Weeds in the tropical savannas

Weeds have an enormous impact on Australia's tropical savannas, and the problem is growing rapidly every year.

From the TS–CRC'S website, Savanna Explorer

The major weedy plant species in northern Australia include grasses, herbs, vines and trees. While only a small proportion of species have been formally declared noxious through legislation, many can still be regarded as weeds from one perspective or another.

Their impact depends on how the land in which they grow is used. Herbs, for example, can compete with more desirable pasture species or be toxic to livestock. Species such as rubber vine, which invades river banks, drastically alter the structure and species composition of the plant communities they invade, affecting the biological integrity and limiting the productive capacity of the area.

Mimosa pigra is another troublesome invader, and currently grows in dense thickets over large areas of wetland in the Northern Territory. The presence of mimosa makes the land utterly unproductive in terms of grazing (although there are some trials under way into the capacity of this weed as fuel for power plants) and dramatically alters the composition of amphibian, bird, reptile and mammal species that live there.

In conservation areas and national parks in the tropical savannas, many resources are spent on weed management. In Kakadu for example, the emphasis is on controlling mimosa and salvinia. There are also coordinated efforts to control other major weeds: para grass (*Brachiaria mutica*), gamba grass (*Andropogon gayanus*), bellyache bush (*Jatropha gossypifolia*), wild cotton, rubber bush (*Calotropis procera*), candle bush (*Senna alata*), mission grass (*Pennisetum polystachion*) and annual pennisetum.

Limitations of weed management

Effective weed management in northern Australia is constrained by several factors. For example, invasions often occur across vast areas of country, and these areas often have a low economic return per land unit. This means that both financial and labour resources available for weed management across the north are limited. There is a strong emphasis therefore on preventing the spread of established weeds; weed control and removal plans need to be highly strategic if they are to be effective and economic.

Weeds on Aboriginal lands

Large areas of land in northern Australia are owned and managed by Aboriginal people and weeds are an important issue in some of these areas, posing a new set of challenges for traditional land management. Invasive weeds can alter the native plant and animal species composition in particular areas and so diminish available bush tucker. Some weeds, such as *Mimosa pigra* which forms impenetrable thickets, can limit access to important cultural sites. There is now a growing focus in Aboriginal communities across the north on weed identification, control and eradication.

Prickly acacia is now a significant threat to cattle production across Australia's north.

Weed encroachment

Some grasses introduced as pastures in northern Australia, such as mission and gamba grass, have the potential to cause problems as weeds if not well managed. These two grasses, for example, can increase the risk of intense late-season fires because they dry out later in the year than native grasses. As they are more productive, they also increase fire fuel loads. Many escaped ornamentals from urban and botanical gardens have also proven to be problematic. Examples include rubber vine in Queensland and candlebush in the Top End of the Northern Territory.

Changed fire regimes in pastoral areas of the tropical savannas are thought to be partially responsible for the 'thickening up' of country, that is, the establishment of both introduced and native shrubs over vast areas. These exotic and native woody weeds displace pasture and make mustering increasingly difficult and expensive, presenting a major challenge to the pastoral industry in some regions.

Fire to manage weeds

Strategic fire management—sometimes in conjunction with other control methods—offers the best hope for managing many of these weeds. Research in the Victoria River District of the NT shows that burning, with a frequency determined by seasonal and local factors, can be effective in managing the native woody weeds there. While fires seldom kill the plants, they can burn away most of the wood and suppress sucker development. In Queensland, research has shown that used in conjunction with the biological control rust, one or two fires in a 10-year period may be sufficient to reduce rubber vine populations, keep the plant at tolerable densities, and reduce the probability of it spreading further.

Fire and weeds: what works and what doesn't

From Savanna Links, the Tropical Savannas CRC newsletter

Surveys undertaken with land managers in northern Australia consistently iden tify control of exotic weeds as one of their key management issues.

Presently there is a suite of weeds invading large tracts of land. They range from grasses such as giant rats tail and grader grass, shrubs such as bellyache bush to larger woody plants like parkinsonia, mesquite, rubber vine, chinee apple and prickly acacia.

Control techniques available to landowners include chemicals, machinery, fire and biological control. Fire offers some advantages, in that it is relatively cheap compared to most other options and it can be applied over large areas. However, Dr Campbell from the Department of Natural Resources & Mines Tropical Weeds Research Centre warns that burning is not effective against all weeds of concern.

Since the release of the biological agent rust, managing rubber vine with fire can be extremely effective.

Photo: CSIRO

"It is critical that we understand how fires affect the different life stages of each weed we are trying to control," said Dr Campbell. "This information then allows us to incorporate or exclude fire when developing integrated control strategies." Some of the woody weeds currently invading our rangelands demonstrate the different responses that can occur following burning and how this affects management decisions.

