

### **4.3 Theme 3: Threatened coastal and floodplain ecosystems**

#### **4.3.1 Floodplains contains endangered ecological communities.**

Six '*Endangered Ecological Communities*' have been identified to occur in floodplain and/or coastal areas within the Macleay Estuary area<sup>34</sup> - Freshwater Wetlands on Coastal Floodplains; Swamp Sclerophyll Forest on Coastal Floodplains; Subtropical Coastal Floodplain Forest; Swamp Oak Floodplain Forest; River Flat Eucalypt Forest on Coastal Floodplains; and Coastal saltmarsh. Other endangered ecological communities in the Macleay Estuary area are Littoral Rainforest and Lowland Rainforest. The Boyters Lane site offers the opportunity for people to learn about a number of these endangered ecological communities at the one place.

#### **4.3.2 Human actions have direct impacts on wetland areas.**

Floodplain and estuarine wetlands are connected to all parts of our environment, and therefore human activity throughout the whole catchment can have both positive and negative impacts on our floodplain and estuarine wetlands. Agricultural practices such as giving stock access to waterways lead to loss of riparian vegetation, resulting in increased nutrient input to waterways; stream bank instability; erosion; reduced water quality; and the spread and establishment of weeds.<sup>35</sup> Both globally and in Australia wetland and floodplain areas are being drained and starved of water due to poor management practices, threatening the high biodiversity these areas contain.<sup>36</sup>

#### **4.3.3 Noxious weeds are a major threat to estuarine ecosystems.**

The Macleay River Estuary Data Compilation Study, finalized in August 2005, identified 66.9% of the riparian zones of the Macleay and its major tributaries as having a high degree of disturbance with only 13.8% considered to be intact. The study also noted a high presence of weed species with 81.4% of the mapped riparian zone containing Category 1 Weeds - the most serious environmental weeds on the North Coast and capable of displacing native communities.<sup>37</sup>

A number of noxious weeds including species listed as Weeds of National Significance, a number on the National Environmental Alert List, and the main so-called 'sleeper' weeds have been identified at the Boyters Lane site. These weeds include lantana, rubber vine, serrated tussock, Mimosa pigra, parthenium weed, blackberry and bridal creeper.

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<sup>34</sup> Kempsey Shire Council 2007a, p. 21.

<sup>35</sup> Kempsey Shire Council 2007a, p. 24.

<sup>36</sup> Eamus et al. 2006, p. 231.

<sup>37</sup> Kempsey Shire Council 2007a, p. 24.

#### **4.3.4 Both feral and domestic animals can impact on wetland values.**

Dogs and foxes appear to be either recently or currently present on the Boyters Lane site as dog tracks have been identified during site inspections and fox burrows have been identified towards the northern end of the Main Berm.<sup>38</sup> The Plan of Management notes that the provision of playing fields adjacent to the wetlands will exacerbate the problem of introduced domestic and feral animals, with potentially serious consequences for site wildlife, particularly birds, which are known to be vulnerable to predation and disturbance by dogs, cats and foxes.<sup>39</sup> As dogs may be brought to the site for recreation, or with families attending weekend sport, education and signage will be needed clearly delineating dog-free areas.

#### **4.3.5 Acid sulphate soils need to be managed in catchment areas.**

Acid sulphate soils (ASS), described as the 'nastiest' soils in the world<sup>40</sup>, underlie a significant part of the Macleay River catchment presenting a major problem for governments and land managers alike. When these soils are exposed to oxygen, due to drought, draining, dredging or excavation, problems occur<sup>41</sup>. The resulting chemical reactions produce sulphuric acid, ferric iron and other metals, which reach various ecosystems through runoff, groundwater movement, soil movement and other methods. These products of ASS are highly toxic and damaging to the natural environment. Some of the impacts include large fish kills, reduced hatching, diseases in aquatic life forms, water oxygen level reduction, loss of land due to acidic 'scalding', reduced water quality, infrastructure damage, loss of native vegetation and risk to human health<sup>42</sup>. These soils were identified in the Macleay River coastal floodplain as early as 1972<sup>43</sup> and, although Boyters Lane is not within a 'hotspot' area and is not regarded as a high-risk zone, large areas of the Macleay floodplain are affected by ASS including the Yarrhapinni, Collombatti-Clybucca, Belmore, Frogmore, Kinchela and Raffertys areas<sup>44</sup>. Due to ASS in the region signage and information should be provided outlining the ways in which human activity has led to the creation of ASS.

