

# Curl Curl Lagoon and Friends

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*Curl Curl Lagoon Friends Inc.*



# Curl Curl Lagoon and Friends

*Dedicated to the thousands of citizens who are genuinely concerned about the preservation of our unique natural environment.*

A publication of



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# Foreword

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The Curl Curl Lagoon estuary on Sydney's Northern Beaches has been the victim of an environmentally insensitive age – a time when waterways and their surrounds were considered to be wastelands to be used – or abused – as garbage tips, reclamation/development sites or industrial areas.

The legacy of this age, for Curl Curl Lagoon as well as Greendale Creek which feeds it, is a severely compromised waterway. There are no less than thirty-six inlets sending stormwater, sewage overflow and other undesirable urban waste into the lagoon and then onwards to North Curl Curl Beach. This is not to mention the ongoing effect of what remains of the garbage tip that was on the site for some forty years.

Clearly, this is not a desirable state of affairs for the environmentally enlightened twenty-first century.



Curl Curl Lagoon  
- looking south

In fact, the story of the effort to reverse the fortunes of Curl Curl Lagoon goes back two decades before the end of the twentieth century, with the establishment of the Curl Curl Lagoon Committee – now known as Curl Curl Lagoon Friends Inc. Since 1980, many hundreds of tireless volunteers have planted trees, pulled weeds, lobbied Councils and Governments, educated school children and generally kept a monitoring eye on the health of the lagoon at the very heart of their community.

The Friends set themselves the task of overseeing the rehabilitation of Greendale Creek and Curl Curl Lagoon – so that it may once again be a source of pride, where children can play and everyone can enjoy it.

Obviously, this is an objective that is taking some time to achieve. The errors of the past were so quickly made yet will take many years to undo. But without the determination of organisations like the Curl Curl Lagoon Friends, assets like Curl Curl Lagoon could have been completely destroyed long ago. Maybe, even, near-sighted politicians would have had the “problem” concreted over years ago. It would now be little more than a forest of home units – with the water flowing to the ocean through a concrete drain.

Luckily, that didn't happen and much has been achieved. Thanks to the efforts and funding of both Warringah Council and the NSW State Government, three stages of a four-stage rehabilitation project have been completed. These are major works which have involved such things as the construction of a Gross Pollutant Trap, the removal of exotic plant species, large-scale planting of native riparian vegetation and the resculpting of

the creek banks. These works have been magnificent and have brought about a significant improvement not only in the health of the waterway but also in the enjoyment that it gives to the many people who use the area for recreation.

In the near future, it is hoped that a start will be made to stage 4 of this rehabilitation project – the major stage involving works to the body of the lagoon itself.

In parallel with these major works, the volunteer members of Curl Curl Lagoon Friends Inc. have worked towards addressing in some way the thirty-six stormwater inlets into the system. To date, twenty-four have received attention – with Gross Pollutant Traps, mini-wetlands and litter booms. The work continues.

This booklet tells the story of one part of that work – the development of a 'pocket wetland' on the south bank of Curl Curl Lagoon. Situated between – and incorporating – stormwater outlets known as S8 and S9, the area is an example of what a community can do when it pools its energies and talents.

It is also a cautionary tale, because much hard work can be wasted without the right levels of follow-up and long-term commitment.

Curl Curl Lagoon Friends hopes that through this booklet, residents will gain a greater appreciation of the work of the Friends and the value of our environment and that other community groups will get some useful tips on what to do and what not to do to see a great idea developed into positive action and a favourable outcome for the whole community.



# Our history and aims

## **Once upon a time...**

There was a time when Curl Curl Lagoon was a pristine waterway with a sandy bottom, clean beaches, large fish and a healthy natural environment. It would flush to the ocean from time to time but never completely empty. The openings were natural, too, not caused by locals with spades!

Surprisingly, that was only about sixty or so years ago. In a few short decades of urban development, we humans managed to poison the water, destroy the surrounding vegetation and habitats and silt up the stream.

Because, the lagoon area was a garbage tip!

The final insult came in the late 1970s when there were proposals ranging from filling in the whole creek and running it through pipes – to piping in sea water to flush the lagoon sludge out into the ocean just past the North Curl Curl rock pool.

*And so was born the Curl Curl Lagoon Committee...*

To put some reality back into the situation, on the 15<sup>th</sup> July 1980, at the North Curl Curl Surf Club, a committed group of citizens formed the Curl Curl Lagoon Committee.

At that first meeting, David James, an environmental consultant to Warringah Council, stressed the need to protect the few natural environments still existing in the area. He urged the new committee to adopt a constructive, well-informed approach to gaining the respect of Council and Government and pressing for

improvements to the health of the lagoon and the surrounding environment.

### **They set about the rehabilitation of the lagoon...**

Throughout the years the committee has initiated and sponsored many projects and events – all with the singular aim of improving Curl Curl Lagoon, the beach, the sand dunes and John Fisher Park. Imagination was the name of the game – who can forget the great “Clean-a-agoon” campaign?

Protecting native flora and fauna by providing or preserving natural habitats has been a major part of the committee's work. This has involved plantings of native trees and other plants that used to grow here naturally – as well as a biodiversity of wetland species for stormwater treatment.

Between Harbord Road and the beach, there are an amazing thirty-six places where water enters the lagoon system – the creek itself plus lots of stormwater drains. Through mini-wetlands, gross pollutant traps, litter booms and bush regeneration, the committee and the Council have always worked together to clean up this water – meeting challenge after challenge.

The committee also recognises the role of children and young people as the environmentalists of the future and has contributed widely to educational programmes.

Of course, the biggest project is one that is still going on – the Curl Curl Lagoon rehabilitation project. This is a four staged programme of works which started with the Gross Pollutant Trap at Harbord Road (to stop silt and things like plastic bags and food and drink containers from getting into the creek) and continued

with the fantastic works completed on Greendale Creek during 1998 and 1999.

This whole project is a tribute to what a dedicated community and an imaginative Council can achieve when they work together.

### **There have always been battles to fight**

There have been inevitable fights – especially when a very significant part of the area is John Fisher Park – which is used for both sporting and recreational purposes.

From time to time one sporting body or other starts to demand dedicated facilities, more carparking, fences or larger buildings despite all commonsense evidence pointing to them not being in the interests of the area and the environment.

Of course, there have been major victories – like acceptance of the Rehabilitation plan, the fun of having the community get together to plant trees and enjoy our fantastic asset and the satisfaction of seeing more and more community members joining the group and becoming stronger – standing up for their rights and making their views heard.

### **It's the people who do it**

Over the decades, dozens of dedicated people have served on the Curl Curl Lagoon committee. They've always been backed up by hundreds more who help by joining the planting days, helping the "Regenerates" – our bush regenerators – or just by paying their membership fees.

The contributions by Warringah Council and local businesses are always significant and fantastic – but so much of the hard-slog



work of looking after the lagoon and the area around it is done by volunteers who head out in all weather to dig and plant and chat and prune and pull weeds.

### **Then we became friends...**

In 1998, the Curl Curl Lagoon Committee became the Curl Curl Lagoon Friends Incorporated – to better reflect the reason for its existence and to recognise its important role with a more formal structure.

### ***...and looked to the future***

In 2001, Stage 3 of the Curl Curl Lagoon and Greendale Creek Rehabilitation project was completed. This stage saw the cleaning up of the bed and banks of the creek up to the point where it meets the lagoon. There's a new bridge and the creek ends at a weir which makes sure that even when the lagoon is empty, the creek won't be.

The next big challenge is Stage 4. This is the big one which will involve dredging and cleaning the lagoon itself as well as restoring the banks. This is going to cost about \$4 million so the Curl Curl Lagoon Friends look forward to continuing to maintain the rage – with the focus clearly on making Curl Curl Lagoon, Curl Curl Beach, John Fisher Park and the surrounding area places that will always be huge assets for Warringah – and in fact the world environment.

