

Backdrop to encounter: the 1770 landscape of Botany Bay, the plants collected by Banks and Solander and rehabilitation of natural vegetation at Kurnell

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Abstract: The first scientific observations on the flora of eastern Australia were made at Botany Bay in April–May 1770. We discuss the landscapes of Botany Bay and particularly of the historic landing place at Kurnell (lat 34° 00' S, long 151° 13' E) (about 16 km south of central Sydney), as described in the journals of Lieutenant James Cook and Joseph Banks on the *Endeavour* voyage in 1770.

We list 132 plant species that were collected at Botany Bay by Banks and Daniel Solander, the first scientific collections of Australian flora. The list is based on a critical assessment of unpublished lists compiled by authors who had access to the collection of the British Museum (now Natural History Museum), together with species from material at National Herbarium of New South Wales that has not been previously available. The list includes *Bidens pilosa* which has been previously regarded as an introduced species.

In 1770 the Europeans set foot on Aboriginal land of the Dharawal people. Since that time the landscape has been altered in response to a succession of different land-uses; farming and grazing, commemorative tree planting, parkland planting, and pleasure ground and tourist visitation. We describe and reconstruct the 1770 vegetation and landscape features of the Kurnell landing place site, now within Botany Bay National Park, based on primary historical sources and surviving remnants of the landscape, and suggest ways in which the remnants can be rehabilitated and enhanced to protect and focus on the botanical, historical and cultural values of this important place.

Cunninghamia (2007) 10 (1): 113–137

Introduction

In April 1770, the British Navy bark *Endeavour* entered Botany Bay, and Lieutenant James Cook and his crew stepped ashore at a small sandy beach that was, and continues to be, ‘country’ for the Dharawal people. Once ashore, Cook, the botanists Joseph Banks and Daniel Solander, and others, began eight days of exploration and encounter.

If you visit Kurnell today and try to picture the events and encounters that occurred in the 1770 landscape you may find it difficult. Certainly the landform as Cook saw it is still there, the foreshore, the sandy knolls and the stream of freshwater; it has not been overwhelmed by urban structures as has Governor Phillip’s landing site at Sydney Cove. At Kurnell the rocky foreshore and a small sandy beach still exist. But the native vegetation, that was the backdrop to the encounters, and had such an impact on the botanists, is but a faint shadow of its original form. Much of the foreshore area today is mown grass; while the *Banksia* scrub of 1770 has virtually disappeared, replaced by a towering forest of Norfolk Island Pines and Australian rainforest trees introduced during more than a century of tree planting by

visiting dignitaries and well-meaning beautification projects. The place is green, neat and tidy, a nice parkland, but what has been lost is the essence of the original landscape, a sense of the landscape of encounter, both botanical and human, that Cook, Banks and Solander found themselves immersed in. Which is sad, because it has certainly been a well-loved site, as indicated by the tree planting and the tidiness!

Yet, if you search carefully you will find some elements of the original vegetation; descendants of some of the plants that astounded the young enthusiastic Banks. Up on the southern sandy knoll is the best place to search, amongst the many weed species that dominate the site. The untrained eye can be tricked by the vegetation here, as it includes gum trees that might seem to be native but are actually Tallowwoods, *Eucalyptus microcorys*, native to the forests of the north coast of NSW, but not to the sandhills of Botany Bay (Benson & Eldershaw 2005).

In order to connect with and understand the events of 1770, and the beginnings of scientific study in eastern Australia, we need to be able to experience some of that landscape of encounter for ourselves. But can we regenerate the native

bushland of this important site? Can we restore the vegetation as it was at the time of the *Endeavour's* visit? We can certainly restore some of the area, using bush regeneration techniques and additional planting, but what about the remnant *Banksia* scrub that is now overtopped by 10–20 m high exotic Pines. The Pines make the area more like a piece of Norfolk Island, a place never visited by Cook, or perhaps more like a place from *Walking with Dinosaurs*. Should Pines be removed, to reinstate the lower tree height of the original vegetation?

The answer is not simple. Since 1770 there has been more than 200 years of landscape change; Governor Phillip's short stay with the First Fleet in 1788, farming and grazing from 1815 to 1900, holidaying and picnicking from 1900 to the present, and of course the commemoration of Cook's landing and other events, by the ceremonial planting of many of the trees that are now so conspicuous. These are legitimate layers of the history of the site, and an awareness of them will enrich visitor experiences. Indeed an awareness of these layers is essential if we are to appreciate the site as more than nice parkland.

The vegetation, both the natural vegetation remnants and the cultural plantings, reflect the layers of history of the site. We see this as a key factor in interpretation and visitor experience. Fundamental is the identification and selective rehabilitation of the 1770 landscape, reflecting layers of Aboriginal landscape and resource use, the setting for the first encounters and the first powerful impact of Australian ecosystems on European science.

In this paper we describe the vegetation of the 1770 landscape, focusing on Kurnell, based on primary historical sources and surviving remnant vegetation. We compile a list of the plant species that were collected at Botany Bay in 1770 by Banks and Solander, and describe the subsequent impact of their collections on the scientific world. We also suggest ways in which the remnant vegetation at Kurnell can be enhanced and restored to recreate some of the botanical and historical character of this important place. Some of the results of this paper are incorporated into the Botanic Gardens Trust website *The Botany of Botany Bay* www.rbg Syd.nsw.gov.au/information_about_plants/botanical_info/Botany_of_Botany_Bay

Location and geomorphic setting

When the *Endeavour* entered Botany Bay in 1770, the crew first stepped ashore on the south side of the bay, at a place approximately 2 km inland of the rocky headland. The landing site is on the Kurnell Peninsula (lat 34° 00' S, long 151° 13' E), about 16 km south of central Sydney (Fig. 1). The immediate area around the landing site was gazetted as a Public Reserve in 1899 and later known as the Captain Cook Landing Place Historic Site. The landing site is now within Botany Bay National Park, a 500 ha conservation park that includes most of the remaining natural bushland on the Kurnell Peninsula, as well as smaller areas at La Perouse on the northern headland of Botany Bay.

Though the area around the monuments associated with Cook's landing is now largely parkland, with planted trees and mown grass, the greater part of the National Park at Kurnell remains natural bushland. This bushland vegetation is mainly eucalypt woodland and sclerophyllous scrub, and is on sand dunes and Hawkesbury sandstone, with very low nutrient soils and naturally subject to periodic fire (Fig. 2). Several of the plant communities, including Kurnell Dune Forest, Swamp Sclerophyll Forest and Littoral Rainforest, are listed as Endangered Ecological Communities under the NSW *Threatened Species Conservation Act* 1995.

Pre-european Landscapes

Kurnell Peninsula is an unconsolidated sandy isthmus joining Cronulla to the sandstone rock-formed south headland of the Botany Bay entrance. The Peninsula has a complex geomorphic history beginning before the last interglacial. A number of palynological studies based on cores from the large fenlands and peatlands on the Kurnell Peninsula give an idea of the pre-history of the area (Martin 1994).

8000 years ago sea level would have been about 3m below present level, and the western part of the floor of Botany Bay would probably have been Pleistocene low dunes covered by sclerophyll woodland vegetation similar to that of the dunes at Kurnell today (Martin 1994). Pollen analysis from a residual fenland (with *Triglochin*, *Baumea*, *Sporadanthus*, *Villarsia*) near the present Oil Refinery by Martin shows that woodland cover with species of *Eucalyptus*, *Angophora costata*, *Banksia integrifolia/Banksia serrata* and species of *Allocasuarina* suffered losses about 5000 years ago, when a nearby coastal protobarrier was destabilised by rising sea-level, while rapidly-forming fen peat replaced slowly formed oxygen-depleted fine detritus. Over a 2000 year period woodland partly recovered, despite heavier or more frequent firing coincident with the entry of hunter-gathering aboriginal people. Minor destabilisation of local duneland about 1700 years ago brought fine sand into the fen basin. Dryland plant cover increased after this time but was mainly dominated locally by *Monotoca elliptical/Leptospermum laevigatum* scrub possibly linked to the higher population density, or greater continuity of tenure, of later Aboriginal people after 2000 years ago (Martin 1994).

Aboriginal landuse at the time of Cook's visit

At Kurnell, Cook landed in country of the Gweagal Aboriginal clan. The explorers tried to make contact with the local people but what eventuated was a failure of communication and no proper meeting occurred (Thomas 2003; Nugent 2005). However over the eight days the *Endeavour's* crew remained in the area, there were many encounters with Aboriginal people and in their journals, Cook and Banks provide descriptions of the appearance of the Aboriginal people and their spears, canoes and huts. They wrote of them as being scattered in small groups, and subsisting mainly on fish and shellfish. Frequent reference is made to their fires,

presumably their camp and cooking fires. *We saw them go into the woods where they lighted fires about a mile from us,* wrote Banks (on 30th April). On 3rd May Cook notes *There were Six Canoes and Six small fires near the shore, and Muscles roasting upon thim and a few Oysters laying near...* The journals give no indication that the Aboriginal people might have burnt the bush deliberately, nor do they mention any signs of past bushfires. It is assumed that the explorers' perspective on the look of the country would be dependent on the how recently the area had been burnt.

The visit of the *Endeavour* April 1770

The *Endeavour*, commanded by Lieutenant James Cook, had set sail from Greenwich in 1769, with a party of scientists lead by Joseph Banks and Dr Daniel Solander. After observing the transit of Venus at Tahiti, Cook made further explorations in the Pacific, including the circumnavigation of New Zealand, and then headed west towards the then unknown east coast of Australia. The *Endeavour* entered Botany Bay on 29th April 1770 and *Anchor'd under the South shore about 2 Mile within the entrence in 6 fathoms water...* During the following days excursions were made to various parts of Botany Bay including Bare Island, the La Perouse peninsula, Cooks River, the mouth of the Georges River and along the coast towards Cronulla.

The *Endeavour* departed on the 6th May, and sailed northward making several landings on the Queensland coast including a forced stay of nearly 2 months at the Endeavour River near Cooktown when the ship was severely damaged on a coral reef.

The Kurnell landscape of 1770

Cook, Banks and Solander landed at Kurnell on the afternoon of the 29th April 1770. The vegetation of the landing site however, is hardly mentioned in either Cooks' or Banks' journals which concentrate on the initial encounters with the Aboriginal occupants of the site. Fresh water was needed; water from a small hole dug in the sand was inadequate, so a site on the northern side of the Bay was searched, but water here in rock pools was difficult to get. The following morning Cook *sent a party of men a shore in the morning to the place where we first landed to dig holes in the sand by which means and a small stream they found fresh water sufficient to water the ship.*

On the 1st May, after the burial of seaman Forby Sutherland (a sailor who had died of consumption) near the watering place, Cook, Banks and Solander *made an excursion into the country which we found deversified with woods, Lawns and Marshes; the woods are free from under wood of every kind and the trees are at such a distance from one a nother that the whole Country or at least great part of it might be cultivated without being oblig'd to cut down a single tree; we found the soil every where except in the Marshes to be a light white sand and produceth a quant[it]y of good grass which grows in little tufts about as big as one can hold in ones hand and pretty close to one another, in this manner the surface of the ground is coated in the woods between the trees...*

I saw some trees that had been cut down by the natives with some sort of blunt instrument and several trees that were barked the bark of which had been cut by the same instrument, in many of the trees, especially the palms, were cut steps about 3 or 4 feet asunder for the conveniency of

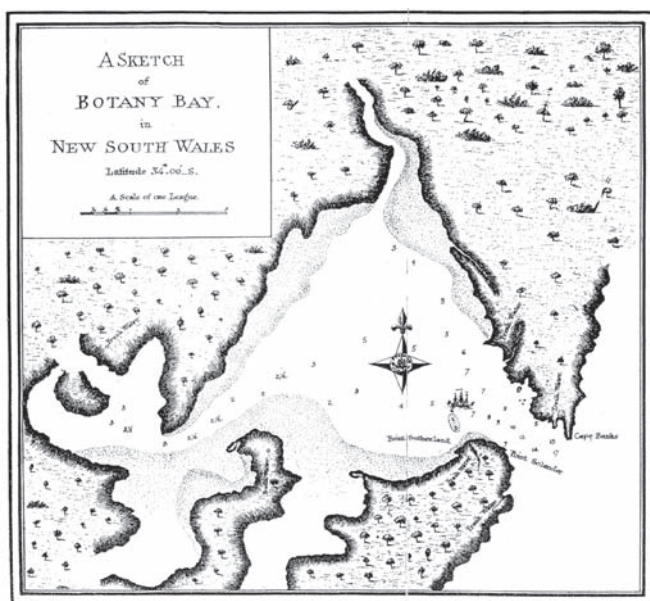


Fig. 1a. James Cook's 1770 map of Botany Bay.



Fig. 1b. Current Locality map showing the Kurnell landing place site and other features around Botany Bay.

climeing them. We found 2 sorts of Gum one sort of which is like Gum Dragon and is the same I suppose Tasman took for gum lac, it is extracted from the largest tree in the woods. (Cook's Journal)

The trees that had been "barked", presumably for Aboriginal canoes or shields, could have been rough-barked Eucalypts like *Eucalyptus robusta* or *Eucalyptus botryoides*, or perhaps *Casuarina glauca* or *Avicennia marina*. The palms would have been *Livistona australis* and the Gum trees, probably *Corymbia gummifera* or *Angophora costata*.

