Athel pine in the Northern Territory: a strategic approach to eradication

Chris Brown[1] and Blair Grace[2]
[1] Department of Natural Resources, Environment and the Arts, PO Box 1170, Alice Springs, Northern Territory 0871, Australia
[2] Department of Natural Resources, Environment and the Arts, PO Box 30, Palmerston, Northern Territory 0831, Australia

Summary Athel pine control along the Finke River in central Australia provides a case study of a successful weed management program against an extensive weed problem in remote areas. The colonisation of Athel pine along the Finke River in response to large scale flooding also provides a classic example of a 'Sleeper' weed scenario. Early control efforts by landholders and trials by Northern Territory Government staff laid the foundations for adopting an integrated and strategic control program. Management of Athel pine currently includes mapping, control work and follow-up monitoring.

Keywords Tamarisk, *Tamarix aphylla*, central Australia, Northern Territory, eradication.

INTRODUCTION

Athel pine (*Tamarix aphylla* (L.) Karst.) is a tall, branched tree, growing up to 15 m high, that is native to northern Africa, the Arabian Peninsula, Iran and India, where it commonly grows around oases and ephemeral streams (Parsons and Cuthbertson 1992).

In central Australia it can form thick monospecific stands (up to 30 km long beside rivers) that out-compete eucalyptus and other native plants, leaving only salt-tolerant chenopods and grasses. It reduces suitable habitat for native fauna and affects the physical environment by altering drainage patterns, salinising the soil surface and lowering water tables. These dense stands also limit stock access to water. It has a high evapotranspiration rate when water is available, which combined with its deep root system can drop water levels in waterholes. It can also exude salt from leaves, increasing the salinity on the surface, which further disadvantages many native species (Parsons and Cuthbertson 1992). Species of *Tamarix* are also causing problems in other countries, particularly the USA (Griffin *et al*. 1989).

Griffin *et al.* (1989) highlighted the risk posed by this plant, and it was declared as a weed in the Northern Territory in 1988 (Fuller 1996). Research commenced in 1989 into the efficacy of various herbicides. Athel pine was declared a Weed of National Significance, one of Australia's worst 20 weeds in 2000 (Thorp and Lynch 2000). It has the potential to spread along inland watercourses throughout much of mainland Australia (ARMCANZ 2000).

There is little known about the biology of this species. Spread is largely by seed dispersed in flood waters (Parsons and Cuthbertson 1992); however, it can also reproduce vegetatively when branches get washed downstream. Anecdotal reports state that young plants can grow 2 m a year in good conditions. Plants have an extensive root system and often resprout after being cut. It is quite common for logs that are buried horizontally to sprout a number of branches that resemble seedlings. This can make treating small plants difficult, as they may not respond to foliar herbicides. The Finke River, where most Athel pine occurs, is unique because it is the largest river in central Australia and one of the oldest rivers in the world.

HISTORY OF SPREAD

Athel pine is an example of a sleeper weed that did not spread noticeably until certain environmental conditions occurred. It was introduced into Australia in the 1920s and 30s and promoted as a drought and salt-tolerant, fast-growing shade tree that could be used as a windbreak and to stablise sand dunes. This led to plantings around numerous station homesteads and out-stations in central Australia. Plantings of Athel pine surrounding homesteads and communities adjacent to the Finke River had remained confined to where they had been planted for 20 to 30 years. However, the 1974 and 1988 floods provided the environmental trigger for Athel pine to spread and colonise approximately 600 km of the Finke River (Fuller 1993). Subsequent floods in 1997 dispersed propagules along much of the length of the Finke River.

Dramatic floods occurred in central Australia in early 2000, making the Finke River flow for its entire length for only the sixth time in recorded history. Following these floods, Athel pine, which had been largely confined to the Finke River, started to appear in the Karinga Creek drainage system. Athel pine seed was most likely dispersed into the Karinga Creek system via wind and waterbirds from plantings of Athel pine surrounding a nearby homestead.

Athel pine in the Alice Springs area has been the subject of a large-scale program aimed at eradicating it from the Finke River and Karinga Creek systems. However, there is little published information on how this control was undertaken or what it has achieved. This paper aims to outline some of this work, what it has achieved and make recommendations for future work on Athel pine.

CONTROL METHODS

Control efforts have been in place against Athel pine since the early 1990s, when the manager of Horseshoe Bend Station began controlling large infestations in this section of the river using a bulldozer to push out and uproot mature trees. This was complimented by blade ploughing to destroy dense patches of juvenile plants lining the main channel of the river. Approximately 25 km of the Finke River was treated. However, these areas were re-infested by propagules washed down from upstream. Clearly a more strategic approach was required, based on good information about the weed's distribution.

