Berry Land Carer Kit

An environmental management resource for landowners and carers in the Berry district

December 2022

Berry Corridor

Berry Landcare

NATIONAL PARKS ASSOCIATION OF NSW

An initiative of the Berry Corridor Bush Links Project, Berry Landcare Inc., funded by the NSW Environment Trust.

NSW GOVERNMENT

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1 Introduction

1.1 About this document

This document is intended to act as a resource for landowners and carers in the Berry corridor and district who wish to manage their landholdings with a view to promoting biodiversity and conserving the natural ecology. It was developed by Berry Landcare as part of the Berry BushLinks project.

Originally drafted as a hard-copy resource, this document has been revised to be accessible as an e-document and to take advantage of the many relevant and continually updated internet resources.

This document is intended as a dip-in and out resource, it is not expected to be a one-off cover-to-cover read. It has been variously written and compiled by volunteers and consequently includes some individuality not normally experienced in the funded varieties of this species. Please enjoy and tolerate these peculiarities as and where required.

2 Setting the scene

This section provides an historical and environmental context to the Berry District, which helps to explain how why the current environment is in its present state and condition.

2.1 Berry BushLinks and the Berry Corridor

2.1.1 Introduction

Berry Landcare Inc. was awarded a Bush Connect Grant of $500,000.00 from the NSW Environment Trust in 2016, to be implemented in partnership with the NSW National Parks Association. The project brought together a consortium including over fifty private landowners, community and government organisation. It aimed to support and augment the Berry Wildlife corridor by connecting existing ‘steppingstone’ patches of native vegetation across private and public tenures. David Rush was engaged as the Project Officer. Funding was provided for six years of a 10-year project timeline. Due to drought, Covid19 and changes in workforce, the period of funding was extended to seven years: 2016 – 2022.

To date [2021] over 200 volunteers have been involved in the project, planting 9,600 native tube stock across 33 private, and 10 government owned properties. The project has also included feral animal control, community workshops and scientific fauna research with the University of Wollongong. Over 23,000 volunteer hours have been invested.

2.1.2 Aim

By strategic tree planting, supporting existing native vegetation, and controlling weeds and pest animals, this project is restoring existing and creating new habitats within the Berry Corridor to support a range of native wildlife including threatened species and endangered ecological communities. The aim, through these activities is to support and increase the connectivity of native habitats, and thus the ecological sustainability of the Corridor.

2.1.3 Location

The area over which this project is focused is called the Berry Corridor. The Corridor extends between the Barren Grounds Nature Reserve and Seven Mile Beach National Park. The western boundary of the corridor approximates Woodhill Mountain and Coolangatta Roads. The eastern boundary approximates the Shoalhaven City Council Boundary (**Figure 1**).

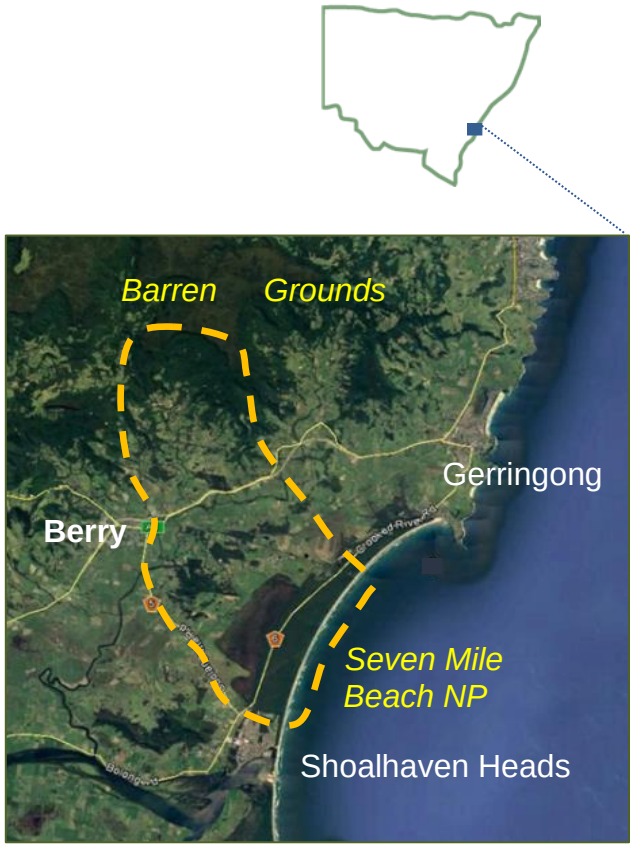


Figure 1 *Location of the Berry Corridor (Yellow dashed line)*

2.3 Aboriginal cultural and historical context

2.3.1 Age of occupation

The earliest archaeological evidence of Aboriginal occupation of the South Coast of NSW dates from 20,000 years ago, from sites at Bass Point and Burrill Lake. At this time the sea level was lower and evidence of camp sites, now near the coast, would have been located some 14 km inland. It is probable that earlier occupation occurred, however the survival and detection of early sites is rare. Most surviving Aboriginal sites post-date the rise of the sea to its current level around 6000 years ago.

Many Aboriginal sites have been located in the course of archaeological surveys on the NSW South Coast and its immediate hinterlands. Site types recorded in the Berry region include rock shelters with art and/or cultural deposit, grinding grooves, artefact scatters, scarred trees, ceremonial sites, coastal and estuarine middens, and burials.

2.3.2 Tribal Boundaries

Due to the nature of early historical records and observations it is difficult to be certain about the location and nature of linguistic and tribal boundaries.

Based on a review of Aboriginal tribal boundaries across Australia by Tindale in 1974, the Berry district falls within the area of the Wodi Wodi people. Tindale found the Wodi Wodi occupied an area which extended from approximately Stanwell Park in the north, to the northern bank of the Shoalhaven River in the south, and west as far as Picton, Moss Vale and Marulan.

The term Wodi Wodi was first recorded by Ridley in 1875, who based it on the testimony of Lizzy Malone, the daughter of a woman of the Shoalhaven tribe. She stated that Wodi Wodi was the name of the language spoken by the Aboriginal people of the Illawarra. Tindale considered the Shoalhaven River to form the boundary between the Wodi Wodi and the Wandandian people to the south.

The tribal groups on either side of this boundary are distinguished by different languages, those to the north spoke Dharawal (Thuruwal) and to the south spoke Dhurga. Both the Dharawal and Dhurga languages form part of the Yuin linguistic group which extends southward from Sydney to almost the Victorian border. For some contemporary Aboriginal groups the term 'Yuin' is problematic and its use as a tribal term is contested.

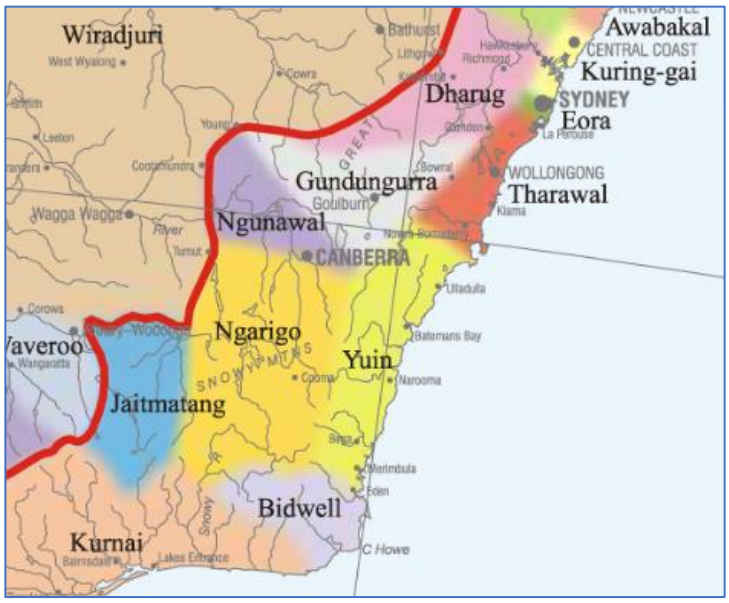


Figure 2 *Extract from Aboriginal Languages map (Museums & Galleries of NSW), showing distribution of the Tharawal language.* *https://mgnsw.org.au/sector/aboriginal/aboriginal-language-map/*

Contrary to Tindale's Shoalhaven river boundary, other ethnographers describe the Aborigines and linguistics of the lower Shoalhaven in terms of a single cultural character, one district, and one dialect. It seems more probable that the tribal boundary on the coastal plain was further south, and consistent with linguistic evidence, adjacent to Jervis Bay. A boundary in this region would roughly be equivalent with the Shoalhaven-Jervis Bay watershed.

Many modern researches use the term Dharawal or Tharawal to refer to the tribal group within the Illawarra and Southern Illawarra. Amongst contemporary Shoalhaven Aboriginal people the terms Jerrinja, Eloura, Wodi Wodi or Wandiwandian may be preferred. The choice of name often relates to family ties and identification with differing Aboriginal communities along the South Coast.

2.3.3 Social Structures

Within these broad language and tribal groupings were smaller social divisions, perhaps consisting of different family groupings, which were associated with local areas or home territories. European observers thought of these groupings as ‘tribes’ and associated them with localities which may have related to home territories. Examples include the Shoal Haven (Nowra and the adjacent area south of the Shoalhaven River), Murro (Meroo Meadow region), Broughton Creek (lower Broughton Creek and coastal plain north of the Shoalhaven River) and Gerongong (Seven Mile Beach hinterland to Gerringong).

Generally speaking, the term 'tribe' is employed to describe a large group of people who, for the most part, speak a common language and occupy a broad tract of land within which 'clans' consisting of loosely-related families own the land, and smaller groups referred to as bands perform the daily tasks of group maintenance. Matthews and Everitt described the clan organization of the Shoalhaven as consisting of related males with married women joining the band of their husband but maintaining an affiliation with their clan of birth. Children belong to the father's clan with both sons and daughters receiving the totem of their father's clan.

The Aboriginal people of the Shoalhaven banded together for specific activities, were together for a time, and then split apart; later they formed new groups which most likely had at their core a number of closely-related families. Leadership was assigned to experienced elders with the males being predominant.

Boundaries between local bands and clans were flexible and permeable, allowing groups to move about. Where resources, food or materials, were particularly rich, it is likely that use of those goods was controlled and permission had to be obtained from the custodians of that place. Where resources were widely distributed across the landscape, movement of people was less controlled.

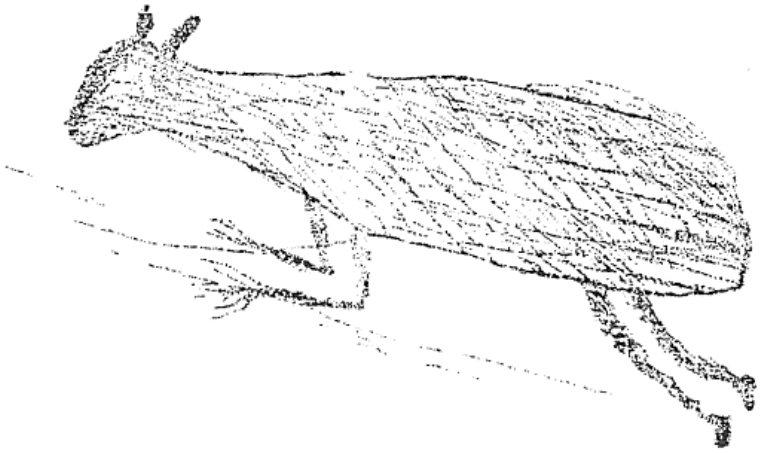
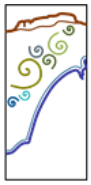


Figure 3 *This Aboriginal drawing from a rock shelter in the Cambewarra Range may depict a Koala. Koalas are now locally extinct in the Berry area.*

It is likely that Aboriginal groups were able to maintain their structure throughout the early period of European settlement. Later responses may have included seeking refuge and establishing camps either at a distance or close to European properties, being partially integrated into European maritime or pastoral activities, or dwelling on the fringes of European communities. As the land-use patterns of the new colonists intensified, there would have been increased demand on natural resources, and the food sources of the indigenous people would have diminished radically. In the 1840s and 1850s, the introduction of dairy farming (Bell 1960) further reduced the availability of game in the Shoalhaven District. The issuing of rations by the government encouraged a clustering of people into camps, which would have caused some breaking down of the previous marriage patterns where polygamy (male having more than one wife) was preferred. It is thought that rations were issued to discourage multiple partners.

New camps frequently were situated close to towns, and most likely contained members of a number of different clans and bands. The camps became more or less permanent, much more fixed on the landscape than the hunting and gathering camps which had provided the primary locus in previous times.

By the 1880s, many traditional social and territorial arrangements were weakening and Aboriginal people were being pressed into reserves or missions. Although the missions provided places for ration distribution they also may have been inappropriately sited or offered constraints and other forms of control such as the infamous removal of children with mixed decent.



2.3.4 Historical Overview

The first European sightings of the Shoalhaven region were made by Captain Cook in April of 1770. He noted a protected bay which would later be named Port Jervis, and on April 26 'several smokes along shore before dark'. This observation may relate to Aboriginal campfires in the vicinity of Bass Point.

First reference to interaction between the Shoalhaven tribes and Europeans comes from the recollections of survivors of the wreck of the 'Sydney Cove' who walked up the south coast from Gippsland to north of the Illawarra before being picked up. As the exhausted party came towards the Shoalhaven they met with 'unfriendly natives, at whose hands it is thought some of the exhausted ones lost their lives'.

In 1805 James Meehan reached the Shoalhaven River on an exploratory trip and noted the existence of considerable stands of red cedar along the lower reaches. The cedar getters, both legal and illegal, quickly followed and were almost certainly the first Europeans to venture into the coastal escarpment of the Illawarra Range. The first official shipment of cedar from the Shoalhaven, cut from its lower reaches, was in 1811. A year later seven ships were engaged in the trade.

An undocumented and probably violent story of culture contact and exploitation followed the cedar cutters. The conduct of the cutters was mostly beyond the control of Colonial Officials. There is evidence to suggest that the Shoalhaven Aborigines were not friendly toward the newcomers. The timber getters were obliged to fell their timber near the river banks, not only due to transport limitations, but partly for fear of the natives who were described as never having been 'otherwise than inimical to us'.

During 1819, John Oxley and Meehan were returning from Jervis Bay to the Shoalhaven with the aid of a local guide, Broughton:

The surveyor Throsby returned to the Shoalhaven from Kangaroo Valley in 1821 and went to a place he called 'Nou-woo-ro', now known as Nowra.

Early in 1822, on returning from verifying the existence and source of the Clyde River, Alexander Berry spent several days exploring the Shoalhaven River, up as far as Burrier. Six months later Berry returned with the aim of establishing a permanent settlement. He was in receipt of a government grant of 10,000 acres on the Shoalhaven River, and a labour force of nineteen convicts. This marked the start of permanent European settlement in the Shoalhaven River valley.

Berry chose for the site of his settlement an area of elevated ground at the foot of a hill variously referred to as Coolungatta, Cullengatty, Coloomgatty, and Cooloomgatta. The name was recorded by Surveyor James McBrien in 1824 as Aboriginal, meaning 'high hill'. It is now known as Coolangatta. Howitt records the name of the Yuin 'clan' inhabiting the Lower Shoalhaven District as Gurungatta-manji. 'Coolangatta' may therefore be a derivation of the name used by the original Aboriginal social groups who lived in the Nowra region.

Berry’s selection of this location was apparently treated with apprehension by the local Wodi Wodi. Berry notes that in June of that year, during construction of a hut and a canal near the Shoalhaven Heads a native called Wagin (a local chief), confronted the workers and claimed the ground where they had been working. This action falls into context when it is acknowledged that the Coolangatta Mountain was a place of ancestral significance to local Aboriginal people.

Berry's settlement grew steadily with the immediate introduction of herds of cattle and the establishment of plant crops at Numbaa. Berry initially considered the local Aborigines to be ferocious and his timber workers tried to drive them away. For several years potatoes and maize was 'stolen' from the fields. Several weeks after Berry's arrival a party of twenty Aborigines camped near his settlement. Berry notes that there were two chiefs, Wagin, chief of Numba (Lower Shoalhaven), and Yagen chief of Jervis Bay. He also describes Brogher (or Broger), the brother of Broughton (an Aboriginal guide employed by Berry), as a native chief (probably of area north of Coolangatta). These probable band groupings suggest that most of the Aboriginal population was centred on the more fertile coastal plains.

Other land grants followed in the early to mid 1820s. From this period, settlers furnished brief descriptions of Aborigines in the Shoalhaven particularly those which settled on pastoral properties and gained employment. Aboriginal people also gained employment in fledgling local industries such as the whaling station at Jervis Bay.

In 1836, James Backhouse toured the Australian Colony and passed through the Shoalhaven, travelling from the Five Islands (Wollongong), through Colomgatta (Berry's estate on the Shoalhaven), and Kangaroo Ground (Kangaroo Valley) to Bong Bong. Backhouse encountered many parties of Aborigines, often describing them as partly clothed in European clothes and subsisting according to both traditional and European sources of food and materials.

At the foot of the Cambewarra Mountains, he met a group of six aborigines dressed in blankets and old European clothes. 'These people were accoutred with hunting and fishing spears, and weapons of war' including a death spear barbed with 'pieces of glass' and a shield painted in white with red lines.

By the late 1830's the majority of the lower coastal plain between Gerringong and the mouth of the Shoalhaven River had been taken up as land grants. By 1840 the Coolangatta Estate had a population of 270 people.

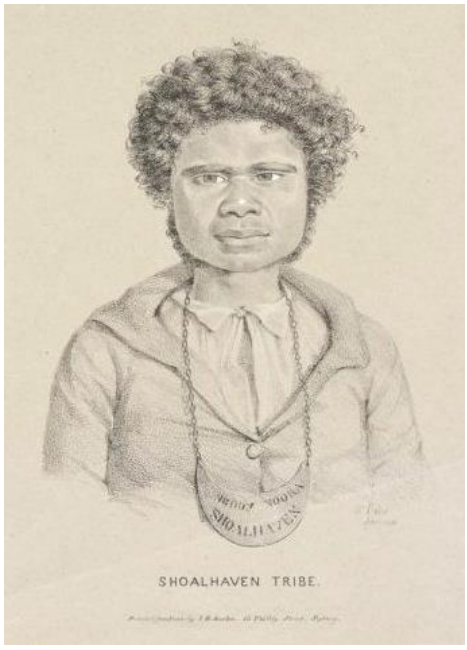


Figure 4 *Portrait of Neddy Noora Aboriginal Chief of the Shoalhaven Tribe by Charles Rodius 1834.*

The breastplate given to Neddy Noora was found in Broughton Creek at Berry in 1925. Neddy and another Aboriginal man, Toodwit (also known as Broughton), guided John Oxley's expedition to mark an overland route between Sydney and Jervis Bay in 1819.

Through the 1840s and 1850s Aboriginal communities were increasingly impacted by the spread and consolidation of European settlement. In response, Aboriginal people either settled on the pastoral stations, in 'fringe camps' adjacent to European settlements, or were forced into adjacent rough and mountainous country. By the 1840s the Shoalhaven Aborigines had been reduced to remnant groups either wandering large tracts of the coast, or subsisting at the edge of the now permanent European settlements.

Permanent Aboriginal camps became established on Broughton Creek (Berry), Crooked River (also referred to as Black Head or Gerongong), around Jervis Bay (notably Bilong on Currambene Creek), and in a gully on the northern side of the Coolungatta Mountain on the Berry Estate. The Coolangatta camp had grown with the Berry Estate, and a number of the residents there were employed as labourers and to grow vegetables.

Other encampments known from the later half of the nineteenth century include the banks of Broughton Creek at Broughton Village, and the banks of Broughton Mill Creek adjacent to Berry.

Reclamation of the Shoalhaven wetlands began on a major scale from 1873. By 1909 a total of 600 km of drains had been constructed. The draining of the wetlands effectively alienated the last terrestrial wild food areas open to the remaining local Aborigines.

Following cholera and typhoid epidemics in the Coolangatta camp in the late 1890's, The Board for the Protection of Aborigines moved residents to a newly proclaimed Reserve at Roseby Park (Orient Point) in 1900.

The last remembered traditional initiation ceremony staged in the region was conducted in the late 1880's by 'the Shoalhaven River tribes' on the southwestern side of Moeyan Hill, a low hill to the north of Coolangatta Mountain.

In 1881 a Protector of Aborigines was appointed. The Protector was replaced in 1883 by the Aborigines Protection Board and by the turn of the century had established 133 reserves across the State. Aboriginal reserves were sited to allow for the exploitation of natural resources (marine and estuarine) at a distance from white rural centres.

The Aborigines Protection Board was also responsible for the infamous policy which resulted in the removal of thousands of Aboriginal children to the Cootamundra Girls Home, the Kinchela Boys Home, and in the lower Shoalhaven, the Bomaderry Aboriginal Children's Home which was established in 1908.

Missionaries were allowed to live on many of the reserves and in popular parlance Aboriginal people came to refer to the reserves as 'missions'. Reserves to which managers were assigned were referred to as 'stations'. Like the many small reserves created in the nineteenth century these places were regarded by the government as temporary arrangements to be altered or closed on the advice of the Board.

Toward the latter part of the nineteenth century, government authorities placed pressure on Aborigines to re-settle within government reserves. This effectively removed local Aboriginal groups from freehold and crown lands, and concentrated the remaining populations onto reserves. Reserves were often situated on marginal land, away from people's traditional lands and forced peoples of differing tribal affiliation into close contact. Despite this, the occupation of coastal and fringe camps continued, especially as part of the required movement of people looking for seasonal work.

In 1899 a government Aboriginal reserve of 43 acres was established near the northern end of Seven Mile Beach (**Figure 5**). The reserve was revoked in January 1953 (AR 29911, McGuigan no date:39). Although the exact nature of Aboriginal occupation on this reserve is not well documented, its location and duration supports the documentary evidence for a historical focus of Aboriginal occupation in the Crooked River (Black Head/Gerringong) area.

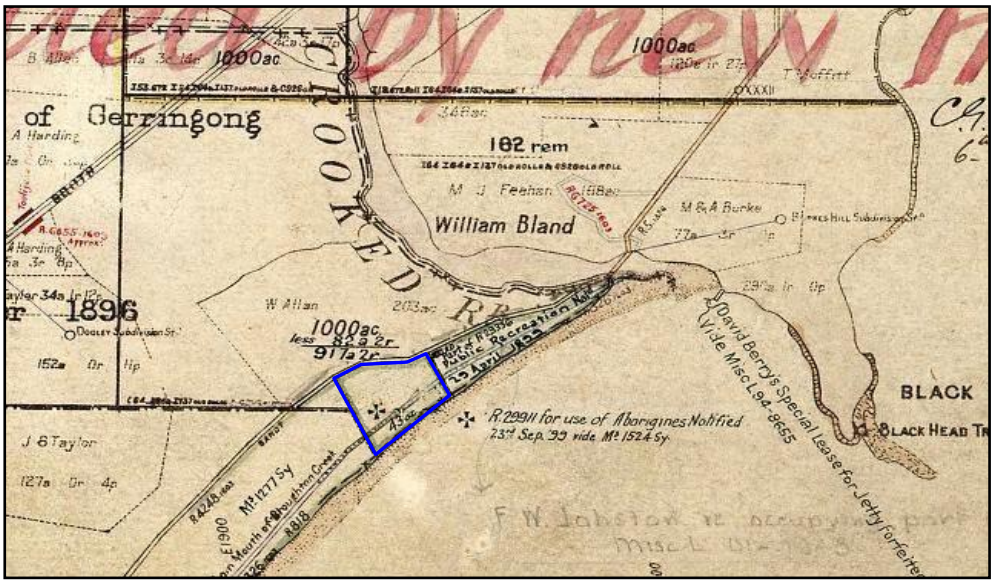


Figure 5 *The location of the Seven Mile Beach Aboriginal Reserve which was gazetted in 1899 and revoked in 1953. Extract from Parish of Broughton Map 4th Ed 1893-1898, (Lands Dept ID 10353801)*

From 1940 to 1969 the Aborigines Protection Board vigorously pursued a policy of assimilation. Reserves were reduced in size or were revoked (Long 1970). Houses and facilities were allowed to deteriorate in an attempt to force Aboriginal people to move off the reserves.

A Directorate was established in 1969 to control reserves and an advisory council with Aboriginal members was appointed. In 1979 the New South Wales Aborigines Welfare Board, the successor to the Aborigines Protection Board, was abolished and the reserves transferred to the Aboriginal Lands Trust. To meet the new policy of self-determination, steps were then taken to consolidate, revitalise and upgrade reserves. Reserve ownership has for the most part been transferred to Local Aboriginal Land Councils.

Today, Aboriginal people live throughout the Illawarra and South Coast as residents of the larger towns and cities - Bega, Nowra, and Wollongong, as well as maintaining communities on former reserves, and are found throughout the region in family groups. Communities of Aboriginal people are located at La Perouse, Orient Point (Jerrinja), Wreck Bay, and Wallaga Lake, as well as on 'informal reserves' such as Browns Lane near Nowra and Murray's Flats outside of Bega.

2.3.5 Some features of the Aboriginal cultural Landscape in the Berry district:

Coolangatta Estate – former location of nineteenth and early twentieth century Aboriginal encampment

Crooked River estuary – former location of nineteenth century Aboriginal encampment and a former Aboriginal Reserve

Berry – site of early original Aboriginal encampment 'Boongarree' (near the confluence of Broughton and Broughton Mill Creeks), and a later nineteenth and twentieth century transient seasonal worker camp (on Broughton Mill Creek, adjacent to and upstream of the Bowling Club)

Broughton Village – nineteenth century Aboriginal encampments were located at 'Brookside' and near water holes on Broughton Creek

Valley floor adjacent to Broughton Village – a traditional Aboriginal battle ground known as 'Dickie Woods Meadow'

Southern Illawarra Range – traditional routes and passes were used across the range and that certain places had cosmological significance and are places of high cultural significance, including the 'Nut Gatherers' at 'Bendthualaly'

Coolangatta Mountain ('Cullunghutti') – a place of high spiritual and cosmological importance known as a place of transit for the spirits of the dead.

Moeyan Hill – an important spiritual place and home of a dreamtime creature, also the location of a male initiation ceremonial ('Bunan') held by 'Shoalhaven tribes' in the 1880s, near Far Meadow.

Harley Hill Cemetery – includes the graves of many local Aboriginal people, some thought to be the victims of cholera and typhoid epidemics.

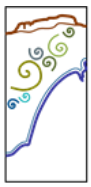
Toolijooa Ridge – a traditional travel route between the coast and the uplands, also the location of a reported ceremonial ground

2.3.6 Aboriginal fire management in South-Eastern Australia

Indigenous people used fire for a wide variety of reasons across much of Australia for thousands of years. Fire was used as an important tool for managing the land and its resources and for ceremonial and spiritual purposes. Accounts by some of the first Europeans witnessing the use of fire by Aboriginal people during early contact years, indicate that Indigenous fire regimes were mostly well controlled and patchy. The effect of this burning regime helped to shape the native plants, animals and vegetation communities and their structure.

Figure 6 *'Aborigines using fire to hunt Kangaroos' by Joseph Lycett c.1820 (National Library of Australia).*

The landscape observed by those first Europeans in south-eastern Australia had already been influenced by several thousands of years of the application of fire by Aboriginal people and was not always recognised as a highly managed practice by some of those European settlers. More recently, studies have recognised the long association that Aboriginal people have had with the use of fire and one review by Bowman (1998) described its impacts as 'one of the most complex and contentious issues in Australian ecology', and that:



> 'fire was a powerful tool that Aboriginal people used systematically and powerfully over the landscape' … and there is… 'little doubt that Aboriginal burning was skilful and was central to the maintenance of the landscapes colonised by Europeans in the 19th Century…This issue is not only important for the development of a comprehensive understanding of the dynamics and evolution of the Australian biota, but is central to the formulation of appropriate strategies for the conservation of the nation's biota'.

While there is no doubt that Indigenous fire practices have shaped Australia's biota, these fire practices have also been modified and or reduced across the landscape over the last 200 plus years. This has resulted in further changes to the Australian biota where once there may have been more extensive forest and woodland with grassy understory to increased forest or closed forest with a range of stratum within those forests. Of course, changing fire practices are not the only impact that has changed the biota in south-eastern Australia as there have also been impacts of land clearing, habitat loss and fragmentation for rural, residential development, roads, rail, agriculture, forestry and mining.

The focus on fire management in recent decades has been more of wildfire suppression and hazard reduction burning for protection of life and property rather than for hunting, natural resource use, ceremony, and cultural practices. It is also important to note that in today's society, Aboriginal fire management practices while they may be a component part of the suite of tools available for management of wildfire, Aboriginal burning practices were not designed solely for the purpose of wildfire suppression.

Fire ecology and management is a complex issue and the impacts of climate change only add to this complexity. No one single tool can be used to protect life and property and provide the necessary needs of a range of different vegetation communities, threatened species and threatened ecological communities. Developing a fire plan for your property should consider a range of tools and management practices that also take into account how your patch of bush contributes (or can potentially contribute) to the wider landscape needs of threatened species and threatened ecological communities. Your patch of bush may already be providing critical habitat for native animals and provide a corridor for their movement across the landscape for their long-term survival.

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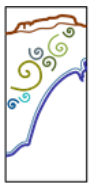

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2.4 European historical context

2.4.1 Early exploration

In April 1770, Captain James Cook was the first European to sight the eastern shores of the region while sailing north towards Botany Bay. Cook named Pigeon House Mountain, Cape St George and noted the entrance of what seemed to be a bay (Jervis Bay), the inner north head of which he named Longnose Point, before passing Kiama's shore and on to further exploration.

Nothing more of the area was recorded by Europeans until after the settlement of Sydney in 1788. On 27 July 1791, Captain Weatherhead of the *Matilda* discovered Jervis Bay, which he named Matilda Bay after his ship, but the name was not retained. Following his visit to the bay on 18 August 1791, Naval Lieutenant Bowen provided the name 'Port Jervis' in honour of Sir John Jervis. Whaling ships immediately began calling there for shelter and water.

In December 1797, George Bass, during his voyage of coastal exploration in a whaleboat with a crew of six seamen, landed in a sheltered bay, later named Kiama Harbour, and followed around the bight of Seven Mile Beach to discover the mouth of a river, which he named Shoals Haven. He spent three days examining the river, noting the fertile banks that he thought would not be subject to flooding.

European knowledge of the area was advanced when on 10 March 1805 Lieutenant Kent of *HMS Buffalo* returned to Sydney after examining the district overland 18 miles north from Jervis Bay with James Meehan, the assistant Surveyor-General. Information from that expedition confirmed that the area was originally covered with rainforest, brush cedar, soft and hardwoods and a variety of bushes, palms, vines and ferns.

Independent cedar getters were in the Shoalhaven from at least 1811. After grounding on the shoals, the *Speedwell* managed to bring the first recorded cargo of cedar from the Shoalhaven River to Sydney in December 1812. The timber industry then grew in scale, exploiting the patches of cedar on the rivers and creeks, but the main concentration was in the Long Brush, which stretched from Kiama to Jamberoo.

Figure 7 *'Cabbage Trees near the Shoalhaven River' painting by Eugene von Guerard 1860 (State Library of NSW). Although the beauty of the tall rainforests on the lowlands (known as 'Brush') was acknowledged by many Europeans, their removal to create pastures and ploughlands was an overriding economic and cultural priority for the European colonists.*

Exploration from landward began in February 1818 when Dr Charles Throsby and James Meehan set out from Sydney to find an overland route to Jervis Bay. The party reached Kangaroo Valley, crossed the Shoalhaven and reached Jervis Bay but found the route to be impractical.

The need for a better route from the Southern Highlands was met, to an extent, in 1821 by a new route pioneered by Hamilton Hume and Charles Throsby through Tallaganda Shire, which Hume reported could be made along a line of where he marked the trees. However, the route was not developed until the 1840s when The Wool Road from Braidwood via Nerriga, Sassafras and Wandandian was created.

No sooner had Hume returned from that expedition when, in January 1822, he left Sydney in the *Snapper* with Lieutenant Johnston and Alexander Berry to explore the coastal rivers, sailing up the Clyde and trudging inland to the Pigeon House. Although it was a government sponsored voyage it appears that Berry's purpose was to seek out land on which he could make a settlement after an adventurous life of roving in his early days.

2.4.2 The Berry Estate

After a brief stay in Sydney in 1808 during his early career as an international merchant, Alexander Berry returned to London in 1812 by way of Cadiz. In Cadiz Berry met Edward Wollstonecraft, who subsequently became Berry's London agent, and later his partner when they decided to start a business in Sydney. Berry returned to Sydney in July 1819, and Wollstonecraft arrived in September. In 1827, Berry married Wollstonecraft's sister Elizabeth.

