

# Fire responses of bushland plants after the January 1994 wildfires in northern Sydney

*P.J.Kubiak*

P.O. Box 439, Ryde, NSW 1680 AUSTRALIA

**Abstract:** In early January 1994 wildfires burned areas of bushland in northern Sydney (lat 33° 45' S, long 151° 05' E) in coastal south-eastern Australia. This paper reports observations of the fire responses for 828 species of bushland plants – 576 native species and 252 exotic species in the Lane Cove River and Narrabeen Lagoon catchment areas. Information recorded includes whether a species was killed by fire or resprouted post-fire, when seedlings were first observed following fire, and the times of first flowering and first fruiting (or spore production) after the fires. The estimated peaks of post-fire flowering or fruiting for a few species are given. It was not practicable to record data in all categories for all of the 828 species due to the logistical challenges involved in recording data across a large area of bushland, over a number of years.

The data presented add to the growing body of knowledge on plant fire responses and will assist the management and conservation of bushland in the study areas, as well as the broader Sydney region.

*Cunninghamia* (2009) 11(1): 131–165

## Introduction

Fire plays an important role in the shaping of Australia's terrestrial ecosystems and the work of many researchers has created a rich literature about fire ecology in Australia (e.g. see Gill 1975, Gill *et al.* 1981, Gill *et al.* 1991, Gill *et al.* 1994, Williams & Gill 1995, Brown & Tohver 1995, DEST 1996, Gill *et al.* 1999, Bradstock *et al.* 2002).

When considering the responses of plant species to fire, a basic distinction is often made between species that are killed by fire and those that resprout after being burnt (Gill 1981, Gill & Bradstock 1992, Keith 1992, Benson & McDougall 1993). The former group have been called 'obligate seeders' (or 'non-sprouters') and the latter 'resprouters' (or 'sprouters') (Whelan 1995). Responses to fire may vary between different populations of a plant species (Gill 1981, Williams & Gill 1995, Bond & van Wilgen 1996, Keith 1996, Auld 1996, Auld 2001). Within a given population of a plant species, the response to fire may be somewhat variable. Such variability may be due to the size/stage of development of individual plants, the intensity of any given fire, the season in which a particular fire occurs, the length of time between successive fires and/or genetic variability between and (possibly) within populations of plants (Gill 1981, Whelan 1995, Morrison 1995, Auld 1996, Bond & van Wilgen 1996, Morrison & Renwick 2000, Myerscough *et al.* 2000, Auld 2001, Whelan *et al.* 2002).

Following a fire, the time taken by plants to flower after germination from seed, is known as the 'primary juvenile period'. The time required for resprouting plants to flower following a fire is called the 'secondary juvenile period' (Gill 1975). Benson (1985) and Benson & McDougall (1993, 2005) indicated that the time taken by plants following a fire to produce mature fruits is more important to the survival of a plant species, than is the time taken to first flowering. However, the first substantial post-fire flowering may be ecologically important for animals dependent on those flowers for food, e.g. nectar and pollen-feeding insects, birds and mammals. Benson (1985) observed that the initial onset of post-fire flowering often involves only a few advanced individuals. Keith *et al.* (2002a) suggested that the initial post-fire flowering season of most obligate seeder plant species is unlikely to result in the production of many seeds. A further delaying factor, for some species, is that they produce fruits that take a relatively long time to mature (Benson 1985). The long-term survival of a plant species can often depend on the formation of a viable seedbank (either in the soil or on the plants), which may take a number of years to accumulate following the initial onset of post-fire fruiting (Benson 1985, Auld 1996, Keith 1996, Benson & McDougall 1998, Auld *et al.* 2000, Myerscough *et al.* 2000, Keith *et al.* 2002a, Keith *et al.* 2002b).

The durations of primary and secondary juvenile periods may vary between populations of a given plant species, due to factors such as differences in the amount of post-

fire rainfall, length of growing season and variations in nutrient availability and soil depth between different habitats (Bradstock & O'Connell 1988, Keith 1996, Benson & McDougall 1998, Keith *et al.* 2002a, Knox & Clarke 2004). Generally, the durations of primary juvenile periods for woody plant species are longer than those for herbaceous species (Keith 1996). Also, woody resprouters tend to have longer primary juvenile periods than woody obligate seeders (Keith 1996). Benson & McDougall (2005) indicated that the primary juvenile periods for many plant species in the bushland of the Sydney region are yet to be recorded.

The responses of flora to fire in south-eastern Australia have been studied by many researchers (see Table 1) while aspects of the fire ecology of individual Sydney plant species have also been studied (Table 2) There are a number of reviews covering fire ecology of major families in the Sydney context; Fabaceae (Auld 1996), Myrtaceae (Myerscough 1998), Proteaceae (Myerscough *et al.* 2000), Rutaceae

(Auld 2001) and Orchidaceae (Weston *et al.* 2005). Benson & McDougall (1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2005) gathered together diverse ecological information, including fire response data, for bushland plants in the Sydney region. Their work drew on both published and unpublished sources.

Between late December 1993 and mid-January 1994 wildfires occurred in many parts of eastern NSW. Major fires occurred in a number of national parks around and within Sydney (Costello 1994, Gill & Moore 1996, 1998) including the burning of sizable tracts of bushland in the Lane Cove River and Narrabeen Lagoon catchment areas of northern Sydney (NSW State Coroner 1995). These fires provided the opportunity to record some of the post-fire responses of bushland plants in the Lane Cove River and Narrabeen Lagoon catchment areas, a study that continued over nearly 6 years following the 1994 fires.

**Table 1 A selection of studies on fire responses of plant species in south-eastern Australia and the Sydney area**

Researcher	Location	Type of observation
Purdie & Slatyer (1976) Purdie (1977)	Canberra	regeneration of plant species following fires in bushland
Wark <i>et al.</i> (1987) Wark (1996, 1997, 1999, 2000)	southern coastal Victoria	responses of plants, after a high intensity wildfire
Fox & Fox (1986) Fox (1988)	Myall Lakes	categorized the modes of post-fire regeneration for plant species in woodland and forest
Myerscough <i>et al.</i> (1995) Myerscough & Clarke (2007)	Myall Lakes	fire responses of plants in coastal heaths
Benwell (1998) Clarke & Knox (2002) Knox & Clarke (2004) Clarke <i>et al.</i> (2005)	north-eastern NSW New England Tablelands	modes of post-fire regeneration of coastal heathland plant species responses of woody plants following fires
Walsh & McDougall (2004)	Kosciuszko National Park	recovery of plants in treeless subalpine vegetation after a major wildfire
<b>Sydney area studies</b>		
Siddiqi <i>et al.</i> (1976)	Bouddi NP	effects of fire on coastal heathland vegetation
Benson (1981) Benson (1985)	Agnes Banks Brisbane Water NP Glenorie	modes of regeneration after fire for plant species on a sand deposit maturation periods for some shrub species after fires
Nieuwenhuis (1987) Bradstock <i>et al.</i> (1997) Auld <i>et al.</i> (2000)	Ku-ring-gai Chase NP Brisbane Water NP Sydney area	effects of fire frequency on bushland effects of high frequency fire in a coastal heathland soil seedbank longevity of plant species

**Table 2 Individual plant species whose fire ecology has been studied in the Sydney area**

Species (family)	Researcher
<i>Acacia suaveolens</i> (Fabaceae)	Auld 1986, Auld & Myerscough 1986, Warton & Wardle 2003
<i>Angophora hispida</i> (Myrtaceae)	Auld 1987
<i>Banksia ericifolia</i> (Proteaceae)	Bradstock & Myerscough 1981, Morris & Myerscough 1988
<i>Banksia oblongifolia</i> (Proteaceae)	Zammit 1988
<i>Blandfordia nobilis</i> (Blandfordiaceae)	Johnson <i>et al.</i> 1994
<i>Eucalyptus luehmanniana</i> (Myrtaceae)	Davies & Myerscough 1991
<i>Persoonia lanceolata</i> (Proteaceae)	Auld <i>et al.</i> 2007
<i>Telopea speciosissima</i> (Proteaceae)	Bradstock 1995

Various facets of fire ecology for groupings of plant species in the Sydney region have been studied, e.g. Auld & Denham (2006), Auld & O'Connell (1991), Auld & Tozer (1995), Bradstock (1990), Bradstock (1991), Bradstock *et al.* (1994), Bradstock & Myerscough (1988), Bradstock & O'Connell (1988), Cary & Morrison (1995), Clark (1988), Denham & Auld (2002), Keith & Bradstock (1994), Kenny (2000), Morrison (1995), Morrison *et al.* (1996), Morrison & Renwick (2000), Ooi *et al.* (2006, 2007), Pannell & Myerscough (1993), Pyke (1983), Thomas *et al.* (2007), Whelan & York (1998) and Zammit & Westoby (1987).

The conservation of biodiversity is an important objective in the management of Lane Cove and Garigal National Parks, the two major reserves in the study area (e.g. see NSW NPWS 1998a, 1998b), while, in recent years, local councils, supported by the community, have also placed increasing emphasis on the conservation of the flora and fauna of many smaller bushland reserves. The increased knowledge of plant responses to fire in this present study will assist in the management, for conservation purposes, of bushland in the Narrabeen Lagoon and Lane Cove River areas. Such information may also have broader application in the management of bushland in the Sydney region, particularly when used in conjunction with the findings of other researchers.

## Methods

### *Study areas*

The Lane Cove River valley is situated in the northern Sydney metropolitan area (lat 33° 45' S, long 151° 05' E), in the Central Coast botanical subdivision of NSW. In the course of European settlement during the last two centuries much of the catchment area has been cleared, for agriculture at first, and subsequently for urban development. Large areas of native vegetation have however survived along the Lane Cove River, and much of this bushland has been protected within Lane Cove National Park (see NSW NPWS 1998a for this Park's plan of management), with smaller portions included in reserves managed by local councils.

The environmental history of the Lane Cove River valley is documented by McLoughlin (1985) and McLoughlin & Wyatt (1993) and the general vegetation by Benson & Howell (1990, 1994). Clarke & Benson (1987) mapped and described 15 vegetation types, including mangrove forest, saltmarsh, tall forest, open-forest, woodland, shrubland and riparian shrubland for Lane Cove National Park (then known as Lane Cove River State Recreation Area). Most of the surviving bushland in the Lane Cove River area is sclerophyllous and occurs on sandstone geology, described in broad terms by Keith (2004) as the Sydney Coastal Dry Sclerophyll Forests. In the Lane Cove River area, these forests are dominated by a few species of eucalypt, most commonly *Angophora costata*, *Eucalyptus piperita* and *Corymbia gummifera*. The floristic diversity of the area is high.

Plant species lists compiled for bushland in the Lane Cove River area, include Coveny (1965–78), Beecroft Cheltenham Civic Trust (1976), Lane Cove River SRA Trust (1983), STEP Inc. (1985), Kubiak (1986–89, 1996), Clarke & Benson (1987), Smith & Smith (1993) and Martyn (1994). In the Lane Cove River area, watercourses and disturbed places, such as the edges of bushland, are frequently dominated by exotic plant species.

The Narrabeen Lagoon catchment area is about 15 km north-east of the Lane Cove River catchment area and is about 8 km closer to the coast. Benson & Howell (1990, 1994) provide

general descriptions of vegetation in the Narrabeen Lagoon catchment. The floristic diversity of the Narrabeen Lagoon catchment area is comparable to that of the Lane Cove River area. Sheringham & Sanders (1993) mapped and described 21 vegetation types in the eastern section of Garigal National Park (centred on Deep Creek) including areas of open-forest, woodland, heathland, wetland, swamp and closed-forest. Heathland is much more common at the Narrabeen Lagoon area than at Lane Cove River (see Benson & Howell 1990, 1994). Plant species lists for the Narrabeen Lagoon area include Coveny (1965–75), National Trust of Australia (NSW) (1980), Kubiak (1992) and Sheringham & Sanders (1993). A plan of management has been prepared for Garigal National Park (NSW NPWS 1998b). Weed infestation in the Narrabeen Lagoon catchment area tends to be confined to some sections of major watercourses and to disturbed areas, such as the margins of bushland and along service tracks.

The management of fire for conservation purposes in the Lane Cove River and Narrabeen Lagoon catchment areas is complicated by the fragmentation of the bushland and by the pressures arising from surrounding suburban development. Clark & McLoughlin (1988) inferred what the frequency of fires may have been in the Lane Cove River area before the arrival of Europeans. Arson and the lighting of fires for management purposes are probably now the main factors influencing fire frequency. Generally, the study areas have experienced bushfires quite frequently in the recent past. However, there may be some patches of bushland within these catchments that escape being burnt for fairly long periods of time.

### *The 1994 fires*

The Lane Cove River fire began on 6 January 1994 in the Browns Waterhole area and was probably deliberately lit (NSW State Coroner 1995). During that day bushland was burnt at North Epping, South Turrumurra, Marsfield and West Pymble. Strong winds on 6 January and the following day rapidly forced fire downriver, with the spread accelerated by spotting. On 7 January, fire burnt bushland along Terrys Creek, Marsfield and downriver to Blue Gum Creek. Fire fighters backburned overnight on 7 January, along Delhi Rd. from Fullers Bridge to Plassey Rd. at North Ryde, in an attempt to contain the wildfire. However, strong winds on 8 January forced fire across Delhi Rd. into the Fairyland area and across the river into Mowbray Park and the Stringybark Creek area at Lane Cove West (NSW State Coroner 1995). The area of bushland burnt in the Lane Cove River catchment was variously estimated to be c. 383 ha (NSW NPWS 2002, DEC NSW 2005a, 2006a) or c. 580 hectares (NSW State Coroner 1995, Gill & Moore 1998). The former estimate may possibly have been limited to bushland burnt in Lane Cove National Park, whilst the latter was for all bushland 'affected' in the Lane Cove River area. The fires were generally described as being of a very high intensity (NSW State Coroner 1995).

The fire in the Narrabeen Lagoon catchment area began on 8 January 1994, having originated at Cottage Point on 7 January, and spread rapidly through the adjoining Ku-ring-gai Chase National Park (NSW State Coroner 1995). On 8 January, and over the next few days, wildfire burnt through bushland in the Deep Creek, Mullet Creek, Middle Creek, Jamieson Park and Wheeler Creek areas. This fire event was estimated to have burnt c. 1000 ha in the eastern section (centred on Deep Creek) of Garigal National Park (DEC NSW 2005b, 2006b). Additional bushland in the Narrabeen Lagoon catchment area, outside of Garigal National Park, was also burnt.

### *Field observations*

Field observations of fire responses of bushland plants were made in Lane Cove River catchment area between January 1994 and October 1999 (a period of almost 6 years), with a few occasional observations in following years (Table 3). Field observations in the Narrabeen Lagoon catchment area, including any flowering or fruiting of plants, were made between March 1994 and late October 1994 (over approximately 8 months). The longer period of study in the Lane Cove River area meant that more observations of post-fire flowering and fruiting were made for plant species in that area, than in the Narrabeen Lagoon catchment.

Observations were recorded while walking through burnt bushland after the fires. No fixed transects or quadrats were used. Observations were made along tracks, roads and walking trails throughout the study areas (Table 3). As wide a variety of habitats as possible were looked at, including bushland away from tracks and known to contain species or vegetation types that did not occur along the tracks. Most of the main tracks, and many of the minor ones, were walked at least once, and some, many times. The total distance walked, while making observations, during the course of this study was probably in the order of several hundred kilometres. The routes walked were often the same, particularly in the more intensively studied areas. Attention was given to repeatedly observing particular species at certain locations, so that parameters such as the time of first flowering and first fruiting could be recorded for some of the rarer or more localized plant species, as well as the more common species. The author's field experience in the study areas prior to the fires was drawn upon to help locate particular species that might otherwise have been overlooked. (Some new 'discoveries' of species, previously unrecorded by the author, were made following the fires). The main references used for plant identification were Harden (1990–1993, 2002), Harden & Murray (2000), Carolin & Tindale (1994), Fairley & Moore (1989) and Robinson (1991).

In the first few months following the fires, the main focus was on whether plant species in the study areas were killed by fire or had resprouted after being burnt. Sometimes the 'skeletons' of burnt plants could be found and, if these showed no sign of resprouting for some months after the fires, then

this suggested that the plants were probably killed by fire. Such skeletons occasionally retained a few scorched leaves or fruits, which helped with the identification of the species killed by the fires. Areas that had evidently experienced the highest intensity fires tended to contain far fewer identifiable plant skeletons. In these situations, the presence of woody fruits, or cones, on fatally scorched plants helped with the identification of some species. In addition, it was often possible to recall that a species had occurred at a particular site prior to that location being burnt. If such a species appeared to be absent from that same site months after the fire, or was only present in the form of post-fire seedlings, then this also helped to decide whether that species was killed in the fires. Terrestrial orchids were amongst the most difficult plants to determine, as most of them were probably seasonally dormant at the time of the fires. Presumably, the terrestrial orchids mostly sprouted from dormant subterranean tubers after the fires (as discussed by Weston *et al.* 2005).

Other data recorded, in the first few months after the fires, included the first appearance of some seedlings and the early post-fire flowering and fruiting of some plant species. As the months and years went by, the time to first flowering and fruiting was recorded for more species. The likely peaks of post-fire flowering or fruiting were also subjectively estimated for a few species. Such 'peaks' of post-fire flowering and fruiting may plateau over a number of years. These estimates are probably best regarded as broadly indicative as their estimation may have been affected by the subjective nature of the observations and by variability between and within populations. The rate of maturation tends to vary between individual plants, within any population of a given species (e.g. see Benson 1985).

### *Fire patchiness and intensity*

Benson (1985) suggested that varying fire intensities within single fire events are a common feature of fires affecting Hawkesbury sandstone vegetation in the Sydney region, and indicated that such variability may be, at least in part, due to landscape or habitat variation. Keith *et al.* (2002a) noted that topographically varied areas, such as the sandstone plateaus of the Sydney region, are likely to exhibit greater fire patchiness than areas of heathland burnt on extensive plains. Walsh & McDougall (2004) also reported variability in the wildfire intensity in the treeless subalpine vegetation of Kosciuszko National Park in southern NSW. Patches of vegetation that have not been burnt by a particular fire can act as fire 'refuges'. Such fire refuges can protect fire sensitive species and also provide sources of seed for dispersal to burnt areas after fires (Benson 1985, Williams *et al.* 1994, Gill & Bradstock 1995, Bradstock *et al.* 1997, Whelan *et al.* 2002). Morrison (2002) studied the effects of fire intensity on the plant species composition of bushland in Ku-ring-gai Chase National Park, following a wildfire of early January 1994.

