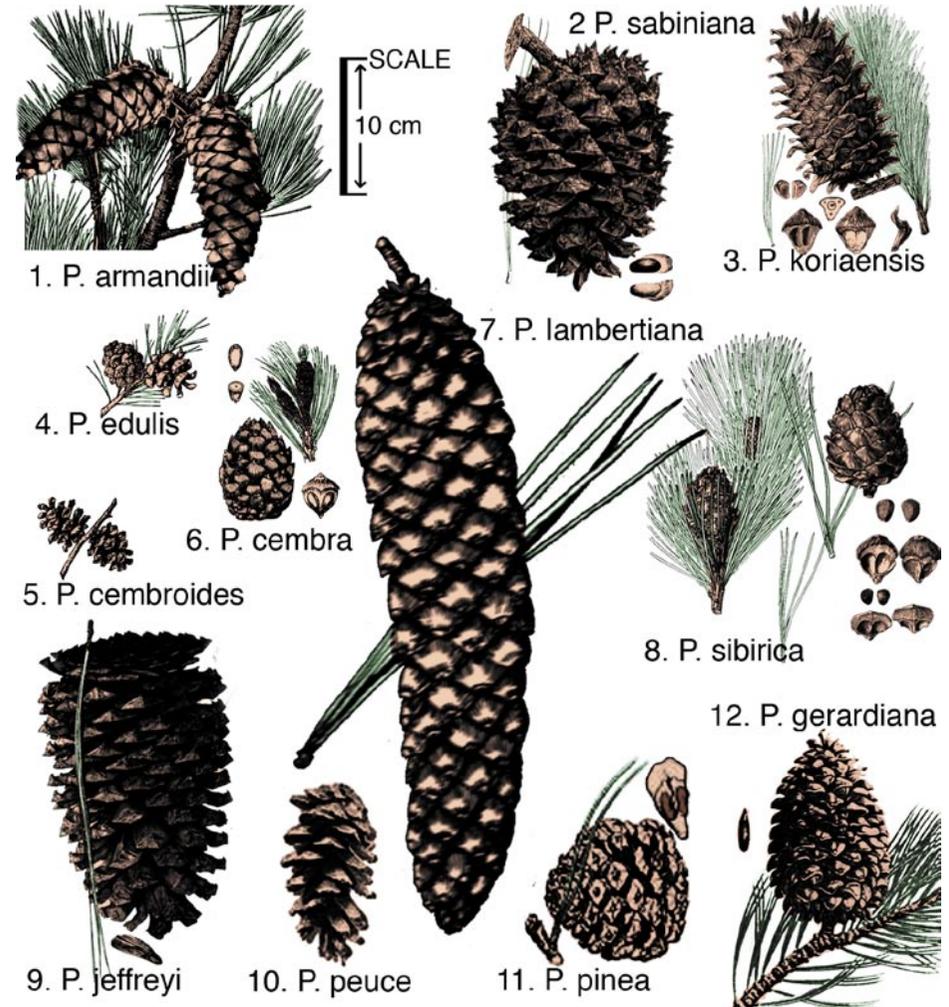


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Pines (*Pinus* spp.) with edible nuts. (See: About the Cover, p. 2)

**DON'T MISS THE NEXT WANATCA GENERAL MEETING:
7:30 pm, Tuesday May 16, 2006**

At our next meeting, we are fortunate to have Dr Joe Sherrard, Manager for Research and Development of Intensive Plant Industries with the Department of Agriculture and Food Western Australia, who will speak to us on:

The Ord Irrigation Area - a long road to success

He will speak about the evolution of cropping in the area, as well as the history of its development, from the construction of the Diversion and Lake Argyle Dams, commencing in the 1960's, and also discuss the proposed Ord Stage 2 development and the opportunities it will provide for expansion of irrigated cropping.

This meeting is at Kings Park Headquarters as usual. It's a unique opportunity to find out more about this interesting topic.

Late enquiries to 9250 1888 please.

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About the Cover

Many pine trees have edible nuts. The trees themselves grow in a wide range of conditions - there is probably a suitable species to plant at any location. The drawings are from several sources, including the U.S.D.A. Forest Service Collection and www.efloras.org/, Flora of China.

See articles about pines and pine nuts on pages 11 and 14.

Material appearing in Quandong is the views of the authors. It is offered in good faith, but neither WANATCA nor Quandong take any responsibility for any use of this material.

[http://www.agritechsmartwater.com.au/about_us/index.html]

[<http://www.warwickhughes.com/agri/AgriOverview.pdf>]

Notes from the meeting: Peter Coyne, speaking on salinity and water

There are two major crises in WA: salinity and water supply. If we can solve salinity, the fresh water problem is solved. Peter Coyne runs two companies with complementary projects, with the idea and aim of correcting salinity in the Wheatbelt, and the restoration of vast tracts of salt-affected land, rivers, streams and lakes as well as providing fresh water and generating electricity in a greenhouse-friendly way.

Agritech Smartwater was specifically established to provide low cost and innovative solutions for the current water crisis, and to meet the State's future water demands.

The scourge of salinity in the Wheatbelt arose from the early requirement that farmers clear the land. The ancient salt that was present in the soil is carried to the surface by rising water tables. The excess salinity first becomes apparent in the valley floors, and expands up the slope in wet years.

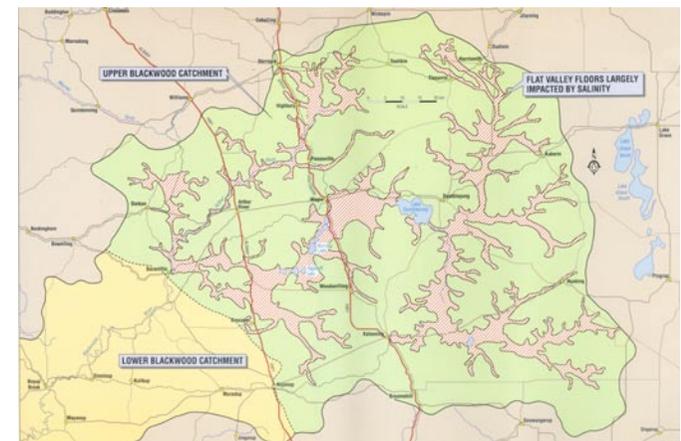
In brief, there are three major projects, covering the Blackwood, Murray and Avon Catchments. These areas contain most of WA's salinity problem, which totals some 2.2 million hectares of lost land. The State is losing land at the rate of 11.4 hectares per hour. Every river, stream and lake in the wheatbelt has become saline.

In early years, the Blackwood, Murray and Avon rivers were seen as potable sources of water for the South West of the State. Now the Blackwood river is discharging more salt at its mouth than the mighty Murray-Darling system (in the east) which is 60 times bigger.

Because the wheatbelt

drains from east to west, transported salt is having an effect on coastal land. The dams along the Darling Scarp are also experiencing increases in their salinity level. Little of consequence is being done by government or their agencies to fix the problem.

The projects involve the construction of a series of canals that drain the wheatbelt and deliver the saline water to the top of the Darling Scarp, from there it would be delivered via pipeline down the scarp to a hydro electric power station which would generate power and discharge the waste water to the sea. The Blackwood project is expected to remove 400 Gigalitres of saline water per year at a flow rate of 12 tonne per second, and generate about 20 megawatts of clean, renewable



Salt-affected land in the Blackwood catchment

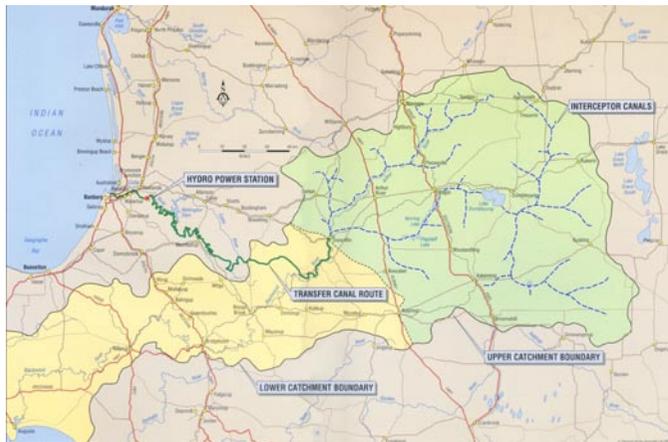
energy. Some of this water can also be used to supply a reverse osmosis plant where more high quality water can be produced.

‘Option A’ canals would be specially engineered 5 x 3 m lined canals or pipes that would run through the middle of lakes and parallel to rivers. They would intercept and reduce hydraulic pressure and allow farmers to discharge saline water (which is currently illegal). The squiggly line on the map allows the canals to fall 1 m in 10 km (1/10,000, which is not erosive) At the western side of the Darling Scarp, there is a 220 m head, which would generate electricity through turbines. This is a clean, green sustainable way to give value to waste water.

Farmers should not have any objections to the canals, because they would only run through land that is already lost to salinity.

Past the turbines, the water would flow through a 9 x 6 m concrete canal to the sea. The removal of 400 million cubic metres of saline water each year would cause the catchment to freshen significantly within 10 years. Rivers and lakes would take a little longer.

The final 14 km of canal would have a 20



Schematic of proposed interceptor canals and canal to the sea

m fall; this is rapidly flowing water, which provides the possibility of recreational uses such as kayaking.

