

Environment Illawarra

An aerial photograph of a coastal town, likely Illawarra, showing a dense residential area with a grid-like street pattern. A major highway interchange is visible in the center-left. To the right, a sandy beach meets the ocean. The image is used as a background for a report or brochure.

The
Keira
Green
Corridor

Message from the Lord Mayor



Alderman David Campbell
Lord Mayor of Wollongong

Wollongong's Green Corridor Program is possibly the most important long-term strategy in place for the well-being of our City's environment. The concept of establishing lineal urban forests from the escarpment to the ocean has caught the imagination of a wide cross-section of the community.

The program commenced in the early 80s and there are now six green corridors either being planted or proposed. Keira was the first and the results of many peoples' efforts are now clearly visible, particularly around the university, Botanic Garden and Porter Street Interchange. New initiatives have seen planting established in Throsby Drive and Beatson, Robinson, Gilmore and Wiseman Parks in the recent past

I am particularly supportive of the Green Corridor Program because apart from its environmental benefits to the City, it is community driven and relies largely on the efforts of many individuals and small groups for results.

This booklet is typical of such community efforts and I would like to thank all those who have made a contribution, particularly the Student's Representative Council of the University of Wollongong who financially supported the printing costs. I am sure the publication will be a very useful historical record and educational resource, but more importantly it will encourage further active participation in the greening of Wollongong.

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Photographs

Cover: From the mountains to the sea — aerial view of the Keira Green Corridor.

Overleaf: Aerial view of the corridor. Mount Keira in the background.

Photographs courtesy of Wollongong City Council Environmental Enhancement Division. Shot by BHP Steel Photogrammetry Section.

Introduction

The urban environment is not often profiled in the media or the environment debate except when there is a crisis such as a dying river or a sewage outfall to be installed. The basics of the urban environment are much more fundamental than such serious issues and, in addressing these basics much progress can be made in alleviating the problems that together create the major issues.

This magazine is dedicated to part of the urban environment of Wollongong. By focusing on one small area of the city the magazine draws out aspects of the urban environment that need consideration and proposes action that will recover much that has been lost and rehabilitate the little that remains. In reading this magazine it is hoped that you will be inspired to become involved in environmental restoration and rehabilitation in your own suburb.

Working together, we can turn Wollongong's environment into a national and international showpiece—an example of what is possible with environmentally sensitive development coupled with restoration to undo the mistakes of the past.

The magazine was made possible by the efforts of many individuals. I would like to thank the authors of individual items for their valuable contribution. Also thanks to Betty Perry and Richard Caladine for proofing the first version of the magazine and to Susan Nicholls for advice and assistance.

And a special thanks to the Students' Representative Council of the University of Wollongong for their contribution toward production.

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The City's Green Corridors program

By JIM MITCHELL

The City of Wollongong is a lineal urban metropolis occupying the foothills and coastal plain between the Illawarra Escarpment and the Pacific Ocean. It was recognised in the early 80s that the City could become a long sprawl of development with the older suburbs expanding and meeting up with their neighbours.

To reduce the impact of urban expansion, and in an attempt to prevent this from occurring, the concept of green corridors, or belts of urban forests, stretching from the escarpment to the sea was developed by Council. It is important for suburbs and communities to maintain their sense of identity.

The basic concept of the green corridor proposal is for trees to be planted on a broad scale, over appropriate sections of the total area, with tacit approval from each organisation for planting to proceed in areas under their jurisdiction. An overall concept is adhered to regarding choice of species, and appropriate landscape design criteria are followed, along with correct horticultural practices when planting. Most of the species planted in the corridor are indigenous to it.

It is now recognised that these linear, well wooded open spaces, particularly when they follow creeks, streams and ridge lines, form important biological corridors in providing habitats for Australia's unique fauna. When these occur in urban areas they are especially valuable, helping to break up the built form, creating visual relief, increasing amenity and providing places of recreation.

Five corridors were initially proposed. These are the Keira, Kembla, Brokers Nose, Mullet Creek and Bulli corridors. Recently a sixth based at West Dapto has been suggested.

Planting in the Keira Green Corridor started in 1983. The corridor broadly consists of the land between Mount Keira and Puckeys Nature Reserve, and includes the University of Wollongong, Wollongong Botanic

Gardens, Wollongong TAFE College, the F5-F6 interchange, Wollongong High School, Wiseman Park, Edmund Rice College, Fairy Creek and all minor parks and reserves in between.

The total area of the Keira Green Corridor is approximately eight square kilometres.

The Kembla Green Corridor belt stretches from Mount Kembla to Hill 60 and includes the very prominent Berkeley Hills and their slopes. Substantial work has been undertaken at Cringila International Forest and a start has been made around the Water Board storage tanks. Other potential

contains substantial natural woodlands and reserves. These are being identified along with the parks in the area to effectively plan for the formation of the Mullet Creek Corridor.

The area to be encompassed by the Dapto Green Corridor is still being defined, but will contain the urban forest in the new development of West Dapto, the retention basin and all adjoining open spaces including Reed Park.

The first plantings undertaken were for the establishment of the Keira Green Corridor in 1983. The catalyst for starting the Keira Green Corridor came from a meeting of The Friends of the University of Wollongong. This meeting was initiated by the then Lord Mayor, Alderman Frank Arkell. Community plantings springing from this meeting saw the establishment of wooded areas at Para Meadows School and in and around the university, Wollongong TAFE College, Keira Technology High School and Wollongong High School.

The community plantings continued over a period of two years. Between 1985 and 1990 the New South Wales Roads and Traffic Authority and the University of Wollongong continued their planting programs. The community planting program was revitalised in 1990 as a result of a Wollongong TAFE Labour Market Program, the Urban Waterways Restoration Course.