#### **4.3.6 Climate change will impact wetlands and coastal ecosystems.**

The *Plan of Management* notes that the impacts of climate change on the Boyters Lane site will be substantial due to sea level rise.<sup>45</sup> Global climate models indicate that sea level rise will be greater on the east coast of Australia than the global mean.<sup>46</sup> In addition to rising sea levels, which may be higher than previously

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<sup>38</sup> Pont et al. 2005.

<sup>39</sup> Pont et al. 2005.

<sup>40</sup> Dent & Pons 1995, p. 263.

<sup>41</sup> White et al. 1999, p. 9.

<sup>42</sup> Pont et al. 2005.

<sup>43</sup> Walker 1972.

<sup>44</sup> Pont et al. 2005, p. 9.

<sup>45</sup> Pont et al. 2005.

<sup>46</sup> CSIRO/BOM 2007, p. 92.

estimated due to faster melting of the Greenland ice shelf<sup>47</sup>, there will also be other climate change related impacts on coastal ecosystems. Climate change is already changing the distributional pattern of some Australian seabirds, and altering the nesting season of some populations.<sup>48</sup>

The site will also be subject to more extreme flooding and drying events, reduced precipitation, higher temperatures and increased evapotranspiration<sup>49</sup>. Drought projections from the CSIRO and Bureau of Meteorology show the possibility of up to 20% more drought months over most of Australia by 2030, with up to 40% more droughts by 2070 in eastern Australia.<sup>50</sup> Even small reductions in precipitation can lead to proportionally larger reduction to run-off, and could prove disastrous to coastal wetland systems.<sup>51</sup>

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<sup>47</sup> Johnson & Marshall 2007, p. 41

<sup>48</sup> Hobday et al. 2006, p. 25.

<sup>49</sup> CSIRO/BOM 2007, pp. 9-12.

<sup>50</sup> CSIRO/BOM 2007, p. 83.

<sup>51</sup> Smith 1998, p. 330.

## 4.4 Theme 4: Learning from Nature

### 4.4.1 Artificial lagoons can provide important habitat for migratory birds.

Migratory birds face major threats today in the form of the ever-increasing human population, development, habitat loss and degradation. Australia provides extensive habitat for many migratory birds. Many species can be found on a wide range of habitat types from freshwater inland wetlands to coastal mudflats and sandy beaches. Intertidal habitats such as Boyters Lane are one of the most important habitats for migratory birds. The creation of Teal Lagoon through the construction of a berm in the early 1960's had the unforeseen consequence of producing a haven for migratory bird species.

Many birds make annual flights to and from the southern and northern hemisphere. Migratory birds fly thousands of kilometres back and forth from breeding grounds. These return journeys cross state boundaries, countries and oceans, linking ecosystems across the globe. Completing long flights depends on the availability of suitable habitat at sites across the flyway and the capacity of those habitats to provide adequate food and resting opportunities. The birds are particularly vulnerable to the modification of their habitat. The Boyters Lane wetlands are at risk of silt in the water, pollution, weed and pest invasion, which can alter the ecological character of the site.

The buffer plantings between the sporting fields and Teal Lagoon to minimise the effects of future lighting and the construction of a wetland to minimise stormwater impacts are recent examples of measures to manage migratory bird habitat on the site.

