

# Management burning of invasive native scrub: principles

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Encroachment of unpalatable invasive native scrub (INS) is a major problem facing landholders in the semi-arid rangelands of New South Wales. This has been recognised by officers from various government departments and by landholders who in many cases have seen 'open' paddocks become unmanageable and 'scrubby' in 10 to 15 years.

Encroachment by INS seriously reduces the productivity of pastoral properties. Property income is reduced because encroachment decreases the carrying capacity of the land and the reproductive performance of livestock,

whilst increasing the cost of managing livestock, especially mustering. The effect of drought is much greater on scrubby properties; these are less able to carry livestock into and through dry periods because of the reduced cover of perennial grasses and herbage.

Dense stands of INS also reduce habitat diversity. INS favours certain fauna species such as insectivorous birds, but the decline of grass-timber mosaics affects a range of other birds and wildlife. Established INS can also lead to the decline of perennial groundcover and soil erosion. Uncontrolled grazing pressure from feral, native and domestic animals worsens these effects by reducing pasture vigour.



Management burning is a proven tool for tackling the ever increasing problem of INS encroachment.

Figure 1. The three photographs below show the same site in a paddock at 'Conlea', before and after management burning.



Figure 1a. Before the management burn. Note the good cover of grass fuel.



Figure 1b. Immediately after the management burn. Although the large bushes still have leaves, they have been scorched to the top and will die.



Figure 1c. Several months later the bushes are dead (91 per cent of the hophush was killed) and the paddock is regenerating after the burn.

Management of existing INS and new seedlings is a major priority for landholders in western New South Wales. This fact sheet examines the principles of management burning as a proven tool for tackling the ever increasing problem of INS encroachment.

The techniques of management burning are discussed in Primefact 853 *Management burning of invasive native scrub: techniques*

## WHAT IS A MANAGEMENT BURN?

A management burn is planned, controlled, and conducted to achieve a management objective; and it does not go beyond the desired area. A management burn is not a wildfire. A wildfire is a fire without a management objective and is usually out of control and can generally damage life and property.

## WHY USE FIRE

Early European explorers and settlers reported that much of western New South Wales looked like 'parkland', with tall trees, few shrubs and well grassed plains. This is no longer the case in many areas of the rangelands which have become encroached by a dense understorey of INS.

One of the reasons for encroachment by INS has been the reduction in the frequency of fire since European settlement. Before that time, fire was very common in the rangelands. Aboriginal people often used fire to manage the land and their food supplies, for communication and for warmth. This is well documented and supported by the accounts of past and recent European explorers and settlers.

For example, Sir Thomas Mitchell made the following observation during his exploration for a route from Sydney to the Gulf of Carpentaria, early in the nineteenth century.

'The extensive burning by the natives, a work of considerable labour and performed in dry warm weather left tracts in the open forest which had become as green as an emerald with the young crop of grass. These plains were thickly imprinted with the feet of kangaroos, and such work is undertaken by the natives to attract these animals to such places.'

Wildfires caused by lightning were also common in western New South Wales in the past, as they are today. However, before European settlement there was more fuel to carry wildfires because there were fewer animals eating the grass. Therefore wildfires would have burnt larger areas than they have usually done in recent years.

Fire was a normal feature of the environment in the semi-arid woodlands of western New South Wales and the influence of these fires contributed

to the 'open' appearance of the country as it was first seen by early Europeans. The re-introduction of fire for management of INS can help to restore the land to its desirable 'open' condition (Figure 1). As well, the direct costs of management burning are far lower than those of alternative techniques like chemical treatment or mechanical clearing.

## THE OBJECTIVES OF MANAGEMENT BURNING

There may be three objectives for management burning.

1. *To reduce the density of woody weeds in an area to be burnt.* When there are fewer woody weeds, more feed that is desirable can grow because more soil moisture is available.
2. *To maintain a plant community by preventing slow encroachment as small woody weeds mature.* Burning early in the encroachment process (at the seedling stage) has the advantage of achieving high death rates of woody weeds, as they are burnt when they are young and highly susceptible. It also increases management flexibility for future burning, as it allows more fuel to become available more often than it would otherwise.

3. *To prevent the spread of wildfire by removing dangerously high fuel loads at a convenient and safe time.*

## WHAT WILL BURNING ACHIEVE?

Research has shown that burning decreases the density of INS in a paddock and increases forage production. There appears to be no long-term damage to forage production after a burn. The growth of forage on the burnt paddock and that paddock's return to full production depends on the seasonal conditions and the grazing pressure after the burn.

