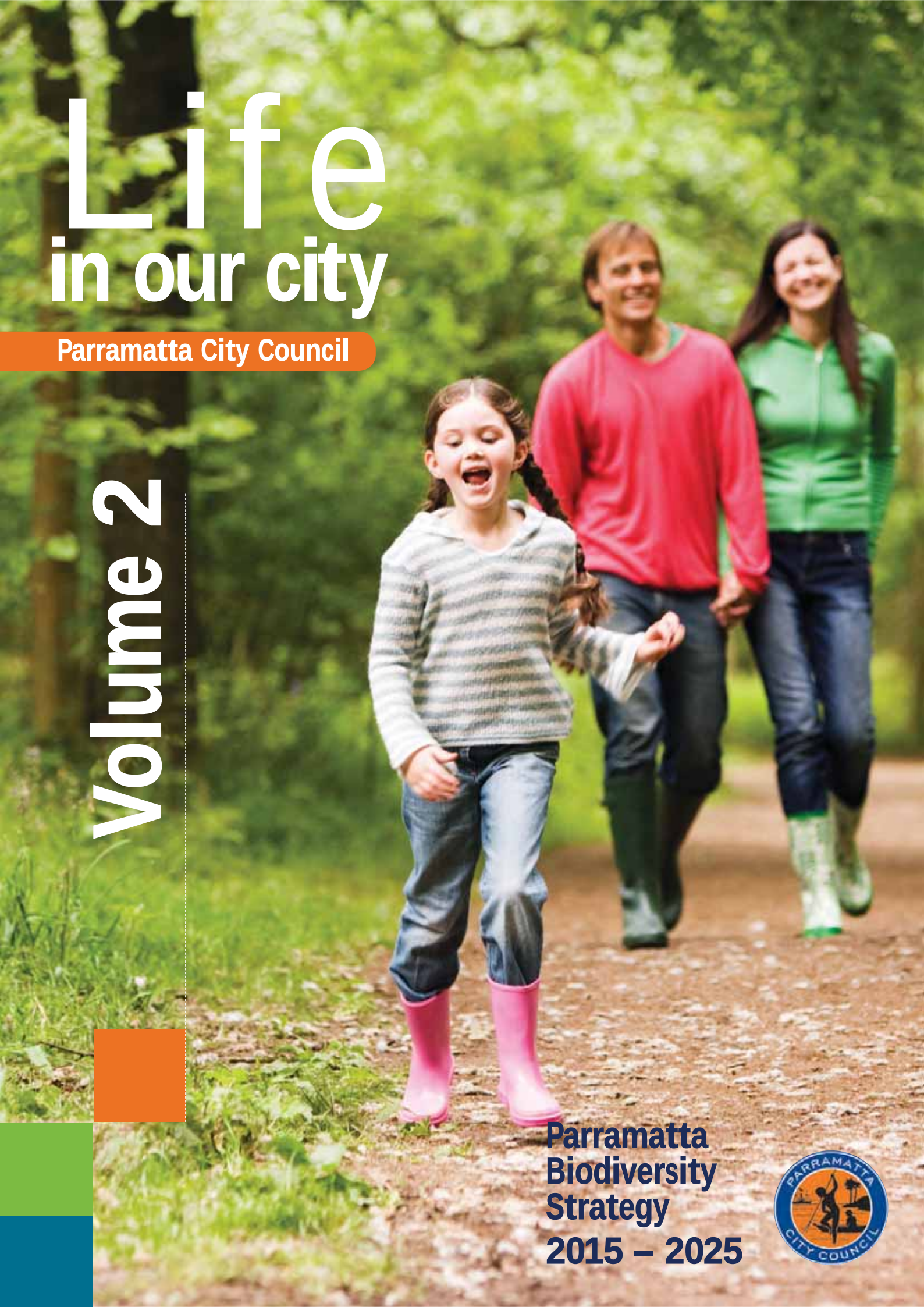
Life in our city

Parramatta City Council

Volume 2



Parramatta Biodiversity Strategy 2015 – 2025

ACKNOWLEDGEMENTS

This document contains supplementary information to *Life in Our City' Parramatta Biodiversity Strategy 2015 – 2025 Volume 1*. It has been prepared by Parramatta City Council staff based upon the *Draft Biodiversity Plan 2012* prepared by Eco-logical Australia and was adopted by Parramatta City Council on 28 September 2015.

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Appendix A: Biodiversity in Parramatta

1.1 ECOLOGICAL COMMUNITIES OF THE PARRAMATTA LGA

Parramatta Local Government Area (LGA) contains 17 distinct ecological communities. Twelve of these native vegetation communities are listed under the NSW *Threatened Species Conservation Act 1995 (TSC Act)* as endangered or critically endangered ecological communities (EEC). Four of these eleven EECs are also listed in Parramatta LGA under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. These endangered and critically endangered vegetation communities are significantly fragmented and only a fraction of their original area remains due to the development and urbanisation of Sydney. They require protection and conservation to ensure their future survival within an increasingly modified urban landscape.

Table 1: Ecological Communities in Parramatta

Native Vegetation Community	TSC Act Name	TSC Act Status	EPBC Act Name	EPBC Act Status
DRY SCLEROPHYLL FORESTS				
Castlereagh Ironbark Forest	Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Endangered	N/A	N/A
Coastal Enriched Sandstone Dry Forest	N/A	N/A	N/A	N/A
WET SCLEROPHYLL FORESTS				
Blue Gum High Forest	Blue Gum High Forest in the Sydney Basin Bioregion	Critically Endangered	N/A	N/A
Coastal Enriched Sandstone Moist Forest	N/A	N/A	N/A	N/A
Coastal Shale-Sandstone Forest	N/A	N/A	N/A	N/A
Sydney Turpentine-Ironbark Forest	Sydney Turpentine- Ironbark Forest	Endangered	Turpentine-Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered
GRASSY WOODLANDS				
Cumberland Shale Hills Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered
Cumberland Shale Plains Woodland				
RAINFORESTS				
Coastal Sandstone Gallery Rainforest	N/A	N/A	N/A	N/A

Native Vegetation Community	TSC Act Name	TSC Act Status	EPBC Act Name	EPBC Act Status
FORESTED WETLANDS				
Coastal Flats Swamp Mahogany Forest	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	N/A	N/A
Cumberland Riverflat Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	N/A	N/A
Cumberland Swamp Oak Riparian Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	N/A	N/A
Estuarine Swamp Oak Forest	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	N/A	N/A
FRESHWATER WETLANDS				
Coastal Freshwater Wetland	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	N/A	N/A
Estuarine Reedland	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	N/A	N/A
SALINE WETLANDS				
Estuarine Mangrove Forest	N/A	N/A	N/A	N/A
Estuarine Saltmarsh	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Subtropical and Temperate Coastal Saltmarsh	Vulnerable

The *Native Vegetation of the Sydney Metropolitan Area* (OEH 2013) report provides descriptions of native vegetation communities occurring throughout the Sydney Basin. A summary description of the 18 ecological communities present within Parramatta LGA is outlined below:

1.1.1 Dry Sclerophyll Forests

Castlereagh Ironbark Forest	
Total Remnant in LGA	**24.63 ha**
Predicted Pre-1750 Distribution	**5,500 – 22,000 ha**
Area remaining within Sydney Basin	**1,100 ha**
Amount in NPWS Reserves	**290 ha**
Amount in Parramatta Reserves	**23.87 ha**

Castlereagh Ironbark Forest is one of two closely related ironbark shrub-grass forests found in western Sydney that occur on gravelly-clay soils. Map users may experience difficulty distinguishing between this unit and Castlereagh Shale-Gravel Transition Forest, and as a result it may be easiest to consider them subtle variations of the one floristic assemblage. Castlereagh Ironbark Forest is associated with clay soils derived from Tertiary alluvial deposits. The structure ranges from a moderately tall open eucalypt forest or woodland to a low dense thicket of paperbarks with low emergent eucalypts. It is suggested that these scrubs may arise from human-induced changes to the original forest structure.

Broad-leaved ironbark (*Eucalyptus fibrosa*) is the most commonly recorded eucalypt although at some sites it may be absent. Woollybutt (*Eucalyptus longifolia*) is a regular associate although sites often have a diverse canopy composition which reflects subtle grades between substrates sourced from Tertiary sand, sandstone bedrock, shale and ironstone gravels. For this reason there are localised unusual occurrences of hard-leaved scribbly gum (*Eucalyptus sclerophylla*), smooth-barked apple (*Angophora costata*) and narrow-leaved apple (*Angophora bakeri*), species more typically associated with siliceous soils of sand deposits and the sandstone plateau. A prominent small tree layer of Melaleuca decora features above a dense cover of shrubs that include Melaleuca nodosa, blackthorn (*Bursaria spinosa*) and peach heath (*Lissanthe strigosa*). The ground layer is a sparse cover of grasses and forbs. These may be very depauperate in locations where dense shrub layers exclude light and suppress plant growth.

