

Tropical Topics

An interpretive newsletter for the tourism industry



Weeds in the wet tropics

No. 27 April 1995

Notes from the Editor

A weed is a plant which grows where it is not wanted. A plant introduced to improve pasture may be unwelcome in our back yards. A plant which we admire in our gardens may well cause the destruction of native vegetation. This issue of *Tropical Topics* concentrates on environmental weeds, specifically those which endanger the natural environment in the wet tropics.

Each component in an ecosystem has natural checks on its population growth; over time providers and consumers have struck a balance. However, when one element of an ecosystem is transplanted into another it usually travels without its enemies, the diseases and predators which would normally check its growth. Some plants fail to thrive in an alien situation, others fit in to some degree and yet others achieve outrageous success — at the expense of the locals. A successful weed is hardy, fast-growing, competitive, aggressive, reproduces quickly and abundantly and disperses with ease.

It is difficult to predict which plants will become weeds. A species may, at first, adapt to its new environment without appearing to be a problem. This is known as the lag phase. Then it may suddenly launch into the expansionist phase — a rapid population increase which may eventually dominate neighbouring vegetation.

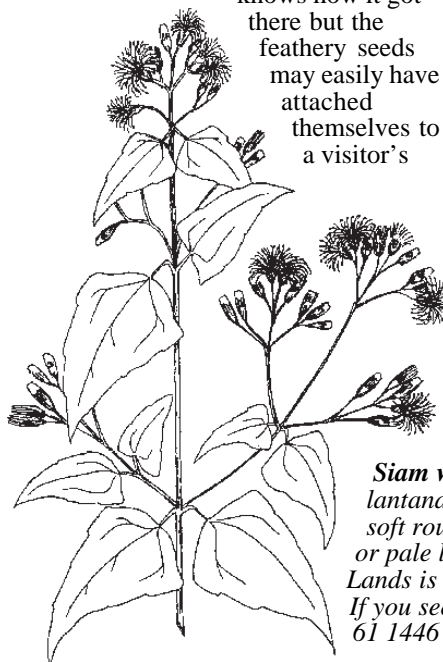
Don't give a weed a break

In the 1840s someone decided that a Central American flowering plant would look good in their garden in Calcutta in India. It grew well. It spread throughout India, across Asia to Siam (Thailand) and on to China, the Pacific islands and Papua New Guinea. Within a century it was also well established in Africa.

Siam weed, *Chromolaena odorata*, is now considered one of the world's worst weeds. It is fast-growing and competitive. In open areas it forms dense tangled bushes which can cause intense bushfires in the dry season. It can climb up to 20m on trees, smothering them with its dense growth. Growing over a metre in just a couple of months it can overwhelm sugar cane and other crops and it is toxic to stock.

Australia was thought to be one of the few tropical areas free from this weed — until July 1994 when a DPI botanist spotted it near Mission Beach. No one

knows how it got there but the feathery seeds may easily have attached themselves to a visitor's



Siam weed has a similar growth habit to lantana, soft hairy roughly triangular leaves, soft round stems, no prickles and masses of white or pale lilac flowers in winter. The Department of Lands is keen to hear of any sightings of the plant. If you see it call the Innisfail office on (070) 61 1446 or your local Department of Lands office.

boots or to machinery used overseas. The Department of Lands has been spraying the infestation with herbicides; the third program is due to start at the end of this month. It is hoped that the weed is confined to the Tully area and can be controlled but there are concerns it may have been carried further.

Siam weed is not the only weed threatening the wet tropics. As can be seen on the following pages vines and creepers, trees, shrubs and grasses all have a destructive potential. However, very few of these weeds are able to establish themselves in unbroken rainforest. If a siam weed seed is dropped under the forest canopy it can't grow in the dim light. However, if the same seed is deposited wherever there is a break — along a river bank, in a clearing, at the roadside or anywhere there has been a disturbance — it will spring to life and quickly destroy surrounding vegetation. The more the forest is disturbed the more danger there is of weeds attacking the remaining part. The best way to defend the rainforest is not to give the weeds a break.

Illustration courtesy Department of Lands



WET TROPICS
MANAGEMENT AUTHORITY



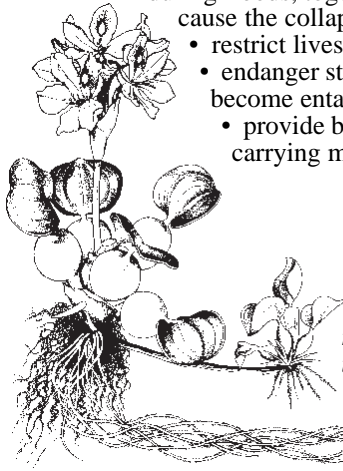
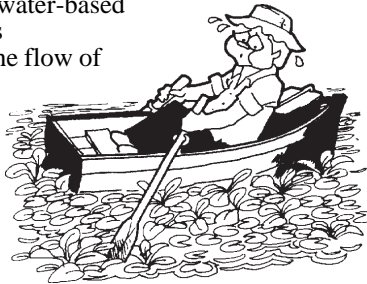
Queensland
Department of
Environment and
Heritage

Weeds in the water

Water weeds are a widespread problem in Australia. Many species have been introduced to decorate garden ponds or aquariums and have then found their way into natural waterways where they have become pests.

