Tamarisk – a real risk for New South Wales

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ABSTRACT

Tamarisks present an emerging weed risk to Australia. There are three species of Tamarisk in Australia namely *Tamarix aphylla* Athel pine, *T ramosissima* and *T parviflora*. These species have naturalised in New South Wales (NSW), Northern Territory (NT), South Australia (SA), Western Australia (WA) and Queensland (QLD). Tamarisk are extremely hardy. They are long-lived, deep rooted, drought and salinity tolerant facultative phreatophytes that produce large amounts of seed and can also reproduce vegetatively. They produce up to 600,000 seeds per mature plant and are highly invasive species given the right conditions of moist ground for seed germination, high water table, and open and sunny ground. Their spread is also assisted by floods that dislodge stems and trees and expand infestations further downstream. They consume large amounts of water (up to 757 litres/ mature tree/ day) and use twice as much water as Willows (*Salix* spp.).

Athel pine is a Weed of National Significance and declared in all Australian States and Territories. It affects the pastoral industry, biodiversity, cultural values, river flow patters, precious water resources and infrastructure and increases local salinity levels. Athel pine is classified as a 'sleeper weed' because it was present in Australia for some time before it became weedy, being first promoted as a useful tree in arid and semi-arid areas from the 1930s onwards. From the 1970s to the 1980s the true weed potential was recognised, by which time it had developed along 600 km of the Finke River in the Northern Territory.

Both *T ramosissima* and *T parviflora* are also invasive species and tend to be naturalising in the more southern semi-arid areas of Australia. They are semi-deciduous turning yellow in autumn and are smaller trees than Athel pine. In addition they have different shaped leaves and flower colour.

The western United States (US) experience with Tamarisk is that it is now covering more than 1.5 million riparian acres and is expanding by 40,000 acres per year. In addition hybrids (*T ramosissima* x *T aphylla*) are starting to be recorded in the US and are of concern as they may prove to be more invasive than either of the parent plants.

New infestations should be prevented because control is difficult and costly. An integrated management approach that incorporates multiple control techniques is required to manage Tamarisk. Mechanical and chemical methods are the main control options however care must be taken using either method around waterways.

BACKGROUND

The genus *Tamarix* is native to a zone stretching from southern Europe and north Africa through the Middle East and south Asia to China and Japan. In Australia there are three species of tamarisk namely *Tamarix aphylla* (Athel pine), *T ramosissima* and *T parviflora*. Currently only Athel pine is a Weed of National Significance and

declared in all States and Territories, however the other two Tamarisk species present a considerable risk as they have also begun to naturalise in Australia. Tamarisk species have been widely planted throughout arid and semi-arid Australia.

Tamarisks in general are long lived surviving from 50 to 100 years. They reproduce by seed and vegetatively and are extremely deep-rooted with taproots to 30 meters and root spread of 50 meters. Tamarisks are capable of absorbing deep water and releasing it at or near the soil surface. This allows shallower roots to absorb nutrients. They consume large amounts of water - up to twice that of Willows (*Salix* spp.) at 757 litres water/ mature tree/ day (Hart, 2003). Obligate phreatophytes, such as willow, require uninterrupted access to saturated soil with roots in the water table or capillary fringe. Tamarisk, a facultative phreatophyte, is able to use water from the water table and capillary fringe, and able to extract water and survive indefinitely in unsaturated soils (Swift, 2001).

Athel pine causes severe environmental damage and affects the pastoral industry by forming dense thickets along inland waterways, including ephemeral streams and lakes impacting on stock mustering. They consume large amounts of water - up to twice that of Willows (*Salix* spp.) reduces water availability for stock and the environment, alters the course of rivers and increases sedimentation rates. It concentrates salt, which is excreted by its leaves, making the ground around Athel pines more salty and excludes native pasture grasses and other salt-sensitive plants, thus reducing biodiversity. It can also cause corrosion of gutters, metal buildings, bores and equipment when planted adjacent to infrastructure, and falling limbs are a hazard to humans and stock. The potential to effect the aesthetics and tourism experience of areas of natural and cultural heritage has significant impacts for the tourism industry (ARMCANZ, ANZECC & FM 2001).

Both *T ramosissima* and *T parviflora* are emerging threats to waterways including dams and reservoirs. Their impacts are similar to Athel pine.

