HOTSPOTS FIRE PROJECT

MANAGING FIRE ON YOUR PROPERTY:

A booklet for landholders in the namoi region

This project has been assisted by the New South Wales Government through its Environmental Trust.

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Managing fire on your property

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Prescribed Burn. © P. Roffe, NSW Rural Fire Service.

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1. LIVING WITH FIRE

Fire in the Namoi

Fire is part of life on the land in the Namoi region of New South Wales. Some landholders use fire as a land management tool. Others are concerned about the impact of wildfire on their properties, particularly during drought conditions.

Developed specifically for the Namoi region, this booklet provides an introduction on how fire can be managed for healthy, productive landscapes and also presents a framework for incorporating fire into property management planning activities.

Knowledge about the nature of fire and its effects on the landscape will help provide greater confidence in managing fire, both for the protection of life and property, and as a land management tool.

For some landholders, this information will stimulate a new understanding of the role of fire in shaping and sustaining local landscapes and the plant and animal species they contain. For those already in the know, this information will add to existing knowledge and hopefully prompt some important new insights into fire management.

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Fire and the Australian continent

Triggered by lightning strikes and traditionally used by Aboriginal Australians, fire has shaped the character of Australian landscapes for millions of years. Many plant and animal species have evolved strategies to deal with fire, while some species have developed ways to take advantage of the opportunities it creates.

Aboriginal Australians actively used fire as a management tool. In some parts of the landscape, we know Aboriginal fire management practices involved smaller and more frequent fires than would have occurred naturally by lightning strike. There is much debate though, about the nature and extent of Aboriginal burning across the Australian continent.

Even if we knew the whole story about Aboriginal fire management, this knowledge may not give us all the answers we need for the future conservation of native plant and animal communities.

The changes to our landscapes since European colonisation have been profound. In particular we are faced with fragmented vegetation, the spread of introduced species, and changes in the abundance of native plants and animals.

We need to draw on both old and new knowledge about fire in order to protect our bush and so manage for healthy productive landscapes. Much of our new knowledge and our current understanding of how fire might best be managed comes from looking at the way plant and animal species in different communities respond to fire. This topic is the focus of the next section.

"For me, fire is part of a bigger narrative about learning to live like an Australian, as if we intend to stay on this continent forever, for good."[1]

© A. Busse, Hotspots Fire Project.

[1] Andrew Campbell - first national landcare facilitator, former Executive Director of Land and Water Australia and current director of Triple Helix Consulting. Campbell, A. (2003) "Learning to live with fire" pp 243-247 in Cary, G., Lindenmayer, D., and Dovers, S. *Australia Burning: Fire Ecology, Policy and Management Issues*, CSIRO Publishing, Collingwood, Victoria.

2. MANAGING FIRE FOR BIODIVERSITY CONSERVATION

Science based management

Scientists and land managers have long recognised the relationship between biodiversity (the variety of different plant and animal species) and healthy land systems.

Only in the last 20 to 30 years, however, have Australia's scientists gained a better understanding of the significant role that fire plays in shaping these land systems and the biodiversity within them. Fire ecology is now an important area of scientific study.

For landholders, the most useful information to come out of this research relates to how different aspects of fire affect vegetation and wildlife, and how different plant and animal species respond to fire.

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Plant responses to fire

Many Australian plant species have developed reproductive strategies in close association with fire. Since fire is such a powerful disturbance force, changes in fire patterns can quickly influence which species (and reproductive strategies) will persist in an area and which won't.

Different plant species respond differently to fire: some do not tolerate fire; some tolerate it but don't rely on it for reproduction. In many Australian plant species, one or more aspects of reproduction; flowering, seed release or germination happens exclusively, or more abundantly, in the months or years after a fire.

Scientists describe two broad post-fire regeneration strategies that occur in areas with a long history of fire which are relevant to fire managers: *obligate seeding* and *resprouting*.`

Obligate seeders

When *obligate seeder* species are exposed to a fire, all, or almost all, plants are killed. These species can persist, by regenerating from seed (they're *obliged* to regenerate from seed if they are to survive in an area). This seed may be stored in the soil, on the plant (e.g. in cones), or brought in from nearby unburnt patches of vegetation by wind, water, birds or other animals.

Land managers implementing fire management strategies need to consider the frequency of burning if they wish to ensure the survival of these obligate seeder species.

Fire frequency needs to take account of the life span of obligate seeders, including the amount of time it takes for these plants to experience their first flowering and to produce seeds. If the interval between two fires is too short, the second fire may wipe out an entire generation of young obligate seeders before they have reached reproductive maturity (i.e. before they have started producing seed).

On the other hand, if fire is excluded from an area for too long, a whole generation of obligate seeders may move beyond reproductive age and die off before a fire has had a chance to trigger germination. While some seeds can survive in the soil for very long periods, seeds of some species are relatively short lived.

Obligate seeders reliant on seed dispersal from other areas may be threatened by extensive fires. This is because no, or few, seed supply areas escape being burnt and the likelihood of animals (or other dispersers) bringing in new seed is reduced.

Fire intensity can also affect obligate seeders because specific temperatures may be necessary to trigger seed release and/or germination.

Resprouters

Resprouters are able to resprout after fire from woody underground *lignotubers* or from buds protected underneath their bark. Many landholders may be familiar with the behaviour of these plants. Some resprouters can

Obligate seeder Pink Five-Corners (*Styphelia triflora*).
© P. Watson, Hotspots Fire Project.

Eucalypt resprouting from buds under the bark. © P. Donatiu.

tolerate frequent fire, and some can live for a long time without fire. However, it is important to note that even resprouter populations may be affected by very frequent fire or by fire exclusion, and may rely on seed to ensure healthy, diverse gene pools.

Not surprisingly, in the absence of fire, those plants which come to dominate the landscape include long lived species and those which are able to regenerate without fire. These plants may competitively exclude other species from available light and space. A fire can help to open up the bush so light can reach ground level triggering resprouting, germination and plant growth.

Eucalypt resprouting from base three months after fire.
© P Watson, Hotspots Fire Project.

Fire regimes

Fire regime is the term used to describe aspects of fire that are important for managing vegetation and wildlife.