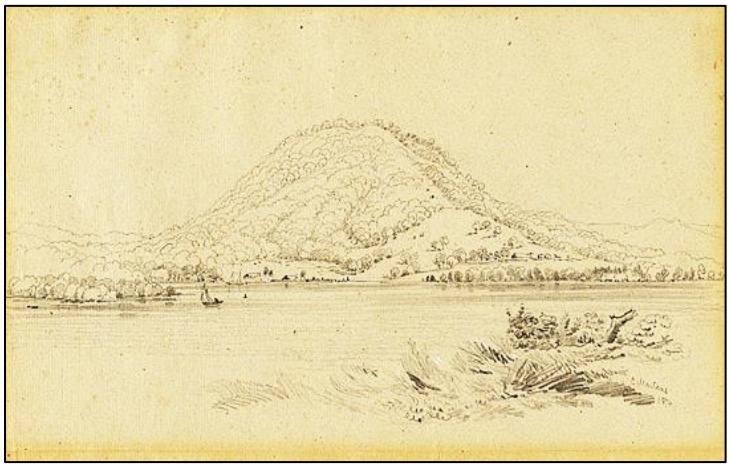

Figure 8 *Sketch of 'Mt Coolangatta' in 1874 by Conrad Martins, looking north) (National Gallery of Australia). The Coolangatta homestead can be seen in the lower right distance. Although now predominantly regrowth, the mount remains forested to this day*

Like other merchants, Berry and Wollstonecraft often had to accept stock in payment of debts, and Berry sought a grant of land on which to accommodate the stock. Governor Macquarie refused, as Berry was about to leave for England, but promised him a grant when he took up permanent residence. While he was away, Wollstonecraft obtained a grant and located part of it on the North Shore where he built a cottage, 'Crow's Nest'.

Figure 9 *The Coolangatta homestead on the Berry Estate in 1896 from the Cocks Shoalhaven Album, (State Library of NSW a6292019h), looking south.*

On Berry's return he sought a site for the grants made to him and Wollstonecraft, travelling widely even in unsettled districts because 'Everybody was flocking to the Hunter River, Bathurst, and other places … and all were elbowing one another. But we neither wished to elbow any one nor to be elbowed'. Berry first visited the Shoalhaven in January 1822, taking the cutter *Snapper* into Crook Haven (formerly Shoals Haven) from which he proceeded overland to examine the country on either side of the river. The rich alluvial soils and natural grassy 'meadows' led him to choose the Shoalhaven as the site for an estate and he returned in June 1822 to occupy it.

In February 1822, Berry and Wollstonecraft had jointly applied for a grant of 10,000 acres, "Coolloomagatta", which was approved by Governor Brisbane, though the deed was not issued until 1830. To this was added a 2,000 acre grant on the south side at "Numbaa".

Berry decided that his station would be built at the south-eastern foot of Mount Coolangatta. He called it "Cullengatty Farm". A store and huts were erected on the lower slope of Mount Coolangatta and the flat at Numba was prepared for cultivation, becoming the first farm on the Shoalhaven. His residence was begun in 1823 and completed in 1824, by which time he had 120 acres under wheat, 40 under maize, three acres under barley and three as a garden with an orchard planted at Numba, where 250 acres were already cleared. He had 600 cattle, 14 horses and 235 pigs on his estate. A barn was completed in 1830 at Upper Numba or Jindiandy where it still stands.

Berry secured additional grants of two lots each of 4,000 acres north of the first grant and one lot of 4,000 acres west of Broughton Creek. West of the latter, John Berry (one of Alexander's younger brothers) later secured 3,225 acres at Bunberra north of Pig Island and several grants surrounding it. On his death in 1848, John Berry's grants passed to Alexander.

Other grants in the area were:

- 1920 acres at Tooliia (Toolijooa) called “Richardson’s Farm” promised to J. G. Richardson 23 March 1830 (granted to A. Berry 11 February 1837).
- 1000 acres called “Hyndeston” near Gerringong to promised to Thomas Hyndes 24 July 1824 (granted to A. Berry 18 Oct 1839).
- 4000 acres called “Broughton Head Farm” promised to Aspinall and Brown 27 May 1829 (granted to A. Berry 29 May 1838).
- 1280 acres called “Cumbewarra Farm”, promised to Charles Staples 27 January 1830 (granted to A. Berry 20 May 1837):
- 1280 acres called “Meroo Farm” promised to Richard Mutton 22 June 1829 (granted to A. Berry 28 November 1837).

By 1840, all of these grants had passed to or been purchased by Alexander Berry in whose name the grants were issued. In 1842, Berry also secured 2560 acres called “Burke’s Farm” promised to John Burke (granted to A, Berry 15 February 1842) along Seven Mile Beach.

By the early 1840s, purchases of land from the crown and private individuals increased the size of the estate to about 32,000 acres, and to more than 40,000 acres by 1863 (**Figure 10**).

The total holdings of the Berry Estate, from grants and purchases, north and south of the Shoalhaven River, amounted to 57,000 acres. The northern extent of the Berry holdings is marked by the line of Boundary Road in Broughton Vale.

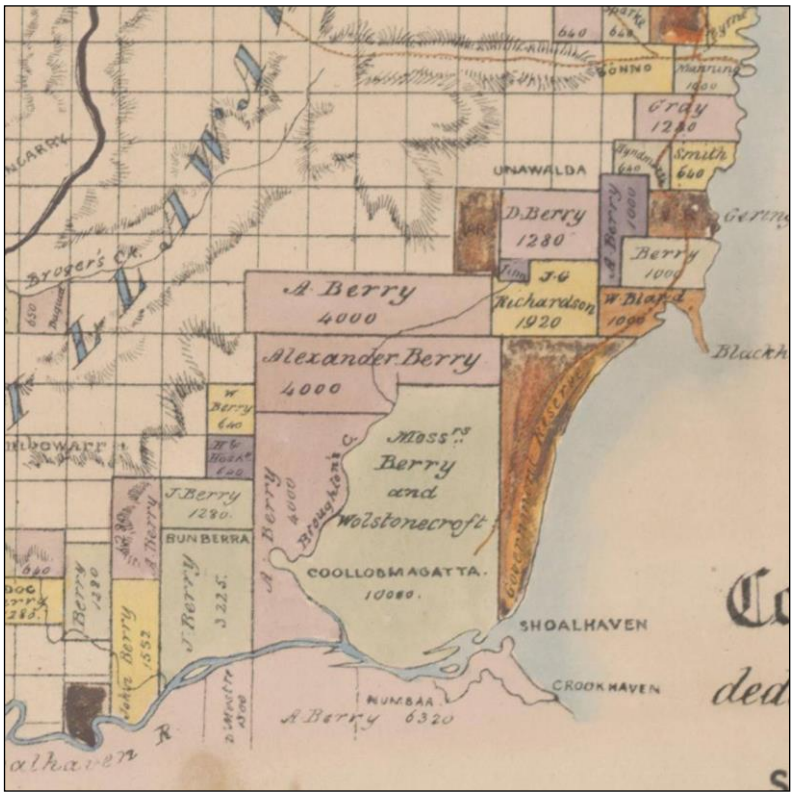

Figure 10 *Extract from Baker’s Australian County Atlas (County of Camden) 1843 - 1846 showing early land grants across the northern Shoalhaven district (National Library of Australia)*

The motivation to enlarge the Berry estate at every opportunity was probably to secure the cedar growing in the district. Demand for cedar was strong given that by the 1820s the supply from the Illawarra and the Hunter River valley was nearing exhaustion. The Estate’s ‘meadows’, originally observed approvingly by Berry, proved to be wetland basins unsuitable for agriculture or sustained grazing, unlike the fertile pastures of their namesakes in the United Kingdom. During his observations of the area in the 1820s, Barron Field noted his fear that 'these grants will hardly ever repay Messrs. Berry and Wollstonecraft for their outlay upon them'. Given the small area of agricultural and cleared land on the Estate at this time, the recovery and sale of red cedar became an economic mainstay in the first decades of the Estate.

Early agriculture on the Estate include the production of maize, tobacco, wheat, barley and potatoes, all marketed in Sydney; pigs were also reared and cattle were brought to Shoalhaven from the Illawarra over a road made for the purpose. Besides buying a ship to provide transport between Sydney and Shoalhaven Berry and Wollstonecraft built a sloop and began to drain the extensive swamps included in their grants.

The development of the estate was not without its controversies. Berry was publicly accused of negligence in his care of convict servants and of ill-treating them; it was said that a government tax on cedar cut on crown land was engineered to give Berry and Wollstonecraft a virtual monopoly, and that a tax on imported tobacco was introduced for their benefit. By 1846, Berry wrote that he had lost interest in the estate and 'would gladly part with it upon any terms'; this feeling grew as labour became scarcer after the abolition of transportation and the discovery of gold.

After his wife's death in 1845, Alexander Berry (**Figure 11**) became a recluse in his Crow's Nest House. After his brother David took charge of the Shoalhaven estate in 1836 he appears to have rarely visited it. He died at 'Crow's Nest' on 17 September 1873.

Berry had no children and his property passed to his brother David.

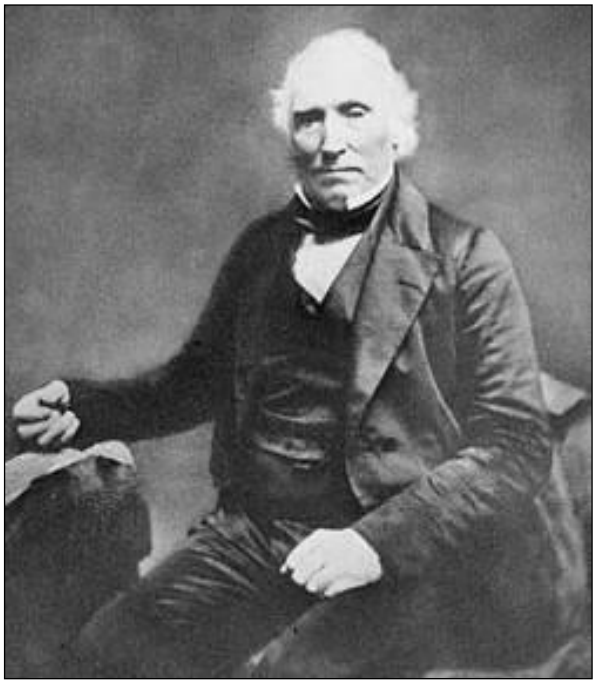

Figure 11 *Alexander Berry (1781–1873) (State Library of NSW*

David Berry, with his brothers John and William and his sisters Janet and Agnes, put into effect a long-held idea to join their eldest brother Alexander in NSW. They arrived at Sydney in July 1836 went at once to Coolangatta, the Shoalhaven property which, at Wollstonecraft's death in 1832, had passed entirely to Alexander.

Until John Berry died in 1848 he and David jointly managed the property. The greater part of the land was undeveloped and most of the work force was convict. The number of their assigned servants appears to have increased from an original 100 to some 300 in the 1840s. The main source of agricultural income was the breeding of cattle and horses, which were scientifically improved by imported bloodlines.

After John's death David began leasing some of the land. By 1850, he had 36 tenants, who paid 20 shillings an acre for cleared ground and were allowed five years without rent in order to clear timbered land. The widespread agricultural development and clearing of the Estate's forest lands began and progressed in parallel with the leasehold system. By 1863 the Estate had almost 300 tenants, who occupied some 8650 acres (3500 ha) or about a sixth of Coolangatta and paid an aggregate rent of about £6,000.

When convict labour ceased, trial was made of Chinese labourers and of German families hired in Hamburg. The Chinese were considered to do well as dairymen and house servants but in general their usefulness was judged to be limited.

When David Berry inherited the estate from Alexander, it was valued at £400,000 and consisted of 60,000 acres at Shoalhaven and 500 acres at North Sydney. William Berry died in October 1875, also leaving a will in David's favour. He continued to lease the Shoalhaven land on terms considered more than lenient. Berry also introduced the practice of share farming with land, implements and materials provided by the estate and labour by the farmer, the profits to be shared on an agreed basis.

Figure 12 *The cottage of a selector or tenant farmer at 'Mt Pleasant near Kiama' by Eugene von Guerard 1859 (https://www.australianarthistory.com/colonial-art-in-the-illawarra). The clearance of the tall forests across the Shoalhaven lowlands gained momentum with closer settlement by tenant farmers.*

After 1883, the management of the Shoalhaven estate passed increasingly to Berry's cousin, (Sir) John Hay. When David Berry died unmarried at Coolangatta in 1889 he left an estate valued at £1,250,000. Hay was the principal beneficiary of his will. Hay died without issue at Rose Bay in 1892. Most of his estate of almost £59,000 was left to the children of his brother James.

The bequests by David Berry to the University of St. Andrews (Scotland) and to the Endowment of a hospital at Berry, amounting to a quarter of a million pounds, made it necessary for the Trustees to sell the Estate. They immediately set about a comprehensive plan of improvements before selling. A substantial component of this plan was the draining of the wetland basins to allow agriculture.

The area of the estate at that time amounted to around 100 square miles (around 26 thousand hectares). Of that area 40 square miles (just over 10 thousand hectares), consisted of alluvial flat consisting of freshwater marshes with surfaces in their lowest, some three or four feet below the flood level of the district in which they lay. To allow agricultural production, these areas had to be protected from the influx of tidal flooding by a system of drains and sluices. Another feature of the reclamation scheme was the construction of levees to restore a consistent crest-level along the natural banks of the Shoalhaven River and Broughton Creek to restrict natural flooding events. The wholesale agricultural transformation, clearance of natural habitats, and control of estuarine inundation across the Shoalhaven lowlands dates from this period.

On 29 March 1892 the sale of the Berry (Shoalhaven) Estates began and continued for three days. The Estate was divided into three for the purpose of the sale; first, the Gerringong farms of which there were four and totalled 175 acres; next came the sale of the whole township of Bomaderry followed on 30 March by the Numbaa estates, which consisted of between 5,000 and 6,000 acres. This was included in the Municipality of Numbaa, which had been incorporated in 1868.

The sale terms were all standardised at 25 per cent deposit, 15 per cent within two years and the balance over five years with an interest rate of five per cent per annum. In all cases preference was given to tenant farmers to secure the land they had formerly farmed and from that date many of the present family holdings date their freehold. The disposal by sale of the estates in Shoalhaven and North Sydney began in 1892 and was not completed until 20 years later in 1912.

2.4.3 The settlement and growth of the Berry township

Until 1899, the town of Berry was known as Broughton's Creek, Broughton Creek, or simply 'The Crick'. Originally a station of the Berry Estate, the subsequent town was a privately owned settlement developed by the Berry Estate to service the Estate's industry and surrounding tenant farmers. The town was subsequently renamed Berry in honour of its patron family after the death of David Berry in 1889.

The place was probably named after Broughton (c.1798-c.1850) who was a local Aboriginal man who was born at 'Boon-ga-ree,' an Aboriginal encampment on Broughton Mill Creek, close to the current town location. Boongaree may have been a semi-permanent occupation site and was the first human settlement at Berry.

Broughton's Aboriginal name was recorded variously as Toodwick, Toodood or Toodwit, and he is an important historical figure because his life illustrates how many local Aboriginal people strove to adapt to the new society introduced by the colonists. Broughton was accepted by the European community as a guide and tracker and appears for a time, to have acted as an intermediary between the white and black communities (**Figure 13**).

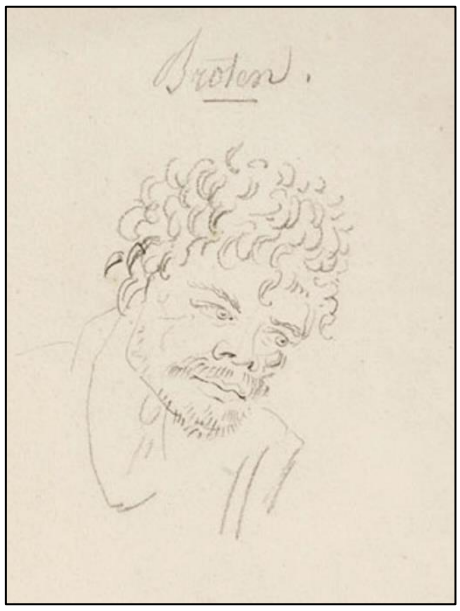

Figure 13 *Charcoal sketch portrait of 'Broten', by Jaques Arago, 1819, "Nlle Hollande J.A."(State Library of NSW PXB 283)*

By 1818 he was working for Dr Charles Throsby of Liverpool, who probably gave him his European name after his friend William Broughton. He served as a guide and translator on several of Throsby's explorations to the south and at least once for John Oxley.

In 1822, Broughton started work for Alexander Berry, setting up Berry's farm, Coolangatta, recruiting Aboriginal labour, 'keeping the peace', capturing bushrangers, droving cattle and providing his own labour. He became a favourite of Berry, who called him 'my Landsman' and later 'my oldest surviving Black friend' and who presented him with a rectangular breastplate inscribed 'Broughton Native Constable of Shoalhaven 1822'. The names of Broughton and his brother Broger (Brogher) survive in several physical features and localities in the Shoalhaven. Brogers Creek is named after the latter. After the former there is Broughton Creek, Broughton's Head, Broughton Vale, Broughton Village, and Broughton Mill Creek. Contrary to this conventional allocation, a 1935 newspaper article notes some alternative possibilities: William Broughton, of the 1821 Hume expedition; and Minne Broughton a little girl who figured in a shipwreck (Sydney Morning Herald 25 June 1935 p12).

Broughton Creek was strategically sited on the northern part of Alexander Berry's Coolangatta Estate. With a double wharf on the junction of Broughton Creek and Broughton Mill Creek, a water powered sawmill and a tannery by 1860, the embryonic town proved a focal point for the farming hinterland.

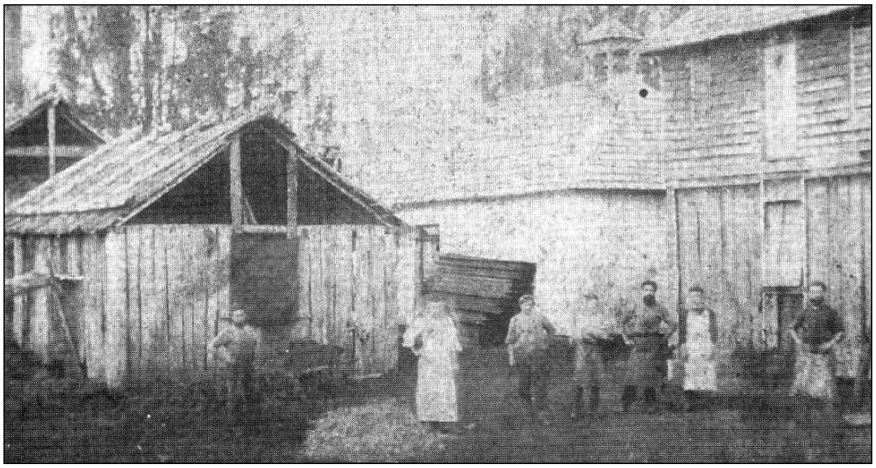

Figure 14 *Photograph of the Tannery, Broughton Creek, c.1875 (In Mabbutt nd:6)*

The milling of timber on the estate appears to have begun as an open saw pit site in 1827. In late 1826, a number of 'free' sawyers signed an agreement to saw at Broughton Creek, and the following year, James Smith, described as the Overseer of the timber establishment at Broughton Creek, was measuring the timber on hand. In the early 1830s, a sawmill was erected on the site to replace the previous saw pits (Antill 1982:350). It was in operation from at least 1836. The Berry Estate timber mill and tannery was one of the first industrial complexes to be established on the NSW South Coast.

On 3 October 1836, when leaving 'Coolangatta' Backhouse noted, "A circuit of about six miles over grassy forest hills between two marshes brought us to Alexander Berry's sawing establishment at Broughton Creek, which is under the superintendence of Alexander Pattison [or Patterson], a respectable Scotchman, with a wife and numerous family". In January 1840, the Reverend W. B. Clarke also recorded visiting the sawmill noting, "We came about 5 o'clock to a river, which we crossed, then to the saw-mill established by Mr Berry, which we visited. The machinery is simple and washed by water in the American plan,". The sawmill was leased to a tenant to cut cedar and hardwood for use on the Estate between 1842 and 1850.

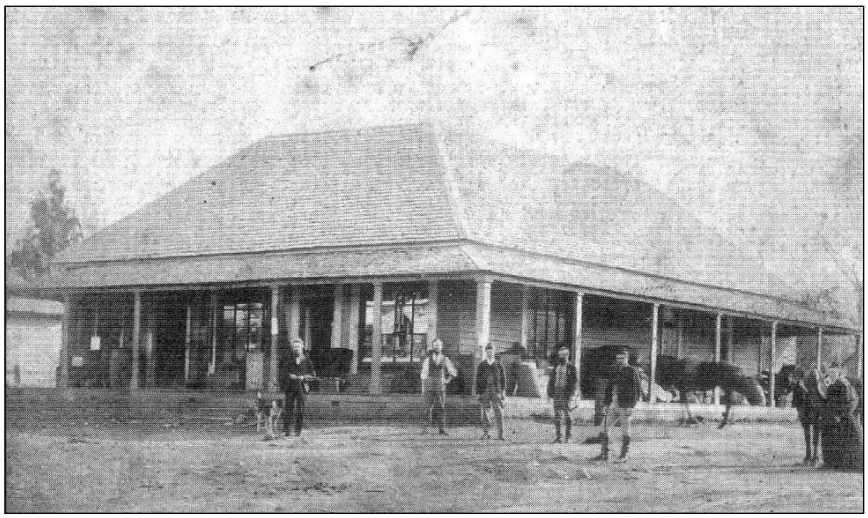

Figure 15 *Photograph of James Wilson's store, Pulman Street, Berry, c.1875 (Photographer: Henry Toose, in Mabbutt n.d.9)*

The village had a schoolhouse provided by Alexander Berry in 1861 and a postmaster from the same date. By 1866, there were 300 people in the immediate vicinity. Although the sawmill had closed, the tannery flourished. There were two stores, a smithy, a saddlery and a hotel.

Figure 16 presents a sketch of Broughton Creek Village in the 1870s, looking southwest towards modern day Pulman Street. At this time, the town was restricted to the ridgeline to the east of Broughton Mill Creek. In the 1880s, the current town grid was surveyed on the west side of Broughton Mill Creek in response to the need for further space and higher ground for town expansion. As part of the move to the west side, tenants were given longer leases, up to 25 years, and later it was made possible to buy the land.

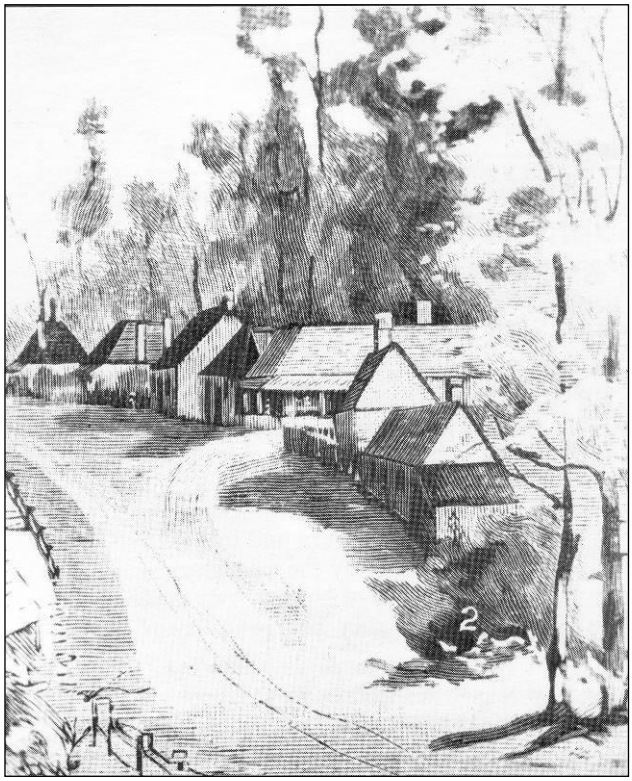

Figure 16 *Broughton Creek Village along the ridge at Pullman Street in the 1870s (In Bayley 1975: 74)*

As the land surrounding Berry was taken up by Europeans, firstly on the Estate by tenant farmers, and from the 1860s by settlers selecting adjacent lands under the Robertson Land Act, Broughton Creek became an important port providing access to the Sydney markets where agricultural goods and butter could be traded. This was critical for the growing dairying industry. **Error! Reference source not found.** shows a photograph of the (second) wharf at Berry in 1896 – the first wharf was at the 'Crooked S', the junction of Broughton and Broughton Mill Creeks. Farmers from Broughton Vale, Broughton Village, Jaspers Brush, Brothers Creek, Woodhill and even Kangaroo Valley, took their butter and other produce to the Broughton Creek wharf. From the wharf it was taken to the ocean steamer at Greenwell Point or drogher, until 1871, when Alexander Berry provided a flat bottomed steamer, the *Coolangatta.*

The Illawarra rail line (now the South Coast line) was opened as an isolated line as far as Bombo in 1887. The Bombo to Bomaderry section was opened in 1893.

The town of Berry continued to flourish as a service centre for a predominantly saw milling and dairying district. The population was 1,300 in 1884, with additional town blocks enlarging the town site from that laid out in 1883. Today, Berry continues to provide basic service needs of the community, but the 1980s saw it transformed into a tourist town, with tea rooms, antique and gift shops.

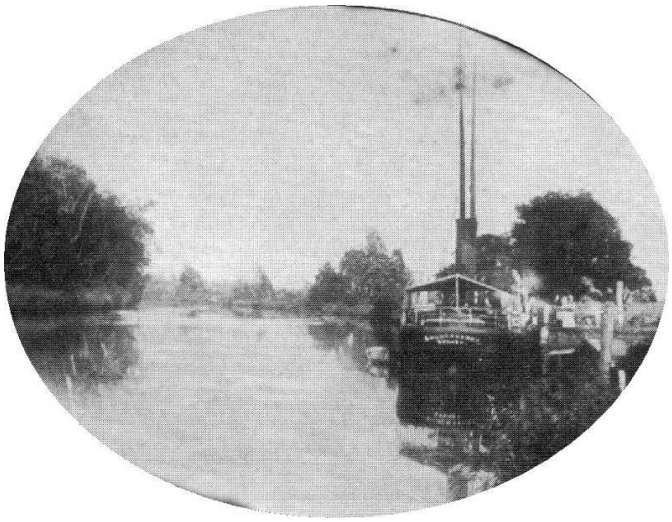

Figure 17 *Photograph of the SS Coomonderry at the (second) Berry wharf, 1896 (In Mabbutt n.d.: 58)*

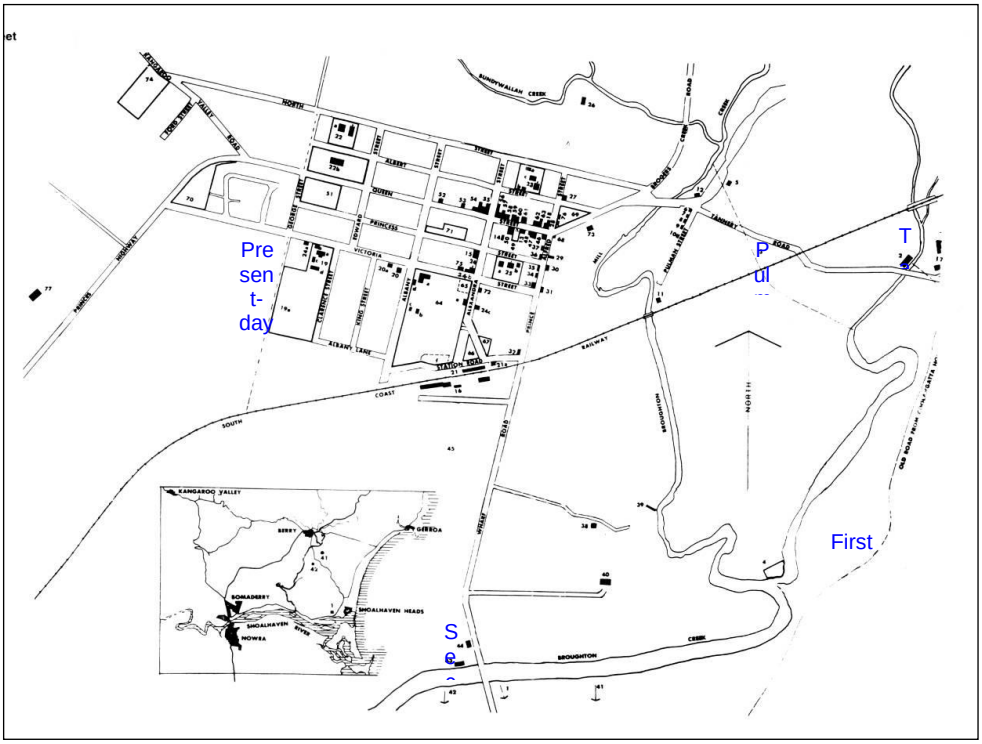

Figure 18 *Map of present day Berry showing locations of historic sites, including Pulman Street, the tannery and the two wharf sites (In Lidbetter 1993:75)*

2.4.4 The dairy industry

Alexander Berry, being the first in the area to create the concept of a farming village community, also became the first to set up a dairy on the South Coast. Within two years of his arrival, he recorded that, “a shipment of farm produce to Sydney … included in this shipment 78 lbs of butter and 20 cheeses”. So, by the end of 1824 his first dairying trade with Sydney Town has begun.

Within another 10 years or so the dairying herd at ‘Coolangatta’ had increased in quantity and quality. While the first dairy structures were hurriedly installed and crudely made from packed mud, as the brickfield production improved, later buildings were more substantial. A large dairy was developed on his grants south of the river at Jindiandy, close to Upper Numbaa and strategically placed three miles from the river bank so as to reduce the risk from flooding.

After his arrival in 1836, John Berry, who managed the Shoalhaven Estate, changed its emphasis from agriculture to stock breeding and the production of beef. He was said to have lived on horseback and was eventually thrown from his horse on April 15, 1848, dying from injuries four days later. With John Berry’s death and in 1849 the introduction of tenant farmers, the early days of the Shoalhaven being a breeding ground for young stock drew to a close.

Twenty acre plots were leased rent free on the condition that they were cleared and fenced by the end of two to five years. By 1850, the leasing of the Estate started and the tenant farmers began to establish dairying as the chief industry of the Shoalhaven district. By the 1870s most of the cedar had been cut out and the clearing leases had given way to farms - originally for wheat production. Eventually wheat growing was replaced by dairying.

Bayley contends that Kiama was the birthplace of dairying in Australia; it was the centre that first tried to export butter to England and it pioneered the system of factory production. A Butter Export Co-operative Co. was formed in 1870 and efforts were made to export butter to London and India, with an initial measure of success. The Kiama Pioneer Co-operative Dairy Factory was officially opened on 18 June 1884 and was the first of its kind in Australia. It was situated near Spring Creek on the Jamberoo Road. A monument commemorating the Butter Factory now stands at that location.

Further south, other dairy factories were established between 1884 and 1894. These were the Kangaroo Dairy Co. (1888) on Sawyers Creek one kilometre south of the Berry Road along Factory Road; the Barrengarry Butter Factory (1888 to 1925); the Kangaroo River Dairy Co. (1890); and the Upper River Butter Factory on the eastern bank 16 km south of the Gerringong Creek junction (1894-1901).

Figure 19 *"A Sketch of the Broughton Creek Road" (Illustrated Sydney News 21 November 1885:p14 & 16), " not far distant from Broughton Creek [Berry]" Note the continued presence of tall forest vegetation on the lowlands at this time.*

When it was opened in September 1895, the Berry Central Creamery was described as the 'largest and most complete butter factory in the colony'. At that time it was noted that 1,075 tons of butter were produced annually in the Berry district from 12,800 cattle, the product of which could be treated by the Berry Central Creamery. The registered trade mark was a bunch of Lillipilli berries, from a local forest species, still present in the region today. In 1911, a group of dairymen purchased the Creamery from the Berry Estate and formed a co-operative, which subsequently became the Berry Rural Co-operative Society Ltd. The milk market continued to grow and in 1958 butter manufacture ceased. A peak annual milk intake was reached in 1976-77 but a downward trend developed in the 1980s. From 1991, milk was collected from farms in the Cooperative's tankers and delivered direct to the Australian Co-operative Foods Limited Factory at Bomaderry.

The sub-division of the Berry estate over the 40 years following the death of David Berry initiated the establishment of many small dairy farms on both sides of the Shoalhaven.

During the last decade of the nineteenth century, when Alexander Hay was the Manager of the Berry Estate, a more scientific approach was adopted towards dairying in the Shoalhaven. Following an investigative trip to Europe by Alexander, the Trustees of the Estate erected the above mentioned Butter Factory at Berry and established a select herd of imported pure bred dairy cattle on a stud farm at Coolangatta.

