A SENSE OF PLACE IN MAITLAND

RESOURCE KIT FOR SCHOOLS

Environmental TRUST

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Helping Communities Helping Australia

A Sense of Place in Maitland

This Resource Kit has been developed through *Our Sense of Place: Improving environmental attitudes and behaviours*, a project of Maitland Region Landcare with assistance from the New South Wales Government through its Environmental Trust.

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Disclaimer:
This Resource Kit has been published to assist schools' and communities' knowledge and understanding of local (Maitland area) natural and cultural heritage, environmental issues and their management, and excursion opportunities. Use of this information may support the development of a local sense of place. No warranty or guarantee, whether expressed or implied is made with respect to the data reported or the information provided in the document. All reasonable steps have been taken to ensure that the information is accurate at the time of publication. It may be updated from time to time and readers should ensure that they make appropriate inquiries to determine whether new information is available on the particular subject matter.

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Our Sense of Place Project Background

Background

A Sense of Place in Maitland: Resource Kit for Schools has been developed through *Our Sense of Place: Improving environmental attitudes and behaviours*, a pilot project of Maitland Region Landcare with assistance from the New South Wales Government through its Environmental Trust.

The *Our Sense of Place* project extended from February 2002 to May 2003. In part, it was motivated by the results of a local school survey in October 2001 that highlighted the kind of support and resourcing schools needed to improve environmental education.

During the implementation phase, the project involved participation of six local schools:

- Metford Public School
- Bolwarra Public School
- Hunter Valley Grammar School
- Maitland Grossmann High School
- Maitland High School
- All Saints College, St Peters Campus.

Teachers and students from these schools worked with Kylie Yeend (Project Manager), Lana Collison (Maitland Landcare Coordinator) and Kate Adkins (Environmental Science student) to trial a range of approaches and resources. The aim was to develop a 'sense of place' in relation to Maitland's natural and cultural heritage.

Development of the Resource Kit

The Resource Kit has been the most important material output of the pilot project. It has been developed to assist schools' and communities' knowledge and understanding of local (Maitland area) natural and cultural heritage, environmental issues and their management, and excursion opportunities. Providing access to and encouraging the use of local information, people and places reflects an important aspect in the development of a local sense of place.

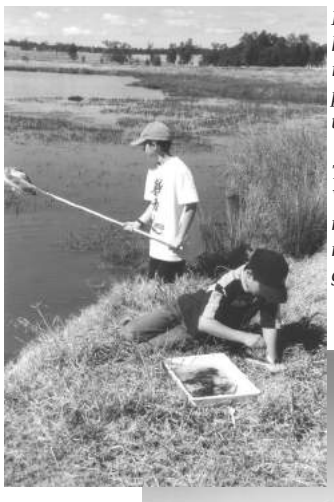
John Cameron explores a 'sense of place' with local teachers during an in-service training day.

The Resource Kit is a culmination of the experiences, information collected, and feedback gathered from those involved in the *Our Sense of Place* pilot project. Its development was made possible only through the generous sponsorship and contribution by a range of organisations and individuals.

Guest speakers to the classroom added an extra dimension to exploring local issues and places.

The Resource Kit has been designed to be 'living' and flexible. The idea is that new information may be inserted in the future and that teachers can mix and match various elements of the Kit. The Resource Kit does not need to be used strictly from beginning to end, instead, each case study, program and worksheet may stand alone.

It is likely that future materials for the Kit will be coordinated through Maitland City Council's Schools Environment Program. It is also hoped that each school will add to the Resource Kit based on their own collection of local information, programs and worksheets.



Excursions that combined hands-on experiences with information on local issues and places were an important part of the project.

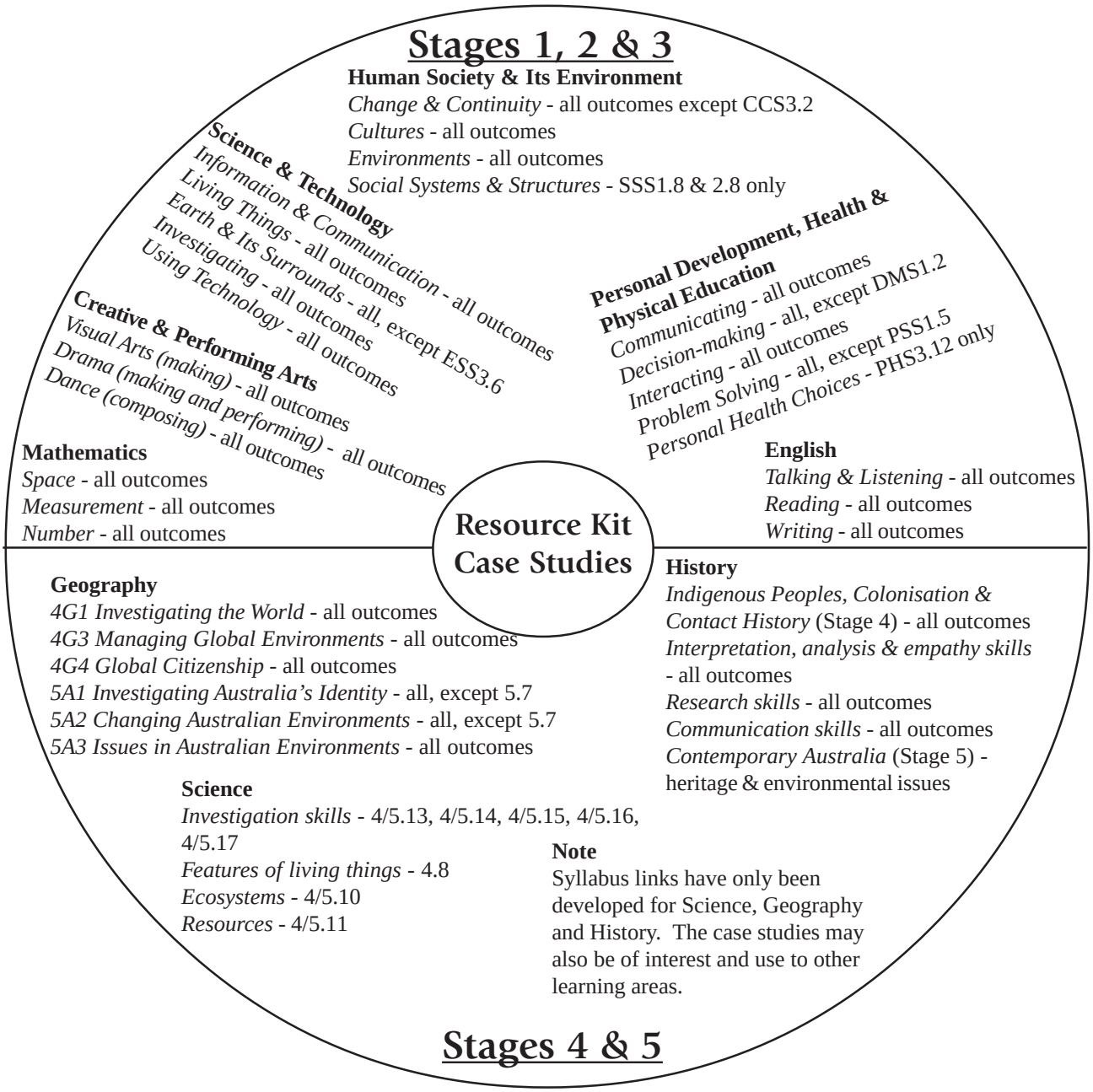
This excursion to Tenambit Wetland involved revegetation, nature journaling, water quality monitoring, and environmental games.

Information

Overview of syllabus links

The case studies, programs and worksheets in *A Sense of Place in Maitland: Resource Kit for Schools* address a range of syllabus outcomes. The programs and worksheets have a stronger emphasis on Stages 3 and 5. This is because the pilot project focused on trialing information and approaches with Years 6 and 10.

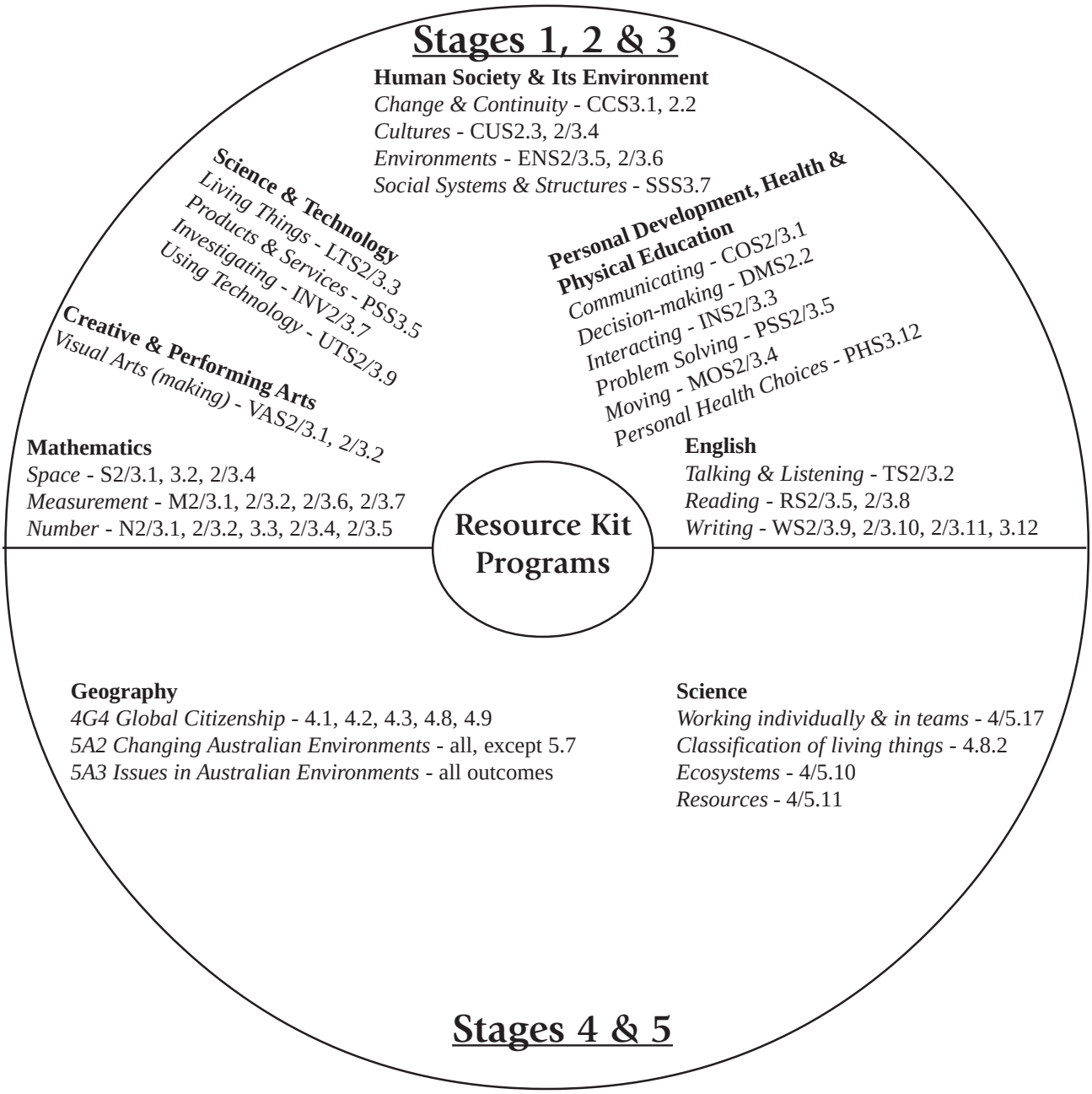
Depending upon which **case studies** are used and how they are applied in the classroom or field, they have the potential to address the following syllabus outcomes:



Information

Overview of syllabus links

An overview of syllabus links is provided at the beginning of each program, including excursions. The diagram below offers a summary of all connections of **programs** and **worksheets** with syllabuses.



Information

Overview of syllabus links

Use of Resource Kit materials will also assists schools meet the mandatory curriculum objectives of the **Environmental Education Policy for Schools** (NSW Dept. Education & Training, 2001):

Students will develop:
knowledge and understandings about:

- the nature and function of ecosystems and how they are interrelated (K1)
- the impact of people on environments (K2)
- the role of the community, politics and market forces in environmental decision-making (K3)
- the principles of ecologically sustainable development (K4)
- career opportunities associated with the environment (K5)

skills in:

- applying technical expertise within an environmental context (S1)
- identifying and assessing environmental problems (S2)
- communicating environmental problems to others (S3)
- resolving environmental problems (S4)
- adopting behaviours and practices that protect the environment (S5)
- evaluating the success of their actions (S6)

values and attitudes relating to:

- a respect for life on Earth (V1)
- an appreciation of their cultural heritage (V2)
- a commitment to act for the environment by supporting long-term solutions to environmental problems (V3).

Information 1

Understanding & Developing A SENSE OF PLACE

Defining 'sense of place'

The term 'sense of place' is often used to refer to the feelings people have for particular places and the meaning they gain from a relationship with these places. A sense of place is one of the fundamental felt senses a person develops along with a sense of self and a sense of community. The main emphasis of a sense of place is on *personal feelings* for places.

There are other definitions of sense of place, however, that describe the interplay of emotion, knowledge and action or the intertwining of meanings, activities and specific landscapes. These definitions suggest that it isn't just a feeling. Our sense of place is also recognised and developed through our actions in a place and the significance of those actions to us.

A sense of place is commonly associated with local areas, the places in which people live and work. It can also be applied to regions, nations or even the whole planet.

A sense of place can come from a feeling of belonging to a place, of being at home there. It is often contrasted with a sense of displacement or placelessness, of not belonging anywhere, which has been linked to the modern condition of alienation. Sense of place is sometimes used in the debate over the effects of modernisation and globalisation, referring to what has been lost or what needs to be more highly valued.

Some writers emphasise that different groups of people have different senses of the same place that may be based on age, class, gender and race. These variations in sense of place should be recognised and handled with respect. In the Australian context, exploring the interactions between Aboriginal and settler senses of place provide an opportunity to understand cultural influences and how these have contributed to Australian identity.

Students can be encouraged to observe, reflect and record the layered stories of a local environment.

The importance of sense of place for environmental attitudes and behaviours

Sense of place is not something a person either has or hasn't, it can develop with care. Fostering a sense of place in a school-age child or adolescent has obvious benefits from a personal and social perspective. At a personal level, a sense of place can contribute to the development of self-esteem, belonging and identity. Socially, a sense of place can strengthen connections with community, and also have environmental benefits.

Love of a place can be a very strong motivator for environmental behaviours. It stands alongside other motivations of an environmental ethic such as fear (of environmental collapse, for example), hope (for a more environmentally friendly society, for example) or moral obligation (to give other animals moral consideration, for example). While all these approaches have their value, love of a local place can provide a more grounded, practical and positive basis to environmental concern.

By drawing out students' understanding of local places and their response to them a teacher can help students make clear links between their actions and their effect on local places. Attention to the felt response to place can help to foster an ethic of care for the local environment that may be extended to the environment as a whole. Encouraging students to explore local places gives them direct experience of the environment in which they live and a means of expression for environmental attitudes.

Sense of place is also developed by increasing knowledge about local places, especially by considering places as the sites of multiple stories. Some of the stories are scientific - how the local landforms were created, and how the plants and animals evolved can be imaginatively told by knowledgeable people in the field to develop much greater ecological literacy. Some of the stories are human - local Aboriginal myths and knowledge, settler histories and oral histories can be collected. These stories develop a richer, more intercultural attitude towards the local environment.

Research on sense of place

Refer to *www.augustana.ca/~janzb/place/education.htm* for direct links and information on sense of place and education.

Information 1

Understanding & Developing A SENSE OF PLACE

Indicators of sense of place

How does a teacher assess the development of students' sense of place? There are many indicators:

Knowledge about local places

How much information about local places can the students provide? Is it of different types - scientific, historical, personal, intercultural?

Integrative capacity

Can the students relate the different types of knowledge of place in order to present a rich and multi-layered sense of place?

Expressive capacity

Can the students express their response to local places in an articulate way? Do they use a variety of modes of expression - written presentation through factual, poetic or imaginative expression, presentation of images such as drawings, sketches, videos and photographs, and oral presentation?

Depth of experience

What experiences of local places are the students reporting upon? What range of experience types are being drawn upon (e.g. active, reflective, data collecting, imaginative and so on)?

Practical engagement

What level of physical engagement with the place have the students shown? What activities have they initiated? How involved have they been in local place-related activities and demonstrating active citizenship?

Appreciating different senses of place

To what extent have the students understood that there are different senses of the same place depending upon factors such as class, gender, age and race? Have they articulated some of these differences, especially Aboriginal stories and understandings of local place? Do they understand the need to respect difference and engage in dialogue across the differences?

Exploring sense of place through school education

School education provides important grounds for developing a child and adolescent's sense of place. Conversely, including local place-based approaches in teaching can make the educational experience more enriching and meaningful for students. They develop a clearer understanding of the relevance and relationship between their day-to-day learnings and what they see, feel and interact with in their surrounding environment and community. It can also build recognition that local places are special and significant - that you don't have to travel great distances to find places of beauty and value.

There are a range of activities that contribute to a sense of place and that may be integrated with school curriculum:

Work in the school grounds

This could involve compiling a school history; understanding the plants and rocks; working to revegetate and regenerate school grounds; and building nature trails.

Oral history projects

Identify older people who are holders of local oral history and interview them. These stories could be compiled and published in a simple format that also includes students' drawings to give an extra dimension to the oral histories.

Mapping local areas

Identify places of local historical , scientific and geographical interest and discover the stories behind them. Students may map their own homes, neighbourhoods, suburbs, towns, regions in concentric circles with flows across the boundaries, showing connections between themselves, their community and places.

Creative writing and drawing

Students select a special place that they visit each week where they write poetry, do drawings, and develop their capacity to respond to place in different ways.

Nature Journaling

Start a regular program of nature journaling within the school grounds or another suitable environment close to the school. This might involve weekly observations and recordings of weather conditions, feeding and breeding patterns for birds, insects and other animals, and the flowering of plants. Taken over the course of seasons and years, these observations encourage students' close attention to their surrounds and offer a wonderful opportunity to explore patterns of nature and weather.

Excursions

Arrange field trips to explore local places and include guest presentations or workshops that give students hands-on and informative experiences. Build an awareness that special places exist in the students' own 'backyard' and uncover the 'layers of stories' (historic, scientific, geographic, artistic) that exist in these places.

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This paper has been prepared by John Cameron (PhD) (Senior Lecturer in Social Ecology, School of Social Ecology & Lifelong Learning, University of Western Sydney).

Case Study C

2.1 Maitland's CHANGING IDENTITY

A 'sense of place' in Maitland

A sense of place refers to a feeling of connection or belonging we might have to a place. We develop a sense of place mostly without even being aware of it. It grows out of our knowledge of the people, landscape, and events of the place combined with our feelings, attitudes and responses to these.

What does living in Maitland mean to you? As you could imagine there are about as many answers to this as there are people in Maitland. Each of us has our own impression of Maitland and sense of place in it.

What is Maitland's identity?

Maitland's identity is based on three main dimensions: (i) physical location and landscape, (ii) social history and community profile, and (iii) economy.

Maitland's identity is influenced by its physical location within the Hunter Valley and its proximity to Newcastle. Maitland is the interface between the city and the country - some see it as a country town and others see it as an extension of Newcastle. People further west and to the north come to Maitland to the livestock saleyards and suppliers. People who live in Maitland and commute to Newcastle see it as a dormitory suburb of Newcastle and a place to live. People who live and work in Maitland see it as their home and also their place of work or school.

Maitland's identity is also shaped by a strong Anglo-Saxon input to the city's European history. While there have been other migrations to Maitland from non-English countries, the city's cultural and social basis is centred around the English, Scottish and Irish cultures. The early loss of the Aboriginal culture from Maitland and its environment has sadly seen the Aboriginal influence being only minimal on the current identity of Maitland.

The economy of Maitland and its identity have changed over the years. For many years it was a major trading post and commercial centre for much of northern New South Wales. This combined with a strong agricultural economy arising from the rich fertile river flats within the boundaries of the city. Both of these influences declined in the 20th century and have been replaced by a strong mining and a lesser, but still important, industrial basis - centred around Maitland's links with Newcastle.

The identity of Maitland therefore is diverse and changing as the economy and cultural mixes change.

The driving forces for Maitland's changing identity...

Physical environment

Maitland's physical environment has been a driving force over the past 200 years. The Maitland area occupies the western fringe of the huge lower Hunter floodplain. The Hunter River catchment is the largest water catchment on the east coast of Australia. As well, the Wallis Creek catchment from the south and the Paterson River from the north all meet close to Maitland.

The floodplain of Maitland is rich alluvial land that once featured dense luxuriant rainforest. The alluvium gives way to heavier clay soils away from the river. This landscape once supported extensive wetlands and swamps. Many of these have been drained and degraded by livestock and farming. The upland areas around Maitland are low rolling hills of little significance to agriculture but have provided a refuge from floods on the floodplain.

The climate of Maitland is mild and humid, never receiving any snow and only a few frosts every winter, with a wet summer and autumn and strong drying westerly winds in the spring. The rainfall is high by Australian standards and the valley often floods but with no regular pattern. Climate affects Maitland's identity both directly in the 'feel' of the place, and indirectly through its influence on land use and settlement.

Living with the land

Maitland was the junction of at least three, possibly four, Aboriginal groups: the Awabakal from the south-east; the Worrimi from the north-east; and the Wanaruah from the west. It is difficult to decipher the tribal land borders of these groups but one assumption could be that the rivers were the natural borders for their land use. The extensive rainforest, wetlands and open forest grasslands provided a vast array of food sources for the Aboriginal people.

The Aboriginal lifestyle and sense of identity was shattered with the arrival of Europeans in the early 19th century. The initial impact would have been fairly mild with contact being made by cedar-cutters coming up the river. There would no doubt have been interaction between the groups and probably the transmission of diseases to the Aboriginal people well before 1810.

Case Study C

2.1 Maitland's CHANGING IDENTITY

Exploitation of the natural resources

Until 1820 cedar-cutter camps were at Wallis Plains (between Maitland and East Maitland) and at Old Banks along the Paterson River just south of Tocal. In the 1820s the land was opened for settlement by wealthy Europeans who had funds to develop the land. This would have been a turning point for the Aboriginal people that saw the rapid destruction of their lifestyle and food sources. What were good sites for Aboriginal camps were also good sites for Europeans to build their homes and farms.

The identity of Maitland had therefore moved from an Aboriginal and natural environment to being a convict cedar-cutting environment, and then to the establishment of farms in a convict colony. Convict life was harsh and often brutal, convicts being unwilling labourers on many farms and owners seeking the right to have them flogged for misdemeanours.

The first 20 years of Maitland's European settlement was particularly exploitive of the natural environment. The luxuriant rainforests were quickly cleared and made into farming land. Until the 1860s the Maitland area was the granary of New South Wales, producing much of the grain required for the colony. Wheat rust broke out extensively in the 1860s and wheat growing then moved to the drier western part of New South Wales. The farms then changed over to growing lucerne and maize. Much of the lucerne was exported to Sydney for horses and dairy cattle.

A series of significant floods in the 1950s saw the demise of much of the vegetable production on the river flats. Before this the Maitland alluvial flats were important sources of potatoes, cabbages, cauliflowers and other vegetables. Various manufacturing enterprises have been set up in Maitland in recent times and have been a major source of employment.

The 1955 flood was one of the first natural disasters in Australia to be beamed around the world. A famous Cinesound film was made which was shown throughout Australia and elsewhere in the world. Maitland's identity has since been associated with serious flooding. This identity particularly remains in the minds of many older Australians.

The local coal industry boom from the 1970s onwards has seen Maitland act as both a dormitory suburb and a service centre for the coal industry to the west. It has also grown as a dormitory suburb for Newcastle.

Transport

Maitland was an important transport route for settlers and their goods and produce when the frontier of European settlement moved to the west. Maitland quickly became a bustling centre and by 1860 was the largest town outside Sydney in New South Wales.

The tidal nature of the Hunter River enabled boats to come up to Morpeth and Maitland. Maitland and Morpeth were the ports for all goods bound for the inland in the early 1800s. Morpeth tended to be the larger of these. Its facilities provided for goods to be unladen quicker and taken by bullock wagon to the west rather than travel further up the then winding Hunter River to Maitland. At that time it was 27 km by river from Maitland to Morpeth. Today it is only 9 km because a series of floods have cut through the original bends and engineering works have 'straightened' the main channel.

Around 1900 extensive mines opened to the south of Maitland and this increased employment in the area. Despite this, Newcastle's population overtook Maitland's in 1900 with a boom in Newcastle's industry and port. Newcastle has grown significantly more than Maitland since, and during the early 20th century Maitland stagnated and became largely overshadowed by Newcastle.

Maitland continued to grow through the late 19th century with the railway coming from Newcastle in 1858 and then proceeding to the west. It remained an important trading, light manufacturing and agricultural centre.

From the late 1990s Maitland has again become a transport hub, this time in association with road transport. The F3 freeway junction with the New England Highway in association with the Newcastle port and Pacific Highway have provided Maitland with an unequalled opportunity to service much of New South Wales. As a result, extensive infrastructure has been, and continues to be, built in the Thornton/Beresfield area to service the road transport industry.

Maitland Railway Station surrounded by 1955 floodwaters. The railway has been an important part of the transport network and Maitland's developing identity since the mid-1800s.

Case Study C

2.1 Maitland's CHANGING IDENTITY

Migration

Maitland has seen various waves of migration over its history. Initially these were convicts from England and Ireland as well as English free settlers. The early settlement was relatively unplanned and random. Lawlessness pervaded for much of the time, with escaped convicts acting as bushrangers and it was some time before law and order was imposed.

In the late 1830s some large groups of Scottish highlanders came to the Maitland area to work and settle. Some were Gaelic-speaking people who were keen to pursue their own strong Presbyterian beliefs. This caused some social unrest at the time.

The next group of migrants were from the Rhineland of Germany who emigrated to work on Hunter Valley vineyards because of a shortage of labour. Many of these German families remained in the Valley. Their arrival was generally uncontroversial, with little social impact.

In the 1850s there was a perception by some that the number of Irish migrants was too great and would cause an imbalance between the largely Protestant society of the area and the Catholic workers. In 1860 a strong-minded and somewhat bigoted Reverend William McIntyre, Free Presbyterian Minister, proposed a public address in Maitland denouncing Catholicism and the heathenism of Popery. This incensed the Irish settlers and a riot ensued outside the Church in Free Church Street, Maitland. It was later calmed down but not without some injury to those involved. This incident was one of the most significant religious riots ever to occur in Australia.

Maitland culture has not been as influenced by post-World War II immigration as many other parts of Australia. It has however seen the arrival of a significant number of post-war migrants, many from Poland. It is still largely an Anglo-Saxon community, with people born overseas very much a minority.

Les Darcy - boxing legend

For much of the 20th century, Maitland has identified itself with its most famous son, Les Darcy. Les Darcy became an international boxing legend through his very short, but spectacular career and tragic death. Many people from the 1920s onwards linked Les Darcy and Maitland and he may aptly be called 'Maitland's favourite son'.

The unveiling of a statue to Darcy's memory in East Maitland in August 2000 drew a crowd in excess of one thousand people. There was a mixture of social backgrounds and vocations in the crowd.

Maitland's future

We can ponder whether Maitland's identity arises from its natural features, its cultural heritage, its tragic sporting star or a catastrophic flood.

Maitland's future is very much linked with that of the Hunter Valley economy. Whilever coal remains buoyant and economic Maitland may benefit. The expansion of various enterprises in Newcastle such as the university and other tertiary industries will continue to provide benefits to Maitland.

Maitland's location on the north edge of the Newcastle-Sydney-Wollongong urban agglomeration provides it with a lifeline for future developments. It is well-placed to grow and develop further, however this development places pressure on the natural environment.

Maitland's identity has largely been based on exploitation of its natural resources, which have in the past brought it wealth and recognition. The challenge today is to forge a future that conserves or improves the environment that sustains us. This requires a *new* shift in identity. Our physical environment provides great economic opportunity but for the sake of Maitland's future residents, the benefits must be sustainable rather than exploitive.

Perhaps Maitland will forge a new sense of identity in the future, hopefully through more famous sporting stars or other luminaries rather than another disastrous flood or the breakdown of its natural environment. Which would you prefer? Which is more likely to occur? The question is whether we as a community can or are willing to make the effort to influence Maitland's identity.

Crowds of people gather to witness the unveiling of the Les Darcy memorial statue, the turnout a testament to the boxer's popularity and connection with Maitland and the Hunter Valley.

Acknowledgement

This case study has been prepared by Cameron Archer (Principal, CB Alexander Agricultural College, Tocal).

Case Study C

2.2 An Environmental History of MAITLAND & THE MIDDLE RIVER

Understanding environmental history

Environmental history is a relatively new form of historical inquiry. Its major purpose is to examine the historical relationships between humans and the natural environment that sustains them. In Australia, this history has a lineage of at least 60,000 years.

The relationship between the river we now know as 'the Hunter' and humans is one that has been told a number of ways. The dominant perspective, however, has been that of European economic development in the period 1800 to the present.

This paper is a brief environmental history of the 'middle river' (Maitland to Singleton). It draws upon a limited number of historical records to give us a glimpse of what the river was like for Koori people and early settlers 200 years ago and compares and contrasts that image with what the river and its catchment are like now.

The original names of the rivers

The *Coquun*[1] is one of the Koori names given to the river that was later renamed the Hunter after the governor of the British colony in NSW. At the beginning of the nineteenth century, this river was part of the country of the *Awabakal*, *Worimi*, and the inland Hunter River tribe, the *Wanaruah*.

The landscape and rivers of the region were all known by name by the Aboriginal people. In 1834, one astute commentator on the new colony of NSW observed:

> Indeed, every remarkable point of land, every hill and valley in the territory, has its native name, given, as far as can be ascertained from particular instances, from some remarkable feature of the particular locality… (Lang, 1834: 87).

Lang was outraged that the original Aboriginal names were replaced, then forgotten, for the sake of "whatever insignificant appendage to the colonial government a colonial surveyor may think to immortalize" (Lang, 1834: 88). He suggested that the native names of *Yimmang* (Paterson River) and *Dooribang* (Williams River) be immediately restored, although he was less enthusiastic about changing the name of the Hunter. Perhaps he considered that the status of a governor of the colony outweighed all previous connections.

Wallis Plains (*Boun*) and Maitland

The area known as Wallis Plains (*Bo-un*, or place of the Bittern) was once covered in forest, but this was cleared to get access to the fertile alluvial soil. A great number of cedar trees were cleared in this area. An example of the size that these trees attained is indicated by one specimen that was found on a tributary of the Hunter which "measured 27 feet in circumference near the base, and the main trunk was 50 feet in length before it threw out vast branches which overtopped the neighboring trees" (in Wood 1972: 2). Cunningham notes that:

> Wallis Plains are of no great extent, and being originally densely wooded, required great labour in clearing; a disadvantage, however, amply compensated by the amazing fertility of the soil, which is all alluvial, and still subject to being covered with water during the high floods (Cunningham, 1827: 150).

Near the town of Maitland, where the vegetation remained uncleared, thick vine scrubs (rainforest) could be found. Breton, in his 'Excursions in New South Wales and Van Dieman's Land, 1830-1833' recorded that behind the town of Maitland:

> … there is one of the thickest vine brushes in New South Wales, so that it is difficult to penetrate even a few yards. Here I saw a most enormous tree … known by the title of the great fig. The form of the trunk is triangular, the side facing the south-east being eighteen feet in width; that to the north nineteen feet and a half; and that to the west, twenty-two and a half; total, sixty feet … The trunk does not rise more than perhaps thirty feet before it separates into branches of such magnitude as to equal trees of considerable size. Will it be credited that the former owner of the farm had actually commenced felling this 'giant of the forest'? … he was only prevented from fulfilling his intention by the remonstrances of the settlers around (Breton, in Sokoloff, 1976: 207).

[1] *Coquun,* is the name for the river recorded by Dr J.D. Lang (1834:64). The Awabakal name for water was *Ko-ko-in.* The origins/translation of *Co-qu-un* and *Ko-ko-in* are likely to be connected (see Threlkeld, in Gunson 1974:161). Another Koori name for the Hunter river was *Myan* (Stretch, A7739 iii) while Lt. Close records *Coonanbarra* as the name used at Morpeth (Elkin, 1937:176). Different clans and tribes of the Kooris of the Hunter region clearly had different names for the same river.

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2.2 An Environmental History of MAITLAND & THE MIDDLE RIVER

Wallis Plains (*Boun*) and Maitland (cont.)

John and Elizabeth Gould stayed at Maitland in 1839 and described the prolific bird life that was present in the brushes and 'wild scenery'. He noted the Lorikeets (*Trichoglossi*) in particular. His journal records:

> However graphically it might be described, I scarcely believe it possible to convey the idea of the appearance of a forest of flowering plants tenanted by *Trichoglossi* … During one of my morning rambles in the brushes of the Hunter I came suddenly upon an immense *Eucalyptus*, which was at least two hundred feet high. The blossoms of this noble tree had attracted hundreds of birds, both Parrots and Honey-suckers… (Gould, in Albrecht & Albrecht, 1992: 12).

Gould also made reference to the mammals typical of the brushes close to the river. Marsupials such as the Red-necked Pademelon, Wallaby, Long-nosed Potoroo and the Brushtailed Possum are noted. Gould specifically warns that the Platypus (*Purramaiban*) was endangered by "wholesale destruction" by settlers along rivers such as the Hunter (Albrecht & Albrecht, 1992: 12). Close to the junction of the Williams and Hunter rivers (Raymond Terrace) James Backhouse observed "noisy" fruit bats and gliders in trees "in contact with the forest" in 1836 (Backhouse, 1843: 398).

The luxuriant brushes

Beyond Maitland and along the "alluvial banks" of the *Coquun*, *Yimmang* and *Dooribang* there was a strip of "heavily timbered" land complete with vine thickets. The vegetation of the valley floor is described by many commentators in terms such as 'wild', 'thick vine brush', 'thickly timbered', and 'luxuriant'. Backhouse gives the most detail of all the observers in his record of plants in the "Cedar Brushes" near Maitland. He notes:

> … we took a walk into one of the luxuriant woods on the side of the Hunter, such as are termed Cedar Brushes, on account of the colonial White Cedar, *Melia Azedarach*, being one of the trees that compose them. *Eugenia mytifolia* and *Ficus muntia*, are among the variety of trees in these brushes … These Cedar Brushes are also thick with climbers, such as *Cissus antarctica*, the Kangaroo Vine, *Eupomatia laurinae*, a briary brush, allied to the Custard apple, but with an inferior fruit … (Backhouse, 1843: 397).

Beyond the valley floor there were large tracts of open land, formed by diversions of the rivers from their former channels. These created remnant lakes and wetlands that gradually filled to form "grassy plains, islands, or peninsulas" (Lang, 1834: 68). A large peninsular known as *Narragan* to the Kooris (now Phoenix Park), is described by Lang in detail:

> … Phoenix Park is without exception the finest piece of land, both for quality of soil and for beauty of scenery and situation, I have ever seen, - being entirely of alluvial formation, and bounded on all sides, with the exception of the narrow isthmus that connects it with the main-land, by broad and deep rivers, the banks of which are ornamented with a natural growth of the most beautiful shrubbery; while over its whole extent, patches of rich grassy plain, of thirty or forty acres each, alternate with clumps of trees or narrow beltings of forest, as if the whole had been tastefully laid out for a nobleman's park by a skilful landscape gardener. (Lang, 1834: 69).

An 'open and park-like' landscape

From Maitland, up the Hunter to the large open plain known as Patrick's Plains, the country away from the river is described as "open and park-like" by many observers. Peter Cunningham describes Patrick's Plains as being "above two thousands acres of the most fertile soil, the greater portion naturally clear of timber" with "luxuriant natural grasses" (Cunningham, 1827: 152). Cunningham paints a graphic picture of the river flats and the surrounding environs:

> On disentangling yourself from among the undulating hills and ridges which bound these beautiful meadows, one of the richest natural prospects that can be witnessed presents itself - the flat alluvial lands spread out before you being matted with luxuriant herbage; branching ever-greens scattered singly or in irregular clumps; the river winding through the midst; whilst dark-foliaged swamp-oaks, bordering with a deep green-fringe its steep and grassy banks, and gently rising hills beyond, thinly clothed with wide-spreading forest-trees, extend in diversified magnificence as far as the eye can see. (Cunningham, 1827: 155).

Cunningham was keen to point out to his readers that the plains of the middle to upper Hunter were able to be settled "without the expense of cutting down a tree". He comments that "in all of these luxuriant plains there is scarcely a superfluous tree to be seen, not often above a dozen to the acre" (Cunningham, 1827: 156).

On these "luxuriant" plains the Bustard or wild turkey was common. This bird stands over a metre tall and weighs up to 10 kilograms. Cunningham notes that:

> [t]hese plains are the great resort of our wild turkeys, which you will see here stalking majestically about, and which afford an excellent and most delicate repast (Cunningham, 1827: 152-3).

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2.2 An Environmental History of MAITLAND & THE MIDDLE RIVER

A first-hand account

A correspondent to the *Maitland Mercury* in July – August 1877 provided detailed recollections of the Maitland area and its flora and fauna. This unnamed person expressed his regret that he was but a boy during the early days of settlement. In a number of separate instalments he proceeds to give an account of the native people and the landscape as it was from about 1820 to the 1870s. In the first recollection he says:

> I can … well recollect the imposing and magnificent appearance of the dense brushes which covered the greater portion of the splendid estates now known as Berry Park, Bolwarra, Phoenix Park, Wallalong, Dunmore, Hinton … and passed many joyous hours with merry companions in hunting the wallaby, bandicoot, kangaroo rat, native cat etc. which abounded within and about them; and enjoyed the sport which shooting wonga wonga and other pigeons, doves, and many other beautiful birds afforded (Maitland Mercury, Sat. July 28, 1877).

He goes on to describe the "brushes" in greater detail:

> Magnificent indeed was their appearance. Gigantic gum trees towered far and away above all others, and spread their radiating and mighty limbs far and wide like umbrellas over the green ocean of lovely foliage, which crowned the tops of the closely wedged mass of their smaller brethren. And less lofty, but still imposing and inconceivably beautiful, were the fig trees, which in many instances were of enormous size, and covered an immense space. The whole of the large cedar trees had long before the period of which I write disappeared, but the huge stumps remained as evidence of their vast proportions, and their well-known beauty must have originally given additional attraction to the scene. All attempts to describe accurately the character of the underwood would be futile. So thickly did the timber grow that it was often difficult to proceed, and we were glad to avail ourselves of the wallaby tracks, which intersected the brushes in various directions. The strongest winds failed to disturb the calm which ever existed in them, and there the blacks spent the cold period of winter, using the bark of the tea tree for covering their gunyahs… (Maitland Mercury, Sat. July 28, 1877).

The correspondent[2] further describes the hunting parties of the 'blacks' who would hunt for various forms of what we now call 'bush tucker' in about 1836:

> Some would fish, others climb trees for possum, squirrels, or bears[3]; and others would go "walbunging" or hunting for wallaby, which were very numerous, bandicoot, kangaroo rat etc.. And woe to any colony of flying foxes which they came across. Of the flesh of this latter they were very fond (Maitland Mercury, Sat. July 28, 1877).

The fate of the middle valley floor

The middle Hunter has suffered widespread degradation of its flora and fauna. The major reason for the regional extinction of flora and fauna has been the almost complete loss of riparian (riverside) vegetation. The isolated patches of native vegetation that remain are incapable of supporting the full diversity of native fauna. To make the situation worse they remain under constant threat from further development.

The loss of the vegetation has had direct impacts on the shape of the river. In general, loss of riparian vegetation has the effect of widening and shallowing the river channel as the banks collapse. In 1877, after a meeting of residents concerned about the siltation of the Hunter River at Morpeth, a correspondent to the Maitland Mercury suggested an 'upstream' approach to the problem of silt in the channel. He suggested that the steamers might be the cause of the problem. He argues:

> Now, it is a well known fact that the steamers themselves fill up the channel; they undermine the high banks, so that the first heavy rain causes them to fall down, and a few days suffices to sweep the debris into the channel. Another thing: the altitude of the banks is thus everywhere lowered, and the back lands rendered more liable to floods. (Maitland Mercury, August 4, 1877).

The Hunter River has also suffered major changes due to the effects of bank erosion, stream bed lowering and sedimentation, and the effects of flooding. The combination of these impacts has been a shortening of the river channel between Maitland and Morpeth by some 18kilometres between 1870 and 1964 (State of the Rivers and Estuaries Report, 2000; p.104)

In order to control flooding, river engineering has transformed the dynamics of the floodplain. The construction of channels and flood levees have deprived the floodplain of new layers of alluvial soil. The alluvial soil that has been historically deposited is now retracting under the impacts of vegetation clearing, erosion from agricultural activity and wholesale removal during periods of flooding (e.g. during the 1955 flood).

Despite the catastrophe that flooding brings, the natural river system was always capable of rebounding from such shocks. Indeed the area's biodiversity depended on regular disturbance to maintain its richness, complexity and diversity. The only species that seems incapable of adapting to flooding as a beneficial feature of floodplains are humans who settle and build in places where floods will wipe them out.

[2] The reader who wants more of the perceptive and sympathetic account of the Correspondent's view of the Aboriginal people of the Maitland district are encouraged to read all the instalments. See Maitland Mercury Sat. August 4, August 11, August 18, August 25 1877 and beyond.

[3] The presence of Koalas is an indication of a specific type of ecosystem with specific tree varieties (see Albrecht, 2000 and Knott *et al*, 1998).

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2.2 An Environmental History of MAITLAND & THE MIDDLE RIVER

The fate of the middle valley floor (cont.)

The factors that cause the 'slow death' of the river system such as soil loss may prove to be more important than sudden events such as occasional flooding. Topsoil loss, for example, is a serious problem in areas of the valley where viticulture is practised. In one recent study, it has been estimated that on some of the steeper slopes where grapes are grown, up to three bottles of soil (3 kg) are lost to erosion in the production of one bottle of wine (Loughran *et al*, 2000). A continuation of such soil losses is a major threat to the survival of the viticulture industry and the health of the rivers.

It has been estimated that 99% of the vegetation on the central valley floor has been removed and in local government areas such as Maitland, over 90% of the native vegetation has been lost (Albrecht & Gutberlet, 2000: 260). Native revegetation has now been undertaken by organisations such as the Hunter Catchment Management Trust (HCMT) and Landcare groups. Even so, remnant patches of native vegetation in the valley floor of the Hunter and Williams River catchments are still inadequately protected by planning policies.

High nutrient loads in the waterways are another major legacy of poor land management. With nitrogen and phosphorous levels increasing due to residential and industrial development and agricultural activity (fertiliser, human sewage, detergents and animal manure), the frequency of algal and bacterial blooms has risen above natural background levels. The levels of faecal coliforms (bacteria) in the Hunter River at a number of middle river sites now regularly exceed primary contact recreation guidelines (State of the Rivers and Estuaries Report, 2000: 91). Severe bacterial blooms and pollution reduce the quality of drinking water for stock and humans and, ultimately, all the fauna dependent on the river.

Conclusion

The landscape around Maitland and the middle section of the Hunter River and its tributaries such as the Williams and Paterson has experienced major transformation. This has largely been a result of colonisation by Europeans and their forms of agriculture, settlement and industry.

The valleys of the *Coquun*, the *Yimmang* and the *Dooribang* have been altered so much that they would not be recognised today by the original people of these valleys. Nor by the first settlers if they were able to be shifted in time.

For the current generation of citizens of this region to have a sense of belonging and attachment to 'their place' knowledge of environmental history is critical. Involvement of local people in restoring the valleys of the *Coquun*, *Dooribang* and *Yimmang* will not only help restore a sense of place, it just might help in the reconciliation between non-indigenous and indigenous Australians.

Acknowledgment

This case study has been prepared by Glenn Albrecht (PhD) (Senior Lecturer in Environmental Studies, School of Environmental & Life Sciences, University of Newcastle). References are on the next page.

It is an extract from Albrecht, G. 2000, *Rediscovering the Coquun: An environmental history of the Hunter River,* paper presented at the Hunter Catchment Management Trust's Water Forum, 2000, pp.4-26. For a full copy of the paper refer to:

www.hcmt.org.au/ep_publications.php3

Poor Bustard

A symbol of Maitland's lost flora and fauna is one of Australia's largest birds, the Bustard. Some 26 years after his visit to the Hunter region, John Gould wrote that:

> It may be possible – and, indeed it is most likely – that … no longer does the noble Bustard stalk over the flats of the … Hunter … and if this be so, surely the Australians should at once bestir themselves to render protection of these and many other native birds: otherwise very many of them … will soon become extinct. (Gould (1865) in Albrecht & Albrecht, 1992: 22).

John Gould was correct and the Bustard has been regionally extinct for well over one hundred years. Other birds such as the Regent Honeyeater that moved through the "apple tree flats" or *Angophora* open forest of the Hunter in their thousands in the early nineteenth century are now among the most endangered birds in the world. The current estimate of their total population is only a few hundred. As well, the Bittern no longer 'booms' near Maitland.

The Once Noble Bustard: edited from a painting by Peter Slater, in *Rare and Vanishing Australian Birds,* 1978; p. 35. Rigby Ltd.

Case Study C

2.2 An Environmental History of MAITLAND & THE MIDDLE RIVER

References

Albrecht, G. 2000, "The Koala and a native sense of place: the urgent need for a distinctively Australian environmental ethic", in *Conference Proceedings of the Australian Koala Foundation Conference*, Noosa, NSW.

Albrecht, G. and Gutberlet, J. 2000, "Sustainability and the Hunter Region", in McManus, P. *et al* (eds), *Journeys: The Making of the Hunter Region*, St Leonards, NSW: Allen and Unwin.

Albrecht, G. & Albrecht, J. 1992, "The Goulds in the Hunter Region of N.S.W. 1839-1840", in *Naturae*, No. 2, Monash University, Centre for Bibliographical and Textual Studies.

Backhouse, James 1843, *A Narrative of a Visit to the Australian Colonies*, London: Hamilton, Adams and Co.

Cunningham, Peter, M. 1827, *Two Years in New South Wales*: *a series of letters …* London: Henry Colburn.

Elkin, A.P. 1937, *Morpeth and I*, Sydney: Australian Medical Publishing Co. Ltd..

Gunson, N. 1974 *Australian Reminiscences and Papers of L.E. Threlkeld Missionary to the Aborigines – 1824-1859*, Canberra: Australian Institute of Aboriginal and Torres Strait Islander Studies.

Knott, T. *et al* 1998 "An ecological history of Koala habitat in Port Stephens Shire and the Lower Hunter on the Central Coast of New South Wales, 1801-1998", in *Pacific Conservation Biology*, Vol. 4, pp.354-68.

Lang, J.D. 1834, *An historical and statistical account of New South Wales*, Vol. II, London: Cochrane and M'Crone.

Loughran, R. *et al* 2000, Soil Loss and Viticulture at Pokolbin, New South Wales, *IAHS Red Series* (in press).

Maitland Mercury, Saturday July 28, 1877 (Correspondent's Report dated July 23, 1877).

Sokoloff, B. 1976, "As it was in the Past", in *Hunter Natural History*, Vol. 8., No. 3, pp. 207-208. Historical sources on Newcastle, Hunter River and Lake Macquarie.

State of the Rivers and Estuaries Report – 2000: Hunter, Karuah & Manning Catchments, Department of Land and Water Conservation, NSW Government.

Stretch, J.C.W. (no date), *N.S.W. Place Names and Meanings* A7739 (iii), A7739 (iv). Archives, Rare Books and Special Collections Unit, Auchmuty Library, The University of Newcastle.

Wood, W.A. 1972, *Dawn in the Valley: The Story of Settlement in the Hunter River Valley to 1833*, Sydney: Wentworth Books.

Case Study C

2.3 A Sense of Place at TOCAL

Tocal means many different things to different people. This case study outlines the factors that have influenced Tocal's identity today and the things that contribute to an individual's sense of what Tocal means to them.

Tocal is a 2200 hectare property located in the Hunter Valley of NSW, 180 kilometres north of Sydney and a 15 minute drive from Maitland.

Geology

The geology of a landscape determines the type of ecosystems found in the area and forms the building blocks of the environment. It is very difficult to talk about the geology of an area the size of Tocal without considering the region surrounding it. Geology can also change significantly within a small area, and this is the case at Tocal.

The area has been subject to many of Earth's geological processes in the last 380 million years, including glaciers, volcanoes, movement, inundation by seas and a changing coastline.

Carboniferous period (320 million years ago)

This is the oldest period of geological evidence on the Tocal property. It involved the influence of volcanoes and glaciers. Volcanoes sent ash across the landscape forming a rock known as basalt. The hills to the near north of Tocal are a result of the volcanic action and weathering of basalt, forming deep black fertile soil. Hills from volcanic action tend to be rounded and smooth.

Evidence of glaciers can be seen in the bedrock of the western part of the Webbers Creek valley. Varved shales exist in parts of the property, these are finely laminated sedimentary rocks associated with glaciers. They have fine and coarse layers resulting from the seasonal freezing and thawing of waters in lakes adjacent to the ice sheet.

Permian period (286 – 245 million years ago)

During the Permian period the area experienced uplifting and folding, and climatic conditions that resulted in the sedimentation of material. This produced sedimentary materials such as mudstone, sandstone and shale. Marine deposits can also be seen across the landscape.

The angular hills associated with the sedimentary rock at the top are resistant to weathering. The flat-topped hills with steep sides to the west on either side of the Webbers Creek valley were formed during this period.

Quaternary period (1.8 million years to present)

The climate of this era saw deposits of sand, silt and clay covering much of the Permian geology. Rivers produced the floodplains of clay, silt and sand of today, which have become the area's most productive agricultural soils.

Native vegetation

The native vegetation of Tocal has been highly modified at least since Europeans moved into the area in the early 1800s and was probably also influenced by the Aboriginal inhabitants before that.

The cleared flats around the Tocal Homestead would originally have been covered in rainforest species very close to the creek, and would then have opened up into a woodland of mainly Coastal Grey Box and Forest Red Gum. In the wetland there would have been a range of species including Paperbarks, Swamp Oaks, Tea Trees and a number of understorey species. There are few remnants of this community left and this has resulted in a very exposed landscape. The wetland became valuable for grazing beef cattle and the flats grew very productive introduced pasture species.

Water

Tocal Homestead is almost completely surrounded by rivers, wetlands and lagoons. On one side of the Homestead is Webbers Creek and a series of wetlands arise from Quarry Creek on the other side. Quarry Creek flows out of timbered country behind the Homestead and winds its way through a narrow corridor of Casuarinas or Swamp Oaks before spreading out into a wetland. The Paterson River is across the road from the Homestead.

The Homestead is in a very strategic position since access to water, particularly in the early days of settlement, was absolutely vital for survival of the settlers and their stock. The original fences of the homestead radiated out from the hill down to a water source so were able to be run stock in a series of paddocks that all led to water.

The wetlands are an important filtering mechanism for pollution from sediments and nutrients from small holdings and activities upstream. The water from the wetlands enters Webbers Creek at the back of the Homestead through a series of cuttings and Webbers Creek joins the Paterson River.

Case Study C

2.3 A Sense of Place at TOCAL

Aboriginal Era

Tocal is on part of the tribal lands of the Gringai clan of the Wanaruah people. The name 'Tocal' is a Koori word meaning 'plenty'.

The Wanaruah believe that interaction between the spirits shaped this empty valley into everything that you see – all the animals and all the plants. Water was created to sustain the life that had been formed. Laws were passed onto humankind, whilst the answers to life's great secrets were held in the land and humans had the ability to read the land. The Wanaruah lived in harmony with the land and what it provided. Tocal's rivers, wetlands, forests, and grasslands provided well for the Wanaruah.

Food was taken from the rivers and wetlands (mussels, eels and fish as well as seeds and rhizomes from plants), the forests (berries, seeds and small animals), and the grassy areas (kangaroo, wallaby, emus and bandicoots). Shelter was taken in huts made from branches and paperbark, blankets or clothes from the hides of the kangaroos and wallabies as well as bark from the paperbark tree. Tools were made from sharpened stones held together by twine and glue. Twine was made from the leaves of the grass tree, strips of bark from the Commersonia, fibres from Stringy Bark trees or leaves from wetland sedges. Glue was made by mixing resin from the base of the leaves of the grass tree and fine sand or dirt. The distilled oil of the paper barks was used for medicinal purposes, to treat headaches, sores and abrasions. And the well-known practice of rubbing sticks together to start fires was often done with the stems of the flower from grass trees.

The Tocal lands were important to the Wanaruah people. Access to fresh water and a range of ecosystems meant that everywhere they looked there were resources and food available to them. Generations of the Wanaruah used this land for many years before the arrival of European settlers.

The site of Tocal Homestead was chosen for its access to fresh water. It was originally a campsite of the Wanaruah tribe for the same reason.

Convict Era

Tocal was granted to wealthy Englishman James Webber who arrived with convict clearing gangs as well as his own convicts in 1822. Webber set about developing the property and setting up a productive farm. He was an active, single man with a strong interest in agriculture and quickly developed Tocal into a leading farm in the district producing wool, tobacco, wine, cheese and grains.

Webber's convicts were from England and Ireland, some having committed minor offences and others much worse; in fact one was a murderer. Most had been caught up in the transformation associated with the industrial revolution and political changes in both England and Ireland. They found themselves in an alien land working on an isolated farm in the Australian bush. They did not have the same connection with the land as the Aborigines, who had lived with this land for many generations, and their sense of place would have been significantly different. The convicts struggled with their own sense of displacement as well as with what was seen to be a harsh and inhospitable land.

Webber sold Tocal to the Wilson family in 1835 who had tenant farmers on the property as well as convict labour. The Wilson family built the grand Tocal Homestead and many of the outbuildings. They were wealthy Sydney people who were supportive of local farmers who found themselves in difficult financial circumstances during the 1840's drought and financial recession. The convict era ended around 1840 bringing many changes through the district. Some old convicts stayed on until they had completed their sentences but no new convicts arrived. They were then replaced by paid staff.

Colonial Era

Charles Reynolds leased Tocal from the Wilson family in 1844 and his family continued this lease until 1907. In 1907 the Reynolds purchased the farm from the Wilsons.

The Reynolds time at Tocal saw it develop into one of Australia's most famous properties for breeding racehorses and cattle. Reynolds was also very innovative in trying other crops such as cotton and tobacco and he was the first person in New South Wales to import a reaping machine to harvest wheat (Tocal grew wheat until disease made it difficult in about the 1860s).

Charles Reynolds was assisted by John Kidd and later his descendants. Unlike the convicts, they saw Tocal as their home and their 'place' for the rest of their lives. They were born on the property, lived, worked and died here for three generations. Their love of this land and their animals was strong and resulted in many accolades for their prized animals at various shows.

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2.3 A Sense of Place at TOCAL

Federation Era

Around the time of Federation Tocal also underwent some changes. Charles Reynolds' widow, Frances, died and management of the property fell completely to their eldest son Frank. He was a capable livestock breeder and he ran the property until his death in 1920.

A dreadful bushfire in 1905 (just before the Reynolds purchase of the property in 1907) burnt most of the fences and many of the improvements on the property. A few years after this the First World War broke out and activity on Tocal slowed because many young men of the property and district went off to war. Tocal was still a leading horse and cattle stud and continued to win prizes at shows. Buyers flocked to purchase their stud bulls.

In 1926 the property was auctioned to wind up Frank Reynolds' estate. The sale of Tocal was a great loss to the Reynolds who had nurtured the land and livestock for three generations and over 80 years.

Alexander Era

The Alexander family purchased Tocal at the 1926 auction, cut back on staff and soon stopped stud-breeding activities. The stud racehorses had been sold and there were just a couple of horses retained for stock work. The cattle stud continued for a while but was then reduced to a shadow of its former self. The Alexanders were, however, very astute pastoralists but they traded in livestock rather than breeding stock. They lived quietly and did not have any children. Tocal was a vastly different place to when it was a vibrant family home with various generations of the Reynolds family. There was only about two people working on the property during the Alexander era but it was still running large herds of cattle. Tocal stayed like this for many years and, when the Alexander family had all passed on, it became the home for their nieces, the Misses Curtis.

Charles Boyd Alexander left a will that allowed for his properties to be set up as a training institution. In 1965 the CB Alexander Presbyterian Agricultural College commenced operations with fifteen students. The fifteen students soon grew to sixty and then later to one hundred. Tocal was becoming an active property again with a new dairy and an architect-designed campus.

The Tocal property has increased through various land purchases since the College commenced – Athcourt Farm, Glendarra, Bona Vista, Dunnings Hill, Clements Farm and Numeralla. It is now 2,200 hectares.

Tocal from the year 2000

Today, activities on Tocal are quite varied and its history is seen as a valuable resource for understanding the present. People who have a connection to Tocal include students, staff, participants in external courses and short courses, visiting lecturers, international guests in intensive training programs, tourists, visitors to events, contractors and delegates to meetings and conferences. Each of these people see Tocal's role differently. Each of these people have a different sense of place at Tocal.

Tocal Homestead today (built in 1841).

CB Alexander Agricultural College, Tocal

Tocal College is home to around 90 full-time students. They live and study here and for them the farms and the College campus are most important. Still, among them are students interested in the activities of the Homestead; some whose passion is horse riding; while others who are here to study find little time for other pursuits.

For the lecturers, Tocal is centred around the campus and teaching students using activities in the classroom and practical experience on farms. Farm staff are involved in the management of the livestock and resources but also have a role to play in training students.

Tocal farms

The Tocal farms are operated as commercial enterprises and are used by the CB Alexander Agricultural College for educational activities as well as for tourism to outside groups. The operations at Tocal include beef, dairy, chicken, horse and sheep production.

Historically, Tocal has had a reputation as a progressive and innovative farm. Current management aims are to maintain the strong reputation of the property by adopting best practice property management for livestock as well as land use practices.

Case Study C

2.3 A Sense of Place at TOCAL

Tocal farms (cont.)

The wetlands were drained by early settlers to provide more grazing land and more reliable pasture in dry times. Draining and grazing destroys the nature of the wetlands and we are in the process of rehabilitating them. The wetlands have been fenced off to stock and planted to improve their condition. The range of trees and shrubs for planting have come from native seed collected from the Tocal property.

Attempts are also being made to establish wildlife corridors to minimise the impact of clearing on the biodiversity of the property. Islands of vegetation are not ideal. It's only when these islands are linked with other vegetation in the form of corridors that they become effective as a wildlife refuge. To encourage links, we have planted alongside existing remnants. The selection of species is important and the species planted are native to the area.

Tocal Field Days

For some people in the local area and exhibitors who attend the Field Days, Tocal *is* the Tocal Field Days. With over 450 exhibitors showcasing the best in agriculture and associated services, it is a significant event in the area. Industries represented include food and wine, livestock, land management, health and safety, aquaculture, commercial machinery and equipment, education, fashion and art and craft.

Tocal Homestead

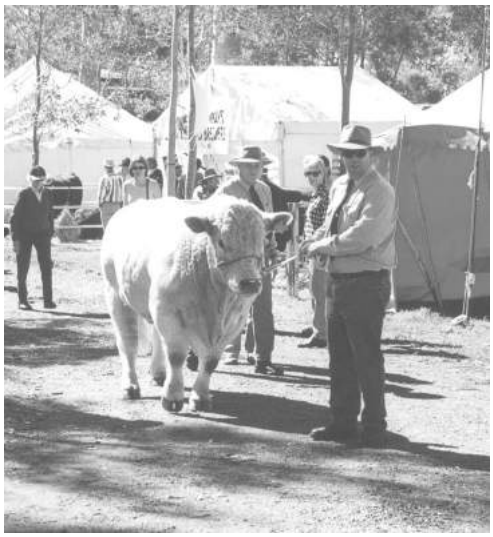
Tocal Homestead provides an experience of rural life as it was in 'the good old days'. With nearly 180 years of European history, Tocal provides a unique opportunity to trace the development of rural Australia from settlement to the year 2000. Visitors to Tocal Homestead leave with a real connection to the Tocal property and comment on the wonderful atmosphere of the site.

Tours

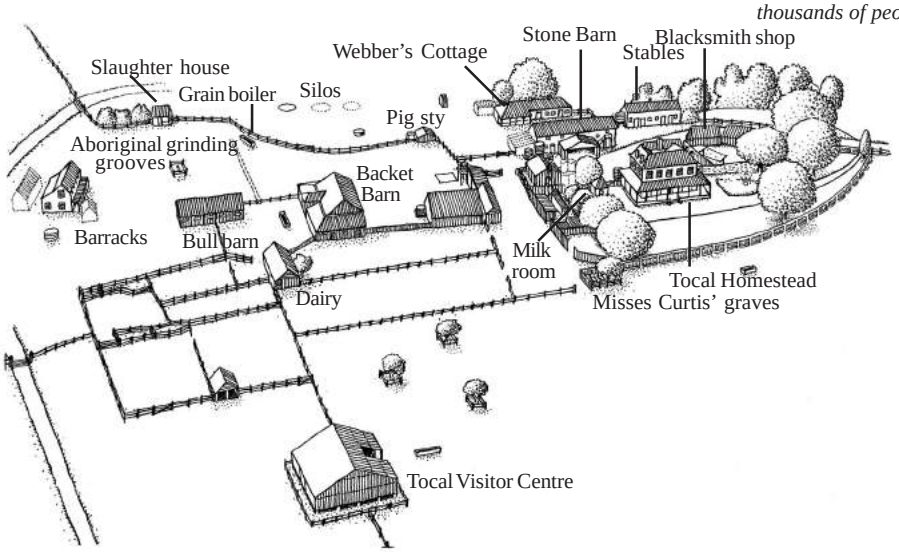
Social and community groups often come to Tocal to take a tour of the Homestead and/or the farms. Tours are also popular with school groups.

"What is your sense of place at Tocal?"

Year 7 students researching and studying Tocal's history.



Tocal Field Days are a major event giving tens of thousands of people a chance to experience Tocal.



Acknowledgement & References

This case study has been prepared by Joanne Hathway (Information Officer, CB Alexander Agricultural College, Tocal).

Other information sources included:

McManus, P., O'Neill, P., & Loughran, R. (Eds) 2000, *Journeys – The making of the Hunter Region*, St Leonards, NSW: Allen & Unwin.

Engel, B. & Nashar, B. 2001, *The Geology of the Tocal Farm (the Mindaribba Basin)*. Unpublished manuscript held at Tocal.

2.1 Exploring local places through NATURE JOURNALING

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Human Society & Its Environment	2 3	ENS2.5, 2.6 (Environments) ENS3.6 (Environments)
Science & Technology	2 3	LTS 2.3 (Living Things); INVS2.7 (Investigating); UTS2.9 (Using technology) LTS 3.3 (Living Things); INVS3.7 (Investigating); UTS3.9 (Using technology)
English	2 3	TS2.1, 2.2 (Talking & listening); RS2.5 (Reading); WS2.9, 2.10, 2.11(Writing) TS3.1, 3.2 (Talking & listening); RS3.5 (Reading); WS3.9, 3.10, 3.11(Writing)
Mathematics	2 3	S2.1, 2.4 (Space); M2.1, 2.2, 2.6, 2.7 (Measurement); N2.1, 2.5 (Numbers) S3.1, 3.2, 3.4 (Space); M3.1, 3.2, 3.6, 3.7 (Measurement); N3.1, 3.5 (Numbers)
Personal Development, Health & Physical Education	2 3	COS2.1 (Communicating); INS2.3 (Interacting); PSS2.5 (Problem Solving) COS3.1 (Communicating); INS3.3 (Interacting); PSS3.5 (Problem Solving)
Creative & Performing Arts	2 3	VAS2.1, 2.2 (Visual Arts - making) VAS3.1, 3.2 (Visual Arts - making)
Science	4 5	4.17 (Working individually & in teams); 4.8.2 (Classification of living things); 4.10 (Ecosystems); 4.11 (Natural resources) 5.17 (Working individually & in teams); 5.10 (Ecosystems)
Geography	5	5A2 (Changing Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5 5A3 (Issues in Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5

Overview

Nature journaling involves keeping a journal about a particular place. It is a method for discovering the layered stories of a place including its natural and cultural history, landform and vegetation structure, animal and plant species and its current and future uses and impacts by humans.

Nature journaling encourages students to spend time in a local area to develop a connection to this area through observation exercises. By developing a connection to a place students may learn to respect the environment of their place and extend this respect to other places, thus improving their attitudes to the environment as a whole.

The method of journaling should be holistic and include a variety of scientific observations, drawings, poetry, and creative writing to evaluate, describe and discuss.

Program P

2.1 Exploring local places through NATURE JOURNALING

Materials Required

Provided

- Worksheet 2.1 - Nature Journal (primary students)
- Worksheet 2.2 - Example Nature Journal (primary students)
- Worksheet 2.3 - Nature Journal (secondary students)
- Worksheet 2.4 - Example Nature Journal (secondary students)

To Obtain

- Individual student workbooks (optional)
- Coloured pens and pencils
- Copies of worksheets

Acknowledgement

This program has been designed by Kate Adkins (University of Newcastle, Environmental Science student) and is based on the Naturewatch programs developed by Kevin McDonald and Newcastle City Council.

Program Instructions

Content	Strategies	Resources
Nature Journaling for primary students	• Students use the worksheets provided and record their observations directly onto them. OR • Students paste the strips of questions into a workbook, giving more flexibility to the space available for each activity. Students can then cover and decorate their workbooks. • Completing the nature journal may be performed in small groups in the schoolyard (if there are sufficient trees and quiet areas). AND/OR • The nature journal could be developed as a series of home-work exercises, allowing students to find their own special place to observe and record.	• Worksheets 2.1 & 2.2
Nature Journaling for secondary students	• Students use the worksheets provided and record their observations directly onto them. OR • Students paste the strips of questions into a workbook, giving more flexibility to the space available for each activity. Students can then cover and decorate their workbooks. • Using the schoolyard students complete a segment of the nature journal to develop confidence and familiarity with the task. • Students then develop their nature journal as a homework exercise over a period of 3 weeks. They should spend 15 - 30min. in 6 to 10 separate sittings to complete the exercises.	• Worksheets 2.3 & 2.4

Worksheet W

2.1 NATURE JOURNAL for primary students

Activity 1

Date:

Time (of day):

What season is it?

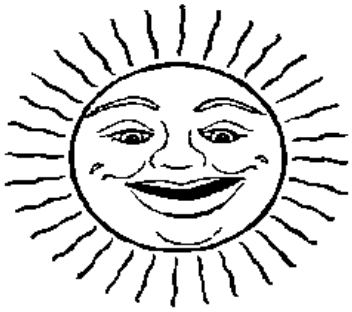
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



The **FEELINGS** you get when you first go to your nature journal place…

- Do you think this place is beautiful or ugly? Why?
- Why did you choose this place?
- What sounds can you hear?
- What does this place smell like?
- Is it damp and dark or sunny with fresh air?

You may want to take some photos and stick them in your diary or draw some pictures or even write a poem.

Remember, your drawings do not have to be works of art! They should just be simple sketches that help you to remember what you see.

Worksheet W

2.1 NATURE JOURNAL for primary students

WHERE is the place you have chosen to do your nature journal?

Draw a map showing how close this place is to your home or school.

Worksheet W

2.1 NATURE JOURNAL for primary students

Activity 2

Date:

Time (of day):

What season is it?