A fire regime includes the following factors:

- Fire Frequency: *the number of fires in a given time*
- Fire Extent: *the area covered by the fire*
- Fire Intensity: *how hot the fire is*
- Fire Season: *what time of year the fire occurs*

More on fire frequency:

It is important to consider the sequence of fire events. Long term effects on landscape and biodiversity are generally the result of a pattern of fires over time, rather than of just a single fire. (Although this is not to say that a single fire doesn't have the potential to significantly impact on a given area, like in a rainforest for example).

The amount of time between successive fires (fire interval) is an important aspect of fire frequency and can have a major impact on the plants and animals of a given area.

Frequent burning tends to reduce shrub cover and increase grassiness in some vegetation types resulting in more open landscapes. Infrequently burnt areas may be naturally shrubbier. These differences in vegetation structure affect the animals and birds that live in the bush. Some animals need shrub cover to shelter and breed, while others need open, grassy areas to find their food.

Different vegetation types are adapted to different fire frequencies. Variability in the interval between fires is important for maintaining species diversity. Repeated fire intervals of similar length are not always good news for plants or animals.

More on fire extent:

The area covered by any particular fire can vary. Some wildfires can be very extensive – the Coonabarabran fires in December 2006 to January 2007 are an example. More than 113,000 hectares of private property, national park and state forest were burnt. Planned burns may range from small burns of a hectare or less, to larger burns of several hundred hectares.

Within a fire perimeter, patches will often remain unburnt. Extensive fires that leave few unburnt patches may limit the ability of animals to find refuge during the fire, and food and shelter after it has passed. Unburnt patches provide a base from which animals can slowly move back into burnt areas as these recover. Those undertaking planned burns often aim to leave unburnt patches.

However, small burns may also have a down side. Animals can easily move into small burnt patches from surrounding unburnt country and may place too much grazing pressure on the recovering vegetation in these small patches. This problem may be particularly prevalent where animals such as kangaroos are abundant. If a greater area is burnt, grazing pressure is more likely to be spread, reducing impacts on regenerating vegetation.

Landholders wanting to burn with biodiversity in mind may therefore want to aim for burns of a varying size, while still ensuring unburnt bushland patches remain for fauna. Burning a number of different patches at around the same time is another way to spread grazing pressure over a larger area. Previously burnt patches can provide boundaries for later patch burns.

More on fire intensity:

A fire varies in intensity depending on factors such as wind speed, temperature, humidity, slope, fuel load and the structure of the vegetation. The most intense fires tend to occur during times of high temperatures, low humidity and strong winds.

Generally:

- Fires tend to be more intense when there is more available dry fine fuel. 'Fine fuel' is material less than a pencil width.
- High intensity fires are more destructive and will kill more plant and animal species, but they are also naturally occurring and important in some plant communities.
- After a high intensity fire, lots of seed germination may occur. Areas opened up by a high intensity fire will provide increased areas of sunlight and space for young plants to develop.
- Variation in fire intensity plays a role in keeping a greater number of species in the community (i.e. maintaining biodiversity).

Fire frequency, extent, and intensity are naturally patterned across a landscape, particularly in mountainous and hilly country. This is determined largely by weather, aspect, slope and vegetation type. Fire management should therefore both respond to and make use of these patterns. For example, gullies often contain more moisture loving plant species than upper slopes and ridges. Unplanned fire are less likely to burn into gullies, since the gullies are naturally wetter; and species in gullies are more likely to be adapted to less frequent fire than species growing on higher ground. A fire management plan should account for this.

Extensively burnt areas can affect the ability of plants and animals to recover after fire. © R Poole, NSW Rural Fire Service.

Unburnt patches will provide animals with a refuge during and after the fire. © W. Drake.

Low intensity fire. © W. Parker, Hotspots Fire Project.

More about fire season:

Climate and weather will influence fire season more than any other factor. In the Namoi region, bush fires generally occur in the summer but the danger period can begin as early as August and extend through to March or April.

Planned burns are, of course, constrained by the bush fire danger period, total fire bans, as well as by weather. In some areas the window of opportunity for planned burns is divided into two time frames; April to June and August to end of September. Autumn is the most popular to conduct prescribed burns, however waiting until frost forms on grasses in the understorey is preferable before burning in some regions.

From an ecological point of view, some variability in the season in which a fire occurs is likely to be the best way to go. While the season appears to affect some individual species, scientific findings do not point to a particular season being 'better' for a whole community of plant and animal species. Where possible, it is probably better to avoid always burning at the same time of year.

Fire regimes: implications for management

At best, fire management planning is a blunt tool and in some parts of the landscape, unplanned fire is inevitable. Prevailing weather conditions and natural landscape patterns will often influence fire season, intensity and extent. Management planning needs to be flexible enough to accommodate unplanned fire, variability in landscape and weather patterns.

Over thousands of years, much of the Australian bush has evolved ways to live successfully with fire and use it to reproductive advantage. Many vegetation types have also developed an ability to 'bounce back' from different fire regimes. This bouncing back is often termed 'resilience'.

The best approach is to vary your fire management actions over time. Talk to people with knowledge in your region, and try different things based on your own observations of vegetation responses to fire on your property.

Biodiversity is more likely to be sustained when fire management extremes are avoided. Excluding all fire from your property, or burning as soon as vegetation has sufficient fuel to support a fire, will eventually see the loss of species adapted to a more moderate or variable regime.

High intensity fire. © G. Walker, NSW Rural Fire Service.

3. FIRE IN THE LANDSCAPE: PUTTING THE SCIENCE INTO CONTEXT

Like many natural processes, the relationship between vegetation and fire regime is complex. However, there are some simple principles that emerge in the following stories about fire in particular plant and animal communities.

FIRE FREQUENCY IN GRASSY WOODLANDS

Grassy woodlands on the slopes and tablelands of the Namoi region, like other regions, have been extensively cleared for agriculture. Patches of good quality grassy woodland where native species still dominate are therefore very valuable from a conservation point of view. Remnants characterised by the presence of White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*), and/or Blakely's Red Gum (*E. blakelyi*) are indicative of the Endangered Ecological Community Box Gum Grassy Woodland. Conservation of these remnants is essential for retaining habitat for many declining native plants and animals.