Water weeds usually grow very fast under tropical conditions, some infestations doubling in size each week. They form dense mats of vegetation on the surface of the water which:

- reduce light reaching submerged plant species
- use up oxygen in the water, depriving and killing fish and other aquatic creatures
- restrict the movements of water-based animals including waterbirds
- choke drains and restrict the flow of water
- clog up pumps, seriously affecting irrigation and aquaculture equipment
- foul boat engines and restrict navigation, watersports, swimming and fishing
- cause water loss, at up to four times the normal evaporation rate, through rapid transpiration from the leaves
- during floods, together with trapped debris, can cause the collapse of bridges and fences.
- restrict livestock access to water sources
- endanger stock and children who may become entangled and drown
- provide breeding places for disease-carrying mosquitoes.

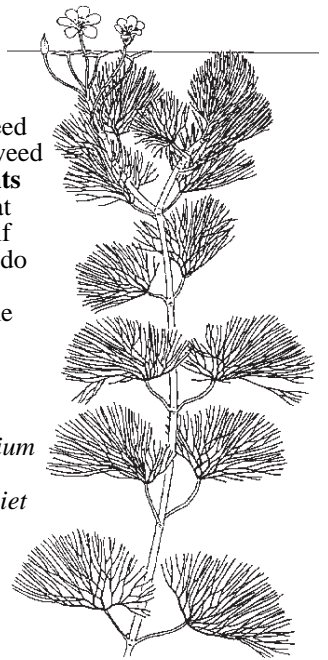


Water hyacinth (*Eichhornia crassipes*) (left) has beautiful purple flowers and despite its remarkable abilities to clean up polluted water, has become an invasive and unwanted species all over the tropical world outside its native Brazil. In Queensland it is a category P2/P3 weed.

Some biological control of four serious waterweeds, salvinia, water hyacinth, alligator weed and water lettuce has been achieved by releasing weevils and beetles which feed on these species. There is no known predator for cabomba.

It is essential for aquarium and pond owners and those dealing in water plants to be aware of the potential problems not just of proven pest plants but also of those not yet released on the environment. Unwanted aquatic plants should be burned or composted and NEVER NEVER dumped in waterways. Pond owners should also be careful to prevent water plants being carried away when there is heavy rain and flooding. (Likewise, unwanted fish should never be released into waterways.)

The best native plants to use are probably *Blyxa* species and stoneworts — *Chara* and *Nitella* species. Others are Pacific and ferny azolla (*Azolla filiculoides*, *A. pinnata*), hydrilla (*Hydrilla verticillata*), clasped pondweed (*Potamogeton perfoliatus*) and ribbonweed (*Vallisneria gigantea*). (See **Waterplants** book in Bookshelf) Please remember that even native plants can cause problems if introduced to the wrong area so please do not dump them in watercourses. Also, please do not collect from the wild. Some natives are rare or threatened.



Cabomba, or fanwort, (*Cabomba caroliniana*) (right) is a popular aquarium plant from America which is causing problems in ponds, lakes, dams and quiet rivers in Queensland. In some areas it has been declared a category P2 plant. Sale of cabomba is illegal in Queensland.

What is a declared plant?

A declared plant (formerly termed 'noxious plant') is a plant considered a serious enough pest to warrant its control being enforced under legislation (the Rural Lands Protection Act 1985-1988).

Declared plants are placed in various categories, though some plants may be in more than one category.

P1 — plants which do not occur in Queensland and whose introduction into the State is PROHIBITED.

P2 — plants which are to be completely DESTROYED throughout an area.

P3 — plants whose numbers and distribution should be REDUCED in an area.

P4 — plants which should be PREVENTED FROM SPREADING beyond places in which they occur.

P5 — plants which should be CONTROLLED only on land under the control of a Government Department or Local Authority.



Rubber vine (*Cryptostegia grandiflora*) (above) is a declared category P3 weed. A garden escapee, originally from Madagascar, it threatens mainly dry rainforest and riverside forest. It invades agricultural land and is poisonous to stock, costing the grazing industry about \$8 million each year.

In a word

Exotic is a word which conveys a positive image to most people. Exotic holidays, exotic food, exotic fruits — the word has come to mean things which are strange or unusually colourful or beautiful. In fact, the word means foreign, from outside that country. While we can safely admire exotic animals and plants when we travel, if transported elsewhere they can become pests. Pigs, foxes, cats, rabbits and so on are all exotic animals — but unwanted in natural areas of Australia. Similarly many exotic plants can become exotic weeds.