Coastal Enriched Sandstone Dry Forest	
Total Remnant in LGA	**69.74 ha**
Predicted Pre-1750 Distribution	**28,710 – 34,860 ha**
Area remaining within Sydney Basin	**24,400 ha**
Amount in NPWS Reserves	**7,700 ha**
Amount in Parramatta Reserves	**62.49 ha**

Coastal Enriched Sandstone Dry Forest is commonly encountered on the upper slopes and dry gullies of Sydney urban areas. It is a tall open eucalypt forest with an understorey of dry sclerophyll shrubs with ferns and forbs amongst the ground cover. The commonly recorded eucalypts are smooth-barked apple (*Angophora costata*), red bloodwood (*Corymbia gummifera*) and Sydney peppermint (*Eucalyptus piperita*). Blackbutt (*Eucalyptus pilularis*) is common on gully slopes of the north shore and Hacking River valley while broad-leaved white mahogany (*Eucalyptus umbra*) replaces this species along the Warringah and Pittwater escarpments. A sparse layer of small trees such as Allocasuarina littoralis and old-man banksia (*Banksia serrata*) is common above a variety of wattles, tea-trees, gee bungs and grass trees. In long unburnt areas sweet pittosporum (*Pittosporum undulatum*) may be prevalent. It is widespread on the Hornsby plateau in areas that receive greater than 1000 millimetres of mean annual rainfall and are at elevations less than 200 metres above sea level. It extends north of the Sydney area into the hinterland of the Central Coast.

One of the distinguishing features of the community is that it appears to persist in areas that have subtle clay enrichment to the sandstone soils. Typically sites are located downslope from large residual shale caps or on exposed Narrabeen sandstone or thin clay bands on coastal sandstone ridgetops. The clay influence is not immediately discernable at sites but does appear expressed in the plant assemblage, resulting in more prominent mesic and grass species and less abundant heath plants than occur in the sheltered forests found on rockier and more siliceous sandstones.

1.1.2 Wet Sclerophyll Forests

Blue Gum High Forest	
Total Remnant in LGA	**35.52 ha**
Predicted Pre-1750 Distribution	**>1,800 ha**
Area remaining within Sydney Basin	**180 ha**
Amount in NPWS Reserves	**20 ha**
Amount in Parramatta Reserves	**33.04 ha**

Blue Gum High Forest is a tall wet sclerophyll forest found on fertile shale soils in the high rainfall districts of Sydney's north shore. It is dominated by Sydney blue gum (*Eucalyptus saligna*), blackbutt (*Eucalyptus pilularis*) and turpentine (*Syncarpia glomulifera*) with a number of other eucalypts occurring patchily. A sparse to open cover of small trees is found at most sites and includes a variety of sclerophyllous and mesophyllous species. The ground layer is variable in both composition and cover. It may be ferny, grassy or herbaceous depending on topographic situation and disturbance history. At some sites vines and climbers are prolific.

Blue Gum High Forest is found on a range of shale or shale-influenced substrates in areas receiving between 900 and 1300 millimetres of mean annual rainfall. This includes elevated gullies, ridgelines, crests and slopes underlain by Wianamatta shales as well as small gully heads where downslope movement of shale soil lies above sandstone bedrock. In these latter situations sandstone outcrops may be present, although occupying only a minor component of the site. Typically the community occurs at altitudes above 117 metres above sea level although it is known to occur as low as 30 metres and as high as 185 metres.

Coastal Enriched Sandstone Moist Forest	
Total Remnant in LGA	**42.60 ha**
Predicted Pre-1750 Distribution	**Not Available**
Area remaining within Sydney Basin	**Not Available**
Amount in NPWS Reserves	**Not Available**
Amount in Parramatta Reserves	**42.60 ha**

Coastal Enriched Sandstone Moist Forest is a tall open eucalypt forest with a distinctive mesic shrub and small tree layer. The canopy may be dominated by various combinations of eucalypts although smooth-barked apple (*Angophora costata*) is invariably present. On the north shore and inner harbours turpentine (*Syncarpia glomulifera*), blackbutt (*Eucalyptus pilularis*) and Sydney blue gum (*Eucalyptus saligna*) are dominant trees while on the Warringah and Pittwater escarpments bangalay (*Eucalyptus botryoides*) and mahoganies (*Eucalyptus umbra/scias*) are more prevalent. Elsewhere, Sydney peppermint (*Eucalyptus piperita*) may dominate. A tall stand of forest oak (*Allocasuarina torulosa*) is often present below the eucalypt canopy. Tall small trees tend to be rainforest plants such as coachwood (*Ceratopetalum apetalum*), blueberry ash (*Elaeocarpus reticulatus*) and occasionally cabbage tree palms (*Livistona australis*). The forest floor is covered by a sparse to dense cover of ferns and twiners.

The distribution of this forest is widespread though patchy across the Sydney area. Typically it is situated in sandstone gullies and sheltered slopes enriched by clay material. This material is sourced from shale bands in the sandstone bedrock associated with Narrabeen sandstone on the Pittwater escarpment or Hawkesbury sandstone in the Lane Cove River valley. At other places the material is sourced from shale caps situated on ridgelines above the creek. Outcropping rocks and benches are common. It occurs at elevations between 10 and 120 metres above sea level and mean annual rainfall of 850-1250 millimetres per annum.

Coastal Shale-Sandstone Forest	
Total Remnant in LGA	**22.30 ha**
Predicted Pre-1750 Distribution	**3,715 – 5,200 ha**
Area remaining within Sydney Basin	**2,600 ha**
Amount in NPWS Reserves	**1,600 ha**
Amount in Parramatta Reserves	**22.30 ha**

Coastal Shale-Sandstone Forest is often a tall open eucalypt forest with a sparse layer of dry sclerophyllous shrubs and a grassy ground cover. It occurs on clay-influenced soils associated with residual shale or lateritic capping, shale bands in the sandstone bedrock or downslope shale wash on exposed sandstone slopes. The eucalypts that occur consistently are tall red bloodwood (*Corymbia gummifera*) and smooth-barked apple (*Angophora costata*), but it is the local abundance of blackbutt (*Eucalyptus pilularis*), turpentine (*Syncarpia glomulifera*) and mahogany (*Eucalyptus resinifera, E. umbra*) that make the forest distinctive from the surrounding sandstone woodlands. A tall sparse layer of casuarinas (*Allocasuarina littoralis*) is found above an open layer of dry shrubs including banksias, wattles, hakeas and geebungs. A diverse combination of grasses, rushes and herbs provide a continuous ground cover. In some areas the forest may form a low open woodland comprising smooth-barked apple, brown stringybark (*Eucalyptus capitellata*) and scribbly gum (*Eucalyptus racemosa*) amongst other species. A thin layer of clay soil is sufficient to retain the grassy ground covers that help to distinguish the community. Some stands of this forest have been described as a variant of Duffys Forest Ecological Community, an Endangered Ecological Community under the NSW TSC Act. Coastal Shale-Sandstone Forest is found in areas that receive an average of more than 900 millimeteres of rainfall per annum and are between two and 372 metres above sea level.

Sydney Turpentine- Ironbark Forest	
Total Remnant in LGA	***96.97 ha***
Predicted Pre-1750 Distribution	***>23,000 ha***
Area remaining within Sydney Basin	***2300 ha***
Amount in NPWS Reserves	***250 ha***
Amount in Parramatta Reserves	***92.44 ha***

Sydney Turpentine-Ironbark Forest is a tall open forest found on shale and shale-enriched sandstone soils on the coast and hinterland of Sydney. It has been extensively cleared but was once widely distributed between Sutherland and the Hornsby plateau. The primary distribution of this forest is in areas receiving between 900 and 1250 millimetres of mean annual rainfall at elevations between 10 and 180 metres above sea level. The forest is characterised by open midstrata of mesic and sclerophyllous shrubs and small trees with a grassy ground cover. The composition of the canopy is variable depending on location and substrate. Typically it is recognised by a canopy dominated by turpentine (*Syncarpia glomulifera*), red mahogany (*Eucalyptus resinifera*) and various ironbarks of which *Eucalyptus paniculata* is most often recorded. On the north shore these forests are found on shale-enriched sheltered sandstone slopes where ironbarks are less common and blackbutt (*Eucalyptus pilularis*) is prevalent.