Within these communities, fire frequency can affect the balance between woody species and grasses. Frequent burning tends to produce open, grassy landscapes, whereas in places where fire has been excluded or is rare, shrubs and young trees may increase in number.

In grassy woodlands, tussock grasses such as Kangaroo Grass (*Themeda australis*), Snowgrass (*Poa sieberiana*) and Wallaby Grasses (*Austrodanthonia species*) dominate the ground layer. Smaller grasses and herbs grow in the spaces between these tussocks. Fire increases diversity by burning the dense tussocks, making space for the smaller species. Many of these grasses and herbs flower rapidly after fire, producing seeds which germinate while gaps between resprouting grass tussocks are still available. Some of the native tussock grasses, particularly kangaroo grass, are also encouraged by fire. Thus fire provides a way for large native grasses, small grasses and herbs to co-exist.

Where fire has been excluded from grassy woodlands, shrubs may increase or decrease depending on whether or not they rely on fire for regeneration. Shrubs and trees that are not reliant on fire and can regenerate between fires will likely increase in density in the absence of fire. If environmental conditions are favourable, these species may then progressively come to dominate the landscape shading out the grasses and herbs. Heavy litter which accumulates over time may also leave little room for small ground layer species. However, there are also shrubs that depend on fire to regenerate. These shrubs may appear in large numbers after a fire as seed stored in the soil is stimulated to germinate. These types of shrubs will tend to die off after a long time without fire, producing a more open understorey.

Both ground layer plants and shrubs form part of the rich diversity of grassy woodlands in the Namoi region. Varying fire over time and space is likely to be important for maintaining this diversity.

Grassy Box Woodland. © S. Hunt, Hotspots Fire Project.

FIRE AND ANIMAL HABITAT

Variability in fire frequency over time and across the landscape has an important role to play in conserving habitat for many bushland animals. Fire can alter the structure and density of vegetation layers and subsequently change the species composition of bushland areas. Some birds and animals may even disappear if fires occur too often or are excluded completely. Although there will always be exceptions, areas which are burnt more often tend to have more open spaces, areas burnt less often tend to be thicker and denser.

Some small birds, like the Hooded Robin (*Melanodryascucullata*) take advantage of the open spaces provided by frequent fire in more open woodland habitats. Similarly many birds of prey will utilise open woodland spaces. By excluding fire completely from woodland and forest landscapes, animals that require open spaces tend to be replaced by species adapted to more shrubby environments.

Hooded Robin © B. Shepherd.

The tiny Eastern Pygmy-possum (*Cercartetus nanus*) seems to prefer the more shrubby environments associated with an understorey of hard-leaved shrubs, like banksias and bottlebrush. Here they feed on the nectar and pollen of woodland and forest flowers, supplementing their diet with insects and soft fruits. The Eastern Pygmy-possum also requires tree hollows and/or loose bark in the forks of trees to nest and breed. By increasing the frequency of fires and removing shrub thickets across the landscape, animals that rely on these environments will eventually disappear.

Some animals will use both open and shrubby environments. Restricted to the low-nutrient deep soils of the Pilliga scrub, the Pilliga Mouse (*Pseudomys pilligaensis*), is one such example. Living in habitat with a good coverage of shrubs, recent studies have found that the Pilliga Mouse seems to prefer foraging in recently burnt moist gullies where there are few shrubs but plenty of low grasses and sedges and ash can still be found on the ground. The Malleefowl (*Leipoa ocellata)* will also take advantage of recently burnt patches to forage for food, but requires long unburnt areas with lots of decomposing litter in which to build its mound. Fires that create a mosaic of burnt and unburnt patches across the landscape can help to retain the range of habitats necessary for the many animals that use both open and shrubby environments in the long term.

Recovery of animal populations in the months and years after a fire will depend on many different factors including fire intensity and frequency as well as the presence of nearby unburnt areas. In some circumstances, valuable habitat features, such as tree hollows, can take hundreds of years to develop and although fire can help with hollow development,

Eastern Pigmy Possum © DECCW.

incineration of older larger trees and hollows in subsequent fire can reduce the habitat value for surviving arboreal fauna. High intensity fire therefore should be avoided in vegetation communities where hollow-bearing trees are essential to threatened wildlife. To maintain an ongoing supply of large hollow bearing trees, dead trees, logs and stumps should be left standing whenever possible.

Varying fire across time and space can help maintain patches of different vegetation structure and habitat type across the landscape. This variability can help to ensure the habitat needs of many birds, mammals and reptiles including some threatened species. By ensuring that some patches remain unburnt, animals and plants will also have a better chance to recolonise from nearby areas.

ENCOURAGING DIVERSITY IN WHITE CYPRESS PINE WOODLANDS

White Cypress Pine (*Callitris glaucophylla*) is a prominent feature of the landscape across central western New South Wales. Like many trees west of the Divide, the recruitment of White Cypress Pine isn't triggered by fire, but rather is an occasional event associated with particularly good rainfall. The density of young pines can be quite stunning. Unlike eucalypts, pine seedlings don't easily self-thin; thick stands of small spindly trees can remain for decades. Whilst these stands provide perches and nest sites for some birds and other animals, dense regrowth is less than ideal habitat for many fauna species and the loss of habitat diversity can reduce the types of animals and plants that can live there.

generally agree that fires started by Aborigines and lightning probably once helped maintain a mosaic of woodland patches. In many places the understorey was open and grassy under a canopy of eucalypts and mature pines, while in other places shrubs and young Cypress grew thickly or in clumps. White Cypress Pine is much more sensitive to fire than the eucalypts that grow with it. Not that all Cypress plants are killed in every fire: even in hot wildfires a proportion are generally tall enough to escape most of the flames. Seedlings, however, are readily killed in a burn. Thus fire has the potential to kill very young regrowth, and to thin dense Cypress stands.

© W. Parker, Hotspots Fire Project.