Weeding in the Wet

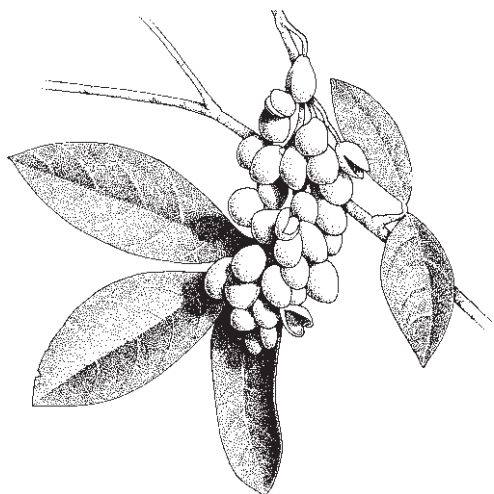
It is tempting, when the ground is wet, to pull up all those nasty weeds by the roots. However, this may leave the soil vulnerable to soil erosion and simply prepare the ground for the next generation of germinating seeds. A more effective method is to snip the offending plants and cover the ground with a thick layer of newspaper and mulch. Few weeds will survive this treatment.

For more information contact your local Department of Lands office.

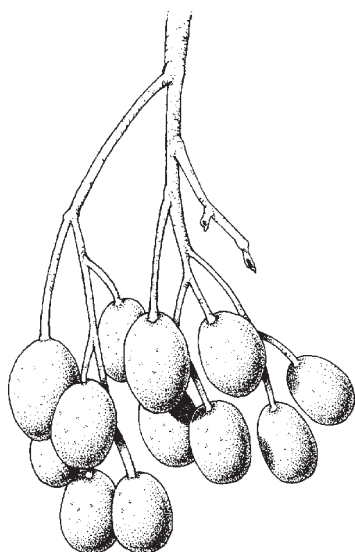
Nature notes

A diary of natural events creates a pleasing journal which grows richer with the passage of time. Watching for the recurrence of an event after noting it in a previous year, and trying to understand what could have caused changes in timing, is intriguing.

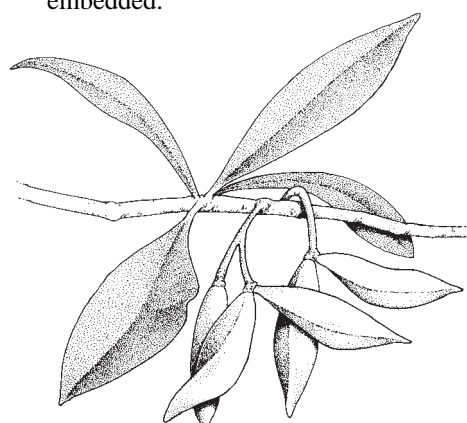
These notes are from the author's own notebook, or were offered by researchers and fellow naturalists. Readers will, inevitably, note variations between their observations and those appearing here. If you do not keep a nature diary perhaps this will inspire you to begin one.



Shell vine (*Connarus conchocarpus*) is one of the woody lianes of wet tropics rainforests. Its bright pink to red fruit have started dropping, and will continue to appear on the forest floor over the next couple of months. When mature they split open showing a dark seed with a small fleshy yellow aril. However, they are sometimes opened beforehand by sulphur-crested cockatoos, presumably because of competition from other birds.



The fruits of **white cedar** will begin to turn yellow towards the end of the month, the crop being eagerly awaited by several bird species including fig birds and orioles. White cedar, also known as Persian lilac, which gives an indication of how widespread this tree is, is in the same family as red cedar and spur mahogany. Trees in this family — Meliaceae — produce a variety of fruit ranging from those with a fleshy aril (spur mahogany) to those with wind-distributed seeds (red cedar). White cedar (*Melia azedarach*) has a thinly-fleshed fruit enclosing a very hard stone. This contains two to five small seeds, not just a single seed as casual inspection might suggest. The ripe fruit hang from the tree for several months serving as an arboreal larder for the birds.

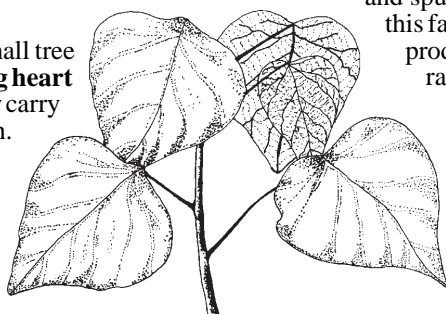


Banana bush is a shrub or small shrubby tree named for the bright yellow fruit it produces at about this time of year. Carried in pairs, these split open when ripe to reveal bright red flesh in which the seeds are embedded.

Banana bush is currently known as *Tabernaemontana pandacaqui*, but was formerly classified as *Ervatamia angustisepala*. Although Latin or Greek names for plants can sound confusing they often provide interesting historical geographic or botanical information. The genus name *Ervatamia*, for example is a latinised abbreviation of the name by which this plant is known in parts of southern India.