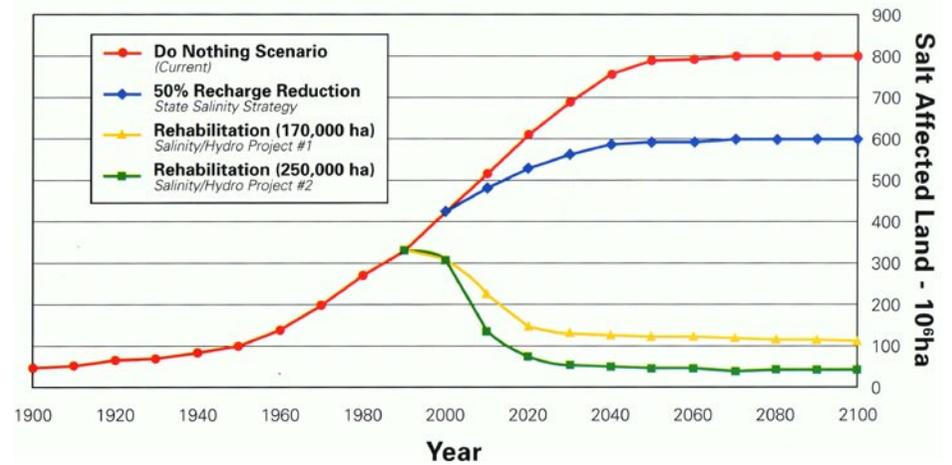
Agritech Hydropower’s Wellington Dam Water Recovery Project is an alternative to the decision by the government of WA to build a reverse osmosis plant at Kwinana, or its preferred option of drawing water from the south west Yarragadee aquifer near Busselton. Both of these projects are designed to deliver 45GL of water to Perth water users.

At specific times of the year, the water flowing into the dam from the Collie River is more saline than the water in the reservoir. Because it is of greater density, the saline water forms a saline layer at the bottom of the reservoir. The volume of this saline layer is large (40GL). If this layer is not properly managed then it will eventually mix with the better quality water above and cause a significant rise in the salinity of water provided to irrigators, etc. Consequently, each year in an endeavour to reduce the dam salinity level, the Water Corporation scours the saline slug through a large gate valve at the bottom of the dam, and discharges it out to sea at the rate of 450,000 tonnes per day, (a tonne of water for every house in Perth, per day).

The Water Recovery Proposal is designed to take the saline scour water, by pipeline, vertically down the Darling Scarp to Brunswick (approximately 20kms). The difference in height between Wellington Dam and Brunswick provides sufficient hydraulic pressure to drive the reverse osmosis process.

At Brunswick the water

Trend in Area of Salt Affected Land for Different Land Management Systems in the Upper Blackwood River Basin, Western Australia



would be treated by a reverse osmosis plant (RO) and then piped 18 kms to Harvey and connected to the pipeline supplying Perth. This process would reduce the water’s salinity level from 1500ppm to 50ppm. Perth’s Dams have an average salinity level of approximately 450ppm.

The environmental bonus for the project is that the RO operation does not require any significant power, saving greenhouse emission of an estimated 300,000 tonnes of carbon dioxide from going into the atmosphere. In contrast, the RO operation to be built at Kwinana needs lots of power, has on-going running costs and much greenhouse gas emissions. Most desalination plants fail because of costs.

Agritech Smartwater has offered to supply the 45GL of water delivered to Harvey for 60 cents per KL, with no capital or operating costs to be borne by the State or taxpayers.

The reason Agritech Smartwater can provide the water at 50% less cost than the Kwinana RO plant is because they would not have the power costs of the Kwinana plant. The salinity level of the water is only 1500 parts per million salt as opposed to 35,000

parts for the seawater to be used at Kwinana. Clearly the lower the salinity the easier and cheaper it is to desalinate.

Governments will only spend money to protect public assets. They seem to ignore the fact that they are losing millions of dollars of tax revenue every year because of lost productivity due to salinity. They do not even begin to cost the social loss; towns depopulating, services lost. For instance, the Royal Flying Doctor service can no longer land at Wagin airport because of rising groundwater.

Our State Government and its agencies continue to promote tree-planting, re-vegetation and farmer education as the tools necessary to fight salinity, but has consistently opposed engineering solutions. Tree-planting is important, but to be successful, trees would need to occupy up to 90% of the land, leaving little room for agriculture.

Peter Coyne, through his companies, commissioned a detailed economic analysis of the plans. He has spent the last 6 years lobbying politicians and presenting his ideas to farmers in the Wheatbelt.

---Pat &

[Australian Horticulture, November 2005]

Off-beat citrus - Australian limes

Lemons, limes, oranges, mandarins, grapefruit - these are the citrus we are familiar with. Over the next few issues, Quandong will explore some of the unfamiliar ones, beginning with Australian native limes, true citrus species, which have been developed into exciting new varieties now coming into commercial production.

For many years Australian finger limes, wild limes and round limes have been popular with native plant and bush food enthusiasts but relatively unknown by other gardeners.

They occur in the warm regions of Queensland, NSW and South Australia and, until recently, were included in the genera of *Microcitrus* and *Eremocitrus*. All have now been included in the larger genus of *Citrus*.

The finger lime (*Citrus australasica* - previously *Microcitrus australasica*) is a particularly outstanding evergreen fruiting plant which grows four to eight metres tall by two to five metres wide with small, glossy, dark green leaves on thorny branches.

Small, fragrant white to pinkish flowers are produced mainly in autumn, followed by citrus fruits which usually have a yellowish-green to purplish skin and are about 10 centimetres long by 1.5cm wide. They mature in winter and spring. The fleshy pulp is in small globular segments with an appearance similar to caviar, full of juice with a delightfully sharp lime flavour.

The segments can be squeezed from the fruit and eaten fresh, used in thirst-quenching drinks, included in marmalades, cakes, desserts or other recipes, or used as a tasty and decorative garnish to cooking.

This finger lime occurs in the subtropical rainforest regions of north-eastern NSW and south-eastern Queensland but will grow and fruit as far south as Melbourne.

They can tolerate light frosts but appreciate watering during extended dry periods. Plants

respond well to light applications of fertiliser and to light pruning, which will encourage bushy growth.

Some exciting new cultivars of this finger lime have been developed by the CSIRO and are available for the home gardener. The Australian Red Centre Lime - also known as the Australian Blood Lime, to which Plant Breeders' Rights (PBR) apply - is a cross between the finger lime and a mandarin. The white flowers are flushed with purple on the outside.

The oval fruit, usually mature in June-August, has dark red flesh and pink-red juice. It is available as a grafted standard plant with a smooth trunk and drooping dense canopy of purple-tipped foliage - plus, of course, flowers and fruit in season.

For the Australian Sunrise Lime (PBR), the finger lime has been hybridised with a calamondin, which is a cross between a mandarin and a cumquat. In this cultivar, the fruit matures from July to September and is somewhat pear-shaped with orange flesh and juice. This citrus is also available as a grafted evergreen standard on top-quality citrus rootstock. The new foliage tips are reddish and attractive white flowers are produced mainly in spring.

To complete a trio of Australian limes being produced as grafted standard trees, there is the Australian Desert Lime (*Citrus glauca* - previously known as *Eremocitrus glauca*). This plant occurs in more arid regions of inland Queensland, NSW and South Australia and in

cultivation likes a warm, well-drained situation. Plants are relatively erect and can grow two to seven metres tall with dark green leaves and reddish new tips on spiny stems.

Small, rounded, juicy green fruit as large as one to two centimetres across are produced later in the year than the finger lime varieties; the tangy limes maturing from about Christmas to late summer. It has similar culinary uses to finger limes.

The plants in this Australian lime collection are well-suited to container cultivation or as decorative evergreen garden trees. While it is important that our native plant species be appreciated and retained for their genetic integrity and as part of our national heritage, it is also exciting to see them being developed in conjunction with other closely related species from overseas to produce new cultivars.

The new cultivars are a valuable addition to our gardens and range of fruiting plants. The lime trio are available as grafted standards from the Australian Lime Collection, Floriana, 385 Greens Road, Keysborough, Victoria 3173.

Citrus australasica var. *sanguinea* 'Rainforest Pearl' is another pink-fruited cultivar of the finger lime with PBR classification applied for by Byron Bay Native Produce, Bangalow, NSW.

Plants of *Citrus australasica*, *Citrus glauca* and other Australian Citrus species are grown by specialist Australian plant nurseries, rainforest nurseries and fruit-tree growers.

Further information on these fruiting plants is available from a number of computer references, including the CSIRO website and by searching under "Australian limes".



New Australian lime varieties, developed by the CSIRO

[Advertisement]

Gardener's Workshops for 2006

Peter Coppin, a horticultural consultant specialising in tree crops, offers a range of workshops covering all aspects of fruit, nut and vine crops. Tailored for hobby farmers, the keen home gardener or anyone with a keen interest in fruits, nuts or vines, there one to suit every need.

2006 General Gardening

Date: Morning Session (9am – 12am)

Fruits, Nuts and Vines

Afternoon Session (1pm – 4pm)

May 13 **Growing Winter Vegetables**

Jun 10 **Soils - a Plant's Healthy Foundation**

Jul 8 **Winter Pruning Roses & Fruit Trees**

Aug 12 **Care of Large Trees & Shrubs**

Sep 9 **Propagating Plants at Home**

Oct 14 **The Summer Vegetable Patch**

Nov 11 **Saving Valuable Trees & Shrubs**

Dec 9 **Growing Plants in Pots & Containers**

What Fruits to Grow in Perth & How

Pruning & Winter Care of Fruit Trees

Grafting & Propagating Fruit Trees

Pruning & Winter Care of Grapevines

Nuts & Other Tree Crops for Perth

Pruning & Spring Care of Fruit Trees

All About Stonefruits & Pomefruits

Summer Fruit Care & Fruit-fly Control

While the topics look specific, you are most welcome to raise any general fruit growing queries during the question and answer sessions. And come prepared to spend time outside, rain or shine!