Intensive plantings have now been undertaken on the foothills, within the University and Botanic Gardens; plantations have been established within Wollongong TAFE College and the High Schools. Street tree plantings are now established along Northfields Avenue. These new wood-lots, together with the natural areas of Mount Keira Summit Park, Wiseman Park and Puckeys Nature Reserve are slowly achieving the master plan envisaged by the Friends of the University some eight years ago and a positive green belt has begun to dominate

"...a positive green belt has begun to dominate the suburbs"

sites include Allens Creek, American Creek Reserve, Unanderra Industrial Area and Berkeley's parks and open spaces, together with numerous primary and secondary schools.

The Brokers Nose Corridor is a less well defined corridor but generally it consists of the area stretching from Brokers Nose to Bellambi Lagoon including Towradgi and Bellambi Creeks, Baden Powell Park, Robert Ziems Park, numerous primary and secondary schools, substantial beach reserves and Corrimal Caravan Park.

The Bulli Corridor will be planted in open areas around Bulli including Slacky Creek and Collins Creek drainage catchment which contains substantial open spaces including the Grevillea Park, Slacky Flat Park, Bulli Park, extensive foreshore reserves and Bulli Caravan Park.

Mullet Creek drainage catchment



Young trees growing on the foothills of Mount Keira. Planted by the university gardeners in 1984.

Photograph by WAYNE DAVIS. 1991.

the suburbs.

Planting in the Kembla Corridor has been steady, with local conservation societies first planting fig trees on Berkeley Hills in 1980. Cringila In-

“...use of indigenous species ... is encouraged to maintain the ecosystem”

ternational Forest also commenced in 1988 and with recent support from Greening Australia the area has begun to take shape.

BHP has plans to plant 500,000 trees and shrubs around their site by the year 2000 and already 70,000 have been planted which puts them well ahead of their target of 50,000 per year. Direct seeding techniques are

being refined in an effort to speed up the work in the corridors.

The corridors are being developed by community groups undertaking new plantings and regenerating existing bushland as well as by landowners, institutions and government departments undertaking major landscape works on their properties.

The use of indigenous species, preferably grown from seed collected on site, is encouraged to maintain the ecosystem. However, it is recognised that this is not always possible and other stock has been used.

The community has formed committees for the Keira and Kembla corridor programs and the others are being organised. These committees are made up of keen tree planters who plan and develop the plantings, and maintain the trees.

JIM MITCHELL is Manager of Wollongong City Council's Environmental Enhancement Division. He is responsible for development of the City's greening program.

Native plants of the Keira Green Corridor

By ANDERS BOFELDT

Two hundred years ago the area now called the Keira Green Corridor was an area of forest extending from the mountains to the sea. This forest was continuous and quite varied in composition and structure.

Only very small areas did not contain forest. The seaward side and top of the fore-dune was one of these, with spinifex grassland grading back to low acacia scrub and then coastal scrub composed mainly of Coast Tea-tree, *Leptospermum laevigatum* and Coast Banksia, *Banksia integrifolia*.

Low scrub composed mainly of Native Rosemary, *Westringia fruticosa*, grading back to a taller scrub composed of Drooping She-oak, *Allocasuarina verticillata*, Swamp Oak, *Casuarina glauca*, Coast Banksia, *Banksia integrifolia* and Coast Tea-tree, *Leptospermum laevigatum* would have grown on exposed coastal areas like the headland around Flagstaff Hill, Wollongong.

Some rainforest species would have occupied these harsh coastal sites. Their growth would have been affected by the salt spray so they probably occurred as a closed-scrub community. Species like Flintwood, *Scolopia braunii*, Native Daphne, *Pittosporum undulatum*, and Muttonwood, *Rapanea variabilis*, would have been typical of this community. An example exists below Cliff Road, and other remnants do exist but they are in very poor condition as a result of disturbance, clearing, fragmentation and subsequent weed infestation.

The forest would have been a mixture of rainforest (closed forest) and sclerophyll forest (open forest). The majority of the coastal plain was sclerophyll forest and most of the escarpment rainforest. All of the escarpment and most the coastal plain is capable of supporting rainforest provided there is no fire. The exact distribution of both forest types would have

been dependent on the extent of fire.

Rainforest would have extended from the escarpment along all the watercourses, but as they neared the coast it would have been increasingly replaced by open forest. The rainforest would have been of five different sub-forms — Littoral, Riverine, Dry, Subtropical and Warm Temperate — which would have merged into each other.

Patches of littoral rainforest would



Snow in Summer, *Melaleuca linariifolia*, provides a stark contrast to the eucalypt's green.
Photograph by WAYNE DAVIS, 1991.

have grown behind the coastal scrub of the fore-dunes and sea-cliffs. A degraded form of this vegetation still exists at Puckey's Nature Reserve. Typical littoral species are Mock Olive, *Notelaea venosa*; Native Daphne, *Pittosporum undulatum*; Red Ash, *Alphitonia excelsa*; and Lilly Pilly, *Acmena smithii*. Littoral rainforest is one of the rarest vegetation types in New South Wales, having suffered extensive clearance and disturbance.

Riverine rainforest would have occurred along most major watercourses throughout the corridor, but not along their entire length. Most of

the original habitat has been destroyed through clearing, grazing and piping, and most remaining areas are degraded through continual disturbance. As a consequence they are weed infested.

An example of this vegetation can be seen on the creek that flows through Wiseman Park. Common riverine tree species include Grey Myrtle, *Backhousia myrtifolia*; Murrogun, *Cryptocarya microneura*; Native Cascarilla, *Croton verreauxii* and Cheese Tree, *Glochidion ferdinandi*.

Dry rainforest would have grown in areas on the coastal plain and lower foothills, and on some of the drier, warmer ridges of the escarpment. Patches would have been found in the gullies and more protected locations in areas around Wollongong like Smith's Hill, Hospital Hill and

Market Square.

These patches may have been quite extensive in the area as they thrive on the fertile soils derived from the Budjong sandstone. Dry rainforest has also suffered extensive habitat loss and disturbance. Common tree species found in dry rainforest are Red Olive Plum, *Cassine australis*; Whalebone Tree, *Streblus brunonianus*; Native Cascarilla, *Croton verreauxii* and Black Apple, *Planchonella australis*.

