Coordinator

ASSOCIATION of
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Wildlife and Native Plants Study Group Newsletter

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Dear Members,

Hello once again! Thankyou to those members who have recently paid their subscriptions for one or more years. It is hoped that most regions have received sufficient rain this year to break the drought. As I write Adelaide has just been hit by a deluge of rain, with many of our rivers and creeks swelling, bursting their banks and flooding certain areas, particularly in the Adelaide Hills. Here at home we sat and watched the hailstorm that hit and carpeted the garden with a blanket of white. And I know many of you will have experienced snow in the mountains. What I can tell you is that our weather has been really, really cold and not the best for working in the garden. But that will change soon as winter moves into spring .

Politicians have talked much about water restrictions, and the one good note has been the recommendation to plant Australian native gardens. Of course we have been recommending that for many years now with Australia's climate!

Let's hope too as winter passes and spring emerges that we can spend lots of time admiring our native flora and fauna - whether it be working in the garden, observing the changes that come with the seasons, bushwalking, or in whatever we do.

Winter is however a time for weeds and so this issue features some articles on the problems of particular weeds. Weeds are considered the greatest environmental challenge facing Australia today.

To quote Dr. Rachel McFadyen, CEO of the CRC for Australian Weed Management in SA, "the spread of invasive species is recognised internationally as the greatest threat to biodiversity after clearing and, in Australia, invasive plants are the major threat. Weeds cost the Australian economy at least $3.5 - 4.4 billion per year. Lantana and blackberry alone choke 120,000 sq. km of pasture and woodland, preventing natural forest regeneration and carrying damaging fires. Other weeds currently degrade many more thousands of kilometres of environmental and agricultural land, and new invasions spread every year."

While we have already discussed some weeds in Issue 44, weeds are such a major problem in all states of Australia, that it's probably worthwhile to mention a few more. I have learnt too recently that not all states allow spraying or baiting for weeds and feral pests using particular chemicals or preparations, so please check with your own State and local regulations about what is recommended to be used.

Also in this issue we look forward to spring, and the problems we face with birds at nesting time and swarming bees. One article features the magpie, one of our own native birds, and another the value that our native flora provides in the way of honey. Remember too, that if you want to see particular information or have stories to tell then please send me the details. I'm only too happy for you to contribute and make my job just a little easier.

Well, happy reading yet again!

IN THIS ISSUE

SMALL WINTER WEEDS

Reprinted from Releaf No.91 Winter 2004

Smaller weeds cause many problems:

- They replace small native species
- They inhibit the establishment of many native species,
- Many smaller weeds die back in summer leaving the ground bare.

Before starting work it is vital to take the whole of your patch of vegetation into account.

It is only during winter/early spring that many of the smaller, winter active weed species can be tackled. This means that you will be working amongst valuable native lilies, orchids or herbaceous species. Care is needed to ensure no damage is done to native species, so walk carefully.

Make sure that you don't overclear the weeds. Only work as far as you would expect native species to benefit.

Different weed species may require different techniques. The list below provides examples of various methods.

Broad leaf Weeds - eg. Salvation Jane, catsear, cape weed, thistles (ensure that they are not native), plantain etc.

If the soil is reasonably moist, remember that careful removal by hand is very effective. Use a screwdriver or kitchen knife and ease the weed out. Alternatively, very careful use of Glyphosate can be helpful, but ensure that no Glyphosate comes into contact with native species, and use the best technique (eg. weed brush, or spray unit/dribbling method).

Annual weed grasses - eg. Briza spp, annual veldt grass etc.

Careful hand weeding is vital when annual grasses have invaded good vegetation. To reduce the chances of reinfestation, use hedge shears in late August and early September, to cut annual weed grasses adjacent to where you have been working (working outward from the best vegetation areas). This will reduce the seed set and provide the best progress.

Sparaxis, freesia, Guildford grass etc. Sometimes these garden escapes can be removed by hand. Guildford grass however is normally very difficult to extract from the soil.

With all three weed species, the use *of the tongs of death* will be effective. The best time for this to be done is from late July to early September. With freesia/sparaxis, if you've missed the best time to use the tongs of death, consider using hedge shears to cut off flower heads to reduce seed set. This will be very useful as you slowly work outwards from your best bushland areas.

Remember, that with any weed control you work to achieve the best outcomes, both ecologically and in terms of your efforts.

MEASURING SLOPES WITH A HOME-MADE CLINOMETER

from Small Talk June-August 2004

Materials needed:

A semi-circular protractor, preferably at least 15cm along its base.

A 25cm long piece of wood (white or light coloured makes reading the protractor scale easier) with a machined straight edge.

A lead fishing weight and a length of fine (preferably coloured) fishing line to make a plumb line.

Using two screws, fix the protractor to the piece of wood, with its straight edge flush with the straight edge of the wood. Bore a small hole through the wood and protractor precisely at the point of intersection of the 90 degree line and the 180 degree base line of the protractor.

Thread the plumb line through the hole so that the plumb line falls down across the face of the protractor and fix the line securely at the back of the piece of wood.

Facing across the slope (not up and down the slope) align the straight edge to coincide with line of the slope to be measured.

The plumb line will now cut the graduated rim of the protractor at a point to the left or the right of the 90 degree line, depending on the direction of the slope in relation to the observer.

The difference, in degrees, between the plumb line reading and the 90 degree line gives the angle, from the horizontal, of the slope being measured. This instrument allows slopes other than the one on which the observer is standing to be measured rapidly.

Using a thin line allows readings to an accuracy of plus or minus half a degree.

DO YOU USE WATER WISELY?

