Wattles – the heart and soul of our woodlands

This here's the wattle, the emblem of our land.
You can stick it in a bottle, you can hold it in your hand.

Monty Python

BACKGROUND TO THE WATTLES

Australia – the land of wattles
Wattles are as iconic as the kangaroo and emu and wattle appears on the Australian Coat of Arms with them, as a background of sprays of Golden Wattle (*Acacia pycnantha*), Australia's official floral emblem.

Golden Wattle - *Acacia pycnantha*

Australia is the land of wattles. Long been recognised as unique symbols of our nation, the wattle's colours of green and gold are our national colours.

It is thought that wattles have been on our continent about sixty million years, as they were part of the original Gondwana vegetation. This is why wattles are also found in Africa, South America and India.

It is thought that the first plant ever collected from the Australian continent was a wattle and was probably collected in 1696 by members of the Vlamingh expedition when they discovered the Swan River in Perth. Wattles were also collected by William Dampier in the following year and 100 years later by Joseph Banks during the Cook expedition in eastern Australia.

There are almost one thousand species of wattle in Australia, making it the largest group of trees and shrubs in Australia, even larger than the eucalypts. They all belong to the genus *Acacia* and 99% of them are endemic to Australia, that is they are found nowhere else in the world. They grow in nearly all parts of Australia, in all climatic regions and there is usually some flowering at any one time.

Weeping Myall

Some are large trees such as *Acacia bakeri* or White Marblewood, which grows up to 50m tall and *A. melanoxylon* or Blackwood which grows to 30m. Even the locally common *A. implexa* or Lightwood can grow up to 15m. These large trees are very long-lived and can live up to 250 years. Even *A. pendula* or Weeping Myall/Boree may live over 200 years. But most wattles are relatively short-lived shrubs of 3 to 4 metres and live for about 10 to 20 years.

Use of wattles by Indigenous Australians

The Australian bushfoods or bushtucker industry has become very popular in recent years. Many books have been written on the subject and bushtucker food is readily available in stores and online. Wattleseed products have been very successfully marketed by the industry.

Aboriginal people relied heavily on wattles for food and every part of the plant was used. The seeds were ground into a flour and mixed with water and eaten raw as a paste, or cooked as damper. Young green pods were eaten raw or roasted. Sweet gums produced by wattle were eaten as sweets. Even the insects that lived on or in the wattles, such as witchetty grubs and honey ants – were consumed.

Wattles and insects associated with wattles, were an important food resource

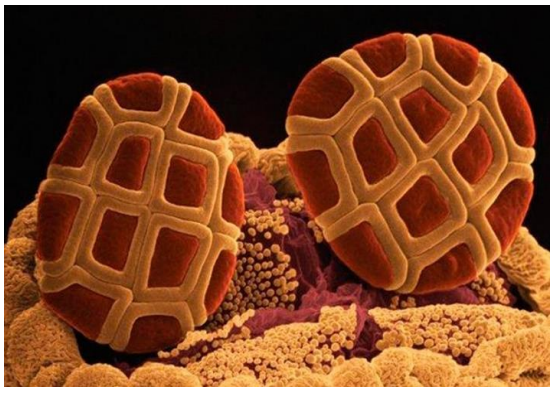
Aboriginal people also used wattles for many other purposes – as medicine, shelters, utensils such as digging sticks, weapons such as clubs, shields and boomerangs, musical instruments such as clapsticks; firewood, glues, string, soaps and dyes.

Where does the word "Wattle" come from?

The Aborigines didn't refer to them as wattles. **'**Wattle' was originally an Anglo-Saxon word referring to a pliable or bendable woody branch or a barrier made from such branches. Early British settlers around Port Jackson (now Sydney) used pliable stems and branches of local shrubs and trees as the framework for their homes. They then daubed them with mud to make 'wattle and daub' huts. The word 'wattle' was then used to describe the trees and shrubs used for this purpose. 'Wattle' then became a word used exclusively for species of Acacia.

Do wattles cause hayfever?

Wattles are often blamed for triggering hayfever and allergies, however grasses and exotic trees such as pine, elm, ash and oak are probably to blame as they produce much larger amounts of pollen. Wattle pollen grains, which are pollinated by insects, are large and tend to fall straight to the ground. Grass pollen grains on the other hand are wind pollinated and are therefore small and blow around in the wind, getting up people's noses.