The January 1994 fires in the Lane Cove River and Narrabeen Lagoon areas were generally of an apparently high intensity



**Table 3. Dates of observations of fire responses for localities in the Lane Cove River and Narrabeen Lagoon catchment areas, following the January 1994 fires.**

<b>Localities</b>	<b>Dates of observations</b>
<b>Lane Cove River catchment</b>	
Upper Stringybark Creek, Lane Cove West	1994 Apr.
Mowbray Park, Lane Cove West	1994 Feb, Apr, Jul, Oct, Dec. 1996 Jul, Sep, Oct. 1997 Mar. 1998 Sep, Oct.
Fairyland, North Ryde (south of Delhi Rd., west of Quebec Road, north-east of Epping Road & north of the river)	1994 Jan.(2), Mar, Aug.(2), Sep, Oct, Nov, Dec.(2) 1995 Jan, Mar, Apr, May (2), Jun, Aug, Sep, Oct, Dec. 1996 Apr, Aug, Oct, Dec. 1997 Jan, Apr, Sep(2), Nov. 1998 Mar, Jun, Sep, Oct. 1999 Jan., Oct. 2002 Oct. 2007 Oct.
Blue Gum Creek, Lindfield	1994 Feb, May, Jul, Oct, Nov. 1995 Sep, Dec. 1996 May, Dec. 1999 Oct.
Sir Phillip Game Reserve, Lindfield	1994 Jul.
Fullers Bridge to De Burghs Bridge, along the south (or west) bank of the river, North Ryde (variously including Plassey Road, Banksia Hill, Carter Creek, Tunks Hill, Riverside Drive, Riverside Walking Track & just north of Kobada Park)	1994 Feb, Mar.(2), Apr, May, Jun.(2), Jul, Aug.(2), Sep(2), Oct.(2), Nov, Dec. 1995 Jan, Mar, Jun, Aug, Sep.(2), Oct.(2), Nov, Dec(2) 1996 Jan.(2), Mar, Apr, May, Jun.(2), Jul, Aug.(2), Sep(2), Oct, Nov.(2) Dec. 1997 Jan, Feb, Mar, May, Jun, Jul, Aug, Sep, Oct.(2), Nov. 1998 Jun, Jul.(2), Aug.(2), Sep, Oct. 1999 Jan, Mar, Sep.(2), Oct. 2000 May 2002 Oct.
Fullers Bridge to De Burghs Bridge, north (or east) bank of the river (mostly Great North Walk)	1994 Feb, Mar, Jun, Jul, Aug, Sep, Oct, Dec. 1995 Mar, Jun, Sep, Oct. 1996 May, Aug, Sep, Oct, Nov. 1997 Feb, Aug, Nov. 1998 Aug.
De Burghs Bridge to Browns Waterhole, south bank of the river	1994 Mar.(2), May, Jun, Jul. 1995 Sep. 1996 May
De Burghs Bridge to Browns Waterhole, north bank of the river	1994 Mar.(2), Jul.(2), Aug, Sep, Oct, Dec. 1995 Sep. 1996 May, Jul, Sep. 1997 Jul, Oct, 1998 Aug. (2), Oct. 1999 Mar, Sep. (2) 2000 May. 2007 Aug.
Terrys Creek (from Somerset Park /Lucknow Park to Browns Waterhole)	1994 Mar.(2), May, Jul, Sep, Oct, Dec. 1995 Sep. 1996 May, Sep. 1997 Jul. 1998 Aug.
Upriver of Browns Waterhole, north bank of the river	1994 Mar, Sep. 1995 Mar.
Upriver of Browns Waterhole, south bank of the river	1994 Mar, Jul. 1996 May, Aug.
<b>Narrabeen Lagoon catchment</b>	
Mullet Creek area	1994 Apr, Sep.
Deep Creek area	1994 Mar, May (2), Jun, Aug, Sep.(2), Oct.
Middle Creek area	1994 Mar, Aug.
Jamieson Park	1994 Apr.
Oxford Creek area	1994 Mar, Oct.
Wheeler Creek area	1994 May, Aug.

– I noted a large proportion of the bushland burnt in both of the study areas experienced 100% tree and/or large shrub canopy scorch. However there was some patchiness— some patches were evidently burnt at low or moderate intensities, other patches of vegetation remained unburnt. During the earliest period of observations, the locations of unburnt patches were noted and plant responses in patches that were apparently burnt at lower intensities were recorded (e.g. *Muellerina eucalyptoides* (Loranthaceae) resprouted after an evidently low to moderate intensity fire). Observations of plant responses in apparently lower fire intensities were used to help understand the responses of the same species in the more severely scorched areas. For example, if a species was observed as being killed (as evidenced by the presence of scorched, dead plant skeletons) in the lower intensity areas (e.g. some of the edges of burnt areas), then this information complemented any observations that no plants of the same species could be found resprouting in the immediately adjoining areas that were evidently burnt at a higher intensity.

## Results and discussion

Fire responses for 828 vascular plant species (576 native and 252 exotic species) were recorded in bushland of the Lane Cove River and Narrabeen Lagoon catchments, following the wildfires of January 1994 (Appendix 1). In many cases it was possible to determine whether a species resprouted or was killed by the fires, and generally, the more widespread and common a species, the greater was the opportunity to reliably determine the mode of regeneration. All fire responses reported here are for individual plants whose above-ground parts were 100% scorched. The responses of individual plants that were only partly burnt are not included.

It was not practicable to record data in all of the categories for all of the 828 species of plants because of the logistical challenges for one observer recording information across large areas of bushland, over a number of years. The first post-fire flowering, or fruiting, of some of the locally rarer species may have been missed. For example, the orchid *Orthoceras strictum* is rare in the bushland of the Lane Cove River area and one plant was seen with green fruits in January 1996, but it is possible that this species may have flowered a year earlier and simply been overlooked, due to its local rarity and inconspicuous colouration.

### *Fire responses of ferns and fern allies*

The ferns and fern allies (pteridophytes) mostly resprouted after the January 1994 wildfires. The exceptions were mostly epiphytic or lithophytic species, such as *Hymenophyllum cupressiforme* (Hymenophyllaceae) and *Pyrrosia rupestris* (Polypodiaceae), which were killed when severely scorched. Most of the resprouting pteridophytes regenerated from below the ground, presumably from buried rhizomes. The treefern *Cyathea australis* (Cyatheaceae) resprouted from

the apex of the trunk after the fires. Benson & McDougall (1993) noted that old plants may survive many bushfires. *Calochlaena dubia* (Dicksoniaceae) and *Pteridium esculentum* (Dennstaedtiaceae) resprouted very vigorously but a few *Calochlaena dubia* rhizomes were apparently killed by fire, probably because they were growing in shallow soil on top of a boulder. Benson & McDougall (1993) stated that *Calochlaena dubia* is a vigorous resprouter following fire and may produce shoots within a month of burning, even in the absence of rain.

The majority of the resprouting ferns produced spores within the first year after the fires. Amongst the earliest resprouting ferns to produce spores were *Blechnum cartilagineum* (Blechnaceae), *Pteridium esculentum* (Dennstaedtiaceae) and *Todea barbara* (Osmundaceae). These species had some fronds with mature sporangia by 10 weeks (March 1994) after the fires. L. McDougall observed that vigorous regrowth of *Blechnum cartilagineum* produced fertile fronds in less than 20 weeks after a high intensity fire at Killarney Heights, in northern Sydney (Benson & McDougall 1993).

### *Fire responses of conifers*

Bond & van Wilgen (1996) stated that resprouting after fire is much rarer in conifers than in woody angiosperms. Of the few species of conifer in the study area *Callitris muelleri* (Cupressaceae) was killed by fire in the Narrabeen Lagoon area. At one site, seedlings (2 – 6 cm tall) were observed growing in the vicinity of fatally scorched adult plants, within 32 weeks of burning, and evidently grew from seed that was shed from cones, which opened after the fire, on the standing plants. Benson & McDougall (1993) recorded that this species is killed by fire and that seedling recruitment occurs mainly after fire.

Benson & McDougall (1993) documented that the low-growing coniferous shrub *Podocarpus spinulosus* (Podocarpaceae) resprouts at ground level or below, after being burnt and noted that this species probably has no soil-stored seedbank and that its seed is probably dispersed by birds. *Podocarpus spinulosus* resprouted vigorously after the 1994 fires in the Lane Cove River and Narrabeen Lagoon areas – no seedlings were observed in the burnt bushland of the Lane Cove River area in the first few years after the January 1994 fires. The resprouted male and female plants in the Lane Cove River area first started flowering in October 1995 and some mature fruit were produced by early December 1995 (c. 100 weeks after the fires). Stems of male plants occurred in groups separate from the grouped stems of female plants probably indicating spread by vegetative means.

### *Fire responses of monocotyledons*

The great majority of monocotyledons resprouted following the 1994 fires, but a few species were killed e.g. *Caustis flexuosa* and *Caustis pentandra* (Cyperaceae). D. Benson

observed *Caustis flexuosa* and *Caustis pentandra* were killed by fire at Leura swamp, in the Blue Mountains, west of Sydney (Benson & McDougall 2002). However, Williams & Clarke (2006) reported that *Caustis flexuosa* resprouted after fire, at Gibraltar Range National Park, in northern NSW.

Adams & Lawson (1984) studying the regeneration of epiphytic and lithophytic orchids (Orchidaceae) in East Gippsland, Victoria, following high intensity fires in March 1983, found that scorched individuals of *Dockrillia striolata* (*Dendrobium striolatum*) and *Thelychiton speciosus* (*Dendrobium speciosum*) showed some capacity to resprout from basal shoots. Weston *et al.* (2005) suggested that epiphytic and lithophytic orchids tend to grow in microhabitats that are less fire-prone and that *Cestichis reflexa* (*Liparis reflexa*) and *Thelychiton speciosus* are capable of resprouting after low intensity fires. In the study areas in northern Sydney the lithophytic orchids *Cestichis reflexa* and *Dockrillia linguiformis* were killed when severely scorched by the 1994 fires.

#### Post-fire flowering and fruiting of monocotyledons

Most of the monocotyledons flowered in the first year after the 1994 fires. *Imperata cylindrica* var. *major* (Poaceae) was one of the first plants to flower and fruit and vigorously resprouted, with new shoots visible within one week after the fires, flowered within 6 weeks (February 1994) and fruited within 11 weeks (March 1994). L. McDougall also observed that *Imperata* flowered prolifically within several weeks of the January 1994 high intensity fire at Narrabeen (Benson & McDougall 2005).

The four species of *Gahnia* (Cyperaceae) were amongst the slowest of the monocotyledons to flower and fruit after the fires in the Lane Cove River area (even though these *Gahnia* species resprouted vigorously). For example, the resprouting large sedge, *Gahnia clarkei*, took approximately 3 years (January 1997) following the fires, to produce fruits.

*Xanthorrhoea arborea* (Xanthorrhoeaceae) exhibited a marked delay between the post-fire development of its fruit at 63 weeks (March 1995) and the release of its seeds at c. 100 weeks (December 1995) after the study fires, in the Lane Cove River area. The related *Xanthorrhoea media* had developed its fruits at c. 49 weeks (December 1994) and was shedding its seeds at 56–63 weeks (January to March 1995), after the fires in the Lane Cove River area. Flowering of these two species occurred earlier in the Narrabeen Lagoon area (*Xanthorrhoea media*: 17–21 weeks, *Xanthorrhoea arborea*: 35–38 weeks after the fires) than in the Lane Cove River area (*Xanthorrhoea media*: 39–43 weeks, *Xanthorrhoea arborea*: flowered 51–56 weeks after the fires).

Keith (1996) recorded that in the Sydney region *Prasophyllum elatum* (Orchidaceae) flowers abundantly only after fire. In the Lane Cove River and Narrabeen Lagoon areas flowering seemed to be stimulated by the January 1994 fires and at several sites there were many more flowering stems of

*Prasophyllum elatum* present in the first flowering season (September 1994) after the fires, than had been evident before the fires. At one previously long-unburnt site in the Lane Cove River area, *Diuris maculata* flowered much more in the first post-fire flowering season (August 1994), than it had prior to being burnt.

Jones (1988, 2006) noted that a number of Australian terrestrial orchids, including *Prasophyllum elatum*, flower much more profusely in the season following a hot summer fire, and indicated that high intensity fires (such as the Ash Wednesday bushfires of February 1983) can result in spectacular flowering displays of terrestrial orchids. Beardsell *et al.* (1986) noted a dramatic increase in flowering of *Diuris maculata* following hot summer bushfires. Weston *et al.* (2005) indicated that the long-term consequences of frequent fires on populations of terrestrial orchids are poorly understood. They suggested that a regime of high frequency fire could possibly deplete populations of some terrestrial orchid species, even though their flowering might appear (initially) to be stimulated by fire.

Bond & van Wilgen (1996) stated that fire-stimulated flowering is very common in monocotyledons and Keith (1996) listed Sydney region monocotyledons that flower abundantly only after fire, including *Blandfordia nobilis* (Blandfordiaceae), *Cyathochaeta diandra* (Cyperaceae), *Haemodorum corymbosum* (Haemodoraceae) and *Xanthorrhoea media* (Xanthorrhoeaceae). The January 1994 wildfires in the Narrabeen Lagoon and Lane Cove River areas were probably an important opportunity for such species to flower, set fruit and to consequently recruit seedlings into their populations. If fires occur too infrequently, then such species can decline (Keith 1996). A few species of woody dicotyledons may also be adversely affected by a regime of infrequent fires, due to their reliance on fire-stimulated flowering, e.g. *Angophora hispida* (Myrtaceae) and *Telopea speciosissima* (Proteaceae) (Keith 1996, Keith *et al.* 2002a). However, species such as *Angophora hispida* and *Telopea speciosissima* may also be adversely affected by too high a fire frequency (Auld 1987, Bradstock 1995).

#### Fire responses and post-fire flowering/fruiting of dicotyledons

A few species of dicotyledons showed variable responses to the January 1994 fires. The shrub *Gompholobium latifolium* (Fabaceae) was killed in the Lane Cove River area, but scattered plants of this species resprouted in the Narrabeen Lagoon area. Auld (1996) recorded that variation in fire response occurs within individual species of the genus *Gompholobium* and suggested that such variability can result from a number of causes, including genetic variation within a species. *Acacia oxycedrus* (Fabaceae) was killed by fire in the Lane Cove River area, but mostly resprouted after the January 1994 fires in the Narrabeen Lagoon area. Auld (1996) noted that *Acacia oxycedrus* is one of a number of *Acacia* species in the Sydney region that exhibit a variable

fire response. The small shrub *Xanthosia pilosa* (Apiaceae) was mostly killed by the January 1994 fires in the Lane Cove River catchment area, but some plants there did resprout. L. McDougall found that *Xanthosia pilosa* displayed a variable fire response in Garigal National Park, northern Sydney (Benson & McDougall 1993). The shrub *Astrotricha longifolia* (Araliaceae) was probably mostly killed by the January 1994 fires at Lane Cove River, but a few scattered plants of this species resprouted.

Of the dicotyledons, the resprouting herb *Brunoniella pumilio* (Acanthaceae) was one of the first species to flower and fruit, and flowered within 6 weeks (February 1994) and fruited within 11 weeks (March 1994), after the fires, in the Lane Cove River area. The resprouting *Leptospermum trinervium* (Myrtaceae) was one of the earliest shrubs to produce some flowers, with one plant in the Narrabeen Lagoon area flowering 17 weeks (May 1994) after the fires. L. McDougall observed *Leptospermum trinervium* flowering from epicormic shoots 5 months after a high intensity fire (of January 1994) at Mona Vale (Benson & McDougall 1998). Myerscough & Clarke (2007) noted that *Leptospermum trinervium* flowered for the first time 307 days after a fire (of January 1991) at Myall Lakes, north of Sydney.

The flowering of some dicotyledon species peaked in the first year, or so, after the fires. For example, the herb *Lobelia dentata* (Lobeliaceae) commonly flowered in the first year after the fires, but no flowering plants of this species could be found in the Lane Cove River area within approximately two to three years after the fires. Klaphake (1995) observed that, at two locations in the Lane Cove River area, *Lobelia dentata* seemed only to appear following fire. Benson & McDougall (1997) found that this species apparently resprouted from a deeply-buried rhizome, on the Lambert Peninsula (just north of Sydney), where it flowered 6–7 months after a fire.

In bushland burnt in January 1994, in the Lane Cove River area, many individuals of the resprouting shrub *Lomatia silaifolia* (Proteaceae) flowered in December 1994 through to January 1995, though only a few individuals flowered in the following December 1996. Keith (1996) noted *Lomatia silaifolia* as one of a number of resprouting plant species in the Sydney region that flower abundantly only after fire. Denham & Whelan (2000) studied a site at Bulli Tops, south of Sydney, burnt in September 1992 and observed that most of the *Lomatia silaifolia* individuals at that locality flowered in the summer of 1993–94. However, only one plant flowered in the subsequent flowering season. Benson & McDougall (2000) noted that, in general, the secondary juvenile period for *Lomatia silaifolia* in the Sydney region is approximately one year. However, Knox & Clarke (2004) reported that resprouting *Lomatia silaifolia* did not flower within 3.5 years of experimental fires in grassy woodland on the New England Tablelands, northern NSW. They suggested that the longer primary juvenile period for several plant species in their study area, when compared with that for the same species in other regions, could be attributable to the shorter

growing season in the New England Tablelands. However, they did not discuss whether such climatic differences might also affect the secondary juvenile period of species such as *Lomatia silaifolia*.

Some dicotyledon species apparently did not produce fruits the first time that they flowered after the 1994 fires. For example, at one site in the Lane Cove River area, a few seedlings of the fire sensitive (obligate seeder) shrub *Persoonia lanceolata* (Proteaceae) flowered for the first time after the fire in January 1996. These seedlings only had a few flowers each and most of the seedlings in the same population did not flower at that time. The few plants that did flower had apparently not produced any fruits by June 1996. This apparent initial lack of fruit production may have resulted from a dearth of effective pollinators. Native bees have been recognized as the probable main pollinators of a number of *Persoonia* species in eastern Australia, including *Persoonia lanceolata* (Bernhardt & Weston 1996) and tend to forage in areas where floral resources are abundant enough to sustain their activity. So, a very small number of *Persoonia lanceolata* flowers would not be likely to attract many, if any, bees. Keith *et al.* (2002a) suggested that most obligate seeders are not likely to produce many seeds in their first post-fire reproductive season, and Whelan (1995) suggested that this could possibly result from poor pollination when flower densities are low or that the resources of the smaller plants might not be sufficient to produce seeds, even though pollination of some flowers may have occurred.

In the Lane Cove River area, the fire sensitive (bradysporous obligate seeder) shrub *Hakea dactyloides* (Proteaceae) was amongst the slowest of the dicotyledons to reproduce, taking approximately 6.5 years after the January 1994 fires to produce a few fruits. Myerscough *et al.* (2000) suggested that the primary juvenile periods for a number of bradysporous obligate seeding species in the family Proteaceae may typically range from between five and eight (or nine) years.

Auld *et al.* (2007) studied a population of *Persoonia lanceolata* (Proteaceae) in bushland in Ku-ring-gai Chase National Park burnt by an extensive wildfire in January 1994. They found that the seedlings did not flower until 6 years after the fire and that the primary juvenile period was 7–8 years.

#### *Fire ephemerals and 'fire-followers'*

Bond & van Wilgen (1996) defined fire ephemerals as plant species that emerge only after fires, are short-lived, are usually dead before the next fire and depend on fire for regeneration. Gill (1999) indicated that a few fire ephemerals occur in Australian tall open forests and rainforests, but they appear to be rare in drier eucalypt forests.