### 4.4.2 Artificial wetlands create habitat for vulnerable and endangered species.

Biodiversity will benefit from the added freshwater species that will colonise the stormwater wetland, with wetland plants providing nesting material, refuge and food for birds.<sup>52</sup> Several species of frogs are likely to inhabit the stormwater wetland, including *Litoria fallax*, *Crinia signifera*, *Limnodynastes peronii*, and *Litoria freycineti*, with another ten to twelve possible species depending on the plant association that develops, and the proximity of particular frog populations.<sup>53</sup>

Australia has 37 frogs species listed nationally as endangered with a further 27 species that are threatened and 14 species that are of concern. Scientists are still uncertain what is causing the alarming decline in the abundance of frogs in Australia, although there are likely to be a number of factors contributing to the decline in frog numbers including habitat destruction and changes in the flow regimes of rivers and wetlands.

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<sup>52</sup> Pont et al. 2005, p. 43.

<sup>53</sup> Pont et al. 2005, p. 43.

#### **4.4.3 Artificial wetlands manage stormwater runoff and minimise erosion.**

Stormwater runoff from urban areas has been recognised as a major contributor to watercourse pollution.<sup>54</sup> The construction of artificial wetlands to assist in the treatment of urban stormwater run-off has intensified the attention given to the ecohydrology of wetland systems.<sup>55</sup> Constructed wetlands, like the natural ones they mimic, have the ability to remove bacteria, enteric viruses, suspended solids, BOD, nitrogen, phosphorus and metals.<sup>56</sup> These constructed biological treatment systems include various forms of ponds, land treatment and wetlands.

Artificial wetlands can also buffer downstream areas from excessive flooding, as well as buffering coastal areas from storm surges. Floodwaters are detained in the wetland, reducing downstream peaks. Reducing these discharge events decreases the potential erosion and flood damage in the catchment. As stormwater enters the wetland it slows down, allowing the sediment to fall out of suspension. Attached to the sediment are many nutrients and other pollutants, which also fall out suspension as water velocity decreases.

The use of wetlands to manage stormwater runoff is not only more cost-effective than traditional centralised treatment systems, it also has the added benefit of enhancing local biodiversity.<sup>57</sup>

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<sup>54</sup> Scholz 2006, p. 109.

<sup>55</sup> Eamus et al. 2006, p. 231.

<sup>56</sup> Scholz 2006, p. 108.

<sup>57</sup> Scholz 2006, p. 109.

## **5 Implementation and Delivery**

### **5.1 Delivering the wetlands experience**

The best way for the public to learn about and increase their appreciation of floodplain and estuarine wetlands is to experience them first-hand. This can be enhanced through appropriate access, informational signage, and facilities for observing the area and species such as bird hides. The public can also gain hands-on experience through a number of programs and exercises, from the monitoring of water quality and bird life to revegetation planting and weed-busting. Some methods of delivery include:

- community education
- information services (print, etc)
- outdoor and leisure education programs
- community development programs
- on-site interpretive signage
- on-site interactive devices
- self-guided interpretive trails
- general education curriculum
- wetland programs for school groups
- outdoor classroom facility

## 5.2 Identified 'Learning Areas'

A number of potential 'learning areas' have been identified on site (Appendix A, Map 2). The concept behind the location of these areas is to allow a wide range of learning experiences over a relatively small area.

- A. Bushfood identification/learning area
- B. Mudflat learning area
- C. Estuarine learning area
- D. *Juncus*/rush learning area
- E. Mangroves learning area
- F. Saltmarsh learning area
- G. Grassland learning area
- H. Rainforest/riparian revegetation demonstration and learning area
- I. Wetlands learning area / bird watching area
- J. Artificial stormwater wetlands learning area

These areas are well spaced along the pathway and are easily accessible. Each site should have appropriate educational and interpretive signage.

## **5.3 Infrastructure**

To maximise the educational potential of the Boyters Lane site it is recommended that the following infrastructure be constructed on site.

### **5.3.1 Parking area**

A parking area needs to be constructed on the southwest corner of the site at the beginning of the proposed track/cycleway (Appendix B, Map 2). The parking area needs to be large enough to accommodate buses in addition to tourist parking. An area separate to the sports field parking is necessary due to the distance between that area and the proposed picnic area.