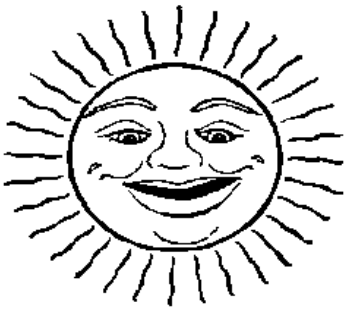
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



BIRDS

- Listen for birdcalls.
- How many different types can you hear?
- Do you hear the same call repeated over and over again?

Can you see any birds? You may want to draw them and describe their colour, patterns, size etc. Maybe you could identify them by looking them up in a bird book.

Worksheet W

2.1 NATURE JOURNAL for primary students

OTHER ANIMALS

Look for signs that animals live here:

- Are there claw scratches on trees?
- Can you see any nests in trees or hollow logs?
- Are there droppings on the ground?

What animals do you think made these marks? Look up some books later to see if your guess was right and write down what you found out.

INSECTS

Have a look in the leaf litter on the ground or look on the bark of trees - can you see any insects?

Draw or write what they look like. You may find lots of different kinds. Remember, lots of different insects and other animals often means that your environment is more healthy and diverse.

Insect behaviour:

- Try to watch an animal or insect for a while.
- What is it doing? Is it hiding? Or looking for food? Or resting?
- How long does it spend doing each of these things?

Worksheet W

2.1 NATURE JOURNAL for primary students

Activity 3

Date:

Time (of day):

What season is it?

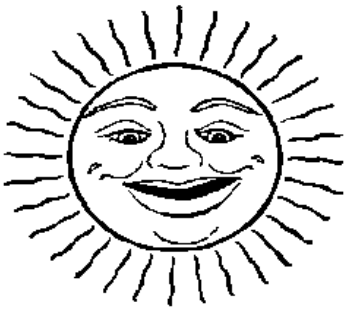
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



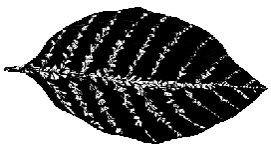
PLANTS

Draw some of the trees nearby and try to guess how high they are. Record this on your drawing.

Do you notice any patterns in your trees? Are some taller than others? Are there layers of different heights?

Look up at the canopy – can you see lots of sky between the trees leaves or is the canopy dense and dark?

Draw a picture of some different leaves. Write down how they feel - smooth? rough? soft? Remember to include detail in your drawings such as veins or wavy edges. Think about why the plant has these details.



Worksheet W

2.1 NATURE JOURNAL for primary students

PLANTS

Choose one plant to look at closely and draw it.

How tall and wide is this plant? Use a piece of string to to measure around the trunk.

Is the plant dense or twiggy? How far apart is it from other plants? Guess why.

Does the plant have flowers or seeds? How do you think its seeds are spread? Why?

Worksheet W

2.1 NATURE JOURNAL for primary students

Activity 4

Date:

Time (of day):

What season is it?

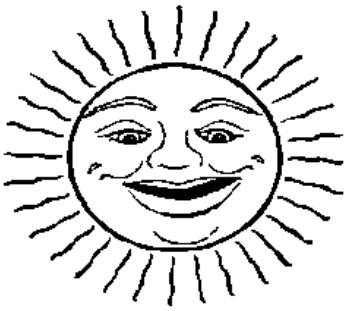
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



SOIL

Feel a handful of soil (wet and dry):

- If it is gritty and you can see little grains and it falls easily through your fingers, write down that you think it is *sand*.
- If it is hard and smooth when wet and holds together in a clump after you squeeze a handful of it, write down it is *clay*.
- If it is dark in colour and has lots of different bits of plant matter in it, write down it is *loam*.
- It may be a combination of one or more types, e.g. a *sandy-loam*.

Is there a layer of leaf litter?
How thick?

Worksheet W

2.1 NATURE JOURNAL for primary students

Activity 5

Reflection Questions

Did keeping a nature journal change the way you feel about your environment? Has it made a particular place feel more or less special?

Did the place seem different when you went there on different days? For example, did there seem to be more birds on sunny days? How do you think this place would change with the seasons?

Do you think this place is an important home for plants and animals? What impacts could affect the health of this place?

Worksheet W

2.2 NATURE JOURNAL Example (Primary)

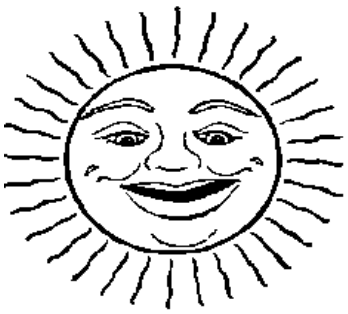
Activity 1

Date: 8/8/02

Time (of day): 10am

What season is it? Winter

How much time did you spend here doing your journal? 10 min



Is it sunny or cloudy? Patchy cloud cover

Has there been any rain? Not for 2 or 3 days

Is there any wind? Gentle breeze

What's the temperature? Cool

The **FEELINGS** you get when you first go to your nature journal place…

- Do you think this place is beautiful or ugly? Why?
- Why did you choose this place?
- What sounds can you hear?
- What does this place smell like?
- Is it damp and dark or sunny with fresh air?

You may want to take some photos and stick them in your diary or draw some pictures or even write a poem.

Remember, your drawings do not have to be works of art! They should just be simple sketches that help you to remember what you see.

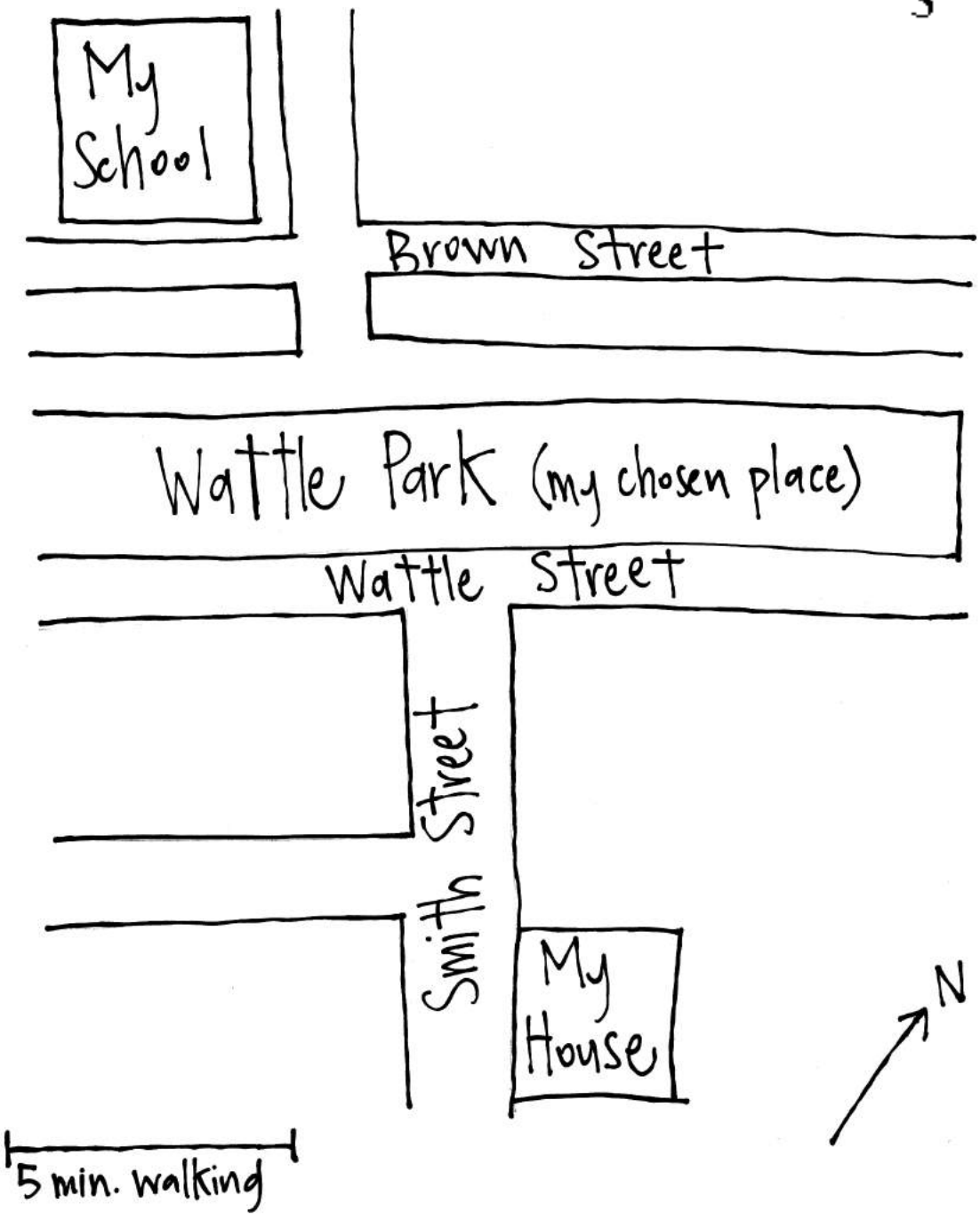
I think the area of bushland I chose is beautiful. It is warm and smells earthy. The trees are not too close together so warm patches of sunlight filter through. The ground is spongy with leaf litter and twigs crack when I walk. It is quiet but I can hear birds. I chose this area because it is away from the main road but still close to my home.

Worksheet W

2.2 NATURE JOURNAL EXAMPLE (Primary)

WHERE is the place you have chosen to do your nature journal?

Draw a map showing how close this place is to your home or school.



Worksheet W

2.2 NATURE JOURNAL EXAMPLE (Primary)

Activity 2

Date: 15/8/02

Time (of day): 4pm

What season is it? Winter

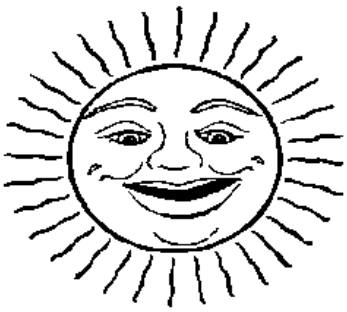
How much time did you spend here doing your journal? 20min

Is it sunny or cloudy? Cloudy

Has there been any rain? yes - this morning

Is there any wind? No

What's the temperature? not too cold



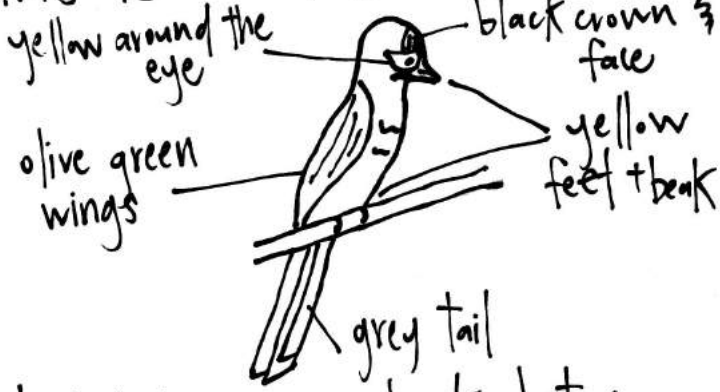
BIRDS

- Listen for birdcalls.
- How many different types can you hear?
- Do you hear the same call repeated over and over again?

Can you see any birds? You may want to draw them and describe their colour, patterns, size etc. Maybe you could identify them by looking them up in a bird book.

I can hear 3 different bird calls. One of them is repeated often - it is a squeeking "pwee-pwee-pwee"

This is a bird that I can see



I looked it up in a book later - it is a 'Noisy Miner'

Worksheet W

2.2 NATURE JOURNAL EXAMPLE (Primary)

OTHER ANIMALS

Look for signs that animals live here:

- Are there claw scratches on trees?
- Can you see any nests in trees or hollow logs?
- Are there droppings on the ground?

What animals do you think made these marks? Look up some books later to see if your guess was right and write down what you found out.

I can see a hollow log on the ground. It is only small but I think that it would make a good home for little native mice or lizards. It would provide protection at night against large birds that would eat them.

INSECTS

Have a look in the leaf litter on the ground or look on the bark of trees - can you see any insects?

Draw or write what they look like. You may find lots of different kinds. Remember, lots of different insects and other animals often means that your environment is more healthy and diverse.

Insect behaviour:

- Try to watch an animal or insect for a while.
- What is it doing? Is it hiding? Or looking for food? Or resting?
- How long does it spend doing each of these things?

I found a slater on the ground. It looked like this:

I also saw a moth fly away when I moved some bark on a tree. I watched the moth for a while. It didn't look for food - most of the time it was flying away from me. I guess this is a natural defense.

Worksheet W

2.2 NATURE JOURNAL EXAMPLE (Primary)

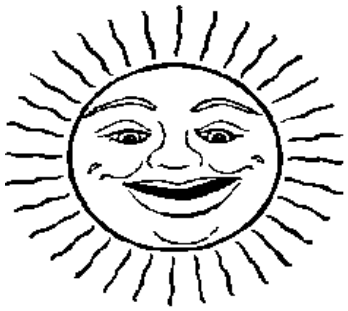
Activity 3

Date: 22/8/02

Time (of day): 12 noon

What season is it? Winter

How much time did you spend here doing your journal? 20 min



Is it sunny or cloudy? Sunny

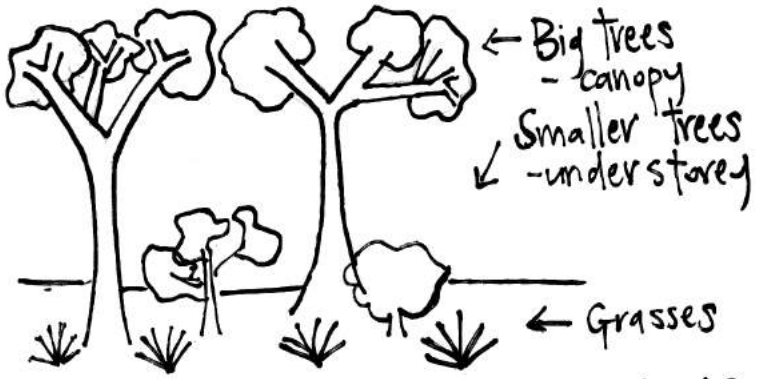
Has there been any rain? No

Is there any wind? No

What's the temperature? Warm

PLANTS

Draw some of the trees nearby and try to guess how high they are. Record this on your drawing.

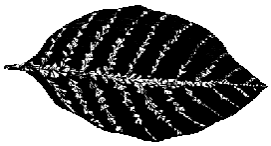


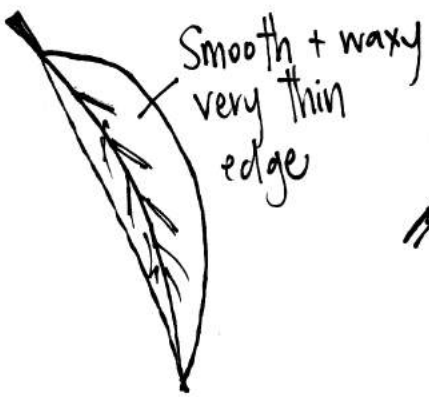
Do you notice any patterns in your trees? Are some taller than others? Are there layers of different heights?

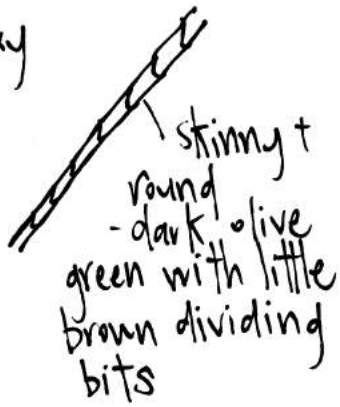
Look up at the canopy – can you see lots of sky between the trees leaves or is the canopy dense and dark?

It looks about half sky and half canopy cover

Draw a picture of some different leaves. Write down how they feel - smooth? rough? soft? Remember to include detail in your drawings such as veins or wavy edges. Think about why the plant has these details.







Worksheet W

2.2 NATURE JOURNAL EXAMPLE (Primary)

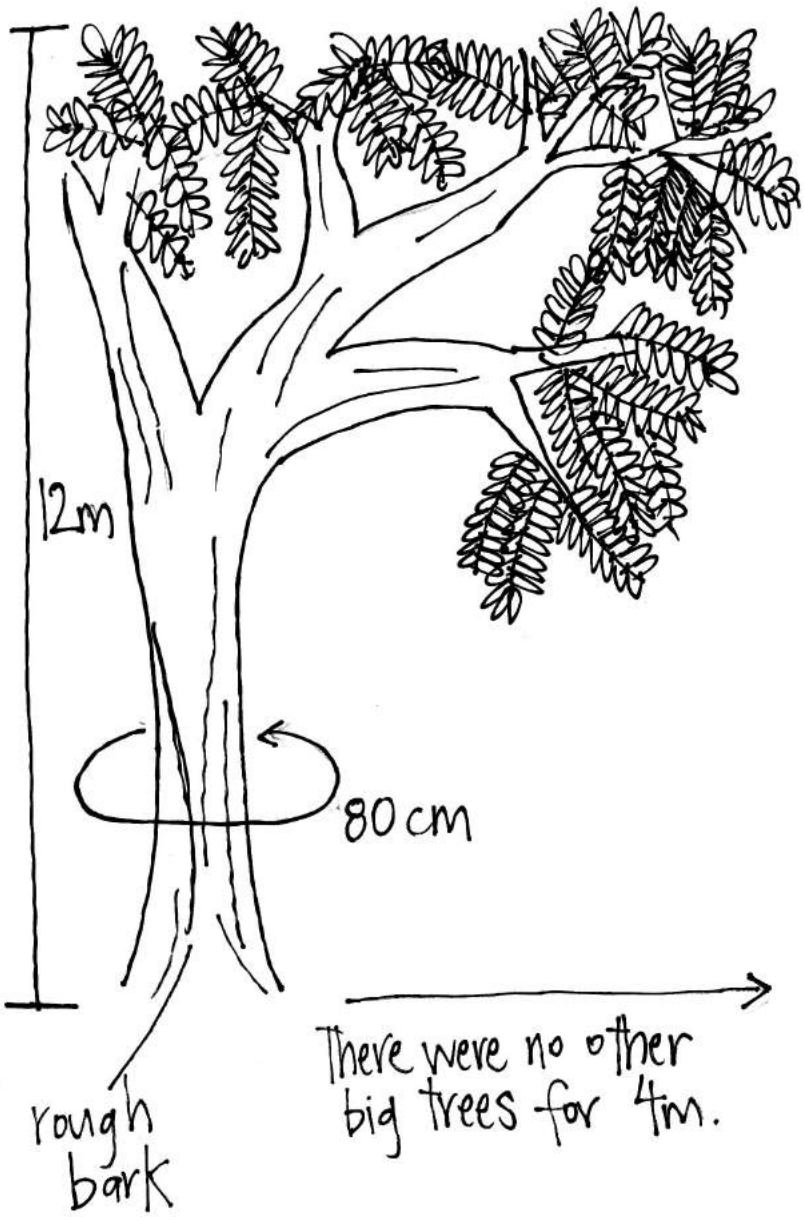
PLANTS

Choose one plant to look at closely and draw it.

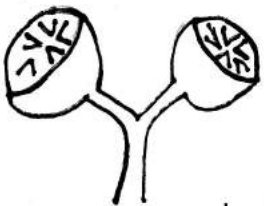
How tall and wide is this plant? Use a piece of string to to measure around the trunk.

Is the plant dense or twiggy? How far apart is it from other plants? Guess why.

Does the plant have flowers or seeds? How do you think its seeds are spread? Why?



I found seeds like these on the ground



These probably just fall to the ground after getting pollinated by insects or birds

Worksheet W

2.2 NATURE JOURNAL EXAMPLE (Primary)

Activity 4

Date: 30/8/02

Time (of day): 2pm

What season is it? Almost spring

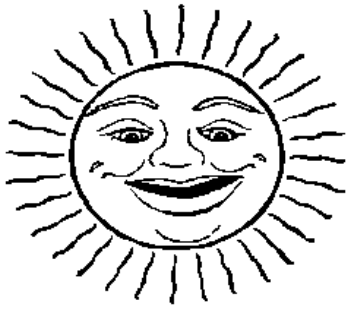
How much time did you spend here doing your journal? 10min.

Is it sunny or cloudy? Cloudy

Has there been any rain? No

Is there any wind? No

What's the temperature? Warm



SOIL

Feel a handful of soil (wet and dry):

- If it is gritty and you can see little grains and it falls easily through your fingers, write down that you think it is *sand*.
- If it is hard and smooth when wet and holds together in a clump after you squeeze a handful of it, write down it is *clay*.
- If it is dark in colour and has lots of different bits of plant matter in it, write down it is *loam*.
- It may be a combination of one or more types, e.g. a *sandy-loam*.

Soil is dark in colour and is not quite sandy (not loose and gritty) and isn't sticky (so it isn't clay). Probably is a loam.

Is there a layer of leaf litter? How thick?

Lots of leaves on the ground - about 2cm thick layer

Worksheet W

2.3 NATURE JOURNAL for secondary students

DAY 1

Date:

Time (of day):

What season is it?

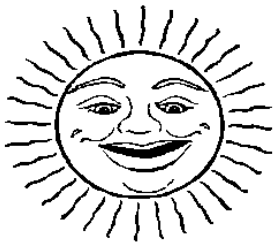
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



FIRST IMPRESSIONS

- What is your first impression of this place?
- Do you think this place is beautiful or ugly? Why?
- Why did you choose this place?
- What sounds can you hear?
- What does this place smell like?
- Is it damp and dark or sunny with fresh air?

You may want to take some photos and stick them in your diary or draw some pictures or even write a poem.

Remember, your drawings do not have to be works of art! They should just be simple sketches that help you to remember what you see.

Worksheet W

2.3 NATURE JOURNAL for secondary students

LOCATION

Draw a map of your nature journal site. Show how close this place is to your home or school.

Worksheet W

2.3 NATURE JOURNAL for secondary students

DAY 2

Date:

Time (of day):

What season is it?

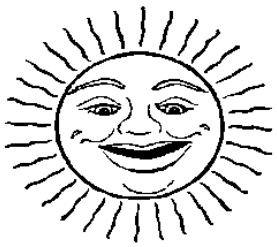
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



BIRDS

Listen for birdcalls, consider the frequency and variety. How many different types can you hear?

Can you see any birds?
You may wish to make a sketch with descriptions and identify the bird later. You could also include some secondary source information about this species.

Worksheet W

2.3 NATURE JOURNAL for secondary students

OTHER ANIMALS

Look for evidence of other animals' presence:

- Are there claw scratches on trees?
- Can you see any nests in trees or hollow logs?
- Are there droppings on the ground?

Try to work out what animals made these marks. Record your thoughts and reasonings in your diary.

Look up some books later to see if your guess was right and write down what you found out.

If you observe an animal at your site you may wish to identify it, classify it and later research its range (e.g. is it common to the area) and status (e.g. is it threatened?).

Worksheet W

2.3 NATURE JOURNAL for secondary students

DAY 3

Date:

Time (of day):

What season is it?

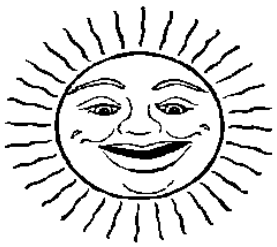
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



INSECTS

Collect a handful or quadrat of leaf litter and soil in a white ice cream container. Sift through the organic material looking for insects. Do a tally of the number of different types and how many there are of each type.

How does this exercise indicate the diversity and abundance of insects within the chosen ecosystem?

Make a sketch of one insect in the field. Through reference to texts, add detail to the sketch by describing and labelling the insect's features.

Worksheet W

2.3 NATURE JOURNAL for secondary students

ANIMAL BEHAVIOUR

Observe the behaviour of a bird, insect or other animal at your nature journal site:

- How does it forage for food?
- Would it be preyed upon by other species? If so, what adaptations does it have to help avoid capture?
- How does it interact with other species?

How long does it spend doing each of these activities?

Which of these activities are common to human behaviour? Which are different?

What other ways does this species adapt to its environment?

At what stage do you think it is in its lifecycle?

Worksheet W

2.3 NATURE JOURNAL for secondary students

DAY 4

Date:

Time (of day):

What season is it?

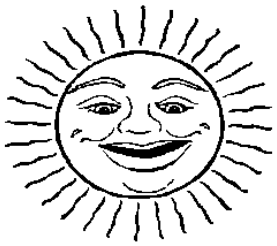
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



PLANTS

Draw a transect and mark where you saw different species and at what height they reached. Do you notice any vertical patterns or distinct layers?

Look for the three most common plant species and identify them down to their genus (e.g. Eucalyptus, Acacia, Casuarina). You may need to take a sample of leaves and bark from each plant to identify later (remember to keep each species sample separate).

Estimate the percentage (%) cover of the canopy.

Draw a diagram of some different leaves. Note how they feel - smooth? rough? soft? Remember to include detail in your drawings such as veins or wavy edges.

Think about the function of these leaf details (e.g. waxy coatings minimise water loss).

Worksheet W

2.3 NATURE JOURNAL for secondary students

PLANTS

Choose one plant to look at closely and draw it.

How tall and wide is this plant? Use a piece of string to to measure around the trunk.

Is the plant dense or twiggy? How far apart is it from other plants? Guess why.

Does the plant have flowers or seeds? How do you thinks its seeds are dispersed? Why?

Is this plant a dominant species in your environment?

Is there a close association between this plant and other specific plants or insects?

What adaptations does the plant have to support its survival in this environment?

Worksheet W

2.3 NATURE JOURNAL for secondary students

DAY 5

Date:

Time (of day):

What season is it?

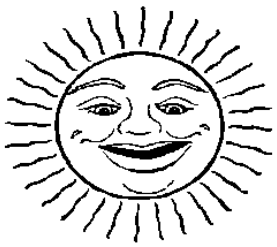
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



SOIL

Feel a handful of soil (wet and dry) and classify it as sand, clay or loam (firstly, you'll need to gather information on soil classification).

Does the soil seem fertile?

Investigate the soil beneath different plants - does the soil texture change with a change in vegetation, geology or landform? Record these differences.

Is there a layer of leaf litter? How thick?

LANDFORM

Try to measure a nearby slope by using a protractor and dangling string (ask your teacher for instructions).

What direction does the slope face? This is called the aspect.

Worksheet W

2.3 NATURE JOURNAL for secondary students

DAY 6

Date:

Time (of day):

What season is it?

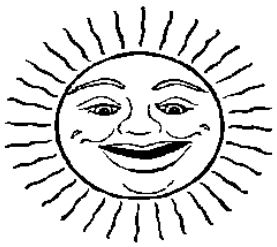
How much time did you spend here doing your journal?

Is it sunny or cloudy?

Has there been any rain?

Is there any wind?

What's the temperature?



IMPACT

Look for evidence of impact or stress around your nature journal site.

Can you see evidence of:

- bushfires?
- erosion?
- weeds?
- pollution?
- pests?

Do you think these impacts have been caused by humans or from some other source? Why?

Worksheet W

2.3 NATURE JOURNAL for secondary students

Reflection Questions

Did keeping a nature journal change the way you feel about your environment? How?

How did changes in the weather and time affect the place you were observing?

Choose one of the following:

(1) Research and discuss the history of this place:
- what were the past land uses by humans?
- what is the natural history of the area? (it may be hard to find specific history but you could look at regional history and relate it to your place);
- how do you think Aboriginal people would have used this place?

(2) Research and discuss possible threats to the area:
- for example: threat of introduced species; housing development; pollution; clearing for agriculture; commercial use; or for transport;
- what would be the impact of likely threats?
- how you would feel if this place was damaged or destroyed?

(3) Discuss the interactions between the biotic and abiotic components of your place:
- how does the weather, location and soil conditions affect plants and animals and how do animals and plants influence each other?
- discuss food chains and nutrient cycling.

Worksheet W

2.4 NATURE JOURNAL Example (Secondary)

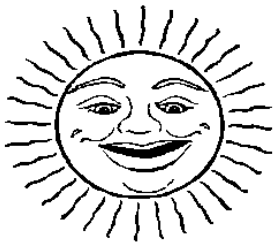
DAY 1

Date: 1/5/02

Time (of day): afternoon

What season is it? Autumn

How much time did you spend here doing your journal? 15min.



Is it sunny or cloudy? Sunny

Has there been any rain? A light shower in the morning

Is there any wind? Cool, gentle breeze

What's the temperature? cool

FIRST IMPRESSIONS

- What is your first impression of this place?
- Do you think this place is beautiful or ugly? Why?
- Why did you choose this place?
- What sounds can you hear?
- What does this place smell like?
- Is it damp and dark or sunny with fresh air?

You may want to take some photos and stick them in your diary or draw some pictures or even write a poem.

Remember, your drawings do not have to be works of art! They should just be simple sketches that help you to remember what you see.

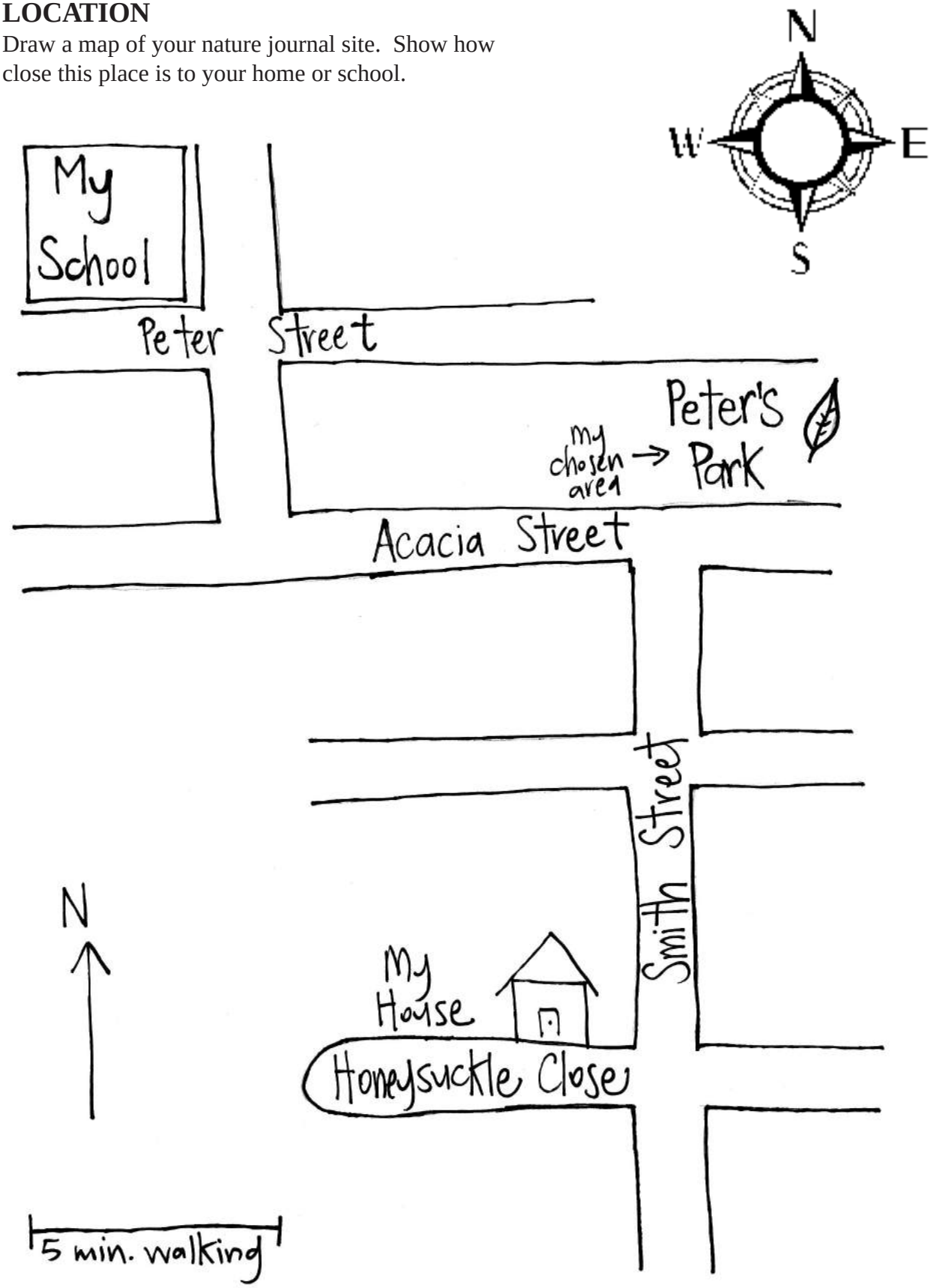
I think the area of bushland I chose is beautiful. It is warm and smells earthy. The trees are not too close together - so warm patches of sunlight filter through.
The ground is spongy with leaf litter and twigs crack when I walk.
It is quiet but I can hear insects and birds.
I chose this area because it is away from the main road but still close to my home.

Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

LOCATION

Draw a map of your nature journal site. Show how close this place is to your home or school.

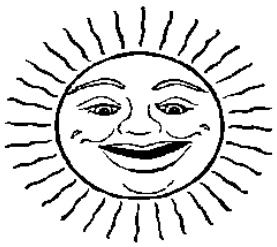


Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

DAY 2

Date:	10/5/02
Time (of day):	Afternoon
What season is it?	Autumn
How much time did you spend here doing your journal?	30 min.
Is it sunny or cloudy?	Cloudy
Has there been any rain?	Light sprinkle after breakfast
Is there any wind?	No
What's the temperature?	Cold



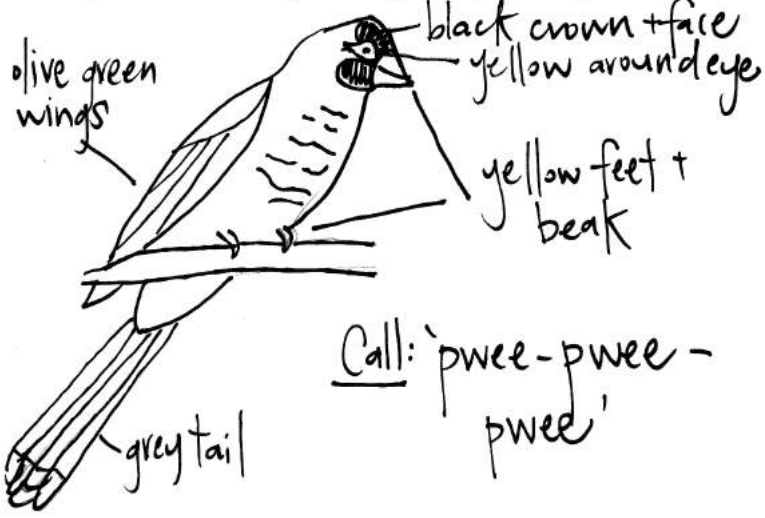
BIRDS

Listen for birdcalls, consider the frequency and variety. How many different types can you hear?

Can you see any birds?
You may wish to make a sketch with descriptions and identify the bird later. You could also include some secondary source information about this species.

Call Types	No. times heard
a	6
b	1
c	2
d	1
total: 4	10

The bird that called six times was a 'Noisy Miner.' This bird is found in woodland areas throughout eastern NSW, QLD, VIC, SA & Tas.



Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

OTHER ANIMALS

Look for evidence of other animals' presence:

- Are there claw scratches on trees?
- Can you see any nests in trees or hollow logs?
- Are there droppings on the ground?

Try to work out what animals made these marks. Record your thoughts and reasonings in your diary.

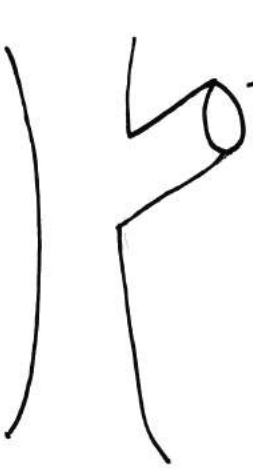
Look up some books later to see if your guess was right and write down what you found out.

If you observe an animal at your site you may wish to identify it, classify it and later research its range (e.g. is it common to the area) and status (e.g. is it threatened?).

I saw a large old gum tree that had hollows in some of its branches and had lots of scratches all around its trunk. On the ground, just under the tree, I found an animal scat that looks like this:

– fibrous

It could be possum poo and the possum lives in one of the hollows. Eg. Sugar Glider



– hollow in the tree branch

Looked up book by Barbara Triggs called "Tracks, Scats and other traces"

Scientific Name: Petaurus Breviceps

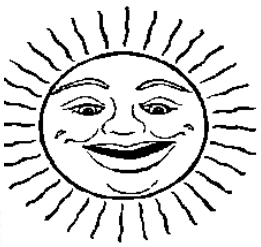
Distribution: Widespread in eastern Aus't, wet & dry open wood land usually with Acacia growth

Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

DAY 3

Date:	28/5/02
Time (of day):	Morning
What season is it?	Autumn
How much time did you spend here doing your journal?	20 min.
Is it sunny or cloudy?	Early sun, very bright
Has there been any rain?	No
Is there any wind?	NO
What's the temperature?	cool, crisp



INSECTS

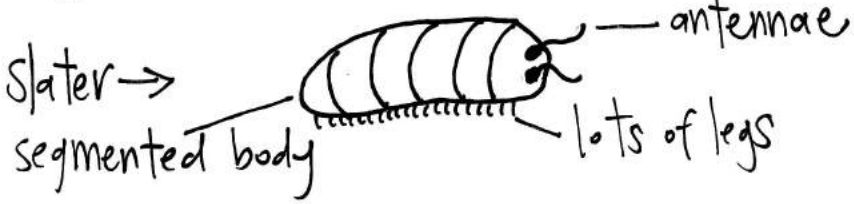
Collect a handful or quadrat of leaf litter and soil in a white ice cream container. Sift through the organic material looking for insects. Do a tally of the number of different types and how many there are of each type.

How does this exercise indicate the diversity and abundance of insects within the chosen ecosystem?

Make a sketch of one insect in the field. Through reference to texts, add detail to the sketch by describing and labelling the insect's features.

Type of Insect	No. Found
snail	I
ant	II
slater	II
spider	I
Total 4	6
This is diversity	This is abundance

Diversity and abundance is indicated through the tally table. There were four different species found (Diversity) and six individuals in total (abundance) To compare diversity + abundance more samples need to be taken at different sites.



Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

ANIMAL BEHAVIOUR

Observe the behaviour of a bird, insect or other animal at your nature journal site:

- How does it forage for food?
- Would it be preyed upon by other species? If so, what adaptations does it have to help avoid capture?
- How does it interact with other species?

How long does it spend doing each of these activities?

Which of these activities are common to human behaviour? Which are different?

What other ways does this species adapt to its environment?

At what stage do you think it is in its lifecycle?

I chose to watch a "butterfly" I watched the butterfly for 5 minutes.

Activities

- Flutters around flowers
- Lands on what seem to be random flowers to feed. The butterfly feeds on nectar by unrolling its 'tongue'. It sucked nectar for about 8-10 seconds.
- Flys away if I get too close. This must be to avoid predation.

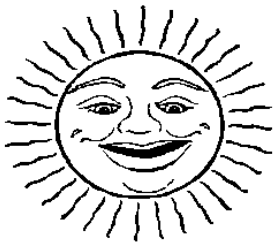
Most of the time the butterfly flew around looking for a flower with lots of nectar to land on. Alot of time was also spent eating. Humans eat alot too but our food isn't as difficult to find compared to a butterfly. Unlike butterflies humans don't have to worry about predation. Butterflies are able to avoid predation by blending (camoflage) into the flower that they are feeding on. I think that I saw an adult butterfly and I know that they have short life cycles so it might die in the next few days.

Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

DAY 4

Date:	3/6/02
Time (of day):	12 noon
What season is it?	Autumn
How much time did you spend here doing your journal?	45min
Is it sunny or cloudy?	Sunny
Has there been any rain?	No
Is there any wind?	No
What's the temperature?	warm



PLANTS

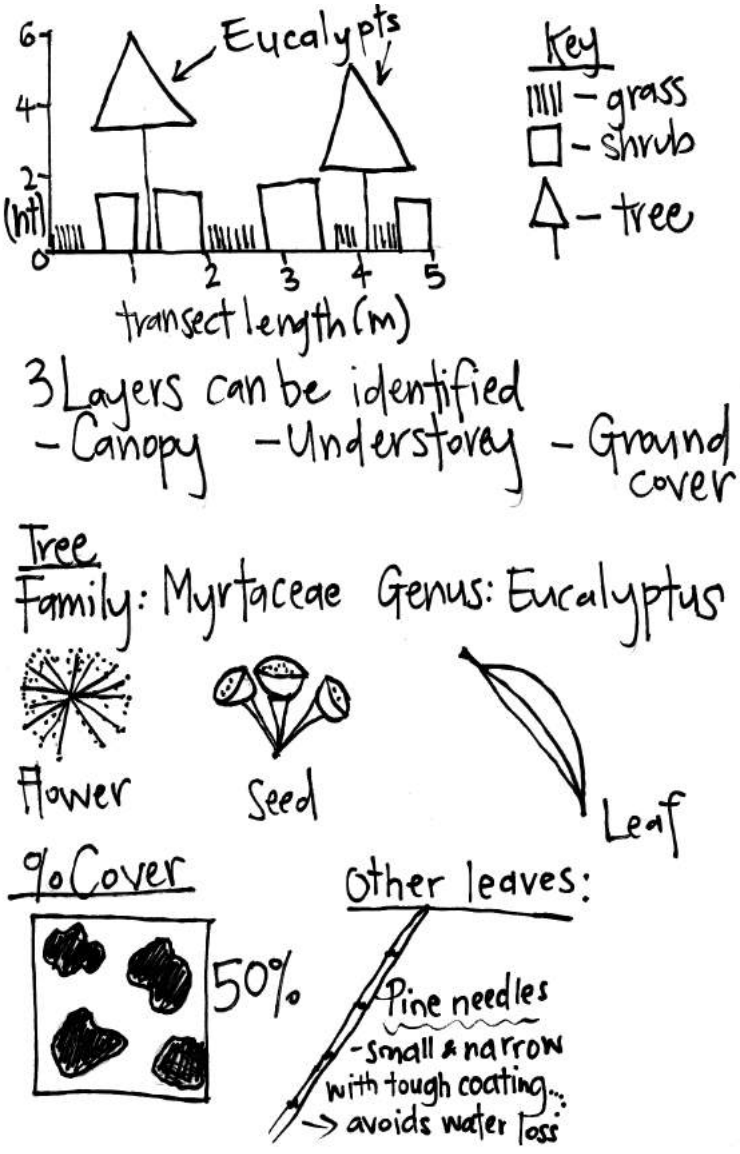
Draw a transect and mark where you saw different species and at what height they reached. Do you notice any vertical patterns or distinct layers?

Look for the three most common plant species and identify them down to their genus (e.g. Eucalyptus, Acacia, Casuarina). You may need to take a sample of leaves and bark from each plant to identify later (remember to keep each species sample separate).

Estimate the percentage (%) cover of the canopy.

Draw a diagram of some different leaves. Note how they feel - smooth? rough? soft? Remember to include detail in your drawings such as veins or wavy edges.

Think about the function of these leaf details (e.g. waxy coatings minimise water loss).



Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

PLANTS

Choose one plant to look at closely and draw it.

How tall and wide is this plant? Use a piece of string to to measure around the trunk.

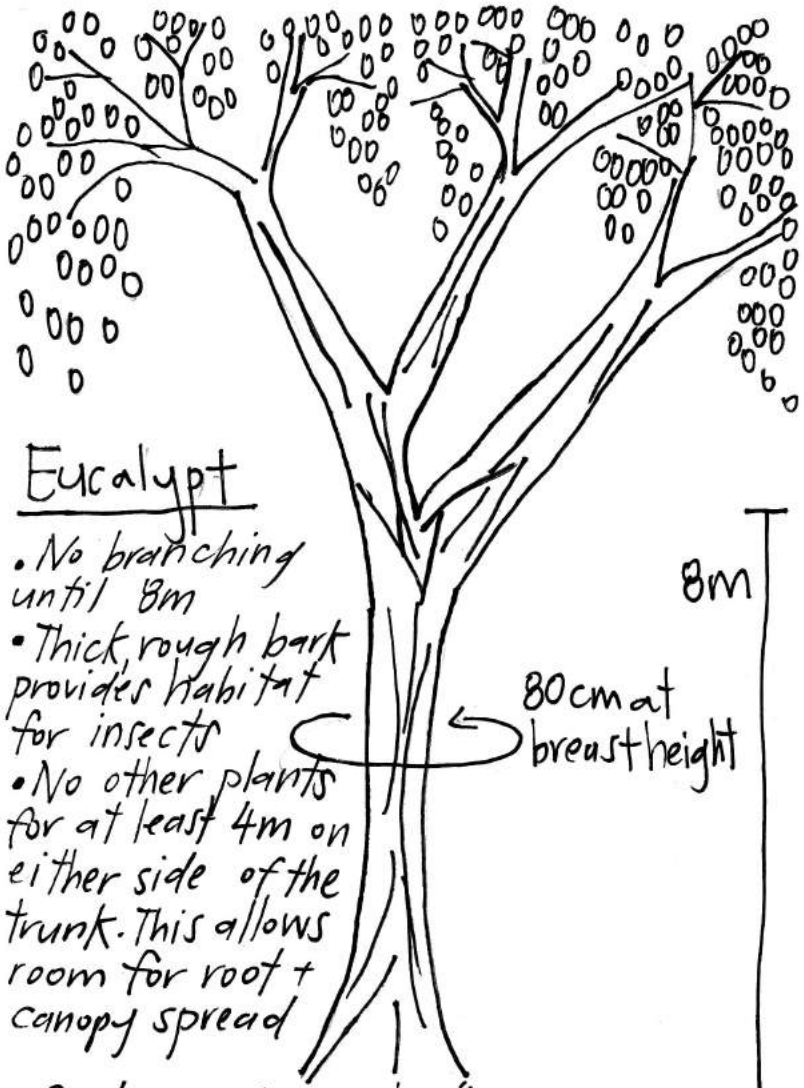
Is the plant dense or twiggy? How far apart is it from other plants? Guess why.

Does the plant have flowers or seeds? How do you thinks its seeds are dispersed? Why?

Is this plant a dominant species in your environment?

Is there a close association between this plant and other specific plants or insects?

What adaptations does the plant have to support its survival in this environment?



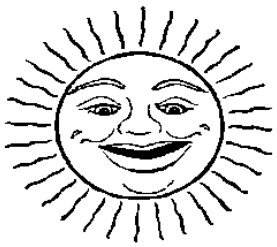
• Seeds are in protective gum nuts that are bright coloured when in flower (this probably attracts birds + aids dispersal).
• Eucalyptus appears to be the dominant genus.
• A special adaptation of the Eucalypt is that it can turn its leaves away from the sun to minimise water loss.
• Leaves have a waxy cuticle to also reduce water loss.

Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

DAY 5

Date:	10/6/02
Time (of day):	late afternoon
What season is it?	Autumn
How much time did you spend here doing your journal?	5min.
Is it sunny or cloudy?	bright and sunny
Has there been any rain?	3 days ago
Is there any wind?	warm breeze
What's the temperature?	warm



SOIL

Feel a handful of soil (wet and dry) and classify it as sand, clay or loam (firstly, you'll need to gather information on soil classification).

Does the soil seem fertile?

Investigate the soil beneath different plants - does the soil texture change with a change in vegetation, geology or landform? Record these differences.

Is there a layer of leaf litter? How thick?

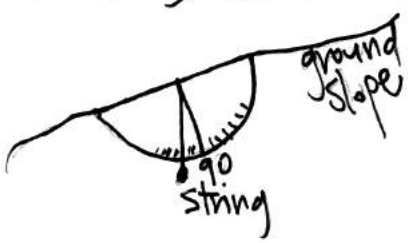
The soil is dark like a loam but feels grainy – pwobably is a sand-loam combination There is a moderate amount of organic matter so I think the soil is pretty fertile. Under a more rocky + cleared section the soil feels more like clay. There is only a thin layer (0·5cm) of leaf litter.

LANDFORM

Try to measure a nearby slope by using a protractor and dangling string (ask your teacher for instructions).

What direction does the slope face? This is called the aspect.

The string hangs about 5° to the left of the 90° mark ∴ the slope is about 5° and faces ENE.



Worksheet W

2.4 NATURE JOURNAL EXAMPLE (Secondary)

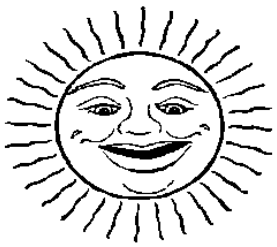
DAY 6

Date: 15/6/02

Time (of day): Sunrise (6 am)

What season is it? Autumn

How much time did you spend here doing your journal? 10min



Is it sunny or cloudy? Sunny

Has there been any rain? no

Is there any wind? no

What's the temperature? cold

IMPACT

Look for evidence of impact or stress around your nature journal site.

Can you see evidence of:

- bushfires?
- erosion?
- weeds?
- pollution?
- pests?

Do you think these impacts have been caused by humans or some other source? Why?

There are exotic plants in this area. Some appear to be only garden plants that have been transfered by birds or the wind. The plant 'Lantana' has become an invasive weed. The change in the vegetation caused by humans means that native birds and animals have to compete for food and shelter or move to another site. Introduced plants also encourage introduced species of birds to inhabit the area. I could not see any erosion or evidence of bushfire. It was great to see that there was very little litter.

Case Study C

3.1 Maitland's Native VEGETATION

Snapshot of the last 130,000 years

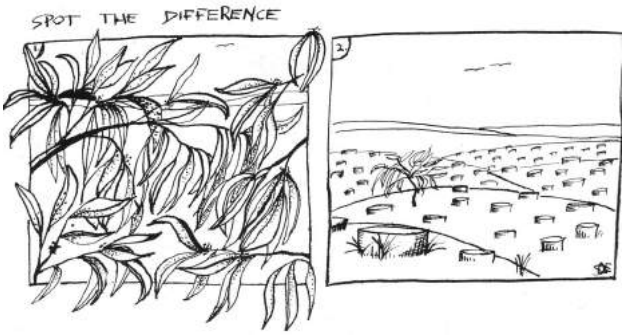
Between about 130,000 and 17,000 years ago vegetation across the Lower Hunter (including Maitland) changed from coastal rainforests and wet eucalypt forests to semi-arid plant communities. This dramatic change was a result of a cooler global climate and falling sea levels.

As global climates became warmer, sea levels rose and rainfall in the Lower Hunter doubled. Eucalypt woodlands and forests expanded throughout the valley. Around 6,000 to 5,000 years ago, Maitland's plant communities were probably found in almost the same areas as today.

The spread of vegetation communities is influenced by elements such as rainfall, aspect, topography, geology and soil type. Information on these natural elements along with vegetation surveys, aerial photos, satellite images and computer modelling have been used to map Maitland's vegetation of today compared with that before European settlement.

A vegetation community is a particular combination of native plants. For example, the *Alluvial Tall Moist Forest* community is composed of tall eucalypt species such as Sydney Blue Gum and Swamp Mahogany, and a number of small trees consisting of rainforest species and paperbarks. These plants are found together on deep alluvial soils (i.e. riverine sediments).

The influence of natural elements on vegetation communities is shown by the *Lower Hunter Spotted Gum and Ironbark Forest*. Locally, there are good examples of this forest type around Ashtonfield and Thornton. It only occurs on clay-based soils formed from Permian geology found on hilltops south of the Hunter River. So we are able to say that where clay-based soils from Permian material occurs, *Lower Hunter Spotted Gum Ironbark Forest* would have once been found.



Edited from a cartoon by Susan Wicks, in Hirst, G. (Ed) 1993, *Black 'n' White 'n' Green,* Sydney: Envirobook; p. 95.

Maitland's native vegetation today

Vegetation mapping has shown that over 90% of native vegetation in the Maitland Local Government Area (LGA) has been cleared. What remains is testament to the diversity of vegetation that once covered the area.

Before European settlement fourteen vegetation communities existed in the Maitland LGA and now ten communities remain. These communities have been severely reduced, with each community cleared by at least 75% of its original extent.

Some vegetation communities have been completely cleared from the Maitland LGA. These include:

- *Coastal Foothills Spotted Gum Ironbark Forest,*
- *Mangrove-Estuarine Complex*, and
- *Swamp Mahogany Paperbark Forest.*

Other communities have also been reduced. The *Lower Hunter Spotted Gum Ironbark Forest* was the most widespread vegetation community found in Maitland before European settlement. It occupied almost 13,000 hectares of land in 1750 but now is reduced to just 1,200 hectares.

Maitland's remaining bushland can be categorised as:

Agricultural bushland

This bushland exists as small isolated patches in the rural landscape. Its survival from vegetation clearance was probably because the land was too steep for agriculture.

Structurally intact bushland

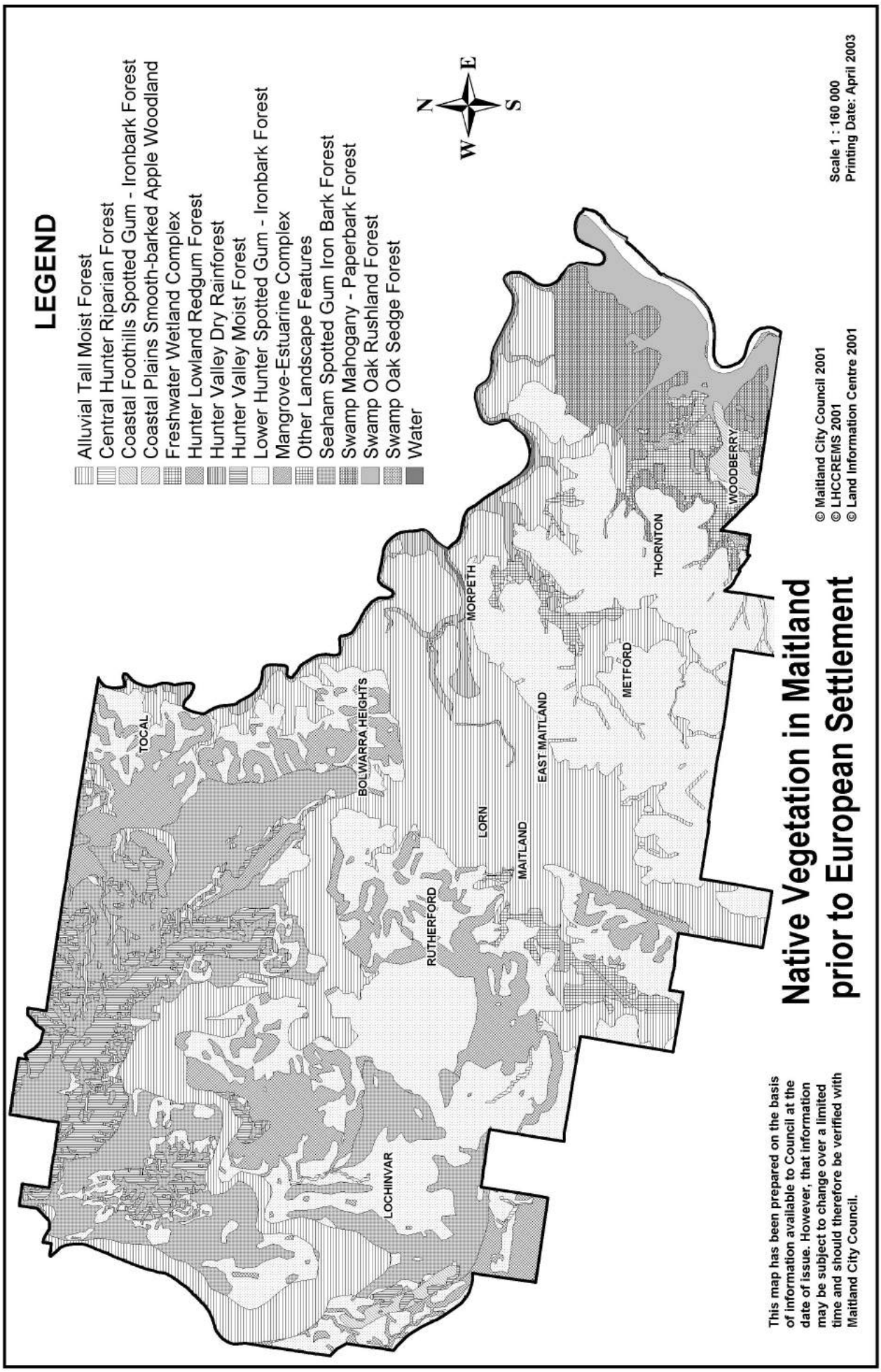
This refers to large intact areas of bushland mainly located in the south-east of the LGA. It was originally retained due to low soil fertility and the presence of mining operations in the area.

Urban bushland

This bushland occurs in small isolated reserves in local urban areas. Brooklyn Park Reserve, located at the end of The Boulevard, East Maitland, is the largest portion of bushland in Maitland that remains in public ownership.

Regrowth

This type of bushland occurs where vegetation was cleared and natural regeneration has occurred.


LEGEND
Alluvial Tall Moist Forest
Central Hunter Riparian Forest
Coastal Foothills Spotted Gum - Ironbark Forest
Coastal Plains Smooth-barked Apple Woodland
Freshwater Wetland Complex
Hunter Lowland Redgum Forest
Hunter Valley Dry Rainforest
Hunter Valley Moist Forest
Lower Hunter Spotted Gum - Ironbark Forest
Mangrove-Estuarine Complex
Other Landscape Features
Seaham Spotted Gum Iron Bark Forest
Swamp Mahogany - Paperbark Forest
Swamp Oak Rushland Forest
Swamp Oak Sedge Forest
Water
N
E
S
W
TOCAL
BOLWARRA HEIGHTS
MORPETH
LORN
EAST MAITLAND
METFORD
THORNTON
WOODBERRY
RUTHERFORD
MAITLAND
LOCHINVAR
Native Vegetation in Maitland
prior to European Settlement
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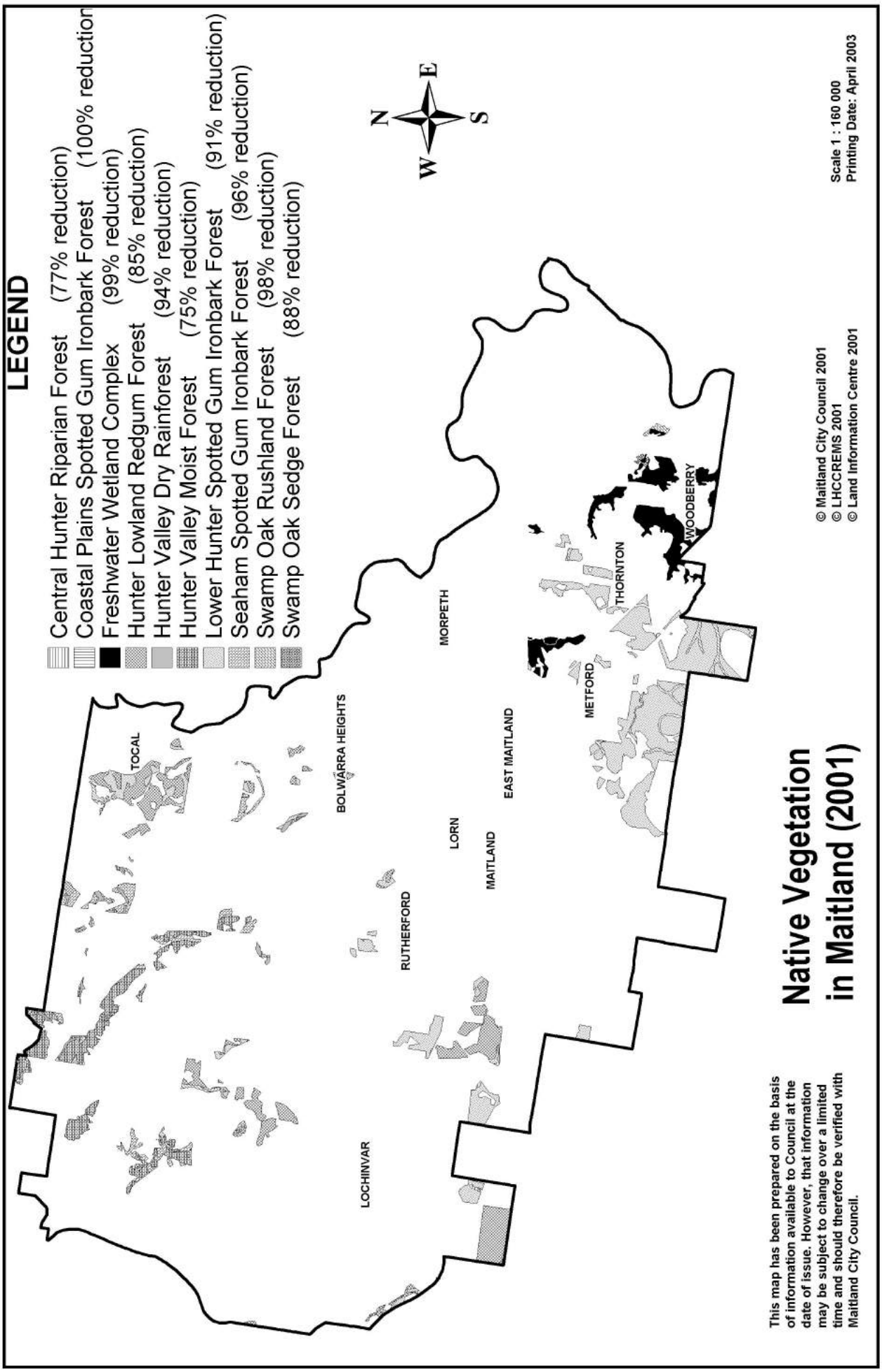
LEGEND
Central Hunter Riparian Forest (77% reduction)
Coastal Plains Spotted Gum Ironbark Forest (100% reduction
Freshwater Wetland Complex (99% reduction)
Hunter Lowland Redgum Forest (85% reduction)
Hunter Valley Dry Rainforest (94% reduction)
Hunter Valley Moist Forest (75% reduction)
Lower Hunter Spotted Gum Ironbark Forest (91% reduction)
Seaham Spotted Gum Ironbark Forest (96% reduction)
Swamp Oak Rushland Forest (98% reduction)
Swamp Oak Sedge Forest (88% reduction)
N
E
S
W
TOCAL
BOLWARRA HEIGHTS
MORPETH
LORN
MAITLAND
EAST MAITLAND
RUTHERFORD
METFORD
THORNTON
WOODBERRY
LOCHINVAR
Native Vegetation in Maitland (2001)
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Case Study C

3.1 Maitland's Native VEGETATION

Impacts of vegetation loss

Loss of native vegetation has a significant impact on the health of our local environment. Removing vegetation can lead to salinity, soil erosion, declining biodiversity, poor water quality and dieback (refer to *Local Issue Investigation* case studies for salinity and erosion).

Declining biodiversity

Biodiversity is the variety of plants, animals and micro-organisms present on earth, including the genes they contain and the ecosystems they form. Biodiversity is essential to all life.

Original or remnant native vegetation is like a biodiversity bank. When this vegetation is cleared biodiversity is lost. Large-scale clearing in Maitland has caused the local extinction of animals such as the Emu and many small animals such as the Squirrel Glider and Brush-tailed Phascogale are now very rare.

The conservation of biodiversity relies upon retaining native vegetation. Many studies have shown that to conserve biodiversity and maintain ecosystem health over 30% of the original extent of an ecosystem needs to be conserved. Across the Hunter Region three vegetation communities have already been cleared below 30%:

- *Alluvial Tall Moist Forest,*
- *Hunter Lowland Redgum Forest,* and
- *Swamp Oak Sedge Forest.*

Poor water quality

Native vegetation affects water quality indirectly by preventing soil erosion and dryland salinity, and directly by filtering surface water. When vegetation is cleared water flows across the land faster and in greater volumes. This causes soil erosion that produces sediments that pollute our waterways. This process is evident along the Hunter River where removal of vegetation has caused river bank instability and the river has begun to fill with sediments.

Dieback

Dieback refers to the decline in tree health and sometimes premature death. It is caused by insect attack, disease and pollution. Dieback mainly affects small patches of isolated remnant trees, especially where soil has been compacted by cattle. Maitland has been identified as a hot-spot for dieback, and examples of dieback are common in the rural landscape.

Human influences on vegetation

Humans, both Aboriginals and Europeans, have influenced vegetation across Maitland for a long time. Firstly, the Wanaruah tribe favoured fertile areas around wetlands and rivers for gathering foods and other resources for over 10,000 years. They used 'firestick farming' to attract wildlife to certain areas. This involved burning vegetation to create and maintain areas of open country and promote the growth of native grasses, which attracted kangaroo and wallaby.

European settlement had a more dramatic effect on vegetation over a shorter period of time. European settlers were attracted to Maitland by the valuable timber resources along the Hunter River and on the surrounding floodplain. Huge quanities of Red Cedar (*Toona ciliata*) and Rosewood (*Dysoxylum fraseraum*) trees were cut from the area. By the 1900s there were no mature Red Cedars left in the entire Hunter Region. Today's extensively cleared landscape is a vast contrast to early settlers' accounts of the local area.

Early Europeans were encouraged to clear native vegetation for agriculture on the fertile floodplains and other low-lying lands at great speed. The only areas left untouched were usually those with less productive soils and slopes too steep for agriculture.

In addition to clearing native vegetation, European settlers impacted on vegetation indirectly by introducing exotic animals and plants. Several animal species brought to Australia have become threats to native flora, particularly cattle which will eat and trample understorey vegetation.

In more recent times local remnants of native vegetation have been cleared for urban and industrial development. This has included a significant loss of the *Lower Hunter Spotted Gum Ironbark Forest*. Large tracts of this forest type were cleared at Ashtonfield to make way for houses, and in Thorton for the Thornton Industrial Estate.

Dieback on grazing land near Aberglasslyn.

Case Study C

3.1 Maitland's Native VEGETATION

Vegetation community profile:

Lower Hunter Spotted Gum Ironbark Forest

Dominant Species:

- Spotted Gum (*Corymbia maculata*)
- Broad-leaved Ironbark (*Eucalyptus fibrosa*)
- Grey Gum (*Eucalyptus punctata*)
- Turpentine (*Syncarpia glomulifera*)
- Ball Honeymyrtle (*Melaleuca nodosa*)
- Mauve Flax Lily (*Dianella revoluta*)
- Kangaroo Grass (*Themeda australis*).

Habitat

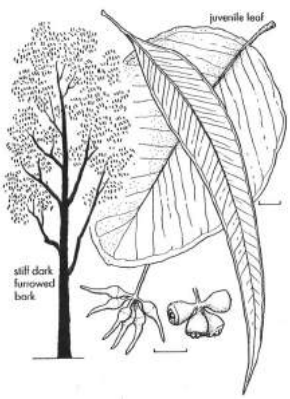
The forest provides habitat and food to many local fauna species, including the Sugar Glider and Ringtail Possum, and the threatened Greater Broad-nosed Bat and Glossy Black Cockatoo.

Status

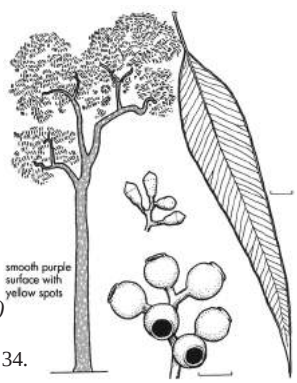
Since European settlement the extent of this community across Maitland has been reduced by 91%. The *Spotted Gum Ironbark Forest* now covers less than 1,200 hectares despite being the most widely distributed community in Maitland.

Much of this forest is found in large structurally intact areas in the south-east of the Maitland LGA in close proximity to the rapidly urbanising areas of Ashtonfield and Thornton.

As a result of the habitat significance and the development threats to the *Lower Hunter Spotted Gum Ironbark Forest*, it has been nominated by the Hunter Catchment Management Trust as an Endangered Ecological Community. This nomination is presently being considered by the NSW Scientific Committee (refer to *www.npws.nsw.gov.au/wildlife/threatened.htm* for information on threatened species in NSW).