Banks version of this trip is similar. ...walkd till we completely tird ourselves, which was in the evening, seeing by the way only one Indian who ran from us as soon as he saw us. The soil wherever we saw it consisted of either swamps or light sandy soil on which grew very few species of trees, one which was large yielding a gum much like *sanguis draconis*, but every place coverd with vast quantities of grass. The gum tree he describes was probably the Red Bloodwood *Corymbia gummifera*, of which a specimen was collected at Botany Bay.

The party presumably left the watering place at Kurnell and travelled southwest, somewhere along the route of the present Captain Cook Drive toward Woolooware or Caringbah. They do not mention the sandhills behind Cronulla beach nor the sandstone heath of Endeavour Heights, so they may have kept close to Woolooware Bay, though they do not mention Mangroves either.

Their description of woods, lawns and marshes, with the woods free of underwood and open and easily cultivable, together with the accounts of vast quantities of grass have always been puzzling. It is likely that the areas they refer to had silty organic soils with areas of swamp forest or woodland. This may have been relatively open with occasional large trees. However areas of true grassland are relatively rare on sandy soils where one would have expected shrubs and sedges to predominate. Grass would be frequent on the clay soils further up the peninsula towards Sutherland, but they surely would have recorded the red coloured clay soils if they had gone that far.

There were evidently grassy areas near the landing place as some of the crew were also occupied as grasscutters and hay cutter collecting fodder for stock kept on the ship, with Banks recording, on 30th April *Our people went ashore as usual, Dr Solander and myself into the woods. The grasscutters were farthest from the body of the people:* It is not clear what species of grass were being collected.

However grasslike plants or graminoids (in the Sedge or Rush families Cyperaceae, Restionaceae, Juncaceae) would have been abundant in sandy wet places at Kurnell, while in the king-tide and storm-surge zone of the *Casuarina glauca* forest there was probably the grass *Sporobolus virginicus* and possibly *Zoysia macrantha*.

In swamp forest and swamp on similar sandy soil at Myall Lakes, well north of Botany Bay, the only true grasses

are *Oplismenus imbecillus* and *Hemarthria uncinata* (Myerscough & Carolin 1986). There are also limited areas of Sand Grassland at Myall Lakes on steep, ocean-facing slopes with grasses including *Themeda australis*, *Imperata cylindrica* and *Cymbopogon refractus*. In swamp forest at Myall Lakes graminoid species include *Baumea juncea*, *Baumea rubiginosa*, *Chorizandra cymbaria*, *Gahnia clarkei*, *Gahnia sieberiana*, *Schoenus brevifolius*, *Schoenus maschalinus*, *Empodisma minus*, *Baloskion tetraphyllum* and *Juncus continuus*, all of which have also been recorded on the Kurnell Peninsula (Coveny 1960–1980).

It would appear therefore that the grass is either sedges or some grassy understorey in swamp forest. There are no grasses on the list of Banks specimens confirmed as being collected at Botany Bay, and the only grasslike species are *Baloskion tetraphyllum*, *Schoenus ericetorum*, *Schoenus paludosus* and *Lomandra glauca*. However a number of the Banks' specimens at the National Herbarium of NSW, including 29 grass species, have no indication of where in New Holland they were collected. Nine of these could have been collected at Botany Bay (Table 1).

Other excursions around the Bay: general impressions of the vegetation

During the eight days they spent in Botany Bay, visits and plant collecting were made to various parts of the bay, including Bare Island (Banks 29th April); *the Sea Coast to the south* (Cook, Banks and Solander 3rd May); *the head of the Bay* (Cook, Solander and Munkhouse 3rd May); *ashore on the NW side of the bay* (Banks 4th May); and *the North shore,... 3 or 4 miles into the Country or rather along the Sea Coast* (Cook 5th May).

However there are relatively few references to the vegetation and landscape in Banks' journal which is concerned mainly with descriptions of interactions with the Aboriginal people; his and Solander's botanical descriptions of the specimens collected were recorded separately from the journal entries.

The journal of the *Endeavour* artist, Sydney Parkinson (1773), includes a brief description of the general landscape of Botany Bay with similar comments to those of Banks and Cook,

The country is very level and fertile; the soil, a kind of grey sand; and the climate mild: and though it was the beginning of winter when we arrived, every thing seemed in perfection. There is a variety of flowering shrubs; a tree that yields gum; and a species of palm, [Borasus flabellifer,] the berries of which are of two sorts; one small, eaten by the hogs, and the other, as large as a cherry, has a stone in it; it is of a pale crimson colour, and has the taste of a sweet acid. We also found a species of Salvia Fortea. The palm doubtless refers to the fan palm Livistona australis, but the berry, as large as a cherry probably refers to the fruit of Syzygium paniculatum, which was brought back by Solander (see below). Salvia Fortea may refer to Plectranthus parviflorus, an herbaceous plant of moist sheltered sites that Banks collected at Botany Bay.

Cook's journal however includes the best landscape descriptions. On 3rd May Cook went with Solander and Dr Munkhouse *to the head of the Bay*, landed and traveled some distance inland. *We found the face of the Country much the same as I have before described but the land much richer, for in stead of sand I found in many places a deep black Soil which we thought was capable of produceing any kind of grain, at present it produceth besides timber as fine meadow as ever was seen. However we found it not all like this, some few places were very rocky but I believe this to be uncommon;*

Where was the head of the Bay? Was it the mouth of the Georges River or the Cooks River? Bertie (1925) argues that it was the Georges River and that the *deep black soil* and *meadow* were near Sans Souci, in the hind-dune swamps later known as Patmores Swamp. Colin Gibson (pers. com. 2006) suggests that they may have landed at the head of Kogarah Bay and traveled inland as far as Allawah or Hurstville, where they would have seen the grassy open-forest on the Wianamatta Shale ridge. The collection of the clay-soil species *Calotis lappulacea* and *Glycine tabacina* could have been made there. However Cook was right that while most of the country was sandy, there were places with better silty

alluvial soils. It seems however that Banks subsequently exaggerated their extent in his enthusiastic advice on Botany Bay as a suitable place for settlement.

Cook's *Journal* (6th May) provides a final summary of the landscape of Botany Bay;

altho wood [for fuel] is here in great plenty yet there is very little variety, the largest trees are as large or larger than our oaks in England and grows a good deal like them and yields a redish gum, the wood itself is heavy hard and black like Lignum Vitae; another sort that grows tall and strait some thing like Pines, the wood of this is hard and Ponderous and something of the nature of American live oaks, these two are all the timber trees I met with. There are a few sorts of shrubs and several Palm trees, and Mangroves about the head of the harbour. The country is woody low and flat as far inland as we could see and I believe that the soil is in general sandy, in the wood are a variety of very boutifull birds such as Cocatoo's, Lorryquets, Parrots &c and Crows exactly like those we have in England. Water fowl are no less plenty about the head of the harbour where there are large flats of sand and Mud on which they seek their food, ...('large' intertidal sand and mudflats are relatively rare in Botany Bay today)



Fig. 2. Scrub along the sandstone foreshores of Inscription Point in 2006 is still much as it was when the *Endeavour* entered Botany Bay in 1770.

So in Cook's view there were two timber trees (the eucalypts and *Casuarina glauca*), several Palms (*Livistona australis* and presumably the cycad *Macrozamia communis*), Mangroves (presumably *Avicennia marina*, though *Aegiceras corniculatum* also grows in the Bay) and a few sorts of shrubs. Banks would have disagreed about this underestimate of the shrubs. By this time he was amassing and processing a huge number of specimens, the result of which was later to persuade Cook to change the name of the bay from Sting-Ray Bay to Botanist Bay and subsequently Botany Bay (Nugent 2005). He also recognised the efforts of the botanists by naming the headlands of Botany Bay, Cape Banks and Point (now Cape) Solander.

The Botany Bay plant specimens

Banks and Solander had certainly collected enthusiastically at Botany Bay. On May 3rd Banks reported *Our collection of plants was now grown so immensely large that it was necessary that some extraordinary care should be taken of them lest they should spoil in the books. I therefore devoted this day to that business and carried all the drying paper, near 200 Quires of which the larger part was full, ashore and spreading them upon a sail in the sun kept them in this manner exposed the whole day, often turning them and sometimes turning the Quires in which were plants inside out.* Despite this, the very next day Banks was back again collecting in the bush, *May 4th Myself in the woods botanizing as usual,...*

A definitive list of the plants collected by Banks and Solander at Botany Bay in 1770 was never formally published. What happened?

In July 1771 Banks and Solander returned to London with an immense amount of material, the botanical part of which, for the most part, already had written descriptive tickets drawn up by Solander. Solander took up residence in Banks' house as botanist-librarian. The descriptive tickets were arranged in systematic order, and transcribed for publication, but formal publication was never achieved. Other botanists including Carolus Linnaeus (the son of Linnaeus) and Joseph Gaertner, a visiting German botany professor, also had access to the material.

Adding to their botanical descriptions was the artwork of Sydney Parkinson, botanical artist on the *Endeavour*, who produced 280 finished and botanically accurate paintings and over 900 sketches and drawings before his death at sea in 1771. About 700 plates were engraved on copper in folio at Banks' expense, and a few prints or proofs were taken, but they too were not published at the time (Hooker quoted in Maiden 1909).

Solander's death in 1782, Banks' devotion to his duties as President of the Royal Society and his involvement with the King's Garden at Kew, as well as economic recession and the wars with France, all probably contributed to the failure of the work to be completed.

The collections were looked after by the botanist-librarian Jonas Dryander (1748–1810) until 1810, and from then on by the botanist Robert Brown (1773–1858). Upon the death of Banks in 1820, Brown inherited Banks' herbarium, library and papers, together with the instruction that they go to the Trustees of the British Museum upon Brown's death. Brown transferred the collections to the British Museum and in 1827 became the first Keeper of the Botanical Department.

In the meantime Sydney plants were being described by other botanists, from specimens and plants grown from seed sent back by the First Fleet, or Spanish and French expeditions. For example, English botanist Sir James Edward Smith (also a friend of Banks) received specimens from Surgeon-General John White in NSW.

Banks himself was perhaps more influential than his specimens. The site at Botany Bay was chosen for a convict settlement largely on his recommendations (though it was later passed over in favour of Port Jackson), and he corresponded with the first governors and sent out a series of naturalists and horticulturalists to the new colony. Among these was Robert Brown, who sailed as a naturalist aboard the *Investigator*. After 1½ years circumnavigating New Holland he spent 3 months in Port Jackson (Sydney). Brown returned to England in 1805 and spent his time clarifying and describing his vast collection of specimens. Brown's descriptions, based mainly upon his own field observations and specimens, are acknowledged as providing the first systematic account of the Australian flora.

As a result, the specimens collected at Botany Bay by Banks and Solander in 1770 did not play a major role in the subsequent systematic description of the Australian flora, and do not include the large number of taxonomic type specimens that might be expected for a major scientific expedition into new territory. However, material collected by Banks in Botany Bay did provide the type specimen for the iconic genus *Banksia* whose type species, *Banksia serrata*, as well as *Banksia integrifolia* and *Banksia ericifolia*, were described by the younger Linnaeus in 1781 in honour of Banks (George 1981).

Joseph Gaertner's visit to Banks in 1778 led to Banks and Solander's material, or the illustrations based on it, being cited as types for a number of species including *Corymbia gummifera*, *Leptospermum arachnoides*, *Leptospermum laevigatum*, *Leptospermum squarrosus*, *Angophora costata*, *Melaleuca armillaris*, *Melaleuca nodosa*, *Syzygium paniculatum* and *Philydrum lanuginosum*. Most recently, reassessment of *Viola hederacea* complex by Thiele and Prober (2003) has included the description of the new taxon *Viola banksii*, citing Banks' Botany Bay collection as a type. The species is still growing wild at Kurnell near Cook's stream.

The Banks and Solander collection is now held in the British Museum (now the Natural History Museum), but in the late 19th century some duplicate material was donated to other institutions relevant to the *Endeavour* voyage. The

National Herbarium of New South Wales received some 600 specimens. A list of 550 species was published at the time (Maiden 1905), including material from Queensland (labelled variously Bustard Bay, Bay of Inlets, Palm Island and Endeavour River) as well as Botany Bay. The material was broken up as a collection and incorporated into the Herbarium with other material of the same species. As a result, it was not possible to access a complete list of the material until it was again separated out in the 1990s, redetermined with current names, databased and maintained as a separate historical collection.