### **5.3.2 Outdoor classroom area**

The following aspects arose from a discussion with a representative from the Booroongen Djugun Aboriginal Corporation/Booroongen Djugun College: A shaded 'sit down' area should be constructed, with seating for at least 15 students. This could possibly be incorporated into either the proposed bird hide or picnic area. The area should have provision for barbeque cooking, possibly with the inclusion of a small fire pit. As noted in Section 4.2.1, the plantings in this area should reflect the natural surroundings with bushfood plants scattered throughout the area and not in block plantings.

In addition to teaching about traditionally used plant and animal species, the college would use the site to teach about the formation of wetlands and about the development of acid sulphate soils.

If constructed an outdoor classroom would be a valued resource for all the schools in the region. It is envisioned the facilities would consist of a shaded circular area, or possibly shaded benches in a horseshoe shape pointing towards a podium or display/teaching area.

This report recommends the proposed picnic area be developed as a multi-functional space incorporating a outdoor learning/classroom area. This spot is centrally located to a number of potential 'learning areas' (Appendix B Map 2), and significant cost minimisation can be achieved through amalgamating these facilities with the picnic area.

### **5.3.3 Linking Pathway**

A linking pathway (Appendix B, Map 2) would allow for a shorter route to the proposed bird hide site (Section 5.3.5). It would also allow for a circular route from the picnic area. Both sides of the linking pathway can be planted with riparian rainforest vegetation as a revegetation demonstration area and to provide shade. Suitable species for this area are included in the *Plan of Management*.<sup>58</sup>

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<sup>58</sup> Pont et al. 2005, pp. 62-64.



### **5.3.4 Bridge/Boardwalk**

Based on the proposed path/cycle way to be adopted by the council, it is recommended that a bridge/boardwalk and linking pathway be constructed (Appendix B Map 2). Through the provision of a boardwalk and linking pathway (5.3.3) a small loop path is created suitable for younger children, while still passing through a number of 'learning areas'. For larger children the boardwalk allows a figure-of-eight route to be taken that passes 8 learning areas. The boardwalk will also allow closer access to the Juncus/rush area, and allow the inlet to be crossed at high tide. In addition to enhancing the educational potential, a well designed bridge/boardwalk will add to the tourism appeal of the site.

### **5.3.5 Bird hide**

Although the potential location for a bird hide has been identified on the western side of Teal Lagoon, this report recommends that either a second bird hide be constructed on the eastern side of Teal Lagoon or the hide location be moved (Appendix B, Map 2). This location allows easier access from the picnic/outdoor learning area to the bird hide. If funding is not available for a hide in this location the construction of a blind plus buffer planting may allow for viewing.



**Photo 4: View from the eastern bank of Teal Lagoon**

## **5.4 Potential Delivery Methods**

### **5.4.1 Waterwatch - Water Quality Testing and Interpretation**

Waterwatch is a national community action program that monitors the state of our waterways and encourages action to protect and improve water quality. Kempsey Shire is within the Waterwatch 'Mid North Coast' catchment region, which comprises the catchments of the Nambucca, Macleay, Hastings and Camden Haven Rivers as well as of smaller coastal creeks, lakes and lagoons. Since 1997, the Waterwatch program has been supported by grant funding from the Federal Governments Natural Heritage Trust in partnership with the states and other project partners. Waterwatch participants include, primary schools, high schools, colleges, TAFE, environment centres, local residents groups, Landcare, Waterwatch, Streamwatch and Bushcare groups, scout and guides groups, and Shire councils. Through a Waterwatch program there is scope for the council to encourage schools and local groups to be closely involved with the ongoing monitoring of the water quality at the Boyters Lane site. This could include monitoring both within Teal Lagoon and in the artificial freshwater wetland.