Subtropical rainforest occurred along the creeks and moister sites in the lower foothills and would have been most widespread on the benches of the escarpment, and at the interme-

diate altitudes. Most of this has been cleared and heavily disturbed through logging and fire, especially at the lower altitudes. Most of the existing subtropical rainforest is re-growth and as such a mere reminder of its former splendour. Typical subtropical species are Red cedar, *Toona australis*; various figs, *Ficus species*; Cabbage Palm, *Livistona australis* and Giant Stinging Tree, *Dendrocnide excelsa*.

The highest altitudes on the upper part of the escarpment contain Warm Temperate Rainforest. Most of this community is intact having suffered only slight disturbance, mainly from fire. Coachwood, *Ceratopetalum apetalum*; Sassafras, *Doryphora sassafras*; Jackwood, *Cryptocarya glaucescens* and Lilly Pilly, *Acmena smithii* are the dominant tree species.

Open forest appears in a variety of forms. There is tall open forest; open forest, or woodland, of the coastal plain; swamp and estuarine open forest and the open forest of the coast.

Tall open forest would have occupied the moister sites on the escarpment, often adjacent to and inter-grading with rainforest communities. It may also have grown on the richer soils in the Wollongong area and along the watercourses. Common trees in this community are eucalypts like Blackbutt, *Eucalyptus pilularis*; Sydney Blue Gum, *Eucalyptus saligna*; White Topped Box, *Eucalyptus quadrangulata*; Grey Ironbark, *Eucalyptus paniculata* and Turpentine, *Syncarpia glomulifera*.

Early logging removed most of the oldest and largest tall forest trees in the area. Some of these would have been as tall as sixty metres and over two metres in diameter. Fortunately, though rarely, some trees escaped. There is a stand of notable Turpentines of this size near Mount Keira.

Open forest woodland of the coastal plain would have occupied large areas. It is a shorter, drier, more open form of open forest. Wiseman Park is a fine example of remnant woodland. Typical species in coastal plain woodland are Grey Ironbark, *Eucalyptus paniculata*; Forest Red Gum, *Eucalyptus tereticornis*; Woolly-butt, *Eucalyptus longifolia*; *Melaleuca decora*; and Turpentine, *Syncarpia glomulifera*. Woodland has

been extensively cleared and is now rare throughout the greater Wollongong area.

Swamp and estuarine forest was

and estuarine species are Snow in Summer, *Melaleuca linariifolia* and Swamp Mahogany, *Eucalyptus robusta*, which are both now rare in the area.

Coastal open forest occurs in coastal areas on sandy soils. It is typically dominated by coast Banksia, coast Tea-tree and Bangalay, *Eucalyptus botryoides*. It usually has a dense under-storey of shrubs and small trees. Puckeys Nature Reserve is a good example of coastal open forest.

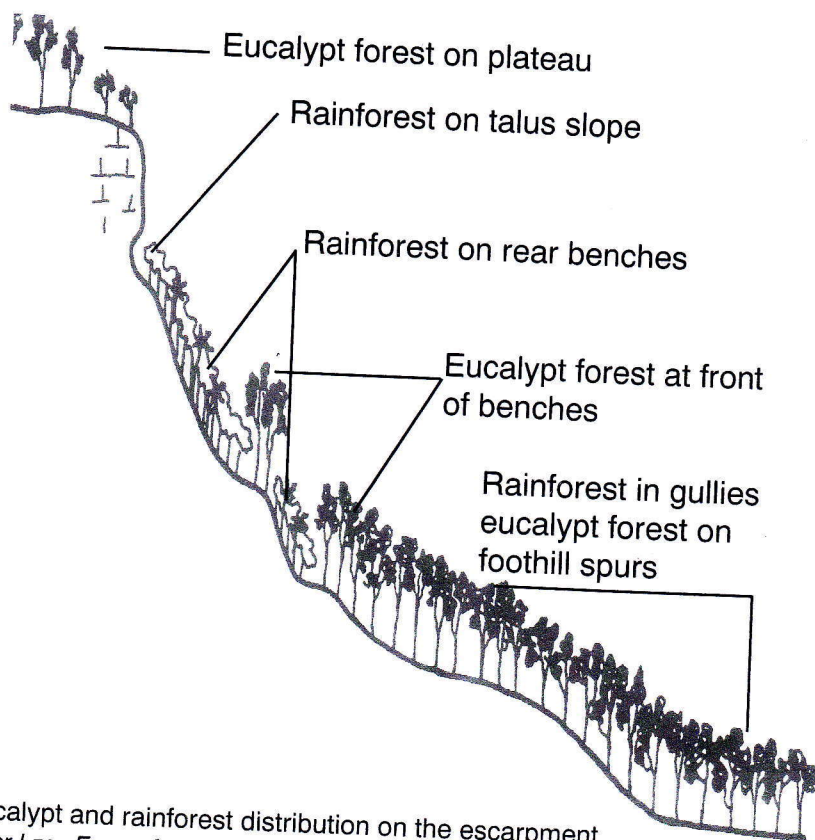
Also, there are small stands of White Mangrove, *Avicennia marina var. australasica*, along the tidal parts of Fairy Creek. Most existing plants are less than eight metres tall. Originally these mangroves would have been composed of trees eight to ten metres tall forming small mangrove forests.

The corridor is rich in forest communities which is reflected in its high species diversity.

Mount Keira, and the Illawarra, are important phyto-geographical areas. Mount Keira is a crossover point with a number of species reaching their northern or southern

"The corridor is rich in forest communities which is reflected in its high species diversity"

present on low lying areas prone to regular flooding and waterlogging. These communities generally grow on alluvial sands and are typically dominated by Swamp Oak, *Casuarina glauca*. There are good examples around Stuart Park and the Fairy Creek estuary. Today the habitat is largely cleared. Other characteristic swamp



Eucalypt and rainforest distribution on the escarpment. After LEON FULLER from Wollongong's Native Trees.

limits within its area. Those at their northern limits are temperate species and usually restricted to higher altitudes in the north of their range. The eucalypts Yellow Stringybark, *Eucalyptus muellerana* and Gully Gum, *Eucalyptus smithii* are examples. Both are large trees which grow in the cooler, higher rainfall tall open forest.