The National Athel Pine Strategic Plan (ARMCANZ, ANZECC & FM 2001) was developed by the Northern Territory with full cooperation of all the States , Territories and the Australian Government. The National Athel Pine Management Committee was formed in 2005 and oversees the implementation of the strategy. The main aims of the strategy are to –

- Prevent new infestations of Athel pine,
- Eradicate all Athel pine in riparian areas,
- Manage Athel pine in non-riparian areas,
- Coordinate strategic Athel pine management throughout Australia.

Sleeper weed

Athel pine is classified as a ‘sleeper’ weed because it was present in Australia for some time before it became weedy. It was first promoted as a useful tree throughout semi-arid and arid Australia and introduced into Whyalla SA and Broken Hill NSW during the 1930s and 40s, via California. These plantings were soon followed in the 1940s and 50s by widespread plantings in other states as wind and sun shelter species at homesteads, communities, bores, stockyards and for erosion control. Later on it was used for mine rehabilitation (eg WA and QLD) and salinity management (eg WA). However, it was not until the 1970s and 1980s that the true weed potential of this species was recognised, by which time it had developed along 600 km of the Finke River in NT. This rapid and sudden expansion

corresponded with several large summer floods which are thought to have provided the perfect environment for seed germination and establishment (Griffin *et al.* 1989). Since then Athel pine has naturalised in other areas of Australia, particularly where original plantings were adjacent to watercourses including ephemeral lakes and streams and along old bore drains. Currently Athel pine only occurs across a small fraction of its potential distribution in Australia (Figure 1).

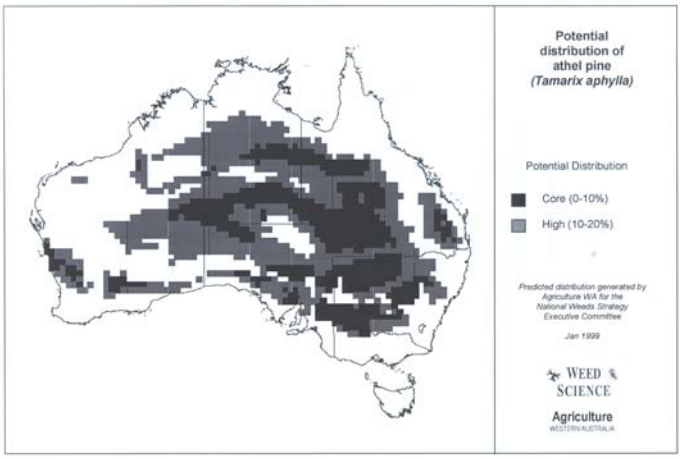


Figure 1 Potential distribution of Athel pine in Australia

There is little information available on the introduction and subsequent naturalisation of the other two tamarisk species for Australia. However from WA experience at Lake Boonderoo we know that *T ramosissima* is also capable of sudden and rapid naturalisation.

IDENTIFICATION

The taxonomy of Tamarisk species is difficult and confusing. In Australia there are three species. Athel pine is easily distinguished from the other two species, however telling the difference between *T ramosissima* and *T parviflora* is much more difficult. In addition we know from USA experience that *T ramosissima* and Athel pine can hybridise (Gaskin and Shafroth, 2005). Given these limitations it is essential to lodge specimens with the NSW Herbarium in order to get an accurate identification.

Athel pine

Athel pine is a spreading tree to 15 meters with pendulous, jointed branches. It is not a true pine but a flowering plant. Immature trees have light grey trunks and stems. Mature trees have a thick, rough, dark grey to black bark, and grey-brown stems, and can be up to 1 meter in diameter. The minute leaves are a dull grey-green and form a sheath around the fine branchlets, giving them the appearance of pine-needles. The surface of the leaf is whitish due to salt secretion and in most specimens very prominently punctate.

Flowers are whitish-pink, small and stalkless with five petals. They occur in spikes 3-4 cm long growing at the end of the previous year's branches. The fruit is bell shaped, capped with a hairy tuft and contains numerous seeds. The seeds are very small, cylindrical and crowned with a tuft of fine hairs which assists wind dispersal. The trees have strong woody roots that penetrate and spread deeply throughout the soil.