Algaroba mesquite

Algaroba mesquite, the most widespread of the mesquite species currently growing in Australia, is very susceptible to fire. Even very large plants (greater than 10 metres in height) can be killed and some of the seed bank is destroyed thereby reducing the number of seedlings that emerge.

Rubber vine

Rubber vine is another highly susceptible species but this was not always the case. Prior to 1995 best kills by fire were only around 50 per cent. Since then a biological control agent in the form of a rust fungus has been released. This disease acts as a defoliant and appears to have three main benefits. Firstly, the vigour of the plant is reduced making it more susceptible to control measures. Secondly, where once grass was excluded because of the dense foliage of the rubber vine it has now returned, allowing a fuel load to accumulate. This enables fire to spread within the rubber vine infestations. Also, the rust reduces seed production thereby reducing the size of the seed bank. Consequently few seedlings emerge once the original plants have been controlled.

For both *algaroba mesquite* and rubber vine, a regime of controlled burning can be implemented to keep populations at a level where they have minimal impact on the productivity of an enterprise or the ecological integrity of the area.

Bellyache bush

Bellyache bush plants appear to be highly susceptible to fire, but seedling recruitment after burning can be substantial. Consequently, if follow-up control action is not taken, the problem can be exacerbated.

A major limitation with burning for bellyache bush control is that once infestations become thick, grass is excluded and burning becomes impossible. In such situations an alternative primary technique may be needed, with fire used as a secondary treatment. Dr Faiz Bebawi from the Tropical Weeds Research Centre is currently researching possible options, such as the use of machinery and chemicals.

Prickly acacia

Prickly acacia is a plant that is only susceptible at the seedling stage so fire is definitely not a primary control option. However, after killing adults through the use of machinery or chemicals, fire may be used to treat seedling regrowth, particularly after wet years when large numbers of seedlings may appear.

Chinee apple

Chinee apple is a plant that appears to have no stages that are susceptible to fire. Even small plants 30 cm high can re-shoot following burning. Consequently the use of fire does not have much of a role to play in managing this weed. It is a difficult plant to remove from an area once infestations become extensive or dense. However, it appears its seed bank does not live much more than a year or two, so there will probably not be much regrowth after the original infestations are killed.

Because fire does not work, the options are either chemicals or machinery—and both of these are expensive for treating thick infestations. This emphasises the need to control chinee apple while infestations are small; you will save a lot of expense later on.

Fire and grazing management

Wherever fire is used its success will largely depend on pre- and post-fire grazing management. It is important that sufficient fuel is available on which to undertake

burning and it is equally important that after burning, pastures are able to recover so that they can compete with any weed seedlings that may appear. Also it is important to remember that while most native species are fairly tolerant of fire there may be some growing within the weed infestations that are highly susceptible. In these situations other control options may be more appropriate.

Research needed

There are still many weeds already present in northern Australia for which we know little regarding their responses to fire. These include giant rat's tail grass, grader grass, and parkinsonia. The Tropical Weeds Research Centre, in collaboration with Dr Tony Grice from CSIRO, is about to begin research on parkinsonia, particularly its susceptibility to fire at different seasons.

The fire research on parkinsonia is part of a broader cooperative project on the ecology and management of parkinsonia that is being conducted under the auspices of the CRC Australian Weed Management and involving CSIRO Sustainable Ecosystems, CSIRO Entomology and Queensland Department of Natural Resources and Mines.

There is also a need to identify grazing and fire regimes that can be implemented to prevent the build up of weeds in the first place. The removal of fire from grazing systems is often highlighted as the primary explanation for why we have such weed problem in our rangelands.

Drs Tony Grice, CSIRO, and Shane Campbell, Qld. Dept. Natural Resources & Mines. Printed in Issue 19, Savanna Links, July–Sept. 2001.

For land-management issues in northern Australia, go to the Savanna Explorer section of our website at http://savanna.ntu.edu.au/

For information about the Centre's extensive research program go to our research section.

Also see:

Smith, N. 2001, *Not from here: Plant invasions on Aboriginal lands*, Tropical Savannas CRC, Darwin, NT.

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First article reference:

Grice, A.C. 2000, 'Weed management in Australian rangelands' in Brian M. Sindel (ed) *Australian Weed Management Systems*, R.G & F.J. Richardson: Meredith, Victoria, pp. 431–458.

Websites

Weeds Australia, includes National Weed Strategy and weeds database

www.weeds.org.au/

Queensland Dept. Natural Resources & Mines, Pest Factsheets

www.dnr.qld.gov.au/resourcenet/fact_sheets/pestfacts.html

Department of Primary Industries and Fisheries NT Weeds page

www.nt.gov.au/dpif/weeds/w_index.shtml

Department of Primary Industries and Fisheries NT Weed Agnotes

www.nt.gov.au/dpif/pubcat/weeds.shtml

CRC for Weed Management Systems

www.waite.adelaide.edu.au/CRCWMS/