The last two hundred years have seen many changes in the Cypress Pine woodlands. Some have been cleared for cropping, while elsewhere the density of pine has increased. The balance between eucalypts and pines, and between large and small trees, has also changed.

Early 19th century leases often required landholders to remove eucalypts, shrubs and young pines. Mature pines provided excellent wood. As foresters know, pine regeneration happens readily in 'understocked' stands: where once mature eucalypts and pines left few resources for new plants, logging created gaps for young pines to come in. Thickening and encroaching native scrub, such as White Cypress Pine, remains a key natural resource issue across many areas west of the divide.

Fire regimes have also changed. Historians and scientists who have studied Cypress Pine forests

Landholders who wish to encourage native plants and animals may find fire a useful tool for managing white Cypress Pine seedlings. Fire and other management techniques that encourage the growth of eucalypts, non-invasive shrubs and deep-rooted perennial native grasses will in turn produce more ground fuel for fires, discourage pine regeneration and directly benefit native birds and animals through providing food (nectar, seeds, insects) and nest sites.

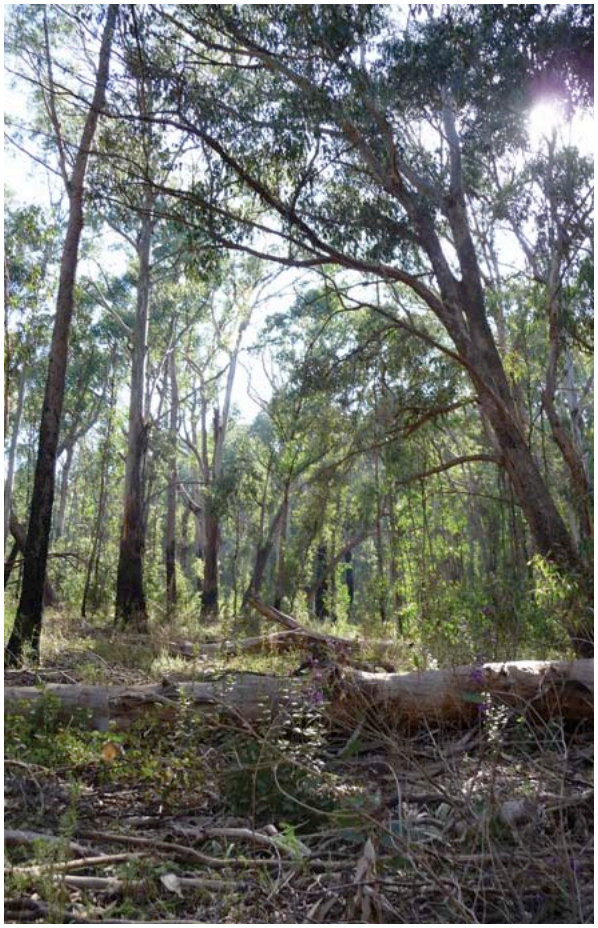
While fire may open up Cypress Pine stands and is likely to increase their habitat value, getting fire into them without burning down the neighbourhood can be challenging. The trick will be to find fire regimes that balance all the different needs of plants, animals and us – a job for landholders, people familiar with fire and scientists to tackle together.

4. MANAGING FIRE FOR DIFFERENT VEGETATION TYPES

If different vegetation types are adapted to different fire frequencies, how do landholders know whether their fire management actions are good for biodiversity?

To help make these decisions, the Department of Environment, Climate Change and Water (DECCW) has developed *fire frequency guidelines* for broad vegetation types around NSW. These guidelines are periods of time (in years) bounded by 'thresholds'. Thresholds refer to the upper and lower limitations to survival for species that are particularly sensitive to very short, or very long, intervals between fires. The fire frequency guidelines aim to ensure fire intervals are long enough to let vulnerable obligate seeders grow to maturity, while also ensuring fire happens often enough to keep short lived species around.

Hotspots is working with DECCW and local ecologists to further develop these guidelines to take into account the considerable differences between regions within NSW. The region covered by the Namoi Catchment Management Authority covers approximately 42,000 square kilometres and extends from the Great Dividing Range in the east, to the Liverpool Ranges and the Warrumbungle Ranges in the south, to the Nandewar Ranges and Mt Kaputar in the north. Across this gradient rainfall averages 800mm in the east decreasing to an average of 500mm near Walgett on the western boundary with slightly higher rainfall at places like Mt Kaputar. Summer temperatures across this range are generally hot to very hot, the number of frost days is variable and soils change. All these factors affect which plants grow where, and how fast they grow. They also affect the way fire behaves. Fire frequency guidelines aim to reflect these differences.



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The recommended fire frequency intervals are based on what scientists currently know about fire ecology, and will continue to be refined as more information comes to hand. Upper thresholds in particular are currently based on very limited data.

Fire frequency intervals for broad vegetation types found in the Namoi region are listed on the following pages.

The vegetation types are classified according to a statewide assessment made in 2004 by Dr David Keith. The groupings can be recognised by specific combinations of plant species, in some cases, these include plant species found nowhere else. The vegetation types are also based on factors such as the height and spacing of the dominant plants as well as geographic indicators of rainfall and soil type.

Vegetation types of the Namoi

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Rainforest

Rainforests are usually dominated by soft leaved trees with vines, ferns and palms in the understorey, and grow on moist sites with fertile soils. In the Namoi region, rainforests are very limited and occur as either small pockets of subtropical rainforest, dry rainforest or western vine thicket and may occur on steep or rocky slopes. Western vine thicket however, is restricted to the dry hills and flats west of the New England plateau and slopes. The moist environment generally shades out the more flammable species that fuel fires, thereby protecting most of the forest from fire events. Weed species such as lantana and buffel grass may increase the likelihood of fire coming into these areas.

Although a wildfire may occasionally go through a rainforest and the community may be able to recover slowly, rainforest is very sensitive to recurring fires. Fire should therefore be excluded where possible.