**“Treat the earth well – it was not given to you by your parents. It was lent to you by your children”**

FROM AN OLD AMERICAN INDIAN PROVERB - QUOTED  
ON A WARRINGAH COUNCIL SIGNBOARD



The waters of Greendale Creek and Curl Curl Lagoon were clean once. Maybe, one day, they will be again.

# The way it was

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## Alan Newton and Lorna Plate remember

Both long-time residents of the Curl Curl area, Alan Newton and Lorna Plate have fond memories of the way it was before the damage was done – before this unique natural environment was converted into a garbage tip.

Alan's family moved to Curl Curl in 1938 when he was just a schoolboy of 6. With his friends, he spent many happy hours exploring the lagoon and the creek. In those days, the creek wasn't straight as it is now – it meandered along and was the source of lots of excitement and adventure for the young Alan.

Lorna's association with the area goes back to the early 1920s. She also fondly remembers the magnificent golden sandhills of Curl Curl beach and has plenty of stories about the healthy large fish in the lagoon – the ones that always seemed to get away.

It was after the second World War that things began to change. This was when the building boom began – the one that continues to threaten what there is left of the natural environment today.

Here are some very specific memories of early Curl Curl – as recalled by Alan Newton:

"When we moved from Robert St (unmade) to Park St (unmade) in 1938, most of the 'streets' in Curl Curl and Nth Curl Curl were either dirt or rocks rolled in. In fact, Carrington Pde, Griffin Rd, Pitt Rd, Harbord Rd, Brighton St, Oliver St and Curl Curl Pde were the only tar roads. Bennett St was a twisty sand-track then.



"The old wooden Griffin Rd bridge, built in the early 30s, was made of planks which used to rattle when the double-deck 136 buses went over it. These buses used Carrington Pde and Evans St – though before Farnell St was tarred, they had to detour via Gardere St, Curl Curl Pde, Park St and Adams St. I remember once when a double decker bus overturned very near Yabsley's shop – on the north corner of Gardere St and Carrington Pde.

"In 1938, there were only 3 houses in Bennett St, 4 in Stirgess Ave, 3 in Stewart Ave (then called "The Sands"), 3 in Travers Road (then called "The Waves") and 5 in Adams St. I can remember when only 9 houses were visible on the whole North Curl Curl hill.

"On the northern side of the lagoon there was Lawson St – not there anymore but it used to run from Abbott Rd to the lagoon opposite the Manly High School – three houses and various small market gardens – from where we stole vegetables.

"Billy and Bandy Mitchell had a pig farm on Allum's Hill and below them Chinese market gardeners grew vegetables – which we didn't steal so much because they were very hard to get at. Next door – where Wyadra and Wyuna Avenues are now – was a paddock owned by Davison's dairy where thousands of chokos grew.

"In Bennett St, Mr Douglas had 3 large glasshouses for tomatoes – and next to him was the original 1880s Bennett farmhouse – which was demolished 1940/41.

"On this site there still stands Warringah's largest tree, a small leaved fig (*Ficus obliqua*). I climbed it many times in the 40s. Next was Holloways bulb farm and nursery – at 15 acres the largest in Australia – huge blackberry patches and "Monty" Atkins' horse paddocks.

"The telephone was only a few wires on poles at that stage.

"As Curl Curl Lagoon didn't open to the sea as often as it does now, it was quite a different place. The fish had a chance to grow to some size. In the 1930s and 40s we used to catch them by line, trap, net and shooting. You could sometimes even get them to jump into the boat at night by using a bright light.

"Eels up to 1.5 metres long and weighing 10 kgs were abundant.

"The water in the meandering Greendale Creek upstream all the way through Brookvale was clear and quite potable. There were holes, between the now Weldon reserve and Harbord Rd that were 12-15 feet deep. I tell you, BIG eels lived there.

"I had a rowing boat on Curl Curl Lagoon and used it to gain access to the sea, over the berm at North Curl Curl beach.



PHOTO: WARRINGAH LIBRARY

"Not that we needed to avoid the roads. Frequency of car traffic in the war years was so light, we could play cricket on Adams St and only pause for a car every 15 or 20 minutes.

"The military occupation during the war brought lots of changes. From early 1942 there was barbed wire everywhere on the beach and dunes and machine gun nests on Carrington Parade and Beach Street and on and behind the dunes.

“Search lights and an anti-aircraft gun was located on the site of the North Curl Curl Public School in Playfair Road – with a telephone line running from it to the command post in a house in Gardere & Farnell Streets.

“There was even an old rifle range along the south bank of Curl Curl Lagoon east of Griffin Road – which gave us a lot of fun collecting spent bullets and other bits of junk.

“At this time also, what is now 16 Huston Parade was a lovely, secluded camping area called ‘The Glen’. After the war there were semi-permanent tent camps all along present Huston Parade and above the North Curl Curl Surf Club.

“We were also enterprising little blighters – trapping or shooting and probably then selling rabbits between Bennett Street and Stirgess Avenue and in the area around Playfair and Abbott Roads.

“We’d pick flowers – Christmas bells from near Park Street and Abbott Road, Christmas bush from Holloway’s farm and Flannel flowers from North Curl Curl Hill – and sell them – illegally no doubt – to florists in Manly.

“And we’d gather shell grit on the beach to sell to the poultry farms at Oxford Falls.

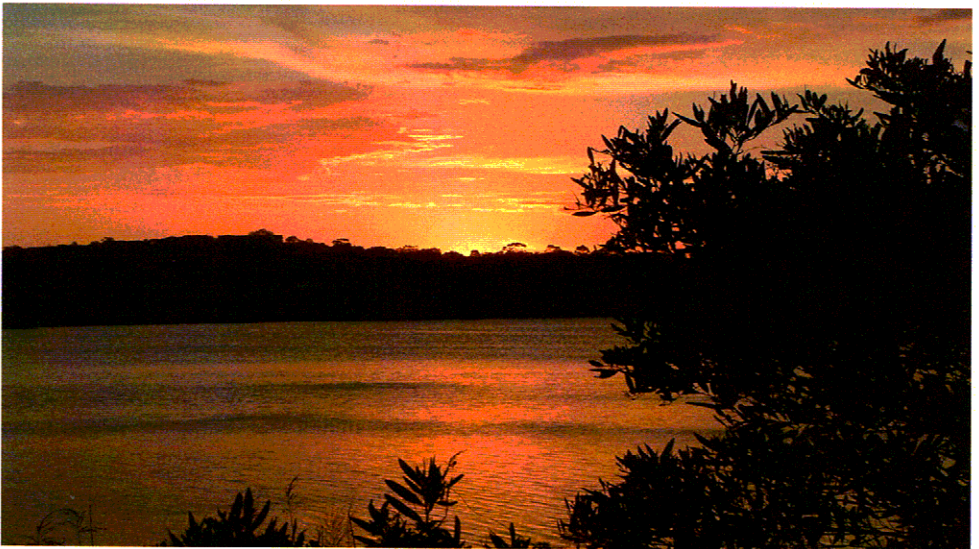
“That’s not all we’d get from the beach – often salvaging good timber that washed up after storms. One particularly fine amount of Oregon timber is now part of 4 Adams St – our house from 1938-91.

“Curl Curl and Curl Curl Lagoon certainly have changed since we would sail down to the Griffin Road bridge in small boats, slide down the huge sand dunes on old car bonnets and ride billy carts down Griffin and Harbord Roads.”

After the war the Brookvale industrial area was established – and that now covers some 14% of the lagoon's catchment area. Most significant, of course, was the development of the now infamous garbage tip in the early 1950s. The entire length of the creek and the lagoon from Harbord Road to the beach was the depository of Warringah's waste right up until the 1980s.

The wetlands were destroyed in the name of progress. So-called wastelands were filled in to overcome perceived health hazards. Immense environmental damage was done.