Listing the plants collected by Banks and Solander at Botany Bay

It is of great interest to know how Botany Bay looked in 1770 and what plants were actually collected there. In researching vegetation patterns in the Sydney district (e.g. for publications such as Benson & Howell 1990), we have previously referred to a list entitled *Plants Collected by Banks*

and Solander at Botany Bay in 1770. This list was originally appended to *Captain Cooks Landing Place Historic Site Plan of Management* (1975). No author is given, but we have always understood that it was compiled prior to the 1770–1970 Cook Bicentenary by Royal Botanic Gardens Sydney botanist, Don J. McGillivray, *Grevillea* expert and enthusiastic botanical historian (McGillivray circa 1970). It is understood that McGillivray's list was based on material held in the British Museum and accessed when he was botanical liaison officer at Kew in 1969–70 (this view is supported by McGillivray's later co-worker Bob Makinson, pers. com 2005).

Unaware of McGillivray's list, a horticulture student in the UK, Susan Edwards, has recently pointed out the absence of a list of Botany Bay specimens and prepared a list based on specimens in the British Museum (Edwards 2004). Edwards appears to have had access to the same British Museum material available to McGillivray, but has included some additional material. She has not had access to the National Herbarium of NSW material.

Table 1. Species collected by Banks and Solander in 1770 at Botany Bay (including Kurnell and La Perouse), based on records at the British Museum (McGillivray, Edwards) and on specimens held in the National Herbarium of NSW.

Record source McG=McGillivray (1969–70), Ed= Edwards 2004, NSW= National Herbarium of NSW. Recent Kurnell records confirm species as native to Botany Bay area. NC= New South Wales North Coast

| Species | Family | 1770 Botany Bay record source | Recent Kurnell record | Nearest record if not Kurnell |
|---|------------------|-------------------------------|-----------------------|-------------------------------|
| Ferns and gymnosperms | | | | |
| <i>Blechnum camfieldii</i> | Blechnaceae | NSW | 2004 | |
| <i>Blechnum indicum</i> | Blechnaceae | NSW | 2004 | |
| <i>Cyclosorus interruptus</i> | Thelypteridaceae | NSW | 1917 | |
| <i>Lycopodiella lateralis</i> | Lycopodiaceae | NSW | - | Austinmer |
| <i>Macrozamia communis</i> | Zamiaceae | NSW | 2004 | |
| <i>Pteridium esculentum</i> | Dennstaedtiaceae | NSW | 2004 | |
| Dicotyledons | | | | |
| <i>Acacia longifolia</i> | Fabaceae | McG, Ed, NSW | 2004 | |
| <i>Acacia suaveolens</i> | Fabaceae | McG, Ed, NSW | 2004 | |
| <i>Acacia terminalis</i> subsp. <i>terminalis</i> | Fabaceae | McG, Ed, NSW | - | La Perouse |
| <i>Acacia ulicifolia</i> | Fabaceae | McG, Ed, NSW | 2004 | |
| <i>Actinotus helianthi</i> | Apiaceae | McG, Ed | 2004 | |
| <i>Actinotus minor</i> | Apiaceae | Ed | 1981 | |
| <i>Allocasuarina distyla</i> | Casuarinaceae | NSW | 2004 | |
| <i>Allocasuarina littoralis</i> | Casuarinaceae | Ed, NSW | 1977 | |
| <i>Angophora costata</i> | Myrtaceae | NSW | 2004 | |
| <i>Aotus ericoides</i> | Fabaceae | McG, Ed, NSW | 2004 | |
| <i>Astroloma pinifolium</i> | Ericaceae | NSW | 2004 | |
| <i>Atriplex cinerea</i> | Chenopodiaceae | Ed | - | Five Islands |
| <i>Avicennia marina</i> | Verbenaceae | Cook's jnl | 2004 | Towra Point, Cooks River |
| <i>Baeckea imbricata</i> | Myrtaceae | McG, Ed, NSW | 2004 | |
| <i>Banksia ericifolia</i> | Proteaceae | McG, Ed, NSW | 2004 | |
| <i>Banksia integrifolia</i> | Proteaceae | McG, Ed, NSW | 2004 | |
| <i>Banksia serrata</i> | Proteaceae | McG, Ed, NSW | 2004 | |
| <i>Bauera capitata</i> | Baueraceae | McG, Ed | - | La Perouse |
| <i>Bauera rubioides</i> | Baueraceae | McG, Ed | - | La Perouse |
| <i>Bidens pilosa</i> | Asteraceae | NSW | 2004 | |
| <i>Boronia parviflora</i> | Rutaceae | McG, Ed | 1981 | |
| <i>Boronia pinnata</i> | Rutaceae | McG, Ed | - | Rose Bay |

| Species | Family | 1770 Botany Bay record source | Recent Kurnell record | Nearest record if not Kurnell |
|---|---------------|-------------------------------|-----------------------|-------------------------------|
| <i>Bossiaea heterophylla</i> | Fabaceae | McG,Ed | 2004 | |
| <i>Breynia oblongifolia</i> | Euphorbiaceae | NSW | 2004 | |
| <i>Callistemon citrinus</i> | Myrtaceae | McG, Ed, NSW | 2004 | |
| <i>Calotis lappulacea</i> | Asteraceae | McG, Ed, NSW | - | Como, Hurstville |
| <i>Cassytha pubescens</i> | Lauraceae | NSW see text | 1977 | |
| <i>Comesperma ericinum</i> | Polygalaceae | McG,Ed | 1981 | |
| <i>Correa alba</i> | Rutaceae | McG,Ed | 1981 | |
| <i>Correa reflexa</i> | Rutaceae | McG, Ed, NSW | - | La Perouse |
| <i>Corymbia gummifera</i> | Myrtaceae | NSW | 2004 | |
| <i>Cryptandra amara</i> | Rhamnaceae | McG, Ed, NSW | 1981 | |
| <i>Dampiera stricta</i> | Goodeniaceae | Ed, NSW | 1981 | |
| <i>Darwinia fascicularis</i> | Myrtaceae | McG, Ed | 1981 | |
| <i>Desmodium rhytidophyllum</i> | Fabaceae | Ed | 1977 | |
| <i>Drosera binata</i> | Droseraceae | McG,Ed | 1981 | |
| <i>Epacris longiflora</i> | Ericaceae | McG, Ed, NSW | 2004 | |
| <i>Epacris microphylla</i> | Ericaceae | McG, Ed, NSW | 1981 | |
| <i>Epaltes australis</i> | Asteraceae | NSW | 1977 | |
| <i>Eriostemon buxifolius</i> | Rutaceae | McG,Ed | 1981 | |
| <i>Exocarpos cupressiformis</i> | Santalaceae | McG,Ed | 1977 | |
| <i>Geranium homeanum</i> | Geraniaceae | NSW | 2004 | |
| <i>Glossogyne tannensis</i> | Asteraceae | NSW see text | - | Glenfield |
| <i>Glycine tabacina</i> | Fabaceae | Ed | - | Penshurst |
| <i>Goodenia ovata</i> | Goodeniaceae | McG,Ed | 1977 | |
| <i>Goodenia paniculata</i> | Goodeniaceae | McG,Ed | 1981 | |
| <i>Grevillea mucronulata</i> | Proteaceae | McG, Ed, NSW | 2004 | |
| <i>Hakea dactyloides</i> | Proteaceae | McG, Ed, NSW | 1981 | |
| <i>Hakea gibbosa</i> | Proteaceae | McG,Ed | 1977 | |
| <i>Hakea teretifolia</i> | Proteaceae | McG,Ed | 1981 | |
| <i>Hardenbergia violacea</i> | Fabaceae | Ed | 1977 | |
| <i>Hemigenia purpurea</i> | Lamiaceae | McG, Ed, NSW | 1977 | |
| <i>Hibbertia scandens</i> | Dilleniaceae | McG,Ed | 2004 | |
| <i>Hybanthus monopetalus (filiformis)</i> | Violaceae | McG,Ed | 2004 | |
| <i>Isopogon anemonifolius</i> | Proteaceae | McG,Ed | 1981 | |
| <i>Isopogon anethifolius</i> | Proteaceae | McG,Ed | 1977 | |
| <i>Kennedia rubicunda</i> | Fabaceae | McG,Ed | 2004 | |
| <i>Lambertia formosa</i> | Proteaceae | McG,Ed | - | La Perouse |
| <i>Lepidium pseudohyssopifolium</i> | Brassicaceae | NSW see text | - | Five Islands |
| <i>Leptospermum arachnoides</i> | Myrtaceae | NSW | 1981 | |
| <i>Leptospermum juniperinum</i> | Myrtaceae | McG | 1977 | |
| <i>Leptospermum laevigatum</i> | Myrtaceae | NSW | 2004 | |
| <i>Leptospermum polygalifolium</i> | Myrtaceae | NSW | 1977 | |
| <i>Leptospermum squarrosum</i> | Myrtaceae | McG, Ed, NSW | 1977 | |
| <i>Leptospermum trinervium</i> | Myrtaceae | McG, Ed, NSW | 2004 | |
| <i>Leucopogon ericoides</i> | Ericaceae | McG, Ed, NSW | 2004 | |
| <i>Leucopogon virgatus</i> | Ericaceae | McG,Ed | - | La Perouse |
| <i>Lobelia dentata</i> | Lobeliaceae | McG, Ed | - | Como |
| <i>Lobelia gracilis</i> | Lobeliaceae | Ed | 1907 | |
| <i>Melaleuca armillaris</i> | Myrtaceae | McG,Ed | 2004 | |
| <i>Melaleuca nodosa</i> | Myrtaceae | McG,Ed | 2004 | |
| <i>Melaleuca thymifolia</i> | Myrtaceae | McG,Ed | 1981 | |
| <i>Melanthera biflora [Wedelia]</i> | Asteraceae | Ed | - | Cronulla |
| <i>Mitrasacme polymorpha</i> | Loganiaceae | Ed, NSW | 1977 | |
| <i>Monotoca scoparia</i> | Ericaceae | NSW | 1981 | |
| <i>Opecularia aspera</i> | Rubiaceae | McG, Ed, NSW | 1977 | |
| <i>Oxylobium cordifolium</i> | Fabaceae | McG, Ed, NSW | 2004 | |
| <i>Pandorea pandorana</i> | Bignoniaceae | McG, Ed | 1977 | |
| <i>Pelargonium australe</i> | Geraniaceae | NSW | - | La Perouse |
| <i>Persoonia lanceolata</i> | Proteaceae | McG, Ed, NSW | 2004 | |
| <i>Persoonia levis</i> | Proteaceae | McG, Ed, NSW | 1981 | |
| <i>Petrophile pulchella</i> | Proteaceae | NSW | 1981 | |
| <i>Philotheca salsolifolia</i> | Rutaceae | McG, Ed, NSW | 1981 | |
| <i>Pimelea linifolia</i> | Thymelaeaceae | McG,Ed | 2004 | |
| <i>Platysace ericoides</i> | Apiaceae | McG,Ed | 1981 | |
| <i>Platysace lanceolata</i> | Apiaceae | McG,Ed | 2004 | |
| <i>Plectranthus parviflorus</i> | Lamiaceae | McG, Ed, NSW | 2004 | |