Athel pine flowers (Photo: L Tanner)

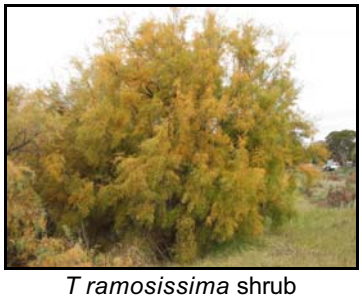

Athel pine flower spike

Athel pine leaves (Photo:L Tanner)

T ramosissima

T ramosissima is a deciduous to semi-deciduous, loosely branched shrub or small to medium tree up to 5 meters tall and is generally bushy in appearance. The branches are slender with minute apressed scaly leaves. The leaves are rhombic to ovate, sharply pointed to gradually tapering, and 0.5-3.0 mm long and evenly thick from base to tip. The surface is more or less smooth with scattered puncti.

Flowers are whitish-pink to purple, small and stalkless with five petals. They occur in spikes 2-5 cm long at the end of the current year's branches. Petals are usually retained on the fruit. The fruit is bell shaped, 3-4 mm long whilst the seeds are very small and crowned with a tuft of fine hairs which assist wind dispersal (Carpenter 2003).


T ramosissima shrub

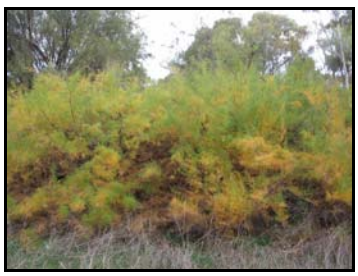

T ramosissima flowers


T ramosissima leaves

T parviflora

T parviflora is a deciduous to semi-deciduous, loosely branched shrub or small to medium tree up to 6 meters tall and is generally bushy in appearance. The leaves are lanceolate acuminate but they are distinctly thickened towards the base with a rugose, rarely tuberculate surface, whilst the upper part is thinner and smooth. *T parviflora*'s bark is dark brown to deep purple, while *T ramosissima*'s bark is reddish brown (SA Herbarium, 2007 pers. com.).

Flowers are pinkish-white, small and stalkless with four petals.


T parviflora shrubs


T parviflora flower
(Photo: BA Rice)


T parviflora leaves

DISPERSAL

Tamarisks reproduce by seed and vegetatively. They are highly fecund and produce masses of minute seeds (up to 600,000/ mature plant of which 22% or up to 13,200 are viable) that are readily transported by wind and water. The seeds have no dormancy or after-ripening requirements, are capable of germinating within 24 hours and are only viable for up to a week. Germination can occur almost immediately upon reaching a moist site and can germinate whilst floating in water and establish on wet banks within two weeks. Germination conditions are broad, good germination being found from 10 - 35°C. Seeds can establish in clay, sand and shingle, but prefers fine-textured soils whilst plants have a wide tolerance of saline and alkaline soils and tolerate frosts to minus 10° C (Carpenter, 2003).

Tamarisks will produce roots from buried or submerged stems, stem fragments and snapped tap and lateral roots. This allows them to produce new plants vegetatively following floods from stems torn from the parent plant and buried by sediment. They will also produce lateral growth from fallen or horizontal limbs.

Ideal conditions for first year survival are saturated soil during the first few weeks of life, a high water table and open sunny ground with little competition from other plants (Carpenter 2003).

CURRENT KNOWN DISTRIBUTION

Athel pine

Athel pine has naturalised at the following locations –

- NSW – Darling River Bourke, Barwon River Walgett, Menindee Lakes
- SA – Kenmore Park; Lake Starvation and Tilcha Flow on Quinyambie Station; Mt Fitton and Mt Searle Stations in the Flinders Ranges, Frome Downs and Muloorina Stations
- WA – Gascoyne River Carnarvon, two mine sites near Laverton
- NT – Finke River (600 km), Karinga Creek (ca 150 km), Ross River, Walker Creek/ Palmer River, Renner Creek (ca 1 Ha) and Helen Springs
- QLD – Flinders River Hughenden, Kings Gully Mt Isa, Gemfields near Emerald and Cracow (mine site) near Rockhampton