### **5.4.2 Monitoring migratory bird species**

The *Plan of Management* proposed that a basic monitoring program be designed that provides information on the abundance and diversity of waterbirds before and after any changes in management occur. This program could also monitor key aspects of waterbird habitat, such as vegetation growth and invertebrates. Members of the local community who have experience identifying and counting waterbirds could work with the council to undertake surveys. The changing abundance of certain bird species may also be good indicators of change in restored habitats.<sup>59</sup>

### **5.4.3 Bushland Regeneration/ Protection of Remnant Vegetation**

Local groups and individuals could be encouraged to join council organized planting days at the Boyters Lane site to enhance their feeling of 'ownership' over the site. Restored and remnant areas could be monitored on a seasonal basis to obtain information on the success of plantings and management regimes. Monitoring tasks could include visual assessment of the health of individual plants, counting of survivors in each revegetation area, and calculation of losses. The council and local Landcare groups could find this information useful in determining how fauna respond to changes in habitat associated with the restoration project. Bushland regeneration projects on-site could also include seed collection and propagation from both remnant and revegetation species.

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<sup>59</sup> Pont et al. 2005, p. 71.

#### **5.4.4 Weed Warriors**

A number of weed species have been identified on site, and so part of the vegetation management for the site will include weed removal. The NSW Department of Primary Industries provides funding under the State Weed Management Project, and could possibly supply funding to support council weed-related communication, education, and publicity activities. There is also an opportunity to involve the local schools through a Weed Warriors program based on the site. Weed Warriors is a national program for students that provide the opportunity to learn about invasive pest plants and local weed issues through interactive learning and hands-on experience. The Weed Warriors program is most often targeted at grades 3–6 in primary schools and years 7–9 in secondary schools, although the program can also be adaptive to all levels of education. As these programs are usually developed in partnership with government and the community there is the potential for the council to encourage the local schools to initiate a Weed Warriors Program for the Boyters Lane site.

#### **5.4.5 Frogwatch**

Several species of frogs are likely to inhabit the stormwater wetland, with another ten to twelve possible species depending on the plant association that develops, and the proximity of particular frog populations.<sup>60</sup> Local South West Rocks schools could be invited and encouraged to incorporate a Frogwatch type program into their curriculum.

#### **5.4.6 Conservation Volunteers Australia**

Conservation Volunteers Australia (CVA) is Australia's largest practical conservation organisation. The CVA program has had extensive links with wetland conservation through the *Revive our Wetlands* program. The initial stage of this program (2001-2003), a landmark partnership between CVA and BHP Billiton, was one of the largest national practical wetland revitalisation programs in Australia and addressed the degraded state of 100 of Australia's high priority wetlands. Although the Boyters Lane site is not a 'high priority' wetland there may be the possibility of accessing practical project conservation assistance from local CVA volunteers.

#### **5.4.7 Climate Change research**

The site could be used as an on going monitoring and research project by a university or research organisation to assess the effects of climate change on a number of coastal ecological communities (saltmarsh, mangrove, grassland, etc). The site could also be suitable for a number of hands-on climate-change activities, such as measuring trunk diameter annually to assess the amount of carbon sequestered by the trees planted onsite.

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<sup>60</sup> Pont et al. 2005, p. 43.

## 5.5 Implementation and Reporting

### 5.5.1 Boyters Lane Wetland Working Group or Committee

Kempsey Shire Council are the major body responsible for overseeing the implementation of recommendations described in Plans for the Boyters Lane site. However to facilitate the delivery of educational programs relevant to the site this plan recommends the formation of a working group or committee. This plan supports the *Plan of Management* recommendation that Council call for members for a working group to manage the site<sup>61</sup>, but further recommends that this group also be responsible for delivery of the educational component. An adaptive management approach will be required to maximise the educational opportunities available through the rehabilitation stage of the site.

This committee would ideally consist of members of Kempsey Shire Council and key stakeholders in the Boyters Lane Site. Such a group should be made up of a broad cross section of the community to ensure the effective integration of educational, environmental, social and economic issues. The group would be composed of representatives from local schools and community groups, and should include a representative from Booroongen Djugun Aboriginal Corporation/Booroongen Djugun College.

The committee could meet frequently during the initial stages of the implementation of the plan (quarterly), and then less frequently once the plan is well established and environmental education has been established as part of the Kempsey community.