Broad-leaved Ironbark
(Eucalyptus fibrosa)
Illustration from:
Robinson, L. 1994; p. 48.



Spotted Gum
(Corymbia maculata)
Illustration from:
Robinson, L. 1994; p. 34.

Managing our native vegetation: The Maitland Greening Plan

Only 6.8% of Maitland's native vegetation remains, with around 95% of this occurring on private property. The management of our vegetation is therefore complicated as it falls to many landholders who all have different interests, values, and resources available to them.

The Maitland Greening Plan has been developed by Maitland City Council to provide a strategy for the future management of vegetation across Maitland. The plan focuses on the vegetation that remains in the Maitland LGA, and provides a strategy for revegetation.

The plan made thirteen recommendations, many of which Council has commenced. Implementation involves a partnership between Council and a community reference group. Some of the key recommendations of the Maitland Greening Plan are:

- Setting **retention targets** for each native vegetation community - a minimum 10% retention target was set for most vegetation communities.
- **Acquisition of bushland** with a high conservation significance and development threat. The purchase of bushland is to be considered with priority given to high conservation value bushland and those areas with a high degree of public benefit.
- Establishing a **native plant distribution program** to distribute local native plant species to landowners in priority areas.
- Setting up **community education trial sites** to demonstrate best management practices for land degradation issues (e.g. erosion, salinity).

On-ground action

Landholders and the community can help conserve and improve local native vegetation. This might involve planting native trees, shrubs and grasses. Revegetation that links remnant vegetation and watercourses can also provide important corridors for wildlife movement.

Landholders can also conserve remnant vegetation by fencing native vegetation to protect it from livestock and by controlling weeds. This can allow for natural regeneration, ultimately leading to expansion and improved health of the remnant vegetation.

Community groups across Maitland undertake on-ground projects to enhance and conserve native vegetation. The projects include revegetation, bush regeneration and lobbying Council to save areas of remnant vegetation.

Case Study C

3.1 Maitland's Native VEGETATION

Native vegetation profile: Maitland's lost rainforests

Where are they found?

If you look carefully around Maitland today you will find some clues that tell you a little-known story about Maitland's vegetation. These clues are windows into our natural history.

Before European settlement, one vegetation type would have dominated Maitland's riverbanks, flood-plain, sheltered slopes and steep escarpments. This land is now mostly cleared and you will only find hints of what this vegetation once was - in sheltered steep terrain on Rosebrook Ridge in the north-west of Maitland, on a rocky escarpment along the Hunter River, and in a deep gully at Webbers Creek, Tocal.

In some places the only clues that remain are just a few trees, such as Fig Trees and Lilly Pillies. These are remnants were once surrounded by a lush and dense rainforest.

All that is left of Maitland's rainforest is patches, such as the remnant trees found at Bolwarra Wetland. Sometimes these isolated remnant rainforest trees do not prosper because they have lost the protection of the full forest community.

Small patch of remnant rainforest on the slopes of Bolwarra Wetland.

Most of Maitland's remnant rainforest is located on private property. A large area of public-owned bushland, however, supports rainforest along Two Mile Creek, East Maitland. This reserve is called Brooklyn Park and is adjacent to Greenhills Retirement Village. Some common plants include:

- Cheese Tree (*Glochidion ferdinandi*)
- Red Ash (*Alphitonia excelsa*)
- Mock Olive (*Notelaea longifolia*)
- Wonga-wonga Vine (*Pondorea pandorana*).

What did Maitland's rainforest look like?

There are several types of rainforest in the Hunter Valley. They range from cool-temperate rainforest at high altitude (e.g. Barrington and Gloucester Tops), to subtropical rainforest (e.g. Paterson and Williams River valleys), with dry rainforest scattered throughout.

Maitland had three types of rainforest communities:

- *Hunter Valley Dry Rainforest* with a low, closed canopy featuring Port Jackson Figs, Whalebone Trees and many climbers. It is found on sheltered slopes and rich soils, including areas like riverbanks.
- *Alluvial Tall Moist Forest* is found on rich soils in the floodplain and consists of a eucalypt canopy and rainforest and paperbark understorey.
- *Hunter Valley Moist Rainforest* is found on the drier hilly slopes and consists of a eucalypt canopy with a dry rainforest understorey.

Today, a large and impressive tract of dry rainforest remains on a rocky escarpment on a bend of the Hunter River close to Maitland Vale. Some of the plants growing here include:

- Whalebone Tree (*Streblus brunonianus*), a small tree usually found in subtropical rainforests;
- Native Frangipani (*Hymenosporum flavum*);
- Wild Quince (*Alectryon subcinereus*), a small tree with edible seeds that are soft and nutty;
- Native Rosella (*Hibiscuis heterophyllus subsp. heterophyllus*) a hibiscus with spectacular pink flowers with a deep red centre. The bark was used by Aborigines as fibre for rope, string and baskets.

Why is there so little left?

Rainforests are important ecosystems because they support a rich diversity of plants and animals, including many food and medicinal plants for humans.

The rich fertile soils of the Hunter Valley floodplain and riverbanks supported diverse rainforest ecosystems. These rainforests and their soils were highly favoured by early Europeans for timber and agriculture respectively. As a result, virtually all of Maitland's rainforests were cleared. Only rare pockets of rainforest escaped clearing and these are now clues to reconstruct a part of our local natural history.

Acknowledgement & References

This case study has been prepared by Lana Collison (*Maitland Landcare Coordinator*). Other information sources included:

- Maitland City Council 2000, *The Maitland Greening Plan, Stage 2 Part B*, Maitland, NSW: Maitland City Council.
- McManus, P., O'Neill, P., Loughran R., & Lescure, O.R. 2000, *Journeys: The making of the Hunter Region*, St Leonards, NSW: Allen & Unwin.
- Maitland City Council 1995, *Brooklyn Park Plan of Management*, Maitland, NSW: Maitland City Council.
- Robinson, L. 1994, *Field Guide to the Native Plants of Sydney* (2nd Ed.), East Roseville, NSW: Kangaroo Press.

Case Study C

3.2 Flora & Fauna of MAITLAND'S WETLANDS

The character and adaptations of wetland plants

The presence of waterplants is often used to define an area as 'wetland'. Living in a wetland environment means plant species need to cope with seasonal cycles of flooding and subsequent drying out, and waterlogged or undrained soils.

Cumbungi (*Typha orientalis*) is found commonly around Maitland's wetlands. It has evolved to survive in these environments through a range of adaptations. These are described and illustrated on the following page.

Other species could be classed as a bit more adventurous or versatile. They manage to cope with life within wetlands but are also adapted to survival in surrounding dry forested areas. Two local examples of this type are Swamp Oak (*Casuarina glauca*) and Broad-leaved Paperbark (*Melaleuca quinquinervia*).

Unlike Cumbungi, these species are not able to survive permanent inundation. They tend to occupy the fringe of wetlands or localised raised areas within the wetland.

Flora of local wetlands

Vegetation surveys and computer modelling were carried out during 2000-01 through the Lower Hunter - Central Coast Regional Environmental Management Strategy (LHCCREMS). As a result, reliable data now exists on the abundance and distribution of local native species and how these have changed over time.

Four vegetation communities once comprised local wetlands. Despite being largely cleared, Maitland is fortunate to have small patches of three of these vegetation communities remaining. Table 1 provides a summary of the vegetation communities that characterise Maitland's wetlands.

Remnant pockets of native vegetation are like pieces of a puzzle. They can help us to understand the features of the local environment and its history. The completed puzzle may also provide a guide to regeneration of areas such as local wetlands.

Threats to local wetland flora

Maitland's wetlands have experienced serious impacts from human activities since the early 1800s. Even prior to this, local Aboriginal people would have used these ecosystems extensively, but with far lesser impact.

The poor fate of wetlands relates to their position on the lowest and most fertile part of the landscape. These areas were most accessible, grew large and good quality trees for timber, and were highly prized for agricultural production.

The main threats to flora of local wetlands today include:

Clearing

Clearing of wetland vegetation (waterplants, grasses, shrubs and trees) for urban, industrial and rural development has resulted in:

- the loss of habitat and food for native wildlife, and reduction of biodiversity across all wetlands;
- an increase in soil erosion;
- salty groundwater rising towards the soil surface causing *dryland salinity* (see below).

Hydrological changes

Changes in hydrology through the construction of flood mitigation works (e.g. levees, floodgates) and sealed surfaces (e.g. roads, buildings), and the filling of low-lying or wetland areas have resulted in:

- an increase in stormwater runoff and more restricted areas for open water. This has caused a general increase in water levels in the last remaining wetland areas with fewer cycles of drying out;
- a decline in the distribution and diversity of plant species as many are not adapted to living in continuously wet conditions. Some native species such as Cumbungi, however, require continuously wet conditions, so have 'taken over' some local wetlands.

Dryland salinity

The emergence of dryland salinity across low-lying areas has resulted in:

- dieback of many species not tolerant to salt conditions leading to the exposure of salty ground to the forces of erosion;
- an increase in abundance of salt-tolerant species (e.g. Common Rush - *Juncus usitatus*), which upsets the balance within existing plant communities.

Case Study C

3.2 Flora & Fauna of MAITLAND'S WETLANDS

Broad-leaved Cumbungi (*Typha orientalis*)
Characteristics and adaptations for life in a wetland

Description
Cumbungi is a native perennial waterplant that can grow up to 4 metres high. It has extensive rhizomes (underground stems) that are branched and up to 2.5 centimetres diameter. The leaves are usually flat and stand erect, up to 3 centimetres wide.

Cumbungi has a distinctive and highly visible inflorescence (group of flowers coming from a common stem), being a spike of tightly packed flowers. The spike of male flowers occurs separately and above that of the female flowers. The two are separated by a short length of stem. One inflorescence can produce up to 200,000 seeds that are dispersed by wind over large distances.

Habitat
Cumbungi grows in stationary or slow flowing water up to 2 metres depth, and does not tolerate drying out. It has spread extensively across many local wetlands including Woodberry Swamp, Tenambit Wetland, and Rathluba Lagoon.

Significance
Due to its wide distribution and restriction of water flow through a wetland, this native plant is considered by some to be a weed. Even so, it provides important food and habitat for small animals and protects the edge of wetlands and creeks from eroding.

Cumbungi had a number of uses by Aboriginal tribes (e.g. Awabakal, Wanaruah) that utilised local wetlands, for example:

- the fibrous and starchy rhizomes were peeled, roasted and then pounded to make a powder. The powder was then mixed with water and cooked again into a gelatinous 'damper';
- new shoots were often eaten, although they contain few nutrients;
- stems were used for weaving, thatching and comprised long, strong fibres that were useful for twine;
- once the flowers had dried and gone fluffy, they were used for fire lighting.

Illustration from:
Robinson, L. 1994; p.432.

Adaptations
The success of Cumbungi is a result of the adaptations it has developed. Changes to our local wetlands have also been advantageous to Cumbungi.

The adaptations enabling Cumbungi to survive and thrive in our local wetlands include:

- tall narrow leaves that pose little resistance to changing water levels and high winds provide protection against damage;
- rough internal fibres and a hollow stem structure also provide protection against damage from high winds;
- significant height so plants are unlikely to ever be completely submerged;
- a large surface area of leaves provides for vigorous growth and maintains ample shade and a microclimate with high humidity. This minimises evaporation from the water surface and helps to maintain the wet conditions needed for the species' survival and expansion;
- large air spaces within the plants' internal structure ensure a constant supply of oxygen, an important feature since wetland soil is typically waterlogged with low to zero availability of oxygen.

Case Study C

3.2 Flora & Fauna of MAITLAND'S WETLANDS

Swamp Oak (*Casuarina glauca*)

Description

The Swamp Oak is a 8-20 metres tall tree that frequently produces root suckers. Swamp Oaks have separate male and female plants. The female's flowers develop into cones and male flowers are short elongated spikes. Swamp Oaks were cut for shingles during early European settlement as the wood makes excellent timber.

Habitat

Swamp Oak is found along wetland edges, coastal streams and major rivers in brackish waters.

Illustration from:
Robinson, L. 1994; p.152.

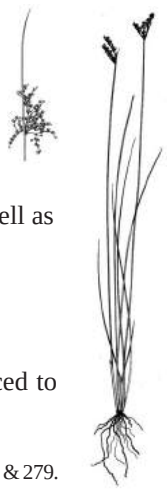
Adaptations

Swamp Oak leaves are reduced to rings of tiny teeth on specialised branchlets. Along the length of the branchlets are grooves sheltering the stomata, these enable the Swamp Oak to tolerate hot dry conditions and inundation. They are also adapted to saline conditions but this may make them stunted.

Common Rush (*Juncus usitatus*)

Description

A native rush forming dense clumps to 1m high, with shiny dark green and narrow blade-like stems (1-2 millimetres wide).



Habitat

Grows in damp and saturated soil, as well as periodically wet areas.

Adaptations

In saline conditions it will often out-compete other plants. Leaves are reduced to sheaths at the base of the stem.

Illustration from:
Harden, G.J. 1993; p.4: 267 & 279.

Sacred Ibis (*Theskiornis aethiopica*)

Description

Sacred Ibis have a white plumage and distinctive sickle-shaped bill. Associated with gods of ancient Egypt, some birds have been found dead in Egyptian tombs. They feed on fish, frogs and macroinvertebrates.

Habitat

Sacred Ibis are found in wetlands and on wetland fringes. They are able to travel long distances.

Illustration from:
Slater *et al* 1989; p.59.

Adaptations

The Sacred Ibis is a wading bird, it is able to walk in shallow water to find food and has a distinctive sickle-shaped bill for removing food from mud or turbid water and among reeds. It is well-adapted to city life and has been seen feeding from rubbish bins.

Damselfly nymph (*Odonata or Zygoptera*)

Description

Nymphs have a long thin body with three tails which are their gills. Their tails can be long and thin like a stick or round and shaped like a leaf. They can be brightly coloured with blue, red, yellow, purple and a shiny black. Damselfly larvae are carnivorous, they feed on small aquatic insects and crustaceans.

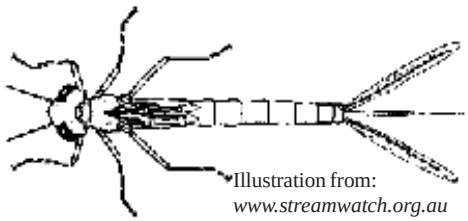


Illustration from:
www.streamwatch.org.au

Habitat

Damselfly larvae live in slow flowing rivers, swamps and creeks in and amongst reeds on the edges of the water. They are almost never found in polluted waters.

Adaptations

A nymph's body is streamlined in shape so that it can move easily through the water. It can flatten its body onto the bottom of the pond to hide from prey. Nymphs have large eyes facing forward to spot prey and judge distances. They have strong claws and legs to resist currents and to grip prey. Their gills are at the back end of the body and have a large surface area to obtain oxygen.

Case Study C

3.2 Flora & Fauna of MAITLAND'S WETLANDS

Table 1: Local wetland vegetation communities - the species and changes in coverage

Vegetation Community	Dominant Species			Extent 1750	Extent 2000	% Reduction
	Tallest	Medium	Lowest (<1m)			
Freshwater Wetland Complex	• Prickly-leaved Paperbark • Swamp Oak • Narrow-leaved Paperbark • Forest Red Gum		• Water Primrose • Water Couch • Tall Spikerush • Common Rush • Slender Knotweed • Ferny Azolla • Cumbungi • *Cyperus exaltatus*	1,105 ha	5 ha	99%
Swamp Mahogany - Paperbark Forest	• Swamp Mahogany • Cheese Tree • Broad-leaved Paperbark • Swamp Oak • Cabbage Tree Palm • Narrow-leaved Paperbark	• Saw Sedge • Sydney Golden Wattle • Bleeding Heart	• Swamp Water Fern • Bordered Panic • Harsh Ground Fern • Bracken	1,561 ha	0 ha	100%
Swamp Oak - Rushland Forest	• Swamp Oak • Swamp Paperbark • Broad-leaved Paperbark • Swamp Mahogany	• Common Reed	• Twig Rush • Sea Rush • Sand or Marine Couch	938 ha	10 ha	98%
Swamp Oak - Sedge Forest	• Swamp Mahogany • Forest Red Gum • Swamp Oak • Swamp Paperbark	• Narrow-leaved Paperbark <u>Vines:</u> • Common Silkpod	• Tussock Sedge • Scurvy Weed • Lesser Joyweed • Bordered Panic • Harsh Ground Fern • Saw Sedge • Buttercups	49 ha	6 ha	88%

(Adapted from the Maitland Greening Plan, Stage 2 Part B (Maitland City Council, 2000)).

Case Study C

3.2 Flora & Fauna of MAITLAND'S WETLANDS

Fauna of local wetlands

The distribution and abundance of local wetland fauna has been greatly reduced since the early 1800s. This is based on a comparison of today with the recollections of older Maitland residents and journal records from early European explorers and settlers to the area.

Despite impacts on local wetlands these ecosystems remain home to a diversity of native animals. Observations have been collected from wetlands at Woodberry, Tenambit, Morpeth, Bolwarra, and Telarah, which give insight to the range of native species found locally.

Birds

Hoary-headed Grebe
Grey Teal
Wood (Maned) Duck
Wandering Whistling-Duck
Masked Lapwing Plover
Dusky Moorhen
Purple Swamphen
Royal Spoonbill
Straw-necked Ibis
Intermediate Egret
White-faced Heron
Little Pied Cormorant
Brown Goshawk
Black-shouldered Kite
Nankeen Night Heron
Pied Butcherbird
Pied Currawong
Black-faced Cuckoo Shrike
Spangled Drongo
Willie Wagtail
Eastern Rosella

Amphibians

Eastern Dwarf Tree Frog
Peron's Tree Frog
Common Eastern Froglet
Brown-striped Marsh Frog

Reptiles

Eastern Water Dragon
Bearded Dragon
Long-necked Tortoise
Red-bellied Black Snake
Three-toed Skink
Wood Gecko

Mammals

Human
Swamp Wallaby
Brown Antechinus
Swamp Rat
Long-nosed Bandicoot
Common Ringtail Possum
Eastern Broad-nosed Bat

Macroinvertebrates

Mosquito Larvae
Damselfly Nymph
Caddisfly Larvae
Mayfly Nymph
Freshwater Shrimp
Water Boatman
Whirligig Beetle
Water Mite
Flat Worm
Nematode
Blood Worm

Threats to local wetland fauna

The widespread loss of native vegetation and extensive filling of local wetlands since the early 1800s have been the main driving forces for the decline in native fauna. Such destruction represents a major loss in habitat and availability of food - both needed for reproduction and survival of species.

As well as the impact of clearing, the major threats to local wetland fauna today include:

Introduced pests and predators

Increased populations and distribution of introduced pests and predators such as foxes, domestic dogs and cats, Mosquito Fish, and European Carp have resulted in:

- reduction in the distribution and abundance of native wetland fauna. For example the Emu, Brolga, and Bustard are now locally extinct partly due to the impact from predators;
- greater competition for food and habitat.

Hydrological changes

Hydrological changes (described previously) have resulted in:

- a shrinking of the range of habitat and food options for fauna, with some species thriving at the expense of others.

Water pollution

Water quality has declined through extensive urban, rural and industrial development adjacent to wetlands. This has resulted in:

- a decline in the health, reproduction and survival of some species (e.g. Green and Golden Bell Frog);
- a decline in macroinvertebrates, a staple food for most wetland fauna.

Acknowledgement & References

This case study has been prepared by Kylie Yeend (Environmental Education & Project Management Consultant). Other information sources included:

Cherikoff, V. 1989, *The bushfood handbook: How to gather, grow, process & cook Australian wild foods*, Sydney: Bush Tucker Supply Australia.

Harden, G.J. (ed.) 1993, *Flora of New South Wales*; Vol. 4, Sydney: NSW University Press.

Maitland City Council 2000, *The Maitland Greening Plan, Stage 2 Part B* Maitland, NSW: Maitland City Council.

Maitland Landcare 1999, *Draft Catchment Management Plan for Woodberry, Morpeth-Tenambit and Millers Forest Catchments*, Maitland, NSW: Maitland Landcare.

Robinson, L. 1994, *Field Guide to the Native Plants of Sydney* (2nd Ed.), East Roseville, NSW: Kangaroo Press.

Sainty, G.R. & Jacobs, S.W.L. 1981, *Waterplants of New South Wales*, Sydney: Water Resources Commission of NSW.

Slater, P., Slater, P. & Slater, R. 1989, *The Slater field guide to Australian birds* (revised edition), Sydney: Lansdowne.

Case Study C

3.3 Investigating WOODBERRY SWAMP

A rich and varied history

Woodberry Swamp was probably inhabited and used by the Pambalong clan of the Awabakal Aboriginal tribe. Their staple foods included fish, shellfish, wildfowl, kangaroos, snakes and goanna, which were abundant in the streams, wetlands and fertile floodplains of the area.

From about 1805 timber-getters cleared the area in and around Woodberry Swamp of its forests - Red Cedars and Eucalypts were of great value. Following on the heels of the timber-getters, settlers moving into the area in the 1830s had a relatively easy task to establish agriculture as there was only regrowth and stumps to contend with. Initially, the area was divided into a few large estates where cotton, wheat, tobacco, maize and sugar were grown.

Farming was undertaken mainly by tenant farmers. In the Millers Forest area they were mostly Irish. An unconfirmed legend states that an estate owner, Vicars Jacob, sent home (England) for his agents to secure tenants for him, placing on the requisition that there were to be *no Irish*. A sympathetic or mischievous clerk, however, changed the "no" to "only".

In the early days, the Hunter River was the 'highway' and Morpeth was established as the main town for river trade. The main northern railway line was extended from Newcastle to Maitland by 1858, cutting through Woodberry Swamp, and leading to the establishment of the townships of Tarro, Beresfield and Thornton along the route. The railway also led to the decline of the Morpeth river trade.

An aerial view of Woodberry Swamp looking south. The main northern railway line can be seen cutting off part of the swamp from the industrial and residential areas at Beresfield.

The pattern for development in the area was set by flooding, the expansion of transport and access, and the location of mines. This pattern continues today. The flood-prone alluvial flats and wetlands were developed for agriculture whilst flood-free areas were developed for residential and industrial uses.

A catchment snapshot

Water flows to Woodberry Swamp through a series of small creeks - Weakleys Flat Creek, Scotch Dairy Creek, and Viney Creek - before meeting the Hunter River at Woodberry. The catchment area for Woodberry Swamp is 5,340 hectares. It features a range of different land use zones.

Agriculture

Agriculture in the area mainly includes beef cattle grazing and poultry production. The area used to support a small number of dairy farms, however, the last of these finished production at the end of 2002. The cropping that once occurred on the floodplain has largely ended with only a small percentage of land (approx. 5%) being used for production of lucerne, turf and vegetables.

Grazing cattle on cleared agricultural land around Woodberry Swamp. Water Hyacinth, covering a dam shown in this photo, has become a major problem on the wetland.

Rural residential subdivision

This land use occurs on the fringe of urban areas amongst remnant bushland and cleared farmland. It features low density residential development with a rural character and a mixture of land use activities (e.g. small scale agricultural production, gardens, and nurseries).

Case Study C

3.3 Investigating WOODBERRY SWAMP

A catchment snapshot (cont.)

Urban (residential) subdivision

Urban development has expanded rapidly in the surrounding towns of Thornton, Beresfield and Woodberry. These residential areas feature medium-density housing with an extensive network of roads and services established mainly on cleared farmland.

Residential development has occurred down to the margins of Woodberry Swamp. The wetland is often used as a sales pitch - "residential lots with beautiful water views".

Industrial subdivision

Industry has also expanded rapidly over land that was otherwise bushland or cleared grazing land. These subdivisions contain 'light' industrial development concentrated mainly in the Thornton and Holmwood Industrial Estates. This form of industry is classed as 'non-offensive' and non-hazardous' in terms of its generation of noise, waste, air and water pollution.

Steggles poultry processing plant also sits on the edge of Woodberry Swamp, this is classed as 'general' industry and has been established on the site since 1954.

Steggles has a licence to discharge waste waters to the swamp but has embarked on a process to reduce the volume of discharge (e.g. through improved water efficiency and alternative uses of waste water).

Mining

The Donaldson coal mine commenced operations in the upper catchment in January 2001. This mine is an open-cut operation that currently has about 100 hectares of active workings within remnant bushland (including infrastructure like roads and workshops). Over the course of its life the mine will have had a 'footprint' of 300 hectares.

The mine does not discharge water to the catchment from its pit. Water runoff from roads and rehabilitated landscapes, however, does flow to Scotch Dairy and Weakleys Flat Creeks. This water must first pass through a series of sedimentation ponds on the mine site before it is discharged from the site.

Donaldson Mine is located amidst remnant bushland to the south of the New England Highway.

Remnant bushland

Extensive clearing of native vegetation has occurred within the catchment. The vegetation coverage is now less than 30% of its original extent.

The largest intact sections of bushland are located to the south of the New England Highway, providing an important vegetation corridor through to the Watagan Mountains and Wollemi National Park. This vegetation community is known as *Lower Hunter Spotted Gum Ironbark Forest*.

Lower Hunter Spotted Gum Ironbark Forest has the potential to be listed as an Endangered Ecological Community. The main concerns are that there has been extensive clearing of this vegetation community and that very little is currently protected in National Parks or State Reserves. Less than 9.5% of the original extent of this forest type remains in the Maitland local government area, and only 5% remains in the Hunter Valley.

The catchment's remnant bushland provides important services to the local community, including water quality improvement, prevention of soil erosion, recreational opportunities and beautification.

Case Study C

3.3 Investigating WOODBERRY SWAMP

The significance of Woodberry Swamp

Ecological importance

Woodberry Swamp provides habitat and food to a variety of native fauna and supports a broad range of native flora. Various threatened fauna species have been observed in and around the wetland area, such as the Green and Golden Bell Frog, Little Bent-wing Bat, Greater Broad-nosed Bat, Powerful Owl, Blue-billed Duck, and Glossy Black Cockatoo.

Woodberry Swamp plays an important role in removing sediment, nutrients and bacteria from water before it flows into the Hunter River. The wetland must struggle with this role as it accepts more than its fair share of sediment, nutrients, pathogens, heavy metals and other water pollutants from surrounding land use.

Economic importance

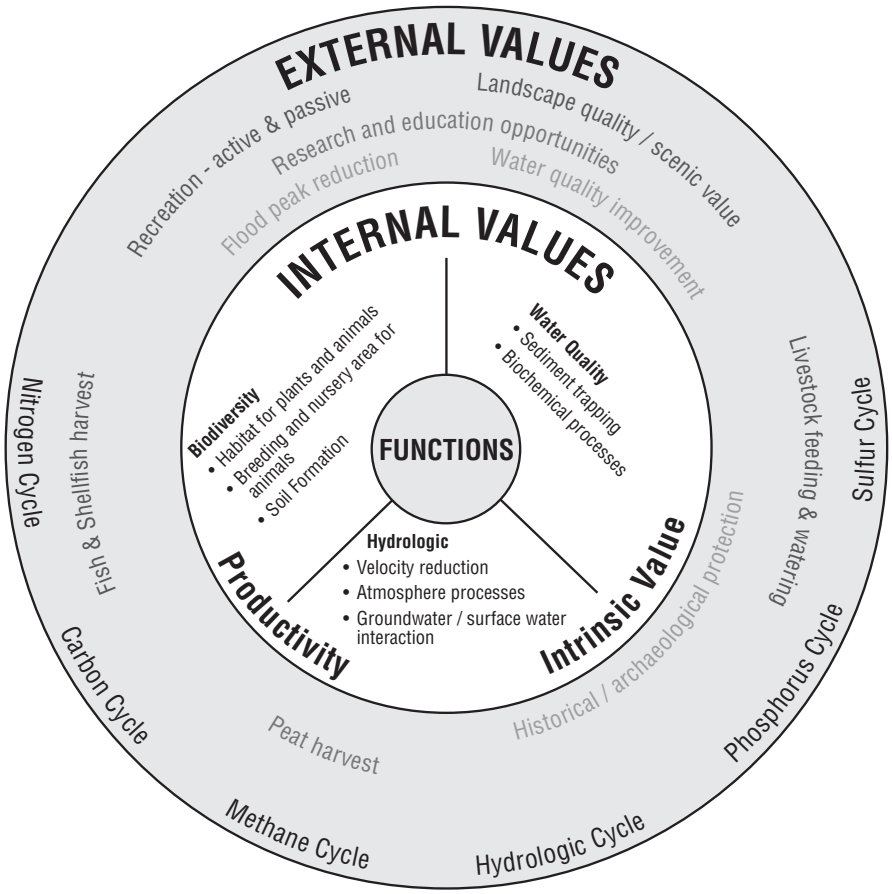
Woodberry Swamp provides a range of natural resources and benefits to the agricultural industry. Historically, the wetland and its surrounds were an important source of valuable timber and agricultural produce. Today, the wetland provides a source of food and water for grazing beef cattle.

The beauty and importance of wetlands has become more recognised since the 1990s. This shift in public perception has meant that residential areas developing alongside Woodberry Swamp have used it to support marketing and sale of residential lots – 'wildlife in your own backyard', 'water views', 'The Ponds'.

Cultural importance

Woodberry Swamp would have been (and remains) a site of Aboriginal significance. It provided food and a range of materials for daily life, with some sites surrounding the wetland having spiritual significance. Even today, Woodberry Swamp is significant to local people as an area to observe wildlife and enjoy the sense of open space - a break from the more harsh urban and industrial landscape.

The environmental and cultural significance of Woodberry Swamp is recognised by its zoning under State Environmental Planning Policy (SEPP) 14. This zone aims to protect and preserve coastal wetlands in the environmental and economic interests of NSW. This means that permission must first be gained for a number of activities such as land clearing, land draining, land filling, and construction of levees.



Wetland ecosystem functions and values (internal and external).
Which of these are relevant to Woodberry Swamp?

Case Study C

3.3 Investigating WOODBERRY SWAMP

Understanding human impacts on Woodberry Swamp

Like many wetlands in the Maitland area, Woodberry Swamp is surrounded and impacted upon by a mosaic of human activities. These impacts often arise due to poor management and an undervaluing of the wetland environment. The table below summarises some of the main impacts of human activities around Woodberry Swamp.

Many of the impacts on Woodberry Swamp are interrelated, which means efforts to address these need to be holistic and apply to the cause of the impact rather than its symptoms in isolation. For instance, dealing with weed invasion should include efforts to reduce the amount of nutrients entering the wetland along with a program of removing the existing weeds.

Managing environmental impacts could be considered similar to caring for our own health – we need to prevent sickness and disease from arising, deal with the symptoms to make life more comfortable but ultimately address the underlying cause of the illness.

IMPACTS	SYMPTOMS AND ISSUES	POSSIBLE CAUSES
Loss of biodiversity	◆ The diversity of native flora and fauna has declined since European settlement in the area. Bird species, however, remain quite rich in their diversity across the catchment. ◆ Impacts on soil and its micro-organisms (an important part of biodiversity) have meant the soil is now less productive and more erodible. ◆ There has been widespread loss of habitat and food supply for native wildlife. ◆ Loss of biodiversity reduces Woodberry Swamp catchment's capacity and resilience to cope with other impacts described below.	◆ Extensive clearing of native vegetation. ◆ Predation by feral and domestic animals (e.g. dogs, cats, foxes, Mosquito fish) has reduced the populations of native fauna. ◆ Clearing, compaction of soil by grazing stock, and the sealing of surfaces with roads and buildings have contributed to the decline in soil health. ◆ Changes in hydrology and water quality have affected habitat, food, and the diversity of vegetation.
Erosion	◆ The main forms of soil erosion around the Woodberry Swamp catchment include sheet, rill and gully erosion. ◆ Erosion has the potential to remove large quantities of soil off the land surface. It becomes difficult to re-establish vegetation in these areas. ◆ Sedimentation (deposition) of eroded soil causes restriction of water flow and loss of open water areas needed for native flora and fauna in lower sections of the wetland.	◆ Extensive clearing has left large areas of land exposed to erosion by wind and rain. ◆ Clearing and an increase in sealed surfaces (e.g. roads and buildings) have resulted in larger quantities of runoff and higher water flow velocities. This often causes more severe erosion.
Salinity	◆ Some minor salt scalds have occurred in the lower sections of Woodberry Swamp during dry weather. ◆ Many plants are not adapted to growing in salty soils. This results in bare ground and an over-abundance of salt-tolerant species, e.g. *Juncus usitatus* (Common Rush). ◆ The water has a higher concentration of salt. Many aquatic plants and animals cannot survive in these conditions.	◆ Clearing of deep-rooted native vegetation results in naturally saline groundwaters being drawn up to the soil surface through evaporation (*dryland salinity*). ◆ Erosion has exposed rocks and sediment that are naturally saline.

Case Study

3.3 Investigating WOODBERRY SWAMP

IMPACTS	SYMPTOMS AND ISSUES	POSSIBLE CAUSES
Water pollution	◆ Water quality of Woodberry Swamp has declined. This has contributed to: (i) a loss of biodiversity; (ii) blue-green algae blooms; (iii) weed infestation; (iv) bad odours from the wetland. ◆ The main water pollutants in the Swamp include: - **sediment** from erosion around development areas; - **heavy metals** from industrial and urban areas; - **pathogens** (e.g. bacteria) from urban and agricultural areas; - **herbicides and other similar chemicals** from urban and rural areas or weed and pest control on the wetland; - **nutrients** (e.g. nitrogen and phosphorus) from urban areas and agricultural activities; - **litter** from urban and industrial areas; - **total dissolved solids** (e.g. salt) from industrial activities and the on-set of dryland salinity.	◆ Water quality decline is a result of both past and present land use activities. ◆ Runoff from rainfall or land use activities (e.g. washing cars, hosing surfaces) dissolves pollutants. Pollutants are transported to the swamp and may remain dissolved in the water or settle out onto the soil as the velocity decreases. ◆ Discharge from industrial point sources contributes nutrients, total dissolved solids, and heavy metals. Unlike stormwater, however, these discharges are monitored and controlled by licences administered by the Environment Protection Authority (EPA).
Change in hydrology	◆ The amount of water flowing to Woodberry Swamp has increased steadily. This has resulted in permanent water cover of areas that may otherwise have regular wet and dry cycles. ◆ The construction of drainage channels across the wetland has changed the flow of water. It has resulted in a concentration of open water in narrow channels rather than larger shallow pools. ◆ The establishment of flood mitigation works along the Hunter River has reduced major flooding of Woodberry Swamp. This would have originally provided for a renewal of alluvial soil and freshwater across the wetland area.	◆ Clearing and more sealed surfaces have increased stormwater runoff. ◆ Steggles has a licence to discharge 14ML/week into the Swamp (approx. 7.7% of average annual flow). Discharge has been decreasing, with plans to find other uses for the water so it can almost cease. ◆ Drainage channels are constructed and maintained for agricultural purposes. ◆ Flood gates control daily water exchange between the Hunter River and Woodberry Swamp via Greenway Creek.
Weed invasion	◆ Woodberry Swamp is affected by a range of weeds including Water Hyacinth, Alligator Weed, and Flowering Lawn. ◆ Depending upon the weed species, they may: - interfere with water flow through the wetland; - out-compete native flora and fauna; - reduce light penetration through the water surface, thereby reducing the natural disinfection process (i.e. the sun's UV radiation kills water-borne pathogens); - reduce the amount of dissolved oxygen in the water during phases of decomposition.	◆ High concentrations of nutrients cause weeds to thrive whereas most native species are adapted to lower nutrient levels. ◆ There is now a large supply of weed seeds in the swamp soil, creating an on-going source of young plants. ◆ Weeds are generally symptomatic of an environment that is out of balance.

Acknowledgement & References

This case study has been prepared by Kylie Yeend (Environmental Education & Project Management Consultant). Other information sources included:

Maitland Landcare 1999, *Draft Catchment Management Plan for Woodberry, Morpeth-Tenambit and Millers Forest Catchments*, Maitland, NSW: Maitland Landcare.

Albrecht, G. 2000, *Rediscovering the Coquun: An environmental history of the Hunter River,* paper presented at the Hunter Catchment Management Trust's Water Forum, 2000.

Case Study C

3.4 WILDFOODS of MAITLAND

Introduction

The Hunter Valley lies at the centre of a number of geological and climatic zones giving the area a wide range of soils and climatic conditions. This has led to a rich diversity of plants, in some areas comparable with the richest floras in the world. From this comes a corresponding high diversity of plants that have been used for food, medicine or other purposes.

There are at least 220 species of what are known as 'bushfood' or 'wildfood' within the Hunter Valley with a large proportion occurring in the Maitland area.

Food and culture

Before the advent of agriculture, people lived a primarily hunter-gatherer existence foraging for fruits, roots, berries and hunting any suitable game. This lifestyle continued for most of human history.

Agriculture slowly developed in the Middle East and other places of the world where climate was predictable and plants and animals were suitable for domestication. Over time the hunter-gatherer way of life was gradually (athough not entirely) forgotten.

In Australia the settled agricultural lifestyle didn't arrive until the First Fleet in 1788. This was mainly due to the unpredictability of the climate and lack of species suitable for domestication. This is amply demonstrated by El Nino-inspired droughts that create havoc every few years and by the scarcity of Australian native plants and animals that have made it into agricultural production.

Compared with the European settlers, Aboriginal people had to rely on their knowledge of the bush to give them a comfortable lifestyle. A farmer may have to know the growth habits and requirements of a dozen plants and three or four species of animals and be able to store excess food. By comparison, Aboriginal people would have to know the ripening times and likely locations of up to several hundred species of plants and dozens of mammal, fish, reptile and bird species.

Bushfoods are commonly thought to be desert or tropical plants and animals. The highest population density of Aboriginal people at the time of arrival of the First Fleet, however, was on the coast, particularly south-eastern Australia where the climate was more favourable and food more plentiful.

For the first part of the early European history of Australia bushfoods played an important role. They were a crucial part of the diet in the first few years of the colony when widespread starvation was only avoided by making use of local bushfood species.

Loss of traditional knowledge

Aboriginal traditional life changed dramatically with the arrival of the First Fleet. Traditional hunting areas became farms, fish resources were over-exploited, and fire regimes were changed. Each of these lowered the land's capacity to support people's traditional lifestyle. In addition, extra pressure was placed on the land when crops failed and settlers and convicts were forced to forage for native foods to supplement their rations.

Knowledge of the range of bushfoods and medicines used by Aboriginal people has been partially lost. Fortunately there are sufficient records and maintenance of Aboriginal culture to gain a good understanding of the resources that may have been utilised.

Along the coastal strip of south-eastern Australia, for example, the rainfall is more reliable and rivers and wetlands are more common. In this area fish, shellfish, and other aquatic plants and animals would have formed a substantial part of the diet.

Finding foods

Edible plants can be found in just about every vegetation community, with wetlands, rainforest and floodplains being particularly rich in edible plants. These areas were also valuable to European settlers for timber and grazing leading to a loss of food as cattle trampled the wetlands, ate the Yam Daisies and other herbs and trees were felled for timber or to open up grazing areas. This understandably led to a great deal of conflict with the traditional owners of those areas.

While there are large numbers of edible plants within the Maitland area, there are many that need preparation or are only suitable for eating when fully ripe. Caution must be used at all times when sampling bush foods: if you are not absolutely sure of its identity or how safe it is to consume, then don't try it.

Case Study C

3.4 WILDFOODS of MAITLAND

Earthcare Park Bushfood Garden

The Bushfood Garden at Earthcare Park has been in development since 1997 and aims to showcase local bushfood species that were or could have been used by Aboriginal people or early settlers.

Plants have been deliberately sourced from local seedstock to hopefully maintain the genetic integrity of the local area.

The Garden is meant only as a demonstration site and it is expected that most of the fruits will end up in the bellies of birds, blue tongue lizards and other (hopefully native) animals.

Bluebells (*Wahlenbergia* species)

Very common throughout the site, the light blue flowers are edible, tasting slightly sweet and would make a colourful addition to a salad.

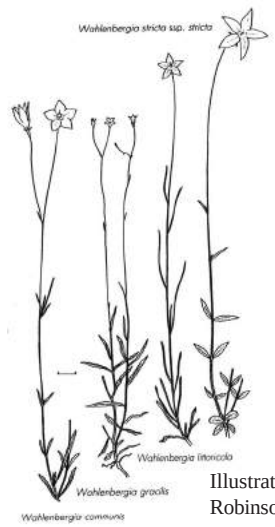


Illustration from:
Robinson, L. 1994; p.149.

Lilly Pillys (*Acmena smithii, Syzigium* species)

One of our best known bushfoods, sweet sometimes tart flesh surrounding a woody seed.

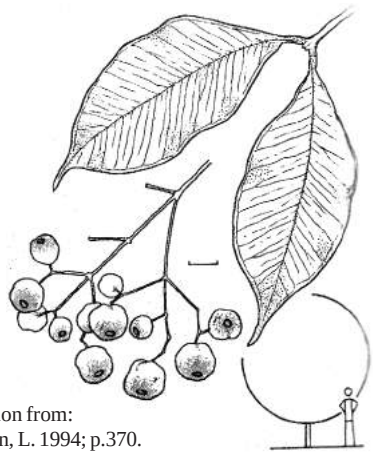
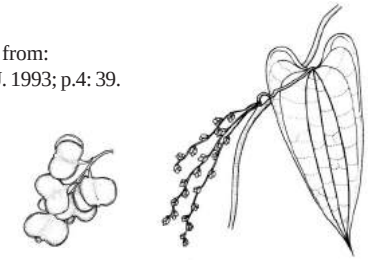


Illustration from:
Robinson, L. 1994; p.370.

Pencil Yam (*Dioscoria transversa*)

Hiding away under some of the shadier shrubs is a thin nondescript vine with heart-shaped leaves. The Pencil Yam is in the same family as the true yams. The vine is followed back to ground level and the tuber gently dug out taking care not to break the stem. The Pencil Yam is normally found in rainforest.

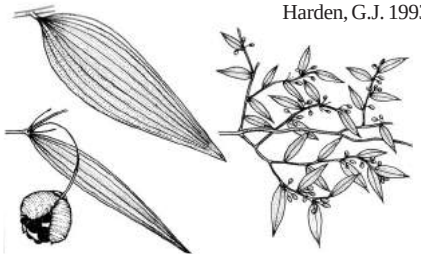
Illustration from:
Harden, G.J. 1993; p.4: 39.



Wombat Berry (*Eustrephus latifolius*)

A tough vine which produces hard orange fruits, these can be eaten but have little taste. The underground tubers can also be eaten and are very sweet and full of moisture.

Illustration from:
Harden, G.J. 1993; p.4: 43.



Slender Grape (*Cayratia clematidea*)

The Slender Grape is probably the best tasting of the local native grapes. The fruit is a small purple berry 8 - 10 millimetres diameter. Being a grape, it has tendrils to help it hold on as it climbs.

Illustration from:
Harden, G.J. 1992; p.3: 44.

Apple Berry (*Billardiera scandens*)

One of the favourite bushfoods having a nice but slightly gritty dried apricot flavour. Fruits are ripe when they go opaque and fall off. It's usually best to break the skin at the bottom of the fruit and squeeze the pulp out.

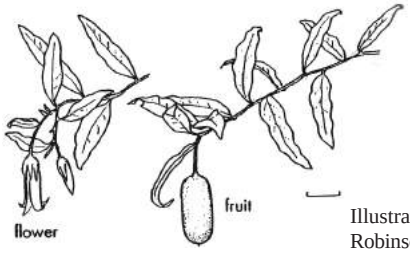


Illustration from:
Robinson, L. 1994; p.338.

Case Study C

3.4 WILDFOODS of MAITLAND

Native Violet (*Viola hederacea*)

A hardy native ground cover. The flowers can be eaten and would go well on a salad.

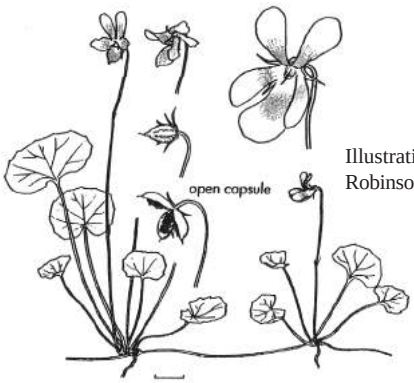


Illustration from:
Robinson, L. 1994; p.224.

Flax Lilly (*Dianella caerulea*)

Looking like a grass or a Lomandra species, the Dianella has attractive dark blue flowers with bright yellow stamens developing into a bright purple berry around 1cm diameter. The berries are edible having a sweet Alfalfa-like taste. There have, however, been reported cases of poisoning, which is probably due to either over-indulgence or eating unripe berries. A couple of these would make an attractive garnish to ice cream or fruit salad.

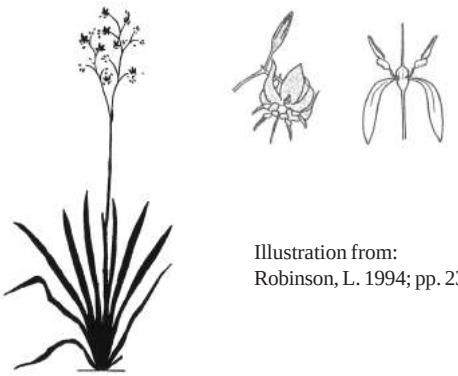


Illustration from:
Robinson, L. 1994; pp. 231, 233.

Sydney Golden Wattle (*Acacia longifolia*)

Probably one of our best known east-coast wattles. It has bright green leaves with 2-5 parallel veins and bright yellow flowers. The unripe seeds can be steamed and eaten, whilst leaves have been used as fish poison.

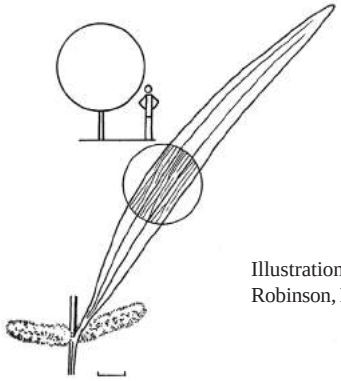


Illustration from:
Robinson, L. 1994; p.70.

Yam Daisy, Murnong (*Microseris lanceolata*)

Perhaps one of the more significant finds on the Earthcare Park site is the Yam Daisy. The Yam Daisy was a very important food source for Aboriginal people prior to and in the early years of European settlement.

They were once so common that only a short amount of time was required to dig enough tubers to feed a whole family. Unfortunately the introduction of cattle and sheep and changed land management practices have led to a huge reduction in abundance of this plant.

The Yam Daisy is so sensitive to habitat modification that it is regarded as an indicator species for healthy Grassy White Box Woodland communities (an endangered ecological community). The Yam Daisy has so far been found in only four locations in the Hunter:

- a couple of square metres near Merriwa;
- approximately ⅛ of a hectare near Wollar;
- a healthy population bordering the wetland at the Earthcare Park site (including a plant or two in the bushfood garden); and
- a small population on Kooragang Island.

The plants are very similar to the more common Cats Ear. The main difference being that Yam Daisies have:

- more or less upright leaves;
- a single flower head per stalk (Cats Ear usually has a number of flower heads);
- reddish flower stalks instead of green; and
- a characteristic 'Shepherds Crook', which straightens up for pollination and seed dispersal when the flower is immature or the seeds are ripening.

The Yam Daisy seems to respond well to to an early spring mowing.

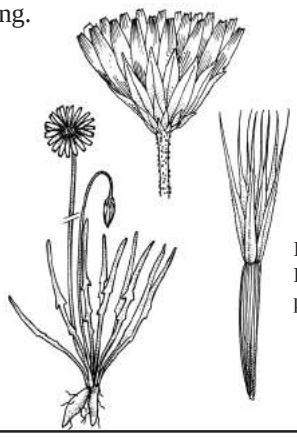


Illustration from:
Harden, G.J. 1992; p.3: 331.

Acknowledgement & References

This case study has been prepared by Paul Melehan (Bushfood & Environmental Education Consultant). Other information sources included:

Harden, G.J. (ed.) 1992, *Flora of New South Wales*, Vol. 3, Sydney: NSW University Press.

Harden, G.J. (ed.) 1993, *Flora of New South Wales*, Vol. 4, Sydney: NSW University Press.

Robinson, L. 1994, *Field Guide to the Native Plants of Sydney* (2nd Ed.), East Roseville, NSW: Kangaroo Press.

Case Study C

3.4 WILDFOODS of MAITLAND

References: Austalian native food plants

Bindon, P. 1996, *Useful Bush Plants*, Perth: West Australian Museum.

Bryce, S. 1992, *Women's Gathering and Hunting in the Pitjantjatjara Homelands*, Alice Springs: IAD Press.

Cribb, A.B. & Cribb, J.W. 1987, *Wild Food in Australia*, Sydney: Collins.

Isaacs, J. 1987, *Bush Food: Aboriginal Food and Herbal Medicine*, Sydney: Lansdowne.

Lassack E.V. & McCarthy, T. 1997, *Australian Medicinal Plants*, Kew, Vic.: Reed.

Latz, P. 1995, *Bushfires and Bushtucker: Aboriginal Plant Use in Central Australia*, Alice Springs: IAD Press.

Lazarides, M. & Hince, B. (eds.) 1993, *CSIRO Handbook of Economic Plants of Australia*, East Melbourne: CSIRO.

Low, T. 1989, *Bush Tucker: Australia's Wild Food Harvest*, Sydney: Angus & Robertson.

Low, T. 1991, *Wild Food Plants of Australia*, Sydney: Angus & Robertson.

Maslin, B.R. *et al* 1998, *Edible Wattle Seeds of Southern Australia*, Collingwood, Vic.: CSIRO.

Nicholson, H. & Nicholson, N. 1996, *Australian Rainforest Plants Vol. I-IV*, The Channon, NSW: Terania Rainforest Publishing.

Robinson, L. 1994, *Field Guide to the Native Plants of Sydney* (2nd Ed.), East Roseville, NSW: Kangaroo Press.

Smith, K. & I. 1999, *Grow Your Own Bushfoods*, Frenchs Forest, NSW: New Holland.

References: Austalian native medicinal plants

Aboriginal Communities of the Northern Territory 1988, *Traditional bush medicines: An Aboriginal pharmacopoeia*, Richmond, Vic.: Greenhouse Publications.

Aboriginal Communities of the Northern Territory 1993, *Traditional Aboriginal medicines in the Northern Territory of Australia*, Darwin, NT: Conservation Commission of the Northern Territory of Australia.

Collins, D.J. *et al* 1990, *Plants for medicines: A chemical and pharmacological survey of plants in the Australian region*, East Melbourne, Vic.: CSIRO.

Cribb, A.B. & Cribb, J.W. 1983, *Wild medicine in Australia*, Sydney: Fontana/Collins.

Kryriazis, S. 1996, *Bush medicine of the northern peninsula area of Cape York*, New Mapoon, Qld.: Nai Beguta Agama Aboriginal Corporation.

Lassak., E.V. & McCarthy, T. 1983, *Australian medicinal plants*, North Ryde, NSW: Methuen Australia.

Low, T. 1990, *Bush medicine : A pharmacopoeia of natural remedies*, North Ryde, NSW: Angus & Robertson.

Wightman, G. & Mills, L. 1991, *Bush medicine identikit: Common medicinal plants of Australia's Top End*, Darwin, NT: Conservation Commission of the Northern Territory.

3.1 Managing human IMPACTS ON WETLANDS

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Science	5	5.10 (Ecosystems)
Geography	5	5A2 (Changing Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5, 5.6 5A3 (Issues in Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5, 5.6

Overview

Students gain information on the features, functions and importance of local wetlands through a PowerPoint presentation and develop an appreciation of the range of human impacts on wetlands. Options for addressing wetland impacts are considered before commencing an investigation of a local wetland – Woodberry Swamp.

Use of the Woodberry Swamp case study and coloured aerial photographs assist students' development of geographical and scientific skills. Students are involved in:

- identifying natural and built features of the wetland and its environs;
- investigating potential threats and impacts to the wetland ecosystem;
- developing management options to address wetland impacts.

Materials Required

Provided

- PowerPoint presentation (CD-rom) - *Maitland's Wetland Ecosystems*
- Case Study 3.3 - *Investigating Woodberry Swamp*
- A3 Aerial Photograph Kit (1 teacher master copy and 15 copies to be shared amongst students)
- Worksheets 3.1 & 3.2

To Obtain

- Clear overlay sheets (3 per aerial photo)
- Coloured permanent markers
- Copies of case studies and worksheets

Program P

3.1 Managing Human IMPACTS ON WETLANDS

Program Instructions

Content	Strategies	Resources
Introduction to local wetlands	Students view PowerPoint presentation. The presentation could be used progressively or in full at the commencement of the program. Definition and Examples of Local Wetlands ◆ Students to complete Worksheet 3.1. Importance of Wetlands ◆ What are students' attitudes towards wetlands? ◆ Have attitudes changed towards wetlands? If so, why? Impacts on Wetlands ◆ Have students seen impacts on local wetlands? If so, what are they and what implications have they noticed? Addressing Wetland Degradation ◆ What approach/s do students believe to be the most important and why?	◆ PowerPoint presentation (CD-rom) ◆ Worksheet 3.1
Introduction to Woodberry Swamp	◆ Students gather background information on Woodberry Swamp through reading Case Study 3.3 and other available materials. ◆ On clear overlays placed on the aerial photo students label the main natural and built landscape features, e.g. towns, main roads, creeks, railway (refer to teacher base map). ◆ Guided by information from the Case Study, students identify the main land use zones around the wetland. The land use zones are to be marked on a clear overlay.	◆ Case Study 3.3 ◆ A3 Aerial Photograph Kit ◆ Clear overlays
Impacts from human activities	◆ Guided by the PowerPoint presentation and Case Study 3.3 hold a class discussion on the potential impacts from each land use. Students record this information on Worksheet 3.2 and on one of the aerial photo overlays.	◆ Worksheet 3.2 ◆ A3 Aerial Photograph Kit ◆ Clear overlays
Managing human impacts	◆ Guided by the PowerPoint presentation hold a class discussion on managing human impacts on Woodberry Swamp. The discussion could include how to implement strategies and possible challenges. Students summarise this information on Worksheet 3.2. ◆ Program 3.2 can be used to extend this program. The focus of 3.2 is on revegetation as a tool to manage impacts on wetlands (or other ecosystems). It develops students' knowledge and skills in the planning and coordination of this management approach.	◆ Worksheet 3.2 ◆ Program 3.2 (optional)

Program P

3.2 Regenerating LOCAL WETLANDS

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Science	5	5.10 (Ecosystems)
Geography	5	5A2 (Changing Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.9 5A3 (Issues in Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.9

Overview

This program follows on from *Managing human impacts on wetlands* (Program 3.1). It develops students' skills in planning and coordinating the regeneration of a wetland ecosystem. It follows the steps used by environmental managers to guide their rehabilitation work.

Materials Required

Provided

- Case Study 3.2 - *Flora & Fauna of Maitland's Wetlands*
- Case Study 3.3 - *Investigating Woodberry Swamp*
- Case Study 5.4 - *Regeneration at Earthcare Park*
- A3 Aerial Photograph Kit - *Woodberry Swamp*
- Worksheet 3.3
- Worksheet 3.3 suggested answers

To Obtain

- Tracing paper and pens
- Copies of case studies and worksheets

Program P

3.2 Regenerating LOCAL WETLANDS

Program Instructions

Content	Strategies	Resources
Introduction to ecosystem regeneration	◆ Using the background information in Worksheet 3.3 as a guide, hold class discussion on: - the importance of revegetation as a management tool; - alternatives to revegetation (e.g. fencing remnant vegetation, direct seeding with native seed, planning restrictions on clearing); - the importance of setting project objectives; - examples of local regeneration projects (draw on students' own knowledge and/or Case Study 5.4 - *Regeneration at Earthcare Park*).	◆ Case Study 5.4 ◆ Worksheet 3.3
Planning a regeneration project	◆ Using Woodberry Swamp as the focus for a regeneration project, students gather background information by reading Case Study 3.3. ◆ Brainstorm some responses to each question on Worksheet 3.3. Refer to suggested answers for guidance. ◆ Students form into small groups and plan their own regeneration project based on the decision points in Worksheet 3.3.	◆ Worksheet 3.3 ◆ Case Studies 3.2 & 3.3 ◆ Suggested answers
Finalising the regeneration project	◆ Students record their project planning on Worksheet 3.3. ◆ Using A3 aerial photographs of Woodberry Swamp students prepare a tracing of the swamp and its environs. They should record the location, layout, and activities of their regeneration project on their traced map. This map could also be used to highlight possible challenges for the project.	◆ Worksheet 3.3 ◆ Case Study 3.2 ◆ Suggested answers
Active citizenship - implementing the regeneration project (Optional)	◆ Make contact with the Maitland Landcare Coordinator (Maitland City Council) and discuss options for implementing one of the regeneration projects. If it is not possible to planting around Woodberry Swamp, there may be other site options (e.g. Tenambit Wetland, Bolwarra Wetland, Morpeth Common Wetland). ◆ Students become involved in: - preparing a media release and other forms of promotion for the regeneration project; - visiting the site and meeting with the Maitland Landcare Coordinator to organise the planting day; - attending a planting day to put the regeneration plan into action.	◆ Contacts & Support Options (Section 8)

3.3 Researching Wetland Species & FOOD WEBS

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Science & Technology	2 3	LTS2.3 (Living Things) LTS3.3 (Living Things)
Science	4 5	4.10 (Ecosystems) 5.10 (Ecosystems)

Overview

Students gain knowledge of local wetland flora and fauna through individual research using case studies, internet searches and observations. This knowledge is used to create a food web for a local wetland ecosystem, providing students with an understanding of the different roles of species in an ecosystem and trophic interactions.

This program would be an ideal follow-up to an excursion to a local wetland area (refer to Resource Kit, Section 7).

Materials Required

Provided

- Case Study 3.2 - *Flora & Fauna of Maitland's Wetlands*
- Worksheets 3.4, 3.5, 3.6
- 3.4 & 3.5 Example Species Profiles

To Obtain

- Internet access
- Copies of case study and worksheets

3.3 Researching Wetland Species & FOOD WEBS

Program Instructions

Content	Strategies	Resources
Identifying local wetland species	◆ Students read Case Study 3.2 and identify the range of flora and fauna species found in local wetlands.	◆ Case Study 3.2
Researching wetland flora and fanua	◆ Each student is assigned a local wetland species to research. ◆ Using the internet, students research their species and record information on Worksheets 3.4 (flora) and/or 3.5 (fauna), or 3.6. Recommend using Google search engine. Useful websites include: Birds: *www.birdsaustralia.com.au* Herpetology: *www.jcu.edu.au/school/tbiol/zoology/herp/herp2.shtml* Native Fish: *www.nativefish.asn.au* Insects: *www.ento.csiro.au/aicn/* Frogs: *www.frogs.org.au* Botanic Gardens: *www.anbg.gov.au/anbg/* Macroinvertebrates: *www.streamwatch.org.au/main.jsp* (look under Electronic Library) Wetlands: *www.ea.gov.au/water/wetlands* *www.dlwc.nsw.gov.au/care/wetlands/* *www.wetlandcare.com.au* *www.wetlands.org.au* (Shortland Wetlands) ◆ Class discussion on the terminology and research tasks associated with the Species Research Sheets. ◆ Students present their research findings to class. This could be done through a PowerPoint slide show or poster presentation.	◆ Worksheets 3.4 & 3.5 (secondary) or 3.6 (primary) ◆ Example species profiles ◆ Internet access
Determine feeding habits of animals	◆ Each student determines the feeding habits of the animals they have researched and then group animals into decomposers, herbivores, small carnivores and large carnivores.	◆ Case Study 3.2 ◆ Completed worksheets 3.4 & 3.5
Create local wetland food web	◆ Use the lists of animals to rearrange this information and place organisms into a food web.	◆ Worksheet 3.7
Extension activities	◆ Exploration of trophic levels, feeding relationships, food pyramids, distribution and abundance of species.	

Worksheet W

3.1 An introduction to MAITLAND'S WETLANDS

STUDENT NAME: _____

CLASS: _____

1. What natural features are shared amongst wetland ecosystems? (*Hint:* look for the features that are common amongst the PowerPoint slides on local wetlands).

_____

_____

_____

2. Using your observations from Q.1 develop a definition of a wetland.

A wetland is.... _____

_____

3. Name 5 locations where you would find a naturally occurring wetland in the Maitland area.

_____

_____

_____

4. Name 3 locations where you would find a constructed wetland in the Maitland area.

_____

_____

5. List the human impacts that have occurred on some of Maitland's wetlands.

_____

_____

_____

_____

Worksheet W

3.2 Managing human IMPACTS ON WETLANDS

STUDENT NAME: _____

CLASS: _____

1. List potential impacts from human land use around Woodberry Swamp and its catchment.

LAND USE	POTENTIAL IMPACTS
Urban development	
Industrial development	
Mining	
Agriculture	
Rural residential development	

2. Using your list choose one human impact on Woodberry Swamp and give greater detail on:
   (a) how this impact could be managed to balance human activities and needs with conserving, protecting and maintaining the quality of the environment.
   (b) the challenges to implement this management strategy.

_____

_____

_____

_____

_____

Worksheet W

3.3 Regenerating LOCAL WETLANDS

Background Information

Wetlands across Maitland have been affected by human impacts since the early 1800s. Despite this, our local wetlands remain important ecosystems and contain a high proportion of the area's biodiversity.

Managing impacts on wetlands is largely about managing human activities in and around these areas. Rehabilitation, however, must also play an important role if we are to restore the health of these ecosystems.

Rehabilitating wetlands is a complex task. A common approach is to regenerate – to reintroduce native plants to the area. This activity brings many benefits including:

- additional food source and habitat for native fauna,
- enhanced biodiversity,
- control of erosion,
- prevention or remediation of dryland salinity,
- improved soil health, and
- beautification of the local area.

The following activity involves planning and coordinating a project to regenerate a local wetland. The steps outlined are often used by environmental managers to guide their work.

Project Planning Information

Your regeneration project must address the following objectives:

- Re-establish a diversity of local native plants in and around the wetland.
- Improve the food and habitat opportunities for local native animals.
- Involve a broad range of the local community.

Let's assume that Maitland City Council has provided $2000 from their Greening Plan budget to assist your regeneration project. Use this budget wisely and develop options to expand your resources by thinking sustainably and applying the principles of *Reduce, Reuse & Recycle*.

Worksheet W

3.3 Regenerating LOCAL WETLANDS

STUDENT NAME: _____

CLASS: _____

Regeneration Planning Schedule

1. The Regeneration Project site: _____

2. What plant species will you include in your Regeneration Project?

_____

_____

_____

_____

3. What sector/s of the local community would you involve in your Regeneration Project?

_____

_____

_____

4. How would you promote the project and involve your local community?

_____

_____

_____

_____

5. What protection will you need for your plantings? (Consider whether plants may be affected by damage from wind, rabbits and hares, grazing cattle, and/or evaporation of water during hot weather).

_____

_____

_____

Worksheet W

3.3 Regenerating LOCAL WETLANDS

Regeneration Planning Schedule (cont.)

6. You have gained the landholder's permission for a planting to occur on their property. You now need to order/gather the materials using the $2000 budget and some creative thinking to make it go even further.

   Use the following table to summarise the materials you need and their cost. Some of these materials may not be required or you may wish to consider more cost-effective alternatives.

Regeneration Materials	Required/ Not Required	Quantity	Unit Cost	Total Cost
Native plants			$1.30 each	
Tree guards & stakes			$0.39 (per plant)	
Mulch mats			$0.37 each	
Loose mulch			$0.22 (per plant)	
Fencing			$4/metre	
Water tanker			$5.50/hr (1000L)	
Labour (volunteers)			$15/hr (not paid)	
Labour (paid contractors)			$23/hr	
Other (please specify):				
			TOTAL	

Worksheet W

3.3 Regenerating Local Wetlands: SUGGESTED ANSWERS

The Regeneration Project site:
Students nominate their own site.

What plant species will you include in your Regeneration Project?
- Refer to species list in Case Study 3.2 - *Flora & Fauna of Maitland's Wetlands.*
- Students should choose a range of species and plant types (trees, shrubs, grasses) to increase diversity, and habitat and food opportunities.
- Species need to be suited to the regeneration site. For instance, waterplants should not be chosen to regenerate the drier slopes surrounding wetlands.

What sector/s of the local community would you involve in your Regeneration Project?
Options might include: landowners surrounding the Regeneration Project site, schools, Guides and Scouts, local farmers, local business/industry, local residents, service clubs, sporting clubs.

How would you promote the project and involve your local community?
Options might include:
- Articles in local newspapers (e.g. Mercury, Lower Hunter Star, The Post) promoting details of the project.
- Guest presentations to community group meetings (e.g. service clubs, sporting clubs etc.) and/or schools.
- Personal (face-to-face) or written invitations to individuals and/or groups.
- Distribute flyers about the project by letterbox drops and/or community and school noticeboards.

What protection will you need for your plantings?
- Maitland's wetlands are open and exposed. Most plantings therefore require some form of protection in their first few years. Generally, tree guards and stakes are used to protect against damage by rabbits, hares and strong winds. These are removed once the plant is able to 'fend for itself' and are reused in other planting activities.
- Mulching is also necessary, particularly on the open slopes surrounding wetlands. Despite being a more expensive option, mulch mats are often used as they are quicker and easier to put in place than loose mulch. The decision on what to use depends upon the project budget and amount of time available.
- Stock-proof fencing will be needed around the planting area if the site is being grazed by livestock.
- Some alternatives:
  Tree guards and stakes – 2L juice or 1L milk cartons with two stakes. These offer a more biodegradable alternative, an important consideration if planting in areas affected by floods. These are not as effective at protecting the plants as they are shorter and provide less space around the plant.
  Mulching – (i) grass clippings after slashing the project site; (ii) old newspapers or cardboard with loose mulch over top; (iii) donations of mulch from tree lopping companies or Energy Australia.

Worksheet W

3.3 Regenerating Local Wetlands: SUGGESTED ANSWERS

Summarise what type and quantity of materials you need and the cost.
Students complete their own regeneration materials table. The following information will be useful to guide them:

Native Plants
The usual spacing for planting native tubestock is: approx. 1.5m between trees; approx. 1m between shrubs; and approx. 0.5m between grasses. These estimates along with the number of species to be planted will give an approximate size for the Regeneration Project.

Tree Guards & Stakes
Refer to comments in Q.5. This cost includes one plastic tree guard and three stakes. If juice or milk cartons were used on wetland flats, the cost for purchasing stakes would be $0.13 each.

Mulch Mats
Refer to comments in Q.5.

Loose Mulch
Refer to comments in Q.5. If loose mulch were used it would probably take an extra 1min./plant to collect and place the mulch. Whilst this may not seem much, when establishing 500 plants it means an extra 8hrs labour just for mulching!

Fencing
Fencing will only be necessary if the regeneration project is within an area that is grazed. Ideally, the planting would be in a paddock already fenced after negotiations with the landholder. The cost estimate for fencing does not include labour.

Water Tanker
Depending upon the weather and soil conditions at the time, each plant should receive about ½ bucket (4L) of water.

Labour (volunteers)
Based on local experience, it usually takes about 12 min. to establish a single plant (this includes digging, planting, placing the tree guards, stakes and mulch mats, and watering the plant). Remember to increase this to 13 min./plant if loose mulch is used.

Labour (paid contractors)
Paid contractors are only used in community plantings when there is sufficient budget (not very often!). Professional contractors would generally take no more than 5 min. to establish a single plant.

Worksheet W

3.4 Wetland Research Sheet: FLORA SPECIES

STUDENT NAME: _____

CLASS: _____

Common Name: _____

Botanic Name: _____

Size: _____

What are the habitat requirements of this species?