Wet Sclerophyll Forest (shrubby subformation)

The term *sclerophyll* refers to the hard, leathery leaves of many distinctly Australian trees and shrubs

Wet sclerophyll forests (shrubby subformation) are tall eucalypt forests with a dense understorey of ferns, herbs, and shrubs with broad soft leaves. These forests grow on relatively fertile soils in high rainfall areas. In the Namoi region, this vegetation type is limited but may occur in the Nandewar Range, toward the east. Although it is understood that fire is important in these forests, the fire intervals needed to preserve the dominant eucalypts and safeguard other biodiversity values are still unclear. Shrubby subformation wet sclerophyll forests are likely to experience occasional intense wild fires, perhaps every 50 to 100 years. Intense fire may be needed for eucalypts to regenerate. Less intense but more frequent understorey fires may have a role in maintaining shrubs, ferns and herbs. Currently, variable fire intervals in the range 25 to 60 years are recommended for shrubby subformation wet schlerophyll forests across the state. However these recommendations may be reviewed and refined as we learn more.

Wet Sclerophyll Forest (grassy subformation)

Wet sclerophyll forests of the Namoi region are dominated by straight trunked eucalypts, with a grassy understorey and sparse shrubs which may have hard or soft leaves. These forests grow on relatively fertile soils in high rainfall areas. It is similar to wet sclerophyll forest (shrubby subformation) but has a more open canopy, less shrubs and a greater grassy or herbaceous groundcover. In the Namoi region, this vegetation type extends from the tablelands along the Liverpool Range. Appropriate fire frequencies for this forest type are still being debated. The present state-wide recommendation is for fires every 10 to 50 years although occasional low intensity fire on a more frequent basis may be necessary for the maintenance of understorey diversity.

Several NSW studies have found that fire frequency has a profound effect on vegetation structure in wet grassy forests. Frequently burnt areas are open and grassy, with a diverse herbaceous ground layer, while infrequent burning is associated with an increased abundance of shrubs and small trees. Each environment provides habitat for a distinct suite of plants, insects, birds and small mammals. To provide for the full range, it is important to keep some parts of the landscape open with relatively frequent fire, while other places are burnt less often to allow thicker habitat to develop.

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Dry Sclerophyll Forest (shrubby subformation)

This vegetation type covers forests and woodlands dominated by eucalypts but may also support White Cypress Pine (*Callitris glaucophylla*), Bulloak (*Allocasuarina luehmannii*) and Belah (*Casuarina cristata*). The shrubby understorey of these forests contain many obligate seeders and resprouting shrubs whose flowers colour the bush in spring. The cover of grasses and sedges is sparse. Dry sclerophyll forests grow on poor soils in moderate rainfall areas. The shrubby forests of eastern Pilliga and the ranges around Mt Kaputar are examples of shrubby dry sclerophyll forest.

Variable fire intervals between 7 to 30 years are recommended to maintain diversity in this vegetation type.

© G. Basnett, Hotspots Fire Project.

Dry Sclerophyll Forest (shrub/grass subformation)

Dry sclerophyll shrub/grass forest consists of open eucalypt forest with a sparse hard leaved shrub layer with a grassy groundcover. These forests occur on moderately fertile soils in moderate rainfall areas, have been used for pasture, and are extensive in the Namoi region. Examples occur on the outwash plains of the Pilliga.

The more grassy open forests may require slightly more frequent fire with an occasional longer interval between fires. The grass component is likely to be best maintained by short intervals, while the shrub component is predicted to increase with longer intervals. Across the state, intervals in the 5 to 25 year range, with occasional intervals of up to 50 years in some areas, have been recommended for these forests.

© K. Nicolson, NCC Bush Fire Program.

Grassy Woodland

This is open eucalypt woodland of trees that are widely spaced with crowns that rarely touch. The understorey is usually quite grassy with herbs and scattered shrubs. Grassy woodlands grow on rolling terrain with fertile soils and moderate rainfall, and have been extensively used for grazing. Remnant grassy woodlands in the Namoi region are now mostly found on the high altitudes of the New England Tablelands although scattered remnants occur on the western slopes. As the slopes give way to the plains the species composition of grassy woodlands shifts towards plants that are able to cope with a drier climate.

In places where plants grow relatively quickly because of higher rainfall and warmer temperatures, intervals compatible with retaining a diverse, grassy understorey along with some shrubs are likely to lie towards the lower end of this range. On the western slopes where rainfall is moderate, plants may grow more slowly and somewhat longer fire intervals may be more appropriate. Across the state, a variable fire frequency of between 5 to 40 years has been recommended.

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Grassland

Grasslands are notable for their lack of woody plants, although some shrubs and trees can sometimes be found in these communities. A wide variety of herbs grow in the spaces between tussocks of perennial native grasses such as Kangaroo Grass (*Themeda australis*), common Tussock Grass (*Poa labillardieri*), and Wallaby Grasses (*e.g. Austrodanthonia/Danthonia spp*). Many plants in native grasslands may not be seen by the casual observer; some may not even be visible through autumn or winter, but re-emerge to flower in spring. Grasslands make up a considerable proportion of the north-east of the Namoi region, with extensive areas in the central areas and some fragmented areas across the north-west. Grazing and pasture improvement have extensively modified the grasslands, so remnants where native species continue to thrive are places to be cherished.

Across the state, fires at intervals between 2 to 10 years are recommended to keep dominant grasses from overwhelming smaller herbs and to open up gaps for seedlings to germinate and grow. A slightly longer interval might be more appropriate in sites with slower growth (high altitude grasslands). As rainfall decreases, the spaces between grass clumps may also close up more slowly. Knowledge of the fire responses of grasslands is still developing.

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Heathland

Heathland is dominated by hard leaved shrubs, many of which are obligate seeders. Heath grows in high rainfall areas, on infertile soils, often in exposed positions. In the Namoi, heathland is usually found in association with rocky outcrops (dry heath) and on sandstone ridges and slopes where soils are not deep or fertile enough to support trees, such as in the southern tip of the New England Tableland bioregion

Fires at a range of intervals between 7 to 30 years are recommended for maintaining biodiversity in heathlands. Within this range, variability is important as this creates the space and opportunity for large and small species with a range of responses to fire, to live together.

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Forested Wetlands

These forests typically feature hard leaved trees (paperbarks, casuarinas, eucalypts), scattered shrubs and patchy groundcover of water loving sedges and herbs. They occur on flood plains or along riparian zones. Scientists have not yet studied the role of fire in this vegetation type in any detail; however variable intervals between 7 and 35 years have been suggested.

