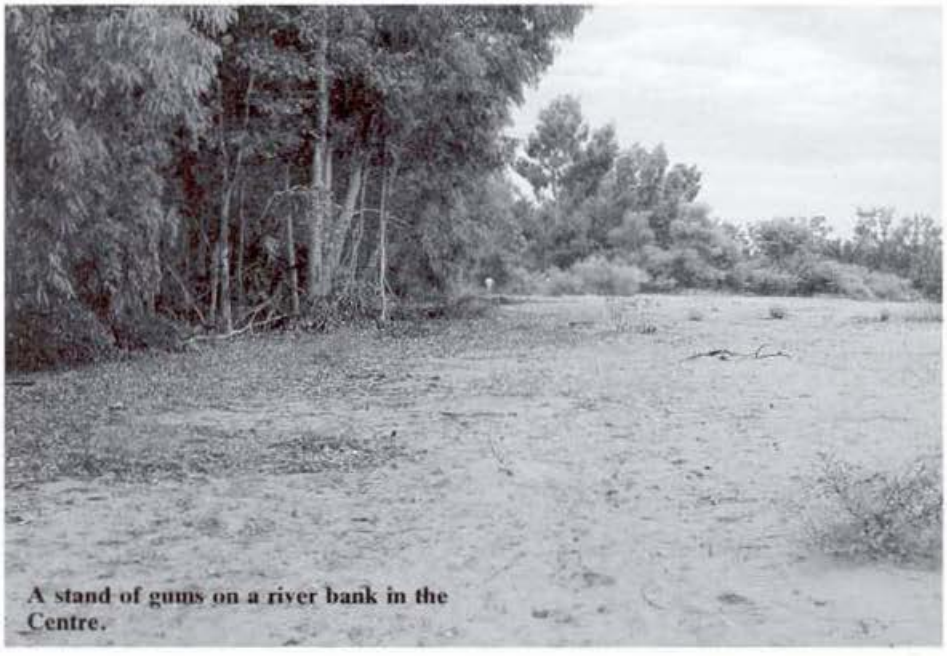
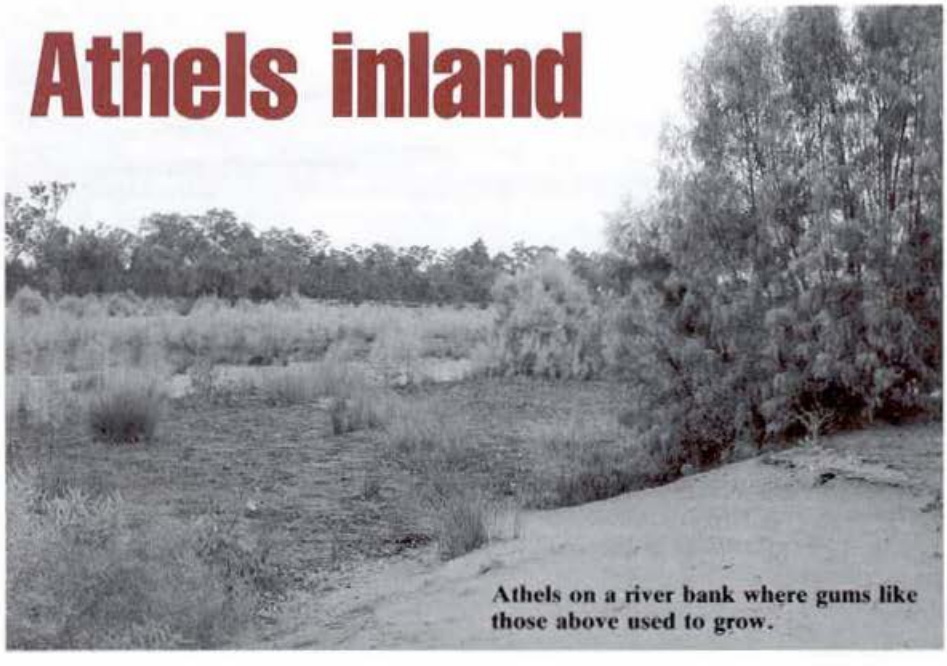


A stand of gums on a river bank in the Centre.

