A Good Weed

the NEWSLETTER of
The Weed Society of New South Wales Inc
ISSN 1325-3689

13
April 1998

THIS ISSUE

Bitou bush
Chrysanthemoides monilifera
Branches with flower, leaves and fruit

Editor: Brian Sindel
Division of Agronomy and Soil Science, University of New England, Armidale 2351
Ph: (02) 6773 3747
Fax: (02) 6773 3238
Email: bsindel@metz.une.edu.au

Secretary: Leon Smith
8 Darwin Drive,
Lapstone 2773
Ph/fax: (047) 393 564

A Good Weed is published four times per year by the Weed Society of New South Wales, PO Box 438 Wahroonga 2076.

Printed by the University of New England

Packaged by the Challenge Foundation in recycled plastic

SMH Saturday, March 7, 1998

Evil weed

The foreign weed bitou bush, made it into the main metropolitan media recently in an article by Bob Beale in the Sydney Morning Herald. The article is reprinted here because it so vividly describes the affect that this weed is having on coastal plant communities.

Bright green foliage stretches as far as the eye can see, a dense wall of leaves dotted all over with dainty yellow daisy flowers. This luxuriant Australian bushland scene may seem like a picture of natural abundance and environmental health, but it is a sad illusion: the sea of green actually marks the scene of an environmental tragedy.

Look closer and you soon realise that one type of plant, and only one, is growing here on the ancient sand dunes behind a peaceful beach in Booderee National Park on the NSW South Coast. That plant is bitou bush, a relentless invader originally from South Africa but now engulfing and killing off countless native plants and animals in its path along thousands of kilometres of the continent's east coast.

Booderee is just one of the 21 national parks and nature reserves on the NSW coastline that are threatened by the devastating spread of this exotic weed. In all, bitou is thought to have infested about three-quarters of the State's coastal headlands. In most cases it is competing strongly and successfully against the native flora and in some places it has totally eliminated it.

"It's certainly an environmental disaster for the east coast," says Mike Patrick, manager of the park on the fringes of Jervis Bay, about 150 kilometres south of Sydney.

The breathtaking beauty and richness of the natural life of the bay and its surrounds have earned it a reputation as a national treasure. But if bitou further extends its insidious foothold on the park it could potentially wreak havoc here, as it already has elsewhere. The nation's premier research facility on such problems, the Co-operative Research Centre for Weed Management Systems in Adelaide, has rated bitou as a prime target for attack. In a recent publication the centre described it as "the worst weed in the Australian coastal environment" because it had so completely taken over such large areas to create "an alien monoculture". Here at Booderee, senior ranger Rebecca Rudd is guiding us through this remote part of the park to show at first hand why the weed is such a menace, and why some highly promising new weapons against it are urgently needed to halt its spread. In many ways, the story illustrates Australia's broader problems with introduced plants and animals, and how hard it is to put such genies back into their bottles.

..."the worst weed in the Australian coastal environment"...

From a four-wheel-drive vehicle travelling a rough sandy track between walls of bitou in places as high as a house, she points out that the hardy plant has thrived here despite a harsh and demanding habitat. It is exposed to buffeting winds, often bathed in ocean salt-spray and gains scant nourishment from ground that is little more than sand.

Other equally hardy native plants once managed a similar feat. Rudd sighs as we stop and she parts the dense bitou branches to reveal the skeletons beneath of what was once a diverse native plant community.

Her botanical training tells her that the dead banksia, eucalypt, hakea, wattle and casuarina bushes once supported many other living things as well. We pause and listen - the familiar buzz of insects and the chorus of birdsong has all but gone. No bees are busy taking nectar from the yellow flowers, no caterpillars chew on the juicy leaves and only a few enterprising birds feast on the bitou's countless plump dark purple fruits. "It's such a shame," she says, shaking her head. It is hardly the stuff that national parks are made of, or that anyone would want them to become.

Back on the move again, she points out how other trails have been overgrown and made impassable by bitou. That in turn is creating access problems for the park's carefully devised bushfire management plan, which aims to regulate the needs of the fire-adapted native flora by creating a controlled mosaic of burnt and unburnt areas along the tracks.

Unlike much of the local plant foliage, bitou's soft fleshy leaves resist all but the hottest fires, making it difficult to send the flames where they are intended to go. We stop to inspect a blackened slope still smouldering in places from an experimental fire lit by Rudd the previous day. Even under good burning conditions, the bitou had kept the intensity of the fire low and many individuals had survived intact enough to resprout.

Worse still, she notes, the plant produces prodigious numbers of seeds that can remain viable for up to 10 years in the soil. A single mature bitou bush may boast 60 or more flowering stems at a time, each of which may produce as many as 20 flowers. In turn, each one of those flowers may yield more than a dozen fruits: a few birds and many foxes find the berries irresistible and spread them far and wide in their droppings.

"It seems to be able to exploit a wide range of ecosystems," Rudd says. "It's amazing to see what it can do."

Elsewhere, as Rudd's colleague Ford Christo points out, bitou has shown itself capable of smothering and killing even relatively tall trees, such as the gnarled "old-man banksias" made famous in the illustrated stories of children's author May Gibbs.

In the cooler southern parts of the continent bitou's equally fearsome sister plant, boneseed, is causing similar problems.

Mike Patrick notes that one trouble is that most Australians still don't recognise the seriousness of the threat posed by such invaders. Unlike their many troublesome and better publicised feral animal counterparts - such as rabbits and cane toads - exotic weeds in Australia are underrated by most people as environmental problems, he believes.

Visitors to places such as Booderee, or the many other stretches of coast similarly blighted in NSW, Queensland, Victoria, Tasmania and South Australia, see lush vegetation and assume it is healthy native bushland, he argues. "For many people, greenery is not necessarily a problem."