Whether you use mains water, a local creek or rainwater, using it wisely helps the user to save money and benefits the environment. Did you know that almost 50% of total water used in urban areas is used on the garden.

There are a number of actions that individuals can do to save water as well as money. Using water saving appliances, planting low water use gardens and maximising irrigation efficiency can all help to reduce water use.

Undertaking a home water audit can assist you in determining how water wise you are and provide some suggestions on how you can maximise your water use efficiency. The home water audit can be downloaded from the website www.watercare.net where you can also get handy tips to save water.

SOURSOB: SOUR BY NAME, SOUR BY NATURE AND SOURING OUR BUSHLAND

Reprinted from Releaf ,No.91. Winter 2004

Soursob (*Oxalis pes caprae*) is familiar to many Australians. Not only is it the cause of much frustration in our gardens and paddocks, but it causes problems in our bushland as well. It is yet another garden plant that has escaped into bushland and across many other areas. It originates from Southern Africa like many of our bushland weeds. Australia and Africa were once joined as one continent, Gondwana, so it is not surprising that African plants do well in Australia and vice versa.

Soursob emerges in mid autumn from underground tuberous roots and bulbils. It spreads up to 20cm. a year and the tuberous root aids the spread of bulbils underground. In South Australia soursob does not produce seed, it only reproduces vegetatively (ie. by its bulbils underground), therefore it spreads slowly, but humans enable it to spread more rapidly via earthworks and other soil disturbances.

Although soursob is not a large weed it dramatically disrupts native vegetation and can be extremely difficult to eradicate.

When in dense infestations soursob excludes almost all light from reaching the soil surface. This results in the death and/or exclusion of almost all plants underneath it and bare soil in summer after soursob dies back.

What it looks like

Most of us are familiar with this weed, and anyone with a garden will inevitably have to deal with it. Soursob is a herb which can grow shin high. The leaves are bright green, whilst groups of bright yellow flowers grow from a single flower stem. Flowering time is variable, with some flowering being observed as early as June. The majority of soursob infestations are seen to flower from August to October.

Using herbicide- what's the best approach?

Soursob can be weeded by hand, but this is tedious and extremely unsatisfying. It requires substantial digging to ensure all bulbils are removed and if the weed is hand pulled, the infestation will increase as bulbils become dislodged and remain in the soil. The only effective solution is the efficient and safe use of herbicide within remnant vegetation.

The most important priority is to prevent any further spread of soursob. In the past Glyphosate was the only herbicide used to control soursob. It is highly effective if sprayed when soursob is flowering or forming flower buds, but it will also kill native plants.

A second problem is that if over cleared, soursob will inevitably be replaced by other weeds that can be more troublesome to deal with. A second alternative is to use the broad leaf herbicide Brush-Off (metsulfuron methyl). With only small infestations careful spraying (or dribbling) with Glyphosate ate a rate of 1:100 just before or during flowering is effective. It is critically important that no native species are sprayed in error. Larger infestations should be tackled by carefully following weed fronts. Using Brush-Off at a rate of 0.1grams per 3 litres, and ensuring that the soursob is only sprayed once, and without run-off, can be very effective. An added bonus with using Brush-Off is that at this low rate, it acts as a broad leaf herbicide and soursob can be sprayed before flowering from June onwards.

Work along the weed front

The depth of any incursion into the weed front should be based on the amount of native vegetation that exists. In other words, allow the native vegetation to dictate the level of weedspraying. For thick `walls' of soursob, spray only about 15 to 30 centimetres into the weed front and continue ALONG the weed front, eventually encircling the infestation. Only spray where there is a likelihood of native vegetation being able to regenerate.

Native oxalis vs. soursob

There are many weed species of *Oxalis* and a number of native species. Many of the weed species including soursob, have their leaves and flower stems emanate from a central point. However, native *Oxalis* species tend to creep along the ground with smaller flowers. The leaf and flower stems often have a pale reddish brown colour. As with any unfamiliar plants, if you are in any doubt do not spray.

ED.NOTE The following *Oxalis* species are weeds found in Australia:

O. acetosella (wood sorrel) from North America and Europe
O. adenophylla from North America and Europe
O. carnosa from of Chile and Bolivia
O. cernua (Bermuda buttercup) from the West Indes
O. corniculata (Yellow wood sorrel or Creeping Oxalis) from North America and Europe
O. deppei (Lucky clover) from Central America
O. gigantea fromChile
O. hedysaroides (Fire fern) from Central America
O. purpurea (Grand Duchess) from Southern Africa

The only native species that I've found mentioned anywhere is *Oxalis perenans* which has smaller flowers than the weed species and the plant tends to creep along the ground. Perhaps other members know of others in their own locations?

FERALS COMPETE WITH NATIVES

From an article written by John O'Bree and published in The Guardian, Vic. 12/3/04 p.16

Another feral bird is the European Greenfinch *(Caesualis chloris)* brought into the country in the 1880s. Today this species inhabits most of Victoria, parts of NSW along the coast to Adelaide in SA and all of Tasmania.

Although not as colourful as the goldfinch, the greenfinch is a pretty bird. Like most feral bird species it feeds on the seeds of weeds, and could be said to be keeping down the feral weed population.

Another feral bird species is the sparrow, which we tend to take for granted. The very common house sparrow, *(Passer domesticus)* was introduced into Australia in the 1860s and has now spread to over half the continent. It has covered an area from the south coast on the border between SA and WA as well as the NT.

Much money and time has been as is continuing to be spent keeping this pest out of WA with birds being shot on sight. Sparrows tend to be thickest around towns and farms where people live, and seem to enjoy scraps of human food and can be quite aggressive in their chase for food. They have learnt to take advantage of buildings for nesting sites and go to extreme lengths to build large nests from dry grasses lined with bits of wool, feathers and other items. They will lay up to seven eggs, although the norm is five per breeding season.
The nests of these ferals are also suspected of causing some household fires, although this point has not been proven.