## EFFECT OF BURNING ON INVASIVE NATIVE SCRUB

The amount of INS killed by burning depends on the species in the paddock. The age of the INS also has an important effect on the numbers destroyed, as older shrubs are more tolerant of fire. The density of INS can also affect the kill rate, as it can be very difficult to achieve desirable fuel quantities under densely growing INS. Shrubs will not burn alone; there must be adequate fuel under them to carry a fire.

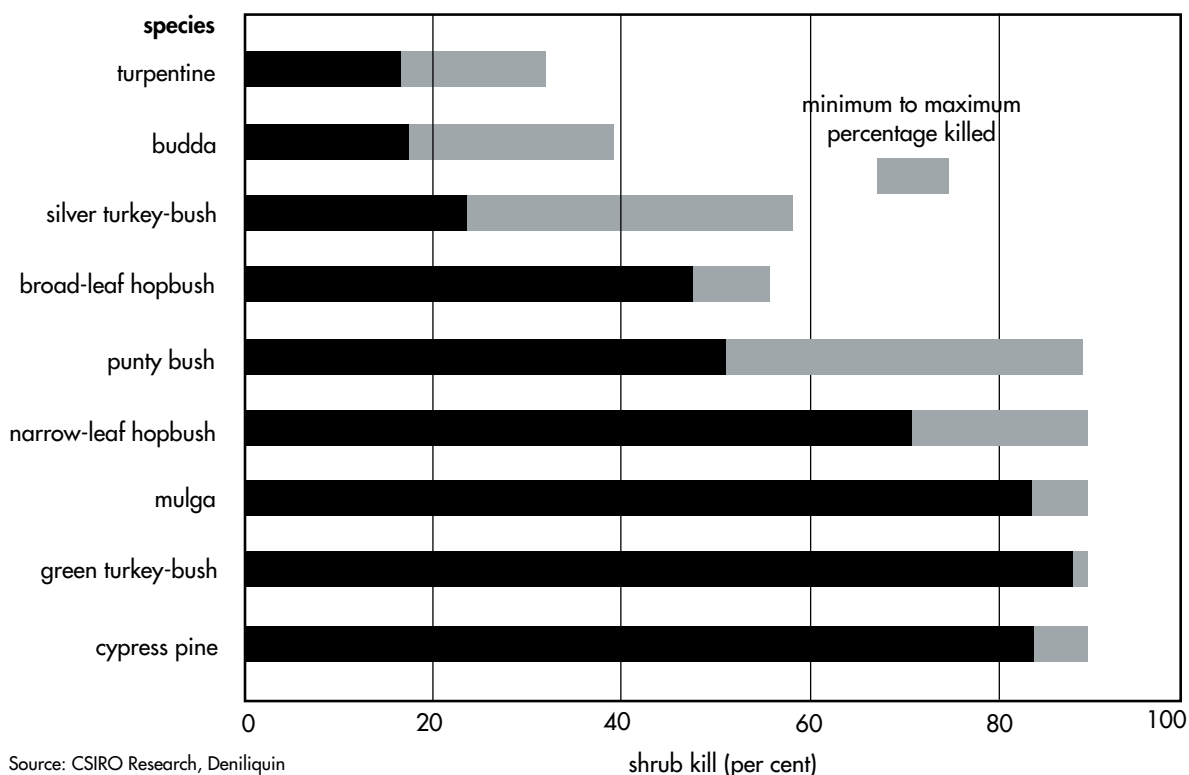


Figure 2. Mortality of mature species of woody weeds, after burning.

**Table 1. Mortality of mature species of woody weeds, after burning.\***

SPECIES	PROPERTY	SHRUB KILL (%)
punty bush	Janina	85
	Cooneybar	73
turpentine	Mt Mulya/Conlea	24
	Janina	30
budda	Cooneybar/Buckeroo	38
cypress pine	Buckeroo	100
mulga	Cooneybar	60
broad-leaf hopbush	Cooneybar	71
narrow-leaf hopbush	Mt Mulya/Conlea	91

\* These results were obtained during large-scale paddock burns carried out by NSW Primary Industries (formerly NSW Agriculture & Fisheries) and CSIRO, Deniliquin.