_____

_____

_____

Is this a flowering plant? If so, when does it flower?

_____

_____

Are there threats to the survival of this plant? If so, what are they?

_____

_____

_____

What are some other interesting facts about this plant?

_____

_____

_____

Summarise your research information in four lines.

_____

_____

_____

_____

Worksheet W

3.4 Wetland Flora Species: EXAMPLE PROFILE

Common Name: Common Rush OR Tussock Rush

Botanic Name: *Juncus usitatus*

Size: Grows up to 1metre in height

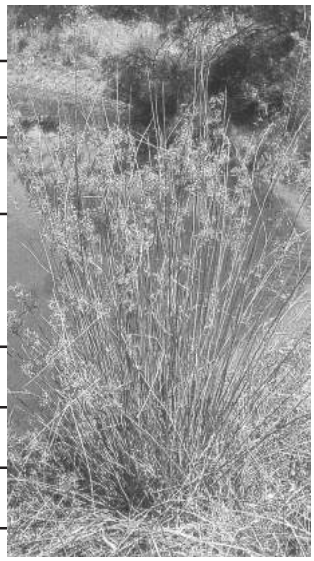


Photo: Sainty & Jacobs 1994; p.265. (see below)

What are the habitat requirements of this species?

It is an 'emergent' waterplant as its roots stay in the soil whilst its stem, flowers and most mature leaves rise above the water surface. It grows in a wide range of damp areas on saturated soils.

Is this a flowering plant? If so, when does it flower?

Yes, it flowers mainly in spring and summer, although old flowers can remain on the plant throughout the year.

Are there threats to the survival of this plant? If so, what are they?

This species is not threatened. Its extent has been reduced in some places, however, by filling and draining of wetlands and clearing for development such as agriculture, and residential and industrial subdivision.

What are some other interesting facts about this plant?

This species is quite salt-tolerant and is often used as an 'indicator species' for dryland salinity across NSW.

Summarise your research information in four lines.

Growing up to 1m, Common Rush flowers from September to February and offers habitat and food for animals as it grows along the fringe of wet areas. It has become an important indicator of the spread of salinity as it is quite salt-tolerant.

Photo taken from: Sainty, G.R. & Jacobs, S.W.L. 1994, *Waterplants in Australia: A field guide* (3rd Ed.), Sydney: Sainty & Associates.

Worksheet W

3.5 Wetland Research Sheet: FAUNA SPECIES

STUDENT NAME: _____

CLASS: _____

Common Name: _____

Scientific Name: _____

Size: _____

What are the habitat requirements of this species?

_____

_____

_____

Are there threats to the survival of this animal? If so, what are they?

_____

_____

_____

What are some other interesting facts about this animal?

_____

_____

_____

_____

Summarise your research information in four lines.

_____

_____

_____

_____

Worksheet W

3.5 Wetland Fauna Species: EXAMPLE PROFILE

Common Name: Peron's Tree Frog

Scientific Name: *Litoria peronii*

Size: Reaches 50mm in length

Photo: Robinson, M. 1998; p.98. (See below)

What are the habitat requirements of this species?

Found in wet and dry forest areas and sometimes in grassland and other open areas. It breeds in the still waters of swamps, dams, ditches and other inundated areas, and at times in backyard fish ponds.

Are there threats to the survival of this animal? If so, what are they?

Stormwater pollution - detergents, oils, nutrients, pesticides and other pollutants from human activities can interfere with breeding, food availability, and frogs''breathing'.

Draining and filling wetland areas which are important breeding sites.

Introduction of **Mosquito Fish** that feed on tadpoles.

What are some other interesting facts about this animal?

It has sometimes been called the **Maniacal Cackle Frog** because of the distinctive call of the male frog, which can be heard from September to January. Its colour can change depending on temperature, temperament and whether it's night or day.

Summarise your research information in four lines.

The male Peron's Tree Frog cackles like a maniac from September to January on the edge of still waters as it tries to attract a mate. It could find its way into your backyard fish pond providing it avoids death by water pollution, Mosquito Fish or filling of its wetland home.

Photo taken from: Robinson, M. 1998, *Field Guide to Frogs of Australia*, Sydney: Reed New Holland.

Worksheet W

3.6 Flora & Fauna of LOCAL WETLANDS

STUDENT NAME: _____

CLASS: _____

FLORA

Draw a picture:

Name: _____

Describe its appearance: _____

_____

_____

_____

Describe its habitat: _____

_____

_____

_____

FAUNA

Draw a picture:

Name: _____

Describe its appearance: _____

_____

_____

_____

Describe its habitat: _____

_____

_____

_____

Worksheet W

3.7 Local Wetland Research: FOOD WEBS & ENERGY FLOW

Create a Local Wetland Food Web

Arrange local wetland organisms into the correct boxes. Draw arrows to show the flow of energy through the food web.

Unbroken arrow = *is eaten by*

Broken arrow = *death and decay*

Secondary Carnivores (3rd order Consumers)

Decomposers

Primary Carnivores (2nd Order Consumers)

Herbivores (1st Order Consumers)

Autotrophs (Producers)

Energy from the sun

Worksheet W

3.8 Waterbird Adaptations: BILLS, FEATHERS & FEET

Background

Waterbirds have adapted in different ways to their watery home. Some swim a lot and need strong feet to paddle about. Other walk around on the edges of swamps. These birds usually have long toes to give them balance and distribute their weight so that they don't sink into the mud.

Birds' beaks or bills also show adaptations to what they eat and how they feed. A duck's bill is wide and flat, ideal for trawling through water for small insects and snails. Other ducks dabble in mud, sifting out small creatures to eat. Egrets have long, pointed bills which they dart at their prey with lightning speed.

Activity

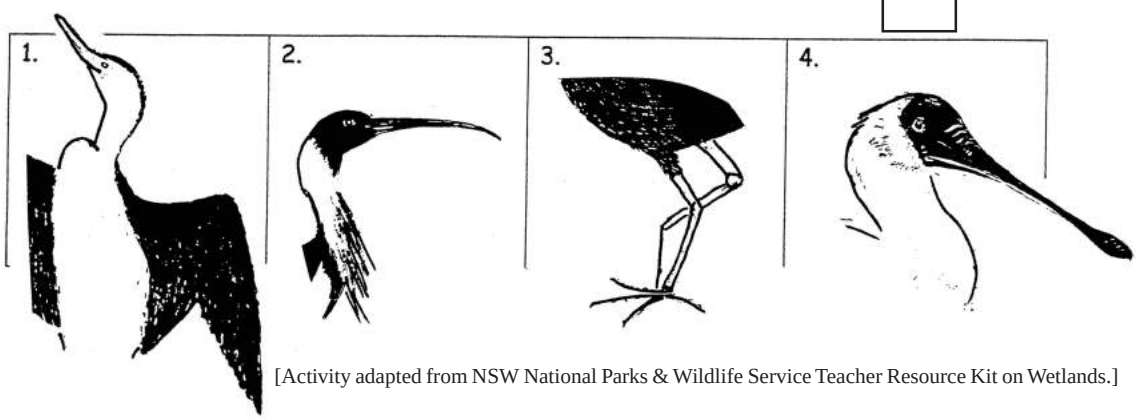
Four waterbirds found around Maitland's wetlands are described below. Read the descriptions and match the feet or bills to the animal described by placing a number in the box.

*I am a **Purple Swamphen**. My beak is bright red. I am found wading in dense reeds along freshwater lakes, swamps and streams. I am about 45cm tall and have medium length legs. I have long toes so I do not sink in the mud when feeding. Which feet are mine?* ☐

***Straw-necked Ibises** feed in both wet and dry places. They eat water insects, molluscs, frogs and snakes. They are usually found in large groups and are often seen flying in a V-formation. They have straw-like feathers hanging from below their long curved beak. Which beak is mine?* ☐

*If you ever see me you won't forget me. I breed in colonies but if I'm disturbed by humans in noisy boats I sometimes abandon my nest. I feed in shallow water. I have a long bill that I place in the water and swish from side to side as I walk along. If my bill touches something I shake it about furiously then snap at my prey. The knobs at the end of my bill help me to crush fish and yabbies before I swallow them. I'm a **Royal Spoonbill**. Which is my bill?* ☐

*I am black and often sit on dead trees or rocks, my wings outstretched in the breeze. Unlike some waterbirds, my feathers aren't waterproof with oil. My feathers get wet and heavy but this helps me swim underwater to catch fish. My bill is long, slender and sharply hooked. The hook helps me to hold onto any fish I catch. Some people call me a shag but I'm also called a **Cormorant**. Which one am I?* ☐



[Activity adapted from NSW National Parks & Wildlife Service Teacher Resource Kit on Wetlands.]

Worksheet W

3.9 Discovering Local Wetlands FIND-A-WORD PUZZLE

Maitland is home to a number of wetlands. These ecosystems are at the lowest part of the catchment and are an important location for the feeding, breeding and sheltering of native wildlife. A wetland is also known by other names such as swamp, lagoon, or marsh.

Wetlands are found at Tenambit, Woodberry, Bolwarra, Telarah and many other places around the Maitland area. Look out for other wetland locations next time you're travelling around the area.

Our local wetlands are home to a number of common as well as threatened species of plants and animals. Some of the more common species you will find are Swamp Oak, Cumbungi, Grey Teal, Sacred Ibis, Bearded Dragon, and Water Boatman. All plants and animals fit into an important and complex food chain.

Find the underlined words in the puzzle below:

K	T	D	S	F	O	O	D	C	H	A	I	N	N	Q
K	D	Z	H	E	C	O	S	Y	S	T	E	M	S	U
W	C	B	E	A	R	D	E	D	D	R	A	G	O	N
L	A	C	N	S	T	J	S	P	E	C	I	E	S	S
A	K	T	H	A	Y	R	R	E	B	D	O	O	W	G
E	H	H	E	C	R	B	C	U	M	B	U	N	G	I
T	I	A	B	R	T	R	W	H	K	U	E	S	D	L
Y	S	K	S	E	B	I	A	E	A	A	V	L	H	A
E	S	A	W	D	H	O	B	W	T	R	K	F	C	G
R	X	O	A	I	S	Z	A	M	L	L	A	F	J	O
G	J	P	M	B	R	L	V	T	A	O	A	L	E	O
H	Q	M	P	I	A	L	Q	V	M	N	B	N	E	N
A	Z	A	F	S	M	W	T	O	X	A	E	P	D	T
I	W	W	W	C	A	T	C	H	M	E	N	T	H	S
L	R	S	M	H	M	A	I	T	L	A	N	D	U	P

Case Study

4.1 Our Water Resource CATCHMENT

What is a catchment?

A catchment is the area of land that supplies surface water to a common collection point - usually a creek, river, dam or the ocean. The edge of a catchment is bordered by hills or ridges that direct the flow of water.

Catchments can vary in scale from the suburb you live in through to entire regions covering thousands of square kilometres. Many smaller catchments can be located within one large catchment.

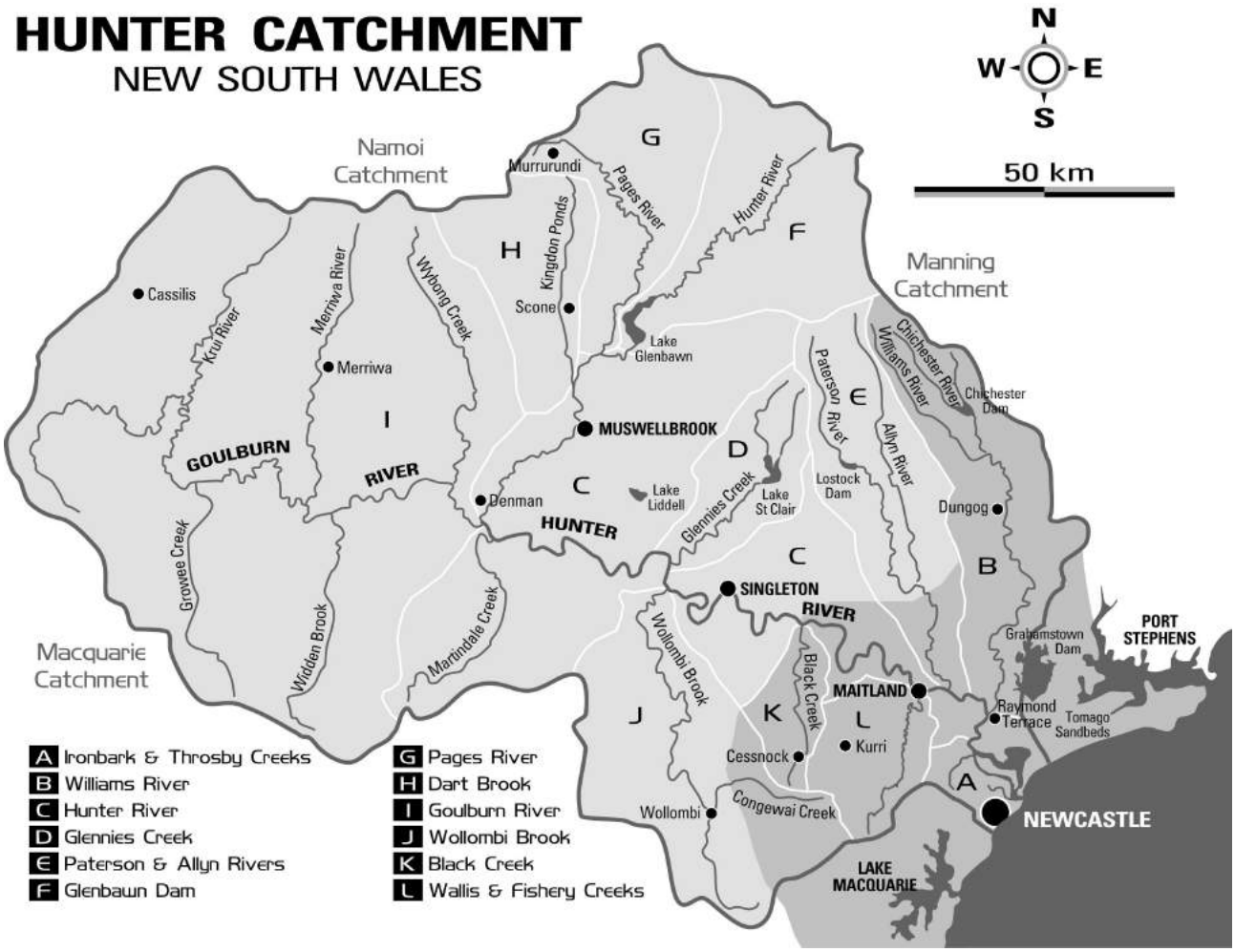
Catchments may be completely natural, or a combination of bushland, agricultural, industrial and urban areas. The types of land use and surfaces found in a catchment will have a major effect on the quality and quantity of water found in the catchment zone.

Breaking the water cycle

The natural water cycle involves evaporation over the oceans, condensation into clouds, precipitation over catchments, run-off collecting in creeks, rivers and lakes, which eventually flow back into the oceans. In this way the world's water has been 'recycled' for millions of years - and since we never really get new water supplies, keeping it clean is very important.

Water is essential for the survival of all life on earth. For humans this means interrupting the natural water cycle to provide homes, farms and industry with large volumes of reliable and clean water and then properly treating the wastewater created before returning the water to nature.

Hunter Water has the responsibility in the Hunter region for collecting, storing, treating and delivering water. It is also in charge of collecting and treating wastewater before returning it to the natural water cycle.



Case Study C

4.1 Our Water Resource CATCHMENT

Catchments and water sources

Hunter Water's water sources are Chichester Dam, Grahamstown Dam and the Tomago Sandbeds, all closely located in either the Williams River or Port Stephens catchments. Management and protection of these two catchments are essential to the management of our water supply system.

Integrated Catchment Management (ICM) links Hunter Water, government departments, councils, industry, farming and community groups to coordinate protection of individual catchments.

Catchments and water quality

The Hunter is one of few regions in the world with large protected catchments for its water supply reservoirs. Very few or no people live in the reservoirs' catchments. As well, public access, recreation and other activities that could degrade water quality are minimised.

Although we are lucky to have well-protected water supply catchments, there are still many factors that affect the remainder of our catchment areas. These are a combination of human and non-human (let's say 'natural') influences.

Natural influences of catchment water quality

- Geology and soil types. For example, weathering basalt contributes phosphorus to our waterways.
- Vegetation coverage maintains cleaner water through minimising erosion and dryland salinity, and acting as a filter of surface water.
- Climate influences the volume of water in waterways, either diluting or concentrating contaminants.

Human influences of catchment water quality

- Urban and industrial development may remove native vegetation, increase soil erosion, and be a source of stormwater runoff containing nutrients, litter, heavy metals, and bacteria.
- Agriculture may remove vegetation and increase nutrient and sediment loads to the water.
- Recreation within or beside waterways can create soil erosion and be a source of pollutants such as greases and oils, nutrients, sediment and litter.

Keeping catchments clean is crucial to the quality of our water. Hunter Water works with the NSW Environment Protection Authority (EPA), NSW Department of Sustainable Natural Resources, NSW Fisheries, NSW Agriculture and many local community groups to protect our catchments.

Monitoring catchments

The population and diversity of aquatic life are easily affected by environmental stresses. Water quality monitoring involves checking for changes in aquatic life and chemical and physical parameters. It provides valuable information on the health of a waterway and the likely stresses it is facing.

Protect your catchment!

Show others what can be achieved

Set a good example by conserving and recycling water, and composting food scraps for starters.

Join a community group

Join a local community group and play an active and rewarding role in protecting your environment and your local catchment area.

Don't overuse detergents and cleaners

Wash cars on the lawn, keep fertilisers and animal manure away from drains, and use correct doses of chemicals.

Choose the right product

Use environmentally friendly products, recycle where possible, and dispose of waste material carefully to minimise pollution and nutrients entering our waterways.

Keep sediment out of waterways

Stop suspended particles such as silt, clay, sand, and other wastes entering waterways. These sediments can reduce light penetration needed for photosynthesis and absorb heat which warms the water and reduces oxygen levels.

Maintain grass and tree cover

Keep grass and/or tree cover where possible to stop soil from washing into gutters, drains or waterways.

Keep organic matter out of waterways

Ensure organic matter from your property - including leaf litter, animal droppings, lawn clippings and garden waste - does not find its way into gutters, drains or waterways.

Properly maintain your septic tanks

Clean septic tanks and, if necessary, move the transpiration area or get a new system that spreads waste over a larger area.

Store and dispose of pollutants carefully

Properly store and dispose of grease and sump oil, paint products, pesticides, fertilisers, chemicals and poisons.

Acknowledgement

Case Study C

4.2 Water & Wastewater Services FOR THE MAITLAND COMMUNITY

Hunter Water Corporation

The Hunter District Water Board was established in 1891 to provide reliable and clean drinking water and to collect and treat the community's wastewater. In 1991, Hunter Water became a corporation to raise efficiency, performance and accountability, and to reduce operating costs and charges to its customers.

Hunter Water Corporation (HWC) provides water and wastewater services for residents and industry in Newcastle, Lake Macquarie, Maitland, Cessnock and Port Stephens.

Hunter Water's Objective - Continuous improvement in being commercially successful and in delivering value-for-money water, wastewater and associated services in an environmentally responsible way.

Hunter Water's links with Maitland

Hunter Water has strong links with the Maitland region. Walka Water Works was the lower Hunter's earliest water source. This facility was constructed in 1887 on the Hunter River floodplain just north of Maitland. Until decommissioning in 1947, water was piped 35 kilometres from the Works to Newcastle.

Today, most of Maitland's drinking water comes from Chichester Dam, and is distributed through a system of reservoirs - the largest being at Stoney Pinch, Cessnock, Buttai, Neath, Rutherford, Pelton and Rothbury.

Hunter Water also operates wastewater treatment works at Morpeth, Farley, Kurri Kurri, Cessnock, Kearsley, Paxton and Branxton. Over the past 15 years most of Hunter Water's wastewater treatment works have been upgraded. These improvements cater for population growth and provide increased protection for local waterways and catchment areas around Maitland.

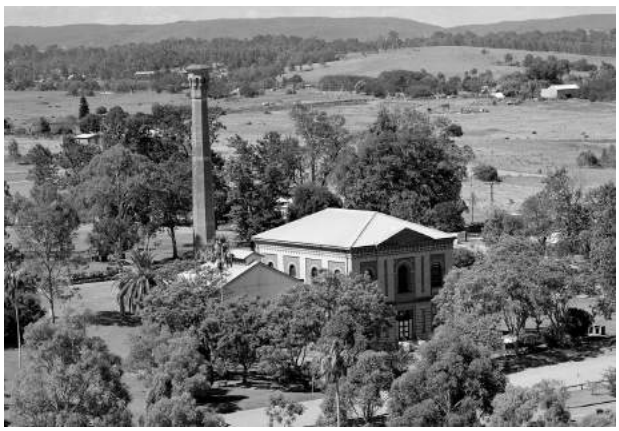
Hunter Water's operating profile

The water supply to customers meets the most recent guidelines for drinking water set by the National Health and Medical Research Council.

The community's wastewater is biologically treated. Clear, treated effluent is then discharged to waterways or reused where it is economical and where there are real environmental benefits for the community.

Population Served	495,000
Total Asset Value	$1.9 billion
Total Annual Revenue	$125 million
Permanent Workforce	430 staff
Water Treatment Works	5
Water Connections	199,000
Water Mains System	4,270 km
Water Reservoirs	77
Pumping Stations	74
Grahamstown Dam	152,000 ML
Tomago Sandbeds	60,000 ML
Chichester Dam	21,500 ML
Anna Bay Sandbeds	16,000 ML
Wastewater Works	17
Sewer Connections	187,000
Sewer Mains System	4,440km
Wastewater Pump Stations	364

ML = megalitre (one megalitre is 1 million litres; an Olympic swimming pool is about 800,000 litres).



Walka Water Works (Oakhampton) was built in 1887 to supply domestic water to Newcastle and the Lower Hunter.

Case Study C

4.2 Water & Wastewater Services FOR THE MAITLAND COMMUNITY

Managing water resources

Hunter Water extracts raw water under a licence issued by the Department of Sustainable Natural Resources (formally Department of Land & Water Conservation). The licence requires Hunter Water to protect the environments affected, such as the Williams River, by monitoring these catchments and developing strategies to minimise the impact of water extraction.

Raw water is treated at Water Treatment Plants (WTPs) to ensure supply of high quality drinking water. This water must comply with the current National Health and Medical Research Council (NHMRC) Drinking Water Quality Guidelines (1996) (*www.health.gov.au/nhmrc*).

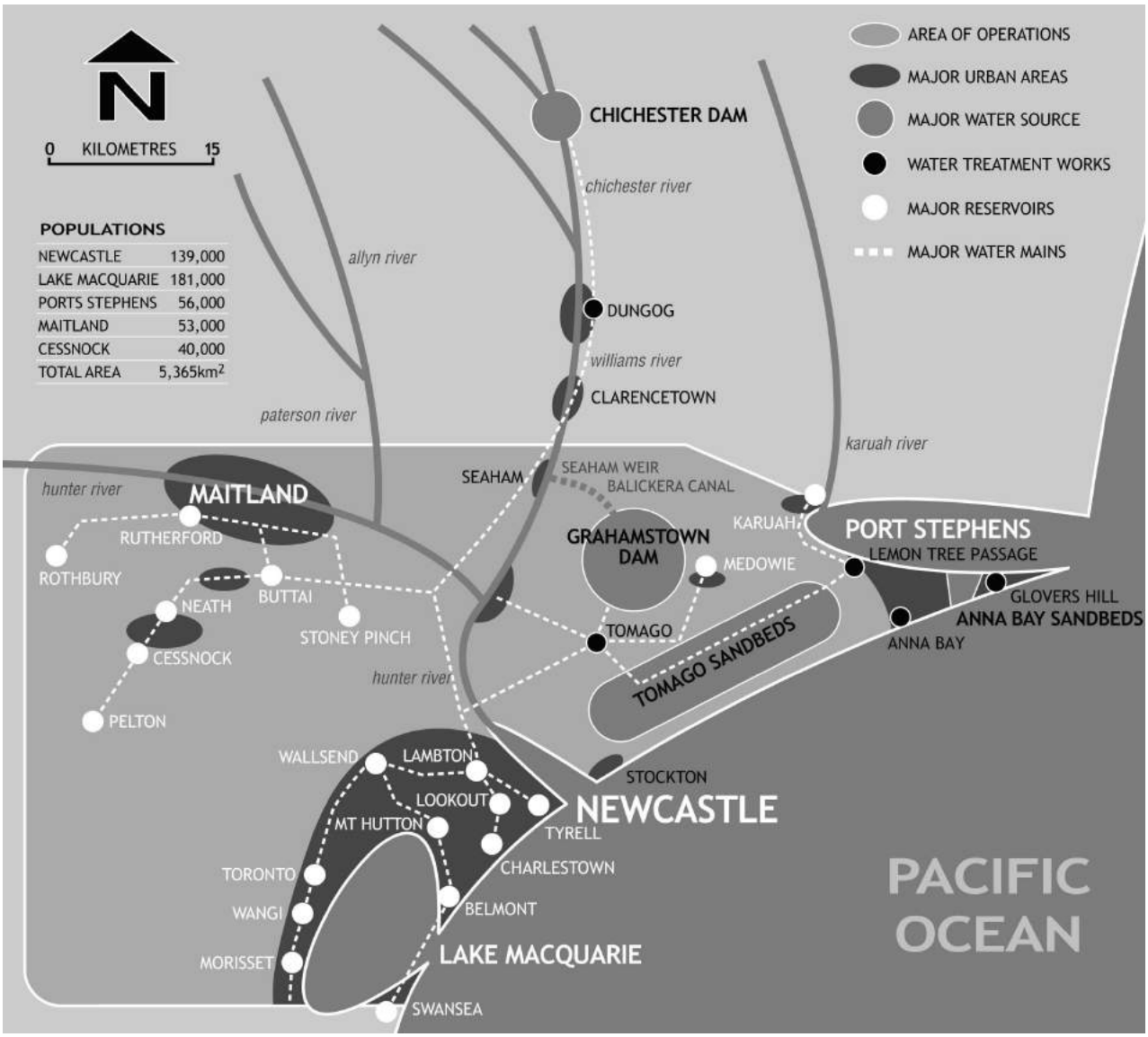
Guaranteeing future water supply

Hunter Water guarantees future water supply by:

- helping to manage and protect local catchments;
- development of a drought management plan;
- promoting water conservation;
- promoting the use of recycled water where possible;
- supporting pricing that rewards water conservation;
- educating the community about water issues; and
- optimising existing water sources before developing new ones.

Consumers can also guarantee future water supplies by:

- using water-saving devices (e.g. dual flush toilets, efficient shower roses) and AAA-rated appliances;
- watering gardens at night rather than during the day;
- sweeping paths instead of hosing them;
- only washing full loads of clothes, and
- repairing leaking taps around the home.



LOWER HUNTER WATER SUPPLY INFRASTRUCTURE

Case Study C

4.2 Water & Wastewater Services FOR THE MAITLAND COMMUNITY

Sources of raw water

Raw water used by Hunter Water includes surface waters from Chichester and Grahamstown Dams, and ground waters from Tomago and Tomaree sandbeds.

Tomago sandbeds, Grahamstown and Chichester dams

Water from Chichester, Grahamstown and Tomago contains some naturally present impurities, which need to be removed by filtration. The raw water may contain clays, silts, natural organic matter, iron and manganese, and micro-organisms. In addition, the natural pH of the water may need adjustment.

Tomaree sandbeds

Untreated water from the Tomaree sandbeds requires only disinfection, fluoridation and pH adjustment.

Issues connected with raw water use

As outlined above, Hunter Water must provide some treatment of raw water to make it suitable for drinking. The issues that may arise if raw water includes:

- clays and silts cause 'cloudy' water and particles can shield micro-organisms from disinfection;
- natural organic matter, iron and manganese can cause taste, odour and discolouration problems;
- high or low pH causes corrosion, taste and odour problems, and ineffective disinfection;
- micro-organisms can cause pathogenic illness.

Good drinking water

Drinking water should be safe to use and aesthetically pleasing. It should be clear and colourless, with no unpalatable taste or odour. As well, it should contain no suspended matter, harmful chemical substances or pathogenic micro-organisms.

KEY PARAMETERS

PHYSICAL:
Turbidity, pH level, Colour

CHEMICAL:
Iron, Manganese, Aluminium, Copper, Lead, Zinc, Fluoride, Chlorine, Trihalomethanes

MICROBIOLOGICAL:
Total Coliforms, Faecal Coliforms

Standards for these parameters are set by the National Health & Medical Research Council (NHMRC) Drinking Water Guidelines.

The water treatment process

① RAW WATER

Rain, river and dam water is diverted and stored in dams, then transported to treatment plants.

↓

② COAGULATION / FLOCCULATION

Liquid aluminium sulfate (alum) and/or polymer is added to the raw water causing tiny dirt particles in the water to stick together (coagulate). The particles eventually form larger, heavier particles called flocs which are easier to remove by settling or filtration.

↓

③ SEDIMENTATION

The water and the floc particles progress into sedimentation basins where the water moves slowly causing the heavy floc particles to settle to the bottom. Floc that collects on the bottom of the basin is called sludge and is piped to drying lagoons. In 'direct filtration' sedimentation doesn't occur and the floc is removed by filtration only.

↓

④ FILTRATION

Water flows through a filter designed to remove particles in the water. The filters are made of layers of sand and gravel, and in some cases, crushed anthracite. Filtration catches the suspended impurities in water and improves the effectiveness of disinfection. The filters are routinely cleaned by a process called 'backwashing'.

↓

⑤ DISINFECTION

Disinfection removes disease-causing bacteria, viruses, and parasites. Chlorine is very effective at guarding against possible biological contamination in the water distribution system.

↓

⑥ FLUORIDATION

Water is fluoridated to improve dental health as required by the Fluoridation of Public Water Supplies Act (1957).

↓

⑦ pH CORRECTION

Lime is added to adjust the pH and stabilise the naturally soft water, minimising corrosion in water pipes.

↓

⑧ SLUDGE DRYING

Solids collected during sedimentation and filtration are removed to drying lagoons.

↓

⑨ DISTRIBUTION

Treated water is transported to storage reservoirs for distribution to homes and industry.

Case Study C

4.2 Water & Wastewater Services FOR THE MAITLAND COMMUNITY

Treating wastewater

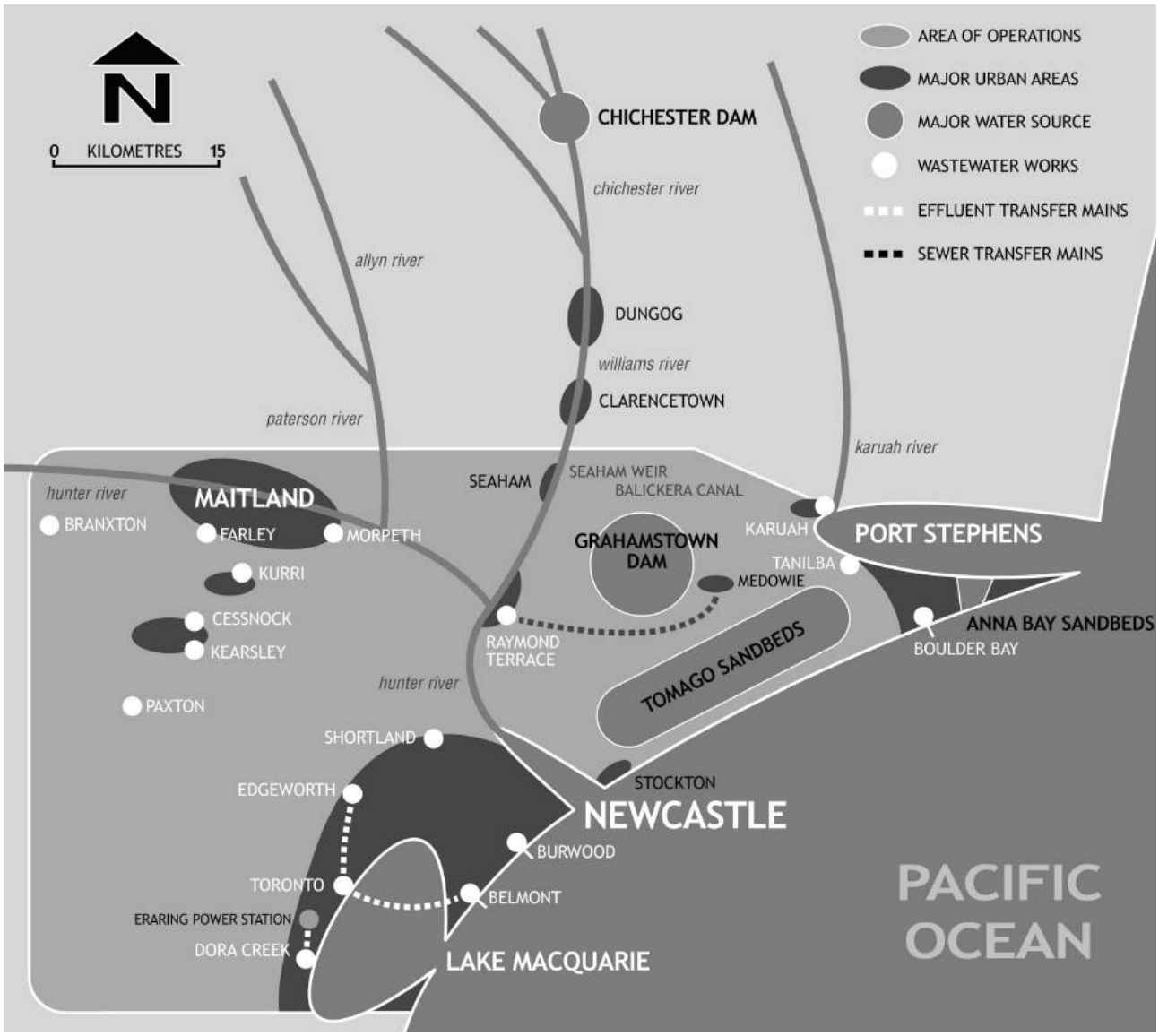
People use water for many activities, most of which contaminate water in some way. This contaminated water is called 'wastewater'. It must be collected, treated and returned to the natural water cycle with minimal impact to the environment.

Hunter Water has upgraded all of its Wastewater Treament Works (WWTW) over the past 15 years to reduce the impact of wastewater on local catchments and waterways. Hunter Water's WWTWs use naturally-occurring bacteria to break down wastewater into simpler and safer substances. The further removal of phosphorus involves the use of metal salts. The disinfection stage uses ultraviolet light or chlorine (with water being declorinated before release by using sulphur dioxide).

Protecting the environment

The water reclaimed during treatment is disinfected and returned to local creeks and rivers. At Hunter Water's coastal plants saltwater and sunlight help to purify this reclaimed water. All discharges must comply with EPA guidelines and Hunter Water's Operating Licence.

The sludge and biosolids produced during treatment are further treated, then dewatered and recycled in local industrial projects. These projects include minesite rehabilitation, industrial landscaping, native woodlots and co-composting facilities. All recycling of water and biosolids must also comply with EPA guidelines.



LOWER HUNTER WASTEWATER TREATMENT INFRASTRUCTURE

Case Study C

4.2 Water & Wastewater Services FOR THE MAITLAND COMMUNITY

What is wastewater?

Wastewater comes from homes, commercial premises, schools, colleges, hospitals, manufacturing and industrial factories. At times wastewater will also contain varying amounts of stormwater from infiltration.

Wastewater contains approximately 99.9% water and 0.1% solids. Expressed in another way, every 1,000 kilograms (or 1,000 litres) of wastewater contains about 1 kilogram of solids. The solids are made up of organic and inorganic compounds suspended in the wastewater.

Volatile solids, which comprise about 70% of the wastewater solids, give the water its unpleasant characteristics. The majority of the solids - carbohydrates, fats and proteins - are broken down during treatment into more stable inorganic compounds by bacteria/micro-organisms.

Wastewater also contains some organic compounds that are very resistant to normal treatment processes. Such compounds include detergents, plastics and cellulose.

WASTEWATER COMPOSITION

ORGANICS:
Carbohydrates, Fats, Oils, Grease, Pesticides, Herbicides, Insecticide, Phenols, Proteins, Surfactants, Volatile Organic Compounds

INORGANICS:
Acidity or alkalinity (pH), Chlorides, heavy metals, Nitrogen, Phosphorus, Sulphur

GASES:
Hydrogen Sulphide, Methane, Oxygen

Biological treatment: air is pumped through the wastewater providing oxygen to micro-organisms as they break down the waste.

The wastewater treatment process

① SCREENING
Non-biodegradable solids and objects are removed from the wastewater by selective screening. These screenings are usually compressed and sent to a landfill site.

↓

② GRIT REMOVAL
Grit and sand is normally separated from the wastewater in a small vortex tank which is designed to permit only the heavier solids (grit) to settle. The grit is collected, washed and then sent to a landfill site.

↓

③ FLOW BALANCING AND ODOUR CONTROL
Flow equalisation tanks provide a means of smoothing out fluctuating flows and limiting the maximum flows entering the treatment works in time of wet weather. The inlet works is fully covered to contain odours which are treated by a soilbed filter underground.

↓

④ BIOLOGICAL TREATMENT
Biological processes are designed to break down organic matter into simpler chemical substances such as carbon dioxide, methane and nitrates. The processes are carried out by micro-organisms which obtain food from the organic matter in the wastewater.

↓

⑤ CLARIFICATION
Biological solids settle out from the effluent in large concrete clarifiers (tanks). The solids are often recycled back to the bioreactor and the clear effluent flows on to the disinfection system.

↓

⑥ DISINFECTION
Potentially harmful bacteria are killed through a disinfection process involving high intensity ultraviolet (UV) lights and/or additions of chlorine to the effluent.

↓

⑦ DISCHARGE EFFLUENT
The effluent (or reclaimed water) is either discharged via pipelines to the Hunter River or may be reused on local golf courses or woodlots.

↓

⑧ SLUDGE DRYING
The sludge (solids/bacteria) resulting from the treatment processes is dewatered forming a biosolid that can be reused in suitable industrial recycling projects.

Acknowledgement

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Case Study C

4.3 The Impact & Management of FLOODING IN MAITLAND

The history of flooding in Maitland

Maitland was brought to prominence during Australia's early European settlement by its location on fertile floodplains at the highest navigable part of the Hunter River. This location, however, was also a weakness because of the constant danger of flooding. Although it was clear to the early settlers that the low-lying areas of Maitland were subject to flooding, this did not deter their development.

Throughout the history of settlement on the Hunter River, floods have been frequent and their impacts widespread and severe. The first recorded flood at Maitland was in 1820. From 1819 to 2000 Maitland recorded over 200 floods. Over 70 floods exceeded the critical level of 8 metres at the Belmore Bridge. Of these, the 1955 was the highest (12.1 metres), although it is thought that the flood of 1820 may have reached a similar level.

Rainfall over the Hunter catchment between 22nd and 28th February 1955 averaged 270 millimetres, with 430 millimetres along the Liverpool Range. This rain fell on an already saturated catchment and the resulting flood volume was one-and-a-half times the river's mean annual discharge.

In the early hours of Friday 25th February, floodwaters at Maitland reached their peak, flowing at over 100,000m^3 per second (or 100 ML per second). At this time, the west bank just north of Maitland gave way and the river poured into the city.

Flooding in eastern High Street, West Maitland. A timber wall had been constructed to keep the river out of High Street. This was the original course of the river until the change in 1893. This photograph could have been taken then or possible during the 1913 flood.
[Source: Maitland City Council collection, in Walsh & Archer 2000]

Tearing of the 1955 floodwaters at the old Belmore Bridge, taken from Lorn looking back towards the Courthouse and High Street.
[Source: Maitland City Council 1983]

The 1955 flood resulted in the loss of fourteen lives, the destruction of many homes, and the inundation of thousands of hectares of productive farmland. 248 hectares of rich alluvial land over a length of 82 kilometres was lost (i.e. 23 million m^3 of soil). Markers to show the highest flood levels from the 1955 event were placed on telegraph poles between Maitland and Hexham. Some of these are still visible today, although apparent impacts on property prices have seen many of these history markers removed.

The 1955 flood put Maitland back on the map and the city has had a reputation for flooding ever since. This was possibly due to the dramatic Cinesound newsreel footage that was shot during the flood and shown throughout Australia and across the world.

The 1955 flood was the first major natural disaster to be communicated to the broader community via the movie screen. The footage involved a dramatic helicopter rescue involving two men being killed whilst in the process of being rescued, and the helicopter crashing after hitting high tension wires. The crew of the helicopter were rescued from the floodwaters by an army duck two miles downstream from the disaster. The helicopter disappeared and was not found until some weeks later, covered by silt in Fishery Creek.

Case Study C

4.3 The Impact & Management of FLOODING IN MAITLAND

Flood mitigation

The 1955 flood was particularly severe as early flood protection works were poorly planned and constructed haphazardly around the Maitland area from the late 1850s until 1930. We now know that the early levees blocked natural flood relief channels and were often located too close to the main river channel. The work was usually carried out by farmers without technical advice, with the objective of excluding all floodwaters.

Without a co-ordinated valley-wide plan, the construction of one levee often led to the construction of another and another (and so forth) as farmers tried to protect their own properties from the impact of floodwaters off their neighbours' land. Flood heights and velocities were increased by the high levee banks, which increased the damage to life and property across the floodplain.

Hunter Valley Flood Mitigation Scheme

Following the 1955 flood, the State Government passed the Hunter Valley Flood Mitigation Act in December 1956. The Act authorised the Department of Public Works with the financial assistance of the Hunter Valley Conservation Trust, to carry out properly-designed flood mitigation works. The 1955 flood also gave impetus to the development of floodplain management, which is now the preferred approach to reducing flood impacts in the Hunter Valley.

The Hunter Valley Flood Mitigation Scheme and its infrastructure aimed to:

- reduce the frequency of flooding;
- reduce the time floodwaters remained on the land after a flood passes; and
- control the direction and velocity of floodwaters to reduce damage to farmland and property.

Smaller floods are to be confined to the river. In the case of larger floods the aim is to gradually allow floodwaters to spill into natural flood basins along the river. Land is then restored to normal production by providing adequate drainage channels and floodgate outlets.

Features of flood mitigation:

Levees

Levees are grassed earth embankments built along the river to confine the waters of smaller floods. They are constructed with gentle back slopes to reduce risk of scour and failure when overtopped. After a large flood, floodwaters are trapped behind levees and in many places enlarged flood drains have been built to return the water to the river in a reasonable time.

Floodgates

A floodgate is contructed where flood drains pass through a levee. These structures have a flap that only opens when the water level behind the levee is greater than that in the river, allowing trapped water to flow out.

Spillways

A spillway is the section of levee at the entrance to a floodway, which is the natural cross-country passage of overbank floodwaters. Spillways allow large volumes of floodwater to leave the river in a controlled manner.

Control banks

Control banks are built perpendicular to the direction of flow along the length of some floodways. They form a series of basins that reduce the water velocity by dropping the floodwaters in steps safely across the land.

Bank protection

Bank protection works are provided along the river in areas where serious erosion is occurring due to scouring action during floods.

The most significant parts of the Hunter Valley Flood Mitigation Scheme are in the Maitland area and comprise the Oakhampton and Bolwarra floodways, the Maitland levee and ring levees, and the Louth Park levees. A map of the scheme is provided on the following page.

Future flooding in Maitland

Maitland will always be subject to floods. The continuing debate, however, is on the severity of future flood events. One possibility is that Glenbawn Dam, which was still under construction at the time of the 1955 flood, would absorb most, if not all, of any excessive run-off coming from the Mount Royal Range. This would mean that flooding from a 1-in-100 year event, like the 1955 flood, would be moderated to a lower category such as a 1-in-20 year event.

The Hunter Catchment Management Trust is the governing body responsible for flood mitigation and floodplain management. As a matter of policy, the Trust takes the view that another 1-in-100 year flood will probably occur again and plan accordingly.

Acknowledgement & References

This case study has been prepared by Stefan Weyer (Oakhampton Landcare). Other information sources included:

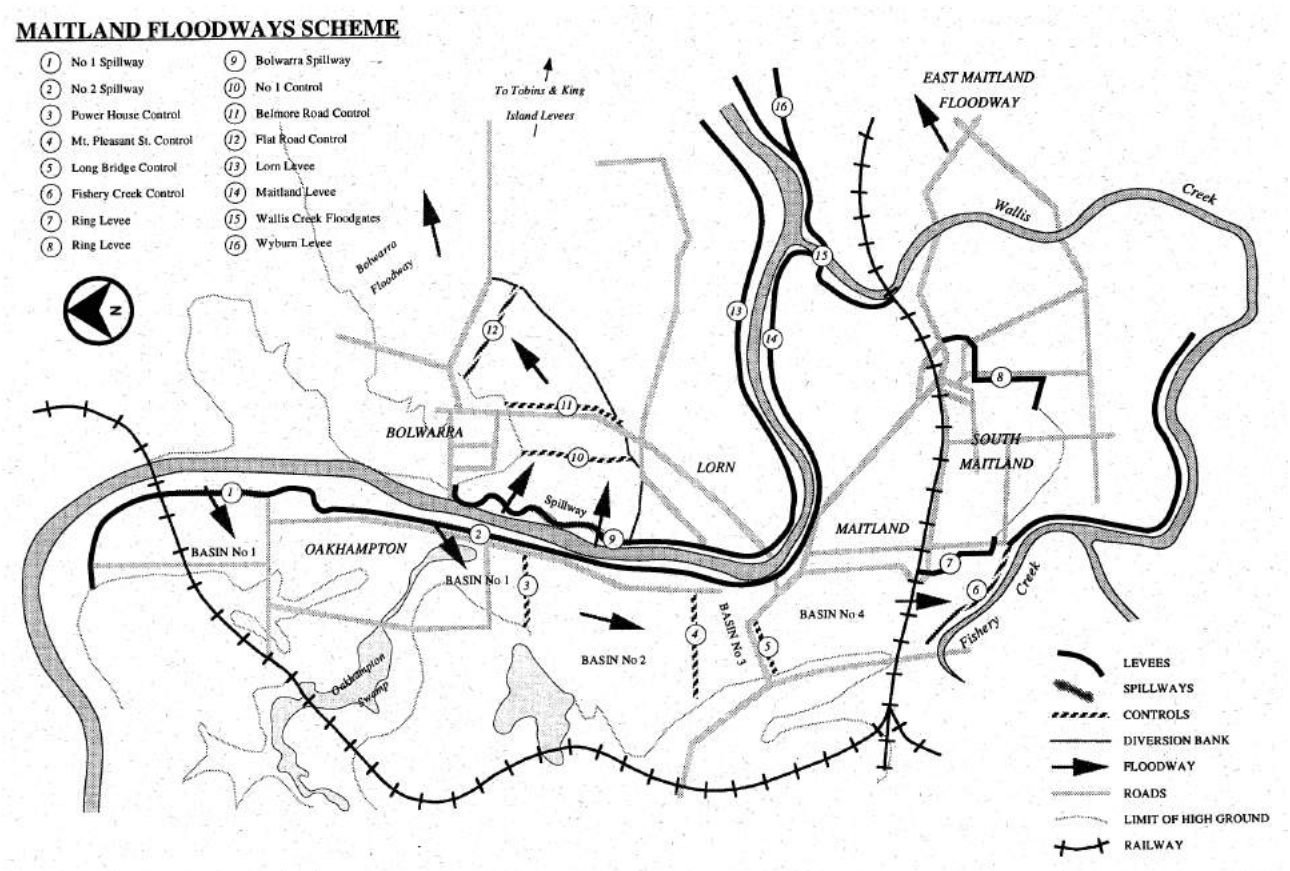
Maitland City Council 1983, *A new history of Maitland*, Maitland, NSW: Maitland City Council.

Public Works Department (NSW) 1994, *Lower Hunter Flood Mitigation Scheme* (compilation of fact sheets).

Walsh, B. & Archer, C. 2000, *Maitland on the Hunter*, Tocal, NSW: CB Alexander Foundation.

Case Study C

4.3 The Impact & Management of FLOODING IN MAITLAND



The predicted path of floodwaters

① During a high magnitude flood (1-in-20 year event or greater), over half of the total flow upstream of Maitland is directed into the Oakhampton and Bolwarra floodways, with the remainder being contained within the river.

② The first overtopping occurs at Oakhampton Spillway (No.1) and the floodwaters start to fill Basin No.1.

③ As the flood rises further, the next two spillways are also overtopped (Oakhampton No.2 and Bolwarra). At the same time, the inflow commences at the downstream ends of each floodway (i.e. over Wyburns Levee and over Tobins and King Island Levees).

④ As the flood continues to rise the Powerhouse Control is overtopped. Control No.1 and Belmore Road control are also submerged.

⑤ The flooding continues establishing a floodway through Bolwarra and the flow from the lower end (back from Tobins and King Island Levees) discharges back into the Hunter River over the lower levees.

⑥ Mt. Pleasant Control is overtopped and very shortly afterwards so is the Long Bridge Control and then Basin No.3.

⑦ As the flood rises even higher the areas covered increase until the whole floodplain, with the exception of Lorn and Maitland, is submerged.

All this can take as little as twelve hours in a rapid rise flood.

Reference

This information has been taken from Public Works Department (NSW) 1994, *Lower Hunter Flood Mitigation Scheme* (compilation of fact sheets).

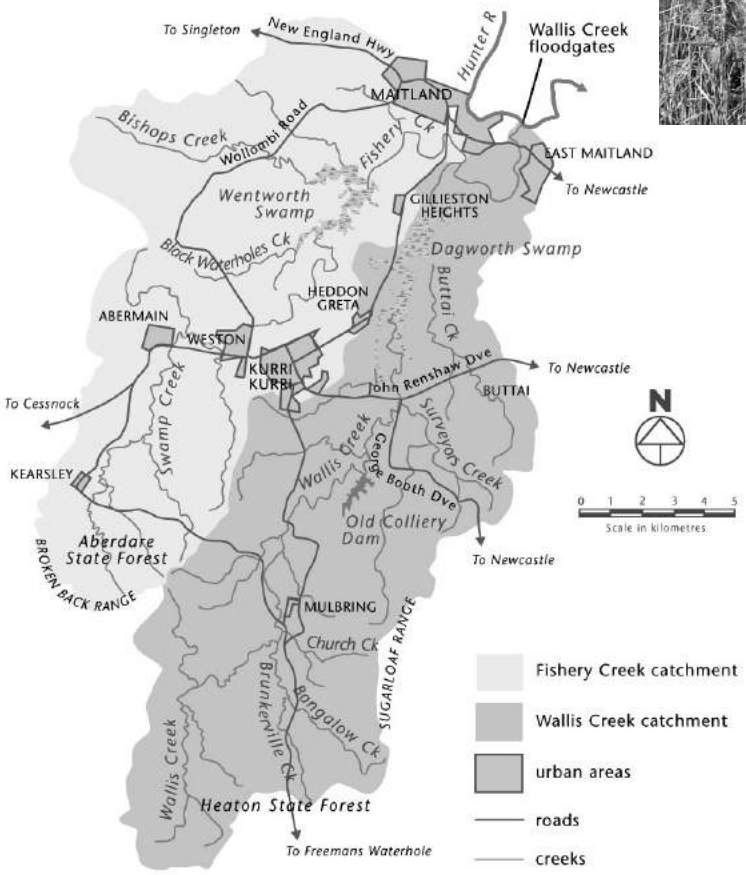
Case Study C

4.4 Catchment Management of WALLIS & FISHERY CREEKS

A catchment description

The catchment of Wallis and Fishery Creeks is inland from Newcastle near Maitland. The catchments of the two creeks are adjacent to each other and drain into the Hunter River about 3 kilometres downstream of Maitland (see map).

The Wallis Creek catchment has an area of 21,100 hectares. The Fishery Creek catchment has an area of 19,300 hectares. The majority of the catchment lies within the Cessnock Local Government Area, with 19.3% of the combined catchment within the Maitland local government area.



Map of Wallis and Fishery Creek catchments

Land use in the catchment

The existing land uses within Wallis and Fishery Creeks' catchment have evolved due to two main factors:

- the natural features of the area; and
- the availability of water.

These two factors have been the main influence on historical land use, which is reflected by the pattern of development within both catchments.

The growing residential area around Rathluba Lagoon is placing pressure on the waterway.

Coal resources and associated mining activities were the drivers for the major land uses within the Fishery Creek catchment. The poor soils of the dry sclerophyll forest that formerly covered the catchment and the ephemeral nature of the creeks, made this area less attractive to agriculture.

Development and settlement within the Fishery Creek catchment was initiated by the surveying of the Greta Coal Seam. The relatively shallow depth to the coal resources led to the opening of numerous mines. Settlements started close to the mines. These areas grew to form villages, and later towns. Due to the need for water, the villages were based along the banks of Fishery Creek.

The current pattern of urban development is characterised by the villages of Abermain, Weston, Loxford and Kurri Kurri. In many cases, development is located too close to the creek (e.g. Abermain and Weston).

Case Study C

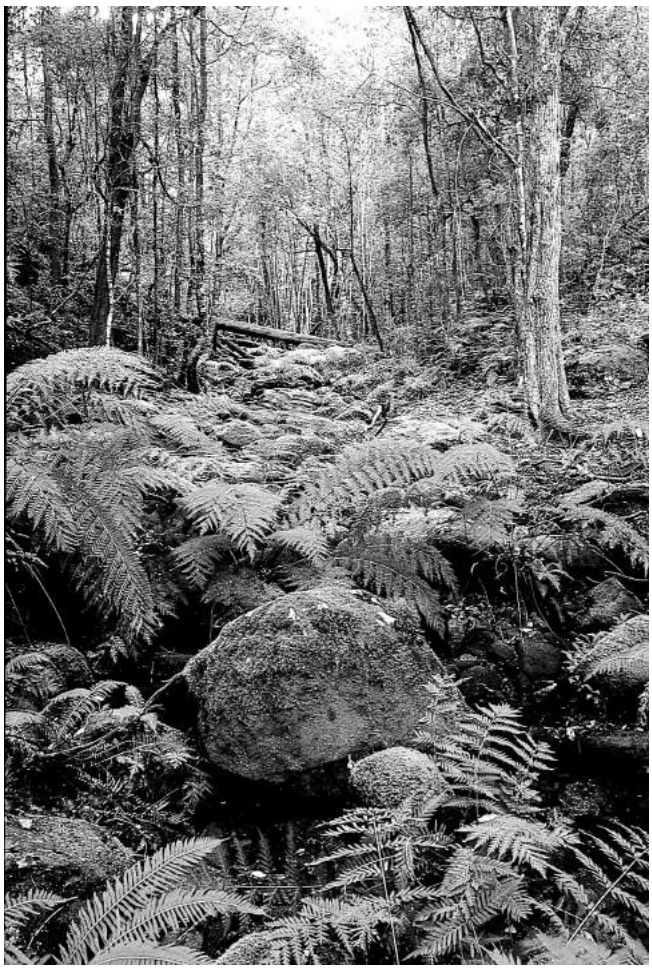
4.4 Catchment Management of WALLIS & FISHERY CREEKS

Land use in the catchment (cont.)

Similarly, historical land uses within the Wallis Creek catchment expanded due to the availability of water for agriculture. Historically, land use within the catchment was linked to the settlement of Maitland, which dates from 1818 when European settlers took up land grants along the banks of the Hunter River.

A SUMMARY OF CATCHMENT LAND USE TODAY

✳ Bushland and forests	48.7%
✳ Grazing	37.2%
✳ Fertilised grazing	1.6%
✳ Intensive cropping	1.2%
✳ Dams and wetlands	1.4%
✳ Low and medium density residential	3.8%
✳ Rural residential	2.2%
✳ Commercial and industrial	1.1%
✳ Other disturbed land	2.8%



Rainforest in the upper Wallis Creek.

Total Catchment Management

Total Catchment Management (TCM) recognises the water catchment as an ideal geographical unit for studying natural resource problems.

TCM brings together government authorities, community groups and individuals to tackle issues that confront the health of a catchment. It seeks to actively involve community members as 'local experts' who know about their own area, its problems and possible solutions.

TCM provides a management direction for a catchment. It encourages everybody within that catchment to consider their impacts on others and on the catchment itself. It involves the development of a strategy to achieve sustainable natural resource management.

Applying Total Catchment Management to Wallis & Fishery Creeks' catchment

Impacts on Wallis and Fishery Creeks' catchment have become more severe over the last ten years due to population growth and an associated increase in development pressure. The effects of these impacts have included:

- a decline in stream water quality;
- a reduction in the diversity of native plants and animals;
- an increase in land clearing; and
- a shift from farming to rural residential living.

Members of the local community raised these concerns with Maitland City Council, Cessnock City Council, the Hunter Catchment Management Trust, the Department of Land and Water Conservation and the Environment Protection Authority. A partnership was then created between community and government - the Wallis and Fishery Creeks TCM Committee was formed (1995).

The TCM Committee includes representatives from:

- Cessnock and Maitland City Councils,
- Department of Sustainable Natural Resources (formerly Dept. Land & Water Conservation),
- Environment Protection Authority,
- Department of Mineral Resources,
- Hunter Water Corporation,
- Hunter Catchment Management Trust,
- local industry,
- Landcare groups, and
- individual community representatives.

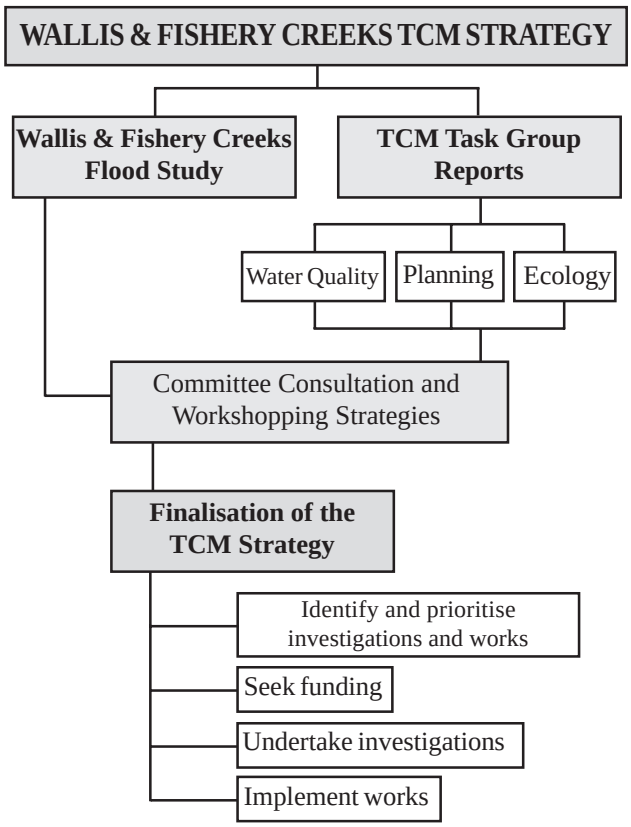
Case Study

4.4 Catchment Management of WALLIS & FISHERY CREEKS

The role of the TCM Committee

The Committee's task was to outline a plan (TCM Strategy) to maintain and improve the health of the catchment and the quality of lifestyle that the wider community would like.

The members' roles in developing the strategy included providing information on the current status of the catchments; identifying issues of concern; and prioritising strategic actions.



The involvement of everyday local people is a vital part of the TCM Committee. Having a diversity of people and organisations working together provides opportunities for sharing different ideas and resources. It also reflects a shared responsibility for the care and management of the local environment.

Being a member on the TCM Committee wasn't the only way for local people to help create the Wallis and Fishery Creek TCM Strategy. Local people were encouraged to:

- raise issues of concern with TCM Committee members;
- join one of the Task groups where discussion of key issues and potential strategies were developed;
- make written submissions on the draft TCM Strategy;
- attend public meetings to obtain information and raise concerns.

Key issues addressed by the TCM Strategy

Degradation of Wentworth and Dagworth Swamps

These wetland areas have been drained and used as grazing land. This has disrupted the wetland's natural processes, including water filtering and providing habitat for native flora and fauna.

Declining creek water quality

There has been a growing number of pollution sources leading to cumulative impact on the waterways.

Control of the Wallis Creek floodgates

The floodgates impact on water quality and flushing of the creek. Water is often not able to flow out into the Hunter River.

Development pressures on rural land

Pressures come from both residential and industrial developments as agricultural land becomes 'sterilised' from production.

Flooding

Areas around Weston and Abermain are prone to flooding, affecting many urban residents.

Soil erosion and creek sedimentation

The soil entering the creeks eventually settles and clogs the creek, disturbing its natural behaviour.

What next?

The next stage of the TCM Strategy is one of the most important. It involves implementing the proposed actions. Those already happening include:

- completing Rivercare Plans for both creeks and working with landholders to implement them;
- protecting areas of existing native vegetation;
- encouraging the establishment of vegetation corridors in priority areas;
- fixing up areas of erosion and maintaining groundcover.

Acknowledgement & References

This case study has been prepared by Jane Young (Wallis & Fishery Creek TCM Coordinator, Hunter Catchment Management Trust). Other information sources included:

Hunter Catchment Management Trust 2000, *Wallis and Fishery Creeks Total Catchment Management Strategy*, Paterson, NSW: Hunter Catchment Management Trust.

Case Study C

5.1 Local Environmental CITIZENSHIP

What is it?

Active and informed citizenship involves participation in community activities and public affairs. Caring for the environment by taking an active role in the local community is described as *environmental citizenship*.

Demonstrating environmental citizenship could start by being sustainable in your own home, e.g. composting kitchen scraps instead of putting them in the rubbish bin.

Local active and informed environmental citizenship

Joining a community group can be a very rewarding experience. You can always achieve more and make a bigger difference when you are working together with like-minded people.

Landcare

Landcare groups across Maitland tackle local concerns such as poor wetland health, riverbank erosion, biodiversity decline, and loss of bushland. Landcare volunteers are involved in on-ground projects that include activities such as planting native trees, shrubs and grasses, weed removal, litter collection, mulching, and raising community awareness.

Local Landcare groups are active at Greenhills Gardens, Tenambit Wetland, Morpeth Common, Largs Community Reserve, Bolwarra Wetland, Melaleuca Ponds and along the Hunter River (from Aberglasslyn to Lorn). Refer to map of community environmental sites across Maitland.

How to get involved:

- Join a local Landcare Group and participate in their meetings, working bees and training workshops.
- **Ph:** Maitland Landcare Coordinator (02) 4934 9838.
- **Website:** *www.maitland.infohunt.nsw.gov.au*

Hunter Bird Observers

The Hunter Bird Observers Club (HBOC) is a group for both beginner and more experienced bird watchers. HBOC aims to encourage the study and conservation of Australian birds and promote bird observing as a leisure time activity.

How to get involved:

- **Ph:** (02) 4958 9838.
- **Website:** *www.users.hunterlink.net.au/hboc/home.htm*

Native Animals

The Native Animal Trust Fund (NATF) is a group of local volunteers involved in the rescue and rehabilitation of sick, injured and orphaned native animals. The group also relocates native animals that are causing distress to property owners.

NATF run a 24-hour emergency hotline for people who find injured or sick wildlife. The hotline number is 0500 502 294.

Volunteers can be involved in animal caring, answering the phone hotline, education activities and administration. NATF runs workshops to train volunteers in animal management; the group's trainers are highly experienced carers and wildlife experts.

How to get involved:

- **Meetings:** the third Tuesday of each month at the Shortland RSL Club at 7.30 pm.
- **Email:** natf@bigpond.com
- **Website:** *www.users.bigpond.com/natf*

Australian Plants

The Australian Plants Society promotes the conservation and use of native plants in gardens and bushland areas. The Lower Hunter group is affiliated with the Australia-wide Plants Society. Members of the group participate in meetings with guest speakers, plant identification sessions and field trips to gardens or natural areas.

How to get involved:

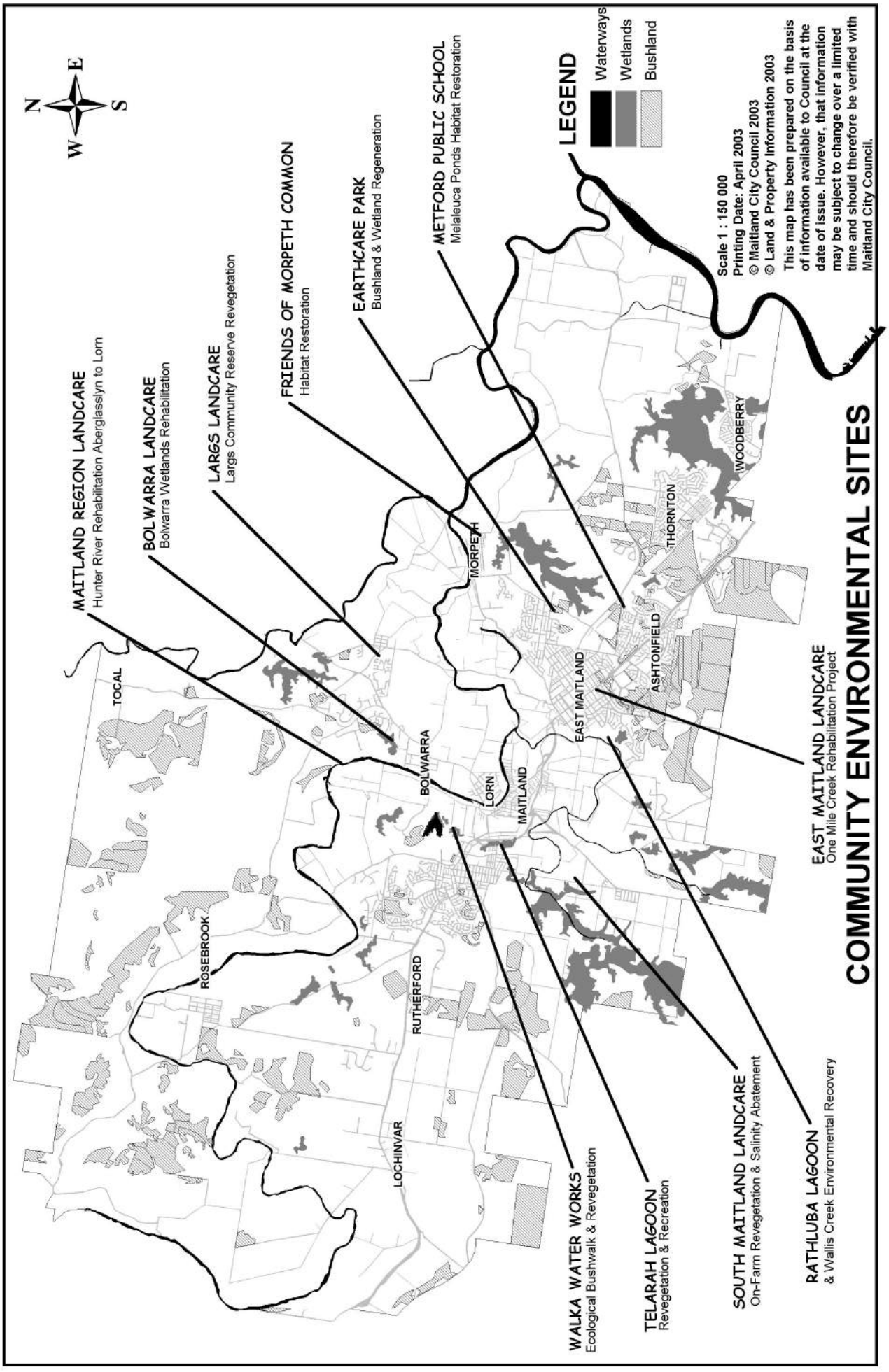
- **Meeting:** the third Wednesday of every month at the Polish Hall, Maitland.
- **Ph:** Sue Newman (02) 4930 5564.