In the cooler southern parts of the continent bitou's equally fearsome sister plant, boneseed, is causing similar problems. Bitou and boneseed are sub-species of the same plant - with the scientific name *Chrysanthemoides monilifera*, coined to describe its chrysanthemum-like yellow flowers and the necklace of beady fruits that form a ring around the flower heads. Bitou is an adaptation of a Hottentot name for a number of similar plants in the Cape Province of South Africa.

Mirroring habits from their native land, bitou has colonised the warmer northern parts of Australia and boneseed has adapted to the cooler southern coast.

...the most hopeful new weapon is an un-named species of moth whose larvae have been found to completely defoliate bitou bushes under the right conditions in South Africa.

Between them, they have left only the coasts of the Northern Territory and Western Australia untouched, notes Dr Penny Edwards, a CSIRO scientist who is part of the specialist team seeking answers to the problem. Much larger areas potentially could be affected, according to the team's computer models.

It is not certain how bitou and boneseed first came to Australia. Dr Edwards says the consensus is that seeds somehow found their way into ballast dumped some decades ago by a South African ship. The sprawling Stockton sand dunes, on the north shore of the Hunter River beside the port of Newcastle, was the most likely origin.

There the seeds managed to sprout and found themselves in conditions much like those which bitou and boneseed enjoyed in their native land. Bitou's ability to grow vigorously under such a tough habitat was noticed later when land managers were seeking out species suitable to stabilise dunes which had lost their plant cover because of sand-mining and poorly controlled recreational uses.

In the 1960s and '70s, bitou and boneseed were actively distributed and deliberately planted for that reason along many parts of the eastern and southern coast, although plantings soon stopped when it became apparent that they were spreading out of control. The invasion of Booderee, for example, began with just 14 plants placed on dunes degraded by former grazing activities - now they cover many tens of hectares and still spreading.

Meanwhile, if you visit the Newcastle area today the legacy of the invasion is even more obvious: the familiar shiny green bitou leaves and pretty yellow flowers have smothered virtually all of the headlands and coastal dunes in the area.

"It is now the dominant vegetation on about a quarter of the NSW coastline," says Dr Alex Nikandrow, a senior plant pathologist with the NSW Department of Agriculture's research centre at Orange.

At first, land managers tried to control bitou and boneseed by removing them by hand or by applications of herbicides. But experience showed that these costly control methods needed to be sustained regularly for years to be fully effective, and few regions have the resources needed to do so.

Booderee's resource manager, Martin Fortescue, notes that for large infestations, aerial spraying with a precisely measured dose of a herbicide will kill adult bitou plants and leave more than 90 species of native plants surviving. Hundreds of hectares have been sprayed in NSW. But the well-stocked seed bank in the soil ensures new squadrons of seedlings will soon rise after spraying. Even at a well-resourced national park such as Booderee, it has proved to be a losing battle, Fortescue laments.

Happily, this gloomy picture is balanced by some genuine signs of hope on two fronts, say Edwards and Nikandrow. That hope lies in the development of biological controls that pit natural enemies of bitou and boneseed against them.

Indeed, it is the absence of those control agents that probably accounts for bitou's great success in Australia, says Edwards.

Conservation-minded land managers fear that the aliens will do too much damage if

they simply wait until natural ecological checks and balances come into play.

For almost a decade, therefore, Australian researchers have been seeking out and screening insects and plant diseases in South Africa that attack bitou and boneseed. Edwards, an insect specialist, notes that four species of beetles and a fly have been found suitable for release in Australia, after laboratory and field tests showed that the predators would not attack other types of plants and so create new environmental problems.

The first such control to be released a few years ago, the bitou tip-moth, has already become established in many areas. Its caterpillars feed, as the name suggests, on the growing tips of the plant and have proved to be effective in damaging bitou flowering and seed production. Another beetle species, which bores into the seeds to feed on them, is almost ready for release as well.

But the most hopeful new weapon is an unnamed species of moth whose larvae have been found to completely defoliate bitou bushes under the right conditions in South Africa. Such assaults can kill off or severely weaken the plants. So hopeful of the potential of this moth is Edwards that she believes no further insect imports will be needed if it passes final field trials as expected this summer. It may be ready for release in Australia by the end of this year.

Nikandrow's team, working under the NSW Department of Agriculture's principal research scientist, Dr Eric Cother, is taking a different tack. They were intrigued to hear of stands of bitou suffering from dieback in places along the NSW coast. Sampling at almost 50 sites between 1992 and 1994 revealed that at least three separate diseases were at work, often causing the plant's leaves to die or its growing tips to wither.

Patient research showed that several native fungi were causing the damage. One in particular has been shown in glasshouse tests to be especially effective. Plants aged three months were killed off by the fungus in just 14 days, Nikandrow points out. Reassuringly, no such deadly effects have been observed in infected native plants.

If similar results are obtained in field trials under way, the fungus may be deliberately spread in large quantities to put even more pressure on bitou, and possibly boneseed as well, he hopes. Using a native biological control in such a way is preferable to risking the introduction of more exotic species whose long-term behaviour in Australia - like that of bitou itself - cannot be accurately predicted, he argues.

But all the researchers tackling this awkward problem agree that in the long term an integrated approach will be needed to keep bitou and boneseed in check - a combination of chemical, mechanical and biological controls.

Bitou Bush Control News

By Paul Milham

In this article, Paul Milham summarises much of the current bitou bush research in NSW.

1. New South Wales National Parks and Wildlife Service

Since Winter 1995, the NPWS has sprayed small areas in several reserves with 2 litres of Roundup® per hectare using a helicopter. Follow-up work is continuing on the ground. Bitou bush is being considered as a *threatening process* under the NSW Threatened Species Conservation Act 1995.