Botanists have recently shifted banana bush into the genus *Tabernaemontana*. Translated as 'mountain tavern', this was the name which an Austrian physician gave himself by translating his own surname of Bergzabern into the Latin *Tabernaemontanus*! This physician, who lived and worked in Germany in the sixteenth century, was honoured by botanists because he wrote an important guide to the medicinal properties of a number of plants. *Acknowledgements to Rebel Elick, Esther Cullen and various texts.*

The distinctive small tree known as **bleeding heart** (right) will usually carry flowers this month. The flowers are either male or female, borne on short spikes which push upwards among the leaves or at the ends of twigs. Fruit of the bleeding heart (*Omalanthus novo-guineensis*, formerly *O. populifolius*) is very important to several species of bowerbirds and pigeons, so a prolific tree on the uplands is busy with the comings and goings of a rich variety of birds. The leaves, which turn a bright red when aged, show a small cup-shaped gland at the base, the secretion from which may attract small insects. The leaves are an important food for Daintree River ringtail possums and to a lesser extent for Herbert River ringtails. They are the only food for caterpillars of the Hercules moth.

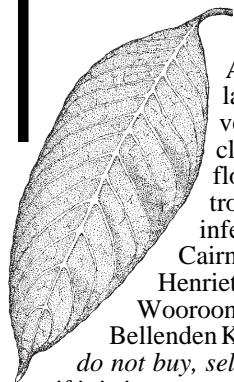
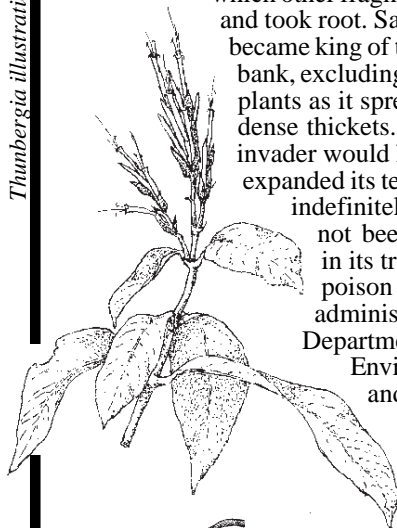


Weeds in the wet tropics

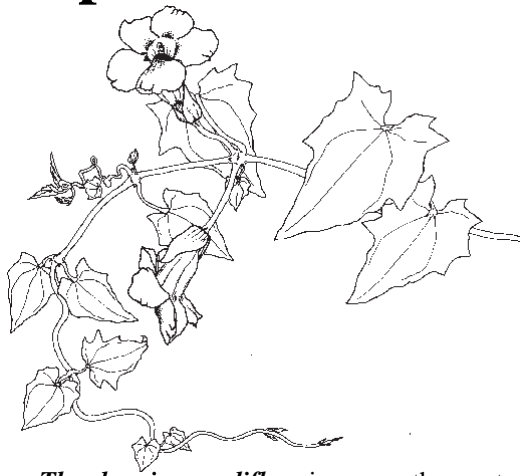
Invaders from the garden

One day, somewhere in the wet tropics, someone may have cleared a drain of choking vegetation, or cleaned up their garden. The easiest way to get rid of the rubbish was to dump it on the nearest patch of bush or river. From there the broken fragments of one plant, *Sanchezia parvibracteata*, (below) were carried away on flood waters. Landing on the banks of a hospitable creek they took root. Soon a large shrub had grown, from

which other fragments fell and took root. *Sanchezia* became king of the river bank, excluding native plants as it spread in dense thickets. This invader would have expanded its territory indefinitely had it not been stopped in its tracks by poison sprays administered by Department of Environment and Heritage staff.



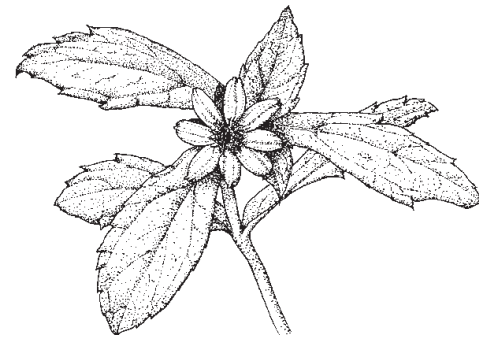
Sanchezia, a South American shrub with large dark green yellow-veined leaves (left) and clusters of yellow trumpet flowers, is common in tropical gardens. It has infested creeks between Cairns and Innisfail, notably Henrietta Creek in Wooroonooran (formerly Bellenden Ker) National Park. *Please do not buy, sell or grow this plant and if it is in your garden please remove it — and dispose of it thoughtfully.*



Thunbergia grandiflora is among the most rapidly growing and destructive weeds in the wet tropics. Introduced as a garden creeper it escaped from cultivation and established itself along lowland rainforest edges and river courses. From there it began its stunningly successful invasion. Climbing rapidly up and over rainforest trees it smothered them completely, reducing them to dead stumps which eventually fell. All that could then be seen was a wasteland, a carpet of triumphant thunbergia. Its destructive march has been measured at 0.6ha per year.

Physical attacks on thunbergia usually just help it to spread. It reproduces mainly by a tuberous root-system, the tubers reaching massive sizes and weighing as much as 70kg. Even small pieces of these will sprout so, if they are transported by river or in land fill, they can start new infestations. Herbicides have been used with success, particularly along the Mulgrave River, south of Cairns. However, the story does not end there. Once the affected area has been cleared of thunbergia it is vulnerable to further invasion by other weeds. A program of revegetation and further vigilant weed eradication is necessary to rehabilitate the area.