The subtropical species of the rainforest prefer the warmer areas. Here trees such as White Bolly Gum, *Neolitsea dealbata* and Red Kamala, *Mallotus philippensis* will be found. Both grow in the rainforest of the lower foothills of Mount Keira.

Red Kamala is of particular interest. It was not known south of the Hunter River until 1985 when it was discovered at Mount Keira. It is common north of Newcastle where it grows in warmer rainforest types. It is also found throughout the Pacific and South East Asia.

At Mount Keira it is restricted to four gullies and the ridges between them in the foothills below 150 metres. Even in this area the species is uncommon, possibly the result of past extensive habitat destruction and disturbance.

There are two rare and endangered plants growing naturally in the corridor. Illawarra Stinking Arum, *Typhonium eliosorum* and White Wax Flower, *Cynanchum elegans* are rainforest plants which are endangered.

Stinking Arum is a herb which grows to 30 centimetres. It forms small spreading colonies and has a preference for moist, semi-shaded sites. The common name refers to the large purple flowers which emit a strong putrid smell.

White Wax Flower is a climber. It grows in drier rainforest at low altitude. It prefers well drained ridges or rocky sites.

Possibly the rarest plant in the Illawarra district, *Rulingia dasyphylla*, grows in the corridor. There is one plant in a very small remnant of open forest at Gywnneville. It is not classed as rare and endangered as it seems to be widespread north and south of the Illawarra.

Wollongong Botanic Garden staff are attempting to propagate this species, so far without success. This species has suffered extensive habitat



The forest giant. A 60 metre tall Turpentine, *Syncarpia glomulifera*; growing on the escarpment behind Wollongong.

Photograph by WAYNE DAVIS. 1991.

loss and disturbance, hence its rarity. It is a good example of a regionally rare plant. There are at least thirty plants currently recognised as being regionally rare occurring in the corridor.

Wollongong Botanic Garden staff have been propagating most of these species for a number of years, and have established plants growing in the gardens. Staff at the garden are carrying out further research on rare and endangered plants, and regionally rare plants. As well as establishing them in the Botanic Garden, suitable species are being reintroduced where possible.

A large number of the plants being planted in the Keira Green Corridor have come from the Wollongong Botanic Garden, with most of the seed being collected from within the corridor itself. These native plants are the

preferred plants for the corridor. Replanting with these species will help maintain and consolidate the existing remnants of rare native vegetation which are scattered throughout the corridor.

There are many reasons for planting local species rather than exotics or native plants from outside the area. The local natives are adapted to the specific local conditions so a high level of success is assured. It is also important to preserve the local ecotype and this is a means of doing so, and of practical importance — seed is readily available.

ANDERS BOFELDT is the Technical Officer at Wollongong Botanic Garden. He is recognised as one of the area's authorities on native flora.

Fairy Creek

By DANIEL DEIGHTON

Fairy Creek is the last continuous link between the escarpment and the ocean within the Keira Green Corridor catchment. It drains an area approximately 7.6 square kilometers, most of which has been urbanised. Land for urban, industrial and commercial use, and associated infrastructure, accounts for approximately 75% of the total catchment area.

As a consequence Fairy Creek no longer functions as a natural creek system. Stream flow has been significantly altered through increased run-off and discharge from the large areas of impervious surfaces associated with urban development. As a result significant erosion along stream channels, modification of the biological environment, excessive rates of sedimentation and the accumulation of domestic, commercial and industrial waste have occurred.

Of more immediate concern to local authorities, however, is the problem of flooding along many sections of Fairy Creek. Encroachment upon and over the stream's channels, piping and the reduction of stream flow through sedimentation and infestation with exotic plants has reduced the ability of Fairy Creek to accommodate run-off during high rainfall periods. Coughlan notes that methods adopted to address the problem of flooding are based on "extensive and costly alterations to the character of the stream system."

They are also aimed at the management of the symptoms of the urban stream degradation rather than the causes. The building of detention basins along the creek system are an example of this approach. However, at the end of the day such protection from flooding will not be guaranteed.

Since European settlement the catchment has been completely transformed. Except for the entrance of the creek and isolated pockets of remnant vegetation on the coastal plain the entire creek-line has been cleared of stream-bank vegetation. Conse-

quently, the biological and physical environment has been significantly altered. The creek can no longer support the range of wildlife that once inhabited the area, and its ability to absorb catchment run-off has been seriously diminished.

The discharge of urban stormwater into the creek has increased plant nutrients, in particular nitrogen and phosphorous compounds resulting in excessive growth of aquatic vegetation along the stream. This reduces

bank topsoils resulting in further siltation of the channel bed and increased rates of sedimentation further downstream.

Urban run-off is also the vehicle for the discharge of domestic animal wastes into the stream system which contributes to the excessive levels of pathogenic bacteria at the stream's entrance. This poses serious health threats to recreational users attracted to the lagoon for its warm shallow waters.

With this in mind I propose that issues associated with the Fairy Creek catchment extend further than the flooding problems and that the structural changes currently in progress are only one part of the formula to effectively address flooding and the quality of the environment we experience in Wollongong.

Coughlan notes that "the basic aim of the Fairy Creek Floodplain Management Study is the implementation of structural controls to retard the arrival and reduce flood-peak waters at the flood prone areas of North Wollongong". These measures include the construction of seven detention basins designed to temporarily store the waters of all rainfall events.

Nonetheless problems of blockages of flow lines and basin outlets from sediment, vegetation and domestic debris cannot be discounted and this poses a significant threat to the successful operation of these structures. The actions of residents contribute to this problem when they use creeks as dumping grounds for their garden refuse and other rubbish.