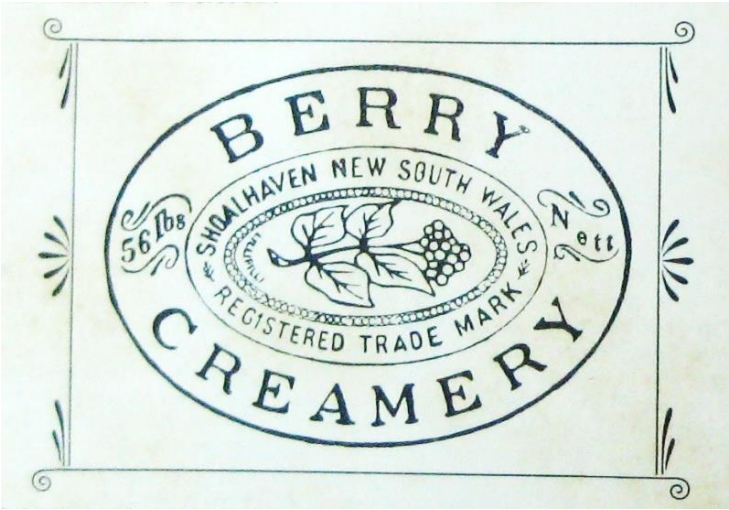

Figure 20 *The logo of the Berry Creamery (from back page of 'Descriptive Account of The Berry Estate Coolangatta Shoalhaven' 1895. W.C. Penfold & Co, Sydney)*

At that time, two public institutions of importance to the dairy farmers of the district were established at Berry. At the urging of Alexander Hay, a Bill was passed through the NSW Parliament to vary the will of David Berry to the extent that a Stud Farm and an Experimental Farm should share in the endowment bequeathed by him for a Cottage Hospital established at Berry. That was agreed upon and a transfer of Port Jackson foreshores belonging to the Estate and judged to be equal in value to the endowment was satisfactorily arranged. The Crown then assumed the Trusteeship of all three institutions (the Hospital, Stud Farm and Experimental Farm) and established them at Berry.

The Berry Experiment Farm opened near the river beside the road to Coolangatta in October 1899, being the first of its kind on the coast. It continued under the Department of Agriculture until in April 1934 it was taken over by the Child Welfare Department. It was remodelled to house 40 boys to take farm training. In 1939,

additional buildings were added, together with more modern farming facilities. In the 1970s the Child Welfare Training Farm closed and re-opened as a holiday home for the underprivileged and was later transferred to the Department of Sport and Recreation.

In the 1920s, a Pasture Research Unit was established off Wharf Road, Berry, by the Department of Agriculture. In the 1950s, the first Artificial Insemination Breeding Station (AIBS) in New South Wales was established at that location, and in 1958, it was moved to Graham Park, southwest of Berry on the Princes Highway. In the 1990s, the Centre closed and the buildings were used by Wollongong University, until new premises were built for them in 2000 in Nowra.

Following the decline of dairying, and in particular small-farm dairying, in the latter decades of the twentieth century, the economic viability of maintaining pasture land, especially on steeper slopes in the Berry district has dramatically declined. This has led, together with landuse trends towards hobby-framing and tourism, to substantial revegetation across steeper gradients in the district's foothills and basal slopes. Much of this vegetation is driven by natural re-seeding of indigenous species from neighbouring forest remnants. This has benefitted soil stabilization and increased connectivity between natural habitats, providing unexpected opportunities for biodiversity and habitat conservation management.

Figure 22 *'View of Berry Training Farm', approx. mid-twentieth century. Note the extend of clearing on the background foothills (State Records of NSW, State Library of NSW digital ID: 12932_a012_a012X2446000077)*

Figure 22 *Compare the top image with this contemporary view showing the extent of native revegetation (Looking northwest from Homestead Lane, Berry, towards Broughton Head (photo: K.Officer 2019)*

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This section is based on selective summaries of content presented in NOHC 2012.

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2.5 Landforms and geological context

2.5.1 Geology and landforms

The Berry district and the Berry Corridor consist of three main landform zones: the escarpment, spurs and steeper slopes of the Cambewarra Range; the adjacent ridgelines rolling hills and foothills; and the valley floor. The Shoalhaven coastal plain comprises the valley floor and adjacent rolling hills and ridgelines. The boundary between the foothills and the coastal plain is not distinct and an approximate cut-off would be the 100 metre to 140 metre contour (above height datum, AHD).

The Cambewarra Range is a southern extension of the Illawarra Escarpment and its seaward side can be characterised as a eroded cross section through the accumulated sedimentary layers of the Sydney Basin. From the Triassic Hawkesbury Sandstone at the top of the escarpment, to the lowland foothills formed on Permian siltstones and shales of the Berry Formation, this 640 m sequence represents 65 million years of geological time. The sandstones in this sequence are the most resistant to weathering and have formed the escarpments and elevated plateaus of the district, including Barren Grounds Nature Reserve at the top of the Range (652 m AHD) on Hawkesbury Sandstone), and Coolangatta Mountain and Moeyan Hill on the coastal plain (on Budgong Sandstone).

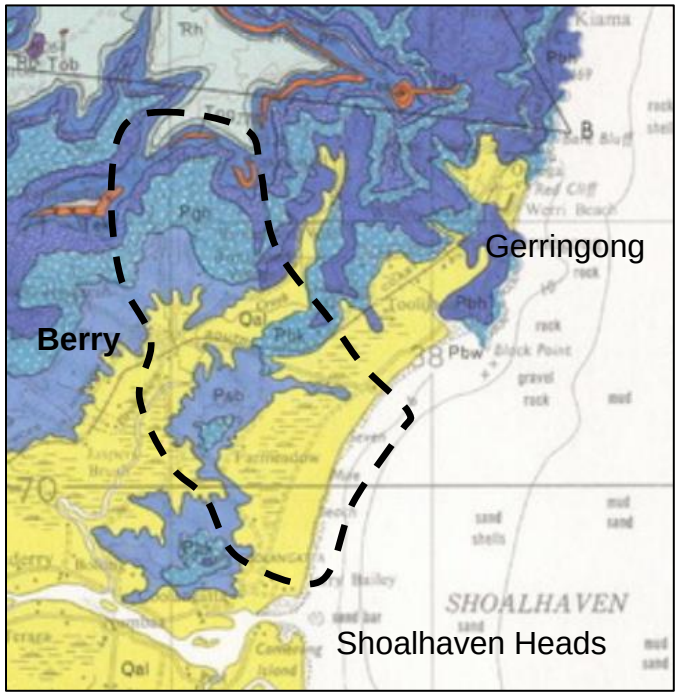


Figure 23 *The geology of the Berry District, the Berry Corridor is delineated by a black dashed line (extract from Wollongong 1:250k Geological Sheet SI5609 2nd Ed 1966, Geological Survey of NSW).*

Blue – Permian sandstones, shales and siltstones and volcanic latite (darker blue)

Light green (top of map) Triassic sandstone

Orange – Tertiary volcanic basalt

Yellow – Quaternary sediments

Interspersed with the sedimentary rocks of this sequence are volcanic rocks, such as latite, belonging to the Permian aged Gerringong Volcanics, and later basalts from the Tertiary era. These volcanic rocks are also resistant to weathering and have formed many of the benches in the upper ranges.

The low ridges and basal slopes bordering and crossing the coastal plain have formed from the Berry Formation (siltstone, shale and sandstones), the Broughton Tuff (tuff and tuffaceous sandstone), and the Bombo Latite. The former two are metamorphic sedimentary formations, the latter a series of igneous lava flows. The Bombo Latite has formed the watershed ridges and higher ground that subdivide the various catchments and valley floors in the Kiama and Gerringong region. It dominates the higher relief to the east of the plain, notably the crest and upper slopes of Toolijooa ridge and the mid-range of the western slopes of the Broughton Creek valley adjacent to Broughton Village. The lower slopes of Toolijooa ridge are comprised of the Kiama Tuff (trachytic tuff). Elsewhere towards the west of the plain, basal slopes and watershed ridges have formed from the Berry formation.

The valley floor of the coastal plain presents a low relief topography of Quaternary (the last 2.5 million years) aged fluvial sedimentary deposits which typically includes a suite of depositional landforms such as colluvial fans, flood plain, terrace sequences, current and former streambeds, wetland basins and old delta deposits. Quaternary fluvial deposits are encountered on the floor of the Broughton and Broughton Mill Creek valleys.

The majority of the fluvial valley deposits were laid down some 20,000 to 30,000 years ago and the high terrace levels probably date to around 29,000 years ago (Walker 1962). There has been a marked increase in water runoff and the rate of sediment discharged from major Illawarra streamlines in the last 100 years (Wollongong City Council 1976). The increase in sedimentation is attributable to the great disruption of

vegetative cover, and the consequent erosion caused by European clearing and agriculture. A consequence has been the deposition of sediment layers across the surface of the plain's basins and fans. Another impact is increased rates of erosion and bank failure.

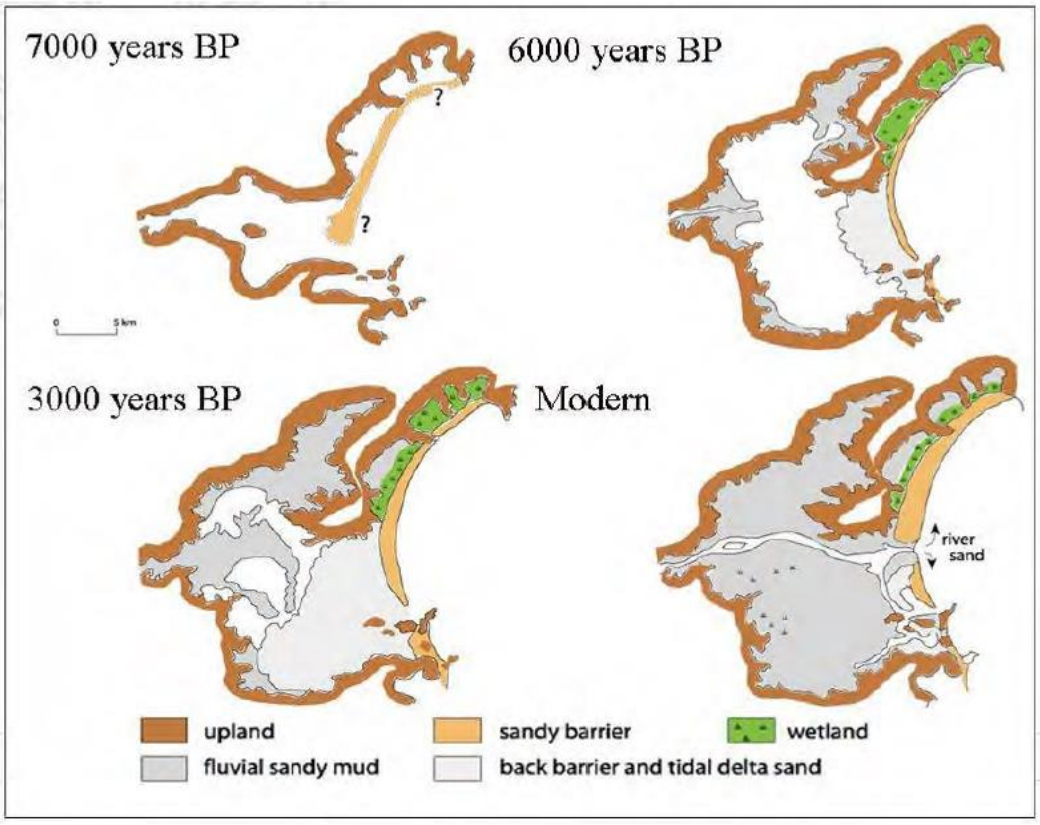


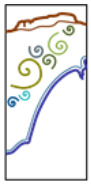
Figure 24 *Stages in the evolution of the Shoalhaven River lower valley and estuarine basin during the Holocene (the last 10,000 years).*

With the rise in sea level, the former marine embayments were replaced with a large estuary behind a sand barrier. This was rapidly infilled with riverine sediments to form a complex of freshwater wetland basins. River sand now reaches the sea and contributes to the widening ('progradation') of the Seven Mile Beach barrier.

Note the past contexts of the Moeyan Hill-Coolangatta Mt ridgeline as a former coastline along its eastern margin, followed by a peninsula between a former estuary (western margin) and wetland embayments (to the east). After Rogers and Woodroffe 2015, based on Woodroffe et al. 2000 and Umitsu et al 2001.

The sediments of the coastal margin are dominated by marine and aeolian (wind-blown) sediments deposited as a result of prograding (encroaching seaward) coastlines after high sea levels. These consist of estuarine deposits, as well as former sand barriers, dune and beach ridges. Around 8000 years ago, the sea was more than 10 metres below the present level, and reached its present level between 6000 to 6500 years ago. This is known as the post glacial marine transgression (Roy 1994, Thom and Roy 1985, Woodroffe et al. 2000).

Following stabilisation of former, and the current sea level, sand barriers formed across drowned valley embayments, creating a series of estuarine environments along the eastern seaboard, which subsequently and variously filled with sediment (Roy 1994). The plains of the lower Shoalhaven River are a large scale example of this process. They demonstrate an evolution from a brackish water estuarine environment to freshwater alluvial plains (**Figure 24**). When the sea reached its present level, most of the plains were flooded to form a large coastal embayment. Following the incipient formation of a sand barrier (of which Comerong Island is an evolved remnant), a coastal lagoon and estuary, similar in extent to Lake Illawarra must have been formed. This lagoon received fluvial input from Broughton Creek to the north and the Shoalhaven River to the west. The gradual infilling of the estuary then proceeded, with a pattern characterised by sedimentation around the periphery and gradual infill in the centre of the flood basin. Most of the plains adjacent to Broughton Creek were infilled between 5000 and 4000 years ago. Infill of the estuary basin was largely complete by 3000 years ago (Woodroffe et al. 2000).



The town of Berry is situated at a point where the fluvial deposits of the Broughton Mill Creek valley (including Bundewallah Creek) interface with the former estuary embayment of the lower Shoalhaven. Upon entering the estuary, these streams would have dumped their sediments, and formed a small delta which extended progressively from north south into the embayment, prior to its infilling by about 4000 years ago (Wearne 1984:Fig 6.1, Woodroffe et al. 2000).

The range that includes Coolangatta Mountain (304 m AHD), Moeyan Hill (163 m AHD), and their associated slopes, forms a bedrock peninsula situated between the now drained wetland basins of the lower Broughton Creek, and the mostly drained basins to the east, formed by the Seven Mile Beach sand barrier. At the time of the sea level rise, following the cessation of the last glacial maximum, around 6000 to 6500 years ago, the Coolangatta – Moeyan rangelands would have formed a promontory, surrounded by coastal, and subsequently estuarine, embayments (Wearne 1984, Woodroffe et al. 2000).

During the last 2000 to 3000 years, the Shoalhaven River appears to have been channelized within levee deposits for most of its course across the plain. Isolated flood basins have persisted to the north and south. (Woodroffe et al. 2000)

2.5.2 Soils

Soil is vital to life in the berry bush corridor by supporting the ground beneath and supplying a medium for organisms to grow. Soils also are integral in the regulation of water flow and filtration therefore affecting stream outputs and water quality. Low quality soils reduced the potential of crops, pastures, live stock and the natural environments also would de damaged

The soils in the foothills are comprised of Podzolic profiles, these are sandy soils cut into the siltstone features of the berry formation and do not provide a very efficient substrate for productive land use. On volcanic bedrock landforms, there are Kraznemic soils which are much richer in nutrients when compared to the Podzolic. These soils formed from weathered volcanic rocks and are high in clay content. Clay in the soil helps retain nutrients and water content and saves money when irrigating and fertilizing (Young R.W, 1982).

Large flooding events in the past deposited large amounts of acid sulphate rich soils across the coastal plain. These are hard to neutralise and sometimes kill all vegetation. Caring, monitoring and maintaining these soils needs to be a key goal for all land holders in the bush corridor to achieve the highest quality soils

2.5.3 Information Sources

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2.6 Climate of the Berry Region

2.6.1 Temperature

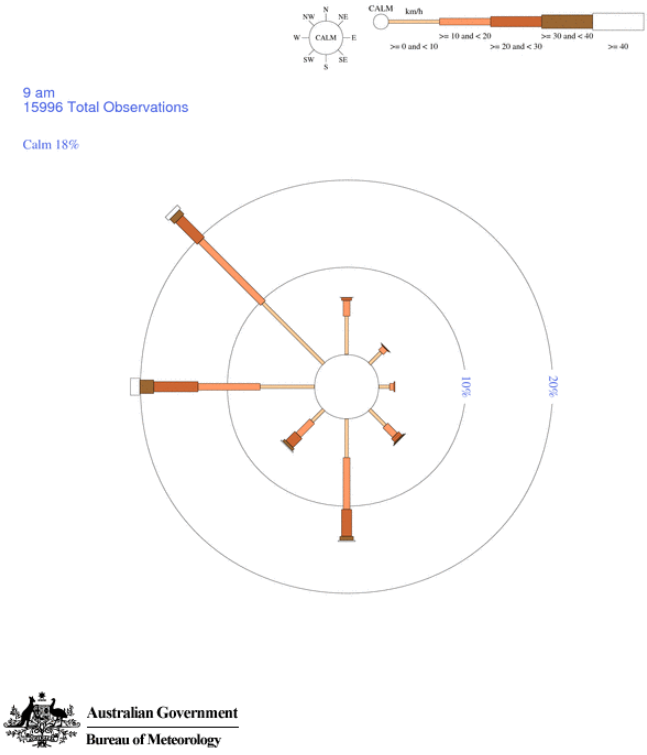
Berry and the surrounding areas have a consistently temperate, warm and mild climate throughout the year with coastal weather systems providing a stable climate. It experiences a relatively warm Summer/Autumn period where temperatures average from 22-17 ℃ with average maximums getting to 27℃ in the warmest parts of the year. During Winter/Spring periods, temperatures average from 17-11℃ and average minimums get down to 7℃.

2.6.2 Rainfall

Rainfall is generally higher in the summer when its warmest, although there is no dramatic difference through the entire year. Annual rain fall for berry is around 1000mm with most rain associated with moisture bearing southerly air streams on the coast.

2.6.3 Wind

The prevailing wind in the region is a calm NW that has an average speed of 12km/hr. Weather conditions often change intra-daily due to fronts from the NE and SE. These fronts form due to oceanic pressure systems often bringing a change in temperature, humidity and wind.



Australian Government
Bureau of Meteorology

2.7 The Shoalhaven Catchment

2.7.1 Overview

Berry is a part of the greater Shoalhaven catchment, that drains into the nearby Shoalhaven River. This catchment is one of the largest in NSW and helps provide water for over 4 million people in the Shoalhaven, Illawarra and Sydney. The berry area contributes higher than average amounts of water to this catchment and is vital to maintaining its health.

Rain events are considered erratic and often form as heavy isolated storms, these storms occur all through the year but are more common in late autumn/ winter. Large anti cyclonic events off the coast to the south often bring large storms with considerable amounts of rain. These storms can quickly inundate low lying areas and usually occur for short periods of time.

Rain variability is highest inland with more consistent rainfall occurring on the coast. The high elevation of the escarpment causes rain to form as moist air is forced up from the coast, this causes wetter than average annual conditions.

In the previous decades the El Nino weather system has caused lower than average rainfall for the area but in recent times the status of the weather system has changed to inactive.

Areas on escarpment may experience more varied temperatures and more extreme minimums compared to the coastal areas as some elevated locations are up to 700m above sea level. The area is subject to four distinct seasons with the summer months being wetter than the cooler months although rainstorms frequently occur in winter and autumn. Daily variability in weather is common with cool cloudy days occurring after warm sunny days.

2.7.2 The Catchment

The Shoalhaven catchment covers 7,300 square kilometres, and includes more than one-third of Sydney's drinking water catchment. The Shoalhaven River has four main tributaries, the Mongarlowe, Corang, Endrick and Kangaroo Rivers, and is highly valued for its wild and scenic attributes. Other tributaries include the Ettrema, Boro, Reedy, Danjerra, Yalwal, Broughton, Broughton Mill and Yarrunga Creeks.

The Shoalhaven River flows through a large coastal floodplain before entering the Pacific Ocean at Shoalhaven Heads. The Berry Corridor extends from the northern edge of the Cambewarra Range, and across the coastal plain at the northeastern end of the river catchment.

Approximately half of the Shoalhaven River Catchment has had minimal disturbance to its native vegetation. About 35% of the Catchment is used for agriculture and a further 11% for forestry. Only about 4% of the Catchment is urbanised – Nowra being by far its largest urban centre with a population of 31,000 (2006 Census).

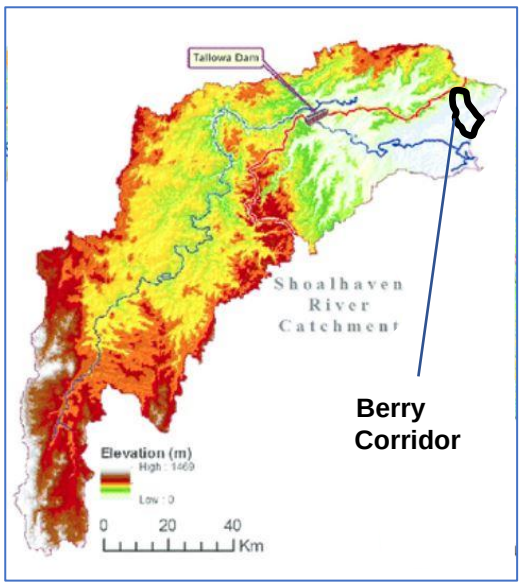
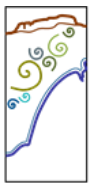


Figure 25 *The location of the Berry Corridor relative to the Shoalhaven River catchment (base image ALUM 2010)*

The Shoalhaven River floodplain covers approximately 5% of the Catchment. The floodplain is experiencing considerable urban and industrial growth, particularly in and around Nowra and Bomaderry. The Nowra/Bomaderry district is identified as a growth area with the population expected to increase by up to 50% by 2030 (https://www.oceanwatch.org.au/wp-content/uploads/2016/05/CS1-Shoalhaven-Catchement.pdf).



The Shoalhaven River catchment, extends from the fine wool country around Braidwood in the south-west to the lush forests and cleared agricultural lowlands of the coastal ranges and plain in the north-east. Cattle and sheep grazing are the largest single land use.

The catchment also supports horse studs, piggeries, dairies, and poultry production as well as vineyards, olive groves, canola and cereal crops. Cleared grazing land covers 36 percent of the catchment, along with large areas of national parks (31 percent) and forests (27 percent).

2.7.3 Historical Shoalhaven River flood levels

Here is a list of the recorded flood levels from the mid-1800s to 1999.

Flood water depth recorded at Nowra 1860 – 1999.
February 1860 .....5.7m
June 1864 .....5.2m
April 1867 .....5m
June 1867 .....5.1m
March 1870 .....5m
April 1870 .....6.5m
May 1871.....4.5m
February 1873 .....6.2m
June 1891 –.....5.3m
February 1898 .....5m
July 1900 .....4.4m
July 1904 .....3.7m
January 1911 .....3.6m
October 1916 .....5.3m
December 1920 .....4.2m
July 1922 .....4.2m
May 11, 1925 .....5.4m
May 27, 1925 .....4.4m
June 1949 .....4m
February 1956 .....4.6m
October 1959 .....4.7m
March 1961 .....4.2m
November 1961.....4.2m
June 1964 .....3.5m
August 1974.....4.9m
June 1975 .....4.9m
October 1976 .....4.1m
March 1978 .....5.3m
April 1988 .....4.8m
August 1990 .....4.3m
June 1991 .....4m
October 1999 .....3.5m

Source

https://www.facebook.com/shoalhavenhistory/ posted: 9 Aug 2020

2.7.4 Flooding and evacuation emergency contact

The NSW state emergency service (SES) is the main organisation that deals with flooding and evacuation, if assistance is required call **132 500**. The Bureau of Meteorology broad casts weather warnings and updates on the radio and real time information can be found on their website http://www.bom.gov.au/.

2.8 Remnant Vegetation of the Shoalhaven Region

2.8.1 The significance of native vegetation

Native vegetation plays a significant role in the diverse natural and social systems that abound in Australia. Native vegetation provides food, shelter and breeding habitat for native animals. When native vegetation is lost, there is a flow on effect to other native plants and animals. A range of degrading influences also affects the long-term conservation of remnant bushland. They include complete and partial clearing for development, fragmented and small remnant areas, encroachment, altered water flow regimes in riparian areas, altered fire regimes, recreational use, feral animal impacts and the consequent weed invasion that is encouraged by all these processes.

2.8.2 Remnant native vegetation in the Shoalhaven

When compared with much of NSW, the Shoalhaven has extensive areas of native vegetation in a relatively undisturbed state, with over 80% of the Shoalhaven area under native vegetation cover. Compared with most of Australia this percentage is high, but reflects the large areas of National Parks, State forests and the generally poor and fragile soils covering most of the Shoalhaven.

Whilst a considerable percentage of this vegetation comprises large continuous tracts in public ownership, away from these areas and closer to human settlement, vegetation exists as remnants of the original plant community. This remnant vegetation is under pressure from human activities, with many of the remnants containing biological communities and species not well represented in the current reserve system. This makes remnant vegetation in the Shoalhaven particularly significant for the protection of the region's biodiversity.

The values of our remnant bushland are many and substantial.

- **Conservation & protection of biodiversity**
- **Habitat & shelter for plants and animals**
- **Soil stability & water quality**
- **Our natural heritage**

2.8.3 Plant communities in the Shoalhaven

Due to the great diversity of geology, soils, topography and climate, the Shoalhaven contains a variety of plant species and communities. Plant communities vary in structure from subtropical rainforest to heathland and include a range of eucalypt-dominated forests and woodlands and extensive wetland communities.

Certain plant communities which once covered the higher nutrient soils suitable for agriculture or were located on coastal areas now cleared for settlement are now represented only in small remnants. For example, the forest red gum *Eucalyptus tereticornis* woodland open forest community, the paperbark *Melalueca* spp open forest of the coastal foothills and plains, and the littoral rainforests of sheltered coastal sites. Many of these remnants are under continuing pressure from agriculture and/or recreational activities, are weed infested and require protection and management measures to ensure their longer-term survival.

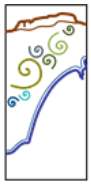
2.8.4 Threatened species in the Shoalhaven

A species is considered threatened if there is a reduction in its population size, it has a restricted geographical distribution, or there are few mature individuals.

In NSW an assessment is undertaken by the NSW Threatened Species Scientific Committee. A species may then be listed under the NSW Biodiversity Conservation Act 2016 (BCA) under the categories *vulnerable, endangered, critically endangered*, or *presumed extinct*.

Other things which can be listed und the BCA are Populations of a species and ecological communities which can also be listed as threatened. Processes that threaten species may be listed as key threatening processes. Habitat essential to the survival of endangered or critically endangered species, populations of a species or ecological communities, can be declared as critical habitat.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth legislation which lists species nationally



2.8.5 Threatened Ecological Communities (TEC's) in the Berry Corridor

Robertson Rainforest	Thin strip straddling the escarpment of the southern edge of Barren Grounds Nature Reserve east from Drawing Room Rocks and eastwards to Shoalhaven/Kiama LGA boundary
Riverflat Eucalypt Forest	Tiny patch on Broughton Head on eastern end of Rodway Nature Reserve
Illawarra Sub-tropical Rainforest	Numerous patches south of Barren Grounds NR escarpment, Moeyan Hill, David Berry Hospital, 3 patches Northern Wire Lane & 1 patch around 160 Beach Road and 2 patches Harley Hill
Swamp Sclerophyll Forest	A patch in land adjacent to (east of) Harley Hill Reserve Beach Rd, north of Toolijooa Rd, Gerroa Sand Quarry & around edges of Coomonderry Swamp
Bangalay Sand Forest	Thin strip on corner of Gerroa Sand Quarry, south east of Coomonderry Ridge & behind dunes of 7 Mile Beach NP
Swamp Oak Forest	Near turn-off to Shoalhaven Heads on Gerroa Road
Sydney Freshwater Wetland	Coomonderry Swamp
Illawarra Lowlands Grassy Woodlands	Adjacent (west) of Connolly's Creek west of Bong Bong Rd & small patch south of Coomonderry Ridge & Jim's Forest. Patches on properties east and south of Moeyan Hill and small patch on property north of Moeyan Hill
Swamp Oak Floodplain Forest	Straddling Broughton Mill Ck east of Woodhill Mtn Rd and 6 patches within & west of Cleary Bros land. Patch on corner of Broughton Ck immediately Nth of rail line and near NE corner of Berry Sport & Rec Centre land

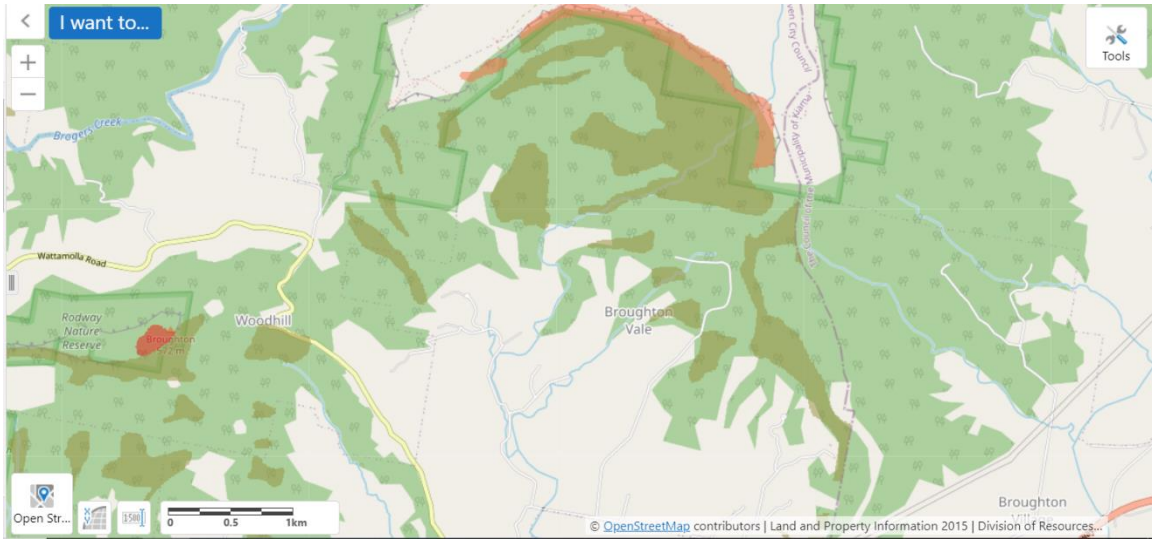


***Figure 26**: Northern Section of Berry Corridor (Barren Grounds to Boundary Road) (Open Street Map Contributors)*

***Figure 27**: Central Section of Berry Corridor (Boundary Road to Beach Road) (Open Street Map Contributors)*

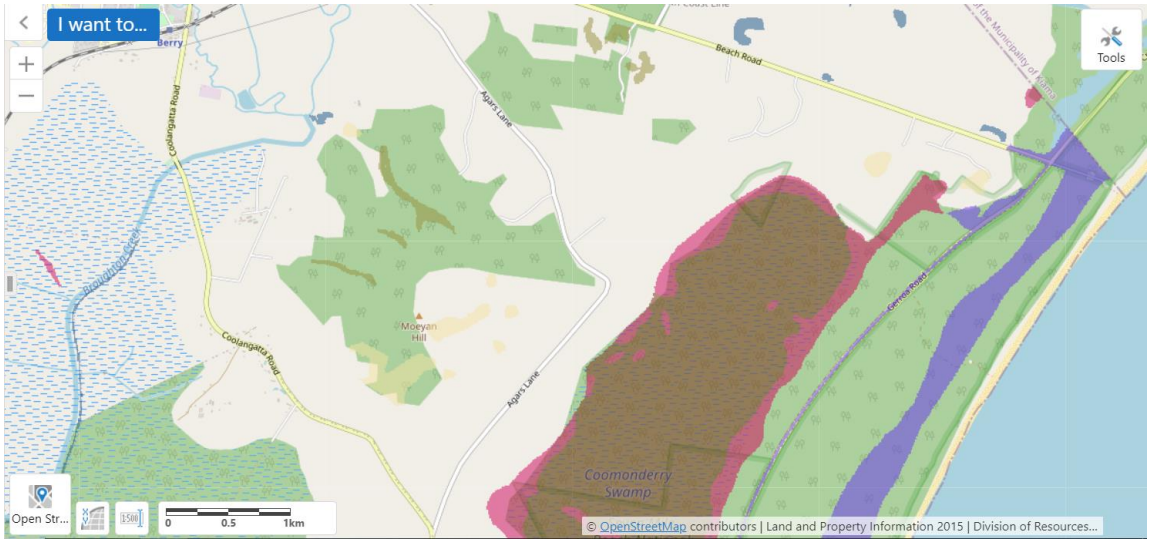


***Figure 28**: Southern Section of Berry Corridor (Beach Road to 7 Mile Beach NP) (Open Street Map Contributors)*

2.8.6 Native fauna of the Shoalhaven

Matching the diversity of plant communities in the Shoalhaven is a rich assemblage of native fauna. At least 60 of the fauna species occurring in the area are listed as endangered or vulnerable on the Threatened Species Conservation Act. The endangered species Green and Golden Bell-frog, Little Tern, Eastern Bristlebird and Broad-headed Snake are considered to have relatively significant populations in the Shoalhaven. Important populations of vulnerable species such as the Giant Burrowing Frog, Glossy Black-Cockatoo, Ground Parrot, Powerful Owl, Masked Owl, Sooty Owl, Tiger Quoll, Brush-tailed Rock Wallaby, Yellow-bellied Glider, Long-nosed Potoroo Large-footed Mouse-eared Bat and Heath Monitor are also found in the Shoalhaven.