*Pelargonium inodorum* (Geraniaceae) may be one of the few species in the Lane Cove River area that could be regarded as a true 'fire ephemeral'. *Pelargonium inodorum* seemed to be a rather short-lived species, apparently disappearing from the burnt bushland by about 2 years after the fires, in



the Lane Cove River area. Benson & McDougall (1997) noted that *Pelargonium inodorum* has been recorded growing in burnt *Imperata cylindrica* grassland and also from the remains of an old campfire. Walsh & McDougall (2004) stated that *Pelargonium australe* and *Pelargonium helmsii* had been rarely collected in the alpine and subalpine vegetation of Kosciuszko National Park, before the wildfires of January 2003, but were locally abundant after those fires. They deduced that these species may have long-lived seedbanks. *Pelargonium inodorum* may also have a long-lasting soil seedbank, in the bushland of northern Sydney, where it seems to be mostly evident following disturbance, particularly fire. Another possible fire ephemeral may be *Rorippa gigantea* (Brassicaceae), which was seen flowering and beginning to form fruit along Deep Creek (Narrabeen Lagoon catchment), within 38 weeks of that area being burnt. Benson & McDougall (1994) noted that the recruitment of *Rorippa gigantea* seedlings tends to occur after disturbance and may be fire-related.

There may be a number of plant species in the study areas that do not meet the strict definition of 'fire ephemeral' (see above: Bond & van Wilgen 1996), but only tend to be abundant in recently burnt areas. These species could be regarded as 'fire-followers'. For example, Benson & McDougall (1993) observed that the seeds of *Actinotus helianthi* (Apiaceae) germinate rapidly after fire, or after other disturbance, such as clearing. They also stated that some very limited germination of *Actinotus helianthi* may occur at undisturbed sites. They noted that an abundance of this species may indicate fire within the previous few years, or that there may have been some other recent disturbance. *Actinotus helianthi* was very abundant in the burnt bushland of the Lane Cove River area in the first few years after the January 1994 fires, but its abundance declined markedly thereafter. *Actinotus helianthi* is often super-abundant in recently burnt areas, in the bushland of northern Sydney, but can persist in relatively small numbers in rocky areas that have apparently not been burnt for many years. Auld (2001) noted that some other fast-growing fire sensitive plant species, such as *Acacia suaveolens* (Fabaceae) and *Boronia serrulata* (Rutaceae), when found growing in long unburnt areas, may be restricted to the more open patches of habitat associated with sandstone rock outcrops. *Actinotus helianthi* probably cannot be regarded as a true 'fire ephemeral', given that this species may display some limited germination in undisturbed sites and may be found growing in relatively small numbers in areas of bushland that have apparently not been burnt for a long time. Whelan et al. (2002) described a pattern of post-fire increase in abundance followed by a decline, which occurs in some animal and plant species. They labelled this pattern as 'facilitation and decline'. This pattern is somewhat similar to the post-fire behaviour shown by *Actinotus helianthi*.

Another example of a 'fire-follower' may be *Pimelea linifolia* subsp. *linifolia* (Thymelaeaceae). Benson & McDougall (2001) indicated that this taxon is generally

killed by fire in the bushland of the Sydney region and often germinates in great numbers after fire. Morrison *et al.* (1995) observed that the abundance of *Pimelea linifolia* tended to decline with increasing time-since-fire and Morrison (2002) found that this taxon is more abundant in burnt areas than in unburnt areas, in sandstone vegetation of the Sydney region. Purdie & Slatyer (1976) noted that *Pimelea linifolia* tended to disappear from sclerophyll woodland near Canberra, in areas that had not been burnt for more than a decade. *Pimelea linifolia* subsp. *linifolia* was killed by the January 1994 fires and was super-abundant in parts of the bushland of the Lane Cove River area in the first few years after the fires; its abundance markedly declined in subsequent years. A few individuals can persist in bushland in northern Sydney that has apparently not been burnt for many years.

#### *Delayed seedling establishment in Persoonia pinifolia*

Seedling establishment of the obligate seeder shrub *Persoonia pinifolia* (Proteaceae) was somewhat slow after the January 1994 fires. No seedlings were seen in the vicinity of fatally scorched adults within 27–31 weeks of the fires (at several burnt sites in the Lane Cove River area and one site in the Narrabeen Lagoon catchment area). Post-fire seedlings of this species (11cm, 19cm, 29cm and 44cm tall) were first observed over 2 years after the fires (124 weeks) in the Lane Cove River area in May 1996. This apparently slow post-fire establishment could indicate that this species relies upon the importation of seed by birds after widespread fires, or that germination of seed in the soil was delayed. Auld *et al.* (2000) found that *Persoonia pinifolia* has a relatively short-lived soil seedbank that depends on annual inputs for its maintenance and that fecundity may possibly diminish with time since fire, due to predation upon its seeds; the fleshy fruits are dispersed by mammals and birds (Buchanan (1989) observed that *Persoonia pinifolia* seeds were frequently present in pellets regurgitated by pied currawongs (*Strepera graculina*) in November). For some species, such as *Persoonia pinifolia*, the primary juvenile period (as strictly defined) may be shorter than the time taken to produce fruits after fires because seedlings are slow to establish after fire.

#### *Responses of rainforest species*

Floyd (1989) noted that 'pioneer' rainforest plant species in south-eastern Australia often have features that enable them to recover following fires, e.g. the insulating, corky bark of *Endiandra sieberi* (Lauraceae) and the resprouting capabilities of species such as *Acmena smithii* (Myrtaceae) and *Synoum glandulosum* (Meliaceae). Floyd (1990) observed that some areas of warm temperate rainforest in the Blue Mountains, west of Sydney, were apparently adversely affected by more intense and/or very frequent fires. Chesterfield *et al.* (1990) found that some warm temperate rainforest species, e.g. *Acmena smithii*, resprouted after a wildfire in Victoria, but some other species were killed. Floyd (1990) and Keith (2004) indicated that a series of fires,

within a few decades, can lead to a deterioration of patches of warm temperate rainforest in southern NSW. Campbell & Clarke (2006) observed that most woody understorey rainforest species vigorously resprouted after some fires in wet sclerophyll forest, on the New England Tablelands of northern NSW. However, they found that there was generally a lack of post-fire seedling recruitment of these rainforest species. One of the areas that they studied (in Washpool National Park) was burnt by high intensity fire in 2002, but had not been previously burnt for at least 50 years.

A few rainforest species grow in some of the more sheltered, moist and fertile sites in the study areas. The wildfires in the study areas were generally of such an apparently high intensity that many of the (usually) wetter areas of vegetation, such as those containing rainforest species, were burnt. The majority of rainforest tree and shrub species in the Lane Cove River and Narrabeen Lagoon catchment areas resprouted following the fires of January 1994. For example, individuals of the species *Ceratopetalum apetalum* (Cunoniaceae), *Schizomeria ovata* (Cunoniaceae), *Trochocarpa laurina* (Ericaceae) and *Acmena smithii* (Myrtaceae) resprouted after experiencing 100% leaf scorch in the fires.

#### *Responses of exotic species*

Keith (1996) considered that fire might enhance the invasion of bushland by some weed species, particularly where other forms of disturbance are also present and suggested that the resulting competition might lead to the decline or extinction of some populations of native plant species. Gill (1999) indicated that some exotic plants, such as *Lantana camara* (Verbenaceae), can act as 'fuel species', perhaps suggesting that concentrations of such weeds may intensify fires. Milberg & Lamont (1995) observed that weed species tended to increase, following fire, in some linear roadside woodland remnants in Western Australia. Walsh & McDougall (2004) found that the weed *Cirsium vulgare* (Asteraceae) seemed to increase in the treeless subalpine vegetation of Kosciuszko National Park, following the wildfires of January 2003. Some highly invasive weeds may take advantage of fires to spread from weed-infested areas into adjoining bushland. Whelan *et al.* (2002) noted that some weed species probably do not have a long-lived, dormant seedbank and suggested that such weeds may rely on long-distance seed dispersal to re-establish populations in burnt areas after fire. In some circumstances, fires may have the potential to accelerate weed invasion of native vegetation, but weed infestation can occur in the absence of fire, especially when other forms of disturbance occur. Reidy *et al.* (2005) recorded observations of weed and native plant regeneration in Lane Cove National Park, following the fires of January 1994 and discussed the effectiveness of bush regeneration efforts after the fires.

Generally, exotic species in the Lane Cove River and Narrabeen Lagoon catchments recovered vigorously following the January 1994 wildfires. Many populations of weed species rapidly re-established themselves by

growing from soil seedbanks and/or by resprouting after the fires. For example, in the study areas, the troublesome environmental weeds *Ligustrum sinense* (Oleaceae), *Rubus ?discolor* (Rosaceae) and *Lantana camara* (Verbenaceae) all resprouted quickly and vigorously after the fires. These resprouting weed species subsequently flowered and fruited profusely in the burnt parts of the Lane Cove River area, within a handful of years after the fires of January 1994.

In the Lane Cove River bushland, seedlings of the exotic shrub *Chrysanthemoides monilifera* subsp. *monilifera* (Asteraceae) were observed 19 weeks after the January 1994 fires, growing in the immediate vicinity of fatally scorched adult plants. These post-fire seedlings flowered in September 1995 and had produced mature fruits by December 1995. It seems that *Chrysanthemoides monilifera* subsp. *monilifera* may have as fast a rate of maturation as (if not faster than) a number of fire-sensitive native shrub species, of a similar size, in the study areas. This could be one factor enabling this weed to compete with native plants. Weiss (1984) and DEC NSW (2006c) noted that *Chrysanthemoides monilifera* subsp. *monilifera* is killed by fire. Wark *et al.* (1987) and Wark (1999) observed that there was prolific germination of this taxon, following wildfire in some bushland areas of the north-eastern Otway ranges, in Victoria. Weiss *et al.* (1998) noted that *Chrysanthemoides monilifera* subsp. *monilifera* can flower rapidly in burnt areas.

A few of the exotic species recorded post-fire, e.g. *Helianthus annuus* (Asteraceae), possibly grew from seed deliberately introduced by people into the bushland after the January 1994 fires, to feed the surviving populations of native birds. Some of the other exotic species may have entered the burnt bushland as seed from adjoining unburnt areas, in the aftermath of the fires e.g. the seeds of many exotic Asteraceae species could easily have been blown into the burnt areas from adjoining unburnt weed thickets and surrounding suburban areas. Also, birds and flowing streams may have introduced some weed seed into the burnt bushland after the fires. Buchanan (1989) found evidence to indicate that the pied currawong (*Strepera graculina*) is an important agent in the dispersal of some major environmental weeds, such as *Ligustrum sinense*, *Ligustrum lucidum* and *Lantana camara*, in the Lane Cove River area.

#### **Concluding remarks**

In general, the majority of the observations recorded in this study are similar to the findings of many other researchers. Most of the recorded differences between various studies, in parameters such as the time to first flowering after fire, or in the mode of regeneration for a given species, are probably due to natural variations in populations and conditions between different study sites and study dates. Benson & McDougall (1998, 2005) briefly discussed such variations, with respect to some contradictory observations of fire responses reported for some of the species in their *Ecology of*

*Sydney Plant Species* series of papers. However, it is possible that some of the discrepancies in the recorded modes of regeneration of particular species may be due to occasional errors by observers. For example, following the January 1994 fires in the Lane Cove River area, I observed *Lobelia dentata* flowering in many long unburnt localities, where I had not previously recorded this species. Subsequently, I assumed that many of these plants were probably seedlings, even though I had not seen any cotyledons on these plants, immediately after their first post-fire emergence. However, my assumption may have been incorrect, as Benson & McDougall (1997) observed that *Lobelia dentata* apparently resprouted after fire from a very deeply-buried fleshy rhizome, at one locality in the Sydney region.

The observations reported in this paper provide useful information for the conservation of bushland in the broader Sydney region, and in particular for planning of fire management for bushland in the Lane Cove River and Narrabeen Lagoon catchments. For example, basic information such as the time a plant species takes to first produce fruits, following fire, can be used in the estimation of 'fire interval thresholds', as discussed by Bradstock *et al.* (1995) and Keith *et al.* (2002b). Such guidelines for bushland management can be refined, as more researchers record their observations of the responses of plants to various fires in different areas of bushland.

## Acknowledgements

I would like to thank the librarians at the National Herbarium of New South Wales, Royal Botanic Gardens, Sydney for providing access to some unpublished floristic lists. I appreciate the encouragement that was provided by Doug Benson and Lyn McDougall, when they welcomed contributions to their *Ecology of Sydney Plant Species* project. I would also like to thank the anonymous referee for making many detailed suggestions that helped to improve the organisation and presentation of this paper, Tony Auld for suggesting the term 'fire-followers' and drawing my attention to his work on *Persoonia lanceolata*, and Doug Benson for creating Tables 1 and 2.

## References

- Adams, P.B. & Lawson, S.D. (1984) The effects of bushfire on Victorian epiphytic and lithophytic orchids. *The Orchadian* 7(12): 282–286.
- Auld, T.D. (1986) Population dynamics of the shrub *Acacia suaveolens* (Sm.) Willd.: Fire and the transition to seedlings. *Australian Journal of Ecology* 11: 373–385.
- Auld, T.D. (1987) Post-fire demography in the resprouting shrub *Angophora hispida* (Sm.) Blaxell: Flowering, seed production, dispersal, seedling establishment and survival. *Proceedings of the Linnean Society of New South Wales* 109(4): 259–269.

- Auld, T.D. (1996) Ecology of the Fabaceae in the Sydney region: fire, ants and the soil seedbank. *Cunninghamia* 4(4): 531–551.
- Auld, T.D. (2001) The ecology of the Rutaceae in the Sydney region of south-eastern Australia: Poorly known ecology of a neglected family. *Cunninghamia* 7(2): 213–239.
- Auld, T.D. & Denham, A.J. (2006) How much seed remains in the soil after a fire? *Plant Ecology* 187: 15–24.
- Auld, T.D., Denham, A.J. & Turner, K. (2007) Dispersal and recruitment dynamics in the fleshy-fruited *Persoonia lanceolata* (Proteaceae). *Journal of Vegetation Science* 18: 903–910.
- Auld, T.D., Keith, D.A. & Bradstock, R.A. (2000) Patterns in longevity of soil seedbanks in fire-prone communities of south-eastern Australia. *Australian Journal of Botany* 48(4): 539–548.
- Auld, T.D. & Myerscough, P.J. (1986) Population dynamics of the shrub *Acacia suaveolens* (Sm.) Willd.: Seed production and predispersal seed predation. *Australian Journal of Ecology* 11: 219–234.
- Auld, T.D. & O'Connell, M.A. (1991) Predicting patterns of post-fire germination in 35 eastern Australian Fabaceae. *Australian Journal of Ecology* 16: 53–70.
- Auld, T.D. & Tozer, M. (1995) Patterns in emergence of *Acacia* and *Grevillea* seedlings after fire. *Proceedings of the Linnean Society of New South Wales* 115: 5–15.
- Beardsell, D.V., Clements, M.A., Hutchinson, J.F. & Williams, E.G. (1986) Pollination of *Diuris maculata* R. Br. (Orchidaceae) by floral mimicry of the native legumes *Daviesia* spp. and *Pultenaea scabra* R. Br.. *Australian Journal of Botany* 34: 165–173.
- Beecroft Cheltenham Civic Trust (1976) *A plan of management for Pennant Hills Park and some surrounding bushland* (Beecroft Cheltenham Civic Trust: Sydney).
- Benson, D.H. (1979) Native vegetation of Deep Creek, Narrabeen. (Unpublished report).
- Benson, D.H. (1981) Vegetation of the Agnes Banks sand deposit, Richmond, New South Wales. *Cunninghamia* 1(1): 35–57.
- Benson, D.H. (1985) Maturation periods for fire-sensitive shrub species in Hawkesbury sandstone vegetation. *Cunninghamia* 1(3): 339–349.
- Benson, D. & Howell, J. (1990) *Taken for granted: the bushland of Sydney and its suburbs* (Kangaroo Press: Kenthurst).
- Benson, D. & Howell, J. (1994) The natural vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* 3(4): 677–787.
- Benson, D. & McDougall, L. (1993) Ecology of Sydney plant species, part 1: Ferns, fern-allies, cycads, conifers and dicotyledon families Acanthaceae to Asclepiadaceae. *Cunninghamia* 3(2): 257–422.
- Benson, D. & McDougall, L. (1994) Ecology of Sydney plant species, part 2: Dicotyledon families Asteraceae to Buddlejaceae. *Cunninghamia* 3(4): 789–1004.
- Benson, D. & McDougall, L. (1995) Ecology of Sydney plant species, part 3: Dicotyledon families Cabombaceae to Eupomatiaceae. *Cunninghamia* 4(2): 217–431.
- Benson, D. & McDougall, L. (1996) Ecology of Sydney plant species, part 4: Dicotyledon family Fabaceae. *Cunninghamia* 4(4): 553–752.
- Benson, D. & McDougall, L. (1997) Ecology of Sydney plant species, part 5: Dicotyledon families Flacourtiaceae to Myrsinaceae. *Cunninghamia* 5(2): 330–544.
- Benson, D. & McDougall, L. (1998) Ecology of Sydney plant species, part 6: Dicotyledon family Myrtaceae. *Cunninghamia* 5(4): 808–987.
- Benson, D. & McDougall, L. (1999) Ecology of Sydney plant species, part 7a: Dicotyledon families Nyctaginaceae to Primulaceae. *Cunninghamia* 6(2): 402–509.