1.1.3 Grassy Woodlands

Cumberland Shale Hills Woodland	
Total Remnant in LGA	**0.99 ha**
Predicted Pre-1750 Distribution	**17,600 – 44,000 ha**
Area remaining within Sydney Basin	**4,400 ha**
Amount in NPWS Reserves	**210 ha**
Amount in Parramatta Reserves	**0.99 ha**

Cumberland Shale Hills Woodland is one of two widespread grassy woodland communities which together are recognised as Cumberland Plain Woodland in the Sydney Basin Bioregion, a Critically Endangered Ecological Community. It is an open woodland of grey box (*Eucalyptus moluccana*) and forest red gum (*Eucalyptus tereticornis*) with narrow-leaved ironbark (Eucalyptus crebra) also common. Hickory wattle (Acacia implexa) occurs amongst the small tree layer, often amongst regrowth stands. This species is one of the more distinctive floristic attributes that helps distinguish between the two components of the EEC. Other features are similar in that the two woodland units are characterised by an open shrub layer and a grassy ground cover. Fire history can have an important influence on the abundance of shrubs, with density of blackthorn (Bursaria spinosa) increasing with time since fire. It is restricted to mean annual rainfall of between 750 and 900 millimetres and elevations between 50 and 350 metres above sea level.

Cumberland Shale Plains Woodland	
Total Remnant in LGA	**3.77 ha**
Predicted Pre-1750 Distribution	**13,600 – 27,200 ha**
Area remaining within Sydney Basin	**6,800 ha**
Amount in NPWS Reserves	**560 ha**
Amount in Parramatta Reserves	**2.99 ha**

The gentle topography associated with the shale plains of western Sydney carries an open grassy woodland dominated by grey box (*Eucalyptus moluccana),* forest red gum (*Eucalyptus tereticornis*) and ironbark (*Eucalyptus crebra/Eucalyptus fibrosa).* Localised patches of spotted gum (*Corymbia maculata*) may occur in the Fairfield LGA. Cumberland Shale Plains Woodland is the second of the grassy woodlands that comprise the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community listed under the NSW TSC Act. Like the related community Cumberland Shale Hills Woodland it is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs. The primary habitat for the community as occurring at elevations less than 150 meters above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. The community occupies the north-west and west zones of the study area but is widespread elsewhere across the Cumberland Plain.

1.1.4 Rainforests

Coastal Sandstone Gallery Rainforest	
Total Remnant in LGA	**3.85 ha**
Predicted Pre-1750 Distribution	**6,300 ha**
Area remaining within Sydney Basin	**3,300 ha**
Amount in NPWS Reserves	**1,500 ha**
Amount in Parramatta Reserves	**3.85 ha**

This depauperate warm-temperate rainforest is found on sandy alluvium or rocky streams in deep protected sandstone gully systems across the greater Sydney region. Coachwood (*Ceratopetalum apetalum*) usually dominates the tallest stratum with black wattle (*Callicoma serratifolia*), lilly pilly (*Acmena smithii*), water gum (*Tristaniopsis laurina*) and tree ferns (*Cyathea spp.)* forming a scattered cover of small trees in the sub-canopy layer. These are rainforests of low species diversity compared to more complex rainforests associated with richer soils. The array of lianes and climbers that are common in other rainforest assemblages are absent here. Instead, the ground cover is an open cover of ferns amongst sandstone boulders and fallen logs. In the Sydney area these narrow ribbons of rainforest form small disjunct patches restricted to very incised Hawkesbury sandstone gullies and sandstone alluvium. It occurs in higher rainfall zones (greater than 900 millimetres per annum) and as a result is more commonly encountered in the eastern portions of the Hornsby and Woronora plateaus.

1.1.5 Forested Wetlands

Coastal Flats Swamp Mahogany Forest	
Total Remnant in LGA	**1.23 ha**
Predicted Pre-1750 Distribution	**27,000 – 63,000 ha**
Area remaining within Sydney Basin	**7,100 ha**
Amount in NPWS Reserves	**895 ha**
Amount in Parramatta Reserves	**0.07 ha**

Coastal Flats Swamp Mahogany Forest is found in areas of impeded drainage near coastal swamps, lagoons and along low-lying drainage flats. This open forest is dominated by swamp mahogany (*Eucalyptus robusta*) with a smaller tree layer of swamp oak (*Casuarina glauca*) and paperbarks (*Melaleuca linariifolia, Melaleuca styphelioides*). A distinct mesic element is present in the understorey, with cheese tree (*Glochidion ferdinandi*) and cabbage tree palm (*Livistona australis*) most prominent. Climbers such as snake vine (*Stephania japonica*) and common silkpod (*Parsonsia straminea*) may be found winding around tree trunks and fallen branches. The ground cover is periodically wet, with standing water rarely persistent throughout the year. While some sedges do occur amongst the ground cover, ferns, grasses and herbs are the most abundant. In the Sydney area this community is restricted to elevations between one and 6 metres above sea level. It appears to be more common on low-lying alluvium rather than marine sediments, although there is considerable gradation between the two.

Cumberland Riverflat Forest	
Total Remnant in LGA	**4.41 ha**
Predicted Pre-1750 Distribution	**26,500 – 106,000 ha**
Area remaining within Sydney Basin	**5,300 ha**
Amount in NPWS Reserves	**150 ha**
Amount in Parramatta Reserves	**4.15 ha**

Cumberland Riverflat Forest is an open eucalypt forest situated on broad alluvial flats of the Hawkesbury and Nepean river systems. It also forms narrower ribbons alongside streams and creeks that drain the Cumberland Plain. Typically the canopy includes one of either rough-barked apple (*Angophora floribunda*) or broad-leaved apple (*Angophora subvelutina*) and one or both of forest red gum (*Eucalyptus tereticornis*) and cabbage gum (*Eucalyptus amplifolia*). However there are a wide variety of other interesting eucalypts that are highly localised. On the Georges River near Bankstown and on Cabramatta and Prospect creeks blue box (*Eucalyptus baueriana*) is commonly encountered, sometimes as a smaller tree beneath the canopy. Further north and east Sydney blue gum (*Eucalyptus saligna*) and blackbutt (*Eucalyptus pilularis*) occurs.

The understorey within this riverflat forest is characterised by an occasional sparse to open small tree stratum of paperbark (Melaleuca spp.) and wattles (Acacia spp.). A sparse lower shrub layer features blackthorn (*Bursaria spinosa*) at most sites. The ground layer is characterised by an abundant cover of grasses with small herbs and ferns. Cumberland Riverflat Forest occurs at altitudes between one and 160 metres above sea level and with a mean annual rainfall of 750-1000 millimetres.

Cumberland Swamp Oak Riparian Forest	
Total Remnant in LGA	**10.49 ha**
Predicted Pre-1750 Distribution	**28,000 – 107,500 ha**
Area remaining within Sydney Basin	**6,500 ha**
Amount in NPWS Reserves	**155 ha**
Amount in Parramatta Reserves	**7.47 ha**

Cumberland Swamp Oak Riparian Forest is found on the riverflats of the Cumberland Plain in western Sydney and in the Hunter Valley. The distinguishing feature is the prominent stands of swamp oak (*Casuarina glauca*) found along or near streams. Often these are relatively young trees, swarming amongst a mix of old and young eucalypts such as rough-barked apple (*Angophora floribunda*), forest red gum (*Eucalyptus tereticornis*) and grey box (*Eucalyptus moluccana*). This community features an open grassy and herbaceous understorey, as is typical of riverflat forests. It may be that this is a pioneering community that is re-establishing following clearing. It is known that many creeklines in western Sydney are slightly saline, particularly during drought. Water tables are likely to rise following clearing, bringing salt water closer to the surface. This may explain why the salt tolerant swamp oak is so prolific in these environments and in many instances appears to survive where the eucalypt species do not.

Estuarine Swamp Oak Forest	
Total Remnant in LGA	**10.49 ha**
Predicted Pre-1750 Distribution	**4,200 – 16,800 ha**
Area remaining within Sydney Basin	**840 ha**
Amount in NPWS Reserves	**140 ha**
Amount in Parramatta Reserves	**7.47 ha**

Estuarine Swamp Oak Forest occurs immediately above tidal influence in the zonation from mangroves to terrestrial sclerophyll and mesophyll forests and woodlands. It fringes the margins of saline waterbodies that include rivers, lagoons and tidal lakes. Swamp oak (*Casuarina glauca*) forms dense monospecific stands above a thick ground cover of salt-tolerant herbs, rushes and sedges. The shrub layer is low-growing and sparse, comprising a mix of terrestrial species while others typical of wetlands. It is a community of relatively low species diversity. Estuarine Swamp Oak Forest is widespread along the coast of the Sydney basin where it is rarely found at more than two meters above sea level.

