

South Creek demonstration site

Western Sydney riparian corridors, Erskine Park



- ❖ *Recovering and managing riparian bushland on an intermediate scale*
- ❖ *Works to retain, enhance and expand a corridor of riparian bushland along South Creek*



Department of
Environment and Conservation (NSW)

**Recovering
bushland** *on the Cumberland Plain*

Introduction

The South Creek demonstration site at Erskine Park is part of riparian corridor lands owned by the NSW Department of Infrastructure, Planning and Natural Resources. The site is undergoing long-term restoration as part of the department's Greening Western Sydney project.

An endangered ecological community, Sydney Coastal River-flat Forest, is found on the site as remnant riparian vegetation along South Creek.

Since 1998, management strategies to restore and expand the remnant bushland on the site have included:

- ❖ works that focus on restoring the remnant riparian vegetation using bush regeneration and weed control techniques
- ❖ an extensive planting program in pastoral lands adjacent to these riparian areas.

Bush regeneration program (since 1998)

The management strategy for the riparian areas has focused on using 'best practice' bush regeneration and weed control techniques along South Creek. These techniques concentrate on controlling and removing environmental and noxious weeds over time, which reduces the competition for native vegetation and allows natural regeneration to take place.

Regeneration has been undertaken in stages with the fauna habitat values considered as part of the program.

Front cover: *The annual and perennial weeds which dominated this site have been controlled by brushcutting and ongoing treatment of regrowth so that native groundcovers now dominate. The charred remains of a pile burn is also evident. (Greening Australia (NSW))*

Tip: Assess the site's resilience

Wherever possible, a policy of minimum intervention should be followed. This is a sound philosophy from both a resource and ecological perspective. Assessing the resilience of the bushland will identify areas where regeneration or revegetation can be used and links created to achieve restoration goals.

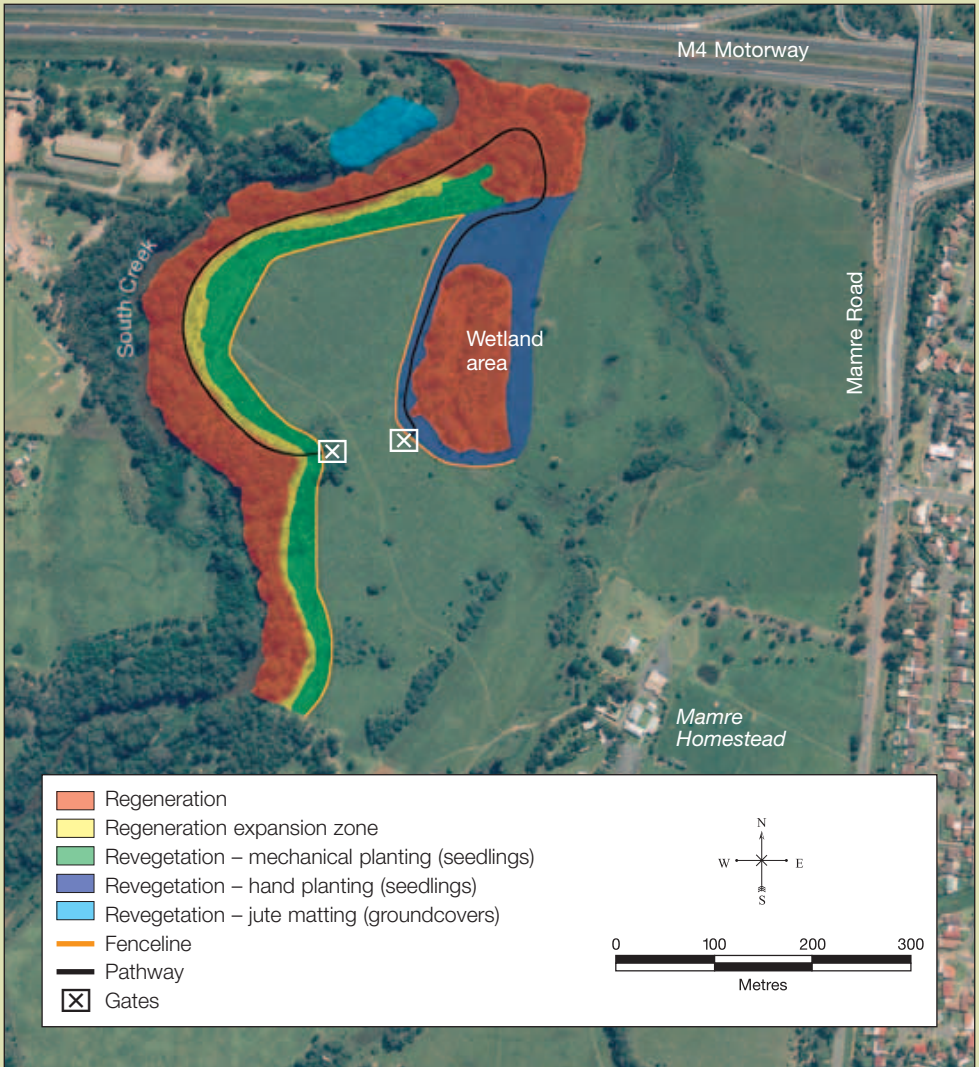
The restoration strategies used at the site have changed over time. This is because an effective restoration approach involves monitoring changes as works proceed and having the flexibility to re-order priorities as the conditions on site change.