| Species | Family | 1770 Botany Bay record source | Recent Kurnell record | Nearest record if not Kurnell |
|---|------------------|-------------------------------|-----------------------|-------------------------------|
| <i>Pomax umbellata</i> | Apiaceae | McG,Ed | 2004 | |
| <i>Poranthera microphylla</i> | Euphorbiaceae | McG,Ed | 1977 | |
| <i>Pratia purpurascens</i> | Lobeliaceae | McG,Ed | 1977 | |
| <i>Rhagodia candolleana</i> (incl <i>baccata</i>) | Chenopodiaceae | McG, Ed, NSW | - | Lady Robinsons Beach |
| <i>Ricinocarpos pinifolius</i> | Euphorbiaceae | Ed, NSW | 2004 | |
| <i>Rumex brownii</i> | Polygonaceae | NSW | 1977 | |
| <i>Scaevola calendulacea</i> | Goodeniaceae | Ed | 1981 | |
| <i>Scaevola ramosissima</i> | Goodeniaceae | Ed | 1977 | |
| <i>Senecio linearifolius</i> | Asteraceae | NSW | - | Ingleburn |
| <i>Stackhousia viminea</i> | Stackhousiaceae | McG,Ed | - | La Perouse |
| <i>Stephania japonica</i> | Menispermaceae | NSW | - | La Perouse |
| <i>Stylidium graminifolium</i> | Stylidiaceae | McG,Ed | 1977 | |
| <i>Styphelia viridis</i> | Ericaceae | McG,Ed | 1977 | |
| <i>Symphionema paludosum</i> | Proteaceae | McG, Ed, NSW | - | La Perouse |
| <i>Synoum glandulosum</i> | Meliaceae | McG,Ed | 1906 | |
| <i>Syzygium paniculatum</i> | Myrtaceae | Bank's jnl | 2006 | also Towra Point |
| <i>Utricularia biloba</i> | Lentibulariaceae | McG,Ed | - | La Perouse |
| <i>Vernonia cinerea</i> | Asteraceae | NSW see text | 1977 | |
| <i>Viola banksii</i> (prev <i>hederacea</i>) | Violaceae | McG, Ed, NSW | 2004 | |
| <i>Westringia fruticosa</i> | Lamiaceae | McG,Ed | 2004 | |
| <i>Woollsia pungens</i> | Ericaceae | McG, Ed, NSW | 1981 | |
| <i>Xanthosia pilosa</i> | Apiaceae | McG,Ed | 1981 | |
| <i>Xylomelum pyriforme</i> | Proteaceae | McG,Ed | 2004 | |
| <i>Zieria pilosa</i> (pinnata) | Rutaceae | McG,Ed | 1977 | |
| Monocotyledons | | | | |
| <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyus</i> | Restionaceae | NSW | 2004 | |
| <i>Blandfordia nobilis</i> | Blandfordiaceae | McG, Ed | 1981 | |
| <i>Commelina cyanea</i> | Commelinaceae | NSW | 2004 | |
| <i>Eustrephus latifolius</i> | Philesiaceae | McG,Ed | 2004 | |
| <i>Lepidosperma concavum</i> | Cyperaceae | NSW | 1981 | |
| <i>Leptocarpus tenax</i> | Restionaceae | NSW | 1981 | |
| <i>Livistona australis</i> | Arecaceae | Ed, Cook's jnl | 1977 | |
| <i>Lomandra glauca</i> | Lomandraceae | NSW | 1981 | |
| <i>Lomandra longifolia</i> | Lomandraceae | McG,Ed | 2004 | |
| <i>Patersonia sericea</i> | Iridaceae | Ed | - | Kogarah |
| <i>Prasophyllum striatum</i> | Orchidaceae | McG,Ed | - | Royal NP |
| <i>Pterostylis revoluta</i> | Orchidaceae | McG, Ed | 1989 | |
| <i>Schoenus ericetorum</i> | Cyperaceae | NSW | 1977 | |
| <i>Schoenus paludosus</i> | Cyperaceae | NSW | - | La Perouse |
| <i>Triglochin procera</i> | Juncaginaceae | McG,Ed | 1981 | |
| Grasses that may have been collected from Botany Bay | | | | |
| <i>Cymbopogon refractus</i> | Poaceae | NSW -no locality | 1977 | |
| <i>Digitaria parviflora</i> | Poaceae | NSW -no locality | 1977 | |
| <i>Eragrostis brownii</i> | Poaceae | NSW -no locality | 1981 | |
| <i>Imperata cylindrica</i> | Poaceae | NSW -no locality | 1981 | |
| <i>Oplismenus aemulus</i> | Poaceae | NSW -no locality | 1977 | |
| <i>Paspalum vaginatum</i> | Poaceae | NSW -no locality | - | Como, Cooks River, |
| Maroubra | | | | |
| <i>Phragmites australis</i> | Poaceae | NSW -no locality | 1977 | |
| <i>Sporobolus virginicus</i> | Poaceae | NSW -no locality | 2006 | |
| <i>Themeda australis</i> | Poaceae | NSW -no locality | 1981 | |
| Unlikely to be from Botany Bay | | | | |
| <i>Calandrinia calyptrata</i> | Portulacaceae | Ed | - | Ingleburn; Hilltop |
| <i>Acacia leiocalyx</i> | Fabaceae | Ed | - | Whale Beach; Qld |
| <i>Acmella grandiflora</i> | Asteraceae | Ed | - | Lismore; Qld |
| <i>Wedelia spilantheidoides</i> | Asteraceae | Ed | - | NC; Qld |
| <i>Chamaesyce macgillivrayi</i> | Euphorbiaceae | Ed | - | NC; Qld |
| <i>Melastoma affine</i> | Melastomataceae | Ed | - | Kempsey; Qld |
| <i>Drosera indica</i> | Droseraceae | Ed | - | Qld |
| <i>Cycas media</i> | Zamiaceae | Ed | - | Qld |
| <i>Acacia legnosa?</i> | Fabaceae | Ed | - | |
| <i>Dodonaea polyandra?</i> | Sapindaceae | Ed | - | |

We have therefore combined the recently available NSW herbarium collections for Botany Bay with the lists of McGillivray and Edwards together with a few references to plants in Banks' and Cook's journals (Table 1). Of this list, 80 of the species are common to the British Museum lists of McGillivray and Edwards, with 31 of these also represented in the National Herbarium of NSW specimens. An additional 37 species held in the National Herbarium of NSW can be added to the definitive 1770 list. A further 21 species are listed by Edwards alone and 1 by McGillivray. Of these, 12 have been subsequently recorded in the Botany Bay area, including McGillivray's record of *Leptospermum juniperinum*. The other 10 recorded by Edwards are more likely to have been collected in Queensland or their identification is uncertain. *Lepidium pseudohyssopifolium* is not definitively labeled as being collected at Botany Bay though the specimen at NSW has been annotated by LAS Johnson as being most likely, based on its natural geographic distribution. A similar case applies to *Geranium homeanum*, *Cassyltha pubescens* and *Utricularia biloba*.

We conclude with a definitive list of 132 species either collected, or noted by Banks and Solander at Botany Bay in 1770. A list of at least 130 species for eight days collecting in April (not the best flowering time of year) for Botany Bay was not a bad effort. This however is likely to be a minimal list. The list is limited for monocotyledons, only 12 species, and for ferns 5 species. There are no grasses on the list, though the Banks and Solander specimens at NSW include 9 species (Table 1) which could have been collected either at Botany Bay, or in Queensland. No locality is attached. Many plant specimens were collected in North Queensland when the *Endeavour* was repaired near Cooktown, and some specimens are labelled with multiple places (e.g. *Botany Bay*, *Bustard Bay*, *Bay of Inlets*).

Were all the collections made at Kurnell?

There are no indications of where particular species were collected around Botany Bay (specimens are at best simply labelled *Botany Bay*), but various day excursions by Cook, Banks or Solander were made to different parts of the Bay. While most of the species listed have been subsequently recorded on the Kurnell Peninsula near the landing place (for example by Coveny 1960–1980, Adam & King 1981), many are relatively widespread in the Sydney area and could have come from many places around the Bay.

A number of species however have narrow habitat requirements and provide evidence for collections at Botany Bay sites other than Kurnell. *Bauera capitata*, now a NSW North Coast species, has only ever been recorded in the Sydney area from La Perouse, on the northern side of the Bay (it was last recorded in 1913 and is now extinct there). *Bauera rubioides*, though generally more widespread has also been recorded from La Perouse. Neither species has been recorded from Kurnell. These species are likely to have been collected on the La Perouse peninsula.

Other species collected in 1770 and since recorded as occurring at La Perouse, but not Kurnell, are *Lambertia formosa*, *Leucopogon virgatus*, *Stackhousia viminea*, *Utricularia biloba* and *Schoenus paludosus*. These species are likely to have been collected from Eastern Suburbs Banksia Scrub vegetation that is restricted to sand deposits on the northern side of Botany Bay, particularly between Botany and La Perouse. For example on the 4th May, Banks is *ashore on the NW side of the bay, where we went a good way into the country which in this place is very sandy and resembles something our Moors in England, as no trees grow upon it but every thing is covered with a thin brush of plants about as high as the knees.* (Banks' Journal). This may have been some of the Eastern Suburbs Banksia scrub near Botany.

Other listed species not subsequently recorded at Kurnell, *Calotis lappulacea*, *Glossogyne tannensis*, *Senecio linearifolius* and probably *Glycine tabacina*, have their nearest known occurrences further inland up the Georges River, particularly at Ingleburn and Glenfield. These are species that generally grow on clay soils such as on the Wianamatta Shale, but may have grown in alluvial forests on the Georges or Cooks Rivers closer to Botany Bay, or on the shale ridgetops near Hurstville, such as was visited by Cook and Solander on 3rd May.

During an excursion to *various parts of the harbour* on 3rd May, Cook and Solander *found also several trees which bore fruit of the Jambosa kind, much in colour and shape resembling cherries. Of these they ate plentifully, and brought home also abundance, which we ate with pleasure, though they had little to recommend them but a slight acid.* writes Banks of presumably, *Syzygium paniculatum*. Presumably this had not been seen near the landing place, although it still grows in the Towra Point part of Botany Bay. As it is cited as a type specimen, a specimen must have been collected, but it has not turned up in our specimen list.

Species which might have been collected on the same excursion are *Rhagodia candolleana*, found on beach dunes, such as on Lady Robinsons Beach and *Lobelia dentata*, a species of sandstone ridges that is conspicuous after fire but not evident in long unburnt sites. It might have been collected in the lower Georges River.

Several other species including *Lepidium pseudohyssopifolium* (now rare, last collected Shellharbour 1949) *Melanthera biflora* and *Atriplex cinerea* (now rare, the 1770 collection is the northern limit) are species of rocky coastal foreshores, and could have been collected along the relatively low level ocean foreshores north from La Perouse.

Melaleuca quinquenervia is currently regarded as reaching its southern geographical limit at Botany Bay. It is certainly native to Rose Bay on Sydney Harbour, but there are no historical collections from further south. Johnson & Briggs regarded the two plants they saw growing at Kurnell in 1965 as native, but there is no confirmed specimen in Banks' collections at Botany Bay (though it was collected

by Banks in Queensland). As three other *Melaleuca* species were recorded at Botany Bay and it was likely to have been fruiting in April–May, its omission is a surprise. Plants at Kurnell may perhaps have been subsequently planted. DNA testing may help confirmation.

Finally *Bidens pilosa* is a most interesting record. This species is currently regarded as an introduced species and is widespread in disturbed sites in eastern Australia. However the identification of it in material from Botany Bay in 1770 (the specimen is in material held in the National Herbarium of NSW) is surely the smoking gun evidence that it is a pre-European occurrence, and therefore should be regarded as a native species. Robert Brown appears to have collected *Bidens pilosa* at Newcastle in 1804 and does not seem to have considered it as introduced (Vallance et al. 2001), while Bentham (1866) could only say *This species is very common as a weed over most warm countries...., and may therefore have been introduced into Australia by cultivation.*

Certainly another case for a bit of DNA work.

Botany Bay in 1788

On the 18th January 1788 the *Supply*, scouting ahead of the First Fleet, entered Botany Bay and anchored on the *Northern side of the Bay, that the Ships which were following might not miss the harbour.* Captain Arthur Phillip explored the foreshores looking for a source of fresh water including going 6 miles up the Cooks River, the country of which he found *low & boggy, & no appearance of fresh water* (P.G.

King quoted in King 1982). By the 20th all the 11 ships were in Botany Bay. Searching for a site for a settlement, Phillip found that *the best situation that offered was near Point Sutherland [Kurnell] where there was a small run of good water but the ground near it was spongy and the ships could not approach this part of the Bay.* He decided instead to explore Port Jackson to the north, but ordered Major Ross to *have the land cleared* on Point Sutherland, in case he did not find a better harbour. Three days were spent clearing before Phillip returned and the fleet re-embarked for Port Jackson.

Chief Surgeon John White wrote *Although the spot fixed for the town (i.e. at Kurnell) was the most eligible that could be chosen, yet I think it would never have answered, the ground around it being sandy, poor and swampy, and but very indifferently supplied with water. The fine meadows talked of in Captain Cook's voyage I could never see, though I took some pains to find them out* (quoted in King 1982)

These early accounts from the First Fleet concur with the earlier descriptions of sandy soils. Cook's descriptions, which are objective with a touch of landscape romance – *diversified with woods, Lawns and Marshes, and woods are free from under wood* – are likely to have been an accurate impression. He describes the soil as light white sand producing a quantity of good grass that grows in tufts, presumably that which the grasscutters cut for the livestock. His final comments are that *the soil is in general sandy.* He does not say that the country has great potential for agriculture, though he does suggest that clearing it would be relatively easy. Banks, too, talks about the *swamps or light sandy soils, and vast quantities*



Fig. 3. A drawing of Cook's monument by William Henry Raworth in 1875 depicts the dominance of *Banksia integrifolia* in the vegetation surrounding the monument, though when he redraws the scene in 1896, presumably after revisiting the site, the understorey is more open and grassy and the *Xanthorrhoea* has gone.



of grass. However distance perhaps enhanced the view when he advised the British government, years later, on the desirability of Botany Bay as a suitable settlement.

The sandy soils were restricted to the coastal areas and better soils were found on the alluvial and shale soils west of Sydney. The floodplains of the Hawkesbury River and the grassy woodlands of the Cumberland Plain provided the necessary agricultural base for development of the early colony (Benson & Howell 1990).

Phillip has the last word. After describing the success of agriculture at Rose Hill near Parramatta in a letter to Lord Sydney (12th February 1790) he writes, *And I presume the meadows mentioned in Captains Cook's voyage were seen from the high grounds about Botany Bay, and from whence they appear well to the eye; but when examined are found to be marshes, the draining of which would be a work of time, and not to be attempted by the first settlers.*

Landscape change from 1788

From 1770 until 1815 the area around the landing place remained relatively undisturbed and would have continued to provide good resources for local Aboriginal people. In 1815, 700 acres of land at Kurnell was granted to James Birnie who established Alpha Farm, named so because it was the first farm in the area. He erected a stone cottage on a foreshore knoll just east of the present Cook Monument site. Over the next 80 years various agricultural enterprises were pursued on the site, generally with little success (Nugent 2005).