The Weed Management Branch of the Northern Territory Government initiated a strategic control program in 1994, by controlling infestations in the upper catchment of the river and working progressively downstream. This program included mapping the weed's distribution, monitoring the control work and ensuring regular follow-up.

Mapping Strategic weed management requires good data on the plant's distribution. Sections of the Finke River downstream from the treated areas were surveyed for Athel pine in 2004 (Figure 1). This data was used to plan future weed management, by determining areas suited to mechanical control and areas that could be treated by hand.

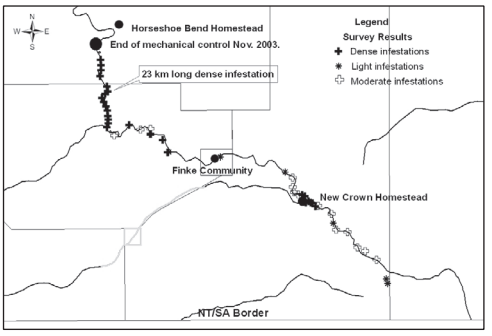

Figure 1. Downstream survey of the Finke River, July 2004.

The entire length of the nearby Karinga Creek system (approximately 130 km of waterway) was surveyed in 2004 and all Athel pine found was treated. Follow-up survey work was undertaken in 2005 using a helicopter for an aerial survey of the Karinga Creek floodout and many of the isolated ephemeral lakes associated with this drainage system. This survey identified several isolated patches of juvenile Athel pine. An additional stand of semi-mature trees was found in an ephemeral lake that connected to the main channel only during large floods.

Weed control Big trees are usually uprooted with bulldozers. Bulldozing ensures that the extensive root system is not left buried under the sand from where they can resprout. When bulldozing is not feasible (e.g. amongst native vegetation or isolated mature trees), the cut stump control technique is used. Seedlings are controlled using foliar herbicide.

Blade ploughing with a bulldozer, followed by herbicide treatment of any surviving or newly recruited plants, is the most cost effective and reliable method of controlling dense Athel pine (Fuller 1996). Follow up control typically consists of foliar spray for small plants and cut stump for mature plants. Importantly, many Athel pine trees in and around Alice Springs, various homesteads and Aboriginal communities were removed, as these posed a threat to waterways (Fuller 1996).

Monitoring A monitoring program was undertaken by the Centralian Land Management Association (CLMA) to assess the overall effectiveness of the control program, habitat recovery and impacts on native flora and fauna in controlled sections of the river. Twenty monitoring sites were established along the Finke River in 1998-99. These were revisited in 1999 and 2001. Flooding in 2000 limited access to most of these sites. The presence of Athel pine was recorded at each site and the number of native and introduced plant species were also recorded at some sites.

RESULTS

Finke River By 1996, 130 km of the Finke River upstream of the Stuart Highway had been treated by NT Government staff with assistance from land managers and Aboriginal communities (Fuller 1996). Control downstream from the Stuart Highway commenced in 1997.

By 2000, approximately 400 km of the Finke River had been cleared of mature Athel pine (Figure 2). It is believed the floods in 2000 assisted control efforts by washing Athel pine debris downstream out of treated areas of the catchment. Of four monitoring sites

revisited in 2000 in areas where Athel pine had been treated, only one site had Athel pine regrowth, which was sprayed. Weeds Branch staff control regrowth and seedlings in the upper 400 km of the river annually.

An additional 15 km of the core infestation of Athel pine located at Horseshoe Bend Station was mechanically controlled by November 2003. The largest remaining core infestation of dense mature Athel pine on the Finke River (approximately 23 km) continues downstream from the site of the last mechanical control campaign, on Horseshoe Bend Station (Figure 1). Once this core infestation has been controlled, it will enable chemical control of light to moderate infestations for a further 70 km downstream to be initiated without the threat of reinvasion.

During a survey of the lower reaches of the Finke River in 2004 it was noted that a large proportion of trees in some areas were damaged by a stem boring insect, probably *Maroga* sp., a native moth with a wide host range.

Young river red gums and coolibahs have been observed recolonising many areas where the Athel pine has been removed, and wildlife and stock have been observed drinking at some previously saline waterholes.

Karinga Creek Some areas of Athel pine remained untreated because there was insufficient data on the weed's distribution. An unpublished report suggests that aerial surveys may be needed to ensure that all Athel pine has been removed from this catchment. Follow-up survey and control within the Karinga Creek drainage system is planned for 2006 (Figure 3).

Other issues There is clearly a need for further research into the weed's biology, impacts and management. Fuller (1996) expressed concerns about possible effects of large-scale clearing of Athel pine. Concerns centred on erosion of river banks and the lack of data about environmental costs and benefits of Athel pine removal. Other unpublished reports express concern about the knowledge gaps regarding habitat preferences and seed biology, which make it difficult to compile management plans and to know the type of country that should be surveyed for the plant.