2. National Centre for Groundwater Management, University of Technology, Sydney

i. David Salotti measured water movement into the dunes of Bherwerre Beach and the properties of the sand that affect the movement.

ii. Anneeta Bidkar is studying leaching of Roundup® and Brush-off® through sand columns in the laboratory.

The results of these postgraduate projects will lead to field studies on the persistence and movement of Roundup® and Brush-off® in sand dunes.

3. Department of Biological Sciences, University of Wollongong

i. Gaby Leahy showed that glyphosate applied to bitou bearing immature seed probably reduces the viability of the seed.
ii. Melanie-Anne Johnson counted seeds in soil sampled under bitou from plots treated in different ways. She concluded that the tip moth may be suppressing seed production by bitou.
iii. Carl Gosper is studying the effects of bitou and the aerial spraying of Roundup® on the ecology of native birds.

4. The Australian Museum

Gerry Cassis and Lance Wilkie are investigating the effects of bitou bush invasion and removal on arthropod populations.

5. CRC for Weed Management Systems

i. John Vranjic is studying revegetation of bitou infested land.
ii. The bitou seedfly, *Mesoclanis polana*, has been released at three sites on the NSW coast. Insects are being mass-reared for further releases. This insect is suitable for bitou bush north of (approximately) Taree.

6. NSW Agriculture

i. A study of the effects of aerial herbicide spraying on the native flora and fauna at Hawks Nest was commissioned by NSW Agriculture from the Australian Flora and Fauna Research Centre, University of Wollongong. The study was conducted by Graham Kohler, Ian van Tets and Rob Whelan. The major conclusions after two years are:

   Plants - *individuals of many of the native plant species had either improved in condition or remained unchanged (relative to those in unsprayed areas nearby)*..... (the) *improvement was generally* (expressed as) *increased size .....probably due to release from bitou competition*

   Fauna - *the bird community did not appear to have changed*..... (and) *the normal population was still low; it was very low in 1993 before spraying started.*

A third year's data were being collected during December 1997.

ii. Over 160 species of native plants are known to withstand aerial spraying with 2 litres of Roundup® per hectare during winter.
iii. Monsanto has released a formulation of glyphosate which contains a wetting agent that is said to be safer in aquatic ecosystems. This formulation was effective against bitou in trials during Winter 1996.
iv. Alex Nikandrow and Ric Cother have exciting data which show that an Australian fungus can infect and kill bitou. This brings the possibility of a mycoherbicide one step nearer.
v. The principal researcher on the use of herbicides to control Bitou, John Toth, retired from NSW Agriculture at the end of January 1997. John is practising as a consultant. The three other members of the research team, Royce Holtkamp, Ildikó Meszaros and Paul Milham, are continuing the project.
vi. Royce Holtkamp is co-ordinating a major revision of the Bitou Control Handbook.

..exciting data which show that an Australian fungus can infect and kill bitou.

7. The Coastal, Floodplain and Riverine Resources Program of the NSW Department of Land and Water Conservation

This group has emerged as a strong supporter of bitou control.

8. The Natural Heritage Trust (NHT)

The Natural Heritage Trust may become a significant player in funding the control of environmental weeds.

i. Coastcare is one program under the NHT which is an appropriate source of funds.
ii. The National Weeds Strategy may in future also have some potential as a source of funding.

9. Potential sources of labour for clearance of bitou bush

i. The Australian Trust Conservation Volunteers
ii. Green Crops, a Federal Government youth environment program.

(Paul Milham works for NSW Agriculture at Orange)

Flower Colour
Variation within and between Populations of Wild Radish

By Roger Cousens

I have become interested in the proportions of colour morphs within populations of wild radish (*Raphanus raphanistrum*). Most populations in Australia would appear to be dominated by yellow flowered forms, although anecdotal reports cite occasional populations that are mostly purple or white. The "yellow" populations invariably include other colour forms at a low frequency. Most Floras from around the world simply refer to the range of colours and venation, and make no mention of the predominance of particular forms.

The colour of wild radish flowers is highly variable; accounts of the species refer to dark yellow, pale yellow or cream, brownish-yellow, white, pink, lilac and purple; other variants that I have seen include yellow petals with pink tinges towards the tips, and yellow petal tips with white bases. The veins on the petals may range from indistinct to very dark; Panetsos & Baker (1967) refer to vein colours of yellow, green, brown and blue, although purple may be a more appropriate description of the darkest form. There can also be considerable variation in petal shape. Aik-Hock Cheam has recognised at least seventeen distinct flower types in Western Australia; however, yellow or white are most common there and pink is rare.

Kay (1976) studied insect pollination of four populations from South Wales and Central England, ranging in proportion of yellow flowers from around 61% to 1%; the remaining 39% to 99% were presumably white. It was suggested that pollinator preference for particular flower colours may have a role in determining the balance of flower colours within populations. Cheam (1984) reported that seeds collected from yellow, white and purple flowered plants differed in dormancy.

Last November while travelling through England I noticed pure white populations growing just south of York; Alastair Fitter (University of York) confirmed that this colour is typical of that region. To what extent, then, are there regional distributions of colour forms? There are many published comments on geographic distributions of flower colour in the UK, but they mostly appear to be derived from a single source, suffering some distortion as later authors have reworded the original (rather like "Chinese whispers"). Unfortunately, I do not have ready access to a comprehensive set of British and European Floras and some of the following sequence may be incomplete (I would appreciate comments from anyone who can add to the story or correct me). I have highlighted the phases on white flowered forms to make the differences between statements more obvious.