© E. Geraghty, Hotspots Fire Project.

© R. Greenslade, Namoi CMA.

Freshwater Wetlands

Wetlands are found along inland rivers in areas that are periodically or permanently flooded with fresh water. In these floodplain areas, forests of river red gum form a mosaic with lignum shrublands and reed-beds. In their natural state these wetlands usually have a dense groundcover of water loving sedges and herbs, and provide wonderful habitat for waterbirds.

Drought, river regulation and grazing have all impacted inland wetlands. Wet-dry cycles play a vital role in maintaining their diversity, and ensuring these continue is the major issue for their survival. Fire intervals of between 7 to 35 years have been suggested for freshwater wetlands and variable fire regimes may play a role in the recruitment of some shrubs in drier heathy wetlands. However, for most other wetland types, fires rarely occur, if at all and have little ecological function. The use of fire therefore is not considered to be a practical management tool and should be avoided if possible. In some cases, these wetlands can occur on peat and peat fires can have a devastating effect on these systems and should be avoided. Freshwater wetlands are areas of great environmental sensitivity, and need to be treated with care.

Semi-arid Woodlands

Semi-arid Woodlands cover most of the western plains and the drier half of the western slopes of New South Wales. Sclerophyll trees such as eucalypts, wattles, cypress pines and she-oaks dominate these areas with drought-resistant shrubs and grasses making up the understorey. Grasses are likely to be more abundant on the occasionally inundated floodplains, while shrubs are thicker on uplands. Semi-arid woodlands are also home to many short-lived grasses and herbs.

Drought plays a major role in shaping the vegetation and also influences fire regimes. In many places fires will only burn when the grasses which flourish after good rains dry off. Though shrubs have always occurred in semi-arid woodlands, in some places they have thickened up considerably since European settlement, and lack of fire is thought to be one of several factors involved in this change. Fire frequency guidelines for semi-arid woodlands are particularly tentative due to lack of data, however intervals between 6 and 40 years have been proposed.

5. FIRE MANAGEMENT PLANNING

Introduction

If you live in a fire prone landscape, eliminating fire from your property is not a practical solution. Managing fire is an important part of living with fire, both to protect life and property and to respond to the needs of the bush.

Traditionally many landholders see their assets as being their house and property as well as the productivity of their land. In addition to this, a growing number of landholders consider the different plant and animal species on their property to be assets of real value.

If you consider native vegetation and wildlife as assets, effective planning will be essential to meeting the challenges associated with fire in the Namoi region.

This planning needs to address two goals: (1) protection of life and property and (2) protection of environmental values.

Each goal requires its own particular management strategies which can be developed and implemented at the property level. However, in particular areas of your property, these two goals may come into conflict. In these instances, the relative advantages and disadvantages need to be weighed up and tradeoffs are often inevitable.

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Protecting *all* your assets

The *Rural Fires Act (1997)* recognises ecologically sustainable development and endorses the Bush Fire Risk Management Planning process which is designed to protect life, property and the environment.

A zoning approach to fire management planning

The Bush Fire Risk Management Planning Process uses a zoning approach to fire management planning.

When planning for a prescribed burn it is important to define your objectives. The fire frequency intervals in a Strategic Fire Advantage Zone (i.e. where your objective is to protect life and property) may be shorter than those needed to protect biodiversity.

Burning native vegetation on your property usually requires environmental assessment and consent. Landholders need to apply to the NSW Rural Fire Service (RFS) for a *Bush Fire Hazard Reduction Certificate* before planning and implementing a burn. Applications for a Bush Fire Hazard Reduction Certificate are assessed under the Bush Fire Environmental Assessment Code for NSW. In processing an application to carry out a burn in a Strategic Fire Advantage or Land Management Zone, the RFS will consider the vegetation type in which the burn is to be carried out, the fire history and the recommended fire frequency intervals for that vegetation type.

A range of RFS brochures are available that provide detailed information about how to undertake a low intensity burn safely and how to maintain Asset Protection Zones.

1. Asset Protection Zones are fuel reduced areas around assets or groups of assets which are adjacent to bush fire hazards. These areas contain highly modified vegetation to prevent fire from having a pathway to the assets. Asset protection zones provide a safe *defendable space* for fire fighters and homeowners to use if there is a fire.

2. Strategic Fire Advantage Zones are strategic fuel reduced areas designed to slow a fire and reduce its intensity. These areas may need to be maintained using slashing or fuel reduction burning to provide strategically located fuel reduced areas to reduce vulnerability of assets. The NSW Rural Fire Service recommends reducing fine fuel in these zones by 50-80%.

3. Land Management Zones are areas that are managed to maintain or enhance land management objectives, including biodiversity. Fire history, vegetation type and fire frequency are important considerations in these areas. The NSW Rural Fire Service recommends burning in these zones to maintain a mosaic of areas with varying fuel loads.

4. Fire Exclusion Zones are areas where fire is actively excluded. These areas may include rainforest and other fire sensitive vegetation and some cultural/historic heritage sites and production areas.

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HOTSPOTS FIRE PROJECT
Managing fire on your property

Some key messages in planning for biodiversity conservation

The relationship between fire and biodiversity is complex, and there is still much for scientists and fire managers to learn.

However fire management planning for biodiversity conservation need not be a complex or difficult process. You can take the information in this book away with you, think about it and decide for yourself how you might be able to apply it on your own property.

Based on existing knowledge, and on the information contained in this book, the following key messages provide simple guidelines for fire planning to protect biodiversity on your property.

When making decisions on issues such as fire frequency it helps to be very clear about what your land management objectives are in different areas of your property.

You should anticipate the need for flexibility with regards to your management actions. For many landholders, this forms part of an overall adaptive management approach to biodiversity on their property.