Singapore daisy (*Wedelia trilobata*) (below) is a useful ground cover with bright green leaves and sunny yellow flowers.



Have you ever tried to get rid of it? If so you will know how tenacious it is, appearing repeatedly after being sprayed and/or pulled up and apparently eradicated. It is extremely aggressive and spreads readily, forming thick swards in sunny and shady places. Ground covers are valued for their ability to suppress weeds — but when they escape into the wild they perform the same function, forming thick invasive carpets which suppress native seedlings. There is particular concern that Singapore daisy planted at island resorts will become destructive. Many other popular ground covers are also potential threats (see the What-not-to-plant guide on page 7).

Clitoria laurifolia, a shrub with a pretty blue flower, is another imported pest, originally from tropical America. It has invaded the understorey of melaleuca swampland in Edmund Kennedy National Park, north of Cardwell, where it had produced dense thickets before it was discovered and control measures begun.

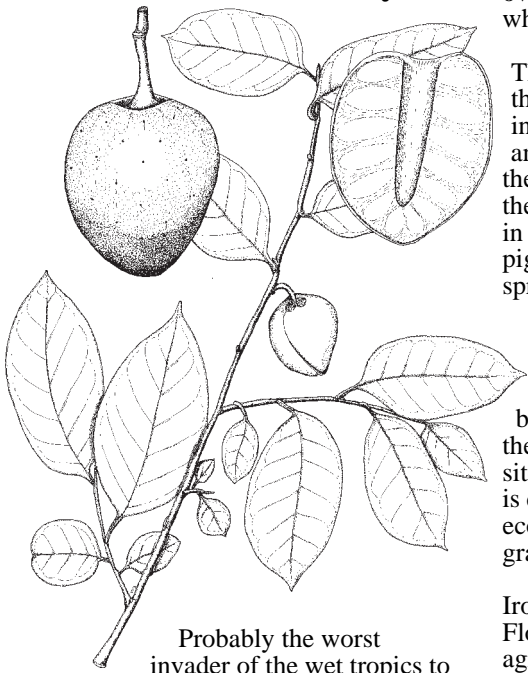
Fire danger



The notorious weed **lantana** (left) is yet another garden runaway which was brought from America in the mid 1800s. Now almost four million hectares in eastern Australia are infested, a particular headache for farmers whose stock are poisoned by the plant. In the wet tropics *Lantana camara* grows on better soils on cleared land and in disturbed open forest; the worst invasions of the wet tropics have taken place in eucalypt forest in the Herbert River area. It doesn't like shade so will not invade intact rainforest but does grow at its edges. There it can cause damage by burning fiercely when dry and damaging nearby trees.

Non-native grasses are even more of a fire hazard. Guinea grass (*Panicum maximum*) and molasses grass (*Melinis minutiflora*) grow lushly after rain providing a large fuel load which, when dry, burns more readily and hotter than native grasses. This damages the rainforest edge, pushing it back and allowing the grasses and other exotic species to become further established. When they burn, the same thing happens again, the rainforest margin continually retreating under fire. This is common throughout the wet tropics and is particularly obvious on hillsides.

Commercial runaways



Probably the worst invader of the wet tropics to date has been **pond apple**

(*Annona glabra*) (above). A native of tropical America and Africa, it was brought to Australia (possibly in 1912) to be used as root stock for its close relative the custard apple which doesn't otherwise grow well in wet soils. It is a shrubby tree which reaches about 15m. It is salt-tolerant and can stand immersion in fresh water so has energetically established itself in lowland seasonal swamps and along drains. It is particularly destructive in melaleuca swamps where it forms a dense understorey which prevents young trees from developing. As mature melaleucas gradually die there are no young ones to replace them and pond apple thrives; in areas where melaleucas have been killed by salt water, pond apple has completely taken

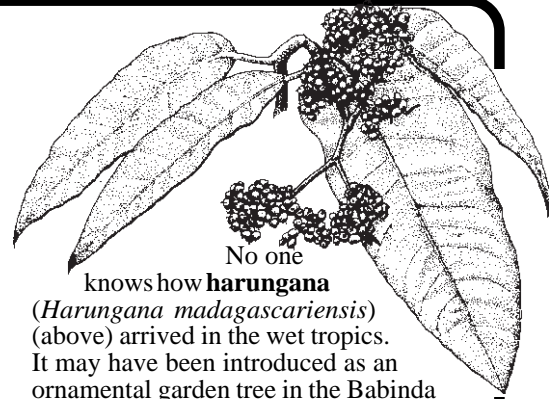
over. It is capable of invading natural areas which are free from human disturbance.

The main area affected by pond apple is the Russell River, near Innisfail, this infestation extending north to Gordonvale and south to Cardwell. It is also growing on the Daintree River and in other spots. Since the fruits can survive long periods floating in water and are eaten and dispersed by pigs and cassowaries this weed is likely to spread rapidly.