Cost:

\$33 per person (\$55 per couple) for one session \$55 per person (\$99 per couple) for both sessions
Garden Gurus Club members receive a further 20% discount. All prices are GST inclusive.

Further substantial discounts of up to 50% apply if you book multiple sessions in advance:

Number of sessions: 2-3 4-5 6-7 8 or more

Cost per session: \$27.50 \$22.50 \$18.33 \$16.50

Venues:

Landsdale Farm School is a Ministry of Education Support School. Located just 15 km north of the City of Perth at 80 Landsdale Road, the Farm School is a 4 hectare demonstration farm featuring farm animals, an organic garden, orchard and nursery. Wheelchair friendly and with good facilities, it's a great place for these workshops. There is a kiosk so you can stay for lunch, but we need to order by morning tea so they are not caught off-guard.

Other venues that will be used later in the year include St Barbe Grove Nursery in Hazelmere, City Farm in East Perth and Challenger TAFE in Murdoch.

The workshops promise to be informative, fun and very good value

Register by phoning Peter Coppin on 0419 906 584, or email pcoppin@tpg.com.au

For more information on these and other workshops, visit

arborlogic.com.au or petercoppin.com.

[<http://www.atelier-vert.com/tech.tmpl?SKU=31316050841556849>]

Pralinage

A simple garden trick to improve the survival of bare-root plants. See the website above for other traditional French methods of gardening.

Question: What is the major cause of failure for bare-root plants?

Answer: Lack of complete contact between roots and surrounding soil, and subsequent dehydration.

Sometimes the best gardening tricks are deceptively simple, as simple, in fact, as making mud pies. To protect your bare-root plants from the above problem, use the old French *truc of pralinage*. No, we're not talking pralines here, it's *pralinage*.

Pralinage is simply the practice of giving your bare-root plants' roots a mud bath before planting. The mud bath forms a protective coating on the roots that minimizes the damaging effects of any air pockets around them after you plant. In addition, the layer of mud on the roots provides a nutritive boost and a perfect environment for the emergence of all-important new root hairs.

Here's how to *praline* the roots of your plant. First get a bucket or basin large enough to comfortably accommodate the roots of your plant. In the bucket, mix a 50-50 quantity of cow manure (bagged stuff is okay) and soil (preferably clay), and add enough water to make a thick slurry.

The resulting soup should be thinner than what you made pies with as a kid, but should have a semi-solid consistency. To test, immerse the roots of your plant in the mixture and pull them back out. If they emerge evenly coated with mud, you're mixture is perfect. If most of it drips off, add more soil/manure. If it is too thick to penetrate among the roots, add more water.

Once you've achieved the perfect mud bath balance and your plants' roots are coated, lay the plants on some layers of newspaper out of direct sun. Leave them there until the coating is dry.

Now you're ready to plant. The *praline* coating around your plants' roots will assure a perfect bond with the surrounding soil, and help protect them from desiccation. Meanwhile, the manure in the mix will provide a light dose of fertilizer. Just what the doctor ordered. As always, water your new plant in thoroughly."

---*Barbara Wilde*



The URL for this site was recommended by Lawrence London, writing on the permaculture@lists.ibiblio.org e-mail list. He suggests that rock dusts, microbial inoculants and rock phosphate could be added to the mix.

Colourful screecher a threat to crops

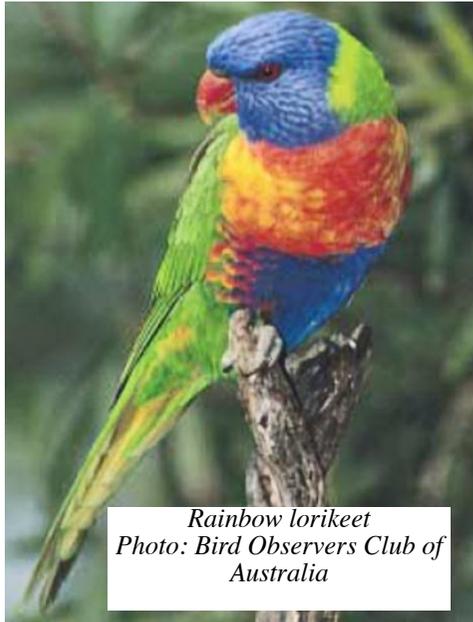
The rainbow lorikeet is a pest of grape, apple, stone fruit, tropical fruit and citrus crops. These birds pose a significant threat to horticultural crops in the State's south west and could be a nuisance. It is thought the birds escaped from an aviary.

The experience with established flocks of rainbow lorikeets in the metropolitan area is that they may also compete with native animals and damage fruit crops.

The Department regularly receives complaints from members of the public in Perth, where the birds have been established since the 1960s and now probably number more than 20,000 in the metropolitan area.

Complaints include reports of nuisance noise, damage to backyard fruit crops, fouling goods with their droppings, competition with other species. Lorikeets recently moved into commercial fruit orchards in the Perth hills for the first time, prompting complaints from growers.

Computer modelling shows that suitable



Rainbow lorikeet
Photo: Bird Observers Club of Australia

areas for establishment of the rainbow lorikeet in the south-west include those between Perth, Bunbury and Albany. In this region there is a favourable mix of climatic conditions, native and exotic vegetation and extensive fruit orchards.

Rainbow lorikeets favour open forest and woodland habitats and adapt well to urban environments and parklands. The birds are quite noisy, continuously screeching while in flight and when at a food source. They have a swift direct flight with rapid whirring wing beats and display flashes of dark green and bright red.

Under legislation administered by the Department of Agriculture, rainbow lorikeets are declared pests of agriculture in the south-west land division excluding the Perth metropolitan area.

It is hoped that the birds at large in Geraldton can be trapped and placed safely back in an aviary.

The Department of Conservation and Land Management has declared the species to be acclimatised fauna (fauna in a wild state because of escape or release) and has gazetted an open season, allowing the species to be shot or live-trapped on private land without the need to obtain a licence.

Anyone keeping rainbow lorikeets must have a licence and ensure that the birds are securely housed, preferably in a double-doored aviary. Anyone who sees rainbow lorikeets outside of the metropolitan area should report the sighting to the Department's Pest and Disease Information Service on 1800 084 881.

[Wikipedia, <http://en.wikipedia.org/wiki/Pine>]

[Encyclopedia Botanica]

[Permaculture Activist Summer 2005, No. 56]

Edible pine nuts

Pines are native to most of the northern hemisphere, ranging from the arctic to the equator. The highest diversity is found in Mexico and California. Most pines have quite small seeds, but those that have larger seeds have been favourites of many cultures on several continents.

Pines are evergreen and resinous. They grow well in acid soils, some also on calcareous soils; most require good soil drainage, preferring sandy soils, but a few will tolerate poorly drained wet soils. A few are able to sprout after forest fires. Several species are adapted to extreme conditions imposed by elevation and latitude; see e.g. Siberian Dwarf Pine. The pinyon pines and a number of others are particularly well adapted to growth in hot, dry semi-desert climates.

Pines are mostly monoecious, having the male and female cones on the same tree, though a few species are sub-dioecious. The male cones are small, typically 1-5 cm long, and only present for a short period (usually in spring, though autumn in a few pines), falling as soon as they have shed their pollen. The female cones take 1.5-3 years (depending on species) to mature after pollination, with actual fertilization delayed one year. At maturity the cones are 3-60 cm long. Each cone has numerous spirally arranged scales, with two seeds on each fertile scale; the scales at the base and tip of the cone are small and sterile, without seeds. The seeds are mostly small and winged, and are wind-dispersed, but some are larger and have only a vestigial wing, and are bird-dispersed. At maturity, the cones usually open to release the seeds, but in some of the bird-dispersed species the seeds are only released by the bird breaking the cones open. In Australia, cockatoos are serious pests that rip pine cones to shreds.

Pines are well-known survival food plants. As well as the high protein and oily nuts, the soft, moist, white inner bark, or cambium, found clinging to the dead, woody outer bark is edible and very high in vitamins A and C. It can be eaten in slices raw as a snack or dried and ground up into a powder for use as a thickener/flavouring in stews, soups, and other foods. The bunches of young green cones found at the ends of branches make a tasty, healthy hiking snack. A tea made by steeping young, green pine needles in boiling water is delicious and high in vitamins A and C.

Growing pine trees

All edible nut pine seeds need cold stratification; store the seeds with damp peat moss at 0°C for a few months. Some of those from cold climates need an initial 3-week period of warm stratification to mature the embryo, and then cold stratification.

It has been found that inoculation with mycorrhizae dramatically improves germination and growth rates. Experiments showed that only locally-adapted ectomycorrhizal fungi had a positive effect: inoculants from other areas failed. It is possible to make local inoculum. For pine trees specifically, you would seek your soil sample underneath healthy coniferous trees. (See 'Make your own mycorrhizal inoculum' in Quandong, Vol. 32 No. 1, 2006.)

Plant seeds in spring. Seeds begin to germinate in about 2 weeks. Young plants

should be in semi-shade initially. They need to be protected from rodents and larger herbivores.

Harvesting

While maturing, cones are medium green, but when ready for harvest they turn brown. Determine ripeness by grasping the cone and giving it a light twist. If it is ripe, it will easily separate from the tree. Cones are covered with a very sticky resin, making gloves a necessity.

Air-dry the cones for three to five days to dry the pitch or resin, but most importantly, to make the cones open allowing the nuts to fall free. Spreading the cones in direct sun can help. Some cones need a little shaking to encourage the seeds to release.

Brief descriptions and the key to the Cover picture.

