Coal Loader Sustainability Learning Guide

Learning from the past and embracing the future

A teaching resource for school years 5-12

NORTH SYDNEY COUNCIL

the Coal Loader
CENTRE FOR SUSTAINABILITY
Learn from the Past : Embrace the Future

Index

About the Coal Loader

The Coal Loader Centre for Sustainability (the Coal Loader) is an exciting place to learn about all aspects of sustainability. Located in Waverton, just 2km from the Sydney Harbour Bridge, it is an ex-industrial coal-loading facility, which has been transformed into a centre of excellence for sustainability by North Sydney Council.

Officially opened in July 2011, the Coal Loader features a cottage for sustainable meeting and learning, wetlands, a community garden, a native bushland nursery, historical tunnels, Aboriginal engravings, workshop space, parklands and a beautiful bushland reserve right next door.

The historic 2.8ha waterfront site has been retrofitted with state-of-the-art sustainable technologies.

The name 'the Coal Loader' comes from the industrial use of the site, which began in 1917 when the Sydney Coal Bunkering Company began developing the site for coal loading operations, which ran until 1992.

The Coal Loader showcases innovation, enables hands-on learning about sustainability in everyday life, and serves as a community meeting point and hub for Council's extensive range of environmental and sustainability programs. (See the topic 'History of the site' for more information.)

What will you see?

A visit to the Coal Loader Centre for Sustainability will expose your students to:

- Information and real-life examples of sustainable living
- Heritage buildings that have been retrofitted to showcase energy and water efficiency
- Aboriginal carvings and bush tucker gardens
- A thriving man-made wetland
- A biodiverse Balls Head Reserve, including rare and endangered flora and fauna
- Community gardens with chickens
- Historic coal-loading equipment from the last century, including the original coal-loading tunnels and wharf
- Artists in residence
- A state-of-the-art government community facility.

How you can use the Coal Loader for learning

- Bring a class for an excursion
- Have a staff development day at the Coal Loader
- Have a tutor group outing to the Coal Loader
- Have an environment group excursion to the Coal Loader
- Use Coal Loader Green Events to help plan green calendar events at your school
- Suggest senior geography and history projects using ideas and data gathered by North Sydney Council, on Balls Head and the Coal Loader
- International Baccalaureate students can use the site for extensive research projects
- Have a School Environment Management Plan (SEMP) planning workshop with your school's green team at the site
- Use the Coal Loader to do a Department of Education and Communities (DEC) Sustainability Action Process challenge e.g. biodiversity
- Bring students to the site for inspiration for art, design, poetry, and reflection opportunities
- While on site, get some tips that will help you in creating a green canteen or school kitchen garden, keeping chooks, doing audits, Nude Food Days or composting.

Opening hours

The Coal Loader is open for school excursions Monday to Friday, 9am to 4pm. Staff may be available during these times to assist with excursions.

Alternatively, Balls Head Reserve, the surrounding parklands and historic tunnel are open any time!

Location

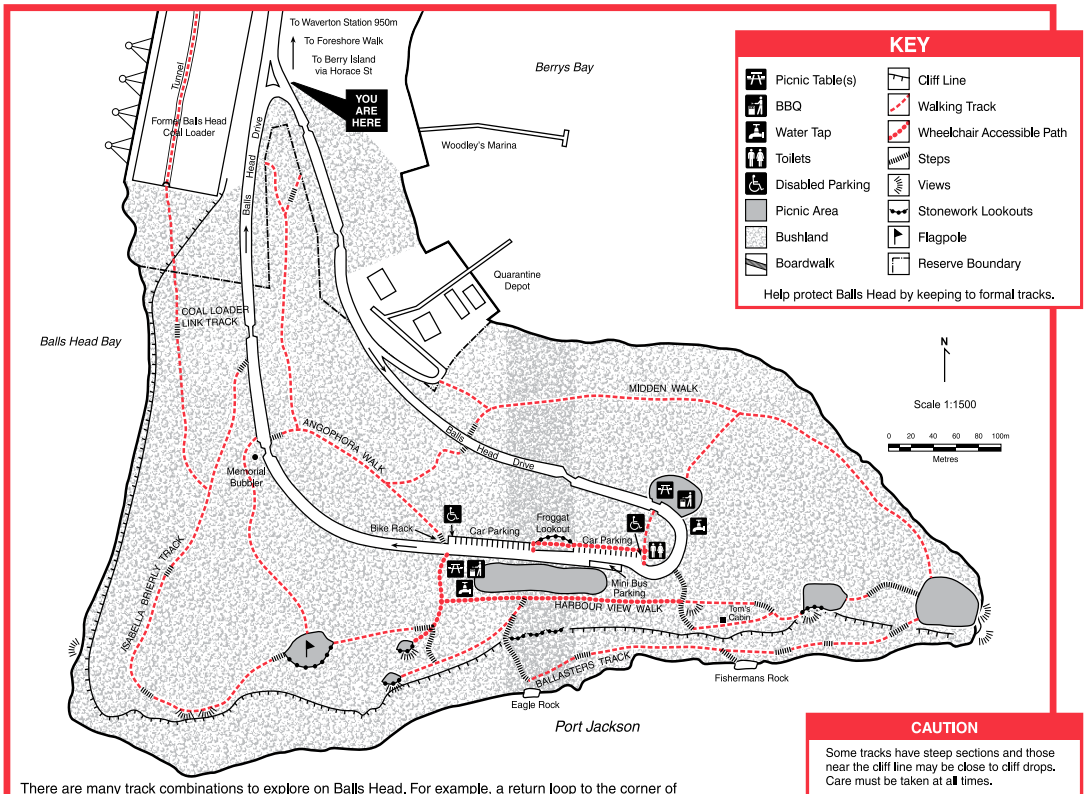
The Coal Loader is located at 2 Balls Head Road, Waverton. It is an easy 7 minute walk from Waverton train station. Bike parking, bus parking and bus drop-off points are available, however parking for cars is very limited.

Coal Loader Location Map

Coal Loader Site Map

www.northsydney.nsw.gov.au/CoalLoader

Balls Head Reserve Walking Map



About the Guide

Purpose

This Sustainability Learning Guide, based on the Coal Loader Centre for Sustainability, has been developed to engage and inspire students, teachers and the wider community to visit the Centre and take further action on sustainability. The Guide is a dynamic and interactive resource that can be used to enrich a visit to the Coal Loader and to extend learning beyond the classroom walls. It is designed to become a living resource that can be adapted to suit your needs and can be added to over time.

The methodology used to develop the Guide included collaboration from a wide range of stakeholders including teachers and students from schools in the North Sydney area, NSW Councils and State Government agencies. It significantly builds on the successes of previous education guides and directly relates to the NSW Syllabus and the National Sustainability Framework.

The Guide provides teachers with all the background information needed to be able to confidently run an activity at the Coal Loader. Furthermore the activities have been thoroughly tried and tested with students and teachers in the North Sydney Council area.

How to use the Guide

The Guide has been designed so that teachers can do a DIY excursion, or enlist help from Council staff. Teachers can choose the topics and learning outcomes relevant to their students' needs. Short video clips (less than three minutes) for each of the following topics have been provided to help you plan your visit, and should be watched in the classroom before your visit.

The Guide has the following topics:

1. *History of the Coal Loader*
2. *Aboriginal Heritage*
3. *Sustainable Retrofit*
4. *Alternative Energy*
5. *Water Conservation, Recycling and Reuse*
6. *Waste Minimisation*
7. *Sustainable Food*
8. *Balls Head Biodiversity*
9. *Overview of the Coal Loader*

Each topic details two activities that students can complete onsite and one they can take back to school or home as follow up. The activities within the Guide could be delivered by a class teacher, a student sustainability committee or by other educators.

It is not necessary to read the Guide from start to finish. It is designed so you can jump in at any point and start using it. However, it is recommended that you read through the background material of the chosen topics with your students before visiting the Coal Loader.

Activities and Lesson Plans

The Coal Loader Centre for Sustainability showcases the many different aspects of sustainability, as well as history, Aboriginal heritage and biodiversity. The topics in the Guide have been designed to give a broad overview of the features of the Coal Loader. A visit to the site will also allow students to gain an understanding of the role of local government in the local community.

More than 20 learning activities have been developed which take into account the diverse needs of students who have different learning styles, learning needs, or have come from different cultural backgrounds. The need for students to be extended is also included in each topic. At the Coal Loader, you can:

- Learn about the adaptive re-use of the site
- Investigate a building that has been sustainably retrofitted with energy and water-saving technologies
- Play the role of the cottage caretaker and make important decisions about how the centre operates
- Follow in Henry Lawson's footsteps by writing poetry about the area
- Create your own bush food cookbook
- Learn how the chickens are managed
- Do a tree shake to look at biodiversity in Balls Head reserve
- Dip your net in the wetland to discover slimy flat worms and other micro-beasts
- Explore one of the 960m tunnels from the historic coal loading system
- And a whole lot more!

Activity Format

Each of the eight topic areas has three activities (two that can be completed at the Coal Loader and one follow-up activity that can be completed at school or home). Each activity includes extension questions for higher years and activities can be adapted to suit the year level of students attending the Coal Loader.

Activities are provided in the following format:

For teachers

- *Aim:* The main purpose of this activity
- *Activity summary:* Useful information relating to the topic and the Coal Loader Centre for Sustainability that will help students to complete this activity
- *Outcomes*: Expected outcomes are identified
- *Materials needed:* Identifies any equipment needed
- *Preparation:* What teachers should do before commencing the activity
- *Background Information:* Useful information that will help frame class discussions

For students

- *Student worksheet:* Provides step-by-step instructions and handouts required
- *Extension:* Each topic area has an optional extension activity to be used for further learning. Additional actions that students don't have time to complete could be used as follow up back at school or as homework

Curriculum Overview

The curriculum in Australian schools is evolving. From 2014, NSW will be adopting the national curriculum developed by the Australian Curriculum, Assessment and Reporting Authority (ACARA). The exciting development for teachers is that sustainability is one of the three cross-curriculum priorities that all teachers will need to incorporate into their teaching and learning practice, along with Aboriginal and Torres Strait Islander histories and cultures.

In NSW this will be delivered through the revised NSW Board of Studies syllabus. Teachers can use the new Board of Studies interactive site for reviewing syllabus and cross-referenced learning associated with sustainability, identified with this icon . More information can be found at *www.boardofstudies.nsw.edu.au/syllabus_sc*. Teachers are not limited to these learning outcomes to make explicit links to environment and sustainability, but can integrate other examples, learning experiences, resources and contexts.

A Curriculum Matrix has been developed (see Appendix 1) which maps where each activity in this Guide sits within the NSW Curriculum. It can be updated and revised as the new curriculum is finalised.

Each Key Learning Area in the curriculum has ways in which sustainability can be embedded into a teacher's practice.

- English assists students to develop the skills necessary to investigate, analyse and communicate ideas and information related to sustainability
- Mathematical understandings and skills are necessary to measure, monitor and quantify change in social, economic and ecological systems over time
- Science assists students to develop an appreciation for the interconnectedness of Earth's biosphere, geosphere, hydrosphere and atmosphere
- History provides content that supports the development of students' world views, particularly in relation to judgments about past social and economic systems, and access to, and use of, the Earth's resources
- Geography – in draft form at time of writing, December 2012.

This Guide will be an invaluable resource for teachers seeking ways to understand what this cross-curriculum priority for sustainability means. ACARA states:

Sustainability *will allow all young Australians to develop an appreciation of the need for more sustainable patterns of living, and to build the capacities for thinking and acting that are necessary to create a more sustainable future. www.acara.edu.au/curriculum/cross_curriculum_priorities.html*

Your Excursion to the Coal Loader and Balls Head

How to book an excursion

Schools are encouraged to run their own excursions at the Coal Loader using this Guide, however staff are availble to assist if required. For more information, or to book the site for your excursion, contact North Sydney Council on 9936 8100 or email *council@northsydney.nsw.gov.au.*

Before you visit the Coal Loader

Background information

Each topic unit includes background information. It is suggested that this forms the basis of pre-reading and class discussion before an excursion to the Coal Loader.

A visit to the Aboriginal Heritage Office or the Stanton Library's local studies section will also help you to prepare.

The NSW Sustainable Schools program, part of the national Australian Sustainable Schools Initiative (AuSSi), has information to assist schools on their sustainability journey. Visit the website at *www.sustainableschools.nsw.edu.au.* Find NSW Department of Education and Communities (DEC) sustainability education support at *www.curriculumsupport.education.nsw.gov.au/env_ed/index.htm,* and locally, the Field of Mars Environmental Education Centre also assists schools *www.fieldofmar-e.schools.nsw.edu.au/.*

Watch the Coal Loader videos

We suggest that you view the short video guides (see 'How to use this guide'), which have been developed for those planning to visit the Coal Loader. The videos are short (less than three minutes each) and can be used to help you decide which topics and activities would best suit your school group.

Get to know the jargon – some Coal Loader terms

Teachers in upper primary and middle school Years 5-8 can take the following words and use them in spelling lists, or to get students to create word puzzles eg, Find-a-Word and crosswords, or to develop a glossary.

Sustainable living	Nude food	Coal lumper
Alternative energy	Eucalypt	Gantry
Permaculture	Compost	Retrofit
Biodiversity	Stormwater	Avoidance
Cammeraygal	Conservation	Heritage

After you visit the Coal Loader

One visit to the Coal Loader may not be enough; we encourage local classes to get to know the Coal Loader and keep visiting to continue learning about living sustainably. Students may be able to extend their learning by undertaking service requirements for the Duke of Edinburgh Award and by volunteering at the Centre.

After your excursion to the Coal Loader, some inspired students may wish to pursue further actions around sustainability back at school.

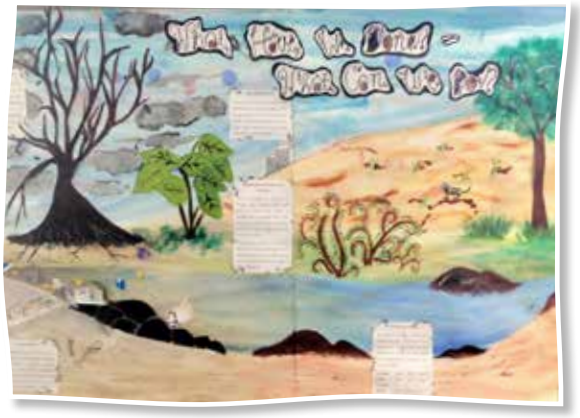
Spreading the message at school:

Use some of the key messages learnt at the Coal Loader in your school newsletter.

Develop a sign for your classroom '10 Tips for an environmentally friendly classroom' using the information about living sustainably found at the Coal Loader.

Ask students to look at their classroom and devise a retrofit using sustainable technologies. What aspects would they keep; what would they add? Do a cost analysis. Could they become an air-conditioning-free classroom?

Document your success by taking photos and/or recording short videos. Send them to the Coal Loader for upload to their Facebook page by emailing *council@northsydney.nsw.gov.au*



Set up a school green calendar of events

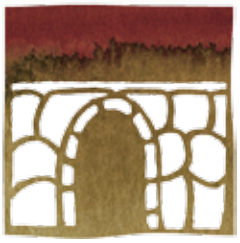
As a Green Team within the school, set up a green calendar and use tips from the Coal Loader to help celebrate at school. Councils assist local schools with events such as National Tree Day, and have advice for running green events at your school. For example:

- January – World Wetland Day
- February – Schools Clean Up Australia Day
- March – Earth Hour
- April – Earth Day
- May – Walk to School day
- June – World Environment Day
- July – Tree Day and NAIDOC Week
- August – Science Week
- September – Biodiversity Month and Threatened Species Day
- October – Water Week
- November – Recycling Week
- December – Green Christmas

Keep connected with the Coal Loader!

- Share your results – Let us know the results of any investigations your students undertake or any take home activities that they do!
- Facebook – we love posting updates about our amazing student visitors on our Facebook page at *www.facebook.com/CoalLoader*
- Check out the Coal Loader website for more information: *www.northsydney.nsw.gov.au/coalloader*
- Contact the Aboriginal Heritage Office for more information, or to book an excursion based exclusively on local Indigenous heritage
- Contact the North Sydney Council's Stanton Library Heritage Centre for information on Local Studies
- Join your local Sustainable Schools Network
- Join SENS – school teachers and students in the North Sydney area can join the Sustainability Educators North Sydney (SENS) network. SENS is an initiative of North Sydney Council and it brings together teachers, students, environmental educators and others, to share knowledge and ideas, provide support, share resources, provide professional development and get information on grants, rebates and programs.

1. History of the Coal Loader



Background Information:

The Coal Loader site demonstrates the layering of human history in Sydney and helps us understand broader changes in attitudes to the environment and place in Australia. An ancient Aboriginal rock carving of a marine creature, illustrating the relationship of the Cammeraygal people with their waterway, sits next to a coal bunkering facility which epitomises the culture of the Europeans who displaced them.

From the 1920s to the 1970s the Coal Loader was part of Sydney harbour's working waterfront. After it was closed in 1992, the Coal Loader became the focus for community opposition to residential development – like many other redundant waterfront sites. Today it is a showcase for sustainable technologies that provide an alternative to heavy dependence on coal and exemplify our attempts to tread more lightly upon the earth, like those that came before, in the face of climate change and pollution.

Aboriginal Heritage

Aboriginal people occupied the Balls Head peninsula at least 6,000 years ago when sea levels stopped rising and Sydney Harbour, as we know it, was created. The local Cammeraygal people fished the waters around the headland. Natural rock overhangs provided shelter and a place to make tools and create art. At least one Aboriginal person was buried on the peninsula.

Copyright Natural History Museum, London

This world changed with the coming of Europeans in 1788. Some Aboriginal people fought the newcomers, others attempted to mediate with them. We know that the Cammeraygal man called Carradah befriended the naval officer Lieutenant Ball who had helped to survey the Harbour and explore the country on its northern shores. Whether Carradah showed Ball the area around this headland is not known but, interestingly, it was the Lieutenant who was immortalised by the European naming of the place – Balls Head.

The First Fleet was followed by another and then more ships. Thirty years later, without treaty or compensation, much of the land of the Cammeraygal had been divided up and given away to colonists.

Read more in the 'Aboriginal Heritage' section.

Henry Lawson

In the early 1900s, the remant bushland on Balls Head was celebrated by the poet Henry Lawson. He criticised the construction of the coal loader in what was one of our first environmental protests. Lawson lived locally off and on for many years and he thought Balls Head was a bushy haven for the working class he mixed with around North Sydney. His poem 'The Sacrifice of Balls Head' was written in 1916 and reveals his resentment at the changes overtaking the place in the early 20th century.

Coal Loading Operations

From the 1920's to the 1970's, the site functioned primarily as a transfer depot for coal from bulk carriers to smaller coal-fired vessels. The Balls Head Coal Loader was extremely advanced for its time, breaking records by delivering nearly 2500 tons of coal in under 20 hours.

In 1934, the lease was taken up by the Wallarah Coal Company which had a mine near Newcastle and a wharf on the coast at Catherine Hill Bay. They would operate the loader for nearly 40 years.

Work at the Coal Loader fell away until the 1970s when the place was completely refitted to supply export coal to Japan. Later the jetty was lengthened to accommodate larger colliers.

By the 1990s technology and social change spelled the end of operations at the Balls Head Coal Loader. The world had not lost its appetite for coal – in fact it had never been greater. But that meant exports directly from Newcastle in ships too large to dock at Balls Head. The ships took on their final load of coal in 1992.

Caretakers Cottage

The state government leased the site in 1994 to a caretaker, who used the old powerhouse building as a base for their pioneering environmental remediation business, Environmental Earth Sciences. Founder Phil Mulvey also set up residence in the old caretaker's cottage, and lived there with his family for 14 years. The site itself was in need of remediation to remove toxic chemicals, so the new tenants set about this job. They turned an old oil tank site into a wetland.

Community Action

The community battled to save the site from redevelopment and retain the land for public use. The protests and negotiations with the State Government announced that the Coal Loader, along with the nearby BP site and several other obsolete industrial waterfronts, would be dedicated to public recreation. It was a landmark announcement that was celebrated locally, and throughout Sydney.

There were public meetings and concepts were put up for comment. After nearly two years of negotiation a master plan for the whole Waverton Peninsula was adopted. The details still had to be decided and the money found to realise the great ideas. But work started at the BP site and the park was completed there in 2005.

Attention was turned to the Coal Loader and there were more workshops and exhibitions so that local opinion could be heard. Plans were approved in 2007. New life was going to be breathed into the Coal Loader by following the principles of sustainability – of living in harmony with our environment. The new ideas were reflected in a new name. The Coal Loader Centre for Sustainability was going to be a 'grass-roots' place to visit, a place where you could meet others interested in new technologies and old eco-systems.

The Present

At the Coal Loader Centre for Sustainability the old infrastructure of coal that powered our economy for 150 years has been overlaid with new 'clean' technologies that reduce pollution and energy use. But just outside there is another overlay that has been removed. The road that covered the ancient carvings has been dug up to reveal what is left of a remarkable collection of images. When that happened in 2008 the Aboriginal community spoke about the discovery of 'an old friend'.

The Coal Loader Centre for Sustainability was officially opened in July 2011 with the motto "Learn from the past, embrace the future". The Centre now enables hands-on learning about sustainability in everyday life, and serves as a community meeting point and hub for Council's extensive range of environmental and sustainability programs.

Curriculum links:

- ✓ Stage 3 English and Mathematics
- ✓ Stage 4 English and Mathematics
- ✓ Stage 5 English and Mathematics

See the Curriculum Matrix (Appendix 1) for more detail.

For more information:

- Before your visit – watch the History of the Coal Loader three minute video
- Read the 'Aboriginal Heritage' section of the Coal Loader Sustainability Learning Guide
- Borrow or purchase the DVD "Return to Community: The story of Balls Head and its Coal Loader" from the Stanton Library
- Visit the North Sydney Heritage Centre at the Stanton Library
- Visit the Aboriginal Heritage Office or see their website *www.aboriginalheritage.org*
- Download the Coal Loader Walking Map from *www.northsydney.nsw.gov.au/coalloader*
- Follow the self-guided information signs throughout the Coal Loader site.

Activity 1 – Using poetry for an environmental message or campaign

Activity Summary:

This activity examines a poem that Lawson wrote about the area when coal loading operations were being introduced back in 1916. Lawson's poem was an early form of environmental activism. This activity is best conducted at the Coal Loader which will act as a muse for this activity. During this activity students will consider the issues important to Lawson, and use them as inspiration to write their own poetry.

Aim:

To write a poem that builds upon the Henry Lawson poem "The Sacrifice of Ball's Head" and captures student's feelings towards the Coal Loader site.

Outcome:

Students can use creative writing as a tool to capture feelings towards the Coal Loader site.

Materials:

Each student will need a clipboard, writing materials and a copy of the Student Worksheet (this includes a copy of Henry Lawson's poem "The Sacrifice of Ball's Head").

Preparation:

Before students begin the activity worksheet the teacher should read the 'Background Information' provided and engage the class in a discussion about how the site has changed over time and how you would have felt putting yourselves in the shoes of Henry Lawson, the local Cammeraygal people and the coal workers.

Background Information:

Henry Lawson (1867-1922) is possibly Australia's best known poet. Along with Banjo Paterson, he presented 'the bush' to Australians at a time, in the late 19th century, when cities were growing but the national identity was linked to rural types such as drovers, shearers, farmers and graziers.

Lawson's portraits of life near the North Sydney waterfront are rare portrayals of working 'harbour people'. The span of Lawson's association with North Sydney coincided with great change. The local population grew from just over 12,000 in 1886 to 48,000 in 1920. During this time, North Sydney was at the forefront of flat development as people crowded around the foreshores to take advantage of regular ferry services to and from the city.

Around 1910 Lawson expressed his annoyance at the changes taking place around him. His poem 'The Sacrifice of Balls Head' was written in 1916 and reveals his ongoing concern at the changes overtaking the area in the early 20th century.

Resources

Henry Lawson's 'North Sydney : a selection of Henry Lawson's North Sydney writings', edited by Olive Lawson for The North Shore Historical Society. Visit the Heritage Centre at the Stanton Library, 234 Miller Street, North Sydney to borrow this resource and for more information.

Student Worksheet – Using poetry for an environmental message or campaign

Introduction

The bush poet Henry Lawson lived around North Sydney off and on for many years. During this time he enjoyed visiting Balls Head which he described as a bushy haven for the working class. His 1916 poem 'the Sacrifice of Balls Head', reveals his concern at the changes overtaking the area in the early 20th century.

Read and reflect on Lawson's poem below. You will use it as inspiration to write your own piece of creative writing.

The Sacrifice of Ball's Head
Henry Lawson, 1916

'They're taking it, the shipping push,
As all the rest must go –
The only spot of cliff and bush
That harbour people know.
The spirit of the past is dead,
North Sydney has no soul –
The State is cutting down Ball's Head
To make a wharf for coal…

And strings of grimy trucks shall run
In everlasting trains
And on the cliff where wild trees are
Shall stand the soulless cranes
To dump their grimy loads below,
Where the great brown rocks are grand;
And the deep grass and wild flowers grow – and boating couples land.

No more shall poorer families
Give "Grandma" and "Grandad"
A glimpse of nature's mysteries
To make their old hearts glad.
No more our eyes shall be relieved
In the city's garish day —
A sordid crime has been achieved!
And none has aught to say.

What do you think were they key messages Lawson was expressing in this poem?

Imagine Henry Lawson was still alive. What might he feel looking at the site today? Is there a connection between Lawson's preferred use of the site and the community action that took place when the Coal Loader was decommissioned?

Use the Henry Lawson poem as inspiration for your own piece of creative writing. Try and capture your own feelings towards the site and write about that or think about some of the issues that Balls Head may face today and include in the poem. Don't forget to give your poem a title!

Draft your poem here

Further Extension

- Select an environmental protest song eg Midnight Oil's 'Beds are Burning' – what were the issues then, what was done about it, what is still to be done?

Activity 2 – The Coal Loading System Materials Flow

Activity Summary:

This activity will encourage students to use the information about the coal loading system provided to construct a materials flow diagram that will show how coal would have been moved on, around and off the site.

Aim:

To increase knowledge and awareness of how the old coal loader system would have operated.

Outcomes:

Students will be able to construct a materials flow chart to show how coal was transported to and from the site.

Materials:

Each student will need a clipboard and writing equipment. Each student will also need their own copy of the Student Worksheet.

Preparation:

Teachers are asked to hold a pre-excursion class discussion using the Background Information provided below.

Background Information

The Coal Loader on the western side of Waverton peninsula is a very special site where many paths of history intersect.

The Coal Loader operated from the 1920's to 1990's primarily as a transfer depot for coal from bulk carriers to smaller coal-fired vessels.

Some coal was also distributed to the local market by road transport. It was a record-breaking facility, demonstrating state-of-the-art technology for its time.

In the 1920s coal was unloaded from large ships (colliers) and dumped on the platform above by

cranes that moved along the seawall. Chutes in the tunnel roof released the coal into elevated travelling 'feeders' which directed coal into skips below. When full, the skips travelled onto the adjacent wharf to discharge their coal onto waiting ships.

The facility consisted of 177m long wharf, which was 18m wide. In 1921, after only a year of operation, the Coal Loader was breaking records, delivering nearly 2500 tons of coal in less than 20 hours.

A high-speed conveyor was installed in the middle tunnels in the 1970s. It was one of the most advanced methods of coaling in Sydney Harbour and dispensed with the need for 'coal lumpers' to shovel fuel from colliers to receiving steamers while out in the Harbour. A 'coal lumper' was a person who was employed to load and unload coal from the ships.