The earliest comment on regional differences that I have found is in my copy of Clapham, Tutin & Warburg's (1962) Flora of the British Isles, Second Edition, which states that *"the yellow-fld form is commoner in the northern and the white-fld in the southern part of the range"*. This is repeated in the 3rd Edition by Clapham, Tutin & Moore; I have been unable to find a first edition. Stace, in his New Flora of the British Isles (1991) states more simply *"yellow petalled plants commonest in N & W"*. Perring (1968) in the Critical Supplement to the Atlas of the British Flora gives more detail, commenting that there is a *"tendency for white forms to be rare in Scotland, whereas yellow forms occur almost*

anywhere within the range of the species. Pure yellow forms, without prominent veins, are more frequent in the north." Perring also states that there *"appears to be no geographical distinction between veined and unveined forms."* Kay (1976) further elaborates and emphasises frequencies within populations, stating that wild radish *"shows both geographic clinal variation and local mosaic differentiation in flower-colour morph frequency. In Britain, the* ***white morph predominates in polymorphic populations in southern and eastern England****, but the yellow morph predominates or forms monomorphic populations in western and northern Britain."* No source of this information is given. Rich (1991) quotes Perring in stating that *"Yellow-flowered plants are widely distributed,* ***white-flowered plants rare in the far north and west****"* and adds that *"purple-flowered plants occur mainly in England"*. Cheam & Code (1995) also quote Perring, but emphasise the white colour form: ***"White flowers are most common in the south and east, but are rare in the far north and west."*** They also repeat Rich's comment that *"Purple flowered plants occur mainly in England"*, but without attribution. Neither Bentham, Hooker & Rendle (1954), nor my other various floras comment on geographic distribution of colour forms.

It is clear that these various sources consider that there are distinct regional differences in colour and, in particular Kay, that there are trends across Britain. But are these published comments all from personal experience? If not, what is the origin of the belief that these trends indeed exist? Is it just anecdotal, or are there data to support it? Has the distribution of colour forms ever been studied formally? Certainly, the maps of records of white and yellow forms published by Perring appear to show differences between regions: there are no white plant records from the Isle of Man or the Scottish islands, few white plants collected in Eire and few yellow plants in Yorkshire. The maps are, however, insufficient to show changes in flower colour proportions across the country and recording frequency varies considerably.

I have only found one account of regional variation elsewhere in the world. In Western Australia, Cheam (Cheam & Code, 1995) suggests that purple forms are more common in the northern wheatbelt of that state.

I would be interested in any anecdotes of regional variations in proportions of flower colours in any country. More importantly, if anyone is interested in collecting quantitative data, I can supply a recording protocol and descriptions of the various colour forms. I can be contacted by fax on (+61) 3 9471 0224, by e-mail on R.Cousens@latrobe.edu.au or by post at Department of Agricultural Sciences, La Trobe University, Bundoora, Victoria, 3083, Australia.

References

Bentham, G., Hooker, J. D. & Rendle, A. B. (1954) *Handbook of the British Flora.* Reeve & Co., Ashford, Kent.

Cheam, A. H. (1984) Coat-imposed dormancy controlling germination in wild radish and fiddle dock seeds. Proceedings of the 7th Australian Weeds Conference, pp. 184-190.

Cheam, A.H. & Code, G. R. (1995) *The biology of Australian weeds 24.* Raphanus raphanistrum. *Plant Protection Quarterly*, 10, 2-13.

Clapham, A. R., Tutin, T. G. & Warburg, E. F. (1962) *Flora of the British Isles*, Second edition. Cambridge University Press, Cambridge.

Kay, Q. O. N. (1976) Preferential pollination of yellow-flowered morphs of *Raphanus raphanistrum* by *Pieris* and *Eristalis* spp. *Nature*, 261, 230-232.

Panetsos, C. A. & Baker, H. G. (1967) The origin of variation in "wild" *Raphanus sativus* (Cruciferae) in California. *Genetica*, 38, 243-274.

Perring, F. H. (ed.) (1968) *Critical Supplement to the Atlas of the British Flora.* Botanical Society of the British Isles, London.

Rich, T. C. G. (1991) *Crucifers of Great Britain and Ireland.* BSBI Handbook No. 6. Botanical Society of the British Isles, London.

Stace, C. (1991) *New Flora of the British Isles.* Cambridge University Press, Cambridge.

Low rates of Frenock® for removal of serrated tussock seedlings from a young improved pasture

By Malcolm Campbell

An 18 month old improved pasture infested with 8 to 18 month old serrated tussock seedlings, near Berridale, NSW, was sprayed with Frenock® rates of 0 to 1.5 l/ha on September 16, 1995. Rates of 0.5 and 0.75 l/ha killed 95% and 100%, respectively, of the tussock seedlings without damaging the pasture which consisted of subterranean and white clovers, phalaris, fescue and cocksfoot. It is necessary to spray in spring or summer

because subclover, the species most susceptible to Frenock®, is more tolerant at that time than in autumn or winter. No new tussock seedlings had established in the pasture up to October 1997, two years after spraying.

Explanatory notes

The use of low rates of Frenock® to selectively remove serrated tussock seedlings from phalaris-based pasture could herald a new philosophy in serrated tussock control.

For example, if, after the control treatment of a mature infestation, either by ploughing or spraying, serrated tussock seedlings were selectively removed with low rates of Frenock® after their first massive re-infestation, then there may be no need to spray again for a number of years.

This is in contrast to the present situation where tussocks are allowed to infest after initial treatment until there are sufficient plants to spot or boom spray. In this situation, the tussocks could be from 5 years old to seedlings which means a high rate of Frenock® would be needed for effective control.

The new philosophy of treating seedlings means that they are treated when they are both young and the population consists of plants of similar age.

The critical factor in maintaining control is to treat the seedlings before they are two years old. This requires close inspection of the pasture to ascertain when heavy seedling re-infestation occurs (e.g. after a drought, after heavy rain, etc.) Such infestations should be treated in the September to January period, that is, from 6 to 18 months after the re-infestation so that Frenock® is applied when it is most effective.