Waterwatch

Hunter Waterwatch is a community water quality monitoring program. It involves volunteers from community groups or schools doing water tests in local creeks, rivers and wetlands. All volunteers are trained to use the Waterwatch Kit and conduct regular water tests, as well as spring and autumn waterbug surveys.

How to get involved:

- **Ph:** Waterwatch Coordinator (02) 4930 1030.
- **Website:** *www.waterwatch.nsw.gov.au*


COMMUNITY ENVIRONMENTAL SITES
MAITLAND REGION LANDCARE
Hunter River Rehabilitation Aberglasslyn to Lorn
BOLWARRA LANDCARE
Bolwarra Wetlands Rehabilitation
LARGS LANDCARE
Largs Community Reserve Revegetation
FRIENDS OF MORPETH COMMON
Habitat Restoration
EARTHCARE PARK
Bushland & Wetland Regeneration
METFORD PUBLIC SCHOOL
Melaleuca Ponds Habitat Restoration
EAST MAITLAND LANDCARE
One Mile Creek Rehabilitation Project
RATHLUBA LAGOON
& Wallis Creek Environmental Recovery
SOUTH MAITLAND LANDCARE
On-Farm Revegetation & Salinity Abatement
TELARAH LAGOON
Revegetation & Recreation
WALKA WATER WORKS
Ecological Bushwalk & Revegetation
LEGEND
Waterways
Wetlands
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Scale 1 : 150 000
Printing Date: April 2003
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This map has been prepared on the basis of information available to Council at the date of issue. However, that information may be subject to change over a limited time and should therefore be verified with Maitland City Council.
TOCAL
ROSEBROOK
RUTHERFORD
LOCHINVAR
BOLWARRA
LORN
MAITLAND
MORPETH
EAST MAITLAND
ASHTONFIELD
THORNTON
WOODBERRY

Case Study C

5.1 Local Environmental CITIZENSHIP

Community Events Calendar

March

Clean Up Australia Day

Since 1989 this event has been held on the first Sunday of March to remove waste from the Australian environment. Across Maitland participants remove about 3 tonnes of waste annually.

- **Ph:** 1800 024 890
- **Website:** *www.cleanup.com.au*

Autumn Water Bug Survey

A Hunter Waterwatch event to measure waterway health in the region using macroinvertebrates.

- **Ph:** Waterwatch Coordinator (02) 4930 1030

July

National Tree Day

Planting local native trees, shrubs, grasses and groundcovers is the focus of this event held on the last Sunday of July.

National Tree Day promotes the importance of native vegetation to wildlife. Landcare groups, Council and other community groups host tree planting sites throughout Maitland.

- **Ph:** Maitland Landcare Coordinator (02) 4934 9838

September

Biodiversity Month

A month to celebrate the variety of life on earth and raise awareness of the importance of the web of life, which provides us with fresh air and clean water.

- **Ph:** Maitland Landcare Coordinator (02) 4934 9838

Spring Water Bug Survey

- **Ph:** Waterwatch Coordinator (02) 4930 1030

October

P-day

Nutrient awareness day to measure phosphorous in waterways.

- **Ph:** Waterwatch Coordinator (02) 4930 1030

Individual action

At an individual level you can contribute to decisions being made in your community. If there is an environmental, social or cultural issue that concerns you, there are a number of ways to have your message heard:

Speak with community leaders

Focus on the people in our community who make decisions, such as Councillors and politicians.

Write a letter

State your concerns in a letter to:

- Local Councillors - find out the contact details of your Councillors from Maitland City Council on (02) 4934 9700.
- Local Members of Parliament - see 'Parliament' in the White Pages.

Petitions

Start a petition about the issue that concerns you and present this to the Mayor of Maitland and the local State Member of Parliament.

Use the media

Raise the issue you are concerned about in the local media, write a letter to the editor or talk to a reporter.

Waterwatch workshops are organised by Maitland Region Landcare to help people gain water monitoring skills.

Gathering data and other information on an issue, like poor water quality, is one of the first steps towards active citizenship.

Revegetating with native species is one way to help improve local water quality and biodiversity.

Case Study C

5.1 Local Environmental CITIZENSHIP

Profile of local environmental citizens

David Power (East Maitland)

Age: 21 years *Profession:*Electrical design

Motivation: The author Bradley Greive once described the earth's ecosystem as a building made of pillars. You can remove one or two with no great effect. You remove several more and from a distance it looks perfectly fine. As you look closer however you can see cracks in the pillars from the extra load they are bearing and if you remove even more you weaken it until it collapses.

How do you contribute to our local environment?
I belong to several community groups in the area:

- Landcare for bush regeneration/preservation;
- Earthcare Park for community education and bush regeneration;
- Native Animal Trust Fund (NATF) for injured native animal rescue, rehabilitation and release.

The most important thing that I do is to think first about how my actions are going to affect the environment and other people. If everyone makes a small effort, together we can make a big difference to the world.

What benefits do you gain from being involved?
I get a sense of pride when I go back to a site that was once an open paddock but now has trees and shrubs supporting a wide range of wildlife that otherwise would have nowhere to go. I also feel great satisfaction when I release an animal back into the wild after having cared and nursed it back to full health.

By working in my local environment I have had some great experiences that the general public may miss. I've canoed down the Hunter River and watched baby turtles being released back into the environment. I have met so many interesting people of all ages and backgrounds that are aiming for the same thing and are doing their bit towards it - it's a great way to make friends.

What is your message to other young people?
Your actions, no matter how small, will have an effect on the people around you. Your actions will affect the environment right around the world as you influence the people around you, around them, and the circle grows.

Catherine Baird (Woodville)

Age: 19 years *Profession:* Environmental Science student, University of Newcastle

Motivation: Initially I joined the Maitland Environmental Youth Council (MEYC) because I enjoyed bushwalking, camping and just being outdoors. I saw MEYC as a group where fun could be had while improving our local environment.

Being involved with local groups puts me in contact with a variety of people who are passionate and well-educated about our environment. These people inspire and motivate me to attend working bees, workshops, forums and meetings.

How do you contribute to our local environment?
I regularly attend working bees at Earthcare Park to help with tree planting, weed removal and litter collection.

I am also involved with the MEYC, Landcare and The Wilderness Society. I study Environmental Science at university so that I can better understand environmental degradation and how we can remedy these problems.

What benefits do you gain from being involved?
I am in contact with environmental professionals from a variety of backgrounds (biological, management, conservation). This allows me to be continually educated (in a non-formal way) about the natural environment while doing on-ground work.

I have also made many new and wonderful friends who share my concern for the environment. Knowing that I am one of many contributing to a more sustainable society is also great.

What is your message to other young people?
The natural environment isn't something that you can separate yourself from, it provides for all requirements of human survival.

Being concerned and involved in your local environment doesn't mean that you're a 'greenie'- it means that you have respect and are considerate towards other living organisms. Don't be scared to get involved; if you set an example and lead the way others will soon follow.

Being involved with local environmental groups is a lot of fun as you get out and enjoy the beauty of Nature, make new friends and learn ways to live more sustainably.

Case Study C

5.2 Maitland Environmental YOUTH COUNCIL

Who are Maitland Environmental Youth Council (MEYC)?

We are a group of young people between the ages of 12 and 25. As a group we put forward our views on local environmental issues and turn talk into action!

Our aims are to:

- improve our local environment,
- increase awareness of environmental issues,
- provide youth perspectives to adults and decision-makers,
- encourage young people to take action and care for the environment, and
- have FUN whilst making a difference.

The MEYC was started in July 1997 by a group of young people from the first Maitland Enviro Youth Forum.

Removing Water Hyacinth at Morpeth Common.

Demonstrating active citizenship

The achievements of the MEYC show that our enthusiasm and commitment to the environment are making a difference.

Our group members participate in local Landcare projects and we have helped to establish thousands of native trees, shrubs and grasses across Maitland. We have carried out bushland regeneration, weed removal, habitat creation and helped to establish a bushfood education area. We have even donned waders and removed Water Hyacinth from Morpeth Common Wetland.

In 2002 we organised the first Maitland Biodiversity Challenge. This event involved over 100 high school students planting native trees for biodiversity at Tenambit Wetland. 800 trees were planted on the day!

Sharing our story and educating others

Since 1998 we have organised the annual Maitland Enviro Youth Forum, which attracts over 150 high school students. The event focuses on developing young people's skills and knowledge and provides them with a way to get involved in the MEYC or other local environmental activities.

Native seed collection workshop at the Enviro Youth Forum.

We have also made guest presentations at international and statewide conferences, Enviro Youth Forums in other regions, and Landcare events.

During 2003-04 we will travel to other regional centres in NSW to present Youth Environmental Workshops and inspire other young communities to set up their own EYCs.

Educating ourselves

The highlight of our year is the environmental youth training camp at Wangat Lodge in the Chichester Forest. The camp provides an opportunity for us to get to know each other and learn how to work as a team.

At the camp we do many different activities including:

- bushwalking and swimming;
- music, drama and environmental role plays;
- cooking foods from different cultures;
- frog and nocturnal animal spotlighting walks;
- bush regeneration; and
- above all, making many great friends.

Case Study C

5.2 Maitland Environmental YOUTH COUNCIL

Have your say!

We strongly believe in young people expressing their views, thoughts and feelings to decision-makers. After all, we are the ones who will inherit the outcomes of these decisions.

Choices made about our environment are going to have consequences for life on earth today, tomorrow and far into the future. Often environmental decisions have unexpected consequences.

At the Maitland Enviro Youth Forum, students complete a survey on their local environmental concerns. We ask what they think should be done to find solutions to environmental issues. The results of the survey are presented in a report to Maitland City Council.

We are actively providing feedback to Maitland City Council and commenting on important plans for our city, such as the Maitland Greening Plan. As a group we felt so strongly about commenting on the Maitland Greening Plan that we produced a video about the protection of our native bushland for our local Councillors to watch.

29th May 2002

General Manager
Maitland City Council
PO Box 220
Maitland NSW 2320

Dear Mr Evans,
RE: Submission on the proposed environmental levy

I am an active member of the Maitland Environmental Youth Council who lives in Ashtonfield.

I have read Council's flyer on *Maitland's Future Environment*. I think that the environmental levy is one of the best ideas Maitland Council has ever had to help take care of our local environment. As a young person I am really concerned that environmental issues are getting worse and worse and that unless we take some kind of action now our quality of life is going to be compromised in the future. Our environment is what supports us, we can't keep taking from it without giving anything back!

Whilst I am too young to be a ratepayer at this stage, I have spoken with my parents, and they are supportive of the environmental levy.

The environmental levy is an investment not just in our local environment, it is an investment in our future. We want to grow up in a Maitland that is truly clean and green, not polluted and totally developed.

I am happy to speak further with you about my support of the environmental levy or my concerns regarding the current state of our environment.

Why should you care?

The environment is what supports us all - it provides us with food, shelter, clothes, air, water - and all of the other things we need for survival (not just for humans but for all living things).

Sadly, our environment is becoming more and more polluted and devastated. We all have a responsibility to secure a healthy future.

Getting involved in the Maitland Environmental Youth Council is a great way to make a big positive difference for our environment. It's also a chance to meet new people, gain skills, do something worthwhile and have heaps of fun.

So, what does it mean to become an MEYC member?

- It shows that you support our group and its aims.
- It gives you the chance to find out about and come along to any of our activities and events.
- You'll receive the Maitland Landcare newsletter to stay informed about all of the things happening across our local environment.
- And most importantly, you'll be helping to look after our local environment and making a real difference!

How to get involved

We meet after school on the first Wednesday of every month. The venue for our meetings is usually the Maitland Town Hall, but other times we're at a working bee, on a field trip or at another member's place.

You can join the MEYC, it only costs $2 and new people are joining all the time. Send your name, postal address and phone number to the address below.

- **Ph:** Maitland Landcare Co-ordinator (02)4934 9838
- **Website:** *www.geocities.com/maitland_eyc*
- **Post:** Maitland Environmental Youth Council, PO Box 392, East Maitland NSW 2323.

The feeling you get from being involved.

Case Study C

5.3 Landcare: Making a DIFFERENCE

What is Landcare?

Landcare is possibly the most well-recognised environmental movement across Australia. A snapshot of NSW shows there are over 34,600 individuals involved in Landcare. These people are volunteers drawn from different backgrounds, professions and of all ages.

The benefits of Landcare are three-fold:

Environmental - improving and conserving the health of our soil, water, native plants and wildlife.

Social - helping people to work together on local problems generates community spirit.

Economic - improving the sustainable management of our natural resources and productivity on farms.

Is there a Landcare group near you?

Most Landcare groups in Maitland work on public land and all projects have been started by the local community.

Morpeth

The Friends of Morpeth Common are improving habitat for waterbirds and other wildlife. This has involved: planting windbreaks; establishing natives around the pond edge; caring for historic fig trees; and creating an outdoor education area and sensory garden.

Largs

At Largs Community Reserve (on Dunmore Road) improvement works are almost complete along an urban stream. Planting native trees and shrubs, constructing a footbridge and undertaking water quality tests have improved habitat and passive recreation opportunities.

Hunter River

Rehabilitation of the Hunter River is taking place at Oakhampton, Maitland Vale, Bolwarra and Aberglasslyn. This involves revegetation and weed control.

East Maitland

Bush regeneration and wetland rehabilitation is the focus of the Earthcare Park project (on Metford Road). Activities involve: establishing a bushfood garden; bushland regeneration; planting on the wetland fringe; and developing the site for passive recreation purposes.

East Maitland

The One Mile Creek urban stream management and rejuvenation project involves native plantings, litter collection, weed control and erosion control.

Metford

Metford Public School cares for Melaleuca Ponds (on Schanck Drive) by removing litter, planting natives and testing water quality.

Bolwarra

The Bolwarra Wetland rehabilitation project aims to conserve and enhance wildlife habitat, including remnant rainforest, by planting natives and controlling weeds.

Maitland Region

Environmental education projects are organised by Landcare. These include the Hunter River Canoe Trip, field days and community training workshops. Maitland Landcare also has input into local and regional decision-making, including the Maitland Greening Plan.

Landcare runs native seed collection workshops and uses plants grown from locally collected seeds in their revegetation projects.

East Maitland Landcare members removing weeds and rubbish from One Mile Creek. Prevention of such issues has focused on education through information pamphlets and leading by example.

Case Study C

5.3 Landcare: Making a DIFFERENCE

East Maitland Landcare Group

One Mile Creek, East Maitland

One Mile Creek is an urban stream fed by stormwater. If you were a leaf that dropped in the gutter along Chisholm Road you would be taken in a pipe to the headwaters of One Mile Creek in Greenhills Gardens. Floating through the public reserve managed by Maitland Council, you would see a mix of bushland and areas of open space.

Then suddenly you would be in darkness, rushing through a pipe under the New England Highway. You continue in an open channel through residential and light industrial areas. After you've travelled about 2.5 kilometres down One Mile Creek you would be met by the waters of Two Mile Creek near the Main Northern Railway Line. The two creeks merge to then flow through Maitland Golf Course and enter Tenambit Wetland.

One Mile Creek was not always a defined channel, as it is now, but a series of ephemeral ponds that filled during wet times and dried out at different rates. The creekline was dug out in the 1970s to create a defined channel with edges. At the time this was the accepted practice for management of urban streams.

Community concern initiates action

One Mile Creek has been dramatically altered by urbanisation of its catchment. In 1994, the local community raised concern about the following changes to One Mile Creek:

- increased infestations of weeds along the waterway;
- sediment coming from urban developments;
- grass mowing in degraded areas causing erosion;
- increased urban run-off and streambank erosion;
- loss of remnant vegetation;
- rubbish dumping and litter; and
- declining water quality.

East Maitland Landcare Group was formed in early 1996 to address these concerns. The group prompted Maitland City Council to prepare a Plan of Management for Greenhills Gardens. It also initiated the development of an Urban Stream Management Plan for One Mile Creek, prepared by the NSW Dept. Land & Water Conservation (now known as NSW Dept. Sustainable Natural Resources).

Working together helps One Mile Creek

East Maitland Landcare group involves about 15 people who volunteer their time to improve One Mile Creek. In addition to group labour, investment in the local creek has been gathered from Maitland City Council, the Commonwealth Government's Natural Heritage Trust, NSW Dept. Sustainable Natural Resources' Rivercare program, Hunter Catchment Management Trust, and Maitland High School's Waterwatch program.

Transformation of One Mile Creek

The on-ground achievements of East Maitland Landcare group include:

- restricting grass mowing in bushland areas to allow for natural regeneration of understorey species;
- planting over 3,500 local native trees, shrubs, groundcovers and grasses;
- decreasing erosion by planting native grasses and constructing mounds to direct run-off;
- constructing rock works to slow the velocity of water at the drain under Brisbane Street;
- regular removal of weeds, rubbish and litter from the creek and its surrounds; and
- placing over 20 bird and possum nest boxes throughout Greenhills Gardens.

East Maitland Landcare have also promoted the importance of caring for catchments and encouraged a strong local appreciation for One Mile Creek. The group has distributed pamphlets about the creek to the local community and hosted school excursions to raise awareness of Landcare activities. Community events such as National Tree Day and Clean Up Australia Day, have also been held at Greenhills Gardens.

Tackling a local issue: Weeds

Both noxious and environmental weeds are present within the One Mile Creek catchment. These are a result of dumping garden waste and weed seed spread by stormwater. Controlling weeds in the catchment encourages the regeneration of native understorey species.

Noxious weeds found in the One Mile Creek catchment include Mother of Millions, Noogoora Burr and Willow trees.

(Source: Auld, B.A. & Medd, R.W. 1992, *Weeds: An illustrated botanical guide to the weeds of Australia*, Melbourne: Inkata Press; p.157.)

Mother of Millions is a vigorous plant that reproduces via vegetative means - if a small piece of plant material breaks away from the mother plant it forms a new plant. The control of Mother of Millions has been particularly successful along One Mile Creek. Landcare members manually remove the plants and place them immediately in bags that are disposed of in the rubbish bin.

How can you get involved?

Contact the Maitland Landcare Coordinator on 4934 9838 to find out about the next working bee.

Case Study C

5.4 Regeneration at EARTHCARE PARK

Where is Earthcare Park?

Earthcare Park is located on Metford Road, East Maitland and is part of a Crown Reserve called East Maitland Common. It is zoned for public recreation and is under the care and control of Maitland City Council.

The site is approximately 35 hectares of gently sloping, low-lying land that includes sections of Tenambit Wetland and remnant Spotted Gum and Ironbark forest.

Site history

Vegetation

Originally the native vegetation at Earthcare Park would have included:

- **Lower Hunter Spotted Gum Ironbark Forest**, found on hilltops, which included an open forest of eucalypts with an understorey of prickly shrubs.
- **Alluvial Tall Moist Forest**, found on the south facing slopes, with tall eucalypts amongst a dense small tree canopy of rainforest and paperbark species.
- **Freshwater Wetland Complex**, found on the low-lying floodplain. It included a dense understorey of rushes, sedges and aquatic plants, with paperbarks and swamp oaks found on the wetland margins.

Aboriginal occupation

Tenambit Wetland would have been an important place for local Aboriginal people because of its abundant food sources. Foods such as waterfowl, turtles, shellfish and various plant foods would have been gathered. Aboriginal sites in the area have been recorded and include open campsites, a fish trap, scarred trees, bora/ceremonial sites, an art site, axe grinding grooves and a midden.

European use

From the early 1800s European settlers cleared most of the Tenambit Wetland area. The site also has a long history of stock grazing as 'Commons' were traditionally shared areas used for this purpose. Cattle have been removed from the Earthcare Park site since August 1996.

In the 1920s the site was the rifle range for the West Maitland Volunteers. The mounds used for shooting practice are still visible on the lower slopes of the site.

Other parts of East Maitland Common have been developed for public recreation purposes including sporting fields, a BMX Track, golf practice range, horse trotting track, and a model aeroplane strip.

Ecosystems and wildlife

Bushland

The site's remnant bushland is limited to the clay-based hill top, which has lost most of its topsoil. This ecosystem includes the following species:

Tall Open Forest

- Spotted Gum (*Corymbia maculata*)
- Grey Ironbark (*Eucalyptus paniculata*)
- Forest Red Gum (*Eucalyptus tereticornis*)

Understorey

- Sickle Wattle (*Acacia falcata*)

Ground Cover

- Kidney Weed (*Dichondra repens*)
- White Root (*Pratia purpurascens*)

Wetland

The wetland zone covers the low-lying part of the site and includes native aquatic species:

- Sedges (*Juncus* species and *Eleocharis* species)
- Water Ribbons (*Triglochin procerum*)
- Clubrushes (*Schoenoplectus* species)
- Jointed Twigrush (*Baumea articulata*)

Fauna

The site offers a range of habitats such as tree hollows, fallen logs and a permanent water source that are mostly suited to birds, reptiles and amphibians. Using these habitats can be a problem for some animals (especially aboreal and ground-based mammals) as they must first travel across a large area of open space to get to the site. This makes them more vulnerable to predators.

Many birds feed and nest at Earthcare Park. These include the Pacific Black Duck, Australian Pelican, Egrets, Ibises, Royal Spoonbill, Nankeen Kestrel, Purple Swamphen, Little Corella, Sulphur-crested Cockatoo, Black Cockatoo, Eastern Rosella, and Superb Fairy Wren.

Reptiles that inhabit the site include the Eastern Bearded Dragon, Blue Tongue Lizard and Red-bellied Black Snake.

Case Study C

5.4 Regeneration at EARTHCARE PARK

Impacts on ecosystems

Land clearing

Extensive clearing of native vegetation in the early 1800s has significantly reduced biodiversity, affecting the variety of flora and fauna found at the site. The clearing also isolated the remnant forest, making it more dangerous for fauna to move through the open areas to the site.

Cattle grazing

The long history of cattle grazing at Earthcare Park has caused soil erosion and compaction. This has led to a decline in the health of older trees. Cattle have also destroyed understorey vegetation and made it difficult for bushland to naturally regenerate.

Weeds

Introduced weed species have become a problem because they compete with native plants for sunlight, water and essential nutrients. Some of the common weeds found on the site are:

- Kikuyu *(Pennisetum clandestinum)*
- Couch *(Cynodon dactylon)*
- Paspalum *(Paspalum dilatatum)*
- Blackberry Nightshade *(Solanum nigrum)*
- Fireweed *(Senecio madagascariensis*)

Domestic and feral animals

Native flora and fauna at Earthcare Park are threatened by domestic and feral animals through grazing and predation. These pest species include dogs, cats, rabbits and foxes (with cattle having already been removed).

Water quality

Water quality in Tenambit Wetland is affected by surrounding land uses including agriculture, residential living, industry and recreation. Run-off from these areas adds nutrients and other pollutants to the wetland.

Land clearing and rising water tables have created a dryland salinity problem in the wetland area, with occasional salt scalds forming on the soil surface.

The steps to demonstrating active and informed citizenship

1. A site was chosen (August 1996) with the aim to transform a degraded area and promote practical and educational environmental activities.

The Metford Road site was preferred because it had been affected by human activities for many years, was located on public land, and offered a chance to link with the Four Mile Creek wildlife corridor.

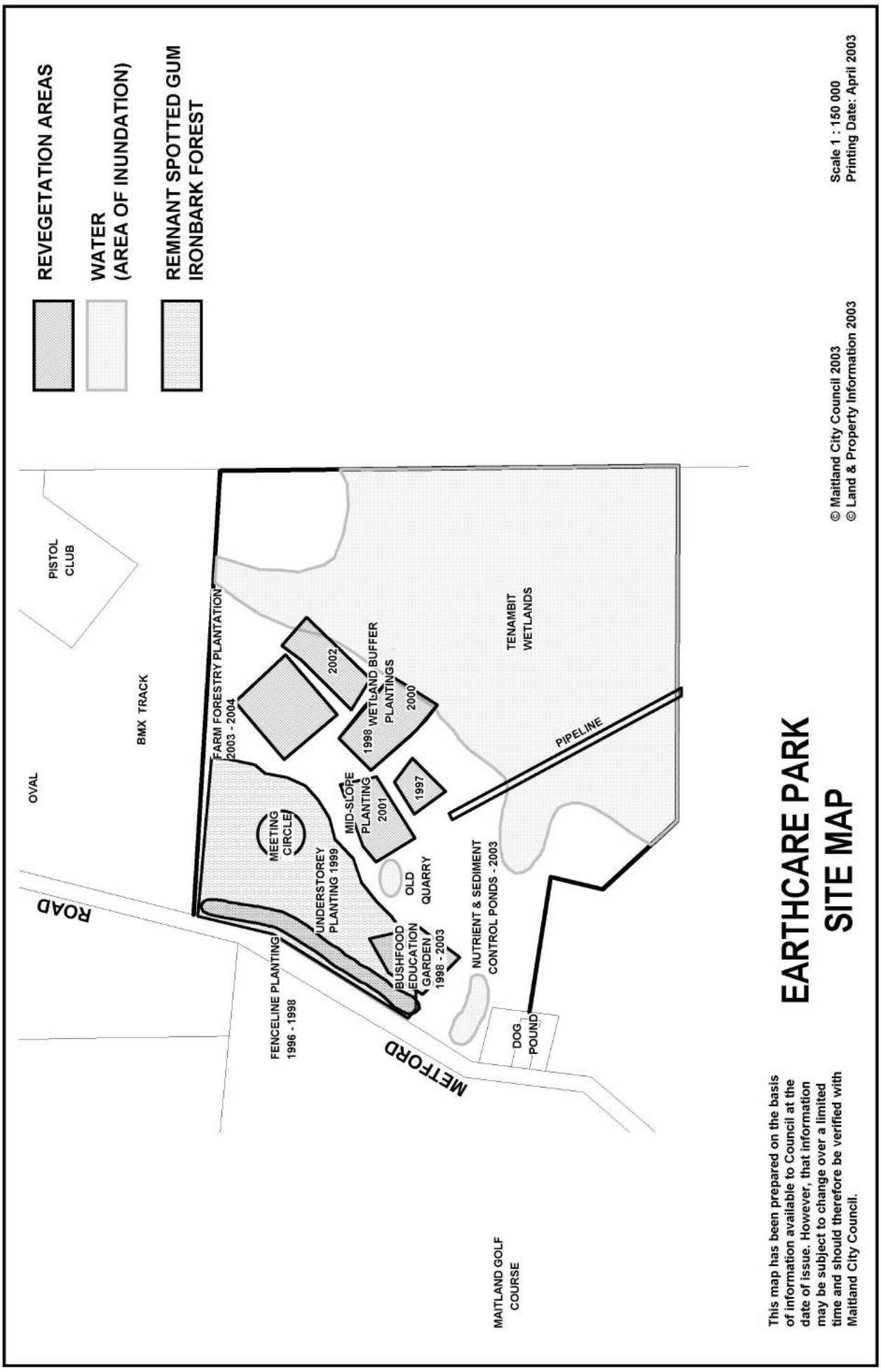
The site was also favoured because it was close to road and rail transport, schools and other recreation facilities.

2. Investigation of the site took place with help from local community members, environmental professionals and organisations. The focus was on flora and fauna, soils, archaeology and hydrology. Studies on these elements gave baseline information about the site and highlighted the issues that needed to be addressed.

3. Developing a plan of action used information from each study and identified priorities for action. The first priority was to seek funding and support for the regeneration of the site. The group gained assistance from Maitland City Council, the Federal Government's Natural Heritage Trust and the Hunter Catchment Management Trust.

4. Making a difference began on the most degraded section of the site. The work aimed to re-introduce native understorey plants, improve the soil, and reduce erosion by building mounds and swales, mulching, and revegetating. Other projects have also addressed issues of concern (refer to Earthcare Park site map):

1996 Planting native understorey along the fenceline.
1997 Wetland buffer planting.
1998 Setting up a community bushfood education area.
1999 Planting more understorey amongst the remnant bushland area.
2000 Wetland buffer planting and nestboxes in trees.
2001 Biodiversity planting on the mid-slope.
2002 Wetland buffer planting with school students through the "Biodiversity Challenge".
2003 Farm Forestry Plantation trial and construction of nutrient and sediment control ponds.


REVEGETATION AREAS
WATER (AREA OF INUNDATION)
REMNANT SPOTTED GUM IRONBARK FOREST
PISTOL CLUB
OVAL
BMX TRACK
FARM FORESTRY PLANTATION 2003 - 2004
2002
1998
WETLAND BUFFER PLANTINGS 2000
TENAMBIT WETLANDS
PIPELINE
1997
MID-SLOPE PLANTING 2001
MEETING CIRCLE
UNDERSTOREY PLANTING 1999
OLD QUARRY
NUTRIENT & SEDIMENT CONTROL PONDS - 2003
ROAD
BUSHFOOD EDUCATION GARDEN 1998 - 2003
FENCELINE PLANTING 1996 - 1998
METFORD
DOG POUND
MAITLAND GOLF COURSE
EARTHCARE PARK
SITE MAP
© Maitland City Council 2003
© Land & Property Information 2003
Scale 1 : 150 000
Printing Date: April 2003
This map has been prepared on the basis of information available to Council at the date of issue. However, that information may be subject to change over a limited time and should therefore be verified with Maitland City Council.

Case Study C

5.4 Regeneration at EARTHCARE PARK

The steps to demonstrating active and informed citizenship (cont.)

5. Monitoring and evaluating progress for all site projects is important. It is part of the group's reporting obligations to sponsors and also helps to maintain motivation and enthusiasm of volunteers.

Changes at the site are recorded through photographs and written descriptions. Areas that were once bare are now covered by native trees, shrubs and grasses.

Dressed in waders, group members are ready to collect water samples and carry out investigations of wetland flora and fauna.

The donation of people's time to on-site projects are recorded. About 500 hours of labour is invested on the site annually, this is valued at $7,500. The number of native plants established is also recorded. Between 1996 and 2003, over 5,000 natives have been planted.

Keeping these records also helps the community group to attract more support and funding from governments and private enterprise. Importantly, it also helps to evaluate the success or otherwise of on-ground works.

Community involvement

The regeneration of Earthcare Park would not have been possible without community involvement. Organising training workshops, media promotion and field days have helped the Earthcare Park group to generate environmental awareness and motivate people.

Some of these community education events involved:

- workshops on understanding biodiversity, native seed collection, bushfoods and permaculture;
- school excursions to the site, including tours of the bushfood education garden;
- tree planting days for the wider community.

Information stalls and workshops at community events have helped to generate interest in the project and get new people involved.

You are invited...

Involvement in the Earthcare Park project is open to everyone. The group's monthly working bees attract about 15-20 people of all ages - young children, teenagers, adults and older people. Enjoyment as well as environmental improvement are the focus of the group's activities.

Assistance is needed with a variety of tasks including revegetation, planning projects, seeking sponsorship, writing newsletters and investigating the plant and animal life on the site.

Placing nestboxes in trees has helped improve habitat for native birds.

How do you get involved?

- **Meetings & Working Bees:** first Sunday of every month at Earthcare Park, Metford Rd, East Maitland.
- **Ph:** Landcare Coordinator (02) 4934 9838.
- **Website:** *www.earthcare.asn.au*

Case Study C

5.5 Restoring Wetlands AT MORPETH

Wastewater to wetlands

The decommissioned treatment ponds at the old Morpeth Wastewater Treatment Works (WWTW) have been transformed into a wetland sanctuary for birds.

The original Morpeth WWTW was constructed in 1940. During 2001 a new $20M treatment works was constructed to accommodate population growth and reduce nutrients entering local waterways.

The original WWTW used a series of shallow ponds to allow direct sunlight to kill bacteria in the effluent. The new facility uses artificial ultraviolet (UV) light in a disinfection tank.

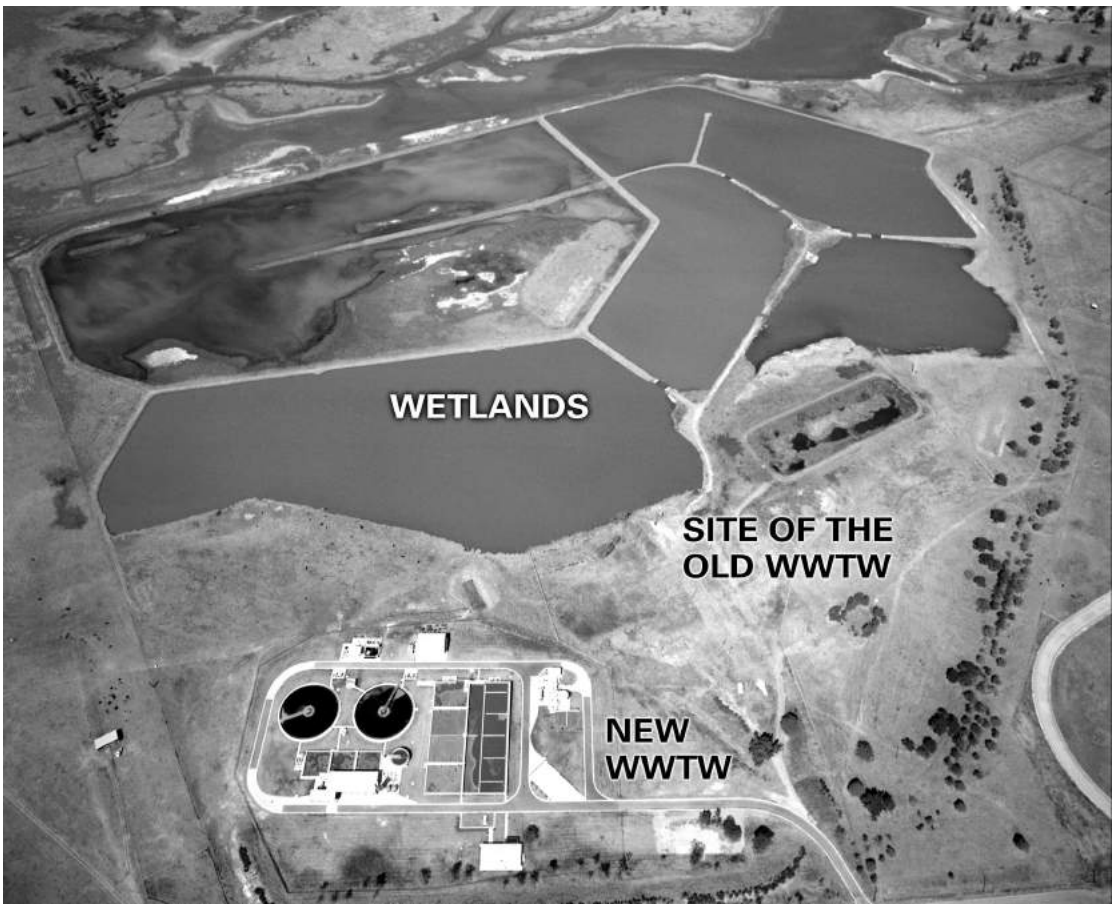
During construction of the new treatment works environmental groups informed Hunter Water that the old maturation ponds had become habitat for local and migratory birds. With this knowledge Hunter Water made a commitment to retain the open water ponds and rehabilitate them as a wetland area for birds.

The rehabilitation project

Over 100 tonnes of concrete and soil waste was recycled on-site instead of being disposed of to landfill. This recycling involved the creation of beaches, islands and shallow areas to attract a variety of wading birds.

The rehabilitated wetlands have created much interest among bird watchers and the local community. A Green Corps team (supported by Maitland City Council) and Hunter Water employees planted many native trees and shrubs around the wetland site. The aim was to recreate as closely as possible a 'natural' wetland ecosystem.

High quality, disinfected treated effluent from the new plant is only pumped into the wetlands when natural water levels fall too low to sustain this ecosystem. This constant source of water has helped support the survival of local and migratory birds during recent droughts.



Case Study C

5.5 Restoring Wetlands AT MORPETH

Treating wastewater at Morpeth

Morpeth Wastewater Treatment Works (WWTW) serves the 40,000 people who live and work in Morpeth, Metford, Thornton, Tenambit, Ashtonfield, Beresfield, East Maitland, and some parts of Maitland.

The WWTW have the capacity to treat an average flow of 14 million litres per day, or about 60,000 people, and can be upgraded to 80,000 people in future.

The Works have been built to minimise impacts on the surrounding environment. Wastewater is collected from houses and industry via pipes and pumping stations. It is treated to a high standard including disinfection.

The final treated effluent is recycled where possible or otherwise discharged into the Hunter River. During dry conditions some effluent is diverted to the wetland ponds.

The recycling of treated effluent includes irrigating golf courses and woodlots. The remaining sludge (solids) is treated, dewatered to become a 'biosolid', and reused in agricultural activities and minesite rehabilitation.

Protecting the Hunter catchment

By 2004 all of Hunter Water's WWTWs will have been completely upgraded. The focus of the upgrades has been to reduce phosphorous and nitrogen in effluent.

In achieving higher levels of treatment, however, some trade-offs have had to be made:

- higher costs for construction and operation of new plants compared to older plants;
- more atmospheric emissions from power stations associated with higher power consumption at plants;
- increased transport needs through recycling greater quantities of biosolids.

A water quality report on the Hunter River indicated that lowering effluent concentrations of nitrogen to 7mg/L and phosphorous to 3mg/L, would protect and improve downstream water quality. Reductions in phosphorous and nitrogen beyond this, however, were considered to be of little benefit as Morpeth WWTW only contributes 2% to 3% of the total nutrient load in the river.

The plant could achieve further improvement in effluent quality through tertiary filtration, but this would be at an additional capital cost of up to $2M. So far there is not enough proof of major environmental benefits.

Pelicans and cormorants are amongst the many different bird species that use the old wastewater treatment ponds for feeding and habitat.

Local school students take a tour of the wastewater treatment plant.

Acknowledgement

© Public Affairs Unit, Hunter Water Corporation.

5.1 Is one planet enough? Calculate your ecological footprint

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Human Society & Its Environment	3	SSS3.7 (Resource Systems)
Science & Technology	3	PSS3.5 (Products & Services)
Personal Development, Health & Physical Education	3	PHS3.12 (Personal Health Choices)
Geography	4 5	4G4 (Global Citizenship) - 4.1, 4.2, 4.3, 4.8, 4.9 5A4 (Australia in its Regional & Global Context) - 5.1, 5.2, 5.3, 5.6, 5.9
Science	5	5.11.1 (Energy Resources)

Overview

This program develops students' understanding of the connection between themselves, their impacts, and the health of the environment.

Ecological Footprint Analysis (EFA) is a tool developed by M. Wackernagel to measure impact on the environment. The measurement is expressed in hectares. It accounts for the amount of land it takes to:

- grow an individual's food;
- provide building materials to house an individual;
- provide raw materials for an individual's other consumables; and
- absorb the CO_2 (through vegetation uptake) released through production of energy for transport, food, housing and consumables.

The underlying principle is that there is a limit to the amount of productive land available. Ecological Footprint Analysis develops an understanding of the inequality in the current 'rationing' of land. For instance, many people in developed countries use $\geq$ 6 hectares per person, while many in the developing world use as little as 0.5 hectares. These figures encourage a realisation that if everyone (6 billion people) used as much area to support themselves as those in developed countries, we may need an extra three or four equivalent worlds to provide for our needs and wants. And this is without considering what land area should be allocated for other species use.

Materials Required

Provided

- Worksheet 5.1 - EFA test
- Worksheet 5.2 - EFA scoring sheet

To Obtain

- Copies of worksheet

Program P

5.1 Is one planet enough? Calculating your ecological footprint

Program Instructions

Content	Strategies	Resources
Ecological Footprint Analysis paper test	◆ Discussion of Ecological Footprint Analysis. ◆ Students each receive a copy of the test (Worksheet 5.1) and have about 15 minutes to complete (some questions may need explanation). ◆ Students swap test answers with the person next to them and assign scores to each answer based on Worksheet 5.2 (do not hand out this sheet until after the test has been completed). ◆ Class or small group discussion of the test results. Class results may be tabulated and graphed. ◆ Students choose one question in the test where they think they could change their behaviour in order to score better. ◆ Explore further issues (e.g. global inequality, use of fossil fuels) based on review of EFA and other websites.	◆ Worksheets 5.1 & 5.2

Acknowledgement

This program has been compiled by Kate Adkins (University of Newcastle, Environmental Science student).

5.1 Is one planet enough? Calculating your ecological footprint

Ecological Footprint Analysis Website Review

The following are some good websites that explore simple EFA:

1. *www.chappy.au.com/* ★★★★★
   This site focuses on energy audits, which can be related to EFA. The site offers workbooks (primary or secondary) that can be downloaded. They cover questions on the amount of energy used within the home depending upon the design of the home and the type of appliances used.

2. *www.bestfootforward.com* ★★★★★
   This is one of the main sites for EFA with plenty of background information. It has a very helpful emailing group, and online EFA and carbon calculators allowing students to calculate their impact in hectares. Downloadable demonstration calculators are also available.

3. *www.futurescapes.com.au* ★★★★★
   This website allows the creation of a future scenario based on answers to questions. The chosen 'future' includes an annotated picture of what life might look like if everyone made the same lifestyle decisions as the participant (e.g. big house vs small house; car vs bicycle). This site is refreshingly different to EFA sites as it asks questions about how you would plan you life (future decisions) rather than how you are currently living it.

4. *www.web.net/~tendays/footprintwkshop.htm* ★★★★★
   A 2.5hr workshop is detailed on this website. The workshop is aimed at middle to upper secondary students and provides some great ideas for activities with clear instructions and a great paper EFA calculator.

5. *www.rprogress.org/programs/sustainability/ef/* ★★★★
   This site outlines concepts and methods, and answers Frequently Asked Questions (FAQs) relating to EFA. It has a very sophisticated online EFA calculator linked to questions on food, transport and travel, shelter, goods and services. The result is expressed in hectares and is able to be compared with the average footprint of a selected country. The result is also conveyed in terms of the number of planets required to support a world population with this size footprint.

6. *basecampearth.org/exp2/* ★★★
   This website features links to other websites produced by US students about their impressions of EFA. It details some of their project activities. There are a lot of graphics so it takes quite a while for pages to come up but it is quite inspiring.

7. *www.ecovoyageurs.com* ★★★
   This website deals with the concept of EFA lightly. It has an online EFA calculator, however, some of the questions are a little odd and the response options are not always clear. It offers downloadable lesson plans for secondary schools, which includes worksheets. Unfortunately all the facts and figures contained throughout the lessons and worksheets refer only to Canada.

8. *www.ecologyfund.com/registry/ecology/res_bestfoot.html* ★★★
   This site features a very simple online calculator that may not give the most accurate results. It has the advantage, however, of showing graphically how many worlds would be needed to support a population with a footprint the size of that calculated. Students can watch this graphic change as they respond to the EFA questions.
   No background information is available from the website.

5.2 Environmental Citizenship SCENARIO

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Geography	5	5A3 (Issues in Australian Environments) - 5.1, 5.2, 5.3, 5.4, 5.6, 5.8, 5.9
Science	5	5.10 (Ecosystems)

Overview

This program provides an opportunity for students to apply their geographical and scientific knowledge, understanding and skills to demonstrate active and informed citizenship. It focuses on a local scenario or site and engages students in discussion and reflection of the balance between conservation and human use of a natural ecosystem.

Materials Required

Provided

- Case Study 3.1 - *Maitland's Native Vegetation*
- Case Study 3.2 - *Flora & Fauna of Maitland's Wetlands*
- Case Study 5.1 - *Local Environmental Citizenship*
- Case Study 5.2 - *Maitland Environmental Youth Council*
- Case Study 5.3 - *Landcare Making a Difference*

To Obtain

- Photos and maps of local scenario site
- Copies of case studies

5.2 Environmental Citizenship SCENARIO

Program Instructions

Content	Strategies	Resources
Introduction to a local place	◆ Provide students with an overview of a local site: - Where is the site? What is the size of the site? - What is the ecosystem type - bushland, wetland? - Who owns the land? - Why is the site important?	◆ Photos and maps
Set up scenario	◆ EXAMPLE: A developer has purchased additional land in the Bolwarra area close to the Bolwarra Wetland. An application is to be submitted to MCC to expand residential land close to the wetland and an area of remnant rainforest.	◆ Case Studies 3.1 & 3.2
Discuss stakeholders	◆ Mind map of who cares about this site. ◆ Position stakeholders on a spectrum according to their environmental philosopies (from preservation to exploitation).	◆ Case Studies 5.1 & 5.3
Discuss influences	◆ Students form into small groups. Each group is given an 'identity' - one of the relevant stakeholders to the scenario (e.g. Landcare, developer, residents, non-carers). ◆ Facilitate a brainstorming session to determine the concerns for each group.	
Role Play	◆ Set up a mock Maitland Council meeting, with each stakeholder group presenting their arguments or writing letters stating their concerns. ◆ Another group of students or the teacher acts as Council. Council considers all stakeholder concerns, makes a decision in relation to the development and explains why they have come to this decision.	
Reflection	◆ Class discussion on other opportunities to demonstrate active citizenship for similar scenarios. ◆ Invite a guest speaker to the classroom - role model of active citizenship.	◆ Case Studies 5.1, 5.2 & 5.3 ◆ Guest speaker (refer to Section 8)

Worksheet W

5.1 Is one planet enough? Calculate your ecological footprint

Background

There are approximately 7.3 billion hectares of productive land in the world and 6 billion people trying to share it. To have an equal share each person would have access to 1.22 hectares (remembering that this also needs sharing with species other than human). This would be the amount of land available to feed, clothe, house and support each person.

Perform the following test - **Ecological Footprint Analysis** - to see how many hectares are currently being used to support your needs and lifestyle.

For each question place a tick beside the answer that is most correct for your current situation. Your teacher will give scores for answers later. Please answer all questions honestly and accurately.

Acknowledgement

This test is adapted from that developed by Eric Krause, City of Toronto and the Recycling Council of Ontario, Canada. The original version can be found at: *www.web.net/~tendays/footprintwkshop.htm*

HOME

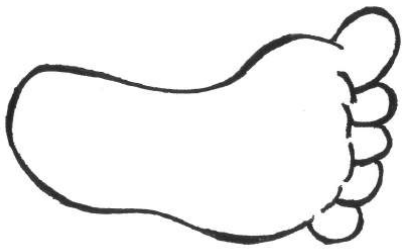
YOUR SCORE:

A. How many people live in your household?

(i) 1
(ii) 2
(iii) 3
(iv) 4
(v) 5 or more

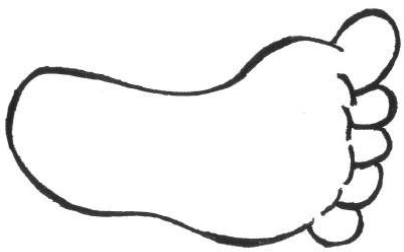
B. How is your home heated?

(i) Natural gas
(ii) Electricity
(iii) Half gas/electricity and half from renewable sources
(iv) Renewable (e.g. solar)



C. How big is your home?

(i) Small unit (1-3 rooms, one bathroom, shared laundry)
(ii) Small house (3-5 rooms)
(iii) Medium house (6-7 rooms)
(iv) Large house (>7 rooms, including two bathrooms)



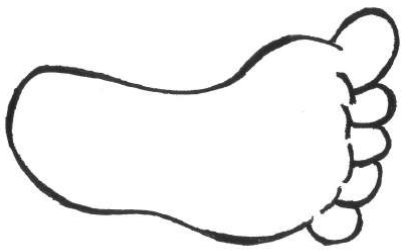
Worksheet W

5.1 Is one planet enough? Calculate your ecological footprint

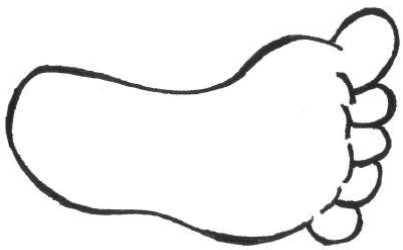
FOOD

YOUR SCORE:

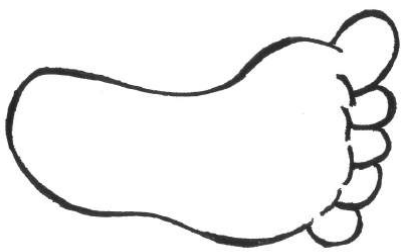
D. How many meals of meat or fish do you eat per week?
(i) 0
(ii) 1-3
(iii) 4-6
(iv) 7-10
(v) More than 10



E. How many home-made meals do you eat per week (including those you bring to school/work)?
(i) Less than 10
(ii) 10-14
(iii) 15-18
(iv) More than 18



F. When purchasing your food items does your family try to buy locally produced goods?
(i) Yes, all the time
(ii) No, never
(iii) Yes, sometimes
(iv) Very rarely
(v) I don't know

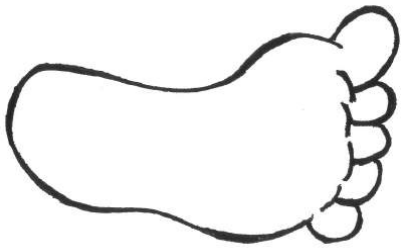


TRANSPORT & TRAVEL

YOUR SCORE:

G. If you or your family own vehicles, what type are they? Add points for each vehicle.
(i) Motorcycle
(ii) Small-compact car
(iii) Medium-sized car
(iv) Full-sized car, mini-van or ute.

H. How do you normally travel to school/work?
(i) Car
(ii) Public transport (bus, train)
(iii) Walk
(iv) Bicycle



Worksheet W

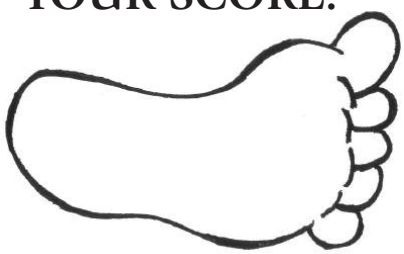
5.1 Is one planet enough? Calculate your ecological footprint

TRANSPORT & TRAVEL (cont.)

YOUR SCORE:

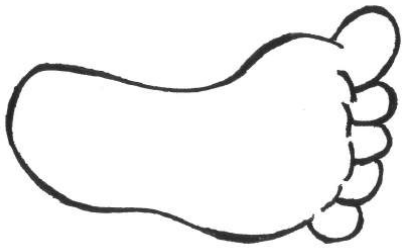
I. How many trips do you make on public transport (e.g. bus, train) per week for which you might otherwise have used a car?

(i) 0
(ii) 1-5
(iii) 6-10
(iv) 11-15
(v) More than 15



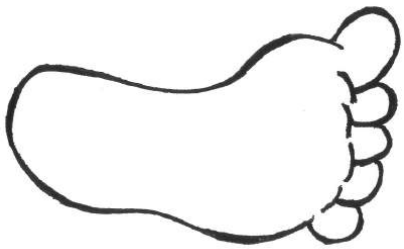
J. Where did you go on holiday within the last year?

(i) No holiday, stayed at home
(ii) Within the region
(iii) To another region, within NSW
(iv) To another State
(v) To another country



K. How many summer weekend trips do you take by car?

(i) 0
(ii) 1-3
(iii) 4-6
(iv) 7-9
(v) More than 9

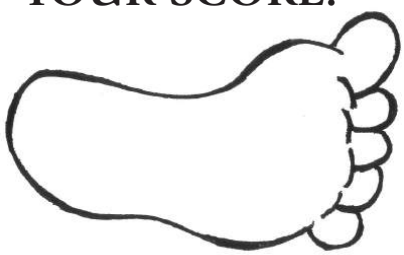


PURCHASES

YOUR SCORE:

L. How many large purchases (e.g. stereo, TV, VCR/DVD, home computer, car, furniture, fridge etc.) has your household made in the past year?

(i) 0
(ii) 1-3
(iii) 4-6
(iv) More than 6



Worksheet W

5.1 Is one planet enough? Calculate your ecological footprint

WASTE

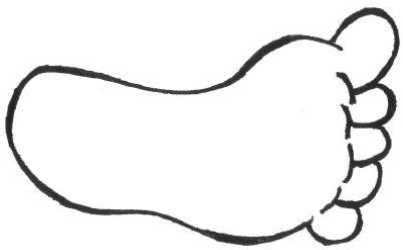
YOUR SCORE:

M. Does your household try to reduce the amount of waste created in the house (e.g. buying food in bulk, refusing junk mail/flyers, reusing containers for storage)?

(i) Always
(ii) Sometimes
(iii) Rarely
(iv) Never

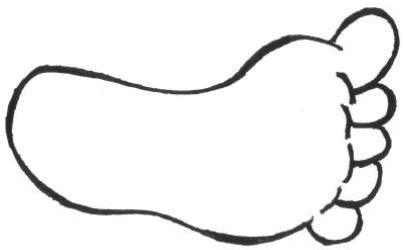
N. Does your household compost food scraps?

(i) Always
(ii) Sometimes
(iii) Rarely
(iv) Never



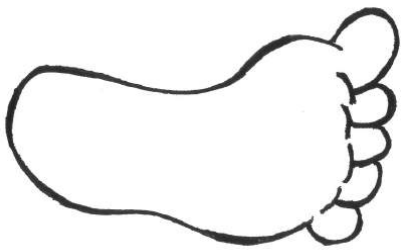
O. Does your household recycle paper/cardboard, aluminium cans, glass and plastic bottles and other recyclables?

(i) Always
(ii) Sometimes
(iii) Rarely
(iv) Never



P. How many garbage bags of waste do you set out for pick-up each week?

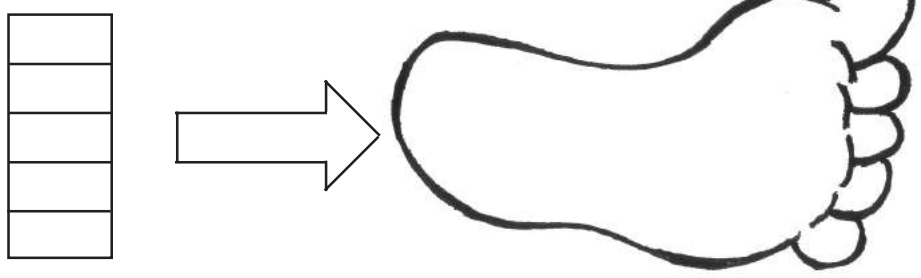
(i) 0
(ii) ˚
(iii) 1
(iv) 2
(v) More than 2



YOUR ECOLOGICAL FOOTPRINT

Add your sub-totals for:

HOME
FOOD
TRANSPORT
PURCHASES
WASTE



Worksheet W

5.2 Calculate your ecological footprint: SCORING SHEET

HOME

A. How many people live in your household?
(i) 30
(ii) 25
(iii) 20
(iv) 15
(v) 10

B. How is your home heated?
(i) 30
(ii) 45
(iii) 15
(iv) 0

C. How big is your home?
(i) 10
(ii) 15
(iii) 20
(iv) 30

FOOD

D. How many meals of meat or fish do you eat per week?
(i) 0
(ii) 10
(iii) 20
(iv) 35
(v) 50

E. How many home-made meals do you eat per week (including those you bring to school/work)?
(i) 25
(ii) 20
(iii) 15
(iv) 10

FOOD (cont.)

F. When purchasing your food items does your family try to buy locally produced goods?
(i) 25
(ii) 125
(iii) 50
(iv) 100
(v) 75

TRANSPORT

G. If you or your family own vehicles, what type are they? Add points for each vehicle.
(i) 15 for each
(ii) 35 for each
(iii) 60 for each
(iv) 80 for each

H. How do you normally travel to school/ work?
(i) 50
(ii) 25
(iii) 0
(iv) 5

I. How many trips do you make on public transport (e.g. bus, train) per week for which you might otherwise have used a car?
(i) 50
(ii) 40
(iii) 30
(iv) 20
(v) 10

Worksheet W

5.2 Calculate your ecological footprint SCORING SHEET

TRANSPORT

J. Where did you go on holiday within the last year?
(i) 0
(ii) 10
(iii) 30
(iv) 40
(v) 70

K. How many summer weekend trips do you take by car?
(i) 0
(ii) 10
(iii) 20
(iv) 30
(v) 40

PURCHASES

L. How many large purchases has your household made in the past year?
(i) 0
(ii) 15
(iii) 30
(iv) 45

WASTE

M. Does your household try to reduce the amount of waste created in the house?
(i) 0
(ii) 10
(iii) 20
(iv) 30

N. Does your household compost food scraps?
(i) 0
(ii) 10
(iii) 15
(iv) 30

WASTE (cont.)

O. Does your household recycle?
(i) 0
(ii) 10
(iii) 15
(iv) 20

P. How many garbage bags of waste do you set out for pick-up each week?
(i) 0
(ii) 5
(iii) 10
(iv) 20
(v) 30

SCORING INSTRUCTIONS

Score	Ecological Footprint (ha)	Number of planets needed if everyone lived like this
< 150	< 4.0	Less than 3 planets
150 - 350	4.0 - 6.0	3 - 4 planets
351 - 550*	**6.0 - 7.7***	**4 to 6.3 planets**
551 - 750	7.7 - 10.0	6.3 - 8.2 planets
> 750	> 10.0	More than 8 planets

* Canadian average

Even low scores of 150 still require 3 equivalent planets to support 6 billion people living in this way. The test recognises that anyone living in a developed country is going to have a larger footprint than the majority of the world's population (who live in developing nations). It highlights the inequality of human impact and the unsustainability of current global impacts from the combined population.

If any students scored less than 150 they should be congratulated as this is well-below the average of people living in affluent countries such as Australia, U.S., Canada, and the U.K.

Case Study C

6.1 SALINITY Turning our soil white

Introduction

Salinity is an urgent national environmental problem resulting from poor land management over the past two hundred years. Salinity is often described in broad national terms. Even so, this issue is of concern within the local environment of Maitland.

What is salinity?

Salt is a naturally occurring compound necessary for a variety of biological processes. Too much salt, however, can be lethal for most living things.

Salinity occurs as a result of poor land management and leads to the concentration of salt in the top soil and upper soil profile. There are two main forms of salinity affecting rural and suburban land - *dryland salinity* and *salinity caused by irrigation*.

Dryland salinity

Dryland salinity is the most common form of salinity affecting land across Maitland and broadly, across Australia. Also known as seepage salting, dryland salinity results from the large scale removal of deep-rooted native vegetation causing the water table (groundwater) to rise. This vegetation would otherwise have kept the water table lower and helped bind soil to prevent erosion.

The water table also rises because groundwater recharge (water added to the ground) exceeds the discharge (water lost/used). As the water table rises it carries dissolved salt from the bedrock and soil profile. This salt becomes more concentrated as the water moves towards the surface. At the upper surface the water evaporates leaving behind salt that is clearly visible on the ground as a white crust.

Irrigation salinity

Irrigation, the use of water from artificial channels, pipes or bores, is another cause of salinity in the Maitland area. Irrigation salinity occurs in places where large amounts of salty water from the Hunter River or groundwater are used to irrigate crops and land.

It is caused by excess water saturating the soil and raising the water table. The process described in 'dryland salinity' above then commences. Irrigation may also add salt directly to the soil, as salty water from the Hunter River, its tributaries, or groundwater is sprayed over crops and pasture for agriculture.

Why does salinity affect Maitland?

Approximately 9.5% of the Maitland local government area is affected by salinity, a combination of both dryland and irrigation salinity (refer to map of salinity 'hot spots'). Maitland is affected by salinity due to a combination of geological and human factors.

The geology factor

The Maitland area is underlain by sedimentary rock material formed during the Permian geological age over three hundred million years ago. At that time, the area was covered by brackish swamps with naturally high levels of salt.

This salty bedrock and associated groundwater now lies about 2 - 2.5 metres below the surface. Watertable levels such as this sound warning bells (NSW Dept. Land & Water Conservation 2000). Groundwater is close enough to the surface that evaporation and capillary action can combine to bring the salty water to the surface, concentrating salts in the soil as described in 'dryland salinity'.

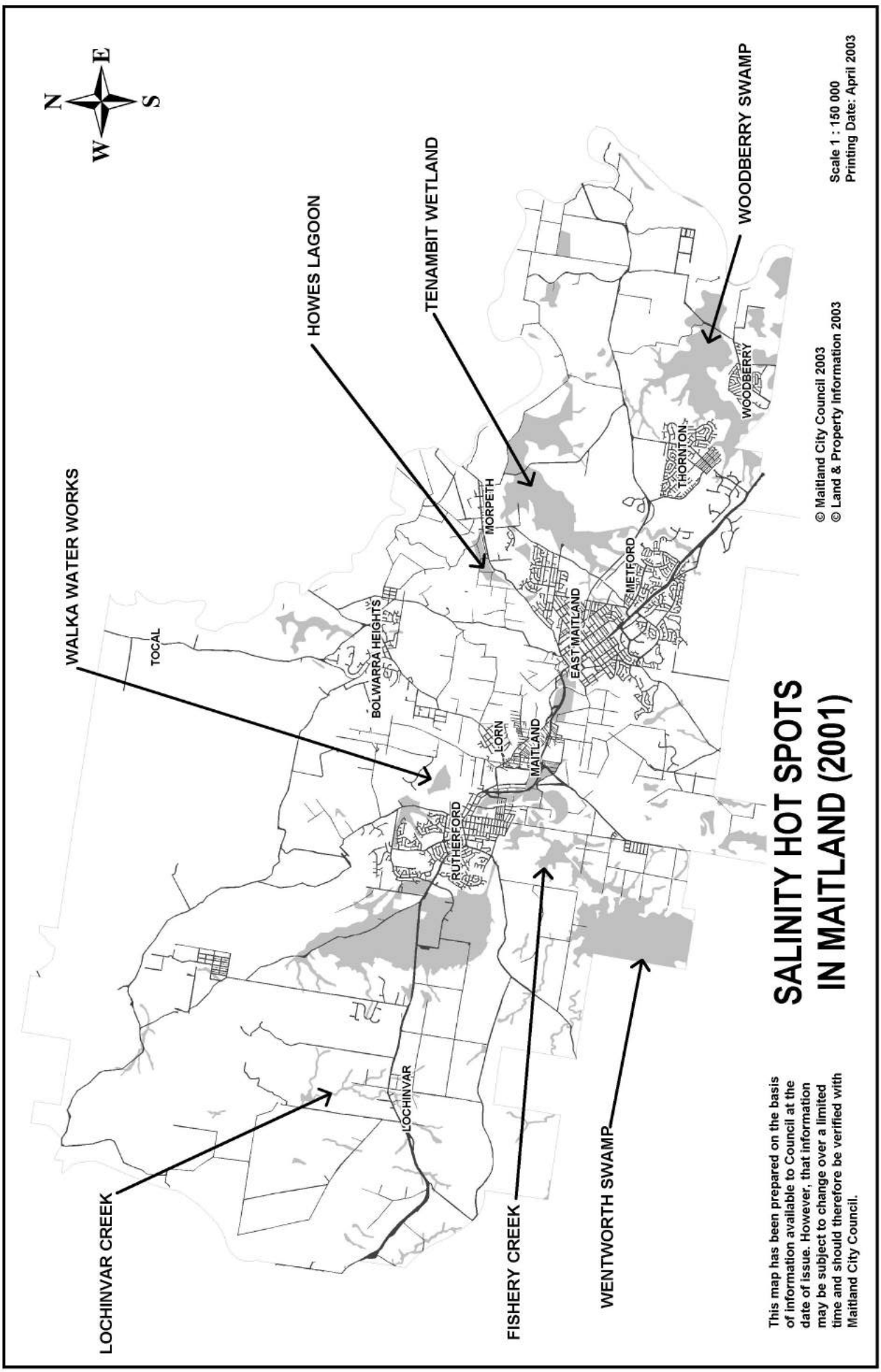
As well, erosion of the landscape may expose the salty rock material and groundwater and wash this down drainage lines to low points in the catchment such as wetlands.

The human factor

The Maitland area, being mainly floodplain and wetlands, was extensively cleared from the early 1800s as European settlers gathered valuable timber and established agriculture, mining and settlements. This trend continues today, despite Maitland having less than 6.8% of its native vegetation remaining.

The dryland salinity we see today is a function of such vegetation clearing practices. The natural balance between surface waters and the salty groundwater has been affected. This has occurred through replacement of deep-rooted native vegetation with shallow-rooted annual crops and pasture, and extensive sealed surfaces (e.g. roads and buildings).

Clearing, poor land management and increased stormwater runoff have also increased erosion across the Maitland landscape. Erosion of salt-bearing geology as described in the previous section, worsens the local salinity problem.


N
E
S
W
WALKA WATER WORKS
HOWES LAGOON
TENAMBIT WETLAND
WOODBERRY SWAMP
LOCHINVAR CREEK
FISHERY CREEK
WENTWORTH SWAMP
TOCAL
BOLWARRA HEIGHTS
MORPETH
LORN
MAITLAND
EAST MAITLAND
METFORD
THORNTON
WOODBERRY
RUTHERFORD
LOCHINVAR
SALINITY HOT SPOTS
IN MAITLAND (2001)
Scale 1 : 150 000
Printing Date: April 2003
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Case Study C

SALINITY: Turning our soil white

The impact of salinity on the Hunter River

During 2001, the Healthy Rivers Commission conducted an independent public inquiry into the health of the Hunter River. The issue of salinity in surface water (e.g. rivers, creeks, lakes) and groundwater bodies was investigated through the inquiry.

The Healthy Rivers Commission report (refer to ***www.hrc.nsw.gov.au/site/river_frame.html***) stated:

The Main Issues

The salinity of surface and underground water at many locations in the Hunter Valley is a threat to the productivity of irrigated agriculture and quality of drinking water, and in some cases may be a threat to the ecology. Dryland salinity is also a problem for land managers.

Median salinity levels in the lower Hunter River are higher than in most western NSW streams, including the lower Murray. More than 1% of the Hunter catchment has water table depths of less than 2m (a higher percentage than any other NSW catchment), indicating high potential for dryland salinity.

The Commission's Conclusions

Many groundwater and surface water bodies in the Hunter Valley are naturally highly saline because of salt-bearing rocks in the underlying geology. However, human activities since European settlement, especially land clearing, irrigation and mining have led to an increase in the salinity of the water reaching streams.

The Commission believes that the contributions of the different sources to stream salinity can be summarised approximately as follows:

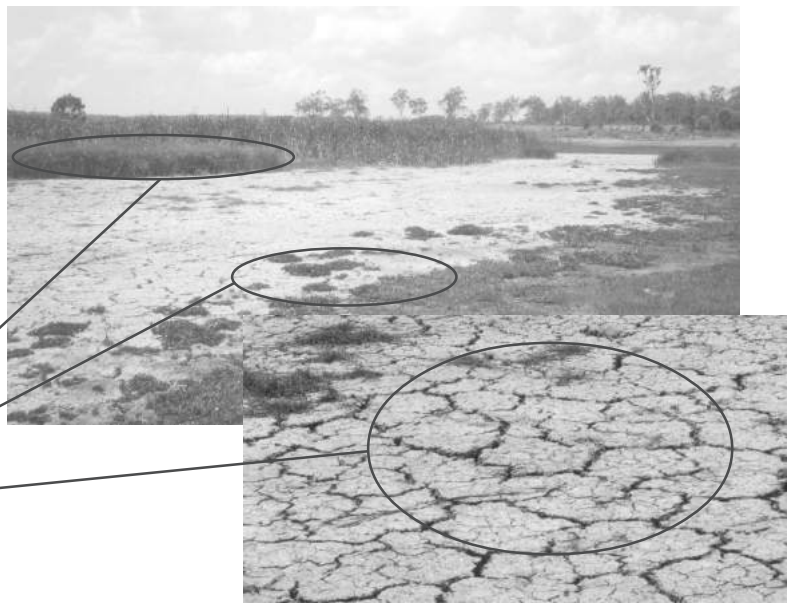
- *natural salinity (as would have occurred prior to European settlement) accounts for about 75% of current levels in the lower Hunter;*
- *increases in stream salinity due to land clearing and agricultural practices account for about 15%;*
- *mining and its after-effects account for about 10%.*

Salinity in groundwaters is continuing to rise, with land clearing, dryland salinity and rising water tables being the probable major causes. Further rises in some locations can be expected, as the longer term impacts of mining emerge. Comparable rises in river salinity could logically be expected, but are not yet evident, possibly because the Hunter Salinity Trading Scheme has masked this effect so far (for information on the Hunter Salinity Trading Scheme go to ***www.epa.nsw.gov.au/licensing/hrsts/***).