Electron scanning microscope image of wattle pollen

Wattle Day and Australia's floral emblem

The concept of Wattle Day goes back to the late 1800s and on 1st September 1910 the first Wattle Day was celebrated in Sydney, Adelaide and Melbourne. On 8th January 1913 Wattle Day was 'federalised' in Melbourne at the first pan-Australian Wattle Day League Conference, and the newly-formed Federal

Wattle Day League then worked towards having the national emblem officially proclaimed and having Wattle Day celebrations throughout the Commonwealth.

However WW1 broke out and the emblem concept lay forgotten until just before the bicentennial year in1988.

Finally, on 1st September 1988 the Golden Wattle was proclaimed as Australia's National Floral Emblem in a ceremony at the National Botanic Gardens in Canberra, during which seven Golden Wattles were planted.

THE ECOLOGICAL ROLE OF WATTLES

Introduction

Wattles have been planted overseas for more than a hundred years in over seventy countries, particularly Africa and SE Asia, covering about two million hectares. Recognised for their important value in the agricultural landscape, they provide shelter for stock, fodder in times of drought, firewood, and in some cases, timber. All parts of the plant have a use – the **wood** for products such as furniture, fuel and paper; **bark** for tanning leather and making wood glues; **flowers** for the cut flower and perfume industries in southern France; s**eeds** as a source of human food in sub Saharan Africa, particularly during famine; and **foliage** as stock fodder and shelter. Wattles are also used extensively in land rehabilitation, soil erosion control and remediation of saline and alkaline soils.

Wattles have important economic value

In Australia however, especially in farming land, wattles have been much-maligned. They are sometimes grubbed out of pastures because of a perceived pasture-competition effect and shunned in new plantings because they are mostly short-lived. But wattles have very important ecological roles.

Landscape function

Most wattles are pioneer plants, rapidly colonising disturbed areas from buried seed that has been able to stay dormant in the soil for many years. It is common to see wattles rapidly colonising sites after a bushfire or in areas where the soil has been disturbed.

Wattles germinating after fire

Their role is to grow quickly and live for a relatively short period of time. While they are growing, they improve the soil and site conditions, making way for other plants in the community, such as eucalypts and grasses.

While they are growing, wattles accumulate large amounts of leaf litter, twigs and empty seed pods on the ground beneath their canopies. This accumulation of organic matter assists in preventing soil erosion. When they die, the wattle's hard wood decomposes, adding more organic matter to the soil - in other words sequestering carbon.

Wattle seeds have a particularly hard coat, adapted to remain in the soil until conditions are right for germination. The seeds may lie dormant for decades. The heat from a bushfire, or high summer temperatures, or scarification by wind-blown sand, act to break the seeds' dormancy. This explains why wattles are often seen germinating in exposed sites or after fires.

Wattle seeds need rupturing before they can germinate

This provides a clue to germinating wattles for your own use: it is necessary to break the seed's dormancy and the best way to do this is by pouring just-boiled water over the seeds and allowing them to soak for a day before planting. Alternatively, you can lightly scarify the seeds between two sheets of sandpaper prior to sowing.

Nutrient and water cycling

The cycling of organic material during and after the life of the plant is part of the carbon cycle. Carbon is captured by photosynthesis and stored in living tissues (leaves and sapwood) and dead material (heartwood). When these are no longer required by the living plant, part of the carbon is returned to the atmosphere as carbon dioxide and part of it is locked up in the soil as soil carbon.

Another important function that wattles have is their role in nitrogen cycling. Like all legumes, they have nodules on their roots that contain nitrogen-fixing bacteria. The bacteria extract atmospheric nitrogen and make this essential nutrient available to the plant. However, there is a generally surplus of nitrogen around the base of wattles (and other legumes), which benefits other plants. It is not uncommon to see bright green Weeping Grass (*Microlaena stipoides*) growing vigorously under large wattle trees. The nitrogen that the grass accumulates is, in turn available to build protein in the animals that eat it.