The second and lesser known sparrow that we have acquired is the Eurasian Tree sparrow *(Passer montanus)* This bird inhabits the eastern half of Victoria and souith east corner of NSW. Also arriving in the 1860s has not been successful as the house sparrow in colonising. It has similar nesting habits and like all ferals are a problem to our native birds by dominating nesting and feeding sites. They have some subtle colour and pattern variations. Like most bird species there is a dominant male in each flock, and is fairly easy to spot as he has a much larger black bib during the breeding season.

Then there is the very plentiful common blackbird *(Turdus merula)* a native of Europe and Asia who arrived in Melbourne in 1862 and has widened its area to most of Victoria. These birds also compete vigorously with our natives for food. They are aggressive feeders and often make quite a mess in people's gardens with their habit of scratching around flower beds in their efforts to get worms and grubs. They are very efficient feeders and because of this they are still building in numbers with the usual detrimental effect on our natives. They build quite solid cup shaped nests in trees, sheds, houses and almost anywhere that they can find protected position about 1.8metres above the ground. There they will usually lay between three and five blue-green splotched eggs. Usually they will fledge young at least once a year, in a good year this number may be doubled. These birds eat a large selection of foods, including grapes, berries, fruit, seedlings and insects and hence have the ability to survive very well in most town or suburban areas.
All of these are ferals because most of them have actually made a niche for themselves in our environment, are probably here to stay at the demise of the native species. They have a detrimental effect not only on native birds but also their habitat and food webs.

BOOK REVIEWS

The New Atlas of Australian Birds *by Geoff Barrett, Andrew Silcocks, Simon Barry, Ross Cunningham and Rory Poulter*, 828pps hb.

The New Atlas Of Australian Birds presents 4,000 distribution maps for over 650 bird species, including seasonal changes and breeding range. Change maps are also presented for 250 species, identifying those that are more common or less common since the first Atlas was completed 20 years ago.
Whether birdwatching among the snappy gums of the Great Sandy Desert or the snow gums in Tasmania, The New Atlas of Australian Birds will tell you which birds you can expect to see.

Australian Native Plants *by John Wriglery & Murray Fagg 5th edn* 696pps. hb.
This new edition of an Australian bestseller is for everyone interested in growing native plants anywhere in Australia, whether they be home gardeners, landscapers or professional horticulturalists.
The Fifth edition of Australian Native Plants has a completely new layout including over 1,000 photographs and new, easy to recognise symbols to indicate different properties of each plant. A must for native plant lovers!

LIVING WITH MAGPIES - *reprinted and adapted in part, from an article from ACT Parks & Conservation Service, and NPWS Lofty/Barossa District SA.*

The magpie is a common bird of suburban gardens and parks, and of farming areas where it can be seen searching for soil dwelling animals, garden pests, other insects and food scraps.

A favourite food is the scarab beetle/grub which damages lawns. So the birds are actually doing you a favour by ridding the lawns of these pests, even if they leave holes behind. The magpie's carolling song makes a pleasant contribution to the morning bird chorus.

For most of the year magpies form associations, and remain in these groups. In the spring they form breeding pairs. The female builds a nest from sticks and lines it with soft fur and grass. Two or three eggs are laid and the young magpies hatch after about twenty days incubation. The parents remain busy with the task of feeding the young until they are old enough to leave the nest about a month later.

Magpies gather food, build their nest and raise their young within a limited area, which is recognised a their territory. When there are eggs or young in the nest the adult birds show great concern for their offspring and defend this territory from other magpies and perceived intruders including hawks, cats and people, which they mistakenly believe are trying to harm them. Nesting magpies defend their territory by swooping upon the intruder, beating their wings, clacking their beaks and occasionally pecking. The more the magpies are provoked the more defensive they become and the harder they attack.

Removing the eggs or the nest will do little to solve this problem, and so it is more sensible to learn to live and make friends with the magpies.. You can make friends and encourage contact with magpies simply by offering them worms, meat and bread or other food scraps. While many may not see this as desirable, it does bring some familiarity between yourself and particular birds, and once they know you are no threat to them they will not attack, but in fact bring their young to you as soon as they can fly by themselves. Again this encourages human contact and if you mean well, the birds will not feel threatened by you.

Sometimes there are particularly aggressive birds and territories, where the birds persist in making everyone an enemy, by swooping. However there are a number of measures you can take to protect people and deter further swoops. Simply avoid the area where the birds are nesting. Make a temporary sign to inform other people. Wear a hard hat, a bicycle helmet for the best protection of the head. You can also make helmet or hat from cardboard or an old icecream container.

Magpies are less likely to swoop if you look at them. If you are swooped try and watch the magpie and at the same time move away from the area quickly and safely. Draw or sew a pair of big eyes on the back of your hat. The magpie may think you are watching him, and may not attack you.

Carry a stick or a branch above your head but don't swing it if the magpie swoops. Remember it will hit the stick and not your head if it swoops. The best protection of all is to carry an open umbrella and don't be afraid if your friends laugh at you - pretty soon they may well be asking to borrow your umbrella.

If you are swooped when riding your bicycle you will probably be trying to watch the magpie rather than the road and this can lead to an accident. If possible wheel your bicycle rather than ride it through a magpie's territory. Remember to wear your hat or attach a tall safety flag to your bicycle. Do not stop if swooped. You are still in the magpie's territory and therefore it will keep swooping you. Walk quickly and safely (don't run, you may trip and fall), until you are out of the magpie's territory. Older children should escort smaller children through areas where magpies are known to swoop.