What does salinity look like?

The symptoms of salinity in the initial stages can be difficult to detect. Some of the typical features of a salinity-impacted area may include:

- Scattered areas of patchy growth in paddocks, especially around water seeps, at a break in slope or along minor drainage lines.
- Species thin out and die, being replaced by more salt-tolerant species like Common Rush (*Juncus usitatus*).
- Reduced vigour and stunting of pastures
- In severe cases, 'salt scalds' (localised areas of white salt crystals) can be seen on the land. There is little or no vegetation surrounding the scalds. Existing native trees and shrubs die due to the inability to cope with the high salt concentration.



Dryland salinity has emerged on Tenambit Wetland at the practice golf range.

Case Study C

SALINITY: Turning our soil white

Local implications of salinity

Environmental

- Increasing salt damages soil structure and micro-organisms which leads to erosion. A decline in the diversity and health of native plants follows, affecting wildlife habitat and biodiversity.
- Agricultural crops are affected by salinity in soil and irrigation water leading to a decline in the quality and quantity of crops.
- Plant and animal species are placed under additional stresses as most do not have the adaptations to successfully cope and survive.
- Water quality declines within the Hunter River, its tributaries and local wetlands as saline groundwater and salt-laden sediments flow in.

Economic

- The economic costs of salinity in the Maitland area have been felt through impacts upon infrastructure. For instance, Tenambit Sports Oval required $15,000 in drainage works and equipment to remedy the problem of salt scalds on the oval.
- Local farmers have inherited the costs of salinity as the quality and quantity of produce supplied to the market has been affected by high levels of salt in irrigation water and the onset of dryland salinity.
- The economic impact on farmers also comes with the cost of remediation through revegetation, advanced irrigation techniques, or in the most extreme circumstances, the building of evaporation ponds to dispose of saline water.

Social

It is difficult to single out salinity in Maitland as having major social implications. It combines, however, with other issues such as vegetation clearance, loss of biodiversity and water quality decline to impact on our way of life. For example:

- our local community today does not enjoy the same level of freedom to drink from and swim in the Hunter River compared to many years ago;
- farmers and landholders are often unable to afford the costs to remedy salinity. This creates significant financial and personal stresses.

Managing salinity

Salinity is a complicated and difficult issue to address. There is no easy answer to solving the salinity problem. The management of local salinity issues should include:

Preservation - Greater value needs to be placed on protecting existing native vegetation combined with revegetation in the upper catchments (recharge areas).

Revegetation - Low-lying areas (discharge areas) should be revegetated. Deep-rooted vegetation has the important role of lowering localised water tables, thereby reducing salinity.

Improved farming practices - Irrigation practices need to become more efficient. Reducing the wastage of water and maximising crop uptake can assist in reducing the amount of irrigation water applied to the land.

Education - Informative, practical and relevant information should be made available to all members of the local community.

Resourcing - Ways of providing support to farmers and landholders are now being sought. Resources are coming from government and other sources recognising that salinity impacts are shared across the broader community.

Current action

- Local farmers have been progressively regenerating their land through native vegetation windbreaks and corridors.
- Maitland Council's Greening Plan has focused funding and labour into:
  - the Native Plant Distribution Scheme which has provided 30,000 native plants (2002-03) to rural landholders across the Maitland area;
  - hosting a Green Corps team to revegetate Tenambit Wetland.
- The Hunter Salinity Audit was undertaken by the Dept. Land & Water Conservation in 2001. This audit assessed the extent of the salinity problem across the Hunter Valley and predicted salinity trends in the Valley's major river systems over the next 100 years. A request can be made for the relevant brochure at: *www.hcmt.org.au/ep_publications.php3*

Acknowledgements & References

This case study has been prepared by Catherine Baird (Maitland Environmental Youth Council), with contribution by Kylie Yeend (Environmental Education & Project Management Consultant). Other information sources included:

Healthy Rivers Commission 2002, *Independent Inquiry into the Hunter River System (Final Report)*, Sydney: Healthy Rivers Commission; pp.16-17.

Maitland City Council 2000, *The Maitland Greening Plan, Stage 2 Part B*, Maitland, NSW: Maitland City Council.

NSW Department Land & Water Conservation 2000, *Hunter, Karuah & Manning Catchments: State of the Rivers and Estuaries Report*, Sydney: NSW Government; p.178.

Case Study C

6.2 EROSION
Losing our natural wealth

What is erosion?

Erosion is a natural process in the development of the landscape. Agents such as wind and water erode away rock to form the mountains, valleys, plains and rivers that are all around us. It is the increased rate of erosion, however, that has become a major concern as valuable soil is lost from the land.

Under natural conditions vegetation holds soil together and protects it from the effects of water runoff and wind. The broad clearing of vegetation since European settlement in the Hunter has accelerated the rate of erosion and made it an environmental issue of concern.

Erosion types across Maitland

In Maitland two main types of erosion affect the local environment: *streambank erosion* and *soil erosion*.

Streambank erosion

This form of erosion is concentrated in areas where past land uses have stripped the riverbank of native vegetation. It can change the length and shape of waterways and affect water quality through increasing the amount of sediment, nutrients and salt transported downstream.

An example of streambank erosion along the Hunter River. Extensive land clearing along streambanks has made this a common sight.

Soil erosion

Soil erosion in the Maitland area mainly affects cleared rural land and may be found in a number of forms:

Rill Erosion - Rills are small grooves that develop as water runs off the land and concentrates into channels. They are often the first sign of an erosion problem.

Sheet erosion - is the most common form of erosion across Maitland and also the hardest to identify. Sheet erosion involves the loss of soil material from across an entire slope without water concentrating into channels.

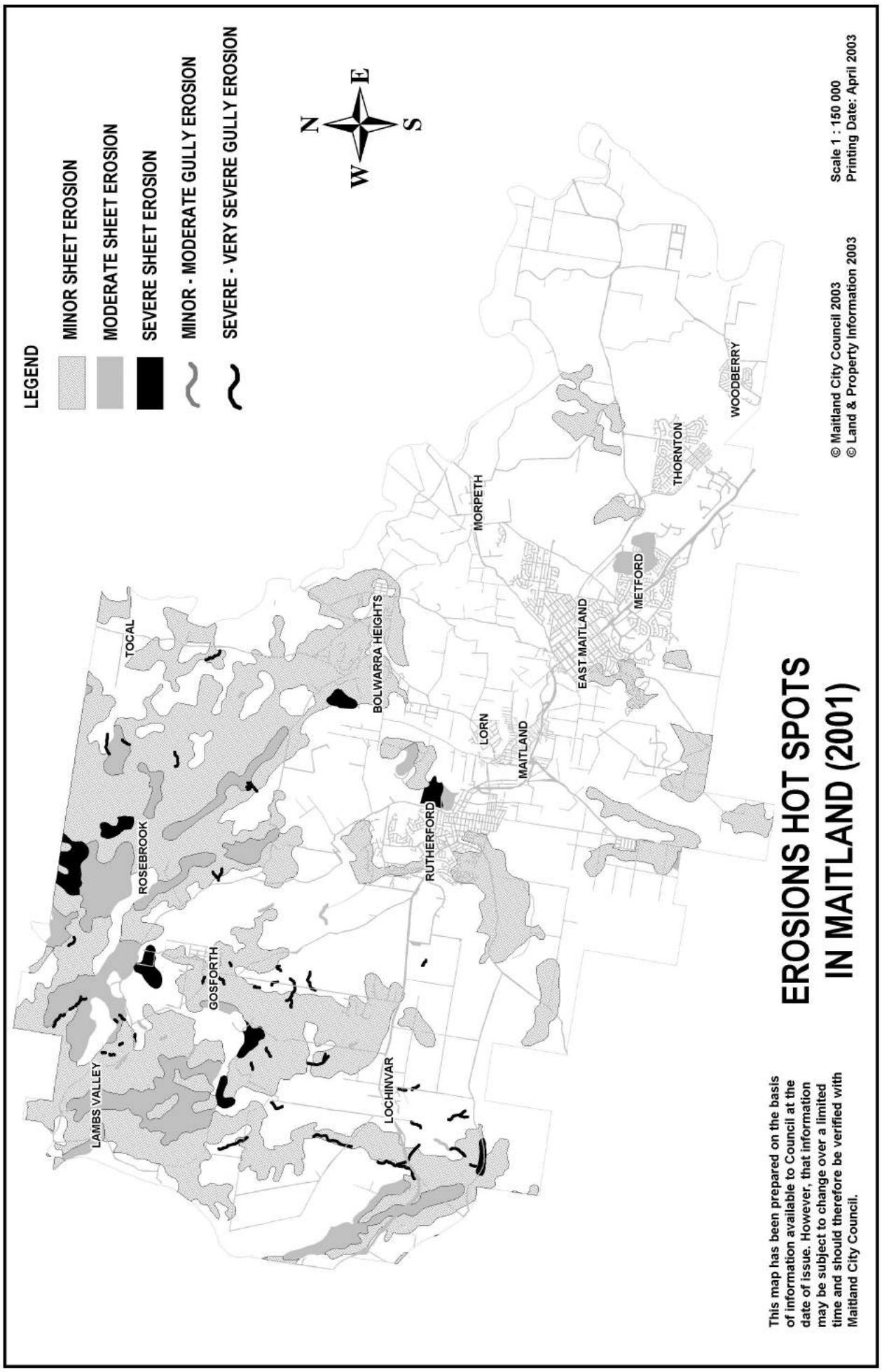
An example of sheet erosion in the local area, also illustrating the lack of vegetation characteristic of areas where erosion is most severe.

Gully Erosion - is the most obvious form of erosion where large areas of soil are washed away creating often deep and permanent scars on the landscape. It is very difficult to rehabilitate areas that have been affected by gully erosion. Prevention through maintaining native vegetation along drainage lines is a far better option.

An example of severe gully erosion. Once established this type of erosion is extremely difficult to restore.

Mass Movement - involves large losses of soil through sudden or gradual events such as landslides or soil creep, respectively. Mass movement is usually associated with the clearance of steep lands.

Mass movement in the form of soil creep is common in the Maitland area. It is recognised as a series of small terraces on steep land often mistaken for cattle tracks.


LEGEND
MINOR SHEET EROSION
MODERATE SHEET EROSION
SEVERE SHEET EROSION
MINOR - MODERATE GULLY EROSION
SEVERE - VERY SEVERE GULLY EROSION
N
E
S
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TOCAL
ROSEBROOK
GOSFORTH
LAMBS VALLEY
LOCHINVAR
BOLWARRA HEIGHTS
RUTHERFORD
LORN
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MORPETH
EAST MAITLAND
METFORD
THORNTON
WOODBERRY
EROSIONS HOT SPOTS
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Case Study C

EROSION: Losing our natural wealth

Locating erosion across Maitland

There are a number of erosion 'hot spots' in the local area. This legacy comes from the past and present mismanagement of land. The main offence has been the clearing of over 93% of Maitland's native vegetation since European settlement.

Erosion is widespread across Maitland. Local examples can be found by a brief walk or drive around new development areas, agricultural land, parkland, or even within your schoolyard. Fortunately, some of these areas also show attempts to manage erosion.

The map on the previous page offers a snap-shot of the areas affected by erosion across Maitland. A comparison of this erosion map with ones of similar scale showing geology, vegetation cover and topography may help to illustrate relationships between these elements.

Local implications of erosion

Environmental

- Erosion affects large areas of the Maitland district. It results in soil loss, permanent changes to the landscape, and leads to the sedimentation of waterways.
- Eroded material is constantly being washed into local waterways including the Hunter River, Wallis Creek and One Mile Creek (East Maitland) to name a few.
- Habitat for native wildlife can be affected through altering of the natural behaviour of local waterways by streambank erosion.

Economic

- The impact of erosion is felt through the loss of productive land. Valuable top soil is stripped away through erosion which reduces the viability of agricultural activities.
- Recent estimates undertaken for the Hunter Catchment Blueprint show costs ranging up to approximately $80,000 per kilometres for treating gully erosion.
- Sinder and Yapp (1992) estimate that if all land degradation in NSW were eliminated, the average value of agricultural output would rise by $7.3M per year per local government area, or $12/hectare.

Social

- The social effects of erosion are tied into the economic and environmental impacts.
- The loss of productive land affects the rural community through decreasing agricultural livelihood.
- Some forms of erosion are also highly obvious and are easily recognisable. This may ruin the visual appeal of an area and make some recreational activities unsafe (e.g. walking, riding, swimming).

Managing erosion

There are no simple methods to manage erosion. Like most degradation issues, the best way to address erosion is to avoid it in the first place.

Generally, erosion rehabilitation projects focus on activities that:

- reduce the effects of the two main erosion agents, water and wind:
  - for water this might include slowing the velocity through building mounds and swales or planting native vegetation;
  - for wind, this might involve planting windbreaks and shelter belts across farmland.
- stabilise the soil through planting native vegetation.

Current action

There are a number of local projects aiming to better control and manage the impacts of erosion. These include:

- establishment of native vegetation and rock revetment works along One Mile Creek in East Maitland;
- establishment of native vegetation around Tenambit Wetland;
- revegetation of the banks of the Hunter River;
- planting native vegetation for windbreaks by local farmers.

Erosion is a major issue identified in the Maitland Greening Plan. It will be the focus of future environmental projects coordinated by Maitland City Council. An example of such a project includes the Native Plant Distribution Scheme. Through this scheme local landholders can access revegetation materials to address streambank and soil erosion on their properties.

The Hunter Catchment Management Trust is also committed to managing erosion. Through the 'Land Management Scheme' it provides financial rebates to landholders who undertake erosion control works and revegetation on their property.

Acknowledgement & References

This case study has been prepared by Tim Crosdale (Environmental Officer, Maitland City Council). Other information sources included:

Hazelton, P. & Koppi, A. 1993, *Soil Technology: Applied Soil Science*, Sydney: NSW Governement Printing Service.

Hunter Catchment Management Trust 2002, *Integrated Catchment Management Plan for the Hunter Catchment 2002*.

Maitland City Council 2000, *The Maitland Greening Plan, Stage 2 Part B*, Maitland, NSW: Maitland City Council.

Sinden, J.A. & Yapp, T.P. 1992, "Estimation of the Opportunity Costs of Land Degradation in NSW: Preliminary findings", paper presented at the *36th Annual Conference of the Australian Agricultural Economics Society*, Canberra, Agricultural Industries, Outlook 99.

Case Study

6.3 BLUE-GREEN ALGAE in local waterways

What is blue-green algae?

Blue-green algae or *Cyanobacteria* comprise several species of naturally occurring algae that affect local waterways.

Blue-green algae become a problem when their numbers multiply rapidly, forming a 'bloom'. They may cause toxic or allergic reactions in humans and other animals when contact is made and therefore pose both a health and environmental threat.

Fact File:

There are two known blue-green algae species in the lower Hunter region that produce toxins of risk to animals and human: *Anabaena* and *Microcystis*. These two species have contributed to blooms in Maitland's waterways.

Identifying blue-green algal blooms

When a 'bloom' forms the water can turn bright blue / green in colour and form a paint-like scum on the surface. Other characteristics of a blue-green algal bloom can include:

- unpleasant odours in and around the water body;
- unpleasant tastes to the water; and
- dried blue-green scum on the edges of the water body.

If any these factors are identified it is possible that the water contains blue-green algae. In public waterways laboratory analysis is often carried out at this point to confirm whether the algae is blue-green algae.

Blue-green algae bloom over surface of water. (Photo: Bruce Cooper; from NSW Dept. Land & Water Conservation 1997)

What factors contribute to the formation of blooms?

There are three main factors that promote the growth of blue-green algae. These are:

- high nutrient levels,
- high water temperatures, and
- relatively calm conditions.

Fact File:

During 2001-02 three blue-green algae blooms appeared in water bodies around Maitland. They were located at Telarah Lagoon, Rathluba Lagoon and sections of Wallis Creek The blooms lasted for about two to three months.

High nutrient levels are an important factor leading to the growth of blue-green algae. Increased levels of nutrients in waterways can come from a number of human sources including stormwater and agricultural runoff and soil and streambank erosion.

Why are blue-green algae a problem?

There are many types of algae present in water. Problems arise if they are present in large numbers, affecting the taste, odour and appearance of the water. Of all algae species, blue-green algae are the worst offenders.

If the toxins produced by blue-green algae come into contact with skin the following may occcur: skin irritations, rashes, swollen lips, eye irritation, ear ache and itchiness, sore throat, hay fever symptoms and asthma.

The use of affected water for drinking may cause nausea, vomiting, stomach pain, diarrhoea, liver problems, muscle weakness or paralysis. Blue-green algal blooms can pose a serious health risk to both humans and animals.

Native wildlife can also be affected by the bloom either through direct contact with the toxic algae or through the loss of oxygen within the water as the algae decomposes.

The formation of a bloom also indicates declining water quality. Blue-green algal blooms are symptomatic of a waterway under stress especially due to high nutrient levels.

Case Study C

BLUE-GREEN ALGAE in local waterways

Fact File:
The occurrence and intensity of blooms in the Maitland area have increased in recent years. Blooms have occurred in the same water bodies -Telarah and Rathluba Lagoons - for three consecutive years. Investigations of the blooms have revealed that high nutrient levels in catchment runoff contributed to the frequency and intensity of the blooms.

Impacts of blue-green algal blooms

Due to their toxicity, blue-green algal blooms can render waterways virtually useless for drinking water, agricultural and recreational purposes.

The economic impacts of a blue-green algal bloom can be widespread. The costs are largely related to the management of the bloom and reducing the risk to humans and animals. In some areas of NSW algal blooms have formed within town drinking supplies, forcing the introduction of water restrictions.

Recreational users are also affected by the formation of the bloom. In this sense, economic impacts may be felt through loss of tourism income and the social impacts of a decline in aesthetics of the waterbody and restrictions in use.

The recent algal blooms in Telarah Lagoon have meant that restrictions on fishing and swimming have had to be imposed. Even walking around the lagoon was affected due to the unpleasant odours of the bloom.

Preventing blue-green algal blooms

Very little can be done to address an algal bloom once it has formed. Whilst there are options to control the bloom, including algicides and water treatment methods, they are often very expensive and can cause considerable environmental harm if not used correctly.

The most effective way of addressing a bloom is to prevent it from occurring in the first place. This can be achieved through controlling the human factors that contribute to blooms.

Central to the prevention of algal blooms is the education of the community on ways to reduce the amount of nutrients in waterways.

Managing blue-green algae

The management of algal blooms in Maitland is guided by the 'Hunter Regional Algal Contingency Plan' which has been prepared on behalf of the Hunter Regional Algal Co-ordinating Committee. There are a number of main players including Maitland City Council and the NSW Department of Sustainable Natural Resources.

The Plan outlines the management of algal blooms. This includes alerting users of the water body to the presence of the bloom and continual monitoring of algae levels.

An example of signage used to alert users of water bodies of the presence of an algal bloom.

Also outlined in the plan are alert levels based on the number and type of algae present in the water body. This is to reduce the risk of humans and animals coming into contact with the contaminated water. High alert levels have been maintained for months at a time during blooms in Rathluba and Telarah Lagoons.

Fact File:
A high alert level is issued when the algae concentration is more than 15,000 cells (individual alga) per millilitre of water.

Education programs have also been designed and used in the areas where blooms are recurring. The educational material focuses on how to reduce the amount of nutrients in runoff from residential, agricultural and commercial areas. Maitland City Council has introduced these educational programs in the Wallis Creek, Telarah Lagoon, and Rathluba Lagoon catchments.

Acknowledgement & References

This case study has been prepared by Tim Crosdale (Environmental Officer, Maitland City Council). Other information sources included:

Hunter Regional Algal Coordinating Committee 2000, *Hunter Region Algal Contingency Plan.*

NSW Dept. Land & Water Conservation 1997, *What scum is that? Algal blooms and other similar prolific plant growth.*

Maitland City Council 2000, *The Maitland Greening Plan, Stage 2 Part B*, Maitland, NSW: Maitland City Council.

Program P

6.1 Developing a Local RESEARCH ACTION PLAN

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Geography	5	5A3 (Issues in Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.9

Overview

This program involves students in an investigation of a current geographical issue, feature or process in their local community by developing a Research Action Plan. The program involves three main stages:

1. **Defining** a geographical issue, feature or process.
2. **Developing a plan** of how to investigate the issue, feature or process.
3. **Implementing the plan** by undertaking the investigation.

Materials Required

Provided

- Excursion Program 7.4 - *Investigating issues & ecosystems at Tenambit Wetland*
- Case Study 3.1 - *Native Vegetation in Maitland*
- Case Study 3.3 - *Investigating Woodberry Swamp*
- Case Study 4.4 - *Catchment Management of Wallis & Fishery Creeks*
- Case Study 5.1 - *Local Environmental Citizenship*
- Case Study 5.2 - *Maitland Environmental Youth Council*
- Case Study 5.3 - *Landcare: Making a Difference*
- Case Study 5.4 - *Regeneration at Earthcare Park*
- Case Study 6.1 - *Salinity*
- Case Study 6.2 - *Erosion*
- Case Study 6.3 - *Blue-Green Algae*
- Worksheet 6.1

To Obtain

- Newspaper clippings of local geographical issues
- Copies of case studies and worksheets

Acknowledgement

This program has been designed collaboratively by Social Science staff at Maitland High School and trialed with Year 10 geography students at Maitland High School and Maitland Grossmann High School.

Program P

6.1 Developing a Local RESEARCH ACTION PLAN

Program Instructions

Content	Strategies	Resources
Issue identification	◆ Students identify a LOCAL geographical issue, feature or process to be investigated. Issues may be identified through: - review of case studies; - implementing an excursion program, e.g. *7.4 Investigating Issues & Ecosystems at Tenambit Wetland*; - review of local newspaper articles; - guest speakers and class discussion.	◆ Case Studies 3.1, 3.3, 4.4, 6.1, 6.2, 6.3 ◆ Excursion Program 7.4 ◆ Local newspaper clippings ◆ Guest speaker (refer to Section 8)
Developing a research action plan	◆ Students develop a PLAN of how they are going to investigate the issue. This should include both *primary* and *secondary* information sources. ◆ The plan should address questions such as: - When and how will information be collected? - How will research findings be presented (communicated)? - What actions (solutions) are proposed to manage the issue? - To whom shall the research findings and proposed actions be reported?	◆ Worksheet 6.1 (student guidelines)
Implementing the research action plan	◆ Students put their PLAN into action by: - conducting secondary research, e.g. review of case studies, reports, publications; and - conducting primary research, e.g. surveys, interviews, drawing maps, taking photos. ◆ Students keep an accurate log of what research they did and when. ◆ Students collate their research findings and present these using appropriate written, oral and graphic forms.	
Communicating research findings and active citizenship	◆ Students report their research findings in a report format: INTRODUCTION (max. 100 words) - Identification of the local issue. - Outline of why this issue was identified for investigation. METHOD OF INVESTIGATION (max. 150 words) - Explanation of how the issue was investigated. FINDINGS (max. 250 words + graphics) - Description of the findings (results) of the investigation. - A range of formats should be used to present findings (e.g. text, graphs, tables, maps, photos). ACTIONS (max. 100 words + letter) - Explanation of proposed actions/solutions to manage or rectify the issue. - Write a letter to an appropriate person and/or authority explaining the research, findings and suggested actions. ◆ Refer students to environmental citizenship case studies to broaden awareness of options for active citizenship.	◆ Case Studies 5.1, 5.2, 5.3, 5.4

Worksheet W

6.1 Developing a Local RESEARCH ACTION PLAN

Student Information Sheet

A requirement of the School Certificate Geography course is that students must investigate a current geographical issue in their local area by developing a RESEARCH ACTION PLAN. Through this Plan students are expected to:

- gather and process relevant data
- evaluate alternative solutions regarding the management of the issue
- communicate research findings
- propose individual or group actions to address the issue
- demonstrate active citizenship.

The steps to develop your LOCAL RESEARCH ACTION PLAN are outlined below along with the criteria that will be used to assess your work.

STEP 1 Identify a local geographical issue of interest or concern to you.

EXAMPLE:
Is the local community concerned about the loss of native vegetation in the Maitland area?

Assessment criteria:
The issue is geographical (i.e. place specific) AND it is clearly explained.

STEP 2 Develop a plan to research the issue.

This plan should include a time frame and address the following questions:

- What *primary* and *secondary* information is required?
- How will the information be collected? What are the information gathering instruments and how will these be used?
- When will the information be collected?
- How will research findings be presented (communicated)?
- To whom will the research findings and proposed actions be reported?

EXAMPLE:

Days 1&2:	Read case study *(3.1 Native Vegetation in Maitland)* and look through the Maitland Greening Plan.
Day 3:	Design questionnaire and tally sheet. Decide on locations and number of people to survey.
Days 5 - 9:	From 4.00-5.30pm, use local shopping mall to implement questionnaire. Ask 40 local residents to respond to questionnaire.
Day 10:	Collate results...

Assessment criteria:
Evidence is provided showing a structured and logical sequence in the research plan with an emphasis on primary information sources.

Worksheet W

6.1 Developing a Local RESEARCH ACTION PLAN

STEP 3 Put the research plan into action.

This step will include:

- conducting secondary research;
- conducting primary research (e.g. distribute surveys, conduct interviews, draw maps, take photos);
- collating the research findings (e.g. use tallies, tables and/or graphs for results from surveys and interviews; finalise maps; develop and annotate photos; select appropriate information to be included in the report).

EXAMPLE:

Date	Step	Activity

Assessment criteria:
Demonstrated ability to initiate and implement research using a range of methods and information sources.
Provide a detailed and accurate log of research activities.

STEP 4 Communicate research findings.

Prepare a report on your research using the format below:

INTRODUCTION (max. 100 words)

- Identification of the local issue.
- Outline of reasons why this issue was identified for investigation.

METHOD OF INVESTIGATION (max. 150 words)

- Explanation of how the issue was investigated.

FINDINGS (max. 250 words + graphics)

- Description of the findings (results) of the investigation.
- A range of formats should be used to present findings (e.g. text, graphs, tables, maps, photos).
- Secondary information (i.e. other people's work) may be used to support your results, this information is to be acknowledged.

EXAMPLE:
Level of local residents' concern for loss of native vegetation across Maitland: 30% highly concerned; 50% concerned; 15% not very concerned; 5% not at all.
65% said they would be willing to pay a small annual environmental levy to help address the issue.

CONCLUSION (max. 100 words)

- State the conclusion to your research.
- Suggest and explain proposed actions/solutions to manage or rectify the issue.

EXAMPLE:
Most local residents are concerned about the loss of native vegetation in the Maitland Local Government Area. This concern could be addressed in a number of ways. Some solutions have been described in the Maitland Greening Plan. An option that some local residents might support is the introduction of an environmental levy. This money could be spent on...

Worksheet W

6.1 Developing a Local RESEARCH ACTION PLAN

STEP 4 Communicate research findings (cont.)

ACTIONS (letter)

- You identified an issue, investigated it, proved it existed (or not), and suggested a possible solution or improvement. ***What would an active citizen do next?***
- Write a letter to an appropriate person and/or authority explaining the research, findings and suggested actions.

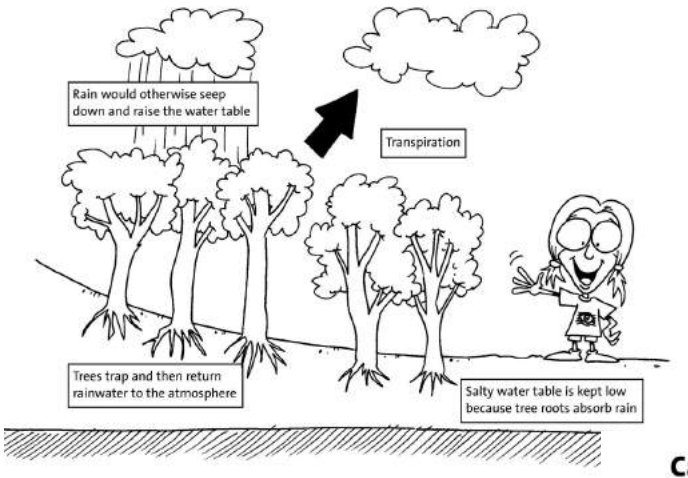
Assessment criteria:

- *Clear and detailed description and analysis of data and results.*
- *Range and depth of research findings.*
- *A logical conclusion, including possible management options deriving from the results.*
- *Degree of appropriateness, structure, and grammatical correctness of the letter.*

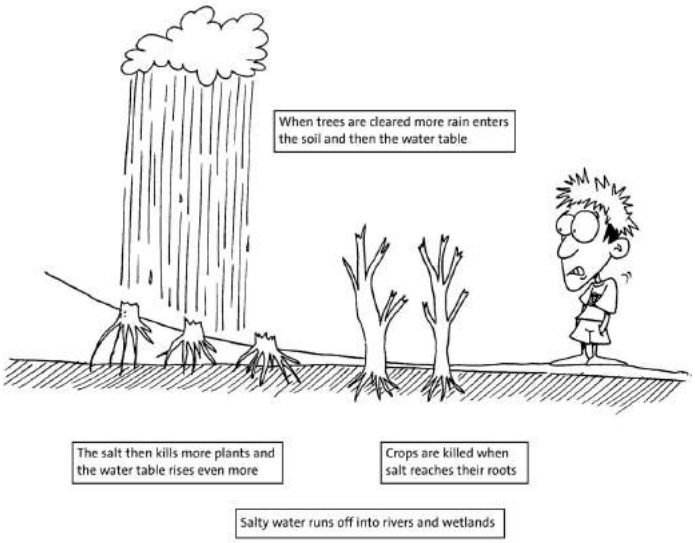
Worksheet W

6.2 Understanding & Managing DRYLAND SALINITY

No Salinity Problem



Causes of Salinity



(Images source: *http://www.streamwatch.org.au/pdf/StreamsAlive22-33.pdf*)

Use these diagrams to explain the link between vegetation clearing and the salinity problem.

Worksheet W

6.2 Understanding & Managing DRYLAND SALINITY

Prior to 1788 Aboriginal occupation was designed to live with the environment. How did this system change with European settlement?

Image source:
www.saltwatch.org.au/saltwatch/book/index.html

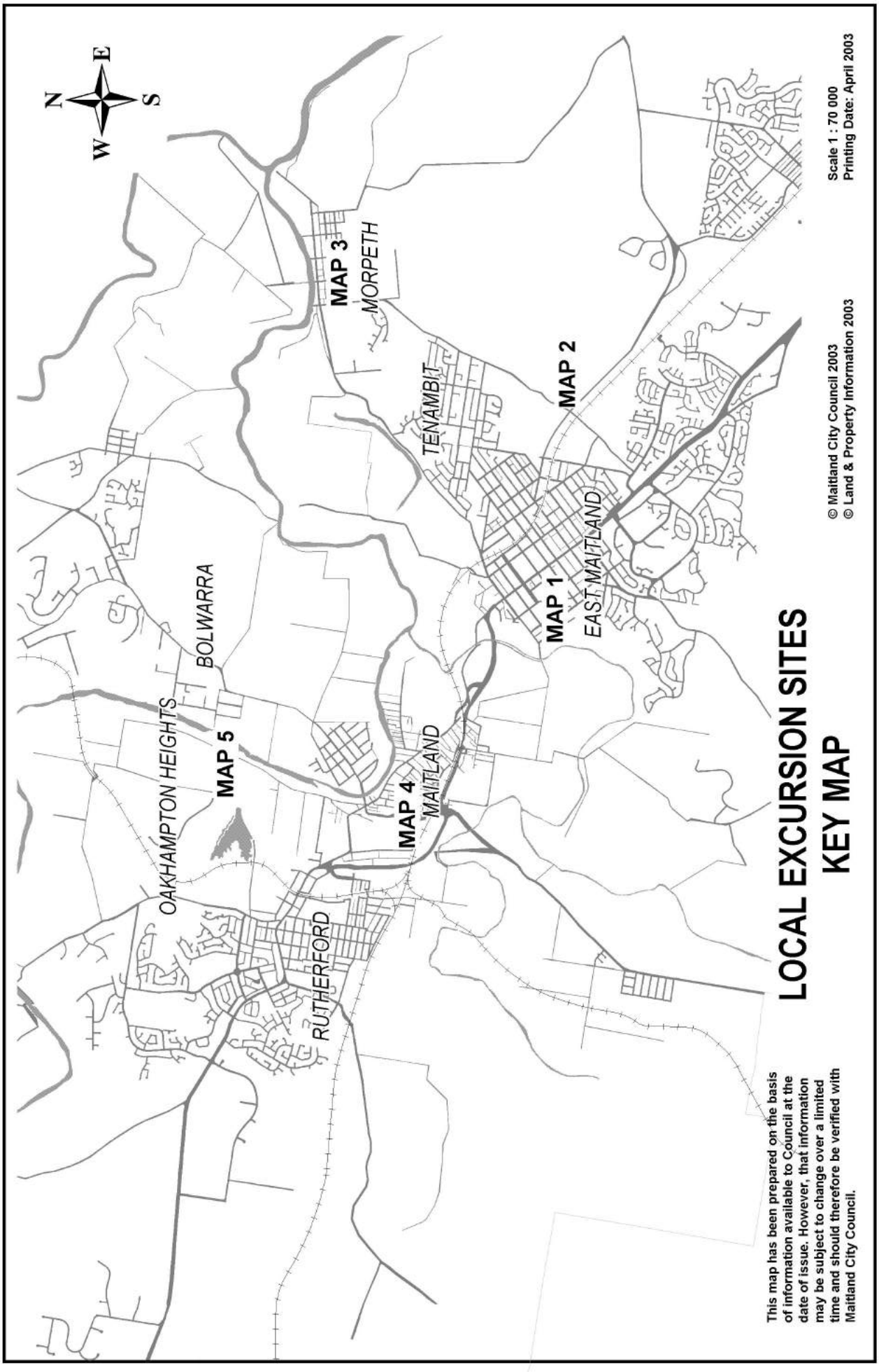
Use the following webpages to assist in determining a management plan for the salinity problem in Maitland. Use Case Study 6.1 from the *Sense of Place Resource Kit* to begin your thinking.

Submit your plan to the EPA outlining the issue and the best way of overcoming the problem. Communicate your findings using ICT media.

Image source: *www.saltwatch.org.au/saltwatch/book/index.html*

Useful links are:

- *www.salinity.com.au/*
- *www.dlwc.nsw.gov.au/care/salinity/index.html*
- *www.saltwatch.org.au/saltwatch/book/index.html*
- *www.ndsp.gov.au/*
- *www.mdbc.gov.au/naturalresources/env_issues/water_and_land_salinity.htm*


LOCAL EXCURSION SITES
KEY MAP
N
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S
W
MAP 1
EAST MAITLAND
MAP 2
TENAMBIT
MAP 3
MORPETH
MAP 4
MAITLAND
MAP 5
OAKHAMPTON HEIGHTS
BOLWARRA
RUTHERFORD
© Maitland City Council 2003
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Scale 1 : 70 000
Printing Date: April 2003
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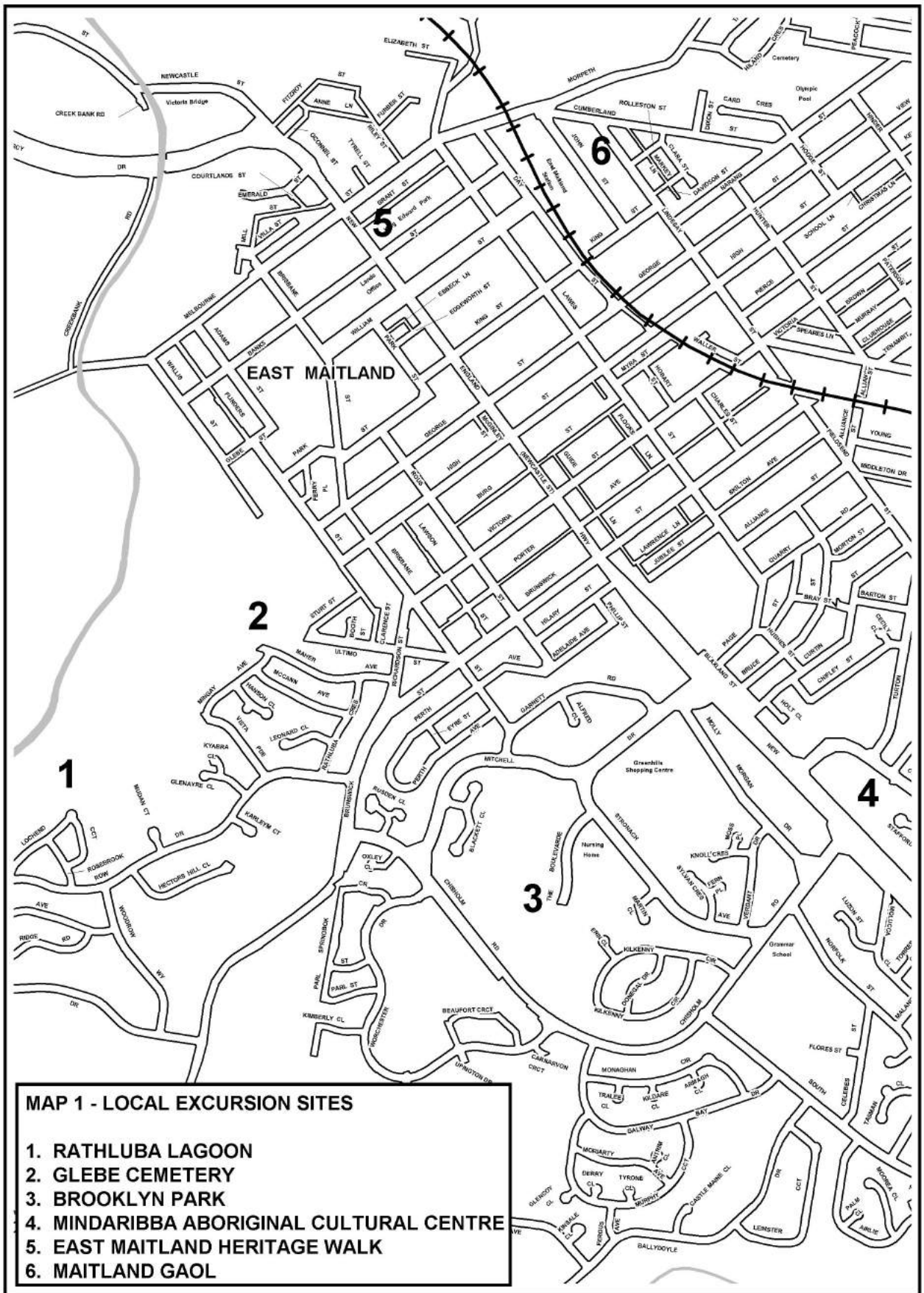
EAST MAITLAND
1
2
3
4
5
6
MAP 1 - LOCAL EXCURSION SITES
1. RATHLUBA LAGOON
2. GLEBE CEMETERY
3. BROOKLYN PARK
4. MINDARIBBA ABORIGINAL CULTURAL CENTRE
5. EAST MAITLAND HERITAGE WALK
6. MAITLAND GAOL
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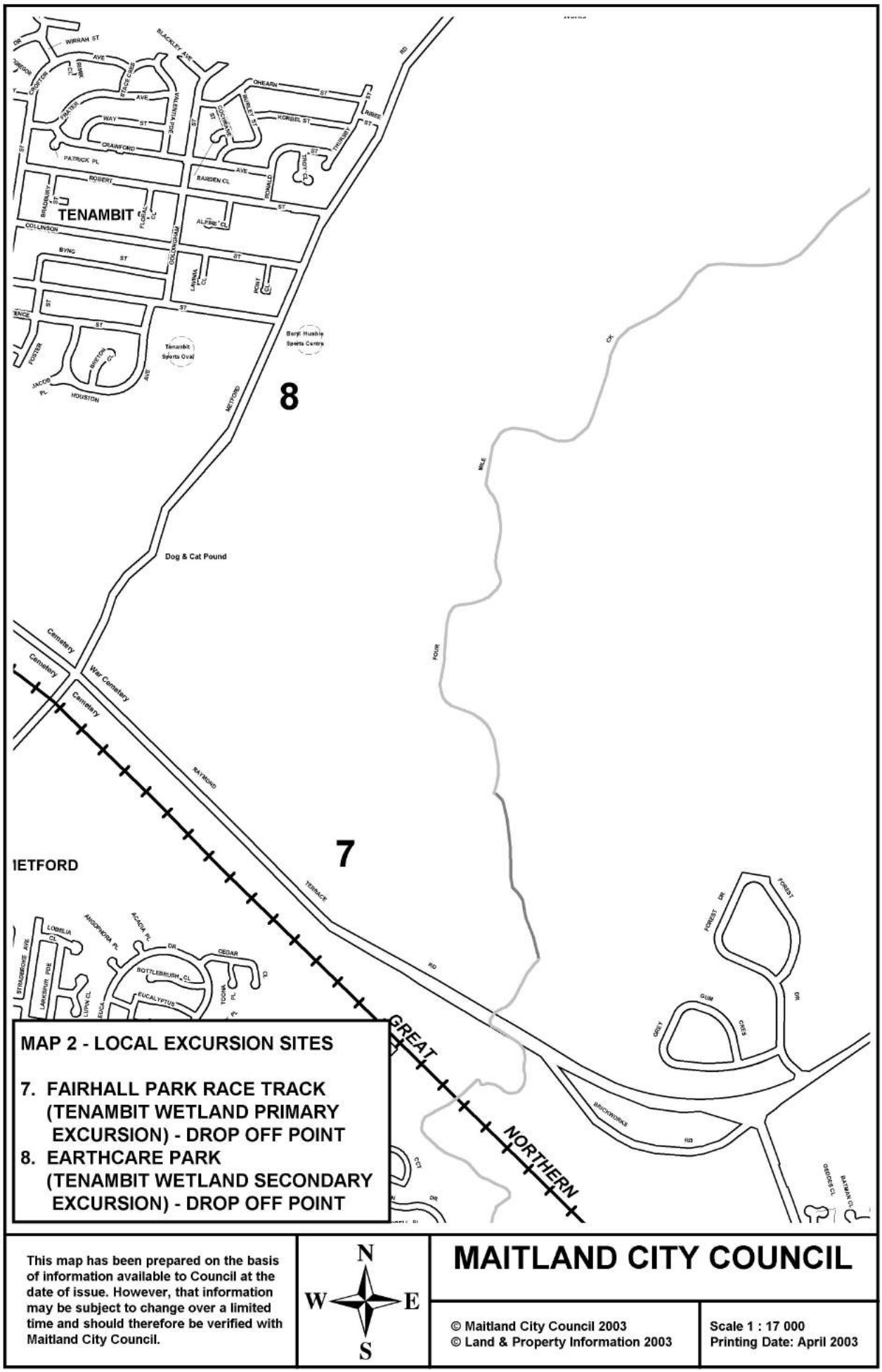
TENAMBIT
8
7
IETFORD
Dog & Cat Pound
Tenambit Sports Oval
Beryl Humble Sports Centre
Cemetery
War Cemetery
GREAT NORTHERN
MAP 2 - LOCAL EXCURSION SITES
7. FAIRHALL PARK RACE TRACK (TENAMBIT WETLAND PRIMARY EXCURSION) - DROP OFF POINT
8. EARTHCARE PARK (TENAMBIT WETLAND SECONDARY EXCURSION) - DROP OFF POINT
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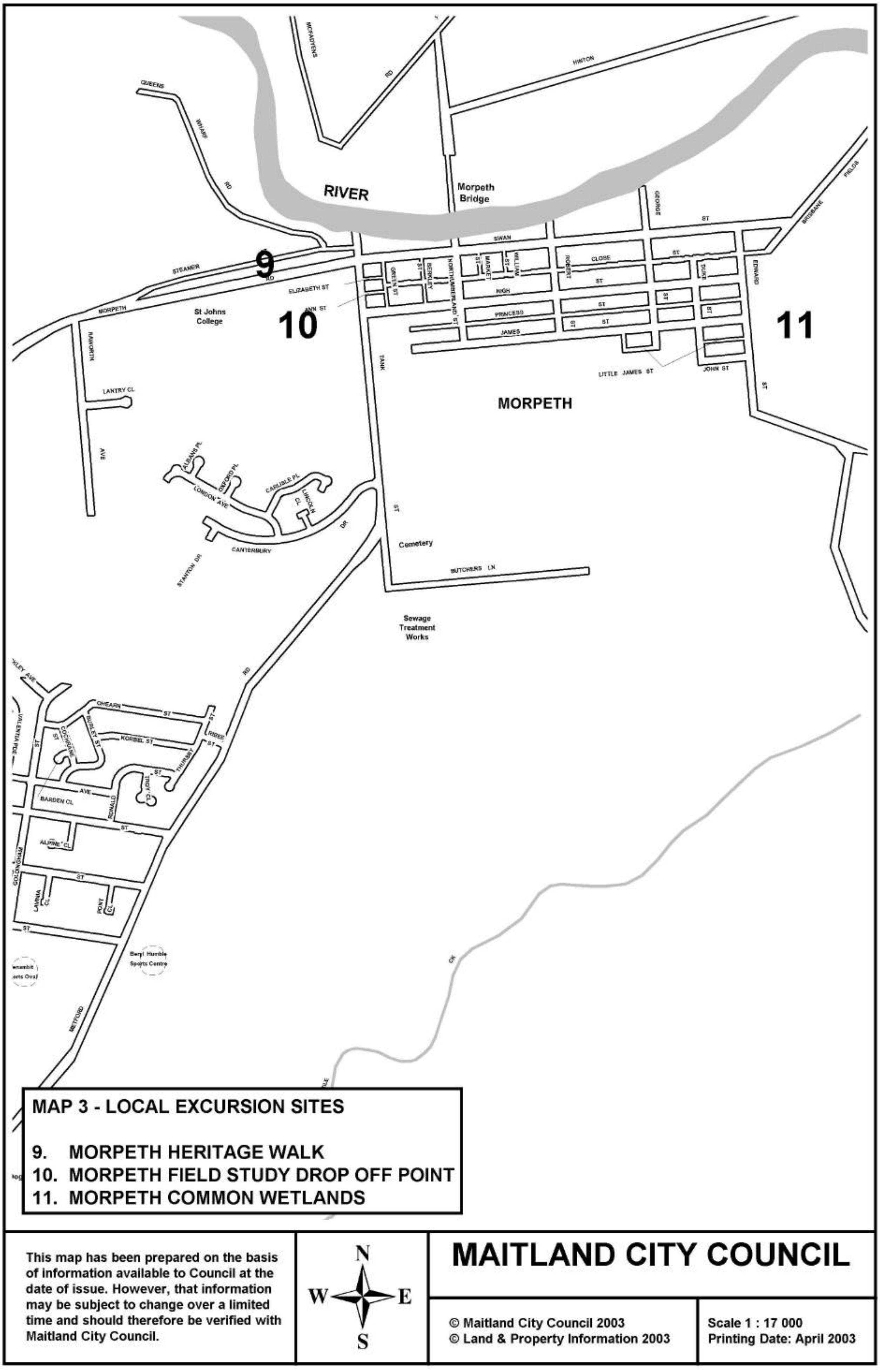
RIVER
Morpeth Bridge
St Johns College
MORPETH
Cemetery
Sewage Treatment Works
9
10
11
MAP 3 - LOCAL EXCURSION SITES
9. MORPETH HERITAGE WALK
10. MORPETH FIELD STUDY DROP OFF POINT
11. MORPETH COMMON WETLANDS
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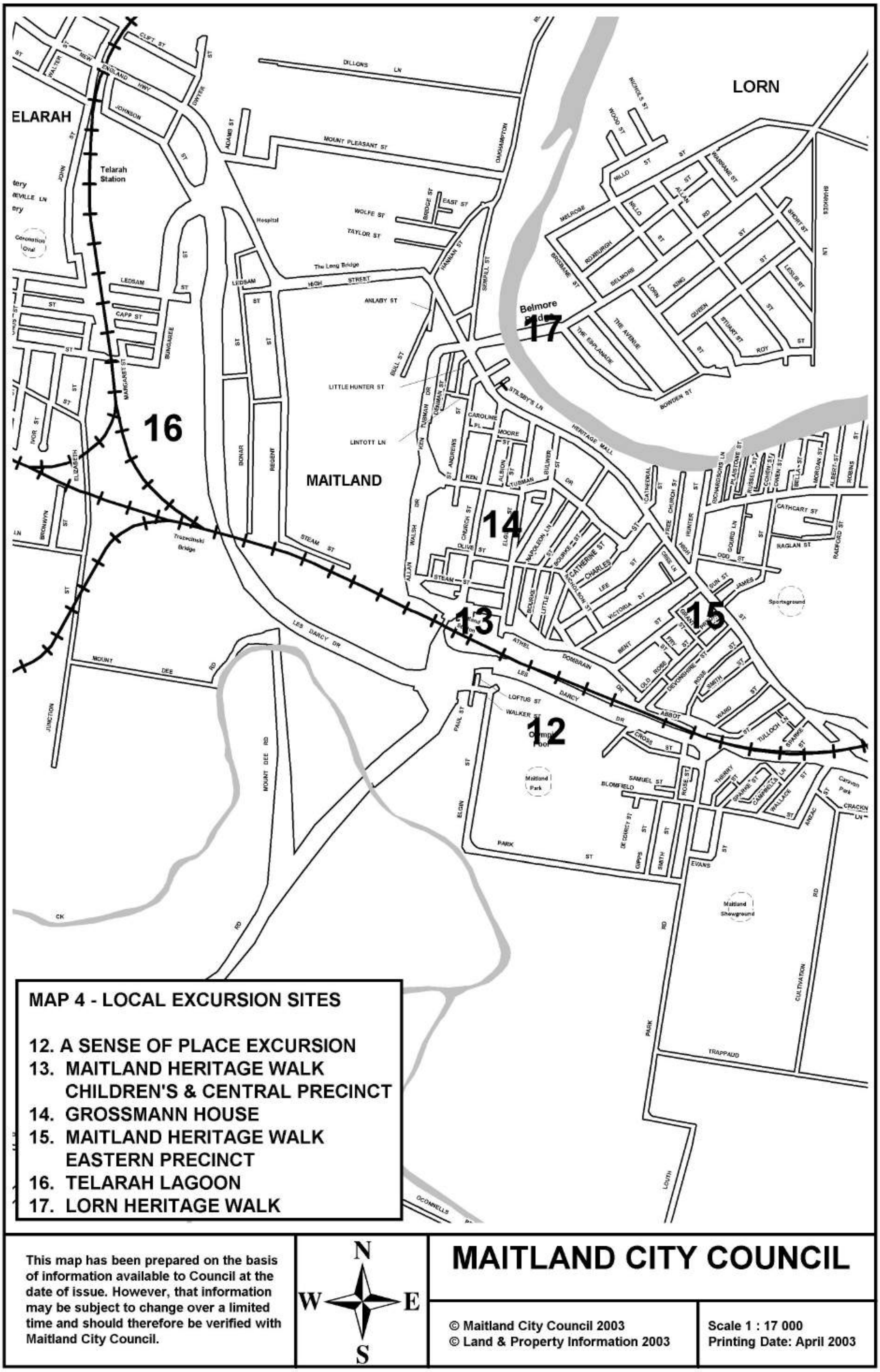
ELARAH
LORN
MAITLAND
Telarah Station
Belmore Bridge
16
17
14
13
15
12
MAP 4 - LOCAL EXCURSION SITES
12. A SENSE OF PLACE EXCURSION
13. MAITLAND HERITAGE WALK CHILDREN'S & CENTRAL PRECINCT
14. GROSSMANN HOUSE
15. MAITLAND HERITAGE WALK EASTERN PRECINCT
16. TELARAH LAGOON
17. LORN HERITAGE WALK
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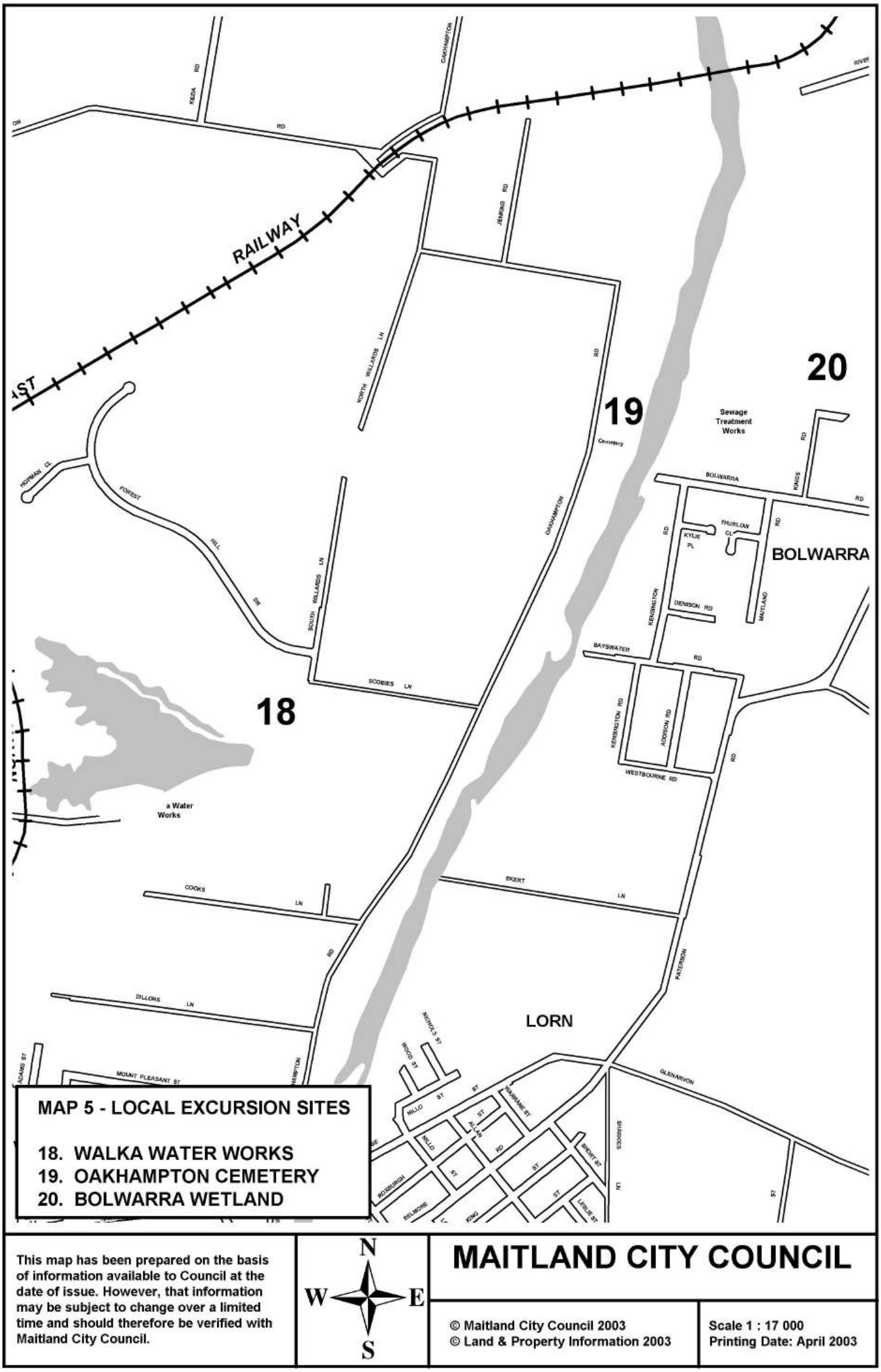

RAILWAY
20
19
18
Cemetery
Sewage Treatment Works
BOLWARRA
LORN
a Water Works
OAKHAMPTON
JENKINS RD
NORTH WILLARDS LN
SOUTH WILLARDS LN
SCOBIES LN
FOREST HILL DR
HOPMAN CL
COOKS LN
DILLONS LN
EKERT LN
PATERSON
GLENARVON
BOLWARRA RD
KINGS RD
THURLOW CL
KYLIE PL
DENISON RD
KENSINGTON RD
MAITLAND
BAYSWATER RD
ADDISON RD
WESTBOURNE RD
MOUNT PLEASANT ST
MAP 5 - LOCAL EXCURSION SITES
18. WALKA WATER WORKS
19. OAKHAMPTON CEMETERY
20. BOLWARRA WETLAND
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Excursion Site E

BOLWARRA WETLAND

Description

Bolwarra Wetland is a freshwater wetland tucked away in the gully below the Bolwarra Sporting Oval. It is surrounded by rural land, although urban development in more recent years has impinged upon the small wetland catchment. Up until 2000 the Bolwarra Wastewater Treatment Works operated on the banks adjacent to the wetland.

Bolwarra Wetland and its immediate surrounds are owned by Hunter Water Corporation. Since 1994, however, Bolwarra Landcare group have held a lease over the site and invested significant time and raised funds to improve and protect the wetland area. Efforts have included the establishment of over 4,000 native trees, shrubs and grasses, construction of a walking track around part of the wetland, fencing to restrict stock access, and educational signage.

Bolwarra Wetland was once a backwater lagoon of the Hunter River. With the construction of levee banks along the Hunter River in the 1960s, the wetland was cut off from from the river. It is now a permanent waterbody and no longer experiences alternating wet and dry cycles. Access to the Hunter River is available through the Bolwarra Wetland site.

The site features remnant trees from the *Tall Alluvial Moist Forest* (rainforest) that once existed over large portions of the Maitland floodplain up until European settlement. This remnant is located on the opposite side of the wetland from the sports oval and may be accessed by a 15 minute walk around the perimeter of the wetland.

The Bolwarra Wetland area is also of Aboriginal significance. Located near the wetland is the grave of King Tom, a respected and prominent member of the Wanaruah local Aboriginal tribe. As well, grinding grooves, open campsites, and stone artefacts have been found in the drainage lines and slopes adjacent to the wetland.

Site Investigation Options

- Understanding wetland and riparian (river/creek) ecosystems.
- Understanding and applying the principles of Total Catchment Management (TCM).
- Investigating human impacts on wetland and riparian ecosystems (e.g. urbanisation, agriculture, wastewater treatement, water quality decline).
- Management of human impacts (e.g. revegetation, fencing, managing public access, educational signage).
- Interpreting local Aboriginal use of the land and resources.
- Water quality monitoring.
- Observation and investigation of wetland flora and fauna.
- Opportunity for hands-on revegetation.

Facilities

- Toilets (with disabled access) available at the Sports Oval. Toilets remain locked unless otherwise arranged.
- Walking track around part of Bolwarra Wetland and through regeneration areas.
- Access to the wetland's edge for water sampling.

Resources

- *Draft Management Plan for Bolwarra Wetland* (Bolwarra Landcare 1993).

Contacts

• Access to site, facilities and resources	Maitland Landcare Coordinator	Ph:	4934 9838
• Hands-on revegetation activities	Maitland Landcare Coordinator	Ph:	4934 9838
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

BROOKLYN PARK: URBAN BUSHLAND RESERVE

Description

Brooklyn Park is a small remnant bushland reserve located at the end of The Boulevard (off Stronach Ave.), East Maitland. It forms part of the upper catchment of Two Mile Creek, which joins One Mile Creek and flows into Tenambit Wetland and then the Hunter River. Now completely surrounded by residential development, Brooklyn Park is an important reminder of what the area known as 'Greenhills' once looked like.

The bushland reserve contains remnants of two vegetation communities:

- *Lower Hunter Spotted Gum - Ironbark Forest*
- *Hunter Valley Dry Rainforest*

Small patches of the rainforest grow along sections of Two Mile Creek which flows through Brooklyn Park. This is a rare find since only 6% (61 hectares) of this vegetation community remains within the Maitland local government area (compared to its extent prior to European settlement).

During 1996 Maitland Council constructed basic bushwalking trails through the reserve to promote the area for passive recreation as part of its broader recreational and environmental linkages program. These trails remain today and provide a chance to explore the different vegetation communities and investigate erosion and bushland management issues.

Site Investigation Options

- Understanding forest ecosystems.
- Understanding and applying the principles of Total Catchment Management (TCM)
- Investigating human impacts on forest ecosystems (e.g. urbanisation, recreational uses, weed invasion).
- Management of human impacts (e.g. revegetation, managing human access, weed control, community education).
- Water quality monitoring (depending upon availability of water in the creek). Water samples could be gathered at various locations along length of Two Mile Creek and down to Tenambit Wetland to investigate spatial changes in water quality linked to changes in land use.
- Study of urban stormwater runoff.
- Observation and investigation of bushland flora and fauna.

Facilities

- Concrete pathway through sections of the reserve (The Boulevard through to Chisholm Road).
- Access to creek's edge for water sampling.

Resources

- *Brooklyn Park Plan of Management* (Maitland City Council 1995).
- *Draft Catchment Management Plan for Woodberry, Morpeth-Tenambit and Millers Forest Catchments* (Maitland Landcare 1999).

Contacts

• Access to site	No need for prior arrangement		
• Copy of relevant resources	Recreation & Community Facilities Coordinator (Maitland City Council)	Ph:	4934 9736
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

EARTHCARE PARK: TENAMBIT WETLAND

Description

Earthcare Park is located on East Maitland Common, Metford Road (between the Dog Pound and the BMX Track). It occupies approximately 35 hectares of gently sloping low-lying land comprising sections of the Tenambit Wetland, remnant bushland, and what was once open grazing land. It also features a small disused rock quarry pit and a series of mounds along the lower slopes that were used in the early 1920s as part of a rifle range.

The catchment for Tenambit Wetland covers 5,680 hectares and is a mix of urban, industrial, and rural land use and bushland, and includes parts of East Maitland, Metford, Ashtonfield and Tenambit. The wetland is fed by One Mile, Two Mile, Three Mile and Four Mile Creeks that combine to flow into the Hunter River near Morpeth. Although now cleared, the low slopes surrounding the wetland would once have featured dense stands of *Tall Alluvial Moist Forest* (rainforest).

Since 1996 the Earthcare Park landcare group have been regenerating and restoring the health of the wetland and remnant bushland. On-ground activities have included the planting of at least 6,000 native trees, shrubs and grasses, creation of a bushfood education area, placing nestboxes in trees, flora and fauna studies, and water quality monitoring.

During 2003 Maitland Council made this site and other portions of East Maitland Common a focus for the implementation of the Maitland Greening Plan. Throughout the year about 5,000 native plants will be re-established around the edge of the wetland area.

Site Investigation Options

- Understanding wetland and forest ecosystems.
- Understanding and applying the principles of Total Catchment Management.
- Investigating human impacts on wetland and forest ecosystems (e.g. dryland salinity, urbanisation, agriculture, water quality decline, recreational uses).
- Management of human impacts (e.g. revegetation, managing human access, community education).
- Water quality monitoring.
- Observation and sampling of wetland and bushland flora and fauna.
- Bushfood garden - learning about the different uses of native plants.
- Opportunity for hands-on revegetation.

Facilities

- Toilets (with disabled access) available at the Sports Oval. Toilets remain locked unless otherwise arranged.
- Walking track around part of Earthcare Park and through extensive regeneration areas.
- Bushfood educational signage.
- Access to the wetland's edge for water sampling.
- Small outdoor classroom area beneath trees.

Resources

- *Draft Catchment Management Plan for Woodberry, Morpeth-Tenambit and Millers Forest Catchments* (Maitland Landcare 1999).
- *Tenambit Wetland Rehabilitation* (Dept. Land & Water Conservation 1996).
- Results from a range of studies coordinated Earthcare Park & Education Centre (archaeology, flora, fauna, geology)
- Bushfood pamphlet and Earthcare Park group pamphlet.
- Website: *www.earthcare.asn.au*

Contacts

- Access to site, facilities and resources — Maitland Landcare Coordinator — Ph: 4934 9838
- Streamwatch monitoring equipment — Maitland Landcare Coordinator — Ph: 4934 9838
  (Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

GLEBE CEMETERY

Description

The Glebe Cemetery, also known as the St Peters Old Burial Ground is an Anglican burial ground located at the end of George Street on the outskirts of East Maitland. It commenced formally with a one acre 'burying ground' established in 1829 by the Clergy and Schools Lands Corporation and was amongst the first in the Hunter Region.

The Cemetery is considered to be significant for its dramatic landscape quality. The monuments ranging from simple steel to elaborate vaults reflect the disparity of wealth and taste in the burgeoning colonial society of the early 1800s.

The Cemetery holds the remains of over two hundred people including some of regional and national importance such as First Fleeter, J. Trimby, and Police Magistrate, D. Day, who tried the Myall Creek Massacre killers. It is also thought to be the place of burial of Colonial Architect Francis Greenway.

The Cemetery was classified by the NSW National Trust in 1982 and was entered on the State Heritage Inventory in 1998. It is protected under Maitland City Council's Local Environmental Plan as an item of State significance. Burials in the cemetery had ceased by the 1900s.

A project involving the conservation of Glebe and Oakhampton Cemeteries commenced in 2000 and involved the clearing of noxious vegetation, preparation of a Conservation Management Plan, construction of all-weather public access, and monument restoration works by specialist stonemasons. In addition, Council initiated a cooperative project with the University of New England where detailed physical site survey work was undertaken at the Cemetery, with the full results adapted into a new website crossed linked to that of Maitland Council.

Site Investigation Options

- Historic site study.
- Investigation of early pioneer settlers.
- Understanding early settlement patterns of the local area.
- Examples of stonemasonry and conservation techniques.
- Interaction of cultural and natural landscapes.

Facilities

- The site remains permanently open to the public.
- The closest toilets are at Stockade Hill Park and Rathluba Reserve. Access is available only by prior arrangement.
- Access to Glebe Cemetery is via a grassed pedestrian track (starting at the end of George Street, East Maitland).

Resources

- *Access Archaeology, Conservation Management Plan for Glebe and Oakhampton Cemeteries* (Maitland City Council 2000).
- Glebe Cemetery website: *www.maitland.nsw.gov.au/cemetery.html*
- Maitland Family History Circle email: mfhc@kooee.com.au
- Waddell, J. 1996, *A History of St Peters Church, East Maitland.* (Maitland City Library Local History Collection).
- National Trust Australia (NSW) website: *www.nsw.nationaltrust.org.au/cemeteries.html*

Contacts

• Access to toilet facilities	Recreation & Community Facilities Coordinator (Maitland City Council)	Ph:	4934 9736
• Copy of relevant resources	Maitland Heritage Officer (Maitland City Council)	Ph:	4934 9832
	Maitland City Library (Local History Collection)	Ph:	4933 6952

Excursion Site E

GROSSMANN HOUSE

Description

Located at 77 Church Street, Maitland, Grossmann House (formerly known as *Entecliffe*) was built between 1870 and 1871 as a townhouse for wealthy Maitland merchant, Isaac Beckett. On the same lot his business partner, Samuel Owen, erected an architectural mirror-image of Beckett's dwelling called Brough House.

Prior to the construction of Grossmann House and Brough House, Beckett and Owen had established a highly prosperous commercial business in High Street, Maitland. The Beckett's had seven children, three of whom died in infancy. They were in their 50s when they moved into their new townhouse, and Alfred, their son, was 18. Isaac continued to live at the house until his death.

In 1893, the then Department of Public Instruction resumed the property to provide a permanent home for Maitland Girls' High School, one of the first four public high schools established in NSW. Miss Jeanette Grossmann MA served as Principal from 1890 until 1913 when she was transferred to found North Sydney Girls' High School.