2.8.7 Threatened Fauna and Migratory Species in the Berry Corridor

Note: this is not a complete list of Threatened fauna in the Berry Corridor

Common Name	Scientific Name	EPBC Act	TSC Act	Occurrence Likelihood
BIRDS				
Gang-gang Cockatoo	*Callocephalon fimbriatum*	-	Vulnerable	Recorded
Powerful Owl	*Ninox strenua*	-	Vulnerable	High
MAMMALS				
Yellow-belied Sheathtail Bat	*Saccolaimus flaviventris*	-	Vulnerable	High
Eastern Freetail Bat	*Mormopterus norfolkensis*	-	Vulnerable	High
Grey-headed Flying Fox	*Pteropus policephalis*	Vulnerable	Vulnerable	High
Eastern Bentwing-bat	*Miniopterus schreibresii oceanensis*	-	Vulnerable	High
Eastern False Pipistrelle	Falsistrellus tasmaniensis	-	Vulnerable	High
Southern Myotis or Fishing Bat	*Myotis macropus*	-	Vulnerable	Recorded
Greater Broad-nosed Bat	*Scoteanax rueppellii*	-	Vulnerable	High
Greater Glider	*Litorea aurea*		Endangered Population	Recorded
AMPHIBIANS				
Green and Golden Bell Frog	*Petauroides Volans*		Vulnerable	Recorded

MIGRATORY SPECIES				
BIRDS				
White-bellied Sea Eagle	*Haliaeetus leucogaster*	M		Recorded
Fork-tailed Swift	*Apus pacificus*	M		High
Cattle Egret	*Ardea ibis*	M		Recorded
Black-faced Monarch	*Monarcha melanopsis*	M		Recorded
Rufous faintail	*Rhipidura rufifrons*	M		Recorded
Australian Reed Warbler	*Acrocephalus stentoreus*	M		High

2.8.8 Threatened Species that live in the Shoalhaven

2.8.9 Fauna

Known threatened species that live in Shoalhaven

Threatened fauna that live in Shoalhaven

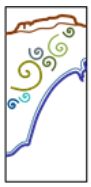
Below is a list of threatened fauna known to occur in the Shoalhaven LGA. This list may not be exhaustive, and it is recommended that you contact Council's Environmental Assessment Unit on (02) 4429 3209 for further information.

Threatened fauna in Shoalhaven

Common Name	Scientific Name	NSW Status	National Status EPBC
Australasian Bittern	*Botaurus poiciloptilus*	Vulnerable	
Australian Grayling	*Prototroctes maraena*		Vulnerable
Australo-African Fur-seal	*Arctocephalus pusillus*	Vulnerable	
Barking Owl	*Ninox connivens*	Vulnerable	
Beach Stone Curlew	*Esacus neglectus*	Endangered	
Black Bittern	*Ixobrychus flavicollis*	Vulnerable	
Black-browed Albatross	*Diomedea melanophrys*	Vulnerable	
Black Rock Cod	*Epinephelus daemelii*	Vulnerable	
Black-necked Stork	*Ephippiorhynchus asiaticus*	Endangered	
Black-tailed Godwit	*Limosa limosa*	Vulnerable	
Blue-billed Duck	*Oxyura australis*	Vulnerable	
Broad Headed Snake	*Hoplocephalus bungaroides*	Endangered	Vulnerable
Broad-billed Sandpiper	*Limicola falcinellus*	Vulnerable	Migratory
Brown Treecreeper	*Climacteris picumnus*	Vulnerable	
Brush-tailed Phascogale	*Phascogale tapoatafa*	Vulnerable	
Brush-tailed Rock Wallaby	*Petrogale penicillata*	Endangered	Vulnerable
Bush Stone Curlew	*Burhinus grallarius*	Endangered	
Common Bent-wing Bat/Large Bent wing Bat	*Miniopterus schreibersii*	Vulnerable	Conservation Dependent
Dugong	*Dugong dugon*	Endangered	Migratory
Diamond Firetail	*Stagonopleura guttata*	Vulnerable	
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	Vulnerable	
East Coast Freetail Bat	*Mormopterus norfolkensis*	Vulnerable	
Eastern Bristlebird	*Dasyornis brachypterus*	Endangered	Endangered
Eastern Cave Bat	*Vespadelus troughtoni*	Vulnerable	
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	Vulnerable	
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable	
Eastern Pygmy Possum	*Cercartetus nanus*	Vulnerable	
Eastern Quoll	*Dasyurus viverrinus*	Endangered	
Flatback Turtle	*Natator depressus*		Vulnerable
Freckled Duck	*Stictonetta naevosa*	Vulnerable	

Common Name	Scientific Name	NSW Status	National Status EPBC
Gang Gang Cockatoo	*Callocephalon fimbriatum*	Vulnerable	
Giant Burrowing Frog	*Heleioporus australicus*	Vulnerable	Vulnerable
Glossy Black Cockatoo	*Calyptorhynchus lathami*	Vulnerable	
Golden-tipped Bat	*Kerivoula papuensis*	Vulnerable	
Great Knot	*Calidris tenuirostris*	Vulnerable	Migratory
Great White Shark	*Carcharodon carcharias*	Vulnerable	Vulnerable
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Vulnerable	
Greater Sand Plover	*Charadrius leschenaulti*	Vulnerable	Migratory
Green and Golden Bell Frog	*Litoria aurea*	Vulnerable	Vulnerable
Green Sawfish	*Pristis zijsron*	Endangered	
Green Turtle	*Chelonia mydas*	Vulnerable	Vulnerable
Grey Headed Flying Fox	*Pteropus poliocephalus*	Vulnerable	Vulnerable
Grey Nurse Shark	*Carcharias taurus*	Endangered	Critically Endangered
Ground Parrot	*Pezoporus wallicus*	Vulnerable	Endangered
Heath Monitor	*Varanus rosenbergi*	Vulnerable	
Hooded Plover	*Thinornis rubricollis*	Endangered	
Humpback Whale	*Megaptera novaeangliae*	Vulnerable	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable	
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable
Large-footed Myotis/Large Footed Mouse-eared Bat/ Fishing Bat	*Myotis adversus*	Vulnerable	
Leathery Turtle	*Dermochelys coriacea*	Vulnerable	Vulnerable
Lesser Sand Plover	*Charadrius monogolus*	Vulnerable	
Little Shearwater	*Puffinus assimilis*	Vulnerable	
Little Tern	*Sterna albifrons*	Endangered	
Littlejohns' Tree Frog	*Litoria littlejohnii*	Vulnerable	Vulnerable
Long-nosed Potoroo	*Potorus tridactylus*	Vulnerable	Vulnerable
Macquarie Perch	*Macquaria australasica*	Vulnerable	Endangered
Masked Owl	*Tyto novaehollandiae*	Vulnerable	Vulnerable
Northern Giant Petrel	*Macronectes halli*	Vulnerable	Vulnerable
Olive Whistler	*Pachycephala olivacea*	Vulnerable	
Orange Bellied Parrot	*Neophema chrysogaster*	Endangered	Critically Endangered
Osprey	*Pandion haliaetus*	Vulnerable	
Parma Wallaby	*Macropus parma*	Vulnerable	Extinct
Pied Oystercatcher	*Haematopus longirostris*	Vulnerable	
Pink Robin	*Petroica rodinogaster*	Vulnerable	
Powerful Owl	*Ninox strenua*	Vulnerable	

Common Name	Scientific Name	NSW Status	National Status EPBC
Providence Petrel	*Pterodroma solandri*	Vulnerable	
Red-crowned Toadlet	*Pseudophryne australis*	Vulnerable	
Regent Honeyeater	*Xanthomyza phrygia*	Endangered	Endangered
Rosenberg's Goanna	*Varanus rosenbergi*	Vulnerable	
Sanderling	*Calidris alba*	Vulnerable	
Shy Albatross	*Diomedea cauta*	Vulnerable	Vulnerable
Sooty Owl	*Tyto tenebricosa*	Vulnerable	
Sooty Oystercatcher	*Haematopus fuliginosus*	Vulnerable	
Southern Brown Bandicoot	*Isoodon obselus*	Endangered	
Southern Giant Petrel	*Macronectes giganteus*	Endangered	Endangered
Southern Right Whale	*Eubalaena australis*	Vulnerable	Endangered
Sperm Whale	*Physeter catadon*	Vulnerable	
Spotted-tailed Quoll	*Dasyurus maculatus*	Vulnerable	Endangered
Square-tailed Kite	*Lophoictinia isura*	Vulnerable	
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable	
Striated Fieldwren	*Calamanthus fuliginosus*	Vulnerable	
Stuttering Barred Frog	*Mixophyes balbus*	Endangered	Vulnerable
Superb Fruit-Dove	*Ptilinopus superbus*	Vulnerable	
Swift Parrot	*Lathamus discolor*	Endangered	Endangered
Terek Sandpiper	*Xenus cinereus*	Vulnerable	Migratory
Turquoise Parrot	*Neophema pulchella*	Vulnerable	
Wandering Albatross	*Diomedea exulans*	Endangered	Vulnerable
White-footed Dunnart	*Sminthopsis leucopus*	Vulnerable	
Yellow-bellied Glider	*Petaurus australis*	Vulnerable	Vulnerable
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	Vulnerable	



2.8.10 Flora

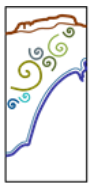
Threatened flora that live in Shoalhaven

Below is a list of threatened flora known to occur in the Shoalhaven LGA. This list may not be exhaustive, and it is recommended that you contact Council's Environmental Assessment Unit on (02) 4429 3209 for further information.

Threatened flora in Shoalhaven

Common Name	Scientific Name	Family	NSW Status	National Status EPBC
Bynoe's Wattle	*Acacia bynoeana*	Fabaceae	Endangered	Vulnerable
Deane's Boronia	*Boronia deanei*	Rutaceae	Vulnerable	Vulnerable
Budawangs Cliff Heath	*Budawangia gnidioides*	Epacridaceae	Vulnerable	Vulnerable
Spider Orchid	*Caladenia tessellata*	Orchidaceae	Endangered	Vulnerable
(Moss)	*Calomnion complanatum*	Calomniaceae	Endangered	
Sand Spurge	*Chamaesyce psammogeton*	Euphorbiacea e	Endangered	
Chef's Cap Correa	*Correa baeuerlenii*	Rutaceae	Vulnerable	Vulnerable
Leafless Tongue Orchid	*Cryptostylis hunteriana*	Orchidaceae	Vulnerable	Vulnerable
Illawarra Socketwood	*Daphnandra sp "Illawarra"*	Monimiaceae	Endangered	Endangered
Australian Salt-grass	*Distichlis distichophylla*	Poaceae	Endangered	
Albatross Mallee	*Eucalyptus langelyi*	Myrtaceae	Vulnerable	Vulnerable
Ettrema Mallee	*Eucalyptus sturgissiana*	Myrtaceae	Vulnerable	
Tangled Bedstraw	*Galium australe*		Endangered	
East Lynne Midge Orchid	*Genoplesium vernale*	Orchidaceae	Vulnerable	Vulnerable
Brittle Midge Orchid	*Genoplesium baueri*	Orchidaceae	Vulnerable	
Genoplesium superbum	*Genoplesium superbum*	Orchidaceae	Endangered	
	Grevillea renwickiana	Proteaceae	Endangered	
Square Raspwort	*Haloragis exalta subsp. Exalta*	Haloragaceae	Vulnerable	Vulnerable
	Hibbertia sp. Nov. "Menai'	Dilleniaceae	Endangered	
Pretty Beard Orchid	*Calochilus pulchellus*	Orchidaceae	Endangered	
Delicate Cress	*Irenepharsus trypherus*	Brassicaceae	Endangered	Endangered
Leafy Peppercress	*Lepidium foliosum*	Brassicaceae	Extinct	
Biconvex paperbark	*Melaleuca*	Myrtaceae	Vulnerable	Vulnerable

Common Name	Scientific Name	Family	NSW Status	National Status EPBC
	biconvexa			
	Melaleuca deanei	Myrtaceae	Vulnerable	Vulnerable
Budawangs Wallaby-Grass	*Plinthanthesis rodwayi*	Poaceae	Endangered	Vulnerable
Cotoneaster Pomaderris	*Pomaderris cotoneaster*	Rhamnanceae	Endangered	Endangered
Jervis Bay Leek Orchid	*Prasophyllum affine*	Orchidaceae	Endangered	Endangered
Villous Mint-bush	*Prostanthera densa*	Lamiaceae	Vulnerable	Vulnerable
Illawarra Greenhood	*Pterostylis gibbosa*	Orchidaceae	Endangered	Endangered
	Pterostylis pulchella	Orchidaceae	Vulnerable	Vulnerable
Budawang's Bush-Pea	*Pultenaea baeuerlenii*	Fabaceae	Vulnerable	Vulnerable
Eastern Australian Underground Orchid	*Rhizanthella slateri*	Orchidaceae	Vulnerable	
Coast Groundsel	*Senecio spthulatus*		Endangered	
	Solanum celantum	Solanaceae	Endangered	
Magenta Lilly Pilly	*Syzgium paniculatum*	Myrtaceae	Vulnerable	Vulnerable
Austral Toad-Flax	*Thesium australe*	Santalaceae	Vulnerable	Vulnerable
Nowra Heath Myrtle	*Triplarina nowraensis*	Myrtaceae	Endangered	Endangered
Narrow-leafed Wilsonia	*Wilsonia backhousei*	Convulvaceae	Vulnerable	
Round-leafed Wilsonia	*Wilsonia rotundifolia*	Convulvaceae	Endangered	
Bomaderry Zieria	*Zieria baeuerlenii*	Rutaceae	Endangered	Endangered
	Zieria murphyi	Rutaceae	Vulnerable	Vulnerable
Warty Zieria	*Zieria tuberculata*	Rutaceae	Vulnerable	Vulnerable



2.9 Threats to Remnant Vegetation in the Shoalhaven

2.9.1 Species loss in Australia

Australia has a tragic record of species extinction. More mammals have become extinct in this country over the last 200 years than in any other country in the world. Many other species that live in our forests and woodlands are now in severe decline.

With so much of Australia's land cleared for either agricultural or urban land use whole ecosystems are permanently transformed. This permanent transformation has resulted in broad scale environmental losses, degradation and a major reduction in biodiversity.

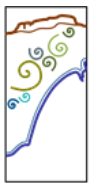
2.9.2 Depletion of vegetative communities

Whilst no vegetation communities have been lost to the Shoalhaven, all have been depleted to some extent since the arrival of Europeans. There are extensive areas of National Park in the western section of the region, however these areas are based primarily on sandstone formations which support types of ecosystems with distinct floristics and fauna habitat. Consequently, many communities based on the richer soils such as spotted gum, blackbutt and red mahogany are poorly represented in the reserve system. Some of these communities are depleted to such an extent that the Federal and State targets of 15% reservation of pre-European vegetation are unable to be achieved.

2.9.3 Impacts of rural development

Broad scale clearing of native vegetation does not occur to the same degree in the Shoalhaven as in other parts of the State. Current clearing activities are associated with rural residential development and urban expansion which has become a significant rural land use in the past twenty years and is undoubtedly the most prominent single issue in the ongoing debate over rural land use in the Shoalhaven.

The greatest impact of rural residential development is the fragmentation of vegetation due to clearing for buildings, access tracks, fences, dams and bushfire management. This leads to pressures on vegetation due to the introduction of exotic plants, domestic pets, stock and increased demands upon natural water sources.



3 What we need to do now

3.1 Overview

As a community, to help protect our remnant bushland there are a few key bushland management principles that we need to adopt and put into practice in our efforts to sustainably manage our remnant vegetation.

Recognise that Shoalhaven's remnant vegetation is a valuable resource that requires a commitment from our community to protect its value.

Retain remnant vegetation in areas of size and shape that will enable the existing flora and fauna communities to survive in the long term.

Protect and enhance the habitats of native flora and fauna, especially threatened species.

Protect and enhance habitat corridors and links with another remnant vegetation.

Protect and enhance remnant along natural drainage lines, watercourses and foreshores to protect, maintain and enhance water quality.

We need to protect and enhance remnant vegetation of scenic value and retain the unique visual character of the landscape of the Shoalhaven.

Encourage and promote community involvement and cooperation in the management of the Shoalhaven's remnant vegetation

3.2 Linking Remnant Patches of Vegetation

3.2.1 Fragmentation in the Berry locality

The Berry region has experienced substantial urban development which can be seen in Figure 1: 'Land Use', with significant agricultural and rural developments occurring in the Berry locality, particularly, south-east of the Berry township. This development increases the pressures already placed on existing vegetation through rural residential development and sub-division, road construction, over-clearing and removal of trees. As a result, it is evident in Figure 2: 'Vegetation' of the Berry locality, that many vegetative communities are currently isolated and fragmented, perpetuating the threatened status of residential species. Based on this, it is critical as a Berry landholder, that even the smallest patch of native vegetation on your property is preserved and linked to either pe-existing patches within your land or adjoining neighbours, to ensure the long-term survival of threatened species, specifically within the Berry Wildlife Corridor.

3.2.2 Creating a successful biodiversity link

In order to create a successful biodiversity link throughout the corridor, regeneration within remnant patches must occur. This can be implemented by using the surrounding bushland as a key indication of the vegetation composition that can be achieved and then applying the appropriate management practices such as weed and pest control. Where possible, remnant patches of native vegetation should be linked to surrounding Threatened Ecological Communities (TEC's).

Please use the following maps to identify where your property is situated in relation to surrounding TEC's, what vegetation types are situated in close proximity and how the surrounding land is used. This will assist you in determining which management practices should be implemented to achieve regeneration and create a successful biodiversity link between patches throughout the corridor. Keep in mind however, that regeneration can be a complex process as vegetation composition is not static but continually changes over time, even within vegetation strata as a result of changing landscape culture and climate.

3.2.3 The significance of landscape culture on vegetation composition

After close assessment of the 'Vegetation' map, you will notice the significant presence of Eucalypt species (a fire adapted species) throughout the Berry area. This is because the majority of vegetation within the Berry area has been pre-exposed to burning, implemented by the local indigenous people for a variety of reasons, resulting in altered vegetation composition and unexpected extinctions with no resources to extinguish runaway fires. In a modern-day context, we incorporate these management practices and often implement controlled burning for seed germination of fire adapted species and as a preventive method to reduce the threat of bushfires to agricultural and rural residential areas. However, floristic change will occur if this fire management is ceased, allowing for the emergence of pre-existing vegetation such as the Illawarra sub-tropical rainforest. Therefore, it is important to consider the management and use of surrounding land and how this can potentially alter vegetation composition when attempting to regenerate remnant patches of native vegetation within your land.

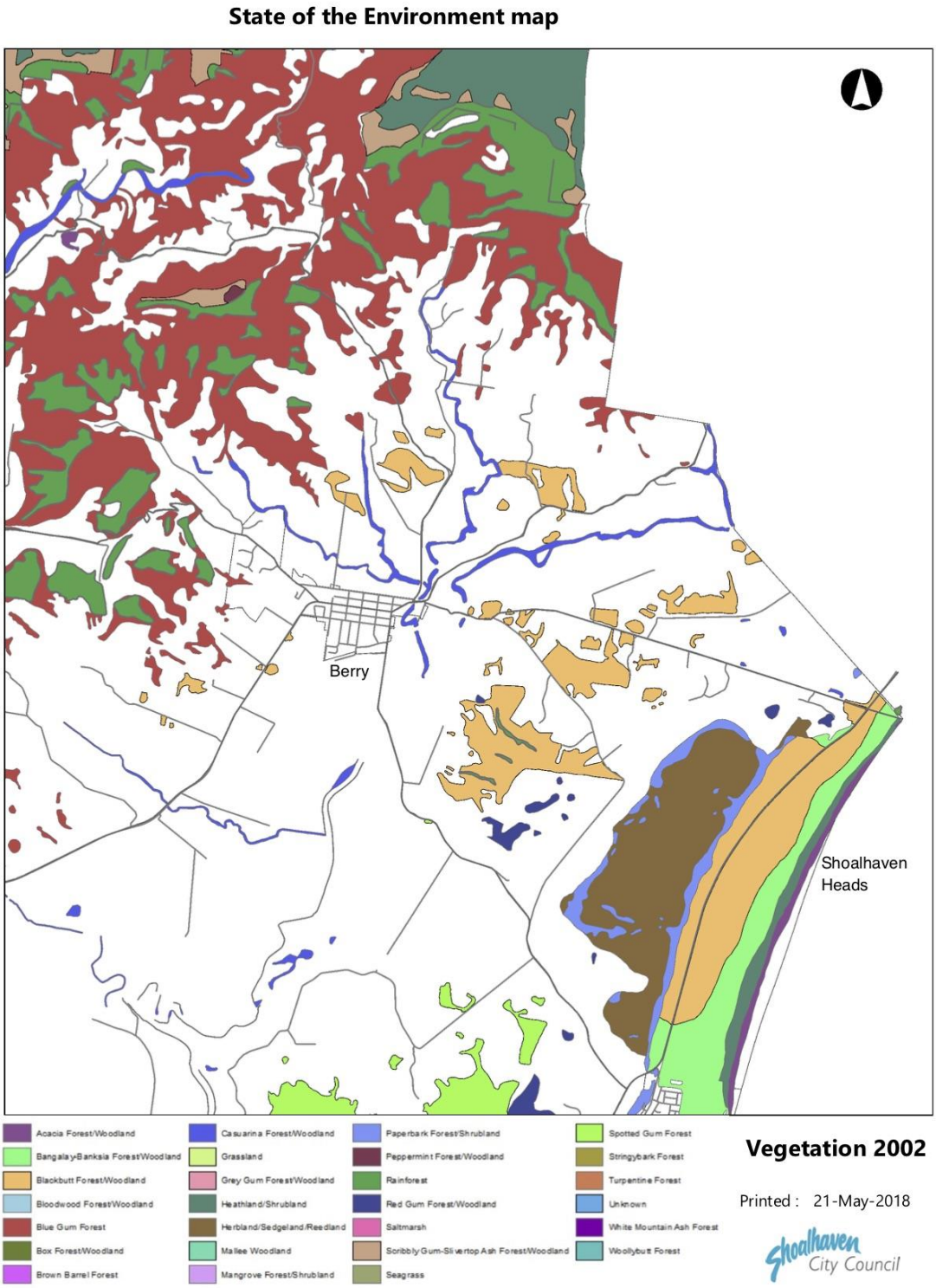


***Figure 29**: Vegetation types present within the Berry locality as of 2002. Adapted from Shoalhaven City Council, 2018.*

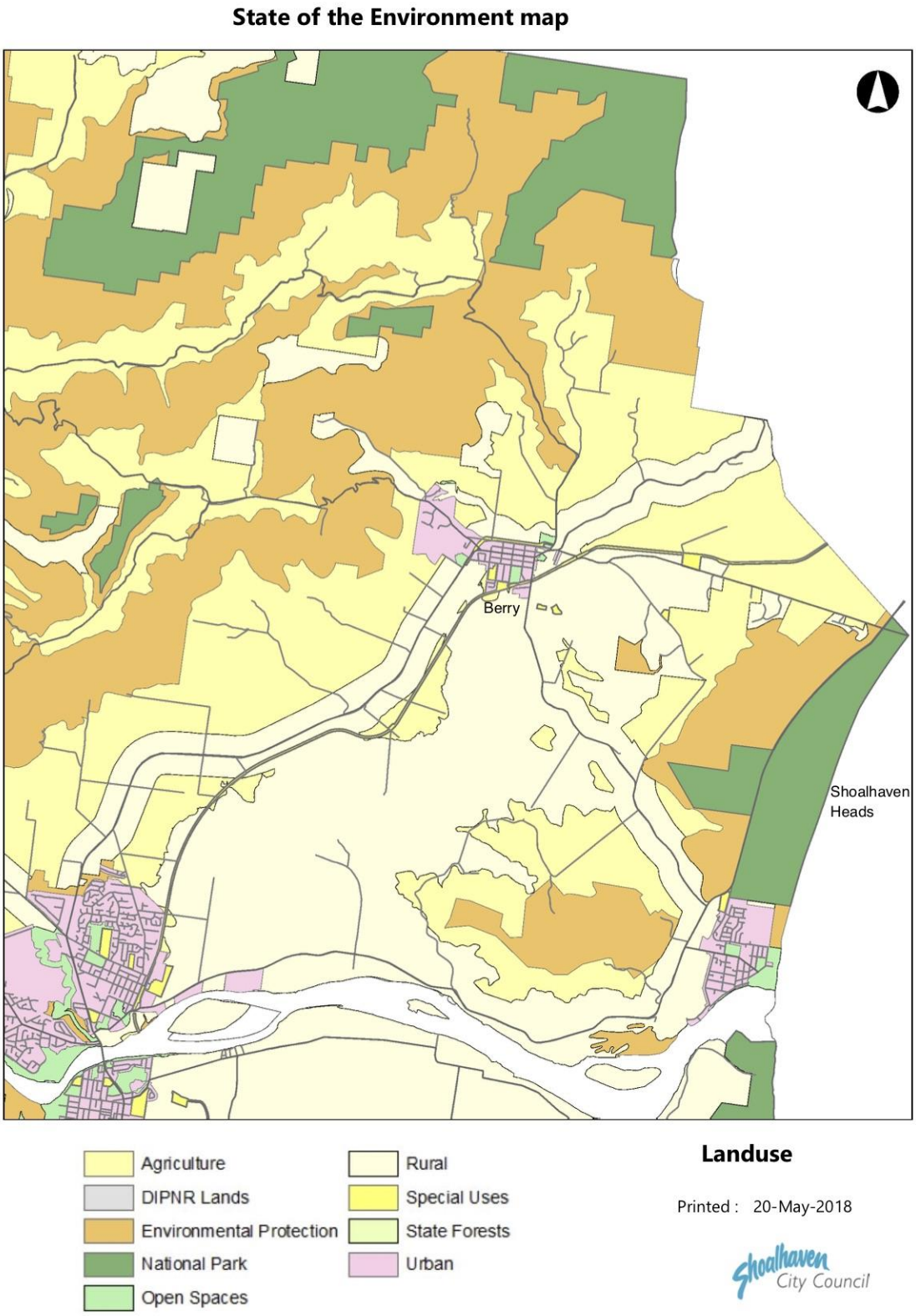


Figure 30: *Land use within the Berry locality. Adapted from the Shoalhaven City Council, 2018.*

Map Source

https://www.shoalhaven.nsw.gov.au/Planning-amp-Building/Maps-Online/SOE

3.3 Protecting Your Patch

3.3.1 Describing Native Vegetation

Broadly speaking the vegetation in the Berry area can be divided into the Coastal zone, coastal plain, and lower and upper escarpment. A more detailed description of these general categories is found at https://blog.growingillawarranatives.org/p/about-region.html.

Vegetation types

The maps in Section 3.2.3 show where different vegetation types are to be found.

Shoalhaven city council *Endangered Ecological Community Mapping* January 2010 lists the vegetation communities identified during the survey of the Berry area. These are:

- **Swamp Sclerophyll Forest - EEC**
- **Illawarra Subtropical Rainforest - EEC**
- Blackbutt – Turpentine forest
- Blue Gum – Turpentine forest
- Early successional wet sclerophyll forest / rainforest
- Mixture of native forests - dry to wet sclerophyll open forest types
- Blue Gum – Grey Ironbark Forest

Maps of vegetation types in the Shoalhaven are found at https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=SEED_Catalog.178.NSW%20Formations,SEED_Catalog.178.NSW%20Classes,SEED_Catalog.178.Labels,SEED_Catalog.178.Biometric

3.3.2 Native Vegetation Condition

There are quick and simple ways to determine the condition of your native vegetation.

Use an aerial map of your property. This is easy to obtain by saving or printing a map of your property using Google maps. Another source is NSW six maps -https://maps.six.nsw.gov.au/ - where you can type in your address or your Lot/DP.

Use this property map to identify property boundaries and where the main features of your property are, such as cleared areas, bushland, dams, fences etc.

Look at your vegetation to identify the extent of weed invasion. An easy way of categorising the extent of weeds invasion on your property is to mark out areas and use a colour code to colour them in. The commonly used code is

- RED – dense weeds
- ORANGE - medium density
- BLUE – low density
- GREEN. – little or barely any weeds

If you are doing weed control, mapping this from time to time will hopefully show you where things are improving.

Such a map helps you determine what areas to focus on.

3.3.3 Habitat Value

Understanding the wildlife habitat values on your property is important. Many native fauna species are reducing in number due to loss of habitat. It is enjoyable to have and watch wildlife on your property and to understand how the area is used by fauna. Maintaining and improving habitat features can be part of managing your property.

Where your property sits in the landscape will add habitat values. This is especially so if your property is part of a corridor of native vegetation, if it includes habitats that are uncommon, or supports one or more of the many threatened native animals.

Important habitat features on your property include healthy native vegetation; old native trees, especially if they have tree hollows; fallen timber; succulent fruiting native species, rivers, streams and wetlands; and rocky outcrops.

Apply these principles to manage habitat:

- retain,
- restore,
- expand and connect.

There are many more habitat features which are described in the Conservation Management Note – *Assessing wildlife habitat* on the NSW Department of Planning, Industry and Environment website. Find this note at https://www.environment.nsw.gov.au/resources/cpp/AssessHabitat.pdf.

3.3.4 Monitoring Native Vegetation

Monitoring your native vegetation allows you to see improvements if you are carrying out bush regeneration, and to be alerted if problems are arising.

Once you have assessed you site, you can repeat an assessment and map from time to time, to see changes.

Photo-points can be set up. By taking photos from the same point and in the same direction from time to time, you can visibly see changes. You will need to record where your photos were taken so that you can accurately take a photo from the same place.

There will be major changes if you are weeding or planting areas, and you might want to take a photo every 6 months.

Over time the changes will not be so noticeable, and photos will not be needed so often.

Record the species on your property both fauna and flora, and both native and feral animals and weeds. Date your sightings. This way you can see changes over time and be alerted if feral animals and weed growth required attention. If you are unfamiliar with species identification, contact Berry Landcare at berrylandcare@gmail.com and also take photos of the species you do not know, especially when they are flowering or fruiting to help others identify them.

3.3.5 Three Steps to Better Management

To achieve sustainable management of your land, the following steps should be implemented:

- Retain Existing Vegetation – Retains ecosystem complexity
- Manage Key Threats – Weed removal is vital
- Restore and Expand – Connect species habitats

3.4 Getting Involved: Landcare and other groups

3.4.1 Berry Landcare

Berry Landcare is a group of locals that aim to achieve sustainable land management to prevent the degradation of and protect local ecosystems. This is achieved via working with private landowners on their land, preventing over clearing of native vegetation, weed management, regeneration of vegetation whilst engaging and working with the Berry community. Berry Landcare organises events, such as displays and talks to raise community awareness of environmental and ecological issues.

Berry Landcare includes groups working under Shoalhaven City Council's Bushcare and Parkcare Programs, together with privately owned sites (Landcare groups). Currently, there are over 100 volunteers operating at 14 worksites within the area, involved with projects including the 'Berry Corridor' and 'Plant Local'.