- Benson, D. & McDougall, L. (2000) Ecology of Sydney plant species, part 7b: Dicotyledon families Proteaceae to Rubiaceae. *Cunninghamia* 6(4): 1016–1202.
- Benson, D. & McDougall, L. (2001) Ecology of Sydney plant species, part 8: Dicotyledon families Rutaceae to Zygophyllaceae. *Cunninghamia* 7(2): 241–462.
- Benson, D. & McDougall, L. (2002) Ecology of Sydney plant species, part 9: Monocotyledon families Agavaceae to Juncaginaceae. *Cunninghamia* 7(4): 695–930.
- Benson, D. & McDougall, L. (2005) Ecology of Sydney plant species, part 10: Monocotyledon families Lemnaceae to Zosteraceae. *Cunninghamia* 9(1): 16–212.
- Benwell, A.S. (1998) Post-fire seedling recruitment in coastal heathland in relation to regeneration strategy and habitat. *Australian Journal of Botany* 46: 75–101.
- Bernhardt, P. & Weston, P.H. (1996) The pollination ecology of *Persoonia* (Proteaceae) in eastern Australia. *Telopea* 6(4): 775–804.
- Bond, W.J. & van Wilgen, B.W. (1996) *Fire and plants* (Chapman & Hall: London).
- Bradstock, R.A. (1990) Demography of woody plants in relation to fire: *Banksia serrata* Lf. and *Isopogon anemonifolius* (Salisb.) Knight. *Australian Journal of Ecology* 15: 117–132.
- Bradstock, R.A. (1991) The role of fire in establishment of seedlings of serotinous species from the Sydney region. *Australian Journal of Botany* 39: 347–356.
- Bradstock, R.A. (1995) Demography of woody plants in relation to fire: *Telopea speciosissima*. *Proceedings of the Linnean Society of New South Wales* 115: 25–33.
- Bradstock, R.A., Gill, A.M., Hastings, S.M. & Moore, P.H.R. (1994) Survival of serotinous seedbanks during bushfires: Comparative studies of *Hakea* species from southeastern Australia. *Australian Journal of Ecology* 19: 276–282.
- Bradstock, R.A., Keith, D.A. & Auld, T.D. (1995) Fire and conservation: imperatives and constraints on managing for diversity. pp. 323–333. In: R.A. Bradstock, T.D. Auld, D.A. Keith, R.T. Kingsford, D. Lunney & D.P. Siversten (eds.) *Conserving biodiversity: Threats and solutions* (Surrey Beatty & Sons: Sydney).
- Bradstock, R.A. & Myerscough, P.J. (1981) Fire effects on seed release and the emergence and establishment of seedlings in *Banksia ericifolia* L.f.. *Australian Journal of Botany* 29: 521–531.
- Bradstock, R.A. & Myerscough, P.J. (1988) The survival and population response to frequent fires of two woody resprouters *Banksia serrata* and *Isopogon anemonifolius*. *Australian Journal of Botany* 36: 415–431.
- Bradstock, R.A. & O'Connell, M.A. (1988) Demography of woody plants in relation to fire: *Banksia ericifolia* L.f. and *Petrophile pulchella* (Schrader) R.Br. *Australian Journal of Ecology* 13(4): 505–518.
- Bradstock, R.A., Tozer, M.G. & Keith, D.A. (1997) Effects of high frequency fire on floristic composition and abundance in a fire-prone heathland near Sydney. *Australian Journal of Botany* 45: 641–655.
- Bradstock, R.A., Williams, J.E. & Gill, A.M. (eds.) (2002) *Flammable Australia: The fire regimes and biodiversity of a continent* (Cambridge University Press: Cambridge).
- Brown, C. & Tohver, L. (1995) *Bushfire! Looking to the future* (Envirobook Publishing: Sydney).
- Buchanan, R.A. (1989) Pied currawongs (*Strepera graculina*): their diet and role in weed dispersal in suburban Sydney, New South Wales. *Proceedings of the Linnean Society of New South Wales* 111(4): 241–255.
- Campbell, M.L. & Clarke, P.J. (2006) Response of montane wet sclerophyll forest understorey species to fire: Evidence from high and low intensity fires. *Proceedings of the Linnean Society of New South Wales* 127: 63–73.
- Carolin, R.C. & Tindale, M.D. (1994) *Flora of the Sydney region* (Reed: Chatswood).
- Cary, G.J. & Morrison, D.A. (1995) Effects of fire frequency on plant species composition of sandstone communities in the Sydney region: Combinations of inter-fire intervals. *Australian Journal of Ecology* 20: 418–426.
- Chesterfield, E.A., Taylor, S.J. & Molnar, C.D. (1990) *Recovery after wildfire: warm temperate rainforest at Jones Creek. Technical Report Series No. 101*. (Arthur Rylah Institute for Environmental Research: Melbourne).
- Clark, S.S. (1988) Effects of hazard-reduction burning on populations of understorey plant species on Hawkesbury sandstone. *Australian Journal of Ecology* 13: 473–484.
- Clark, S.S. & McLoughlin, L.C. (1986) Historical and biological evidence for fire regimes in the Sydney region prior to the arrival of Europeans: implications for future bushland management. *Australian Geographer* 17: 101–112.
- Clarke, P.J. & Benson, D.H. (1987) *Vegetation survey of Lane Cove River State Recreation Area* (Royal Botanic Gardens: Sydney).
- Clarke, P.J. & Knox, K.J.E. (2002) Post-fire response of shrubs in the tablelands of eastern Australia: do existing models explain habitat differences? *Australian Journal of Botany* 50: 53–62.
- Clarke, P.J., Knox, K.J.E., Wills, K.E. & Campbell, M. (2005) Landscape patterns of woody plant response to crown fire: disturbance and productivity influence sprouting ability. *Journal of Ecology* 93(3): 544–555.
- Costello, S (ed.) (1994) *New South Wales burning*. (Sesta Pty Ltd: Melbourne).
- Coveny, R. (1965–1975) *Deep Creek, Narrabeen – plant checklist* (Unpublished).
- Coveny, R. (1965–1978) *Cheltenham – plant checklist* (Unpublished).
- Davies, S.J. & Myerscough, P.J. (1991) Post-fire demography of the wet-mallee *Eucalyptus luehmanniana* F. Muell. (Myrtaceae). *Australian Journal of Botany* 39: 459–466.
- Denham, A.J. & Auld, T.D. (2002) Flowering, seed dispersal, seed predation and seedling recruitment in two pyrogenic flowering resprouters. *Australian Journal of Botany* 50: 545–557.
- Denham, A.J. & Whelan, R.J. (2000) Reproductive ecology and breeding system of *Lomatia silaifolia* (Proteaceae) following a fire. *Australian Journal of Botany* 48(2): 261–269.
- Department of Environment and Conservation NSW (2005a) *Lane Cove National Park fire management plan* (National Parks and Wildlife Service: Sydney).
- Department of Environment and Conservation NSW (2005b) *Kuring-gai Chase and Garigal National Parks fire management plan* (National Parks and Wildlife Service: Sydney).
- Department of Environment and Conservation NSW (2006a) *Lane Cove National Park, Wallumatta Nature Reserve and Dalrymple Hay Nature Reserve fire management strategy* (National Parks and Wildlife Service: Sydney).
- Department of Environment and Conservation NSW (2006b) *Garigal National Park fire management strategy* (National Parks and Wildlife Service: Sydney).
- Department of Environment and Conservation NSW (2006c) *Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed): Threat abatement plan*. (DEC NSW: Hurstville).



- Department of Environment, Sport and Territories (1996) *Fire and biodiversity: The effects and effectiveness of fire management* (Biodiversity Unit, DEST: Canberra).
- Fairley, A. & Moore, P. (1989) *Native plants of the Sydney district: an identification guide* (Kangaroo Press: Kenthurst).
- Floyd, A.G. (1989) *Rainforest trees of mainland south-eastern Australia* (Inkata Press: Melbourne).
- Floyd, A.G. (1990) *Australian rainforests in New South Wales* (Surrey Beatty & Sons Pty Ltd: Sydney).
- Fox, M.D. (1988) Understorey changes following fire at Myall Lakes, New South Wales. *Cunninghamia* 2(1): 85–95.
- Fox, M.D. & Fox, B.J. (1986) The effect of fire frequency on the structure and floristic composition of a woodland understorey. *Australian Journal of Ecology* 11: 77–85.
- Gill, A.M. (1975) Fire and the Australian flora: a review. *Australian Forestry* 38(1): 4–25.
- Gill, A.M. (1981) Adaptive responses of Australian vascular plant species to fires. pp. 243–271. In: A.M. Gill, R.H. Groves & I.R. Noble (eds.) *Fire and the Australian biota* (Australian Academy of Science: Canberra).
- Gill, A.M. (1999) Biodiversity and bushfires: an Australia-wide perspective on plant-species changes after a fire event. pp. 9–53. In: A.M. Gill, J.C.Z. Woinarski & A. York (eds.) *Australia's biodiversity – responses to fire. Biodiversity Technical Paper, No. 1* (Department of the Environment and Heritage: Canberra).
- Gill, A.M. & Bradstock, R.A. (1992) A national register for the fire responses of plant species. *Cunninghamia* 2(4): 653–660.
- Gill, A.M. & Bradstock, R. (1995) Extinction of biota by fires. pp. 309–322. In: R.A. Bradstock, T.D. Auld, D.A. Keith, R.T. Kingsford, D. Lunney & D.P. Sivertsen (eds.) *Conserving biodiversity: Threats and solutions* (Surrey Beatty & Sons: Sydney).
- Gill, A.M., Groves, R.H. & Noble, I.R. (eds.) (1981). *Fire and the Australian biota* (Australian Academy of Science: Canberra).
- Gill, A.M. & Moore, P.H.R. (1996) Regional and historical fire weather patterns pertinent to the January 1994 Sydney bushfires. *Proceedings of the Linnean Society of New South Wales* 116: 27–36.
- Gill, A.M. & Moore, P.H.R. (1998) Big versus small fires: the bushfires of greater Sydney, January 1994. pp. 49–68. In: J.M. Moreno (ed.) *Large forest fires*. (Backhuys Publishers: Leiden).
- Gill, A.M., Moore, P.H.R. & Armstrong, J.P. (1991) *Bibliography of fire ecology in Australia*. Edition 3 (Department of Bush Fire Services).
- Gill, A.M., Moore, P.H.R. & Martin, W.K. (1994) *Bibliography of fire ecology in Australia (including fire science and fire management)*. Edition 4 (NSW National Parks and Wildlife Service: Hurstville).
- Gill, A.M., Woinarski, J.C.Z. & York, A. (1999) *Australia's biodiversity – responses to fire. Biodiversity Technical Paper, No. 1* (Department of the Environment and Heritage: Canberra).
- Harden, G.J. (ed.) (1990–1993) *Flora of New South Wales*. Vols. 1–4 (New South Wales University Press: Sydney).
- Harden, G.J. (ed.) (2002) *Flora of New South Wales*. Vol. 2, Revised Edition (University of New South Wales Press: Sydney).
- Harden, G.J. & Murray, L.J. (eds.) (2000) *Supplement to Flora of New South Wales, Volume 1* (University of New South Wales Press Ltd: Sydney).
- Johnson, K.A., Morrison, D.A. & Goldsack, G. (1994) Post-fire flowering patterns in *Blandfordia nobilis* (Liliaceae). *Australian Journal of Botany* 42: 49–60.
- Jones, D.L. (1988) *Native orchids of Australia* (Reed Books Pty Ltd: Sydney).
- Jones, D.L. (2006) *A complete guide to native orchids of Australia, including the island territories*. (Reed New Holland: Sydney).
- Keith, D. (1992) Fire and the conservation of native bushland plants. *National Parks Journal* 36(5): 20–22.
- Keith, D. (1996) Fire-driven extinction of plant populations: a synthesis of theory and review of evidence from Australian vegetation. *Proceedings of the Linnean Society of New South Wales* 116: 37–78.
- Keith, D.A. (2004) *Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT* (Department of Environment and Conservation (NSW): Hurstville).
- Keith, D.A. & Bradstock, R.A. (1994) Fire and competition in Australian heath: a conceptual model and field investigations. *Journal of Vegetation Science* 5(3): 347–354.
- Keith, D.A., McCaw, W.L. & Whelan, R.J. (2002a) Fire regimes in Australian heathlands and their effects on plants and animals. pp. 199–237. In: R.A. Bradstock, J.E. Williams & A.M. Gill (eds.) *Flammable Australia: The fire regimes and biodiversity of a continent* (Cambridge University Press: Cambridge).
- Keith, D.A., Williams, J.E. & Woinarski, J.C.Z. (2002b) Fire management and biodiversity conservation: key approaches and principles. pp. 401–425. In: R.A. Bradstock, J.E. Williams & A.M. Gill (eds.) *Flammable Australia: The fire regimes and biodiversity of a continent* (Cambridge University Press: Cambridge).
- Kenny, B.J. (2000) Influence of multiple fire-related germination cues on three Sydney *Grevillea* (Proteaceae) species. *Austral Ecology* 25(6): 664–669.
- Klaphake, V. (1995) Case study: Warraroon Reserve in the Lane Cove River valley. pp.40–43. In: C. Brown & L. Tohver (eds.) *Bushfire! Looking to the future*. (Envirobook Publishing: Sydney).
- Knox, K.J.E. & Clarke, P.J. (2004) Fire response syndromes of shrubs in grassy woodlands in the New England Tableland Bioregion. *Cunninghamia* 8(3): 348–353.
- Kubiak, P.J. (1986–1989) *A floristic list of the natural vegetation of the Lane Cove River catchment area* (Unpublished).
- Kubiak, P.J. (1992) *Narrabeen Lagoon catchment area – floristic list (excluding exotic species)* (Unpublished).
- Kubiak, P.J. (1996) *Lane Cove National Park – floristic list (excluding exotic species)* (Unpublished).
- Lane Cove River SRA Trust (1983) *Lane Cove River State Recreation Area* (Lane Cove River State Recreation Area Trust: Chatswood).
- Martyn, J. (1994) *A field guide to the bushland of the upper Lane Cove Valley* (STEP Inc.: Turramurra).
- McLoughlin, L. (1985) *The middle Lane Cove River: a history and a future*. Monograph No. 1 (Centre for Environmental and Urban Studies, Macquarie University: Sydney).
- McLoughlin, L. & Wyatt, M. (1993) *The upper Lane Cove: History, heritage, bibliography* (Graduate School of the Environment, Macquarie University: Sydney).
- Milberg, P. & Lamont, B.B. (1995) Fire enhances weed invasion of roadside vegetation in southwestern Australia. *Biological Conservation* 73: 45–49.
- Morris, E.C. & Myerscough, P.J. (1988) Survivorship, growth and self-thinning in *Banksia ericifolia*. *Australian Journal of Ecology* 13: 181–189.
- Morrison, D.A. (1995) Some effects of low-intensity fires on populations of co-occurring small trees in the Sydney region. *Proceedings of the Linnean Society of New South Wales* 115: 109–119.

- Morrison, D.A. (2002) Effects of fire intensity on plant species composition of sandstone communities in the Sydney region. *Austral Ecology* 27(4): 433–441.
- Morrison, D.A., Buckney, R.T., Bewick, B.J. & Cary, G.J. (1996) Conservation conflicts over burning bush in south-eastern Australia. *Biological Conservation* 76: 167–175.
- Morrison, D.A., Cary, G.J., Pengelly, S.M., Ross, D.G., Mullins, B.J., Thomas, C.R. & Anderson, T.S. (1995) Effects of fire frequency on plant species composition of sandstone communities in the Sydney region: Inter-fire interval and time-since-fire. *Australian Journal of Ecology* 20: 239–247.
- Morrison, D.A. & Renwick, J.A. (2000) Effects of variation in fire intensity on regeneration of co-occurring species of small trees in the Sydney region. *Australian Journal of Botany* 48(1): 71–79.
- Myerscough, P.J. (1998) Ecology of Myrtaceae with special reference to the Sydney region. *Cunninghamia* 5(4): 787–807.
- Myerscough, P.J. & Clarke, P.J. (2007) Burnt to blazes: landscape fires, resilience and habitat interaction in frequently burnt coastal heath. *Australian Journal of Botany* 55: 91–102.
- Myerscough, P.J., Clarke, P.J. & Skelton, N.J. (1995) Plant coexistence in coastal heaths: Floristic patterns and species attributes. *Australian Journal of Ecology* 20: 482–493.
- Myerscough, P.J., Whelan, R.J. & Bradstock, R.A. (2000) Ecology of Proteaceae with special reference to the Sydney region. *Cunninghamia* 6(4): 951–1015.
- National Trust of Australia (NSW) (1980) *Narrabeen Lagoon survey*. (National Trust of Australia (NSW): Sydney).
- Nieuwenhuis, A. (1987) The effect of fire frequency on the sclerophyll vegetation of the West Head, New South Wales. *Australian Journal of Ecology* 12: 373–385.
- NSW National Parks and Wildlife Service (1998a) *Lane Cove National Park plan of management*.
- NSW National Parks and Wildlife Service (1998b) *Garigal National Park plan of management*.
- NSW National Parks and Wildlife Service (2002) *Draft fire management plan – Lane Cove National Park*. (NSW NPWS: Sydney).
- NSW State Coroner (1995) *New South Wales bushfire inquiry – findings*. (Coroners Court: Westmead).
- Ooi, M.K.J., Auld, T.D. & Whelan, R.J. (2006) Dormancy and the fire-centric focus: Germination of three *Leucopogon* species (Ericaceae) from south-eastern Australia. *Annals of Botany* 98: 421–430.
- Ooi, M.K.J., Auld, T.D. & Whelan, R.J. (2007) Distinguishing between persistence and dormancy in soil seed banks of three shrub species from fire-prone southeastern Australia. *Journal of Vegetation Science* 18: 405–412.
- Pannell, J.R. & Myerscough, P.J. (1993) Canopy-stored seed banks of *Allocasuarina distyla* and *A. nana* in relation to time since fire. *Australian Journal of Botany* 41:1–9.
- Purdie, R.W. (1977) Early stages of regeneration after burning in dry sclerophyll vegetation. I: Regeneration of the understorey by vegetative means. *Australian Journal of Botany* 25: 21–34.
- Purdie, R.W. & Slatyer, R.O. (1976) Vegetation succession after fire in sclerophyll woodland communities in south-eastern Australia. *Australian Journal of Ecology* 1: 223–236.
- Pyke, G.H. (1983) Relationship between time since fire and flowering in *Telopea speciosissima* R. Br. and *Lambertia formosa* Sm.. *Australian Journal of Botany* 31: 293–296.
- Reidy, M., Chevalier, W. & McDonald, T. (2005) Lane Cove National Park Bushcare volunteers: Taking stock, 10 years on. *Ecological Management and Restoration* 6(2): 94–104.
- Robinson, L. (1991) *Field guide to the native plants of Sydney* (Kangaroo Press: Kenthurst).
- Sheringham, P.R. & Sanders, J.M. (1993) *Vegetation survey of Garigal National Park and surrounding crown lands* (NSW National Parks and Wildlife Service: Sydney).
- Siddiqi, M.Y., Carolin, R.C. & Myerscough, P.J. (1976) Studies in the ecology of coastal heath in New South Wales. III. Regrowth of vegetation after fire. *Proceedings of the Linnean Society of New South Wales* 101(1): 53–63.
- Smith, J. & Smith, P. (1993) *Vegetation and fauna of Pennant Hills Park* (report prepared for Hornsby Shire Council).
- STEP Inc. (1985) *A plan of management for South Turramurra bushland. Second edition* (STEP Inc.: Turramurra).
- Thomas, P.B., Morris, E.C. & Auld, T.D. (2007) Response surfaces for the combined effects of heat shock and smoke on germination of 16 species forming soil seed banks in south-east Australia. *Austral Ecology* 32: 605–616.
- Walsh, N.G. & McDougall, K.L. (2004) Progress in the recovery of the flora of treeless subalpine vegetation in Kosciuszko National Park after the 2003 fires. *Cunninghamia* 8(4): 439–452.
- Wark, M.C. (1996) Regeneration of heath and heath woodland in the north-eastern Otway Ranges three to ten years after the wildfire of February 1983. *Proceedings of the Royal Society of Victoria* 108(2): 121–142.
- Wark, M.C. (1997) Regeneration of some forest and gully communities in the Angahook–Lorne State Park (north-eastern Otway Ranges) 1–10 years after the wildfire of February 1983. *Proceedings of the Royal Society of Victoria* 109(1): 7–36.
- Wark, M.C. (1999) Regeneration of *Melaleuca lanceolata* Otto. and *Melaleuca squarrosa* Donn ex Sm. communities of the coast and river valleys in the north-eastern Otway Ranges 1–10 years after the wildfire of February 1983. *Proceedings of the Royal Society of Victoria* 111(2): 173–213.
- Wark, M.C. (2000) After the 1983 wildfire: the Anglesea vegetation regeneration project – how it grew. *The Victorian Naturalist* 117(3): 96–106.
- Wark, M.C., White, M.D., Robertson, D.J. & Marriott, P.F. (1987) Regeneration of heath and heath woodland in the north-eastern Otway Ranges following the wildfire of February 1983. *Proceedings of the Royal Society of Victoria* 99(2): 51–88.
- Warton, D.I. & Wardle, G.M. (2003) Site-to-site variation in the demography of a fire-affected perennial, *Acacia suaveolens*, at Ku-ring-gai Chase National Park, New South Wales, Australia. *Austral Ecology* 28: 38–47.
- Weiss, P.W. (1984) Seed characteristics and regeneration of some species in invaded coastal communities. *Australian Journal of Ecology* 9(2): 99–106.
- Weiss, P.W., Adair, R.J. & Edwards, P.B. (1998) *Chrysanthemoides monilifera* (L.) T. Norl. pp.49–61. In: F.D. Panetta, R.H. Groves & R.C.H. Shepherd (eds.) *The biology of Australian weeds*. Volume 2 (R.G. and F.J. Richardson: Melbourne).
- Weston, P.H., Perkins, A.J. & Entwisle, T.J. (2005) More than symbioses: orchid ecology, with examples from the Sydney Region. *Cunninghamia* 9(1): 1–15.
- Whelan, R.J. (1995) *The ecology of fire* (Cambridge University Press: Cambridge).
- Whelan, R.J., Rodgerson, L., Dickman, C.R. & Sutherland, E.F. (2002) Critical life cycles of plants and animals: developing a process-based understanding of population changes in fire-prone landscapes. pp. 94–124. In: R.A. Bradstock, J.E. Williams & A.M. Gill (eds.) *Flammable Australia: The fire regimes and biodiversity of a continent*. (Cambridge University Press: Cambridge).