The site operated for over 70 years before being decommissioned. It was dedicated as public open space in 1997, formally transferred to North Sydney Council in 2003, and opened as the Coal Loader Centre for Sustainability in 2011.

Student Worksheet – The Coal Loading System Materials Flow

Introduction:

The Coal Loader is a former industrial site that operated from the early 1920s to the early 1990s. It functioned primarily as a transfer depot for coal from bulk carriers to smaller coal-fired vessels. During this activity you will use the information provided to draw a flow diagram that shows how the coal would have been moved around the site in the 1920's.

In the 1920s coal was unloaded from large ships (colliers) and dumped on the platform above by cranes that moved along the seawall. Chutes in the tunnel roof released the coal into elevated travelling 'feeders' which directed coal into skips below. When full, the skips travelled onto the adjacent wharf to discharge their coal onto waiting ships.

The facility consisted of 177m long wharf, which was 18m wide. In 1921, after only a year of operation, the coal loader was breaking records, delivering nearly 2500 tons of coal in less than 20 hours.

Activity:

1. Use the information provided in the Introduction to draw a flow diagram that shows how the coal was moved to, from and around the site
2. Use arrows to show the direction of the coal needed to travel
3. Include any other outputs eg fuel, water and noise etc

Draw flow diagram here

4. The Coal Loader was considered to be extremely advanced for its time. If it took 20 hours to load 2500 tonnes of coal, what would the time be if loading started at 6am_____, 12pm_____ and 4pm_____?
   (List your answers in both analogue and 24hr time)

Extension Activity

The history of the site tells an important story about the change from a reliance on coal fired power to a move towards renewable energy forms such as solar power. Research the alternatives to coal power, when were they discovered and how could they be used at the Coal Loader. The alternative energy unit in this Guide could help get you started.

Activity 3 – Reconstruct the Coal Loader Timeline

Take away activity – for home or back at school

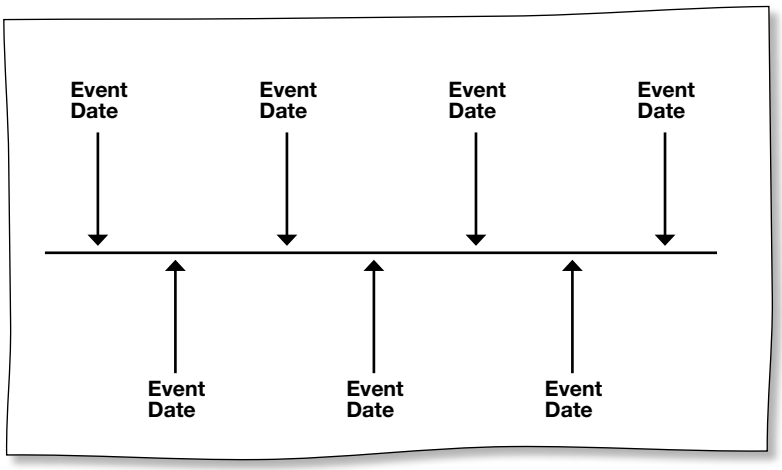
Activity Summary:

During this activity students use the key dates and activities to reconstruct a historical timeline. Teachers should encourage students to make the timeline as creative and visually appealing as possible.

Essential to this activity is reading the pre-visit information 'Coal Loader History'.

Aim:

To reconstruct the history of the Coal Loader site by placing key dates and events along a timeline.



Outcomes:

Students will be able to gather, select and organise information on the main historical events and activities that combine to form the story of the Coal Loader site.

Materials:

Students will require a clipboard, writing equipment and a copy of the Student Worksheet.

Preparation:

Teachers are asked to hold a class discussion using the background information provided in this 'Coal Loader History' chapter and the following sources:

- Watch the Coal Loader History three minute video
- Borrow or purchase the 30 minute DVD "Return to Community: The story of Balls head and its Coal Loader" from the Stanton Library, or allocate time to watch the Coal Loader's copy during your excursion
- Visit the North Sydney Heritage Centre at the Stanton Library
- Visit the Aboriginal Heritage Office or see their website *www.aboriginalheritage.org*

Student Worksheet – Reconstruct the Coal Loader Timeline

Introduction:

The history of Ball Heads is extremely varied and interesting. This activity requires you to research the key historical events that occurred at Balls Head and it's Coal Loader and reconstruct the timeline in a fun and creative way.

Activity:

1. Gather and record the key dates and activities that have occurred from past to present at Balls Head and the Coal Loader site. Plot them in chronological order (first to last)

   Consider how you will present the timeline. Some suggestions include an animal's tail, circular spiral or a straight line. Also consider how you will represent the key activities eg drawing, symbol or icon

Draw timeline here

2. Present your timeline to your class. Discuss any inconsistencies
3. Which time period would you have most liked to live though and why?

Extension Activities

1. The Coal Loader has had an interesting and varied past. Try and cast your mind forward 50 years. What would the site look like and how will it be used? You might like to paint, sculpt or draw your vision. Try and pay tribute to the Centre's motto "Learn from the past, embrace the future"
2. Consider submitting your artwork to North Sydney Council. Perhaps it will be shared on the Coal Loader Facebook page *www.facebook.com/CoalLoader*

2. Aboriginal Heritage

Background Information:

This significant site was the home of the Cammeraygal people. They were a clan of the Guringai language group. The Cammeraygal lived a sustainable lifestyle in keeping with the Dreaming. This area provided bountiful water resources with easy access to the harbour for bark canoes. Bush resources for food and tools were plentiful. This gave the Aboriginal people plenty of time for Spiritual practice and ceremony.

It is written in history that Cammeraygal were the main clan in the region that held the initiation ceremonies for the men and were feared, but also looked up to. The Cammeraygal were known over a very wide area and early historians wrote and drew of their ritual ceremonies. Early paintings show the Cammeraygal tooth removal ceremony.

For the Cammeraygal people, their way of living with Country and spirit followed the rules of the Dreamtime, and was learned and expressed in the Dreaming. Obligations for family and each other were expressed in Kinship lore and with Totems.

The Aboriginal Dreamtime

Just as every culture has its creation stories – the Dreamtime is the creation period whereby Creation Spirits (ancestors) shaped the world and created every natural thing in it. The Dreamtime was the beginning of the world. In essence creation stories generally involve the intervention of supernatural events and beings as a means of explaining the origins of the world and the beings in it.

The Aboriginal Dreaming

The Aboriginal concept of time is cyclic rather than linear. Although the Dreaming activities occurred at the beginning of the world and are now in the past, there is also a sense that they are still present. Each generation of Aboriginal people through ritual, song, and dance is able to enter into a direct relationship with the Dreaming and experience its present day reality. The Dreaming establishes the rules of governing interrelationships between people, land and spiritual beliefs.

Kinship

Aboriginal Kinship is a multi-level system which often went back 16 generations. Kinship identifies skin groups, totems and language groups. Kinship systems enable Aboriginal people to know how to behave towards every other Aboriginal person in terms of reciprocal obligations. These obligations could relate to food, sharing, shelter, marriage, teaching and more. Importantly these obligations also include spiritual protection and caring for Country and sacred sites.

Totems

Aboriginal people are given a totem at birth by elders or close family members. An animal, sea creature, bird or plant can be your totem. It is a person's duty to take care of their totem. An Aboriginal person may paint their totem or carve their totem. People generally are not allowed to hunt or eat their totem as this would make them sick. Aboriginal people may not only have a personal totem but a family and clan totem.

The Cammeraygal people who lived in this area left important evidence of their way of life before colonisation. Information about the Aboriginal heritage evidence they left is kept on a central register. The things you may find in this area include:

Middens

These are mounds of shell built up over hundreds or thousands of years as a result of countless meals. They primarily contain mature species of edible shellfish species. They might also contain bird and animal teeth and bones, campfire charcoal and stone tools.

Rock Shelters – "giba gunyahs"

These are places where the Cammeraygal people would have taken shelter. This would have been a warm place to eat, sleep, repair or fashion tools and, we can imagine, talk of stories and exploits. Artefacts such as stone tools may be found in the rock shelters.

Rock Art

Stencils are produced by mixing ochre in the mouth with other material into a wet paste and spraying it over the object to be stencilled. Often we find stencilled hands and tools represented in rock shelters. Other forms of artwork include ochre painting as well as charcoal drawings and etchings.

Grinding Grooves

These are grooves resulting from the production or sharpening and maintenance of an edge ground tool such as a stone axe. These sites are usually located near a water source, like a water hole.

Engravings

Engravings were made by drilling or pecking a series of holes in the rock which were then connected to form a line. An accepted understanding of these engravings is that they are the product of sacred ceremonies and were periodically re-engraved as part of ongoing ritual and to pass on knowledge and stories.

Today the Cammeraygal engraving at the Coal Loader is protected by a raised viewing platform. Sites like this are under threat every day from development, vandalism and natural erosion and cannot be replaced. Once they are destroyed, they are lost forever.

Curriculum Links:

- ✓ Preliminary HSC Course- Aboriginality and the Land
- ✓ Preliminary HSC Course – Heritage and Identity
- ✓ Stage 3 Science and History
- ✓ Stage 4 English and History
- ✓ Stage 5 English, Science and History

See the Curriculum Matrix (Appendix 1) for more detail.

Further Information:

Watch the Coal Loader Aboriginal Heritage three minute video found at *http://www.youtube.com/watch?v=CtyQHTYGJhE* which will give your class an overview of what you will find at the Coal Loader.

Aboriginal Heritage Office

The Aboriginal Heritage Office (AHO) is a joint initiative with eight councils in the north of Sydney, including North Sydney Council, established to protect Aboriginal heritage within these areas.

NSW State laws regulate the requirement to protect Aboriginal heritage, defined as any kind of material evidence of Aboriginal occupation. In line with these laws, the AHO monitors, maintains and protects sites such as rock art and engravings, shelters, stone arrangements, shell middens, and many more.

Therefore in order to ensure ongoing protection and sustainable handling of those sites, the AHO raises awareness through special training for council staff and many different education and school programmes. Presentations, walks, talks and also a Keeping Place and Museum, located at the AHO office in Northbridge, are available to the public.

Contact the Aboriginal Heritage Office for further information ph: (02) 9949 9882 or see their website *www.aboriginalheritage.org*.

Stanton Library Heritage Centre

Another excellent source of information is North Sydney Council's Stanton Library Heritage Centre, which aims to document North Sydney's social and cultural heritage with a particular focus on the natural and built environments. The Centre collects and makes available primary and secondary materials for research. The Historical Services staff at the Centre conduct research, mount regular exhibitions and organise public programmes. Specialist staff are available to assist with information. See *www.northsydney.nsw.gov.au* or call 9936 8400.

Australia State of the Environment Report 2001 – Natural and Cultural Heritage Theme Report

This report discusses the natural and cultural heritage places, objects and Indigenous languages that are significant to Australians. See *www.environment.gov.au/soe/2001/publications/theme-reports/heritage/introduction-1.html*

North Sydney Council thanks the Aboriginal Heritage Office for providing advice and information on this chapter.

Activity 1 – Cammeraygal Dreaming Writing Exercise

Activity Summary:

Students will participate in a pre-excursion class discussion with their teacher using the Information provided. This will be followed by an excursion to the site where the students will complete an Activity Worksheet focussing on historical land-use in the area and Aboriginal Dreaming. Students will be asked to write or draw their own dreaming story.

Aim:

To gain an understanding of the Cammeraygal people and their cultural practices and imagine how they would have walked the land.

Materials Needed:

Each student will need a clipboard and writing equipment. Each student will also need their own copy of the Student Worksheet.

Preparation:

Teachers are asked to hold a pre-excursion class discussion using the Information provided below. Please remind the students and teachers that we ask everyone to respect the spiritual significance of this site by not walking on the carving.

Outcomes

- An understanding of what the Dreamtime is and why the Dreaming is important for local Aboriginal people and how it is expressed today.
- An understanding of Aboriginal heritage and Aboriginal connection to land.
- An appreciation of how archaeologists use scientific methods to examine evidence from the past and help increase understanding about Aboriginal people and their relation to their Country.
- Learn how to gather, select and organise information on the main cultural and spiritual aspects that combine to form Aboriginal peoples' relationship to the environment.

Student Worksheet – Cammeraygal Dreaming Writing Exercise

The Cammeraygal Engraving

This engraving has been called a 'whale' by archaeologists since 1843 and is known locally as 'whale rock'. Other archaeologists point out that it is more likely to be a shark due to the number of fins. Inside the 'whale' is another engraving. Some say it is a person, some say it's a dingo and others call it a koradji (doctor or magic man) singing whales into the harbour. What do you see?

We can imagine that we know what this engraving means but in reality this engraving has its connection to Dreamtime and the Dreaming. At the start of the colony in Sydney, the loss of so many Aboriginal people through disease and conflict with early settlers means that the dreaming story of this engraving was lost.

Scientific Excavation

The Cammeraygal engravings were first seen by colonists in the early years of the colony and the first official record of them was made in 1843. As with many Aboriginal sites this site was not seen as valuable and later partly covered with a bitumen road.

The Aboriginal Heritage Office and North Sydney Council wanted to improve the protection of the site and also to try and find the other buried figures that had been recorded. In 2008 a major archaeological dig was carried out. It included the Aboriginal Heritage Office, North Sydney Council and the community of Redfern, and the original sandstone was uncovered. Several engravings were rediscovered as well as two previously unknown figures, that of an echidna and an eel.

Today the engraving is visible to all by means of a viewing platform which protects the carving.

David Watts, Manager of the Aboriginal Heritage Office, working with others at the archaeological dig to uncover the whale engraving.

Activity

Please respect the spiritual significance of this site by not walking on the carving

Sit quietly on the raised walkway and imagine you are looking at the site prior to 1788.

1. What would you see? Eg fishing, children, bark canoes, women gathering food?

2. What physical features of this area make it a good food gathering area? Hint: to answer this question think about what food Aboriginal people ate and how they went about getting it.

3. Observe the Cammeraygal carving, and make your own drawing of it.

4. Write or draw your own dreaming story about the carving, in this story emphasise how important whales are to the Cammeraygal people.

We can gain an understanding of the respect for Country that people had in each era by looking at the way in which the engraving was cared for.

5. Using information found at the Coal Loader on its history, create a local land use time line, describe how the land around Balls Head was used and by whom. What was the dominant activity carried out on the peninsula? How was the engraving cared for at this time? What is your evidence?

Time	Land Use	Care of engraving	Evidence
Prior to 1788			
Early settlers			
Industrial era			
Community owned site			

Extension

North Sydney Council is working with the Aboriginal Heritage Office to protect this Aboriginal heritage site.

1. What construction has Council completed with the aim to protect the Cammeraygal engraving?
2. If you were working for Council how would you safeguard the engraving?
3. If you were a visitor to the site, how would you show respect and safeguard the engraving?
4. Why is the Cammeraygal engraving important to Aboriginal people?
5. Why is the Cammeraygal engraving important to all Australians?

Further extension:

1. Create a totem for your school and a school emblem or badge using this totem
2. Write the story of the totem and why it became the school totem
3. Write a story from either the Aboriginal perspective or the early colonial perspective on your connection to land at Balls Head.

Activity 2 – Bush Foods Role Play

Activity Summary:

Students will participate in a pre-excursion class discussion with their teacher using the information provided. This will be followed by an excursion to the site where the students will complete a Student Worksheet focussing on understanding how bush foods were used in traditional Aboriginal culture and how they are still being used today. Students will be asked to undertake a role play activity and describe the bush food plants grown at the Coal Loader.

Aim:

To increase knowledge and awareness of how plants were used by Aboriginal people, and how diet contributes to a healthy lifestyle.

Materials Needed:

Each student will need a clipboard and writing equipment. Each student will also need their own copy of the Student Worksheet.

Preparation:

After learning about bush foods at the Coal Loader, students are asked to use their creativity and imagination by participating in a role play. First the students are assigned their role, and they then take on that perspective while discussing bush foods.

Outcomes :

- Improved understanding of the importance of various plant species used by Aboriginal people.
- Increased awareness of the impact moving away from a traditional diet has had on health

Student Worksheet – Bush Foods

The Cammeraygal Aboriginal people lived on the North Shore of the harbour for many thousands of years before the British arrived, making use of the bushland and coastal environment around them for food, medicine, shelter and tools and spiritual practices. Bush resources found in this area include Red Gums, Red Bloodwoods, Casuarinas, Lillipillies, Dianella and heath plants such as Grevillias, Wattles, Banksias, Geebungs as well as many native grasses.

In 2011 a bush foods garden was established at the Coal Loader featuring a variety of edible and otherwise useful native plants.

Just a few of the plants that were useful to Aboriginal people were:

Xanthorrhoea:

These plants are sometimes known as the grass tree and once covered the Sydney landscape, taking hundreds of years to grow to a substantial height. The flowers made a good sweet drink. After flowering the long seed pod stem was used as a fishing spear or firestick. Also the starchy trunk pith of the plant could be eaten raw or roasted. The plant also produces a gum that is said to be stronger than superglue and was used for sealing bark canoes, sealing rope that had been made from bark, and attaching spear and axe heads.

Melaleuca (Paper Bark)

There are over 210 species of paper bark in Australia. Traditionally paper bark blossoms were sucked for nectar and you could drink collected water caught in the bulges of the bark. Young leaves could be used for headaches and sickness. The 'paper' was used for wrapping objects and the softest part could wrap a baby.

Banksia

Banksia blossoms were a good source of nectar and sugar. This could be sucked straight from the flower heads or soaked in water to make a sweet drink called *bool*.

Note – It is very important to remember that many plants contain toxins and cannot be eaten. Often foods require careful preparation over several days to render poisons harmless. Aboriginal people knew what preparation was needed to make them safe.

Activity:

Get to know the plants that would have been used by the Cammeraygal people to live sustainably.

1. Use the information found near the Coal Loader's bush foods garden to fill in the table below.

Plant	Scientific name	Part of plant used	How is it used
Coast Wattle			
Lilli Pilli			
Heath Banksia			
Coffee Bush			
Native Grape			
Hop Bush			
Mat Rush			
Native Raspberry			
Wombat Berry			
Brush Cherry			
Warrigal Greens			
Wild Parsnip			

2. What other bush foods would have been sourced locally to create a balanced diet?

3. Now that you know more about the local plants used by the Cammeraygal undertake a role play activity where the class is split into four groups.
   a. Food nutritionist – presents how bush foods can be good for your health
   b. Florist – presents how a bush food garden can be used
   c. Naturopath – presents how a bush food plants can be used as medicines
   d. Gardener – presents why bush foods are good to have in our gardens

Be creative in your thinking and persuasive in your arguments. While each group is speaking take down some notes on the benefits of bush foods.

Bush food uses	Benefits
Food nutritionist	
Florist	
Naturopath	
Gardener	

4. From the plants listed in the bush food garden and the information that can be found at the Centre create a breakfast menu for a child living at Balls Head prior to 1788.

5. How does it compare to your breakfast this morning?

Extension

1. In your school grounds scope out a reconciliation garden. What plants would you include? What artwork would you include?
2. Write a letter to your environment group seeking support for your garden.
3. Research what other foods were available to the Cammeraygal and what season they were available.

Further Extension

1. What indigenous plants are being used in the cosmetic, therapeutical and pharmaceutical industries?

Activity 3 – Coal Loader Bush Foods Cookbook

Take away activity – for home or back at school

Activity Summary:

To help develop recipes for the Coal Loader Bush Foods Cookbook students are asked to find their favourite recipe and experiment using bush food ingredients.

Aim:

To gain an understanding of how bush foods can be used in cooking to create a class bush foods cookbook.

Materials Needed:

Students will need access to some cookbooks to look at the recipes in them. This activity does not need to have access to cooking facilities at school but this would be an advantage to test the new recipes. Those schools without cooking facilities may design a recipe in class and do the test cooking at home.

Preparation:

Students are advised to first undertake the Aboriginal Heritage activities at the Coal Loader to gain an understanding of Aboriginal heritage and the bush foods used by the Cammeraygal people.

Outcomes:

- Learn about healthy eating and a better understanding of Aboriginal heritage and cultural practices.
- Learn about the sustainable living concept of local food and eating in season.

Student Worksheet – Coal Loader Bush Foods Cookbook

Introduction:

Using bush foods in cooking was first made popular in the 1970's when horticulturalists started to assess bush food plants for commercial use and cultivation. Chefs started to notice that many bush foods have strong spice-like flavours and started experimenting. Jams and teas have also become popular.

Some sources of bush food recipes include:

- Feeding your Mob cookbook *www.mbcommunitygardens.com.au/*
- Mark Olive (an indigenous bush food cooking expert) *www.blackolive.net.au*

Activity

1. Name some of the bush food ingredients found in the Coal Loader bush food garden.

2. Name two additional bush food ingredients used in Australian cooking that are not from the North Sydney area.

   1.

   2.

3. Write out one of your favourite recipes, you may need to refer to your favourite cookbook.

My favourite recipe:

4. Can any of the bush food ingredients you have listed above be substituted in your favourite recipe?

   a. Bush food ingredient

   _____

   _____

   b. Substituted for

   _____

   _____

5. Write out your new bush food recipe:

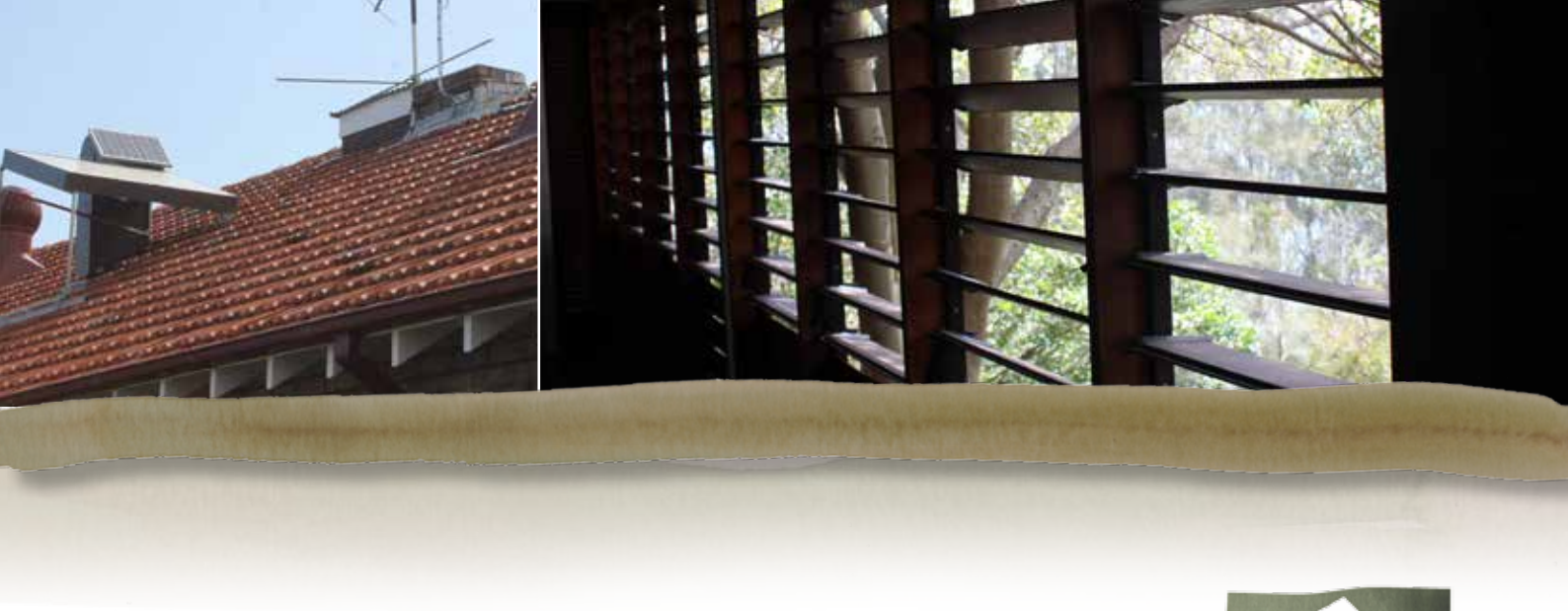
My new bush food recipe:

Extension

1. Combine together all the recipes developed in the class to create a class recipe book, with illustrations or photographs for each recipe.
2. Have a bush tucker day at school to test each recipe.
3. Use a mind map with the class to brain storm what is needed for the book to be published.
4. Share your favourite recipes with the Coal Loader team for possible inclusion in the Coal Loader Bush Foods Cookbook!

Further extension:

1. Investigate the importance of "Country" and traditional diets.
2. Investigate the link with western diets and disease in many Aboriginal communities, which has led to a prevalence of diabetes in many Aboriginal communities.



3. Sustainable Retrofit

Background Information:

The original caretakers cottage at the Coal Loader is a great example of how retrofitting can be achieved on an existing building. Retrofitting is the process of modifying something after it has been manufactured. For buildings, this means making changes to the systems inside the building or even the structure itself at some point after its initial construction and occupation. Retrofitting an existing building can save money, energy, water, and waste, and provide a more comfortable environment.

The cottage uses wind-assisted turbo ventilators to drive airflow through the building and ceiling-mounted fans increase cool air movement in summer and distribute warm air in winter. This means there is no need for air conditioners and therefore a reduced electricity bill.

The cottage is achieving a reduction of energy use of up to 55% by installing ceiling and wall insulation, utilising natural ventilation and natural lighting, using solar hot water for winter heating, and glazing windows. An electronic display measures how much solar power and recycled water the building uses which can be demonstrated in real time.

The Coal Loader has also retrofitted the bathrooms to become more sustainable. The bathrooms include 4 star WELS rated toilets which use only 3.5L water per flush compared with 12L for a traditional toilet. The bathrooms also include 6 star WELS rated taps, using only 4.5L water per minute compared to a normal tap using up to 18L per minute.

The materials that have been used to furnish and finish the building have been selected to be as low impact on the environment as possible. For example the carpet is made from natural and recyclable materials and the paint used is low in volatile compounds (VOCs).

More than 95% of the timber used in the refurbishment is either recycled or FSC (Forestry Stewardship Council) certified, and the light-weight structural steel is 100% recycled.

Reusing and recycling building materials (up to 80%-90%) on site has resulted in the saving of energy and water used to make new products, less truck movements to transport materials and less waste to landfill.

A discussion about any recent retrofitting undertaken in the school or home environment will help frame the activities and learning to be undertaken at the Coal Loader Centre for Sustainability.

Curriculum links:

- ✓ Stage 3 English, Science and Mathematics
- ✓ Stage 4 English and Science
- ✓ Stage 5 Science

See the Curriculum Matrix (Appendix 1) for more detail.

For More Information:

Before your visit, watch the 'Sustainable Retrofit' three minute video which will give your class an overview of what you will find at the Coal Loader.

Check out the 'Your Home Guide' at www.yourhome.gov.au

Activity 1 – Spot the Sustainable Design Features

Activity Summary:

In this activity students will learn about sustainable retrofitting and how it has been implemented at the Coal Loader Centre for Sustainability. They will be able to identify sustainable retrofit features at the Coal Loader and consider how these can be carried out at school and at home. Students will design their own sustainable home as an optional extension of this activity.

Aim:

To identify the design features and retrofits that help make the original caretakers cottage more sustainable.

Outcomes:

- Learn about sustainable retrofitting
- Investigate the environmental and cost saving benefits
- Apply learning to own home and school environment

Materials Needed:

Each student will need a clipboard, writing equipment, and a copy of the Student Worksheet.