Athels inland



Athels on a river bank where gums like those above used to grow.

Research has recently identified a new potential menace to the ecosystem of our arid interior: as if it didn't already have enough problems! As is so often the case, the threat derives from settlers' misguided attempts to 'improve' what they perceived to be a harsh country.

It comes in the form of a tree that, at first glance, seems ideal for planting in the Centre. The athel tree (*Tamarix aphylla*) can survive with little water, is remarkably salt-tolerant, and provides good shade. What more could one want? Native to arid areas of Asia minor, north-western India, and northern Africa, athels — also called tamarisks — were imported into Australia early this century and grown as shade trees around many homesteads in the Northern Territory, and also in the semi-arid and arid areas of other States.

The problem is that the trees have 'escaped' — and their successful establishment is not good for the environment. They are now spreading along waterways and, according to recent research by CSIRO scientist Mr Graham Griffin, are displacing the native trees and hence causing unwanted changes in the ecology of the river systems. Although often dry at the surface, arid-zone river beds retain subterranean moisture that trees can tap.

Mr Griffin, of the CSIRO Division of Wildlife and Ecology in Alice Springs, has documented the athels' invasion of the Finke River, the largest of the active central Australian river systems. In collaboration with Mr Grant Allan and Mr Noel Preece, of the Conservation Commission of the Northern Territory, Mr Griffin and his Divisional colleagues Dr Mark Stafford Smith, Dr Steve Morton, and Ms Pip Masters conducted surveys of the vegetation cover of this large river system, assessing the abundance and diversity of birds and reptiles in athel-dominated and native tree stands.

The scientists also counted athels from the air to give a more accurate picture of the extent of the invasion. They correlated factors such as flooding and salinity with their observations of the establishment and spread of the species.

The aerial survey showed that the number of athels usually increased near a settlement or an area where mature trees were already established. The most severe infestation occurred around Horseshoe Bend homestead (see the map), an area that the scientists then chose as a site for study of an athel-dominated ecosystem.

The invasion

Examination on the ground showed that many of the mature trees in the Horseshoe Bend area must have started life in about 1974. This was an important year for the region, as the largest floods in recorded history occurred then, making the 'red centre' green.

The floods uprooted most of the river red gums (*Eucalyptus camaldulensis*), which were the dominant native trees at Horseshoe Bend. Now the main channel of the river there contains the greatest athel infestation. Smaller trees are the result of more recent establishments, following floods in 1983 and 1984.

Mr Griffin has built up a picture of how an athel invasion proceeds. The trees can start producing seeds after 2–3 years in moderately good conditions. The seeds are well-adapted for wind dispersal, but remain viable for only a few weeks. To establish themselves, they need water.

For several decades before 1974, athels remained restricted to the areas around homesteads where they had been deliberately planted. Presumably their seeds, although dispersed, either failed through lack of water or found sufficient competition in the form of the river red gums to prevent any large-scale establishment. However, in that year the floods not only removed many of the gums but provided ideal conditions for seedling growth. Wet conditions along the river persisted for

several years, giving the young athels a helping hand.

Salt complicates the story even further. The strength of the athels is that they are particularly salt-tolerant. After the 1974 flood at Horseshoe Bend, the homestead had to abandon its domestic water supply from the river, which became too saline. Other nearby bores also suddenly turned salty. It seems that the flooding caused drainage of salt water from the Amadeus salt pans in the west along the remains of an ancient, partially buried river system.

However, further upstream from the homestead little change in salinity occurred. This lends weight to the idea that the flood did not simply raise the water table throughout the area, but rather brought about a selective discharge of salty water into one part of the river.