Entecliffe became officially known as Grossmann House in 1935, and continued to serve as the School House until 1963 when Maitland Girls' High School moved to East Maitland. The Hunter Regional Trust was granted permissive occupancy of Grossmann House in 1964 and it was opened to the public in 1966 as a mid-Victorian-period house museum after the local committee furnished it with gifts from local families and bequests held by the National Trust in Sydney.

Following a further extensive $600,000 program of restoration in 2001, Grossmann House now reflects Beckett's period of occupancy. The property also has a rich costume and textile collection, and features the only operational gas lighting of a house in public ownership in NSW. The wallpapers are also a stunning highlight, having been painstakingly recreated from evidence of actual pieces found under the architraves.

Site Investigation Options

- Historic site study.
- Investigation of early pioneer settlers and their lifestyle.
- Reconstruction of history through analysis of objects, images and documents held at site.

Facilities

- Opening hours: 10am - 3pm, Thursday, Friday, Saturday and Sunday, or by appointment for groups.
- Education program investigating the changes in the community, education and family life. The program is discovery-based and 90 minutes duration.
- Ramp access to ground floor.
- Toilets (with disabled access).
- Grossmann House can accommodate a maximum of 48 students at any one time.

Costs

Admission to Grossmann House	$3.00 per person

Resources

- *Grossmann House Conservation Management Plan* (Shelley McKerrow, University of Canberra 1998).
- *National Trust Grossmann House Property Information* brochure
- National Trust Australia (NSW) website: *www.nsw.nationaltrust.org.au*

Contacts

Bookings and access	Grossmann House Property Manager	Ph:	4933 6452
National Trust of Australia	Education Unit, The National Trust Centre	Ph:	(02) 9258 0130

Excursion Site E

KOORAGANG CITY FARM

Description

Kooragang City Farm occupies 150 hectares of the north-western part of the Kooragang Wetlands Ash Island site in the Hunter estuary, just 15 kilometres north-west of Newcastle. Once the site of a dairy farm, City Farm features mangrove forests and saltmarsh along its northern and eastern borders, alluvial soils, kikuyu pastures, remnant native vegetation, freshwater swales and the ruins of a 1860s farmhouse.

City Farm is an integral part of the Kooragang Wetland Rehabilitation Project. It seeks to demonstrate sustainable farming in harmony with natural ecosystems, especially wetlands. The Farm has a rural setting despite its proximity to urban and industrial areas. Now almost completely cleared of native vegetation, higher areas of the farm were once covered with coastal rainforest.

Since 1998 Kooragang City Farm has erected solar-powered electric and permanent fencing to manage cattle and protect sensitive wetland and revegetation sites. A holistic grazing management strategy is in place for cattle, with Cattlecare and Meat Standards of Australia accreditation.

Kooragang City Farm has produced a wide range of fresh and preserved goods including seasonal fresh fruit and vegetables, bottled preserves from garden fruit and vegetables and honey from the Farm's bee hives.

In addition, Kooragang City Farm has planted over 9,000 trees and shrubs as windbreaks and wildlife corridors, planted 4 hectares with 3,500 eucalypt trees as farm forestry, developed a bush food garden, completed a Rivercare project to protect a kilometre of Hunter River shoreline, constructed a cycleway to connect points of interest around the farm, established a community garden, developed an integrated permaculture orchard with native trees and a vast array of sub-tropical and stone fruit trees.

Site Investigation Options

- Understanding permaculture and organic farming techniques.
- Investigating impacts of cattle grazing on wetland ecosystems.
- Management of human impacts.
- Water quailty monitoring.
- Observation and sampling of wetland and bushland flora and fauna.
- Opportunity for hands-on revegetation.

Facilities

- Self-composting toilets with disabled access (toilets remain locked unless otherwise arranged).
- Two picnic gazebos.
- 3 kilometres of walking track, cycleway and boardwalks. Limited interpretative signage.

Resources

- *Kooragang City Farm Management Report* (Henderson, R. 1995).
- *Kooragang City Farm Business Plan* (Henderson, R. 2001).
- Various student reports held at Kooragang Wetlands Information Centre

Contacts

• Access to site, facilities and resources	Kooragang City Farm Manager	Ph:	4964 9308
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

KOORAGANG WETLANDS: ASH ISLAND

Description

Kooragang Wetlands comprises three sites in the Hunter River estuary totalling 1,560 hectares: Ash Island, Tomago and Stockton Sandspit just north-west of Newcastle.

Ash Island site (750 hectares) is located at the western end of Kooragang Island (via Ash Island bridge, Pacific Highway, Hexham). It contains large areas of estuarine wetlands, including mangrove forests, saltmarsh and mudflats, as well as areas of uplands that have been grazed and contain isolated freshwater wetland areas. A World War II radar building plus farmhouse and dairy ruins indicate past human activities.

The catchment for Kooragang Wetlands is a mix of industrial, urban, rural land use and bushland. The wetlands are under the influence of the tides plus water that flows down the Hunter River and its tributaries. Non-tidal areas were once covered by coastal rainforest of which only a few small remnants remain.

Since 1993 the Kooragang Wetland Rehabilitation Project (KWRP) has been working to create and restore fisheries habitat, to create high tide roosting sites for wading birds, and to conserve threatened species. On-ground activities have included: increasing tidal flushing in a number of creeks; creating saltmarsh wetlands; fencing; planting of 78,000 trees and shrubs indigenous to the site; creation of frog ponds; flora and fauna studies; and water quality monitoring.

The Kooragang Wetland Rehabilitation Project is a sub-committee of the Hunter Catchment Management Trust. In 1997 it became a major capital works project of the NSW Government through the Dept. Land & Water Conservation's (now Dept. Sustainable Natural Resources) Estuary Management Program.

Site Investigation Options

- Understanding estuarine wetlands and riparian (river/creek) ecosystems.
- Investigating human impacts on wetland and riparian ecosystems (e.g. urbanisation, agriculture, water quality decline, recreational uses).
- Managing human impacts (e.g. restoring tidal flows, revegetation, managing human access, educational signage).
- Water quality monitoring.
- Observation and sampling of wetland and coastal rainforest flora and fauna.
- Opportunity for hands-on revegetation and bush regeneration.

Facilities

- Self-composting toilets with disabled access (toilets remain locked unless otherwise arranged).
- 15 kilometres of roads, cycleways, walking tracks and raised boardwalks. Interpretative signage along a mangrove boardwalk and through revegetation areas.

Resources

- *Kooragang Wetland Rehabilitation Project Management Plan* (Svoboda, P. 1996).
- *Kooragang Wetland Rehabilitation Project: History of Changes to Estuarine Wetlands of the Lower Hunter Estuary* (Williams, R.J., Watford, F.A., Balashov, V. 2000, NSW Fisheries Report Series No.22).
- KWRP website: *www.hcmt.org.au/kooragang*

Contacts

• Access to site, facilities and resources	KWRP Communications Officer	Ph:	4964 9308
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

KOORAGANG WETLANDS: STOCKTON SANDSPIT

Description

Stockton Sandspit is a high tide roosting site for migratory wading birds. It is located at the lower end of the Hunter River estuary, on the north-west side of Stockton bridge. It was formed from sand dredged during construction of the bridge in 1971. The Sandspit occupies 10 hectares of land consisting of sand, saltmarsh and mangroves. It is part of the globally significant Kooragang Nature Reserve, the most important coastal site for migratory wading birds in NSW.

In 1996 the Kooragang Wetland Rehabilitation Project (KWRP) rehabilitated the site which had become overgrown with woody weeds. The weeds were removed and a lagoon was created with weirs put in place to ensure only tides above 1.7 metres would enter. This was to favour saltmarsh rather than mangroves.

Since 1996 KWRP and the Hunter Bird Observers Club with help from NSW National Parks and Wildlife Service (NPWS), have carried out activities to further restore the health of the roosting area. On-ground activities have included removal of exotic Spiny Rush, Bitou Bush and other woody weeds from sandy beach areas and saltmarsh, building a bird hide, and planting screening trees and shrubs.

The area attracts up to 4,000 birds of 10-15 migratory and wading species during high tide from October to April. Smaller numbers use the area during winter months. This site is a major focus of attempts to redress the falling numbers of migratory birds seen in the Hunter estuary and elsewhere in south-east Australia over the past 30 years.

Site Investigation Options

- Understanding estuarine wetlands.
- Investigating human impacts on wetland ecosystems (e.g. urbanisation, agriculture, water quality decline, recreational uses).
- Management of human impacts (e.g. revegetation, managing human access, educational signage).
- Monitoring of bird usage of Stockton Sandspit.
- Assessment of the crab community at Stockton Sandspit.
- Water quality monitoring (only when birds will not be disturbed, e.g. during winter or low tide).

Facilities

- A birdhide with some interpretive material inside (birdhide remains locked unless otherwise arranged) is suitable for small groups only, no more than 12 at a time.
- Some interpretative signage.
- Car-parking under Stockton Bridge (access from north-east side of the bridge, turn towards Stockton then take immediate right along a road taking you under the bridge).

Resources

- *Review of environmental factors Stockton Bridge Sandspit: Migratory shorebird habitat rehabilitation* (Shortland Wetlands Centre Consultancy 1995).
- *Kooragang Nature Reserve: Rehabilitation of wader habitat on the Stockton Sandspit* (NSW National Parks and Wildlife Service 2001).
- KWRP website: *www.hcmt.org.au/ kooragang*

Contacts

• Access to site, facilities, birdhide and resources	KWRP Communications Officer	Ph:	4964 9308
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

MAITLAND GAOL

Description

Maitland Gaol is located between John and Lindsay Streets, East Maitland. It has been in use since the 1840s but from time to time its function within the NSW prison system has changed. During the last century it served as the main gaol of northern NSW taking in both short and long term prisoners and some special prisoners from other areas.

Early in the 20th century the role of the gaol altered to take in mainly short term male prisoners from the northern areas of the state. It became the reception prison for the Hunter Region and served in this capacity until the 1950s. It also housed prisoners such as those in need of protection or special treatment. By the 1950s the future of the gaol was doubtful because it was considered outdated, but by 1967 it was classified as a maximum security prison and continued in that role until its closure in 1998.

The highly respected historian James Kerr rates the Gaol as having considerable heritage significance, just below the top international standard. The Gaol is the only remaining "Inspector" type of gaol of the 1840s, a design influenced by the penal philosophy of Inspectors of Prisons in England that provided for the separation of prisoners into separate classes to prevent contamination and to allow for a range of punishments.

The siting of the Gaol on the crest of a hill in East Maitland was chosen deliberately as a focal point of the axial town plan of East Maitland, laid out in 1829. It is also likely that the site was chosen because it placed the Gaol at the extreme boundary of the town as far form the commercial centre as possible. The first inmates were brought in by river steamer from the old Newcastle Gaol in 1848, and took residence in 'A wing', the oldest remaining wing at the Gaol. The original plan for the Gaol was implemented in several stages between 1837 and 1887 initially under colonial architect Mortimer Lewis, and later James Barnet. Stone was sourced from quarries at Morpeth and Farley.

Site Investigation Options

- Historic site study.
- Investigation of the evolution of the site and the early status of the town by interpreting buildings and architecture.
- Understanding what makes history – people, places and events.
- Evidence of changing penal attitudes and practices over the last 150 years.
- Long history of notorious criminals.

Facilities

- Opening hours: Monday to Friday 9am – 4pm.
- Maximum of 30 students per group/guide. Prior bookings required for school groups.
- Toilets available on-site.
- Refreshments can be made available by prior arrangement.

Resources

- *What is History: A Resource for Secondary History Students* (Landmark Tourism 2001).
- *Inside Maitland Gaol* - video (Cinetel Productions 2000).
- *Most Healthily Situated? Maitland Gaol 1844 - 1998* (John Ramsland, Verand Press 2001).
- *Maitland Correctional Centre and Police Properties Conservation Plan* (The Heritage Group, Department of Public Works and Services 1998).

Costs

- Details available on request from Maitland Gaol.

Contacts

- Bookings, access to site, and resources — Maitland Gaol Bookings Officer — Ph: 4936 6610

Excursion Site E

MINDARIBBA ABORIGINAL CULTURAL CENTRE

Description

The Mindaribba Aboriginal Cultural Centre was established at its present site on Chelmsford Drive, Metford, during 1996. The Centre offers a range of facilities and services and is the base for the Mindaribba Local Aboriginal Land Council and the Community Development Employment Program. The Land Council manages the resources and services for Aboriginal communities of the Maitland, Woodberry, Beresfield, Kurri Kurri, Cessnock, and Branxton areas.

The Maitland area formed part of the tribal lands of the Awabakal and Wanaruah Aboriginal tribes.

The Cultural Centre offers an important opportunity to develop an understanding of Maitland's local Aboriginal heritage. The Centre includes a museum containing a range of Aboriginal artefacts and art works from local sites and other areas outside of the Hunter region. It also features a large multi-purpose room with TV-video facilities, and a library containing a range of books, articles and videos on Australian Aboriginal heritage (local through to national focus).

Site Investigation Options

- Understanding and appreciation of local Aboriginal heritage.
- Understanding the role of Aboriginal Land Councils in local governance.
- Understanding current issues facing local Aboriginal communities and approaches to address these.

Facilities

- Aboriginal museum (including guided tour and discussion session).
- Library featuring books, articles and videos on Australian Aboriginal heritage (local through to national focus).
- Toilets are available within the Centre.
- Catering can be provided at a minimal charge.
- Self-catering facilities are available within the Centre.
- Guest presentations to schools (away from the Centre) may be arranged and could include viewing artefacts from the museum.

Resources

Range of titles able to be perused and sourced through the Centre.

Costs

Guided tours and use of the Centre's library	$3.00 per person
Use of the Centre's library	FREE
Guest presentations to schools (away from Centre)	$100.00
Hire of the multi-purpose room and TV-video facilities	$150.00
Catering	POA
Hire of the self-catering facilities	FREE

Contacts

Access to site, facilities and resources	Administrative Assistant (Mindaribba Aboriginal Land Council)	Ph: 4934 8511

Excursion Site E

MORPETH COMMON WETLAND

Description

Morpeth Common Wetland Reserve (also known as Ray Lawler Reserve) is owned and managed by Maitland Council for the dual purpose of passive recreation and wetland conservation. The wetland receives most of its water from the town of Morpeth and is nestled on the edge of the urban area, adjacent to beef and dairy farms.

The site has been the focus of regeneration works by the Friends of Morpeth Common Landcare group since 1998. This has involved the planting of over 4,000 native trees, shrubs and grasses, placement of educational signage, removal of weeds and raising community awareness of the wetland's importance.

Site Investigation Options

- Understanding wetland ecosystems.
- Understanding and applying the principles of Total Catchment Management (TCM).
- Investigating human impacts on wetland ecosystems (e.g. urbanisation, agriculture, water quality decline, weed infestation - Water Hyacinth).
- Management of human impacts (e.g. revegetation, managing public access to the wetland, educational signage).
- Water quality monitoring.
- Observation and sampling of wetland flora and fauna.

Facilities

- Picnic and BBQ facilities.
- Toilets (with disabled access) remain open during daylight hours.
- An outdoor classroom with bench seating is located beneath the old fig trees and overlooks part of the wetland ponds.
- A native sensory planting has been established behind the outdoor classroom.
- Mown grass and bridges provide easy access around the entire perimeter of the wetland.
- Access to the wetland's edge for water sampling.
- Wetland bird signage.

Resources

- *Morpeth Common / Ray Lawler Reserve, Morpeth, Plan of Management* (Maitland City Council 1996).
- *Friends of Morpeth Common Landcare* pamphlet.

Contacts

• Access to site	No need for prior arrangement		
• Access to facilities and resources	Recreation & Community Facilities Coordinator (Maitland City Council)	Ph:	4934 9736
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

OAKHAMPTON CEMETERY

Description

Oakhampton Cemetery is situated on the southern bank of the Hunter River in open farmland, about 2 kilometres north of Maitland along Oakhampton Road. The Cemetery is a Methodist burial ground that came into Council ownership in 1995. Although only 72 x 56 metres, almost 100 monuments have been recorded. Burials are believed to have begun in 1849 and continued until 1894. Among the burials is the infant son of William Arnott, belonging to the family known nationally for Arnott's Biscuits.

Because the cemetery stands on a low ridge top seamed with shallow gullies headstones are at all sorts of different heights - there is over a metre difference between some where they overlap an old terrace. Soil deposited on the site has filled the small gullies partly burying some headstones as though Oakhampton were some ancient ground of monuments sunken and lost.

Early records speak of dense tree cover along the river. Photographs show the Cemetery capped a small rise above the river with a series of natural terraces stepping down to the water. The impacts of cedar cutters, pastoralists, and floods have altered the scene profoundly. What may look like an ordinary river bank is a human creation.

In recent times, Maitland Council has completed a Conservation Management Plan for the site with a team of heritage specialists to assist in the future management of the graves and the landscape setting. Some of the works completed under this plan have included the clearing of noxious weeds and trees, the fencing of the site to keep out stock, and sandstone restoration of some of the monuments and the erection of interpretative signage. Oakhampton Landcare is also working in association with Maitland Council to reinstate the original Victorian period planting scheme on the site.

Site Investigation Options

- Historic site study.
- Investigation of early pioneer settlers and settlement patterns of the area.
- Understanding the impact of flooding and European settlement on the landscape (e.g. the undulating headstones at Oakhampton Cemetery are the only surviving tangible evidence of 1800's topography).
- Investigation of historical planting patterns (e.g. the Victorian plantings at Oakhampton Cemetery marked the boundaries of the site).
- Examples of stonemasonry and conservation techniques.
- Interaction of cultural and natural landscapes.

Facilities

- The site remains permanently open to the public, although no off-street parking is available.
- The closest toilets are at Maitland Courthouse, open during business hours, or the Mt Pleasant Street Sportsground, open only by prior arrangement.
- On-site interpretive signage.

Resources

- *Access Archaeology, Conservation Management Plan for Glebe and Oakhampton Cemeteries* (Maitland City Council 2000).
- Maitland Family History Circle email: mfhc@kooee.com.au
- National Trust Australia (NSW) website: *www.nsw.nationaltrust.org.au/cemeteries.html*

Contacts

• Access to toilet facilities	Recreation & Community Facilities Coordinator (Maitland City Council)	Ph:	4934 9736
• Copy of relevant resources	Maitland Heritage Officer (Maitland City Council)	Ph:	4934 9832

Excursion Site E

RATHLUBA LAGOON

Description

Rathluba Lagoon is a freshwater wetland on the rural-urban fringe of East Maitland. The lagoon and most of the land surrounding it is in public ownership and managed by Maitland Council. Wallis Creek, a major tributary of the lower Hunter River, is within close walking distance of Rathluba Lagoon.

Regeneration works and creation of walking trails commenced around the edges of Rathluba Lagoon in 1992. These improvements have meant that the area is utilised for passive recreation by the local community and have encouraged a greater diversity of native birdlife back to the lagoon.

Site Investigation Options

- Understanding wetland and riparian (river/creek) ecosystems.
- Understanding and applying the principles of Total Catchment Management (TCM).
- Investigating human impacts on wetland and riparian ecosystems (e.g. urbanisation, agriculture, water quality decline, blue-green algae, weed infestation).
- Management of human impacts (e.g. revegetation, managing public access to the lagoon, educational signage).
- Water quality monitoring.
- Observation and investigation of wetland flora and fauna.

Facilities

- Small undercover area adjacent to lagoon.
- Toilets (with disabled access). Toilets remain locked unless otherwise arranged.
- Walking track around half the perimeter of Rathluba Lagoon.
- Access to lagoon's edge for water sampling.

Resources

- *Rathluba Lagoon Equestrian Centre Plan of Management* (Maitland City Council 1994).
- *Wallis Creek Rivercare Plan* (Dept. Land & Water Conservation 2002)
- Monthly water quality monitoring results from one sampling location on Wallis Creek (1995 - onwards). Recent results from the water quality monitoring program are included on Maitland City Council's website: *www.maitland.infohunt.nsw.gov.au*

Contacts

• Access to site and facilities	Recreation & Community Facilities Coordinator (Maitland City Council)	Ph:	4934 9736
• Copy of relevant resources	Environmental Health Officer (Maitland City Council)	Ph:	4934 9833
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

TELARAH LAGOON

Description

Rathluba Lagoon is a freshwater wetland bounded by Les Darcy Drive, Bungaree Street and the Main Northern Railway Line. The lagoon and most of the land surrounding it is in public ownership and managed by Maitland Council. The lagoon forms part of the catchment of Fishery Creek, which flows into Wallis Creek and then the Hunter River.

Since the 1830s and up until Council ownership in 1996, the land surrounding Telarah Lagoon was cleared and grazed with cattle. The construction of the Les Darcy Drive bypass meant that the lagoon became a permanent waterbody, no longer going through regular cycles of drying out.

Due to its high visibility from road and railway networks there has been strong public interest to have the area managed for recreational and conservation purposes. Maitland Council has coordinated and funded a range of investigation and improvement works around Telarah Lagoon since 1996. These have included revegetation adjacent to roadways and along drainage lines, and provision of picnic facilities.

Site Investigation Options

- Understanding wetland ecosystems.
- Understanding and applying the principles of Total Catchment Management (TCM).
- Investigating human impacts on wetland ecosystems (e.g. urbanisation, agriculture, water quality decline, blue-green algae, weed and pest infestation - Water Hyacinth, European Carp).
- Management of human impacts (e.g. revegetation, managing public access to the lagoon, educational signage).
- Water quality monitoring.
- Observation and investigation of wetland flora and fauna.

Facilities

- Picnic and BBQ facilities.
- Walking track around part of Telarah Lagoon.
- Access to the lagoon's edge for water sampling.
- Closest available toilets are located at Coronation Oval, South Street, Telarah.

Resources

- *Telarah Lagoon Plan of Management* (Maitland City Council 2001).

Contacts

• Access to site	No need for prior arrangement		
• Access to toilet facilities and resources	Recreation & Community Facilities Coordinator (Maitland City Council)	Ph:	4934 9736
• Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

TOCAL AGRICULTURAL CENTRE

Description

Tocal is a 2,200 hectare property 15 kilometres from Maitland. The property is home to the CB Alexander Agricultural College, Tocal Homestead, the offices of NSW Agriculture's advisory and regulatory services for the Hunter, the Tocal Field Days and commercial beef, dairy, sheep, horse and chicken farms. Ecosystems on Tocal include rainforest, wetlands, dry schlerophyll forests and streambank vegetation. Tocal offers a range of activities and support resources specifically designed for students from Kindergarten to Year 12 to meet a range of syllabus outcomes.

Site Investigation Options

A Study in Change

This full-day visit focuses on the heritage of Tocal. Students experience life in the 1890s through a range of hands-on activities. The package is designed for Years 3 – 6 and includes before and after visit classroom activities.
Time required on site: 4 hours Cost: $7.70/student

The Way We Were

This half-day visit is designed for K-2 and gives students a glimpse of rural life 100 years ago. Students experience this time in Australia's history through dress-ups, games, and stories, providing a memorable lesson of the 'way we were'.
Time required on site: 2 hours Cost: $5.50/student

Farms

The Tocal farms are commercial enterprises operating to industry best practice. Students see and discuss the daily activities of working on beef, horse, dairy and sheep enterprises at Tocal.
Time required on site: 2 hours Cost: $5.50/student

Environmental

Tocal has a reputation as a progressive and innovative farm. Sustainable land use is a management theme of the property. The tour features farming practices such as creation of windbreaks, wildlife corridors, revegetation of riparian zones and wetland management, giving students an appreciation of environmental issues facing farmers and land managers.
Time required on site: 2 hours Cost: $5.50/student

Campus

The campus tour provides a background to the CB Alexander Agricultural College development and the way that the College operates. This tour can be incorporated into other tours where time permits.
Time required on site: Up to 1 hour Cost: free as part of another tour

Tocal will soon offer targeted ***Sense of Place at Tocal*** programs to provide an overview of the landscape and ecosystems of Tocal, how they have developed and how they have been used and impacted upon by humans.

Costs

- $5.50 to $7.70 per student (minimum $110) plus transport costs. Teachers and accompanying parents are free.

Resources

- Tocal Code of Landuse Practice $13.00
- Introduction to Tocal Farms
- Bringing back the Rainforest $14.00
- Tocal Aboriginal Heritage Video $20.00
- Guide to Tocal $9.90

Contacts

- Bookings, access to site and resources Information Officer 4939 8888

Excursion Site E

WALKA WATER WORKS

Description

Walka Water Works is an important historic landmark of Maitland located on the Hunter River floodplain at Oakhampton, 2 kilometres from the Maitland Courthouse. It was built in 1887 for the purpose of domestic water supply to Newcastle and the Lower Hunter.

The main pumphouse building is a striking example of Victorian Italianate architecture, which represents the pinnacle of fine Victorian buildings housing large machinery. The complex is one of the largest and most intact 19th century industrial complexes in the Hunter Valley. It was classified by the National Trust in 1976.

The grounds of Walka Water Works offer other important learning opportunities. A constructed lake occupies 18 hectares, with about 40 hectares of remnant bushland adjoining sections of the lakes. Both these ecosystems support a wide variety of native fauna and flora. The site has become a popular location for bird observers and is home to a relatively large group of Eastern Grey Kangaroos (approx. 100).

Walka Water Works is set amidst a range of flood mitigation structures including spillways, levee banks, and the Oakhampton floodway. It provides an excellent opportunity to view the layout of these structures as well as other surrounding land use including beef and dairy farms and rural residential development.

Site Investigation Options

- Historic site study.
- Understanding the management of water resources (historic perspective), including flood mitigation works.
- Understanding wetland and forest ecosystems.
- Management of human impacts (e.g. revegetation, fencing, managing public access, educational signage).
- Observation and investigation of wetland flora and fauna.
- Water quality monitoring.
- Opportunity for hands-on revegetation, including native seed collection and plant propagation (nursery on-site).

Facilities

- Picnic, BBQ, and toilet facilities.
- 3-dimensional working model of the waterworks infrastructure.
- Indoor and outdoor museums with continous running of historic film on Maitland's 1955 flood.
- Guided tours of the site and its features.
- Walking trails around wetland perimeter and through remnant and regenerating bushland areas.
- Outdoor classroom areas.

Resources

- *Pipelines & People: The history of the Hunter District Water Board, Newcastle NSW* (Armstrong, J.W. 1967).
- *The conservation and development of the former Walka Water Works, West Maitland* (Manic, N. 1984; Unpublished Master of Architecture thesis, University of Newcastle).

Costs

◆ Entry to Walka Water Works	$3/vehicle (Bus $20 extra payable to Caretaker)
◆ Guided tours of the site	$2/person (large groups - fee negotiable)

Contacts

◆ Access to site, facilities and resources	Walka Water Works Caretaker	Ph:	4932 0522
◆ Hands-on revegetation activities	Walka Water Works Site Manager	Ph:	4932 0533
◆ Streamwatch monitoring equipment	Maitland Landcare Coordinator	Ph:	4934 9838

(Note: this equipment is available on loan to local schools through Maitland City Council).

Excursion Site E

WETLANDS ENVIRONMENTAL EDUCATION

Description

The Wetlands Centre is located on Sandgate Rd, Shortland. It occupies approximately 45 hectares of restored and rehabilitated natural and artificial freshwater ponds. The previously degraded site has been rehabilitated to increase understanding of and appreciation for wetlands through communication, education and public awareness.

The Wetland Centre is adjacent to Ironbark Creek and Hexham Swamp and part of the Hunter Estuary wetland complex. In 2002 The Wetland Centre was recognised as a wetland of international importance and listed as a Ramsar site, an extension of the previously listed Kooragang Ramsar site. Together they now form the Hunter Estuary Ramsar Site.

The restoration of The Wetlands Centre commenced in 1985 under the Wetlands Trust, a community organisation formed to secure the property, prevent further degradation and establish a centre for conservation, rehabilitation, education and research. At that stage the site consisted of an abandoned building, sports fields constructed on filled wetlands and areas of disturbed wetlands.

Today the site is managed by The Wetlands Centre, Australia, a not-for-profit community-based company which employs about 6 staff and relies on the support of over 1,000 voluntary hours each month.

Site Investigation Options

The education program is managed by NSW Department of Education and Training staff of The Wetlands Environmental Education Centre. Education staff offer excursions for K - 12 students covering wetland topics such as:

- Understanding wetland ecosystems.
- Understanding and applying the principles of Total Catchment Management (TCM).
- Investigating human impacts on wetland ecosystems.
- Management of human impacts on wetland ecosystems.
- Waterbirds, shore birds and nesting Egrets.
- Habitat assessment.
- Investigation of pond animals.
- Water quality monitoring.

Facilities

- Visitors' Centre includes interactive and static display area, café and toilets.
- Access to theatrette, classroom, and outdoor shelters.
- Walking tracks, bird observation tower, dipnetting wharf and boardwalks.

Resources

Library facilities	The Wetlands Centre
The Wetlands Centre website	*www.wetlands.org.au*
Education Library	Wetlands Environmental Education Centre (Wetlands EEC)
Wetlands EEC web site	*www.wetlands-e.schools.nsw.edu.au*

Costs

Entry to The Wetlands Centre and facilities	$4.50.
Wetlands education program	$5.00/student (incl. entry to Wetlands Centre)
Accompanying parents	$4.50 (entry to Wetlands Centre)

Contacts

Wetlands Environmental Education Centre	Ph:	4955 8673
The Wetlands Centre	Ph:	4951 6466

Local Excursions CHECKLIST

This checklist can be used to help plan for the local excursion programs contained in the *Sense of Place Resource Kit*. The checklist is a general one, in which case, there may be some instructions that are not relevant to your excursion.

- ❑ Set date and wet weather alternative for the excursion.
- ❑ Gain permission for access to the site/s.
- ❑ Make bookings for: (i) venue; (ii) tours; (iii) workshop presenters; and/or (iv) group leaders.
- ❑ Organise transport.
- ❑ Determine excursion cost (consider: transport, venue, workshop presenters etc.).
- ❑ Prepare permission slips.
- ❑ Finalise list of students attending excursion (for roll call etc.).
- ❑ Notify canteen of students' absence for the day.
- ❑ Make copies of the student excursion sheets (refer to relevant Worksheets).
- ❑ Visit the excursion site/s to become familiar with the site layout and constraints and clarify how the excursion will take place (e.g. bus drop-off location/s, workshop locations, toilet facilities).
- ❑ Provide guidelines to workshop presenters and/or group leaders based on the chosen program.
- ❑ Equipment for the day:
  - Sturdy clothing and footwear for walking through long grass and wet areas
  - Backpack or other appropriate carry bag
  - Clip board and pencils
  - Binoculars and field guide to birds (if available)
  - Lunch and recess.

7.1 A Sense of Place IN MAITLAND

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Human Society & Its Environment	2 3	CCS2.2 (Change & Continuity); CUS2.3 (Cultures); ENS2.5, 2.6 (Environments) CCS3.1 (Change & Continuity); CUS3.4 (Cultures); ENS3.5, 3.6 (Environments)
Science & Technology	2 3	LTS 2.3 (Living Things); INVS2.7 (Investigating); UTS2.9 (Using technology) LTS 3.3 (Living Things); INVS3.7 (Investigating); UTS3.9 (Using technology)
English	2 3	TS2.2 (Talking & listening); RS2.5, 2.8 (Reading); WS 2.10, 2.11 (Writing) TS3.2 (Talking & listening); RS3.5, 3.8 (Reading); WS3.9, 3.10, 3.11, 3.12 (Writ.)
Mathematics	2 3	S2.1, 2.4 (Space); M2.1, 2.2, 2.6, 2.7 (Measurement); N2.1, 2.4, 2.5 (Numbers) S3.1 (Space); M3.1, 3.2, 3.6, 3.7 (Measurement); N3.1, 3.4, 3.5 (Numbers)
Personal Development, Health & Physical Education	2 3	COS2.1 (Communicating); DMS2.2 (Decision-making); INS2.3 (Interacting); PSS2.5 (Problem Solving); MOS2.4 (Moving) COS3.1 (Communicating); INS3.3 (Interacting); PSS3.5 (Problem Solving); MOS3.4 (Moving)
Creative & Performing Arts	2 3	VAS2.1, 2.2 (Visual Arts - making) VAS3.1, 3.2 (Visual Arts - making)

Venue

Maitland Park, Maitland CBD, Oakhampton Cemetery and Walka Water Works.
Refer to Local Excursion Sites (Maps 4 and 5).

Recommended Time Frame

The excursion is based on a full-day (5 hrs) program: 9.30am - 2.30pm.

Description

Students develop their knowledge of Maitland's natural and cultural heritage by exploring Maitland Park, old and new features of the Maitland CBD, the Hunter River, Oakhampton Cemetery, Walka Water Works and its environs. These places all contribute to an identity for Maitland. Students also develop environmental observation, interpretation and recording skills, and are involved in hands-on activities such as revegetation and water bug sampling.

Costs

- Bus transport to and from excursion venues.
- Vehicular entry to Walka Water Works (refer to information on local excursion sites).

Program

7.1 A Sense of Place IN MAITLAND

Contacts

Site Access

Walka Water Works	Walka Water Works Caretaker	Ph:	4932 0522

Guest Speakers and Workshop Options

Maitland Park	Recreation & Community Facilities Coordinator (Maitland City Council)	Ph:	4934 9736
Landcare (possible group leaders)	Maitland Landcare Coordinator	Ph:	4934 9838
Revegetation	Walka Water Works Site Manager	Ph:	4932 0533
Waterwatch	Hunter Waterwatch Coordinator	Ph:	4930 1030

Resources

Maitland Library (Local History Collection) (borrow)	Ph:	4933 6952
Maitland Heritage Officer (Maitland Council) (purchase)	Ph:	4934 9832
Hunter House Publications (Cynthia Hunter) (purchase)	Ph:	4988 6401

Materials Required

Provided

- Excursion preparation:
  - Case Study 2.1 - *Maitland's Changing Identity*
  - Case study 2.2 - *An Environmental History of Maitland & the Middle Hunter River*
- Pre-excursion information - case studies 2.1 & 2.2
- Local Excursion Sites (Maps 4 and 5)
- *Maitland Children's Heritage Walk* booklet
- Excursion Program
- Excursion checklist
- Worksheets 7.4, 7.6, 7.7, 7.8, 7.9, 7.10

To Obtain

- Refer to excursion checklist
- *Maitland Park* (Hunter, C. 2001).
- *Access Archaeology, Conservation Management Plan for Glebe and Oakhampton Cemeteries* (Maitland City Council 2000).

Acknowledgement

This excursion program has been developed by Helen Curran and Shirley Mort (Metford Public School), Roy Warry (Bolwarra Public School), and Janne Alexander (Hunter Valley Grammar School) through the *Our Sense of Place* pilot project.

7.1 A Sense of Place IN MAITLAND

Excursion Program

Content	Strategies	Resources
Introduction and overview of excursion (15 min.)	◆ Students form into groups of 15-20 and are introduced to a group leader. ◆ Outline the program for the day.	
Exploring Maitland Park (30 min.)	◆ Introduction to Maitland Park by guest speaker - brief history, its facilities, how is it managed, who takes care of the Park? (students listening and questioning). ◆ Guided by Worksheet 7.6 students explore the uses, facilities and heritage of the Park.	◆ Guest speaker ◆ Worksheet 7.6
Investigating transport (15 min.)	◆ Students depart Maitland Park and walk along pedestrian overpass observing different transport types. ◆ Option: list and tally transport types observed.	
Walking Church Street (30 min.)	◆ Students walk along Church St. observing heritage buildings and completing Worksheet 7.7	◆ Worksheet 7.7
Business in the Maitland CBD (10 min.)	◆ Students observe and discuss businesses, services and jobs. ◆ Discussion point: What are some of the different jobs people have in the Maitland CBD today?	
Investigating the Hunter River (30 min.) *Including recess*	◆ Students walk to Hunter River behind shops. Sitting along the edge of the walkway students may record observations on river flow, uses of the river (now and then), flood mitigation works (e.g. levees), and river bank management.	◆ Worksheet 7.8
Maitland Courthouse - departure point for bus	◆ Students walk past Maitland Library and across the road to Maitland Courthouse. ◆ Discussion points: Who works in these buildings? What is the role of the courts in our community?	
TRAVEL TO OAKHAMPTON CEMETERY or WALKA WATER WORKS (approx. 10 min.)		
Discovering Oakhampton Cemetery (45 min.) OPTIONAL	◆ Students walk around cemetery observing and recording surroundings and types of headstones. The details on the headstones provide an opportunity to learn about local history. ◆ Students can easily view the Hunter River and even walk down to the water's edge. Discuss the Hunter River environs: - **upstream** is an escarpment with one of the last remaining patches of Maitland's rainforest - why was this area spared from the clearing that occurred over the rest of the floodplain? - **downstream** are the remnants of an old timber bridge that once crossed the river - why was this bridge important? why is it now disused? NOTE: There is no off-street parking or road verge available for vehicles at Oakhampton Cemetery. Buses would need to stop on the straight stretch of road in front of the cemetery with students getting off under strict supervision.	◆ Worksheet 7.9

7.1 A Sense of Place IN MAITLAND

Excursion Program (cont.)

Content	Strategies	Resources
TRAVEL TO WALKA WATER WORKS (approx. 5 min.) Lunch and workshop series *Depending upon the time remaining, student groups are rotated through a series of workshops each 40 min. duration.*		
OPTION 1: Floods in Maitland and history of Walka Water Works (40 min.)	◆ Students watch video of Maitland's historic 1955 flood showing original newsreel footage of the event. This is followed by viewing a scale model of Walka Water Works and discussion on the history and significance of the site.	
OPTION 2: Waterwatch (40 min.)	◆ Students sample the water for macroinvertebrates (waterbugs) and use species identification and counts to interpret the biological health of the wetland. These results are compared with basic physical parameters also measured by students (i.e. pH, turbidity, temperature, total dissolved solids).	◆ Worksheet 7.4
OPTION 3: Bushland regeneration (40 min.)	◆ Students take part in a hands-on workshop to revegetate the edge of remnant bushland on the site. They learn about what kind of plants grow here, their importance, and how to plant native tubestock.	
OPTION 4: Nature Journaling (40 min.)	◆ Students record observations in their worksheets. Students develop their observation and recording skills whilst spending time reflecting and experiencing the bushland and wetland environments. END OF EXCURSION - RETURN TO SCHOOL	◆ Worksheets 7.3 & 7.10

7.2 MORPETH FIELD STUDY: Where the past meets the future

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Geography	5	5A2 (Changing Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.8 5A3 (Issues in Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.8

Venue

Morpeth township. Refer to Local Excursion Sites (Map 3).

Recommended Time Frame

The excursion is based on a half-day (2.5 hrs) program: 9.30am - 12.00pm.
Suggest conducting excursion later in the week as some tourist traders are closed on Mondays and Tuesdays.

Description

Morpeth is studied as an example of an Australian community that has and continues to change in response to a range of factors. The excursion provides students with the opportunity to develop their knowledge, understandings and skills so they may:

- name and locate the community of Morpeth and its associated environment;
- identify factors that contribute to Morpeth's sense of identity;
- identify factors creating change in both the environment and community;
- describe the spatial and ecological impacts of the changes;
- identify how the local and wider community (e.g. Maitland City Council) have formed policy and made decisions in response to these changes.

Costs

- Bus transport to and from Morpeth.

Contacts

Site Access

No formal approach/bookings are required. If intending to allow students into local shops, however, suggest that operators be advised prior to the visit.

Guest Speakers

Prominent tourist-based traders and/or local historians from Morpeth could be sourced as guest speakers on site.

Support Resources

Maitland Library (Local History Collection) (borrow) Ph: 4933 6952
Maitland Heritage Officer (Maitland Council) (purchase) Ph: 4934 9832

Acknowledgement

This excursion program has been developed by Tony Keating (Head Teacher Social Science, Maitland Grossmann High School). It has been trialed with Year 10 geography students from Maitland Grossmann High School

Program P

7.2 MORPETH FIELD STUDY: Where the past meets the future

Materials Required

Provided

- Excursion Program
- Excursion Checklist
- Local Excursion Sites (Map 3)
- *Morpeth Heritage Walk* pamphlet
- Worksheets 7.11, 7.12, 7.13
- 7.11 - 7.13 Worksheet suggested answers

To Obtain

- Refer to excursion checklist
- *Morpeth Management Plan* (Maitland City Council 2001).
- *Queens Wharf Archaeological Management Plan* (Higginbotham & Associates 2002).

Excursion Program

The nature of the program will largely depend upon the number of students. Students should be divided into three groups that rotate through the three focus sites each allocated 30 minutes. In the case of larger student groups, each focus site could be sub-divided on the basis of the activities addressed by the worksheets.

Content	Strategies	Resources
Introduction and orientation to the site (15 min.)	• Students form into three groups and assemble at their first focus site.	
Site A: The role, benefits and impacts of tourism in Morpeth (30 min.)	• ASSEMBLE: near Bond Stores (corner of Swan and Northumberland streets) or adjacent to Unicomb Park. • NOTE: A copy of the *Morpeth Management Plan* is recommended for this activity. • Guest speaker (if possible) or teacher to present a perspective on the role tourism has played in the development of Morpeth's identity and the impacts (good and not-so-good) of tourism on the local community. • Students may either prepare individual responses to the worksheet questions or be engaged in a group discussion based on these questions.	• Worksheet 7.11 • Suggested answers
Site B: Commercial land use survey (30 min.)	• ASSEMBLE: Illalung Park (adjacent to Morpeth Bridge). • Students work in pairs to locate, classify and record the land use of premises along Swan St., the main focus for business in Morpeth.	• Worksheet 7.12 • Suggested answers
Site C: Investigation of Queens Wharf (30 min.)	• ASSEMBLE: Queens Wharf (Morpeth Boat Ramp). • NOTE: A copy of the *Queens Wharf Archaeological Management Plan* is recommended for this activity. • Students read background information on the significance and historical changes to Queens Wharf and Morpeth. • Using Worksheet 7.14, which includes excerpts from the *Queens Wharf Archaeological Management Plan*, students observe and record elements of the site's significance and develop opinion regarding its future management.	• Worksheet 7.13 • Suggested answers
Bus tour of Morpeth environs (10 min.)	• Students take a bus tour of Morpeth village and surrounding rural landscape to develop broader context and sense of place.	• *Morpeth Heritage Walk*

Program P

7.3 Exploring TENAMBIT WETLAND

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Human Society & Its Environment	2 3	CUS2.4 (Cultures); ENS2.5, 2.6 (Environments) CCS3.1 (Change & Continuity); CUS3.4 (Cultures); ENS3.5, 3.6 (Environments)
Science & Technology	2 3	LTS 2.3 (Living Things); INVS2.7 (Investigating); UTS2.9 (Using technology) LTS 3.3 (Living Things); INVS3.7 (Investigating); UTS3.9 (Using technology)
English	2 3	TS2.2 (Talking & listening); WS 2.10, 2.11 (Writing) TS3.2 (Talking & listening); RS3.5 (Reading); WS3.9, 3.10, 3.11, 3.12 (Writing)
Mathematics	2 3	M2.2, 2.6, 2.7 (Measurement); N2.1, 2.2, 2.4, 2.5 (Numbers) M3.1, 3.2, 3.6, 3.7 (Measurement); N3.1, 3.2, 3.3, 3.4 (Numbers)
Personal Development, Health & Physical Education	2 3	COS2.1 (Communicating); DMS2.2 (Decision-making); INS2.3 (Interacting); PSS2.5 (Problem Solving); MOS2.4 (Moving) COS3.1 (Communicating); INS3.3 (Interacting); PSS3.5 (Problem Solving); MOS3.4 (Moving)
Creative & Performing Arts	2 3	VAS2.1, 2.2 (Visual Arts - making) VAS3.1, 3.2 (Visual Arts - making)

Venue

Tenambit-Morpeth Wetlands.
Refer to: (i) Local Excursion Sites Map 2, and (ii) Tenambit Wetland Excursion Site Plan - primary.

Recommended Time Frame

The excursion is based on a full-day (5hrs) program: 9.30am - 2.30pm.

Description

The excursion provides students with the opportunity to learn about and experience a local wetland ecosystem. Students will develop environmental observation, interpretation and recording skills, and be involved in hands-on activities such as revegetation and water bug sampling. The excursion aims to develop a *sense of place* in students by exploring a part of the local environment that is familiar to them but largely 'undiscovered'.

Costs

- Bus transport to and from excursion venues.
- May need to consider 'donations' to cover transport costs of volunteer (community) group leaders or presenters.

Program

7.3 Exploring TENAMBIT WETLAND

Contacts

Site Access

Fairhall Park Racetrack gate	Secretary, Mait. Model Aircarft Society (Fred Wagner)	Ph:	4966 1067
Earthcare Park site and toilet facilities	Maitland Landcare Coordinator (Maitland City Council)	Ph:	4934 9838
Morpeth Wastewater Treatment Plant	Public Affairs Officer (Hunter Water Corporation)	Ph:	4979 9645

Group Leaders and Workshop Options

Landcare	Maitland Landcare Coordinator	Ph:	4934 9838
Maitland City Council	Senior Environmental Officer	Ph:	4934 9829
Waterwatch	Hunter Waterwatch Coordinator	Ph:	4930 1030
Dept. Education & Training	Teacher in Charge Wetlands Environmental Education Centre	Ph:	4955 8673

Materials Required

Provided

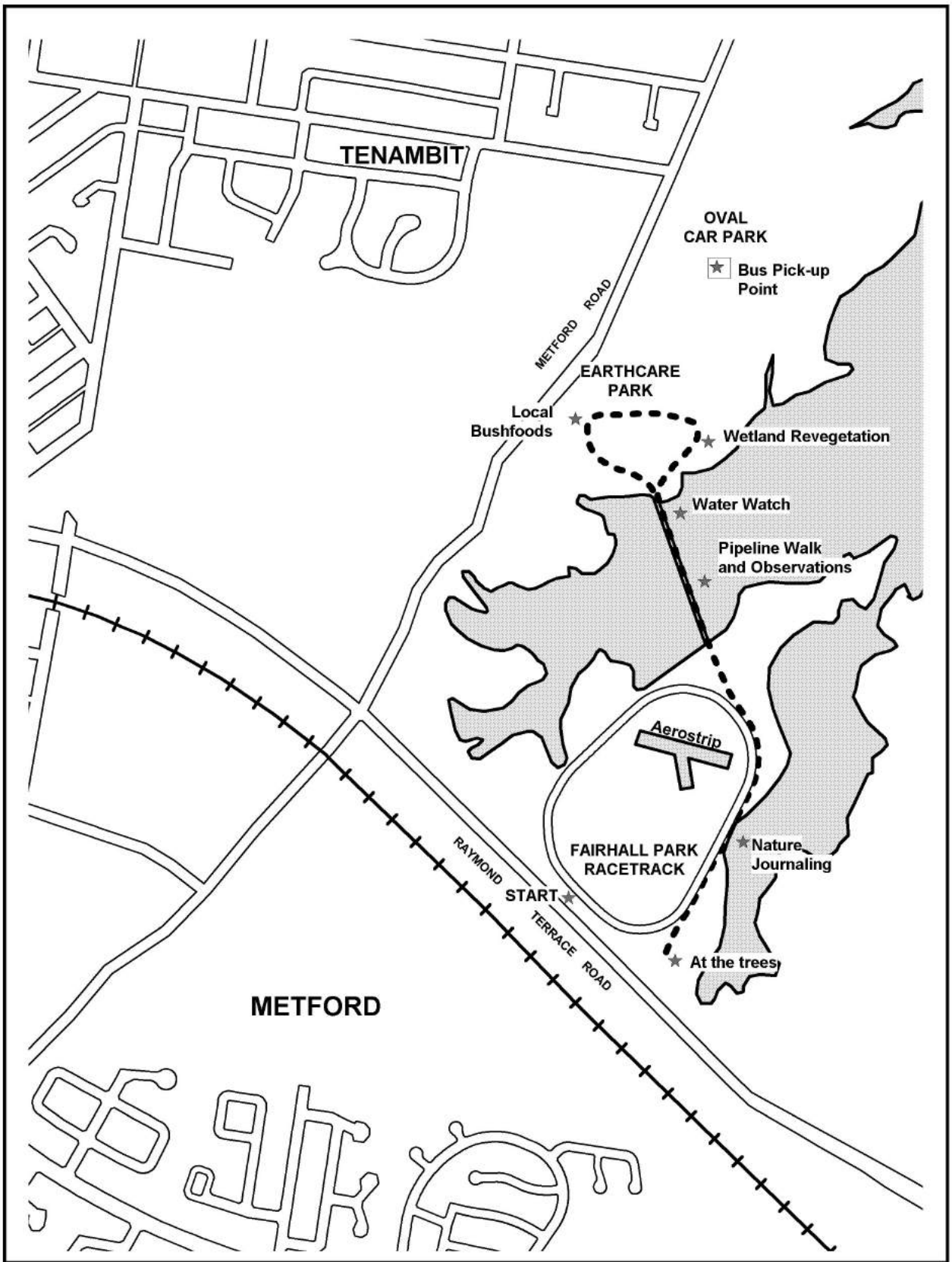
- Excursion preparation:
  - Case Study 3.1 - *Maitland's Native Vegetation*
  - Case study 3.2 - *Flora & Fauna of Maitland's Wetlands*
  - Case study 3.4 - *Wildfoods of Maitland*
  - Case Study 5.4 - *Regeneration at Earthcare Park*
- Local Excursion Sites (Map 2)
- Tenambit Wetland Excursion Site Plan - primary
- Excursion Program
- Excursion checklist
- Activities 7.1 & 7.2
- Worksheets 7.1, 7.2, 7.3, 7.4, 7.5

To Obtain

- Refer to excursion checklist
- Copies of UBD map/s showing location of school and excursion site (one copy per student)
- Blindfolds for environmental games (one between two students)
- Copies of case studies and worksheets

Acknowledgement

This excursion program has been developed by Kylie Yeend (Environmental Education & Project Management Consultant) with contribution from Shirley Mort (Metford Public School). It was trialed with 60 Year 6 students from Metford Public School and 40 Year 6 students from Hunter Valley Grammar School through the *Our Sense of Place* pilot project.


TENAMBIT
OVAL
CAR PARK
Bus Pick-up
Point
METFORD ROAD
EARTHCARE
PARK
Local
Bushfoods
Wetland Revegetation
Water Watch
Pipeline Walk
and Observations
Aerostrip
FAIRHALL PARK
RACETRACK
Nature
Journaling
RAYMOND
START
TERRACE ROAD
At the trees
METFORD
TENAMBIT WETLAND EXCURSION SITE PLAN - PRIMARY
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7.3 Exploring TENAMBIT WETLAND

Excursion Program

Content	Strategies	Resources
Introduction and orientation to the site (15 min.)	◆ Arrive at Fairhall Park racetrack. ◆ Students form into groups of 10-15 and are introduced to a group leader. ◆ Site orientation: - discuss location of the site relative to familiar landmarks (refer to UBD map); - students mark their journey from school to the wetland (use copies of the UBD map).	◆ Local Excursion Sites (Map 2) ◆ Tenambit Wetland Excursion Site Plan ◆ Copies of UBD map
Environmental Game (15 min.)	◆ Students form into pairs and take part in a sensory game (*Greet a Tree*). The game takes place amongst the eucalypts beside the race track.	◆ Activity 7.1 ◆ Blindfolds
Environmental interpretation at the trees (15 min.)	◆ Students discuss the features and issues observed amongst the eucalypts. Worksheet 7.1 will help to guide this discussion and allows students to record their observations.	◆ Worksheet 7.1
Next two sessions: *Half of the groups take part in nature journaling on the racetrack overlooking the wetland, whilst the other half walk along the pipeline across the wetland (see below). After 30 min. those students who walked the pipeline first take part in nature journaling at Earthcare Park, the other group walks the pipeline.*		
Nature Journaling (30 min.) *Including recess*	◆ Students record observations in their worksheets. They develop their observation and recording skills whilst spending time reflecting and experiencing the wetland environment.	◆ Worksheets 7.2 & 7.3
Pipeline walk and observation (30 min.) *Including recess*	◆ Students walk carefully and with close supervision across the length of the large pipeline. Alternatively, students may walk on the raised ground alongside the pipeline. ◆ Students discuss and interpret the features and issues observed on the wetland. For example: *The main tree species found along the pipeline is Swamp Oak (Casuarina glauca). These trees are adapted to growing in wet areas and are either male or female; look for woody fruits on the tree to distinguish it as female or red tips on leaves to distinguish it as male. They have the smallest leaves in the whole world! The 'leaf teeth' can be found by breaking one of the green branchlets at its node. The fine, hair-like structures are the leaf teeth. Swamp Oak is partly characterised by having 12-16 leaf teeth (River Oak, Casuarina cunninghamiana, has 8-10 leaf teeth).*	◆ Worksheets 7.2 & 7.3
Environmental Game (20 min.) *This activity is optional (i.e. if time permits).*	◆ Keeping within their small groups, students take part in a game (*Predator-Prey*) that aims to demonstrate the importance of hearing to many wetland mammals and how adaptations such as large ears help these animals avoid predation.	◆ Activity 7.2 ◆ Blindfolds

7.3 Exploring TENAMBIT WETLAND

Excursion Program (cont.)

Content	Strategies	Resources
Next two sessions: *Choose two of the three workshops listed below. Half of the student groups take part in one workshop, whilst the other half take part in the second workshop. After 40 minutes student groups swap over.*		
OPTION 1: Wetland revegetation (40 min.)	• Students take part in a hands-on workshop to revegetate the low slopes of the wetland with local native plants. They learn about what kind of plants grow on wetlands, their importance, and how to plant native tubestock.	
OPTION 2: Waterwatch (40 min.)	• Students sample the water for macroinvertebrates (waterbugs) and use species identification and counts to interpret the biological health of the wetland. The results are compared with basic physical parameters also measured by students (i.e. pH, turbidity, temperature, total dissolved solids).	• Worksheet 7.4
OPTION 3: Local bushfoods (40 min.)	• Students learn about the different bushfoods used by local Aborigines and early European settlers to the area, and how they were prepared. They have the opportunity to sample local bushfoods and will take a walk through Earthcare Park's Bushfood Education Area.	• Worksheet 7.5
TRAVEL TO MORPETH WASTEWATER TREATMENT WORKS (approx. 10 min.)		
Next two sessions: *Half of the student groups have a guided tour of the Morpeth Wastewater Treatment Works, whilst the other half walk down to the wetland ponds on the property (see below). After 30 min. student groups swap over.*		
Tour of Morpeth Wastewater Treatment Works (30 min.)	• Students learn about the processes involved in treating wastewater and the practical ways individuals can conserve and protect water resources.	
Observing birdlife on Morpeth Wetland ponds (30 min.)	• Students walk down to the old wastewater treatment ponds and take observations of the birdlife. These ponds are regularly monitored by the Hunter Bird Observers Club as an important feeding and breeding site for waterbirds. They have also become a release site for rehabilitated native birds. END OF EXCURSION - RETURN TO SCHOOL	• Worksheets 7.2 & 7.3

Program P

7.4 Investigating issues & ecosystems at TENAMBIT WETLAND

Links with Syllabus

Key Learning Area	Stage	Syllabus outcomes addressed
Science	4 5	4.17 (Working individually & in teams); 4.8.2 (Classification of living things); 4.10 (Ecosystems); 4.11 (Natural resources) 5.17 (Working individually & in teams); 5.10 (Ecosystems)
Geography	5	5A2 (Changing Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.9 5A3 (Issues in Australian environments) - 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.9

Venue

Tenambit Wetland area, Earthcare Park.
Refer to: (i) Local Excursion Sites (Map 2), and (ii) Tenambit Wetland Excursion Site Plan - secondary.

Recommended Time Frame

The excursion is based on a full-day (approx. 5.5 hrs) program: 9.20am - 2.40pm.

Description

Tenambit Wetland offers a place to study the features and functions of a wetland ecosystem, the impacts of human activities on ecosystems and the management of these impacts. The excursion program develops students' scientific and geographic field skills with a focus on topics including:

- water quality;
- biodiversity and the conservation of native fauna and flora;
- uses of native plants (bushfood);
- observing and recording nature.

The program is also designed to place students in contact with professionals that work in the environmental field.

Costs

- Bus transport to and from excursion venue.
- Booking for Taronga Zoo's Zoomobile and education officer @ $4.00/student.
- May need to consider 'donations' to cover transport costs of volunteer (community) group leaders or presenters.

Contacts

Site Access

Earthcare Park site and toilet facilities	Maitland Landcare Coordinator (Maitland City Council)	Ph:	4934 9838

Workshop Options

Revegetation and bushfoods	Maitland Landcare Coordinator	Ph:	4934 9838
Waterwatch	Hunter Waterwatch Coordinator	Ph:	4930 1030
Conserving native widllife	Taronga Zoomobile Officer	Ph:	(02) 9978 4554

Program

7.4 Investigating issues & ecosystems at TENAMBIT WETLAND

Materials Required

Provided

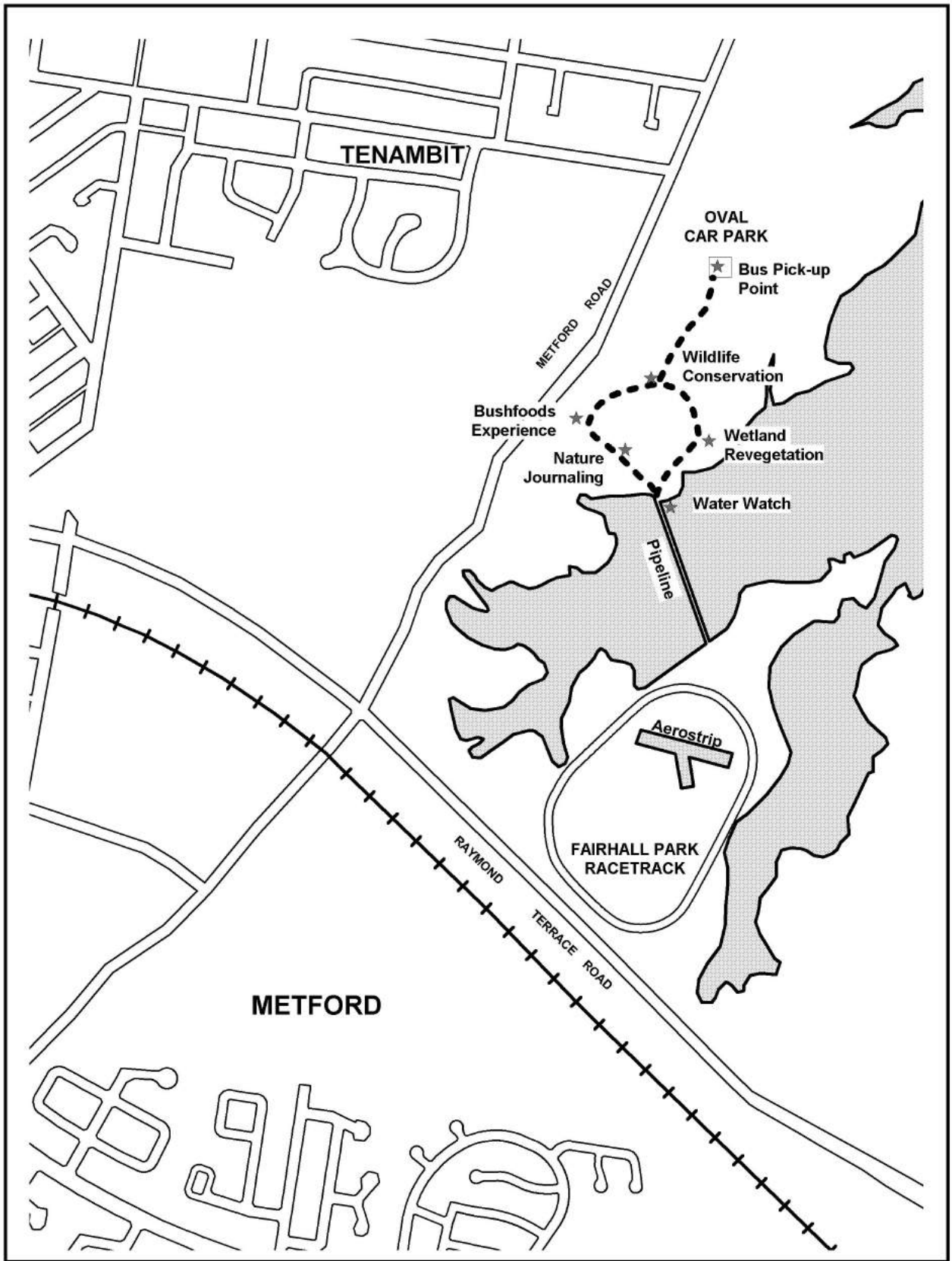
- Excursion preparation:
  - Case Study 3.1 - *Maitland's Native Vegetation*
  - Case study 3.2 - *Flora & Fauna of Maitland's Wetlands*
  - Case study 3.4 - *Wildfoods of Maitland*
  - Case Study 5.4 - *Regeneration at Earthcare Park*
- Local Excursion Sites (Map 2)
- Tenambit Wetland Excursion Site Plan - secondary
- Excursion Program
- Excursion Checklist
- Worksheets 7.4, 7.14, 7.15, 7.16, 7.17

To Obtain

- Refer to excursion checklist
- Copies of case studies and worksheets

Acknowledgement

This excursion program has been developed by Kylie Yeend (Environmental Education & Project Management Consultant) with contribution from Lana Collison (Maitland Landcare Coordinator). It was trialed with 170 Year 10 science students from Maitland Grossmann High School through the *Our Sense of Place* pilot project.


TENAMBIT
OVAL
CAR PARK
Bus Pick-up
Point
METFORD ROAD
Wildlife
Conservation
Bushfoods
Experience
Wetland
Revegetation
Nature
Journaling
Water Watch
Pipeline
Aerostrip
FAIRHALL PARK
RACETRACK
RAYMOND TERRACE ROAD
METFORD
TENAMBIT WETLAND EXCURSION SITE PLAN - SECONDARY
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Program P

7.4 Investigating issues & ecosystems at TENAMBIT WETLAND

Excursion Program

The program assumes involvement of about 150-200 students. Two parallel programs would operate on the day. Students should be divided into **eight groups** and would take part in **four workshops (55 minutes each)**.

Three workshops would be common across all students: (i) water quality monitoring; (ii) vegetation issues and revegetation; and (iii) conserving native wildlife. For the fourth workshop, half the students would take part in a workshop on observing and recording nature, whilst the other half would experience a bushfood workshop.

Content	Strategies	Resources
Introduction and orientation to the site (15 min.)	◆ Students form into their assigned groups and assemble at their first workshop.	
Waterwatch (55 min.)	◆ Students use field-based water quality monitoring equipment and basic methods of analysis to determine the health of Tenambit Wetland. ◆ Students' biological monitoring skills are developed by collecting and identifying water bugs. ◆ The results collected from the day will be used to build a bigger picture about the health and quality of local waterways.	◆ Worksheet 7.4
MOVE TO NEXT WORKSHOP (5 min.)		
Conserving native wildlife (55 min.)	◆ Students are introduced to a variety of native animals, learn about their adaptations, have the chance to handle them, and discuss strategies to protect and care for them.	◆ Worksheet 7.14
RECESS AND MOVE TO NEXT WORKSHOP (20 min.)		
Biodiversity and revegetation (55 min.)	◆ Students learn about the importance of local bushland and biodiversity and gain revegetation skills on the slopes of Tenambit Wetland. ◆ The workshop involves students in active environmental citizenship.	◆ Worksheet 7.15
MOVE TO NEXT WORKSHOP (5 min.) *Half of the student groups do one of the workshops whilst the other half do the other. For example, Groups 1 - 4 participate in a bushfood workshop, whilst Groups 5 - 8 participate in nature journaling.*		
Observing and recording nature (55 min.)	◆ Students develop observation, reflection and recording skills focused on the Tenambit Wetland ecosystem.	◆ Worksheet 7.16
MOVE TO NEXT WORKSHOP (5 min.)		
Experiencing bushfoods (55 min.)	◆ Students learn about the different uses of native plants, the types of native plant foods and gain skills to identify local bushfood species. ◆ Students experience a range of local bushfoods.	◆ Worksheet 7.17
LUNCH (40 min.) FOLLOWED BY BUS DEPARTURE		

7.4 Investigating issues & ecosystems at TENAMBIT WETLAND

Workshop schedule

Group	Session 1 9.45 - 10.40am	Session 2 10.45 - 11.40am	Session 3 12.00 - 12.55pm	Session 4 1.00 - 1.55pm
1	Waterwatch	Native Wildlife	Revegetation	Nature Journaling
2	Nature Journaling	Waterwatch	Native Wildlife	Revegetation
3	Revegetation	Nature Journaling	Waterwatch	Native Wildlife
4	Native Wildlife	Revegetation	Nature Journaling	Waterwatch
5	Waterwatch	Native Wildlife	Revegetation	Bushfoods
6	Bushfoods	Waterwatch	Native Wildlife	Revegetation
7	Revegetation	Bushfoods	Waterwatch	Native Wildlife
8	Native Wildlife	Revegetation	Bushfoods	Waterwatch

Worksheet W

7.1 AT THE TREES

STUDENT NAME: _____

CLASS: _____

1. What native animals might live in this kind of location?

_____

_____

2. There are logs on the ground. Why should we leave them alone?

_____

_____

3. Name the two main kinds of gum trees that are found at this site.

_____

4. What other vegetation can you see?

_____

_____

5. Humans have had an impact on this area, what evidence is there of this?

_____

_____

_____

Worksheet

7.2 Tenambit Wetland NATURE JOURNAL

STUDENT NAME: _____

CLASS: _____

Wetland ponds at Morpeth Wastewater Treatment Plant	Along the Pipeline	The Wetlands at the Racetrack or Earthcare Park (depending on what group you're in).	
			HEAR
			SEE
			FEEL
			SMELL
			WHAT I FOUND OUT

Worksheet

7.3 Wetland Bird OBSERVATIONS

SACRED IBIS

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

STRAW-NECKED IBIS

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

LITTLE EGRET

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

CATTLE EGRET

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

Worksheet W

7.3 Wetland Bird OBSERVATIONS

ROYAL SPOONBILL

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

YELLOW SPOONBILL

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

WHITE-FACED HERON

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

BLACK SWAN

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

Worksheet

7.3 Wetland Bird OBSERVATIONS

DUSKY MOORHEN

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

PACIFIC BLACK DUCK

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

GREY TEAL

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

PURPLE SWAMPHEN

SIZE

Smaller than a football ☐
About the same as a football ☐
Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:
Wading in water? ☐☐
Swimming? ☐☐
Flying? ☐☐
Other? _____

Worksheet W

7.3 Wetland Bird OBSERVATIONS

MANED (or WOOD) DUCK

SIZE

Smaller than a football ☐

About the same as a football ☐

Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:

Wading in water? ☐☐

Swimming? ☐☐

Flying? ☐

Other? _____

_____

_____

MASKED LAPWING PLOVER

SIZE

Smaller than a football ☐

About the same as a football ☐

Bigger than a football ☐

SHAPE

Body	Beak
Legs	Neck
Feet	Wings

SURROUNDINGS

Where was the bird observed:

Wading in water? ☐☐

Swimming? ☐☐

Flying? ☐

Other? _____

_____

_____

TALLY OF BIRDS OBSERVED

Black Swan	Dusky Moorhen
Royal Spoonbill	Pacific Black Duck
Yellow Spoonbill	Grey Teal
Sacred Ibis	Purple Swamphen
Straw-necked Ibis	Maned (Wood) Duck
Little Egret	Masked Lapwing Plover
Cattle Egret	Other
White-faced Heron	

Acknowledgement

The *Wetland Bird Observation* worksheets have been prepared by Shirley Mort, Metford Public School:
Tel: (02) 4933 2655.
Illustrations from The Wetlands Environmental Education Centre:
Tel: (02) 4955 8673.