*These are images of most of the well-known edible nut species. The * indicates species that are present in Australia, as recorded by Encyclopaedia Botanica. **D. Noel records a planting.*

(1) *Armand Pine (*P. armandii*)

Temperate climate. Maximum height at maturity from 12-18 m. Bearing age: 12 years. Very ornamental with bluish needles. Grows best in sandy, well-drained soil. 1848 nuts/kg. Cones are 15 cm, pendant, in 2s & 3s.

(2) Digger Pine (*P. sabiniana*)

Dry temperate climate. Three needles. Mature height 18 m. Bearing age: 18 years. Grows in loam to sand, prefers good drainage. 1353 nuts/kg. Cones 15 - 25 cm, scales very long, thick and tipped with a sharp spine.

(3) *Korean Pine (*P. koraiensis*)

Cold climate. A tall tree, looks very similar to the eastern white pine. The needles are in fascicles of five and range from a light green to bluish green colour. Height range from 27-45 m. Bearing age: 10 years. May bear for

150 years plus. 1930 nuts/kg. Cones 15 cm, conical to oblong.

(4) Two Needle Pinyon (*P. edulis* Engelm.)

Dry temperate climate. The number of needles in a bundle is primarily 2 (although rarely 1 and 3), 0.75 to 1.5 inches in length. A small tree 4-10 m in height and 30 to 60 cm in diameter. Cones: 4 -5 cm long, ovate to round; cones very resinous; seeds large and wingless, edible. Southwestern USA

Singleleaf Pinyon (*P. monophylla*)

Dry temperate climate. This tree can be differentiated from the other local Pinyon Pine by the fact that the leaves (needles) occur in bundles of one, whereas *Pinus edulis* has needles bundled in twos. The two trees are otherwise similar and are often found together.

(5) *Pinyon Pine (*P. cembroides*) Mexican Nut Pine

Dry temperate climate. Maximum height from 9-12 m. Bearing age: 15 years. Slow-growing tree. Needle colour ranges from very bright blue to light green. Prefers a sandy soil, but will do well on a loam as long as there is good drainage. 2035 nuts/kg. Cones 3 - 5 cm, round to oval, needles in groups of 3 to 5.

(6) *Swiss Stone Pine (*P. cembra*)

Cold climate. Needles in fives. Maximum height 18 m. Bearing age: 14 years. It grows naturally in well-drained heavy clay. It will do very well in soils from loam to sand. Outstanding as an ornamental, with year-round bluish colour. 2145 seeds/kg. Cones are 7.5 cm, deep blue to purple.

(7) *Sugar Pine (*P. lambertiana*)

Temperate climate. Needles in fascicles of threes. Maximum height 60 m. Bearing age: 15 years. Fast-growing. Prefers well-drained soil from loamy to sandy texture. 2167 nuts/kg. Cones narrow, 50 cm.

(8) Siberian Stone Pine (*P. siberica*)

Cold climate. Looks similar to Korean pine, with maximum height of 120 feet. Very ornamental. In their native habitat they usually grow in wet boggy areas. An outstanding feature is the thin seed coat which is easily broken with one's fingers. Bearing age from 12 to 150 years plus. 1430 nuts/kg. Cones 5 - 10 cm.

*Dwarf Siberian Stone Pine (*P. pumila*)

Cold climate. Needles in fascicles of fives. Shrub growth type, similar to Mugho pine, but will withstand heavy snow without branches breaking. Will reach a maximum height of 6 m. Bearing age: 10 years. Prefers well-drained loamy to sandy soils. Two types are recognized, both ornamental: One is a very bluish green all year; the other is greyish green. Both have 1848 nuts/kg. Cones 4 -5 cm, upright.

(9) *Jeffrey Pine (*P. jeffreyi*)

Temperate climate. Needles in fascicles of threes. Maximum height to 45 m. Bearing age: 18 years. The tree is very unusual in appearance, especially when young. The trunk diameter is quite large in comparison to height of tree. The needles give off a very aromatic fragrance in the spring. Needles are long, sometimes up to 20 cm. Prefers a well-drained soil ranging from loam to sandy. 3000 nuts/kg. Cones ovoid, 25 cm, native to SW USA.

(10) *Macedonian Pine (*P. peuce*)

Temperate climate. Needles in fascicles of fives. Maximum height to 21 m. Bearing age: 12 years. Grows best in a well drained soil, requires adequate drainage. Soils range from loam to sandy. Very ornamental tree, with bluish colour in spring, changing to a darker green in August. 2100 nuts/kg. Cones 15 cm, clusters. Native to Balkans.

(11) *Italian Stone Pine (*P. pinea*)

Warm temperate climate. Needles in fascicles of twos. Maximum height is 12-18 m. Bearing age: 18 years. Prefers a well-drained

soil ranging from loam to sand. 1353 nuts/kg. Cones ovoid and solitary. Native to N and E Mediterranean. Cones about 8 - 15 cm and take 36 months to mature.

(12) **Nepal Pine (*P. gerardiana*)

Temperate climate. Needles in threes. Height 16-24 m. Bearing age: 15 years. From the Himalayas. Very difficult to grow. Fine specimen tree once established. Requires a well-drained mixture of very fine gravel with good loam and sand. 1888 nuts/kg. Cones 13 - 20 cm.

Some other edible nuts (endangered)

*Lacebark Pine (*Pinus bungeana*)

Native to northeastern and central China, a slow-growing tree to 15-25 m tall with very ornamental bark. The needle-like leaves are produced in threes with a deciduous sheath, spread widely apart on the shoots, glossy green, 6-9 cm long and 2 mm broad. The cones are ovoid, 4-7 cm long and 3-5 cm across, dark brown with relatively few scales. The seeds are 6-8 mm long.

*Torrey Pine (*Pinus torreyana*)

A broad, open-crowned pine growing to 8-15 m tall, with 20-35 cm long leaves ('needles') in groups of five. The cones are stout and heavy, typically 8-15 cm long and broad, and contain large, hard-shelled, but edible, pine nuts. The wild population is restricted to about 7,000 trees growing in a narrow strip along the southern California coast.

Bigcone Pinyon (*Pinus maximartinezii*)

A tree to 16 m, crown broad, with irregular branches. Leaves blue-green, in fascicles of 5, 6-12 cm long. Cones huge, massive, oval-cylindric, 14 - 26 cm long. Seeds very large, 22-26 mm (the largest of any pine). A single population, numbering approximately 2000 to 2500 mature individuals is found in scattered stands across an area of about 5-10 km² on ridges and E-facing slopes in montane dry forest at 1900-2200 m altitude in Mexico.

[<http://www.pinenut.com/history.htm>]

Ancient pine nut technology

Pine nuts were a most valuable part of American Indian diet and culture.

Archaeological reconstruction suggests human habitation stretching back some 12,000 years in the Great Basin, the area between the Sierra Nevada range and the Rocky Mountains of the USA. The Great Basin provided small game for hunting, but seeds and plant roots were even more important.

There are probably one hundred different species of grass in the Basin that provide harvestable seeds. One could walk through the grass with a tray and a beating stick knocking the seeds into the tray, and occasionally emptying the tray into a burden basket. Seeds could be stored without much treatment; eventually, they could be ground into flour. By far the most important seed to the Great Basin people was the pine nut, taken from the single-needle pinyon pine (*Pinus monophylla*) or the double-needle pinyon (*P. edulis*).

The pine nut was to the people of the Great Basin what the buffalo was to the plains people. The nut is protein-packed, with all 20 amino acids and very high in concentration of eight of the nine amino acids necessary for growth. They were a staple in the diet of all the peoples of this region.

The pine nut is large and an excellent food source. It is, however, relatively difficult to harvest and requires a substantial group effort to do so. The pine nuts required major processing before they could be stored for later use. Fresh nuts become rancid within weeks. Use of pine nuts therefore required technological innovations. While pine nuts can easily be picked from the ground out of fallen cones they are rarely good for consumption by that time and the crop has been substantially reduced by insects and small mammals. The pine nut became a staple food only after the

people learned how to harvest the nut prior to the final ripening stage of the cone.

The technology for pine-nut harvest was messy and complex, and the harvest and processing were practiced communally. The pine nut harvest began in late summer before the cones had fully ripened and dropped, and lasted into the fall. It was the last big food-gathering opportunity of the year before retirement to winter lowland quarters. In fact, pine-nut harvest defined the great social time of year, being the greatest gathering of the people. It occurred at intermediate elevations in arid upland hills where junipers and pinyons tend to grow. Most Great Basin people held these regions to be sacred ground.

When harvest began, the men pulled cones from the trees using large willow branches equipped with a sturdy V-shaped hook at the end. Women and children piled the cones in large conical burden baskets carried on one's back with a cordage band across the forehead. At this point, the cones were just starting to open and were usually full of pine pitch. The people processed the pine cones in camps surrounding the forest. They roasted the pine cones around hot coals, turning them often, to make them open up. Then they beat the cones lightly to knock the nuts out. These required further processing since the nuts were covered by a soft brown shell. Cracking this shell is difficult and can injure the fruit inside. The nuts were shelled by placing them on a basketry tray with hot coals from the fire. The whole mass of nuts and coals was kept in constant motion, throwing them up and swirling the tray, until the shells were roasted to a hard, crisp dark brown. The coals were removed at this point and the nuts poured onto a grinding

stone where they were lightly pounded with a mano until all the shells had cracked and fallen free of the inner fruit.

Cracked pine nuts are yellow-orange, translucent, and soft. They can be eaten at this point and are delicious. Far more pine nuts were harvested than could be eaten raw so they needed to be processed further. The nuts were placed on a winnowing tray and thrown repeatedly into the air to allow wind to carry off the cracked shells. When the shells were gone, they placed hot coals back on the tray and roasted again until the nuts were dry and hard, somewhat darker in color.