### 5.5.2 Recommended Reporting Procedures

The following reporting procedures are recommended to ensure delivery of the plan:

- A biannual report prepared by the working group/committee to council, detailing the happenings with regards to the implementation of the above recommendations and other environmental education initiatives over the previous six months. A plan for the following six months should also be included with this report.
- The first biannual report should contain a timeframe for the implementation of the above recommendations.
- Assessment against the KSC Ecologically Sustainable Development guidelines and the goals of the Boyters Lane Playing Fields and Wetlands Plan of Management.
- Upon acceptance by the council the reports to be available to the wider community.

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<sup>61</sup> Pont et al. 2005, p. iii.

## 6 Financial Considerations

No specific funding for the Boyters Lane Wetland development was identified from Kempsey Shire Council budgets<sup>62</sup>. However, depending on council and community priorities, some of the funding for new parks in the South West Rocks area could be directed to the Boyters Lane site. The largest capital expenditure would be for the boardwalk bridge, and thus unlikely to receive funding until a later stage of development. In contrast a well-designed outdoor classroom area would be comparable in price to the proposed picnic area, while still being suitable for both purposes.

Budget Item			Funds allocated per budget period (\$)			
			2007-08	2008-09	2009-10	2010-11
Boyters Lane	Asset Management Program – Specific	Bridges	-	-	40,000	-
New Parks: South West Rocks	Capital Expenses	Horticultural and Land Care Services – Parks, Gardens and Reserves	120,000	120,000	-	-
South West Rocks	Town Improvement Works	Capital Works	162,940	187,850	196,800	205,740

**Table 1:** Potential Shire Budget Funding Opportunities

An important task of the working group/committee (section 5.5.1) would be to explore options for funding components of the Education Plan. This funding could be obtained through existing funded programs (e.g. Landcare, WaterWatch) or through specific funds raised for the Boyters Lane site. Section 18 of the *Boyters Lane Playing Fields and Wetlands Plan of Management*<sup>63</sup> details a number of similar funding sources. As many of the initial educational exercises would involve rehabilitation of the site it would be possible to attract funding for both education and land care activities (see also 5.4 Potential Delivery Methods).

There is also an opportunity to gain funds from private sources such as Nestles, who are already funding similar environmental projects in the area, or companies such as BHP Billiton who have significantly contributed to wetland rehabilitation funding in Australia. At a more local level it may be possible to gain funding from companies either based or currently involved in projects in the South West Rocks area.

<sup>62</sup> Kempsey Shire Council 2007c.

<sup>63</sup> Pont et al. 2005, pp. 88-89.

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## Appendix B Maps

### Map 1. The Boyters Lane Playing Fields and Wetlands Site



Map taken from Pont, et al. 2005, map BB028-2.

## Map 2. Learning areas and infrastructure



- A. Bushfood identification/learning area
- B. Mudflat learning area
- C. Estuarine learning area
- D. *Juncus/Schoenoplectus* rushes learning area
- E. Mangroves learning area
- F. Saltmarsh learning area

- G. Grassland learning area
- H. Rainforest revegetation demonstration and learning area
- I. Wetlands learning area / bird watching area
- J. Artificial stormwater wetlands learning area

The infrastructure recommended in this report will enhance the site as both an educational center and a tourism destination. Through the provision of a bridge/boardwalk and linking pathway a loop path is created suitable for younger children, while still passing through a number of 'learning areas'. The boardwalk allows a figure of 8 route to be taken that passes 8 learning areas. The linking pathway also allows for a shorter route to the proposed bird hide site. Both sides of the linking pathway can be planted with riparian rainforest vegetation as a revegetation demonstration area and to provide shade.