Detention basin walls and toes will also be subjected to stress associated with expansion and contraction of underlying clay soils. The presence of expanding clays and highly erodible bank sediments in the lower catchment can also undermine the success of proposed culverts and levy banks. These factors have been taken into account with the detention basins in the Fairy Creek system.

**"...problems
with Fairy Creek
cannot be
viewed in
isolation..."**

the flow velocity and rapidly increases the rate of siltation of the channel. During low-flow periods decomposing aquatic plants and trapped domestic refuse contribute to higher nutrient levels and further plant growth. This in turn impedes water flow resulting in blockages and eventually flooding at some locations, in effect creating a self-perpetuating cycle.

Yassini has noted that the clearing of native vegetation followed by the introduction of exotic plants, particularly willows along stream banks, has resulted in extensive erosion of stream banks and sedimentation downstream. Willow trees, which have a prolific root system, trap sediment along the creek-line and impede stream flow. During high rainfall periods the willow trees are easily undermined and when they eventually fall they create further obstructions to stream flow in the form of broken branches and overhanging trunks. This causes bank over-flow, flooding and stripping of stream-

Bank top barriers such as buildings, fences, vegetation and land-fill/reclamation measures affect the flow capacity of the stream line. Problems such as restricted water flow and increased volumes being conveyed through restricted channels may be exacerbated by the proposed bank-top and within-channel walls.

In employing such strategies the ability of the creek to absorb run-off, control the nutrient and sediment load and reduce concentrations of pathogenic bacteria is seriously impeded. The objective appears to be to channel water as quickly as possible away from the problem areas. In doing so the character of the creek line is completely altered. As Rayment notes, a natural creek-line is characterised by a variety of gradients and depths, and different water speeds and patterns. Within this there are collections of aquatic plants and objects such as boulders and fallen logs. The adjacent stream-bank supports a range of plant associations which provide shade and shelter. These plants also dissipate the light reaching the aquatic environment which is important for the survival of native fish.

Replacing such diverse natural systems with lifeless concrete culverts and levy banks will only further diminish species diversity and encourage the use of creek-lines as urban drains for the disposal of domestic and industrial wastes which ultimately end up in the sea and on the beach.

An alternative approach to expensive, isolated channel modification and construction of detention basins would be to address the entire creek line, with specific attention to the causes of flooding and stream degradation.

In the short term, regulations preventing development over unsuitable land and guidelines for the control of run-off and sediment from new developments need to be strictly enforced. Through effective management of both sediment and run-off from new developments, flood and erosion hazards within the catchment can be significantly reduced.

In the medium term residents should be encouraged to adopt proven soil conservation and flood mitigation methods. This may involve shar-



A section of Fairy Creek between University Avenue and Saunders Oval. Continual dredging has greatly deepened the stream channel.

Photograph by WAYNE DAVIS. 1992.

ing the costs of removing obstructions and rubbish, battering of banks and the acquisition of dedicated drainage reserves and easements.

According to Nanson and Young the restoration of channel capacity through "clearing of within channel snags and bank-top obstructions in association with channel widening to increase cross-sectional area will result in [an increase] of within channel capacity." This approach can be used to complement the structural mitigation methods currently being implemented by Wollongong City Council.

Also the stabilisation and restoration of stream banks through revegetation can enhance and compliment the flood mitigation measures that are already in place.

The success of such proposals requires a fundamental change in government, business and community attitudes toward the land which we inhabit. A major problem is accessing a continuous corridor along the creek-line that can accommodate such restoration as this would require acquisition and use of private property. However, in doing so an effective flood management strategy of a one-in-100-

year flood level protection could be achieved to the longer term benefit of residents and Council.

The community needs to accept that mistakes have been made and that it is in their best interests to give a little in order to gain a lot. Slowly attitudes are changing and an increasing awareness and appreciation of the environment we live in is occurring. This can be seen in the growing support for community based restoration and rehabilitation projects such as the Keira Green Corridor.

Apart from all of the above noted reasons for restoring Fairy Creek there is also the potential to develop a marvellous tourist attraction with the natural features of the Illwarra. A nature walk along the restored and rehabilitated creek would be an invaluable economic and educational asset.

DANIEL DEIGHTON is studying Landscape Architecture at the University of New South Wales. He worked on the Keira Green Corridor Project at Wollongong City Council in 1990-91.

Wiseman Park

By WAYNE DAVIS

Wiseman Park is a unique area in the City of Wollongong. Bounded by Foley Street to the east, Vickery Street to the west and Gipps Street to the north, it is an area of original woodland, or open forest, a short walk from the Central Business District (CBD).

In 1911 the council of the day discussed resumption of the area for dedication as a public reserve, and in January 1912 the government of the day agreed to purchase 22 acres from E. Vickery & Sons for £600.00.

The area was originally known as Dobbin's Bush. A small brickworks once occupied the site and a rail line once ran down its southern side.

This line was used to transport coal from the Mount Keira mine to Wollongong Harbour.

The *Illawarra Mercury* of Tuesday February 13, 1912 reported 'that Alderman Smith proposed "that in recognition of the many years service given to the Municipality by the present Mayor, Alderman W.J. Wiseman, the Department of Lands be asked, in dedication of land now being acquired for purposes of public recreation at Dobbin's Bush, to formally apply the name 'Wiseman Park', to such area.'"

The park was proclaimed on January 8, 1913.

Today the park is host to two tennis courts, a sports oval with its associated dressing shed and stands, a bus shelter and the Wiseman Park-Wollongong City Bowling Club. The sports oval was declared open on November 21, 1925.

According to a Municipality of Wollongong document, on 1 May, 1945, the park was 19 acres and the

tennis court had been built.

Encroachment on the park over the years has posed a very real threat to its survival as an open woodland.

Wiseman Park is an essential component of the Keira Green Corridor. It is also one of Wollongong's irreplaceable assets.