Teachers may choose to provide students with the reference posters (note these posters are available for download from *www.northsydney.nsw.gov.au/coalloader*, can be viewed on display at the Coal Loader Centre for Sustainability, and a copy is included in Appendix 2).

- 'Keeping Our Cool In the Caretakers Cottage'
- 'Powered By The Sun'
- 'Is Your Home Climate Friendly?'

Preparation:

Before students begin the activity worksheet, the teacher should read the class the 'Background Information' provided and engage the class in a discussion on 'what recent retrofitting has been undertaken in the school or the student's home environments?'

Student Worksheet – Spot the Sustainable Design Features

The original caretakers cottage was constructed in the mid 1920s, presumably to replace the smaller sandstone block site office that survives opposite. This building was the administration hub of the site. The main office was situated in the south-western corner of the building and the site caretaker also lived there in the rooms on the north-western side. When coal-loading operations ceased in the 1990s, the whole building was used as a caretaker's residence for 15 years.

The building now features meeting facilities, a resource room, display areas, kitchen/lounge and amenities. It is now being adaptively reused as a sustainability learning and resource centre.

Key features of the building's refurbishment include:

- water recycling and reuse
- solar power generation
- gas-boosted solar heating
- natural ventilation
- insulation
- use of natural daylight
- low-energy, controlled artificial lighting
- low toxicity indoor materials, fixtures and fittings
- use of recycled or renewable building materials
- monitoring of energy and resources through smart metering

Many of the building features at the Coal Loader have been retrofitted to become more sustainable.

Take a walk around the building (inside and outside) and complete the following table:

List the sustainable design features you can see	**Why is it sustainable?**	**How could you use something like this at home or school?**

List the sustainable design features you can see	Why is it sustainable?	How could you use something like this at home or school?

Extension Activity:

The following table summarises the properties of three different types of lightbulbs, each providing the same amount of light. Look at the information provided and answer the following questions:

1. Which type of light bulb
   - Lasts the longest? _____
   - Is the most expensive per bulb? _____
   - Uses the least amount of electricity over 50,000 hours? _____
2. You will notice that both LED and CFL light bulbs save a similar amount of money compared to incandescent light bulbs. Considering the fact that CFL bulbs contain mercury (which is harmful to the environment), and LED contain no mercury, which would you choose for your own use?

   _____

Light Bulb Comparison Table*

	LED Light-emitting Diode	**CFL** Compact Fluoroescent Lamp	**Incandescent**
			
Light bulb projected lifespan	50,000 hours	10,000 hours	1,200 hours
Watts per bulb (equiv. 60 watts)	10	14	60
Cost per bulb	$35.95	$3.95	$1.25
KWh of electricity used over 50,000 hours	400	700	3000
Cost of electricity (@ 0.10per KWh)	$50	$70	$300
Bulbs needed for 50,000 hours use	1	5	42
Equivalent 50,000 hours bulb expense	$35.95	$19.75	$52.50
Total cost for 50,000 hours	**$85.75**	**$89.75**	**$352.50**

Energy Savings over 50,000 hours, assuming 25 bulbs per household:

Total cost for 25 bulbs	$2143.75	$2243.75	$8812.50
Savings to household by switching from incandescents	$6668.75	$6568.75	0

*Source: www.eartheasy.com/live_led_bulbs_comparison.html

Activity 2 – Sourcing Sustainable Fixtures and Fittings

Activity Summary:

This activity will encourage students to consider why certain fixtures and fittings have been used for the Coal Loader site. It will also demonstrate that retrofitting existing materials can save money and lessen the impact on the environment. This activity involves students putting themselves in the shoes of the Coal Loader Coordinator by deciding what other sustainable fixtures or fittings could be purchased, built or salvaged for the site.

Aim:

To increase knowledge and awareness of what factors make a product a more sustainable alternative.

Outcomes:

- Be able to determine what qualities make a product, fixture or fitting a more sustainable choice.
- To be able to apply a set of sustainability criteria to help make purchasing decisions.

Reference:

"Low Impact Materials" Poster – downloadable from *www.northsydney.nsw.gov.au/coalloader*, can be viewed on display at the Coal Loader, or a copy is included in Appendix 2.

Materials Needed:

Each student will need a copy of the Student Worksheet, writing materials and clipboard.

Preparation:

Prior to beginning this activity teachers should lead a discussion about what is retrofitting and why it is of benefit to the environment. Teachers can refer to the background information provided below to assist.

Background Information:

The life cycle of a product is often thought of as the journey of materials from cradle to grave. Many of the fixtures and fittings have been retained or retrofitted at the Coal Loader in order to save resources and reduce the environmental impact. Fixtures are items that are secured or bolted to the walls or floor eg light fixtures, kitchen units and bathroom suites and 'fittings' are free standing items eg carpets, fridge and furniture.

Retrofitting is the process of making changes to an already existing building, re-using and recycling materials that have already been manufactured rather than spending resources on making new ones.

For example the carpet in the former caretakers cottage is made from natural and recyclable materials. Other materials that have been used for retrofitting include hand basins in the public amenities, windows in the cottage, rainwater tanks, solar panels and recycled timber for balconies.

Student Worksheet – Sourcing Sustainable Fixtures and Fittings

Introduction:

In this activity you will investigate the fixtures and fittings installed at the Coal Loader and determine which ones have been retrofitted to become more sustainable. You will also be able to put yourselves in the shoes of the Coal Loader Coordinator and make a decision about how you would allocate an extra $500 to improve the Centre and make it even more sustainable.

Activity

1. Look around, inside and outside the original caretakers cottage and list the fixtures or fittings that have been retrofitted to become more sustainable. Look for things that may have recycled content are energy or water efficient, low waste, non toxic or are sustainable in another way.

2. List three fixtures or fittings that you find interesting. Using the information provided, describe why they are a better alternative for the environment.

   (a)

   (b)

   (c)

3. If you had an extra $500 to allocate to the improvement of the building what other sustainable item(s) would you purchase, build or salvage for the site? What factors make them a sustainable choice?

Extension Activity

4. Consider your school building. What fixtures or fittings could potentially be modified to make it more sustainable? What impact would this have on the environment?

Activity 3 – Design Your Own Sustainable Home or School

Take away activity – for home or back at school

Activity Summary:

This activity will inspire students to use technology to redesign their own home to incorporate more sustainable features. Google SketchUp *www.sketchup.com* (free to download) or other design software can be used to replicate a 3D model of an existing building. Markers can be added to point out the sustainable design features.

Aim:

For students to redesign their home to become more sustainable using the information they have learnt from the Coal Loader Centre for Sustainability.

Outcomes

- Students will use design skills and new technology to integrate sustainability into an existing building.

Materials Needed

- Floor plan of student's homes (or a tape measure to estimate)
- Google SketchUp free design program (or a scale ruler if you don't have access to a computer)

Preparation

- Before the students begin this activity, the teacher should engage the class in a discussion on sustainable design and retrofitting. Use examples of sustainable retrofitting at the Coal Loader to prompt students into thinking about their own homes and what could be done to make them more sustainable.
- Ask students to measure the rooms within their own homes or locate an existing floor plan.
- Ask students to download Google SketchUp *www.sketchup.com* or another design software package.
- If students don't have access to a computer they can use a scale rule to do a technical drawing

Student Worksheet –
Design Your Own Sustainable Home or School

Introduction:

This activity will allow you to imagine you are modifying your existing home or school to become more sustainable. You will use online software to help create a model of your retrofitted home. This could be presented to your parents or Principal as a plan for a sustainable retrofit or the beginnings of a future design project!

Activity:

1. Locate a floor plan of your home or school or measure it yourself using a tape measure.
2. Use actual dimensions and orientation to recreate your existing layout on Google SketchUp or another software program.
3. Add design elements that you think would make it more sustainable.
4. Retrofit existing fixtures and fittings to save money and reduce your environmental impact.
5. Clearly label those features that you consider most important and highlight why they are a sustainable alternative.

Extension Activity:

- Consider adding a rooftop garden to your retrofitted building!
  How much roof space do you have available?

- Do you need to modify the existing roof to accommodate growing plants?

- Now calculate how much soil you will need (10cm height max)

- What plants eg natives, edible plants, flowers would you plant and why?

- What water system would you use? Can you use recycled water?

4. Alternative Energy

Background Information

The Coal Loader Centre for Sustainability is using alternative energy to reduce its environmental impact. Alternative energy is defined as energy from sources that do not use up natural resources or harm the environment. One of the biggest sources of alternative energy is the sun.

The Coal Loader has not always been a place where alternative energy has been promoted and used. As its name suggests the Coal Loader was once a transfer depot for coal from the bulk carriers to smaller coal-fired vessels. It has only been recently that the old infrastructure of coal that powered our economy for 150 years has been overlaid with new 'clean' technologies that reduce pollution and energy use.

When you visit the Coal Loader make sure you look up on the roof. North Sydney Council has installed solar power (photovoltaic, or PV, panels) to generate electricity from the sun.

The 16 PV panels at the Centre produce 2.96 kilowatts of power at their peak. They have a long life span and produce over 3000kWh of electricity every year. This reduces greenhouse gas emissions from the Centre by 2.7 tonnes annually.

Power generation varies throughout the day with the majority of power generated at the peak of the day. Excess energy can be stored for later use. The solar panels work in all weather but are best on clear cool days.

Solar power is used to heat water on site. Hot water is generated by a solar boosted integral heating and hot water storage system. All the hot water pipes are insulated to minimise loss from the system. Hot water at the Coal Loader is used not just for showers and washing hands, but for heating the building as well.

Did you know that water heating is responsible for 25% of the energy used in an average home? That makes it a very good reason to consider a less intensive way to heat water. Installing an energy efficient solar hot water system can save a family $300 to $700 off electricity bills and a massive three tonnes of greenhouse gas emissions each year.

The original caretakers cottage also has a passive lighting system that collects sunlight using a light tube lined with reflective material. The light tube directs sunlight into the building, lights up the work areas and helps to reduce overall energy consumption.

Other examples of alternative energy sources include wind turbines, solar thermal, biomass energy, fuel cells, geothermal and wave and tidal energy.

Curriculum links:

- ✓ Stage 3 English, Mathematics and Science
- ✓ Stage 4 English, Mathematics and Science
- ✓ Stage 5 English, Mathematics and Science

See the Curriculum Matrix (Appendix 1) for more detail.

For more information on alternative energy

Before your visit, watch the 'Alternative Energy' three minute video which will give your class an overview of what you will find at the Coal Loader.

Or check out the following useful sites:

- Clean Energy Council *www.cleanenergycouncil.org.au*
- Climate Clever Shop *www.climateclevershop.com.au*
- Australian Government *www.climatechange.gov.au*
- Australian Technology Association *www.ata.org.au*

Activity 1 – The Cottage Caretaker – an Energy Decision Making Role Play

Activity Summary:

Students will be allocated various roles including cottage caretaker, different types of energy company representatives, a local resident or the mayor. In these roles, student will think of, and discuss the positive and negative aspects of different energies, and make a decision about which type of energy should be used to run the caretakers cottage and Coal Loader site. Students will then present their decision to the rest of the class, and explain why they chose their particular energy type.

Aim:

To explore the concept of alternative energy sources.

Outcomes:

- To increase knowledge and awareness of the different types of energies, and to illustrate the positives and negatives of each
- To encourage students to consider more sustainable energy choices at school or home
- To learn about civic leadership and what decision making processes are used at a local government level to make decisions on sustainability and other issues.

Materials:

- Teachers will need to bring butchers paper, and students will need to bring writing materials for this activity.
- Note that role playing cards eg Col Richie – "Electricity company representative" and Joe Quimby "Mayor" will be provided by the Coal Loader Centre for Sustainability.

Preparation:

Teachers may choose to provide students with the reference posters below or to discuss them as a class prior to coming to the site.

Note that these posters are displayed on site, so time could be allowed for viewing them at the Coal Loader. They can be downloaded from *www.northsydney.nsw.gov.au/coalloader*, and a copy is included in Appendix 2.

- Poster: "Critical Decade for Climate Change"
- Poster: "Powered by the Sun"

Student Worksheet – The Cottage Caretaker – an Energy Decision Making Role Play

Introduction:

This activity will involve both role playing and group work. During the activity you will be asked to help the appointed Cottage Caretaker decide which energy type should be used to run the Centre. The purpose of the activity is for energy company representatives to try and convince the Cottage Caretaker, the Mayor and the community that their energy type is the most appropriate.

The activity works best in small groups with a minimum of four and maximum of eight people in each. Prior to the activity you will each be given a card with a key role eg cottage caretaker, solar company representative, wind company representative, coal company representative and natural gas company representative etc printed on one side and an explanation on the back. Use this card as a basis for your role playing but also use other relevant information you may have learnt to help build your case. Remember try and stay in character and act based on your role not on your own opinions!

Activity:

1. Look at the card you have each been given. You have 10 minutes to plan your argument by recording the following information.
   Energy company representatives – write down both positive and negative aspects of your energy type. Other stakeholders – such as residents, environmentalists and the Mayor, use this table to record the perceived benefits and concerns for each energy type.

Energy Type	Positives (benefits)	Negatives (concerns)
Coal		
Wind		
Solar		
Natural Gas		

The Cottage Caretaker should list all the things that he/she will require energy for.

1. eg lighting office space
2.
3.
4.
5.
6.
7.
8.

2. Now the role playing can begin!
   The setting is a community meeting held at North Sydney Council. The appointed Mayor should run the meeting and maintain order at all times. You can begin by asking each person attending to introduce themselves.
3. The Mayor should ask each of the company representatives to explain what their energy is, detail one positive aspect of their energy, and one negative aspect and finally why it should be used at the Centre. The Cottage Caretaker should record for each energy type the positive and negative aspects on butchers paper.
4. Others stakeholders may ask questions at any time with permission of the Mayor.
5. After listening to the positive and negatives aspects, and the concerns from the other stakeholders, the Caretaker should choose one or more preferred type(s) of energy to run his/her cottage. The Caretaker may seek further input from other stakeholders eg the Mayor or residents, to help make this decision.
6. The Caretaker must present their final decision on which energy type to use, and explain why they chose the energy type(s) over the others available.

Extension Activity:

7. Discuss various ways that the Coal Loader has reduced its electricity consumption.
   -
   -
   -
   -
   -
8. How could you implement these initiatives at school or home?
   -
   -
   -

Activity 2 – Count the Kilowatts

Activity Summary:

This activity will use real time energy consumption data collected by the Coal Loader to calculate how much energy is consumed at different intervals in time. Students can calculate the amount of energy generated by alternative energy such as solar power, using the smart energy meter located on-site. This activity will encourage students to interpret the data to help determine what factors cause variation of energy consumption at the Centre.

Aim:

To calculate the energy consumption of the Coal Loader and be able to identify the energy saving features used at the Coal Loader.

Outcomes:

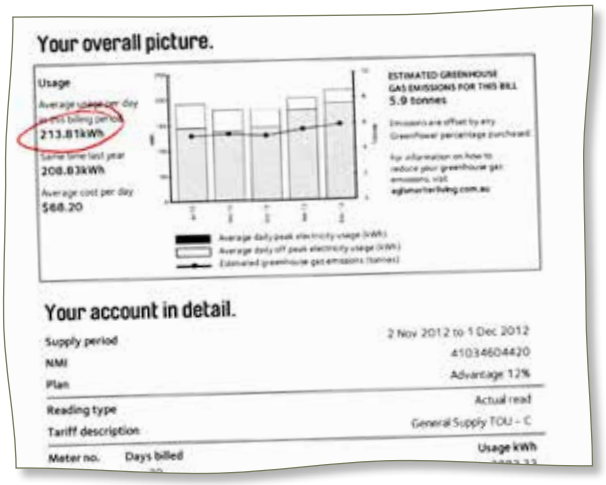
- Learn to calculate energy consumption
- Learn how to interpret energy consumption data in order to make conclusions about what factors influence consumption patterns.

Materials Needed:

- Students will need to bring a calculator, clipboard and writing equipment

Preparation:

Teachers are asked to hold a pre-excursion class discussion about energy consumption and energy data. A useful pre-excursion activity is to analyse a typical energy bill beforehand so students are familiar with the units of measurement and terminology used.



Student Worksheet – Count the Kilowatts

Introduction

This activity will allow you to calculate how much energy is consumed at the Coal Loader. You will also be able to calculate the amount of energy generated by solar power. By being able to track the energy performance of the Centre you will able to identify what factors contribute to the variation of energy use during the day and what behaviours or devices could help reduce energy consumption even further.

Activity:

Locate the energy monitor inside the former Caretakers Cottage. Use the information displayed to help you answer the following questions.

1. Record the average amount of energy consumed in kilowatts each day_____
2. What would be the amount in kilowatts consumed each year? _____
3. Look at the variation in the amount of energy used at different times of the day.
   List some possible reasons for this below

   _____

   _____

   _____

   _____
4. If the cost of electricity is 24c per kWh how much would the electricity bill for the Coal Loader be per quarter? _____
5. The solar PV system produces over 3000kWh of electricity every year. How many kWh is that per day?

   _____
6. How much money does this save the Coal Loader each year when compared to electricity?

   _____
7. How many additional PV solar cells would need to be installed to cover 100% of the Coal Loader's electricity consumption?_____

   Note: The kilowatt-hour (symbolised kWh) is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour (1 h) of time, and 1000 watts = 1kW.

Extension Activity:

Alternative energy is one great way to reduce our use of non renewable resources. However the way we use energy is also an important consideration. Look around the Coal Loader and list (3) energy saving devices and/or pieces of equipment you can see.

1. _____
2. _____
3. _____

Identify (2) practical behaviours you would use to reduce overall consumption at the Coal Loader?

1. _____
2. _____

Activity 3 – Energy Audit

Take away activity – for home or back at school

Activity Summary:

Students will conduct a simple school energy audit using a Save Power Kit which includes an energy meter. Students will report back ways that they could reduce their energy use at school. Note this activity could also be conducted at home if enough energy meters are available or students could take turns in borrowing.

Aim:

To increase awareness of the amount of energy that is consumed at school by common appliances, identify some practical steps that can be taken to save money and power, and reduce the school's impact on the environment.

Outcomes:

- Be able to identify the most energy intensive appliances/ equipment
- Identify strategies to reduce energy at school and home

Materials Needed:

Borrow a Save Power Kit (which includes an energy meter) free of charge from your local library.
See *www.savepower.nsw.gov.au* for a list of locations and for more information.

Preparation:

1. Conduct a class discussion around why we need to reduce our energy usage. Also discuss how we can reduce energy use, (eg. switching off the lights when we leave, opening a window instead of using the air-conditioning, making sure that computers are turned off at the end of the day.)
2. Demonstrate how to use an energy smart meter (note the Save Power Kit will come with instructions and activities). Explain why measuring how much energy an appliance uses can help raise awareness of issues eg we can measure the impact of standby power and we can also locate potentially inefficient equipment.
3. Use classroom examples to measure the energy consumed. This could be a computer in the classroom, fridge in the canteen, microwave or kettle in the staff room.
4. If conducting this activity as a take home exercise students are given a note and worksheet to take home which explains to parents/guardians how to use the energy meter.
5. A worksheet is filled in, with the assistance of the parent/guardian if required.
6. After students have returned their worksheets, conduct a class discussion about the different energy saving measures reported.

Student Worksheet – Energy Audit

Introduction:

Inefficient use of appliances and equipment such as leaving a computer on overnight or leaving a television on standby mode can lead to a surprisingly large use of energy.

This activity is a fun and educational way to learn more about power use and how to reduce power consumption, and bills, at your school. The activity makes use of energy smart meters to measure the amount of energy used by individual appliances. Note this activity could also be conducted at home if an energy smart meter is available.

Activity

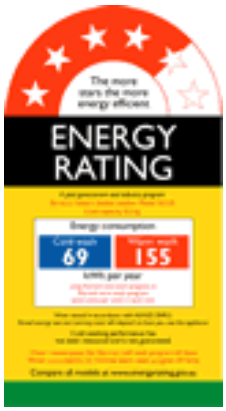
Follow the instructions and complete the worksheets in the Save Power Kit.

Extension Activity

- Locate a recent school or home energy bill. How much energy was used in the last quarter?

- How much does that equate to for each person in your home?

- Who has the lowest energy consuming household in the class?



5. Water conservation, recycling & reuse

Background Information

Water is an extremely precious resource. Of all the water in the world, 97% is salt water and only 3% is fresh water. Of this 3%, a tiny amount (less 0.01%) is available for human use. The rest is frozen in glaciers or polar ice caps, or is deep within the earth, beyond our reach. To put it another way, if 100 litres represents the world's water, about half a tablespoon of it is fresh water available for our use.

At the Coal Loader Centre for Sustainability there is a strong emphasis on water conservation, recycling and reuse. A 50,000 litre underground water tank (pictured) captures rainwater from the roofs of surrounding buildings. The water is used for toilet flushing, garden and nursery irrigation and general washing-down. If the tank is full it overflows into the adjacent wetland. This thriving wetland now occupies the former site of one of two Union Steam Shipping Company fuel tanks.

Other water saving measures at the Coal Loader include the use of water saving devices such as tap aerators, dual flush toilets and water saving appliances eg dishwasher. The bathroom includes 4 star WELS rated toilets which use only 3.5L water per flush compared with 12L for a traditional toilet, and 6 star WELS rated taps, using only 4.5L water per minute compared to a normal tap using up to 18L per minute.

By visiting the Coal Loader site you will also be able to see the wetland developed in the 1990s on the sandstone bedrock as part of site remediation works, by the site caretaker. The wetland is fed by stormwater runoff from adjacent buildings and is home to wildlife including fish, turtles, ducks and a vocal colony of frogs.

In the past, wetlands were often thought of as

wastelands. They were often drained, filled and used for parks, playing fields and housing developments. This meant that stormwater was no longer filtered through the wetlands but instead piped directly to our local waterways through a system of man-made concrete drains. This is why our waterways became polluted.

In urban areas today, one of the primary functions of wetlands is to improve the stormwater quality that enters our oceans. Wetlands remove pollutants from our stormwater such as nutrients and suspended solids such as soil. By doing so, it assists the health of our coastal waterways.

Curriculum links:

- ✓ Stage 3 Mathematics and Science
- ✓ Stage 4 Mathematics and Science
- ✓ Stage 5 Science

See the Curriculum Matrix (Appendix 1) for more detail.

Further Information

- Save Water *www.savewater.com.au*
- Wetland Australia *www.wetlandcare.com.au*
- Sydney Water *www.sydneywater.com.au*
- Streamwatch *www.streamwatch.org.au/cms/resources/manual_pdfs/BugGuide.pdf*

Watch the three minute video! The Water Conservation, Recycling & Reuse video will give your class an overview of what you can expect to see and learn about water conservation, recycling and reuse at the Coal Loader.

North Sydney Council thanks Sydney Water for providing advice and information on this chapter.

Activity 1 – Spot the Water Wise Design Features

Activity Summary:

This activity requires students to locate water saving technologies or devices at the Coal Loader.

Students are encouraged to think not only about systems and devices but also consider water use behaviours and their impact on water consumption eg waiting until the dishwasher is full before use or hand washing if there are only a couple of items.

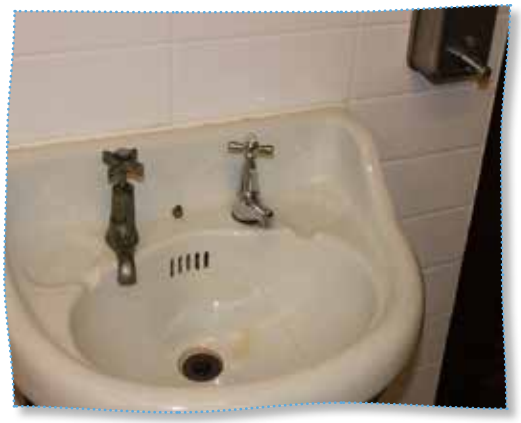
Located in the original caretakers cottage is a water and energy meter that displays data on the amount of water captured and used on site. In this activity students will use real time data from the meter to estimate the amount of water used per week.

Aim:

To be able to calculate the amount of water consumed at the Coal Loader and identify the different water saving devices and technologies used to conserve water.

Outcomes:

- An understanding of the importance of water saving and what systems, devices and behaviour can be used to reduce water consumption
- An ability to use real time water data to calculate consumption.



Reference Material:

Teachers may choose to provide students with the reference poster below or to discuss it as a class prior to coming to the site. Note that these posters are displayed on site, so time could be allowed for viewing them at the Coal Loader. They can be downloaded from *www.northsydney.nsw.gov.au/coalloader*, and a copy is included in Appendix 2.

- Poster – "Can you find our water tank?"

Materials & Preparation:

Students are to bring a clipboard or notebook, writing equipment and a calculator. Before commencing this activity teachers should review the background reading provided and lead a class discussion around water saving devices and behaviours.

Student Worksheet – Spot the Water Wise Design Features

Introduction:

This activity asks you to locate water saving technologies or devices at the Coal Loader, and to consider the water use behaviours of people at the site and their impact on water consumption eg waiting until the dishwasher is full before use or hand washing if there only a couple of items.

To complete this activity you will need to find the water and energy meter located in the former caretakers cottage. This interactive meter displays data on the amount of water captured and used by the Centre. In this activity you will use real time data from the meter to estimate the amount of water used per week.

Activity:

1. Look in and around the Coal Loader's former caretaker's cottage. Identify any water savings devices or systems. Record your findings in the table below

Location	Water saving device/system	What water saving behaviours could save even more water?
Kitchen		
Bathrooms		
Community Garden		
Jacaranda Square		
Other locations?		

2. Locate the energy and water display meter. Do visitors to the Centre have a noticeable impact the amount of water used? YES NO (circle answer)
3. Record three simple tips that could be used to help visitors and occupants reduce water consumption at the Coal Loader.

4. What is the difference between tank water and potable water?

5. Take a closer look at the water data for the past (7) days. What is the average amount of tank and potable water used per day?

   (a) Tank water

   (b) Potable water

6. For both tank water and potable water, at what time of the day is the most water used and why? Identify and explain any other patterns you can see

   (a) Tank water

   (b) Potable water

Extension Activity

7. Consider the water use at your school. What devices or systems could be utilised to reduce water consumption?

Activity 2 – Coal Loader Wetland Water Testing

Activity Summary:

This activity will illustrate how a wetland system works and how it can be used to improve the quality of stormwater on the Coal Loader site. During the activity students will be able to examine the macro-invertebrates living in the wetland and use a simple water testing kit to determine water quality. They will use their results as an indicator to determine the overall health of the wetland.

Aim:

To increase knowledge and awareness of how a wetland system can filter water to produce a better quality product, that in turn, can support many and varied life-forms.

Outcomes:

- A greater appreciation and understanding of the diversity of wetland ecosystems
- A greater understanding of wetlands and the importance of their role and function within our environment
- Learn how to classify insects and macro-invertebrates based on their physical appearance
- Begin to determine the quality of the water by identifying the diversity of insects living in the wetland
- Be able to use basic water testing equipment to help determine water quality (extension activity)

Equipment (provided by North Sydney Council):

- Dip net
- Rubber boots
- Rubber gloves
- Bucket
- Large open container
- Spoons
- Pipettes
- Magnifying glass
- Streamwatch Water Bug Guide
- Water quality testing kit (extension activity)

Students need to bring a notepad and writing materials and a copy of the Student Worksheet.