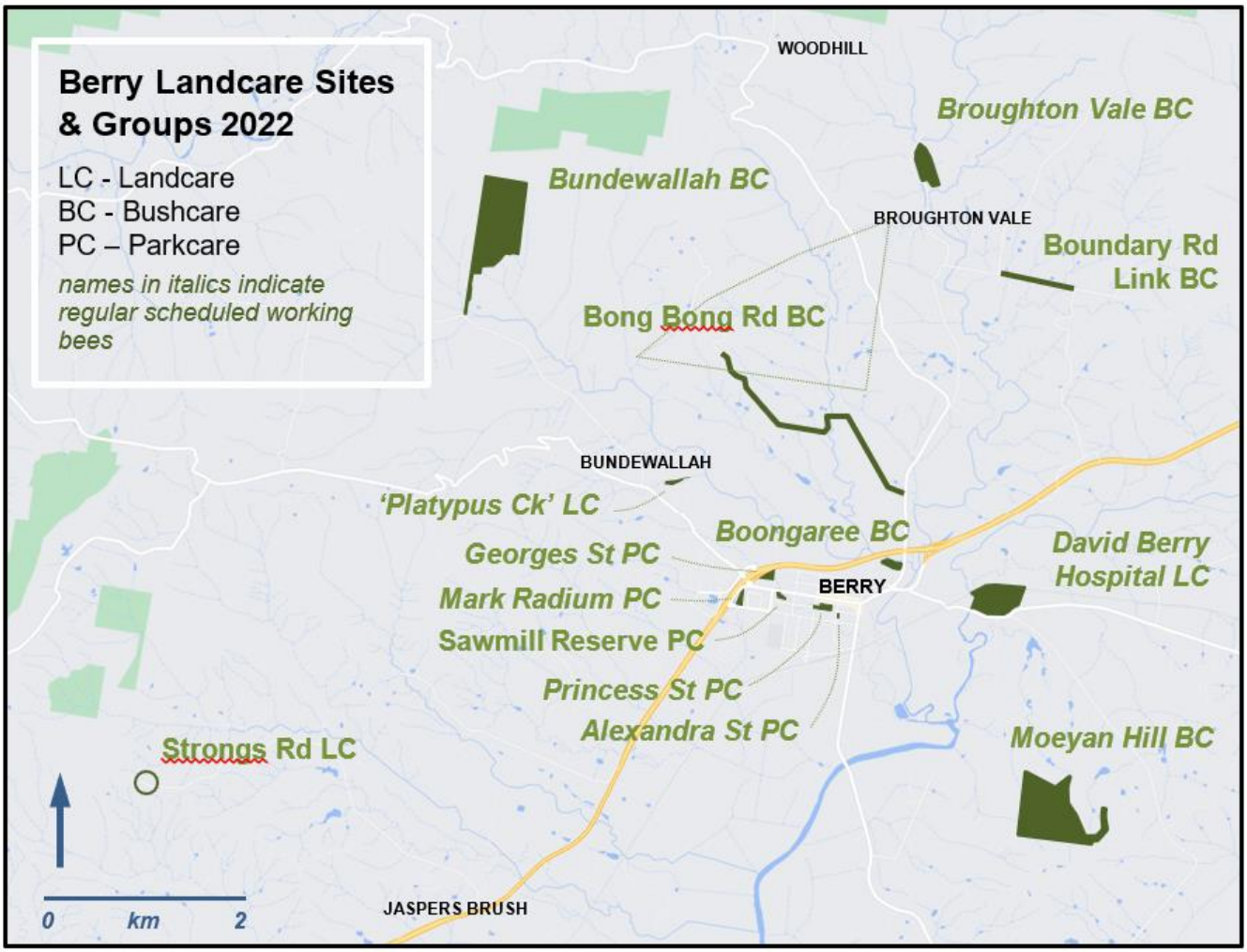
The objectives of Berry Landcare are:

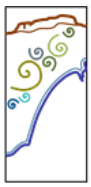
1. Working to protect our natural environment and prevent and repair degradation of our natural resources, by action which includes:
    a) restoration of creek and river banks,
    b) weed management,
    c) prevention of over clearing of native vegetation and soil erosion,
    d) planting of appropriate native vegetation.
    e) promotion of the planting of locally indigenous plant varieties
2. Engaging members of the Berry Community in educational and fundraising activities, harnessing community skills and creating public awareness.
3. Working with the Berry Community to achieve a sustainable and resilient natural environment with vegetation connections supporting the movement of wildlife between the coast and the escarpment.
4. Engaging community members in caring for country at Landcare, Bushcare and Parkcare sites, through working bees and other activities
5. Sharing information on Natural Resource management and sustainable agriculture
6. Establishing appropriate and nurturing existing partnerships with the Berry Alliance, Shoalhaven City Council, Southern Rivers Catchment Management Authority and the Shoalhaven Landcare Association

Berry Landcare Email: berrylandcare@gmail.com

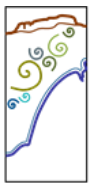
Website: https://landcare.nsw.gov.au/groups/berry-landcare/

Berry Landcare Sites





SITE	*INFORMATION*
Boongaree Bushcare	Bush regeneration and woodland along Bundewallah Creek, Boongaree Nature Play Park
Bundewallah Rainforest Reserve Bushcare	Illawarra subtropical rainforest remnant. Regeneration of rainforest remnant and restoration of walking track.
David Berry Hospital Rainforest Remnant Landcare	Unique EEC Illawarra subtropical rainforest remnant with a wide range of species.
Georges St Reserve Parkcare	Parkland established and supported by the Berry Garden Club
Moeyan Hill Reserve Bushcare	36 ha reserve with Illawarra subtropical rainforest and tall open woodland. High conservation value with wildlife corridor and local biodiversity.
Mark Radium Park Parkcare	'Arboretum' of locally indigenous rainforest trees.
'Platypus Creek' Landcare	Weed management and regeneration along the riparian corridor of a tributary of Bundewallah Creek, shared between a group of residential lots
Sawmill Reserve Bushcare	Weed management and regeneration within an urban reserve and former Sawmill site
Town Creek Parkcare: Princess Street Park	Removal of rampant weeds
Town Creek Parkcare: Alexandra Street Park	Removal of rampant weeds
Tindalls Lane Bushcare 'The Link'	Local residents remove weeds and maintain Boundary Road link between Tindalls Lane and Tulloch Road.
Broughton Vale Bushcare	Weed removal and revegetation in 'The Common' along Broughton Mill Creek.
Strongs Road, Jaspers Brush Bushcare	Weed management
Bong Bong Road Bushcare	Weed management



3.4.2 Form a new Landcare group

If there is no Landcare group in your area or you feel you have specific issues that would require the formation of a new group, there are a few simple steps you need to consider.

1. Talk to your neighbours, friends or surrounding property owners about your ideas.

2. Contact Berry Landcare for support and advice.

3. Contact nearby Landcare Groups to get some advice on how they got started and how they did it.

4. You may need to hold a public meeting to let others in the community know of your intention.

5. Your new group will need to work with the Berry Landcare coordinator to draw up a plan of action that can guide your group into the future.

3.4.3 Bushcare

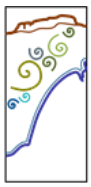
A number of Berry Landcare Groups are under Shoalhaven Council's Bushcare Program. These groups work on council owned or managed land, with council support. The aim of this program is to promote and implement ecologically sustainable management of the bushland within the Shoalhaven area.

For information on the Bushcare Program, how to join a group, how to start a group and the support council provides visit https://shoalhaven.nsw.gov.au/Environment/Bushcare or call the Environmental Services Team on (02) 4429 3610.

3.4.4 Parkcare

Parkcare groups are also part of Berry Landcare (noted on the active site list), and are based in Berry township. Parkcare is a volunteer program supported by the Shoalhaven City Council with the aim to promote and facilitate the implementation of ecologically sustainable management of parks and reserves within the area.

If you would like to become involved in Parkcare please talk to Berry Landcare and visit https://www.shoalhaven.nsw.gov.au/For-Residents/Sports-Recreation/Parkcare.



4 Bush Regeneration

4.1 Regenerate or Revegetate: A Landholders Approach

4.1.1 Native vegetation restoration

Restoring native vegetation can be achieved under two main approaches:

Bush regeneration also known as **Assisted Natural Regeneration** – Damaged ecosystems bounce back under the right conditions (weed control, stimulation of seed germination)

Revegetation – Ecosystems are too damaged to regenerate naturally (plants reintroduced with indigenous stock via planting or direct seeding)

Bush regeneration, or assisted natural regeneration, can be defined as the practice of restoring bushland by strengthening and re-establishing the systems' natural regeneration processes. The aim to create a natural system which can maintain itself in a stable condition with minimal human intervention.

4.1.2 Site resilience

The resilience of your site should also be taken into consideration in order to implement the most appropriate form of land management. Building resilience can be as simple as fencing off areas with vegetative condition improving quickly if resilience is strong, however, conditions that result in reduced resilience will need to be remedied before successful regeneration. Refer to the table below for common indicators of strong or reduced resilience.

Strong Resilience	Reduced Resilience
Older trees that offer a seed source	Few living trees
Native vegetation present in various strata	Increased presence of weed species
Native regrowth	High nutrient levels from fertilisers
Natural watercourses	Stormwater runoff from urban areas
Intact soil profiles	Soil erosion
A healthy abundance of leaf litter and humus	Salt scalding

Source:

This information was sourced from The Office of Environment and Heritage, 'Conservation Management Notes – Managing Bushland and Wildlife Habitat'
https://www.environment.nsw.gov.au/resources/cpp/RestoringVeg.pdf .

4.1.3 Choosing a Vegetation Management Approach

Assessing resilience takes skill, experience and the ability to identify local native plant species at various life stages along with recognising the effects of past disturbances. We have included a basic guide to assist landholders in determining the appropriate vegetation management approach. Keep in mind, that resilience may differ between strata for example, grasses, shrubs and trees. Threats including weeds, grazing livestock and drift from herbicides should be managed. An understanding of how wildlife uses the site is also vital when enforcing management strategies, for example, some species of birds may use weeds and invasive plants as a form of shelter and nesting. We suggest weed removal be performed in a mosaic style patterns to allow fauna to move through undisturbed areas whilst restoration is implemented.

Bush regeneration will be beneficial within areas on your land where the capacity to germinate from a seed bank is high (presence of seed source in the soil from existing plants), irrespective of the degradation of the vegetation. This approach retains the complexity of the ecosystem and is therefore ecologically sound and the most cost effective. If the opportunity for natural regeneration exists, reintroducing vegetation via planting should be avoided

Choosing a vegetation management approach: a basic guide

First assess vegetation condition and hence its resilience. Column 3 suggests the appropriate strategy, with vegetation which is less degraded being more suitable to strategies involving natural regeneration. Where vegetation is more degraded, the appropriate strategy may be either a combination of assisted regeneration and revegetation or revegetation alone.

Vegetation condition	Vegetation resilience	Restoration Approach	Actions	Priority
Near-natural.	Intact.	Protect.	Continue existing management.	1
Little disturbed.	Intact.	Protect.	Continue existing management. Increase protection.	
Modified — generally not deliberately cleared or fertilised, but subject to prolonged disturbance.	Largely intact.	Natural regeneration.	Increase protection. Remove causes of degradation. Monitor to see if regeneration starts or if a trigger is needed.	2
Degraded — likely to have non-native ground cover, and may have been fertilised.	Depleted.	Assisted natural regeneration.	Increase protection. Remove causes of degradation. Provide a regeneration trigger.	3
Highly degraded. Most of the original biodiversity is missing.	Severely depleted.	Assisted natural regeneration for some species. Revegetation.	Increase protection. Remove causes of degradation. Provide a regeneration trigger. Reintroduce plant materials.	4
Totally cleared — native plant communities have been completely removed, and soil-stored seed may no longer exist.	Absent.	Revegetation.	Increase protection. Remove causes of degradation. Reintroduce plant materials.	5

Source
This table has been sourced from the Office of Environment and Heritage 'Conservation Management Notes – Managing Bushland and Wildlife Habitat'
https://www.environment.nsw.gov.au/resources/cpp/RestoringVeg.pdf

4.1.4 Assisting natural regeneration

Bush regeneration or assisted natural regeneration can occur when sites are left to regenerate after the removal of weeds or other adverse impacts such as altered water flow. However some sites can benefit from further intervention to assist the regeneration process. Natural regeneration can occur from the seed bank stored in the soil, or from seed being brought onto the site by fauna, wind, or water. We can encourage regeneration after the removal of weeds by facilitating the natural processes. Follow-up weeding is essential to remove the competition so native plants can survive.

Attracting seed spreading native fauna

In rainforest, weed removal is the first step, but we can use existing weed to attract native fauna which import native seeds. In rainforest sites, we can leave dead trees, (which could be poisoned weed trees) to provide perches for native birds and other fauna which will import native seeds.

Stimulation of Native Seed Germination Using fire or smoke

In sclerophyll forests or other vegetation, which is adapted to fire, we can use fire to promote regeneration. This need to be carefully planned and often permission must be obtained to use fire in this way. Contact your local Rural Fire Service.

Smoke treatments are also used for triggering germination of dormant seed banks when applied directly to sites containing native plants species. Typically, the germination of native seeds after treatment will occur in 6-8 weeks depending on a number of plant attributes.

Smoke can be applied as 'smoke water' directly to bushland soil (using automated sprayers), with a combination of dry and green foliage plant material producing useful smoke. The benefit of applying the smoke treatment is that the process can be defined to the desired area. In addition, it is also useful for soil seed bank auditing and stimulating rare species.

Smoke treatment can also be used for germination seed for plant propagation. Go to https://www.abc.net.au/gardening/factsheets/smoke-your-own/9440844.

Water flows

Wetlands often needs episodes of flooding and drying to promote regeneration. Where water flows across the landscape might remove top soil and seed, placing brush of native species can slow water flow and provide niches which allow seed to collect and germinate.

4.1.5 Bush Regeneration on your site

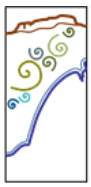
Use the information on the previous pages to determine your approach to your bushland. You can identify and mark on your aerial map where native vegetation is present and will regenerate easily. To plan your regeneration program, there are a few key points you should consider.

Weed control is usually the major work required, and Section 5 provides information on the identification and control of common weeds.

Determine how big a site you will treat initially. This needs to be over an area and at a pace so that you will have the time to remove the subsequent flushes of weed growth and maintain the area weed-free.

General principles for bush regeneration are:

- Start from the good (less weedy) areas and work outwards into the weedier areas as time and resources permit. This allows you to retain the natural diversity on site and have minimal follow-up weed removal requirements.
- Allow the health of treated sites to dictate how quickly you progress into less healthy areas.
- Try to minimise over-clearing which can make follow-up weeding a daunting task.



- Initially try and avoid excessive disturbance. Disturbance favours regrowth of both weeds and natives. When you start it is best to minimise disturbance so that weed regrowth is limited and manageable.
- Before controlling weeds consider if the weeds are providing a positive function such as habitat or are the weeds helping stabilise soil, minimising erosion and protecting creek banks. In these cases do not over-clear. Allow some areas to regenerate before treating the entire site

Follow-up

- Follow-up to remove weed regrowth is essential. Done regularly the weed regrowth and the time required to control it should reduce over time. Regular inspection after preliminary weed removal means that most work will only involve hand pulling of weeds. Even 1 metre high lantana seedlings can easily be removed.
- It is important to disturb the soil as little as possible as this can lead to further weed infestation. Disturbance favours regrowth of both weeds and natives. When you start it is best to minimise soil disturbance so that weed regrowth is also minimised. Once you know your site and weeds are management, you may want to use techniques to trigger native regeneration especially if regeneration is limited.

More about bush regeneration

Growing Illawarra Native Bush Regeneration Basics
https://blog.growingillawarranatives.org/p/bush-regeneration-basics-for-illawarra.html .

Conservation Management Note – Natural Regeneration
https://www.environment.nsw.gov.au/resources/cpp/NaturalRegen.pdf .

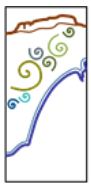
Read about the **Bundewallah Regeneration Project** here:
https://landcare.nsw.gov.au/groups/berry-landcare/bundewallah-regeneration-project-1/

Bundewallah is one of the Bushcare site with Berry Landcare. The Fact Sheet provides a good picture of how a bush regeneration project is being implemented and what the group have learnt about their site.

4.1.6 Berry Landcare and bush regeneration

Berry Landcare implements various regeneration and revegetation projects that work to protect our natural environment and prevent and restore land degraded from urbanisation and agricultural activities within the Berry region. Berry Landcare can assist with how you, as a landholder, can achieve ecologically sustainable management of your patch of land, when your land makes up part of the Berry wildlife corridor, contains threatened species or has remnant patches of land that are vital to the connectivity of threatened species habitats. This is implemented through the stimulation of natural regeneration of native species, weed management, and when needed, promotion of the planting of locally indigenous plant species.

For more information or an assessment of your patch of land, please visit
https://landcare.nsw.gov.au/groups/berry-landcare/ or email *berrylandcare@gmail.com*.



4.2 Getting to Work – Removing Weeds

4.2.1 Getting to know weeds

Weeds fall into four categories:

- ❖ Small hand pull-able plants
- ❖ Soft leafy plants with underground reproductive parts
- ❖ Woody plants with tap or lateral root systems
- ❖ Climbers or scramblers

Weeds can be treated in a variety of ways. Generally bush regenerators either remove weeds by hand or use herbicides. Neither method is correct all the time. Several factors should influence your choice:

- Time in the life cycle of the plant.
- Available tools.
- Weather conditions.
- Surrounding plants (can herbicide be used safely).
- Accessibility of the weed
- Often a combination of methods needs to be used.
- Growth Habits of the plant

4.2.2 Weed invasion

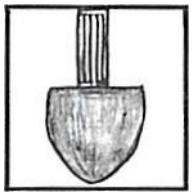
As a community, we must change the way we think about weeds. Weeds are not those troublesome little plants that sprout amongst the garden shrubs. They are in fact one of Berry's most urgent environmental problems — and one that is least acknowledged.

Weeds invade the bush through dumping, birds, wind and runoff. They turn feral by setting roots and shedding huge quantities of seed. Weed invasion is most severe along the boundaries of remnant bushland and cleared and developed areas, quickly invading and taking the place of our unique native plants, degrading and destroying the habitat of our native fauna, reducing biodiversity and permanently changing ecosystems.

4.2.3 Preventing invasion

To assist in the prevention of weed invasion on your property and surrounding bushland, you can begin by removing identified weeds or pruning spent flowers before they form seed, composting if possible, planting local native species as alternatives or joining a Landcare or Bushcare group to stay up to date and gain hands-on experience.

4.2.4 A Summary of weed removal techniques



Dig

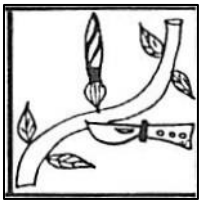
As this symbol suggests, this is a hand removal technique. Using an implement that suits the job i.e.. a hand trowel for small tubers and roots. A Peter Lever for crowns such as Asparagus Fern, and a shovel for larger roots.

Cut and Paint

Use the most suitable cutting implement, such as a chainsaw for large species like Privet and Coral trees, loppers for small woody stems, secateurs and/or knives for vines. Usually undiluted glyphosate is painted onto the cut surface with a paintbrush or suitable applicator. Apply the poison mix as soon possible as some plants seal their wounds within 30 seconds. Don't waste poison on large stumps by painting the whole stump, instead just paint the outer rings (cambium) as this is where the plants nutrient transport system is located

Spray

Following the manufacturer's instructions, mix herbicide solution. Using a pump spray pack, wet the foliage of the target species to the point of run off. A small garden WPE sprayer is usually sufficient.



Scrape and Paint

Scrape and paint is a technique usually used on vines. It allows a larger surface area to be treated therefore more herbicide can enter the vines nutrient transport system. Using a knife scrape, away a length of outer bark, then paint the wound quickly with herbicide using a suitable applicator.

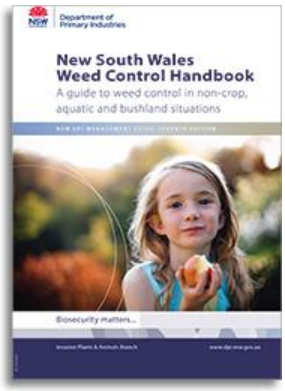
Frill/Drill and Chip

This technique is useful for treating larger shrubs and tree species. Making a series of chips at approximately 45-degree angle fill each chip with herbicide, usually undiluted. DO NOT RING BARK the plant. Tree injection can also be used as a substitute for this method - drill holes at a 45-degree angle and fill with herbicide using a syringe.

4.2.5 Herbicides

Herbicide is a valuable tool for treating certain types of weeds; large trees, rampant vines and persistent weeds like blackberry and onion weed. It is also useful in tackling densely infested sites and area prone to erosion.

The most widely accepted herbicide for bush regeneration is glyphosate, marketed under the trade names Round-Up®, Zero® and Glyphosate 360® . Round-Up Bi-active® contains a different surfactant additive and is safer to use near waterways. Like all herbicides, it should be treated with extreme care in line with the directions on the label. If herbicides are being used on public land the regulations of the Pesticides Act must be followed.



Alternatively, there are a number of other herbicides that can be applied, each only certified for specific weeds and methods of application.

The best book on weed control and herbicides is the NSW Weed Control Handbook from NDE Department of Primary Industries. Download from https://www.dpi.nsw.gov.au/biosecurity/weeds/weed-control/management-guides/noxious-enviro-weed-control
This handbook also provides information on weed control methods that do not use herbicides. Contact Berry Landcare for information about Biological Control.

If you wish to undertake Chemical Safety Awareness training, contact Local Land Services to find out where you can do this.

4.2.6 Native Plants as Weeds

There are some problem native species in the Berry region. These originate There are some native species originating from other parts of Australia that have now become problem plants that compete and sometimes dominate our local native species. The main problem native species in the region are:

Acacia baileyana (Cootamundra Wattle, Baileys Wattle)

This wattle is endemic (or native to a restricted region) in southern NSW. It is characterised by its silvery green or mauvish foliage. Still sold in local nurseries, this species is very fast growing and is invasive in some local bushland areas.

Acacia podalyriifolia (Queensland wattle, Mt Morgan wattle, Pearl Acacia)

This large wattle (to 7 metres) is endemic to north-eastern Australia but has been marketed in nurseries throughout the country. It has silvery, oval phyllodes (leaves). Like Acacia baileyana this species is very fast growing and is invasive in some local bushland areas.

Acacia saligna (Golden Wreath Wattle, Weeping Wattle)

This wattle is endemic to the dryland areas of Western Australia. Introduced to NSW in the 1970's as a coastal dune stabilising plant, it has now become a 'problem plant' dominating and competing with local dune vegetation.

Grevillea robusta (Silky oak, Silk oak)

Silky oak has been a long-time ornamental favourite, particularly in rural areas. It is large (up to 50 m) fast growing tree that can easily self-propagate and now is seen escaping into many bush land areas around the Shoalhaven.

Pittosporum undulatum (Sweet pittosporum)

This is a native plant and is found in the Shoalhaven. It has been widely planted and has frequently become invasive in forests and bushland outside its natural range, and at rainforest edges.

4.2.7 Weeds of the Berry Region

There are a number of sources that can help you identify the weed on your property and provide advice on their control.

Berry Landcare weed fact sheets

Barry Landcare had a set of fact sheets that give you advice on weeds found in the local area.
In **the Appendix of this Kit (Section 12) there are 41 Weed Fact Sheets** for common weeds of the Berry area.

NSW Weed Wise

The NSW Department of Primary Industries has a program NSW WEED WISE. This program contains key information to help users reduce the impact of over 325 weeds in New South Wales. You can access this at the NSW Weed Wise web page, or you can download the app.

DPI Weed control handbook

Download this handbook from the NSW Department of Primary Industries.
https://www.dpi.nsw.gov.au/biosecurity/weeds/weed-control/management-guides/noxious-enviro-weed-control

Weed Photos

The International Environmental Weed Foundation (IEWF) has an easy weed, environmental weed and invasive plant identification system. Here you will find many weed photos. Go to
http://www.iewf.org/weedid/iewf_front_id.html

4.2.8 The Biosecurity Act and Weeds

In NSW, weed management is under the *Biosecurity Act 2015* (which replaced the *Noxious Weed Act*).

This Biosecurity Act is to

- prevent the entry of new pests, diseases and weeds into NSW
- quickly find, contain and eradicate any new pests, diseases and weeds
- effectively minimise the impacts of pests, diseases, weeds and contaminants that cannot be eradicated by implementing robust management arrangements.

The NSW Department of Primary Industries (DPI) plays a major role and works with Local Land Services and Local Government to management of biosecurity risks.

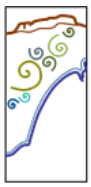
There is a general biodiversity duty under this act.

> *Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.*

Information on this act and also weeds is available from the Agencies involved.

Shoalhaven City Council. https://www.shoalhaven.nsw.gov.au/For-Residents/Our-Environment/Pests-Weeds/Weed-Management-Biosecurity.
This includes information on Priority weeds.

Department of Primary Industries https://www.dpi.nsw.gov.au/biosecurity/weeds
This includes the WeedWise program.



There is also a section on Weed categories. This included Weeds of National Significance where you can download a management manual for some of the weeds.

5 Revegetation

5.1 Revegetation: The right tree, in the right place, at the right time

5.1.1 The importance of revegetating

Where there is no possibility to regenerate and retain existing vegetation on your land, revegetating using local seed proves to be an effective secondary approach in linking patches of native vegetation to surrounding bushland. Connecting remnant patches of land creates a mosaic of ecosystems across the landscape and is thus vital to the connectivity of threatened species habitats.

You, as a Berry landholder, can link patches of vegetation on your land, to assist the movement of species such as the Greater Glider (an arboreal mammal), which is currently locally extinct between Seven Mile Beach NP and the Illawarra escarpment. You can improve the success of the Berry Corridor by planting local native species along with learning how to assess the quality of your land in regard to identifying weeds.

5.1.2 Selecting species for revegetation

When you have found the area you want to revegetate, the best guide is, if possible, to find an area of native vegetation nearby to see what species of native plants are growing. Include fast growing colonisers, shrubs and trees. Seek advice from plant nurseries which propagate local native species from local plants and also Growing Illawarra Natives. The Berry Species list below will give you an idea of the species in the area.

5.1.3 Berry Landcare Species List

Berry Landcare

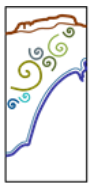
BERRY LANDCARE SPECIES LIST

The whole Berry area was previously covered by dense rainforest. From various reports and surveys, Berry Landcare has compiled a list of the plant species that are found in the berry locality, including the Illawarra Subtropical Rainforest remnant at the David Berry Hospital and the 36-hectare public reserve on Moeyan Hill.

TREES

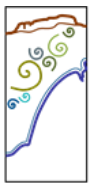
Acacia binervata	Two-veined hickory
Acacia maidenii	Maiden's wattle
Acacia mearnsii	Black wattle
Acmena smithii	Broad-leaved lilly pilly
Acronychia oblongifolia	White aspen or Tic tac
Allocasuarina littoralis	Black she-oak
Alphitonia excelsa	Red ash
Angophora floribunda	Rough-barked Apple

Archontophoenix cunninghamiana	Bangalow palm
Baloghia inophylla	Brush bloodwood
Banksia integrifolia	Coast banksia
Brachychiton acerifolius	Flame tree
Brachychiton populneus	Kurrajong
Callistemon salignus	Pink tips
Casuarina cunninghamiana	River oak



Casuarina glauca	Swamp oak
Ceratopetalum apetalum	Coachwood
Cinnamomum oliveri	Oliver's sassafras
Citronella moorei	Churnwood
Croton verreauxii	Green native cascarilla
Cryptocarya glaucescens	Jackwood, Native Laurel
Cryptocarya microneura	Murrogun
Cyclophyllum longipetalum	Brush canthium
Dendrocnide excelsa	Giant Stinging Tree
Diospyros australis	Black plum
Diospyros pentamera	Myrtle ebony, Grey persimmon
Diploglottis australis	Native tamarind
Doryphora sassafras	Sassafras
Ehretia acuminata	Koda
Elaeocarpus kirtonii	Pigeonberry ash
Elaeocarpus reticulatus	Blue berry ash
Elaeodendron (Cassine) australe	Red-fruited olive plum
Emmenosperma alphitonioides	Yellow ash/Bonewood
Endiandra sieberi	Corkwood
Eucalyptus botryoides	Bangalay
Eucalyptus quadrangulate	
Eucalyptus maculata	Spotted Gum
Eucalyptus paniculata	Grey Ironbark
Eucalyptus pilularis	Blackbutt
Eucalyptus punctata	Grey Gum
Eucalyptus saligna	Blue gum
Eucalyptus saligna X botryoides	

Eucalyptus tereticornis	Red Forest Gum
Eucryphia moorei	Pinkwood
Euroschinus falcata	Ribbonwood
Ficus coronata	Sandpaper fig
Ficus macrophylla	Moreton Bay fig
Ficus obliqua	Small-leaved fig
Ficus rubiginosa	Port Jackson / Rusty fig
Ficus superba	Deciduous fig
Geijera salicifolia	Brush wilga
Glochidion ferdinandi	Cheese tree
Gmelina leichhardtii	White beech
Guioa semiglauca	Guioa
Leptospermum laevigatum	Coastal tea tree
Litsea reticulata	Bolly gum
Livistona australis	Cabbage tree palm
Melaleuca decora	White feather honey myrtle
Melaleuca linariifolia	Snow-in-summer
Melaleuca quinquenervia	Broad-leafed paperbark
Melaleuca styphelioides	Prickly paperbark
Melia azedarach	White cedar
Melicope micrococca	Doughwood
Myoporum acuminatum	Boobialla
Notelaea longifolia	Native olive, Large Mock-olive
Pararchidendron pruinosum	Snow wood
Pennantia cunninghamii	Brown beech
Pisonia umbellifera	Birdlime tree
Pittosporum undulatum	Native Daphne
Planchonella australis	Black apple



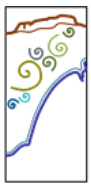
Podocarpus elatus	Plum pine
Polyosma cunninghamii	Featherwood
Polyscias elegans	Celery wood
Polyscias murrayi	Pencil cedar
Quintinia sieberi	Possumwood
Sarcomelicope simplicifolia	Yellow aspen
Schizomeria ovata	Crab apple
Scolopia braunii	Flintwood
Sloanea australis	Maiden's blush
Stenocarpus salignus	Scrub beefwood
Streblus brunonianus	Whalebone tree
Symplocos thwaitesii	Buff hazelwood
Syncarpia glomulifera	Turpentine
Synoum glandulosum	Scentless rosewood, Bastard Rosewood
Syzygium australe	Brush cherry
Syzygium oleosum	Blue lilly pilly
Syzygium paniculatum	Magenta cherry
Toona ciliata	Red cedar
Tristaniopsis collina	Water gum
Wilkiea huegeliana	Wilkiea

TREE/SHRUBS

Acacia binervia	Coast Myall
Acacia floribunda	White sallow wattle
Alectryon subcinereus	Native quince
Androcalva (Commersonia) fraseri	Brown Kurrajong
Backhousia myrtifolia	Grey myrtle
Banksia ericifolia	Banksia
Callicoma serratifolia	Callicoma
Claoxylon australe	Brittlewood
Duboisia myoporoides	Corkwood
Hedycarya angustifolia	Native mulberry
Homalanthus populifolius	Bleeding heart tree
Mallotus philippensis	Red kamala
Melaleuca armillaris	Bracelet honey myrtle
Melaleuca ericifolia	Swamp paperbark
Myrsine (Rapanea) howittiana	Brush muttonwood
Myrsine (Rapanea) variabilis	Muttonwood
Notelaea venosa	Veined Mock-olive, Smooth Mock-olive
Polyscias sambucifolia	Elderberry Panax
Prostanthera lasianthos	Victorian Christmas tree
Rhodamnia rubescens	Brush turpentine
Exocarpos cupressiformis	Cherry Ballart
Trema tomentosa	Native peach
Trochocarpa laurina	Tree heath

SHRUBS

Abrophyllum ornans	Native hydrangea
Abutilon oxycarpum	Lantern Bush
Acacia sophorae	Coastal Wattle
Acacia suaveolens	Sweet Wattle
Breynia oblongifolia	Little breynia
Bursaria spinosa	Sweet Bursaria
Citriobatus pauciflorus	Orange Thorn
Clerodendrum tomentosum	Hairy clerodendrum
Coprosma quadrifida	Prickly coprosma
Correa alba	White correa
Dodonaea viscosa	Broad-leaf Hop bush



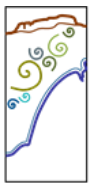
Einadia hastata	Berry salt bush
Eupomatia laurina	Bolwarra
Goodenia ovata	Hop goodenia
Goodia lotifolia	Clover tree
Hibiscus heterophyllus	Native hibiscus / Rosella
Hibiscus splendens	Pink hibiscus
Homolanthus stillingifolius	Small-leaved bleeding heart
Indigofera australis	Indigofera
Kunzea ambigua	White Kunzea, Tick Bush
Melaleuca hypericifolia	Red-flowering paperbark
Melicytus (Hymenanthera) dentatus	Tree violet
Monotoca elliptica	Tree broom heath
Myoporum boninense	Common boobialla
Ozothamnus diosmifolius	Everlasting Flower, Rice flower
Persoonia linearis	Narrow-leaved Geebung
Pittosporum multiflorum	Orange thorn
Pittosporum revolutum	Rough-fruited pittosporum
Platylobium formosum	Handsome flat pea
Plectranthus parviflorus	Cockspur flower
Psychotria loniceroides	Hairy psychotria
Pultenaea blakelyi	Graceful bush pea
Rhagodia candolleana	Sea berry salt bush
Sambucus australasica	White elderberry
Santalum obtusifolium	Sandalwood
Senna acclinis	Rainforest senna
Solanum aviculare	Kangaroo apple
Tasmannia insipida	Brush pepper bush
Westringia fruticosa	Coastal rosemary
Zieria smithii	Sandfly zieria

GROUND LEVEL

Ajuga australis	Austral bugle
Aneilema acuminatum	Aneilema
Austrocynoglossum (Cynoglossum) latifolium	Forest hound's tongue
Carpobrotus glaucescens	Pigface
Coronidium (Helychrysum) elatum	Paper daisy
Dichondra repens	Kidney weed
Elatostema reticulatum	Rainforest spinach
Pelargonium australe	Native Storksbill
Pollia crispata	Pollia
Pseuderanthemum variabile	Pastel flower
Tetragonia tetragonoides	Warrigal greens
Veronica plebeia	Trailing Speedwell
Viola hederacea	Native violet

GRASSES/CLUMPING

Alocasia brisbanensis	Cunjevoi
Arthropodium milleflorum	Pale vanilla lily
Austrostipa ramosissima	Stout bamboo grass
Crinum pedunculatum	Swamp lily
Dianella caerulea	Blue flax lily
Gymnostachys anceps	Settler's flax
Libertia paniculata	Branching grass flag
Lomandra longifolia	Mat rush
Themeda triandra (australis)	Kangaroo grass



RUSHES/SEDGES

Carex appressa	Tall sedge
Carex longibrachiata	Common sedge
Ficinia (Isolepis) nodosa	Knobby club rush

CYCADS

Macrozamia communis	Burrawang

ORCHIDS

Dendrobium kingianum	Pink rock orchid

SCRAMBLER/VINES

Billardiera scandens	Apple dumpling
Cissus antarctica	Water / Kangaroo vine
Clematis aristata	Old man's beard
Deeringia amaranthoides	Deeringia
Eustrephus latifolius	Wombat berry
Geitonoplesium cymosum	Scrambling lily
Gynochthodes jasminoides	Morinda
Hardenbergia violacea	Hardenbergia
Hibbertia scandens	Golden guinea vine
Kennedia rubicunda	Dusky coral pea
Marsdenia rostrata	Common milk vine
Parsonsia straminea	Silky or Monkey pod vine
Sarcopetalum harveyanum	Pearl vine
Stephania japonica	Snake vine
Trophis (Malaisia) scandens	Burnie vine

FERNS

Adiantum aethiopicum	Maidenhair fern
Adiantum formosum	Giant maidenhair fern
Cyathea australis	Rough Tree Fern
Cyathea cooperi	Straw tree fern
Davallia solida	Hare's foot fern
Pellaea falcata	Sickle fern
Pteris tremula	Tender brake
Zealandia (microsorum) pustulata	Kangaroo fern

5.1.4 Site Preparation and Maintenance

- Before planting, carry out weed control. You may need to stabilise the soil if on a slope or rip if the soil compacted.
- Use tree guards or fence the area to limit grazing and browsing.
- If planting a large area, consider allowing space between plants for weed control by mowing/slashing.
- Control weeds regularly especially when plants are small. You may need to focus on problem weeds which are highly invasive.
- Have access to water so that seedlings can be watered during the first few months
- Take photos so you can see the change over time.
- Once larger plants are established consider planting understorey species.