## Appendix C Identified weeds on site

Name	Family	Weed of National Significance?	Description
Groundsel Bush <i>Baccharis halimifolia</i>	Arteraceae	No	Erect perennial shrub or small tree. Small branches striate and hairless. Leaves 7cm long and to 4cm wide. Distinguished by wedge shaped leaves usually with a few large teeth towards the apex. Spread by wind dispersal. Suspected of poisoning livestock.
Camphor Laurel <i>Cinnamomum camphora</i>	Lauraceae	No	Evergreen hardy spreading tree up to 20m. Leaves are ovate, 5-11cm long, 2-5cm wide, g, distinguished by aromatic camphor oil smell when crushed. Seed dispersal by birds and water. Invasive of stream banks and crowding out other species. Oil possibly causes fish kills.
Fleabane <i>Conyza sp</i>	Arteraceae	No	Annual taproot plant. Dispersed through wind.
Morning Glory <i>Ipomea indica</i>	Convolvulaceae	No	A pale and hairy stem. Leaves are large and heart shaped or lobed. Recognised by its large bluish-purple bell shaped flowers seen from spring through summer and autumn. Relies on vigorous growth to spread. Smothers trees and shrubs.
Fireweed <i>Senecio sp</i>	Asteraceae	No	Erect annual or biennial herb up to 70cm high. Leaves variable to 8cm long to 1.5cm high. Distinguished by lanceolate to elliptic leaves. Spread by wind and animal dispersal. Can cause death in horse and cattle.
Pink Lantana <i>Lantana camara</i>	Verbenaceae	Yes	Thicket forming perennial shrub up to 5m high. Distinguished by colourful flowerheads composed of tubular flowers, to 12mm long. Thorns on young stems. Dispersed through birds. Toxic to stock and smothers plants.
Kikuyu Grass <i>Pennisetum clandestinum</i>	Poaceae	No	Perennial ground hugging grass which spreads by runners. Cultivated for pastures, lawns and playing fields.
Common Reed <i>Phragmites australis</i>	Poaceae	No	Tall grass that inhabits wet areas like brackish and freshwater marshes. Displaces native plants and forming monocultures. Spreads by seed and strong vegetative growth.
Blackberry <i>Rubus ulmifolius</i>	Rosaceae	Yes	Semi-deciduous scrambler to 2m. Prickles can be straight or curved. Leaves comprise 3 or 5 ovate leaflets and are dark green on the upper surface. Spread by seed, rooting of cane tips and lateral roots producing suckers.
Water Ribbons <i>Triglochin procerum</i>	Juncaginaceae	No	Robust aquatic perennial. Bears roots which end in tubers. Leaves can be up 2m. width of leaves can be 0.5-4cm broad. Fruit is subglobular to broad-elliptic. 10-20mm long. Grows in fresh water systems to 1.5m deep.

## Appendix D Bushfoods and Functional Plant Species

Wetlands provided a wide range of food for Aboriginal people, including fish, crabs, eels, and small mammals. There are also a diversity of plant species that grow in or near wetlands that were traditionally used for food and other purposes (medicine, tools, canoes, nets and bags, etc.). The plants listed below are potentially suitable for planting in and around the picnic/outdoor classroom area, although consultation should be carried out with the Booroongen Djugun College prior to species selection and layout planning.

<b>Bushfoods, medicinal and functional plant species</b>	
<b>Scientific name</b>	<b>Common name</b>
<i>Acmena smithii</i>	Lilly Pilly
<i>Alphitonia excelsa</i>	Red ash
<i>Avicenna marina</i>	Grey Mangrove
<i>Casuarina glauca</i>	Casuarina
<i>Crinum pedunculatum</i>	River Lily/Mangrove lilly
<i>Cupaniopsis anarcardioides</i>	Coastal tuckeroo
<i>Elaeocarpus obovatus</i>	Hard Quandong
<i>Elaeocarpus reticulatus</i>	Blueberry ash
<i>Ficus coronata</i>	Creek sandpaper fig
<i>Ficus rubiginosa</i>	Rusty fig
<i>Ficus obliqua</i>	Small-leaf fig
<i>Flindersia schottiana</i>	Cudgerie
<i>Guioa semiglauc</i>	Guioa
<i>Melaleuca quinquenervia</i>	Broad leaf paperbark
<i>Podocarpus elatus</i>	Plum pine
<i>Rubus spp.</i>	Native raspberry
<i>Smilax australis</i>	Native Sarsaparilla
<i>Tristaniopsis laurina</i>	Water gum
<i>Waterhousia floribunda</i>	Weeping lillypilly

## **Appendix E Wetlands Educational Resources**

### **Flora & Fauna**

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## **NSW and Commonwealth Government Policies, Plans and Legislation**

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