Rates of Frenock® to use

On the Monaro from 0.5 to 0.75 l/ha of Frenock® should be effective if the pasture is spelled immediately after spraying or if very young plants (under 6 months of age) were sprayed.

In other areas of NSW the critical rates of Frenock® have not been determined.

Native grasses

Red grass, kangaroo grass and Poa tussock will tolerate low rates of Frenock® but wallaby grasses and weeping grass (Microlaena) are killed by application rates of 1.0 l/ha. Whether wallaby grass and weeping grass will tolerate rates lower than 1.0 l/ha is being determined in experiments near Orange.

Other weeds

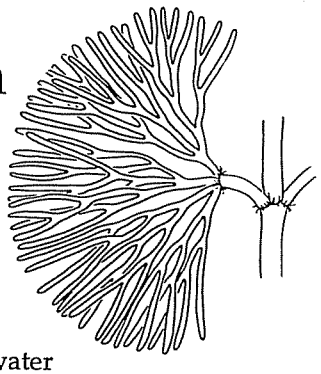
Selective removal of African lovegrass seedlings with low rates of Frenock® may be possible as research at Orange has shown that seedlings of this weed are very susceptible to Frenock®.

In addition, it may be possible to selectively remove St. John's wort seedlings with low rates of Starane® because this herbicide will not harm legumes and grasses when applied in December, the best time to spray wort at Orange.

Further information on the use Frenock® in tussock control is published in a paper in *Plant Protection Quarterly*, Vol 12, pages 175-6, 1997.

(Reprinted from the newsletter of the Grassland Society of NSW, vol 12, 4. Malcolm Campbell is a researcher with NSW Agriculture at Orange.)

Cabomba: aquarium environmental time bomb



By Lalith Gunasekera

Dumping of unwanted plants into local water ways and deliberate 'seeding' of areas to allow wild cultivation for the aquarium trade has resulted in the wide establishment of the threatening weed cabomba, or fanwort, *Cabomba caroliniana*.

Cabomba is an aquatic perennial plant considered to be native to both the south-eastern United States of America and South America. "Cabomba" is an aboriginal American name for an aquatic plant and fanwort described the fanlike leaf shape. It was introduced into Australia as an aquarium plant and was first recognised as naturalised in 1986. Cabomba has since become widely established in Queensland, New South Wales, the Northern Territory and Victoria as a result of the activities of aquarium owners.

Cabomba grows under water except for a few floating leaves and flowers in season. The roots grow in mud but parts of the plant can survive free-floating for 6-8 weeks in deep water. The stems may grow up to 3 to 10 metres long. Shoots are grass green to olive green or sometimes reddish brown. The green floating feathery leaves are alternate and

repeatedly branched into a fan shape up to 5cm across. The leaves are on a short stalk. The flowers, which are white or cream with 6 petioles with yellow bases, appear in summer above water.

The plant grows prolifically and soon dominates billabongs and lakes reducing water quality and displacing native flora and fauna. It has the ability to clog up waterways and nutrient-rich lakes. This leads to fouling of irrigation and aquaculture systems. Cabomba has little value to wildlife and no known predators. It is able to live in a wide variety of climates and can tolerate average daily temperatures of 11.6 - 25.4°C and average absolute temperatures of 19.5 - 41.1°C.

Cabomba has become a significant water weed in Queensland where it has been declared a restricted plant under the Rural Land Protection Act 1985. In the Northern Territory, it has very recently been declared a Class A weed (must be eradicated). The sale of cabomba anywhere within Queensland and the Northern Territory is illegal. Cabomba has also become a significant water weed in New South Wales.

(Excerpts reprinted from Under Control - Pest Plant and Animal Management News, Keith Turnbull Research Institute, No.4, 1997)

Old Weed Anecdotes

What truth is there in old anecdotes about weeds? Please send us your comments on the following ones as well as any useful anecdotes/rules of thumb that may have been passed on to you in the past.

"**Bathurst Burr** is a wonder feed if treated properly i.e. if cut at the right "hay" stage, when the plant is very green and the burr is soft (similar to the stage that one cuts cereal crops for hay) and then made into ensilage. The heat created burns off all the spikes and the oil which is in the burrs makes a perfect feed for stock.

Saffron thistle also contains a very good oil. At one stage, it was used in the early jet engines for, I think, some form of lubrication. The same stage of cutting as hay applies. It is then made into ensilage. The heat takes off all the prickles and the stock do very well on it.

Variegated thistle can be poisonous to cattle at certain stages. (If horses are in the same paddock, poisoning of cattle can occur if the horses "paw" the thistles.) However, if cut at the right "hay" stage and ensiled, wonderful feed for cattle is produced. I have seen the cattle eat the dirt which was under the ensilage stack.

This type of harvesting is really WASTE MANAGEMENT. It is also beneficial as generally the seeding of weeds is prevented and thus the paddocks, so treated, are to a large extent cleaned up." (Name withheld)

Members Matter

We welcome the following new members to the Society:

Jennifer Cowie, Tarcutta,
Fleur Creel, Paddington,
Geoff Doret, Cronulla,
Tony Gellen, Frenchs Forest,
Eris Hess, Granville,
Ian Johnstone, Boral Energy, Fyshwick,
Brett Luhrmann, Eagle Environmental Services, East Lidcombe, and
Hans Weber, Novartis Crop Protection Australasia Ltd, Wentworthville.

Please send your weed stories to the Editor (see p2) for publication in *A Good Weed*.

Young Weed Scientist Travel Award

The Council of Australian Weed Science Societies (CAWSS) is calling for applications for their annual travel award available for a young Australian weed scientist.

Applications are invited to attend national or international conferences or for specific overseas study tours of a short duration.