The riparian remnant contained a scattered canopy of Cabbage Gum (*Eucalyptus amplifolia*), Rough-barked Apple (*Angophora floribunda*) and Swamp Oak (*Casuarina glauca*), with occasional patches of shrubs such as Bursaria (*Bursaria spinosa*), Sydney Green Wattle (*Acacia parramattensis*) and Black Wattle (*A. decurrens*). Native groundcovers were present, but limited in number and extent.

Weed removal

The site was dominated by a dense mid-storey of woody weeds including Narrow-leaved Privet (*Ligustrum sinense*), African Olive (*Olea europaea* spp. *africana*), Tree of Heaven (*Ailanthus altissima*), African Boxthorn (*Lycium ferocissimum*), Broad-leaved Privet (*Ligustrum lucidum*) and Green Cestrum (*Cestrum parqui*). Other weeds included Bridal Creeper (*Asparagus asparagoides*), Blackberry (*Rubus fruticosus*) and Wandering Jew (*Tradescantia fluminensis*).

Primary works involved treating large woody weeds with herbicide. Large areas of young exotic growth were brushcut to ground level and



any regrowth up to half a metre high was sprayed with appropriate herbicides. Some of the large debris from the treated woody weeds was spread across the restoration site, while other dead woody weeds were left in place to provide habitat, and reduce the risk of erosion and the cost of weed removal.

The Wandering Jew on site was raked up and piled on weed mats or tarpaulins to allow its relocation. The piles were then moved to a sunny location not favoured by the weed and above the high water level of nearby waterways. The dying piles of weed were monitored for regrowth and the edges sprayed with appropriate herbicide where necessary.

Use of fire

Techniques using fire to trigger a regeneration response were trialled and gradually developed successfully on the site. Pile burns allowed the resilience and diversity of the site's soil seed bank to be gauged, as well as being an effective and cheap means of removing woody debris.

Creating long and narrow piles of woody debris is the best technique for ecological pile burns. Piles on the site were limited to around a metre in height and an area of not more than 10 square metres. This ensured the fire was able to be controlled and did not sterilise the soil by being too hot for the seed stored in it. Water was sprayed on the piles during burning to regulate the temperature.

Seed collected from hard-seeded species, such as *Acacia*, nearby was scattered onto the cooling embers. Seed from other herbs and grasses was also scattered but some days later when the embers had completely cooled.

To protect the native regrowth from grazing rabbits, a silt fence was erected around the ashen area.

Weed debris from bush regeneration collected and stacked in a long thin pile ready to be burnt. (Greening Australia (NSW))



Tip: Managing for fire

Conservation of western Sydney's vegetation communities involves the conscious management of fire. Species diversity is promoted by fire regimes that encourage variation in the intervals between fires, fire intensity and the burn season between August and January. The Rural Fire Service and the Department of Environment and Conservation can provide advice for land managers on managing for fire.

Follow-up works

Following completion of the primary works, ongoing monitoring of the site began immediately. Despite the success of primary control measures, weed seedlings still managed to germinate and required treatment. Any regrowth of woody weeds and herb seedlings was spot sprayed; species treated included Privet, African Olive, *Sida rhombifolia*, *Solanum pseudocapsicum* and *Cirsium vulgare*.

Annual weeds which had not been treated as seedlings and had reached about a metre in height were brushcut prior to seeding. All of this weedy debris was then raked and piled, which concentrated it in one area and allowed checking for any seed that had germinated after brushcutting. These piles were treated in the same manner as the Wandering Jew piles above. Keeping annual weeds at bay requires continual monitoring of the site and repeated spot spraying.