In 1881, following a succession of landowners, the property became part of the Holt-Sutherland Estate and subsequently subdivided. In 1899, 25 ha near the landing place was

dedicated as public reserve and placed in the care of the Captain Cook Landing Place Trust. The Trust began various 'improvements' on the site and in the early days they continued to allow grazing of cattle and horses. In 1902 a guesthouse was built on the site of the old Alpha Farm cottage, incorporating the ruins of its cellar. With the management of the site as a public reserve, began a new period of significant impact on the landscape and vegetation of the site.

Perhaps the greatest long-term impacts of the Trust were the modifications to natural drainage systems and the changes to vegetation communities. The Trust regularly reported on drainage problems in the reserve and invested substantial efforts to rectify problems, including installing metres of underground drains. Most significantly affected was the freshwater stream where the crew of the *Endeavour* took water (Fig. 7). The stream has been diverted into an underground pipe for much of its length, has been dammed at various points, and the swamp that supplied it with water has been substantially modified by road works. In addition to the impacts on the stream's hydrology, the natural riparian vegetation has been virtually eliminated. Few clues remain to its original form and composition. Many of the surrounding areas of swamp forest were also impacted by drainage works, no longer able to support their natural vegetation communities.

In 1845 two Norfolk Island Pine trees (*Araucaria heterophylla*) were planted in front of Alpha Farm house. These were the earliest recorded non-local trees planted at the site (Fig. 4a). Together with the Prince's Pines planted in 1881, they paved the way for an extensive tree planting program carried out by the Captain Cook's Landing Place Trust from 1899 until 1975 (CCLP Trust records). During the years of management



Fig. 4a. Photographs taken in the period 1880 to 1910 show grassy areas around Cook's monument with native low scrub and *Banksia integrifolia*, most no taller than about 8 m, but some taller single-stemmed *Banksia* plants 10–12 m high, a number with deteriorating canopies. This view was taken from the ferry wharf in 1905. Alpha House and the 1845 Norfolk Island Pines are on the far left, and the 1881 Prince's Pine is behind Cook's monument.



Fig. 4b. Similar view above, taken in 2005 showing predominance of planted *Araucaria* trees. The shed marks the site of the old ferry wharf.

Table 2. Summary of the likely main composition of 1770 plant communities of Cook's landing site, Kurnell, with brief comments on the condition in 2006 (introduced species marked*). For full species lists see Appendix 1.

| Plant community | Main canopy species likely in 1770 | Ground species likely in 1770 | Condition in 2006 |
|---|---|--|--|
| 1. Coastal Scrub/ woodland on sand knolls | <i>Banksia integrifolia</i> , <i>Monotoca elliptica</i> | <i>Acacia ulicifolia</i> , <i>Kennedia rubicunda</i> , <i>Notelaea longifolia</i> | Many weeds * <i>Asparagus aethiopicus</i> * <i>Stenotaphrum secundatum</i> * <i>Eucalyptus microcorys</i> * <i>Ehrecta erecta</i> , part of Kurnell Dune Forest EEC) |
| 2. Littoral rainforest | <i>Cupaniopsis anacardioides</i> , <i>Livistona australis</i> , <i>Syzygium paniculatum</i> , <i>Glochidion ferdinandi</i> | <i>Viola banksii</i> <i>Hypolepis muelleri</i> <i>Calochlaena dubia</i> | Many planted exotics |
| 3. Swamp Forest | <i>Casuarina glauca</i> , <i>Eucalyptus robusta</i> , <i>Ficus rubiginosa</i> | <i>Commelina cyanea</i> , <i>Hydrocotyle peduncularis</i> , <i>Marsdenia rostrata</i> , <i>Oplismenus aemulus</i> , <i>Smilax glycyphylla</i> , <i>Pteridium esculentum</i> | Very small remnants only. Has largely been replaced with mown grassland. Weeds include: * <i>Hydrocotyle bonariensis</i> . (part of Swamp Sclerophyll Forest EEC) |
| 4. Dune woodland | <i>Eucalyptus botryoides</i> , <i>Corymbia gummifera</i> | <i>Xylomelum pyriforme</i> , <i>Dodonaea triquetra</i> , <i>Hibbertia scandens</i> , <i>Lepidosperma laterale</i> | Largely in good condition, except road edges and areas of planted exotics. (part of Kurnell Dune Forest EEC) |
| 5. Sedge-swamp | | <i>Baloskion tetraphyllum</i> , <i>Callistemon citrinus</i> , <i>Gleichenia dicarpa</i> , <i>Blechnum</i> spp, | Greatly disturbed by drainage changes. Increased spread of drier species such as <i>Corymbia gummifera</i> . Weeds include * <i>Lantana camara</i> |
| 6. Scrub on Sandstone | <i>Angophora costata</i> , <i>Eucalyptus haemastoma</i> | <i>Acacia ulicifolia</i> , <i>Kunzea ambigua</i> , <i>Melaleuca nodosa</i> , <i>Allocasuarina distyla</i> , <i>Leucopogon ericoides</i> , <i>Pteridium esculentum</i> | Largely in good condition, except road edges. |
| 7. Foreshore scrub on sand | <i>Leptospermum laevigatum</i> , <i>Acacia longifolia</i> subsp. <i>sophorae</i> , <i>Banksia integrifolia</i> , <i>Casuarina glauca</i> | <i>Isolepis nodosa</i> , <i>Stephania japonica</i> <i>Commelina cyanea</i> , <i>Lomandra longifolia</i> | Sandy foreshore scrub now replaced by mown lawn particularly * <i>Stenotaphrum secundatum</i> Buffalo grass. |
| 8. Foreshore scrub on sandstone | <i>Banksia integrifolia</i> , <i>Westringia fruticosa</i> , <i>Melaleuca armillaris</i> | <i>Lomandra longifolia</i> , <i>Isolepis nodosa</i> , <i>Stephania japonica</i> <i>Commelina cyanea</i> | Sandstone scrub still remains on Inscription Point. |

by the Trust, significant events, such as the anniversary of Cook's landing and his birth, were commemorated with tree plantings. In addition, the Trust carried out an annual tree planting program aimed at beautifying the site and restoring areas of bush ravaged by bushfire and gales.

The planting programs and drainage modifications, together with the history of relatively intensive land use, have had a major effect on the native vegetation of the site. Extensive areas were cleared for grazing and many of these now correspond to areas of mown exotic grass. Not only was the native vegetation directly affected by tree planting, but

also by weed invasion including naturalizations from the plantings. In addition, particularly in the last few decades, many areas have been protected from fire, decreasing the abundance of native species which rely on open conditions and heat for seedling recruitment, whilst benefiting weed species. Cessation of mowing in some areas within the last decade has not resulted in a significant increase in native species arising from the soil-stored seedbank or rootstock, probably because these species had already gone many years earlier during the intensive grazing periods.

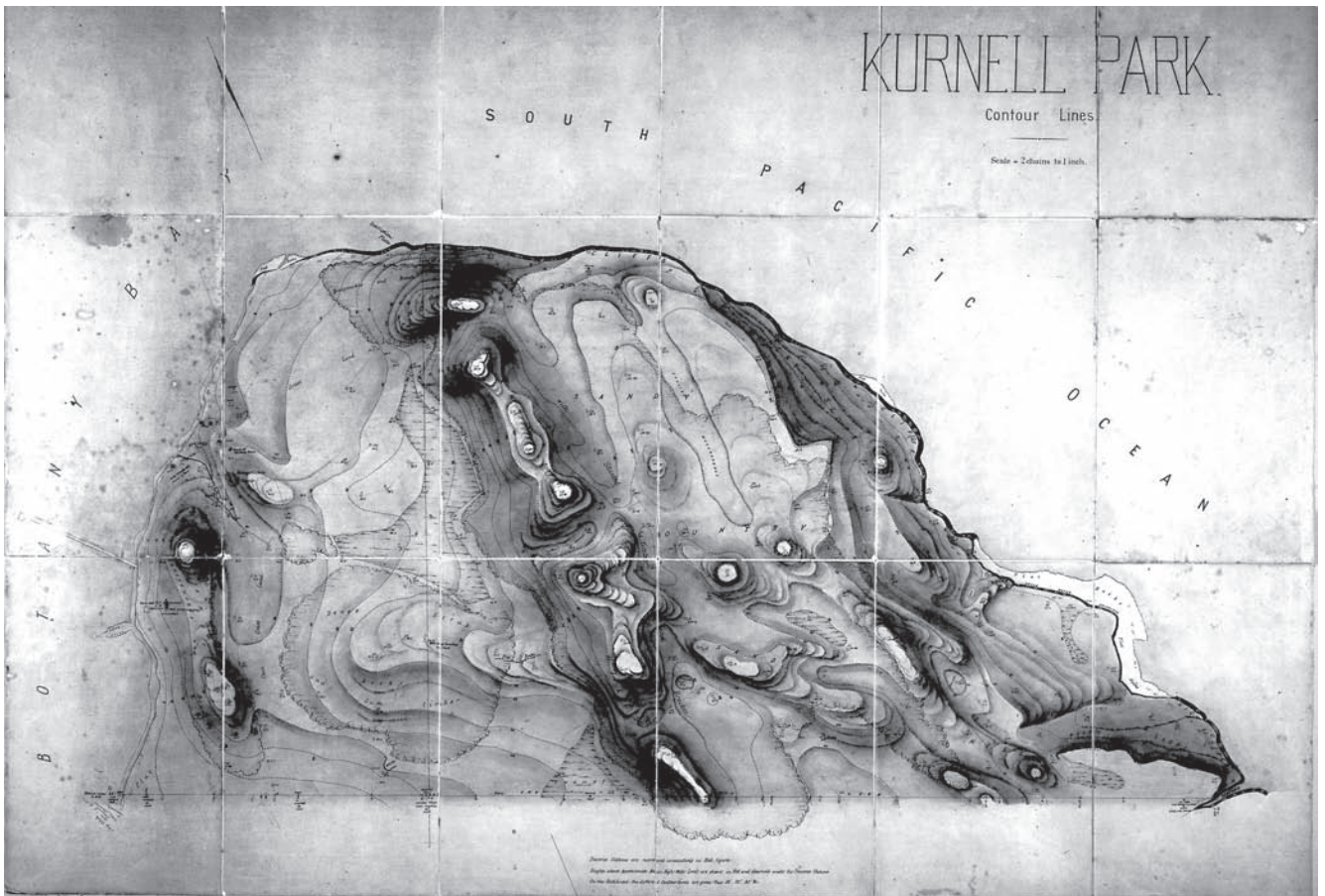


Fig. 5. 1899 Department of Lands plan of “Kurnell Park” showing contours and geographical features at that time. The Landing Place, ferry wharf and sandy knolls are on the far left.

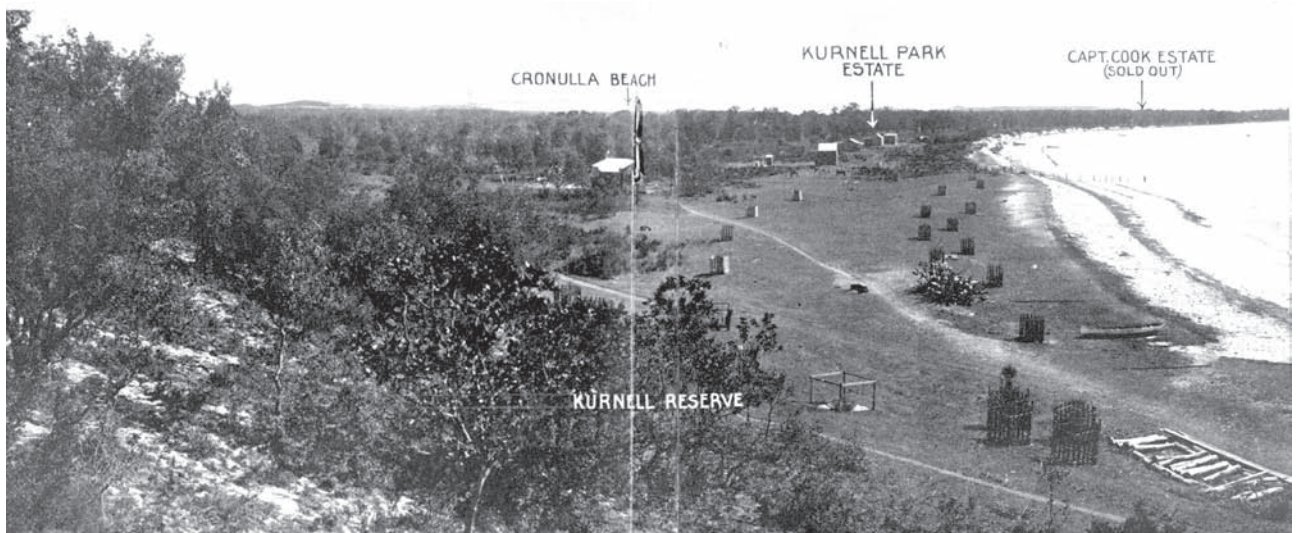


Fig. 6. 1914 view from the southern knoll looking west showing *Banksia – Monotoca* scrub in the foreground and grazed grassland along the immediate foreshore. There is scrub along the foreshore beyond the fence near the houses. The picture is from a contemporary land sale brochure.