The change favoured the athels at the expense of any seeds from the uprooted river red gums, which are less tolerant of high salinity. However, athels have also established themselves upstream of the location of the Amadeus salt-pan input, in areas of low salinity levels. Here the trees are not quite so abundant. Mr Griffin believes that very salty water gives the athels a comparative advantage, and so may favour heavy initial infestations, but it is not absolutely necessary for a lower density and slow establishment to occur.

The difference

But why need we be concerned about the widespread establishment of athel trees? Mr Griffin's research gives a clear answer. Detailed ecological analysis showed that the athel sites carried a ground cover dominated by a small number of species occurring in great abundance — mainly saltbushes and introduced grasses. By contrast, the river red gum sites contained more varied species, with a more even distribution of abundance. These sites also were strewn with a good cover of loose litter and large logs. Where the athels held sway, their fine leaves were compacted into a tight mass of litter and, as the trees don't lose branches easily, few logs were present — any pre-existing logs from the river red gums having been swept away by the floods.

All of this may seem trivial, but it is, in fact, of great importance for the animals of the area. Dr Morton and Ms Masters carried out a census of birds in both types of site; they counted all the birds seen, noting their location, at 20 different points about 100 metres apart, spending 5 minutes at each point. The total number of birds seen was significantly greater at the river red gum site than at the athel site, although the numbers of species at the two sites were about the same.

Just 4% of the birds seen at the athel site were actually spotted in the trees, and only one species, the willie wagtail, behaved in a way that suggested it could be nesting. Observations in the river red gum site, on the other hand, suggested intensive reproductive activity in many of the bird species living among coolibahs and gums.

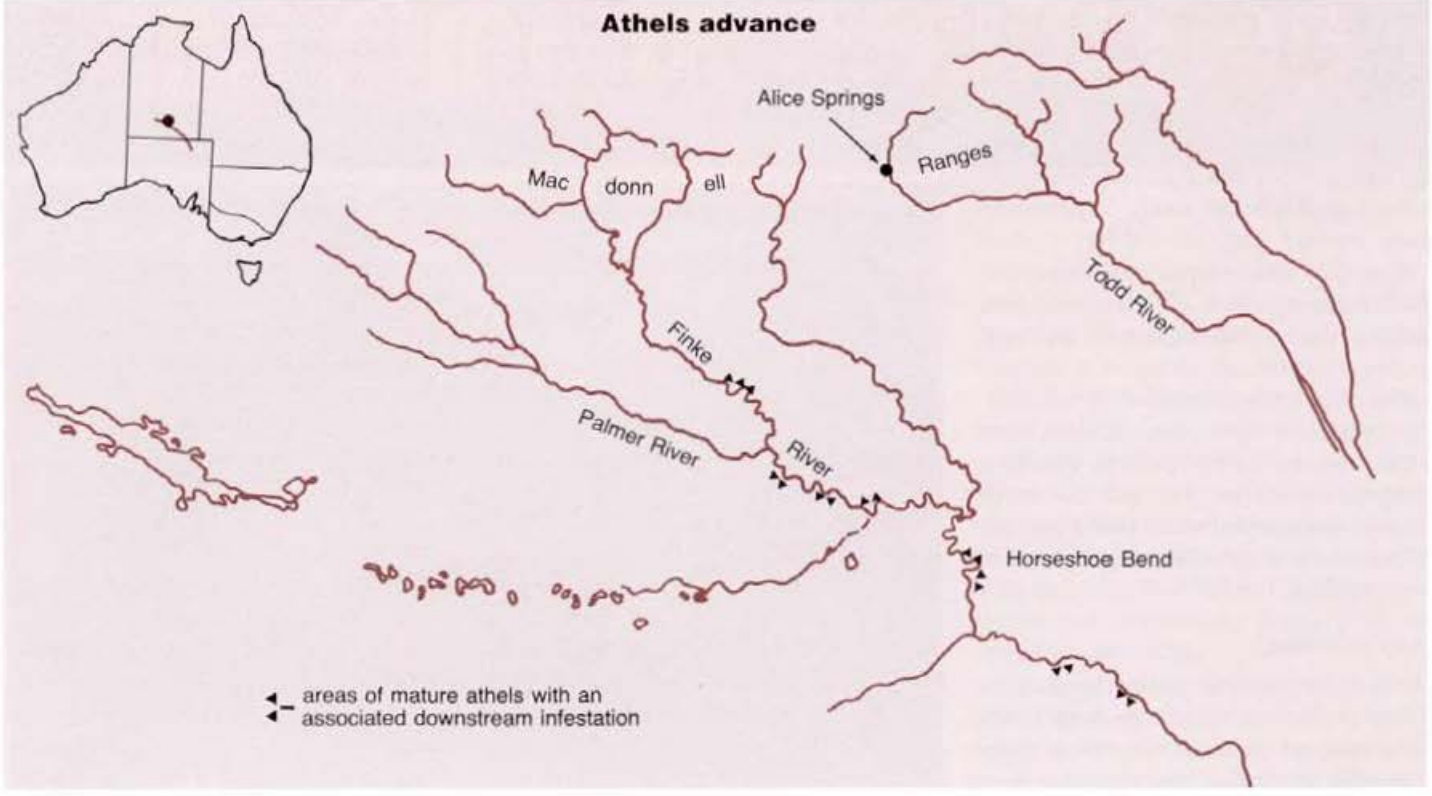
When the bird species were classified according to their feeding behaviour, further differences between the sites emerged. The athel site supported fewer predators and scavengers, insectivores, and nectar- and fruit-eaters, but more of the seed-eaters and those that eat insects on the wing. Thus, the replacement of the native trees not only reduces bird abundance, it also changes the structure of the bird communities.