CONCLUSIONS

The floral composition of central Australian rivers is determined largely by patterns of floods (Griffin *et al.* 1989) and this is particularly the case for Athel pine. Athel pine is a classic example of a sleeper weed because it remained confined to where it had been planted for a number of years until floods in the 1970s and 80s triggered its invasion along the Finke River.

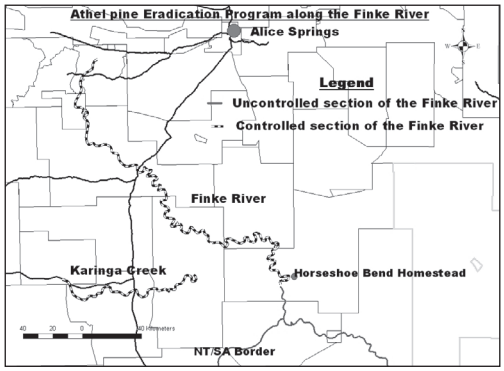

Figure 2. The controlled and uncontrolled sections of the Finke River and controlled section of Karinga Creek.

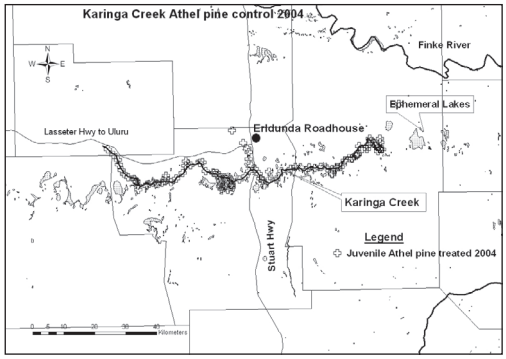

Figure 3. Survey and control of Athel pine along Karinga Creek August 2005.

Propagules are dispersed by floodwaters, which create disturbance and increase the chances of successful invasion. The increased moisture levels remain for several months following flooding, which greatly facilitates seedling recruitment. Floods therefore provide ideal conditions for Athel pine to colonise riparian areas. The rapid growth rate of Athel pine compared to the slower growing native species also gives it a competitive advantage.

The eradication efforts against Athel pine have used good mapping and monitoring data to ensure effective and strategic control. The success of the program to date can be directly measured by the time and resources that are used to re-treat the upstream sections of the catchment. Each successive follow-up campaign has required less time and resources, indicating control strategies are successful.

WHERE TO NOW?

The program, although highly successful in controlling the problem in the upper 400 km of the catchment, has failed to progress further downstream in recent years due to the presence of a core infestation in the lower section of the catchment. Control of this infestation should continue before more floods spread propagules. Funds have been applied for through the 'Defeating the Weed Menace' initiative for mechanical control of the last remaining 23 km section of the core infestation on Horseshoe Bend Station. The presence of this heavy infestation upstream of 70 km of light and moderate infestations along the river (Figure 1) has frustrated efforts to progress downstream control due to the threat of reinvasion.

There is a need for more information on the weed's biology, impact and control. There also needs to be a long term commitment by the Northern Territory Government and landholders to monitor and treat the upper controlled sections of the Finke River to prevent it reverting back to the extensive stands that previously existed.

ACKNOWLEDGMENTS

Much of the control work has been funded by the Northern Territory Government, Natural Heritage Trust, CLMA, National Landcare Program, Bushcare and WoNS programs. This paper was based on unpublished reports to funding bodies such as NHT. Laura Wirf provided useful comments on earlier drafts of this paper.

REFERENCES

ARMCANZ (2000). 'Weeds of National Significance, Athel pine (*Tamarix aphylla*) strategic plan'. (National Weeds Strategy Executive Committee, Launceston).

Fuller, M.R. (1993). The invasion and control of *Tamarix aphylla* on the Finke River, Central Australia. Proceedings 10th Australian Weeds Conference and 14th Asia-Pacific Weed Science Society Conference, Brisbane, pp. 44-6.

Fuller, M. (1996). 'Athel pine (*Tamarix aphylla*) control in central Australia: history and future directions'. (Department of Primary Industries and Fisheries, Darwin).

Griffin, G.F., Stafford-Smith, D.M., Morton, S.R., Allan, G.E. and Masters, K.A. (1989). Status and implications of the invasion of tamarisk (*Tamarix aphylla*) on the Finke River, Northern Territory, Australia. *Journal of Environmental Management* 29, 297-315.

Parsons, W.T. and Cuthbertson, E.G. (1992). 'Noxious weeds of Australia'. (Inkata Press, Melbourne).

Thorp, J.R. and Lynch, R. (2000). 'The determination of Weeds of National Significance'. (National Weeds Strategy Executive Committee, Launceston).