Pond apple can be killed by fire which does not destroy melaleuca but it is difficult to burn many swamp areas. The best control is achieved with chemicals but the process is laborious and slow and the sites often inaccessible. However, if nothing is done it is predicted that melaleuca ecosystems in the wet tropics will be gradually lost to this invader.

Ironically, pond apple is rare in its native Florida where it was extensively cleared for agriculture. Now *Melaleuca quinquenervia*, introduced from Australia, is seriously threatening the native vegetation!

A number of other plants which were introduced for commercial purposes also threaten the wet tropics. **Coffee** plants have spread from plantations into rainforest around the Atherton Tableland and Kuranda. Spread quickly and easily by birds and other animals, this plant, an understorey species by nature, flourishes in the forest. Many plants have been removed from Lake Barrine National Park. While not yet a major problem, coffee may become one. *Chukrasia velutina* is a cabinet timber tree, related to red cedar, a small number of which were planted near Lake Tinaroo in the 1960s. Its seeds are wind dispersed and now that the original trees are mature, seedlings are being found in large numbers. It seems to be on the verge of a population explosion.



No one knows how **harungana** (*Harungana madagascariensis*) (above) arrived in the wet tropics. It may have been introduced as an ornamental garden tree in the Babinda area where it was first recorded in 1937. It has not yet spread more than about 30km but is now considered to have moved into an expansionist phase.

Harungana is a pioneer species which germinates en masse and establishes itself quickly, easily and in large numbers wherever there has been any sort of disturbance — at the rainforest edge, along tracks, roads, drains and rivers (such as the Russell) and in clearings. Its spreading roots sucker, producing numerous new plants sometimes several metres from the adult. If it is cut or blown down it suckers again. Other species cannot compete with this and harungana quickly dominates until the canopy over a few hectares consists exclusively of this species.

Harungana produces numerous seeds which may be dispersed by small birds, fruit bats, by water and on machinery. Researchers have found it thriving 2½km into undisturbed rainforest in small gaps created by tree falls, landslips and so on as well as dominating disused logging tracks throughout the Wooroonooran (formerly Bellenden Ker) National Park. Since it is found up to altitudes of 1800m in its native Africa, there are fears that over the next 20-30 years the forest in this park, right up to the mountain tops, could become dominated by this aggressive species. Many of the more accessible trees have been poisoned successfully and eradication of this species may be possible although the longer the problem is left the more difficult and expensive it will become.

Harungana is a large tree which grows to 25m or more. It has bunches of small pale flowers and orange-brown fruit. Its most characteristic feature is its orange sap which can be seen if leaves are broken off or if the bark is scraped.

Camphor laurel (*Cinnamomum camphora*) is causing similar problems on the Atherton Tableland. Originally from China, Japan and Taiwan, it has spread along creek lines and edges of rainforest, excluding rainforest species and preventing regeneration of native forest. Its very fertile seeds are spread by birds and like harungana it suckers from the roots and is very difficult to kill.

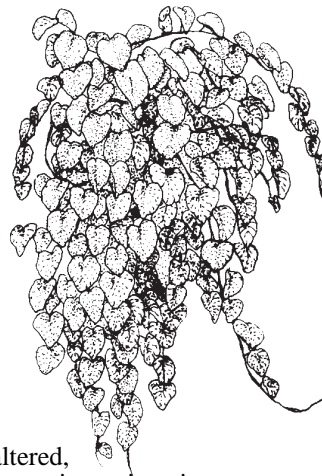
Troublesome natives

Although most weeds are exotic plants, under certain circumstances even the natives can cause problems. There are two ways this can happen.

When a plant is moved from one part of Australia to another it may dominate the local ecosystem. This has happened with **sweet pittosporum** (*Pittosporum undulatum*), a rainforest shrub which, after being introduced as an ornamental plant, is now invading southern Australian eucalypt forests. There it crowds out the young trees, just as pond apple does with melaleuca in the wet tropics. **Cadagi** (*Eucalyptus torelliana*), familiar from north-east Queensland rainforests especially around Kuranda, is considered an invasive plant in southeast Queensland.

Natives can also dominate an environment which has been altered, allowing certain local species an unfair advantage. In the wet tropics native vines grow vigorously following cyclone damage. The opening up of rainforest artificially by roads and other clearings allows them additional opportunities.

Merremia peltata (above) is a native vine which has grown up over much of the roadside vegetation along the Daintree road.



Questions & Answers

Q What are the effects of fresh water (rain) on the reef?

A Fresh water, because it is less dense than salt water, floats on top and usually diffuses without changing the salinity too much. However, a massive amount of rain falling on the reef at low tide can affect the corals. The next tide should bring in salt water to remedy the situation but if there is continuous heavy rain for several days the corals, which require a certain degree of salinity, become stressed and may 'bleach'. Most hard corals have, living in their tissues, algal cells (zooxanthellae) which provide the corals with much of their food in return for a home. However, stressful conditions such as high temperatures or fresh water can lead to the corals expelling the zooxanthellae — a process known as bleaching because the corals then appear to be almost pure white (see question below). Continued stress may eventually lead to the corals' death.