Reptiles, the other great denizens of the arid interior, were also affected. As we might have expected, the number of reptiles, assessed by trapping, was considerably less at the athel site.

The fact that athels cope well with salt is something of a disaster at ground level — they actually concentrate salt. The trees take up large quantities of salty water through their roots, which many plants cannot. Then, as with all plants, they transpire water through the gas-exchange pores in their foliage, leaving the salt behind in such quantities that the leaves exude crystals of it. Indeed, the salt concentration in their foliage can be up to 50 times that in the water supply to the roots.

Naturally, they produce a salty leaf litter, and so low-growing, shallow-rooted ground plants must be very salt-tolerant to establish under an athel stand. The study found that few native herbs can persist under the thickest clumps of athels.

When the Finke system floods, athels spread.



Scientists Steve Morton, Mark Stafford Smith, and Pip Masters collecting fauna specimens from a pit trap in the river red gum study site.

Waterholes such as this one in the Finke river system are now threatened by athels.

Changes in flora inevitably affect fauna. Reptiles probably find the athel environment less sustaining because the litter contains a poorer invertebrate community — whether because of the flora changes, the increased salinity, or the compact nature of the litter remains to be seen. Also, the paucity of logs or dead branches on the ground means a housing shortage for many lizards. The few logs present lacked the persistent thick bark of gum trees, an attribute that reptiles appear to appreciate when it's present.

The athels' lack of attraction for birds could stem from a number of reasons — several of them involving food supplies. The trees produce tiny flowers that would not satisfy nectar-eaters and presumably would not attract many insects. The foliage has few leaf-eating insects on it — a state of affairs quite common with introduced plants — and fewer ground-dwelling insects would be present because of the different characteristics of athel litter and the reduction in richness of herbs. This explains why the insectivorous and nectar-feeding birds were comparatively poorly represented there.