Lorna and Alan are so pleased to have seen this era of degradation pass and the birth of a new era of understanding of the natural environment. As active members of Curl Curl Lagoon Friends, they both now work tirelessly – literally on their hands and knees at times – to foster biodiversity, protect and improve wildlife habitats, restore the delicate riparian vegetation and undo the misguided endeavours of the past.





# Rehabilitation into the future

## **A vision for the future**

To put it politely, in only 50 years or so, European settlers had managed to mess up a lagoon environment that had been pristine for maybe millions of years. That's something of which we should not be proud.

If all pollution and further degradation stopped right now, it would probably take a few thousand years before nature could take its course and the waterway returned to its pristine state.

Obviously, that's too long to wait – besides the pollution and degradation hasn't stopped. That's why we need to take positive action to do whatever is possible to speed up the recovery process. And we need to take that action now!



The banks of Greendale Creek were rehabilitated as part of Stage 3.

Lagoon rehabilitation has to take account of the realities of the situation – the Brookvale industrial area will still be there, urban consolidation will continue to pave the catchment and many people will continue to litter, pour stuff down the drains and generally be environmentally insensitive.

### **The importance of a healthy riparian zone**

The word 'riparian' means pertaining to the banks of a waterway. In terms of an urban waterway like Greendale Creek or Curl Curl Lagoon, the so-called 'riparian zone' is an area of natural or near natural vegetation along the banks which acts as a buffer between the water and the developed world. If there was no riparian zone acting as a filter, there would be nothing to stop the pollutants of modern life getting into the water unchecked.

In fact, this is exactly what has been happening at Curl Curl for many years – and is still happening to some extent now.

A healthy riparian zone forms both a physical and a biological barrier that contains a diverse range of native vegetation – giving the water the maximum chance of becoming and remaining clean. Riparian vegetation is also an important habitat for some species of native flora and fauna. Without it, these plants, animals and birds simply wouldn't survive in this area.

Curl Curl Lagoon Friends takes every opportunity to lobby government at all levels about the importance of the riparian zone. After much debate, it was generally agreed in 2001 that a zone 40 metres wide (from the top of the bank) on either side of Greendale Creek and Curl Curl Lagoon was to be designated as a buffer zone and – over a period of time – further restored to being a fully-fledged riparian zone. In some places, this can take

place in the short term and in other places the rationalisation of sporting and other uses will need to precede rehabilitation.

The task over the coming years is to hold the Council and the State Government to their commitments to this important environment and to make sure they undertake sensitive and genuine riparian restoration works.

### **Greenlinks**

No vision for an area like Curl Curl Lagoon should be conceived in isolation. This area should be just one link in a connected chain of natural environments – thereby improving the environmental health of all of Sydney. Curl Curl Lagoon is a part of the green corridor that includes Manly, Dee Why and Narrabeen lagoons.

Open green space is the lungs of a community. Our own healthy future is absolutely dependent on the maintenance of these areas and the resistance of the inevitable constant demands for development.

### **A work in progress**

Here, in brief, is a summary of the major works that have been done in recent years – as well as the major works planned for the near future. More information on the Greendale Creek and Curl Curl Lagoon Rehabilitation project is available from the Warringah Library. Info on the other projects is available from Curl Curl Lagoon Friends.

### **Stage one of the rehabilitation project**

This stage of the project revolved around the construction of a Gross Pollutant Trap on Greendale Creek at Harbord Road. This was an important first step in the creek's rehabilitation because it





The Gross  
Pollutant Trap  
near Harbord  
Road

dramatically reduces the amount of large litter that gets into the waterway. The trap has been hugely successful and Council routinely cleans it out – taking around 300 tons of litter and sediment away from the creek each year.



Part of the  
Stage 3 works  
to Greendale  
Creek



## Stage two of the rehabilitation project

The second stage of the project saw the restoration of the creek from the Gross Pollutant Trap to a point midway between the two footbridges. While this work repaired the new, straight course of the creek and didn't attempt to find the original course, the stage involved significant plantings of native vegetation species, redevelopment of stormwater inlets, the construction of a multi-use pathway – vital to giving the community access to appreciate the area – and associated landscaping.

## Stage three of the rehabilitation project

The remainder of Greendale Creek was the target of the third stage of the project. This was a very important stage because it saw the installation of a weir between the creek and the lagoon – for maintaining the water levels in the creek – as well as a sediment retention pond to reduce the amount of fine sediment being washed into the lagoon and on to the beach. This was achieved through deepening and widening the creek immediately to the west of the Park Street footbridge.

Below: The old Park Street bridge removed in 2000



Above: The new bridge and viewing platform

One interesting feature of the weir is a thing known as a 'fish ladder'. This is a series of gaps in the rock, at various heights, which allows fish and eels an opportunity to move from the lagoon into the creek no matter what the relative water levels. The fish ladder can be seen towards the northern end of the weir, just east of the Park Street bridge.

Public access was also greatly enhanced during Stage Three – with the extension of the multi-use path and the construction of a new footbridge and observation deck.

This stage, above all others, has had the greatest public impact and has brought about the highest levels of support for the overall project. The jungle of exotics has gone and it is a pleasure to see the transformation of the creek banks. Visitors and locals enjoy the Badu Muru Nature Walk, where they have the opportunity to read the displays describing the plants and animals found in the area. From the viewing platform and new footbridge they can see what has already been achieved and contemplate the next big challenge – the rehabilitation of the lagoon.

### **Planting day – 1996**

As the main rehabilitation project has been progressing, Curl Curl Lagoon Friends volunteers have been concentrating on small projects – starting from the beach end of the lagoon to meet up with the major works – aimed at treating stormwater before it enters the main body of the lagoon.

The objective is to see the establishment of biodiverse vegetation and habitats on the lagoon margins.

The 28<sup>th</sup> of September 1996 was the first of the major planting days in this programme and the work that day focussed on the outlet referred to as NI4 on the north side of the lagoon east of the Griffin Road bridge at the end of Surf Road.

This project was funded by a \$5,000 grant from the Sydney Northern Beaches Catchment Management Committee Inc (now Northern Beaches Envirolink Inc).



Macrophyte beds are important bird habitats

### Mini wetland – Surf Road

On the 24<sup>th</sup> October 1997, Curl Curl Lagoon Friends volunteers, with the support of Federal Coastcare funding, installed a mini-wetland to address the problem of stormwater pollution entering the lagoon at the outlet referred to as NI6 – at the Surf Road Reserve, just below Huston Parade, North Curl Curl. This supported a pollutant trap and trash rack on the same outlet.

The way the mini-wetland works is that the stormwater inflow is ponded and the wetland is planted thickly with native macrophytes (like reeds) and other vegetation. These plants naturally purify the water through taking up nutrients, filtering out litter and allowing coarser particles to settle before the water discharges into the lagoon.

While this area may have become a little overgrown in recent times – despite the ongoing efforts of Curl Curl Lagoon Friends volunteers and bush regenerators – the principle holds good and the lagoon is just a bit cleaner for it.

### **Southbank Pocket Wetland**

This major project of Curl Curl Lagoon Friends is discussed in detail in the following chapters of this booklet.

In brief, the project addressed on-going issues along an important section of the south bank of the lagoon between Park Street and Travers Road.

Work included the planting of many native species to combat the native, but dominant, *Phragmites australis*, landscaping and the installation of two litter booms over the adjoining stormwater outlets to further reduce the amount of large pollution able to enter the water.

### **Stage four of the rehabilitation project**

Now it is time for Stage 4 – the big one. To get this done, a lot of money has to be raised and a lot of work has to be done. It is very pleasing that Warringah Council – assisted by NSW State Government funding – has started the process. The first step is to update the Statement of Environmental Effects (SEE) for the project.



An SEE was prepared in 1994 by environmental consultancy Patterson Britton and Partners. However since then there have been significant changes to planning regulations and environmental guidelines related to the proposed activities for Stage 4. The SEE is to be updated in light of these changes, including a review of the preferred Rehabilitation Proposal by Council and the Community.