The pre-European vegetation of the landing place at Kurnell

Despite landscape change and modification of the natural vegetation, the site today still contains remnants of the vegetation that Cook and Banks would have seen in 1770. We have used these remnants, together with historical documentation, such as park plans and aerial and ground photos, to reconstruct the pre-European vegetation communities in the area corresponding to “Cook’s Landing Place”, the public reserve declared in 1899. Within this 30 hectare site, the likely extent of 1770 plant communities has been inferred (Table 2, Fig. 8a, b) from geological and topographic features using stereoscopic air photo coverage, and historic maps including a detailed 1899 Lands Dept survey which includes notes on vegetation. We have also walked extensively throughout the site noting current species distributions. Notes on individual communities are given below and a current species list is included at Appendix 1.

1. Coastal Scrub/woodland of *Banksia integrifolia*, *Monotoca elliptica* on sand knolls

Apart from descriptions in the journals of Cook and Banks, and the specimens they brought back to London, the earliest recorded clues to the natural vegetation of the site are early illustrations of the Cook’s monument, erected in 1870. An 1878 watercolour of the monument by Thomas George Glover (National Library of Australia) shows a few scattered trees on a dune behind the monument. The form of the trees strongly suggests *Banksia integrifolia*, but artistic licence has allowed the bushland to be over-simplified and the scene romantically egyptianised. A more realistic 1875 drawing (Fig. 3) by William Henry Raworth (1820–1905) depicts the dominance of *Banksia integrifolia* in the vegetation surrounding the monument, though when he redraws the scene in 1896, presumably after revisiting the site, the understorey is more open and grassy and the *Xanthorrhoea* has gone.

Photographs taken between 1880 and 1910 (eg. Fig 4a) show grassy areas around the monument, with low scrub. There are *Banksia integrifolia* plants, most no taller than about 8 m, but some taller single-stemmed plants 10–12 m high. There are a number with deteriorating canopies. There also appear to be some eucalypts that may be *Eucalyptus botryoides*, and some dead trees. The introduced Princes Pine (planted 1881) is already overtopping the native trees. There appears to be the affects of stock browsing up to about 2 m from the ground. The groundlayer is grassy and evidently heavily grazed and there are some scattered low shrubs, possibly *Monotoca*. One photo shows extensive areas with inflorescences that are probably the grass *Cymbopogon refractus*, Barbed Wire Grass. According to Maiden (1909), locals at Kurnell called this plant *Banks’ Orchid*, suggesting it was relatively conspicuous at that time (1909). Several trees of *Banksia integrifolia* were evidently planted within the railing of the monument and these may have been taken

from nearby. Compare the original canopy height with the currently towering *Araucaria*-dominated skyline (Fig. 4b).

A detailed 1899 Department of Lands plan of the Landing Place site (Fig. 5) showing contours and geographical features such as rocky areas, gives an overall view of the landscape. The creek is shown as fresh water and is not dammed. Areas of vegetation and open grass land are shown. The two knolls and the connecting saddle adjacent to Cooks Monument are marked ‘Sandy ridge covered with Beech Honeysuckle and Scrub’. ‘Honeysuckle’ would be *Banksia integrifolia* while ‘Beech’ was a name used for *Monotoca elliptica* (Maiden 1889). Similar ‘Honeysuckle and scrub’ is shown on a sand hill behind Inscription Point.

From this historical evidence, particularly the late 19th century photos and maps, it would appear that the pre-european vegetation of the sandy northern and southern knolls near Cook’s Monument was dominated by small trees of *Banksia integrifolia* and *Monotoca elliptica* with a dense shrubby understorey. We suggest this community was also found on the sandy knoll where Alpha House now stands and on the knoll above Inscription Point. The structure of this community probably ranged from woodland to scrub, depending on the degree of exposure to salt laden winds, and would have contained many of the species of the dune forest of the deeper inland sand areas but the predominance of the *Banksia* and *Monotoca* would have given it quite a different look.

By 1933 A.G. Alanson was writing, *To-day much of the scrub has gone, but banksias and some apple gums remain well grown, while there towers above the low forest a pine planted there, August 9, 1881, by late Prince Albert Victor of Wales, brother of King George V. ... The Princes each planted two trees, but three died. The apple gums were probably Angophora costata.*



Fig. 7. Photo at the dam on Cook’s stream (the Watering Place) in 1910 showing *Casuarina glauca* where it meets Botany Bay. Note: wooden tree-guards to protect planted trees from stock.

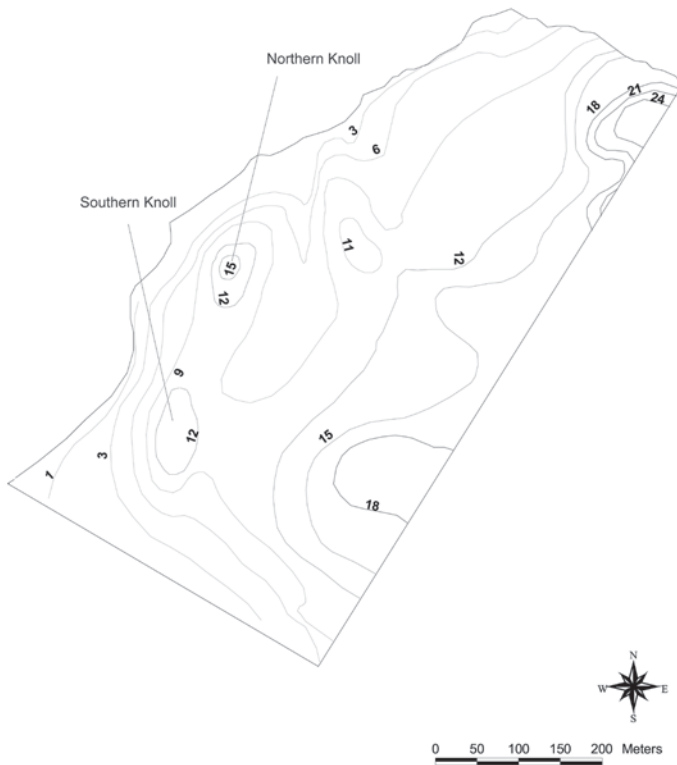


Fig. 8a. Contour map of the Landing Place site based on 1899 survey, contour interval in metres.

Fig. 8b. The likely extent of plant communities in 1770 at the Landing Place inferred from geological and topographic features. Despite the extent of vegetation cover shown in this 2004 photo, much of it is planted rather than native vegetation.



Fig. 9. Engraving of Alpha Farm (by H G MacLeod) after about 1870.

Today this community is in a relatively poor state due to grazing, mowing and clearing, weed invasion, particularly of *Asparagus aethiopicus*, the absence of fire which would promote germination of native species, the planting of exotic species such as the Norfolk Island Pine and the planting and subsequent naturalising of non-local native species particularly Tallowwood trees, *Eucalyptus microcorys*. These tree plantings have reduced light to the lower growing shrub species, provided perches for birds dispersing weed seeds, and have destroyed the appearance of the low-growing scrub/woodland, which would probably have been about 3–8 m high (see Fig. 6), by providing a towering canopy 20–25 m tall. Despite the poor condition of the community, remnant species provide evidence to help us in developing a picture of the structure and content of the original community. The west-facing slope of the southern knoll is the best place to find remnant species, including *Banksia integrifolia*, *Monotoca elliptica*, *Clerodendrum tomentosum*, *Elaeocarpus reticulatus*, *Notelaea longifolia*, *Dianella* sp., *Lomandra longifolia*, *Imperata cylindrica* and *Eustrephus latifolius*. The extent of the original community corresponds to 6.6 hectares of the 30 hectares declared a public reserve in 1899 (Fig. 8).

2. Littoral rainforest – *Cupaniopsis anacardioides*

Today along Cook's Stream is a vegetation community that displays the structure and indicative species of littoral rainforest. But unlike other areas of the site there are few remnants and little historical evidence to guide our assessment of the original nature of this plant community. The 1899 map (Fig. 5) shows this area substantially free of vegetation with only a small clump of "Oaks" (*Casuarina glauca*) just to the south west of Alpha House. Early 20th century photos at the mouth of the stream (the Watering Place) show *Banksia integrifolia* and *Casuarina glauca* as the dominant species (Fig. 7), but there are no photos of areas further upstream.

On the western side of the creek there is now a woodland canopy with a grassy (exotic) understorey. Most of the trees on the east-facing slope to the creek and up onto the northern knoll are rainforest species, with *Cupaniopsis anacardioides* as the most common, but also present are *Castanospermum australe*, *Syncarpia glomulifera*, *Lophostemon confertus* and *Podocarpus elatus* and other obviously introduced and planted species. Of the species present, *Cupaniopsis* is clearly native to the site. There are records of *Cupaniopsis* from Kurnell from the early 20th century, though a specimen was collected by Banks in 1770 is not labeled as whether it came from Botany Bay or Queensland. *Cupaniopsis* is a common component of littoral rainforest in the Sydney area and there are remnant trees elsewhere on the Kurnell Peninsula (including a number of stands of large ones along Silver Beach and Bonna Point – some have the structure and composition of Littoral rainforest – P. Adam pers. com. 2006). However though there are no records of *Cupaniopsis* being planted, the spacing and general size of the trees, together

with the lack of any other associated remnant vegetation such as vines, suggests that these are planted trees.

The exotic grassy groundcover also suggests that the area was formerly cleared, and grazed or mowed. Rather than a rainforest community, we therefore suggest the northern knoll originally displayed similar Coastal scrub/woodland to the southern knoll.

However the sandy coastal creekline site is not inconsistent with littoral rainforest habitat in other parts of coastal NSW, and there may have originally been littoral rainforest associated closely with the stream. There are old trees of *Livistona australis* (an indicator species of littoral rainforest) beside the creek now, although historical records suggest some of these may have been planted (CCLP Trust records). However to further complicate the assessment, Cook noted in his journal that he had seen palms that had Aboriginal footholds cut in them. Similarly old trees of *Syzygium paniculatum* near the creek are consistent with the littoral rainforest habitat. In terms of conservation our best position would be to infer an original occurrence of littoral rainforest associated closely with Cook's stream, with Swamp Forest on adjacent alluvial soil, and restore or rehabilitate appropriately.

3. Swamp Forest – *Eucalyptus robusta*, *Casuarina glauca*

This community is the most enigmatic. A swamp forest or woodland with large trees of *Eucalyptus robusta* and a grassy understorey would fit with Cook's accounts to some extent and would provide better grazing than the other communities. The main picnic area today (Commemoration Flat) is shown on the 1899 map as *gentle sloping open grass land with good black soil* on the foreshore. It is possible that the grassy areas associated with the landing site picnic areas could have been derived from swamp forest vegetation by a century of low-level cattle grazing, the gradual removal of old trees for timber and firewood, tree death from cattle debarking or just old age, alteration of natural drainage systems, and the lack of replacement tree recruitment because of grazing and trampling of seedlings. In some areas tree cover may have been very sparse and the areas may have been virtually grassland.

Given that a land grant was made as early as 1815, and a substantial cottage established soon after, suggests that there is likely to have been some reasonable natural grazing land for stock in the immediate vicinity, though perhaps only for a subsistence lifestyle. In the 1850s John Laycock evidently ran the farm as a dairy and an engraving (Fig. 9), done after 1870, shows the cottage evidently occupied, and 6 dairy cattle and 8 sheep on grassy foreshores. The grazing land is unlikely to have been on the sandstone plateaus or the sandy swamps, but there may have been understorey in the swamp forest associated with peaty soils – Cook's *Lawns and woodlands* – that provided some fodder for stock.

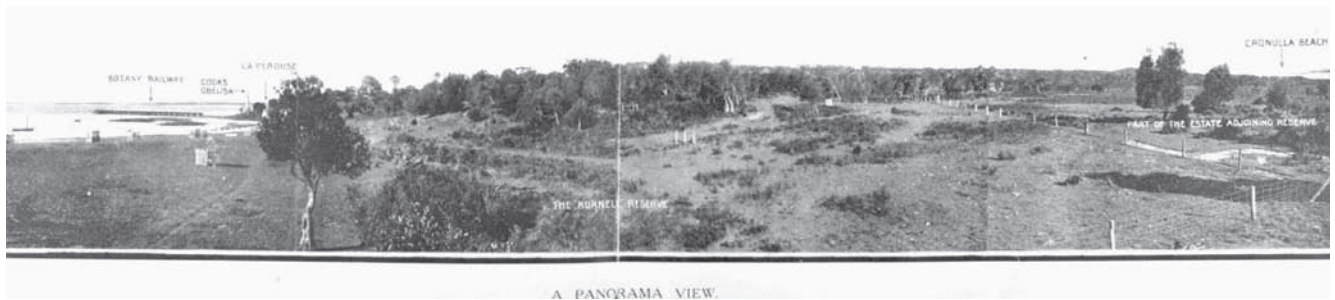


Fig. 10. 1914 panorama looking northeast from near current entrance to Reserve showing the southern knoll. After years of grazing the foreshore flat is completely grassy, though the dune, and sandstone country on the right of the picture, still retain patches of shrubs.