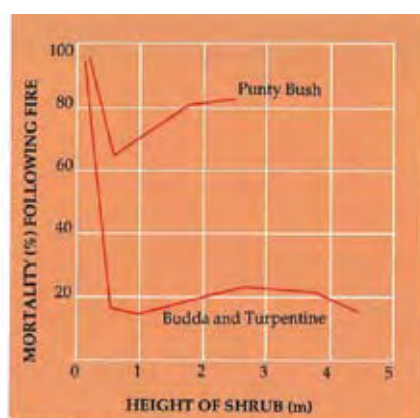


Figure 3. Mortality of shrubs by height, after burning.

## EFFECT OF BURNING ON SPECIES OF INVASIVE NATIVE SCRUB

Figure 2 shows how the mortality of INS varies between species. Later paddock burns confirm these species differences (Table 1).

Generally, death rates vary from 20 to 30% for turpentine and budda and from 70 to 100% for hopbush, punty bush and cypress pine.

## EFFECTS OF BURNING AND AGE OF INVASIVE NATIVE SCRUB

Most invasive native scrub will likely be killed by fire when they are young. There is a death rate of almost 100% for all species if they are burnt while they are seedlings – that is, during the first two years after germination and while they are less than 30 cm high (Figure 3).

**Early recognition of encroachment by INS is vital if successful management is to be achieved.**

## DOES BURNING PROMOTE GERMINATION OF INVASIVE NATIVE SCRUB?

Large scale paddock burns have not shown general increase in germination of INS after fire. Mulga germination can be enhanced after fire, but this effect seems to be confined to fiercer wildfires. Hopbush and punty bush germination may also increase after a burn, but this is usually confined to small ‘hot spots’ in the paddock, such as around a burnt-out log. In these ‘hot spots’ seedlings are usually so dense that they rarely survive to maturity.

Management burning does not cause massive germination of INS seeds over large areas; indeed, seed germination is usually lower on burnt than unburnt paddocks, because the fire removes some of the seed. However, this may not be the case in very hot wildfires, where more woody weeds could germinate after fire.

Germination and survival of the seedlings of INS in a burnt paddock depend on the season after the burn and, importantly, on the management of that paddock after the burn (Figure 4). Stocking pressure must remain at zero after the burn to encourage the growth of regenerating or germinating perennial grasses. These perennial grasses compete very effectively with INS seedlings for scarce soil moisture, and this competition can cause the death of most woody weed seedlings in the first summer after germination.

## HOW MUCH FUEL IS REQUIRED FOR A MANAGEMENT BURN?

To achieve the maximum benefit from management burning, there must be enough fuel to ensure that woody weeds are scorched to the top leaves. Many more will survive if they are not scorched to the top. However, scorch height is not flame height. It is not necessary to ‘burn’ up to the tops of woody weeds as radiant heat from the fire can scorch to the top leaves.

Fuel levels of about 900 to 1200 kg/ha are needed to properly scorch woody weeds up to 3 m high.

It is important to ensure that there is enough fuel in the paddock to get the desired result from the management burn under the prevailing wind, temperature and humidity. If the fire is not intense enough to ensure an adequate scorch height, more woody weeds will survive. Also, if the fuel is spread unevenly over the paddock, it will be difficult to light and manage the burn and large patches of unburnt woody weeds will survive to become a source of seeds for a new germination.



1993



2006



Figure 4. This area experienced a wildfire in the summer of 1984. By 1990 there was ample fuel for a second burn. If a second burn had taken place this regrowth and germination would have been eliminated. However, encroachment continued and the area is now dominated by woody vegetation.

## PLANNING FOR MANAGEMENT BURNING

The key to a successful program of management burning is long-term planning, which should include the following.

- Understanding what burning can achieve in a paddock through a knowledge of the plant community in the paddock and how it will change in response to either seasonal conditions, fire, or grazing management.

- Incorporating burning into the routine management practices on the property. This will ensure that both the livestock and the plant communities are managed together.
- Allowing enough fuel to build up, before burning, to achieve the desired management objective. This can be done by excluding livestock from the burn paddock after rainfall, or taking advantage of the fuel that is available after unusually wet seasons.
- Ensuring that regenerating grasses are allowed to establish before grazing.

Management burning has been shown to be effective for controlling INS and seedlings on the rangelands of western New South Wales, and should be seriously considered as a management strategy by landholders.

## FURTHER INFORMATION

For assistance with planning and conducting a management burn, please contact your local Rural Fire Service or Catchment Management Authority office.

Under the Native Vegetation Act, burning is defined as clearing and a Property Vegetation Plan (PVP) will be required. Please contact your local Catchment Management Authority for further details.

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