Root nodules on wattles fix atmospheric nitrogen

Some wattles also have an association with mycorrhiza, fungi species that extend the plants' root systems. Mycorrhizal fungi have a role in extracting phosphorous for the plants' use. Additionally, some wattles have so-called cluster-roots that grow near the soil surface. These specialised roots enable the plant to capture nutrients from decomposing litter.

Many wattles are arid-adapted. They achieve this through a variety of mechanisms. Many species have phyllodes (not true leaves but flattened leaf-stalks) which, unlike leaves, have thicker coatings and fewer stomata (sunken pores), which serve to reduce water loss. Many wattle phyllodes have a waxy or hairy coating, further reducing water loss. So-called pinnate wattles (those with feathery leaves) have the ability to fold their leaves in dry conditions. This also reduces water loss in wattles.

Phyllodes are modified leaves

Wattles' roots systems are also adapted to maximise water intake. Species from wetter areas have shallow root systems. Those with shallow cluster-roots are able to benefit from light rainfall events. This feature may enable these species to out-compete other plants in their ecosystems that have deeper root systems. Species from arid areas have both shallow and deep root systems, which enables them to benefit from both light rainfall and deep soil moisture.

Food and shelter

Wattles appear to be relatively common throughout our landscapes. However, this is often an impression gained from those wattles growing in roadside reserves. To quote Ian Davidson, formerly of Greening Australia at Albury: "we see the landscape through the lens of the roadside".

While the foliage of adult wattles is relatively nutrient-poor (though some species are used as fodder in times of drought), the freshly emerged seedlings are readily eaten by sheep and cattle. Without reserves of nutrients to support them, and no capacity to accumulate them (as eucalypts do with their lignotubers), wattle seedlings appear particularly vulnerable to grazing and are in fact, quite scarce in grazing lands everywhere.

In several other ways, wattles are resource rich. They produce masses of flowers, which though they have no nectar, attract many insects, which in turn provide food for a host of insectivorous birds. The insect pollen vectors are beetles, and the wasps that prey on thrips and mites that feed on the flowers. The pollination by wasps is therefore incidental. Native bees and the Honeybee (*Apis mellifera*) collect the pollen of wattles, and in the process are pollen vectors as well. Wattle pollen is high in protein.

The flowers are followed by pods, which contain highly nutritious seeds. These are sought after by many animal species. The vulnerable Superb Parrot (*Polytelis swainsonii*) is particularly fond of wattle seeds, as is the Common Bronzewing Pigeon (*Phaps chalcoptera*).

Ants are particularly fond of wattle seeds, though they do not eat the seed, but rather a fleshy attachment to the seed (known as an aril or funicle). This is an adaptation by the wattle to entice the ants to carry the seeds off and away from the parent plants; the ants take the seeds to their nest, where they nip off the arils and discard the seeds. In so doing, the ants are effectively placing a buried seed store out of harm's way for the wattles to emerge at the next fire, or after erosion has exposed the seed-store years later.

Animals are attracted to the aril on wattle seeds

Some wattles have bright red arils; these are designed to attract birds. In these species, the seed hangs onto the open pods by this attachment. The birds digest the aril and the hard-coated seeds pass through their guts, after which they germinate, once again, away from the parent plant.

Wattles have nectar glands, either on or near their leaves and phyllodes. These glands attract nectar-eating insects and occasionally, birds. Birds may cross-pollinate plants if they collect the nectar from phyllodes close to flowers.

Many wattles produce gum which is an important winter food resource for possums, particularly the Sugar Glider (*Petaurus breviceps*). An absence of wattles is thought to result in increased beetle attacks on eucalypts, as these are also a major food source of the Sugar Glider. Thus elimination of wattles from the landscape may be one of the many interacting causes of eucalypt dieback. Other possum species that are known to feed on wattle gum include the Feathertial Glider (*Acrobates pygmaeus*), and the Leadbeater's Possum (*Gymnobelideus leadbeateri*) of the tall wet forests.

Sugar gliders help to control insect pests

The foliage, bark, wood and twigs of wattles are hosts to many insect species, some of which are confined to particular *Acacia* species. For example, alone in one family of thrips, there are 30 genera containing 250 species, and all are confined to the wattle genus in Australia. These thrips produce either galls, or other "domiciles" (for example, glued-together phyllodes) within which they live out their lives, feeding on the tissue of their wattle hosts. The wattle galls in turn are eaten by some birds, for example cockatoos and the Little Corella (*Cacatua sanguinea*). Cockatoos are also particularly fond of the large grubs of longicorn beetles that bore into wattle wood.