Q Besides zooxanthellae, what causes colour differences in coral?

A The colours of coral are caused by a combination of the zooxanthellae, which are a brownish colour, and the natural pigments of the coral tissue. The zooxanthellae colour acts as a background, enhancing the tissue colour. This can be appreciated when bleaching takes place and the corals become very pale versions of their normal hues. This is due to the visual effect of the white background skeleton, normally masked by the zooxanthellae. In healthy staghorn corals, the more intense colours at the branch tips indicate points where the colony is

growing.

Blue coral (the uncommon *Heliopora caerulea*) actually has pigments in its skeleton due to the presence of iron salts, although in the living animal this colour is masked by brown tissues. Other corals have red or black skeletons. However, none of these are true hard corals, their tentacle structure more closely resembling soft corals. The colour of some soft corals, for example the Gorgonians, is caused by crystalline structures in their tissues, called sclerites or spicules.

Of course, colour appears to change with depth; even in the clearest water the long wavelengths (reds) are excluded beyond the first 10-15 metres. Only short wavelengths of light — the blues — can penetrate deep into the ocean.

Facts and Stats

on weeds

There are about 15-20 000 native plants in Australia. Naturalised plant species (those which have become part of the environment) range from about five percent of all plants in the Northern Territory to 31 percent in Tasmania with an overall proportion of at least 15 percent. Of these about half invade native vegetation and probably a quarter are serious or very serious environmental weeds or have the potential to be so. Weeds, mainly those affecting agriculture, cost Australia an estimated 3 billion dollars each year.

Over 60 introduced plant species are declared noxious for Queensland. Of those, 31 percent were introduced deliberately as ornamental plants.

In 1992 eight species of weeds were identified as the most destructive to native plant communities in the Wet Tropics World Heritage Area. They were **pond apple/cherimoyer** (*Annona glabra*) (tropical American and African tree), **Harungana madagascariensis** (African tree), **blue sky vine** (*Thunbergia grandiflora*) (Indian vine), **Turbina corymbosa** (American vine), **Lantana camara** (American shrub), **Sanchezia parvibracteata**, (South American shrub), **Clitoria laurifolia** (tropical American shrub) and **Coffea** species (originally tropical African shrub).

Over 3200km of roads cross the Wet Tropics World Heritage Area. Together with powerlines and railways they provide long breaks in the canopy allowing light-loving weeds to develop, particularly where the soil has been disturbed.

A study of tourist vehicles in Kakadu National Park found that 70 percent of them were carrying seeds, many of them alien to the area.

Siam weed poisons over 3000 cattle each year in the Philippines. Up to 87 000 seeds have been recorded from just one siam weed plant in India.

There is a plus side to pond apple — its fruits are a food source for cassowaries, although these threatened birds therefore serve to disperse the seeds.

If you have any queries about noxious (harmful) weeds contact your local council or Department of Lands office. For information about crop weed control contact the Department of Primary Industries.

Tourist talk

ENGLISH	GERMAN	JAPANESE
weed	Unkraut	za sso 雑草
exotic	nicht-heimich	gairai shu no 外来種の
introduced	eingefuehrt	mochi komareta 持ち込まれた
native	heimich	jisei no 自生の
grass	Grass	kusa 草
vine	Wein	tsuru つる
tree	Baum	ju moku 樹木
shrub	Busch/Strauch	tei boku 低木
invade	eindringen	shin nyu suru 侵入する
smother	ueberwuchern	so shi suru 阻止する

The what-not-to-plant guide

As can be seen on previous pages, a large number of serious weeds in the wet tropics, and indeed in all of Australia, were originally introduced as garden ornamentals. When planting your personal or resort garden there are some particularly troublesome species which it is best to avoid. Bear in mind that the plants least likely to cause trouble are those native to the local area. They will also grow well and, in the case of resorts, provide a uniquely Australian experience for visitors.



African tulip tree (*Spathodea campanulata*) is grown widely for its attractive scarlet flowers (above) but this tree's windblown seeds are rapidly spreading the species throughout the wet tropics. Why not plant the local flame tree (*Brachychiton acerifolius*) instead? Its dramatic red flowers attract rainbow lorikeets.

Neither *Thunbergia grandiflora*, nor its close relative *Thunbergia laurifolia*, can be sold. Interestingly, thunbergia belongs to the family Acanthaceae which includes other bad weeds such as *Sanchezia parvibracteata* (see page 4), metal plant/red ivy (*Hemigraphis colorata*), *Stephanophysum longifolium*, a scrambling plant and *Perilepta dyeriana*. It is a good idea to avoid planting all imported plants from this family.

Thunbergia is by no means the only destructive vine, there are many many others. *Turbina corymbosa*, a native of tropical America and a member of the morning glory family, has been found behaving like thunbergia on the banks of the Barron River. Certain passion flowers (particularly

Passiflora coccinea) have beautiful flowers but are also dangerous plants. If a vine is required several natives such as bower climber (*Pandorea jasminoides*) with pink trumpet flowers and *Tecomanthe hillii* with spectacular bunches of pink flowers are very decorative. (But take care — many vines can be invasive.)