Patterson Britton has again been selected as the Consultant who will undertake the SEE update. They will hold public workshops to obtain feedback – because it is imperative that Warringah Council has community support for the measures to be undertaken as part of the project.

There are contentious issues to be resolved, such as sediment removal or “dredging”. The Community wants to know what contamination is there and what is the best option - should it be full scale dredging or selective dredging.

During the early days of the Rehabilitation Project a lot of thought was put into the possibility of securing feeding areas for the many birds who visit Curl Curl Lagoon. There was concern about cats – both feral and domestic – and the destruction they could cause. Islands were mooted. This requires review and discussion with possible options being offered - whether it be islands or special sand banks.

The riparian zone, the vegetation buffer that protects the waterway from the developed world, requires special consideration as it determines the health and rehabilitation of Curl Curl Lagoon.

This will be a busy and testing time for all of us interested in the future of the lagoon and its environs.

# **A** community co-operates

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## **Funding for community environmental action**

As an active and vigilant environmentally sensitive organisation, Curl Curl Lagoon Friends Inc is always on the look out for opportunities to further its objectives - particularly the core objective of seeing the rehabilitation of Curl Curl Lagoon and its catchment.

In 1998 the association applied for a NSW Wetlands Action Grant and put together a plan to undertake significant works on the lagoon's south bank. The nature of the funding opportunity required input from various sources and Curl Curl Lagoon Friends set about the application task.

### **Sources of funding**

Funding for community projects can come from a variety of sources and groups should be vigilant – and creative – in seeking opportunities.

Curl Curl Lagoon Friends – while not being cash rich – has been able to contribute significantly to projects through its wealth of volunteer labour. For example, in 1996/1997, the association was able to have a major participation in the production of the Greendale Creek and Curl Curl Lagoon Stormwater Treatment and Management Plan. A Federal Government Coastcare Grant of \$10,000 was matched by Warringah Council. Curl Curl Lagoon Friends was able to contribute a creditable \$12,000 worth of support – making the whole project valued at \$32,000 and resulting in a detailed and worthwhile plan.

A significant part of the association's contribution was in 1996 when Alan Newton and Lorna Plate visited every stormwater inlet – either on foot or by punt – and prepared a detailed brief for the consultant, Patterson Britton and Partners.

Curl Curl Lagoon Friends has continued to play their part in ensuring that Government Funds continue to flow and have both lobbied successfully for major projects and applied for funds for smaller projects – always, of course, bearing in mind at all times the rehabilitation plans developed in 1992.

### **Grants received over the years**

The first external funding received by the community was a small grant of \$5,000.00 from the Sydney Northern Beaches Catchment Management Committee (now Northern Beaches Envirolink Inc). Along with funds from Warringah Council, this made possible the first mini or pocket wetland – at stormwater outlet N14 on the north side of the lagoon.

With Warringah Council, Curl Curl Lagoon Friends has made many submissions to State and Federal Agencies. While not all successful they did enjoy their share of success.

From the Federal Government, three Coastcare grants have been received – \$10,000 for the Stormwater Treatment Plan described above, \$10,000 for a Stormwater Treatment Zone at stormwater outlet N16 on the north side and \$16,500 for a Stormwater Treatment Zone at outlet N13 – as well as the development of diverse habitats from N13 to N17 – also on the north side of the lagoon.

From the State Government, two grants have been received – \$10,000 for a Stormwater Treatment Zone at outlet N12 and \$19,500 for the Southbank Wetlands Restoration Project.

This total of \$66,000 has attracted a Warringah Council commitment of \$37,090 in cash or in kind and a Curl Curl Lagoon Friends contribution of \$43,630 in cash and volunteer labour – making an impressive grand total of \$146,720 worth of valuable environmental works undertaken as a result of the efforts of the community. And this doesn't include the many hundreds of thousands of dollars spent on the main rehabilitation project described earlier.



The Badu Muru walk and multi-use pathway were established as part of Stages 2 and 3



# Southbank pocket wetland

## The Southbank project in detail

### The aim

The aim of the Pocket Wetland project was to make a start on the restoration and rehabilitation of the wetlands on the southern shores of Curl Curl Lagoon – in keeping with the objective of restoring the native vegetation that prevailed in the area before it was used as a garbage tip.

Since that time, the dominant plant species along the lagoon bank has been *Phragmites australis*. While this is a native, it is a robust perennial that thrives in degraded areas. It has dominated and taken over the lagoon margins – a very successful monoculture.

The first aim of the project, therefore, was to establish a biodiversity of native wetland species in order to restore the diverse wetland habitats that prevailed in the natural wetland system of Curl Curl Lagoon.

Following from this, the biodiverse system created would preserve, enhance and protect native bird habitats and promote the cultural and natural heritage of the Curl Curl Lagoon Wetlands. In addition, it would enable the continuation of environmental learning programs in local schools – allowing them to address issues ranging in relevance from catchment-wide to regional to those of the international significance of links in the natural chain of coastal wetlands.

## **The opportunity**

In close association with Craig Tucker, Team Leader of the Catchment Management Team at Warringah Council, Curl Curl Lagoon Friends completed an application for a Grant for Wetland Action from the 1998/1999 Natural Resource Programs of the Department of Land and Water Conservation.

Grant criteria included demonstrating the environmental significance of the site and the issues that needed to be addressed and stating what was to be achieved by the project – as well as explaining how the project would be carried out and how the results would be assessed and promoted.

To support the grant, Curl Curl Lagoon Friends committed cash and volunteer labour to the value of \$9,780 – in fact 652 volunteer hours – Warringah Council contributed cash and in-kind contributions to the value of \$9,750 and the Wetland Action support application was successful to the tune of \$19,500.

The grant funds were received on 12 October, 1998 and were administered by Curl Curl Lagoon Friends Inc.

## **Planning**

After careful consideration and inspections of the south banks of Curl Curl Lagoon, the executive committee decided on the precise areas to be worked on and formulated a preliminary action plan.

Like all successful non-profit community organisations, the Friends make maximum use of available talent within their membership. One member of the executive committee is Rick Shepherd, a landscape designer. His offer to prepare a detailed Wetland Management Plan was accepted without hesitation.

## Weeds

At the southbank wetland site various weed species were identified and removed. They included:

Canna Lily (*Canna X generalis*)

Mirror Bush (*Coprosma repens*)

Coral Tree (*Erythrina* spp.)

Kurnell Curse (*Hydrocotyle bonariensis*)

Coastal Morning Glory (*Ipomea cairica*)

Kikuyu grass (*Pennisetum clandestinum*)

Although a native species, *Phragmites australis* was also considered to be a weed within the work area due to its dominance.

More information on weeds is included later in this booklet.

## Revegetation

A study was undertaken of the types of native plants that would have originally grown in this area and species were selected based on their availability and hardiness.

Some of the trees that would have grown here include:

*Banksia integrifolia*

*Banksia ericifolia*

*Casuarina glauca*

*Cupaniopsis anarcardiodes*

*Eucalyptus botryoides*

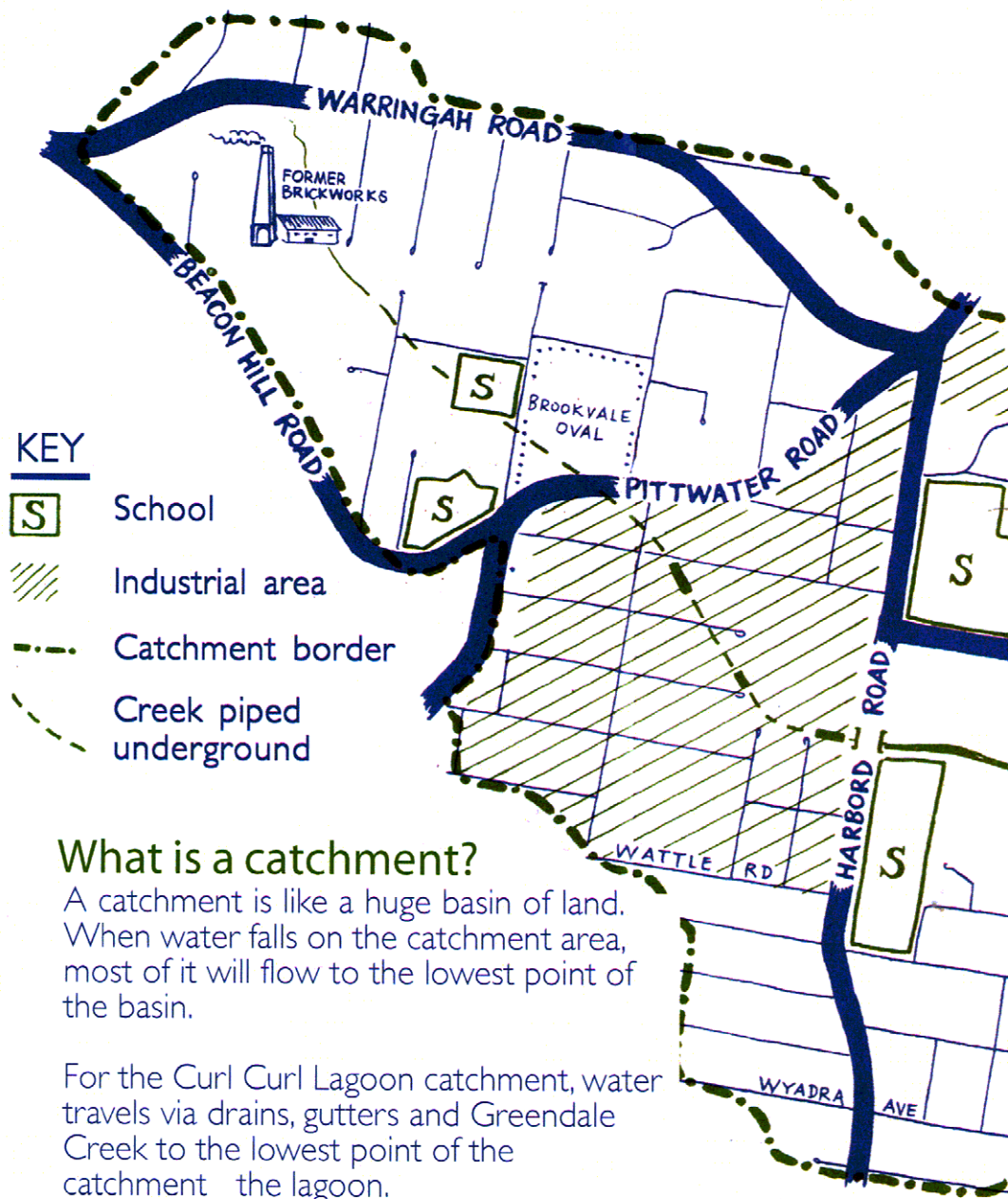
*Ficus rubiginosa*

*Leptospermum laevigatum*

*Melaleuca ericifolia*

*Myoporum acuminatum*

*Westringia fruticosa*



**KEY**

- S School
- Industrial area
- Catchment border
- Creek piped underground

## What is a catchment?

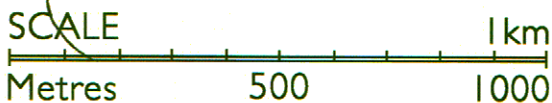
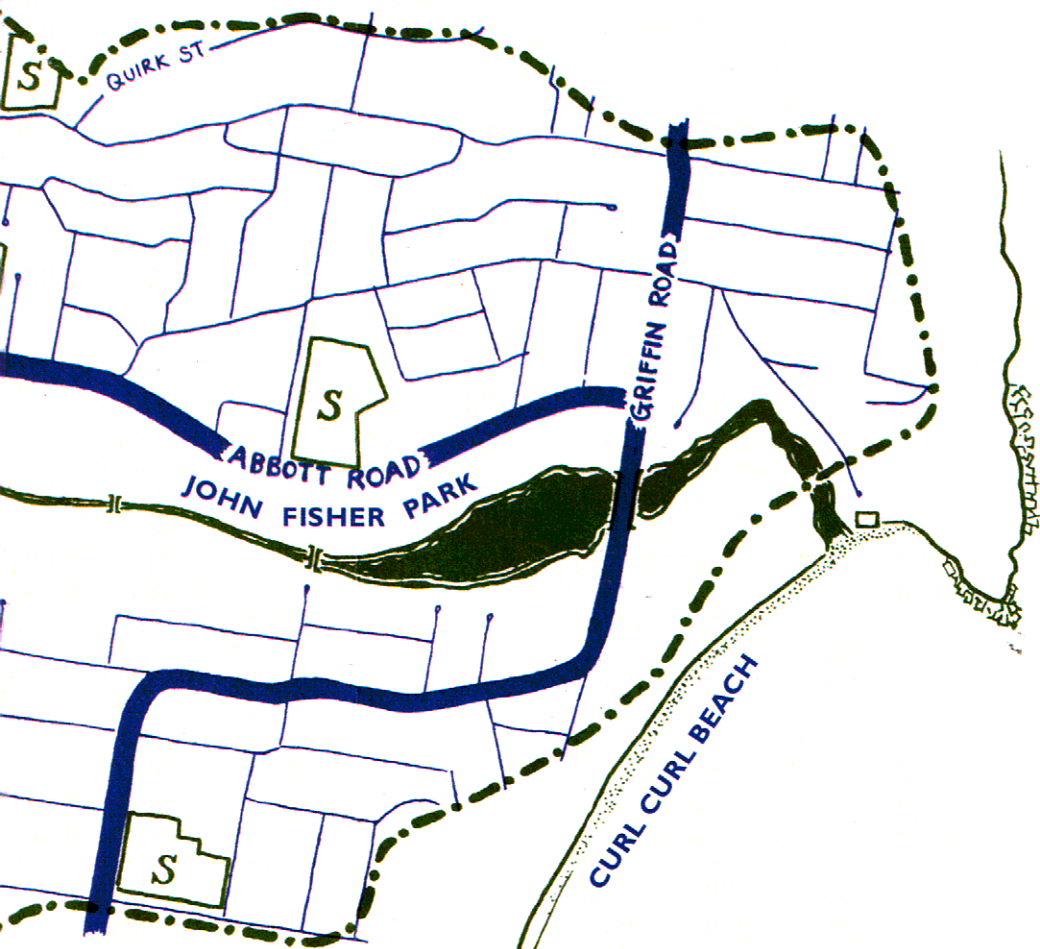
A catchment is like a huge basin of land. When water falls on the catchment area, most of it will flow to the lowest point of the basin.

For the Curl Curl Lagoon catchment, water travels via drains, gutters and Greendale Creek to the lowest point of the catchment – the lagoon.

That's why everything that happens in the catchment has a direct effect on the lagoon and the beach.

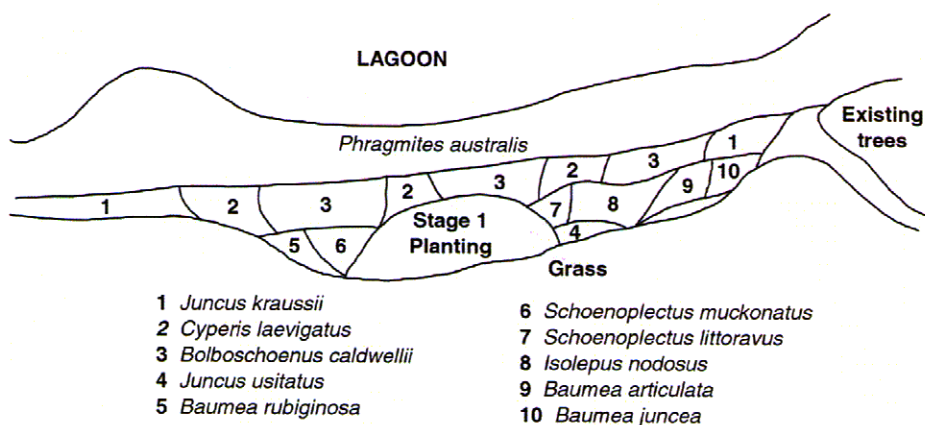


# CURL CURL LAGOON CATCHMENT



There are also quite a few native shrubs that would have been common in areas like Curl Curl Lagoon. They include:

- Baumea juncea*
- Baumea articulata*
- Baumea rubiginosa*
- Bolboschoenus caldwellii*
- Crinum pedunculatum*
- Cyperus laevigatus*
- Isolepus nodosus*
- Juncus kraussii*
- Juncus usitatus*
- Lomandra longifolia*
- Schoenoplectus mucronatus*
- Schoenoplectus validus*



**Native species planted at the southbank project**

There is more information about some of these species in a later chapter of this booklet.