Cattle continued to graze the site under licence from the Captain Cook Landing Place Trust, until at least 1911 (Fig. 10). The native grassy understorey of the swamp forest would not have stood up to the grazing, draining of the sand and subsequent mowing, and today the grassy areas are of exotic species. Native understorey species in this community might have been *Oplismenus imbecillus*, *Microlaena stipoides*, *Imperata cylindrica*, *Hemarthria uncinata*, *Phragmites australis*, *Cymbopogon refractus* and the herbs *Commelina cyanea*, *Persicaria decipiens*, *Centella asiatica* and *Viola banksii*.

J. H. Maiden comments that when he was making a list of plants from Kurnell around 1900 (Maiden 1909), *I was amused to find that around Kurnell the grass Andropogon [now Cymbopogon] refractus, is known as 'Banks' orchid'!* Maiden's list of Kurnell plants does not seem to have survived.

Johnson & Briggs (1965) describe a small area of forest on the Kurnell Peninsula on land to the east of Cooks Stream. *Small but very interesting area, a hanging flat above the bay, sheltered by high land to east, high water-table, carrying a semi-swamp forest of E. robusta and 2 trees only of Melaleuca quinquenervia (southern limit, very important to preserve).*

Banks does not appear to have collected any specimens of *Melaleuca quinquenervia* although he collected 3 other *Melaleuca* species, and as *Melaleuca quinquenervia* is likely to have been in flower, or at least just finishing, in April we could reasonably expect that this species would have been collected, had he come across it.

We have inferred that this community occupied about 11 hectares of the landing place reserve (Fig. 8), concurrent with low-lying areas overlaying sandstone. Remnants of this community are generally in poor condition and their extent is limited. The dominant pressure on this community has been the continual removal of the understorey initially by grazing followed by regular mowing. Swamp forest is consistent with the TSC Act listed Endangered Ecological Community Swamp sclerophyll forest.

4. Dune woodland dominated by *Eucalyptus botryoides*

On deeper sand away from the foreshores, we find dune woodland intergrading with coastal scrub on stabilised transgressive dunes. This community has been less impacted by grazing and early park management activities, and has been subject to frequent fires. The remnants are in good condition and provide the key evidence for the pre-1770 structure and composition of this community.

This community is part of the TSC Act listed Endangered Ecological Community Kurnell Dune Forest. While this community is extensive to the east of the original landing place reserve, it occupies less than a hectare of the original reserve (Fig. 8).



Fig. 11. Treeless sedgeswamp and wet scrub along the track to Kurnell in 1927.

5. Sedge-swamp

The 1899 park plans clearly show an area of swamp in the upper reaches of Cooks Stream. The plans give no indication of species composition and there are no early photographs of this community. Small remnants of the community can be found along Cape Solander Drive near the Discovery Centre, although the extent and nature of the swamp was substantially impacted by the construction of the tourist road in the late 1960s. The understorey in this community includes *Gahnia sieberana*, *Calochlaena dubia*, *Baloskion tetraphyllum* subsp. *meiostachys*, *Blechnum camfieldii*, *Gleichenia dicarpa*, *Hibbertia scandens* and *Pteridium esculentum*. In the shrub layer and canopy we find *Banksia oblongifolia*, *Glochidion ferdinandi* and *Eucalyptus robusta*. In recent years there appears to be an increased spread of drier species such as *Corymbia gummifera* as a result of draining and decreased rainfall. We infer this community occupied about 1.2 hectares of the landing place reserve (Fig. 8).

6. Scrub on Sandstone

Scrub on sandstone currently occurs mostly on the southern side of Cape Solander Drive, with a small remnant occurring to the north of the road. Again, there is a dearth of early photographs or historical documents to help us develop a picture of this pre-1770 community, rather it is the remnants that provide us with the clues. South of Cape Solander Drive, and along the foreshores near Inscription Point (Fig. 2), the remnants are in good condition. The canopy is dominated by *Angophora costata* and *Eucalyptus haemastoma*, whilst the shrub layer includes *Acacia ulicifolia*, *Kunzea ambigua* and *Melaleuca nodosa*. Other species include *Allocasuarina distyla*, *Leucopogon ericoides* and *Pteridium esculentum*. We infer this community occupied about 7.5 hectares of the landing place reserve (Fig. 8).

7. Foreshore scrub on sand

Patches of foreshore scrub are likely to have occurred on the sand ridge behind the small beaches along Botany Bay, probably interspersed with more open grassy areas. Species probably depended on local conditions and included *Leptospermum laevigatum*, *Acacia longifolia* subsp. *sophorae*, *Banksia integrifolia*, *Casuarina glauca* with understorey such as *Isolepis nodosa*, *Stephania japonica* and *Commelina cyanea*.

8. Foreshore scrub on sandstone

Sandstone foreshores such as on Inscription Point have similar species to the sandstone scrubmore sandstone with some additional salt tolerant species such as *Banksia integrifolia*, *Westringia fruticosa* and *Melaleuca armillaris*.

Rehabilitation of remnant native vegetation

In 1965 Johnson & Briggs (LAS Johnson was later Director of the Royal Botanic Gardens Sydney) wrote *The Kurnell Peninsula and surrounding areas were the scene of the first botanical collecting in eastern Australia and carried an interesting and varied vegetation and flora. The Captain Cook's Landing Place Park includes only a few of the communities of the area, but these are all well worthy of preservation (which means no interference, no "improvement", no planting, of natives or otherwise, outside those areas already 'developed' for recreational purposes).*

Since the National Parks and Wildlife Service assumed control of the site in 1967, Johnson & Briggs's advice has largely been followed; however now it is time to give consideration to managing and restoring the vegetation in those areas that have been *developed for recreational purposes*. There are many good reasons for this; honoring the work of Banks and Solander; saving remnants of what are now endangered communities; acknowledging the plant resources that were available to Aboriginal people; and providing a vegetation "backdrop" to the interpretation of the history of the site.

Revegetation Strategies

Revegetation of the site is a complex task. There are a number of considerations in developing a revegetation strategy, foremost is working out which areas to focus revegetation on. Partly this depends on which areas have capacity for effective regeneration. The remnant vegetation communities are of variable condition and extent, some such as the coastal scrub of the southern knoll display reasonable species diversity and have good potential for effective rehabilitation, others such as the swamp forest have been substantially disturbed and almost need to be rebuilt. Introduced plantings add a further dimension to the strategy, not only due to their impact on native communities but because some have developed significant cultural value as evidence of the more recent history of the park (Design 5, 2006). The strategy must consider the presence of remnant plant communities recognized as endangered under NSW legislation. A further consideration in determining the focus for revegetation activities is the potential for the landscape to provide a backdrop to the interpretation of the site, helping visitors to immerse themselves in understanding the events of 1770.

It will be necessary to employ adaptive management to restore the vegetation communities of the site. The coastal scrub on the southern sandy knoll may be a good place to begin. It is a recognized endangered community (Kurnell Dune Forest) and one of the communities most disturbed by past management activities, it includes species collected by

Banks and Solander and, given its location behind the landing site, it has the potential to provide a backdrop to the story of encounter between Cook's crew and the local Gweagal people. The community is generally in poor condition but contains enough native vegetation to support regeneration. The dominant problems here are exotic species, both trees and ground species, and the relative paucity of natural native species regeneration.

It is suggested that restoration be commenced in this area, not only to restore this area, but with a view to contributing to a model for restoration that could be extended to other areas of the site. Suggested treatment for the southern knoll includes:

- Removal of *Eucalyptus microcorys* Tallowwood trees (and other introduced canopy species) – reducing the artificial canopy and creating more open conditions that may favour natives
- Spot poisoning of *Asparagus aethiopicus*, or hand removal of plants.
- Trial burning of strips say 50m wide to see whether native regrowth is improved
- Planting of *Banksia integrifolia* and *Monotoca eliptica* in local clusters
- Planting of native groundlayer species that are likely to spread readily, particularly vegetatively eg. *Pteridium esculentum*, *Microlaena stipoides*, *Themeda australis*, *Calochlaena dubia*, *Imperata cylindrica*, *Dodonaea triquetra*.
- Use of woodchip mulch to control exotic grasses and provide additional fire fuel.

Conclusion

At Botany Bay in 1770 all those on the *Endeavour*, including Cook, Banks and Solander, encountered a landscape that had remained largely unchanged for thousands of years. They were fascinated by flora and fauna and the diversity of species they encountered and their resulting specimen collections continue to be of botanical interest. By analysing various plant lists and historical records we have been able to prepare a definitive list of the specimens they collected, together with a picture of the landscape and vegetation communities they encountered when they landed at Botany Bay.

Following settlement of the area by Europeans in the early 1800s, landscape disturbance and the extensive planting of non-local, often robust and long-lived species, throughout the area of the landing site has guaranteed the persistence of

a hybrid landscape for many decades. However, remnants of the pre-European species and communities remain, and these provide the opportunity to restore some of the landscapes that were the backdrop to the encounters between Cook's crew and the local Aboriginal people in 1770.

Acknowledgements

The authors would like to thank Jocelyn Howell for help with initial fieldwork, Peter Wilson and Peter Hind for comments on particular species, Colin Gibson for sharing his ideas on Cook's excursion to Kogarah Bay, and Bob Makinson and Paul Adam for comments on the manuscript.

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Appendix 1. Distribution of remnant native plant species (recorded in 2004–2006) among inferred plant communities of the Cook's Landing site, Kurnell.

FS=Foreshore Scrub on sandstone; CsSwl= Coastal Sand Scrub-woodland; DuneF=Dune Forest; LitRF= Littoral rainforest; SwampF=Swamp Forest; SedgeSw= Sedgeswamp; SsScrub= Sandstone Scrub

| Species | Coll. Bot. Bay 1770 | Present At Kurnell | FS | CsSwl | DuneF | LitRF | SwampF | SedgeSw | SsScrub |
|---|---------------------------|--------------------------|----|-------|-------|-------|--------|---------|---------|
| <i>Acacia implexa</i> (Fabaceae) | | 2005 | | CsSwl | | | | | |
| <i>Acacia binervia</i> (Fabaceae) | | 2004 | | | DuneF | | | | |
| <i>Acacia floribunda</i> (Fabaceae) | | 2004 | | CsSwl | | | | | |
| <i>Acacia longifolia</i> (Fabaceae) | 1770 | 2004 | | CsSwl | DuneF | | | | SsScrub |
| <i>Acacia suaveolens</i> (Fabaceae) | 1770 | 2004 | | | DuneF | | | | SsScrub |
| <i>Acacia terminalis</i> subsp. <i>angustifolia</i> (Fabaceae) | | 2004 | | | DuneF | | | | |
| <i>Acacia ulicifolia</i> (Fabaceae) | 1770 | 2004 | | CsSwl | DuneF | | | | SsScrub |
| <i>Actinotus helianthi</i> (Apiaceae) | 1770 | 2004 | | | DuneF | | | | SsScrub |
| <i>Allocasuarina distyla</i> (Casuarinaceae) | 1770 | 2004 | | | | | | | SsScrub |
| <i>Allocasuarina littoralis</i> (Casuarinaceae) | 1770 | 1977 | | | DuneF | | | | |
| <i>Angophora costata</i> (Myrtaceae) | 1770 | 2004 | | CsSwl | DuneF | | | | SsScrub |
| <i>Aotus ericoides</i> (Fabaceae) | 1770 | 2004 | | | DuneF | | | | |
| <i>Astroloma pinifolium</i> (Ericaceae) | 1770 | 2004 | | | DuneF | | | | |
| <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyus</i> (Restionaceae) | 1770 | 2004 | | | | | | SedgeSw | |
| <i>Banksia integrifolia</i> (Proteaceae) | 1770 | 2004 | FS | CsSwl | DuneF | | | | |
| <i>Banksia oblongifolia</i> (Proteaceae) | | 2004 | | | | | | SedgeSw | |
| <i>Banksia serrata</i> (Proteaceae) | 1770 | 2004 | | CsSwl | DuneF | | | | |
| <i>Billardiera scandens</i> (Pittosporaceae) | | 2004 | | | DuneF | | | | |
| <i>Blechnum camfieldii</i> (Blechnaceae) | 1770 | 2004 | | | | | | SedgeSw | |
| <i>Blechnum indicum</i> (Blechnaceae) | 1770 | 2004 | | | | | | SedgeSw | |
| <i>Bossiaea heterophylla</i> (Fabaceae) | 1770 | 2004 | | | DuneF | | | | |
| <i>Bossiaea scolopendria</i> (Fabaceae) | | 2004 | | | DuneF | | | | |
| <i>Brachyloma daphnoides</i> (Ericaceae) | | 2004 | | | DuneF | | | | |
| <i>Breynia oblongifolia</i> (Euphorbiaceae) | 1770 | 2004 | FS | CsSwl | DuneF | | SwampF | | SsScrub |
| <i>Callistemon citrinus</i> (Myrtaceae) | 1770 | 2004 | | | | | | SedgeSw | |
| <i>Calochlaena dubia</i> (Dicksoniaceae) | | 2004 | | | | LitRF | SwampF | SedgeSw | |
| <i>Casuarina glauca</i> (Casuarinaceae) | | 2004 | FS | CsSwl | | | SwampF | | |
| <i>Centella asiatica</i> (Apiaceae) | | 2004 | | CsSwl | | | | | |
| <i>Ceratopetalum gummiferum</i> (Cunoniaceae) | | 2004 | | | DuneF | | | | |
| <i>Cissus hypoglauca</i> (Vitaceae) | | 2005 | | | | | SwampF | | |
| <i>Clematis aristata</i> (Ranunculaceae) | | 2004 | | CsSwl | | | | | |
| <i>Clerodendrum tomentosum</i> (Verbenaceae) | | 2004 | | CsSwl | | | | | |
| <i>Commelina cyanea</i> (Commelinaceae) | 1770 | 2004 | | CsSwl | | LitRF | SwampF | | |
| <i>Corymbia gummifera</i> (Myrtaceae) | 1770 | 2004 | | | DuneF | | | SedgeSw | |
| <i>Cryptocarya ?microneura</i> (Lauraceae) | | 2004 | | | | | | SedgeSw | |
| <i>Cupaniopsis anacardioides</i> (Sapindaceae) | | 2004 | | CsSwl | | LitRF | SwampF | | |
| <i>Cymbopogon refractus</i> (Poaceae) | | 2004 | | CsSwl | | | | | |
| <i>Daviesia mimosoides</i> (Fabaceae) | | 2004 | | | DuneF | | | | |
| <i>Desmodium varians</i> (Fabaceae) | | 2004 | | CsSwl | | | | | |
| <i>Dianella caerulea</i> (Dianellaceae) | | 2004 | | CsSwl | | | SwampF | | |