Persistent weeds, such as *Cestrum parqui* and *Phytolacca octandra*, and small woody weeds were hand treated.

As a result of sustained follow-up efforts, a dense native groundcover has been restored, including Kidney Weed (*Dichondra repens*), Swamp Pennywort (*Centella asiatica*), *Einadia* spp., Forest Nightshade (*Solanum prinophyllum*),

Hydrocotyle spp., Creeping Speedwell (*Veronica plebia*), White Root (*Pratia purpurascens*) and Weeping Grass (*Microlaena stipoides*).

Expansion zone

Up to 20 metres has been left between the riparian regeneration zone and the revegetation further away from the creek. This area is designed to allow for the natural recruitment, regeneration and expansion of the remnant riparian vegetation. This is a very important best practice restoration technique that aims to both buffer the remnant vegetation while also encouraging it to expand.

Revegetation program (since 2000)

When considering the restoration of vegetation on the Cumberland Plain, it is important to be aware of the potential for revegetation programs to oversimplify an ecosystem. Any restoration project should aim to re-create an *ecosystem* not simply make a bushland *garden*. This will ensure that the genetic integrity of the re-created bushland does not compromise remnant bushland nearby.

Controlling access

A fence was erected in 1999 to control stock access into the regeneration and revegetation area. The fence provided for a 50–100 metre wide buffer area between pastoral activities on the bulk of the property and the regeneration and revegetation activities along the creekline. Immediately inside the fenceline, an area approximately 20 metres wide is being revegetated. Between this and the remnant riparian vegetation is the expansion zone for the regenerating bushland along South Creek.

Re-creating a woodland structure

The revegetation program aims to mimic the structure and diversity of the remnant bushland found on the property. Revegetation methods for re-creating a woodland structure were used where canopy trees were almost absent and pasture grasses dominated. Canopy species and fast-growing nitrogen-fixing pioneer shrubs were introduced first, while groundcovers, native grasses, herbs and climbers were not brought in for at least 12 months, except where natural recruitment of these species had already occurred.

This approach is based on the theory that getting the upper strata (trees and shrubs) established first will improve soil condition and create better conditions for the growth of native grasses and herbs previously disadvantaged by exotic grasses.

The technique relies on sustained intervention over time to manipulate competition through a weed control program which will harness the site's underlying potential for natural recovery. If natural regeneration is slow or non-existent, this approach can be used in combination with various 'trigger' methods, such as fire, to encourage natural recruitment of native vegetation. However diversity is only achieved over time and in stages and long-term commitment is important.

Site preparation

Site preparation for revegetation involved slashing the existing pasture along the contours of the land. Subsequent planting along the contours minimised the risk of erosion. The slashed areas were left for 2–3 weeks to allow for pasture regrowth. Narrow lines of herbicide approximately a metre wide

were then sprayed along the contours to be planted. The site was left until the herbicide had taken effect (approximately two weeks) before seedlings were planted along the pre-treated contour lines. This staged process ensured that the young plants were free from competition as they established themselves.

Planting

In early autumn 2000, over 10,000 tubestock seedlings were mechanically planted in the revegetation area inside the fenceline. The use of mechanical equipment only becomes cost-effective when 5000 or more seedlings are being

Mechanical planting of seedlings in 2000 was designed to provide protection and a buffer to the remnant riparian vegetation along South Creek. Photograph from 2002. (Greening Australia (NSW))



By 2005 the seedlings have performed well in the rich riparian soils along the buffer boundary. (Greening Australia (NSW)/T.Beshara)



planted and it also has limitations: it only plants in straight lines and can be difficult to use on slopes and in rocky soils. The mechanical planting operation at South Creek placed seedlings about two metres apart in each row, which was around 2.5 metres wide. These distances allowed for vehicle access during the maintenance program.

Tip: Plant selection

Careful plant selection is essential and local species from provenance stock should be used in any planting program on the Cumberland Plain. These local species are adapted to the local climate and soil conditions and are therefore more likely to lead to a successful self-perpetuating plant community.

Seedlings used in the revegetation program were propagated from seed collected from bushland remnants on or adjacent to the property. All plants were mixed and planted in a random fashion, as this has been found to give the best results in re-establishing vegetation. Plants were also installed with a recycled cardboard weed mat and tree guard. This technique protects the seedlings from rabbits, weed competition and the extremes of weather, as well as ensuring valuable moisture is retained. Tree guards also help to protect the seedlings from herbicide drift during maintenance spraying regimes.