An *Illawarra Mercury* journalist once described it as 'one of the fine "breathing spaces" provided for us by

remnant native grasses also grow in the park.

The importance of this, and other, old growth forest in the urban area of greater Wollongong cannot be understated. The mature trees in Wiseman Park are a nursery of future generations. Without them seed from the park would not be available, and the birds and animals that live there would be without nesting sites or refuge.

Nearly all of the trees in Wiseman Park are mature. Some are showing signs of age, and during 1991 a large Forest Red Gum died. It is unfortunate that this dead tree was lopped back as this has denied native fauna much needed refuge and nesting sites.



The view into Wiseman Park from the southern end of Vickery Street. Turpentine, *Syncarpia glomulifera*; *Melaleuca decora* and Grey Ironbark, *Eucalyptus paniculata* are the prominent trees.
Photograph by WAYNE DAVIS. 1991.

our far-seeing pioneers.'

A large number of native species grow in it, including Grey Ironbark, *Eucalyptus paniculata*; Turpentine, *Syncarpia glomulifera*; Prickly Paperbark, *Melaleuca styphelioides*; Blackbutt, *Eucalyptus pilularis*; Woollybutt, *Eucalyptus longifolia*; White Stringybark, *Eucalyptus eugenioides*; and Forest Red Gum, *Eucalyptus tereticornis*. Patches of

In a forest situation this tree would have rotted out and nest holes would have developed providing birds and animals with homes for decades. Such is the way that habitat develops for native animals.

The trees in the park have been subject to neglect and poor management practices over the years. Slash mowing under the trees has compacted the soil and prevented young trees

from growing to regenerate and rejuvenate the park, and the lopping of trees compounds this, and other, problems within the park environs. This has also created the conditions for weed growth within the park's environs.

Weed species such as large and small leaf privet, *Lingustrum vulgare*; lantana, *Lantana camara*; wandering jew, *Tradescantia albiflora* and kikuyu, *Pennisetum clandestinum* are common in the area, and will continue to be so while the park is not managed effectively.

In 1990 community opposition prevented the construction of a car-park under the trees bordering Foley Road, and in 1991 Wollongong City Council constructed a large flood retention basin on the park's southern edge. The basin will be grassed and planted with appropriate species. This will bring the forest one step closer to the CBD.

The value of the park as a resource for the city has been sadly neglected. Its proximity to the CBD makes it an ideal pivot for linking the forests of Mount Keira to the city, and radiating out along the freeway, streets and creeks to link the schools, university and TAFE college into the corridor. Of particular note is the section of

Fairy Creek that stretches to Gilmore Street. A bushland regeneration program has been started in this area. When completed this will bring back another twenty acres of our urban woodland for public recreation.

“...we can continue the far-seeing spirit of the pioneers who had the foresight to leave Wiseman Park for us”

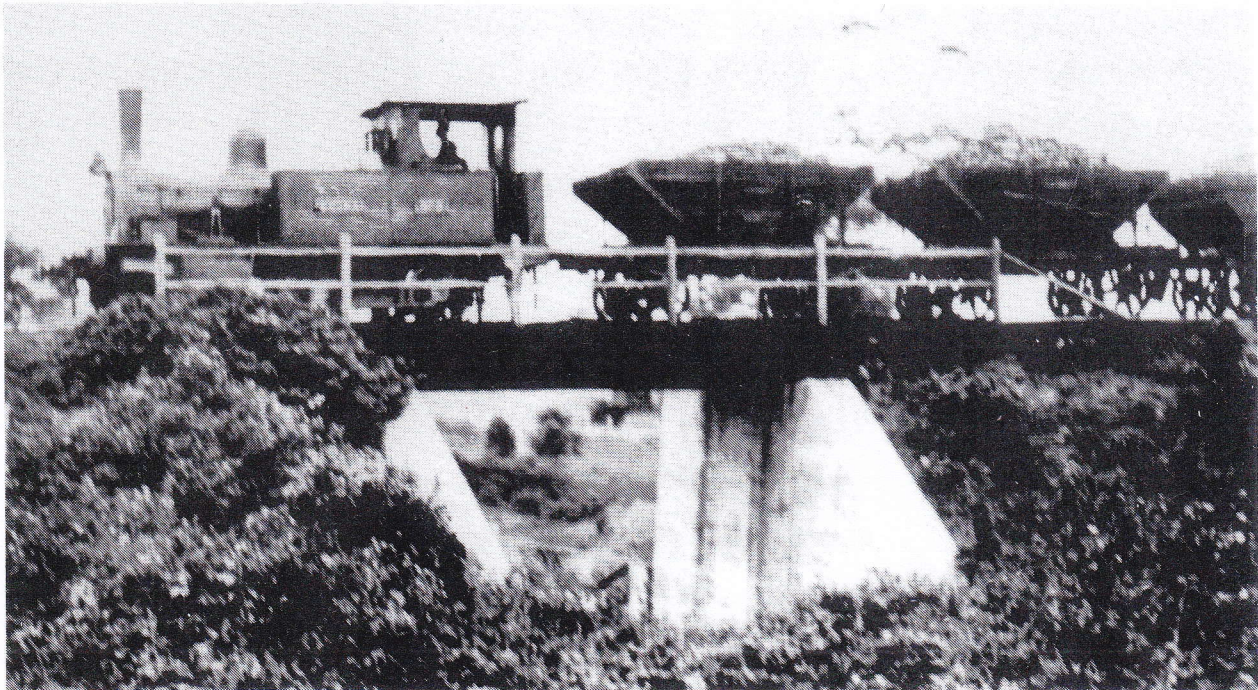
On Sunday May 5, 1991 over 50 local residents planted 50 young trees in Wiseman Park. This was the first planting organised by the re-formed Keira Green Corridor Committee. All trees planted were raised by staff at Wollongong Botanic Gardens from seed collected from the mature trees in the park.