Reference Material:

- Poster – Coal Loader Wetland – *www.northsydney.nsw.gov.au/coalloader* or see Appendix 2
- Guide – Streamwatch Water Bug Guide – *www.streamwatch.org.au/cms/resources/manual_pdfs/BugGuide.pdf*
- Guide – How to perform basic water quality tests – *www.streamwatch.org.au/cms/resources/manual_pdfs/StreamwatchManual.pdf*

Preparation:

Before coming to the Coal Loader to complete this activity, teachers should lead a classroom discussion about what are aquatic macro-invertebrates and why they are a good indicator of wetland health. Some background information has been provided below.

This activity is best conducted in small groups (8 or less students). Teachers will need to supervise students at all times. Students participating in the dip netting and water testing will need to wear rubber boots and gloves, which can be provided by North Sydney Council.

Background Information:

Aquatic macro-invertebrates or water bugs are animals that have no backbone, are visible with the naked eye and spend all or part of their life in water. Aquatic macro-invertebrates are a very diverse group of animals that include worms, molluscs, arachnids, crustaceans and insects.

Why test aquatic macro-invertebrates?

Aquatic macro-invertebrates are excellent indicators of water quality and ecosystem health. This is because:

- They spend most or all of their lives in the water
- They are an important part of the aquatic food chain and therefore the wetland ecosystem
- Different species have varying sensitivities to pollution.

In highly polluted waterways only the most pollution-tolerant water bugs are able to survive. In pristine waterways all species are able to survive, even those that are very sensitive, resulting in a higher diversity of species.

Aquatic macro-invertebrates are relatively easy to collect and identify, and have been used extensively by environmental managers and researchers to assess water quality throughout Australia. Depending on the species found they can give an indication of the specific pollutants impacting on a body of water.

Further Information:

- Wetland Australia *www.wetlandcare.com.au*
- Streamwatch *www.streamwatch.org.au*

Student Worksheet – Coal Loader Wetland Water Testing

Introduction:

During this activity you will be able to examine the bugs living in the wetland and use a water testing kit to determine water quality. You will use your results as an indicator for the overall health of the wetland.

The wetland at the Coal Loader was constructed by a former caretaker of the site in the footprint of an old oil tank. The wetland acts as a filter, helping clean stormwater runoff from the site before it enters Sydney Harbour.

When it rains, the water from roofs and pathways, plus overflow from the rainwater tank, all flow into the man-made wetland. The water flows through a litter basket that strains out larger pieces of litter and debris, and then enters a pond which spreads and slows the gush of incoming water. This allows some of the debris and sediment in the stormwater to settle to the bottom of the pond.

The reeds and rushes planted in the pond filter out dissolved pollutants such as nitrates and phosphates, further slows down water flow, and draws floating solids to the bottom, which mixes with leaf litter. The sediment is soon converted to rich humus, much the same way as a compost heap works.

Appropriate water levels are maintained with a weir, through which cleaned water passes before flowing down a pipe and into Sydney Harbour.

Activity:

Walk down to the wetland accompanied by a teacher. Find a comfortable place to sit and record some basic site information in the table below before you start sampling the water.

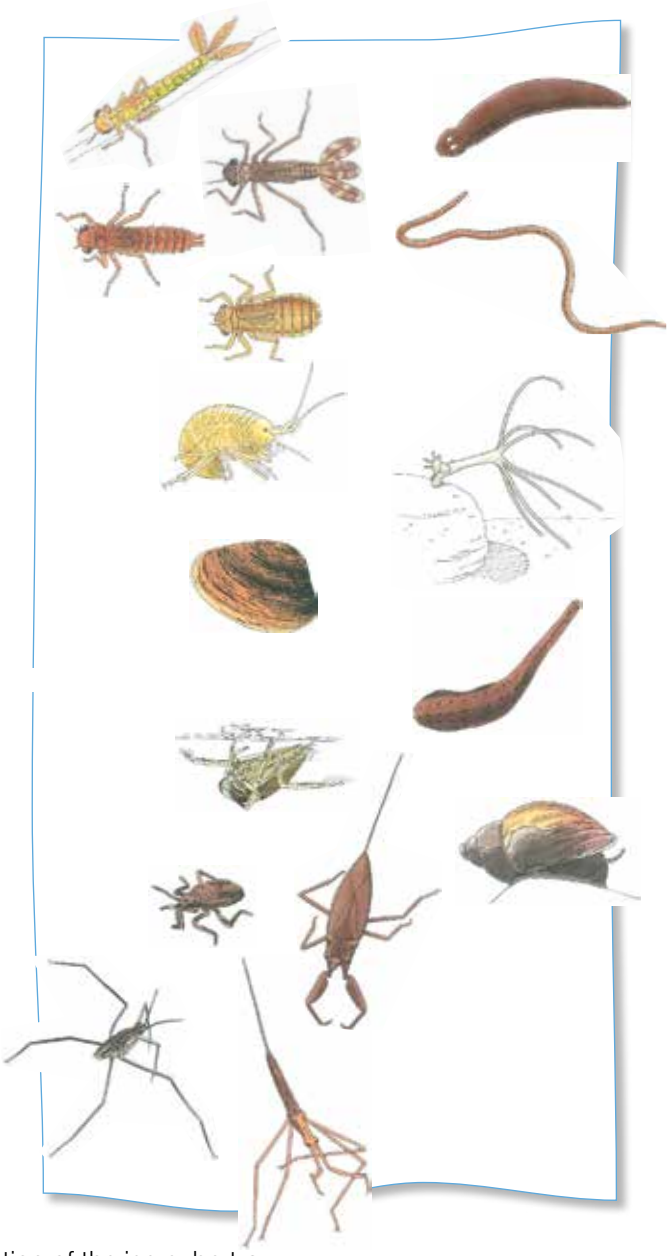
Site Information

Site Name	Coal Loader Wetland		
Date			
Your school name			
Your name			
Water body type			
Location			
Site access			
Landowner name			
GPS reading		*Water flow*	
Former land use		*Native vegetation*	
Current land use		*Weeds*	
Site width		*Native animals*	
Water depth		*Other observations*	

Catching the Water Bugs

Check you have all the appropriate equipment for this activity including wearing rubber boots and gloves.

- One or two people at a time will use a dip net to catch the water bugs. You should try and catch bugs from deep, still areas with plants near the edge and shallow rocky areas. This way you will get a good variety of bugs
- Stay on the bank holding the net close to the edge of the water
- Spend a few minutes sweeping the net backwards and forwards trying to catch bugs (but not too much sediment)
- Spend about 10 minutes catching bugs
- Holding the net upright, rinse it in the water to remove some of the sediment
- Turn the net inside out over a bucket and tip the entire contents into the bucket. Wash some water over the net to ensure everything gets into the bucket.



Repeat this process if you have time, and try to sample a different spot.

Sorting Out the Water Bugs

Find a safe place to look at what you have caught. Use a sorting tray and an ice cube tray to sort out the bugs.

- Pour the water containing the water bugs from the bucket into the sorting tray.
- Use spoons and pipettes to remove each bug from the sorting tray and put it in a section of the ice cube tray (half filled with water).
- Put the same type of bugs together in each section of the ice cube tray.

Working Out What Bugs You Have

- Compare the bugs in the ice cube tray to the ones pictured on your Water Bug Guide to help work out what they are.
- Use a magnifying glass to get a better look

How healthy is this waterway?

Record your results in the Streamwatch Pollution index table opposite.

How to calculate weighting:

Abundance	Weighting
1-5	1
6-15	2
>15	3

Streamwatch Pollution Index Sheet

	Common name	Scientific name	Bug value (tolerance measure)	Abundance (number of each bug)	Weighting	Bug value x weighting
Very sensitive	Mayfly nymph	Ephemeroptera	10			
	Cadisfly larvae	Tricoptera	10			
	Stonefly nymph	Plecoptera	9			
	Freshwater crayfish	Parastacidae	8			
Sensitive	Dobsonfly larvae Scorpionfly larvae	Megaloptera Mecoptera	7			
	Water mite	Acarina	6			
	Beetle larvae	Coleoptera	6			
	Beetles adult	Coleoptera	5			
	Freshwater sandhopper	Amphipoda	4			
	Dragonfly larvae	Odonata	4			
	Damselfly larvae	Odonata	4			
	Freshwater shrimp	Atyidae	4			
	Nematodes, Nematomorpha	Nematoda	4			
	True bug – water strider/ measurer/ treader	Hemiptera – on water surface	4			
Tolerant	Flatworm	Turbellaria	3			
	Freshwater slater	Isopoda	3			
	Freshwater mussel	Bivalvia	3			
Very tolerant	Hydra	Hydrozoa	2			
	Fly larvae (flies, mosquitoes, bloodworms)	Diptera	2			
	True bugs – back swimmer boatman, water scorpion	Hemiptera – found under water	2			
	Leeches	Hirudinea	2			
	Copepods, seed & clam shrimps, water fleas	Copepoda	1			
	Freshwater snails	Gastropoda	1			
	Aquatic earthworm	Oligochaeta	1			
						TOTAL

Source: How to calculate weighting: Streamwatch Manual *www.streamwatch.org.au/cms/resources/manual_pdfs/StreamwatchManual.pdf*

Make sure you add up the column total!

Questions:

1. Using the Stream Evaluation Chart below, rate the water quality in the wetland.
   Poor *Fair* *Good* *Excellent* (circle your answer)

Stream Evaluation Chart

Column Total (bug value x weighting)	Water Quality Rating
0-20	Poor
21-80	Fair
81-150	Good
>150	Excellent

2. What key factors do you think could be impacting on the water quality of the wetland?

Extension

3. If you have access to water quality equipment, eg a Streamwatch kit, measure other key indicators of water quality of the wetland at the Coal Loader eg pH levels, turbidity and dissolved oxygen. How does this compare to drinking water?

4. List (3) practical actions you could take at home or at school to improve the water quality of stormwater runoff

Activity 3 – School Water Audit

Take away activity – for home or back at school

Activity Summary:

This activity will use a water audit to survey the quantity and quality of all the school's water devices, check where water is used, and identify opportunities for saving water.

In this activity students will learn how to conduct an audit and then work in groups around the school to collect data. They will then return to the classroom to collate results. A template audit recording sheet has been provided for your use. A simple video produced by Sydney Water can be watched beforehand to help explain the audit process.

Aim:

To identify where the most water is used at school and what could be done to reduce overall water consumption.

Outcomes

- Students learn where most water is consumed and explore different water-efficient devices.
- Students will learn how to conduct an investigation, collate information and interpret investigation results.

Materials & Preparation

- DVD – 'How to do a water audit' (one free copy is available for each school in Sydney Water's area of operations. Call 1800 724 650).
- DVD player
- Water audit recording sheet (provided)
- Map of school grounds. The school should be divided into five roughly even areas and each group's audit area individually marked with a highlighter pen (Tip – the group that has the least number of buildings/rooms to be audited could also be allocated all outside taps)
- Five measuring jugs
- Blackboard, overhead or interactive whiteboard to collate results.

Reference:

The water audit methodology has been adapted from *Sydney Water School Water Audit Guide*. It is recommended that teachers read this guide as background information before commencing the activity.

Further Information:

Sydney Water *www.sydneywater.com.au*

Student Worksheet – School Water Audit

Introduction:

Do you know how many taps your school has or how many bubblers are leaking? This activity gets you to conduct a water audit on your school. You will collect information about your school's water system to see how efficient it is.

By doing a water audit you can find out:

- how many water fixtures and fittings your school has
- how many are efficient
- which areas of the school could be improved

After conducting the water audit you are encouraged to present your findings to the school and prioritise any areas that that could be improved to save water and money.

Activity:

1. Organise yourselves into five groups and name them. Your group will be provided with a Water Audit Student Worksheet and an A3 map with your audit area highlighted. It is important that your group stays in your area to avoid double counting.
2. Allocate a scribe for each group.
3. Familiarise yourselves with the Audit Worksheet. These will be tallied as a class total at the end of the audit period.
4. Hints on filling in the Worksheet:
    - Column 2 – Tally all water devices in your survey area under column two.
    - Column 3 – For each device, record any water saving features eg spring-loaded taps, headless taps, waterless urinals, low flow showerheads or dual flush toilets.
    - Column 4 – Tally any broken/leaking appliances and write their location in the appropriate column. Broken devices cannot be turned off.
    - Column 5 – Dripping devices are those that are not turned off tightly enough. These can be turned off during the audit.
5. If rooms (particularly storerooms) are locked, you could ask a nearby teacher to unlock it or help them fill in the sheet.
6. If your school is mixed gender, ensure at least one boy and one girl are in each group to cover any toilets in your area. Note – each urinal is counted as one device even though there may be several water outlets.
7. You will have around 30 minutes to complete your audit. You must return to the classroom when you have finished auditing or when time is up.
8. Complete the audit and write your results in the Water Audit Student Worksheet opposite.

Our School's Water Audit – Student Worksheet

Water devices	Number of devices	Number of water efficient devices	Number broken or leaking and their location	Number dripping
Toilets				
Urinals				
Bubblers				
Taps				
Zip hot water heaters				
Showers				
Other				
Group total				
Class total				

If possible, find a dripping tap and use the measuring jug and watch/timer to work out how much water is wasted in one minute. Fill in the table below to work out how much water is wasted from the tap.

A	B	C	D	E
Water lost in one minute	Water lost in one hour (A x 60)	Water lost in 24 hours (B x 24)	Converted to litres (C/1000)	Water lost in one year (D x 365)
mL	mL	mL	L	L

Water Audit Results:

- Copy the audit sheet either onto the blackboard, an overhead or an interactive white board. Ask each group's scribe to fill in their results in the appropriate area to get a class total.
- Prepare a list of broken or leaking appliances to give to the school's general assistant to fix.

Extension

- Discuss the class results and devise an action plan to improve school water efficiency.

You may like to use the Water Efficiency Action Plan template from Sydney Water *http://www.sydneywater.com.au/Publications/_download.cfm?DownloadFile=../Education/doc/3-5-4-3efficiencyplanteachers.doc*

6. Waste Minimisation

Background Information

Avoid, Reduce, Reuse and Recycle (ARRR) is often referred to as the waste management hierarchy. It says that the best way to manage your waste is to avoid it, reduce it, reuse it and then recycle it. By following this process the Coal Loader has dramatically reduced the amount of waste it sends to landfill.

The Waste Management Hierarchy is a nationally and internationally accepted guide for prioritising waste management practices. It sets out the preferred order of waste management practices, from most to least preferred. The further the activity moves up the waste management hierarchy, the more greenhouse gases are avoided and the less water and energy consumed.

The Coal Loader runs numerous workshops that assist the local community and the general public in how to avoid waste and how to better reuse and recycle resources. It also demonstrates a number of examples of ARRR on-site, including:

AVOID – the least energy intensive strategy:

- sustainably retrofitting existing buildings – for example, the original caretakers cottage is now an office and meeting space, the former mechanics workshop is now a cafe
- growing our own herbs instead of purchasing from shops
- making a conscious decision not to buy things we dont really need such as colour photocopiers
- purchasing recycled construction materials such as wood used for decking
- using reusable glasses, crockery and cutlery for all our meetings and events rather than using disposable items
- making our office a paper-free office – ie. no printing unless it is absolutely necessary
- using home-made green cleaning products instead of buying commercial, packaged products
- using a bicycle instead of a car whenever possible
- collecting seeds in the community garden to grow new plants, rather than buying new plants or seeds

REDUCE – requiring less energy than reusing or recycling:

- Diverting organic material from landfill and reducing greenhouse gases through composting, worm farming or feeding the chooks our food scraps
- A kitchen bench composting bin to recycle food waste. This reduces the amount of waste put out for garbage collection.
- Buying goods in bulk
- Using a calico bag rather than a plastic bag
- Producing our own eggs with our chooks, instead of buying eggs

REUSE – requiring more energy than reducing, however less energy than recycling.

- Resue of old street signs which have been made into a coffee table
- Reuse of old guttering as flower beds in the vertical garden
- Purchasing second hand items whenever possible such as computers, office chairs and photocopiers
- Reconditioning and repair of furniture and appliances
- Scrap paper for notes/phone messages
- Bricks from original building used to build pathways
- Turning food scraps into fertiliser for the garden by using compost bins and worm farms

RECYCLE – when materials from waste streams are broken down into raw materials and reprocessed either into the same product (closed loop) or a new product (open loop).

- Recycling all paper waste
- Collecting plastic bottles and containers for reprocessing into outdoor furniture

The Coal Loader also provides residents with a recycling station that has bins for recycling ink cartridges, mobile phones, batteries and compact fluorescent lamps.

Curriculum links:

- ✓ Stage 3 English and Science
- ✓ Stage 4 English, Mathematics and Science
- ✓ Stage 5 English, Science and History

See the Curriculum Matrix (Appendix 1) for more detail.

Further Information

Watch the Coal Loader Waste Minimisation three minute video which will give your class an overview of what you will find at the Coal Loader.

North Sydney Council *www.northsydney.nsw.gov.au*

NSW Government *www.environment.nsw.gov.au/households/recwaste*

Sustainable Schools NSW *www.sustainableschools.nsw.edu.au*

Planet Ark *www.planetark.org*

Activity 1 – An Investigation of Waste Minimisation Techniques

Activity Summary:

In this activity students will identify the different ways the Coal Loader Centre for Sustainability is avoiding, reducing, reusing and recycling waste.

Aim:

To be able use the waste hierarchy to categorise the various waste management strategies implemented at the Coal Loader.

Outcomes:

- An understanding of the waste management hierarchy
- Be able to identify different strategies to avoid, reduce, reuse, and recycle waste

Materials

Students will need to each bring a notebook and writing equipment.

Preparation:

Before visiting the Coal Loader teachers should lead a class discussion on the waste management hierarchy.

Student Worksheet – An Investigation of Waste Minimisation Techniques

Activity:

1. For each of the strategies listed in the table, decide if you would consider it to be avoiding, reducing, reusing or recycling waste. Discuss your answers as a group.

Item or process	Waste hierarchy – avoid, reduce, reuse or recycle?
Composting and worm farming	
Book swap	
Second hand computer	
Office waste paper bins	
Scrap paper as notepad	
Buying sugar in bulk rather than individual packets	
Polishing old floorboards rather purchasing new	
Not buying commercial cleaners	
Vertical garden made from old guttering	
Bricks from original building used to build pathways	
No purchases of disposal items eg plastic cups, cutlery	
Horse hair plaster ceilings retained	
Structural steel can be disassembled and used elsewhere	
Bottles and cans collected and sent for recycling	
Chickens eat food scraps and produce fresh eggs	
What else can you think of?	

Extension Activities

2. Can you identify any other strategies that the Coal Loader could use to avoid, reduce, reuse or recycle its waste? What strategies could you use at home or school?

3. An additional step in the waste hierarchy is recovery. Can you think of ways the Coal Loader could recover waste and turn into energy?

Activity 2 – Product Life Cycle Analysis

Activity summary:

This activity will demonstrate that all products have life cycles that can be studied to estimate the ecological impact of the product. Students are challenged to research and analyse the life cycle of one product, the orange juice popper, compared to another that could meet the same need with a lower ecological impact, the orange.

Aim:

To conduct a life cycle analysis on two items that both produce the same product, but which have different life cycles. Students will compare the life cycle of an orange juice popper and an orange, and examine the ecological impact of each.

Outcomes:

- Be able to research and assess the life cycle of a product
- Compare and contrast the ecological impact of different products

Materials Needed:

- Orange juice popper
- Orange

Preparation:

The teacher may choose to provide students with a copy of the Background Information for this Activity, or may choose to use it to engage the class in a discussion.

Activity 2 – Product Life Cycle Analysis

Background Information:

What is a product life cycle?

Just as living things are born, get older, and die, products also complete a life cycle. Each stage of a product's life cycle can affect the environment in different ways.

Some products, such as an orange juice popper, have many different components for example the tetra box carton, the straw, the plastic wrap to encase the straw, the ink on the label, the lining, as well as the juice itself, each of which has its own life cycle. The stages of a product's life cycle usually include:

- **Design** – A product's design can influence each stage of its life cycle and in turn the environment. Design affects which materials will be used to manufacture a product. For example, cheaper materials are often less durable, which means the product will have a short useful life. Product design can also prevent waste in many ways. Products can be designed with modular components that can be easily replaced so that the entire product does not have to be thrown away if only one piece breaks.
- **Materials Extraction** – All products are made from materials found in or on the earth. "Virgin" or "raw" materials, such as trees or ore, are directly mined or harvested from the earth, a process that can create pollution, use large amounts of energy, and deplete limited natural resources. Making new products from materials that have already been used (recycled materials) can reduce the amount of raw materials we need to take from the earth.
- **Materials Processing** – Once materials are extracted, they must be converted into a form that can be used to make products. For example, paper is made from trees, but the wood has to undergo several different processes before we can use it.
- **Manufacturing** – Products that are made in factories require a great deal of energy and water to create. The manufacturing process can also produce pollution. Many products require the use of packaging as well, to prevent spoilage, damage, contamination, and tampering.
- **Packaging & Transportation** – The use of packaging can protect products from damage and provide product information. However, packaging consumes valuable natural resources and when used excessively can be wasteful. Some packaging can be made from recycled materials. Finished products are transported in trucks, ships, planes, and trains to different locations where they are sold. All of these forms of transportation burn fossil fuels, which can contribute to global climate change.
- **Use** – The way products are used can impact the environment. For example, products that are only used once create more waste than products that are used again.
- **Reuse/Recycling/Disposal** – Using a product over and over again prevents the need to create the product from scratch, which saves resources and energy while also preventing pollution. Recycling or re-manufacturing products also reduces the amount of new materials that have to be extracted from the earth. Throwing a product away means that it will end up in a land-fill and will not be useful again.

Renewable versus non-renewable resources

A renewable resource is one that can be replaced by nature eg sun, wind, water (and oranges!)

Non renewable resources cannot be replaced by nature once they have been used. eg: oil, coal, petroleum

Student Worksheet – Product Life Cycle Analysis

In this activity you will be asked to consider the life cycle of two different products, an orange juice popper and an orange.

Complete the table below, which looks at the life cycle of the popper and the orange.

	Orange juice popper	**Orange**
		
What is this product made from?		
What materials are used to make it?		
Are they renewable or non renewable resources?		
Where did the components come from?		
Who made them?		
Where was it made?		
How is it packaged?		
How is it transported to market?		
What are the inputs and outputs of each? eg soil, air, water, fertilisers		
What will happen to the item at the end of its life?		

Class Discussion:

1. Which product do you think has the lower environmental impact? Discuss your reasons why.
2. Could you answer all the questions about each product? What information is missing and where could we go to find this out?

Using all the information you have gathered as a class help piece together a product life cycle for both the popper and the orange. You could either draw pictures to represent the different stages in the products life or you might like to use the following headings.

1. Raw materials
2. Transport
3. Manufacturing and packaging
4. Distribution
5. Use by consumer
6. Disposal or recycling

At every stage be sure you consider both the inputs eg soil, air, water, fertilisers etc, and the outputs eg waste, emissions to air and water etc

Discuss the differences between the two product life cycles. Which would you choose to buy? What could be done to reduce the environmental impact of the orange juice popper?

Extension

The Coal Loader Cafe is trying to decide how to best provide orange juice to its customers. The Cafe owners have narrowed the decision down to the following two products. They would like to order orange juice that the customers will love and that will have the lowest impact on the environment.

Organic Valley Juice	**Colo River Oranges**
• Organically grown oranges	• Farm grown oranges
• Packaged in 500ml bottles for convenience	• No packaging must squeeze own juice
• Grown in Valencia, Italy renowned for best oranges	• Grown on the Colo River (1hr from Sydney)
• Placed into cold storage to keep fresh	• No storage. Stays on tree until order taken
• Plastic bottles can be recycled	• Orange skins can be composted onsite
• Transported via air for speedy delivery	• Driven to Coal Loader Cafe (1hr drive)
• Company employs over 1200 people internationally	• Employs 12 people from the Colo River area

Which product would you choose to use in the Coal Loader cafe? Explain the factors behind your decision.

Activity 3 – Low Waste Lunch Campaign

Take away activity – for home or back at school

Activity Summary:

This activity will challenge students to design a campaign that will engage the whole of the school community to reduce waste by packing a low waste lunch. The ultimate goal is that everyone including the school canteen would participate and over time permanent changes can be made. Essential to the campaign is monitoring participation and measuring the amount of waste avoided from landfill. A waste audit is conducted both prior and post campaign to measure results.

Aim:

To reduce the amount of school waste going to landfill in the form of packaging and uneaten food.

Outcomes:

- Learn how to avoid food and packaging waste from school lunches
- Explore why food waste and packaging has an adverse impact on the environment
- Design a campaign that will inspire parents/students/teachers to take action to avoid waste from uneaten food and excess packaging
- Learn how to monitor and evaluate the success of an education campaign

Preparation:

Before undertaking a low waste lunch campaign, a waste audit should be undertaken without the knowledge of the whole school. A select group of students (eg environment group) could participate in the audit. The audit methodology has been provided.

Materials required for your audit:

- Gloves for all students participating
- Large plastic sheets, or tarp for bin contents
- Tongs
- 3 buckets or large containers
- Scales
- Waste Audit Sheet (A template can be dowloaded at *www.northeastwasteforum.org.au/NEWF/CMS/index.php?page=School_Resources*, courtesy of the North East Waste Forum)
- Camera

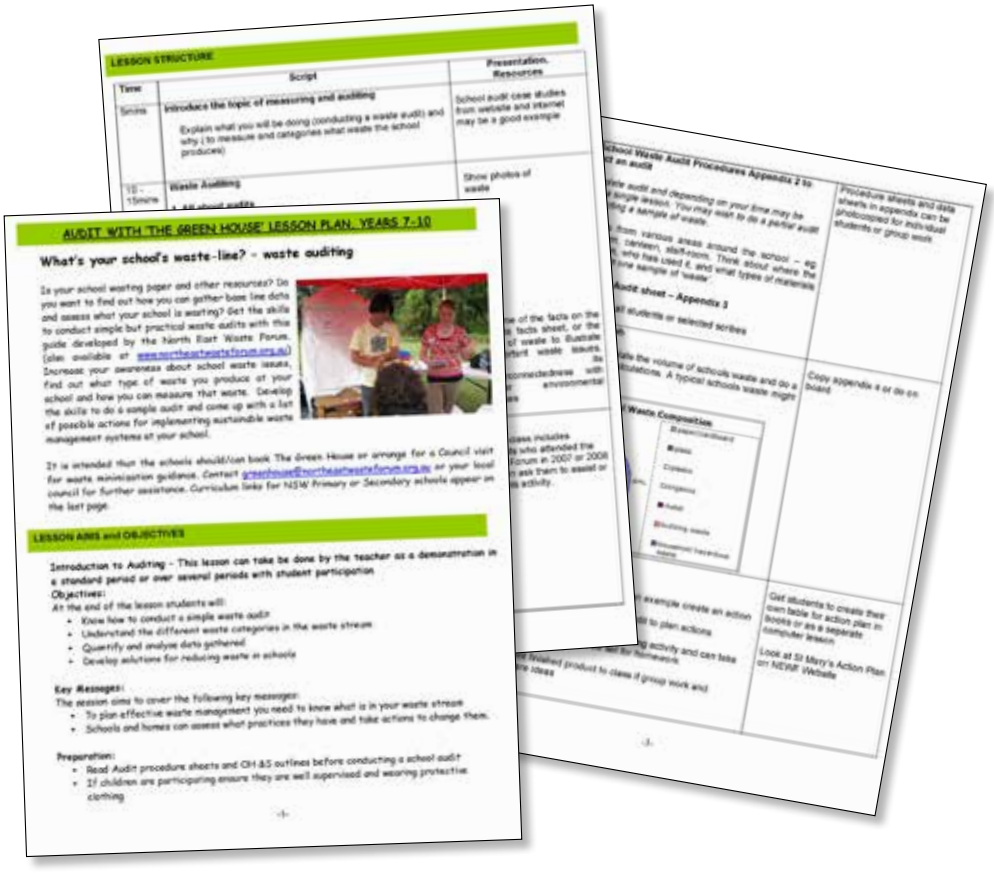
Activity 3 – Low Waste Lunch Campaign

Conducting the audit:

After lunch, on the day you have chosen, students empty all the school playground rubbish bins (not including recycling or compost bins) onto large plastic sheets or tarps.