## Propagation of native species

Where possible, the integrity of the vegetation was maintained by harvesting seeds from native species growing in the lagoon margins and having them propagated locally. This was done at a local nursery, Harvest Seeds, by members of Curl Curl Lagoon Friends and by teachers and students at Freshwater High School.

Alan Newton supplied the seeds to Freshwater High School where the students were supervised by teacher, Louise Fletcher. To assist them in this valuable contribution, the school received a grant from Warringah Council to conduct a special environmental programme that included "seed collection, growth and establishment in the Curl Curl Lagoon Catchment".



Another major factor in the success of the project was the assistance and enthusiasm of Marina Grassecker from Harvest Seeds, who visited the site and gave the Executive invaluable advice on wetland species suitable for the project.

**Marina Grassecker plants a fig tree in the wetland**

## Talking to the neighbours

Another key to the success of any community project, whether initiated by a Council or a community group, is making sure that it has wide-spread support from local residents – particularly ones likely to be directly affected by the project.

To this end, a flyer was prepared and delivered to all residents neighbouring the site. They were invited to visit the site on Saturday morning, May 29, 1999, to meet members of the association, discuss plans and ask questions.

About a dozen local residents attended – and Rick Shepherd was able to explain the concept plan and the reasons for needing to increase the biodiversity of native wetland species in the area.



The reaction of the residents was positive and executive committee members were promised assistance during the planting and nurturing stages of the project.

Talking to neighbouring residents



## Preparation of the site

The plan involved significant preparation of the area – most of which was undertaken by Warringah Council – with on-going assistance from the Curl Curl Lagoon Regenerates. In all, 600 square metres of land was cleared between Park Street and Travers Road. A variety of methods was used – including mowers, hand weeding and some use of herbicide. This was particularly necessary due to the vigour of some of the exotics like *Erythrina* and *Coprosma*.



Harry Elliffe discusses the project with Scot Hedge and Craig Tucker from Warringah Council

## Planting days

After site preparation, three major planting days were held – supported by various smaller planting efforts by different groups of volunteers. It was decided not to do all the planting on the same day for several reasons. Firstly, it would allow each group of plants some time to consolidate before others were added, but possibly more importantly, it spread the workload for the volunteers who would be doing the planting and on-going maintenance. Volunteer resources are always limited so should not be over-used.

The first planting day was Saturday 30<sup>th</sup> October 1999, when volunteers, the Regenerates and Curl Curl Lagoon Friends planted 100 advanced plants – including two Port Jackson Figs, sixteen Banksias, 35 Crinum lilies and 15 Dianellas.

On Saturday 25<sup>th</sup> March 2000, over 4,000 wetland plants were put in. But the hard work didn't end there - because without watering, weeding and general tender loving care, the wetland's chances of becoming a successfully biodiverse area would be limited.

The first days are critical and many local residents – particularly CCLF member Reg Paling who lives next to the area – helped by maintaining a sprinkler system and carrying buckets of water.

Weeding has since been carried out by both the “Regenerates” – volunteer bush regenerators – and a local professional bush regeneration company Gondwana Bush Regeneration.

Despite the site having been carefully prepared (Warringah Council arranged for 6 volunteers with a supervisor from the Australian Trust for Conservation Volunteers to work on weed

control and site preparation in September 1999) and the determination of the weeding effort after planting, the very hardy and dominant *Phragmites australis* has crept back in. Other species such as the flat leaved Penny Wort (*Hydrocotyle bomariensis*) – the most common on this site – and Turkey Rhubarb (*Rumex sagittata*) are also a problem.

While this has slowed the process and brought about the loss of some of the new plants, it is generally felt that the survival rate has been sufficient to be able to declare the project an overall success.

The efforts of the Regenerates and others will go on for some time until the pocket wetland is well and truly established.





# Pollution

## Establishment of Litter Traps adjacent to the project

A part of the funding for this project was allocated to providing some sort of litter trapping on the stormwater outlets immediately to the east and west of the new pocket wetland. These outlets are designated S8 and S9. It was decided to install floating litter booms on these outlets.



The litter boom in operation at S8

Not only improving the water quality in the immediate area, these new booms added to the overall aim of placing some sort of pollution intervention over all of the 36 places where water enters the creek and lagoon.

The stormwater inlet numbering system is simple. 'N' and 'S' stand for north and south respectively - and the inlets are numbered from Harbord Road. Therefore, 'S8' is the eighth inlet east of Harbord Road on the south side.



In fact, the two new booms make 24 of the 36 inlets now covered:

- Three are part of the Harbord Road Gross Pollutant Trap
- 13 were developed as part of the rehabilitation works on Greendale Creek Works – S1A, S2 (double), S3, S4, S5, S6, S7, N3, N4, N5, N6 and N7A
- N7 (double) has a small Gross Pollutant Trap, a Council initiative
- N14 was our first mini wetland
- N16 is another mini wetland with water quality control devices
- N12 has a water quality control device
- N13 has a sediment basin and trash rack
- S8 and S9 have the new boom attachments.

The project to investigate options and supervise the installation of the booms was overseen by Curl Curl Lagoon Friends executive committee member Harry Elliffe.

Harry and other Curl Curl Lagoon Friends members have been monitoring the booms and improving their effectiveness. Modifications to the booms and the attachment points – together with repairs to the headwalls – have been made.



Pollution will always be a problem in any urban area

Harry has also been removing litter from these booms for the first 12 months of their operation – and it is anticipated that Council will assume responsibility for future maintenance through a regular program.

Observation of the operation of these booms and the other pollution control devices in the creek and lagoon area has highlighted the absolute necessity for regular inspection of the devices. It appears that the trash racks, in particular, are subject to being rapidly blocked by leaves and the subsequent flood flow allows the floating litter to escape over the rack into the creek and then the lagoon.

It is apparent that the trash rack in the main GPT at Harbord Road may require some modification. It will certainly need frequent inspection and cleaning. Because of limited Council resources – all the racks in the area really need to be inspected after major rain events – the priority for rack cleaning is not always determined. Curl Curl Lagoon Friends encourages community participation in this, looking for volunteers who can assist with inspections or do minor clearing to help minimise the pollution of our waterways.

Of course, these various barriers and devices will not completely put a stop to the presence of litter and other pollution in the waterway. The annual Clean Up Australia Day has been important for years in removing large amounts of litter, but, in the end, we have the reality of living in an urban area where litter and pollution are unavoidable realities. Sadly, not all residents and visitors have the same respect for the environment and beauty of our world as we do. Hopefully, however, we are in the majority and all that can really be done is for good citizens to continue to take pride in our environment and maybe put the miscreants to shame.

# Community awareness

## Continuing Environmental Awareness and Learning Programme

Throughout the project, Curl Curl Lagoon Friends has engaged in a concerted campaign of promotion and public awareness. Features of this have included newsletters, public meetings and school outings.



Freshwater High students on a field trip to Curl Curl Lagoon

This has been an extremely important part of the overall project. Residents and visitors need to be aware of the importance of establishing and protecting biodiverse riparian areas, preserving and protecting wildlife habitats and rehabilitating wetlands and degraded foreshores – as part of the health of the waterway and the overall environmental health of their city.