Successful groundcover introduction

Greening Australia (NSW) has been trialling a technique to reintroduce native groundcovers in areas dominated by the exotic groundcover Wandering Jew. By cultivating seed on jute matting and then laying the mats along prepared sections of the northern bank of South Creek, two native groundcovers,

Microlaena stipoides and *Commelina cyanea*, have been successfully introduced.

Wetland area

An oxbow section of the creek was recognised as a significant frog habitat area. The waterhole had an excellent native grass cover but was devoid of trees and heavily infested with Blackberry. An extensive regeneration and revegetation program was undertaken in 2001–02. Hand plantings of seedlings led to the successful establishment of Sydney Coastal River-flat Forest vegetation around the wetland area. The revegetation works have also linked the planted areas with the remnant vegetation along South Creek.

Maintenance

Regenerated areas need ongoing monitoring and management as self-sustaining conditions may take many years to reach.

An integrated weed control program has been implemented at the South Creek site. The bush regeneration maintenance program focuses on removing and controlling environmental and noxious weeds over time, using regeneration techniques. These

Applying herbicide using a spray arm mounted to a 4WD vehicle, a technique often used to control weeds on broad-acre mechanically planted sites. (Greening Australia (NSW))



Tip: Maintenance

Do not attempt to clear more than you will be able to maintain. It is essential that weeds are controlled throughout the process of seedling germination and establishment.

techniques aim to reduce competition with native vegetation and thus encourage natural regeneration.

Maintenance in the revegetated areas involved spraying herbicide to a small area around the base of the newly planted seedlings approximately three months after planting. This reduces the competition for water and nutrients from the surrounding weeds and pasture. Competition for water during the first spring and summer is possibly the most important influence on seedling survival and growth rates.

Two types of herbicide maintenance spraying techniques have been used at South Creek. Backpacks were employed in the bush regeneration areas, while in the larger revegetation area a spray arm mounted to a 4WD vehicle was used.

Seedlings were maintained under a regime where they were sprayed three times a year at peak weed growth periods, such as early spring, summer and mid-autumn. This maintenance program is followed only for the first 1–2 years (ideally two) of the plant's life, after which the plants are self-sustaining. At this point installing groundcovers, such as *Dichondra* or *Pratia* spp., is ideal but requires a commitment to maintain works for at least three years.

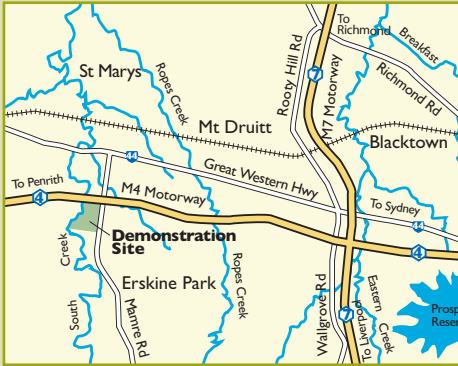
Tip: Monitoring

Monitoring at the South Creek site has revealed changes in the composition and distribution of both native and exotic species over time. Assessing the monitoring results has allowed for a more responsive tailored restoration program.

More information

For further information and access to the South Creek demonstration site contact:

Land Management Branch
Department of Infrastructure, Planning
and Natural Resources
Phone: (02) 9895 7626



Detailed information on current and successful techniques for restoring ecosystems across the Cumberland Plain are available by downloading the report *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland* from the NSW Department of Environment and Conservation (DEC) website at www.environment.nsw.gov.au or by phoning DEC Environment Line on 131 555.

Identify the vegetation community on your site

Consult the report *Native Vegetation of the Cumberland Plain: Final Edition* (2002) to check which vegetation community is likely to be on your site: go to the DEC website www.environment.nsw.gov.au and enter 'Cumberland Plain Vegetation Mapping Project' in the search field.

Licensing

Anyone working on or in close proximity to bushland that has been classed as endangered under the *Threatened Species Conservation Act 1995* must have a licence from DEC. Contact the DEC Wildlife Licensing Unit on (02) 9585 6540 for details.

Published by:
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Phone: 131 555 (environment information and publications requests)
Phone: 1300 361 967 (national parks information and publications requests)
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DEC 2005/233
ISBN 1 74137 382 4
July 2005

Printed on recycled paper

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