| Species | Coll. Bot. Bay 1770 | Present At Kurnell | FS | CsSwl | DuneF | LitRF | SwampF | SedgeSw | SsScrub |
|--|---------------------------|--------------------------|----|-------|-------|-------|--------|---------|---------|
| <i>Dianella longifolia</i> (Dianellaceae) | | 2004 | | | DuneF | | SwampF | | SsScrub |
| <i>Dichondra repens</i> (Convolvulaceae) | | 2004 | | CsSwl | | | | | |
| <i>Dillwynia retorta</i> (Fabaceae) | | 2004 | | | | | | | SsScrub |
| <i>Dodonaea triquetra</i> (Sapindaceae) | | 2004 | | | DuneF | | | | SsScrub |
| <i>Echinopogon ovatus</i> (Poaceae) | | 2004 | | | DuneF | | | | |
| <i>Elaeocarpus reticulatus</i> (Elaeocarpaceae) | | 2004 | | CsSwl | DuneF | | SwampF | | SsScrub |
| <i>Epacris longiflora</i> (Ericaceae) | 1770 | 2004 | | | | | | | SsScrub |
| <i>Eragrostis brownii</i> (Poaceae) | | 2004 | | | DuneF | | | | SsScrub |
| <i>Eucalyptus botryoides</i> (Myrtaceae) | | 2004 | | CsSwl | DuneF | | | | |
| <i>Eucalyptus haemastoma</i> (Myrtaceae) | | 2004 | | | DuneF | | | | |
| <i>Eucalyptus piperita</i> (Myrtaceae) | | 2004 | | | DuneF | | | | |
| <i>Eucalyptus robusta</i> (Myrtaceae) | | 2004 | | CsSwl | | | SwampF | | |
| <i>Eustrephus latifolius</i> (Philesiaceae) | 1770 | 2004 | | CsSwl | DuneF | | SwampF | | |
| <i>Ficus rubiginosa</i> (Moraceae) | | 2004 | | CsSwl | | | SwampF | | |
| <i>Gahnia sieberiana</i> (Cyperaceae) | | 2004 | | | | | SwampF | SedgeSw | |
| <i>Geitonoplesium cymosum</i> (Phylesiaceae) | | 2004 | | CsSwl | | | | | |
| <i>Geranium homeanum</i> (Geraniaceae) | 1770 | 2004 | | | | LitRF | | | |
| <i>Gleichenia dicarpa</i> (Gleicheniaceae) | | 2004 | | | | | | SedgeSw | |
| <i>Glochidion ferdinandi</i> (Euphorbiaceae) | | 2004 | FS | | DuneF | | SwampF | SedgeSw | |
| <i>Glycine ?clandestina</i> (Fabaceae) | | 2004 | | | DuneF | | | | |
| <i>Glycine tabacina</i> (Fabaceae) | ?1770 | 2004 | | CsSwl | | | | | |
| <i>Gompholobium grandiflorum</i> (Fabaceae) | | 2004 | | | DuneF | | | | |
| <i>Gonocarpus teucroides</i> (Haloragaceae) | | 2004 | | | DuneF | | | | |
| <i>Goodenia ?paniculata/stelligera</i> (Goodeniaceae) | | 2004 | | | | | | | SsScrub |
| <i>Grevillea mucronulata</i> (Proteaceae) | 1770 | 2004 | | | DuneF | | | | |
| <i>Haemodorum planifolium</i> (Haemadoraceae) | | 2005 | | | DuneF | | | | |
| <i>Hakea sericea</i> (Proteaceae) | | 2004 | | | | | | SedgeSw | |
| <i>Hardenbergia violacea</i> (Fabaceae) | ?1770 | 2004 | | CsSwl | DuneF | | | | |
| <i>Hibbertia empetrifolia</i> (Dilleniaceae) | | 2004 | | | DuneF | | | | |
| <i>Hibbertia scandens</i> (Dilleniaceae) | 1770 | 2004 | | | DuneF | | SwampF | SedgeSw | |
| <i>Hybanthus monopetalus (filiformis)</i> (Violaceae) | 1770 | 2004 | | CsSwl | | | | | |
| <i>Hydrocotyle peduncularis</i> (Apiaceae) | | 2004 | | CsSwl | | LitRF | SwampF | | |
| <i>Hypolepis muelleri</i> (Dennstaedtiaceae) | | 2004 | | | | LitRF | | | |
| <i>Imperata cylindrica</i> (Poaceae) | | 2004 | | CsSwl | DuneF | | SwampF | | |
| <i>Indigofera australis</i> (Fabaceae) | | 2004 | | CsSwl | | | | | |
| <i>Isolepis nodosa</i> (Cyperaceae) | | 2004 | FS | CsSwl | | | | | |
| <i>Kennedia rubicunda</i> (Fabaceae) | 1770 | 2004 | | CsSwl | | | SwampF | | |
| <i>Kunzea ambigua</i> (Myrtaceae) | | 2004 | | | | | | | SsScrub |
| <i>Lepidosperma laterale</i> (Cyperaceae) | | 2004 | | CsSwl | DuneF | | | | |
| <i>Lepidosperma sp. (tall)</i> (Cyperaceae) | | 2004 | | | | | | SedgeSw | |
| <i>Leptospermum laevigatum</i> (Myrtaceae) | 1770 | 2004 | FS | CsSwl | | | | | |
| <i>Leptospermum trinervium</i> (Myrtaceae) | 1770 | 2004 | | | DuneF | | | | |
| <i>Lepyrodia scariosa</i> (Restionaceae) | | 2004 | | | | | | | SsScrub |
| <i>Leucopogon ericoides</i> (Ericaceae) | 1770 | 2004 | | | DuneF | | | | SsScrub |
| <i>Livistona australis</i> (Arecaceae) | ?1770 | 2004 | | | | LitRF | SwampF | SedgeSw | |
| <i>Lomandra longifolia</i> (Lomandraceae) | 1770 | 2004 | FS | CsSwl | DuneF | | | | |
| <i>Macrozamia communis</i> (Zamiaceae) | 1770 | 2004 | | CsSwl | DuneF | | | | |

| Species | Coll. Bot. Bay 1770 | Present At Kurnell | FS | CsSwl | DuneF | LitRF | SwampF | SedgeSw | SsScrub |
|--|---------------------------|--------------------------|----|-------|-------|-------|--------|---------|---------|
| <i>Marsdenia rostrata</i> (Asclepiadaceae) | | 2004 | | | | | SwampF | | |
| <i>Melaleuca armillaris</i> (Myrtaceae) | 1770 | 1981 | FS | | | | | | |
| <i>Melaleuca nodosa</i> (Myrtaceae) | 1770 | 2004 | | | | | | | SsScrub |
| <i>Melaleuca quinquenervia</i> (Myrtaceae) | | 2004 | | | | LitRF | SwampF | | |
| <i>Microlaena stipoides</i> (Poaceae) | | 2004 | | CsSwl | | | SwampF | | |
| <i>Monotoca elliptica</i> (Ericaceae) | | 2004 | | CsSwl | DuneF | | | | SsScrub |
| <i>Notelaea longifolia</i> (Oleaceae) | | 2004 | | CsSwl | | | SwampF | | |
| <i>Omolanthus populifolius</i> (Euphorbiaceae) | | 2004 | | CsSwl | | LitRF | SwampF | | |
| <i>Oplismenus aemulus</i> (Poaceae) | | 2004 | | | | | SwampF | | |
| <i>Oplismenus imbecillis</i> (Poaceae) | | 2004 | | CsSwl | | | | | |
| <i>Oxalis</i> sp. (Oxalidaceae) | | 2004 | | | DuneF | | | | |
| <i>Oxylobium cordifolium</i> (Fabaceae) | 1770 | 2004 | | | | | | | SsScrub |
| <i>Persicaria decipiens</i> (Polygonaceae) | | 2004 | | | | | SwampF | | |
| <i>Persoonia laevis</i> (Proteaceae) | | 2004 | | | DuneF | | | | |
| <i>Persoonia lanceolata</i> (Proteaceae) | 1770 | 2004 | | | DuneF | | | | SsScrub |
| <i>Phragmites australis</i> (Poaceae) | | 2004 | | | | | SwampF | | |
| <i>Pimelea linifolia</i> (Thymelaeaceae) | 1770 | 2004 | | | DuneF | | | | SsScrub |
| <i>Pittosporum revolutum</i> (Pittosporaceae) | | 2004 | | CsSwl | DuneF | | SwampF | | |
| <i>Pittosporum undulatum</i> (Pittosporaceae) | | 2004 | | CsSwl | | | SwampF | | |
| <i>Platysace ericoides</i> (Apiaceae) | 1770 | 2005 | | | DuneF | | | | |
| <i>Platysace lanceolata</i> (Apiaceae) | 1770 | 2004 | | | | | | | SsScrub |
| <i>Plectranthus parviflorus</i> (Lamiaceae) | 1770 | 2004 | | CsSwl | | | | | |
| <i>Poa</i> sp. (Poaceae) | | 2004 | | | | | | SedgeSw | |
| <i>Pomax umbellata</i> (Apiaceae) | 1770 | 2004 | | CsSwl | DuneF | | | | SsScrub |
| <i>Portulacca oleracea</i> (Portulacaceae) | | 2004 | FS | CsSwl | | | | | |
| <i>Pratia purpurascens</i> (Lobeliaceae) | 1770 | 2004 | | | | LitRF | | | |
| <i>Pteridium esculentum</i> (Dennstaedtiaceae) | 1770 | 2004 | | CsSwl | DuneF | LitRF | SwampF | SedgeSw | SsScrub |
| <i>Pterostylis</i> sp. (Orchidaceae) | | 2004 | | CsSwl | | | | | |
| <i>Ricinocarpos pinifolius</i> (Euphorbiaceae) | 1770 | 2004 | | | DuneF | | | | |
| <i>Sarcopetalum harveyanum</i> (Menispermaceae) | | 2004 | | CsSwl | DuneF | | | | |
| <i>Senecio ?hispidulus</i> (Asteraceae) | | 2004 | | | | | SwampF | | |
| <i>Smilax glycyphylla</i> (Smilacaceae) | | 2004 | | CsSwl | DuneF | | SwampF | | |
| <i>Stephania japonica</i> (Menispermaceae) | 1770 | 2005 | FS | | | | | | |
| <i>Syzygium paniculatum</i> (Myrtaceae) | | 2006 | | | | LitRF | | | |
| <i>Themeda australis</i> (Poaceae) | | 2004 | | CsSwl | DuneF | | | | |
| <i>Typha orientalis</i> (Typhaceae) | | 2004 | | | | | SwampF | | |
| <i>Viola banksii</i> (Violaceae) | 1770 | 2004 | | | | LitRF | SwampF | | |
| <i>Westringia fruticosa</i> (Lamiaceae) | 1770 | 1981 | FS | | | | | | |
| <i>Xanthorrhoea arborea</i> (Xanthorrhoeaceae) | | 2004 | | CsSwl | DuneF | | | | |
| <i>Xylomelum pyrifforme</i> (Proteaceae) | 1770 | 2004 | | CsSwl | DuneF | | | | |