Set up a bird feeding table in your backyard and learn to enjoy regular company of magpies and other bird which come to visit. A platform made from wood or metal, mounted on a pole or fence, in an open area where cats cannot sneak up on feeding birds, is most suitable. Place food scraps and parrot seed mixes on the table every day and you will soon have a flock of regular customers. Birds which feed regularly will soon learn to recognise you as a friend and will not swoop you or your neighbours. Instead they will bring you many hours of pleasure and understanding can contribute to your own education and to conservation where ever you live.

ED.NOTE We used to feed one magpie, then two at our sanctuary. These two birds became so familiar with us, that each breeding season they brought their young to us as well. We befriended and fed about 8 magpies who claimed our area as their particular territory. They tolerated our cat

and dogs, and shared this territory with us, and our other birds and wildlife.

They even helped watch over a magpie which had been brought to us initially as an injured rescued bird -which we nursed back to health. This magpie could never be returned to the wild because of its injuries. When she escaped through an open cage door, the other magpies rounded her up ever so gently and made her sit in the one spot until we had picked her up and returned her to her cage. There was no malice, they knew where she should be - she belonged in the cage- and they made sure that she was to be safely returned to the cage, by one sitting watching over her, telling her to stay in the one spot, and another alerting us that she was out away from her cage. They protected her from other predators because she was defenceless. Once she was returned to her cage they warbled and flew off. We were so pleased that they had helped in this way otherwise in the wild this bird would not have survived.

These magpies were fed daily with scraps of chicken mince or diced steak and often bread, enough to supplement their food source in the drier years. They repaid us by carolling and warbling morning song to us and by their amusing antics. They came right up to the doors and windows, and if we were sitting outside they were not afraid to come up to us. Not once did they swoop on any of us, or attack us because we were eating outside, and they never stopped other birds from being fed.

We would have walks around the property, where we must have come very close to their nesting sites. They never swooped us, or attacked us. We posed no threat. They alerted us when other raptors were in the area, frightening the smaller birds, and they took to these raptors and chased them out and away from the area.

They became so friendly that we had them eating out of our hands and would call in regularly as visitors at a certain hour. If we were not there, they waited awhile and then went off and did their own food searching, but returned each day just in case we were there and had some tasty morsel of food for them. Perhaps it was the food, perhaps they appreciated the company, just like we did. We built up a healthy respect to the magpies and looked forward to their daily visits. Other birds in the wild such as New Holland honeyeaters, red wattle birds, pigeons, babblers, mallee ringnecks and galahs were not at all perturbed by them. They all lived and tolerated each other, undoubtedly each knowing its own place in the environment and food chain. The only pesky bird which annoyed the magpies was the magpie lark or Murray magpie which delighted in annoying others. The magpies put up with it.

The magpies were also tolerated by the birds we had in the aviaries from crimson winged parrots, cockatiels, budgies, Princess Alexandrine parrots, red rumps, regents, bourke and turquoise parrots. They obviously posed no threat and were tolerated because of their actions to the raptors in the wild. The magpies were not at all threatened by the larger aviary birds - the Sulphur crested cockatoos or corellas, or even other raptors in the aviaries such as the white winged chough, barn owls or Australian kestrel. Many of the larger birds were rescued birds, and were unmoved by the magpies' presence. I'm sure they each knew of the other's presence but were unaffected .

I don't doubt for a moment that some birds in the urban areas will swoop on those that come too close to their nests or are perceived to be in their particular territory. I guess it's equivalent to infringing one's own personal space and protecting what we believe is ours. Sometimes near school yards and parklands it is even understandable given the actions of children - cycling through an area, shouting, waving objects, climbing trees, often raiding nests. And like all things there will be innocents hurt.

There will always be those people who believe that some birds should be culled from areas where they pose a danger to others and where they believe humans should remain supreme. But in the natural world all creatures live together, not necessarily in harmony with each other, but each having its own place in the scheme of things. Do we remove people that are obnoxious or we don't like, of course not. We simply avoid them. And perhaps that is what we humans should do when we are confronted with birds protecting their territories, or posing a danger to us by their actions. We also need to understand why they act the way they do.

Magpies like most birds can be a source of joy and inspiration, their warbling and birdsong a pleasure to be heard. Perhaps we were lucky in the magpies who settled with us, and called our home their territory as well, and so I admit that I might be a little biased. So many of our native bird species have been hunted to extinction, or displaced by pest birds. We should tolerate and enjoy all those native birds that are around us, before we lose them all. Common sense should dictate our actions.

Christine Jones

THE SWEETNESS OF THE BUSH - a story of Honey *by Christine Jones*

We all know when walking through the bush the smell that is so sweet, and over powering that there is a native plant in flower, whether it be the honey myrtle, a eucalypt, banksias, wattles, the mat rush or some other. We know too that there will be bees aplenty and the sounds of buzzing bees makes us look about to ensure we don't walk into their pathway. Of course there are other telltale signs as well - such as the birds and insects seeking out the sweetness of honey from nectar and pollen producing plants, and flitting from one bush to another; or the dropped flower caps and massing red or yellow stamens under the gumtree, and the obvious blooms themselves. If we walk far enough, we will soon come across the beekeeper's boxes, or hives confirming the production of honey.

Leach (1960) in his Australian Nature Studies tells us that there are over 900 different kinds of bees in Australia, including the native bee and the hive or honeybee. The honeybee is the most highly civilized, organised and developed of all. The bee colony consists of one queen, several hundred males or drones, and many thousand workers.