School students need to be given knowledge and a respect for our environment – so that they can go forward as adults with an understanding of the issues and an innate desire to protect our fragile world.



On the 16th November 1998, a special student excursion was held in conjunction with Freshwater High School, the Coastal Environment Centre and Curl Curl Lagoon Friends.

Under the supervision of Glen Holliday, Teacher, Freshwater High School and Toni Wilson from the Coastal Environment Centre, students identified 30 amphipods, 1 dragon fly nymph, 5 juvenile fish, 50 small brown shells and 1 beetle.

The Southbank Project has also been a great learning exercise for the volunteers who have worked so hard and the friendly visitors who have watched the implementation of the various stages. Overall, there is a much greater awareness of the history and – hopefully – healthy future of our lagoon.



Local residents and visitors have always enjoyed Curl Curl Lagoon and its environment. These people gathered for a 'Save John Fisher Park' family picnic day in 2001.



# A cautionary tale

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Without in any way downplaying the value of the work done on the Southbank pocket wetland or the amazing work done by the many volunteers and professional people who contributed, no honest analysis of a community project like this would be complete without some words of warning about the potential pitfalls.

Volunteer groups should always be very aware of their limitations when taking on major projects and not make too many assumptions about the numbers of people who will willingly give up their weekends to work on the project. This involvement must go on well beyond the enjoyable team effort of building something new – into the often solitary effort of on-going maintenance.

It can be disheartening to see hard work go to waste – and it was discouraging when the weeds came back into the pocket wetland in such force that some of the new plants were lost. In a highly degraded area like the banks of Curl Curl Lagoon this is inevitable and these losses should be viewed as an integral part of the project.

The important thing is that the overall benefit of the project has been positive. Many more native species are now thriving in this area than previously when there was really only one. The surviving plants have passed their dangerous settling-in period and will stay on as testament to the community's contribution to the wonderful environmental asset that is Curl Curl Lagoon.

# A guide to local native plants

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This list and the following pages of photos is a brief guide to some of the native plant species that might be found around Curl Curl Lagoon. The list has been compiled based on historical records and assumptions based on species that exist in other, less damaged, areas. It is by no means exhaustive and Curl Curl Lagoon Friends will continue to review the list and add or subtract species as more information comes to hand.

Species	Size	Comments
<i>Banksia integrifolia</i> (p.49)	6-16 m	Often abundant beside estuaries
<i>Banksia ericifolia</i> (p.52)	2-5 m	Important species for nectar feeding birds
<i>Casuarina glauca</i>	to 20 m	Preferring brackish marshes and estuaries
<i>Cupaniopsis anacardiodes</i>	3-10 m	Found in humid places near the sea
<i>Eucalyptus botryoides</i>	20-30 m	Salt resistant leaves, first Eucalyptus in coastal succession
<i>Ficus rubiginosa</i> (p.48)	4-10 m	Common around Sydney in the sides of gullies
<i>Leptospermum laevigatum</i>	to 8 m	Forms barrier against salt winds with <i>Banksia integrifolia</i>
<i>Melaleuca ericifolia</i>	3-6 m	Occurs on the fresh side of salt marshes near <i>Casuarina glauca</i>
<i>Myoporum acuminatum</i>	3-6 m	Associated with <i>Casuarina</i>

*Westringia fruticosa* (p.50) 1-1.5 m Common on coastal cliffs and headlands

There are also quite a few wetland plants that would have been common in areas like Curl Curl Lagoon. They include:

Species	Size	Comments
<i>Baumea juncea</i>	1 metre	Freshwater seepage on the edges of saltmarshes
<i>Baumea articulata</i>	1-2 m	Swamps, attractive plant
<i>Baumea rubiginosa</i>	1 m	Marshy, sandy soils
<i>Bolboschoenus caldwellii</i>	0.5-1 m	Brackish conditions, growing inland from <i>Phragmites</i>
<i>Crinum pedunculatum</i>	1.5-2 m	Swampy ground near brackish estuaries
<i>Cyperus laevigatus</i>	0.4-0.6 m	Saline estuaries and coastal lagoons
<i>Isolepus nodosus</i>	0.7 m	Moist areas near the sea
<i>Juncus kraussii</i>	1-2 m	Edge of brackish estuaries, often inundated at high tide
<i>Juncus usitatus</i>	1 m	Moist to swampy land, mainly disturbed sites
<i>Lomandra longifolia</i> (p.50)	0.5-1 m	Common in this area, important food and fibre to local Aborigines
<i>Schoenoplectus mucronatus</i>	0.4-0.7 m	Near the coast in shallow fresh water; rare
<i>Schoenoplectus validus</i>	1.5 m	Edges of freshwater streams

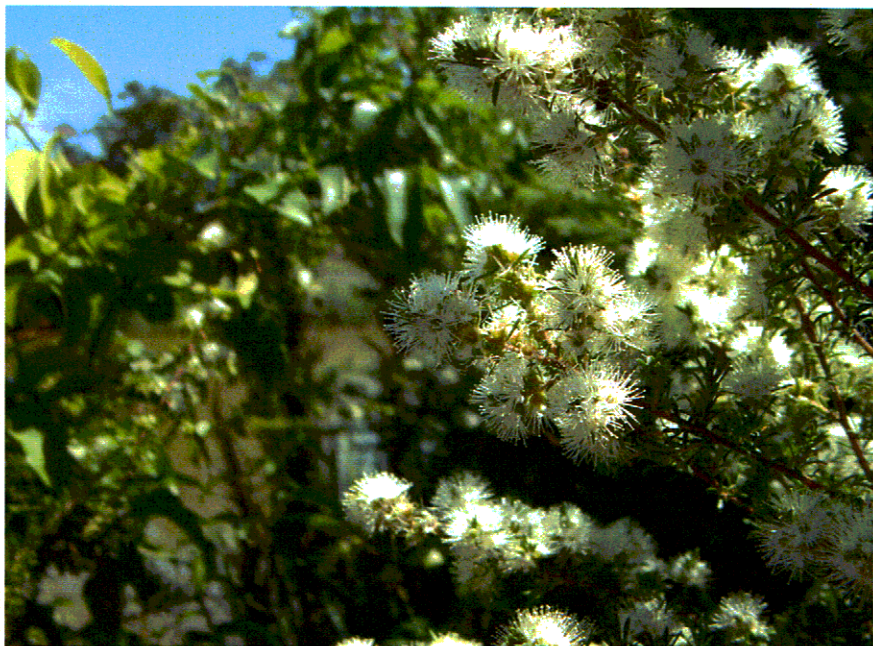
Regeneration adjacent of Greendale Creek. This is biodiversity at work - it looks good and it provides important habitat.



*Ficus rubiginosa* is a good shade tree



Coastal Banksia (*Banksia integrifolia*) is common in the local area. Its flowers are often visited at night by fruit bats.



Tick Bush (*Kunzea ambigua*) provides dense cover for small birds.



The strap-like leaves of the Matt Rush (*Lomandra longifolia*) tend to "sweep" the ground - helping to keep down weeds.



The Coastal Rosemary (*Westringea fruticosa*) grows naturally on Dee Why Headland. It is a common landscaping plant and has been used in Stage 3 of the Curl Curl Lagoon Rehabilitation.



The Blue Flax Lily (*Dianella* sp.) can be seen beside the path along Greendale Creek. The rich blue flowers are followed by shiny purple blue berries.



The shiny orange red nut of the Saw Sedge (*Gahnia* sp.). These giant sedges have sharp leaves so provide good cover for native fauna.





*Commelina cyanea*, a ground cover, thrives in most shady places.



*Banksia ericifolia*, a small tree growing to 3 metres, is important as its winter flowering season provides food for nectar feeding birds.