Planting will continue into the coming years and as the young trees take hold the true value of Wiseman Park will be better appreciated and its future will be assured. The planting of young trees is the beginning of the restoration and conservation of Wiseman Park.

The *Illawarra Mercury* of 13 February, 1912 reported that during the debate dedicating Dobbin's Bush as Wiseman Park 'Ald. Payne supported the motion. He had not always agreed with the Mayor, but at the same time he had great respect for that gentleman. He was prepared to fight anybody in the Council over any matter, but when the meeting was over he bore no animosity in regard to the matter. Ald. Wiseman had done a great deal for the district and had worked to the best of his ability to advance the town and the municipality.'

With the Keira Green Corridor restoration program we can continue the 'far-seeing' spirit of the 'pioneers' who had the foresight to leave Wiseman Park for us. We can leave it for those who follow us.

WAYNE DAVIS is the chairperson of the Keira Green Corridor Committee.



The coal train from Mount Keira mine crossing the bridge over Foley Street just south of Wiseman Park. Circa 1920.

Photograph courtesy Local Studies Section, Wollongong City Library.

Puckeys Nature Reserve

By NEIL GRAHAM

Puckeys Nature Reserve is one of the few remaining examples of coastal dune (psammosere) and estuarine vegetation (halosere) successions left on the highly urbanised Illawarra coast.

Puckeys is located on the coastline approximately one kilometre north of the Central Business District of Wollongong. It is bounded by Fairy Creek to the south, Elliots Road to the north, the Pacific Ocean to the east and Squires Way to the west.

In the eighty-six years since it was purchased by Mr Puckey from Mr William Wilson in 1905 Puckeys has undergone many changes.

A private residence once stood among the dune vegetation, and salt extraction towers were once constructed by Puckey. Clearing and filling of the northern section was undertaken for a "night-soil" (sewage) dump and the then Metropolitan Water Sewage and Drainage Board constructed a drain through Puckeys to drain Thomas Dalton Park. There has also been uncontrolled pedestrian access to Puckeys for many years.

Over the years developments proposed for Puckeys have included the construction of a marine drive, construction of a holiday park, construction of a caravan park and construction of a five star resort and marina development.

Despite these proposals Puckeys was given a reasonably secure future when it was resumed by Wollongong Municipal Council in 1953 and dedicated as a public park. Its security was further enhanced in 1983 when it was made an annex of the Wollongong

Botanic Garden. Shortly afterwards it was classified as a Nature Reserve.

Puckeys Nature Reserve is an important biological, ecological and educational remnant in the Illawarra. It is the only remnant estuarine and hind-dune ecosystem on the Illawarra coast,



A Grey Mangrove, *Avicennia marina* var. *austrasica*, growing on the bank of Fairy Lagoon, centre of photograph. Once common in the corridor, mangroves are now very rare.

Photograph by ANDERS BOFELDT. 1991.

and is one of the few vegetation communities in the Wollongong region in which a relatively natural ecosystem of this type has survived. Also, despite the degree of human activity over the years, large areas are still very close to their natural state. It is therefore possible, with sound management, to restore a significant part of Puckeys to its natural condition.

There are many reasons for Puckeys Nature Reserve to be pro-

tected, maintained and restored to its natural condition. The primary one is that it is biologically unique in the Wollongong region. Also it is the last vestige of dune-lagoon vegetation that remains in a retrievable condition along the Wollongong coastline.

The plant succession at Puckeys starts with Spinifex, *Spinifex hirsutus*, and other grasses such as *Lomandra longifolia* beginning immediately above the high tide mark. Behind these grasses small ground cover succulents grow below the dune crest.

On and behind the dune crest species such as Coast Banksia, *Banksia integrifolia*; Coastal Tea Tree, *Leptospermum laevigatum*; and the Sydney Coast Wattle, *Acacia sophorae*; are found. These species grow in the slightly more protected conditions provided by the dune crest where the developing soil profile has a higher organic content.

The hind-dune region supports mature open woodland which is dominated by species such as the Bangalay, *Eucalyptus botryoides*; and the Swamp Oak, *Casuarina glauca*; while the lagoon community is dominated by species such as the Swamp Oak, Swamp Mahogany, *Eucalyptus robusta*, and Bangalay, *Eucalyptus botryoides*. The lagoon community has the only example of Grey Mangrove, *Avicennia marina* var. *australasica* to be found in the Wollongong area.

Puckeys is an important habitat for birds and other wildlife. It is an aesthetically pleasing area in a harsh urban environment which has great potential for use as a passive recreation area and outdoor classroom. It also provides bio-diversity of plant species for the Wollongong Botanic Gardens, and is an important genetic pool for future coastal restoration projects.

Puckeys Nature Reserve can pro-



Fairy Lagoon from the southern border of Puckeys. Mount Keira in background. Circa 1920.
 Photograph courtesy of Wollongong University Library.

vide and encourage a greater awareness in the community of the importance of dune lagoon plant communities, and is a highly significant educational and scientific resource for schools, colleges and universities. It provides a natural habitat for native flora and fauna, and is a valuable resource for scientific, educational and recreational activities.

Puckeys Nature Reserve is a very important element in the Wollongong environment and a significant component of the Keira Green Corridor. It is also an important part of a wider ecosystem, in particular, the Fairy Creek catchment area, and activities in this area can have a significant effect on the well-being of Puckeys.

Although Puckeys Nature Reserve is an integral part of the Wollongong Botanic Garden it is improbable that sufficient resources will be available from the gardens to undertake major restoration work at the reserve. This heightens the need for some form of community management structure to be established to initiate and oversee the restoration of the reserve.