1.1.6 Freshwater Wetlands

Coastal Freshwater Wetland	
Total Remnant in LGA	**2.28 ha**
Predicted Pre-1750 Distribution	**5,300 – 12,000 ha**
Area remaining within Sydney Basin	**3700 ha**
Amount in NPWS Reserves	**480 ha**
Amount in Parramatta Reserves	**1.45 ha**

Coastal Freshwater Wetland is associated with freshwater lagoons and swamps on alluvial flats and sand depressions across the New South Wales east coast. Lagoons have fluctuating levels of standing water that gives rise to a varied assemblage of species. They include a range of sedges, rushes and aquatic herbs with woody shrubs and small trees found only on the margins of the wetlands in low abundance. Tall reedlands (reaching over three metres in height) may dominate individual wetlands. Cumbungi (Typha orientalis) is typically dominant in urban wetlands and may be joined by common reed (Phragmites australis). Other tall reeds include Eleocharis sphacelata and tall sedges such as twig-rushes (Baumea spp.). The margins of open water carry a range of aquatic herbs such as Isachne gibbosa and Persicaria decipiens.

Less frequently inundated wetlands support only a few species of sedges or rushes such as Carex appressa and or Baumea spp. which do not reach the height of the taller reedlands found elsewhere. In the Sydney metropolitan area Coastal Freshwater Wetland is most commonly found at low elevations less than five metres above sea level on coastal plains and flats. Several swamps occur on highly disturbed floodplains of the Cumberland Plain where elevations reach 20 metres above sea level. Many of the remaining swamps are situated amongst intensely developed urban landuses. In these environments, drainage patterns have been altered and weeds may be prolific.

Coastal Freshwater Wetland

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Estuarine Reedland

Total Remnant in LGA	**0.25 ha**
Predicted Pre-1750 Distribution	**Not Available**
Area remaining within Sydney Basin	**Not Available**
Amount in NPWS Reserves	**Not Available**
Amount in Parramatta Reserves	**0 ha**

Estuarine Reedland is characterised by tall dense swards of the common reed (*Phragmites australis*). It is found in environments inundated by saline or brackish water. These include low-lying swamps on riverbanks, riverflat depressions, and banks on coastal lagoons that are open to tidal influence. This community is commonly encountered on the landward side of saltmarsh flats. Several salt-tolerant species are shared with saltmarshes including sea rush (*Juncus kraussii*), bare twig-rush (*Baumea juncea*) and the small herb creeping brookweed (*Samolus repens*). In the Sydney metropolitan area this community is patchily distributed along lagoon fringes and riverflats of the Georges, Parramatta and Hacking rivers and in major brackish lagoons such as the Narrabeen Lakes. The common reed can be a vigorous recolonising species in disturbed environments. Estuarine Reedland is common and widespread along estuarine environments of the New South Wales coastline.

1.1.7 Saline Weltands

Estuarine Mangrove Forest	
Total Remnant in LGA	**50.03 ha**
Predicted Pre-1750 Distribution	**4,900 – 7,400 ha**
Area remaining within Sydney Basin	**3,700 ha**
Amount in NPWS Reserves	**740 ha**
Amount in Parramatta Reserves	**25.89 ha**

Stands of mangroves form a low closed to open forest on mudflats in Sydney's harbour, river coves and estuaries. There are two mangrove species found in Sydney. Grey mangrove (*Avicennia marina*) is the taller and more common, often seen in pure stands. Stands of grey mangrove comprise very few species other than the canopy, with the understorey mostly an open mudflat sometimes with scattered saltmarsh herbs. The second mangrove species is river mangrove (*Aegiceras corniculatum*). It is more often a small tree or shrub found scattered amongst swathes of grey mangrove or along upper reaches of coastal riverbanks. It occurs where freshwater influences from runoff or rivers cause lower salinity levels. The distribution of mangrove appears dynamic. Estuaries have been extensively cleared and infilled for industrial and urban development. Stands of mangroves were also cleared and used to fuel lime kilns during early settlement. Since then there is evidence that mangroves have colonised areas formerly occupied by saltmarsh and have established on sites of recent sediment accumulation.

Estuarine Saltmarsh	
Total Remnant in LGA	**3.96 ha**
Predicted Pre-1750 Distribution	**>4,400 ha**
Area remaining within Sydney Basin	**2,200 ha**
Amount in NPWS Reserves	**740 ha**
Amount in Parramatta Reserves	**3.23 ha**

Saltmarshes consist of low succulent herbs and rushes on tidally inundated land. These marshes form plains that adjoin open water and mangroves. Throughout the marsh salinity varies greatly according to tidal influence, evaporation and fresh water accumulation. Some of the areas are flooded regularly, while at slightly higher elevations flooding is rare. After rain fresh water accumulates and adds extra water to the marsh, leaving pools of standing water when the tide recedes. Chenopod species dominate areas more frequently inundated by the tides, while sea rush (*Juncus kraussii*) occupies the more elevated terrestrial margin. Local scalds occur in small depressions where intensely saline deposits accumulate from the evaporation of tidal waters preventing the growth of any plants at all. Like many estuarine vegetation communities, large areas have been reclaimed for industrial, recreational and urban land use. Many examples that remain in Sydney are small in size, highly fragmented and patchy in distribution. Historical photographs taken in 1943 across much of the Sydney area (LPI 2013) clearly indicates that some former saltmarshes and mud flats are now colonised by dense stands of mangroves. This is particularly visible along the Georges and Parramatta rivers.

1.2 LOCAL NATIVE PLANTS OF THE PARRAMATTA LGA

A total of 600+ naturally occurring native flora species have been recorded in the Parramatta LGA and are outlined in the folllwing tables. These have been recorded in the 2003 Biodiveristy Plan, 2011 Bushland Surveys or the OEH Wildlife Atlas.

Scientific Name	Common Name	TSC status	EPBC status
Acacia binervata	Two-veined Hickory		
Acacia binervia	Coastal Myall		
Acacia brownii	Heath Wattle		
Acacia decurrens	Sydney Green Wattle		
Acacia elongata	Slender Wattle		
Acacia falcata	Sickle-leaved Wattle		
Acacia falciformis	Broad-leaved Hickory		
Acacia floribunda	Gossamer Wattle		
Acacia implexa	Hickory Wattle		
Acacia linifolia	Flax-leaved Wattle		
Acacia longifolia	Sydney Golden wattle		
Acacia longifolia var longifolia	Sydney Golden wattle		
Acacia maidenii	Maiden's Wattle		
Acacia parramattensis	Parramatta Green Wattle		
Acacia parvipinnula	Silver-stemmed wattle		
Acacia pubescens	Downy Wattle	V	V
Acacia stricta	Hop Wattle		
Acacia suaveolens	Sweet-scented wattle		
Acacia terminalis	Sunshine Wattle		
Acacia ulicifolia	Prickly Moses		
Acianthus fornicatus	Pixie Caps		
Acmena smithii	Lily Pilly		
Acronychia oblongifolia	White Aspen		
Actinotus helianthi	Flannel Flower		
Adiantum aethiopicum	Maiden Hair Fern		
Adiantum hispidulum	Rough Maiden Hair Fern		
Aegiceras corniculatum	River Mangrove		
Agrostis aemula			
Agrostis avenaceae	Oat Spear Grass		
Alisma plantago- aquatica	Water-plantain		
Allocasuarina littoralis	Black She-oak		
Allocasuarina torulosa	Forest She-oak		
Alphitonia excelsa	Red Ash		
Alternanthera denatata	Ruby Leaf		
Alternanthera denticulata	Lesser Joy Weed		
Alternanthera nana	Dwarf Joy Weed		
Ampera xiphoclada	Broom Spurge		
Amyema gaudichaudii			
Angophora bakeri	Narrow-leaved Apple		
Angophora costata	Smooth-barked Apple / Sydney Red Gum		
Angophora floribunda	Rough-barked Apple		
Arthhropodium milleflorum	Pale Vanilla Lily		
Anthropodium minus	Small Vanilla Lily		
Aristada ramosa	Three-awn Speargrass		
Aristata vagans	Wire Grass		
Asperula conferta	Common Woodruff		
Asplenium australasicum	Birds Nest Fern		
Asplenium flabellifolium	Necklace Fern		
Asterolasia correifolia	Lemon Starbush		
Astroloma humifusum	Cranberry Heath		
Astrotricha latifolia	Broad-leaf Star Hair		
Atriplex semibaccata	Creeping Satlbush		
Austrodanthonia fulva	Copper-awned Wallaby-grass		