Further information:
A Conservation Management Note on **Revegetation** can be found at
https://www.environment.nsw.gov.au/cpp/ConservationManagementNotes.htm

5.1.5 Berry Area Nursery Contacts

The following nurseries are local businesses that grow local provenance plants and are sources of local native plants for the Berry Bush Links project. Some of these nurseries receive seeds from Berry Landcare volunteers and from the Landcare Illawarra seedbank. Berry Landcare does not run its own nursery, but rather, has chosen to support these local businesses. Use the following list as a starting point for sourcing local provenance plants.

LOCATION	CONTACT
Berry Public School Plant Propagation Program at the school nursery	Lyn Clark - P: 4464 3911 E:Lyn-clark@outlook.com.au Berry Plant Prop Facebook Page
Mountain Echo Landscape and Horticulture, Berry	Katie Wright & Ryan Hogan KW M: 0424 236 235 RH M: 0409 743 828 Email:Mountainecho1@hotmail.com Website:https://mountainecho.com.au
Currys Mountain Estate, Willow Vale	John McNamara & Andrew McNeil AM M: 0404 086 040 E:currysmtn@bigpond.com
A Taste of Paradise Farm, Berry	Tim Francis - M: 0414 641 085 E:info@atasteofparadise.com.au
Jamberoo Native Nursery, Curramore	P: 4236 0445 E:sales@jamberoonatives.com.au Website:http://jamberoonatives.com.au Minimum order $500
Oyster Tree Nursery, Broughton Village	M: 0412 536 118
Wirin Wirra Nursery, Tomerong	P: 4443 4029 https://www.wirinwirra.com/
Located in Kiama Downs	Carl Gleister - M: 0420 813 284
Located in Tongarra	Stuart Alexander - M: 0438 560 099

6 Introduced Pest Animal Species

6.1 Overview

With the arrival of Europeans around 200 years ago, came numerous alien species that disturbed the Australian continents vast range of natural environments. Most of these foreign invaders were brought to use for food and working the land but some were stowaways, hitching on the ships, humans and livestock. Not all the species that came were successful with many being outcompeted by the native flora/fauna. Some of the species that survived have flourished and populations have grown out of control, causing massive ecological disruption, with Australia having the largest array of species and the largest populations of invasive animals in the world.

6.1.1 Introduced species management

Introduced species can be placed into three categories:

- **Invasive** – This organism increases its distribution over large areas
- **Feral** – Animals that were intended for domestic/recreational purposes that have escaped and live completely wild.
- **Pests** – Animals that affect communities' welfare or wellbeing

As a Berry Landholder, you have the important responsibility to implement pest management on your property, regardless of size, to ensure the longevity of threatened species whilst also protecting livestock from disease. Pest management is more effective if a landscape wide program is implemented, therefore, it is strongly encouraged that all rural property owners within the Berry area participate.

Section 6.2 provides information on Pest Animals in the Berry area and their control.

6.1.2 Pest management resources

There are numerous online resources that can assist you including:

- **DPI** (Department of Primary Industries) has information on pest animals in NSW.
- **Local Land Services** provides Vertebrate Pesticide Induction Training. To acquire and use 1080, Pindone, RHDV, or PAPP baits in NSW, you must be accredited (or under the direct supervision of an accredited person) with an AQF3 Chemical Accreditation or Vertebrate Pesticide Induction Training (VPIT) course accreditation. Historically, this has been done with face-to-face training, but landholders can also choose to undertake this training online.
- **South East Local Land Services** runs the Feral Fighters Program, to strategically target pest animals at a regional and state scale through strategic, coordinated group baiting control programs. Any land manager can become a Feral Fighter. Go to https://www.lls.nsw.gov.au/regions/south-east/key-projects/feral-fighters. Contact your Local Land Services Office 1300 795 299
- **Feral Scan** is an online data base https://www.feralscan.org.au/. Here you can register sightings of feral animals on your property, assisting with coordinating control methods with neighbours.

  This is available as an app - **FeralScan Pest Mapping**.

6.1.3 Shoalhaven Fox Control Project

Information on foxes and why they are a major threat to native fauna and agricultural assets, such as new born lambs and calves is found in Section 6.2.1.

How the program operates

Working closely with South East Local Land Services as a major stakeholder in the program**,** the Shoalhaven Landcare Fox Control Program (Shoalhaven Fox Control (SFC)) engages trained landholders and volunteers to undertake a variety of fox control methods including: camera monitoring and data collection, trapping, baiting, and shooting of foxes across the Shoalhaven LGA.

The program operates completely free of charge. Social gatherings and workshop days are often held with the program's 85 Volunteers and 80 landholders. Since the program began 4 years ago, it is estimated that 2400 foxes have been removed from our local environment.

How can landowners become involved?

As conservation is a group effort, SFC encourage landholders to participate in the program where possible, and training is provided by both South East Local Land Services and SFC Program Coordinators.

By managing foxes on your landholding, you are making a significant change in the environmental balance, and in most cases where the program operates, SFC have noted livestock survival rates increase, and a resurgence in native fauna such as bandicoots, wallabies, bird species, turtles, frogs and reptiles.

Where to find more info and who to contact

The Shoalhaven Fox Control Program encourages all enquiries regarding fox management, no matter how insignificant it may seem. For more information please visit www.shoalhavenlandcare.org.au/fox-control or please contact the program coordinator.
Ryan Wall Ph:0414547839 Email: slafoxcontrol@gmail.com.

6.1.4 Pest animal legislation

The management of domestic and introduced pest animals is the responsibility of the landholder. In NSW, weed management is under the *Biosecurity Act 2015*

Legislation and other information regarding biosecurity can be found at:
https://www.dpi.nsw.gov.au/biosecurity/managing-biosecurity.

6.2 Introduction to Pests Animals of the Berry Bush Corridor

Domestic and feral animals are a major problem Australia wide. The impact of foxes, dogs and cats in particular on native fauna is likely to be significant, although no specific figures are available on the abundance or distribution of these pests in the Berry area.

Predator species such as foxes and cats decimate native populations of mammals, reptiles and birds while herbivorous species such as rabbits consume vegetation at a faster rate than it can recover or simply outcompete native rivals. This then leads to larger physical changes such as erosion and soil degradation. Not only do these species effect wild animals but harass and kill livestock threatening agricultural practices.

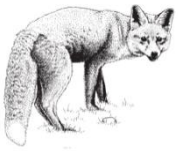
The Berry Bush corridors primary pest species include:

- Foxes
- Feral Cats
- Rabbits
- Wild Deer
- Feral Pigs
- Indian Myna Birds
- Feral dogs
- Feral Goats

See Sections 6.2.1 to 6.2.8 for information on these species.

6.2.1 Foxes

Information



The red fox is a small to medium sized, burnished rusty red coloured canid. Closely related to domestic dogs, the adult European red fox (*Vulpes vulpes*) weighs about 5 to 9 kg with males generally heavier than females. Foxes were introduced into Victoria in the late 1860s and was first recorded in Western Australia (W.A.) in 1912.

Distribution

The red fox is favoured by the fragmented landscapes common in all districts that provide shelter, food and den sites. Densities vary from around 1/km2 in the coastal forests, 2 to 5/km2 in the semi-arid and sub-alpine regions and 6 to 8/km2 in the temperate grazing lands that cover most of NSW. Populations of the red fox are well established in peri-urban and urban areas where food is abundant, and densities may range from 12/km2.

Impacts

They have a significant impact on grazing industries (spreading the abortion-causing Neospora disease in cattle, attacking newborn calves and mothers during childbirth and killing new born and young lambs and kids), on domestic livestock (in particular poultry), on endangered native animal species (five species are currently actively protected by fox baiting programs in the Shoalhaven) and on the general abundance and distribution of many small and medium sized ground dwelling native species. Foxes are believed to assist in spreading the mange disease among wombats. Additionally, foxes also have the ability to spread invasive weeds, carrying seeds in their fur.

Control methods

Reducing the impact of the red fox relies on a mixture of control techniques comprising of poison baiting (certified personal only), shooting (licence needed), trapping (case traps, leg hold traps), fencing and guard animals. Targeting trophic cascade species such as rabbits and cats in conjunction should also be employed as an additional control method to maintain species dynamics. All these techniques have a short-term effect on local fox numbers. No single control method will be successful on its own and when foxes are removed from an area, reinvasion or immigration from existing untreated areas generally occurs within 2 to 6 weeks. The most efficient way to reduce the impact of foxes is to conduct a strategic coordinated program over several land holdings.

Source

http://www.environment.gov.au/biodiversity/invasive-species/publications/factsheet-european-red-fox-vulpes-vulpes

6.2.2 Feral Cats

Information

Feral cats are predominantly solitary and nocturnal, spending most of the day in the safety of a shelter such as a rabbit burrow, log or rock pile. They are carnivores, generally eating small mammals, birds, reptiles, amphibians, fish and insects depending on their availability.

Distribution

They are found all over Australia in all habitats, including forests, woodlands, grasslands, wetlands and arid areas. Feral cats are found in all habitats except the wettest rainforests on the mainland and some offshore islands. Dingos and foxes may restrict feral cat numbers by both direct predation and competition. Feral cats also fall prey to wedge-tailed eagles.

Impacts

Cats are highly efficient and successful killers preying mainly on small vertebrates. They are identified as a threat to 35 species of birds, 36 mammals, 7 reptiles and 3 amphibians. Feral cats can carry infectious diseases which can be transmitted to native animals, domestic livestock and humans.

Control methods

Control of feral cats is challenging as they are found in very low densities over large home ranges and are shy, making them difficult to locate. The current control methods of shooting and trapping feral cats are quite difficult, expensive and time consuming and require skilled staff. The most effective form of feral cat control over large areas is poison baiting.

Source

http://www.environment.gov.au/biodiversity/invasive-species/feral-animals-australia/feral-cats

6.2.3 Rabbits

Information

The European rabbit, *Oryctolagus cuniculus*, is native to north-western Africa, Spain and Portugal. The first genetically wild rabbits were imported into Victoria in 1859. This small population of 24 individuals grew to over 20,000 within 6 years. Rabbits quickly spread across Victoria and the rest of the continent. Within 70 years rabbits inhabited two thirds of the continent.

Distribution

Rabbits prefer short grassy areas either found naturally, as in semi-arid areas, or resulting from heavily grazed pastures. They are common throughout suburban areas, foreshore reserves, rural lands, road reserves and neglected farmland.

Impacts

The rabbit is classified as a major agricultural and environmental pest. Competes with livestock and native herbivores for food. Highly selective grazers that concentrate on the most nutritious plants and eat them below ground level. Can lead to change in species composition, disruption to regeneration and soil erosion. Can be a problem where farmers are trying to regenerate native vegetation or undertaking tree planting programs because it eats young tree seedlings and can also disrupt regeneration after fire.

Control methods

Shooting is the most common method controlling rabbit populations and is effective for keeping moderate to low populations of rabbits down whilst suppling a source of meat. This is harder over a large scale but would be useful throughout the berry corridor. Destroying warrens is another effective method to reduce rabbit numbers especially on farmland where location of warrens is easier than in bushland. This is done by ploughing, blasting or fumigating the warrens. Ploughing is especially effective in the coastal berry area as the sandy soils are easy to dig. Poisoning is also a common method used as it requires the least effort, but baits could affect non-target species.

Source

http://www.environment.gov.au/biodiversity/invasive-species/publications/factsheet-european-wild-rabbit-oryctolagus-cuniculus

6.2.4 Wild Deer

Information

Deer were introduced to Australia in the 19th century, and today 6 species have been established in the wild. Australians have considered deer a pest and an important economic and hunting resource since their early introduction. Their preferred food is grass but they also eat the leaves of shrubs, trees and herbs, bark and some fruit.

Distribution

Deer live predominantly in grassy forests. The habitats they occupy in Australia include rainforests, eucalypt forests and farmlands.

Impacts

Wild deer can have a range of environmental impacts, including browsing and grazing that affects plant seedling recruitment and growth; damage to vegetation through trampling and antler rubbing; impacts on water quality through wallowing and faecal contamination; and transporting weed seeds.

Wild deer have a range of economic impacts, including competition with livestock for grazing resources and difficulty in 'resting' pasture in rotational systems; crop damage; damage to young trees in commercial forests through antler rubbing; and potential spread of disease.

Control methods

Control measures for deer have not been extensively investigated as priority has been given to other pest species in Australia. A common control measure is shooting. This may be necessary if herds cannot be easily trapped and transported to a secure, enclosed area or when shooting of a small, isolated population will prevent that population growing in size or distribution. Shooting is carried out by recreational hunters and sometimes by professional marksmen. Where deer populations are well established, containment within defined boundaries may be the most efficient control approach.

Source

http://www.environment.gov.au/biodiversity/invasive-species/publications/factsheet-feral-deer

6.2.5 Feral Pigs

Information

The feral pig in Australia is a descendant of various breeds of *Sus scrofa*, the domestic pig. Pigs were kept by settlements unrestrained and in semi-feral conditions. Stock could readily escape and wander, and by the 1880s pigs had run wild in NSW.

Distribution

In NSW, feral pig populations are found primarily in western areas, their distribution closely related to the location of inland watercourses and flood plains. Feral pigs need to live in moist areas that can provide adequate food and water and enough shelter. Increasingly, feral pigs have been spreading from exclusively inland areas to coastal regions such as berry.

Impacts

Feral pigs' prey on newborn lambs. They also reduce yields in grain, sugarcane, fruit and vegetable crops through consuming or trampling plants. Fences and water sources can be damaged, and dams and waterholes fouled through wallowing and defecation. Feral pigs also compete with livestock for pasture and damage pasture through up-rooting vegetation. Feral pigs also eat a range of live native animals including, earthworms, beetles, centipedes, amphipods, snails, frogs, lizards, snakes, turtles and their eggs.

Control methods

There are a range of methods used to control impacts of feral pigs such as fencing, it is sometimes used to protect valuable enterprises in small areas. Poison baiting with 1080 can be an effective initial control of pig numbers if undertaken in a methodical manner. It is particularly effective if green feed and other food sources are scarce. Shooting feral pigs from the ground is a method normally used opportunistically to follow up and maintain numbers after an initial knockdown program has occurred. Often ground shooting is conducted using dogs to locate feral pigs. This can be effective as long as both the dogs and the pigs are treated in a humane fashion. Trapping of feral pigs is an effective technique to use as a follow-up after an initial knockdown of a population and as a maintenance technique to prevent numbers from quickly building back up.

Source

http://www.environment.gov.au/biodiversity/invasive-species/feral-animals-australia/feral-pigs

6.2.6 Myna Birds

Information

The myna (also known as Indian, Calcutta or house myna) is a medium-sized (25–26 centimetres head to tail) but heavily built bird with mainly brown plumage. It has a dark brown to black head with a bright yellow patch behind the eye, and a yellow bill, legs and feet. Large communal roosts of up to 5000 can occur, but smaller roosts of 40–80 are more typical in Australia.

Distribution

The common myna is a common inhabitant of urban areas, savannah, cleared agricultural lands, cultivated paddocks, plantations and roadside vegetation. Mynas are closely associated with human development, especially following initial introductions. They are non-migratory birds, so they tend to stay put for longer periods of time.

Impacts

Mynas can cause considerable damage to ripening fruit, particularly grapes, but also figs, apples, pears, strawberries, blueberries, guava, mangoes and breadfruit. Cereal crops such as maize, wheat and rice are susceptible where they occur near urban areas. Roosting and nesting commensal with humans create aesthetic and health concerns. Mynas are known to carry avian malaria and exotic parasites such as the *Ornithonyssus bursia* mite which can cause dermatitis in humans. The myna can help spread agricultural weeds. Mynas are regularly observed to usurp nests and hollows, kill the young and destroy the eggs of native bird species including seabirds, parrots and kill small mammal.

Control methods

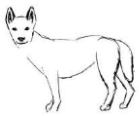
Trapping is the most effective way of reducing numbers of mynas but has not been found to eradicate populations entirely. Because of this the best practice is it limit the damage that mynas can do to your property or locality. This can be done in several ways; Planting open canopy species to reduce communal roosting options, Feed pets indoors or after dark, seal off potential entry points to your roof to reduce nesting options, Remove access to any food source.

More Information

https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/pest-animals-in-nsw/pest-birds/myna-birds

6.2.7 Feral Dogs

Information



Feral dogs are defined as: 'any dog, including a dingo, that is, or has become wild'. Wild dogs are predominately golden or yellow but can also be white, black, black and tan, brown, brindle, patchy and any combination of these. Weights of adult wild dogs generally range from 11 to 25kg for males and 7 to 22kg for females.

Distribution

Feral Dogs are found throughout the eastern ranges, but the coastal hinterland and tablelands have the highest populations. Increasingly, wild dogs are found close to towns where they intermingle with local dogs and can become mis-identified as 'strays'. The wild dog is highly adaptable and may live successfully in arid to rainforest environments, providing there is an adequate supply of food, water and shelter.

Impacts

Wild dogs may significantly affect domestic livestock industries such as sheep, cattle, goats and poultry, through predation and disease. The sheep industry is the most significantly impacted but attacks on calves and larger cattle are quite common. Predation may occur in all months of the year and patterns vary slightly among areas but commonly peaks in March to June on the tablelands and inland, and in October to November on the coast. The impacts of wild dogs on native species varies between areas. Predation by wild dogs can have negative impacts on some threatened species.

Control methods

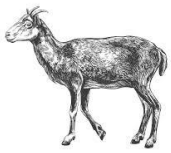
Wild dogs may have large home ranges that include a number of land holdings. Therefore, it is important for land managers to approach wild dog problems as a group. The aim of wild dog control should be to minimise the likelihood of wild dogs interacting with domestic livestock. No single control technique will solve a persistent wild dog predation problem. A combination of methods, such as ground or aerial baiting, trapping, shooting and fencing should be applied if the impacts of those pest animals are to be successfully managed.

Source

https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/pest-animals-in-nsw/wild-dogs/wild-dog-biology

6.2.8 Feral Goats

Information



Goats arrived in Australia with the First Fleet in 1788. As they were small and hardy, ate a range of plants and provided milk and meat, they were convenient livestock for early European settlers. Feral goats have a varied diet — leaves, twigs, bark, flowers, fruit and roots. They will eat most plant types in pastoral regions and often consume vegetation that is avoided by sheep or cattle.

Distribution

They are most common in the rocky or hilly semi-arid areas but are often found in sheep-grazing areas, where dingos and wild dogs have been removed or heavily controlled by pastoralists. They are found in many other areas including arid and semi-arid rangelands, as well as higher rainfall and agricultural areas of eastern NSW. They have benefited from sheep grazing practices and the provision of artificial water points throughout the dryer regions of NSW.

Impacts

Feral goats have a major effect on native vegetation through soil damage and overgrazing of native herbs, grasses, shrubs and trees. This grazing can cause erosion and prevent regeneration. They foul waterholes and can introduce weeds through seeds carried in their dung. Particularly during droughts, feral goats can compete with native animals and domestic stock for food, water and shelter.

Control methods

Feral goat populations tend to recover well from culling and, except on islands, eradication is usually not possible. To protect the environment, control is best focused on areas that contain threatened native plants, animals and ecological communities.

When looking for food, feral goats centre their movements around the availability of permanent water. In times of drought, they need to drink more and stay closer to water. This makes the water source an ideal place to trap feral goats by surrounding it with goat-proof fencing and using one-way gates that allow the goats into the trap to drink but does not allow their movement out again.

Source

http://www.environment.gov.au/biodiversity/invasive-species/publications/factsheet-feral-goat-capra-hircus

7 Seed Collection and Propagation

7.1 What Seeds to Collect?

7.1.1 Seed collection – A landholder guide to what, when & how

Endemic native plants that produce seeds give you the opportunity to reproduce your own strong plants that have evolved to cope with local conditions. Planting out young plants on your property that have been grown from local seed gives your plants a better chance for survival than using immature plants struck from cuttings. This is because the root system is better developed. They are also generally hardened off to local conditions and therefore need a lot less ongoing maintenance.

Collecting indigenous seed also helps to maintain genetic integrity within a species. Local varieties adapted to our conditions are called "provenances". By mixing species from other areas we can unknowingly create hybrid plants that may not necessarily cope with our range of conditions. It is also important to keep in mind that even native species can become garden escapees and thus environmental weeds when grown outside their natural range and habitat, further highlighting the importance of using indigenous stock.

You can collect seed from native species within your land or alternatively, choose to collect local tubestock used for the Berry Bush Links Project from local nurseries and businesses including the Berry Public School nursery, that has a Plant Propagation Program. For more information please call *Berry Public School on 4464 3911* or refer to the 'Berry Area Nursery Contacts' page. In addition, Berry Landcare has a wide range of knowledge on seed collection and propagation. For further information on how they can offer assistance with these projects on your land, please call ***4464 3241.***

Keep in mind, that there are regulations you must abide by if the plant you wish to collect from is a threatened or endangered species. Check with the Threatened Species Officer at Shoalhaven City Council on ***4429 3111***, for more information. A list of threatened flora and fauna of the Shoalhaven is included in this guidebook.

7.1.2 Choosing the collection site

The site that you collect seed from should be as close to the site you wish to revegetate as possible. That does not mean it has to be within a certain distance, but rather have similar soil, altitude and aspect. For example, seeds collected from plants in sheltered gullies will probably not be successful mature plants on windswept salt affected foreshores.

Note that collection of material in National Parks and Nature Reserves requires a licence - https://www.environment.nsw.gov.au/licences-and-permits/scientific-licences.

Collection of material from threatened species and protected plants also has restrictions - https://www.environment.nsw.gov.au/licences-and-permits/protected-native-plant-licences.

7.1.3 Plant species of the Berry Locality

Now that you have the basics to begin seed collecting, you will want to know which seeds to collect. You will get to know your land as you work and observe the things that are happening, you see the flowers, watch seed pods develop and eventually know the best time to collect seeds in your microclimate. Other indicators to look out for are increased bird and animal activity; it's often a good sign that some good food is on.

The **Berry Landcare Species List** in Section 5.3.1 lists the common plant species that are found in the Berry locality.

7.1.4 Rules for seed collection

1. Collect from multiple plants of the same species within a 100m radius
2. Collect from healthy plants
3. Collect only what you need
4. Be kind to the surroundings
5. Do not over collect from a single plant. A general guide is not more than 10% of the plants covering of seed, or 1% of the biomass. This helps with preserving the survival of the species.
6. Be careful not to infect the area you are collecting in with weed species. Seeds of weeds can find their way into a site on your tools, your shoes, vehicles etc.

7.1.5 Seed Collection Materials

Now you know the rules, what do we need to collect seed?

Bags

Bags for your collected seed, plastic is OK for short periods, but DONT leave your seeds in plastic for too long. Plastic doesn't breathe and any moisture in the bag can make your valuable seed collection rot. Paper bags are great for small amounts of seeds; you can conveniently record the details on the outside. Calico bags or feedbags are robust and will hold a lot of seed.

Tools

The tools you need will be determined by the size of the plant species from which you are collecting seed. Secateurs and fingers are all you will need for some species, but tools such as long handled pruning saws may be necessary for the larger species. Take advantage of stormy weather and scout around for fallen branches with seeds intact. Remember your personal safety when collecting seeds. Glasses, gloves, maybe even a hard hat if you are attempting to cut down branches above your head.

Drying Equipment

Most seed species need to be dried - except the fleshy covered seeds. Paper bags are sufficient for small amount of seed as they breathe and still capture the seed as it is released from the capsules. Larger seed collections may need to be dried outdoors on drop sheets or cardboard. Just allow for good ventilation by suspending slightly above ground.

Seed Extraction

Once your seeds are dry, some may take a little manual handling to release from the seed housing. *Banksia* seeds need to be extracted individually from their woody home, whereas woody fruits such as *Eucalyptus* sp. and *Leptospermum* sp. may only require a gentle tap to dislodge the remaining seeds. *Lomandra* sp. may need to be threshed by placing inside a calico bag and hitting against a solid surface. Some species need elevated temperatures to open pods, such as Hakea. You can speed the process along by placing pods in an oven no more than 100 degrees Celsius with the door partially open. Some of the woody seedpods can stay intact on a plant for a long time, or until a disturbing event, such as injury or death of the parent plant.

Storage and Viability

Once your seeds have been cleaned of debris and freed from their pods, they will need to be stored until you are ready to sow them. Some seeds have a brief period of viability although most will remain viable for up to two years. Some species, such as Acacia's are very long lived. Old jars are good as they keep the seed dry and protected from predators. Keeping the seeds in a low temperature and at low humidity may help prolong their life. The fridge is a good place, but make sure they are well labelled.

7.1.6 Record keeping

If your seed collection is a one-off project related activity, accurate records are not so critical. Should it become a long-term focus, ensure you keep information about the collection process. This information can help in long-term vegetation mapping and may assist to other landholders if you are swapping grown plants. You may even wish to join a seed saving network. Generally, the following information should be recorded:

- Genus and species
- Date of collection
- Name of collector
- Site location/map
- Number of plants from which seed collected
- What type of plant community?
- Geology of the area

7.1.7 Propagation

You are now ready to continue to propagate.

The best information on how to do this is found on the **Growing Illawarra Natives** website.
The Plant Propagation guide (prepared by Lyn Clark from Berry Public School Plant Prop and other contributors) is found at https://blog.growingillawarranatives.org/p/blog-page.html.

This Guide covers:

- Propagating from seed - how to collect, process and sow seeds
- Vegetative methods of propagation - making new plants without seeds
- Propagating ferns - working with spores and other fern-specific techniques
- Potting up and planting out - what to do next when you've successfully propagated a plant
- Warnings and safety advice - essential reading before you get started
- References and further reading - for when you want to know even more!

7.1.8 Further information

A Conservation Management Note on **Seed Collecting** can be found at
https://www.environment.nsw.gov.au/cpp/ConservationManagementNotes.htm

Books:

Angus Stewart (2012) Let's Propagate. A plant propagation manual for Australia.

Doug and Robin Stewart (2008) *From Seeds to Leaves*.

Murray Ralph (2011) *Growing Australian Native Plants from Seed*.

Murray Ralph (1994) *Seed Collection of Australian Native Plants for Revegetation, Tree Planting and Direct Seeding*.

Mark Dunphy, Steve McAlpin, Paul Nelson, Michelle Chapman, Hugh Nicholson (2020) *Australian Rainforest Seeds. A Guide to Collecting, Processing and Propagation*.

7.1.9 Contacts

Berry Landcare	berrylandcare @gmail.com
Berry Public School Plant Propagation	berryplantprop@outlook.com
Shoalhaven Landcare Coordinator	coordinator@shoalhavenlandcare.org.au
Shoalhaven Bushcare	**P:** 1300 293 111
Greening Australia	www.greeningaustralia.org.au

8 Creating Habitat

8.1 Habitat in Your Own Backyard

8.1.1 Making your garden bush & wildlife friendly

We can all make a truly positive contribution to the survival of our native fauna and flora by sharing our gardens with the wild creatures of our local bushland. The greatest threat to our native wildlife is the loss of habitat. The most dramatic impacts on the habitat of our native animal are from weed invasion and land clearing.

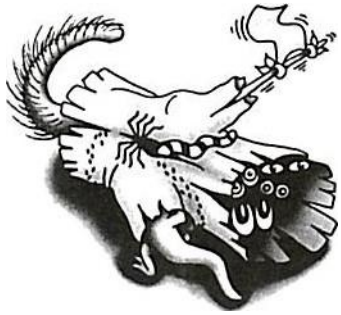
Habitat for wildlife has several essential elements that we can easily incorporate into our gardens to help native wildlife suffering from the impacts of habitat loss

Food

Water

Nesting sites & Materials

Shelter & Protection



8.1.2 Resources

There are many resources and websites which can assist you to creating habitat for a diversity of wildlife.

Backyard Buddies https://backyardbuddies.org.au/ is a program run by the Foundation for National Parks & Wildlife, and provides a lot of information on creating habitat.

The **Growing Illawarra Natives** website has a list of resources which includes articles by Garry Daly on the right sort of plants to attract wildlife to your garden https://blog.growingillawarranatives.org/p/useful-articles-and-other-resources.html.

Birds have a whole website to themselves with the **Birds in Backyards** program through Birdlife Australia https://www.birdsinbackyards.net/.

The Frog and Tadpole Study Group of New South Wales (FATS) have a wonderful collection of **Frog Facts** information sheets which explain how to create frog-friendly habitats and facts of frog biology. https://www.fats.org.au/publications.

Wildthings Australia https://www.wildthingsaustralia.org.au/ is based in Victoria, but has great information on native pollinators. Download the ebook Planting for Pollinator Guide .

9 Legislation

Landholders have legal rights and obligations to manage land in accordance with environmental and natural resource management law. These can be state or national.