At this point, the nuts could be stored in baskets for later use. Dried nuts could be

eaten without further processing but the usual procedure was to grind them into flour. The grinding stone and mano were used to pound them lightly until well-fragmented. They ground small amounts quickly so they could push the fine flour off the metate into a bowl or onto a tray.

When enough flour was available, it could be warmed in water to make a thick paste. The paste could be diluted to make whatever consistency was desired. While pine-nut mush may not sound especially appealing, addition of berries, various leafy vegetables, and/or ground meat or fish made it a feast.

---Penny Frazier

Coconut tree

In WANATCA Yearbook 2, 1977, Dennis Hearne mentions a tropical nut named *Horsfieldia australiana*, which he thought delicious and worthy of promotion. I tried to find more information on the internet, with scanty success. It is a member of the Myristicaceae family, and is only mentioned in a few lists of native and bushtucker plants. Yuruga Nursery on the Atherton Tablelands in Queensland mentions it. A posting on rarefruit@yahoogroups.com brought a reply from someone who knows it.

“*Horsfieldia australiana* grows in monsoon forests here, a moderately large tree up to 15 metres. It needs water input all year; where it's growing wild the monsoon forests are spring fed. I haven't seen nuts '... over twice the volume of a reasonable almond ...’

“I tried growing it many years ago from seed and had a 100% failure rate. Some friends of mine are trying to grow

some again this year, be interesting to see if they're successful.

“The seeds/nuts have a very short viability. Usually where they grow is inaccessible when the nuts come on, at least where I know they're growing. That makes it very hard to get viable seed.

“The trees flower during the build-up season and produce seed during the monsoon period of the wet season. They taste a bit like coconut, hence here they're commonly called Coconut Tree (as opposed to Coconut Palm), although they're not commonly known except amongst the more ardent nature-philes, outdoor adventurers. If you try eating a bad one (gone off) you'll really know it, they taste really foul. Eating too many can give you diarrhoea. There are separate male and female trees.”

---Zig

Northern Territory,
Sub-equatorial, Wet/dry monsoonal,
12.5° S, 131°E.

[Permaculture Activist, No. 56, Summer, 2005]

Tree vegies, part 2

More trees with edible leaves. This is an extract from a new book entitled *Perennial Vegetables* by Eric Toensmeier.

Chaya (*Cnidocolus chayamansa*)

Throughout Mexico and Central America, this productive and nutritious woody leaf crop is an important vegetable. Chaya has a finer texture than many leafy vegetables, and is convenient to use because the leaves are large, and, unlike many greens, do not reduce much in size when cooked. That said, it does have some drawbacks. Most types have stinging hairs like nettles, although “stingless” varieties are available. The other major drawback is that the leaves have cyanide in them. However, cooking chaya leaves for three minutes completely renders the cyanide harmless.

Chaya is tropical, but is root hardy in cooler areas with protection. This crop loves heat, and is drought-tolerant, Chaya also can grow in hot humid areas. It grows in dry to mesic soils, and prefers full sun. Note that chaya is actually native in the southern tip of Texas, USA. Plants grow about 3-4 m in frost-free areas.



Chaya tree, left. Chaya leaves come in a great variety of shapes, right.

Cranberry Hibiscus (*Hibiscus acetosella*)

Picture a beautiful red Japanese maple

with edible leaves. That's cranberry hibiscus, a plant with tremendous edible landscaping potential. The leaves can be eaten raw or cooked, and have a sour taste, like sorrel but milder. This is a plant that we should be planting much more frequently in our gardens.

This African vegetable is a short-lived woody perennial, but with pruning (or frost-killing) it can persist for several years. It grows to about 4 m, but is usually pruned lower for harvest. It regrows from freezing, and can be grown as an annual anywhere with a warm summer. It needs full sun.



Cranberry hibiscus, *Hibiscus acetosella*

Moringa (*Moringa oleifera*)

Moringa is one of the world's most nutritious vegetables. The fresh young leaves and tender stems are used like spinach. When eaten raw, they have a somewhat horseradish-like flavour (cooked and dried leaves are mild). The leaves are the most nutritious part of the plant, being high in protein, calcium, iron, vitamin A, and B vitamins. Raw greens have

a high vitamin C content. Dried moringa leaf is sometimes known as “mother's best friend,” for its important role in the nutrition of pregnant and nursing women and young children in many poverty-stricken areas of the tropics. One-to-three year old children can get 14% of their daily protein needs, as well as 40% of calcium, 23% of iron, and almost 100% of vitamin A, from just a single tablespoon of dried leaves.

The pods are edible, you can make horseradish from the root, and the seeds purify water. Talk about multiple functions! Moringa trees can grow up to 14 m, but for leaf production they are generally coppiced or pollarded. Frost kills them to the ground but they grow back rapidly. The trees are tolerant of drought, and not picky about soils. Moringa can also be grown as an annual in areas with long, hot summers.



A pod on a Moringa tree. Photo: by Chef James at the Fruit & Spice Park, Homestead, Florida

Nopale Cactus (*Opuntia ficus-indica*)

Throughout the world's warm, dry regions cactus pads are a popular vegetable. First domesticated 9,000 years ago in Mexico, edible cactus pads are three times as widely grown as carrots. Nopale pads taste similar to green beans with a hint of asparagus and lemon flavours. They somehow manage to

be both crisp and quite mucilaginous, and are reminiscent of okra in texture and colour. “Spineless” varieties are much easier to work with, although they still have some tiny spines (glochids) that must be removed before eating. The sweet fruits of some *Opuntia* cacti, known as tunas or sabras, are also important commercially.

Nopale are hardy and quite drought tolerant. They also can succeed in humid climates as long as drainage is excellent. The shrubs can grow to 5 m high, although they are usually kept lower for harvest. Plant them in full sun and give them some fertile soil and you will only need to return to harvest.

Katuk (*Sauropus androgynus*)

This species, originally from Borneo, is becoming quite popular in Hawaii. Tropical vegetable expert Dr. Frank Martin rates katuk as one of the finest leaf crops for the tropics, due to its year-round production, flavour, yields, and nutrition.

The flavour of katuk leaves and shoots resembles a mild blend of green peas and peanut. Note - overconsumption of raw katuk juice (once a weight loss fad) can lead to health problems. It has been a staple in Indonesia for centuries and has never caused problems with ordinary use.

Katuk is a lanky shrub, which grows up to 3 m tall but is usually kept trimmed to 1 to 2 m. It grows in sun to shade in rich soil. Katuk is best suited to the humid tropics, but makes a fine dieback perennial in cooler areas as long as the ground does not freeze.



Katuk, also called “Sweetleaf”

[Australian Horticulture, Oct-Nov 2005]

Short wait with 'long johns'

A grafted apple branch producing fruit in its first year? A relatively new technique using 'long john' scions is delivering just that.

This is not an article about underwear or pyjamas. I'm going to describe an approach to grafting that I have been developing that results in very productive branches on deciduous fruit trees in the very same season in which they are grafted to the tree.

Usually when short scions (graft pieces) are grafted to any fruit tree or rootstock, the scions used have only leaf buds evident. When the graft 'takes', it will produce only leafy shoots to form branches. It can then take from three to five years or even more before the branch is large or mature enough to produce significant amounts of fruit. This is especially so if spur-pruning is used.

I have found, though, that by using a different technique, selected scions with flower buds already formed on them can be encouraged to produce lots of fruit in the same season in which they are grafted to the tree.

This new approach has developed from success I have had grafting short scion pieces with flower buds attached onto apple trees. These grafted pieces produced some fruit in the same season in which the grafts were done but I have found that longer pieces resulted in a heavier crop in the first season.

For many years I have been experimenting with, and developing the technique of, using long scions (from 20 centimetres to 100cm or more) together with a plastic sleeve. I have described in detail the use of plastic sleeves in several of my books, particularly *All About Apples* (Hyland House, 2001) and *Just Nuts* (Hyland House, 2005).

I originally used it for grafting a 'Granny Smith' (*Malus domestica* 'Granny Smith') onto

an established green/purple-fruited 'Northern Spy' (*Malus domestica* 'Northern Spy') apple tree in 1998.

In this first attempt, I used an unpruned single one-year-growth scion (lateral) over one metre long that contained leaf buds but no flower buds or spurs.

The graft piece was positioned almost horizontally on the tree and was covered with a plastic sleeve moistened inside, sealed at the top end and open at the base for air circulation. I gave the name 'long johns' to these grafts because of the warming aspect of the sleeve and the length of scion used.

The grafted scion formed spurs with flower buds along its entire length in its first season of growth (1998-99). In the next season (1999-2000), it produced many green apples that had developed from these formed flower buds. The weight of the apples bent the branch downward and it was easy to pick from the ground. The grafted branch stayed bent in the same position even after the fruit was picked, adding to the low-profile shape of the tree. This low profile is also characteristic of the little or no pruning approach I have been developing (also detailed in *All About Apples* and *Just Nuts*).

I have since grafted lengthy, unpruned single scions on plums, prunes, cherries and pears with great success. It is worth noting, however, that if the attached scion is pruned at the tip before or after grafting occurs, flower bud and spur formation along its length will be unsatisfactory. This is because the shoots formed at the pruned end become dominant and suppress lower growth.

If the selected scion has flower buds, then it is wise to remove the plastic sleeve after grafting just as the flowers start to open. This allows bees and other pollinating insects to do their work and results in the scion producing fruit in the season in which the graft was done.