Scientific Name	Common Name	TSC status	EPBC status
Austrodanthonia racemosa var.	Slender Wallaby Grass		
Austrodanthonia tenuior	Wallaby Grass		
Avincennia marina	Grey Mangrove		
Backhousia myrtifolia	Grey Myrtle		
Banksia ericifolia	Lantern Banksia		
Banksia integrifolia	Coastal Banksia		
Banksia serrata	Old Man Banksia		
Banksia spinulosa	Hairpin Banksia		
Bauera rubioides	Dog Rose		
Billardiera scandens	Plum Puddings		
Blechnum ambiguum			
Blechnum cartilagineum	Soft Water Fern		
Blechnum nudum	Water Fishbone		
Blechnum patersonii	Strap Water Fern		
Bolboschoenus caldwellii	Marsh clubrush		
Boronia polygalifolia	Dwarf Boronia		
Bossiaea buxifolia	Matted Bossiaea		
Bossiaea heterophylla	Variable Bossiaea		
Bossiaea obcordata	Spiny Bossiaea		
Bossiaea prostrata	Creeping Bossiaea		
Bothriochloa decipiens	Pitted Bluegrass		
Bothriochloa macra	Red-leg Grass		
Brachychiton acerifolius	Illawarra Flame Tree		
Brachychiton populneus	Kurrajong		
Brachycome angustifolia var angustifolia	Stiff Daisy		
Brachyloma daphnoides	Daphne Heath		
Breynia oblongifolia	Coffee Bush		
Brunoniella australis	Blue Trumpet		
Brunoniella pumilo	Dwarf Trumpet		
Bursaria spinosa	Blackthorn		
Caesia parviflora	Pale Grass Lily		
Caesia vittata			
Caladenia sp	Spider Orchid		
Callicoma serratifolia	Black Wattle		
Callistemon citrinus	Crimson Bottlebrush		
Callistemon linearifolius	Netted Bottlebrush	Vulnerable	
Callistemon linearis	Narrow-leaved Bottlebrush		
Callistemon pinifolius	Pine-leaved bottlebrush		
Callistemon rigidus	Stiff Bottlebrush		
Callistemon salignus	Willow-leaved Bottlebrush		
Calochlaena dubia	False Bracken Fern		
Calotis cuneifolia	Rough Burr-Daisy		
Calotis dentex	Daisy Burr		
Calotis lappulacea	Yellow Burr-daisy		
Calystegia marginata	Bindweed		
Calystegia sepium	Bindweed		
Carex appressa	Tall Sedge		
Carex inversa	Knob Sedge		
Carex longibrachiata			
Cassinia aculeata	Dogwood		
Cassinia aurionitens	Yellow Cassinia		
Cassinia longifolia	Shiny Cassinia		
Cassinia uncata	Bent Cassinia		
Cassytha glabella	Slender Devil's Twine		
Cassytha pubescens	Devils Twine		
Casuarina cunninghamiana	River Oak		
Casuarina glauca	Swamp She Oak		
Caustis flexuosa	Curly Wig		
Cayratia clematidea	Slender Grape		
Centaurium spicatum			
Centella asiatica	Swamp Pennywort		

Scientific Name	Common Name	TSC status	EPBC status
Centipede minima			
Ceratopetalum apetalum	Coachwood		
Ceratopetalum gummiferum	NSW Christmas Bush		
Chamaesyce dallachyana			
Cheilanthes distans			
Cheilanthes seiberi	Rock Fern		
Cheilanthes sieberi subsp. sieberi			
Cheilanthes tenuifolia	Rock Fern		
Chloris truncata			
Chloris ventricosa	Windmill Grass		
Chorizema parviflorum			
Christella dentata	Binung		
Cissus antarctica			
Cissus hypoglauca			
Citriobatus pauciflora			
Cladium procerum	Leafy Twig-rush		
Clematis aristata	Old Mans Beard		
Clematis glycinoides	Forest clematis		
Clematis glycinoides var. glycinoides			
Clerodendrum tomentosum	Hairy Clerodendron		
Commelina cyanea	Scurvy Weed		
Convolvolus erubescens	Blushing Bindweed		
Correa reflexa	Native Fuchsia		
Corymbia citriodora	Lemon Scented Gum		
Corymbia gummifera	Red Bloodwood		
Corymbia maculata	Spotted Gum		
Cotula australis	Carrot weed		
Cotula coronopifolia	Common Cotula		
Crassila seiberiana			
Crinum pedunculatum			
Culcita dubia	Soft Bracken		
Cuscata australis	Dodder		
Cyathea australis	Rough Tree Fern		
Cymbopogon refractus	Barbed-wire Grass		
Cynodon dactydon			
Cyperus difformis	Variable Flat Sedge		
Cyperus gracilis			
Cyperus imbecillus			
Cyperus laevis			
Cyperus mirus			
Cyperus polystachyos			
Cyperus sanguinolentus			
Dampiera sp.			
Danthonia linkii var fulva	Wallaby Grass		
Danthonia linkii var linkii	Wallaby Grass		
Danthonia longifolia	Wallaby Grass		
Danthonia pilosa	Wallaby Grass		
Danthonia racemosa	Wallaby Grass		
Danthonia setacea	Wallaby Grass		
Danthonia sp.	Wallaby Grass		
Danthonia tenuior	Wallaby Grass		
Darwinia sp.			
Daviesia ulicifolia	Gorse Bitter-pea		
Dawsonia sp.	Moss		
Dendrophthoe sp.	A Mistletoe		
Dendrophthoe vitellina			
Desmodium rhytidophyllum			
Desmodium varians			
Desmonium rhytidophyllum			
Desmonium varians			

Scientific Name	Common Name	TSC status	EPBC status
Deyeuxia quadriseta			
Dianella caerulea var caerulea	Blue Flax Lily		
Dianella caerulea var producta	Blue Flax Lily		
Dianella laevis			
Dianella longifolia			
Dianella revoluta	Mauve Flax Lily		
Dianella revoluta var. revoluta			
Dichelachne crinata	Short-haired Plume Grass		
Dichelachne micrantha	Long-haired Plume Grass		
Dichelachne rara	Plume-grass		
Dichondra repens			
Dichondria repens	Kidney weed		
Dichopogon strictus			
Dicksonia antarctica	Soft tree fern		
Digitaria brownii			
Digitaria parvifolia	Small Flowered Fingergrass		
Digitaria ramularis			
Dillwynia juniperina			
Dillwynia retorta	Eggs & Bacon		
Dillwynia sieberi	Prickly Parrot Pea		
Dipodium punctatum	Hyacinth Orchid		
Diuris brevifolia			
Diuris maculata			
Diuris sulphurea			
Dodonaea triquetra	Common Hop Bush		
Dodonaea viscosa			
Doodia aspera	Rasp Fern		
Doodia caudata	Small Rasp Fern		
Dracophyllum secundum			
Drosera peltata	Sundew		
Dysphania littoralis			
Echinopogon caespitosus	Tufted Hedgehog Grass		
Echinopogon ovatus	Forest Hedgehog Grass		
Echinopogon sp			
Echinopogon stricta			
Einada polygonoides			
Einadia hastata	Saloop		
Einadia nutan ssp nutans			
Einadia polygonoides			
Einadia trigonos	Salt Bush		
Einadia trigonus subsp. Leicarpa	Fishweed		
Elaeocarpus reticulatus	Blueberry Ash		
Eleocharis acuta			
Elymus multiforus			
Elymus scabrus			
Enchylaena tomentosa	Ruby Saltbush		
Entolasia marginata	Bordered Panic Grass		
Entolasia stricta	Wiry Panic Grass		
Epacris pulchella	NSW Coral Heath		
Epacris purpurescens var purpurescens	Rigid Epacris	Vulnerable	
Epaltes australis			
Epilobium billardieranum spp billardierianum	Willow Herb		
Epilobium billardieranum spp cinereum			
Eragrostis brownii	Brown's Love Grass		
Eragrostis elongata			
Eragrostis leptostachya			
Eragrostis parviflora			
Eragrostis philippica			
Eremophila debilis			
Eriostemon australasius			
Eucalyptus (moluccana x fibrosa spp fibrosa)			
Eucalyptus acmenoides	White Mahogany		