1. Weigh your empty buckets
2. Label buckets: recyclables, compostable material, and garbage
3. The students use gloves and tongs to sort the materials into the labelled buckets
4. Weigh each bucket once it is full
5. Subtract the weight of the empty bucket to give the true weight of the waste
6. Record your results on the waste audit recording sheet.

The audit process should be repeated immediately after a low waste lunch campaign.



Further information:

North East Waste Forum *www.northeastwasteforum.org.au*

Sustainable Schools NSW *www.sustainableschools.nsw.edu.au* look under "resource centre" then "resource management" then "waste".

Student Worksheet – Low Waste Lunch Campaign

Introduction:

Low Waste Lunches are a great way to get us all to think about the *rubbish* or *waste* that we are throwing in the bin. Many of us throw things out every day without considering the environmental impact of what we are doing.

This activity will challenge you to design a campaign that will engage the whole of the school community to reduce waste by packing a low waste lunch. Before running your Low Waste Lunch campaign you will need to conduct a pre campaign waste audit. This audit needs to have your teacher's permission but must not be revealed to the whole of school community until after the audit has taken place. This is essential to be able measure the impact of your campaign on the amount of waste going to landfill.

Packing a low waste lunch is easier than you think, and they are often much healthier as they encourage us to eat more fresh food!

Low Waste Lunches:

AVOID:

- × Plastic wrap and foil
- × Disposable items like plates knives and forks
- × Paper lunch wrap
- × 'Gimmicky' packaged items e.g. chips, biscuits, small yoghurts, individually wrapped serves of food

ALWAYS:

- ✓ Use re-useable containers and drink bottles that can be washed out
- ✓ Choose items with reusable, recyclable or compostable packaging
- ✓ Pack cheese & biscuits or yoghurt from larger containers into a reuseable smaller container

Activity: The Low Waste Lunch Campaign

How you design your campaign is totally up to you however we have provided some key questions to get you thinking.

1. Who will you involve in the campaign? Think about allocating key roles and responsibilities.

2. What will be your key messages and focus?

3. What sort of educational materials or marketing strategies will you use?

4. Will your low waste lunch challenge take place on just one day or more frequently eg every week?

5. Why will people want to participate?

6. Will you offer incentives for student participation?

7. How will you communicate the results from the pre and post campaign waste audit?

8. How will you ensure that the waste reduction results will continue beyond the life of the campaign?

Extension

- Present your pre and post campaign audit results to your school Principal and request that the school designates one day each week as a Low-Waste Food Day (or Nude Food Day)
- Is your school canteen on board? Are some of the wasteful items being sold really necessary? Can they be avoided or replaced with less wasteful alternatives? Work with the canteen and the P & C to begin to address these issues.

Past school waste audits have found that the amount of uneaten food in the bins is enormous. In fact it is a problem not just faced at school, NSW households throw away more than $2.5 billion worth of edible food per year!

Your future campaigns could encourage students to come up with ideas for creating low waste lunches from last night leftovers. Log on to *www.lovefoodhatewaste.nsw.gov.au* for more information.

7. Sustainable Food

Background Information:

Does your school have a kitchen garden? The Coal Loader Community Garden is a wonderful resource for any school wanting to know more about growing food and getting students involved in the learning opportunities that a garden allows.

Originally a carpark for workers at the Coal Loader until 1992 and then caretaker's courtyard garden between 1992 and 2006, this beautiful area is now a community garden.

Established in 2007, and planned and built by local residents, the Garden is operated on organic principles and is irrigated using rainwater captured from the roof of the adjacent building. The garden is open to all within the community.

The garden uses several forms of composting including compost heaps, compost bins and worm farms. Composting and worm farming are one the best ways to utilise green kitchen waste and makes great organic fertiliser.

The community garden at the Coal Loader is designed using permaculture principles. Permaculture is a garden design philosophy that encourages zonation around the home – herbs and vegetables closest, livestock further away and food trees further away in the orchard. It has evolved from farmers in the 1920's who coined the phrase permanent agriculture. Many gardeners today use permaculture as a way to become more self-reliant through the design and development of productive and sustainable gardens and farms.

Growing your own food is not only good for your health, it is good for the environment and a good way to get involved locally.

Organic, home-grown fruit, vegetables and herbs are fresher, more nutritious and more delicious than conventionally farmed fruit, vegetables and herbs. You are eating in the right season and you know where your food has come from.

Freshly eaten home-grown food produces no greenhouse emissions. Your home-grown food travels metres instead of hundreds or thousands of kilometres. Reducing your food miles is a great way to reduce our ecological footprint.

The Coal Loader Community Garden offers an excellent opportunity to demonstrate how to grow food and keep chickens to students and teachers alike. Like all community gardens, it has its roots in motivated local residents coming together around a common need and goal to produce local fruit, vegetables and eggs sustainably in a community space.

Curriculum links:

- ✓ Stage 3 Mathematics and Science
- ✓ Stage 4 Mathematics, Science and English
- ✓ Stage 5 English and History

See the Curriculum Matrix (Appendix 1) for more detail.

Further Information:

Watch the Coal Loader Grow your Own Food three minute video which will give your class an overview of what you will find at the Coal Loader.

For help with setting up your school garden see the "Tips for Creating a School Garden" in the Coal Loader Garden Project teachers guide developed by North Sydney Council and Northern Sydney Area Health Service. *www.nsccahs.health.nsw.gov.au/healthpromotion/publications/documents/CoalLoaderGardenProjectResource.pdf*

Kitchen gardens website *www.kitchengardens.det.nsw.edu.au*

Visit *www.northsydney.nsw.gov.au/communitygardens* for more details.

For keeping chickens at school see *www.poultryhub.org*

For more information about using permaculture designs in your school gardens visit *www.permaculturenorth.org.au*

North Sydney Council thanks the Coal Loader Community Garden Group for providing advice and information on this chapter.

Activity 1 – Keeping Chooks

Activity Summary:

Students will participate in a pre-excursion class discussion with their teacher using the Information provided. This will be followed by an excursion to the site where the students will complete an Activity Sheet focussing on Keeping Chickens, standards for free range chickens, and health considerations for keeping poultry. Students will be extended to develop a chicken program at their school using the knowledge gained from observing the chickens at the Coal Loader.

Aim:

To increase knowledge and awareness of keeping chickens in the school or backyard.

To utilise mathematical skills to understand the production rate of the chickens at the Coal Loader site, and the management issues around keeping chickens.

Materials Needed:

- Each student will need a clipboard and writing equipment.
- Each student will also need their own copy of the Student Worksheet.

Preparation:

Teachers are asked to hold a pre-excursion class discussion using the Information provided below.

Outcomes:

- Understand how guidelines and law on keeping chickens are implemented.
- Using the background information on chicken production and observations at the Coal Loader, students will be given confidence to develop a chicken program back at school.

Background Information:

The benefits of keeping chickens include providing regular supply of fresh eggs, recycling food waste, making excellent pets, helping aerate garden soil, managing insect pests, and providing the garden with fertiliser.

Raising and keeping chickens provides a great way to teach us about responsibility and how to care for living things. They also provide an experience in small animal farming and egg hatching if eggs are fertile.

Chickens can be fed food scraps, including waste that cannot be composted such as the remains of dishes that incorporate meat, pasta, rice and bread. Hens need to have a secure, warm, and safe environment in which to lay their eggs. If their environment is conducive to production, one hen can lay an egg a day in the laying season which is defined by daylight length, but on average they lay five eggs a week.

The chickens at the Coal Loader are maintained by volunteers from the Community Garden group who are rewarded daily with fresh eggs. The high fence is effective in keeping foxes away from the chickens, and as an extra precaution the chickens are always closed in the coop at night. As egg production is the outcome at the Coal Loader, roosters are not needed in the management process, so crowing is not an issue. In fact North Sydney Council has a Rooster Policy which forbids the keeping of roosters in the municipality.

The Coal Loader chickens are housed in what was once an old shed, so even the chicken coop at the Coal Loader follows adaptive reuse principles!

North Sydney Council has guidelines to assist in keeping chickens in the backyard or school — *www.northsydney.nsw.gov.au/*

Student Worksheet – Keeping Chooks

Facts and figures about keeping chooks in NSW

Keeping chooks in your backyard is legal. In NSW, the legislation that covers the keeping of chickens is the Local Government (General) Regulation 2005 and State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 which are administered by local councils.

- The house
  - must not be more than 3.5 m above ground
  - must not be more than 15 square metres in floor area
  - must be located in the rear yard
  - must not house more than ten fowls or poultry
  - must be constructed so that roofwater is disposed of without causing a nuisance to adjoining owners
- Poultry must not be kept under such conditions as to create a nuisance or to be dangerous or injurious to health.
- Poultry yards must at all times must be kept clean and free from offensive odours.
- Chickens and guinea fowls must not be kept within 4.5 metres of a dwelling, public hall, school or premises used for the manufacture, preparation, sale or storage of food.
- Poultry, other than chickens and guinea fowls, must not be kept within thirty (30) metres of any dwelling, school or premises used for the manufacture, preparation, sale or storage of food.
- The floors of poultry houses must be paved with concrete or mineral asphalt underneath the roosts or perches. However, this subclause does not apply to poultry houses:
  - That are not within 15.2 metres of a dwelling, public hall or school; or
  - They are situated on clean sand.
- Poultry yards must be so enclosed as to prevent the escape of poultry.
- There must be no more than 1 development per lot.

Activity:

To be free or not to be free. That is the question!

Eggs in Australia can be labelled organic, free range, organic free range, green, or eco, which can be confusing for us as consumers. This is because there is no single standard in Australia for organic or free-range products and anyone can use those terms. The RSPCA standards for free range are:

- ✓ Hens are housed in sheds and can go outside by choice.
- ✓ Within a shed there are a maximum of nine hens per square metre.
- ✓ Outside there are a maximum of 1500 hens per hectare.

1. Are the Coal Loader chickens 'free range' according to the RSPCA standards? Yes / No (circle answer). Why?

Be a Council Environmental Health Inspector for a day:

Every local government has a team of environmental health officers who oversee certain policies, rules and regulations including keeping chickens.

2. Does the chicken enclosure at the Coal Loader meet North Sydney Council requirements? Yes / No (circle answer) Why?

3. What is one management intervention that you can see has been done by the community gardeners to ensure the well-being of the chickens?

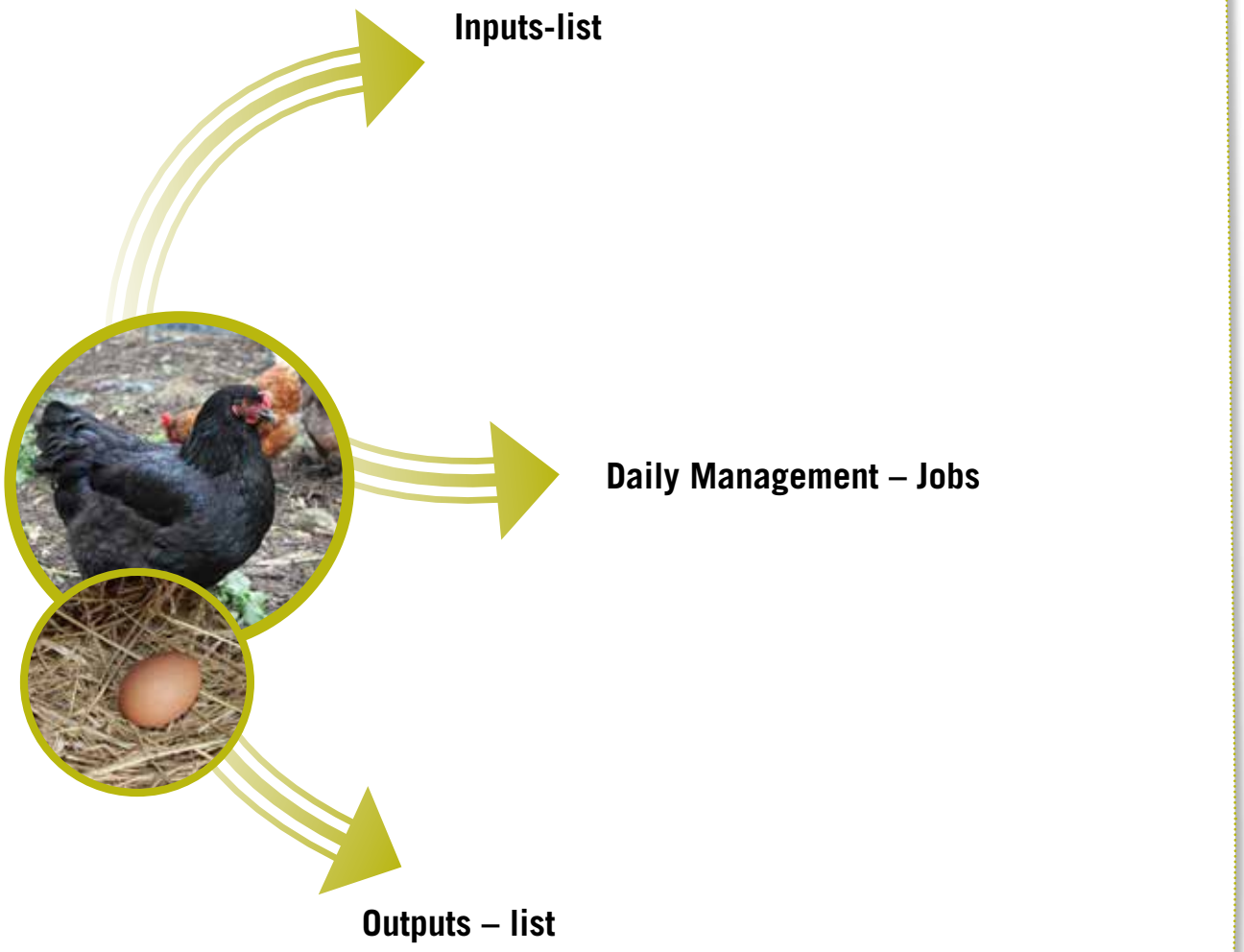
Chicken management at the Coal Loader:

Having chickens at school is a great way to learn about where our food comes from, and the school canteen can benefit as well. Make some observations to take back to your school about the chicken program at the Coal Loader.

4. Sit and observe the chickens for five minutes:
   a. What did they eat?
   b. What sounds did they make?
   c. Was there a bossy chook?
   d. What is their main activity?

5. On the Poultry System diagram below, list the following:
   a. What are the inputs to ensure the chickens are well managed?
   b. What are the outputs that occur with running chickens at the Coal Loader?
   c. What are the management jobs that the community gardeners need to do daily?

Poultry System diagram



Chicken Production at the Coal Loader:

6. If each chicken laid an egg a day what would be the weekly production?

7. What would be the yearly production?

8. Hens don't lay an egg every day of the year. What is one reason for this?

Extension Activity:

9. The eggs at the Coal Loader are collected by the community gardeners who look after them, but let's imagine that Council has all these eggs ready to sell, they need your help to develop a marketing plan.

Form small groups and create a marketing plan that could be used by the community gardeners. You may want to include a business name, cost to sell, an advertising plan, a distribution plan. What else?

Marketing Plan

Further extension:

10. Using the 'Facts and figures about keeping chooks in NSW' information**,** plan where a chicken coop could be set up in your school. Is your space close to water? Does it have some shade and enough room to store food? List what you need to make a chicken program a success at your school.
11. Write a letter to the school environment group, or your school Principal, suggesting a school chicken program. Include information on how and why it would work at your school.

Activity 2 – Community Gardens

Activity Summary:

Students will participate in a pre-excursion class discussion with their teacher using the Information provided. This will be followed by an excursion to the site where the students will complete an Activity Sheet focussing on Community Gardens and what is needed to establish a kitchen garden at school.

Students will be extended to develop a garden program at their school using the knowledge gained from observing the community garden at the Coal Loader.

Aim:

To increase knowledge and awareness of community gardens using the Coal Loader Community Garden for comparison, and gain an understanding of growing food in small places.

Materials Needed:

- Each student will need a clipboard and writing equipment.
- Each student will also need their own copy of the Student Worksheet.
- The optional activity in the extension list is the Compost Gin card game that will be provided by the Coal Loader Centre for Sustainability.

Preparation:

Discuss in class some of the benefits of having a community garden. Include in the discussion how the community benefits, how council benefits. What are other ways students have seen community and councils work together?

Outcomes:

- Increased confidence to create a school kitchen garden.
- Encourage students to get involved locally, learning to live sustainably.
- Learn about turning green kitchen waste into fertiliser.

By using the garden as a classroom, students:

- Gain knowledge and understanding of the environment and the challenges facing the planet
- Foster cooperation through teamwork, develop leadership skills, gain resilience
- Achieve a heightened understanding of where their food comes from
- Learn about food preparation, develop practical cooking skills utilising ingredients they have produced
- Learn about sharing space, food, knowledge and ideas
- Learn what is truly local food
- Find out what's in season, and why eating foods that are in seasons is good for us and the environment

Further resources:

- *www.outdoorclassrooms.com.au*
- *www.edibleschoolgardens.com.au*
- *www.growingcommunities.org.au*
- *www.northeystreetcityfarm.org.au*
- *www.cultivatingcommunity.org.au*
- *www.kitchengardenfoundation.org.au*

Student Worksheet – Community Gardens

Introduction:

The Coal Loader Community Garden is a wonderful tool to showcase what it means to live a sustainable life, to learn how to care for the earth, to learn how to work with others in the garden and finding ways to share the harvest.

In the community garden general activities include planting, watering, weeding, fertilising, mulching, seed saving, tending to the worm farm, composting, pest management and harvesting. The Coal Loader Community Garden Group meets every Wednesday between 10am and 12pm. The Group also look after the Coal Loader chooks, who provide fresh eggs daily.

Plans are underway to develop a food forest on the Coal Loader platform in the future. A food forest uses permaculture principals and is where the gardener creates a forest-like garden where all the plants are productive.

Activity:

1. Below is a list of activities undertaken in the Community Garden. Why are they important for the running of the garden?

Gardening Job	Why this is important
Planting	
Crop rotation	
Watering	
Weeding	
Fertilising	
Mulching	
Seed saving	
Worm farm maintenance	
Composting	
Pest management	
Harvesting	

2. List the plants that are ready for harvest at the moment.

3. Find three different gardening styles at the Centre

Garden style	Features	How is it sustainable?
Raised bed		
Vertical Garden		
Keyhole Garden		
Pots		

4. How many different ways can scraps be composted at the Coal Loader?

5. Do you have any of these compost systems at school?

Extension

1. Plan what would go in one of the raised beds at the Coal Loader if your school was in charge of looking after it.
2. Take some photos of the plants at the Coal Loader that are attractive to you and back at school make a collage around a theme of your choice, e.g. living sustainably.
3. Can you plan your own community garden? What rules would you need to set up a garden in your school? Identify who you would need to help. Where would you get money? Help with planning a garden can be found at www.communitygarden.org.au.

Further extension

1. Research how a vertical garden or a hydroponic system works. Sketch your own system.
2. Play the compost gin game.
3. Watch the "Harvest" DVD and take the challenge to start a 1 sq metre veggie bed at home. Take photos of your challenge or write a journal of your gardening endeavours, and send your photos to Council to place on the Facebook page.

Activity 3 – Calculating Food Footprints

Take away activity – for home or back at school

Activity Summary:

Students will participate in a pre-excursion class discussion with their teacher using the information provided. After undertaking Activities 1 and 2, students will complete the food footprints activity. They will be extended to think about their food miles and that of food in the school canteen.

Aim:

To take back to school what has been learnt from the community garden at the Coal Loader, and to encourage students to take ownership of their food footprint and as a class or school green group set up a school kitchen garden.

Materials Needed:

- Each student will need a copy of the Student Worksheet.

Preparation:

Students are advised to first undertake the Growing Food activities at the Coal Loader to gain an understanding of community gardens. Undertaking an ecological footprint either on-line or a Worksheet provided by the Coal Loader is a crucial part of this activity.

Outcomes:

- Understanding of a student's ecological footprint and ways it can be reduced through looking at food.

Further Information:

- Ecological footprint calculator *www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp*
- *The Powerhouse Museum Eco'Tude website http://ecotude.powerhousemuseum.com/*
- *Love Food Hate Waste www.lovefoodhatewaste.nsw.gov.au/*
- Sustainable Seafood *www.sustainableseafood.org.au/*
- Food Diary *www.healthyfoodguide.com.au/resources/weekly-food-diary*

Student Worksheet – Calculating Food Footprints

Introduction

Living sustainably means we all work towards reducing our ecological footprint.

By measuring our ecological footprint, we can each get a measure of the impact we are having on the Earth. Every human activity consumes resources from the planet and produces waste that the planet must then deal with. The Earth has a finite amount of resources and if we are living sustainably we are living within the limits of the Earth's resources. There are different footprint calculators that measure different impacts for example water, carbon and food.

Reducing your food footprint

Tips for reducing your food footprint:

❶ Grow your own food... ❷ Buy food in season... ❸ Eat less processed or packaged food... ❹ Review the transport needed for each food item... ❺ Don't buy too much food... ❻ Compost or use left-over food when cooking... ❼ Eat meat grown on farms that are sustainable... ❽ Use the sustainable fish guide when buying fish... ❾ Avoid bottled water... ❿ Find a local growers market and get to know the farmers.

Activity:

1. Calculate your ecological footprint by using this easy tool *www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp*

2. As a class, conduct a Food Footprint mind map around the ways you can reduce it, using the tips provided and any others tips you may research to think of ways you can reduce your food footprint.
3. As a class take on the challenge to see who can reduce their food footprint the most.

Step 1 – Undertake a food diary for one week. Here's an example but you can make it a journal.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Breakfast							
Snack							
Lunch							
Snack							
Dinner							
Snack							
Exercise (time & type)							
Cups (250ml) of water							

Step 2 – With the results of your food diary, categorise the foods you eat:

- What is the percentage of fresh, organic and processed?

- What other food footprint tips can you incorporate into your food diary to reduce your footprint?

Step 3 – As a class:

- Decide who has the smallest food footprint and congratulate them.

- Calculate who has the largest food footprint and as a class find ways to help implement the tips that would help them to reduce their footprint.

Extension

1. Take three items of food in your diary and research the food miles. This could be done by reading the labels of various food items and finding out where they have come from.
2. A history of the future. Imagine a sustainable future and then describe the changes that would allow this sustainable future to occur. Use these changes to demonstrate all the steps that need to occur in the school community to reach a sustainable future.

Further extension

1. What is the food footprint of one item of food in your canteen?
2. Work with your canteen to look at ways to reduce the overall food footprint of the canteen. Consider issues such as the unsustainable palm oil content of products sold.

8. Balls Head Biodiversity

Background Information

Balls Head Reserve lies within the North Sydney Council area, which is a small highly urbanised area. It is located right next door to the Coal Loader site. Less than 5% of the original vegetation that occurred in the area before European settlement remains, so Balls Head is therefore very precious as an example of the area's original vegetation. It is also vital as habitat for the wildlife that call the Waverton Peninsula home.

Balls Head Reserve is one of North Sydney's most significant areas of urban bushland. The entire area is approximately 10.2 hectares, and is located within 2km of the Sydney CBD. It contains diverse vegetation communities and is home to a range of animals, including migratory birds that use it as a breeding site.

> Biodiversity refers to the astounding array of plant and animal species that interrelate to form the web of all life on earth. It also refers to the ecosystems in which they live. Biodiversity is the building block of life and supports all life on earth. It ensures clean air, water and fertile soils.

The area has changed dramatically over the years. In the early 1920's the area was almost totally denuded of its natural vegetation cover. Whether through wharf construction, wood gathering or fire, the headland was largely cleared of vegetation.

However, in 1926 a section of Balls Head became a public park after the local community and North Sydney Council urged the State Government to save it from development. In the 1930s, huge numbers of trees were planted under the leadership of early environmental campaigners like Walter Froggatt and National Trust founder Annie Wyatt. They helped the naturally regenerating headland grow into a forest again. Now, Balls Head Reserve consists of four distinct vegetation communities that provide a snapshot of the headland's original bushland diversity. The remnant vegetation communities include Sandstone Foreshore Scrub, Kunzea Scrub, Angophora Foreshore Forest and Disclimax Sandstone Scrub.

The canopy of Balls Head Reserve is typical of bushland throughout Sydney's North Shore. It is characterised by an Open Forest/Woodland form that is dominated by two main species of trees *Angophora costata* (Sydney Red Gum) and *Corymbia gummifera* (Red Bloodwood). The headland also supports three lower-growing scrub communities, dominated by a diverse range of shrubs, such as *Kunzea ambigua* (Tick bush), which thrives on the shallow cliff-top soils that are found in the headland's south-west corner. This shrub attracts numerous birds and colourful soldier beetles when in flower.

Like most urban bushland, the Reserve contains a mix of native and non-native plants. You will notice along the edges of Balls Head Drive and throughout Balls Head Reserve that exotic plants (from overseas) and non-indigenous plants (native to other parts of Australia) have been planted. These plantings are now surrounded by mature and regenerating native vegetation, the remnants of which were preserved in the precious soil seed-bank.

Weeds are a constant threat to the ecological health of urban bushland. Throughout Sydney's northern suburbs many bushland reserves are under threat because of the invasion of plants escaping from backyards and gardens.

Common garden plant species can be spread by birds eating the seed or people tossing garden clippings into the bush. Some exotic species are vigorous invaders, growing faster than native species and usually producing much more seed. Once weeds take over an area, the character of the bushland changes, diminishing habitat for native wildlife and altering the fire regimes that play a fundamental role in bushland ecology.

Weeds are scattered throughout Balls Head Reserve but are particularly found on the edges of the bushland, and along the bush tracks.

Most common annual weed species	**Other common weed species**
Ehrharta sp. (Velt Grass)	*Tradescantia fluminensis* (Wandering Trad)
Briza spp. (Quaking Grass or Shivery Grass)	*Protasparagus aethiopicus* (Asparagus Fern)
Bidens pilosa (Cobblers Pegs)	*Ochna serrulata* (Mickey Mouse Plant)
Sida rhombifolia (Paddy's Lucerne)	*Anredera cordifolia* (Madeira Vine)
Conyza sp. (Fleabane)	*Acetosa sagittata* (Turkey Rhubarb)

To manage the spread of weeds, bush regeneration activities are carried out by North Sydney Council's Bushland Management Team, community volunteers (through the Balls Head Bushcare Group) and professional bush regeneration contractors. Contract bush regenerators have worked in Balls Head Reserve since 1980 and continue to regenerate the bushland between Balls Head Drive link road and the foreshore area.

Bushcare groups work with Council to eradicate noxious weed infestations and regenerate bushland vegetation. The Balls Head Bushcare Group was formed in 1987 and the dedicated members of this group meet twice a month to work in the Reserve.

Both Brushtail and Ringtail Possums inhabit Balls Head Reserve, as do a variety of other native mammal, amphibian, reptile and bird species. The Reserve, and the adjacent Coal Loader site, form part of an important wildlife corridor for native animal species. It provides shelter, food and protection from predators, allows wildlife to move to under-populated areas and access a wider range of breeding partners, thus preventing inbreeding and loss of genetic diversity in a local population.