Relevant NSW legislation includes:

Biodiversity Conservation Act 2016

The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development

Biosecurity Act 2015

The primary object of this Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

Local Land Services Act 2013

This act established Local Land Services through which publicly funded biosecurity, natural resources management and agricultural advisory services are provided by a single organisation. Berry is in the area of South East Local Land Services.

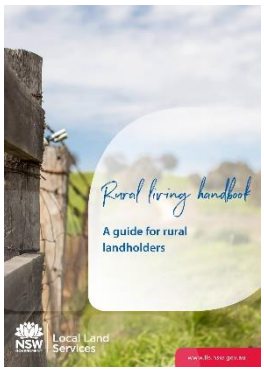
Water Management Act 2000

The objects of this Act are to provide for the sustainable and integrated management of the water sources of the state for the benefit of both present and future generations and, in particular: Ecologically sustainable development, and to Protect, enhance and restore water resources.

National Parks and Wildlife Act 1974

The NPW Act is currently the main piece of legislation for managing and protecting Aboriginal cultural heritage in New South Wales

The ***Rural Living Handbook*** is a guide which gives practical information on the rights and responsibilities of landholders. Go to https://www.lls.nsw.gov.au/what-we-do/plans-and-publications/rural-living-handbook to download this book.



10 Bush Fires of the Berry Region

10.1 Bushfire History of Berry

10.1.1 Introduction

Vegetation communities in the Berry area tend to comprise of mainly moist forest or rainforest, and over the last 40 years some people could be forgiven for thinking that bush fire doesn't' really happen in the Berry area. However, on closer inspection, evidence of fire is evident throughout the forests surrounding Berry, including the usually very wet escarpment areas. In fact, if you search 100 or more years into the past, you will find multiple accounts of several serious bush fires that have occurred around Berry.

Wildfire unsurprisingly, is consistently preceded by hot dry conditions. Indeed, the summer of 2019/2020 was the catalyst for perhaps one of the most devastating and widespread bush fires ever recorded in eastern Australia. Although, on this occasion, the Berry area was largely spared of any significant fires, the Shoalhaven region experienced at least three years of drought and hot dry weather especially in the winter to summer of 2019. Massive bush fires burned across most of eastern Australia taking many homes, lives and decimating wildlife and native habitat. The following list is a brief chronological summary of bushfires that have affected the Berry area over the previous 150 years.

10.1.2 Chronological history

1968 The most recent serious bush fire to affect the Berry area was in September 1968 when a fire, preceded by three years of below average rainfall and an unseasonably hot dry August, started on 14 September at Bundewallah. The fire burned along the escarpment fanned by hot north-westerly winds to the north of Berry. Bruce McIntosh, Shire President at the time recalled "In that fire the escarpment was ablaze basically from Budgong to Wollongong – an unbelievable sight and an unstoppable fire". That was the last time the whole escarpment was alight, but it was not the first.

1946 A severe bushfire in the Woodhill, Wattamolla, Broughton Vale areas north of Berry, was preceded by extremely dry conditions leading up to the fire, which was driven by a strong, westerly wind. The Berry Fire Brigade was called out to save the house of Mr and Mrs J. Coulson.

1945 Berry forms its first bush fire brigade.

1939 Following two years of drought (later known as the World War II Drought), extreme heatwave conditions hit eastern Australia in January 1939. Areas of the South Coast were very dry and hot with several consecutive days of temperatures over 40 degrees. In December 1938, Penrith recorded its hottest recorded temperature at that time of 45.3 degrees Celsius. This period is regarded as the most extreme heatwave to affect south-eastern Australia during the twentieth Century.

The Black Friday bushfires in Victoria on the 13th of January saw 2 million hectares burn across the state with 71 lives lost. Widespread fires broke out across NSW and the ACT including the Blue Mountains, Bathurst, Castle Hill, Cronulla, Nowra, Ulladulla, Mittagong and Wollongong where six people died. The 14th of January was known locally as 'Black Saturday' and 'all the mountains around Berry were ablaze'. Bruce McIntosh was a boy at that time and remembered vividly the intensity of the fire which 'was so great it tuned night into day'. The highway was blocked, and people genuinely feared for their lives'. Bruce McIntosh noted …the whole escarpment was alight … in 1939'.

1899 Farmers around Broughton Vale were 'kept up all night combating bush fires' which burned on 16th May 1899. [Editor's note: for fires to be bad in May, the area must again have been preceded by dry and unseasonably warm weather in the autumn leading up to the fire].

1895 Farms were devastated by bush fires in September of 1895 and, in particular, the localities of Broughton Vale, Coolangatta, Broughton Creek and many others.

1874 Another dry season preceded serious bush fires driven by westerly winds burning Broger's Creek and Broughton Vale areas.

10.1.3 Resources

For more information on the history of bushfires within the Berry region, please visit the following sources:

Antill, R.G. 1982 Settlement in the South. Weston & Co Publishers Pty Ltd Kiama

Australian Institute for Disaster Resilience 'Sydney and southern NSW bushfires, 1939' https://knowledge.aidr.org.au/resources/bushfire-sydney-and-southern-new-south-wales/

Australian Institute for Disaster Resilience 'Victoria January 1939 Black Friday bushfires, 1939' https://knowledge.aidr.org.au/resources/bushfire-black-friday-victoria-1939/

Bureau of Meteorology (Australian Government) Berry (68003), Record of monthly rainfall 1886 – 2018. http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=68003

Blue, H. 2018 'A History of Bushfires in the Berry Area' Town Crier Feb 2018 p.7

Daily News 16 January 1939 'Four N.S.W. Burned to Death' (Sydney NSW) p.1

Duggin, J.A. 1976 Bushfire History of the South Coast Study Area. CSIRO Division of Land Use Research, Canberra. Technical Memorandum 76/13 July 1976.

Evening News 19 May 1899 'Brevities' (Sydney NSW) Friday p.4.

Kiama Independent, and Shoalhaven Advertiser 1 October 1874 'Broughton Vale' p.2.

King, A. 2002 'A Short History of the Wollongong Bushfire Brigades Part 2' Illawarra Historical Society Mar/Apl p.7-14.

Northern Star 24 May 1899 'South Coast News' (Lismore NSW) p.5.

Shoalhaven Heads History – 4 https://shoalhavenheads.net.au/shoalhaven-history-4/

South Coast Register 5 Nov 2012 'The escarpment from Budgong to Wollongong was ablaze' https://www.southcoastregister.com.au/story/572756/the-escarpment-from-budgong-to-wollongong-was-ablaze/

South Coast Register 31 October 2012 'Real fire risk on escarpment' https://www.southcoastregister.com.au/story/478271/real-fire-risk-on-escarpment/

Sydney Mail and New South Wales Advertiser 12 September 1874 'Broughton Creek' p339.

Sydney Morning Herald 13 September 1946 'Fires Still Burn In Country' p.1.

Sydney Morning Herald 11 January 2019 Lessons Learnt (and perhaps forgotten) from Australia's 'worst fires' by Peter Hannam https://amp.smh.com.au/environment/climate-change/lessons-learnt-and-perhaps-forgotten-from-australia-s-worst-fires-20190108-p50qol.html

The Kiama Independent and Shoalhaven Advertiser 17 September 1895 'Local and General Items' p.2.

Ulladulla Info 'Bush fire nearly destroys the town of Ulladulla' http://www.ulladulla.info/bush-fire-nearly-destroys-the-town-of-ulladulla

10.2 Bushfire Management

10.2.1 The threat of bushfire

Living with the bush is part of living in Berry, but so too is living with the risk of fire. Fires in dense bushland can be intense, hot and fast moving, producing embers that can travel many kilometres ahead of a fire, destroying houses by burning twigs and leaves carried in the wind and landing on or around the house. Similarly, grass fires that occur in paddocks can start easily, produce huge amounts of heat and move faster than that of bushfires, destroying both houses and crops.

While there are elements of a bush fire that you cannot control, like the weather, there is a wide range of planning and preparation activities that you can undertake which will dramatically increase the chances of you, your family and your home surviving in the event of a bush fire.

10.2.2 Protecting your home and property

There are some practices that may help minimize the damage caused to your home in a bush fire. As a rural landowner, you should plan and prepare for fire.

The NSW Rural Fire Service provides the information needed to plan and prepare for bush fires.
https://www.rfs.nsw.gov.au/plan-and-prepare.

Have you Bushfire survival plan ready so that you will know what you will so if there is a bush fire near you.

Berry is under the Shoalhaven Rural Fire Service - **contact 02 4424 4424.**

In the case of an emergency, please dial Triple Zero 000.

10.2.3 Hotspots Fire Project

The Hotspots Fire Project is a NSW training program which provides landholders and land managers with the skills and knowledge needed to actively and collectively participate in fire management planning and implementation for the protection and enhancement of biodiversity conservation. The project is delivered through the NSW Rural Fire Service and the NSW Nature Conservation Council. Find out more at https://www.hotspotsfireproject.org.au/.

Some Berry landholders have attended the 2-day Hotspots training to learn about fire and the environment. Keep an eye out for more opportunities.

There are many resources available if you have not yet attended a workshop. Berry is in the Southern Rivers Region and relevant resources can be found for this region.
https://www.hotspotsfireproject.org.au/region/southern-rivers-cma.

11 Resources: Further Reading and Contacts

11.1 Books

Weed identification

Adam Muyt (2001). *Bush Invaders of South-East Australia*. Richardson, RG & FJ

Fiona Richardson, Robert Richardson, Rosamond Shepherd, 2006. *Weeds of the South East: An Identification Guide for Australia.* Richardson, R G & F J

Bush regeneration

Bradley, J. 2002. *Bringing Back the Bush: The Bradley Method of Bush Regeneration*. New Holland.

Buchanan, R. 1989. *Bush Regeneration: Recovering Australian Landscapes*. TAFE NSW.

Buchanan, R. 2009. *Restoring Natural Areas in Australia*. Department of Industry and Investment.

Native plant identification

Leon Fuller (2011). *Wollongong's Native Trees*. Kingsclear Books

Kevin Mills, Jacqueline Jakeman (2011) *Native trees the NSW South Coast.* Envirobook.

Les Robinson (2003). *Field Guide to the Native Plants of Sydney.* Simon & Schuster.

Alan Fairley, Philip Moore (2010) *Native Plants of the Sydney Region: From Newcastle to Nowra and west to the Dividing Range* Allen & Unwin

Books and Manuals to download

NSW Weed Control Handbook https://www.dpi.nsw.gov.au/biosecurity/weeds/weed-control/management-guides/noxious-enviro-weed-control

Rural Living Handbook https://www.lls.nsw.gov.au/what-we-do/plans-and-publications/rural-living-handbook

Department of Planning Industry and Environment Conservation Management Notes
https://www.environment.nsw.gov.au/cpp/ConservationManagementNotes.htm.
Nine management notes that cover ***Wildlife on your property*** and ***Managing bushland and wildlife habitat.***

11.2 Websites

The **Growing Illawarra Natives** Website has a 'Plant Finder" a list of resources which includes articles on native3 plants https://blog.growingillawarranatives.org/.

AABR (Australian Association of Bush Regenerators) https://www.aabr.org.au/ .

View the videos about post fire weed control https://www.aabr.org.au/do/post-fire-bush-regeneration-map-and-resources/ .This is a series of **6 videos**. Although initially for post fire weed control, the videos are about carrying out bush regeneration and covers weed removal techniques.

Department of Primary Industries https://www.dpi.nsw.gov.au/biosecurity/weeds
Biosecurity and weeds including the WeedWise program.
https://www.dpi.nsw.gov.au/biosecurity/weeds/weed-control/management-guides/noxious-enviro-weed-control

NSW Flora Online. PlantNET
https://plantnet.rbgsyd.nsw.gov.au/floraonline.htm Search botanical descriptions of native plants and maps showing their distribution.

International Environmental Weed Foundation (IEWF) although much of the information is Sydney based, the Web Weed Lookup http://www.iewf.org/weedid/iewf_front_id.html **has** a great photo gallery which will help you identify weeds

11.3 Where to Get Advice and Help

Berry Landcare

Email: berrylandcare@gmail.com
https://landcare.nsw.gov.au/groups/berry-landcare/

Berry Public School Plant Prop

Local native plants and advice
Lyn Clark - P: 4464 3911 Lyn-clark@outlook.com.au
Berry Plant Prop Facebook Page

Other nurseries. See Nursery List Section 5.1.5

Shoalhaven Landcare

(Berry Landcare is a member of Shoalhaven Landcare) Shoalhaven Landcare runs a number of projects. The resources page on the website has a number of useful publications.
https://www.shoalhavenlandcare.org.au/.
Contact the co-ordinator. **Email:** shoalhavenlandcare@gmail.com **Phone:** 0410 961 449

Shoalhaven City Council

Weeds management and biosecurity; feral animals; Bushcare and Parkcare (some of Berry Landcare groups are part of Council's programs).
https://www.shoalhaven.nsw.gov.au phone 1300 293 111

Local Land Services

https://www.lls.nsw.gov.au/
Feral Animals and feral animal control training
Berry is in the LLS South east region
https://www.lls.nsw.gov.au/regions/south-east
Berry LLS Office 13 Schofields Lane PO Box 63 Berry NSW 2535
Telephone: 02 4464 6000 Office hours: 8:30am - 4:30pm

Wildlife Rescue South Coast

Phone: 0418-427-214 Kiama to Batemans Bay, Southern Highlands and Kangaroo Valley
https://www.wildlife-rescue.org.au/ .
The website has information on how to help animals such as using wildlife friendly fencing.

12 APPENDIX

12.1 Weed Fact Sheets

FACT SHEET No.	COMMON WEED NAME	TYPE
Fact Sheet 12.1.1	Asparagus & Climbing Asparagus (S)	S
Fact Sheet 12.1.2	Bitou Bush or Boneseed (S)	S
Fact Sheet 12.1.3	Blackberry Nightshade (A)	A
Fact Sheet 12.1.4	Blackberry or Raspberry Bramble (S)	S
Fact Sheet 12.1.5	Bridal Veil Creeper (V)	V
Fact Sheet 12.1.6	Broad-Leaf Privet (T)	T
Fact Sheet 12.1.7	Camphor Laurel (T)	T
Fact Sheet 12.1.8	Cape Ivy, Climbing Groundsel (V)	V
Fact Sheet 12.1.9	Cobblers Peg (A)	A
Fact Sheet 12.1.10	Coral Tree (T)	T
Fact Sheet 12.1.11	Crofton Weed (A)	A
Fact Sheet 12.1.12	Dolichos Pea (V)	V
Fact Sheet 12.1.13	English Ivy (V)	V
Fact Sheet 12.1.14	Fire Weed (A)	A
Fact Sheet 12.1.15	Fishbone Fern (S)	S
Fact Sheet 12.1.16	Formosa Lily (A)	A
Fact Sheet 12.1.17	Giant Paramatta Grass (A)	A
Fact Sheet 12.1.18	Japanese Honeysuckle Vine (V)	V
Fact Sheet 12.1.19	Indian Coral Tree (A)	A
Fact Sheet 12.1.20	Ink Weed (A)	A
Fact Sheet 12.1.21	Lantana (S)	S
Fact Sheet 12.1.22	Madeira Vine (V)	V
Fact Sheet 12.1.23	Madeira Winter Cherry (A)	A
Fact Sheet 12.1.24	Morning Glory (V)	V
Fact Sheet 12.1.25	Mirror-Bush (T)	T
Fact Sheet 12.1.26	Mistflower (A)	A
Fact Sheet 12.1.27	Montbretia (A)	A
Fact Sheet 12.1.28	Moth Vine (V)	V
Fact Sheet 12.1.29	Mother of Millions (S)	S
Fact Sheet 12.1.30	Noogoora Burr (A)	A
Fact Sheet 12.1.31	Ochna, Mickey Mouse, Birdseye Bush (S)	S
Fact Sheet 12.1.32	Pampas Grass	G
Fact Sheet 12.1.33	Panic Veldt Grass	G
Fact Sheet 12.1.34	Passionfruit Vine (V)	V
Fact Sheet 12.1.35	Senna, Cassia (S)	S
Fact Sheet 12.1.36	Small-Leaf Privet (T)	T
Fact Sheet 12.1.37	Spear Thistle	A

FACT SHEET No.	COMMON WEED NAME	TYPE
Fact Sheet 12.1.38	Tall Fleabane (A)	A
Fact Sheet 12.1.39	Tobacco Bush (A)	A
Fact Sheet 12.1.40	Turkey Rhubarb, Potato Vine (V)	V
Fact Sheet 12.1.41	Wandering Jew, Creeping Christian (S)	S

A = Annual/Herb, S = Shrub, T = Tree, V= Vine, G=Grass

Please read on for more information on each plant species, or visit https://weeds.dpi.nsw.gov.au/ and https://www.kiama.nsw.gov.au for more extensive weed listings.

NOTE

All herbicides should be treated with extreme care and only for the purposes identified, and used in accordance with the directions on the label. If herbicides are being used on public land the regulations of the Pesticides Act must be followed.

12.1.1 Asparagus Fern & Climbing Asparagus (S)

Botanical Name
Protoasparagus aethiopicus/Protoasparagus plumosus

Botanical Family *Asparagaceae*

Plant Description

Asparagus Fern and Climbing Asparagus are multi branched spiny, persistent, dense scrambler to 2 metres high that forms thick mats of tuberous roots. Small white to pinkish, pinkish-white bell-shaped flowers. Form green then bright red berries. Both are a problem along the along entire coast of NSW thick infestations occur in shady sites in closed forest and moist gullies.

Removal Techniques

Crown plant just below soil surface with knife or dig with mattock. The small light brown globular parts of the roots store water and do not make new plants. Seed is long lasting and germinates readily, especially after fire. Spraying with Brush-off may be effective to control high density infestations.

Other information

- Introduced from Sth Africa
- Spread by birds and garden refuse dumping
- Still seen in many gardens

Sources

https://weeds.dpi.nsw.gov.au/Weeds/GroundAsparagus
https://weeds.dpi.nsw.gov.au/Weeds/ClimbingAsparagusFern

12.1.2 Bitou Bush or Boneseed (S)

Botanical Name *Chrysanthemoides monilifera*

Botanical Family *Asteraceae*

Plant Description

Leaves mostly smooth on the margin but may be toothed near the tip. Broad ovate leaves with alternate leaf arrangement. Leaves usually less than 7cm in length. Young growth has a fine cotton like 'fluff' about the leaves. Flowers are yellow, daisy like and flower most of the year but the main season is April to June. Berries mature to a purplish black and are around for most of the year. Boneseed has narrower leaves with toothed margins.

Confusing Species

Myoporum boninense or Boobialla (native)

Removal Techniques

Spray 1:100 glyphosate mix. Best time to spray is during winter when Bitou Bush is most active. Manual removal of smaller seedlings. Cut and paint with glyphosate effective.

Other Information

- Introduced from South Africa to assist in sand dune stability and repair.
- Seed can be dormant for more than 10 years.
- Will germinate readily especially after fire.
- Can be treated by aerial spraying with low concentration of glyphosate.

Sources

https://weeds.dpi.nsw.gov.au/Weeds/BitouBush

12.1.3 Blackberry Nightshade (A)

Botanical Name *Solanum nigrum*

Botanical Family *Solanaceae*

Plant Description

A short-lived up to 1m high dark green or purple green shrub. Leaves are ovate and flowers are in groups of 4-12, white, with star—shaped corolla and triangular calyx lobes. Fruit is a dull black or purple-black berry; fruit peduncles are turned downward. It is suspected of being poisonous or toxic to livestock because many contain glycoalkaliods and alkamines which produce gastro—intestinal irritation and nervous disorders.

Removal Techniques

Nightshade can be easily pulled and bagged.

Other Information

- Cousin of the Wild Tobacco Tree
- Is considered a problem in over 60 countries
- Imported for Mauritius in the 1850's.

Sources

https://keyserver.lucidcentral.org/weeds/data/media/Html/solanum_nigrum.htm
https://www.une.edu.au/__data/assets/pdf_file/0020/305471/une-weeds-blackberry-nightshade.pdf
http://www.herbiguide.com.au/Descriptions/hg_Blackberry_Nightshade.htm

12.1.4 Blackberry or Raspberry, Bramble (S)

Botanical Name *Rubus ulmifolius or Rubus fruticosus*

Botanical Family *Rosaceae*

Plant Description

Scrambling vine with stout, thorny branches or canes forming dense thickets 2-3 m high. May be deciduous in winter depending on climate. Enjoys fertile soils and good rain. Can be found mainly in disturbed areas, roadsides, streambanks, farmlands etc. White flowers or pink, 5 petals, summer to autumn. A well-known weed because of its edible berries that ripen from February to March.

Confusing Species

Rubus parvifolius Small-leaved Bramble (native species), *Rubus rosifolius* Native Raspberry (native species), *Rubus nebulosus* Bush Lawyer (native species)**,** a climber in rainforests north of Batemans Bay.

Removal Techniques

Most effective for large infestations is to spray, with a registered blackberry spray such as Garlon, Grazon or Brush-off. Small runners can be dug, but the entire crown and roots must be removed. Best to spray in summer after flowering whilst in active growth stage.

Other Information

- Biological control with virus reduces growth for natives of Europe.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Blackberry

12.1.5 Bridal Creeper (V)

Botanical Name *Asparagus asparagoides syn.*

Botanical Family *Asparagaceae*

Plant Description

Scrambling twining perennial herb. Leaves are alternately arranged, ovate coming to a sharp point, smooth edged and a bright glossy green. Leaf veins are parallel. Small flowers appear in small clusters during August/ September. Berries ripen to red and can remain on the plant for months. Bridal creeper likes fertile well drained soils.

Confusing Species

Eustrephus latifolius Wombat Berry (native)

Removal Techniques

Dig out/crown rhizome- take care when tracing stems back, locate rhizomes as they break very easily. Can be sprayed with glyphosate & surfactant, but results are not consistent.

Other Information

- Native to South Africa
- Introduced horticultural species used by the florist industry
- Dormant in November through to late February/March
- Seeds can remain viable for up to 5 years

Source

https://weeds.dpi.nsw.gov.au/Weeds/BridalCreeper

12.1.6 Broad-leaf Privet or Large-leaved Privet (T)

Botanical Name *Ligustrum lucidum*

Botanical Family *Oleaceae*

Plant Description

A large shrub to small tree with dark green semi glossy leaves with a paler underside. Leaves are opposite, oval in shape with entire margins. Stems have conspicuous spots called lenticels. Flowers in summer, with small white clusters at branch tips. Flowers have a distinct smell and cause allergic reactions in some asthma sufferers. Berries mature in winter July to August and are blackish.

Confusing Species

Acmena smithii Lilly Pilly (native species) *Backhousia myrtifolia* or Grey myrtle (native species)

Removal Techniques

Seedlings can be hand pulled. Cut and paint larger plants and treat with undiluted glyphosate. If injecting, ensure holes are no more than 2.5cm apart (two finger width). Retreat branches where necessary.

Other Information

- Privet was introduced from China and Japan. It was a popular species for hedging along with small leaf privet.
- Privet provides a feast for birds and seeds germinate more readily once they have passed through the bird.

Source

https://weeds.dpi.nsw.gov.au/Weeds/PrivetBroadleaf

12.1.7 Camphor Laurel (T)

Botanical Name
Cinnamomum camphora

Botanical Family *Lauraceae*

Plant Description

Large spreading tree (20-35 metres) with greyish-brown bark trunk that shows prominent vertical cracks. Leaves are less than IO cm in length, alternate, ovate, glossy above, dull green below and apple green. Leaves have a distinctive camphor odour when crushed. Fruit is pea-sized berry less than 10mm. Fruit matures April —June. Flowers are small and whitish usually seen around October.

Confusing Species

Cinnamomum Olivier

Endiandra sieberi Corkwood (native species)

Cryptocatya glaucescens Brown Beech, She Beech, Native Laurel

Jack Wood (native species)

Cryptocatya microneura Murrogun (native species

Removal Techniques

Remove seedlings manually. Cut and paint or inject trees with undiluted glyphosate. Without herbicide, total removal of root system is required.

Other Information

- Native to China and Japan, known to live to 500 years in native habitat. Introduced in 1822 as an ornamental and as a source of camphor. The timber is used to make storage boxes.
- The plant contains a substance that is toxic to some insects. When found near creeks, it can have a profound effect on the natural ecosystem as the toxic substance leaches from the plant into the surrounding soil.

Source

https://weeds.dpi.nsw.gov.au/Weeds/CamphorLaurel

12.1.8 Cape Ivy, German Ivy, Climbing Groundsel (V)

Botanical Name *Delairea sp.*

Botanical Family *Asteraceae*

Plant Description

Alternate leaves, simple very fleshy, light green in colour. Usually the leaves are six pointed, sharply palmate lobes. They can range however from 5-7 lobes. Flowers are daisy like, yellow, in clumps usually appearing from May to August. It prefers moist areas in the coastal zone and can tolerate full sun to semi shade.

Removal Techniques

If removing by hand, use a rake to gather together all parts of the plant. Spray 1:50 glyphosate. Difficult to burn as it is so fleshy. A follow-up program is necessary as herbicide is really only effective as a knockdown mechanism, until all the vegetative parts can be removed.

Other Information

- Cape Ivy, originally from South Africa, tops the list as an invasive weed in Victoria Other countries affected are California (America) and Hawaii.
- Wherever possible this plant should be discouraged from being used. It is a very vigorous plant and has been prized previously for its supposed attractiveness.
- German Ivy variety is becoming highly invasive on the south coast. Infestations dominate all native vegetation levels, with this species often penetrating high in native canopy.

Source

https://weeds.dpi.nsw.gov.au/Weeds/CapeIvy

12.1.9 Cobblers Peg (Farmers Friend/Beggers Tick) (A)

Botanical Name *Bidens pilosa*

Botanical Family *Asteraceae*

Plant Description

Bidens Pilosa is an erect annual herb with Opposite, compound leaves and numerous terminal flower heads. Disc florets are yellow, White or may be absent. These plants produce clusters of long black or dark brown 'seeds' that have slender, barbed spines at their summit which cling to clothing, fur and fleece. *Bidens pilosa* is a weed of disturbed areas, roadsides, wasteland and gardens.

Removal Techniques

They can be easily pulled but be careful to bag the plants and especially the seed heads to prevent their distribution.

Other Information

- Can grow to 1.8m tall.
- Used a source of food/medicine in Africa and Asia.
- Chinese traditionally applied it to open wounds.

Sources

https://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Bidens~pilosa
https://weeds.brisbane.qld.gov.au/weeds/cobblers-pegs

12.1.10 Coral Tree (T)

Botanical Name *Erythrina x sykesii*

Botanical Family *Faboideae*

Plant Description

Stout, deciduous, exotic hybrid tree with thorny branches, corky bark and numerous 'hands' of large, bright red flowers appearing before leaves. Limbs are easily broken and thus a wind problem. Widely used for its ability to establish quickly as a shade tree

Confusing Species

Erythrina vespertilio or Bat Wing Coral Tree (exotic species)

Removal Techniques

When tree is in lead, frill or drill at ground level and apply undiluted glyphosate within 15 seconds. Follow-up every six months until the tree is dead.

Other Information

- Coral trees propagate by vegetative means. Any pruned matter should be disposed of carefully

Sources

https://keyserver.lucidcentral.org/weeds/data/media/Html/erythrina_x_sykesii.htm
https://sydneyweeds.org.au/weeds/coral-tree/

12.1.11 Crofton Weed (A)

Botanical Name *Ageratina adenophora*

Botanical Family *Asteraceae*

Plant Description

A herbaceous perennial herb of 1-2m high with opposite, triangular leaves with toothed margins, and numerous upright stems and branches. Flower heads are white in terminal corymbs. This is a weed of pastures, wasteland, railway embankments and native bushlands and is poisonous to horses. The related Ageratina riperia (mistflower or creeping crofton weed) is distinguished by its lanceolate leaves and scrambling habit. It is usually less than 1 m high and occurs in damp areas.

Removal Techniques

Crofton weed can be easily pulled and bagged.

Other Information

- Native to Mexico
- Introduced around 1940
- Uses harmful chemicals to kill neighbouring plants.

Source

https://weeds.dpi.nsw.gov.au/Weeds/CroftonWeed

12.1.12 Dolichos Pea, Dipogon (V)

Botanical Name *Dipogon lignosus*

Botanical Family *Faboideae*

Plant Description

Twining vine with thin, three pointy-tipped leaflets, clusters of pink or mauve pea flowers and flat pea-like pods. Thin-textured leaves, alternate, leaflets. Likes sunny positions in disturbed sites

Confusing Species

Juvenile *Kennedia rubicunda* Dusky Coral Pea (native species)

Removal Techniques

Hand pull or dig young plants. Older plants should be stem scraped or painted with undiluted glyphosate. Follow-up control will be required.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Dipogon

12.1.13 English Ivy (V)

Botanical Name *Hedera helix*

Botanical Family *Araliaceae*

Plant Description

A well-known decorative horticultural species of vine that climbs trees clinging by small suckers. Leaves are thin, slightly glossy, shape and division variable, shallowly palmately 3-5 lobed or margins entire and ovate, upper surface darker. Flowers in summer and produces a dull blue to black berries which are poisonous. Mostly in bushland adjoining housing areas.

Confusing Species

Parsonsia straminea Common Silk pod (native species)

Removal Techniques

Hand pull small plants. For badly infested trees, cut stems a metre from base and scrape and paint both ends of the cut stems. Stems growing across the ground can be sprayed with selective woody weed herbicides but add a penetrant to improve take-up.

Sources

https://weedsbluemountains.org.au/weeds/english-ivy/
https://www.helensburghlandcare.org.au/2018/07/be-weed-wise-english-ivy.html

12.1.14 Fireweed (A)

Botanical Name *Senecio madagascariensis*

Botanical Family Asteraceae

Plant Description

It is an erect hairy, annual or biennial herb with furrowed or winged stems, branching in the upper parts. Leaves are fleshy, dark green, twice to thrice dissected, each lobe ending in a sharp, ridged spine. Flower heads are purple, terminal, globular, surrounded by numerous rows of lanceolate, spine – tipped bracts.

Removal Techniques

Fireweed can be sprayed but is easy to pull out. This should be done, and the plant bagged prior to seed set.

Other Information

- Considered a noxious weed in Hawaii
- Toxic to livestock
- Also named Madagascar fire wort and Madagascar groundsel

Source

https://weeds.dpi.nsw.gov.au/Weeds/Fireweed

12.1.15 Fishbone Fern (S)

Botanical Name *Nephrolepis cordifolia*

Botanical Family *Davalliaceae*

Plant Description

Dense clumps of dark green, pinnate fronds, new tufts spread by creeping rhizome. Often seen with a row of pale dots on upper surface near margin. Grows in sheltered areas often damp. Has been widely cultivated in suburban gardens especially in older suburbs. It is a very competitive plant.

Confusing Species

Pellaea falcata Sickle Fern (native species) *Doodia aspera Rasp Fern* (native species)

Removal Techniques

Remove with knife or trowel by hand making sure to remove rhizomes and stolons. Spray glyphosate 1:100 although not completely successful but may assist in arresting development.

Other Information

- This plant is an Australian Native to Northern NSW, QLD and NT
- Regrows from rhizome and stoloniferous spread
- Spores of this plant can be spread by wind or water, but it is usually self-propagating vegetatively

Source

https://weeds.dpi.nsw.gov.au/Weeds/FishboneFern

12.1.16 Formosan Lily, Formosa Lily (A)

Botanical Name *Lilium formosanum*

Botanical Family *Liliaceae*

Plant Description

Erect, perennial herb 50 cm to 2 metres high, with alternate leaves, linear to lanceolate decreasing in size up the stem, purple-brown at base. Stem forms in July to October. Flowers February to March with large, attractive, white, funnel-shaped and fragrant. Seeds are contained in long pods up to 9cm long. Abundant along roadsides of the south coast. Likes sun or semi shade.

Removal Techniques

Dig up corms/bulb (hand pulling leaves corms intact in the soil). Cut and paint or spray patches with 1:100 glyphosate solution at late flowering.

Other Information

- Originally from Taiwan
- A prolific seeder and grows readily from seed

Sources

https://weeds.dpi.nsw.gov.au/Weeds/Taiwanlily
https://sydneyweeds.org.au/weeds/formosa-lily/

12.1.17 Giant Parramatta Grass (A)

Botanical Name *Sporobolus fertilis*

Botanical Family *Poaceae*

Plant Description

A stoloniferous perennial grass with aerial shoots that sprout from the stoloniferous base after considerable monsoon rains and seed set late in the fall. This grass grows between 70-160cm in height and has fibrous roots. The leaves have a slight blue colouration are around 16mm wide and 18cm long. When in flower there is a dark green flower anywhere from 2-10 cm spike like panicle.

Removal Techniques

Herbicides can be very effective as root systems are hard to pull out. Can be dug with a shovel alternatively.