To conclude this section on natives, special mention needs to be made of *Phragmites australis*. This is the reed grass that grows prolifically all around the lagoon banks. *Phragmites* provides a good link to the next section - on weeds.

Just as important as nurturing native species is the encouragement of biodiversity - where many different species live together and provide a full range of habitats, food sources and nutrient intakes.

While *Phragmites* is certainly a native of Curl Curl Lagoon, it tends to dominate at the expense of biodiversity. Given the definition of a weed as any plant that grows in a way that is contrary to the best interests of the environment around it, at times *Phragmites* can be considered as a weed.



The dominant reed on the lagoon bank, *Phragmites australis*, is a native to this area. Because of its dominance, however, it is sometimes treated as though it were a weed - to help other plants to get established.

# A guide to weeds

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A weed is simply a plant that is growing where it shouldn't. Just because something is attractive doesn't mean it can't be a weed. In fact, many weeds in a natural area are escaped ornamental exotics originally imported by residents from other countries or other parts of Australia.

In the case of an environment like Curl Curl Lagoon, the intention of Curl Curl Lagoon Friends and the Warringah Council is to return it as close as possible to its natural state. This is important because a natural ecosystem is best able to clean the water, provide habitat for native fauna and provide links to other nearby remnant vegetation.

Weed control, however, has to be done very carefully and in a managed way. Birds and other fauna are forced to adapt to whatever conditions prevail at any given time. If we were to just go into the park and remove every weed we would run the risk of destroying the only habitat these animals have.

Consequently, our bush regenerators work systematically – making sure native species are encouraged and allowed to thrive as exotic species are gradually removed. Also, many animals rely on what falls to the ground as places to hide. Regenerators often stack weeds so that they can, in the short term, provide valuable habitats and in the long term disintegrate into mulch. The same applies to fallen branches. This is part of the natural cycle and these also provide valuable habitat.

The lesson from this is that a healthy natural environment is not always an attractive one from the point of view of people used to carefully manicured parks and gardens. It is a careful balancing act



between the demands of our high-impact urban lives and the necessities for survival of our native birds and animals.

On the following pages are some photos of some of the weed species found around Curl Curl Lagoon – so that you will be able to recognise them and understand why they need to be removed.



One of the worst. Don't be fooled by the colourful blue, purple or sometimes white flowers of the overbearing climber Morning Glory (*Ipomea* spp.). This weed can smother the native plants it grows over.

## The prickly lantana



Native birds, insects and other animals can be very adaptable when the going gets tough. For example, in the absence of a better natural alternative, some small birds make their homes in amongst lantana bushes. Its prickly leaves and stems provide them with pretty good protection from large predators - like foxes, dogs and cats.

It is therefore important that we take care when clearing weeds from the bush so that we don't take away this habitat all in one go. Often, weeds like the lantana is cleared in stages while native alternatives are becoming established.



The Pennywort (*Hydrocotyle bonariensis*), with its glossy green leaves, is almost impossible to get rid of. Also known as Kurnell Curse, it thrives in moist conditions and is a major problem around the lagoon.



Moth Vine. A climber, this vine can be identified by its 'choko' type fruit and delicate cream flowers. It also prevents natural undergrowth by forming a canopy over trees, starving them of light.



*Coprosma repens*, or Mirror Bush, has attractive foliage but is spread by birds and can take over coastal heathland.

The colorful Coral Tree (*Erythrina* spp.) is a weed in creeks and low lying areas. Being deciduous, it drops its leaves into waterways with their resultant decomposition robbing the water of vital oxygen.



Madiera Vine (*Anredera cordifolia*) is spread by tiny tubers and can smother bushland.





*Senna*, also known as *Cassia*, is a garden escape that has become a weed in bushland.



The Canna Lily is another garden escape that has naturalised on the lagoon margins.



# Native birds

There are many native birds that make their homes in Curl Curl Lagoon and its surrounding areas.

There have been several controlled studies of native bird species around the lagoon and the general results of these give some cause for concern.

In the late 1970s, volunteer ranger W. Beckett conducted a survey and identified 102 species – including both feral and native birds.

However, when Alan Newton conducted observations in 1997, he was only able to identify 75 species including migratory and seasonal visitors.

In a further study as part of her PhD thesis, Louisa Best – assisted by Alan Newton – recorded only 45 species in a controlled survey.

These figures suggest that we should be very concerned about the continued degradation of the natural environment in Warringah and not allow any further unnecessary encroachment of development on our open spaces.

Observers have noted that water birds have generally remained – albeit some in reduced numbers – and large tree habitat birds have remained constant. The real changes in numbers and species have been amongst the birds whose habitats are on the ground or in dense low bush – like the partalopes, finches, pipits, cistacolas for example. This has been caused by clearing of vegetation, night lighting and the proliferation of dogs and cats ranging the parklands.

One difficult issue is the relationship between human users and the natural environment. Obviously, it is wonderful that the usage of John Fisher Park and the Flora & Richie Roberts Reserve has increased over recent years and that people are getting real enjoyment out of these unique facilities. But they need to take care. Dogs chasing sticks into the bushes – or, what’s worse, chasing the birds themselves – can unwittingly disturb nesting birds and damage their habitats.

Hand feeding of birds is also detrimental to many native bird species and can have serious negative consequences, including:

- the development of an unnatural dependence on humans;
- a tendency for one species to dominate at the expense of diversity;
- unnatural diets can cause defects in egg shells and deformities in young birds; and
- hand feeding has a habit of attracting feral birds.

While not taking away from our enjoyment of the park and lagoon, we should just be careful about what we do there and how it might affect the environment.

Sometimes bush regenerators leave piles of cut leaves and branches on the ground. These provide ideal short term habitat for small birds.



If you want to know more about the birds that are native to this area, there are some good books on the subject.

Here are a few that we know of:

Australian Waterbirds – Richard Kingsford

The Slater Field Guide to Australian Birds – Peter Slater et al

The Graham Pizzey & Frank Knight Field Guide to the Birds of Australia – Graham Pizzey

Birdwatcher's Guide to the Sydney Region – Peter Roberts

Hand feeding of birds can attract nuisance species from other areas - seagulls for example. This is not always desirable for protecting local species and keeping the area clean.



There are many native birds living around Curl Curl Lagoon - like the Purple Swamphen (*Porphyrio porphyrio*), above and the Pacific Black Duck (*Anas superciliosa*), below.





Useful contact points for more information about anything in this booklet or any aspect of the Warringah environment:

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lagoon@charliebravo.com.au

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Catchment Management Team  
725 Pittwater Rd  
Dee Why NSW 2099  
genmgr@warringah.nsw.gov.au

Warringah Library Local Studies  
725 Pittwater Rd  
Dee Why NSW 2099  
Phone (02) 9942 2610  
grahat@warringah.nsw.gov.au

Northern Beaches Envirolink Inc  
PO Box 522  
NARRABEEN NSW 2101  
Phone (02) 9905 2475  
redan@ans.com.au

Coastal Environment Centre  
Lake Park Rd  
NARRABEEN NSW 2101  
Phone (02) 9970 6905  
pitcec@intercoast.com.au

There are also a large number of very interesting books and studies to read if you want to know more about the history or ecology of the northern beaches. Here are just a few to get you started:

Harbord: Queenscliff and South Curl Curl 1788 - 2000 – Gwen Gordon

Waterplants in Australia – G. R. Sainty and S.W. L. Jacobs

Native Plants of the Sydney District – Alan Fairley and Philip Moore

Burnum Burnum's Wildthings around Sydney – Geoff Sainty, Peter Abell & Surrey Jacobs

Beach Plants of South Eastern Australia – Roger Carolin & Peter Clarke

A Field Guide to Australian Native Shrubs – Ivan Holliday and Geoffrey Watton

Weeds: An illustrated Botanical Guide to the Weeds of Australia – B. A. Auld & R. W. Medd

Field Guide to Weeds in Australia – Charles Lamp & Frank Collet

Common Weeds of Sydney Bushland – Robin A. Buchanan