Unfortunately, introduced pests such as the European Red Fox also call Balls Head home. These voracious hunters have no doubt contributed to the loss of some native species from the Reserve and inhibit others from flourishing. Council undertakes targeted fox control programs twice a year in coordination with other Northern Sydney councils and local National Parks.

A snapshot of fauna found at Balls Head Reserve:

	Common Name	Conservation Status
Mammals	Brown Antechinus	Locally significant
	Common Brushtail Possum	Locally common
	Common Ringtail Possum	Locally common
	Grey-headed Flying-Fox	Nationally threatened
	Eastern Bent-wing Bat	Threatened in NSW
Amphibians	Common Eastern Froglet	Locally common
	Striped Marsh Frog	Locally common
Reptiles	Lesueur's Velvet Gecko	Locally significant
	Southern Leaf-tailed Gecko	Locally common
	Fence Skink	Locally common
	Eastern Water Skink	Locally significant
	Common Garden Skink	Locally common
	Delicate Garden Skink	Locally common
	Eastern Blue-tongued Lizard	Locally significant
Birds*	Australian Brush-turkey	Regionally threatened
	Little Penguin	Regionally threatened
	White-throated Gerygone	Regionally threatened
	Fairy Martin	Regionally threatened
	Rufous Fantail	Migratory species
	Spectacled Monarch	Migratory species
	White-bellied Sea-Eagle	Migratory species
	White-throated Needletail	Migratory species

* Note there are dozens more species of birds found at Balls Head Reserve. See the full species list at *www.northsydney.nsw.gov.au*

Curriculum links:

- ✓ Stage 3 English, Mathematics, Science and History
- ✓ Stage 4 English, Mathematics, Science and History
- ✓ Stage 5 Geography, English, Science and History

See the Curriculum Matrix (Appendix 1) for more detail.

Further Reading:

Watch the Coal Loader Balls Head Biodiversity three minute video which will give your class an overview of what you will find at the Coal Loader.

Other reference material, available at *www.northsydney.nsw.gov.au* includes:

- North Sydney Council Bushland Rehabilitation Plan 2013
- North Sydney Council Balls Head Reserve Species List
- North Sydney Council Natural Area Survey 2010
- North Sydney Council Continuing Bird Survey 2008
- North Sydney Council Bushland Plan of Management 2007

Activity 1 – Balls Head Biodiversity

Activity Summary:

Students will participate in a pre-excursion class discussion with their teacher using the information provided. This will be followed by an excursion to the site where the students will complete an Activity Sheet that encourages students to observe the biodiverse nature of Balls Head Reserve, learning about the key species found on the site. Students will be extended to look at ways to reduce the threats to bushland reserves close to school or where they live.

Aim:

To encourage students to explore Balls Head Reserve to increase their skills of observation and gain an awareness of the impacts occurring to the bushland at Balls Head.

Materials needed:

- Students will need writing materials, a copy of the Student Worksheet, and access to a Balls Head Reserve Species List.

Preparation:

Please liaise with North Sydney Council about walking in Balls Head, and ensure you take a walking map of Balls Head Reserve – *www.northsydney.nsw.gov.au*

Think safety for your walk. Ensure you have sturdy shoes and a first aid kit, sunscreen and water.

This activity uses the technique of attentive listening, where students are asked to sit, observe and connect to the environment for 5 minutes without communicating with anyone. This simple experiential activity encourages students to engage all of their senses when making observations. Connecting to the environment forms the basis for caring, the foundation to living sustainably.

Encourage students to get to know the Reserve over many visits. Get to know the seasons, what birds are visiting and when, and when are the nest boxes active?

Outcomes

- Making observations of the environmental elements with the reserve system, and the effect this had on the flora and fauna that make a home in the Reserve.
- Seeking ways to take actions to managing the impacts threatening Balls Head.
- A greater understanding of what a Council is responsible for regarding managing a bushland reserve.

Student Worksheet – Balls Head Biodiversity

Balls Head Reserve is a beautiful and important bushland area. The main type of vegetation community found there is called Open Forest, and features spectacular Sydney Red Gum and Red Bloodwood trees.

The shorter understorey layer of the Open Forest community features Grevilleas, Wattles, Banksias, and Geebungs, as well as shrubs and grasses. In sheltered gullies you will see species such as Cheese Trees, Sweet Pittosporum, Blueberry Ash, NSW Christmas Bush, and Lilly Pillys.

On the south/western side of the Reserve you can hear the wind blow through the stands of She Oaks and on summer nights the Port Jackson Figs are filled with Grey-Headed Flying-Fox eating the fleshy fruits. Some locally rare orchids can also be found in the Reserve.

Balls Head Reserve is a refuge for native fauna, with Geckoes, Blue-tongued Lizards, Skinks, Common Eastern Froglets, Brushtail and Ringtail Possums, a colony of Eastern Bent-wing Bats, and many species of birds living and visiting the area. Sea birds can be found on the rocks around the foreshore and Parrots, Lorikeets, Kookaburras, Butcher Birds, Wrens and Figbirds can be found in the trees. Keep an eye and ear out for migrant Cuckoos and Koels in summer.

Our bushland is under threat from many urban pressures such as weeds, pollution, dumping and encroachment, urban expansion causing fragmentation, feral animals and changing weather patterns. Plants that become weedy include the native *Pittosporum undulatum*. *Pittosporum* would have been managed by Aboriginal fire regimes. Today this does not happen and the *Pittosporum* has become the dominant species, shading out other native plants and decreasing biodiversity.

Activity:

Activate your senses:

1. Sit for five minutes under a tree. Record what you see and hear. After five minutes, discuss with a friend, or you may like to draw what you see or write a poem).

2. Go on a blind trust walk – take a person by the hand and while they close their eyes lead them to a spot nearby. Guide them so that they may feel the environment, lead them back to the start and get them to open their eyes and ask them to find the spot.
3. Class bushwalk – as a class take one of the walks around Balls Head Reserve, stop along the way and enjoy the views across Sydney Harbour but also take note of the changing ecosystems found along the path often due to a change in the micro-climate, geology and geography.

   See how many plant species you can find in the list below.

	Balls Head Plant Species	**Tick when you've spotted it**
	Angophora costata (Sydney Red Gum)	
	Corymbia gummifera (Red Bloodwood)	
	Pittosporum undulatum (Sweet Pittosporum)	
	*Ficus rubignosa (*Port Jackson Fig)	
	Kunzea ambigua (Tick bush)	
	Other ...	

4. What evidence can you see of animals living in the area? Evidence could include nests in trees, dreys in branches, and holes in termite nests.

5. Note what plants are in flower at this time of the year? If you don't know the name of the plant, give a description or draw it. NB don't pick flowers – not only is it illegal but it prevents the plant from developing seed and replenishing the all-important soil seed-bank.

6. From the table above, which plant has adapted its root system to grow on the cliff faces around the Coal Loader?

7. Get to know our little friend, the Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) who roosts for part of the year in the far coal-loading tunnel. After reading all about microbats on the sign near the tunnel, suggest why it is considered to be special.

Extension

1. Consider what you can do at home to create habitat for native animals in your area e.g. planting a native garden, leaving fallen logs, nest boxes etc.
2. Using a local vegetation guide try to key out one tree, one shrub and one ground cover found at the Coal Loader
3. Look out for coal dust at the end of the tunnel, a remnant of the land use practices of the past. What evidence can you see that vegetation growth has been affected by coal dust?

Activity 2 – School vs Balls Head: a biodiversity comparison

Activity Summary:

Bushland sites such as Balls Head Reserve are likely to contain a greater range of biodiversity than your school. A comparison of the two sites will be used as a basis for what can be done in your school to improve biodiversity.

In this activity, students compare the biodiversity abundance found at their school site to the biodiversity found in an area of Balls Head. Students may then undertake a native plant propagation activity at the Coal Loader which will help increase the biodiversity abundance at their school.

Aim:

To conduct investigations of bushland ecosystems, develop skills used to understand and measure bushland ecology, and to learn practical ways to increase biodiversity abundance.

Materials needed:

- Students will each need writing materials, a clipboard and a copy of the Student Worksheet.
- Materials needed for the Invertebrate Survey tree shake are a white sheet, ice cube trays, tweezers, paint brush (note these can be supplied by North Sydney Council if needed).
- The Australian Museum's Bugwise Invertebrate Guide will help students idenitfy the bugs they catch *www.australianmuseum.net.au/Uploads/Documents/9362/invertebrate_guide.pdf*
- Background information on the Tree Shake activity can be found by reading Lesson 4 of Planet Ark's Earth Alive Manual *www.treeday.planetark.org/documents/doc-378-earth-alive-2012.pdf*
- Additonal downloadable bio data survey sheets can be found *http://australianmuseum.net.au/Bugwise*

Preparation:

Before visiting the Coal Loader, conduct a biodiversity survey of your chosen school site. Discuss the results as a class and bring your completed worksheets and class results along to the Coal Loader with you.

A booking application to visit Balls Head needs to be made through Council's Customer Service section. Certain conditions, such as keeping to the formal walking track system and not venturing 'off track' must be observed by students. As in a National Park, all flora and fauna are protected in Council's bushland reserves and it is an offence to damage these sensitive environments.

Teachers are advised to bring a map of the Balls Head walking trails – downloadable from *www.northsydney.nsw.gov.au*

Outcomes:

- Develop skills needed by scientists to understand biodiversity health.
- Learn measuring skills that can be used to better manage our local biodiversity.
- Understand the role the community nursery has with bushland management in North Sydney

Student Worksheet – School vs Balls Head: a biodiversity comparison

Background Information:

Biodiversity refers to the astounding array of plant and animal species that interrelate to form the web of all life on earth. It also refers to the ecosystems in which they live. Biodiversity is the building block of life and supports all life on earth. It ensures clean air, water and fertile soils.

Observe the chosen study area at your school and complete the following tables. Bring your worksheet to Balls Head to complete the worksheet.

1. Biodiversity at School

SCHOOL	None	Some	Lots
Trees			
Shrubs			
Ground cover			
Leaf litter/mulch			
Rocks			
Logs or fallen branches			
Tree hollows/nest boxes			
Flowering plants			
Water			

2. Biodiversity at Balls Head Reserve

BALLS HEAD	None	Some	Lots
Trees			
Shrubs			
Ground cover			
Leaf litter/mulch			
Rocks			
Logs or fallen branches			
Tree hollows/nest boxes			
Flowering plants			
Water			

3. Invertebrate Survey

As a class, conduct a tree shake activity at school and then at the Coal Loader to see how biodiverse the two sites are.

Method: Students hold a white sheet under a branch while another person shakes the branch. The invertebrates will be dislodged and fall onto the sheet. They can then be sorted into a collection container and counted.

Number of Invertebrates found	School	Balls Head Reserve
Butterfly		
Moth		
Dragonfly		
Centipede		
Millipede		
Pill Millipede		
Beetle Pupa		
Beetle		
Slater		
Bug		
Bush Cockroach		
Slug		
Ant		
Spider		
Grasshopper		
Other		

After you have completed the surveys, discuss:

- Is the biodiversity found at Balls Head similar to what was found at school?
- Did you find the same number of animals at both sites?
- Which site had the greatest amount of biodiversity?
- What might explain the difference?
- What impact would building houses on Balls Head have on the biodiversity of the area?

Extension – Plant propagation

While at the Coal Loader visit the Community Nursery. Staff and community volunteers work here to propagate local native plants that are used to help rehabilitate local bushland and parkland, help residents provide habitat in their own backyards, and for green corridor projects. You can work with the Coal Loader staff to propagate your own native plant to take back to school to help improve its biodiversity.

Observe the nursery layout. What are the steps for a seed or cutting to become a plant that can be used in Bushcare projects?

	What happens here?	Where does water come from?
Step 1 – Potting table		
Step 2 – Misting house		
Step 3 – Greenhouse		
Step 4 – Hardening off bench		

Work with the Bushcare Nursery Coordinator to propagate a native plant to take back to your own school.

1. What is the name of the native plant that you have propagated to plant at school?

2. Does it need to be planted in sun/shade?

3. What type of plant is it?

4. How tall will it grow?

Activity 3 – Building Biodiversity Back at School

Take away activity – for home or back at school

Activity summary

This activity brings the focus back to your school and what can be done to improve biodiversity on your school grounds. After visiting Balls Head and the Coal Loader, and discussions with the teacher, students will study the original ecological communities on their school grounds and consider how they can improve biodiversity at school, and how they can link with local Bushcare or Landcare groups for assistance.

Aim:

To use the knowledge of Balls Head biodiversity to assist with understanding and improving the biodiversity values back at school. To incorporate biodiversity lessons from the Coal Loader into environment units undertaken throughout the year at school.

Materials needed:

- Map of the school with existing vegetation identified and information about local Bushcare or Landcare groups. Your own local Council will be able to assist with this information.

Preparation

Students are advised to first undertake the Balls Head Biodiversity activities at the Centre to gain an understanding of biodiversity at Balls Head Reserve.

Outcomes

- Students will gain an understanding of the ecological community that once covered their school grounds.
- Students may be inspired to get involved locally to work on improving the biodiversity in their backyard, in the school grounds or at a local reserve.

Student Worksheet – Building Biodiversity Back at School

Bringing Back the Bush

Many school grounds have had some, or sometimes all, of their original bushland removed, but all schools can increase the biodiversity of their grounds. Biodiversity can be increased by planting trees, removing weeds, growing plants in pots or growing up walls. Improving vegetation cover at school will provide homes for native wildlife, cool your school, and make it more beautiful too.

For those schools with remnant bush on their grounds, starting a Bushcare group at school is a great way to regenerate your bushland and improve the local environment. If your school is adjacent to a council reserve, your Council's Bushcare groups could help.

Most councils provide training and equipment for Bushcare volunteers. If you are doing regeneration work at your school, get in touch with your Council to find out how they can help you, including finding out what weeds you should be targeting, how to control them effectively (and without causing damage to the surrounding environment) and what native plants occur naturally in your area.

Activity:

1. Find out from your local council what ecological community once grew at your school. Your local Catchment Management Authority may have vegetation maps also.

> An ecological community is a unique group of plants, animals and micro-organisms that occupy, and interact within, the same geographical space. Each ecological community is adapted to occur in a particular habitat type, usually determined by factors such as soil type, position in the landscape, climate and water availability.

The ecological community that once grew on our school grounds was:

_____

The main species in this community are:

_____

2. Using the map of your school identify where biodiversity values could be improved.
   a. Map out the existing vegetation. Is it healthy?
   b Where are the remnant trees and other plants? Could they be better managed?
   c. Where can bushland be extended? e.g. along a school oval
   d. Where could you help provide homes for native animals at your school? Eg. Nest boxes, lizard lounges, protective shrubs for birds
3. Can you improve or create a vegetation corridor through your school. Why are vegetation corridors important?
4. Create an action plan to improve your school's biodiversity. Discuss ways that biodiversity could be improved at your school by students, staff and parents. Collate your ideas into a Biodiversity Action Plan. Consider:
   - WHAT – what are you going to do?
   - WHERE – where in the school will you do it?
   - WHEN – time frame
   - WHO – class, parent helpers, teachers, council?
   - WHY – what is the purpose?
   - HOW – steps involved?

Extension

5. Find out information about your closest Bushcare or Landcare group.

My local group is	
Where is the group located?	
When does it meet	
They are working on	

6. No matter where you live, you can encourage native wildlife into your backyard or balcony. What are two ways that you could encourage biodiversity at your home?

   1.

   2.

Appendix 1 – Curriculum Matrix

Appendix 1: Curriculum Matrix – Stage 3

Themes	1. History of the site			2. Aboriginal heritage			3. Sustainable retrofit			4. Alternative energy			5. Water conservation, recycling and reuse			6. Waste minimisation			7. Growing food			8. Biodiversity of Balls Head		
Stage 3 Activity Matrix	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Stage 3 English																								
EN3-2A Objective A Writing and representing																								
Compose texts that include sustained and effective use of persuasive devices, eg texts dealing with environmental issues	x							x		x								x					x	x
EN3-8D Objective D Expressing themselves																								
Expressing themselves - Consider how texts about local events and issues in the media are presented to engage the reader or viewer	x		x					x		x								x						
Stage 3 Mathematics																								
Number and Algebra; Fractions and Decimals 2																								
Interpret and explain the use of fractions, decimals and percentages in everyday contexts, eg percentage of trees in the local area that are native to Australia (Communicating, Reasoning)		x									x	x			x				x				x	
Statistics and Probability Data 1																								
Collect categorical and numerical data through observation or by conducting surveys, eg observe the number of a particular type of insect in one square metre of the playground over time									x			x		x	x				x	x		x		
Recognise that line graphs are used to represent data that demonstrates continuous change, eg hourly temperature (Communicating)			x									x			x				x					
Stage 3 Science																								
SkillsWorking Technologically																								
Developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations							x		x	x			x						x	x				

Appendix 1: Curriculum Matrix – Stage 3 *continued*

Knowledge and Understanding – Natural Environment Physical World																							
Describe how scientific knowledge can be used to inform personal and community decisions about the use and conservation of sustainable sources of energy							X		X				X								X			
Knowledge and Understanding – Natural Environment Living World																								
Observe and describe the structural features of some native Australian animals and plants					X	X																X	X	X
Use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things																		X	X		X	X	X	X
Knowledge and Understanding – Made Environment Products																								
Research the reasons for and the benefits of using solid, liquid and gaseous fuels for heating											X	X												
Knowledge and Understanding – Natural and Made Environment Material World																								
Research the environmental impact of an everyday product from its production through to its use and disposal, eg a PET bottle, a car or newspaper							X	X							X	X	X							
Knowledge and Understanding – Made Environment Products																								
Redesign a product to respond to a specific social or environmental consequence, eg redesign the packaging of a food product to reduce garbage							X	X	X						X	X								
Stage 3 History																								
The Australian Colonies				X																				
Discuss the impact of settlement on local Aboriginal peoples and the environment																					X			
As of November 2012 the following KLA's were still in draft																								
Geography – still in draft																					X	X	X	
TAS – still in draft																		X	X	X				
Creative Arts – still in draft				X																				

Appendix 1: Curriculum Matrix – Stage 4

Themes	1. History of the site			2. Aboriginal heritage			3. Sustainable retrofit			4. Alternative energy			5. Water conservation, recycling and reuse			6. Waste minimisation			7. Growing food			8. Biodiversity of Balls Head		
Stage 4 Activity Matrix	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Stage 4 Geography – still in draft																								
Year 7 Water in the World																				x	x			
Stage 4 English																								
EN4-5C Objective C Outcome 5																								
Express considered points of view and arguments on areas such as sustainability and the environment accurately and coherently in speech or writing with confidence and fluency	x				x			x		x								x			x			x
EN4-7D Objective D Outcome 7																								
Analyse how combinations of words, sound and images can create particular perspectives of the same event or issue such as environmental sustainability	x					x				x												x		
Stage 4 Mathematics																								
Number and Algebra Fractions, Decimals and Percentages																								
Interpret and use statements about the environment involving percentages, eg energy use for different purposes, such as lighting (Problem Solving)		x									x	x			x								x	
Statistics and Probability Data Collection and Representation																								
Analyse a variety of data displays used in the print or digital media and in other school subject areas, eg share-movement graphs, data displays showing sustainable food production (Problem Solving)		x	x									x			x			x	x	x	x			

Appendix 1: Curriculum Matrix – Stage 4 *continued*

Stage 4 Science																							
Knowledge and Understanding Physical World																							
Debate intergenerational implications of the use of non-renewable energy resources								x		x								x			x			
Knowledge and Understanding Earth and Space																							
Investigate some strategies used by people to conserve and manage non-renewable resources, eg recycling and the alternative use of natural and made resources							x	x	x	x		x		x	x	x	x	x			x			x
Demonstrate how scientific knowledge of the water cycle has influenced the development of household, industrial and agricultural water management practices												x		x	x					x				
Knowledge and Understanding Chemical World																								
Investigate the application of a physical separation technique used in everyday situations or industrial processes, eg water filtering, sorting waste materials														x	x									
Stage 4 History																							
Depth Study 1: Investigating the Ancient Past																							
Describe an Australian site which has preserved the heritage of Aboriginal and Torres Strait Islander peoples				x	x	x															x		
Depth Study 6: Expanding Contacts																							
Describe the main features of the chosen Indigenous culture prior to colonisation				x	x																		
As of November 2012 the following KLA's were still in draft																							
Geography – still in draft																			x				
TAS – still in draft																						x	
Creative Arts – still in draft				x																			

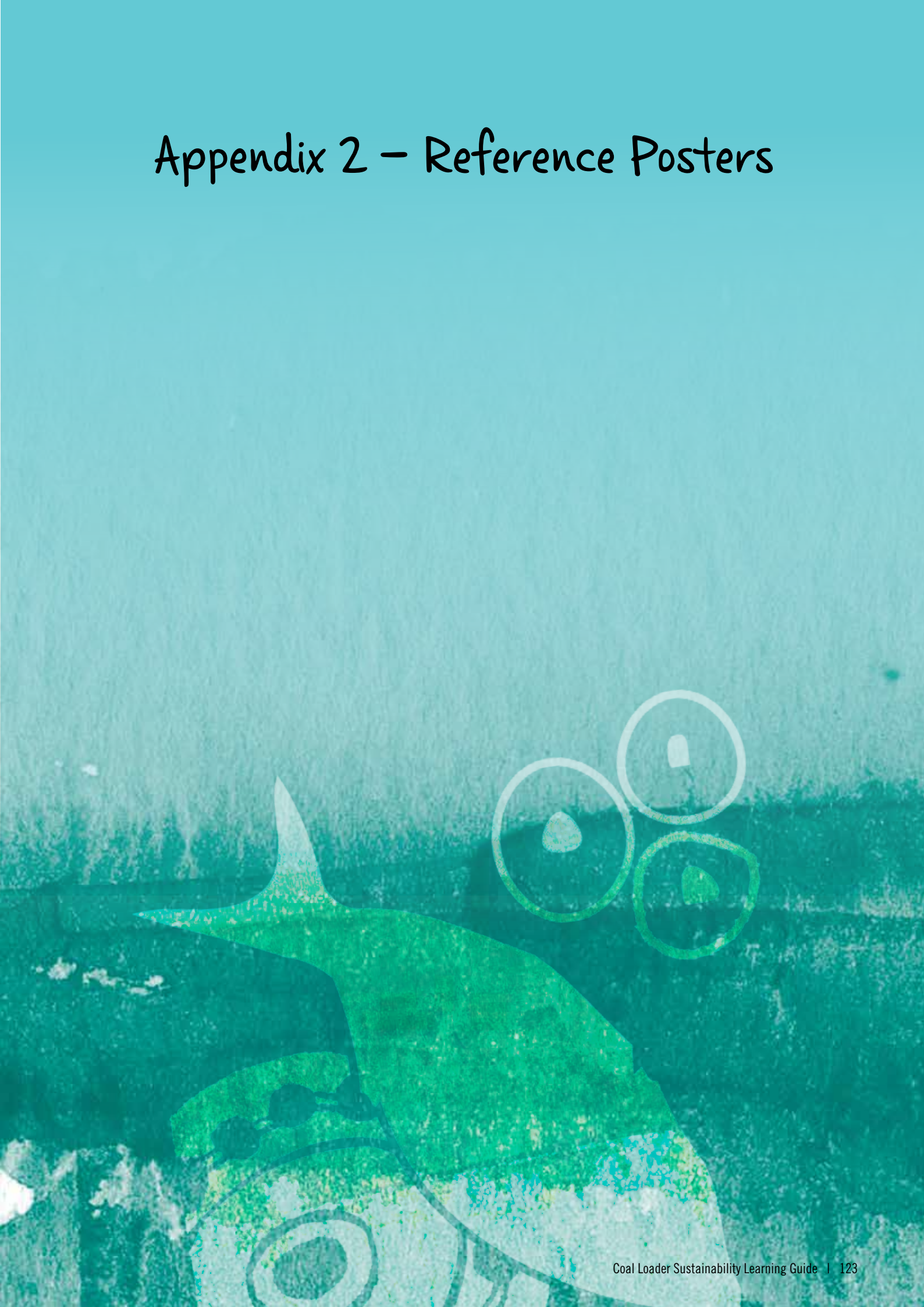
Appendix 1: Curriculum Matrix – Stage 5

Themes	1. History of the site			2. Aboriginal heritage			3. Sustainable retrofit			4. Alternative energy			5. Water conservation, recycling and reuse			6. Waste minimisation			7. Growing food			8. Biodiversity of Balls Head		
Stage 5 Activity Matrix	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Stage 5 Geography – still in draft																								
Year 10 Environmental Change and Management																						x	x	x
Stage 5 English																								
EN5-5C Objective C Outcome 5																								
Formulate, develop and express their own ideas and beliefs creatively, thoughtfully, positively and confidently on issues such as sustainable patterns of living	x					x			x	x								x			x			x
EN5-7D Objective D Outcome 7																								
Use and analyse increasingly complex language features to present a viewpoint on issues such as environmental and social sustainability	x									x							x	x			x			
Stage 5.1 Mathematics																								
Statistics and Probability Single Variable Data Analysis																								
Interpret media reports and advertising that quote various statistics, eg environmental data		x	x								x													
Stage 5 Science																								
Knowledge and Understanding Physical World																								
Discuss, using examples, how the values and needs of contemporary society can influence the focus of scientific research in the area of increasing efficiency of the use of electricity by individuals and society							x		x	x														
Discuss viewpoints and choices that need to be considered in making decisions about the use of non-renewable energy resources										x						x	x							

Appendix 1: Curriculum Matrix – Stage 5 *continued*

Knowledge and Understanding Earth and Space																								
Evaluate scientific evidence of some current issues affecting society that are the result of human activity on global systems, eg the greenhouse effect, ozone layer depletion, effect of climate change on sea levels, long-term effects of waste management and loss of biodiversity									X	X			X	X	X	X	X	X				X	X	X
Knowledge and Understanding Living World																								
Assess ways that Aboriginal and Torres Strait Islander peoples' cultural practices and knowledge of the environment contribute to the conservation and management of sustainable ecosystems				X	X	X																		
Stage 5 History																								
Depth Study 5: The Globalising World																								
Identify major threats to the natural environment					X													X		X		X	X	X
Describe the response to key environmental issues in Australian agriculture, eg the back-to-the-land movement, organic farming and permaculture																				X	X			
As of November 2012 the following KLA's were still in draft																								
Geography – still in draft																								
TAS – still in draft																								
Creative Arts – still in draft																			X					

Appendix 2 – Reference Posters



Return to Community

A History of Balls Head & its Coal Loader

Aboriginal engraving at Balls Head c.1900. North Sydney Heritage Centre/Stanton Library

Balls Head is a special place where many pathways of history intersect. It has been a site of spiritual significance, repose and industry. Most recently, it has become a place for people to explore sustainable development and options for the future of our environment.

The Cammeraygal people met here for thousands of years. They fished the abundant waters around the headland, sheltered in its sandstone overhangs and carved an image of a marine creature – possibly a whale - on a rock platform with views up and down the Harbour.