Wattles are favoured as habitat by birds, particularly small insectivores. Two small woodland bird species, the Yellow Thornbill (*Acanthiza nana*) and Brown Thornbill (*A. pusilla*), are especially fond of wattles. They rarely occur in patches of woodland without wattles. The bushy nature of wattles makes them particularly attractive as nesting sites for many small birds, for example the Double-barred Finch (*Taeniopygia bichenovii*), Superb Fairy-wren (*Malurus cyaneus* and Grey Fantail (*Rhipidura fuliginosa*). Some prickly species, for example the Kangaroo-thorn, are particularly favoured as nesting sites.


Yellow Thornbill


Brown Thornbill


Grey Fantail

Interestingly, it seems that wattles, particularly the pinnate species such as Silver Wattle (*A. dealbata*), Dean's Wattle (*A. deanei*) and Green Wattle (*A. mearnsii*), have a role in the control of the problem of Noisy Miner (*Manorina melanocephala*) dominance in bush remnants. Noisy Miners often create large colonies in remnants, especially those that are small, isolated and/or of the other small bush birds. Studies have indicated that planting a high cover of wattles, particularly the pinnate species, and if creating new plantings, limiting the overstorey to about 80% eucalypts, can have a deterrent effect on miners and will increase populations of other small birds. Clearly this is not a solution to be advocated in woodland remnants with an intact grassy and forb-rich groundlayers, but would be recommended where a tree canopy remains and the groundlayer is severely degraded.


Feathery bipinnate foliage of Silver Wattle

The material, above, highlights the many and interesting roles wattles have in our landscape. It is thought that wattles have been on our continent since its break-up from Gondwanaland about 60 million years ago. It is not a surprise to realise that there are so many ecological interactions that have developed in that time. Our Australian emblem has been much maligned and neglected. It is time bring them back into our woodland landscapes.

Acknowledgments
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Reference websites

Below are the websites from which much of the above information has been compiled. The reader is urged to visit these sites – there is so much more information on wattles out there.

http://plantnet.rbgsyd.nsw.gov.au/PlantNet/wattle/ecol.html

http://anpsa.org.au/aca-feat.html

http://www.ento.csiro.au/thysanoptera/Symposium/Section8/43-Morris-Mound.pdf

http://www.une.edu.au/ers/staff-profile-doc-folders/steve-debus/debus-n-miner.pdf

http://www.understorey-network.org.au/newsletters/Newsletter36.pdf

http://www.worldwidewattle.com/socgroups/

http://www.anbg.gov.au/acacia/

Image acknowledgements

Weeping Myall - http://myallparkbotanicgarden.com/plants-in-the-garden/

Wattle seed pods - http://vro.depi.vic.gov.au/dpi/vro/vrosite.nsf/pages/sip_salt_coast_wattle

Honey ant - http://www.mbantua.com.au/bush-tucker/

Wattle pollen - http://www.australiangeographic.com.au/news/2011/10/the-microscopic-world-of-pollen/

Floral design - http://botanicalbrouhaha.com/?p=13569

Germinating wattles - http://friendsoftarrabulga.org.au/2014/04/03/silver-wattle-babies/

Wattle seeds - http://www.victoriannativeseed.com.au/

Phyllode - http://davesgarden.com/guides/pf/showimage/18314/#b

Bee - http://chookyblue.blogspot.com.au/2010/09/wattle.html

Ant and aril - http://www.fsd2010.org/miscellaneous/frugivores_of_the_month/17.htm

Sugar Glider - http://jeremyringma.deviantart.com/art/Sugar-Glider-159584484

Yellow Thornbill - http://www.murrundi.org/arborial-feeders.html

Brown Thornbill - http://canberrabirds.org.au/birds/brown-thornbill/

Grey Fantail - https://en.wikipedia.org/wiki/Grey_fantail

Silver Wattle - http://www.ala.org.au/blogs-news/using-the-ala-to-help-develop-biodiverse-plantings-suitable-for-changing-climatic-conditions/