The workers tend to feed the young; gather water, nectar and pollen, make wax and honeycomb, regulate the temperature and do any other work. The worker bee is of moderate size and does the flower visiting. Its tongue is long enough to reach the nectar of many flowers. The body and legs are clothed with hairs, which catch the pollen; the hind foot has a brush of stiff hairs to enable it to brush the pollen from its body and legs; the end of the hind shin has a comb to get the pollen out of the brush; the pollen basket on the swollen hind shin then receives the pollen. Between the end of the shin and the brush is the wax-nipper. The crop stores the nectar taken from the flowers. At the hive this, nectar and saliva is regurgitated and stored in the honeycomb.
Most of us are aware of the barbed sting that the worker uses as a weapon, and its swift "bee-line" flight to the hive when loaded with honey.

The making of wax is a drain on the bee's time and energy, having to eat 40 kg. of honey to make 1 kg. of wax. For this reason apiarists extract the honey from the comb and replace the comb, which is again filled by bees.

Basically the workers collect and store food and manufacture cells, while the queen lays eggs. Bailey (1982:7) suggests that the queen is able to lay eggs twice her own body weight every 24 hours. The number of eggs laid by the queen at the height of the season is thought to be 1500 to 3000 per day. The worker takes about 21 days to pass from egg to adult, the drones 24 days and the queen 17 days. If there are no rival queens the queen may live several years, but no males (the drones) survive winter. The workers are female, usually die worn out before two months old, but the last autumn brood survives the winter and replenishes food stores in spring. The collection of bees in the colony form a swarm when the queen has a rival and takes the workers off to build a new hive.

Three types of food are necessary to maintain a healthy colony of bees. These are: pollen for the protein content and body building of the young brood; a sugar compound (usually in the form of nectar and honey) for carbohydrates or energy production; and water for the dilution of stored honey, for the maintenance of the correct level of humidity in brood rearing, and for use in cooling or air conditioning the hive under hot weather conditions. (Bailey,1982 :37)

In early Spring the honey stores within the hive will often crystallize or 'candy'. The bees need water to reliquify these stores for their own use, and will get it from such places as dams, pools or water troughs in the paddocks. The bees under normal conditions will store enough pollen during Summer and Autumn to allow them to start brood rearing in late Winter and early Spring. Where bees have no access to pollen bearing flora the colony will dwindle rapidly as no brood can be reared without pollen. In Summer the beekeeper looks forward to a harvest of honey, the quantity and quality of which is dependent on several factors including the location, availability of nectar yielding flora, climatic conditions, and colonies of working bees.

Blake & Roff (1958) suggest that to the beekeeper, the flower is the most important part of the plant. "Although there are many different kinds, most flowers have a number of features in common. The *ovary* is the central part which later produces the seed. It sometimes has a stalk-like prolongation at the top called the *style*. Surrounding either the top or the bottom of the ovary are the *stamens*. Each of these consists of a thread-

like stalk, sometimes very short, at other times quite long, carrying at the top an *anther*, or pollen-sac, which consists usually of two tiny compartments containing the pollen. The anthers open in different ways to shed the pollen grains. Outside the stamens are the *petals* and outside these again are the *sepals*.

In many flowers the petals are the showy part, but sometimes it is the stamens or the sepals that are most conspicuous, and some have no petals at all. In some flowers the sepals and petals are joined in their lower parts to form tubes, one inside the other; in these flowers the stamens are attached to the tube formed by the petals. Nectar is produced by small *glands* or *nectaries* usually placed between the ovary and the stamens.

In many plants, two kinds of flowers are produced - those without an ovary, called male flowers, and those without stamens, called female flowers. Male and female flowers may be produced on the same or on different plants.

After fertilisation, the ovary develops into the *fruit*, which contains the seeds. The fruit is often fleshy, but in most of the plants ...is often called a seed-pod or *seed-capsule*. These seed-capsules are usually divided into compartments or *cells*, each of which may split separately or open by a lid-like *valve* to set free the seed."

To the beekeeper there are many plants of importance. These plants depend on their location and availability as to the characteristics of the honey produced, and each state will have its own particular species for which it is widely recognised. For example in SA the bluegum honeys are perhaps the best known. Honey varies in colour, aroma, flavour and density depending on the floral source and also on the alkalinity or acidity of the soil around the floral source as previously mentioned.

Honey is marketed by its colour, with light coloured honeys having a mild flavour generally, and these appear to fetch the highest prices. The Australian official colour standards were approved in 1987. These colour standards reflect the entire range from extra white (0-17mm), white (17-34mm), extra light amber (34-50mm), light amber (50-65mm), pale amber (65-75mm), medium amber(75-90mm) to dark amber(90-114mm). To produce one kilogram of honey for our breakfast table, the bees carry almost 80,000 loads of nectar, and in doing so would fly a total of 160,000 kilometres.

The best known plants of importance to the beekeeper are the **eucalypts**. These may "include bloodwoods, boxes, gums, ironbarks and stringybarks. The flowers of eucalypts have no sepals or petals" although many stamens, and the very characteristic buds with lids, caps or *operculum*. Seed capsules are divided into three to six cells, and open by valves which are not easily seen. Each of the types of trees mentioned have characteristic barks which usually gives meaning to their name, eg. the stringybark which has thick, fibrous bark which comes away in long shreds. Lophostemon (or Tristania), Angophora and Corymbia are also similar to eucalypts. Eucalypts are highly valued for their nectar and pollen.