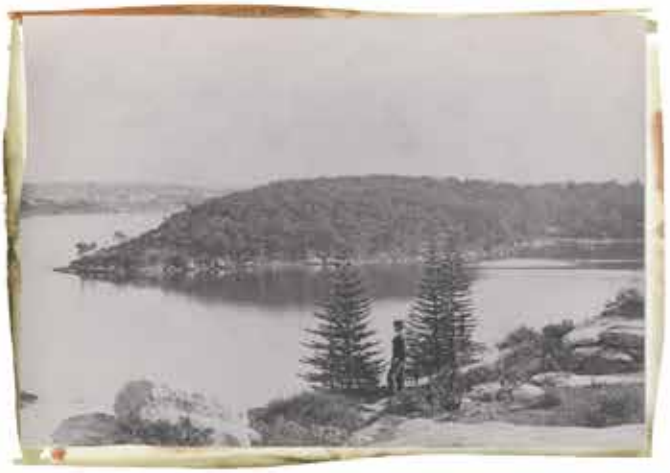
Thirty years after the arrival of Europeans in 1788, the headland and more than 200 hectares behind was simply given away to merchant Edward Wollstonecraft. The land later passed to his partner Alexander Berry.

Steamer docked for taking on coal, 1940s. Photograph by Robert Donnell. North Sydney Heritage Centre / Stanton Library

There was some development on the eastern side of the peninsular through the 1800s but much of the headland remained undisturbed. In the early 1900s Henry Lawson, who had lived locally over many years, described its 'tracks and tangle' and its 'peaceful hush'. It was a bush oasis for the working people of North Sydney. Lawson was outraged therefore when the government re-acquired the land and leased it to the Sydney Coal Bunkering Company. His protest in poetry was an early expression of conservationism.

The coal loader that operated from 1921 reflected Sydney's place as a major working port and the importance of coal as the fuel that powered modern industry and transport. Balls Head serviced the needs of steamships until the 1960s for the Wallarah Coal Company and then despatched coal for overseas markets through Coal and Allied until 1992. Its obsolescence, in turn, reflected the decline of waterfront industry on Sydney Harbour.

Environmental Earth Sciences ran their pioneering environmental remediation operations from the site from the mid-1990s. The place was saved as public open space by the State Government in 1997, in accordance with the wishes of local residents. Control was later given to North Sydney Council. After community consultations, it was decided that a Centre for Sustainability using the existing infrastructure would ideally serve the interests of local residents and, indeed, people from beyond North Sydney. Its motto is 'Learn from the Past, Embrace the Future'.



View to Balls Head from McMahons Point 1870s. North Sydney Heritage Centre / Stanton Library

You can find out more about the history of the Coal Loader by following the signs throughout the site or viewing the DVD *Return to Community – A History of Balls Head and its Coal Loader.*

your environmental levy at work

NORTH SYDNEY COUNCIL

Critical Decade for Climate Change

Over many decades thousands of scientists have painted an unambiguous picture: the global climate is changing and humanity is almost surely the primary cause. The risks have never been clearer and the case for action has never been more urgent.

Our Earth's surface is warming rapidly and we can already see social, economic and environmental impacts in Australia. Failing to take sufficient action today means potentially huge risks to our economy, society and way of life into the future. This is the critical decade for action.

Key messages from the bipartisan Independant Climate Commission

1. There is no doubt that the climate is changing. The evidence is overwhelming and clear.

- The atmosphere is warming, the ocean is warming, ice is being lost from glaciers and ice caps and sea levels are rising. The biological world is changing in response to a warming world.
- Global surface temperature is rising fast; the last decade was the hottest on record.

2. We are already seeing the social, economic and environmental impacts of a changing climate.

- With less than 1 degree of warming globally the impacts are already being felt in Australia.
- In the last 50 years the number of record hot days in Australia has more than doubled. This has increased the risk of heatwaves and associated deaths, as well as extreme bush fire weather in South Eastern and South Western Australia.
- Sea level has risen by 20 cm globally since the late 1800s, impacting many coastal communities. Another 20 cm increase by 2050, which is likely at current projections, would more than double the risk of coastal flooding.
- The Great Barrier Reef has suffered from nine bleaching events in the past 31 years. This iconic natural ecosystem, and the economy that depends upon it, face serious risks from climate change.

3. Human activities – the burning of fossil fuels and deforestation – are triggering the changes we are witnessing in the global climate.

- A very large body of observations, experiments, analyses, and physical theory points to increasing greenhouse gases in the atmosphere - with CO^2 being the most important - as the primary cause of the observed warming.
- Increasing CO^2 emissions are primarily produced by the burning of fossil fuels, such as coal and oil, as well as deforestation.
- Natural factors, like changes in the Earth's orbit or solar activity, cannot explain the world-wide warming trend.

4. This is the critical decade. Decisions we make from now to 2020 will determine the severity of climate change our children and grandchildren experience.

- Without strong and rapid action there is a significant risk that climate change will undermine our society's prosperity, health, stability and way of life.
- To minimise this risk, we must decarbonise our economy and move to clean energy sources by 2050. That means carbon emissions must peak within the next few years and then strongly decline.
- The longer we wait to start reducing carbon emissions, the more difficult and costly those reductions become.
- This decade is critical. Unless effective action is taken, the global climate may be so irreversibly altered we will struggle to maintain our present way of life. The choices we make this decade will shape the long-term climate future for our children and grandchildren.

This is the critical decade

Source: Independent Climate Commission, 2011

your environmental levy at work

NORTH SYDNEY COUNCIL

Dirty little household secrets

Tips for a squeaky clean, green & healthy home

Are you waging chemical warfare against household grime? Powerful cleaners that zap household grime can contain ingredients you'd really rather not be breathing, wearing or washing in.

Choice Magazine tested bathroom cleaning products and found that 43% of testers reported skin irritations from a popular mould remover. Nasty cleaning chemicals can be absorbed through our skin or inhaled. Here is a better way that's healthier for you, your family and our planet.

Get your kit together

Bicarbonate Soda
(Baking Soda)
An excellent odour absorber and mild abrasive for cleaning.

Borax
Natural in its concentrated form, borax disinfects, deodorises and inhibits mould growth. Keep out of reach of children as it can be an eye irritant and is toxic if swallowed.

Essential Oils
Essential oils such as mint, eucalyptus, lavender, lemon and tea tree are mostly used for deodorising or scenting cleaners.

Lemon Juice
A mild bleach, deodorant and cleaning agent.

Liquid Soap
Vegetable-based soap sometimes referred to as castile soap.

Washing Soda
(Sodium Carbonate)
Slightly caustic and a great grease cutter. Don't use it on waxed floors (unless you want to remove the wax), fibreglass or aluminium.

White Vinegar
Removes soap scum, grease and mineral deposits and acts as a deodoriser.

Note: these ingredients may be toxic in their concentrated form. When used in small amounts, they are non-toxic.

Our favourite green cleaning recipes

Everyday All Purpose Cleaner

1 cup vinegar
1 cup water

Fill a spray bottle with half water and half white vinegar. Spray on any surface (except wood) and wipe off. Leave for 5 mins on soap scum.

Drain & Toilet Cleaner

1 cup bicarbonate soda
1 cup vinegar

Sprinkle bicarb soda into toilet bowl and pour vinegar on top. Watch it react. Leave it for 10 minutes then clean with a toilet brush and flush. To finish, put a few drops of tea tree oil on a cloth and wipe around the bowl and seat to provide some antibacterial protection.

Mould Remover

Vinegar & Salt

Mix equal parts vinegar and salt into a spray bottle. Spray onto mouldy surface, leave for a few minutes and then wipe off using a soft cloth.

Awesome Liquid Handwash

250ml boiling water
2 tsp glycerol or glycerine
2 tbsp grated Sunlight/natural soap
2 tsp rosewater

Add the grated soap to boiling water, stir and then let sit for about 10 minutes until it melts. Stir in glycerol and rosewater. When mixture is smooth, pour into dispenser bottle. Do this while it is still warm as it will set to a jelly when cold and be difficult to pour.

Gutsy All Purpose Cleaner

1 tsp Borax
½ cup Bicarbonate soda
Vinegar
Eucalyptus oil

Place borax and bicarb soda into a recycled glass jar. Mix in enough vinegar to make a paste. Add a few drops of eucalyptus oil. Wipe mixture onto surfaces to be cleaned and wipe off with a soft cloth. You can make a milder version of this paste without the borax. If the paste dries out over time, simply add more vinegar.

Window Cleaner

1 part vinegar
4 parts water

Mix vinegar and water into a spray bottle. Spray onto windows and wipe off with newspaper, window squeegee or a soft cloth.

Oven Cleaner

Bicarbonate soda
Vinegar

Sprinkle a little bicarbonate soda over oven surface. Spray vinegar over bicarbonate soda (watch it sizzle!) then leave overnight. Wipe off with a cloth dampened with water. Wipe over one final time with vinegar on your cloth.

Squeaky Clean Baby Steps

Do your best to learn about whatever you clean with in your home. Scrutinise the labels on your cleaning products and then go on a product diet. Phase out harmful commercial cleaning products and replace them with healthy alternatives.

A note on commercial cleaning products

There are many environmentally responsible cleaning products on the market. If purchasing commercial cleaning products, look out for these qualities:

- Phosphate free
- Low sodium < 20g per wash
- Plant-based ingredients
- Synthetic fragrance free
- Petrochemical free
- Microfibre cloths

your environmental levy at work

NORTH SYDNEY COUNCIL

Compost

Nature's gift to the garden!

Your garden will love you

Compost strengthens plant's immune systems, allows soils to breathe and ensures plants are healthy and vibrant. It also increases the water holding capacity of the soil and fertilises our plants.

4 easy steps to great compost

1. Choose your site

The ideal location for compost has good drainage, is well shaded in summer, and not too cold in winter.

2. Know what to compost

Compost is a mix of different materials:

- fresh kitchen or garden organics such as fruit and vegetable peelings, grass clippings, green leaves, weeds and manure, which are rich in nitrogen
- brown garden organics such as dry leaves, woody twigs, paper and straw, which are low in nitrogen
- water – compost needs to be moist
- soil or completed compost to introduce vital micro-organisms

3. Use the layering recipe

Building compost is like making a layer cake. Start with a thick layer (15cm) of twigs or coarse mulch at the base for drainage. Add a thin layer of kitchen organics and green garden organics, then cover with a layer of finished compost or manure. Finish with a layer of brown garden organics. Moisten, then continue building the heap with alternate layers of green and brown organics.

4. Maintain your compost

Adding air is vital to keep your compost fresh. Turn compost at least once a week with a garden fork or cork-screw compost turner, or place garden stakes or pipes through the heap to allow air in.

Keep your compost moist but not wet. If compost gets too wet, simply add dry organics and turn it.

Hints:

Keep a bucket with a well-sealed lid in the kitchen to collect food scraps.
Use the lawn mower to chop up coarse garden prunings.

Why compost?

- Reduce the amount of organic waste sent to landfill in everyday rubbish. Approximately 60% of Australia's 'rubbish' is food waste
- Reduce the potential for landfills to create liquid 'leachate' which can pollute our streams, oceans and underground water
- Reduce the production of methane, a powerful greenhouse gas

What you can compost

Anything that was once a plant or animal can be composted, including fruit and vegetable peelings, newspaper, grass clippings, weeds, tea leaves, coffee grounds, egg shells, old potting mix, dead flowers, tea bags, human and animal hair, even the vaccum bag contents! Experienced composters can even compost meat and dairy products.

Compost Q & A

"Help, I have smelly compost!"

Causes of smelly compost include too much moisture, not enough air, or too much food waste and not enough dry ingredients. Solutions to smelly compost include:

- Mix in dry leaves or garden mulch
- Turn the compost to aerate and let more air in
- Combine food waste with sawdust or shredded newspaper before adding to the heap
- Give your compost heap a 'floor' of twigs to ensure good drainage
- Add garden lime, dolomite or woodfire ash to reduce acidity of the heap and counteract too much food waste

"I have unwelcome visitors in my compost!"

Ants, cockroaches, mice or rats can sometimes make your compost their home. Solutions include:

- Ensure food in the heap is covered with a layer of green organics – then cover heap with underfelt, hessian or thick cardboard
- Turn the heap regularly to discourage ants and cockroaches
- Place fine wire under the compost bin or heap to keep out mice and rats
- Avoid placing dairy products, meat and seafood in the compost

"My compost is slow to mature"

A slow composting system can mean that the compost is not hot enough, or there may not be enough air or water. Solutions include:

- Move the compost to a warmer location
- Add nitrogen-rich material, such as kitchen organics or green garden organics to speed up the composting process
- Turn the heap and add water
- Cover the compost with insulating material in winter if it gets too cold

Did you know you can pick up a compost bin at cost price from North Sydney Council!

your environmental levy at work

NORTH SYDNEY COUNCIL

Worm farming

Why worm farm?

- Recycle food scraps into soil-like worm castings – great for the garden
- Make liquid fertiliser from diluted liquid or 'worm tea'
- Worms can be grown in worm farms, or in beds or troughs in the ground
- Worm farms can be kept outside, inside, on the balcony or in the garage
- They are ideal for apartments

Handy hint – red or tiger worms are the most commonly used worms. Generally sold by the thousand, worms can be bought direct from commercial worm growers or through a local nursery or hardware store.

Worm Farming Q & A

"My worm farm smells!"
Your worm farm can start to smell if the worms are being fed more than they can eat or if the worm farm is too wet. Start by feeding the worms slowly and gradually build up. Make sure that your worm farm is well drained. If it is too wet, the worms may drown.

"My worm farm has vinegar flies"
Add a handful of lime.

"My worms won't multiply!"
Worms need the right conditions in order to breed. Keep worm farms well drained, cool (ideally 18-25°C), wet, and away from direct light. Limit acid forming foods such as fruits, grains and sugary foods as worms will not breed well in acidic conditions. Add a sprinkling of wood ash, dolomite or lime every few weeks to prevent the worm farm from becoming too acid.

"I have ants and cockroaches"
Keep a lid on your worm farm or keep a hessian sack or underfelt cover over the food scraps. This will discourage unwelcome visitors. If your worm farm sits on legs, place each leg in a bowl of water.

"I'm going on holiday"
Add shredded paper to the worm farm before you go.

Hint: Worms find smaller scraps easier & quicker to digest. Blend food scraps with water before feeding worms.

4 easy steps to successful worm farming

1. Choose your site

Worms don't like to get too hot, so make sure your worm farm or bed is in a well shaded spot.

2. Collect worm food

Worms like to eat food wastes like vegetable and fruit peelings, pulp from the juicer, tea bags, crushed egg shells and bread. They also like small amounts of soiled paper and cardboard (such as shredded egg cartons). Worms least favourite foods include dairy products, butter and cheese, meat, fish, fat and bones, very oily foods, citrus, onion and garlic.

3. Set up your worm farm

You can buy a worm farm, build one yourself with boxes, or make a worm bed in your garden.

Typical dimensions for a worm box are 30cm deep, 60cm wide and 90cm long. The box must have holes in the base to allow air in and for good drainage and a lid or cover of hessian or underfelt. Styrofoam fruit boxes are ideal. A tray underneath will catch liquid.

Make a bedding layer 10-15cm deep using a combination of finished compost, leaves and shredded paper. Soak the bedding layer before adding 1000-2000 worms. Spread the worms out gently on the surface and allow them to burrow down into the bedding.

Start adding your kitchen waste regularly in small amounts. Simply place the food waste in the box and cover it with bedding material or a handful of soil or compost. Don't add too much at once. Give the worms more food only when they have eaten most of their previous meal.

4. Harvesting worms

Harvest the worm castings/compost (vermicompost) by moving it all to one side of the bin. Add fresh bedding to the empty side.

Many of the worms will migrate to the fresh bedding in a few days.

The valuable worm castings can then be taken out and used.

Worms need:

- Moisture as they breathe through their skins and need to keep moist
- Drainage as they can suffocate if it gets too wet
- Shade as worms don't like direct light. Shade also discourages flies and other pests
- Alkaline surroundings. Avoid too many acidic foods such as citrus peels or onions

your environmental levy at work

NORTH SYDNEY COUNCIL

Powered By The Sun

Did you see what was on the roof?

Council has installed solar power (photovoltaic panels) on this building to generate electricity directly from the sun.

Solar power is the cleanest and most viable form of renewable energy available. By using photovoltaic (PV) panels to convert sunlight into electricity, we are protecting the environment and saving money.

The 16 PV panels at the Centre produce 2.96 kilowatts of power at their peak. They have a long life that will produce over 3000kWh of electricity every year. This will reduce greenhouse gas emissions from the Centre by 2.7 tonnes annually.

How does PV work?

Photovoltaic panels are made of semiconductors such as silicon. When light strikes the cell, energy from the sun is absorbed. The energy allows electrons to flow freely as a current, and by placing metal contacts on the top and bottom of the cell, the current is made available for use as electricity. Cells are connected together and covered by a glass sheet for protection, thus forming a solar panel.

Power generation varies throughout the day with the majority of power generated at the peak of the day. The solar panels work in all weather but work best on clear, cool days.

Designing with daylight

The Caretakers Cottage has a passive lighting system that collects sunlight using a light tube lined with highly reflective material. The light tube directs sunlight into the building, lights up a work area, and helps us reduce energy consumption. Our light tube has a dimmer so we can completely adjust daylight levels in the room with the touch of a switch.

your environmental levy at work

NORTH SYDNEY COUNCIL

Can you find our rainwater tanks?

The Centre for Sustainability saves thousands of litres of drinking water each year by harvesting rainwater to use on the site.

Rainwater is collected, treated and reused for toilet flushing. This saves drinking water, reduces stormwater flow and pollutant loads entering Sydney Harbour.

How is the water collected?

Rain that falls on the roofs of the buildings is funnelled along the gutters and into downpipes connected to the 50,000 litre concrete tank, located underneath the grassed area at Jacaranda Square. First flush devices and leaf guards reduce the amount of sediment and other materials that pollute the water from entering the tank. Insect screens cover all tank openings to prevent mosquitoes entering and breeding in the tank.

A small pump provides pressure to move the water to flush the toilets. A control valve automatically switches to mains water when the tank is empty. When the tank is full, water overflows to the wetlands on the lower level of the site.

A smaller, above ground rainwater tank, at the southern end of the Caretakers Cottage, provides water to irrigate the community garden.

You can do this too!

You can save water (and your hip pocket) by installing water efficient appliances and a rainwater tank; reducing hard surfaces; mulching and creating rain gardens to help reduce run off on your property.

your environmental levy at work

NORTH SYDNEY COUNCIL

Keeping our cool in the Caretakers Cottage

Council has maximised the use of natural ventilation for cooling in the Caretakers Cottage, meaning we don't need an air conditioner! Building orientation and sea breezes make North Sydney ideal for maximising natural ventilation.

Wind-assisted turbo ventilators drive airflow through the Cottage (there is one fitted at the top of the raked ceiling in the lounge room), and ceiling-mounted fans increase cool air movement in summer and distribute warm air in winter.

The Caretakers Cottage and Mess Hall balconies are designed to protect the buildings from wind and hot afternoon sun. The trees and the louvres provide shading and help break up the movement of air.

Hot stuff in the Cottage

In winter, the Cottage is warmed by hot water heated by the sun through solar panels on the roof. This water is then circulated through insulated pipes to a series of radiators which warm each room. The system is controlled by a thermostat and is gas boosted overnight and on cloudy days. This hot water also supplies taps in the kitchen and bathroom. All the hot water piping and fittings are insulated to minimise heat loss.

The Cottage also has a solar powered air heating system. The fans pump cool inside air up through a ceiling vent to a roof mounted collector, where the warmth from the sunlight is captured, and returns warm air into the house. This system is well-suited to colder climates and commercial spaces when heat is not required at night or early in the morning.

The ceiling and walls of buildings at the Coal Loader have been insulated using batts comprised of a minimum of 85% recycled polyester content, and we are saving 45-55% of heating and cooling energy.

Have a look to your left at the electronic display that measures how much solar power and recycled water is captured and how much gas, water and energy the building uses.

Trees, glorious trees

When planted around buildings, in parking lots and along streets, trees help keep us cool. They also shade us from the sun, cool the air, filter air pollutants, sequester and store carbon, improve water quality, reduce noise levels and create habitats for animals. Trees are the embodiment of cool!

your environmental levy at work

NORTH SYDNEY COUNCIL

Low impact materials

During renovation and construction of the Coal Loader Center for Sustainability, 80-90% of demolition waste by weight was reused or recycled. Corrugated roofing was reused and bricks from old buildings have been used to build pathways. Plastic and steel was recycled.

We've reused crushed tiles and concrete to make the gravel paths in the Community Nursery, and even repurposed some old North Sydney street signs to make some furniture.

Our electrical equipment is low impact – the lamp in the Meeting Room's projector is energy efficient and can be recycled, the computers in the Resource Room are second hand and refurbished, and all the structural steel has been bolted together so that in the future it can be disassembled for use somewhere else.

Many of the new materials used around the site have a low environmental impact during their life cycle. The carpet is made from natural and recyclable materials, the chairs are the most sustainable on the market, and the paint is 100% Volatile Organic Compound (VOC) free (did you know that VOCs are potentially dangerous chemicals commonly found in household finishes, furnishings and products that can affect interior air quality and cause both short and long-term health problems?!)

Artist anthonywhyte.com
Photo by lunasolfoto.com.au

Reusing and recycling materials decreases the demand on the environment's natural resources, saves energy and water used in making new products, and reduces waste going to landfill.

Didn't the polished antique floorboards come up a treat!

Many things didn't even need replacing. Most of the original plasterboard & horse hair ceilings were retained, and any new ceilings have been made from compressed straw reinforced with galvanised wire to match.

your environmental levy at work

NORTH SYDNEY COUNCIL

Coal loader wetland

A natural water filter

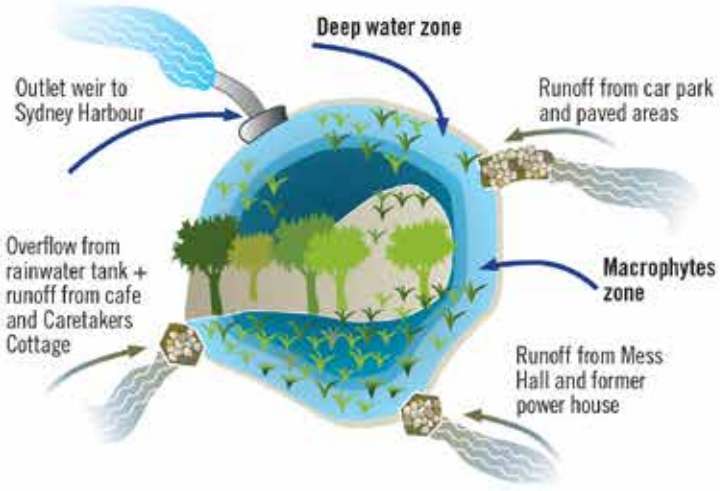
A wetland was constructed by a former caretaker of the site in the footprint of an old oil tank. The wetland acts as a filter, helping clean stormwater runoff from the site before it enters Sydney Harbour.

Increasing development has led to the destruction of many of our natural wetlands. In the past, wetlands were thought to be wastelands which were drained, filled and used for parks, playing fields and housing developments. This meant that stormwater was no longer filtered through the wetlands but instead piped direct to our local waterways through a system of man made concrete drains. This is why our waterways became polluted.

How our wetland works

When it rains, water from building roofs and pathways, plus overflow from the rainwater tank, all flow into the man made wetland. The water flows through a litter basket that strains out larger pieces of litter and debris, then enters a deep pond which spreads and slows the gush of incoming water. This allows some of the debris and sediment in the stormwater to settle into the pond's bottom.

The reeds and rushes planted in the pond's macrophyte zone filter out dissolved pollutants such as nitrates and phosphates, further slow down water flow, and draw floating solids to the bottom, which mixes with leaf litter. The sediment is soon converted to rich humus, much the same way as a compost heap works.



Appropriate water levels are maintained with a weir, through which cleaned water passes before flowing down a pipe and into Sydney Harbour.

Biodiversity in North Sydney

Endangered – Sunshine Wattle *(Acacia terminalis subspecies terminalis)*

What is biodiversity?

Biodiversity, or biological diversity, is the variety of all species on earth. It is the different plants, animals and micro-organisms, their genes, and the terrestrial, marine and freshwater ecosystems of which they are a part[1].

For the last 200 years, Australia has witnessed the largest documented decline of biodiversity of any continent in the world[1].The repercussions of this decline are not yet fully understood, however, it is feasible that the loss of key species such as insects could have a dramatic affect on our way of life. The goods and services we have come to rely on are inevitably derived from the wide variety of organisms on our planet. It is in our own best interests to preserve biodiversity.

Endangered – Magenta Lilly Pilly *(Syzgium paniculatum)*
Photo by P&J Smith

North Sydney's Biodiversity

North Sydney Council is a small, highly urbanised local government area. Only 5% of the original vegetation observed before European settlement remains. It occurs in narrow fragmented reserves that are vulnerable to urban pressures. Council's Bushland Plan of Management addresses these issues and aims to build ecological resilience.

In 2007, ecologists were engaged to survey avian biodiversity and to prioritise areas of habitat critical to the survival of less common native birds in our bushland reserves. Council then undertook a more comprehensive Natural Area Survey in 2010 of all North Sydney's remnant bushland. Several threatened plant and animal species, as well as three endangered ecological communities were identified. This survey established a baseline of North Sydney's natural assets and a measure of their intrinsic value for rehabilitation and recovery.

[1] (Australian Government Department of Sustainability, Environment, Water, Population and Communities)

Main photo:
'Forest Red Gum Foreshore Forest' occurs in Badangi Reserve and is a rare form of the critically endangered 'Sydney Turpentine Ironbark Forest' vegetation community. Photo by *P&J Smith*

your environmental levy at work

NORTH SYDNEY COUNCIL

Natural Area Survey Highlights

Council's 2010 natural area survey uncovered many rare and unusual highlights including: North Sydney's bushland reserves support 12 distinct native vegetation communities, three of which (Coastal Saltmarsh, Swamp Oak Forest on Coastal Floodplains, and Sydney Turpentine-Ironbark Forest) are listed as endangered ecological communities in NSW.

One type of Turpentine-Ironbark Forest, called Forest Red Gum Foreshore Forest is rare and unusual, and is listed as critically endangered under Commonwealth legislation.

Vulnerable – Powerful Owl (*Ninox strenua*). Photo by P&J Smith

Vulnerable – Grey headed Flying-fox (*Pteropus poliocephalus*). Photo by P&J Smith

2 biodiversity hotspots were identified:

1. The Wollstonecraft reserves Berry Island, Bandangi, Gore Cove and Smoothey Park have the most native vegetation communities, with 10 out of the 12 communities found here
2. Tunks Park was identified as the most important reserve for small native birds

190 native birds and animals were recorded in North Sydney, including 4 frog species, 20 reptile species, 148 bird species and 18 mammal species

3 threatened animal species occur regularly in North Sydney – Powerful Owl (*Ninox strenua*), Grey headed Flying-fox (*Pteropus poliocephalus*) and the Eastern Bent-wing Bat (*Miniopterus schreibersii*)

15 species are listed as migratory species under Commonwealth legislation and international migratory species agreements

15 species are significant at a regional level

61 species are significant at a local level

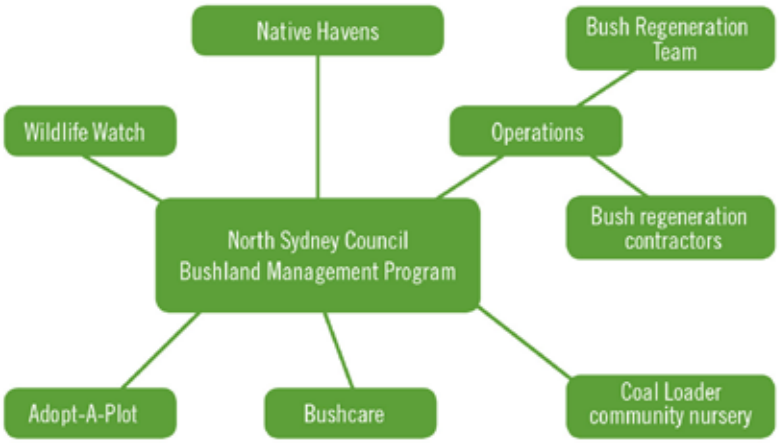
347 plant species were recorded, two of which are nationally threatened – the Sunshine Wattle (*Acacia terminalis* subspecies *terminalis*) and the Magenta Lilly Pilly (*Syzgium paniculatum*)

39 plant species are listed as significant at the Sydney Metropolitan Catchment Management Authority (SMCMA) regional level

Managing Council's Bushland

The biodiversity of North Sydney's natural areas is threatened by a multitude of urban pressures such as habitat fragmentation, invasive weed species, dumping, tree vandalism, feral animals, soil erosion and urban run-off. These impacts are addressed by Council through the Bushland Plan of Management and reserve-specific Bushland Rehabilitation Plans.