Birds that nest in holes would also find athels a poor prospect. At the river red gum site the observers saw most of the local species of parrots and cockatoos investigating eucalypt hollows, preparatory to breeding. In the arid region, most of these birds depend on the narrow belt of eucalypts along the creeks as their only source of suitable nesting sites, which makes the lack of tree hollows in athel stands another serious failing.

Any solutions?

An unusual series of events allowed the athels to 'escape'. Floods as large as the 1974 ones are expected only about every 200 years, on average. But once this event had established athels along the Finke River, the smaller floods that arise every 10–50 years could spread the trees further. Mr Griffin and his colleagues think that the invasion is far from complete, and the impact on the river ecosystem will continue. It will be very difficult, and expensive, to clear the river now. The athel has no known pests in Australia, its leaves are unpalatable to stock (unless these are salt-deficient!), and it thrives on saline water.

The United States has suffered a similar invasion, with half a million hectares in the dry south-west taken over, causing a great impact on native wildlife. Scientists there have found that dense stands of athel can act to dry water holes that are important for animals. The trees can also alter the course of rivers by trapping and stabilising sediment during floods.

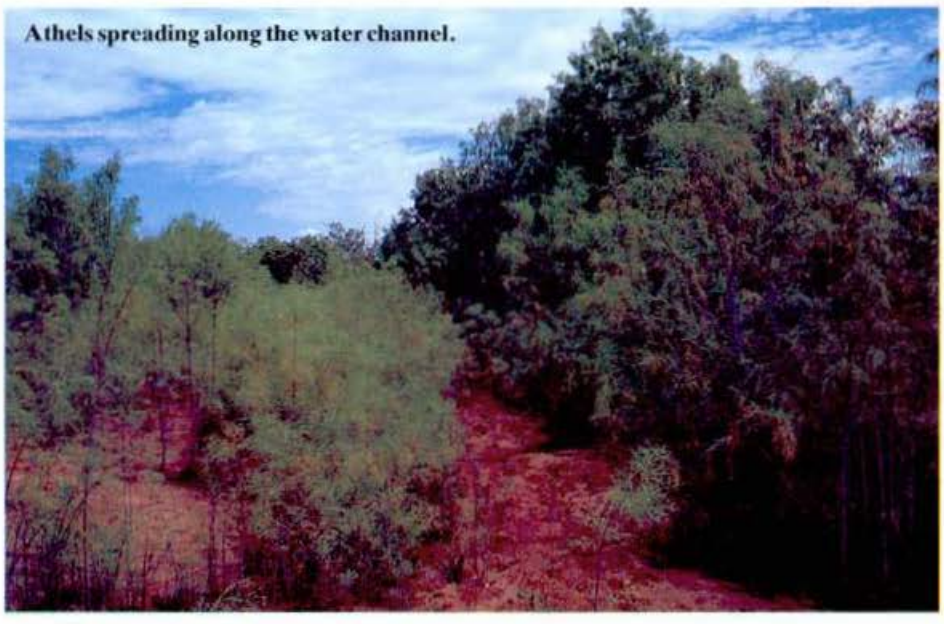
What can we do to avoid a gloomy future for the vital river systems of our arid lands? The first step is to recognise that athels are truly a noxious weed. Recently, as a result of Mr Griffin's work, they have been declared as such in the Northern Territory. Other States should follow. The tree does have natural enemies in its native habitat, so biological control may be possible. However, many years' research will be needed before we can contemplate releasing a control agent.

Mr Griffin believes that, for now, athels should be removed from any area where they could escape into a natural ecosystem. The most important thing is to prevent their establishment in other river systems, so that the events of the Finke are not repeated elsewhere.

Roger Beckmann

More about the topic

Status and implications of the invasion of tamarisk (*Tamarix aphylla*) on the Finke River, Northern Territory, Australia. G.F. Griffin, D.M. Stafford Smith, S.R. Morton, G.E. Allan, K.A. Masters, and N. Preece. *Journal of Environmental Management*, 1989, **29** (in press).



Athels spreading along the water channel.