The Award will be made to undergraduates studying in the fields of agriculture, biology, ecology, horticulture and forestry or related subjects, who have a desire to continue their studies in weed science. It will also be made to young weed scientists who have recently (within five years of finishing their degree) commenced employment in any branch of weed science. The Award will be open to anyone residing in Australia, but members of Societies affiliated with CAWSS may be given preference.

The Young Weed Science Travel Award is worth up to $2000 per annum. It is not expected to cover the total cost of the conference or study tour being undertaken, so it will be necessary for an applicant to ensure that other funding is available. Applicants attending conferences will be expected to give a presentation at the conference and to submit an abstract of their paper with their application.

On return, the successful applicant will be expected to give a report to the nominating Society, either as a written report for the Newsletter or as part of a seminar, meeting or workshop conducted by that Society. It will be part of the successful applicant's duty to pass on as much information as possible to the nominating Society and it is the right of the Society to specify the format of the report.

Application forms are available from Leon Smith (our Secretary - see p2 for address) and must be submitted by **30 June** to the Secretary/Treasurer of CAWSS, Bob Richardson, PO Box 42, Meredith, Vic 3333.

INTERNATIONAL WEED SCIENCE SOCIETY

Description

The International Weed Science Society (IWSS) was formed in 1975 by individuals from Europe, North America, South America and the Asian-Pacific area, to deal with global weed science issues. The Society has held two highly successful International Weed Control Congresses, in Melbourne (1992) and Copenhagen (1996) and its next congress will be in Brazil (2000).

The IWSS is a worldwide scientific organisation, open to all who are interested in weeds and their control. The formation of IWSS was promoted actively by the six existing regional weed science societies. The purpose of IWSS is to supplement and complement their vital role. Additionally, IWSS provides benefits and functions of a weed science society not currently existing at a national or regional level.

Membership

The Society welcomes individuals, societies and institutions who wish to become members in any of the following categories:

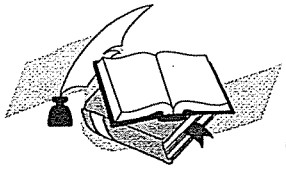
Individual: **US$10/year**
For any individual interested in supporting the aims and objectives of the Society and realising the benefits of membership.

Associate: **US$50/year**
For weed science and other societies, associations, institutes, departments, or other bodies desirous of supporting the aims and objectives of the Society.

Lifetime: **US$200/year**
One time payment.

Sustaining: **variable/year**
For any commercial organisation, foundation, development bank, government department or agricultural organisation wishing to provide financial support for the Society.

Please contact our Society Secretary for a membership form if you are interesting in joining the IWSS.



Other 'Good Reads'

Weed Management in Temperate Native Grasslands and Box Grassy Woodlands in South Australia.

Richard J.-P. Davies. 1997. ISBN 0 7308 0172 1. Black Hill Flora Centre, Botanic Gardens of Adelaide. 156 pp. $15.

Temperate native grasslands and grassy woodlands are amongst the most

threatened habitats in Australia. Heavy weed invasion is usual in these remnant ecosystems and contributes to their continued degradation. Public land managers frequently resort to bulldozing or broadacre spraying in such areas, often resulting in irreparable damage to the native flora. Well researched, broadscale weed control methods are needed.

This book reports studies partially funded by the 'Save the Bush' program to achieve this objective. Sections include a literature review; significance and conservation status; threats; weed management including prevention, hand pulling, digging, herbicides, slashing, fire, grazing, and tree planting; phenology of common plant species of grassy ecosystems; and results of weed management experiments.

Available from the Department of Environment and Natural Resources Information Centre, 77 Grenfell St., Adelaide, SA, 5000. Phone 08 8204 1910, fax 08 8204 1919.

The Biology of Australian Weeds Volume 2

Edited by F.D. Panetta, R.H. Groves and R.C.H. Shepherd, 328 pages, $59.50 plus $10 postage in Australia, ISBN 0 9587439 0 8

The publication of The Biology of Australian Weeds Volume 1 at the end of 1995 reviewed sixteen of Australia's worst weeds. Seventeen more of these weeds are now reviewed in the newly published Volume 2. These plants are responsible for significant land degradation and threaten farms, waterways and park land. They contribute significantly to Australia's weed costs of over $3 billion per year.

The Biology of Australian Weeds Volume 2 is another essential text for research staff, students, consultants, naturalists and others interested in weeds and the environment. The books are based on a series of papers by some of Australia's foremost weed scientists, that were first published in the *Journal of the Australian Institute of Agricultural Science* and more recently in *Plant Protection Quarterly*. The papers, published over a period of 17 years, have been brought up to date by either the original authors or by other highly qualified researchers.

The detailed text has been edited by three of Australia's leading weed scientists: Dane Panetta, Alan Fletcher Research Station in Sherwood, Queensland; Richard Groves, CSIRO Division of Plant Industry in Canberra; and Ros Shepherd, an entomologist originally from the Keith Turnbull Research Institute, Frankston, Victoria, and now pursuing a career consulting on weed related topics.

Each weed is reviewed in considerable detail and information on it's name, description, history, distribution, habitat preferences, growth and development, reproductive processes and hybridisation, population dynamics, importance in Australia, legislative restrictions and methods of management are examined. The reviews are complemented with line drawings, maps, graphs and photographs.