A multi-faceted approach...



Councils Bushland Rehabilitation Program features:

Council's Bush Regeneration Team works to:

- Control weed infestation
- Promote biodiversity in bushland reserves
- Implement ecological fire management practices
- Implement pest management
- Control erosion
- Deliver education programs

Bushland Contractors

- Facilitate natural regeneration in bushland
- Control weed infestations
- Promote species diversity and habitat creation
- Control erosion and other 'edge effects'

Bushcare Program

The Bushcare Officer, Bushcare Supervisors and Bushcare Volunteers work eleven sites in nine reserves across the North Sydney LGA. Volunteers regularly donate their skills and time to maintain these bushland areas.

BUSHCARE

Native Havens Program

Participants in the Native Havens program help to create wildlife corridors and habitat zones between North Sydney's bushland reserves by planting native gardens on their own property.

Adopt-a-Plot Program

The Adopt-a-Plot program works on marginal bushland areas adjacent to residential properties through the financial and physical assistance of resident volunteers.

Adopt a Plot

Wildlife Watch Program

Information collected by Wildlife Watch volunteers has contributed to North Sydney's Natural Area Survey, Council's bushland management practices and the Atlas of NSW Wildlife.

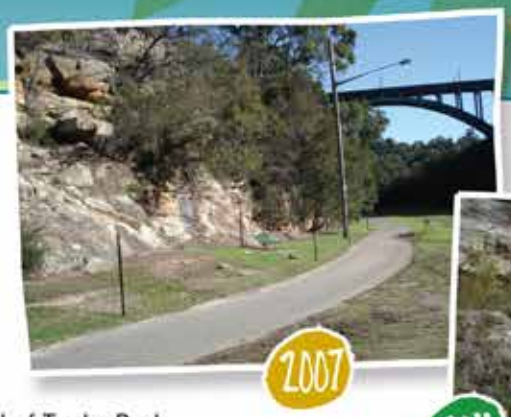
your environmental levy at work

NORTH SYDNEY COUNCIL

Bushcare Regeneration

Tunks East Seed Rain Experiment

After exclusion of mowing and pedestrian traffic, the seed resource from resilient bushland raining over the cliff face has been utilised to further extend the wildife corridor and bushland of Tunks Park.



Successional Revegetation at Primrose Park

The 2008 National Tree Day event was planned and executed to replicate the natural succession that occurs in healthy bushland. Ground and shrub layers were planted to emulate primary succession, whilst canopy species were excluded from the planting. Over time the surrounding native tree species seeded into the site. This is how secondary succession would occur in healthy bushland.

Disturbance + Resilience = Regeneration at Badangi Bushcare Site

When a large Sydney Red Gum fell down in 2006, the disturbance coupled with strong resilience and dedicated Bushcare workers has resulted in excellent regeneration of the Angophora Foreshore Forest vegetation community.

Bushcare Transformations

Tunks Park Success Story

Creation of a formalised track greatly minimised erosion and invasive weeds spreading down this steep site. Dedicated volunteers have helped transform this site to at least 80% native species cover. Rare bush birds have begun utilising the site for nesting.

Transforming our Bushland

A familiar scene from the past. Many bushland sites had heavy weed infestations which have been managed successfully over time. Within North Sydney the next phase of regeneration works is moving towards building structure, habitat and increasing species richness, which aims to achieve greater ecosystem resilience and health.

Berry Creek from Rags to Riches

Infested with weeds, the natural ecosystem processes of Berry Creek were being choked. Community volunteers, Council's bushland team and contractors have worked tirelessly to transform this degraded creekline and raise local awareness about the benefit of healthy ecosystems.

Adopt-a-Plot Program

The concept of Adopt-a-Plot was devised by Cremorne Point Bushcare volunteers to assist the rehabilitation of marginal bushland areas adjacent to private properties of Cremorne Point. This initiative was made possible through an Australian Government 'Envirofund' grant, sponsored by North Sydney Council. Adopt-a-Plot's success exceeded expectations and as a result gained further funding beyond its initial 12 month duration from North Sydney Councils Environmental Levy.

Adopt a Plot has expanded activities to four separate bushland reserves since its inception including Cremorne Reserve, Gore Cove Reserve, Harry Howard Reserve and Badangi Reserve. The program operates in two ways:

Sponsorship of Bush Regeneration Works

This option allows participants to donate an annual fee to cover half the cost of employing a professional bush regenerator to work on the adopted plot. The donation is matched with funding from Council to pay for 4 hours of bush regeneration work each month.

DIY Bush Regeneration

This option allows participants to commit three hours of their time each month to work alongside a professional bush regenerator on their adopted plot of bushland.

O'Briens plot, north eastern corner of Cremorne Reserve, Cremorne Point

Before Regeneration works began, Plot covered in Asthma Weed and Wandering Trad with understorey of Privet.

After primary weeding completed.

After 5 years of continual work on site, regeneration of native groundcovers & grasses, ferns, and shrub layer have established.

Page & Sally's plot, eastern side of Cremorne Reserve, Cremorne Point

Prior to Regeneration works, the plot was covered in Wandering Trad, Asthma Weed and Ehrharta.

After primary weeding completed in upper and central plot areas.

After 6 years of continual work on site, regeneration of native groundcovers & grasses has occurred. Shrub and tree species have established well, note the healthy Sydney Red Gum & Sunshine Wattles.

You can get involved in Adopt-a-Plot by calling Council on 9936 8100.

your environmental levy at work

NORTH SYDNEY COUNCIL

Native Havens

Create Habitat in your backyard

Habitat for native animals in North Sydney has been drastically reduced with urbanisation. Less than 5% of the original 1048ha of bushland remains. Pockets of remnant bushland are separated from each other by urban development, which impedes the movement of native fauna. The Native Havens program helps to alleviate these pressures by increasing native habitat and creating wildlife corridors in private gardens and public open space.

North Sydney residents can help our native fauna by turning their own gardens into native havens. Residents can contact the Bushland Project Officer and arrange a free professional assessment of their property. Council will recommend and then supply free plants, ongoing advice, support, and site visits.

Native Havens participants receive many benefits for their involvement. Small birds, lizards and invertebrates are attracted to native gardens for food and shelter. Native plants require less water than exotics and are generally a low maintenance alternative.

Native plants for a layered garden structure

Groundcover

Mid-Storey

Canopy

Native Haven Gardens in North Sydney

Why not turn your garden into a Native Haven?
Call Council on 9936 8100 or go to
www.northsydney.nsw.gov.au

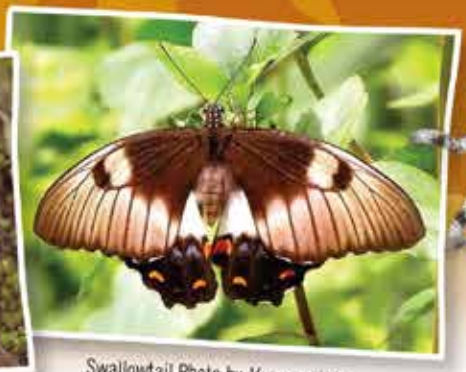
your environmental levy at work

NORTH SYDNEY COUNCIL

Wildlife Watch

Superb Fairy Wren Photo by *Peter Simth*

Eastern Water Skink



Swallowtail Photo by *Vanessa itea*
© Australian Museum

Wildlife Watch is a community based program in which participants regularly record their observations of fauna in and around North Sydney's bushland reserves and report their sightings to Council. This valuable data is collated and added to the NSW National Parks & Wildlife Service Atlas of NSW Wildlife.

North Sydney Council has utilised this information in its Natural Area Survey along with previous observations and ecological studies. This baseline information plays an important role in developing Council's future Bushland Plans of Management.

Ringtail Possum

Striped Marsh Frog

How Wildlife Watch works

Volunteers register with Council to receive a Wildlife Watch Kit, containing:

- a map of North Sydney Council's parkland, bushland reserves and residential areas
- a key which identifies all observation areas
- tools for fauna identification
- a record sheet

Volunteers send their observations to Council on a regular basis and enjoy regular training opportunities with professional ecologists.

You can join more than 300 Wildlife Watch volunteers in North Sydney. Not only can you observe our native fauna in your own time, but you will be helping Council manage our biodiversity for the future. Contact Council on 9936 8100.

your environmental levy at work

NORTH SYDNEY COUNCIL

Regenerating the Bush with Fire

Woody Pear in Smoothey Park after burn.

Dipodium orchid responded well after fire with increased numbers observed

Geebung (*Persoonia laurina*) after a burn

Bushfires are naturally occurring events in the bushland around Sydney. In fact, they are essential to the health and long-term sustainability of our remnant bushland areas. The life-cycles of our native plants and wildlife that inhabit these bushland reserves are well adapted to cope with fire, providing it conforms with particular ecosystem requirements of intensity and length of time between burns.

In the context of North Sydney Council's bushland reserve system, managed (or prescribed) burning is used to meet both ecological objectives of bush regeneration and hazard reduction to adjoining assets – namely residential housing. While the risk of a wildfire damaging property or threatening life is relatively low in North Sydney, Council's Bushland Management Team actively undertakes hazard reduction activities including the creation of fire access management zones, manual fuel reduction, pile burns and broad area burns.

Oat Speargrass was not found in Tunks Park Reserve until after burn occurred.

Extensive flora and fauna species lists are created pre and post fire. Site monitoring is carried out on all managed burns within North Sydney. Monitoring of fire sites is as imperative as it creates baseline data which is compared to future survey results and highlights changes in vegetation structure and species diversity over time.

Sustainability makes good business sense

North Sydney businesses are leading the way in sustainability

North Sydney Council is dedicated to helping local businesses reduce their environmental footprint with the Better Business Partnership (BBP) program for small to medium businesses, and CitySwitch Green Office for commercial office tenants.

Better Business Partnership

Support local businesses with the BBP badge on their shopfront

In partnership with Willoughby and Ku-ring-gai Councils, BBP works with small to medium sized businesses to improve their environmental performance.

Through the free program, businesses save money through reduced energy and water bills, improve their environmental performance, and are promoted and recognised for their actions.

www.betterbusinesspartnership.com.au

BETTER BUSINESS PARTNERSHIP
Success through sustainability

CitySwitch Green Office

Commercial office tenants can influence up to 50% of the total energy use in office buildings

CitySwitch is a national energy efficiency program helping tenants improve energy efficiency and reduce greenhouse gas emissions. CitySwitch focuses on saving electricity within the office (and thereby reducing the CO_2 emissions attributed to climate change) and uses NABERS ratings to measure.

CitySwitch benefits include:

- Proven methodology to improve energy efficiency, with a formal assessment and reporting process
- Positioning as environmental leader, and public recognition of achievements
- Networking opportunities
- Branding and marketing opportunities

www.cityswitch.net.au

CITY SWITCH Green Office

NABERS is a performance-based rating system for existing buildings. Using a 5 star rating scheme to assess energy, water, waste and indoor environment, it's a great tool to assess your building's impact on the environment.

www.nabers.com.au

your environmental levy at work

NORTH SYDNEY COUNCIL

North Sydney Schools Making it Happen!

Sustainability Educators North Sydney (SENS)

Launched in June 2008, the SENS network is a great mix of primary and secondary school students, teachers and parents from 12 schools in the North Sydney local government area.

Recognising we are all teachers and students, no matter our age, the SENS bi-monthly get-togethers are filled with sharing ideas and experiences to support each other in progressing environmental sustainability within our school communities.

GreeNSchools Grant program

Council's GreeNSchools grant program aims to provide local schools with funding to develop and implement environmental projects. For schools, this environment may be within the school itself, the immediate school grounds or be an area of community concern in which the school can be involved.

Some great projects have been supported through the GreeNSchools program ranging from the installation of edible gardens, school ponds and waste management systems, to energy savings, water audits and school conferences.

For more information on the **SENS** network or the **GreeNSchools Grant** program, please visit www.northsydney.nsw.gov.au or, contact Council's Sustainability Education Officer on **9936 8100**.

your environmental levy at work

NORTH SYDNEY COUNCIL

Community Gardens

A place to grow

Community gardening is more than simply growing food and improving your gardening skills. It is also a way to grow a sense of place, community and stability.

Working with your neighbours at a community garden will help you grow new social networks and friendships. You will become part of the growing movement of people across Australia and the world who are producing locally grown, fresh, nutrient rich fruits and vegetables that haven't been transported around the world to arrive at our dinner plates.

Love the sound of growing your own herbs, veggies, fruit and collecting eggs from the chicken coop? Then come along and get growing with us.

your environmental levy at work

NORTH SYDNEY COUNCIL

Community Gardens

Student Teacher; Teacher Student

By working together in a community garden you soon discover that we are all teachers and students, no matter your age or life experience.

Community gardens are great at bringing together all types of people, each with a different story or skill to be shared. As we share our abilities, we can also learn new skills like how to stake a tomato plant; what worm castings are; and how to garden as a group.

In addition to practical gardening skills, community gardens allow us to be creative and explore the natural environment and our place within it.

your environmental levy at work

NORTH SYDNEY COUNCIL

All the world's problems can be solved in a community garden

Community gardens provide healthy fruit and vegetables for the community as well as a local hub for residents to come together with a common purpose, and develop new friendships and connections.

Working together to produce healthy food also fosters communal problem solving and decision making, like how to split this pea and who gets the ripe pumpkin?

Beyond this, community gardens bring a sense of ownership, stewardship and community identity.

your environmental levy at work

NORTH SYDNEY COUNCIL

The Coal Loader Community Garden

One paver at a time

Like all community gardens, The Coal Loader Community Garden has its roots in motivated local residents coming together around a common need and goal to produce local fruit and vegetables sustainably in a community space.

Not only did the site offer beautiful views of the harbour and a local historic story but the former tenant living at the site had built a series of in-ground garden beds and a chicken run. This provided for a great foundation for the garden and its community to grow from early 2007.

In 2008, the garden volunteers secured grant funding through the ABC Open Garden program. This allowed the group to build on the initial garden foundation and expand. A new garden design was established based on permaculture principles.

With volunteer effort and teamwork, a new keyhole garden bed was established along with a series of raised garden beds constructed from recycled hardwood sourced from a local packaging manufacturer.

Since then, the garden and the group of volunteers have continued to share their stories, harvests and love of gardening amongst themselves and the wider North Sydney community.

The Coal Loader Community Garden is run by volunteers on a communal basis. Pop along to a meeting any Wednesday from 10am or for more information, www.northsydney.nsw.gov.au

your environmental levy at work

NORTH SYDNEY COUNCIL

Be a good neighbour protect our harbour

The Dubious Frogfish is living in your neighbourhood.

Let's be honest, Frogfish aren't pretty – they have a face that only a mother could love and even she's too embarrassed to stick around.

There are plenty of Frogfish in Sydney Harbour but fortunately they rarely dare to be seen out in public. They spend their days, hiding from view, in dark and dingy holes.

The Frogfish in Sydney are known as Dubious Frogfish. We have no idea how they earned the 'dubious' title but the 'Frogfish' part of the name is wholly appropriate. When anglers catch a Frogfish and drag this dubious character out in public… it complains loudly by croaking like a frog.

Be a good neighbour and keep our catchments clean. This little guy needs all the help he can get.

SYDNEY COASTAL COUNCILS GROUP

Underwater SYDNEY

NORTH SYDNEY COUNCIL

Is your home climate friendly?

1 Ceiling insulation
- A well insulated house can be up to 10°C warmer in winter and 10°C cooler in summer. As much as 35% of heat loss is through un-insulated ceiling.
- Insulation can cut 40% from home-heating costs.

2 Cooling
- Avoid using air-conditioning – it is the worst form of domestic greenhouse gas pollution.
- Install ceiling fans – they are cheaper to run and cause less greenhouse gas pollution

3 Electronics
- Turn off electrical appliances at the powerpoint when not in use. The average Australian home has many items of equipment on standby power, together generating over 750 kilograms of greenhouse gas and costing around $100 each year!

4 Indoor Heating
- Always put on a jumper before putting on the heater!
- Turning down the thermostat reduces your energy consumption.
- Gas heaters are cheaper to run and produce less greenhouse gas than electric heaters.

5 Lighting
- Flick the switch – turn off unnecessary lights. Simple as that.
- Use compact fluorescent light bulbs – they last 10 times longer and use 80% less energy than regular light globes.
- Use skylights and windows for natural lighting.

6 Insulating Paint
- If you are repainting your home, check out the thermally-insulating paints on the market. They work by cutting heat loss through painted walls and ceilings.

7 Windows
- External shades help reduce heat from direct sunlight and cool your home in summer.
- Internal curtains can trap up to 50% of the heat inside and warm your home in winter.
- Double glazing can reduce heat loss in winter and reduce indoor temperatures by up to 80% in summer.

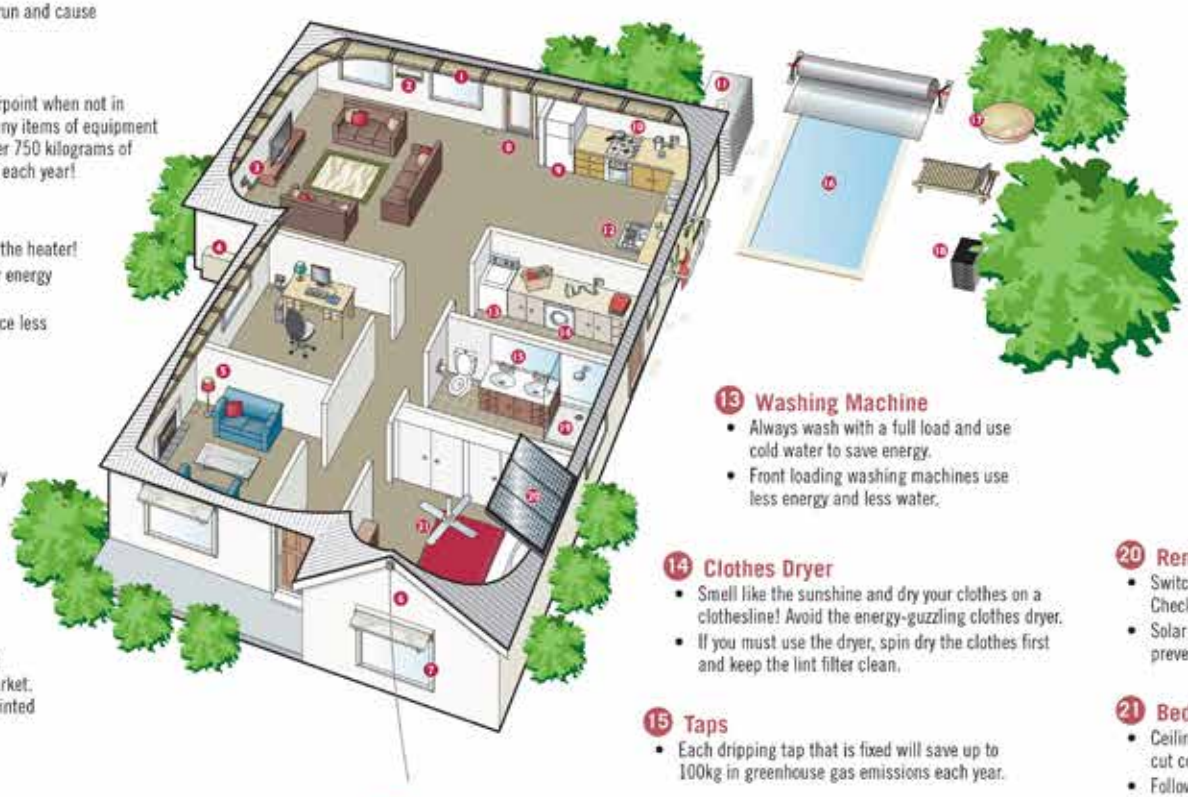
8 Air Flow
- Draughts and unwanted gaps that allow air to leak from the house can increase heating costs up to 25%. Repair door seals, hang heavy curtains and lay rugs on bare floors.

9 Fridge
- Fridges are one of the biggest energy users in the home so buy a 5 star rated fridge.
- Get rid of the drinks fridge – it is costing you up to $200 each year to keep those drinks cold!

10 Cooking
- Gas and microwave cooking generates 30 to 50% of the greenhouse gas generated by traditional electric cooking
- Cook as many organic, unpackaged, unprocessed meals as you can.

11 Rainwater Tank
- Collect filtered rainwater from the roof in tanks and use it for the garden, washing machine, and flushing the toilet.
- Rebates are available for rainwater tanks.

12 Dishwasher
- Only use your dishwasher when you have a full load.
- Choose a dishwasher with top energy and water star-ratings.



13 Washing Machine
- Always wash with a full load and use cold water to save energy.
- Front loading washing machines use less energy and less water.

14 Clothes Dryer
- Smell like the sunshine and dry your clothes on a clothesline! Avoid the energy-guzzling clothes dryer.
- If you must use the dryer, spin dry the clothes first and keep the lint filter clean.

15 Taps
- Each dripping tap that is fixed will save up to 100kg in greenhouse gas emissions each year.

16 Backyard Pool
- Pool filter pumps generate up to 3 tonnes of greenhouse gas emissions per year. Save energy by using the correct size pump and fit a timer switch to ensure it only runs when needed.
- Heat your pool with a solar blanket or solar heating.
- Cover the pool when not in use to prevent water evaporation.

17 On-site Sewage Treatment
- You could potentially disconnect from the sewerage mains if you correctly treat your own waste water.
- On-site treatment systems can kill bacteria with a UV radiation system and the treated water can be used in the garden, for washing or flushing toilets (Council application required).

18 Garden
- Plant local native trees and shrubs. Shade provided by trees can reduce your cooling bill by 15%.
- Grow some of your own food to reduce greenhouse gas emissions associated with food production, transport, storage and retail.
- Compost or worm farm your food waste – 50% of our weekly garbage is food waste that produces methane emissions when it goes to landfill.

19 Bathroom
- Bathrooms account for around 65% of hot water use in the home.
- Turn your hot water thermostat down – water heating accounts for 30% of total household energy use and about 30% of a household's greenhouse gas emissions.
- Installing a AAA-rated water efficient showerhead can save more than 500kg of greenhouse gases each year.
- Take shorter showers or try a navy shower – lather up with the water turned off.
- Convert your hot water system to solar – this will save energy now and money in the long term!

20 Renewable Energy
- Switch to renewable energy sources from wind, sun, water or waste. Check out the government-accredited GreenPower scheme for suppliers.
- Solar hot water systems can save up to 75% on hot water costs and prevent up to 3 tonnes of carbon dioxide emissions each year.

21 Bedrooms
- Ceiling fans can reduce indoor temperatures by 10°C in summer and cut cooling costs by 40%.
- Follow passive solar heating principles and orient bedrooms to the south side of the house and living areas to the north side of the house.

the Coal Loader
CENTRE FOR SUSTAINABILITY
Learn from the Past : Embrace the Future

NORTH SYDNEY COUNCIL

Source: ACF Greenhome, Australian Government Department of Climate Change and Energy Efficiency, NSW Government Department of Environment & Heritage, NABERS. Illustration by K Cutsil/HWT

Top tips for healthy catchments

There are many things you can do to help our catchments stay healthy

1 Plant natives instead of exotics – the native Mauve Flax Lily (*Dianella revoluta*) looks gorgeous but won't spread into bushland like Agapanthus.

2 Use native grasses for your lawn – they need less water than non-native species and do not become weeds in local bushland.

3 Dispose of garden waste responsibly – through composting, mulching or recycling. Dumping weeds and grass clippings is against the law. It spreads weeds throughout the catchment and increases the chances of an algal outbreak through nutrients released from rotting vegetation.

4 Avoid using chemical-based pesticides & fertilisers – especially before rain or next to creeks and waterways. Encourage natural pest controllers like Blue-tongued Lizards and Leaf-tailed Geckos into your garden by providing rocks and logs for them to live in.

5 Use a broom, not a hose – sweep up leaves from paths, paved areas, driveways and guttering. They make great mulch or compost.

6 Clean up after your dog – place dog droppings in the dog litterbins provided or take them home. Dog droppings add unwanted nutrients that change the soil to favour weeds over native plants.

7 Install a rainwater tank – this can store water from your roof to use on your garden and around the home. It also reduces the amount of stormwater going down our drains.

8 Oil and chemical disposal – motor oils and chemicals should be recycled. Spills can be absorbed by sawdust or sand and disposed of in a rubbish bin. Don't put chemicals, oils or paint down the sink or drain.

9 Washing your car – to keep phosphorous-based detergents out of the catchment, park on the grass and use a bucket. Use car-washing products that don't require water, or a car wash that uses recycled water.

10 Keep rubbish out of the drain – rubbish left on our roads ends up in our local waters.

11 Check driveway drainage – ensure it drains towards a vegetated area. That way you will water your plants when it rains and stop precious water loss down stormwater drains.

12 Minimise hard surfaces – cut down on paving, tiling, and concrete. Keep water on your property wherever possible through the use of permeable paving, pebble paths, lawns and garden areas.

13 Prevent root rot – wash soil from boots, tools and tyres to prevent the spread of *Phytopthora cinnamomi*, a fungus that causes root rot.

Image courtesy of NSW Department of Environment and Conservation

the Coal Loader
CENTRE FOR SUSTAINABILITY
Learn from the Past : Embrace the Future

North Sydney Council

What is Council doing?

North Sydney Council is committed to walking the green talk. Sustainability underpins Council's 10 Year Community Strategic Plan and results in many excellent outcomes, such as these:

Feedback

We would like to continually improve and update this resource Guide.

If you have used the Guide and would like to share what worked and what needed improvement, email your feedback to council@northsydney.nsw.gov.au and leave your name and contact details.

Acknowledgements

North Sydney Council acknowledges that when you visit the Coal Loader Centre for Sustainability you are walking on the land of the Cammeraygal people, who were the traditional owners of this land and are part of the oldest surviving continuous culture in the world. The Coal Loader Centre for Sustainability recognises North Sydney's Indigenous heritage and culture.

The authors would like to thank the many schools, universities, local councils, organisations and individuals who have contributed to the development of this Guide, including:

- Aboriginal Heritage Office
- Coal Loader Community Garden Group
- Curriculum consultants from the Department of Education and Communities (DEC)
- Environment teachers from schools in the North Sydney Area
- Ex-students of North Sydney Boys High School
- Macquarie University
- North East Waste Forum
- North Sydney Council Sustainability Educators North Sydney (SENS)
- Permaculture North
- Sydney Water

Special thanks go to SustainMe and EcoLearn consultancies for their work in preparing this Guide.

NORTH SYDNEY COUNCIL

the Coal loader
CENTRE FOR SUSTAINABILITY
Learn from the Past : Embrace the Future