When your objective is biodiversity protection:

1. Think about the key messages listed here; and

2. Use the recommended fire frequency intervals for the different vegetation types on your property as a guide.

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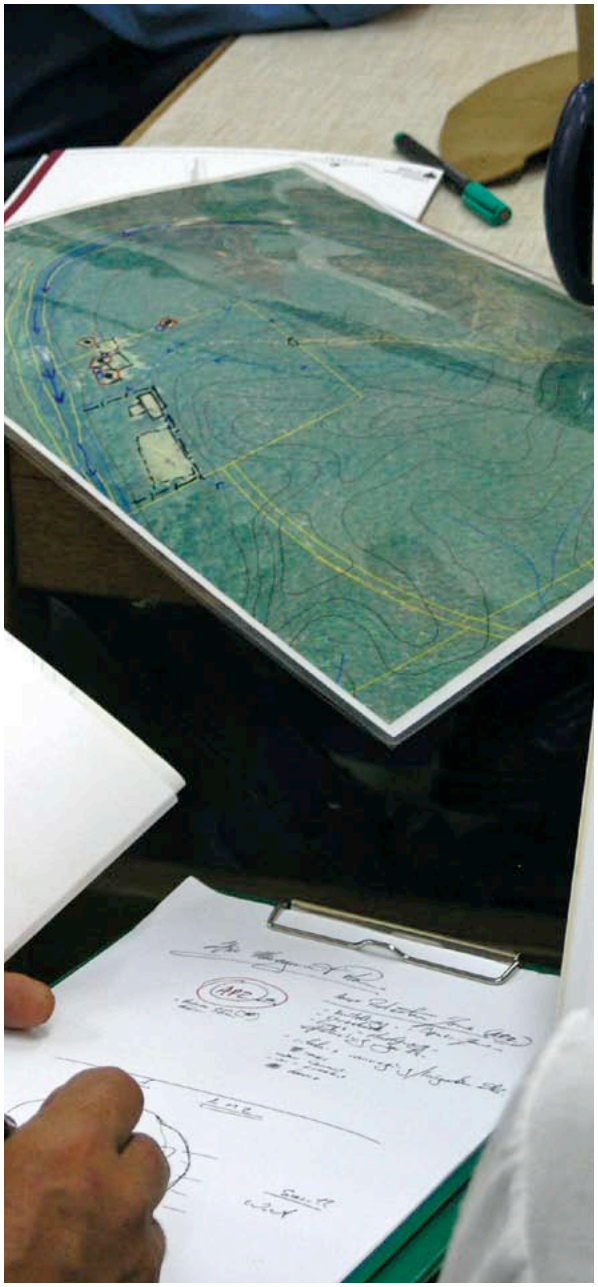
THE KEY MESSAGES

Simple principles for management

- Different vegetation types are adapted to different fire regimes.
- Both too frequent and too infrequent fire can trigger negative impacts that throw systems 'out of balance' e.g. loss of species, weed invasion.
- Even within a single vegetation type, different species have different needs in relation to fire. To address this, vary fire frequency over time and space to allow for the full range of species.
- The bush at each stage of growth after fire looks different. Each stage provides different habitat, each has value.
- Do not burn entire vegetation types at once. Patchiness provides refuges for animals and a seed source for plants to recolonise burnt areas.
- Fires occur in a landscape context. It's useful to think about how the different vegetation types in a landscape are related in terms of fire.
- Coordinate fire activities with neighbours to provide a mosaic of vegetation in different stages of post-fire development, as different animals use different stages.
- When planning how often to burn, think about unplanned as well as planned fire. Unplanned fires may happen often enough to fulfil the needs of the bush.

6. PREPARING A PROPERTY FIRE MANAGEMENT PLAN



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The following steps can help you prepare a property fire management plan:

1. Identify your property and productivity assets and map them.

- Talk to the NSW Rural Fire Service about setting up and maintaining Asset Protection Zones and Strategic Fire Advantage Zones.

2. Identify and map the vegetation types in your Land Management Zones.

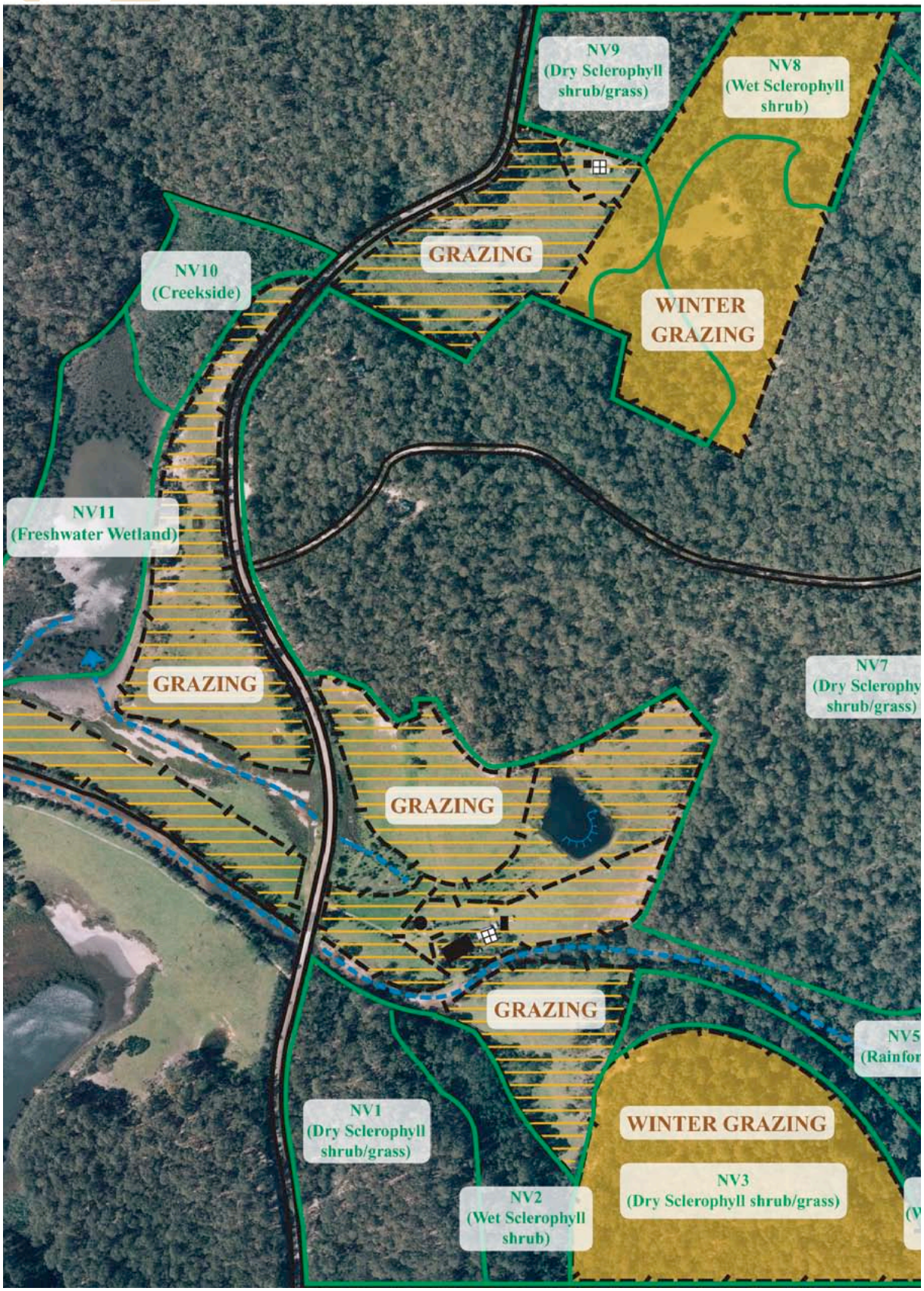
- Make a note of the fire frequency intervals recommended for the vegetation types on your property.
- How often have these vegetation types burned in the past? Note when and where fires have occurred.
- Are past fire regimes consistent with recommended regimes? Make a note of vegetation areas on your property that don't meet recommended fire regimes.
- Think about actions you could take to bring fire frequency into line with the recommendations.