- Whelan, R.J. & York, J. (1998) Post-fire germination of *Hakea sericea* and *Petrophile sessilis* after spring burning. *Australian Journal of Botany* 46: 367–376.
- Williams, J.E. & Gill, A.M. (1995) *The impact of fire regimes on native forests in eastern New South Wales. Environmental Heritage Monograph Series No. 2* (NSW National Parks and Wildlife Service: Hurstville).
- Williams, J.E., Whelan, R.J. & Gill, A.M. (1994) Fire and environmental heterogeneity in southern temperate forest ecosystems: implications for management. *Australian Journal of Botany* 42: 125–137.
- Williams, P.R. & Clarke, P.J. (2006) Fire history and soil gradients generate floristic patterns in montane sedgeland and wet heaths of Gibraltar Range National Park. *Proceedings of the Linnean Society of New South Wales* 127: 27–38.
- Zammit, C. (1988) Dynamics of resprouting in the lignotuberous shrub *Banksia oblongifolia*. *Australian Journal of Ecology* 13: 311–320.
- Zammit, C. & Westoby, M. (1987) Population structure and reproductive status of two *Banksia* shrubs at various times after fire. *Vegetatio* 70: 11–20.

Manuscript accepted 31 March 2009

## Appendix 1. Observations on fire responses (after 100% leaf scorch) of vascular plants in the Lane Cove River (LCR) (observations mainly Jan 1994 – Oct 1999) and Narrabeen Lagoon (NL) (Mar – Oct 1994) catchments, following the fires of January 1994.

**R** = majority of adult plants resprouted after the fires;

**K** = majority of adult plants killed by the fires;

**r** = a small proportion of adult plants of this species resprouted after the fires;

**k** = a small proportion of adult plants of this species were killed by the fires;

**pR** = probably resprouted after the fires; **pK** = Probably killed by the fires;

**?R** = possibly resprouted; **?K** = Possibly killed.

Note: 'possibly' = say 50–70% sure of observation; 'probably' = say 80–90% sure of observation.

**Seedlings first observed** = first time seedlings noticed (adv = advanced seedlings).

**First flowering and fruiting times**(or spore production) after the fires are shown for resprouted plants (Resp) and plants from seed. (If unclear whether plants grew from seed or resprouted, then time of first flowering or fruiting bridges both columns and is underlined).

Flowering time in **bold type** = sizable proportion of population was flowering (e.g. when first flowering involved only a few plants).

**Primary and secondary juvenile periods** are given for some species.

**Probable or possible peaks of post-fire flowering**(prob.pk.pf.flower.; poss.pk.pf.flower.) or **fruiting** (prob.pk.pf.fruit.; poss.pk.pf.fruit.) are given in the left hand column.

\* = exotic species (introduced plants growing in bushland, or in weed thickets and patches of weeds in close proximity to bushland).

Other abbreviations: **grn.** = green fruit; **imm.** = immature fruit; **ri.** = ripe fruit; (**shd**) = shedding seed or spores; **w** = weeks; **y** = year(s); **m.i.f.** = moderate intensity fire; (**1**) = one plant; **buds** = flowers in bud; **prob.** = probably; **c.** = approximately.

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<b>PTERIDOPHYTES</b>									
<b>Adiantaceae</b>									
<i>Adiantum aethiopicum</i> (s.lat.)	R	R				50w			c.1y
<i>Adiantum hispidulum</i>	R					41w			41w–(shd)
<b>Aspleniaceae</b>									
<i>Asplenium australasicum</i>	K								
<i>Asplenium flabellifolium</i>	R	R				26w			26w
<b>Blechnaceae</b>									
<i>Blechnum ambiguum</i>	R	R				50w			63w–(shd)
<i>Blechnum camfieldii</i>		R				38w			38w
<i>Blechnum cartilagineum</i>	R	R				10w			10w–(shd)
<i>Blechnum indicum</i>	R	R				10w			10w–(shd)
<i>Blechnum nudum</i>	R					33w			33w–(shd)
<i>Doodia aspera</i>	R	R				23w			23w
<i>Doodia caudata</i>	R					23w			23w
<i>Doodia linearis</i>	R					15w			29w–(shd)
<b>Cyatheaceae</b>									
<i>Cyathea australis</i>	R					49w			c.1y
<b>Davalliaceae</b>									
<i>Davallia solida</i> var. <i>pyxidata</i>	K/r	K/r							
* <i>Nephrolepis cordifolia</i>	R/k	R							
<b>Dennstaedtiaceae</b>									
<i>Histiopteris incisa</i>	R	R							

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Hypolepis muelleri</i>	R					44w-grn			
<i>Pteridium esculentum</i>	R	R				10w			10w-(shd)
<b>Dicksoniaceae</b>									
<i>Calochlaena dubia</i>	R	R				50w			c.1y
<b>Gleicheniaceae</b>									
<i>Gleichenia dicarpa</i>	R/k								
<i>Gleichenia microphylla</i>	R								
<i>Gleichenia rupestris</i>	R	pR							
<i>Sticherus flabellatus</i>	K/r	K/R				35w-grn			
<b>Grammitaceae</b>									
<i>Grammitis stenophylla</i>		K							
<b>Hymenophyllaceae</b>									
<i>Hymenophyllum cupressiforme</i>		K							
<b>Lindsaeaceae</b>									
<i>Lindsaea linearis</i>	R					50w			c.1y
<i>Lindsaea microphylla</i>	R	R				21w			21-50w
<b>Lycopodiaceae</b>									
<i>Lycopodiella lateralis</i>		pK							
<b>Osmundaceae</b>									
<i>Todea barbara</i>	R	R				10w			10w
<b>Polypodiaceae</b>									
<i>Platyserium bifurcatum</i>	K								
<i>Pyrrosia rupestris</i>	K	K							
<b>Psilotaceae</b>									
<i>Psilotum nudum</i>	K/r	K/r				50w-grn			
<b>Pteridaceae</b>									
<i>Pteris tremula</i>	pR								
* <i>Pteris vittata</i>	R					23w			
<b>Schizaeaceae</b>									
<i>Schizaea bifida</i> (s.lat.)	R	R				63w			
<i>Schizaea rupestris</i>	pR	R				38w-grn			
<b>Selaginellaceae</b>									
<i>Selaginella uliginosa</i>		R							
<b>Sinopteridaceae</b>									
<i>Cheilanthes distans</i>		?K					140w		
<i>Cheilanthes sieberi</i>	R					23w			23w
<i>Pellaea falcata</i>	R								
<b>Thelypteridaceae</b>									
<i>Christella dentata</i>	R					23w			23w
<b>GYMNOSPERMS</b>	<hr/>								
<b>Cupressaceae</b>									
<i>Callitris muelleri</i>		K	32w						
<b>Pinaceae</b>									
* <i>Pinus radiata</i>		K							
<b>Podocarpaceae</b>									
<i>Podocarpus spinulosus</i>	R	R		92w		100w			c.2y
<b>Zamiaceae</b>									
<i>Macrozamia communis</i>	R	R							
<b>DICOTYLEDONS</b>	<hr/>								
<b>Acanthaceae</b>									
<i>Brunoniella pumilio</i> (poss.pk.pf.flower.c.1y)	R			6w		11w			26w-(shd)
<i>Pseuderanthemum variabile</i>	R	R		7w		10w			20w-(shd)
* <i>Thunbergia alata</i>	pR			26w					



Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering	First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary
<b>Aceraceae</b>								
* <i>Acer negundo</i>	R							
<b>Aizoaceae</b>								
<i>Tetragonia tetragonioides</i>	?K		7w		39w		39w-grn	
<b>Amaranthaceae</b>								
<i>Alternanthera denticulata</i>	R			10w				
* <i>Amaranthus hybridus</i>	?K				12w		19w	
* <i>Amaranthus viridus</i>	?K		9w					
<b>Amygdalaceae</b>								
* <i>Prunus cerasus</i>	R							
* <i>Prunus persica</i>	R	R						
<b>Anacardiaceae</b>								
* <i>Toxicodendron succedaneum</i>	R							
<b>Apiaceae</b>								
<i>Actinotus helianthi</i> (prob.pk.pf.flower.c.2-3y)	K	K	15w		41w		56w	56w-(shd)
<i>Actinotus minor</i>	K	K	24w		42w			
<i>Centella asiatica</i>	R					10w		
* <i>Ciclospermum leptophyllum</i>					<u>28w</u>		<u>43w-grn</u>	
* <i>Eryngium pandanifolium</i>	R			50w-buds				
* <i>Foeniculum vulgare</i>	R	R	9w(1)	50w-buds		63w		63w-(shd)
* <i>Hydrocotyle bonariensis</i>	R	pR		11w		20w		
<i>Hydrocotyle peduncularis</i>	R		15w	10w		16w		
<i>Platysace lanceolata</i> (prob.pk.pf.flower.c.3-5y)	R	R	15w	56w		63w		63w
<i>Platysace linearifolia</i> (prob.pk.pf.flower.c.2-3y)	R/k	R	24w	63w		64w-imm		
<i>Platysace stephensonii</i>		R	17w					
<i>Trachymene incisa</i>		R		35w		35w		35+w-(shd)
<i>Xanthosia pilosa</i> (prob.pk.pf.fi.flower.c.4y)	K/r	K	22w		85w			
<i>Xanthosia tridentata</i>	K		20w					
<b>Apocynaceae</b>								
* <i>Nerium oleander</i>	R	R		150w				
<i>Parsonsia straminea</i>		K/R						
* <i>Vinca major</i>	R			36w				
<b>Araliaceae</b>								
<i>Astrotricha floccosa</i>		K	13w					
<i>Astrotricha latifolia</i>	K		44w		146w			
<i>Astrotricha longifolia</i> (prob.pk.pf.flower.c.3y)	K/r		43w		<u>92w</u>		<u>101w-imm</u>	c.2-3y
* <i>Hedera helix</i>	R							
<i>Polyscias sambucifolia</i>	R		38w	51w,101w		114w-ri		c.2-3y
<b>Asclepiadaceae</b>								
* <i>Araujia sericifera</i>	R	R	10w				<u>61w-(grn)</u>	
* <i>Gomphocarpus ?fruticosus</i>					<u>38w(buds)</u>			
<i>Marsdenia suaveolens</i>	R	R		10w		32w		32+w
<i>Tylophora barbata</i>	R			43w				
<b>Asteraceae</b>								
* <i>Ageratina adenophora</i>	R	R	42w	38w		44w		44w-(shd)
* <i>Ageratina riparia</i>	R		63w	34w		38w		40w-(shd)
* <i>Ageratum houstonianum</i>		?K			38w			
* <i>Ambrosia artemesiifolia</i>		?R			<u>13w(1)</u>			
* <i>Arctotheca calendula</i>					<u>38w</u>			
* <i>Aster subulatus</i>					<u>61w</u>		<u>63w-(shd)</u>	
* <i>Bidens pilosa</i>	pK	pK	7w		13w		19w	19w-(shd)

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>*Bidens subalternans</i>	pK		12w		12w		16w-grn.		
<i>*Bidens tripartita</i>	pK				15w		15w		
<i>Brachyscome angustifolia</i> var. <i>angustifolia</i>	pR			11w			16w-(shd)		16w-(shd)
<i>Cassinia aculeata</i>	K						136w	c.3y(shd)	
<i>Cassinia denticulata</i>	K								
<i>Cassinia longifolia</i>					202w(buds)				
<i>*Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	K		19w		88w		101w	c.2y(shd)	
<i>*Cirsium vulgare</i>	?R				26 & 38w		46,51w-(shd)		
<i>*Conyza bonariensis</i>	pK				38w		50w	61w-(shd)	
<i>*Coreopsis lanceolata</i> (prob.pk.pf.flower.c.2-3y)		R	10w		42w				
<i>Cotula australis</i>	pK						15w		
<i>*Crassocephalum crepidioides</i>	pK		15w		15w		15w	39w	
<i>*Delairea odorata</i>	pK				125w				
<i>*Dimorphotheca pluvialis</i>					36w				
<i>*Dittrichia graveolens</i>					63w				
<i>*Erechtites valerianifolia</i>	pK				28w		30w	39w	
<i>*Erigeron karvinskianus</i>	R			10w		27w			27w-(shd)
<i>Euchiton sphaericus</i>					43w		43w		
<i>*Facelis retusa</i>							43w-(shd)		
<i>*Galinsoga parviflora</i>	pK		7w		12w		15w	15w	
<i>*Gamochaeta americana</i>	K/R					10w			10w-(shd)
<i>*Gamochaeta pensylvanica</i>	pK		15w		15w		15w	15w	
<i>*Gamochaeta spicata</i>	pK						27w	27w-(shd)	
<i>*Helianthus annuus</i>					12w				
<i>Helichrysum elatum</i> (prob.pk.pf.flower.c.3y)	?K	pK			87w		97w	c.2y(shd)	
<i>Helichrysum rutidolepis</i>	R			18w		18w			
<i>Helichrysum scorpioides</i>	R			16w		23w			43w-(shd)
<i>*Hypochaeris radicata</i>	R			10w		10w			10w
<i>*Lactuca serriola</i>	?K				50w		50w		
<i>Lagenifera gracilis</i>	R			9w		12w			12w-(shd)
<i>Olearia microphylla</i> (prob.pk.pf.flower.c.4-5y)	K/r				85w		94w	c.2-3y(shd)	
<i>Olearia tomentosa</i>		K/r	35w						
<i>Ozothamnus diosmifolius</i> (prob.pk.pf.flower.c.3-4y)	K/r		36w		100w		104w	c.2y(shd)	
<i>Pseudognaphalium luteoalbum</i>					41w		43w	43w-(shd)	
<i>*Roldana petasitis</i>	R	R				38w			
<i>Senecio hispidulus</i> var. <i>hispidulus</i>	pK				38w		44w	44w-(shd)	
<i>*Senecio madagascariensis</i>	pK				15w		20w	26w-(shd)	
<i>Senecio minimus</i>					43w-buds				
<i>*Senecio pterophorus</i>					154w				
<i>Sigesbeckia orientalis</i>	pK		11w		11w		16w	16w-ri.	
<i>*Solidago canadensis</i>	R			16w		33w			33w-(shd)
<i>*Soliva sessilis</i>							43w(grn)		
<i>*Sonchus oleraceus</i>	pK		8w		15w		15w	15w	
<i>*Tagetes minuta</i>		pK			20w		20w	20w	
<i>*Taraxacum officinale</i>	R			11w		25w			25w-(shd)
<i>*Xanthium occidentale</i>	K								
<b>Avicenniaceae</b>									
<i>Avicennia marina</i> var. <i>australasica</i>	R/K								
<b>Balsaminaceae</b>									
<i>*Impatiens walleriana</i>	pK		18w		18w				

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering	First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary
<b>Basellaceae</b>								
* <i>Anredera cordifolia</i>	pR	R	19w(1)	Note: aerial tubers forming within 39w of fire.				
<b>Baueraceae</b>								
<i>Bauera ?microphylla</i>		R						
<i>Bauera rubioides</i>	K	K/r	23w	90w		198w	c.4y	
<b>Bigoniaceae</b>								
<i>Pandorea pandorana</i>	R			26w		50w		c.1y-(shd)
<b>Boraginaceae</b>								
* <i>Echium plantagineum</i>				<u>38w</u>		<u>38w(grn)</u>		
<b>Brassicaceae</b>								
* <i>Brassica fruticulosa</i>	pK		12w	12w		28w	28w-(shd)	
* <i>Brassica juncea</i>	pK			43w				
* <i>Brassica tournefortii</i>		?K		42w				
* <i>Capsella bursa-pastoris</i>		pK	20w	20w		20w	20w-grn	
* <i>Cardamine flexuosa</i>	pK		15w			15w	15w-(shd)	
* <i>Cardamine hirsuta</i>	pK			24w		24w	24w	
* <i>Coronopus didymus</i>	pK		15w			15w	15w	
* <i>Lobularia maritima</i>	pK			23w				
<i>Rorippa gigantea</i>				38w			38w-imm	
* <i>Rorippa nasturtium-aquaticum</i>	?K						43w-imm	
<b>Buddlejaceae</b>								
* <i>Buddleja davidii</i>	R	R		51w				
* <i>Buddleja madagascariensis</i>		R		38w				
<b>Campanulaceae</b>								
<i>Wahlenbergia communis</i> (s.lat.)				<u>38w</u>		<u>43w-grn.</u>		
<i>Wahlenbergia gracilis</i>	?K		24w	<u>15w</u>		<u>23w-(shd)</u>		
<b>Caprifoliaceae</b>								
* <i>Lonicera japonica</i>	R	R						
<b>Caryophyllaceae</b>								
* <i>Cerastium glomeratum</i>	pK		23w	23w		23w	23w-(shd)	
* <i>Petrorhagia velutina</i>		pK		38w		38w	44w-(shd)	
* <i>Polycarpon tetraphyllum</i>	pK			43w		44w	44w	
* <i>Silene gallica</i> var. <i>gallica</i>	pK			36w		38w	38w-grn	
* <i>Stellaria media</i>	pK					15w	15w-(shd)	
<b>Casuarinaceae</b>								
<i>Allocasuarina distyla</i>		K	17w		86w		167w	
<i>Allocasuarina littoralis</i>	K/r		10w	124w			179w	
<i>Allocasuarina torulosa</i>	R	R						
<i>Casuarina glauca</i>	R	R						
<b>Celastraceae</b>								
<i>Maytenus silvestris</i>	R	R				124w-ri		c.2-3y
<b>Chenopodiaceae</b>								
* <i>Atriplex ?prostrata</i>	pK		10w					
* <i>Chenopodium album</i>	pK	pK				20w		
<b>Chloanthaceae</b>								
<i>Chloanthus stoechadis</i>		pK	10w		42w-(1)			
<b>Clusiaceae</b>								
<i>Hypericum gramineum</i>	R			11w		38w		38w-(shd)
* <i>Hypericum perforatum</i>	R			43w		50w		63w-(shd)
<b>Convolvulaceae</b>								
<i>Calystegia marginata</i>	pK		9w	41w		46w	46w-grn	
<i>Convolvulus erubescens</i>						<u>51w-(shd)</u>		
<i>Dichondra repens</i> (s.lat.)			9w			<u>18w(1)</u>		
* <i>Ipomoea cairica</i>		R						
* <i>Ipomoea indica</i>	R	R		15w				