Integral to the success of this method is a non-pruning or very-minimal-pruning system for the attached scions to maintain spur growth. Also significant to the success of grafting these very scions is the use of a plastic sleeve to cover the scion and graft area to prevent the scion drying out.

I cover the entire graft piece with a very thin plastic sleeve made from a section of tubular packaging plastic sealed at one end with heavy-duty packaging tape. Any recycled plastic material can be used to make these sleeves (including bubble-plastic which, because of double layering and sealed pockets

of air, is an even greater encouragement to callus formation).

Before placing the sleeve over the graft piece, water is squirted into it. The sleeve is placed over the graft, leaving the base open to provide aeration, and can be anchored at the base with an ordinary sewing pin or a mapping pin to prevent it blowing away.

Longer grafts are more susceptible to damage as a result of wind movement, so it may be worth securing the scion to another branch or resting it on another limb. If the scion is moved too much by the wind, the graft will not 'take' and the operation will be a failure.

If the graft piece is likely to be very exposed to sunlight or high UV light, then it will be necessary to shade the graft in some way. This can be done either by placing a paper bag over the plastic sleeve or by partially painting the outside of the sleeve with white paint. The protective sleeve has several effects on the scion: the graft piece is protected from the effects of weather, the humidity prevents it drying out and dying, and the warmth inside the sleeve helps the graft to knit quickly (that is, enhancing callus formation).

For attaching the lengthy scions I have been describing, I have found an elongated whip and tongue graft is best, providing the graft area is triple-wrapped with budding tape to secure the scion at that point and to prevent any movement at the graft union. This wrapping tape is left on for nine to ten months to ensure the tissue is fully healed all around the graft wound area.

To make a whip and tongue graft, identical cuts are made at the top of the rootstock branch or lateral and at the base of the scion.

An elongated whip and tongue graft is created by making the sloping cuts on the root-stock and scion about 100 millimetres long or longer.



Plastic sleeve over a 'long john' graft



Normal whip and tongue graft fitted together. 'Long John' grafts have much more extended (shallow) initial cuts to make the graft longer.

This allows better contact with cambium layers. (The cambium layer is situated just under the bark layer and is responsible for producing healing growth tissue.) Contact between these layers is essential for grafting to occur.

To create the tongue, a horizontal cut is made across the original sloping cuts made on the scion and rootstock and split for 10 millimetres to 20mm. One horizontal cut is made halfway along the original sloping cut on the rootstock and scion piece, and the other cut one-third of the way along the other sloping cut so as to make sure the whip and tongue fit neatly together.

Taking the 'long john' technique further I have continued to experiment with these long grafted pieces, some of which are well over a metre long. Mostly they are from two- to four-year-old branches that have already formed flower buds and short flower spurs

along their length.

I have placed some unpruned scion pieces on espalier-trained fruit trees to obtain fruit in their first season of growth. On one espalier apple tree, I grafted two selected scions over a metre long: one was an improved selection of *Malus x domestica* 'Golden Delicious' named *Malus x domestica* 'Jim Riley', and the other an old heritage cultivar, *Malus x domestica* 'James Grieve'. I grafted these onto a *Malus x domestica* 'Snow Apple' in August and by the end of November, the flower buds on the scions had started to open slightly.

The plastic sleeve was removed to allow bees to pollinate the flowers - a successful operation as each 'long john' scion piece produced a 10-litre plastic bucket of apples in late summer. These branches were left unpruned and the following year (their second) they produced another bountiful crop. They were also left unpruned in their third year and again produced a heavy crop.

One advantage of the 'long john' approach on espalier-trained fruit trees is that you get almost instant limbs with spur systems already formed that suit the no-pruning or minimal-pruning approach. The traditional way, using harsh spur-pruning methods, may take three or four years to train a limb or graft scion to



Long John grafts of James Grieve and Jim Riley apples on espaliered Snow Apple Tree

that same length.

The 'long john' technique can also be used to graft onto cut limbs to achieve an almost instant fan-shaped espalier. I have been experimenting with substantially cutting back an aged or misshapen tree, even to a stump, and then allowing it to grow many long thin branches. These can then be grafted using 'long johns' grafts the following winter. Scions can all be from the same cultivar or could each be from a different cultivar, giving a range of fruit maturing over a long period.

Multi-grafting is a space-saving method of growing different fruit cultivars as well as a way of keeping rare heritage cultivars going.

I have found many old apple cultivars in back gardens on Bruny Island, Tasmania, including a 'French Crab' - one of the most popular cooking apples before the advent of the 'Granny Smith'.

[http://www.dirtdoctor.com/view_question.php?id=972]

Land planaria

An unusual worm may be in your garden that you need to know about. You also need to kill it. The predatory land planarian is no friend of earthworms. In fact, they are parasites that eat earthworms and can wipe out entire populations.

It can stretch out up to 20 inches long, gliding along on a layer of mucus secreted from glands along its underside. This gruesome worm feeds by extending its throat out of its mouth and into the earthworm. Small bits of the earthworm is swallowed a little at a time.

Land planarians are native to Indo-China, but have been transported to many other parts of the world in the soil of greenhouse plants. They can survive in freezing climates but don't do well in dry climates. (Editor's note: they have been seen in Perth.) They are primarily nocturnal, but can often be found out and about early in the morning especially on

In any case, the 'long john' approach can be used to rejuvenate old trees past their 'use by' date. I have also used the technique to graft onto sucker growth on rootstocks. It uses rootstock potential and slows further suckering from the root system.

I have also experimented with grafting onto potted plant specimens to produce 'instant' formed trees suitable for smaller gardens. I have used the technique on fruit trees other than apples, including stone fruit, with excellent results.

I believe this approach has commercial potential as well as being valuable for home gardeners interested in quick production from fruit trees or in multi-grafting espalier-grown trees. I am continuing to work on the 'long john' approach, improving the technique and developing its potential.

---Allen Gilbert

wet surfaces. They can also be found on the trunks of trees.

There are a number of different species: some are striped, some may have a hammer-shaped head. If the planarian is cut or smashed into pieces, each piece can regenerate into a complete, new worm. Probably they are best killed by collecting them into a container and dosing with toxic substances or boiling water. ---Howard Garrett



Tiny but tricky killer

These wasps are your friends - every garden and orchard needs them.

Wasps in the family Trichogrammatidae are among the smallest insects known. Unfortunately for people not used to scientific names, *Trichogramma* (pronounced trick-o-gramm-a) is the insect's common name as well as the genus part of its scientific name.

They really are tiny. Common species found in Australia are less than 0.5 millimetres long. These minute wasps are effective parasites of a range of moth and butterfly pests. More than a thousand scientific papers have been published on *Trichogramma* and its use as a biological control agent, making it one of the most researched natural enemies in the world.



A Trichogramma female lays eggs in grain moth eggs.

Trichogramma is effective because it is an egg parasite. Potentially, it can kill 100% of pest moth eggs before they hatch out as potentially damaging caterpillars. Some species of *Trichogramma* have a wide host range while other species are more specialised.

Adult female wasps use chemical and visual clues to locate moth eggs on foliage.

The chemical clues, called 'kairomones', are on moth scales left near moth eggs by female moths during oviposition (egg laying).

Kairomones are a type of pheromone produced by organisms to attract a mate. Unfortunately, they can also attract the attention of parasites or predators. The visual clues are the egg shape and colour.

Once a *Trichogramma* female finds a moth egg, she drills a hole through the egg shell and inserts two to three of her own eggs into the moth egg. The internal pressure of the moth egg forces out of the oviposition hole a small drop of yolk on which the female feeds.

Trichogramma adults also feed on nectar, plant sugars and honeydew. The yolk and embryo of the parasitised moth egg are digested before the *Trichogramma* egg hatches. Enzymes injected by the female at the time of oviposition are believed to cause this predigestion of the egg's contents.

Trichogramma eggs hatch after about 24 hours and emerging wasp larvae feed on predigested contents of the moth egg. Larvae develop through three instars (moult). During the third instar (three to four days after the host egg was parasitised), dark melanin granules are deposited on the inner surface of the moth egg, causing it to turn black.

Trichogramma larvae pupate inside the moth egg and develop into adult wasps after about five days. Finally, the adult wasps chew a circular hole in the moth egg to emerge.

Trichogramma adults emerge from host eggs in the early morning and, typically, more than one wasp emerges from each parasitised egg. Males emerge first and remain at the host

egg to mate with emerging females if they are present.

Interestingly, female wasps can parasitise eggs even if they have not mated but all the offspring will be male. Mated female wasps produce both male and female offspring. Females begin laying eggs within a few hours of emergence.

Trichogramma females live for about 10 to 14 days and can parasitise more than 50 eggs in that time. The life-cycle, from egg to adult, of a *Trichogramma* wasp normally takes about 10 days in warm conditions.

This high reproductive rate enables large numbers of wasps to develop rapidly. They are active during daylight hours and prefer fine days to rainy days.

The economically important moth pests which *Trichogramma* parasitise include heliothis (also known as budworm) (*Helicoverpa* species), lightbrown apple moth (*Epiphyas postvittana*), loopers (*Chrysodeixis* species), cabbage moth (*Plutella xylostella*) and codling moth (*Gydia pomonella*).

Trichogramma are commercially available in Australia (contact **BioResources Pty Ltd**, phone: (07) 3289 4919). They are dispatched as parasitised moth eggs either loosely or in capsules of 1000 eggs. Capsules can be placed in, or clipped onto, foliage of plants regularly attacked by moth pests so that emerging wasps can easily find moth eggs to parasitise.