The bloodwoods normally flower during periods of nectar and pollen shortage. The honey is of fair quality, poor density, characterised by its stringiness and is medium amber with a reddish tint in colour. Its main use is as a sweetening agent in processed foods or blended with other honeys. The 'Southern Mahogany' found from the Adelaide hills, to the south east in South Australia, and from Bairnsdale in Victoria to the NSW border, and often in wind break plantations on suburban golfcourses, yields both nectar and pollen in good quantities. In some instances the combs become clogged with the cream coloured pollen. This is a dense honey with a pleasant flavour. The boxes however are of more importance than the bloodwoods.

The mallee-box has a mild, slightly woody flavour, and a light amber colour. The white box has a reasonable density and candies quickly with a smooth creamy texture. It is perhaps the preferred honey for creamed honeys. The yellow box remains a major honey source, and is one of the best known honey producing trees in Victoria, New South Wales, and southern Queensland with its properties of a liquid honey, with very sweet flavour. The grey box is found on large stands and forest areas north of the Great Dividing Range, from the Grampians throughout the goldfield areas, and through NSW into southern Queensland where it is sometimes named 'Brown box'. In South Australia the coast greybox is found in the Mt.Lofty Ranges, South East, Yorke and Eyre Peninsula. In the 'on' seasons it yields copious quantities of both pollen and nectar. The grey box and yellow box often produce a blend of honey of yields of up to 30kg, the honey being extra light amber in colour with a mild, sweet flavour and good density. The 'coolibah' and River redgum in the Darling

Downs area has been known to produce yields of 50kgs of honey per colony. The brown box is a first grade honey when the nectar flow is rapid and heavy. It is a dense honey with pleasant flavour and during good seasons a yield of 40kg. may be obtained by a colony within a few weeks. The red box is found from Warrandyte in Victoria, through the Ovens Valley into New South Wales, also found in Gippsland around the Buchan and Snowy River, yielding a dense honey. The black box of the lower rainfall areas in South Australia produce nectar and honey. All the other boxes produce a honey which is light amber in colour.

As for the gums, the bluegum as mentioned previously is a medium source of honey and a major source of pollen. It is a well known and widely distributed species found in the Wimmera and central Victoria and South Australia, and sought after by apiarists (beekeepers). It produces a reasonably dense honey of medium amber colour and has a pleasant flavour often similar to caramel or toffee. Yields of up to 20kg or more per colony have been known. The river redgum also is a major honey and pollen source with honey of a medium amber colour. The river redgum has been known to produce yields of 60kg in each colony. River redgums provide pollen for storing and use in a time of scarcity, and the flowering period is said to assist the queen rearing ability of the bees. River redgum honey is dense with a pleasant woody flavour, it granulates slowly with a large brown coloured grain. The river redgum flowers at about the same time as the yellow box, giving pollen at a time when otherwise little would be available. Blakelys redgum found in north eastern Victoria, NSW and the ACT is said to yield good quantities of nectar. The sugar gum native to South Australia, has been planted extensively on roadsides and in parklands throughout south eastern Australia, and is under-rated as a nectar and pollen producer. The manna gum provides a first grade honey of fair density and candies slowly with a coarse brownish grain, however is said to be an unreliable source of pollen and nectar. The mountain grey gum found south and east of the Great Dividing Range yields good quantities of both pollen and nectar, but does not flower every year. Other gums are known mainly as pollen producers.

The honey from ironbarks is generally used to blend with lighter honeys to improve the overall colour. The ironbarks generally have more importance as a pollen producer. However, Eucalyptus caleyi confined to southern areas of Queensland and E.nubilis (bluetop ironbark) are said to produce some of Queensland's finest honey, being exceptionally clear and dense, with an excellent sweet flavour, it granulates rapidly with a smooth transparent grain. It has a bright light amber colour. The grey ironbark produces honey that is dense, with excellent colour and flavour and blends well with other coastal gum honeys. It is the one exception known in regard to pollen production, as it is an unsatisfactory pollen plant. The red ironbark (E.crebra) while an erratic producer of nectar does have a 1 in 5 year good harvest with yields up to 80kg having been recorded in the Darling Downs area. It is a prolific producer of pollen.

The stringybarks have a medium-dark amber coloured honey producing both fair quantities of honey and pollen. It has a sharp dominant flavour distinctly stringybark. Some beekeepers tend to vie away from the stringybarks because of their poor density and slightly acrid, sharp flavour. Stringybarks tend to be seen to be a supporting species for the bees providing pollen and useful winter stores of bee food.

Other eucalypts have minor qualities for honey, and tend to be mainly pollen species. However those interested in producing honey and/or planting the right trees for honey production need to consult experts for their local area to ascertain the better groupings of species, and the likelihood of achieving reasonable honey yields or pollen production.

The **Lophostemon** or **Tristania** species such as the scrub box produce a first grade honey with an excellent, slightly aromatic flavour and reasonable density, it candies quickly with a whitish hard grain. The honey is popular for blending. However it is an erratic nectar producer, and an unreliable source of pollen.

The **Angophoras** produce a second grade honey of dark amber colour, with a strong flavour and good density. Angophora floribunda is probably the most important Angophora species for honey, often yielding 30kg.of honey per colony in a good season. Most Angophoras are highly regarded by beekeepers as a pollen source.

The second group of plants contains one I previously mentioned - the "tea-trees" and honey myrtles, or **Melaleucas**. The flowers of these consist mainly of long cream or white bundles of stamens, grouped into feathery spikes or heads that are often tufted. **Leptospermums** although commonly called

"tea-trees" are shrubs with rounded petals and short stamens. **Callistemons** (or bottlebrushes) are similar to the melaleuca but the stamens are usually red in colour. "Tea trees" produce both nectar and pollen.