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Polymeria calycina</i>	pR	R		38w		56w			
<b>Crassulaceae</b>									
* <i>Crassula multicava</i>		pR		38w					
<i>Crassula sieberiana</i>	pK	pK	13w		26w	26w			
<b>Cunoniaceae</b>									
<i>Callicoma serratifolia</i> (poss.pk.pf.flower.c.3+y)	R		15w	91w		108w			c.2y(shd)
<i>Ceratopetalum apetalum</i>	R								
<i>Ceratopetalum gummiferum</i>	R	R	101w	50w					c.2-3y
<i>Schizomeria ovata</i>	R	R							
<b>Dilleniaceae</b>									
<i>Hibbertia aspera</i>	R			50w					
<i>Hibbertia bracteata</i>	R	R		38w, <b>87w</b>					
<i>Hibbertia cistiflora</i>		pK							
<i>Hibbertia dentata</i> (prob.pk.pf.flower.c.4-5y)	R		39w	38w					
<i>Hibbertia diffusa</i>	R			23w-buds					
<i>Hibbertia fasciculata</i> (prob.pk.pf.flower.c.3-5y)	pK		51w		56w, <b>87w</b>				
<i>Hibbertia linearis</i> (prob.pk.pf.flower.c.4-6y)	K	K	26w		72w, <b>86w</b>				
<i>Hibbertia nitida</i>	K		135w-adv						
<i>Hibbertia riparia</i> (s.lat.)	R			89w		108w			
<i>Hibbertia scandens</i>	R	R							
<i>Hibbertia serpyllifolia</i>		R							
<b>Droseraceae</b>									
<i>Drosera auriculata</i>	pR	pR		26w		26w			26w-(shd)
<i>Drosera binata</i>	R	R		17w					
<i>Drosera peltata</i>	pR	pR		17w		32w			32w-(shd)
<i>Drosera spatulata</i>	pR	pR		41w		63w			63w-(shd)
<b>Elaeocarpaceae</b>									
<i>Elaeocarpus reticulatus</i>	R	R		201w		<u>c.5y-grn</u>			c.5y-a few fruit
<b>Ericaceae</b>									
<b>Styphelioideae</b>									
<i>Acrotriche divaricata</i>		K							
<i>Brachyloma daphnoides</i> (prob.pk.pf.flower.c.3-5y)	R	R		40w, <b>86w</b>					
<i>Dracophyllum secundum</i>	K	K	67w			c.3y	c.3-4y		
<i>Epacris crassifolia</i>	K	K	20w						
<i>Epacris longiflora</i>	K	K	88w-adv		124w				
<i>Epacris microphylla</i> (prob.pk.pf.flower.c.4-6y)	K	K	61w		86w				
<i>Epacris obtusifolia</i>		K	38w(1)						
<i>Epacris pulchella</i>	K	K			120w	122w	c.2-3y(shd)		
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	K				c.3-4y				
<i>Leucopogon amplexicaulis</i>	pK	K	63w		87w-(1)	142w	c.3-4y		
<i>Leucopogon appressus</i> (poss.pk.pf.flower.c.5+y)	K	K	75w-adv		108w				
<i>Leucopogon ericoides</i> (prob.pk.pf.flower.c.4-6y)	K				135w	143w	c.3y		
<i>Leucopogon esquamatus</i>	pK	K				196w	c.4y		
<i>Leucopogon juniperinus</i>	K				c.3-4y				
<i>Leucopogon lanceolatus</i>	R	R		88w		90w-grn			c.2-3y
<i>Leucopogon microphyllus</i> (prob.pk.pf.flower.c.4-6y)	K	K			75w				
<i>Leucopogon setiger</i>	K	K			c.4y				



Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods		
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary	
<i>Lissanthe strigosa</i> subsp. ? <i>subulata</i>		R		37w-(1)						
<i>Melichrus procumbens</i>				c.3-4y(1)						
<i>Monotoca elliptica</i>	K/r									
<i>Monotoca scoparia</i>	R	R		67w						
<i>Sprengelia incarnata</i>		K								
<i>Styphelia longifolia</i>	K		126w-(1)-adv		186w		195w	c.4y		
<i>Styphelia triflora</i>	K		61w				149w	c.3y		
<i>Styphelia tubiflora</i>	K	K	64w		124w		242w	c.4-5y		
<i>Trochocarpa laurina</i>	R	R								
<i>Woollsia pungens</i>	K	K	72w-adv		120w					
<b>Euphorbiaceae</b>										
<i>Amperea xiphoclada</i>	R	R		16w		38w			50w-grn	
<i>Bertya brownii</i>		K	13w							
<i>Breynia oblongifolia</i> (poss.pk.pf.flower.c.3-4y)	R	R		46w		63w			63w	
* <i>Chamaesyce supina</i>	pK						9w			
* <i>Euphorbia depauperata</i> var. <i>pubescens</i>	pK				43w					
* <i>Euphorbia peplus</i>	pK		7w				9w	9w		
<i>Glochidion ferdinandi</i>	R	R				76w			c.2-3y	
<i>Micrantheum ericoides</i> (prob.pk.pf.fruit.c.5-6y)	K	K	30w		85w		86w	c.2-3y		
<i>Monotaxis linifolia</i>		pK								
<i>Omalanthus populifolius</i>	R		6w							
<i>Phyllanthus hirtellus</i>	R	R	26w	23w		38w			43w-grn.	
* <i>Phyllanthus tenellus</i>	pK				18w					
<i>Poranthera corymbosa</i>	pK				94w					
<i>Poranthera ericifolia</i>	pK	K	38w		38w		43w	50w		
<i>Poranthera microphylla</i>	pK	pK	15w		18w		18w	18-39w		
<i>Ricinocarpus pinifolius</i>	R	R	133w-adv	86w		94w			c.2y	
* <i>Ricinus communis</i>	pK	pK	8w		25w		25w	25-38w		
<b>Eupomatiaceae</b>										
<i>Eupomatia laurina</i>		R								
<b>Fabaceae</b>										
<b>Caesalpinioideae</b>										
* <i>Senna pendula</i>	R	R	7w	61w		85w			c.2y	
<b>Faboideae</b>										
<i>Bossiaea heterophylla</i>	pK	?r	10w		67w		97w	c.2y(shd)		
<i>Bossiaea obcordata</i> (poss.pk.pf.fruit.c.4-5y)	R			36w		100w			c.2y-(shd)	
<i>Bossiaea scolopendria</i>	R	K	?63w?	86w		104w			c.2y-(shd)	
<i>Daviesia alata</i>		?K								
<i>Daviesia ulicifolia</i>	?K	?K	37w		37w		c.4y			
<i>Desmodium ?gunnii</i>	R			11w						
<i>Desmodium rhytidophyllum</i>		R		13w		13w				
<i>Dillwynia floribunda</i> var. <i>floribunda</i>	pK	K	63w		90w					
<i>Dillwynia retorta</i> (prob.pk.pf.flower.c.5y)	K	K	10w		85w		150w	c.3y(shd)		
<i>Dillwynia rudis</i>	K	pK					90w	c.2y		
* <i>Dipogon lignosus</i>	R		10w	38w		50w			c.1y-(shd)	
* <i>Erythrina crista-galli</i>	R	R		13w						
* <i>Erythrina x sykesii</i>	R	R		38w						
* <i>Genista monspessulana</i>	K		11w		86w		104w	2y		
<i>Glycine clandestina</i>	R	pR		35w						
<i>Glycine tabacina</i>	R	pR	8w	10w		30w			30w-(shd)	

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Gompholobium glabratum</i>	pK		23w				89w	c.2y	
<i>Gompholobium grandiflorum</i>	R	?k		90w		125w			c.2–3y(shd)
<i>Gompholobium latifolium</i> (prob.pk.pf.fruit.c.4–5y)	K	R	37w		140w		154w	c.3y(shd)	
<i>Hardenbergia violacea</i> (prob.pk.pf.flower.c.3–5y)	R	pR	7w	31w		40w			c.1y
<i>Hovea linearis</i> (s.lat.)	R	R		31w		100w			c.2y
<i>Hovea longifolia</i>	K		30w		190w		198w	c.4y	
<i>Kennedia rubicunda</i>	?K/r	?K/r	6w		35w		46w	c.1y	
* <i>Lotus angustissimus</i>	pK	pK	27w		37w		43w	43w	
* <i>Medicago arabica</i>	pK				38w		38w		
* <i>Medicago polymorpha</i>	pK				33w		38w		
* <i>Melilotus indicus</i>	pK	pK			26w		38w		
<i>Mirbelia rubrifolia</i>	pK	K	17w		141w		3–4y	c.3–4y(shd)	
<i>Mirbelia speciosa</i> subsp. <i>speciosa</i>					189w				
<i>Phyllota grandiflora</i>	pR	R		37w					
<i>Phyllota phylloides</i> (prob.pk.pf.flower.c.4–5y)	R/k	R	63w	86w					
<i>Platylobium formosum</i> (prob.pk.pf.flower.c.3–5y)	R	R	36w	<u>36w.87w</u>		101w			c.2y–(shd)
<i>Podolobium ilicifolium</i>		K/R	35w	38w					
* <i>Psoralea pinnata</i> (prob.pk.pf.flower.c.4y)	pK		12w		92w		122w	c.2–3y(shd)	
<i>Pultenaea daphnoides</i> (prob.pk.pf.flower.c.3–5y)	K	K	20w		86w		150w	c.3y(shd)	
<i>Pultenaea flexilis</i> (poss.pk.pf.flower.c.5+y)	K	K	10w		88w				
<i>Pultenaea mollis</i> (prob.pk.pf.flower.c.3–5y)	?K		97w–adv		140w		154w	c.3y(shd)	
<i>Pultenaea polifolia</i>		K							
<i>Pultenaea retusa</i>	pK				86w		90w	c.2y	
<i>Pultenaea stipularis</i> (prob.pk.pf.flower.c.3–5y)	K	K	21w		90w		104w	c.2–3y(shd)	
<i>Pultenaea tuberculata</i> (prob.pk.pf.flower.c.5–6y)	K	K	24w		61w	<b>c.2y</b>			
<i>Pultenaea villosa</i>	K		26w						
<i>Sphaerolobium minus</i>					<u>90w</u>				
* <i>Trifolium campestre</i>	pK				41w		43w		
* <i>Trifolium cernuum</i>	pK				16w		38w		
* <i>Trifolium dubium</i>	pK				43w		43w		
* <i>Trifolium glomeratum</i>	pK				36w				
* <i>Trifolium repens</i>	pK				36w				
* <i>Vicia hirsuta</i>	pK						<u>38w</u>		
* <i>Vicia sativa</i>	pK	?K			37w		37w		
* <i>Vicia tetrasperma</i>	pK		11w		33w		36w		
<i>Viminaria juncea</i> (poss.pk.pf.flower.c.2–5y)	K	pK	17w		91w		100w	c.2y(shd)	
* <i>Wisteria ?sinensis</i>	R								
<b>Mimosoideae</b>									
* <i>Acacia baileyana</i>	pK		44w–adv		135w		198w	c.3–4y	
<i>Acacia binervia</i>	K		124w–(adv)		142w		198w	c.3–4y	
<i>Acacia echinula</i>					<u>186w</u>				
(*?) <i>Acacia elata</i>	?K								
<i>Acacia falcata</i>	pK		51w–adv				90w–grn	c.2–3y	
<i>Acacia floribunda</i>	R/k	k		135w					
<i>Acacia hispidula</i>	pK				61w		124w	c.3y	
<i>Acacia implexa</i>		R							
<i>Acacia irrorata</i> subsp. <i>irrorata</i>					153w				
<i>Acacia linifolia</i> (prob.pk.pf.fruit.c.4–6y)	K	K	9w		56w		97w	c.2–3y(shd)	

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering	First fruiting		Juvenile periods		
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Acacia longifolia</i> subsp. <i>longifolia</i> (prob.pk.pf.flower.c.4–6y)	K	K	10w		85w		149w	c.3y(shd)	
<i>Acacia longissima</i>	K		88w–adv		153w		169w		
<i>Acacia myrtifolia</i> (prob.pk.pf.fruit.c.4y)	K	K	25w		131w		149w	c.3y(shd)	
<i>Acacia oxycedrus</i>	K	R/k	17w		136w				
<i>Acacia parramattensis</i>	pK/r								
<i>Acacia parvipinnula</i>	?K				135w				
* <i>Acacia podalyriifolia</i>	pK	K	36w		124w		154w	c.3y(shd)	
* <i>Acacia saligna</i>		R	21w		<u>140w</u>		<u>145w(gm)</u>		
<i>Acacia schinoides</i>	K		51w		154w		235w	c.5y	
<i>Acacia suaveolens</i> (prob.pk.pf.flower.c.2–4y)	K	K	15w		71w		97w	c.2y(shd)	
<i>Acacia terminalis</i> (prob.pk.pf.flower.c.3–4y)	K	K	12w		91w		149w	c.3y(shd)	
<i>Acacia ulicifolia</i> (prob.pk.pf.flower.c.3–5y)	K	K	10w		67w		101w	c.2–3y(shd)	
* <i>Paraserianthes lophantha</i> subsp. <i>lophantha</i>					87w		163w	c.3y(shd)	
<b>Fumariaceae</b>									
* <i>Fumaria capreolata</i> subsp. <i>capreolata</i>	pK		12w		12w		12w		
* <i>Fumaria ?officinalis</i>			15w		15w		15w		
<b>Gentianaceae</b>									
* <i>Centaurium tenuiflorum</i>	?K				43w				
<b>Geraniaceae</b>									
<i>Geranium homeanum</i>	R		10w	19w		19w			
<i>Pelargonium inodorum</i> (prob.pk.pf.flower.c.1y)			20w		<u>35w</u>		<u>44w–(shd)</u>		
<b>Goodeniaceae</b>									
<i>Dampiera purpurea</i> (prob.pk.pf.flower.c.2–3y)	R		33w	36w		49w		c.1y–(shd)	
<i>Dampiera stricta</i> (prob.pk.pf.flower.c.2–3y)	R	R	21w	31w		64w			
<i>Goodenia bellidifolia</i>	R	R	26w	31w		51w		c.1y–(shd)	
<i>Goodenia hederacea</i>	R			39w		49w		c.1y	
<i>Goodenia heterophylla</i> (prob.pk.pf.flower.c.2–3y)	R	R		20w		46w		46w–(shd)	
<i>Goodenia ovata</i>	K	K	20w		143w		146w	c.2–3y	
<i>Goodenia paniculata</i>		pR			<u>10–20w</u>				
<i>Goodenia stelligera</i>					<u>31w(1)</u>				
<i>Scaevola ramosissima</i>	R	R		16w		51w		c.1y	
<i>Velleia lyrata</i>					<u>36w</u>		<u>51w–(shd)</u>		
<b>Haloragaceae</b>									
<i>Gonocarpus micranthus</i> subsp. <i>micranthus</i>	pK	pK	12w		43w				
<i>Gonocarpus salsoloides</i>		pK	17w						
<i>Gonocarpus teucroides</i> (prob.pk.pf.flower.c.2–3y)	K/r	K	10w		94w		100w	c.2y	
<b>Hamamelidaceae</b>									
* <i>Liquidambar styraciflua</i>	R								
<b>Lamiaceae</b>									
<i>Hemigenia purpurea</i>	pK	K	51w		100w		104w	c.2y	
<i>Plectranthus parviflorus</i>	pK	pK	15w		49w		49w		
<i>Prostanthera denticulata</i>		K							
<i>Prostanthera linearis</i>	K	K/r			150w				
* <i>Prunella vulgaris</i>	?K		19w		51w		51w	c.1y–(shd)	

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods		
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary	
<i>*Stachys arvensis</i>	pK				16w		23w		23w–(shd)	
<b>Lauraceae</b>										
<i>Cassytha glabella</i> (prob.pk.pf.flower.c.3–6y)	K		33w		61w		91w		c.2–3y(ripe)	
<i>Cassytha pubescens</i> (poss.pk.pf.fruit.c.5y)	K				150w		191w		c.3–4y	
<i>*Cinnamomum camphora</i>	R	R		94w						
<i>Endiandra sieberi</i>		R								
<b>Lentibulariaceae</b>										
<i>Utricularia dichotoma</i>		?R			<u>32w</u>					
<i>Utricularia lateriflora</i>		?R			<u>32w</u>					
<b>Linaceae</b>										
<i>*Linum trigynum</i>	?K	?K			38w		38w			
<i>*Reinwardtia indica</i>	pR			23w						
<b>Lobeliaceae</b>										
<i>Lobelia alata</i> (prob.pk.pf.flower.c.3y)	?R		20w		<u>49w</u>		<u>63w</u>			
<i>Lobelia dentata</i> (prob.pk.pf.flower.c.1y)					<u>19w</u>		<u>49w–(shd)</u>			
<i>Lobelia gracilis</i>					<u>49w</u>		<u>67w</u>			
<i>Pratia purpurascens</i>	R	pR		6w		15w			15w–grn	
<b>Loganiaceae</b>										
<i>Logania albiflora</i> (poss.pk.pf.flower.c.4–6y)	R	R	63w	87w		163w	c.4y(1)		c.3y(shd)	
<i>Mitrasacme polymorpha</i> (prob.pk.pf.flower.c.3y)	pK	K			37w		43w	c.1y		
<b>Loranthaceae</b>										
<i>Amyema congener</i> subsp. <i>congener</i>	K		The host of this mistletoe was also killed by the same fire.							
<i>Muellerina eucalyptoides</i>	R(1)m.i.f		One plant resprouted after low to medium intensity fire. The canopy of its host was not 100% scorched.							
<b>Malaceae</b>										
<i>*Cotoneaster ?franchetti</i>	R	R								
<i>*Cotoneaster glaucophyllus</i>	R					122w			c.2–3y(ripe)	
<i>*Eriobotrya japonica</i>		k								
<i>*Pyracantha angustifolia</i>	R					122w			c.2–3y(ripe)	
<i>*Pyracantha crenulata</i>	R					125w			c.2–3y(ripe)	
<i>*Pyracantha fortuneana</i>	R									
<b>Malvaceae</b>										
<i>Hibiscus diversifolius</i>		?K	?13w							
<i>*Malva parviflora</i>	?K				11w		11w			
<i>*Modiola caroliniana</i>	?K		7w		38w		50w	c.1y–(shd)		
<i>*Pavonia hastata</i> (poss.pk.pf.fruit.c.2+y)	pK		9w				44w(1)			
<i>*Sida rhombifolia</i> (poss.pk.pf.flower.c.3y)	pK		6w		15w		28w	28w–(shd)		
<b>Meliaceae</b>										
<i>*Melia azedarach</i>	R									
<i>Synoum glandulosum</i>	R	R								
<b>Menispermaceae</b>										
<i>Sarcopetalum harveyanum</i>	R	R								
<i>Stephania japonica</i> var. <i>discolor</i>	R	R	9w(1)	50w						
<b>Menyanthaceae</b>										
<i>Villarsia exaltata</i>		pR		20w		20w			20w–(shd)	
<b>Monimiaceae</b>										
<i>Wilkiea huegeliana</i>		?K								



Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<b>Moraceae</b>									
<i>Ficus coronata</i>	R								
* <i>Ficus pumila</i>	?K								
<i>Ficus rubiginosa</i>	R	R				140w			
* <i>Morus alba</i>	R	R				44w			c.1–2y
<b>Myrsinaceae</b>									
<i>Aegiceras corniculatum</i>	R/k								
<i>Rapanea variabilis</i> (syn. <i>Myrsine variabilis</i> )	R	R	39w		122w–buds				
<b>Myrtaceae</b>									
<i>Acmena smithii</i>	R	R							
<i>Angophora bakeri</i> (poss.pk.pf.fruit.c.1–2y)	R		67w		50w		61w		61–67w(shd)
<i>Angophora costata</i>	R		35w						
<i>Angophora hispida</i> (prob.pk.pf.flower.c.1–2y)	R	R	104w		32w,49w		61w		61w(shd)
<i>Austromyrtus tenuifolia</i> (poss.pk.pf.flower.c.3+y)	R	R			150w		163w–ri.		c.3y
<i>Babingtonia densifolia</i>	K	K	61w–adv		2y,3y		164w		c.3–4y(shd)
<i>Babingtonia pluriflora</i>	R						124w		
<i>Backhousia myrtifolia</i>	R								
<i>Baeckea brevifolia</i>		R							
<i>Baeckea diosmifolia</i>	R	R			46w		56w		56w
<i>Baeckea imbricata</i>	K	K					184w		c.3–4y
<i>Baeckea linifolia</i>	R	R			161w		190w		c.3–4y
<i>Callistemon citrinus</i>	R	R			97w				
<i>Callistemon linearis</i>	R	R			92w		144w		c.3y
<i>Calytrix tetragona</i> (poss.pk.pf.flower.c.4+y)	K	K;r–m.i.f	71w			139w			c.?3–4y?
<i>Corymbia gummifera</i>	R						163w		c.3+y
<i>Darwinia biflora</i> (poss.pk.pf.flower.c.5+y)	K		36w			91w			
<i>Darwinia fascicularis</i> var. <i>fascicularis</i> (poss.pk.pf.flower.c.5+y)	K	K	31w			139,186w			
<i>Darwinia procera</i>		K							
<i>Eucalyptus botryoides</i>		R							
<i>Eucalyptus haemastoma</i>	R		75w		139w		177w		c.3–4y
<i>Eucalyptus luehmanniana</i>		R							
<i>Eucalyptus obstans</i>		R							
<i>Eucalyptus paniculata</i>	R		?85w–adv						
<i>Eucalyptus pilularis</i>	R		?49w						c.4–5y
<i>Eucalyptus piperita</i>	R		?49w						c.3–5y
<i>Eucalyptus punctata</i>		R							
<i>Eucalyptus racemosa</i>	R								
<i>Eucalyptus resinifera</i>	R				190w–buds				
<i>Eucalyptus saligna</i>	R								
<i>Eucalyptus umbra</i>		R							
<i>Euryomyrtus ramosissima</i>	pK				139w				
<i>Kunzea ambigua</i>	K	K	24w			97w	100w		c.2–4y
<i>Kunzea capitata</i>	R	K/r	31w		91w				
<i>Leptospermum arachnoides</i> (prob.pk.pf.flower.c.2–3y)	R	R			97w		124w		c.2–3y
<i>Leptospermum grandifolium</i>	R	R							
<i>Leptospermum juniperinum</i>		R							

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Leptospermum parvifolium</i>	R			90w		108w			c.3–4y(shd)
<i>Leptospermum polygalifolium</i> (prob.pk.pf.flower.c.4y)	R			94w		143w			c.3y
<i>Leptospermum squarrosum</i>	K	K	22w		169w		184w	c.3–5y	
<i>Leptospermum trinervium</i> (poss.pk.pf.flower.c.4y)	R	R	?126w	17w,31+w		37w–grn.			c.2y(shd)
<i>Melaleuca deanei</i>	R			90w–m.i.f.					
<i>Melaleuca hypericifolia</i>	k/r								
<i>Melaleuca linariifolia</i> (prob.pk.pf.flower.c.4y)	R	R	6w	94w					
<i>Melaleuca nodosa</i>	R			91w		100w			c.2+y
<i>Melaleuca stphelioides</i>		R							
<i>Micromyrtus ciliata</i> (prob.pk.pf.flower.c.4y)	pK	K	32w		88w				
<i>Syncarpia glomulifera</i>	R	R							c.5y
<i>Tristania neriifolia</i>		R							
<i>Tristaniopsis collina</i>	R	R		154w					
<i>Tristaniopsis laurina</i>	R	R				124w			c.2–3y(shd)
<b>Ochnaceae</b>									
* <i>Ochna serrulata</i>	R	R				93w–grn			
<b>Olacaceae</b>									
<i>Oxax stricta</i> (poss.pk.pf.flower.c.4–5y)	?R				<u>120w</u>		<u>198w</u>		
<b>Oleaceae</b>									
* <i>Jasminum polyanthum</i>	?R				<u>87w</u>				
* <i>Ligustrum lucidum</i>	R		44w	156w					
* <i>Ligustrum sinense</i> (poss.pk.pf.flower.c.5+y)	R	R	39w	92w		122w			c.2–3y
<i>Notelaea longifolia</i>	R	R				101w			c.2y(ripe)
<b>Onagraceae</b>									
<i>Epilobium billardierianum</i> var. <i>cinereum</i>	R			11w		11w–(shd)			
* <i>Epilobium ?ciliatum</i>					<u>38w</u>	<u>38w(green)</u>			
* <i>Ludwigia peruviana</i>		R				20w–grn			
* <i>Oenothera mollissima</i>						<u>39w(green)</u>			
<b>Oxalidaceae</b>									
<i>Oxalis</i> “ <i>corniculata</i> ” (s.lat.)	pR				<u>10w</u>		<u>12w</u>		
* <i>Oxalis debilis</i> var. <i>corymbosa</i>	pR				<u>19w</u>				
* <i>Oxalis incarnata</i>	pR				<u>12w</u>				
* <i>Oxalis latifolia</i>	pR				<u>8w</u>				
* <i>Oxalis pes–caprae</i>	pR				<u>26w</u>				
<b>Passifloraceae</b>									
* <i>Passiflora edulis</i>							<u>150w(grn)</u>		
<i>Passiflora herbertiana</i> (prob.pk.pf.flower.c.4y)	pR				<u>122w</u>		<u>122w(grn)</u>		
* <i>Passiflora suberosa</i>							<u>262w(grn)</u>		
<b>Phytolaccaceae</b>									
* <i>Phytolacca octandra</i>			7w		15w		29w	29w–ri	
<b>Pittosporaceae</b>									
<i>Billardiera scandens</i> (poss.pk.pf.flower.c.4–5y)	R	R		38w		101w			c.2y
<i>Bursaria spinosa</i> (poss.pk.pf.flower.c.5y)	R	R		51w		71w–(shd)			c.1–2y(shd)
<i>Pittosporum revolutum</i> (prob.pk.pf.flower.c.5 y)	R	R		36w,88w		41w–grn			

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Pittosporum undulatum</i>	k/r			242w		262w		At least 5 years	
<i>Rhytidosporum procumbens</i> (prob.pk.pf.fruit.c.3-4y)	?K	? r		<u>43w</u>		<u>43w</u>			
<b>Plantaginaceae</b>									
* <i>Plantago lanceolata</i>	R	pR		10w		10w		50w-(shd)	
* <i>Plantago major</i>				<u>50w</u>		<u>50w(grn)</u>			
<b>Polygalaceae</b>									
<i>Comesperma ericinum</i> (prob.pk.pf.flower.c.3-5y)	pK			87w		101w		c.2y	
<i>Comesperma sphaerocarpum</i>	pR			16w		16w(grn)		Less than 1 year	
<i>Comesperma volubile</i> (prob.pk.pf.flower.c.3-5y)	?K			<u>89w</u>					
* <i>Polygala myrtifolia</i>				142w					
* <i>Polygala virgata</i>	K			142w		142w		c.2-3y	
<b>Polygonaceae</b>									
* <i>Acetosa sagittata</i>	R					30w		30w-(shd)	
* <i>Acetosella vulgaris</i>				<u>39w</u>		<u>39w(grn)</u>			
* <i>Fallopia convolvulus</i>						<u>17w</u>			
* <i>Persicaria capitata</i>	R			19w					
<i>Persicaria decipiens</i>				<u>20w</u>					
<i>Persicaria lapathifolia</i>				<u>20w</u>		<u>20w</u>			
<i>Persicaria strigosa</i>				<u>20w</u>					
<i>Rumex brownii</i>	R			9w		19w			
* <i>Rumex conglomeratus</i>						<u>50w</u>			
* <i>Rumex crispus</i>	R			<u>41w</u>		<u>51w-(shd)</u>			
<b>Portulacaceae</b>									
* <i>Portulaca oleracea</i>						<u>15w(grn)</u>			
<b>Primulaceae</b>									
* <i>Anagallis arvensis</i>				37w		50w			
* <i>Primula malacoides</i>				<u>38w</u>					
<i>Samolus repens</i>	?K			<u>49w</u>		<u>49w(grn)</u>			
<b>Proteaceae</b>									
<i>Banksia ericifolia</i>	K	K	17w		177w		234w	c.4-5y-a few fruit	
<i>Banksia integrifolia</i>		R/k							
<i>Banksia marginata</i> (poss.pk.pf.flower.c.10+y)	K	K	21w		169w		218w	c.4-5y-a few fruit	
<i>Banksia oblongifolia</i>	R	R	17w	114w			234w	c.4-5y- a few fruit	
<i>Banksia robur</i>		R	32w						
<i>Banksia serrata</i>	R		12w	108w			177w	c.3-4y-a few fruit	
<i>Banksia spinulosa</i>	R			122w			201w	c.3-4y	
<i>Conospermum ericifolium</i> (prob.pk.pf.flower.c.3-5y)		K			91w		97w-(shd)	c.2y(shd)	
<i>Conospermum longifolium</i> subsp. <i>angustifolium</i>		K							
<i>Conospermum longifolium</i> subsp. <i>longifolium</i>	R	R		37w			42w	c.1-2y	
<i>Grevillea buxifolia</i> (prob.pk.pf.flower.c.4-6y)	K	K	9w		86w		114w	c.2-3y(shd)	
<i>Grevillea linearifolia</i> (poss.pk.pf.flower.c.5-6y)	K	K	30w		87w		120w	c.2-3y(shd)	
* <i>Grevillea robusta</i>			28w(1)						
<i>Grevillea sericea</i> (prob.pk.pf.flower.c.4-6y)	K	K	10w		56w,2y		114w	c.2-3y(shd)	

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods		
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary	
<i>Grevillea speciosa</i> (poss.pk.pf.flower.c.5y)	K	K			136w					
<i>Hakea dactyloides</i> (s.str.)	K	K	32w			c.6.5y		c.6.5y—a few fruit		
<i>Hakea gibbosa</i>	K	K	30w		129w	159w		c.3–4y		
<i>Hakea laevipes</i> subsp. <i>laevipes</i>	R	R		97w		200w			c.4y	
<i>Hakea propinqua</i>	K	K	21w		124w	177w		c.3–5y—a few fruit		
<i>Hakea salicifolia</i>	K	K	41w		295w—buds	c.6.5y		c.6.5y—a few fruit		
<i>Hakea sericea</i>	K		24w		129w	163w		c.3–4y		
<i>Hakea teretifolia</i>	K	K	22w		153w	184w		c.3–5y		
<i>Isopogon anemonifolius</i>	R			90w		196w			c.3–4y—a few fruit	
<i>Isopogon anethifolius</i>	R/K	R/K	124w—adv	142w	?198w		242w	c.4–5y—a few fruit		
<i>Lambertia formosa</i>	R			71w, <b>94w</b>		195w			c.3–4y	
<i>Lomatia myricoides</i>	R	R		163w		184w			c.3–4y(shd)	
<i>Lomatia silaifolia</i> (prob.pk.pf.flower.c.1y)	R		104w(1)	49w		63w—(shd)			c.1–2y(shd)	
<i>Persoonia lanceolata</i> (poss.pk.pf.fruit.c.4–6y)	K	K			108w		196w	c.3–4y		
<i>Persoonia laurina</i>	R			101w		131w			c.2–3y	
<i>Persoonia levis</i>	R	R	64w(1)	50w		100w			c.2y—a few fruit	
<i>Persoonia linearis</i>	R	R	140w—adv	108w		133w			c.2–3y	
<i>Persoonia pinifolia</i>	K	K	124w—adv		270w		295w	c.5–6y—a few fruit		
<i>Petrophile pulchella</i>	K	K	24w				191w	c.3–5y—a few fruit		
<i>Stenocarpus salignus</i>	R	R		154w		163w			c.3–4y	
<i>Telopea speciosissima</i>	R			c.1–2y		c.2–3y			c.2–3y—a small pop.	
<i>Xylomelum pyriforme</i>	R	R	133w—adv	39w		133w			c.2–3y	
<b>Ranunculaceae</b>										
<i>Clematis aristata</i>	R			38w						
<i>Ranunculus plebeius</i>	?K				<u>41w</u>					
* <i>Ranunculus repens</i>	R			39w		44w—grn.			c.1y	
<b>Rhamnaceae</b>										
<i>Cryptandra amara</i> (prob.pk.pf.flower.c.3–5y)	pK				71w		75w			
<i>Cryptandra ericoides</i>		K			64w					
<i>Pomaderris discolor</i> (prob.pk.pf.flower.c.4–6y)	K				140w		249w			
<i>Pomaderris elliptica</i>		K			195w					
<i>Pomaderris ferruginea</i> (prob.pk.pf.flower.c.4–6y)	K		63w—adv		140w		149w	c.2–3y		
<i>Pomaderris intermedia</i> (prob.pk.pf.flower.c.4–6y)	K		50w		89w		143w			
<b>Rosaceae</b>										
* <i>Potentilla indica</i>	R						23w			
* <i>Rubus ?discolor</i>	R			38w			49w		c.1y	
<b>Rubiaceae</b>										
* <i>Galium aparine</i>	?K				44w		44w	c.1y		
<i>Galium binifolium</i>			36w							
<i>Morinda jasminoides</i> (poss.pk.pf.fruit.c.5+y)	R			101w—grn					c.2y	
<i>Opercularia aspera</i>	R	R	21w			23w				
<i>Opercularia varia</i>	pR				<u>33w</u>		<u>33w</u>			
<i>Pomax umbellata</i>	pK	pK	15w		38w		49w	c.1y—(shd)		
* <i>Richardia stellaris</i>	?R						<u>25w</u>			
<b>Rutaceae</b>										
<i>Asterolasia correifolia</i>		K								



Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering	First fruiting		Juvenile periods		
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Boronia ledifolia</i> (prob.pk.pf.flower.c.4–5y)	K	K	23w		85w		97w– (shd)	c.2y	
<i>Boronia mollis</i>		pK	35w						
<i>Boronia pinnata</i> (poss.pk.pf.flower.c.3+y)	R	R		37w, <b>89w</b>		97w–(shd)			c.2y
<i>Boronia polygalifolia</i>	pR								
<i>Boronia rigens</i>	K	pK							
<i>Correa reflexa</i> (prob.pk.pf.flower.c.4–5y)	pK	pK	85w		<b>131w</b>		89w–grn	c.2y	
<i>Crowea saligna</i>		?K	22w						
<i>Eriostemon australasius</i>		K/r	17w						
<i>Leionema dentatum</i> (poss.pk.pf.flower.c.10+y)	K	K	30w		189w		247w	c.4–5y	
<i>Phebalium squamulosum</i> subsp. <i>squamulosum</i>		K							
<i>Philotheca salsolifolia</i> subsp. <i>salsolifolia</i> (prob.pk.pf.flower.c.5–6y)	pK	K			89w, <b>135w</b>		141w–grn	c.2–3y	
<i>Zieria laevigata</i>		?K	17w				97w		
<i>Zieria pilosa</i> (poss.pk.pf.fruit.c.3y)	pK		15w		63w, <b>85w</b>		85w	c.2y	
<i>Zieria smithii</i> (poss.pk.pf.flower.c.3–5y)	K		26w		88w		143w	c.2–3y	
<b>Salicaceae</b>									
* <i>Populus alba</i>	R								
* <i>Salix ?alba</i>		R							
* <i>Salix babylonica</i> (s.lat.)	R								
<b>Santalaceae</b>									
<i>Exocarpos cupressiformis</i>	R	R	26w	61w			<u>190w</u>		
<i>Leptomeria acida</i>	K		122w–adv		163w		190w	c.3–5y	
<b>Sapindaceae</b>									
* <i>Cardiospermum grandiflorum</i>	R		7w		<u>63w</u>		<u>89w</u>		
<i>Dodonaea pinnata</i>		pK	31w						
<i>Dodonaea triquetra</i> (prob.pk.pf.fruit.c.4–5 y)	K	pK	6w		63w		87w–grn	c.2–3y	
<b>Scrophulariaceae</b>									
* <i>Verbascum virgatum</i>							<u>51w</u>		
* <i>Veronica persica</i>					38w		38w		
<i>Veronica plebeia</i>	R		19w		<u>39w</u>		<u>44w(grn)</u>		
<b>Simaroubaceae</b>									
* <i>Ailanthus altissima</i>	R	R							
<b>Solanaceae</b>									
* <i>Cestrum parqui</i>	R			41w		51w			c.1y–grn
* <i>Datura ferox</i>							<u>16w(grn)</u>		
* <i>Datura stramonium</i>			8w		<u>8w</u>		<u>12w(grn)</u>		
<i>Duboisia myoporoides</i>		R							
* <i>Lycopersicon esculentum</i>			12w		15w		29w		
* <i>Petunia ?(hybrid)</i>					35w				
* <i>Physalis peruviana</i>					140w		140w		
<i>Solanum americanum</i>					<u>37w</u>		<u>37w</u>		
<i>Solanum aviculare</i>			16w		<u>50w</u>		<u>94w(grn)</u>		
* <i>Solanum chenopodioides</i>	R			7w		50w			
* <i>Solanum mauritianum</i>	R	pR		36w		41w			c.1y
<i>Solanum prinophyllum</i>			13w		35w		35w		
<i>Solanum vescum</i>			20w		38w		38w		