Other Information

- Seed are edible
- Used to prevent famine in Ethiopia
- Native to tropical Asia

Source

https://weeds.dpi.nsw.gov.au/Weeds/GiantParramattaGrass

12.1.18 Honeysuckle or Japanese Honeysuckle Vine (V)

Botanical Name *Lonicera japonica*

Botanical Family *Caprifoliaceae*

Plant Description

Vigorous, woody, perennial climber or scrambling shrub. Leaves are opposite, broadly lanceolate to ovate. Strongly roots at nodes. Fruit is a shiny black ovoid berry. Flowers are sweet honey smelling, mixed pale orange and white on each plant.

Removal Techniques

Difficult to remove as it roots strongly from the nodes. Trace and manually remove smaller stems. Scrape and paint larger swollen nodes and stems with undiluted glyphosate. Spray with 1:100 glyphosate. Thorough follow-up will be required.

Other Information

- Native to China and Japan
- A common escapee in suburban gardens

Source

https://weeds.dpi.nsw.gov.au/Weeds/JapaneseHoneysuckle

12.1.19 Indian Coral Tree (A)

Botanical Name *Erythrina variegata*

Botanical Family *Fabaceae*

Plant Description

Deciduous, fast-growing trees 10–15(–20) meters tall with a spreading crown (except in the cultivar ‘Tropic Coral,’ which is columnar and evergreen, often used for hedges). The leaves are variable in shape and size and sometimes variegated with yellow or pale green.

Removal Techniques

Herbicides can be very effective as root systems are hard to pull out. Can be dug with a shovel alternatively.

Other Information

- Other names include tiger’s claw, Lenten tee and coral tree.
- Used for cultivation in coastal areas in USA
- Native to Africa and Asia

(See also Section 12.1.10 Coral Tree)

12.1.20 Inkweed (A)

Botanical Name *Phytolacca octandra*

Botanical Family *Phytolaccaceae*

Plant Description

Short-lived perennial herbaceous shrub, slightly woody towards the base and deciduous in colder areas. Leaves are ovate-lanceolate, smooth edged, thin, alternate, green with tinges of red. Flowers are white-green, sometimes pink occurring in August to November. Berries are red-purple to black, in a spike of 8 black seeds per fruit flowering again in autumn. Size varies with nutrition. Found mostly in disturbed areas with rich soil and a warm climate. Common after fire disturbance.

Confusing Species

Presario sp. Knotweeds (native species) (This species is normally found in damp sites, whereas Inkweed prefers better drainage)

Removal Techniques

Dig or mattock mature plant and upper part of taproot. Coppices from taproot.

Other Information

- Introduced from tropical America o Used in herbal medicine preparations

Sources

https://keyserver.lucidcentral.org/weeds/data/media/Html/phytolacca_octandra.htm
https://weedsofmelbourne.org/inkweed-phytolacca-octandra

12.1.21 Lantana (S)

Botanical Name *Lantana camara*

Botanical Family *Verbenaceae*

Plant Description

Perennial, erect or scrambling thicket-forming shrub. Much-branched woody stems are brittle and arching sprawling with prickles; can be vine-like and climb high in trees. Leaves are oval shaped with toothed edges, roughly hairy, and with a distinctive odour. Stems hairy prickly, 4-angled or square with hooked prickles when young. Fruits black and fleshy. Flowers are dense, mixed clusters of pink/red, yellow/orange, pink/orange, on flat-topped clusters. Mostly occurs in coastal areas. Lantana flowers and fruits for most of the year provided there is sufficient moisture

Confusing Species

Trema aspera Native Peach / Poison Peach (native species)

Plectranthus graveolens Cockspur Flower (native species)

Removal Techniques

Hand remove taproot and large surface roots. Cut and paint with glyphosate. Large thickets may be supressed with glyphosate spray.

Other Information

- Introduced from Central America to be cultivated as hedges and grown as garden plants
- Lantana coppices from the base when cut. Any stems left lying on the ground may re-shoot

Source

https://weeds.dpi.nsw.gov.au/Weeds/Lantana

12.1.22 Madeira Vine (V)

Botanical Name *Anredera cordifolia*

Botanical Family *Basellaceae*

Plant Description

Madeira vine is a twining vine with wide, fleshy, heart-shaped leaves that are 2-5cm long with fragrant, cream coloured flower spikes up to 30cm long. These spikes take the appearance of 'lamb's tail' and are often commonly referred to under this name.

Where is it Found

Madeira vine is common in coastal, summer-rainfall dominant areas of NSW, including margins of rainforests. This vine thrives in sub-tropical, warm temperate areas, known to be a salt tolerant specie, growing over mangroves.

Control

Madeira Vine flowers in summer and reproduces through the production of thousands of tubers (underground) and bulbils (aerially along the stems), which fall to the ground as the vine ages remaining viable for many years and therefore difficult to control. All tubers and bulbils are required to be removed or killed over a long-term period, requiring regular follow-ups for the duration of many years. Vigorous re-growth can occur if single control activities are implemented.

Chemical Control

Madeira Vine can be chemically controlled with the use of herbicides, using scrape and paint and foliar spraying application techniques.

Scrape and Paint – Sections are scraped to fibrous layer with exposed area painted with concentrated herbicide. Every stem must be treated individually on both sides.

Foliar Spray – Prostrate stems, seedlings and regrowth are spot sprayed with handheld equipment.

Herbicide options

- Glyphosate 360 g/L – Undiluted – Stem scrapping application
- Glyphosate 360 g/L – 100mL glyphosate per 10L of water – Spot spray for seedling control. Add a surfactant.

Source

https://weeds.dpi.nsw.gov.au/Weeds/MadeiraVine

Control

With Herbicide

- Before using herbicides always read the label, and refer to the permit for the use of the appropriate product: https://weeds.dpi.nsw.gov.au/Weeds/MadeiraVine
- Vines on the ground and on unwanted trees and shrubs can be sprayed with 2% glyphosate (Roundup) or Starane, or a mixture of Brush-Off (1.5 gms/10 litres) and 2% glyphosate (Roundup).
- Use a surfactant to allow leaf penetration, except when spraying near frog habitats.
- Vines in the canopy or on wanted vegetation should be poisoned *in situ* with direct application of Vigilant to scraped portions of the lower stems. Alternatively undiluted Glyphosate 360g/l (Roundup) can be used. Do not pull or remove the vine (this will displace and spread the bulbils). Do not cut the stem, the plant must be alive to spread the herbicide to its roots and bulbils.
- Young plants may be hand weeded but make sure you dig and remove any tubers.
- Be prepared to regularly monitor the site and repeat treatment.

Here is a YouTube video link which demonstrates stem scraping: https://www.youtube.com/watch?v=4L7GBMF2NU4

Without Herbicide

It is difficult to control Madeira Vine without chemicals. Be prepared to revisit and weed an area repeatedly over many years.

- Extract, remove and destroy the whole plant, including below-ground roots and tubers, and above stems and bulbils.
- Collect all displaced bulbils from canopy vines by spreading ground tarps during removal.

More Information

For assistance contact: Ian: ianlindap@shoalhaven.net.au 4448 6359 (please leave a message);
or Hugh: admin@boongareebushcare.org 0417 407477

Madeira Vine

'Lambs Tails' *Anredera cordifolia*

a weed of national significance

a rampant weed in our gardens, backyards and natural areas

now established in Berry

a threat to our native habitats

spreads quickly

hard to eradicate

smothers plants

out-competes

pulls down canopies

Shoalhaven City Council

Berry Corridor

Berry Landcare

help us control this pest

Madeira Vine

is a native of South America, has drooping cream flowers, a sweet scent, a picturesque creeping habit, and has edible leaves and tubers. It is also unfortunately a vigorous and invasive **Weed of National Significance**, is difficult to eradicate once established, and has made Berry its home.

This weed has escaped the garden and is now spreading rapidly in our farm and bushlands, and especially along the banks of Broughton, Broughton Mill and Bundewallah Creeks.

This vine forms dense mats and climbs into, and smothers tree canopies. It out-competes native vegetation, posing a serious threat to biodiversity and habitat values. It reproduces vegetatively via dispersal of stem fragments, tubers, and bulbils (aerial tubers) which grow prolifically along its stems and are easily separated when disturbed. Each bulbil can start a new plant and may lie viable in the soil for at least 10 years.

Berry Landcare calls on all land-owners, carers and gardeners to recognise the imminent threat this weed poses and to remove it from our environment.

Simple one-off spraying is ineffective and slashing, mowing or composting without treatment simply spreads the problem. If you pull it down, you spread thousands of bulbils and multiply your problem many times over.

Disposal

Do not use it as surface mulch on your garden. All material must be bagged and go into the red bin, or burned, or hot-mulch processed as green waste at a Council waste depot or tip.

Do not place it in your home compost bin, as they do not create enough heat to kill the tubers and bulbils.

Identification

This twining vine is easiest to spot when flowering, with its creamy coloured flowers on pendulous spikes up to 30cm long.

At other times it can be identified by its heart shaped, glossy, thick and fleshy leaves (between 2 and 15cm long), and the presence of the bulbils along its mature stems.

Below the ground it develops numerous and often large tubers.

If you have Madeira Vine in your garden and want to keep it, you must prevent it spreading to your neighbours or escaping into fields and natural areas.

How does it spread?

Madeira Vine may not produce seed in Australia and overwhelmingly reproduces vegetatively. Any stem material, bulbils and below-ground tubers can produce new plants. Bulbils float and are transported down creeks and rivers, especially by flood waters. They get caught in tyre grooves and boot treads and may be carried by birds.

This vine is spread when included in mulch and in dumped garden waste.

If it's on your fence, you may be sharing it with a neighbour.

v.U1 Berry Landcare May 2021

12.1.23 Madeira Winter Cherry, Jerusalem Cherry (A)

Botanical Name *Solanum pseudocapsicum*

Botanical Family *Solanaceae*

Plant Description

A woody shrub to 1 metre. Leaves are lanceolate, dark green, slightly glossy with smooth margins. Flowers spring to winter with small star shaped white flowers with bright yellow stamens. Fruits are small cherry like berries that mature to a bright red fruit that are spread by birds. Prefers moist situations in shady forest gullies and can tolerate deep shade.

Removal Techniques

Pull out plant, chip or dig. Cut and paint with undiluted glyphosate if necessary. Large areas can be treated with a foliage spray of 1:100 glyphosate solution.

Other Information

- Introduced as a garden ornamental from South America in Northern Australia.
- Berries are very poisonous to humans, has been sold by the nursery trade labelled incorrectly as an edible chilli**.**

Sources

https://weedsofmelbourne.org/madeira-winter-cherry-solanum-pseudocapsicum
https://keyserver.lucidcentral.org/weeds/data/media/Html/solanum_pseudocapsicum.htm

12.1.24 Mile-a-minute, Coastal Morning Glory (V)

Botanical Name *Ipomoea cairica*

Botanical Family *Convolvulaceae*

Plant Description

Vigorous woody perennial climber, with trailing and twining stems, heart shaped deeply divided leaves and purple trumpet like flowers during summer. Scrambles over other plants smothering native species. Usually grows in wet areas. The leaves and flowers are not as big as Common Morning Glory.

Confusing Species

Three native twining species *Calystegia marginata*, *Convolvulus erubescens* and *Polymeria calycina* have white or pink morning glory-like flowers much smaller than the weed species.

Ipomoea plebeiaor Bell Vine (native species with white flowers) *Ipomoea pes-caprae* or *brasiliensis* (native species on coastal sand dunes).

Removal Techniques

Small amounts can be removed by hand, gently pull away from any native plants and stem scrape and paint with undiluted glyphosate. Large infestations should be cut from the canopy that is supporting it. Once on the ground, can be sprayed with 1:75 glyphosate solution.

Other Information

- Introduced from tropical Africa and Asia as a horticultural species.

Source

https://weeds.dpi.nsw.gov.au/Weeds/MorningGloryCoastal

12.1.25 Mirror Bush, Looking-Glass Bush (T)

Botanical Name *Coprosma repens*

Botanical Family *Rubiaceae*

Plant Description

Perennial bushy shrub or small tree with very glossy round green leaves. Stout branches. Flowers small and greenish white, arranged in clusters. Succulent orange-red fruits ripen summer to autumn.

Removal Techniques

Hand pull small seedlings. Cut and paint or drill and inject larger plants. Watch for suckers.

Other Information

- Mirror bush was introduced from New Zealand where it occurs in rocky foreshore communities
- May root from lower branches.

Source

https://weeds.dpi.nsw.gov.au/Weeds/MirrorBush

12.1.26 Mistflower (A)

Botanical Name *Ageratina riparia*

Family Name *Asteraceae*

Plant Description

Mistflower is a low-growing perennial herb that commonly reaches a height between 40-60cm. This species stems are branched, producing roots at the joints where they touch the ground. The root system is short and thick with many fibrous roots extending downwards and outwards. The leaves are green in colour with toothed edges arranged oppositely along the branch at a length between 3-13cm. Flowers present as white with a 'fluffy' appearance 4-6mm wide, occurring in clusters of up to 30 and the end of branches. Seeds are dark brown to black and 1-2mm in length with 4-5 hairy ridges that run lengthwise, topped with a ring of 3-4mm long bristles.

Where is it Found

Mistflower is commonly found along the east coast of Australia, ranging from Queensland in the north to Jervis Bay, NSW in the south. This species prefers humid sub-tropical climates with annual rainfall over 700mm. Mistflower needs minimal sunlight and will often be found along shaded, damp creek banks, amongst rocks and other sheltered areas.

Control

Mistflower is an aggressive invader of pastures, reducing pasture production and as a result, carrying capacity. This species has the ability to dominate bushland edges, competing with native vegetation and displacing native animals. Mistflower disperses via wind, water and human intervention through contaminated agricultural produce, increasing existing infestations. Control of this species is best approached when infestations are minimal to prevent establishment. All control strategies should be implemented prior to flowering and seed set, with regular follow-ups.

Small infestations can be manually removed by hand, whereas larger infestations can be slashed or cultivated followed by planting of competitive pasture species or native vegetation. Strong competition from pasture species prevents the establishment of Mistflower.

Herbicide Options

- Glyphosate 360g/L – 5mL per 1L of water – Apply on actively growing bushed with full foliage.
- Fluroxypyr 200g/L – 500mL per 100L of water – Apply on actively growing seedlings and young bushes before flowering – Withholding period of 7 days.
- Triclopyr 300g/L + Picloram 100g/L – 350mL per 100L of water – Spring to Autumn growing bushes.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Details/87

12.1.27 Montbretia (A)

Botanical Name
Crocosmia x crocosmiiflora

Botanical Family *Iridaceae*

Plant Description

Orange lily to 60cm occurring in drains, roadsides and coastal areas. Copes well with drought as it propagates from bulbs. Long flat leaves arise from the base of the plant producing orange to crimson flowers in a spike-like inflorescence.

Removal Techniques

Dig out bulbs. For high density infestation, spray with 1:100 glyphosate and retreat if necessary.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Montbretia

12.1.28 Moth Vine or Moth Plant (V)

Botanical Name *Araujia sericifera*

Botanical Family *Apocynaceae*

Plant Description

Perennial climber which can have a slightly woody appearance. Exudes a milky sap from the stems when broken. Leaves are simple, less than 10cm long oblong with a flat base where stalk attaches. Greyish green with a whitish film, green underside. Flowers are creamy-white in spring. The choko like fruit ripens from late summer through to winter. It contains many seeds that are transported by wind.

Confusing Species

Marsdenia sp. Milk Vines (native species)

Parsonia straminea Monkey Rope, Common Silkpod (native species)

Tylophora barbata (native species)

Removal Techniques

Young plants are easily hand pulled. Scrape and paint large plants with undiluted glyphosate. Bag any fruit and remove from site. Dispose carefully by burning or deep burial.

Other Information

- Introduced from South America
- Sap may cause skin irritation
- Moth Plant can have dense seedling regrowth around disturbed parent plants

Source

https://weeds.dpi.nsw.gov.au/Weeds/MothVine

12.1.29 Mother-of-Millions (S)

Botanical Name *Bryophyllum delagoense*

Botanical Family *Crassulaceae*

Plant Description

A smooth succulent erect perennial, herb with pinkish to grey stems. Leaves are almost cylindrical with purplish markings with some small " teeth" in pairs near the tip. Buds at the leaf tips produce plantlets that drop and root easily. Flowers range from yellow to salmon red and come in clusters at the end of stems. They are bell shaped. It prefers dampish sheltered sites and is mostly coastal. It is a widespread garden escapee.

Removal Techniques

Hand pull the seedlings and more mature plants, being careful not to disturb any intact plantlets that mature plants may be carrying. Spray with 1:100 glyphosate, which should be mixed with a penetrant to improve spray effectiveness.

Other Information

- Native to Africa and Madagascar.
- As the common name suggests this plant is capable of making thousands of new seedlings.
- Make sure to factor in follow-up time when planning to remove this weed.

Source

https://weeds.dpi.nsw.gov.au/Weeds/MotherOfMillions

12.1.30 Noogoora Burr (A)

Botanical Name *Xanthium occidentale*

Botanical Family *Asteraceae*

Plant Description

Noogoora Burr is a stout, erect, single stem or many branched annual plant with large, grapevine leaves reaching up to 2m in height. Stems are hairy and purple/green mottling in colour. Leaves grow in alternating patterns along the stem with the upper surface darker green with purplish veins. The shape of the leaves are broad ovate to triangular, cut in 3-5 lobes with a rough texture. The Noogoora Burr presents fruit that is hard and woody, 16-22m in length, covered in hooked spines 1-3cm long. The fruit turns brown with maturity.

Where is it Found

Noogoora Burr is widespread within NSW, found in most areas apart from the southern tablelands. This species is often found within riparian areas, along roadsides, in wastelands or in cultivated, low lying areas subject to periodic flooding, thriving in wet summers.

Control

Noogoora Burr is an annual plant that reproduces by seed contained in the burr, dispersed during the autumn and winter seasons, germinating after rainfall events. Control methods include prevention of the seed set to manage and eliminate infestations. Repeated control is required as trials have shown that six years of prevention of seed, reduces the existing population by 1%. Larger populations can be treated with herbicides or cultivating and slashing techniques. Smaller populations can be managed with spot spraying, chipping or inter-row cultivation in crops.

Cultivation – Controls seedlings. Inter-row cultivation is used in row cropping to control seedlings that have germinated after irrigation events.

Slashing – Used in clean-up operations after spraying with herbicides.

Chipping – Known as hand hoeing, used for small and isolated populations. Provides an effective follow up method to other methods of seed set prevention.

Herbicide Options

- 2,4-D amine 625g/L – 800ml-1.1L/ha – Seedlings only
- 2,4-D LV ester 680g/L – 1.7 to 3.3L per ha – Boom spray application from seedlings to pre-flowering.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Details/15

12.1.31 Ochna, Mickey Mouse Plant, Birdseye Bush (S)

Botanical Name *Ochna serrulata*

Botanical Family *Ochnaceae*

Plant Description

Shrub to 3 metres. Branches have numerous lenticels. Leaves are narrow, oblong, toothed. Flowers have 5 yellow petals, with fall off leaving behind sepals that turn red. The red sepals surround the fruit that is a black berry. The fruit usually matures in summer. Ochna likes a sheltered site on shale or sandstone.

Confusing Species

Ochna atropurpurea

Removal Techniques

Pull out small seedlings, making sure to get taproot. Can be cut and painted, but it is more effective to scrape the basal bark and paint the wound with undiluted glyphosate. Will coppice from the base.

Other Information

- Native to South Africa o A common garden escape
- Seeds germinate readily and are spread by birds

Source

https://weeds.dpi.nsw.gov.au/Weeds/Ochna

12.1.32 Pampas Grass

Botanical Name *Cortaderia selloana*

Botanical Family *Poaceae*

Plant Description

A very large, long-lived, dense perennial, tussock-forming grass with long, flower stalks of white plumes. Leaves develop from base, forming a tussock of dead curled leaves at base. Leaf blades dull green folded at the base arching away from the stem with very sharp edges. The flower plumes like most grasses carry thousands of seeds. Each plant can carry up to 100,000 seeds! Prefers wet areas.

Confusing Species

Gahnia sp. Native Saw Sedges (native species)

Removal Techniques

Wear gloves- this plant is sharp! Remove seed heads carefully and bag for burning or deep burial before attempting any other control. Small plants can be dug out. Cut larger plants to ground level with brushcutter, allow to re-shoot, then spray with glyphosate 1:75 solution.

Other Information

- Introduced from South America as a horticultural species. Still found readily in gardens.

Source

https://weeds.dpi.nsw.gov.au/Weeds/PampasGrass

12.1.33 Panic Veldt Grass

Botanical Name *Ehrharta erecta*

Family Name *Poaceae*

Plant Description

Panic Veldt Grass has mid to dark green leaves that are 5-20cm in length and 2-10mm wide with a prominent mid-vein on the underside. Seed stems range between 10-80cm long, displayed upright or curved, branched near the base and are tinged red. Seeds are 3mm in length and appear dry and bleached at maturity. Roots are fibrous and shallow. This species reaches a height of 60cm.

Where is it Found

Panic Veldt grass occurs in a variety of habitats along the east coast of NSW, including grassy woodlands, forests and heathland, growing abundantly in open areas. In addition, this species is shade tolerant and can exist within moderately shaded conditions with well-drained soil, with seeds continually produced under these conditions. Panic Veldt grass is also known to colonise roadsides and disturbed soils associated with construction work. This species flowers between the seasons of spring to summer.

Control

Panic Veldt grass is an aggressive, rapid seeding, perennial grass species known to thrive in a variety of soil and weather conditions, allowing for rapid infestation. Control methods include removing the whole plant, as its root system is shallow, ensuring to remove the entire rhizome and dispose appropriately to avoid regrowth. Seed in the ground will remain viable for the duration of 12 months, with regrowth occurring within 4-6 weeks of applied control methods. A period of 1-2 years of follow-up should be implemented to achieve long term control of this species.

Herbicide Options

Panic Veldt grass can be sprayed with non-selective or grass selective herbicides. This method will kill the plant but the seedlings will remain unaffected, requiring long-term follow-up.

Source

http://www.sutherlandshire.nsw.gov.au/Outdoors/Environment/Plants-and-Bushland/Weeds/Panic-Veldt-Grass

12.1.34 Blue Passionflower Vine (V)

Botanical Name *Passiflora caerulea*

Family Name *Passifloraceae*

Plant Description

Blue Passionflower species have large leaves 8-12cm in length, deeply divided into five lobes. It has a distinct passionfruit flower with filaments (hairlike structure in centre) ranging from greenish white, corona bluish or purplish.

Where is it Found

Blue Passionflower is distributed along the east coast of Australia north from Queensland to Victoria in the south, originating from South America. This species is known to be evergreen in tropical climates and deciduous in cooler environments, dying off during the winter and regrowing from deep roots.

Control

Blue Passionflower is regarded as an environmental weed throughout NSW and Victoria, cultivated for its passionfruit flowers and as stock for grafted passionfruits. This species has the ability to escape cultivation through the growth of small fruit, which is consumed by birds, resulting in seed dispersal throughout bushland, densely smothering native vegetation. Control methods for this species involve hand removal using a shovel or trowel, ensuring to remove the entire root and disposing of appropriately. If the infestation is large, however, herbicides are required.

Herbicide Options

- Fluroxypyr 200 g/L – 500-1000mL per 100 L of water – Spot spray application – withholding period of 7 days.
- Glyphosate 360 g/L – One-part product to 1.5 parts water – Cut, scrape and paint application – No withholding period.
- Metsulfuron-methyl 600 g/kg – 10 g per 1 L of water plus surfactant – Wipe onto leaves application – No grazing for 7 days prior and after treatment.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Bluepassionflower

12.1.35 Senna (S) or Cassia (T)

Botanical Name *Senna pendula glabrata*

Botanical Family *Fabaceae – Caesalpinioideae*

Plant Description

Perennial, spreading large shrub with bright yellow pea like flowers all year and slightly curled, elongated green to straw coloured pods. Ovate elliptic light green leaves with paler underside often with yellow edge. Often in bush around towns and old farms. Still occurs in many suburban gardens.

Confusing Species

Senna aciphyll

Senna claggier

Indigofera australis (native species)

Breynia oblongifolia Breynia (native species)

Senna multiglandulosa

Removal Techniques

Seedlings removed by hand. Cut and paint mature plants undiluted glyphosate. Bag and remove seed pods from site.

Other Information

- Introduced from South America as a horticultural species.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Cassia

12.1.36 Small-leaf Privet, Chinese Privet (T)

Botanical Name *Ligustrum sinense*

Botanical Family *Oleaceae*

Plant Description

Perennial evergreen large shrub to small tree with smooth grey bark and glossy leaves in opposite pairs. Leaves less than 6cm but can be variable with either wavy or straight leaf margins. Oval, pale green. Flowers creamy white, small, in spring dense clusters at branch tips. Berries mature in winter (May to September). Germinates well in shady positions. Privet loves nutrient rich moist sites, such as damp gullies.

Confusing Species

Backhousia myrtifolia Grey Myrtle (native species)

Breynia oblongifolia Breynia (native species)

Removal Techniques

Small plants can be easily hand pulled if they haven't been grazed. Blanket spray small seedlings with 1% glyphosate. Take care not to overspray desirable native species. Cut and paint is the most effective for mature species. If drilling in injecting, make sure holes are close (two finger widths apart). This method should be considered when it is difficult to cut and paint or when allowing replacement plants time to establish before removing Privet debris. Plan to follow-up in spring.

Other Information

- Native to China and Japan
- Suckers from roots when disturbed. Should remove prior to fruit set in winter.
- Seeds reduce in' viability after the first year

Source

https://weeds.dpi.nsw.gov.au/Weeds/PrivetNarrowleaf

12.1.37 Spear Thistle

Botanical Name *Cirsium vulgare*

Botancial Family *Asteraceae*

Plant Description

Spear Thistle has dark green leaves that are white and 'woolly' underneath, narrow towards the base and 30cm in length. Flowers present purple, 1.2-4cm in width with long spreading to recurved spines.

Where is it Found

Spear Thistle often weeds in areas of cultivation, wastelands and roadsides concentrated along the southern east coast of NSW. This species flowers between the months of November-February.

Control

Control of Spear Thistle is required as it is mainly a weed of agricultural areas, competing with sown species, inhibiting livestock movement causing fault to wool and physical injury of livestock. Currently in NSW, three biological control agents have been introduced as a method in controlling the seeding of this species. The control agents include a seed fly (*Urophora stylata),* an established impact on seed production and two weevil species, a seed head weevil (*Rhinocyllus conicus*) and a crown weevil (*Trochosirocalus horridus*) with unknown establishment. In addition to this, herbicides can be applied.

Herbicide Options

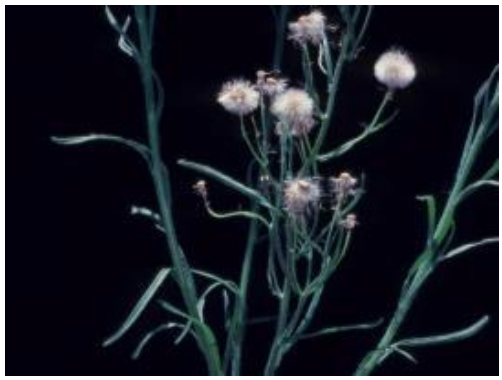
- 2,4-D amine 625g/L – 1.1-1.6 L/ha – Boom spray: Pastures – spray young rosettes.
- 2,4-D LV ester 680g/L – 1.15 to 2.1 L per ha – Boom spray: Seedling to rosette stage.
- Fluroxypyr 140g/L + Aminopyralid 10g/L – 500mL in 100L of water – Handgun application to actively growing plants.
- MCPA 500g/L – 1.5-2.0L per ha – Boom spray: Apply to rosettes actively growing, use higher rate on larger plants.

Source

https://weeds.dpi.nsw.gov.au/Weeds/MadeiraVine

http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Cirsium~vulgare

12.1.38 Tall Fleabane (A)



Botanical Name *Conyza albida*

Botanical Family *Asteraceae*

Plant Description

Fleabane is an erect annual herb with stems and leaves finely hairy. Leaves ae grey green and narrow. Flowers present in branched heads with each cluster of tiny flowers being enclosed in a series of narrow green bracts. This species contains daisy spherical clusters of small seed with a parachute of fine hairs.

Where it is Found

Fleabane is a widespread species throughout NSW, most commonly found in highly disturbed areas including roadsides, however, has known to be found in undisturbed areas of bushland. This species smothers native vegetation when in high density, mostly in remnant patches of farming areas.

Control

Fleabane is relatively palatable to native wildlife including wallabies and livestock alike which have a reducing effect on this species seeding. Due it is ability to disperse via wind and resistance to glyphosate herbicides, Fleabane requires integrated methods of weed management in order to be controlled.

Herbicide Options

- 2,4-D amine 700g/L – 285mL in 100mL of water – Applied to pastures and industrial areas – Avoid livestock grazing for 7 days.
- Flumioxazin 500g/L – 700g per ha – Fence line (pre-emergence) – Avoid livestock grazing for 2 weeks after treatment.
- Glufosinate-ammonium 200g/L – 3 to 5 L per ha – Boom spray: Commercial and industrial areas, rights of way and non-crop areas – withholding period of 8 weeks.
- Glufosinate-ammonium 200g/L – 500mL in 100 L of water – Spot spray: Commercial and industrial areas, rights of way and non-crop areas – withholding period of 8 weeks.

Source

https://www.esc.nsw.gov.au/living-in/natural-environment/introduced-plants-and-animals/weeds/weed-profiles/fleabane-conyza-albida

12.1.39 Tobacco Bush (A)

Botanical Name *Solanum mauritianum*

Botanical Family *Asteraceae*

Plant Description

An unarmed, evergreen shrub to small tree that varies from 2–10 m in height. Typical features include the densely pubescent foliage, caused by fine, whitish trichomes, and inflorescences of lilac blue flowers, which produce terminal clusters of green berries that ripen to a dull yellowish colour. Inflorescences bearing flowers, immature and mature fruits often are present on plants at the same time.

Removal Techniques

Best controlled by spraying with herbicide early at the rosette stage before stem develops and seed sets.

Other Information

- A major problem in coastal areas of NSW
- Toxic to livestock
- Native to Africa

Source

https://weeds.dpi.nsw.gov.au/Weeds/TobaccoBush

12.1.40 Turkey Rhubarb, Potato Vine, Rambling Dock

Botanical Name *Acetosa sagittata*

Botanical Family *Polygonaceae*

Plant Description

Vigorous perennial creeper, tough but not woody, with potato-like tubers, dense sprays of papery, hop-like fruits and triangular dock-like leaves with wavy edges. The stem is fine and strong, often with purple ribs. Seed capsules are 3-winged, starting green the turning red and dry to brown with a papery texture. Flowers are small and made up of 5-6 segments or lobes taking place of petals and sepals. Found in sunny or shady damp disturbed areas.

Confusing Species

Calystegia marginata Forest Bindweed (native species)

Muehlenbeckia gracillima Slender Lignum (native species).

Removal Techniques

Considerable digging to remove tubers as vine reshoots from tubers. Germinates and colonises vigorously after fire. If time is limited, spraying with glyphosate may assist in arresting development but long-term use is not effective. Best to apply in November before fruiting and seeding.

Other Information

- Collect and destroy as much seed as possible as it germinates for at least two years after removal of parent plant.
- Introduced from South Africa

Source

https://weeds.dpi.nsw.gov.au/Weeds/TurkeyRhubarb

12.1.41 Wandering Jew, Creeping Christian, Trad

Botanical Name *Tradescantia fluminensis*

Botanical Family *Commelinaceae*

Plant Description

Weak-creeping fleshy herb, rooting from well-defined nodes. Invades vigorously and creates dense carpets in shaded moist areas, smothering shrubs. Leaves are crisp and watery, alternate, dark green and shiny, ovate to long pointed with parallel veins. Flowers white, three petalled. Flowers spring to summer.

Confusing Species

Commelina cyanea Native Wandering Jew which has blue flowers and smaller leaves (native species)

Removal Techniques

Blanket spray in winter with 1:100 glyphosate with a surfactant for greater penetration. Should be sprayed again when starting to reshoot with a higher concentration 1:80. Can be raked and rolled into piles and then sprayed. Watch for regrowth as each little piece of stem has the ability to regrow. Needs follow-up treatment.

Other Information

- Introduced from South America as an ornamental garden plant and for indoor plants
- Variegation used to be common, but once naturalised the tone change disappeared.
- Wandering Jew does not propagate by seed in Australia.
- Wandering Jew smothers seedlings of other plants and disturbs natural patterns of revegetation.

Source

https://weeds.dpi.nsw.gov.au/Weeds/Trad