The paper-bark "tea-trees" produce a dark amber coloured honey of minor importance. The species is useful as the nectar and pollen are utilised by the bees to build up colony populations. However, the quantities of honey produced are not considered sizeable enough to warrant their use by beekeepers. Leptospermums produce a dark amber honey with a strong flavour, and because it jellies is a good bee food but unsuitable as a table honey.

Callistemons provide valuable sources of pollen and nectar. The blossoms are worked freely by honeybees and the bee food gathered stimulates colonies to breed and build in strength enabling them to take full advantage of the following season's major nectar flows.

Banksias were often used by the Aborigines as a sweet suckled plant to ease the thirst, and were given the common name of "honeysuckle" in many areas. Banksia produce pollen and a watery type of nectar, with stiff looking spike flowers usually consisting of four narrow, petal like curved or coiled sepals, each with a single anther near the top and a slender style in the middle of the flower. Banksia are a common plant sought by beekeepers. If you look at or pick banksias when they are flowering at their best you'll find lots of tiny insects inside the flower head, no doubt feeding on the nectar left behind.

Banksias provide both nectar and pollen in medium amounts. The properties of the dark amber coloured honey are usually masked, although pure samples of honey indicate a weak density and a strong flavour. It candies with a coarse hard grain and is difficult to reliquify. In general the banksias' yields of nectar and pollen are utilised as bee food.

The mass of dense, yellow flowering wattle bushes fill the air with a very strong, sweet to pungent smell , and are common in most areas. In fact the smell may be so heavy that it produces a headache in some people or an allergy in others. The **Acacias** with their fluffy, yellow balls or spikes of small flowers, tiny sepals and petals and many stamens are extremely valuable to the apiarist as pollen producers rather than sources of nectar. Most acacias are of limited value as pollen is not sought once the flowers begin to wilt. This may be compensated by the prolific flowering and pollen production in the early days.

Other native species which provide value as a source of pollen include the **Baeckeas**, and **Boronias**- both of which the bees rely on, with the nectar being a valuable bee food and which encourages brood rearing. **Marsdenia** (bush banana) flowers contain a great deal of nectar which tastes like a sweet peanut paste, and was also prized as a bush food. Its nectar and pollen are a source to bees. Grass trees or **Xanthorrhoeas** are also a source of both pollen and nectar. The honey however is rank and unpalatable. To beekeepers these plants provide the resin for use as *propolis* for sealing cracks and spaces in the hives. The aborigines used to soak the flowers of the Xanthorrhoea to produce a sweet drink. Bush peas or **Pulteneas,** are another valuable source of pollen for bees. Nectar is also utilised as a native bush food source from a number of plants. **Acrotriche** (trailing ground berry) has an inflated 'honeypot' in the lower part of the flower. The **Bauhinia** has nectar which can be sucked directly from the flower or washed out with water. **Grevillea robusta** where the brush-like clusters of golden flowers, ooze nectar. This can be sucked or shaken out into a dish or washed out with a small quantity of water. The nectar rich blossoms of **banksias and melaleucas,** full of honey, when soaked, impart a sweetness to the water. The heath plant often known as 'Honey pots' or 'jam tarts', **Melichrus procumbens** with its flowers hidden on the undersides of the branches contain much nectar, as does the waratah, **Telopea speciosissima** in its dome of red flowers.

Other sources of nectar and pollen for bees include shrubs and trees which grow in the mangroves or tidal mud flats, the sheoaks (Casuarinas), pasture crops such as canola, lucerne and peas, other native plants, ornamental trees and shrubs, and weeds.

In the mangroves **Avicennia** or grey mangrove, produce a medium amber coloured honey, which has a strong flavour, yet possesses weak density and does not granulate readily. It therefore is used mainly as a bee food and the pollen is more highly sought after. In comparison, the river mangrove, **Aegiceras** which grows in the north of Australia is prized as a major honey and pollen source. The honey is bright water white, and is probably the most sought after honey from the mangroves. It has an

excellent colour, inferior density and a distinctive but not unpleasant flavour.

The **Casuarinas** including she-oaks, bull oaks, swamp, river and forest oaks are a source of pollen early in the season. When orange-brown flower particles are present at hive entrances it can be assumed that the bees are working the she-oaks. The River she-oak is worked readily by bees when other blossoms are unavailable, providing valuable supplies of pollen.

Pasture crops can provide both varying degrees of honey and pollen. Lucerne (Alfalfa) when allowed to flower is a good nectar and pollen producer, and the honey produced has a fair density and an unusually slightly acid but pleasant flavour. It granulates quickly with a hard, fine grain. Apiarists generally have no difficulty in obtaining hive sites near lucerne crops, as farmers are aware that pollination is assisted by bees. Clover or Trifolium produces pollen and a small amount of honey. This honey is first grade with a weak density and a characteristic mild, sweet flavour. It granulates quickly with a transparent slightly coarse grain. The nectar and pollen are used to build up bee colonies, especially in Qld, and near irrigated pastures. **Citrus crops** particularly orange trees are recognised as providing a source for honey. They produce a first grade orange honey, which has a characteristic excellent flavour and aroma, and candies readily with a whitish fine grain. Orange trees also provide a small amount of pollen. Blackberries found throughout southern and eastern Australia yields nectar and pollen. Some **vegetable crops** with lengthy flowering periods, such as pumpkins, also provide a good pollen source.