The weeds described in this book are problems over a wide variety of areas in Australia. Cabomba (*Cabomba caroliniana*) and common reed (*Phragmites australis*) are weeds of aquatic areas. Parthenium weed (*Parthenium hysterophorus*), rubber vine (*Cryptostegia grandiflora*), lantana (*Lantana camara*) and prickly acacia (*Acacia nilotica*) are weeds of tropical pastures and natural ecosystems. Sifton bush (*Cassinia arcuata*), doublegee (*Emex australis*), catsear (*Hypochoeris radicata*), European blackberry (*Rubus fruticosus*), fireweed (*Senecio madagascariensis*), gorse/furze (*Ulex europaeus*), squirrel-tail fescue (*Vulpia bromoides*) and rat's-tail fescue (*Vulpia myuros*) are weeds of temperate pastures. Doublegee (*Emex australis*), soursob (*Oxalis pes-caprae*), wild radish (*Raphanus raphanistrum*) and the *Vulpia* spp. are weeds in cropping areas while boneseed/bitou bush (*Chrysanthemoides monilifera*), broom (*Cytisus scoparius*) and European blackberry (*Rubus fruticosus*) are problem weeds in temperate bushland areas.

The Biology of Australian Weeds Volume 2 is printed on quality paper and is section sewn for strength. With 328 pages, it is conservatively priced at $59.50 plus $10 postage in Australia and $25 postage overseas. Prices are in Australian dollars.

Crop Weeds

(updated and reprinted 1998)
By J.L. Wilding, A.G. Barnett and R.L. Amor, 154 pages, $65 plus $10 postage in Australia, ISBN 0 9587439 1 6

In crop production, weeds are unwanted plants which lower yields, interfere with harvesting, act as hosts for crop diseases or use up moisture and plant nutrients that are being stored by fallowing. Weed management plays a critical role in increasing crop production and, in recent years, it has been an

essential part of the development of intensified cropping systems. Optimising weed management within crop production involves the use of mechanical, cultural and chemical methods of weed control and its success relies on identifying and understanding the nature of the weeds present in the crop. It is critical to identify weeds at the earliest possible stage so that they can be controlled before seriously reducing crop yields. The first step in controlling weeds is to recognise those that are present as the response of different species to chemical or other control methods will often vary.

This book is a straightforward guide to the identification of the main weeds, particularly in their seedling stage, in temperate crops throughout Australia. Common and scientific names are used for each of the 117 weeds. Their life cycles and the appearance of the seeds, seedlings and mature plants are described and illustrated. Weeds occurring in fallows are noted as their control is important in Australia where chemical or mechanical fallows are widely used to conserve moisture for crops.

This practical publication enables farmers and others to identify important weed seedlings as well as the mature plants. The text is brief and recognition of the species relies mainly on drawings and photographs of weeds and their seeds. A key is included to aid the identification of grasses.

Crop Weeds and it's newly published companion volume More Crop Weeds are essential manuals for farmers, agricultural research and extension agencies, universities and agricultural colleges, and companies offering services to farmers.

Crop Weeds has been reprinted on quality paper and section sewn for strength. With 154 pages and over 340 colour photos, 100 black and white photos and numerous beautiful line drawings, it is conservatively priced at $65 plus $10 postage in Australia and $25.00 postage overseas. Prices are in Australian dollars.

More Crop Weeds

By M.R. Moerkerk and A.G. Barnett
124 pages, $55 plus $10 postage in Australia,
ISBN 0 9587439 2 4

The identification of weed seedlings in crops has always been difficult. There had never been an appropriate and readily available source of information until the publication of Crop Weeds in 1986.

As cropping areas have expanded and rotations have become more diverse in southern Australia many new weeds and crops are being encountered by growers. More Crop Weeds has been produced as an aid to the identification of these new weeds. The book comprehensively describes 90 weed species, not previously covered by the earlier book Crop Weeds. Where appropriate, descriptions are included for life cycle, cotyledons and the first leaves through to the mature plant. Illustrations follow the plant from the seed through the seedling stage to the mature plant. More than 300 colour and 90 black and white photographs and 300 line drawings are included making accurate identification of these plants easy.

More Crop Weeds is designed to expose the reader to many common and not so common weeds in their seedling and mature stages. Colour photos and line drawings highlight the characteristics that need to be observed to aid in accurate identification. Seed outlines are drawn to actual size. More Crop Weeds includes two keys to assist in identification of weeds at the seedling stage and they cover all the species in both Crop Weeds and More Crop Weeds. The keys are designed to allow quick and simple identification of seedlings that can be confirmed by referring to the photos and illustrations that accompany the species descriptions.

Recognition and the correct identification of weeds, especially at early growth stages, are essential components in managing weeds in crops. Crop Weeds and More Crop Weeds are necessary manuals for farmers, agricultural research and extension agencies, universities and colleges, and companies offering services to the rural community.

More Crop Weeds is a worthy companion to the popular Crop Weeds. It's 25 narrow leaf (monocotyledons) and 65 broad leaf (dicotyledons) weed descriptions brings the total number of plants covered by both references to 207.

More Crop Weeds is printed on quality paper and is section sewn for strength. With 124 pages and over 300 colour photos, 90 black and white photos and numerous beautiful line drawings it is conservatively priced at $55 plus $10 postage in Australia and $25 postage overseas. Prices are in Australian dollars.

Both volumes of the Biology of Australian Weeds, More Crop Weeds and Crop Weeds are available direct from the publishers

R.G. and F.J. Richardson, PO Box 42, Meredith, Victoria 3333, Australia (Phone/Fax +61 3 5286 1533, email robfiona@iaccess.com.au).

CAWSS Homepage
Try out the CAWSS home page at **http://home.vicnet.net.au/~weedss/**

Recent Incursions of Weeds to Australia 1971-1995

Convened by RH Groves, Appendix compiled by JR Hosking, 1997, CRC for Weed Management Systems, Technical Series No.3.

This report looks at the more recent plants introduced to Australia that have become invasive. It assigns dates to weed incursions and naturalisations wherever known. It includes a listing of these plants and details of their known introduction.