Trichogramma wasps are extremely sensitive to insecticides. Minimal use of toxic pesticides is required if you want to encourage naturally occurring *Trichogramma* or maintain commercially bred wasps. This is not to say no pesticides are allowed.

Biological insecticides containing *Bacillus thuringiensis* (such as Dipel) have little or no effect on *Trichogramma* as the formulations contain strains of bacteria specific and lethal

to caterpillar pests.

To monitor the success of your *Trichogramma* wasps and determine the level of moth egg parasitism, you need keep an eye on moth eggs. The best way to achieve this is to randomly collect some moth eggs from plants, put them in a container and see if they turn black after a couple of days.

As an example, if you collect 100 moth eggs and 50 turn black, then the level of egg parasitism is 50%. That is a 50% reduction in the number of potentially damaging caterpillars on your plants.

Footnote: Beneficial insects which parasitise and kill pest insects are technically known as 'parasitoids'. Parasitoids differ from true parasites in their relationship with the host. In a parasitic relationship, the parasite and host live side by side with little or no damage to the host organism while the parasite takes enough nutrients to live on and reproduce without killing the host. In a parasitoid relationship, the host is killed after full development of the parasitoid.

---*Denis Crawford*

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Wasps deliver pest-killing viruses

And clever wasps potentially have another beneficial trick up their sleeves.

Scientists from the Wuhan Virus Research Institute in China have developed a new system of pest control which uses parasitic wasps as a means to spread pest-killing viruses. The system makes use of the behavioural characteristics of female wasps, which crawl over hundreds of pest eggs before selecting one to lay their own egg in.

The research team found that if parasitised eggs were coated in a solution containing a virus, the hatching wasp would pick up the virus on its body. Female hatchlings would in the course of time spread the virus to many other eggs, and the virus would infect the pest larvae, which feed on the remains of their eggs

after hatching.

Over 15 years of research, the team has identified more than 20 viruses which affect insect pests - particularly caterpillars - but are harmless to wasps. If the technology were developed, farmers would be able to target particular pests through selection of a specific virus solution.

The research team estimates that the approach would reduce costs by 40 per cent compared to chemical control and, with trials complete on more than 10,000 hectares of cropland, could be commercially available in China within two years.

[www.fs.fed.us/psw/programs/cufr%]

[*Australian Horticulture Vol 104 No 3 March-April 2006*]

Trees pay their way

Trees have multiple endearing qualities and are essential cohorts of Planet Earth, the only planet we have. They have been used and abused throughout the ages of humanity, but not respected sufficiently. Here is news about trees to give the driest and most conservative economist pause for thought.

Research unveiled by the Centre for Urban Forest Research (CUFR) reveals "a large 40-year-old tree in a 'cold and snowy climate' pays back tax payers and homeowners nearly \$US60 per year".

"For a community with 10,000 trees, that benefit is almost \$U5600,000 per year, and the larger the tree the greater the environmental benefits for communities," CUFR director Greg McPherson says.

According to McPherson, "A 40-year-old green ash (*Fraxinus pennsylvanica*) on public property annually intercepts more than 2143 gallons (8112 litres) of stormwater, remove 2.5 pounds (1.13 kilograms) of air pollutants, conserves 7% of energy bills for cooling, and

adds 1% to the resale value of a home.

Costs for the same large tree are considerably less than the total benefits, ranging from \$US88 for a yard tree to \$US18 for a street or park tree, so the benefit/cost ratio for a community is as high as 7.9 to one - well worth the investment."

Rainfall interception is the single biggest benefit, paying back to the community more than \$US23 for every large tree 40 years after planting.

"Property value enhancement is put at nearly \$US15 per tree, air pollution reduction at \$US13 and energy conservation for heating and cooling at nearly \$US8.

[*Central Midlands & Coastal Advocate, 30 March 2006*]

Industry proposed for Dalwallinu wattle

Dalwallinu wattle could become a new industry and not just a flower as the Shire of Dalwallinu look into the development of a wattle seed industry.

The Shire of Dalwallinu has been awarded \$10,000 in funding through the Wheatbelt Development Commission's (WDC) Wheatbelt Regional Development Scheme (WRDS) to contribute to a feasibility study into the industry.

Currently wattle seed production in Australia is considered a 'boutique industry' with most supplies coming from small commercial operators in South Australia or from Aboriginal pickers.

The Shire of Dalwallinu is hoping to look into the growth of the industry within the region.

Dalwallinu Shire President Robert Nixon said the potential in the project is significant.

"The outcome of the study will determine Dalwallinu's potential to become a player in the growing bush food industry," Cr Nixon said.

"The potential to export products around the world with Dalwallinu's name will boost our local gross domestic product output, employment opportunities and the tourism industry."

The Shire has been working with Department of Conservation and Land Management (CALM) wattle expert Bruce Maslin on the wattle seed project.

Mr Maslin said the wattle seed production could have benefits not only as an industry but also as a way of controlling salinity.

"It is a very innovative and very interesting angle that the Shire of Dalwallinu has taken on wattle seed production," he said.

"There are many ways the wattle seed can be used as a food source and as many species occur naturally in the environment, it could be

a different way of using a natural resource."

Wattle seeds can be used in pesto, biscuits, medicines, alternative to coffee and wheat flour and as a flavouring agent.

If determined viable through the feasibility study the development of wattle seed production will complement the planned Dalwallinu Inland Environment Centre, which is expected to be ready by late 2007.

Mark South from the WDC said the idea of wattle seed production was one with merit, which is why funding was awarded to the project.

"Dalwallinu is the ideal location in the Wheatbelt to explore the use of wattle as an industry," Mr South said.

"The flow on effects socially and economically could be of benefit to the region."

"We are keen to see the Shire of Dalwallinu also engage with local Aboriginal groups to gain some of their knowledge and insight into the wattle seed."

More funding will be sought through other means in the coming months for the study and it is understood the study will go out to tender within the year.

---Megan Beange

Trees are the best monuments that a man can erect to his own memory. They speak his praises without flattery, and they are blessings to children yet unborn.

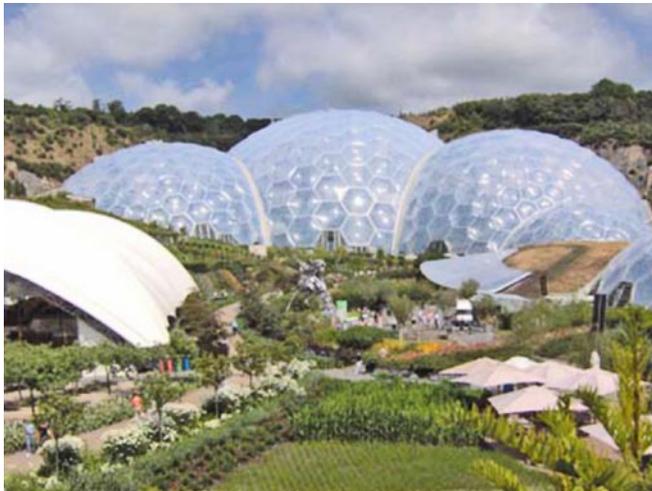
--- Lord Orrery, 1749

David's travels, part 3

The final installment of the story of David Noël's round-the-world journey last year

Leaving Rio de Janeiro, my next flight took me via Madrid to London. In the UK, I spent about two weeks looking up relatives and friends from my youth. I hired a car for this, but England is so crammed with people and cars that parking is a nightmare. One change I did notice from my early days (I left in 1964) was that England was, surprisingly, much greener. Both the old local roads and the ever-upgrading motorways were all lined with trees, with new plantings apparently going in as soon as the earthworks were completed. Britain has a policy of encouraging tree planting as much as possible. If a landowner is willing to set aside a bit of property for trees, the government will supply and plant these at no cost and even pay the landowner a worthwhile amount each year to 'maintain' them to maturity.

The range of species used is limited, apparently mostly natives or species introduced centuries ago. When driving, the overall impression is of muted green surroundings.



The Eden Project has vast inflated domes in an old claypit.

Down in Cornwall, southwest England, I visited the Eden Project. This is a display of economic plants, mostly crop trees, from all over the world, housed in vast inflated domes. Each set of domes has a simulated climate or 'biome', e.g. Tropical Jungle, Mediterranean, Arid Lands. The whole complex is set in a worked-out China Clay pit, and is very well done, very informative.

From London I flew to St Petersburg in Russia. After an extended period of stagnation following perestroika, St Petersburg is coming good again, with perhaps half the grand old buildings having their facades, at least, restored, and the rest underway or planned. It's a lively city with perhaps the most fashionably-dressed woman of anywhere, bookshops full of new books of every description.

While there I visited the Vavilov Institute, Russia's principal plant research and development organization. One of WANATCA's exchange partners, staff were kind enough to show me their extensive seed banks, with dried, chilled, and liquid-nitrogen-stored specimens intended as a gene bank reserve in case of variety loss or for genetic research. The building was once splendid, now somewhat run down, but the storage facilities were of world class.

After St Petersburg I flew to Helsinki in Finland. As expected, a clean and efficiently run city, with a tendency to stark, solid



Vavilov staff in a seed storage area. L to r: Artyum, Boris, and Tamara

design. It was August, and the local markets were full of berries, locally wild-harvested -- cloudberries, snowberries, blueberries, bilberries, and others. These berries are the principal food of bears and other animals, fattening themselves up to get through their long hibernation. These northern countries have quite a short growing season, and only small fruits can get through to maturity, larger fruits come from warmer places.

A trip out to a national park gave a glimpse of the heavily forested 'land of a thousand lakes'. Although the trees are everywhere, the number of species is quite small, perhaps as few as 10. The result is rather bland for someone familiar with, say, WA's Fitzgerald



One of the thousands of Finnish lakes

National Park, with a thousand times as many species.