Weed species are also heavily worked by bees, but in most cases this tends to produce a sourness in the honey. Dandelions tend to be reflected in the comb by a yellowish tinge. Salvias or mint weed perhaps the exception, as it was once famous in QLD. in conjunction with lucerne crops. The small quantities produced a mintweed-lucerne honey with excellent table qualities. The honey is a light amber, bright, first grade and with a pleasing flavour. Turnip weed is a most important pollen plant sought after by apiarists in the Darling Downs area as the pollen and nectar are used to stimulate brood rearing and strengthen weak bee colonies. The honey develops a strong flavour and aroma. Onion grass and onion weed are useful for building up stocks of bees. Thistles of all kinds are valuable as a source of pollen and in some cases give a good nectar flow. Salvation Jane or Patersons Curse, while a noxious weed in much of south and eastern Australia is seen by apiarists as a valuable plant yielding both pollen and nectar profusely in Spring. Capeweed has been blamed for over stimulating bees and causing swarming. Flatweed may be useful in yielding pollen throughout the active season but is poor in nutritional value and is sometimes toxic to larvae.

For the commercial production of honey the supply of nectar and pollen is critical. When beekeepers or small scale farmers enter into honey production, they need to plant a variety of trees to sustain the yearly food requirement for bees. There are some guidelines which need to be taken into account. Goodman (1983) suggests the following:

- that species are chosen that grow well in your area, or district;
- that you choose species that yield nectar or pollen, or both, at a time when these are scarce in your area, or district;
- that you avoid planting large numbers of winter flowering species because it may be too cold for the bees to leave their hives and work the flowers. Some pollen bearing plants are an asset during winter, but the thin nectar from some species can be hazardous and may cause sickness in bees; for example white box (Eucalyptus albens) or winter flowering red ironbark (Eucalyptus sideroxylon) in southern Australia
- if bees are kept for crop pollination, then avoid planting species that will entice them away from the flowering crop.

The value of honey in the market place is dictated as mentioned by its quality, and colour according to the Australian standard, and its value as a table honey by its taste, density, and texture. There is no doubt that the best and finest flavoured honey is that taken straight off the hive in the comb and eaten while still warm from the bees. From this time onwards the flavour is naturally and progressively lost. Hooper (1979:236) suggests that "many of the fine flavours and the bouquet of the honey are composed of aromatic oils and other substances of plant origin which are extremely volatile and mostly lost during crystallization. This also applies to bad flavours and bouquets."

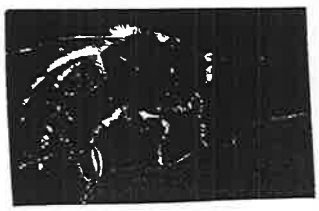
Honey is composed of 18% water, 35% glucose (dextrose), 40% fructose, 4% other sugars and 3% other substances. It is this

that makes honey unique in its vast mixture of substances found in the 3% of other substances. A breakdown of this indicates that honey includes vitamins, pigments, enzymes and various biologically active substances such as plant growth hormones, rooting compounds, choline and acetycholine. These other substances include about fifteen organic acids including acetic, butyric, gluconic, malic and succinic; about twelve mineral elements including potassium, calcium, sulphur, chlorine, iron, etc., about seventeen free amino acids including proline, glutamic acid, lysine etc. and about four to seven proteins. As Hooper (1979:233-234) indicates it can be appreciated that honey is a conglomeration of materials, and varies according to its relative proportions which provide the permutations which makes every honey slightly different in colour, flavour, aroma and texture from the next.

With all these compounds it is no wonder that honey has anti-bacterial and hygroscopic properties. It has found medical favour as a wound dressing, because of its lack of side effects on healthy tissue and the fact that it does not dry out. And as most of already know it doesn't taste bad either!

GLOSSARY

Brood: the eggs and larvae of a colony
Colony: the bees and their combs of brood and stores with all its products and parts.
Comb: The cellular structure built by the bees to live in, and house their stores and young.
Hive: the home in which bees live.
Honey: bee food made by worker bees from nectar and stored in some of the comb (hence honey-comb) until needed to feed the young, or the whole colony in times of shortage of external food supply.
Propolis: bee glue, a substance gathered from the resin of trees, used to seal the hive against weather, draughts and insects.
Stores: reserved food (honey)
Swarm: a massed group of bees with a young queen in search of a home.
Swarming: the impulsive flying of a group of bees when a queen bee leaves the hive to start a new colony.



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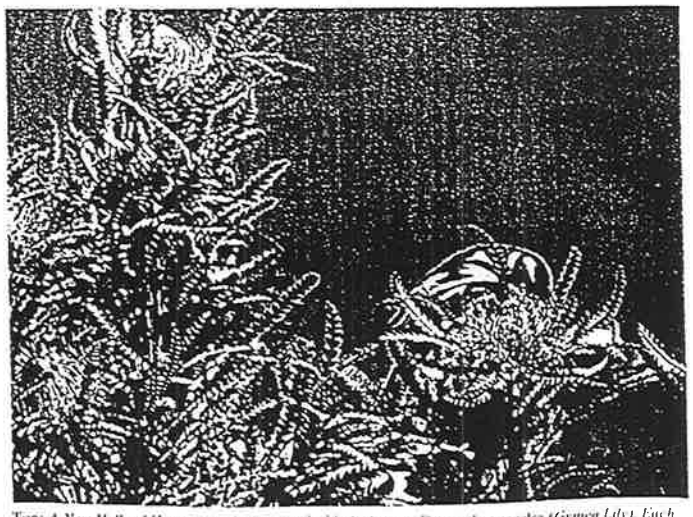

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Top: *A New Holland Honeyeater shares a meal with the bees on* Dryandra excelsa *(Gymea Lily). Each flower resembles a deep wine cup full of nectar and attracts nectar-feeding insects and birds.* Bottom: *A honeyeater seeks nectar in the cupped flower-head of* Dryandra formosa *(Showy Dryandra), the most commonly cultivated of the fifty-six species found only in Western Australia*