Some of the many interesting findings include:

- 295 taxa were recorded as becoming naturalised in Australia over the last 25 years (between 1971 - 1995), and
- 65% of these taxa were introduced for ornamental purposes, 7% for agriculture, and 2% as contaminants.

A very interesting read containing lots of plants with potential to expand in their distribution.

Available from Sharon Corey at CSIRO Entomology, ph 02/6246 4001, email: sharon.corey@ento.csiro.au

Upcoming Events

4-11 July 1998 - 10TH INTERNATIONAL SYMPOSIUM ON INSECT-PLANT RELATIONSHIPS
Oxford, UK. Contact: SIP10, Oxford International, Summertown Pavilion, Middle Way, Oxford OV2 7LG, UK. E-mail: sip10@oxfordint.co.uk Fax: 44-0-1865-511-570. Website: www.ashmol.ox.ac.uk/oum/

4 August 1998 - SYMPOSIUM ON INTEGRATED PEST MANAGEMENT FOR VEGETABLE PRODUCTION IN THE TROPICS
Brussels, Belgium. Contact: G. Grubben, CPRO-DLO, PO Box 16, 6700 AA Wageningen, the Netherlands. Fax: 31-317-418094. Email: g.j.h.grubben@cpro.dlo.nl Phone: 31-317-477323. Website: www.agr.kuleuven.ac.be/ishs/ishshome.htm

6-7 August 1998 - 4TH INTERNATIONAL BIOHERBICIDE WORKSHOP
Glasgow, UK. Contact: M.N. Burge, Dept. of Biosci./Biotech., Univ. of Strathclyde, The Todd Centre, Taylor Street, Glasgow G4 0NR, UK. E-mail: m.n.burge@strath.ac.uk. Fax: 44-0-141-553-4115. Phone: 44-0-141-548-3626.

18-19 February 1999 - 2ND ASIA-PACIFIC CROP PROTECTION CONFERENCE,
Juhu, Mumbai, India. Contact: P.P. Dave, PMFAI, B-4, Anand Co-op Housing Society, Sitladevi Temple Road, Mahim (W.), Mumbai 400016, India. E-mail: pmfai@bom4.vsnl.net.in Fax: 91-22-437-6856. Phone: 91-22-437-5279.

8-10 March 1999 - INTERNATIONAL CONFERENCE, "Emerging Technologies in IPM: Concepts, Research, Implementation" Raleigh, NC, USA. Contact: T.B. Sutton, Dept. of Plant Pathology, North Carolina State Univ., Raleigh, NC 27695, USA. E-mail: tsutton@ppent1.ppath.ncsu.edu Fax: 1-919-515-8795. Phone: 1-919-515-6823.

28 March - 10 July 1999 - INTERNATIONAL COURSE ON INTEGRATED PEST MANAGEMENT, "Strategies to Control Diseases and Insect Pests"
International Agricultural Centre (IAC), Wageningen, Netherlands. Contact: H.A.I. Stoetzer, IPM Course Coordinator, IAC, P.O. Box 88, 6700 AB Wageningen, Netherlands. Email: h.a.i.stoetzer@iac.agro.nl Phone: 31-317-490353. Fax: 31-317-418552. Website: www.iac-agro.nl

Annual Dinner and AGM

The date for this important event is Thursday 29 October with the venue being the Duntry League Golf Club at Orange. Plan now to attend.

WEEDBUSTER WEEK

11-18 OCTOBER, 1998

INFORMATION SHEET

It's on again in October! Weedbuster week launched as a National event was a great success in 1997, and plans are already underway to make 1998 even more successful.

Background.

Australia has about 220 declared plants but over 3,000 naturalised or potential pest species. It is estimated that almost 50% of our pest plants have been introduced, mostly as garden ornamentals. For this reason it is important that the whole community is aware of the dangers of some plant species to our environment, and help to prevent further weed introductions and reduce the effect of weeds in our communities.

Weedbuster Week 1998.

The promotion is to raise the profile of weed control at all levels of government, private enterprise and the community. We aim to support and promote weed control through local groups, by making it interesting and enjoyable. A national program helps to secure greater resources , as well as encourage a coordinated approach which can have a more effective result. This year our theme is **"Identification for a weed free Nation"** and activities will again be planned for school children, and material made available for displays wherever an interest is expressed - local government offices, landcare groups, catchment management groups, shopping centres, community clean ups, bushcare groups or Scout groups.

Publicity.

We encourage any organisation involved to generate publicity about their own weed control projects, drawing on the support from the national and state coordinators, under the banner of national Weedbuster Week. Register your name with the NSW Coordinator by filling in the registration form attached, and you will be kept informed about Weedbuster events. We will also promote your event, and supply some promotional material free. Larger quantities for distribution by your organisation may be purchased.(See list).

Competitions.

School competitions this year will be similar to last year. Primary students will be encouraged to enter the poster competition, and secondary students can prepare a herbarium collection. The competitions can be a class project if preferred. Valuable prizes will be presented to the winners of each section at the state judging. Local judging will be organised by the local council, who will also award prizes. Notes on the competitions, promotional material available and further details on Weedbuster Week will be in the promotional kit supplied to all who register.

Registrations.

To register your name or group contact:
Bob Trounce, Weeds Agronomist
NSW Agriculture Locked Bag 21 ORANGE 2800

Phone - (02) 6391 3156
Fax - (02) 6391 3740
email-bob.trounce@agric.nsw.gov.au

A Good Weed

the NEWSLETTER of
The Weed Society of New South Wales
PO Box 438
WAHROONGA NSW 2076

Print Post Approved
PP247134/00010

SURFACE MAIL

POSTAGE PAID AUSTRALIA

The Weed Society acknowledges the generous support of Dow AgroSciences Aust Ltd, Frenchs Forest, and Eagle Environmental Services, Lidcombe, for their sponsorship of *A Good Weed.*