After Helsinki, I flew with Finnair on a great-circle flight to Beijing, China. First day was hot and rainy, 100% humidity. China has greatly changed since I visited 26 years ago, when there were no private cars, everyone dressed in blue Mao suits. Now there is dense traffic, with much construction underway (4th ring motorway, new underground lines) with 2008 Olympics in prospect. A big range of clothes, foods, and other goods available. I visited the Great Wall, a section 45 km NW of the centre.

The shops were full of fruits such as huge jujubes and lychees, and supermarkets had a big range of nuts, including 'Small Walnuts' (a *Juglans* species, possibly *mandschurica*) and Kaya Nuts (*Torreya nucifera*)

From Beijing I took an overnight sleeper train to Shanghai, also a prosperous, bustling city with both old and striking new buildings. McDonalds outlets every 200 metres or so! I made a train and bus trip out to Bao Shan, the commercial port area 30 km N on the Yangtze Kiang ('yellow river', heavy with silt).

Finally I caught the Maglev train (no wheels, only magnets, 450 km/hr) out to the airport and checked into the Qantas counter for the trip home, back to familiar surroundings. Great to travel, if only to confirm that Western Australia is still the best place in the World!

---David Noël

Thanks, David, for sharing these interesting moments in your journey.

---Pat

[<http://www.rarefruit-sa.org.au/Espalier/Espalier.htm>]

An elegant solution

Shortage of planting space, birds stealing and destroying fruit - sound familiar? John and Margaret Poole, members of the South Australian Rare Fruit Society, faced those problems and overcame them. There are many excellent photos on the web site.

We commenced planting our fruit tree orchard in the early eighties. Diligently we spaced a variety of trees a recommended 17 feet apart.

The trees grew very well, with a little help from a friend's chicken manure, and it was not very long before we were picking our first fruit.

It soon became apparent that the birds were enjoying the fresh fruit more than Margaret and I. Not a problem, we can simply throw a net over the trees. We soon discovered that one has to be in a good mood before attempting this feat, because one certainly wasn't by the time one had finished. Removing the nets, tearing holes and stitching them together again is another story.

When we joined the Rare Fruit Society, it became evident that we had no more space on our land to plant some of the rare and exotic fruits grown by other members.

There had to be a way to overcome both the bird and the space problems. Let's build a netted framework over an espaliered system.



View from the north

Pine posts soaked in arsenic didn't appeal to us, nor did termite eating timber. How about steel? We didn't have, or know how to use a welder, so we successfully experimented with square sectioned steel tubing, galvanised brackets and self-tapping screws.

A plan was drawn and a spacing was decided upon of 5 feet between rows and 7 feet between trees. We read that fruit is generally more prolific on horizontal branches, so we chose a simple 4 wire tiered system which would provide space for about 25 feet of main branches.

The reject steel was delivered by a local salvage yard at less than half normal price. They even cut it into requested lengths. We also ordered rolls of half inch square mesh to cover the framework.

Erection was a lot of fun using a cordless screwdriver, brackets and screws. The netting was also attached with screws and netting clips.

The watering system consisted of a half inch polypipe tied to the bottom trellis wire,



Controls for the watering system

with upside-down low output micro sprinklers which comply with our water saving regulations. We figured that drippers would not give an even coverage and overhead watering would encourage fungus growth.

When the first stage was nearing completion, it was looking so good that we decided to double the originally planned area. Since then we have had two more extensions. A small area was covered with plastic film which provides a plant propagating area for John. Another corner is covered with shade cloth where Margaret's grows her ferns.

The soil below is covered with a mulch of wood chips and prunings from our shredder, as well as almond shells which are a by-product of Corella destruction.

Training the new growth of the young trees



Flowering plumcot

is a regular but satisfying job in the Spring and early Summer. We have found that the most suitable material for initially securing the branches, is tree tie made from re-cycled fabric. It is flexible enough to allow expansion of the developing branch and is re-useable for several seasons. Later we replace the ties with about 2 or 3 cable ties to each branch.

To label the espaliered fruit trees, we use a black, engraved, ultra-violet stable plastic, attached by speed nuts to the supporting wire.

---John Poole



Mammoth quince



Persimmons



Jujubes

China is a giant in many respects - size, population, emerging impact on the rest of the world. There have been many encouraging reports about China's reforestation efforts. However, it seems that there is a bright side and a dark side... First, the bright side.
[FAO INFOSYLVA 2006-5, February 26, 2006]

Tree-planting under way in China

BEIJING, China (AP) -- China planted 12 billion trees over the past five years in an effort to restore its scarce forest cover and combat flooding and the loss of farmland blamed on excessive tree-cutting, forestry officials announced Monday.

The new trees, many planted by volunteers, covered some 32 million hectares (80 million acres), Jia Zhibang, director of the State Forestry Administration, said at a news conference.

China has been trying for more than a decade to reverse the rapid loss of what little remains of its forests.

Experts blame heavy tree-cutting, spurred by rapid economic growth, for the loss of farmland to deserts and devastating summer flooding in areas where denuded hillsides fail

Now the dark side.

[New Scientist, 1 April 2006]

China tops league of loggers

Beware the "Made in China" label on that new table or patio chair. Those words could be a synonym for "illicit goods". Washington-based think tank Forest Trends says China is now the "wood workshop of the world", and the largest importer of illegally cut timber from tropical rainforests. The US and the UK are its two biggest markets.

"Few consumers realise that the cheap prices they pay for furniture are directly linked to the exploitation of some of the poorest people on Earth and the destruction of their forests," says Andy White, lead author of the report.

The report says that since the late 1990s,

to trap rainfall.

Tree-planting in northern China has helped to reduce the severity of spring dust storms in Beijing and other northern cities.

The trees planted in 2001-2005 raised the portion of China covered by forests from 16.5 percent to 18.2 percent, and the government hopes to raise that to 20 percent by 2010, Jia said.

The amount of China covered by what outsiders would consider forest is usually smaller than reported because the government figures often include fruit orchards and other territory with trees.

The government also hopes to increase the amount of vegetation in China's densely crowded cities, Jia said.

China has stopped logging its own dwindling natural forests and started plundering the forests of Papua New Guinea, Burma, Liberia and Indonesia, where 80 per cent of logging is reckoned to be illegal. If logging continues at the same rate in Papua New Guinea all its natural rainforests will be gone by 2020.

While demand for wood is rising in China itself, two-thirds of imported timber is subsequently exported. China now supplies 30 per cent of the global trade in furniture. Since 1998, US imports of Chinese timber products have increased tenfold, and those in the European Union eightfold, with the UK leading the way.

Two new Yearbooks, AND 'Quandong' issues online!

In a major advance in WANATCA's plans to move our huge store of information online, the first two issues of our Yearbook have been converted to PDFs and placed on the Web for member use.

Yearbooks 1 and 2 were dated 1975 and 1976 respectively. Their contents lists are shown below. They join Yearbooks 26 and 27, making a total of four issues now available.

You can access these Yearbooks at www.aoi.com.au/wanatca/Yearbook. You can see a listing of all articles to date there without being a member, but to view or download full articles, you will need a password.

Each quarter, the password will change. You will receive a new password by email each quarter or you can find the password printed at the bottom left of the address panel on the mail slip sent with the current issue of Quandong. Members will be supplied with a new password each quarter as long as they are current.

Even more goodies!

Issues of WANATCA's magazine Quandong have been converted to PDF form (readable with the free Adobe Acrobat application) since the 3rd Quarter 2005 issue. Now the Executive has agreed to place these Quandong PDFs on the web as an additional benefit for current members.

Not only will these issues remain permanently available for reference, they have enhanced features over the printed versions, and the latest issue may even be available before the printed version hits your postbox. Many illustrations in the on-line version will be in colour. You can bring up the Contents list on page 2 of each issue, and clicking on a particular article will take you there directly.

(The same feature will apply to the early Yearbook Contents lists, but all except the latest Yearbook had only black-and-white illustrations.)

Access to issues of Quandong online is via www.aoi.com.au/wanatca/Quandong. With a current password, you can pass through a gateway to all our online publications.

Contents list for Yearbook 1

The Jojoba Nut - Paul Thomson
Nutmeg in Tasmania - Bill Mollison
The Chilghoza Nut Pine - B.N. Gupta & K.K. Sharma
Problems of Bush Planting - David Noel
Almond Production in California - Roger Baccigaluppi
Bunya Pine: Grafting, Pollination, Seeding - 'Queco'
Trial on Basamid
Prospects for Pistachio in Australia - D.H. Maggs
Photographs of Cashew Nut Trees in the North West - Fred Lullfitz
Cashew Production in the Kimberleys - Derek White
History of Nut Trees - George L. Slate
The Nutgrowing Zones of WA - David Noel

Yearbook 2

The Double Coconut of the Seychelles - Guy Lionnet
Flail Cultivation in Nut Orchards - Wayne Roberts
A Proposed Pistachio Orchard in Moora - AC. Belford
A Nut Tree from New Guinea - D.B. Foreman
Nut Nursery Notes - David Noel
Bird Damage to Nut Crops, A 'Paper' Symposium
Some Nut Trees of the NT - Dennis A. Hearne
The Langanda Nut of the NW - Ian M. Crawford
Hicksbeachia, A Neglected Australian Nut - Noel Thies
Notes on Nutgrowing in the SW - Neville Shorter
The Marula, an African Nut Tree - P. van Wyk
Planning the Filbert Orchard - H.B. Lagersted
Nut Trees as Replacement for Apples - Mary Busher
A Large Commercial Pecan Planting in NSW - E. F. Gillin