T ramosissima

T ramosissima has naturalised at the following locations –

- NSW – Imperial Lakes Broken Hill (ca. 5 Ha) and is recorded by the NSW Herbarium at three sites near Deniliquin, one site near Condobolin, one site on Central Coast and one site on South Coast
- SA –Florina Station Mannahill (ca. 1 Ha) and Teetulpa Station Yunta (unknown due to recent flooding and potential downstream colonisation), Murray River (Berri, Blanchetown/ Riverland area)
- WA – Lake Boonderoo (30 km perimeter) and Norseman stormwater dam (ca. 3 Ha) near Kalgoorlie

T parviflora

T parviflora has naturalised at the following locations –

- WA - Avon River at Toodyay, Northam and York

FUTURE RISK

The western United States (US) experience with Tamarisk is that it is now covering more than 1.5 million riparian acres (Stenquist 1999) and is expanding by 40,000 acres per year (DiTomaso 1998). In addition hybrids (*T ramosissima* x *T aphylla*) are starting to be recorded in the US and are of concern as they may prove to be more invasive than either of the parent plants (Gaskin and Shafroth 2005). Tamarisks present an emerging weed risk to Australia. They are capable of sudden and rapid expansion given the right seasonal and environmental conditions - moist ground for seed germination, high water table and open sunny ground, whilst their spread is assisted by floods that move stem fragments further downstream from parent plants.

New infestations should be prevented because control is difficult and costly. An integrated management approach that incorporates multiple control techniques is required to manage Tamarisks. Mechanical and chemical methods are the main control options and care must be taken using either method around waterways.

In New South Wales Athel pine has been widely planted since the 1930s at towns, homesteads, stockyards and bores. In addition there have been plantings of *T ramosissima* at several locations throughout NSW. Where these plantings are adjacent or close to water ways, including ephemeral lakes and dams, they present a high risk for future invasion. There is also an urgent need for State government authorities, weeds officers, CMAs, landholders and community groups to become familiar with all three species.

Essential next steps for NSW –
- Increase reporting of 'high risk' plantings,
- Weed Risk Assessments of all three Tamarisk species leading to the prioritisation of all known sites,
- Proactive and long-term control of all known naturalised infestations (underway),
- Develop a Tamarisk reduction program,
- Record naturalised and high-risk plantings via field surveys, GPS locations using WoNS Core Attributes, and lodge specimens with the NSW Herbarium,
- Prevent further Tamarisk plantings,
- Increase education and awareness about the risk that Tamarisk pose to NSW.

TAKE HOME MESSAGE

1. Learn to recognise all three Tamarisk species,
2. Remember the Western USA experience with Tamarisk – it currently infests 1.5 million acres along waterways and is expanding by 40,000 acres/ year,
3. 1 mature Tamarisk plant uses 757 litres of water/ tree/ day,
4. 1 Ha of Tamarisk trees use 1.8 million litres water/ year,
5. Tamarisk trees consume twice the water of willows,
6. Report all naturalised infestations to your local weeds officer,
7. Keep on the lookout for high risk plantings near to waterways including reservoirs, dams, and ephemeral streams and lakes,
8. Report all high risk plantings to your local weeds officer,

9. NSW weeds officers please forward information to Don MacKenzie (NSW member on the National Athel Pine Management Committee), Senior Weeds Officer, Bourke Shire Council dmackenzie@bourke.nsw.gov.au or Sandy Leighton, National Athel Pine Coordinator sandy.leighton@nt.gov.au

ACKNOWLEDGEMENTS

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BRIEF BIOGRAPHY

Sandy Leighton has over 25 years experience in Natural Resource Management throughout Australia. She has recently taken on the role as National WoNS Coordinator for *Mimosa pigra* and Athel Pine under the Weeds of National Significance Program and is based in Alice Springs, Her position is funded by the Australian Government under the *Defeating the Weed Menace* initiative and hosted by the NT Department of Natural Resources, Environment and The Arts. Prior to this she worked as the National Gorse Coordinator based in Tasmania.

Sandy has also worked as an NRM facilitator and as the Tasmanian WeedPlan Education Officer including involvement in the national Weedbuster program. In addition Sandy has eight years experience as an integrated weed management consultant where she worked with a wide range of community groups and also delivered a weeds awareness program, in partnership with the Tasmanian Institute of Agricultural Research, into 14 Tasmanian schools including the rearing and release of bio-control agents.

Her aim is to increase adoption of sustainable weed management practices through education, building networks, community capacity and ownership. Her passions are Australia's wild places and the protection of our unique biodiversity and cultural landscapes.