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.