Scientific Name	Common Name	TSC status	EPBC status
Eucalyptus amplifolia	Cabbage Gum		
Eucalyptus botryoides	Bangalay		
Eucalyptus crebra	Narrow-leafed Ironbark		
Eucalyptus eugeniodes	Brown Stringybark		
Eucalyptus fibrosa	Red Ironbark		
Eucalyptus globoidea	White Stringybark		
Eucalyptus gummifera	Red Bloodwood		
Eucalyptus haemastoma	Scribbly Gum		
Eucalyptus longifolia	Woollybutt		
Eucalyptus maculata	Spotted Gum		
Eucalyptus moluccana	Grey Box		
Eucalyptus paniculata	Grey Ironbark		
Eucalyptus parramattensis	Drooping Red Gum		
Eucalyptus pilularis	Blackbutt		
Eucalyptus piperita	Sydney Peppermint		
Eucalyptus punctata	Grey Gum		
Eucalyptus punctata spp punctata	Grey Gum		
Eucalyptus resinifera	Red Mahogany		
Eucalyptus robusta	Swamp Mahogany		
Eucalyptus saligna	Sydney Blue Gum		
Eucalyptus scias ssp. *scias*			
Eucalyptus sparsifolia	Narrow-leaved Stringybark		
Eucalyptus tereticornis	Forest Red Gum		
Euchiton sphaericus			
Euphorbia drummondii			
Eustrephus latifolius	Wombat Berry		
Exocarpus cupressiformis	Cherry Ballart		
Exocarpus stricta	Dwarf Currant		
Ficus coronata	Sandpaper Fig		
Ficus macrophylla	Morton Bay Fig		
Ficus rubiginosa	Port Jackson Fig		
Gahnia aspera	Rough Saw-sedge		
Gahnia clarkei	Saw Sedge		
Gahnia grandis			
Gahnia melanocarpa	Black Fruit Saw-sedge		
Galium binifolium			
Geitonoplesium cymosum	Scambling Lily		
Geranium homeanum	Northern Cranesbill		
Geranium solanderi	Native Geranium		
Gleichenia dicarpa	Coral Fern		
Glochidion ferdinandi	Cheese Tree		
Glossogyne tenuifolia	Native Cobbler's Pegs		
Glycine clandestina	Love Creeper		
Glycine microphylla	Love Creeper		
Glycine tabacina	Variable Glycine		
Gnaphalium involucrutum			
Gnaphalium sphaericum			
Gompholobium glabratum			
Gompholobium minus			
Gonocarpus tetragynus			
Gonocarpus teucrioides	Germander Raspwort		
Goodenia bellidifolia ssp bellidifolia			
Goodenia hederacea	Violet-leaved Goodenia		
Goodenia hederacea subsp. hederacea			
Goodenia heterophylla	Variable Goodenia		
Goodenia ovata			
Goodenia paniculata			
Goodenia stelligera			
Gratiola pedunculata			
Gratiola sp.	Brooklime		
Grevillea linearifolia	White Spider Flower		
Grevillea robusta	Silky Oak		

Scientific Name	Common Name	TSC status	EPBC status
Grevillea sericea	Pink Spider Flower		
Haemodorum planifolia	Bloodroot		
Hakea dactyloides	Finger Hakea		
Hakea gibbosa	Large-fruited Needlebush		
Hakea salicifolia	Willow-leaved hakea		
Hakea sericea	Needle Bush		
Hakea teretifolia	Dagger Hakea		
Hardenbergia violacea	False Sarsparilla		
Helichrysum adnatum	Paper Daisy		
Helichrysum apiculatum	Yellow Buttons		
Helichrysum collinum	Paper Daisy Bush		
Helichrysum scorpiodes	Daisy Bridal Bush		
Hemarthria uncinata	Matgrass		
Hibbertia aspera			
Hibbertia dentata	Guinea Flower		
Hibbertia diffusa			
Hibbertia empetrifolia			
Hibbertia linearis			
Hibbertia pedunculata			
Hibbertia scandens	Snake Vine		
Hibbertia vestita			
Hibiscus heterophyllus	Native Rosella		
Histiopteris incisa	Batswing Fern		
Hovea linearis			
Hovea longifolia var longifolia			
Hydrocotyle peduncularis	Pennywort		
Hydrocotyle tripartite			
Hymenanthera dentata	Tree Violet		
Hypericum gramineum	St Johns Wort		
Hypericum japonicum			
Hypolepis muelleri	Harsh Ground Fern		
Hypoxis hygrometrica			
Imperata cylindrica	Blady Grass		
Indigofera australis	Austral Indigo		
Isolepis cernua	Fiberoptic Grass		
Isopogon anemonefolius	Drumsticks		
Isotoma fluviatalis ssp. fluviatalis			
Jacksonia scoparia			
Juncus bufonius			
Juncus continuus			
Juncus homalocaulis			
Juncus kraussii	Sea Rush		
Juncus planifolius			
Juncus remotiflorus			
Juncus sarophorus			
Juncus subsecundus			
Juncus usitatus	Common Rush		
Kennedia prostrata			
Kennedia rubicunda	Running Postman		
Kunzea ambigua	Tick Bush		
Lagenifera sp.A			
Lambertia formosa	Mountain Devil		
Lasiopetalum parviflorum			
Lasiopetalum rufum			
Laxmannia gracilis			
Lepidosperma laterale	Variable Sword-sedge		
Lepidosperma lineare			
Lepidosperma squamatum	Sword Sedge		
Lepidosperma urophorum			
Leptomeria acida	Acid Drops		
Leptospermum deanei	Deane's Tea-tree	Vulnerable	Vulnerable

Scientific Name	Common Name	TSC status	EPBC status
Leptospermum polygalifolium	Lemon-scented Tea-tree		
Leptospermum trinervum	Paperbark Tea-tree		
Leucopogon ericoides			
Leucopogon juniperinus	Bearded Heath		
Leucopogon lanceolatus	Lance Beard-heath		
Lindsaea linearis			
Lindsaea microphylla			
Linium marginale			
Lissanthe stigosa	Native Cranberry		
Livistona australis	Cabbage Palm		
Lobelia alata			
Lobelia gracilis			
Logania albiflora			
Lomandra brevis	Tufted Mat-rush		
Lomandra cylindrica			
Lomandra filiformis			
Lomandra filiformis ssp coriacea	Wattle Mat-rush		
Lomandra filiformis ssp filiformis	Wattle Mat-rush		
Lomandra fluviatilis	Lomandra		
Lomandra glauca			
Lomandra longifolia	Spiny-headed Mat-rush		
Lomandra multiflora			
Lomandra multiflora ssp multiflora	Many-flowered Mat-rush		
Lomandra obliqua	Fishbones		
Lomatia myricoides			
Lomatia salaifolia	Wild Parsley		
Lophostemon confertus	Brush Box		
Ludwigia peploides	Water Primrose		
Macrozamia spiralis			
Marsdenia rostrata			
Maytenus silvestris	Orange Wood		
Melaleuca decora	White Feather Honeymyrtle		
Melaleuca ericifolia	Swamp Paperbark		
Melaleuca erubescens			
Melaleuca linariifolia	Snow-in-Summer		
Melaleuca nodosa	Ball Honey-Myrtle		
Melaleuca quinqeunervia	Broad-leaved Paperbark		
Melaleuca sieberi			
Melaleuca stypheliodes	Prickly-leaved Paperbark		
Melia azedarach	White Cedar		
Mentha satureioides			
Micrantheum ericoides			
Microlaena stipiodes	Weeping Meadow Grass		
Microlaena stipoides var. stipoides			
Microtis sp.			
Mitrasacme polymorpha			
Monotoca scoparia			
Morinda jasminoides	Morinda		
Muelhlenbeckia gracillima	Lignum		
Muellerina eucalypoides			
Myoporum debile			
Myoporum insulare			
Notelaea longifolia	Mock Olive		
Olearia microphylla			
Olearia viscidula			
Omalanthus nutans	Bleeding Heart		
Omalanthus populifolius	Bleeding Heart		
Omalanthus stillingiifolius			
Omphacomeria acerba			
Opercularia aspera	Common Stinkweed		
Opercularia diphylla			
Opercularia hispida			

Scientific Name	Common Name	TSC status	EPBC status
Opercularia varia			
Oplismenus aemulus	Basket Grass		
Oplismenus imbecillis			
Oplismenus minus			
Oxalis corniculatus	Yellow Wood Sorrel		
Oxalis exilis			
Oxalis perennans			
Oxalis radicosa			
Ozothamnus diosmifolium	Paper Daisy/White Dogwood		
Pallaea falcata			
Pandorea pandorana	Wonga Wonga Vine		
Panicum effusum			
Panicum simile	Two-coloured Panic Grass		
Papaver sp.	Poppy		
Parsonsia straminea	Monkey Rope		
Paspalidium distans			
Paspalidum albovillosum			
Paspalidum aversum			
Paspalidum criniforme			
Paspalidum distans			
Paspalidum distichum	Water Couch		
Paspalidum radiatum			
Paspalidum vaginatum			
Passiflora herbertiana			
Patersonia fragilis			
Patersonia glabrata			
Pelargonium inodorum			
Persicaria decipiens			
Persicaria hydropiper			
Persicaria lapathifolium			
Persicaria prostrata			
Persoonia laurina			
Persoonia levis	Broad-leaved Geebung		
Persoonia linearis	Narrow-leaved Geebung		
Persoonia nutans	Nodding Geebung	Endangered	
Persoonia pinifolia	Pine-leaved Geebung		
Petrophile pulchella	Cone-sticks		
Phebalium squameum	Satinwood		
Phragmites australis			
Phyllanthus gasstroemii	Spurge		
Phyllanthus gunnii			
Phyllanthus hirtellus	Thyme Spurge		
Phyllanthus virgatus	Spurge		
Phyllota phylicoides			
Pimelea linifolia			
Pimelea linifolia var.linifolia			
Pimelia curvifolia spp curvifolia	Curved Rice-flower	Vulnerable	
Pimelia linifolia	Slender Rice Flower		
Pittosporum revolutum	Hairy Pittosporum		
Pittosporum undulatum	Common Pittosporum		
Plantago debilis			
Plantago varia	Native Plantain		
Platycerium bifurcatum	Elkhorn		
Platylobium formosum	Handsome Flat-pea		
Platysace ericoides			
Platysace lanceolatus			
Platysace linearifolia			
Plectorrhiza tridentata	Tangled Orchid		
Plectranthus parviflorus	Cockspur		
Poa affinis	Tussock Grass		
Poa labillardierei			
Poa liabillardieri var liabillardieri			
Poa sieberana var sieberana	Snowgrass		