3. Develop and maintain a mosaic of different stages of post-fire development.

- Do you have the resources to maintain parts of your property at different stages of development after fire?
- Could you work with your neighbours to make this happen?

4. Monitor and review.

- Keep a record of when fires occur and what areas they cover.
- Observe what happens to the vegetation, and to different species. Like all land management planning, fire planning is partly a matter of observation and responding to the needs of the land.
- Review your plan as you learn more.



Sample Map. © Photo supplied by the Department of Lands Panorama Avenue Bathurst 2795. www.lands.nsw.gov.au.

7. FIRE AND CLIMATE CHANGE

It is now generally accepted that the world is undergoing a significant change in climate.

The impacts of climate change in Australia are not yet clear although an increase in extreme weather conditions including drought, storms, floods as well as changes in rainfall (increase or decrease in different places) are anticipated.

It is possible that the frequency and intensity of fire may increase as conditions for fire (such as hot, dry conditions) increase. By 2020 in south-east Australia, days of high or extreme fire danger are forecast to increase by 5 to 25 per cent if the effects of climate change are low, and by 15 to 65 per cent if they are high[1]. For the Namoi region, this means warmer temperatures and the likelihood of more hot days.

However, it is not just climate change that will influence future fire regimes and subsequent fire management planning. Human development, settlement patterns and the changing landscape will also play an important role.

'Altered fire regimes are expected, over the coming decades, and may be one of the major ecological challenges for Australia' [2]

© R. Poole, NSW Rural Fire Service.

1 CSIRO 2007 report *Bushfire Weather in South-East Australia: Recent Trends and Projected Climate Change Impacts*.

2 Morton SR, Hoegh-Guldberg O, Lindenmayer DB, Harriss Olson M, Hughes L, McCulloch MT, McIntyre S, Nix HA, Prober SM, Saunders DA, Anderson AN, Burgman MA, Lefroy EC, LonsdaleWM, Lowe I, McMichael AJ, Parslow JS, Steffen W, Williams JE & Woinarski JCZ (2009) The big ecological questions inhibiting effective environmental management in Australia. *AustralEcology* 34: 1-9.

8. WORKING TOGETHER TO MANAGE FIRE ACROSS THE LANDSCAPE

Cooperation in the Namoi region

Fire management planning to protect life, property and the environment requires collaboration within communities, between agencies and across tenures.

In the Namoi region, this is already happening. Fire management planning, using a risk management approach, is being undertaken across the wider landscape in national parks, state forests and on public lands.

By working together, individual landholders can be part of a much broader process of fire management, whilst being able to make independent choices about fire management on their own land.

This process has a number of individual and potentially far reaching benefits. Among other things, it encourages landholders to:

- Plan and talk together about assets and how best to protect them;
- Listen to others with knowledge and ask them challenging questions; and
- Protect all of the aspects of the landscape most valued by landholders.

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Partners and collaborators

This booklet has been compiled for the Hotspots Fire Project, with input from and in consultation with a wide range of stakeholders. The information contained herein reflects our understanding at the time of publication. We are learning more about fire and the environment every day and anticipate that some recommendations may change as new information comes to hand.

For further information on this initiative contact the Hotspots Project Coordinator on (02) 9279 2466 or visit the project website:
www.hotspotsfireproject.org.au

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Hotspots also has close affiliations with the NSW Land and Property Management Authority and the NSW Landcare Inc.

The following agencies have useful websites and may be of assistance:

- Hotspots Fire Project
  www.hotspotsfireproject.org.au
- NSW Rural Fire Service
  www.rfs.nsw.gov.au
- Nature Conservation Council of NSW Bushfire Program
  www.nccnsw.org.au/bushfires
- Namoi Catchment Management Authority
  www.namoi.cma.gov.au
- Forests NSW
  www.dpi.nsw.gov.au
- Southeast Queensland Fire and Biodiversity Consortium
  www.fireandbiodiversity.org.au
- NSW State Emergency Services
  www.ses.nsw.gov.au
- NSW National Parks & Wildlife Service
  www.environment.nsw.gov.au

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Landholders and agency staff working together at a Hotspots workshop. © K. McShea, Hotspots Fire Project.

HOTSPOTS FIRE PROJECT

NSW GOVERNMENT

NSW Environmental TRUST

Nature Conservation Council of NSW

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