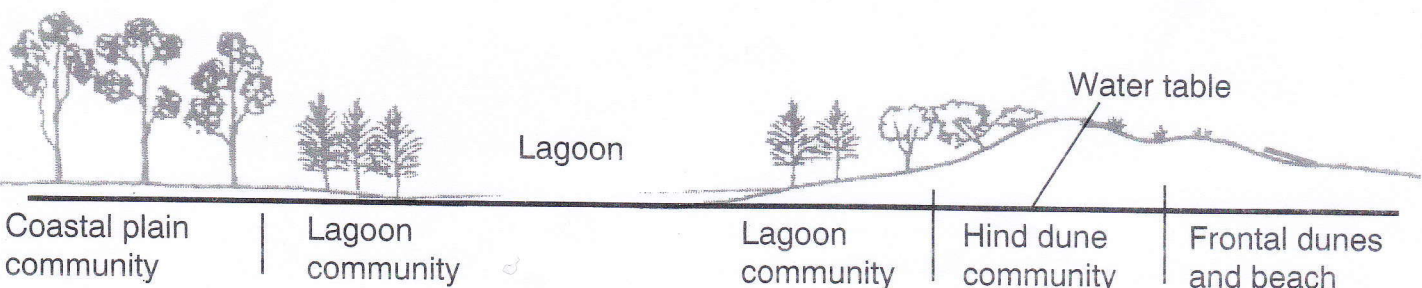
An appropriate management committee is being established by Wollongong City Council. This committee will have representatives from Council, the Botanic Gardens and members of the South Coast Conservation Society, the Illawarra Environment Centre, National Parks and Wildlife Association, educational institu-

tions and statutory bodies.

As the major aim of the committee will be to preserve, maintain and restore Puckeys to as close to its natural state as possible, it will be essential that a systematic inventory be taken prior to specific management proposals being developed.

Every possible effort must be made to restore and preserve Puckeys in the most natural condition that can be achieved.

NEIL GRAHAM is a member of the South Coast Conservation Society. He recently completed a major research project on Puckeys.



Coastal vegetation succession at Puckey's Nature Reserve.
 After LEON FULLER from Wollongong's Native Trees.

The Urban Forest Organisation

By ESTHER NYERS

Members of the Urban Forest Organisation (UFO) are regenerating native bushland in areas of public open space around Wollongong. They have been actively involved in planting in the Keira Green Corridor since UFO was formed in September 1990. UFO members have also been involved in planting at Cringila International Park and the Berkeley Hills in the Kembla Green Corridor.

As a welfare student I had the opportunity to implement an Urban Forest project at the Wollongong Youth Resource Centre. I felt that unemployed people would enjoy creating a forest adding beauty to the area while developing skills from concept design to digging holes in land fill.

About six of us who did the course, not satisfied to rest on our laurels, began to meet once a week to renew friendships and plan community tree plantings. As most of us were unemployed we had humble beginnings; as parents also we had a vested interest in what is left for our next generation.

In the spirit of permaculture, and without money, we used freely available resources, spent soil from a wholesale nursery, old newspapers and natural fibre carpet underlay as well as stable sweepings from Kembla Grange. Donations of plants came from the Botanic Gardens, stakes from local timber yards, fertiliser from the Wollongong Garden Centre, and later from the sewerage treatment plant of the Bellambi Water Board depot, and the Bellambi depot of the County Council gave us lots of lovely mulch.

I was happily surprised with the high level of support we received in our endeavours. The Illawarra Environment Centre took us under their wing and gave us a home base. The Environmental Enhancement Division of Council and the Keira Green Corridor committee supported our activities. Lou Zulian, the TAFE gardener, gave us well received support and advice. Gaye DeVries donated

more than 50 Illawarra Flame Tree saplings from her family's back garden, and a pitch fork which unfortunately broke when transplanting.

There are good reasons as to why we use three good layers of mulch—newspaper followed by carpet under-

“...job creation does not have to be at the expense of the environment.”

lay then tree prunings, stable sweepings or seaweed—when planting. First it helps keep the moisture in the ground around the plants. It also helps keep the weeds and grass at bay and it looks heaps better. It has been said that planting the tree is the easy bit and that's true enough. Mulching, however, is a worthwhile investment in time as it reduces maintenance time markedly.

Initially the holes were dug by the Council Parks Division but when they weren't able to continue the University landscaping people came to the rescue and helped us out greatly. Much of the area in which we planted was compacted or reclaimed so mechanically drilled holes were essential.

We held meetings weekly in the first year. We gathered around, had cuppas, and talked about our hopes, our concerns and who would do what for the upcoming planting. In 1991 we had four plantings averaging about 150 plants each time, resulting in 600 young “Australians”: a bit of a compromise from our ambitious 100 trees per month but at the end of the year we felt we had really achieved a lot.

We did not use any artificial chemicals, no Round-Up or insecticide, and our success rate is excellent.

Sharyn, one of our most dedicated members, made an interesting discovery one hot summer day while we were watering. More than 50 cup moth caterpillars had decided to busily defoliate our baby trees. Not agreeing with chemical solutions we soon worked out that if we wore rubber gloves we could remove the immature cup moths without getting stung and squish them underfoot. Time consuming perhaps but there was no detrimental side effects to the trees and the bugs died a quick painless death.

The Urban Forest Organisation's achievements in its first year would not have been possible without the people who gave freely of their time and energy, incurred out-of-pocket expenses and made available transport and storage space. Significant contributions were made by Shayrn Lacey, Konrad Jones, Tony Konjarski, Bruce Saunders, Terry Cox and Tess Malady.

Our hopes for the future include gaining recognition for our work. Job creation in the field of bush regeneration; a socially useful occupation that is environmentally desirable.

We believe strongly that job creation does not have to be at the expense of the environment: quite the reverse. A healthy environment has close ties with personal health. People who find increased leisure time on their hands through unemployment, retirement or shorter working weeks have the opportunity to learn through hands-on experience and gain personal satisfaction from participating in urban forestry. Whether local parks or the creeks, roadways, train lines or nature strips, the need for rehabilitation is urgent. Just take a look around and you too will start to see the potential for growing something truly beautiful in your neighbourhood.

ESTHER NYERS is a Welfare student at Wollongong TAFE. She played a key role in the formation of UFO.