Scientific Name	Common Name	TSC status	EPBC status
Podocarpus spinulosa			
Polygala japonica			
Polymeria calycina	Swamp Bindweed		
Polyscias sambucifolia	Elderberry Panax		
Pomaderris discolor	Pomaderris		
Pomaderris elliptica	Smooth pomaderris		
Pomaderris ferruginea	Rusty Pomaderris		
Pomaderris lanigera	Woolly Pomaderris		
Pomaderris prunifolia	Plum-leaf Pomaderris	Endangered Population	
Pomaderris seiberiana			
Pomax umbellata			
Poranthera microphylla			
Portulaca oleraceus			
Pratia purpurescens	White Root		
Pseuderanthemum variabile	Pastel Flower		
Psilopsida			
Psilotum nudum	Fork Fern		
Psuedognaphalium luteoalbum			
Pteridium esculatum	Bracken Fern		
Pteris tremula	Tender Brake		
Pterostylis longifolia			
Pterostylis nutans			
Pultenaea daphnoides	Bush Pea		
Pultenaea flexilis	Graceful Bush-pea		
Pultenaea retusa			
Pultenaea villosa			
Pyrrosia rupestris	Rock Felt Fern		
Ranunculus lappaceus			
Ranunculus sessiliflorus			
Rapanea howittiana			
Rapanea variabilis	Muttonwood		
Rhodamnia rubescens	Scrub Turpentine		
Rubus parvifolius	Native Raspberry		
Rubus rosifolius	Native Raspberry		
Rulingia dasyphylla			
Rulingia pannosa			
Rumex brownii			
Sambucus australasica			
Samolus repens	Creeping Brookweed		
Sarcocornia quinqueflora	Samphire		
Sarcopetalum harveyanum			
Scaevola albida			
Scaevola ramosissima			
Schizomeria ovatus			
Schoenoplectus validus	River Club-rush		
Schoenus apogin			
Schoenus melanostachys			
Senecio bipinnatisecus			
Senecio hispidulus			
Senecio hispidulus var. dissectus			
Senecio hispidulus var. hispidulus			
Senecio lautus			
Senecio linearifolius			
Senecio quadridentatus	Groundsel		
Seringea arborescens			
Sigesbeckia orientalis	Indian Weed		
Smilax australis	Austral Sarsparilla		
Smilax glyciphylla	Native Sarsparilla		
Solanum aviculare	Kangaroo Apple		
Solanum campanulatum			
Solanum nodiflorum			
Solanum prinophyllum	Forest Nightshade		

Scientific Name	Common Name	TSC status	EPBC status
Solanum pungetium	Eastern Nightshade		
Solenogyne bellioides			
Sporobolus creber	Rat Tail Grass		
Sporobolus elongatus	Rat Tail Grass		
Sporobouls virginicus	Salt Grass		
Stackhousia viminea			
Stenocarpus salignus			
Stephania japonica var. discolor			
Sticherus flabellatus	Fan Fern		
Stipa pubescens			
Stipa ramosissima	Stout Bamboo Grass		
Stipa rudis ssp.*nervosa*			
Stipa rudis ssp. *rudis*			
Stipa scabra			
Stylidium gramminifolium	Trigger Plant		
Suaeda australis	Austral Seablite		
Syncarpia glomulifera	Turpentine		
Tetragonia tetragonioides	Warrigal Spinach		
Tetratheca sp			
Thelymitra ixiodes	Dotted Sun Orchid		
Thelymitra pauciflora			
Themeda australis	Kangaroo Grass		
Thysanotus juncifolius			
Thysanotus tuberosus			
Todea barbara	King Fern		
Trachymene incisa			
Trema aspera	Native Peach		
Tricoryne elatior			
Tricoryne simplex	Northern Rush-lily		
Triglochin multifractum	Water Ribbons		
Triglochin striata	Streaked Arrow Grass		
Triplodiscus pygmaeus			
Tristaniopsis laurina			
Tylophora barbata	Bearded Tylophora		
Typha domingensis			
Typha orientalis	Cumbungi		
Venonia cinerea var. cinerea			
Veronica calycina			
Veronica plebeia	Speedwell		
Viola betonicifolia			
Viola hederacea			
Vittadinia cunteata			
Vittadinia muelleri			
Vittadinia pustulata	Fuzzweed		
Wahlenbergia communis	Tufted Bluebell		
Wahlenbergia gracilis			
Wahlenbergia stricta	Austral Bluebell		
Wilsonia backhousei	Narrow-leafed Wilsonia	Vulnerable	
Woolsia pungens			
Xanthorrhoea arborea			
Xanthorrhoea concava			
Xanthorrhoea media	Forest Grass Tree		
Xanthorrhoea minor	Grass Tree		
Xanthorrhoea resinosa ssp multiflora			
Xanthosia pilosa	Hairy Xanthosia		
Xanthosia tridentata	Rock Xanthosia		
Xylomelum pyriforme	Woody Pear		
Zieria compactus			
Zieria involucrata	Velvet star-bush	Vulnerable	Vulnerable
Zieria pilosa			
Zieria smithii	Sandfly Zieria		
Zornia dyctiocarpa			

1.3 CONSERVATION STATUS OF SIGNIFICANT PLANT SPECIES

A number of threatened species are known, or have the potential, to occur within the LGA. Database searches of the LGA using OEH Wildlife Atlas (NPWS) and Environmental Protected Matters search database (DSWEPC), along with data collated by Parramatta Council are included in Table 1. Results of this search identified a total of 13 threatened flora species known or potentially occurring in the Parramatta LGA. 12 of these have been recorded in one or more of Parramatta LGA's reserves as highlighted in section 1.2 above.

ROTAP and Regionally Significant Flora

Two ROTAP listed species was found the study area: *Lomandra brevis* (2RC-) and *Lomandra fluviatilis* (3RCa).

Table 2: Threatened Flora found in the LGA

Species	Common name	TSC Act Status	EPBC Act Status	Recovery Plan	Source
Acacia pubescens	Downy Wattle	Vulnerable	Vulnerable	Recovery Plan for the Downy Wattle (Acacia pubescens) 2003	DSEWPC, PCC
Callistemon linearifolius	Netted Bottle Brush	Vulnerable		None	OEH, PCC
Epacris purpurascens var. purpurascens	Rigid Epacris	Vulnerable		None	OEH, PCC
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Endangered		None	DSEWPC
Leptospermum deanei	Deane's Tea-tree	Vulnerable	Vulnerable	National Recovery for Melaleuca deanei (Deane's Paperbark) 2010	PCC
Persoonia nutans	Nodding Geebung	Endangered	Endangered	Persoonia nutans Recovery Plan 2006 OEH (NSW)	OEH
Pimelea curviflora var. curviflora	Curved Rice-flower	Vulnerable	Vulnerable	None	DSEWPC, OEH, PCC
Pomaderris prunifolia in the Parramatta, Auburn, Strathfield and Bankstown LGA's	Plum-leaf Pomaderris	Endangered Population		None	OEH
Pterostylis saxicola	Sydney Plains Greenhood	Endangered	Endangered	None	OEH DSEWPC
Tetratheca glandulosa	Glandular Pink- bell	Vulnerable		None	DSEWPC
Wahlenbergia multicaulis Endangered population in Auburn, Bankstown, Baulkham hills, centerbury, Hornsby , Parramatta and Strathfield LGA	Tadgell's Bluebell	Endangered Population		None	PCC
Wilsonia backhousei	Narrow-leafed Wilsonia	Vulnerable		None	OEH, PCC
Zieria involucrata	Velvet star-bush	Endangered	Vulnerable	The Recovery Plan for Zieria involucrate 2007	PCC

***Note:** DSEWPC: Department of Sustainability, Environment, Water, Population and Communities. OEH:NSW Office of Environment & Heritage. PCC: Parramatta City Council.*

1.4 NATIVE FAUNA SPECIES IN THE LGA

A total of 230 naturally occurring native fauna species have been recorded in the Parramatta LGA. The following table gives an overall comprehensive list of the native fauna found in the Parramatta LGA.