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<b>Stackhousiaceae</b>									
<i>Stackhousia nuda</i>		R		17w(1)					
<i>Stackhousia viminea</i>	pK	pK	32w		37w		42w	c.1y	
<b>Sterculiaceae</b>									
<i>Commersonia fraseri</i>	R			63w					
<i>Lasiopetalum ferrugineum</i> (prob.pk.pf.flower.c.4–5y)	K	K	22w		87w		97w	c.2y(shd)	
<i>Lasiopetalum parviflorum</i>	K				144w				
<i>Rulingia dasyphylla</i> (prob.pk.pf.flower.c.3–4y)			20w		38w		92w	c.2y(shd)	
<b>Stylidiaceae</b>									
<i>Stylidium graminifolium</i>	R			30w		51w			c.1–2y
<i>Stylidium lineare</i> (poss.pk.pf.flower.c.3y)	?K	K/r	?75w	?42w	93w		104w	c.2y(shd)	
<i>Stylidium productum</i>	R	pR	26w		<u>97w</u>		<u>101w(grn)</u>		c.2–3y?
<b>Thymelaeaceae</b>									
<i>Pimelea curviflora</i> (poss.pk.pf.flower.c.2y)					56w		61w		
<i>Pimelea linifolia</i> (prob.pk.pf.flower.c.3–5y)	K	K	22w		56w		75w	c.2y(shd)	
<i>Wikstroemia indica</i>		?K							
<b>Tremandraceae</b>									
<i>Tetralochea ericifolia</i>		K							
<i>Tetralochea glandulosa</i>	R	R		90w					
<i>Tetralochea thymifolia</i>	R/?k	R	38w						
<b>Tropaeolaceae</b>									
* <i>Tropaeolum majus</i>					26w		26w		
<b>Ulmaceae</b>									
* <i>Celtis australis</i>	R								
<i>Trema tomentosa</i> var. <i>viridis</i>		?K	10w						
<b>Urticaceae</b>									
<i>Urtica incisa</i>					<u>38w</u>				
<b>Verbenaceae</b>									
<i>Clerodendrum tomentosum</i>	R	R		143w–buds		4y–grn.			
* <i>Lantana camara</i>	R	R		16w		20w–grn			
* <i>Verbena bonariensis</i> (s.lat.)	R		11w		<u>37w</u>		<u>56w</u>		
* <i>Verbena litoralis</i> (s.lat.)	R			7w		10w			
* <i>Verbena rigida</i>					<u>12w</u>		<u>23w–(shd)</u>		
<b>Violaceae</b>									
<i>Hybanthus monopetalus</i> (prob.pk.pf.flower.c.2–3y)	R			36w		43w–grn			c.1y
<i>Viola hederacea</i>	R		10w		<u>10w</u>		<u>38w</u>		
* <i>Viola odorata</i>	R								
<b>Vitaceae</b>									
<i>Cayratia clematidea</i>	R	R		51w		51w–grn			c.1y
<i>Cissus hypoglauca</i>	R	R							
* <i>Vitis</i> sp.		R							
<b>MONOCOTYLEDONS</b>									
<b>Agavaceae</b>									
* <i>Agave americana</i>	R			19w					
* <i>Yucca aloifolia</i>	R								
<b>Alliaceae</b>									
* <i>Nothoscordum borbonicum</i>	pR	pR		9w		18w			
<b>Alstroemeriaceae</b>									
* <i>Alstroemeria pulchella</i>	pR			49w		49w			
<b>Amaryllidaceae</b>									
* <i>Amaryllis belladonna</i>	pR					12w			

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>*Clivia miniata</i>	R								
<i>*Narcissus sp.</i>	pR	pR		18w					
<b>Anthericaceae</b>									
<i>Caesia parviflora</i>	R	R		37w, <b>42w</b>		49w			c.1y
<i>*Chlorophytum comosum</i>	pR			16w					c.1y
<i>Laxmannia gracilis</i> (s.str.)	?K			<u>43w(1), 46w</u>		<u>51w-(shd)</u>			
<i>Sowerbaea juncea</i>		R		32w					
<i>Thysanotus juncifolius</i>	pR	pR		17w		<u>64w-(shd)</u>			
<i>Thysanotus tuberosus</i>	R			46w					
<i>Tricoryne simplex</i>	R			16w		41w			c.1y
<b>Araceae</b>									
<i>*Colocasia esculenta</i>	pR	pR							
<i>Gymnostachys anceps</i>		R		35w		35w			
<b>Arecaceae</b>									
<i>Livistona australis</i>		R		35w					
<i>*Phoenix ?canariensis</i>	R								
<b>Asparagaceae</b>									
<i>*Asparagus aethiopicus</i>	R			50w					
<i>*Asparagus asparagoides</i>	R					46w			c.1y
<i>*Asparagus officinalis</i>	pR					18w			
<i>*Asparagus scandens</i>	R								
<b>Blandfordiaceae</b>									
<i>Blandfordia nobilis</i> (prob.pk.pf.flower.c.2y)	R	R		46w, <b>49w</b>		56w-(shd)			56w-(shd)
<b>Cannaceae</b>									
<i>*Canna indica</i>	R	R		38w					
<b>Centrolepidaceae</b>									
<i>Centrolepis strigosa</i>	pK			36w		44w			44w-(shd)
<b>Colchicaceae</b>									
<i>Burchardia umbellata</i>	R	R		36w		46w			46w-(shd)
<b>Commelinaceae</b>									
<i>Commelina cyanea</i>	R	R		10w					
<i>*Tradescantia fluminensis</i> (poss.pk.pf.flower.c.3y)	R			43w					
<b>Cyperaceae</b>									
<i>Baumea juncea</i>	R	R		49w		51w			
<i>Baumea rubiginosa</i>	R	R		38w					
<i>Carex inversa</i>	?R				<u>15w</u>				
<i>Caustis flexuosa</i>	K	K	56w		c.2-3y				
<i>Caustis pentandra</i>	K	K					198w	c.4y	
<i>Chorizandra cymbaria</i>	R	R		31w		42w			c.1y
<i>Chorizandra sphaerocephala</i>		R		17w		32w			32w-(shd)
<i>Cyathochaeta diandra</i> (prob.pk.pf.flower.c.1y)	R	R		45w		56w			
<i>*Cyperus albostriatus</i>	pR	pR		26w					
<i>*Cyperus brevifolius</i>	R			10w		10w			
<i>*Cyperus eragrostis</i>	R			10w		10w			
<i>Cyperus ?polystachyos</i>	R			10w					
<i>Fimbristylis dichotoma</i>	pR					<u>71w-(shd)</u>			
<i>Gahnia clarkei</i>	R					159w			c.3y
<i>Gahnia erythrocarpa</i>	R	R		91w		201w			c.3-4y
<i>Gahnia melanocarpa</i>	R					125w			c.2-3y
<i>Gahnia radula</i>	R	R		90w					c.2-3y
<i>Gymnoschoenus sphaerocephalus</i>		R							
<i>Isolepis ?cernua</i>	R			10w					
<i>Isolepis inundata</i>					<u>28w</u>				

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods		
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary	
<i>*Isolepis prolifera</i>	pR					<u>63w</u>				
<i>Lepidosperma filiforme</i>		?K								
<i>Lepidosperma gunnii</i>	pR					61w				
<i>Lepidosperma laterale</i>	R			49w		56w			56w	
<i>Lepidosperma limicola</i>		R		32w						
<i>Lepidosperma neesii</i>	R	R		35w		63w				
<i>Ptilothrix deusta</i> (prob.pk.pf.flower.c.1y)	R	R		10w		32w			c.1y-(shd)	
<i>Schoenus apogon</i>	?K	?K			<u>38w</u>					
<i>Schoenus brevifolius</i>	R			41w		63w				
<i>Schoenus ericetorum</i>	R			36w						
<i>Schoenus imberbis</i>	R	R		37w		76w				
<i>Schoenus melanostachys</i>	R	R		35w		51w			c.1y	
<i>Schoenus moorei</i>	R	R		32w		51w			c.1y	
<i>Schoenus paludosus</i>		K								
<i>Schoenus turbinatus</i>					<u>104w-buds</u>					
<i>Schoenus villosus</i>	R			56w-buds						
<i>Tetraria capillaris</i>	R			50w						
<i>Tricostularia pauciflora</i>	pR					104w				
<b>Haemodoraceae</b>										
<i>Haemodorum corymbosum</i>	R	R		42w		64w				
<i>Haemodorum planifolium</i> (prob.pk.pf.flower.c.1y)	R	R		42w		56w			56w-(shd)	
<b>Hypoxidaceae</b>										
<i>Hypoxis hygrometrica</i> (s.lat.)	pR			16w						
<b>Iridaceae</b>										
<i>*Anomatheca laxa</i>	pR			40w						
<i>*Aristea ecklonii</i>	pR	R		41w		44w				
<i>*Crocoshmia X crocosmiiflora</i>	pR	pR		18w		38w-grn				
<i>*Freesia hybrid</i>	pR			33w		38w				
<i>*Gladiolus angustus</i>	pR	pR		40w						
<i>Patersonia glabrata</i>	R	R		38w		49w			c.1y-(shd)	
<i>Patersonia sericea</i>	R	R		31w		44w			c.1y-(shd)	
<i>*Romulea rosea</i>	pR			33w						
<i>*Sisyrinchium iridifolium</i>		?K			<u>42w</u>		<u>42w</u>			
<i>*Sisyrinchium species A</i>	?K	?K			<u>42w</u>		<u>44w</u>			
<i>*Watsonia meriana</i> cv. Bulbillifera	pR	pR		38w					Note: Bulbils began to be shed within 50w of fire.	
<b>Juncaceae</b>										
<i>*Juncus articulatus</i>	R			10w						
<i>*Juncus bufonius</i>						<u>38w(grn)</u>				
<i>Juncus continuus</i>		R		42w-buds						
<i>Juncus planifolius</i>						<u>40w</u>				
<b>Juncaginaceae</b>										
<i>Triglochin procerum</i> (s.str.)		pR		20w		20w			20w	
<b>Liliaceae</b>										
<i>*Lilium formosanum</i>	R	R		26w		29w-grn				
<b>Lomandraceae</b>										
<i>Lomandra cylindrica</i>	R			40w		56w			56w-(shd)	
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	R	R		35w		51w			c.1y	
<i>Lomandra fluviatilis</i>	R									
<i>Lomandra glauca</i>	R	R		36w		49w			c.1y	
<i>Lomandra gracilis</i>	R	R		38w		51w			c.1y-(shd)	
<i>Lomandra longifolia</i>	R	R	131w	34w		50w			c.1y-(shd)	
<i>Lomandra micrantha</i>	R			64w						
<i>Lomandra multiflora</i>	R	R		41w		51w			c.1y	



Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Lomandra obliqua</i>	R	R		41w		49w			c.1y
<b>Luzuriagaceae</b>									
<i>Eustrephus latifolius</i>	R	pR		15w		35w			35w-ri
<i>Geitonoplesium cymosum</i>		R		35w-buds					
<b>Orchidaceae</b>									
<i>Acianthus caudatus</i>	pR			28w		38w			
<i>Acianthus fornicatus</i>	pR			23w		33w			
<i>Acianthus pusillus</i>	pR			16w		26w			
<i>Caladenia carnea</i>	pR			36w					
<i>Caladenia catenata</i>	pR			34w		39w			
<i>Caladenia testacea</i>					86w (1)				
<i>Caleana major</i>	pR	pR		37w		49w			
<i>Calochilus campestris</i>	pR	pR		37w		42w			
<i>Calochilus paludosus</i>	pR	pR		37w		41w			
<i>Calochilus robertsonii</i>	pR			39w					
<i>Cestichis reflexa</i>		K	Lightly burnt plants resprouted from pseudobulbs -NL.						
<i>Chiloglottis sp.</i>		pR		10w					
<i>Corybas pruinus</i>		pR		Leaves emerged within 35w of fire.					
<i>Cryptostylis erecta</i>	pR			46w		108w			
<i>Cryptostylis subulata</i>	pR				101w	101w-grn			
<i>Cymbidium suave</i>	pK	pK		Resprouted, low intensity-flowered 92w after fire.					
<i>Dipodium roseum</i>	pR				101w				
<i>Dipodium variegatum</i>	pR			49w					
<i>Diuris aurea</i>		pR		37w		42w			
<i>Diuris maculata</i> (prob.pk.pf.flower.c.1y)	pR			30w		36w			
<i>Dockrillia linguiformis</i>	K	K		143w-buds					
<i>Eriochilus petricola</i>	pR			64w					
<i>Genoplesium fimbriatum</i>		pR		10w		21w			
<i>Genoplesium pumilum</i>		pR				17w			
<i>Genoplesium rufum</i>	pR	pR		16w		24w			
<i>Glossodia major</i>		pR		31w					
<i>Glossodia minor</i>	pR	pR		31w		36w			
<i>Lyperanthus suaveolens</i>	pR			36w					
<i>Microtis unifolia</i> (s.lat.)	pR	pR		36w		43w			
<i>Orthoceras strictum</i>							104w		
<i>Prasopphyllum elatum</i>	pR	pR		36w		43w			
<i>Prasopphyllum striatum</i>		pR				22w			
<i>Pterostylis acuminata</i>	pR			18w					
<i>Pterostylis concinna</i>	pR			29w		30w			
<i>Pterostylis daintreana</i>		pR		22w		31w			
<i>Pterostylis longifolia</i>	pR			24w					
<i>Pterostylis nutans</i>	pR	pR		30w		36w			
<i>Rimacola elliptica</i>	pR	pR		38w					
<i>Thelymitra ixiooides</i>	pR	pR		31w		43w-(shd)			
<i>Thelymitra pauciflora</i>	pR	pR		37w		42w			
<b>Philydraceae</b>									
<i>Philydrum lanuginosum</i>		pR				20w			
<b>Phormiaceae</b>									
<i>Dianella caerulea</i>	R	R		41w		49w			c.1y
<i>Dianella prunina</i>	R	R		43w		51w			c.1y
<i>Dianella revoluta</i>	R			94w					
<i>Thelionema caespitosum</i>	R			91w		100w			
<b>Poaceae</b>									
* <i>Agrostis capillaris</i>					43w				
* <i>Agrostis stolonifera</i>					43w				
* <i>Andropogon virginicus</i>	R	R		15w		20w			20w

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering		First fruiting		Juvenile periods	
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>Anisopogon avenaceus</i> (poss.pk.pf.flower.c.1-2y)	R	R		41w		49w			c.1y-(shd)
<i>Aristida benthamii</i>		R		17w		32w			32w-(shd)
<i>Aristida calycina</i> var. <i>calycina</i>	R					26w			26w-(shd)
<i>Aristida ramosa</i>	R	R		8w		17w			17w
<i>Aristida vagans</i>	R			6w		15w			15w-(shd)
<i>Aristida warburgii</i>	R			11w		16w			16w
* <i>Arundo donax</i>	R								
<i>Austrodathonia ?linkii</i>						<u>30w-(shd)</u>			
<i>Austrodanthonia tenuior</i>	R			11w		18w			18w
<i>Austrostipa pubescens</i>	R					49w			c.1y-(shd)
* <i>Avena sativa</i>				<u>23w</u>		<u>43w-(shd)</u>			
* <i>Briza maxima</i>	?K				43w		50w	1y-(shd)	
* <i>Briza minor</i>	?K	?K			28w		43w	43w	
* <i>Briza subaristata</i>							<u>51w</u>		
* <i>Bromus catharticus</i>					<u>39w</u>				
* <i>Bromus diandrus</i>					<u>41w</u>				
* <i>Chloris gayana</i>		R		13w		35w			
* <i>Cortaderia selloana</i>	R	R		18w		20w			
<i>Cymbopogon refractus</i>	R			9w		19w			19w
<i>Deyeuxia quadriseta</i>					<u>39w</u>		<u>44w</u>		
<i>Dichelachne crinita</i>	R	pR		37w		49w			c.1y-(shd)
<i>Dichelachne micrantha</i>	R			16w					
<i>Dichelachne parva</i>					<u>39w</u>				
<i>Dichelachne rara</i>					<u>41w</u>				
<i>Digitaria parviflora</i>	R	R		13w		30w			30w-(shd)
<i>Echinopogon caespitosus</i>	R			8w		15w			15w
* <i>Ehrharta erecta</i>	R			12w			<u>38w</u>		
* <i>Eleusine indica</i>					<u>15w</u>				
<i>Entolasia marginata</i>	R			9w		28w			28w-(shd)
<i>Entolasia stricta</i>	R	R		8w		22w			22w
<i>Eragrostis ?brownii</i>	R			8w					
<i>Eragrostis leptostachya</i>	R			9w					
<i>Hemarthria uncinata</i>	R	R		11w					
* <i>Hordeum distichon</i>					<u>12w</u>		<u>40w</u>		
<i>Imperata cylindrica</i> var. <i>major</i>	R			6w		11w			11w
<i>Lachnagrostis filiformis</i>					<u>39w</u>		<u>44w</u>		
* <i>Lolium multiflorum</i>					<u>38w</u>				
* <i>Lolium perenne</i>					<u>44w</u>				
* <i>Melinis repens</i>	R			19w		26w			
<i>Microlaena stipoides</i>	R			8w		15w			15w
<i>Oplismenus aemulus</i>	?K				<u>19w</u>				
<i>Panicum simile</i>	R			15w		16w			
* <i>Paspalum dilatatum</i>	R			10w		15w			15w
* <i>Paspalum quadrifarium</i>	R	R		11w		28w			28w-(shd)
* <i>Paspalum urvillei</i>	R			9w		9w			
* <i>Pennisetum clandestinum</i>	R	pR							
* <i>Pennisetum macrourum</i>	R			50w					
<i>Phragmites australis</i>	R					71w			c. 1-2y
* <i>Phyllostachys aurea</i>	R								
* <i>Poa annua</i>					30w				
<i>Poa labillardieri</i>	R			9w					
* <i>Setaria gracilis</i>	R			9w		10w			
* <i>Setaria palmifolia</i>	R	R		16w		30w			
* <i>Setaria sphacelata</i>		R		38w		38w			

Family/Species (Post-fire fl, fr peaks)	Fire Response		Seedlings first observed	First flowering	First fruiting		Juvenile periods		
	LCR	NL		Resp	Seed	Resp	Seed	Primary	Secondary
<i>*Sorghum bicolor</i>					23w		23w		
<i>*Sporobolus africanus</i>					<u>19w</u>				
<i>Sporobolus creber</i>	pR			15w					
<i>Themda australis</i>	R	R		13w		49w			c.1y
<i>*Vulpia bromoides</i>					<u>43w</u>				
<b>Restionaceae</b>									
<i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i>		R							
<i>Chordifex dimorphus</i>		K/ r							One plant resprouted. Others apparently killed.
<i>Chordifex fastigiatus</i>		K							One plant resprouted, but it was <u>not</u> 100% scorched.
<i>Empodisma minus</i>	R								
<i>Eurychorda complanata</i>		pK							Unable to find this species in one location where it previously occurred before the fire (as observed 38w after the fire).
<i>Leptocarpus tenax</i>		R					<u>32w</u>		
<i>Lepyrodia scariosa</i>	R	R		56w					
<b>Smilacaceae</b>									
<i>Smilax australis</i>	R	R		35w– (1)					
<i>Smilax glyciophylla</i>	R			46w		50w			c.1y
<b>Typhaceae</b>									
<i>Typha ?orientalis</i>	pR					85w			
<b>Uvulariaceae</b>									
<i>Schelhammera undulata</i>	R	R		13w		44w			44w–grn.
<b>Xanthorrhoeaceae</b>									
<i>Xanthorrhoea arborea</i> (prob.pk.pf.flower.c.1y)	R	R		35w,51w		100w			c.2y–(shd)
<i>Xanthorrhoea media</i> (prob.pk.pf.flower.c.1y)	R	R		17w,39w		56w			56–63w(shd)
<i>Xanthorrhoea ?minor</i>				38w					
<i>Xanthorrhoea resinifera</i>	R	R		43w					
<b>Xyridaceae</b>									
<i>Xyris gracilis</i>	R			51w					
<i>Xyris juncea</i>		R		17w		32w			
<i>Xyris operculata</i>		R		32w					
<b>Zingiberaceae</b>									
<i>*Hedychium gardnerianum</i>	R					88w			