Worksheet W

7.4 Water Quality MONITORING

STUDENT NAME: _____

CLASS: _____

Field Results Sheet

Group: _____

Date: _____

Site: _____

Catchment: _____

Observations at the site: _____

_____

_____

Temperature: _____ °C

Temperature affects the rate of photosynthesis of plants, the metabolic rate of aquatic animals, timing and success of reproduction, mobility, migration patterns, and the sensitivity of organisms. Life cycles of aquatic organisms are often related to changes in temperature.

Temperature is also significant because it affects the amount of dissolved oxygen in the water.

TODAY: Air _____°C Water _____°C
LAST TIME: Air _____°C Water _____°C
(circle) Water Temp. Increase **or** Water Temp. Decrease

The difference in temperature since last time is most likely due to following reason/s (tick the relevant box or boxes)

- ❑ Depth of water
- ❑ Flow rate of water
- ❑ Shade cover
- ❑ Sunlight exposure
- ❑ Seasonal change
- ❑ Time of day
- ❑ Water release from dam
- ❑ Turbidity
- ❑ Other (please specify): _____

Worksheet W

7.4 Water Quality MONITORING

pH: _____ units

pH is a measure of the acidity or alkalinity of a substance.
The pH scale ranges from 0 to 14:

0 to 6.9	Acidic
7	Neutral
7.1 to 14	Alkaline (Basic)

Rainwater usually has a pH value of between 5.5 and 6.0.

Seawater has a pH value of 8.2.

The optimal pH for most organisms in Australian waterways is between 6.5 and 8.2 units.

Changes in pH outside this normal range will cause a reduction in species diversity and the more sensitive species will disappear.

Factors influencing pH:

- *Natural factors*: pH will vary depending upon the geology of the area. Water flowing through limestone will be alkaline, and in basalt and sandstone water will be slightly acidic.
- *Human activity*: industrial and urban stormwater runoff and sewage may affect the pH of water.
- *Daily changes*: pH will rise (become more alkaline) during the day due to photosynthesis and may fall during the night.

☐	**≤ 6**	**Acidic**	 **Poor**
☐	**6 to 8**	**Neutral**	 **Excellent / Very Good**
☐	**≥ 8**	**Alkaline**	 **Poor**

Worksheet

7.4 Water Quality MONITORING

Total Dissolved Solids: _____ ppm

Total Dissolved Solids (TDS) or salinity is a measure of the dissolved salts in the water. The most common salts include not only sodium chloride (table salt), but also the chlorides of calcium, magnesium, potassium and bicarbonates, and sulphates of these.

TDS is usually highest during periods of high flows and increase as water levels decrease.

Salt enters the water through various means including:
- Rainfall
- Salty groundwater
- Wind borne sea spray
- Erosion of rocks
- Runoff from urban and agricultural land
- Discharges from industrial areas and sewerage treatment works.

Many species can only survive in a very narrow range of salt concentration. Low levels of some salts can inhibit the growth of some organisms.

☐ **< 250ppm**
< 400µS/cm

Excellent / Very Good

☐ **250 - 500ppm**
400 - 800µS/cm

Fair

☐ **> 500ppm**
> 800µS/cm

Poor

NOTE: These guidelines are for freshwater. If you are in an estuarine environment remember to check the guidelines for estuarine conditions.

Worksheet W

7.4 Water Quality MONITORING

Turbidity: _____ NTU

Turbidity is the amount of sediment in water. During floods turbidity may temporarily increase, as soil is washed into the waterway.

Turbidity has a major affect on aquatic life by reducing the amount of light that penetrates into the water. This light is needed for plants and aquatic weeds to use in photosynthesis.

High levels of turbidity may coat gill membranes of fish, making it difficult for them to breathe. When suspended material eventually settles to the bottom, it may cover food supplies for fish, or make spawning areas unsuitable.

The long-term effect of high levels of turbidity may be reduced biodiversity.

Many water bugs are filter feeders, which means they filter food particles out of the water with special feeding mechanisms. When these are blocked by sediment, the numbers of these species may decline.

☐	**≤ 10 NTUs**		**Excellent / Very Good**
☐	**15 - 30 NTUs**		**Fair**
☐	**> 30 NTUs**		**Poor**

Acknowledgement

The *Water Quality Monitoring* worksheets have been prepared by:
Hunter Waterwatch
Tel: (02) 4930 1030
Email: waterwatch@hcmt.org.au

Worksheet W

7.5 Identifying Local BUSHFOODS

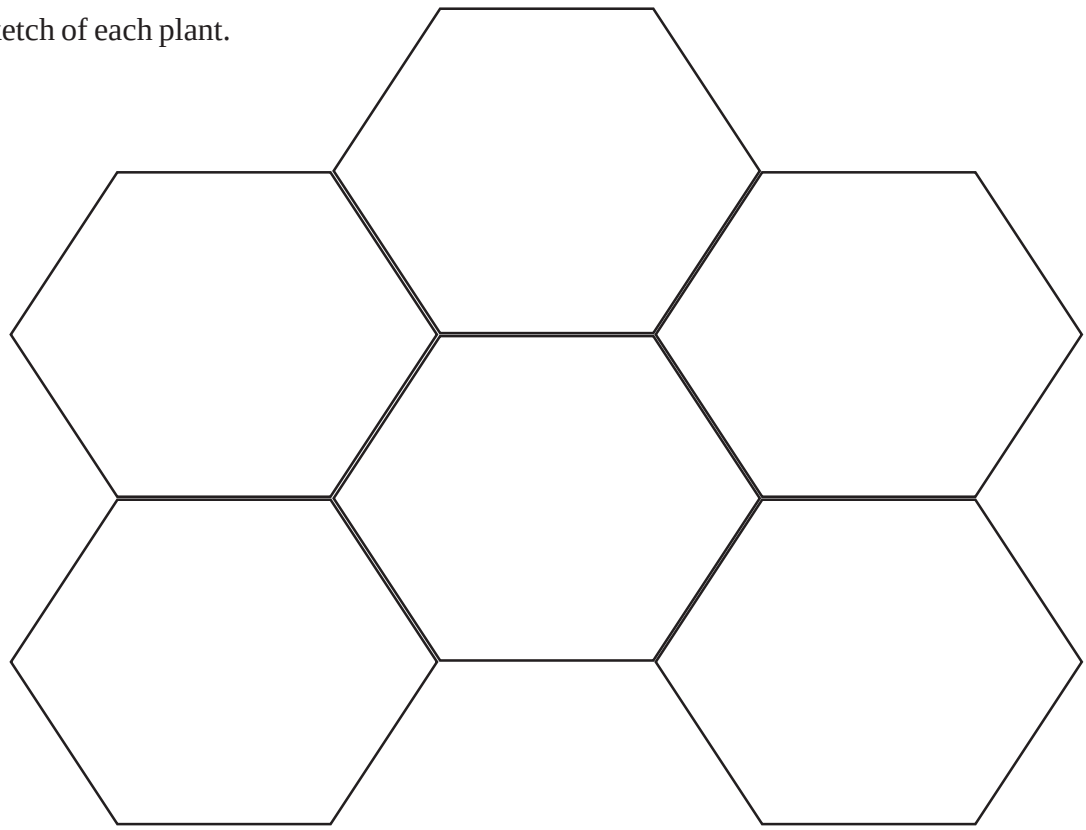
STUDENT NAME: _____

CLASS: _____

1. List at least 5 native plants that are useful and say what they can be used for.

Plant name	This plant can be used for...

2. Make a sketch of each plant.



Worksheet W

7.6 Exploring MAITLAND PARK

STUDENT NAME: _____

CLASS: _____

1. List at least 5 things people can do at Maitland Park.

_____

_____

_____

_____

_____

THE CENETAPH

2. What do you think the cenetaph is used for?

_____

_____

3. List 4 names and dates that appear on the cenetaph.

_____

_____

4. Sketch or describe the cenetaph.

THE WATER FOUNTAIN

5. Use informal units to measure the dimensions of the water fountain. _____

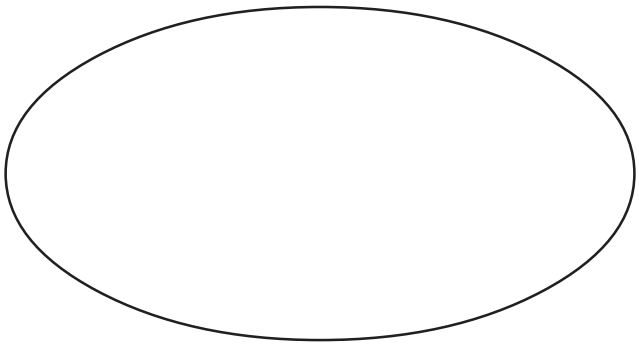
Worksheet W

7.7 Heritage Walk: CHURCH STREET

STUDENT NAME: _____

CLASS: _____

1. As you walk along Church Street draw a wrought iron pattern you see on a building.



MAITLAND PUBLIC SCHOOL

2. When do you think the school was built? _____

   How old is this building? _____

BROUGH HOUSE & GROSSMANN HOUSE

3. Look at these two buildings. Count the number of windows on each one.

   ☐ Brough House ☐ Grossmann House

4. Are the windows the same? YES / NO

5. What is Brough House used for today? _____

   _____

   _____

Worksheet W

7.8 Investigating the HUNTER RIVER

STUDENT NAME: _____

CLASS: _____

1. The Hunter River at Maitland is still affected by the rise and fall of the ocean's tides. Draw an arrow showing which way the river mainly flows as the tide comes in (rises) and goes out (falls).

Water flow direction as the tide comes in.	Water flow direction as the tide goes out.

2. If you look across the river to Lorn you will see grassed banks in front of the houses. What are these 'special' banks called? _____

   Why were these banks built? _____

   _____

3. The Hunter River has always been an important place for humans (and native wildlife). List some of the uses of the river.

Uses of the river NOW:	Uses of the river THEN:
•	•
•	•
•	•
•	•
•	•

4. Draw and label a cross-section of the Hunter River.

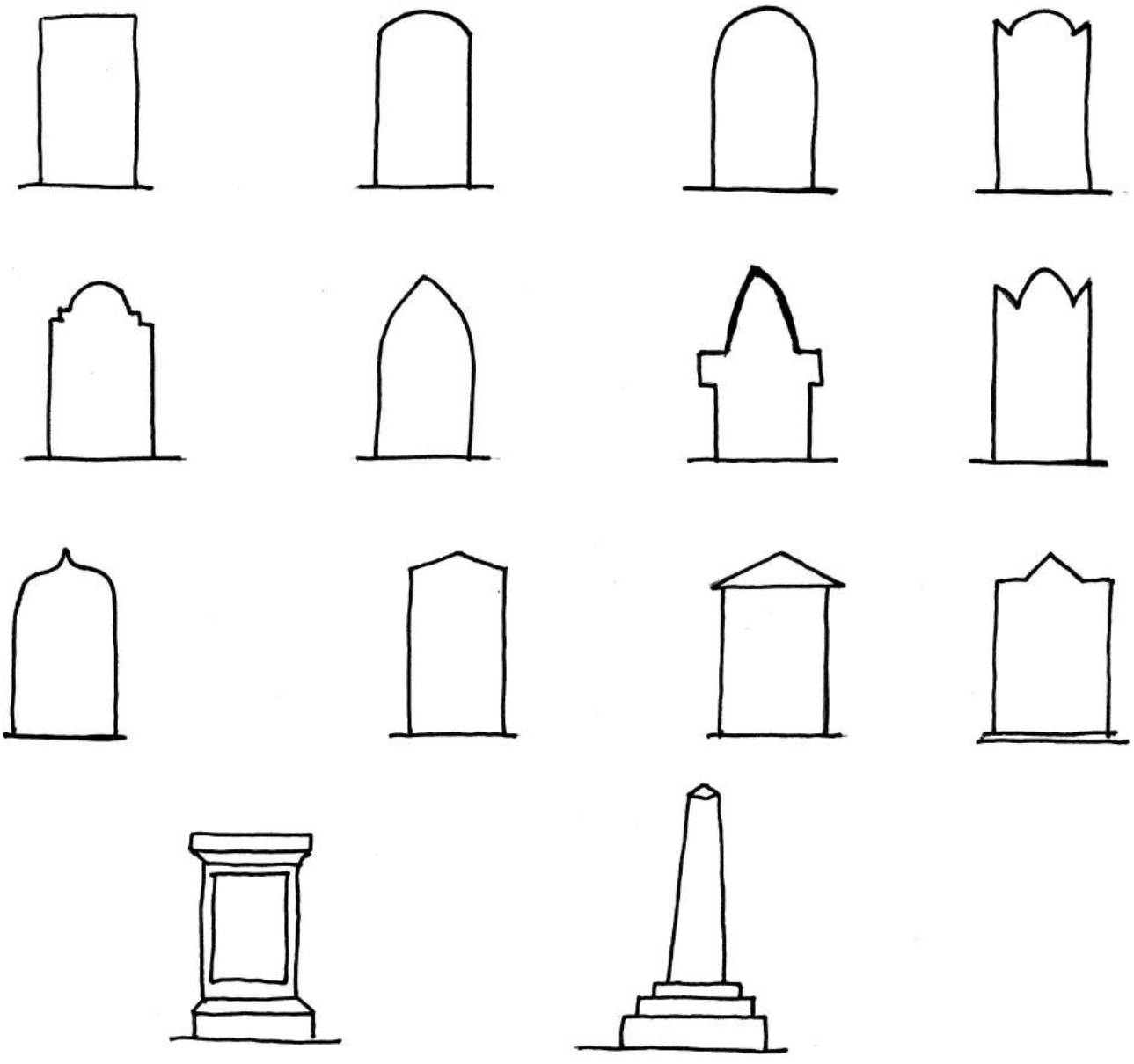
Worksheet

7.9 Discovering OAKHAMPTON CEMETERY

STUDENT NAME: _____

CLASS: _____

Keep a tally of the types of headstones at Oakhampton Cemetery.



Worksheet W

7.9 Discovering OAKHAMPTON CEMETERY

What happened to **John and Clarence Bowden**?

_____

_____

How old were they when they died? _____

Which is the **oldest grave** you found?
Year: _____ Name: _____

Which is the **youngest grave** you found?
Year: _____ Name: _____

Which person was the **oldest** to be buried at Oakhampton Cemetery?
Name: _____ Age: _____

Which person was the **youngest** to be buried at Oakhampton Cemetery?
Name: _____ Age: _____

Choose one of the graves. Describe it and copy its inscription.

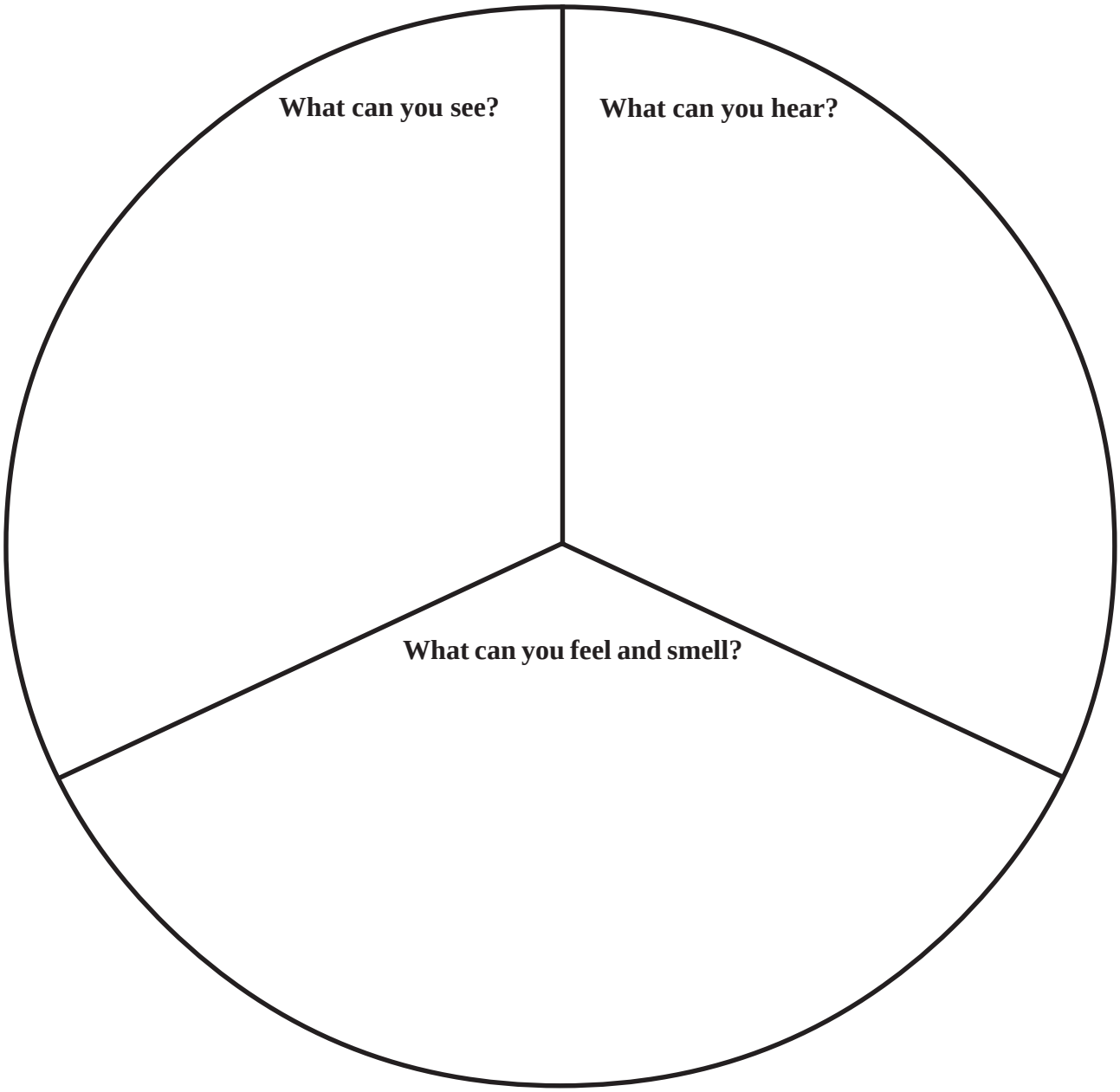
Worksheet W

7.10 Walka Water Works NATURE JOURNAL

STUDENT NAME: _____

CLASS: _____

Describe in words and/or drawings the environment of Walka Water Works.



Worksheet W

7.11 INVESTIGATING TOURISM in Morpeth

STUDENT NAME: _____

CLASS: _____

SITE A: The role, benefits and impacts of tourism in Morpeth

Why is Morpeth considered an area of State (NSW) heritage significance?

1. _____

2. _____

3. _____

4. _____

5. _____

Identify some of the BENEFITS of tourism to the village of Morpeth.

1. _____

2. _____

3. _____

Identify some of the COSTS of tourism to the village of Morpeth.

1. _____

2. _____

3. _____

4. _____

5. _____

Worksheet W

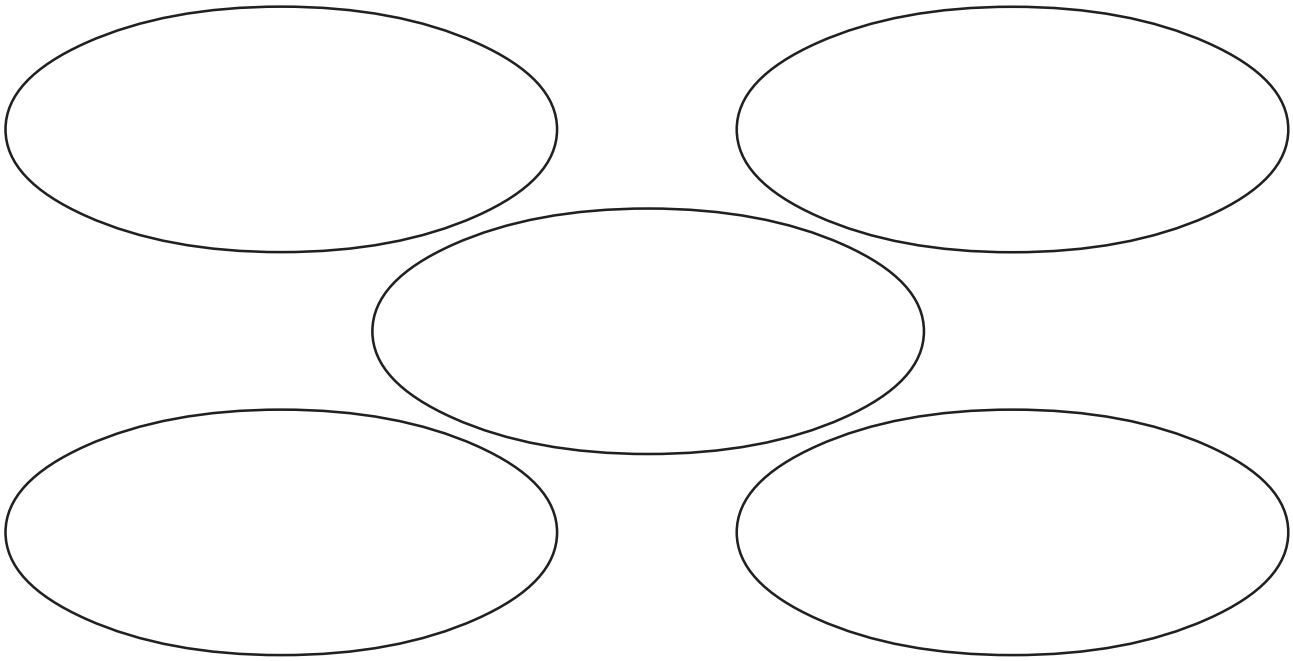
7.11 INVESTIGATING TOURISM in Morpeth

SITE A: The role, benefits and impacts of tourism in Morpeth

SPATIAL DIMENSION:
Describes where things are and why they are there.

ECOLOGICAL DIMENSION:
Describes the relationship between people and the environment and the effect that that have on each other.

What are the SPATIAL issues/impacts associated with Morpeth as a tourist centre?



What are the ECOLOGICAL issues/impacts associated with Morpeth as a tourist centre?

Worksheet W

7.11 INVESTIGATING TOURISM in Morpeth

SITE A: The role, benefits and impacts of tourism in Morpeth

How are the community and decision-makers such as Maitland City Council responding to these issues/impacts?

MORPETH MANAGEMENT PLAN

Who was responsible for the development of this ACTION PLAN?

_____

_____

_____

When was the Plan put into action (or adopted)? _____

What are some of the key recommended ACTIONS of the Plan?

_____

_____

_____

_____

_____

_____

Worksheet W

7.12 Commercial Land Use SURVEY OF MORPETH

SITE B: Locate, classify and record land use along Swan Street, Morpeth

Using the map provided over page, your task is to divide each of the properties at the southern end of Swan Street (between Northumberland and Tank streets) into either:

Tourist-based Traders (TT)
Traders serving mainly the local residents (LT)
Residential (R)
Vacant (V)

Some properties may have two classifications, e.g. TT on the ground with R on the first floor.

Numbers on the map are street numbers. Look for these numbers on the shops, particularly over doors.

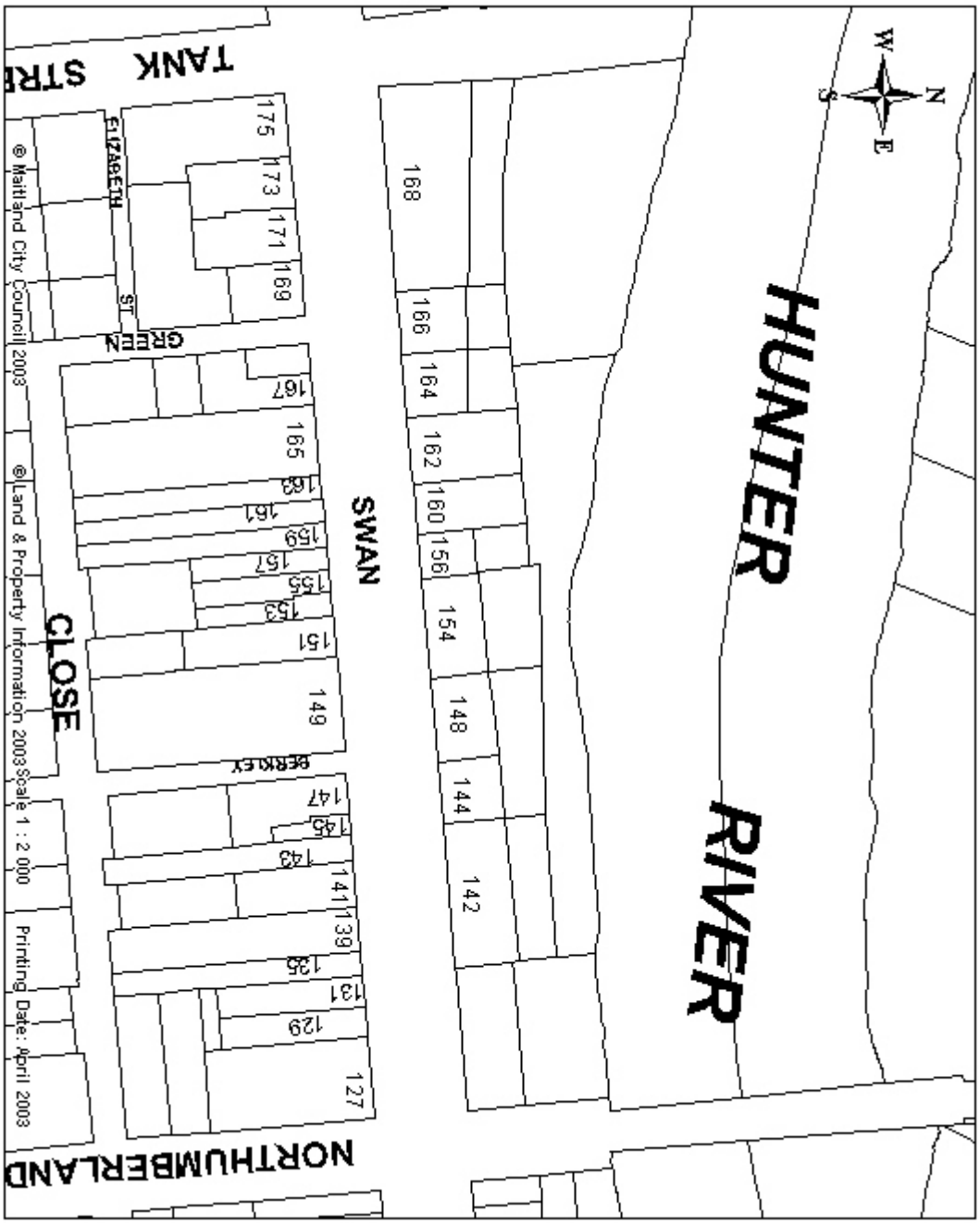
Worksheet W

7.12 Commercial Land Use SURVEY OF MORPETH

STUDENT NAME: _____

CLASS: _____

SITE B: Locate, classify and record land use along Swan Street, Morpeth



Worksheet W

7.13 Investigation of QUEENS WHARF

SITE C: Investigate the significance, changes and future management of Queens Wharf

Background Information

Queens Wharf, Morpeth, was the site for one of the earliest and busiest river ports in NSW. For decades Queens Wharf and Morpeth were more significant than Newcastle or Maitland as a trade and commercial centre.

It was the place where farmers, timber merchants and craftsmen from the Hunter and parts of the North West brought their products and resources to send to Sydney. It was also the place where they secured their personal and business supplies that came to Morpeth by steamship.

Time-Line

1823	Land grant to E.C.Close - Morpeth is a privately-owned town

Morpeth the River Port

1832	*Sophia Jane*, first steamship in Australian waters, arrives in Morpeth to commence regular service between Morpeth and Sydney. First store is built.
1833	Queens Wharf is built.
1850s & 60s	Morpeth, particularly Queens Wharf, is a thriving river port.
1862	Punt built across the Hunter River at Queens Wharf.
1864	Railway line opened between East Maitland and Morpeth.
1865	Coal staithes (or shoots) built for 10,000 pounds.
1870	Queens Wharf re-built.
From 1870s	Railways compete with river/steamships to move goods and people.
1910	River transport declines due to competition from road and rail.

Morpeth in Decline

1920	Queens Wharf closed.
1950	Newcastle & Hunter River Steam Navigation Co. takes its last cargo from Morpeth ending 120 years of river trade.
1953	Last train from Morpeth to East Maitland.
1950s to 1980s	Industry and commerce decline due to changing transport networks and hubs - Newcastle becomes major port and Maitland a major railway and road centre. Maitland becomes the service centre for local residents and farmers.

Urban Renewal - Morpeth becomes 'trendy'

1980	Campbell's Store re-developed, start of a new growth phase based on tourism.
1990s	Morpeth becomes a 'trendy' residential location.
2000s	Morpeth's boom continues due to tourism and the growth in surrounding rural residential areas.

Worksheet W

7.13 Investigation of QUEENS WHARF

STUDENT NAME: _____

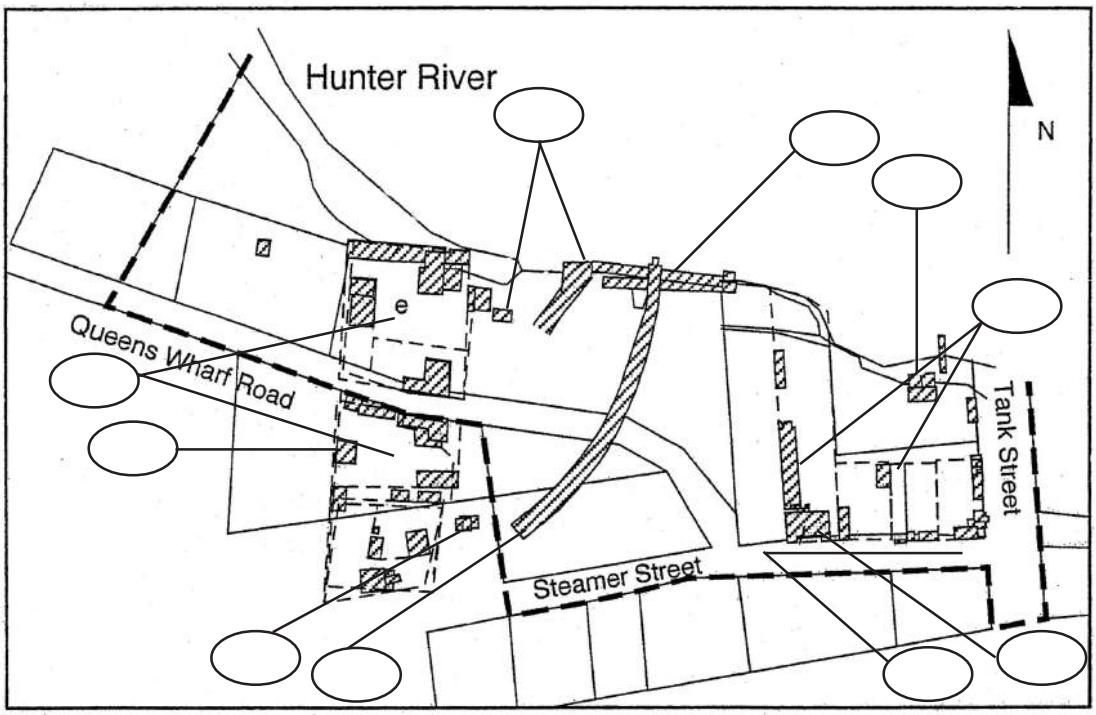
CLASS: _____

SITE C: Investigate the significance, changes and future management of Queens Wharf

On the map below shade in the location of the following:
Hunter River *Tank Street* *Steamer St.* *Queens Wharf Road*

On the map use a numbering key to show the location of the following:

1. *Queens Wharf* - built 1833, rebuilt 1870, closed 1920
2. *First store in Morpeth* - built in 1832
3. *Coal staithes (or shoots)* - built in 1865 for 10,000 pounds
4. *Punt crossing and Punt House* - built in 1860's
5. *Railway line and embankment* - built in 1863
6. *Wheatsheaf Inn*
7. *Anlaby's Inn*
8. *Lock-up*
9. *Other buildings - quarters and cottages.*



QUEENS WHARF PRECINCT, MORPETH.

Composite plan of buildings depicted on historical plans.
(Note that the outline or position of a building or structure may change from one historical plan to another).

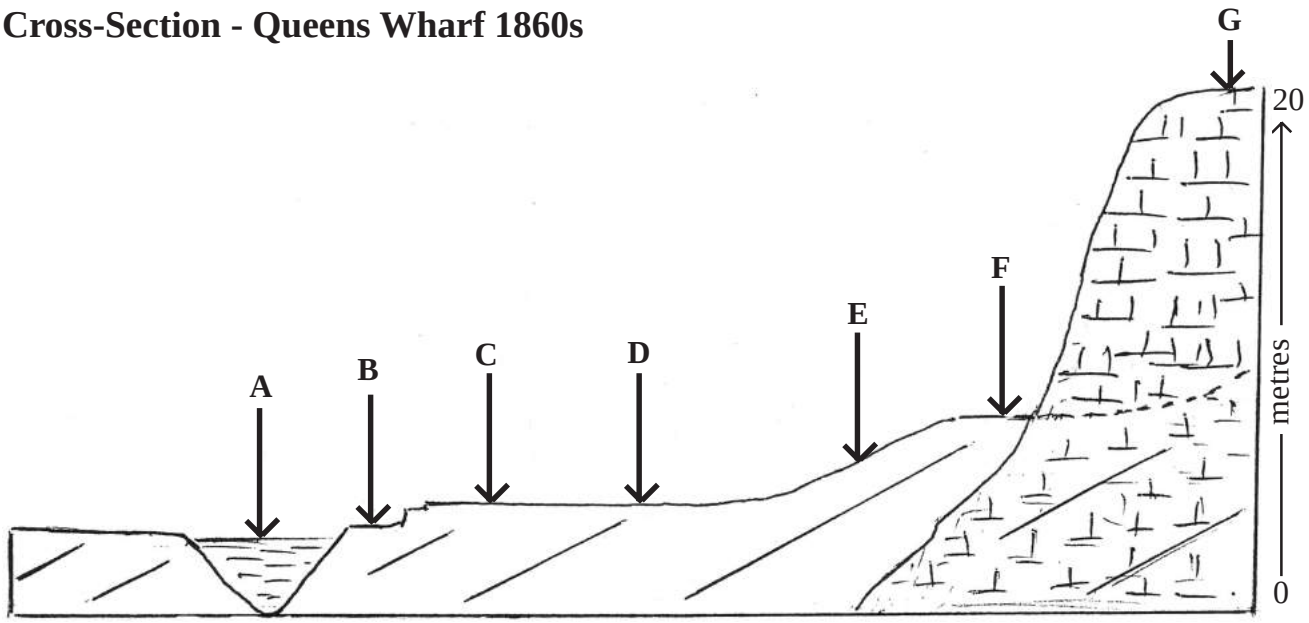
0 250 metres

Worksheet W

7.13 Investigation of QUEENS WHARF

SITE C: Investigate the significance, changes and future management of Queens Wharf

Cross-Section - Queens Wharf 1860s



A Hunter River (narrow and deep) with punt crossing
B Queens Wharf
C Cottages
D Queens Wharf Road
E Lock-up and Guard House
F East Maitland/Morpeth railway line and sandstone embankment
G Swan Street/Morpeth Road

In the space below draw a labelled cross-section of Queens Wharf today.

Worksheet W

7.13 Investigation of QUEENS WHARF

SITE C: Investigate the significance, changes and future management of Queens Wharf

Heritage/historical items are classified on the basis of their significance. **State heritage significance** of a site and/or item means significance to the State (NSW) in relation to the historical, scientific, cultural, social, archaeological, natural and/or aesthetic value of the site and/or item. **Queens Wharf is of State heritage significance.**

Some items on Queens Wharf have a higher classification than others. **Using the key provided complete the following table to show some of the differences in classification.**

Level of significance: **Some**
Considerable
Exceptional

Items	Level of Significance
Queens Wharf	
First Store in Morpeth	
Coal staithes (or shoots)	
Punt crossing and Punt House	
Railway line and embankment	
Wheatsheaf Inn	
Lock-up	

Suggest REASONS why Queens Wharf is an item of State heritage significance.

Worksheet W

7.13 Investigation of QUEENS WHARF

SITE C: Investigate the significance, changes and future management of Queens Wharf

CONSERVATION:
means taking all necessary steps to ensure a site and/or item retains its heritage significance.

PRESERVATION:
means maintaining the site and/or item in its existing state and minimising further damage or loss.

Do you believe that Queens Wharf should be CONSERVED or PRESERVED?

_____

Give your reasons:

_____

_____

_____

_____

Read the Maitland Mercury (Oct.'02) article on the next page and respond to the following questions.

Maitland City Council has developed a plan to turn Queens Wharf into a modern recreation area by:

- Upgrading and extending the boat ramp
- Building a new toilet block
- Constructing a formed earth and grass car park for 200 vehicles
- Tar sealing roads
- Providing landscaped open space
- Building a walkway from Queens Wharf, along the riverbank, to Morpeth Bridge

Being mindful of the State heritage significance of Queens Wharf, do you think that Maitland Council should be allowed to implement its PLAN for future use of the site?

_____ (YES/NO)

Give reasons for your decision:

_____

_____

_____

_____

_____

Worksheet W

7.13 Investigation of QUEENS WHARF

SITE C: Investigate the significance, changes and future management of Queens Wharf

Toilet block, boat ramp under attack

THE refurbishment of the public toilet facilities at Queens Wharf in Morpeth came under attack from Maitland Councillor Steve Procter yesterday.

He classed the toilet facilities as "appalling" and said it was about time both the toilets and the boat ramp were replaced.

Speaking at Tuesday night's council meeting, Cr Procter said it was disappointing to see the vast number of people attending the triathlon event over the weekend forced to line up to use the substandard facilities.

"We allocated funds 18 months ago but it was put on hold for an archaeological study of the area," he said.

"The works have been postponed but both the boat ramp and the toilets are ready to go ahead.

"It should have been done. It was promised it would be done last year before the Bass competition.

Council received funding of $110,000 to replace the toilets and $210,000 to make improvements to the existing boat ramp, extending it to two lanes.

"Queens Wharf is the best site. The site for the new toilet facility is where they are currently located," Cr Procter said.

"They are also looking to put in an 80-lot car park which is needed in Morpeth, but that hasn't been approved yet.

"It's all in a handy location for the business district, tourists and residents. We have to give the best and give them what they deserve."

Maitland Mercury Thursday, October 24, 2001, p.5

ROOM FOR IMPROVEMENT: The toilet block and boat ramp at Queens Wharf in Morpeth are said to be appalling and in need of immediate replacement.

How has Maitland City Council responded to this clash between the need to conserve/preserve the past and provide modern facilities for the present and future?

Worksheet W

7.11 - 7.13 Morpeth Field Study: SUGGESTED ANSWERS

7.11 INVESTIGATING TOURISM in Morpeth

Why is Morpeth considered an area of State (NSW) heritage significance?

- A major river port town in the 19th century, particularly 1830-1890.
- Privately founded town (E.C. Close).
- Unique British rectangular street layout.
- Buildings (commercial, residential, churches) of State heritage significance.
- Strong and special association with its community – sense of place.
- Rural surrounds with farmhouses and out-buildings of State significance.

Identify some of the BENEFITS of tourism to the village of Morpeth.

- Employment.
- Income & prosperity.
- Redevelopment and reuse of heritage buildings.
- Reliving the lives of the past – educational.

Identify some of the COSTS of tourism to the village of Morpeth.

- Traffic issues – parking and congestion.
- Loss of privacy for residents.
- Increased noise.
- Loss of village identity – sense of place.
- Disruption and inconvenience to the daily lives of residents.
- Stress and frustration, particularly with older residents.

What are the SPATIAL issues/impacts associated with Morpeth as a tourist centre?

- PARKING – difficulties in providing sufficient long-term parking for tourists and short-stay parking for residents.
- TRAFFIC – congestion in Swan street; delays in crossing Morpeth Bridge.
- POLLUTION – noise from tourists; increased garbage.
- INFRASTRUCTURE OVERLOAD – "old" sewer and drainage systems unable to cope with increased demand, overflows and loss of water pressure.
- PLANNING CONTROLS – Morpeth is a conservation or heritage area. Maitland Council imposes many regulations over development in the village.

What are the ECOLOGICAL issues/impacts associated with Morpeth as a tourist centre?

- Loss of village "identity".
- Loss of "ownership" of the village by residents.
- Loss of privacy.
- Difficulties with parking and traffic movement.
- Health issues – stress, frustration and resentment with and over tourists and the problems/issues they create.

Who was responsible for the development of this ACTION PLAN?

Maitland City Council conducted a number of community workshops with STAKEHOLDERS (residents, community leaders, tourist-based traders, other traders, government authorities, and interest groups including youth of Morpeth) to determine feelings and needs of the community.
Heritage Planners continued to CONSULT with these individuals and groups over a 12-month period and produced an ACTION PLAN for the Morpeth village called the MORPETH MANAGEMENT PLAN.

When was the Plan put into action (or adopted)?

2000

7.11 - 7.13 Morpeth Field Study: SUGGESTED ANSWERS

7.11 INVESTIGATING TOURISM in Morpeth (cont.)

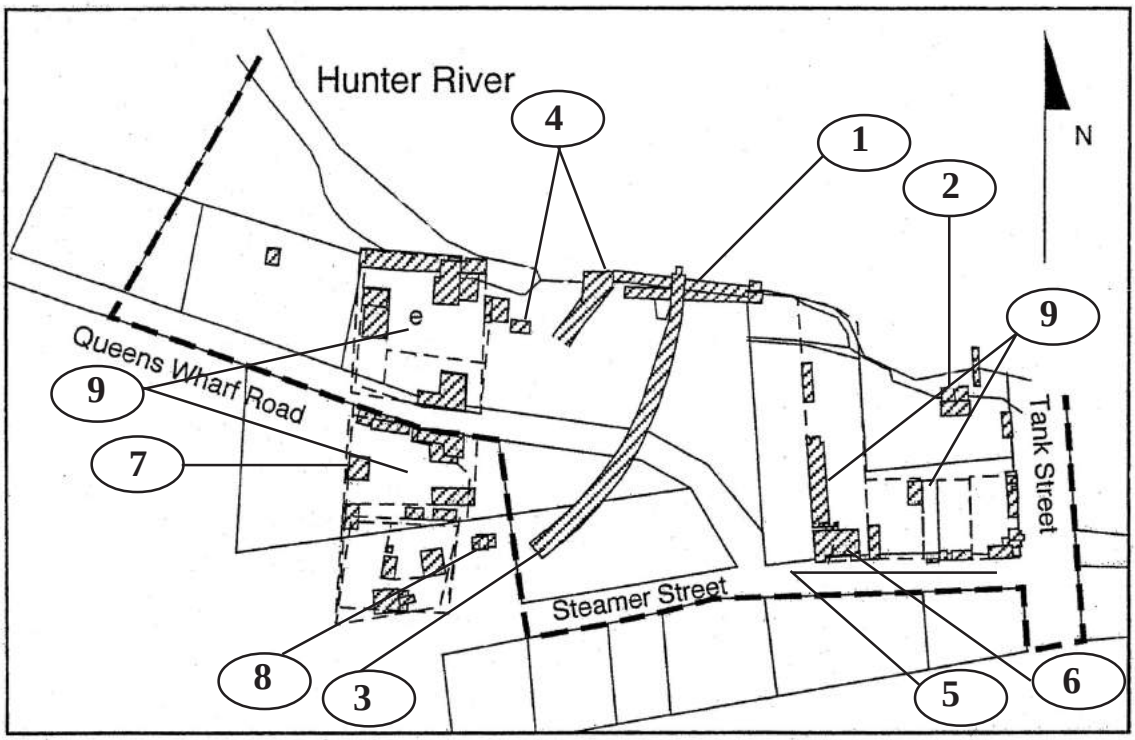
What are some of the key recommended ACTIONS of the Plan?

- Protect Morpeth's heritage and rural character.
- Improve traffic flow and parking.
- Improve the amenity of the town – streetscape, parks, facilities – for visitors and residents.
- Investigate and develop an Action Plan for the historical Queens Wharf site.

7.12 Commercial Land Use SURVEY OF MORPETH

Students complete their own survey of land use along Swan Street, Morpeth.

7.13 Investigation of QUEENS WHARF



QUEENS WHARF PRECINCT, MORPETH.

Composite plan of buildings depicted on historical plans.
(Note that the outline or position of a building or structure may change from one historical plan to another).

0 250 metres

Cross-section of Queens Wharf today:

Students complete their own annotated cross-section.

Worksheet W

7.11 - 7.13 Morpeth Field Study: SUGGESTED ANSWERS

7.13 Investigation of QUEENS WHARF (cont.)

Levels of significance:

Queens Wharf	Considerable
First Store in Morpeth	Exceptional
Coal Staithes	Considerable
Punt Crossing & Punt House	Some
Railway line & embankment	Considerable
Wheatsheaf Inn	Considerable
Lockup	Considerable

Suggest REASONS why Queens Wharf is an item of State heritage significance.

- Site of first wharf and store in Morpeth.
- Major river port from 1830 – 1890.
- Close association with the Close family (E.C Close was founder of Morpeth).
- Site has potential to reveal significant information about the development of Morpeth and living/working conditions in the past.
- Survival (evidence) of a public wharf is rare in NSW, particularly one as old as Queens Wharf.

Do you believe that Queens Wharf should be CONSERVED or PRESERVED? Give reasons. Being mindful of the State heritage significance of Queens Wharf, do you think that Maitland Council should be allowed to implement its PLAN for future use of the site? Give reasons.

Students complete with their own responses displaying informed citizenship.

How has Maitland City Council responded to this clash between the need to conserve/preserve the past and provide modern facilities for the present and future?

- Morpeth Management Plan (2000)
- Archaeological Study of Queens Wharf (2002)

Worksheet W

7.14 Conserving NATIVE WILDLIFE

STUDENT NAME: _____

CLASS: _____

1. What are three common threats to native wildlife in urban areas?

2. What are three things that you can do to protect & conserve native wildlife?

3. Consider each of the animals you've been introduced to today. Describe two adaptations or features about one of these animals.

Worksheet W

7.15 Regenerating NATIVE VEGETATION

STUDENT NAME: _____

CLASS: _____

1. What percentage of Maitland's native bushland remains today?

_____

2. Historically what were the three main land uses that resulted in clearing of native vegetation?

_____

_____

_____

3. What steps can we take to deal with the lack of native vegetation in our local area?

_____

_____

_____

_____

_____

Worksheet W

7.16 Observing & recording NATURE

STUDENT NAME: _____

CLASS: _____

Date / Time: _____

Location: _____

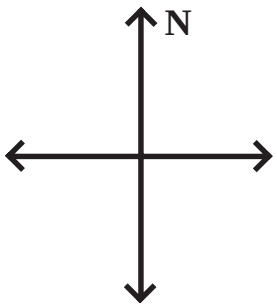
Weather: _____

Temperature: _____

Humidity: _____

Moon Phase: _____

Sunrise / sunset: _____



Clouds

Sound

Examples of sound drawings:

Traffic

Frog

Whip bird

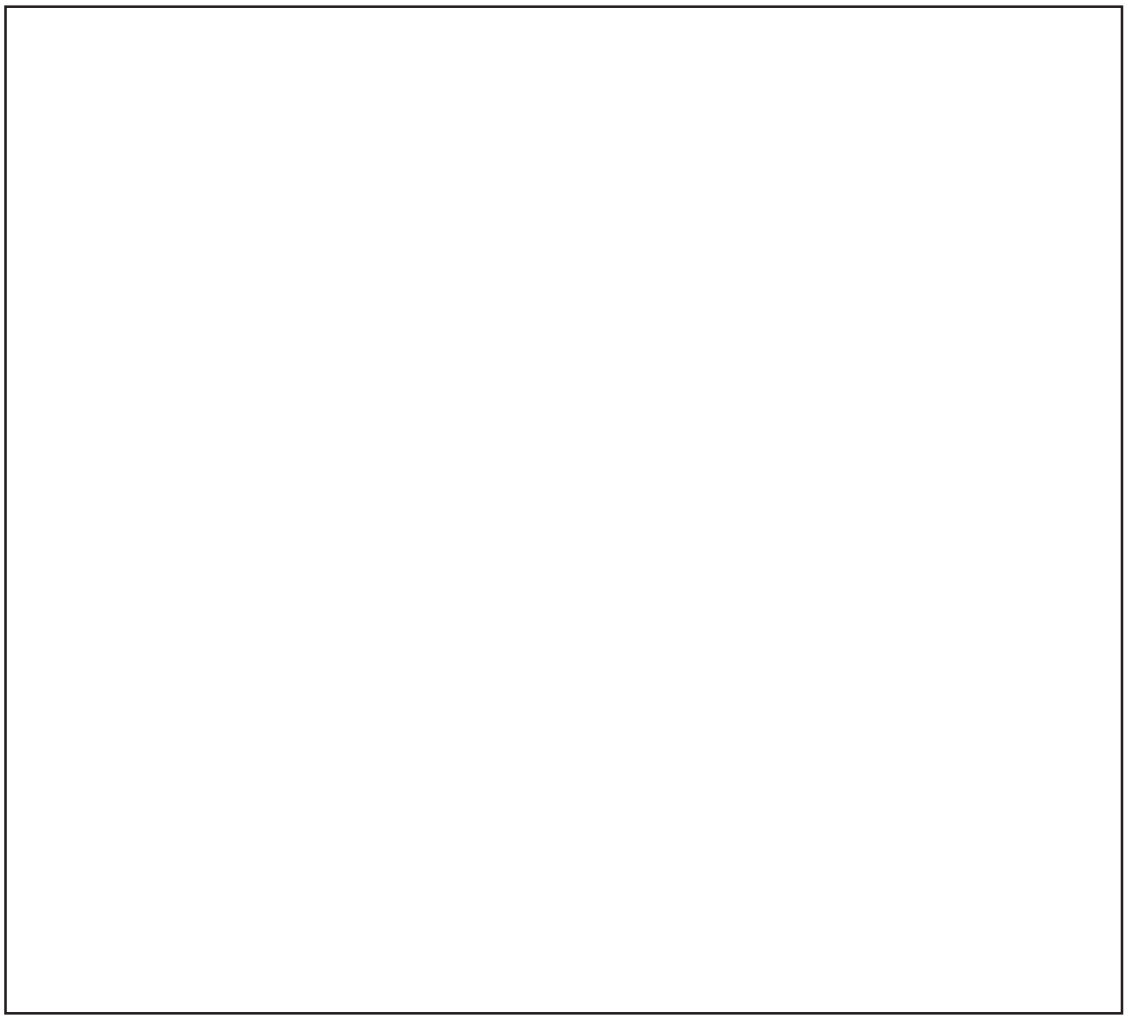
Crow

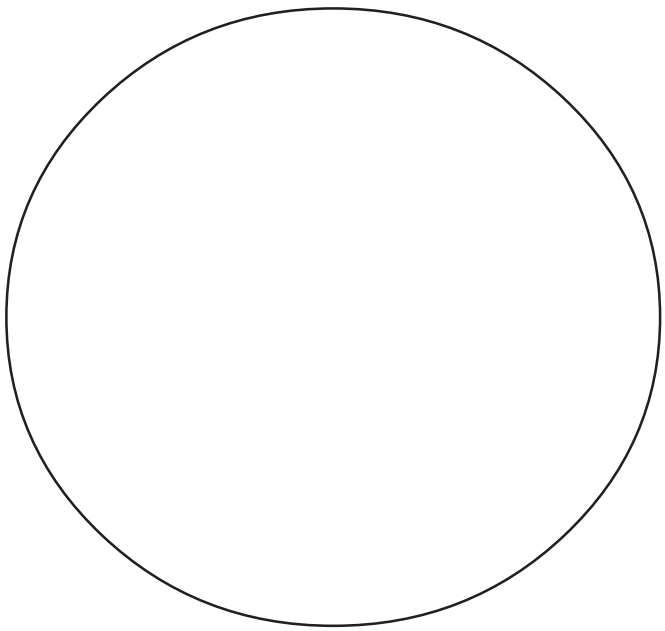
Magpie

Worksheet W

7.16 Observing & recording NATURE

Landscape:





Written Description:

Worksheet

7.17 Experiencing LOCAL BUSHFOODS

STUDENT NAME: _____

CLASS: _____

1. What parts of a native plant are typically used for bushfood?

2. Why is fire important to the gathering and availability of bushfood?

3. Name three local native plants used by Aboriginal people and describe how they were used.

4. Name three local native plants used by early Europeans and describe how they were used.

Information

Environmental Education Award & Funding OPPORTUNITIES FOR SCHOOLS

Organisation	Funding/Award	Contact Details
AGL and University of NSW	**AGL Sustainable Living Competition** Students (Yrs 7 – 12) develop sustainable solutions to deal with environmental impacts arising from building cities, transport, waste, recycling, and energy production. Over $30,000 in prizes on offer.	◆ **Ph:** (02) 9385 4979 ◆ **Website:** *www.fbe.unsw.edu.au/events/sustliving* ◆ **Email:** SLP@fbe.unsw.edu.au
Australian Museum	**Eureka Awards** The Eureka Awards are Australia's pre-eminent Science Awards, rewarding excellence in Australian science and raising the profile of science in the community. As part of these annual awards, there are categories open to schools ($10,000 per category): ***Eureka Prize for Environmental Education Program*** Awarded to an innovative, leading edge EE program ($10,000). ***Eureka School Prize for Biological Sciences*** Design of a webpage by Year 10-12 students (although other years may be considered) that demonstrates excellence in the investigation and study of biology ($11,000). ***Eureka School Prize for Earth, Environmental & Planetary Sciences*** Design of a webpage by Year 10-12 students (although other years may be considered) that demonstrates excellence in the investigation and study of Planet Earth and the interrelationships of its physical and biological systems ($11,000).	◆ **Ph:** (02) 9320 6039 ◆ **Website:** *www.austmus.gov.au/eureka/* ◆ **Email:** eureka@austmus.gov.au
Environment Australia	**Australian Government Envirofund** The Australian Government Envirofund is the local action component of the Commonwealth Government's Natural Heritage Trust. It supports communities to undertake local projects aimed at conserving biodiversity and promoting sustainable resource use. Community groups and schools that have established their own incorporated group may apply for up to $30,000 through the Envirofund. This grant program has a strong focus on projects that utilise partnerships between a range of groups and individuals and must involve on-ground works and other actions to target local problems. P&Cs are also eligible to apply.	◆ **Ph:** 1800 065 823 ◆ **Website:** *www.nht.gov.au/index.html* ◆ **Email:** envirofund@affa.gov.au

Information

Environmental Education Award & Funding OPPORTUNITIES FOR SCHOOLS

Organisation	Funding/Award	Contact Details
Gould League of NSW	**Project Environment Competition** Schools are awarded funds for special projects related to the competition theme that changes each year. Categories include poetry, research, photography, art and music (Years K – 12). **Sustainable Management of Schools Project** Grants are awarded to schools that develop and implement ecologically sustainable management practices within the school, e.g. strategies to reduce the amount of packaging generated from the canteen (Years K – 12).	◆ **Ph:** (02) 9560 7844 ◆ **Website:** www.gould.edu.au ◆ **Email:** *gould@ozemail.com.au*
Hunter Catchment Management Trust (HCMT)	**Small Scale Funding** HCMT provides grants of up to $5,000 to assist community groups involved in natural resource management within the Hunter with on-ground works projects.	◆ **Ph:** (02) 4930 1030 ◆ **Website:** www.hcmt.org.au ◆ **Email:** *funding@hcmt.org.au*
Keep Australia Beautiful NSW	**Tidy Towns** There are a range of categories and awards in the Tidy Towns Awards Program that may be relevant to schools, particularly the NSW Dept. Public Works & Service's (DPWS) School Environment Award.	◆ **Ph:** (02) 9633 3380 ◆ **Website:** www.kabnsw.org.au/ ◆ **Email:** *tidytowns@kabnsw.org.au*
Landcare Australia	**National Landcare Awards** A range of prestigious awards are presented biennially to groups and individuals involved in Landcare practices. There are a number of categories open to schools. Groups/individuals must first qualify by competing in the State awards, these are coordinated in NSW by the Department of Sustainable Natural Resources. ***Westpac Landcare Education Award*** Awarded to an education group (primary, secondary, tertiary, adult, and/or community education). Recognises excellence in raising awareness, knowledge and understanding of Landcare amongst students and/or the community, and for implementing Landcare practices on its own property or within the local community. ***NHT Rivercare Award*** Awarded to a community organisation or group that has made a significant contribution to sustainable management, rehabilitation and conservation of a waterway. ***Bushcare Nature Conservation Award*** Awarded to a community organisation or group that demonstrates excellence and innovation in implementing nature conservation activities on land outside formal parks and reserves.	◆ **Ph:** (02) 9412 1040 ◆ **Website:** *www.landcareaustralia.com.au/awards.asp* ◆ **Email:** *jquealy@landcareaustralia.com.au*

Information

Environmental Education Award & Funding OPPORTUNITIES FOR SCHOOLS

Organisation	Funding/Award	Contact Details
Maitland City Council	**Maitland Schools Environment Program** An annual program that aims to promote and support local schools' environmental education activities. It is open to all schools in the Maitland local government area and alternates biennially between environmental education 'outreach' (e.g. providing technical advice, guest speakers etc.) and celebrating and resourcing schools' environmental initiatives ($100 in environmental resources are available to schools that enter).	◆ **Ph:** (02) 4934 9833 ◆ **Website:** *www.maitland.infohunt.nsw.gov.au* ◆ **Email:** duncanj@maitland.nsw.gov.au
Mercy Foundation	**Environmental Grants for Schools** Run on an annual basis, schools may apply for up to $1,000 to assist in environmental education and site rehabilitation activities.	◆ **Ph:** (02) 9699 8726 ◆ **Website:** *www.mercyfoundation.com.au/grants.html* ◆ **Email:** mercyfoundation@ozemail.com.au
NSW Department of Education & Training (DET)	**Envirothon** A competition for teams of four Year 11 students interested in applying their fieldwork skills to examine ecosystems. The competition involves data collection, problem solving and an environmental quiz.Teams compete with schools in their own region. The winning regional teams compete in the final envirothon against other regional winners. The Hunter Region Envirothon is facilitated by the Wetlands Environmental Education Centre. The competition is a joint initiative between DET and NPWS.	◆ **Ph:** (02) 9267 6488 ◆ **Website:** *www.curriculumsupport.nsw.gov.au/enviroed/envirothon*
NSW Environment Protection Authority (EPA)	**Environmental Trust** ***Eco Schools Grants Program*** This program provides grants of $1,500 to 80 schools each year. Such funding may be used by schools to involve community and students in developing and implementing environmental management initiatives, e.g. reduction of energy use (Years K – 12). ***Environmental Education Program*** This program provides grants of $5,000 - $100,000 to community-based organisations for educational projects or programs that develop or widen the community's knowledge of, skills in, and commitment to protecting the environment. ***Environmental Restoration & Rehabilitation Program*** This program provides grants of $5,000 - $100,000 to community-based organisations and local government for projects that involve: restoring degraded environmental resources; protecting rare and important ecosystems and habitats; preventing or reducing future environmental damage; and enhancing the quality of valuable environmental resources.	◆ **Ph:** (02) 9995 5369 ◆ **Website:** *www.epa.nsw.gov.au/envtrust/index.htm* ◆ **Email:** envirotrust@epa.nsw.gov.au

Information

Environmental Education Award & Funding OPPORTUNITIES FOR SCHOOLS

Organisation	Funding/Award	Contact Details
NSW Minerals Council	**School Environmental Management Plan (SEMP) Award** The award encourages, promotes and recognises environmental excellence in NSW schools that develop and implement a SEMP. Schools are awarded cash prizes between $1,000 and $5,000 to assist in the implementation of their SEMP (Years K – 12).	◆ **Ph:** (02) 9267 6488 ◆ **Website:** *www.nswmin.com.au* ◆ **Email:** info@nswmin.com.au
Readers Digest	**Readers Digest Environmental Awards** Awards are presented annually for environmental projects ranging from recycling, biodiversity, natural resource management, to wildlife conservation. The total annual prizemoney is $50,000 (Years K – 12).	◆ **Ph:** 1800 817 626 ◆ **Website:** *www.readersdigestawards.com/rdea/index.htm*
Science Teachers Association of NSW	**Young Scientist Award** Open to teachers and students undertaking scientific investigations and presentations. A range of award categories, along with a range of prizes (cash and material) are on offer (Years K–12).	◆ **Ph:** (02) 9816 5056 ◆ **Website:** *www.stansw.asn.au/ys/ysmain.htm*
University of Sydney	**Physics Competition** Prizes are available for student and school entries (Years K–12) in pursuit of demonstrating the solution to a physics-based problem or issue.	◆ **Ph:** (02) 9351 3201 ◆ **Website:** *www.physics.usyd.edu.au/competition/* ◆ **Email:** outreach@physics.usyd.edu.au
Waterwatch Australia	**Race Around the Catchment** A national competition coordinated by Waterwatch Australia as part of National Water Week. Schools produce a 3 minute video or take a photo that highlights the importance of water catchment issues across Australia. The Hunter region has its own Waterwatch Facilitator to assist schools entering the competition (Years K – 12). **Australian Junior Water Prize** A competition for individuals or small groups of senior high school students who carry out a water science project. The cash prize is sponsored by Waterwatch Australia and the Australian Water Association (AWA).	◆ **Ph:** (02) 4930 1030 (Hunter Region) ◆ **Website:** *www.waterwatch.org.au* ◆ **Ph:** 1300 361 426 (AWA) ◆ **Website:** *www.awa.asn.au/about/awards/sjwp.asp* ◆ **Email:** ijarman@awa.asn.au

Information

Information, Guest Speakers & Workshops: LOCAL OPTIONS FOR SCHOOLS

Before making contact...

There is no guarantee that the people and organisations outlined in the following table will be able to respond to all requests for guest speaker or workshop presentations. As well, some community-based organisations and individuals may require a fee for their services to help cover costs.

Topic	Contact Details
Aboriginal Heritage	**Mindaribba Local Aboriginal Land Council** Adminstrative Assistant (Marissa Jamieson) **Ph:** (02) 4934 8511 **Email:** mlalccdep@ozemail.com.au
Blue-Green Algae	**Maitland City Council** Environmental Health Officer (Duncan Jinks) **Ph:** (02) 4934 9833 **Email:** duncanj@maitland.nsw.gov.au
Bushfoods	**Amanda Burns** **Ph:** (02) 4984 5511 **Email:** gingarra@idl.net.au **Paul Melehan** (advice) **Ph:** 0409 987516 **Email:** spottedquoll@hunterlink.net.au
Ecosystems (issues and management)	**Maitland Region Landcare** Maitland Landcare Coordinator (Lana Collison) **Ph:** (02) 4934 9838 **Email:** lanac@maitland.nsw.gov.au **Maitland City Council** Environmental Health Officer (Duncan Jinks) **Ph:** (02) 4934 9833 **Email:** duncanj@maitland.nsw.gov.au **Hunter Catchment Management Trust** Project Officer - Remnant Vegetation (Travis Peake) **Ph:** (02) 4930 1030 **Email:** t.peake@hcmt.org.au **Greening Australia** Project Manager - Bushcare Support (Stephen Bladwell) **Ph:** (02) 4950 0055 **Email:** sbladwell@ga.org.au **Lower Hunter & Central Coast Regional Environmental Management Strategy** Project Coordinator (Kirsty Winter) **Ph:** (02) 4962 0921 **Email:** enviro@huntercouncils.com.au
Erosion	**Maitland City Council** Environmental Health Officer (Duncan Jinks) **Ph:** (02) 4934 9833 **Email:** duncanj@maitland.nsw.gov.au

Information, Guest Speakers & Workshops: LOCAL OPTIONS FOR SCHOOLS

Topic	Contact Details
Flood Mitigation	**Hunter Catchment Management Trust** Catchment Manager - Floodplain & Coast (Sharon Vernon) **Ph:** (02) 4930 1030 **Email:** s.vernon@hcmt.org.au
Heritage (natural and cultural)	**Mindaribba Local Aboriginal Land Council** Adminstrative Assistant (Marissa Jamieson) **Ph:** (02) 4934 8511 **Email:** mlalccdep@ozemail.com.au **Maitland City Council** Maitland Heritage Officer (Clare James) **Ph:** (02) 4934 9832 **Email:** clarej@maitland.nsw.gov.au **Local Historians** Harry Boyle — **Ph:** (02) 4930 5130 Cameron Archer (advice) — **Ph:** (02) 4939 8888 **Email:** cameron.archer@agric.nsw.gov.au Brian Walsh (advice) — **Ph:** (02) 4939 8888 **Email:** brian.walsh@agric.nsw.gov.au Maitland Family History Circle — **Email:** mfhc@kooee.com.au Alan Todd (Grossmann House) — **Ph:** (02) 4933 6452 **Email:** a.todd@hunterlink.net.au
Landcare	**Maitland Region Landcare** Maitland Landcare Coordinator (Lana Collison) **Ph:** (02) 4934 9838 **Email:** lanac@maitland.nsw.gov.au
Native Seed Collection and Plant Propagation	**Amanda Burns** **Ph:** (02) 4984 5511 **Email:** gingarra@idl.net.au
Native Wildlife	**Hunter Bird Observers Club** Jim Smart **Ph:** (02) 4933 7761 **Email:** jimsmart@idl.net.au **Native Animal Trust** **Ph:** 0500 502 294 **Email:** natf@bigpond.com **Taronga Zoo Education Centre** Zoomobile Education Officer (Nikki Bodel) **Ph:** (02) 9978 4554 **Email:** nbodel@zoo.nsw.gov.au

Information

Information, Guest Speakers & Workshops: LOCAL OPTIONS FOR SCHOOLS

Topic	Contact Details
Natural Resource Management	**Maitland Region Landcare** Maitland Landcare Coordinator (Lana Collison) **Ph:** (02) 4934 9838 **Email:** lanac@maitland.nsw.gov.au **Maitland City Council** Environmental Health Officer (Duncan Jinks) **Ph:** (02) 4934 9833 **Email:** duncanj@maitland.nsw.gov.au **Hunter Catchment Management Trust** Total Catchment Management (TCM) Coordinator (Wallis & Fishery Creeks) (Jane Young) **Ph:** (02) 4930 1030 **Email:** j.young@hcmt.org.au **Lower Hunter & Central Coast Regional Environmental Management Strategy** Project Coordinator (Kirsty Winter) **Ph:** (02) 4962 0921 **Email:** enviro@huntercouncils.com.au
Nature Journaling	**Port Stephens Council** Environmental Health Development Officer (Rosemarie Rohr) **Ph:** (02) 4980 0279 **Email:** rosemarie.rohr@portstephens.nsw.gov.au **Jenny Musicka** **Ph:** (02) 4988 6343 **Email:** bushaven@cnn.net.au
Salinity	**Hunter Catchment Management Trust** Catchment Manager - Water & Vegetation (Dean Chapman) **Ph:** (02) 4930 1030 **Email:** d.chapman@hcmt.org.au **NSW Agriculture** Salinity Advisory Officer (Anthony Collins) **Ph:** (02) 4939 8940 **Email:** anthony.collins@agric.nsw.gov.au
Water Quality Monitoring	**Hunter Catchment Management Trust** Hunter Waterwatch Coordinator (Colin Mondy) **Ph:** (02) 4930 1030 **Email:** waterwatch@hcmt.org.au **Maitland City Council** Environmental Health Officer (Duncan Jinks) **Ph:** (02) 4934 9833 **Email:** duncanj@maitland.nsw.gov.au