Singapore daisy (*Wedelia trilobata*) has already been mentioned (page 4). Other ground covers with a tendency to smother everything in their path are wandering jew (*Tradescantia* and *Zebrina* species), metal plant/red ivy (*Hemigraphis colorata*) and peacock fern (*Selaginella willdenovii*).

Please don't buy, sell or grow the above plants — and if weeding them out please dispose of them thoughtfully. Don't dump them in bushland.

Ecotourism — towards a definition?

In future the 1990s may well be seen as the decade of ecotourism. It may also be seen as a time when the tourism industry, academics and natural and cultural resource agencies all jumped on the bandwagon, only some of them understanding the concept of ecologically sustainable development (ESD) while others simply indulged in the marketing benefits.

So, what exactly is ecotourism? Don't panic if you can't answer. You are not alone! Even the authors of the National Ecotourism Strategy (yes, there is one!) have recognised that "*the term 'ecotourism' has been widely open to misinterpretation by planners, operators, managers, marketers and the media.*" (Wright 1993)

Hector Ceballos-Lascurain, who first coined the notorious term, defined ecotourism as: "*Tourism that involves travelling to relatively undisturbed natural areas with the objective of admiring, studying and enjoying the scenery and its wild plants and animals, as well as any cultural features found there.*" (Hector Ceballos-Lascurain 1991)

However, this definition doesn't really address ESD. Peter Valentine includes it: "*Ecotourism is nature-based tourism that is ecologically sustainable and is based on relatively undisturbed natural areas; is non-damaging and non-degrading; provides a direct contribution to the continued protection and management of protected areas used; and is subject to an adequate and appropriate management regime.*" (Valentine 1991)

But this omits cultural appreciation and conservation elements. Ceballos-Lascurain includes it in yet another definition: "*Environmentally responsible travel and visitation, to enjoy and appreciate nature and accompanying cultural features, that promotes conservation, has low visitor impact and provides for beneficially active socioeconomic involvement of local populations.*" (Ceballos-Lascurain, 1992)

Contributed by Margot Warnett, DEH Townsville

Ecotourism — how do you measure up?

So, what is the 'ecotourism factor' of your tour program or operation? A simple way to determine this is to study the following four key elements of ecotourism (defined within the National Ecotourism Strategy) and ask yourself the questions below.

• The natural environment

Is your operation based on the natural environment and does it include cultural values?

• Ecological and cultural sustainability

Does your operation attempt to minimise environmental impacts, for example, through use of environmentally-friendly cleaning agents, and support local communities?

• Education and interpretation

Does your operation provide educational or interpretive programs for increasing public awareness of environmental and cultural issues and values?

• Provision of local and regional benefits

Does your operation use locally-based companies and facilities, employ local guides with specialised knowledge and purchase provisions and services in the area?

If you'd like more information on ecotourism in Australia, a copy of the National Ecotourism Strategy can be obtained from the Federal Department of Tourism Tel: (06) 27 97111.

Bookshelf

Weeds in the Wet Tropics World Heritage Area of north Queensland
Stella Humphries and Peter Stanton
Wet Tropics Management Agency
(1992)

This report identifies and deals particularly with the eight species which most threaten the wet tropics environment (see facts and stats).

The biology, distribution, impact and control of five weeds of the Wet Tropics World Heritage Area
Dr J.T. Swarbrick
Wet Tropics Management Agency
(1993)

The first of three reports, this looks at pond apple, harungana, turbina, sanchezia and coffee. Two later reports deal with chemical control.

Plant Invasions — the incidence of environmental weeds in Australia
Kowari 2 — Australian National Parks and Wildlife Service (1991)

Less specific to the wet tropics, but a useful look at weeds with papers from the ninth Australian Weeds Conference.

Australian Water Weeds
Australian Water Resources Council

An informative collection of one booklet and nine leaflets.

Waterplants in Australia
G.R. Sainty and S.W.L. Jacobs
Australian Water Resources Council

An excellent field guide to natives and exotics with colour photos and key.

Noxious Weeds of Australia
W.T. Parsons and E.G. Cuthbertson
Inkata Press (1992)

A massive tome dealing with harmful weeds all over Australia. However, recently discovered environmental weeds of the wet tropics such as harungana and sanchezia are not included.

Pestfact
Department of Lands
These excellent pestfact sheets on a number of weeds and feral animals are available from offices of the Department of Lands.

Poster
Bushland Weeds is an excellent colour poster produced by Brisbane City Council. Call (07) 225 0411 for a copy.

This newsletter was produced by the Queensland Department of Environment and Heritage (now The Environmental Protection Agency) with funding from the Wet Tropics Management Authority.

Opinions expressed in *Tropical Topics* are not necessarily those of the Department of Environment and Heritage (EPA).

While all efforts have been made to verify facts, the Department of Environment and Heritage (EPA) takes no responsibility for the accuracy of information supplied in *Tropical Topics*.

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