Table 3: Parramatta LGA Native Fauna

Common Name	Scientific Name	TSC status	EPBC status
BIRDS			
Australasian Bittern	*Botaurus poiciloptilus*	Endangered	Endangered
Australasian Darter	*Anhinga novaehollandiae*		
Australasian Grebe	*Tachybaptus novaehollandiae*		
Australian Hobby	*Falco longipennis*		
Australian King Parrot	*Alisterus scapularis*		
Australian Magpie	*Gymnorhina tibicen*		
Australian Pelican	*Pelecanus conspicillatus*		
Australian Raven	*Corvus coronoides*		
Australian White Ibis	*Threskiomis molucca*		
Australian Wood Duck	*Chenonetta jabata*		
Azure Kingfisher	*Alcedo azurea*		
Barking Owl	*Ninox connivens*	Vulnerable	-
Barn Owl	*Tyto alba*		
Bell Miner	*Manorina melanophrys*		
Black Bird	*Turdus merula*		
Black Bittern	*Ixobrychus flavicollis*	Vulnerable	-
Black Shoulder Kite	*Elanus axillaris*		
Black Swan	*Cygnus atratus*		
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		
Black-faced Monarch	*Monarcha melanopsis*	-	Migratory
Black-faced Woodswallow	*Artamus cinereus*		
Black-fronted Dotterel	*Elseyornis (Charadrius) melanops*		
Black-tailed Native Hen	*Gallirallis ventralis*		
Brown Gerygone	*Gerygone mouki*		
Brown Goshawk	*Accipiter fasciatus*		
Brown Honeyeater	*Lichmeria indistincta*		
Brown Quail	*Coturnix ypsilophora*		
Brown Thornbill	*Acanthiza pusilla*		
Brush Turkey	*Alectura lathami*		
Buff-banded Rail	*Gallirallus philippensis*		
Buff-rumped Thornbill	*Acanthiza reguloides*		
Bulbul*	*Pycnonotus jocosus*		
Catbird	*Ailuroedus crassirostris*		
Cattle Egret	*Ardea ibis*	-	Migratory
Channel-billed Cuckoo	*Scythrops novaehollandiae*		
Chestnut Teal	*Anas castanea*		
Cicadabird	*Coracina tenuirostris*		
Clamorous Reed-Warbler	*Acrocephalus stentoreus*		
Comb-crested Jacana	*Irediparra gallinacea*		
Common Blackbird*	*Turdus merula*		
Common Bronzewing	*Phaps chalcoptere*		
Common Starling*	*Stumus vulgaris*		
Crested Pigeon	*Ocyphaps lophotes*		

Common Name	Scientific Name	TSC status	EPBC status
Crimson Rosella	*Platycercus elegans*		
Darter	*Anhinga melanogaster*		
Diamond Dove	*Geopelia cuneata*		
Dollarbird	*Eurystomus orientalis*		
Domestic Duck (Pekin)*	*Anas platyrhynchos domestica*		
Double-Barred Finches	*Taeniopygia guttata*		
Dusky Moorhen	*Gallinula tenebrosa*		
Eastern Rosella	*Platycercus eximius*		
Eastern Spinebill	*Acantorhynchus tenuirostris*		
Eastern Whipbird	*Psophodes olivaceus*		
Eastern Yellow Robin	*Eopsaltria australis*		
Eurasian Coot	*Fulica atra*		
Fairy Martin	*Hirundo ariel*		
Fan-tailed Cuckoo	*Cacomantis flabelliformis*		
Galah	*Eolophus roseicapillus*		
Glossy Ibis	*Plegadis falcinellus*		
Golden Whistler	*Pachycephala pectoralis*		
Golden-Headed Cisticola	*Cisticola exilis*		
Great Cormorant	*Phalacrocorax carbo*		
Great Egret	*Ardea alba*	-	Migratory
Green Catbird	*Ailuroedus crassirostris*		
Grey Butcherbird	*Cracticus torquatus*		
Grey Fantail	*Rhipidura fuliginosa*		
Grey Goshawk	*Accipter novaehollandiae*		
Grey Shrike-thrush	*Colluricincla harmonica*		
Hooded Robin	*Melanodryas cucullata*		
House Sparrow*	*Passer domesticus*		
Indian Myna*	*Acridotheres tristis*		
Jacky Winter	*Microeca fascinans*		
Koel	*Eudynamys scolopacea*		
Laughing Kookaburra	*Dacelo novaeguineae*		
Leaden Flycatcher	*Myiagra rubecula*		
Lewins Honeyeater	*Meliphaga lewinii*		
Little Black Cormorant	*Phalacrocorax sulcirostris*		
Little Corella	*Cacatua sanguinea*		
Little Eagle	*Hieraaetus morphnoides*	Vulnerable	
Little Egret	*Egretta garzetta*		
Little Lorikeet	*Cyclopsitta pusilla*	Vulnerable	-
Little Pied Cormorant	*Phalacrocorax melanoleucos*		
Little Wattlebird	*Anthochaera chrysoptera*		
Long-billed Corella	*Cacatua tenuirostris*		
Magpie Lark	*Grallina cyanoleuca*		
Major Mitchell's Cockatoo	*Cacatua leadbeateri*		
Mallard*	*Anas platyrhynchos*		
Mallee Ringneck	*Barnardius zonarius*		
Masked Lapwing	*Vanellus miles*		
Mistletoebird	*Dicaeum hirundinaceum*		
Musk Lorikeet	*Glossopsitta concinna*		
Nankeen (Rufous) Night Heron	*Nycticorax caledonicus*		
New Holland Honeyeater	*Phylidonyris novaehollandiae*		
Noisy Friarbird	*Philemon corniculatus*		

Common Name	Scientific Name	TSC status	EPBC status
Noisy Miner	*Manorina melanocephala*		
Pacific Baza	*Aviceda subcristata*		
Pacific Black duck	*Anas superciliosa*		
Pallid Cuckoo	*Cuculus pallidus*		
Australian Pelican	*Pelecanus conspicillatus*		
Pheasant Coucal	*Centropus phasianinus*		
Pied Butcherbird	*Cracticus nigrogularis*		
Pied Cormorant	*Phalacrocorax varius*		
Pied Currawong	*Strepera graculina*		
Powerful Owl	*Ninox strenua*	Vulnerable	-
Purple Swamp Hen	*Porphyrio porphyrio*		
Rainbow Lorikeet	*Trichoglossus haematodus*		
Red Wattlebird	*Anthochaera carunculata*		
Red-browed Finch	*Neochmia temporalis*		
Red-rumped Parrot	*Psephotus haematonotus*		
Red-whiskered Bulbil	*Pycnonotus jocosus*		
Reed Warbler	*Acrocephalus australis*		
Restless Flycatcher	*Myiagra inquieta*		
Richard's Pipit	*Anthus novaeseelandiae*		
Rock Dove*	*Columba livia f. domestica*		
Rose Robin	*Petroica rosea*		
Royal Spoonbill	*Platalea regia*		
Rufous Fantail	*Rhipidura rufifrons*		
Rufous Night Heron	*Nycticorax caledonicus*		
Sacred Kingfisher	*Todiramphus sanctus*		
Satin Bowerbird	*Ptilonorhynchus violaceus*		
Satin Flycatcher	*Myiagra cyanoleuca*		
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*		
Scarlet Honeyeater	*Myzomela sanguinolenta*		
Scarlet Robin	*Petroica boodang*	Vulnerable	-
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*		
Silver Gull	*Chroicocephalus novaehollandiae*		
Silvereye	*Zosterops lateralis*		
Sooty Owl	*Tyto tenebricosa*	Vulnerable	-
Southern Boobook	*Ninox novaeseelandiae*		
Spangled Drongo	*Dicrurus bracteatus*		
Speckled Warbler	*Pyrrholaemus sagittatus*	Vulnerable	-
Spotted Pardalote	*Pardalotus punctatus*		
Spotted Turtle-dove	*Streptopelia chinensis*		
Straw-necked Ibis	*Threskiomis spinicollis*		
Striated Pardalote	*Pardalotus striatus*		
Striated Thornbill	*Acanthiza lineata*		
Striped Honeyeater	*Plectorhycha lanceolata*		
Sulphur-crested Cockatoo	*Cacatua galerita*		
Superb Fairy-wren	*Malurus cyaneus*		
Superb Fruit-dove	*Ptilinopus superbus*		
Superb Parrot	*Polytelis swainsonii*		
Swift Parrot	*Lathamus discolor*	Endangered	Endangered
Tawny Frogmouth	*Podargus strigoides*		

Common Name	Scientific Name	TSC status	EPBC status
Tree Martin	*Hirundo nigricans*		
Tree Sparrow*	*Passer montanus*		
Variegated Fairy-wren	*Malurus lamberti*		
Weebill	*Smicrornis brevirostris*		
Welcome Swallow	*Hirundo neoxena*		
White-browed Scrubwren	*Sericornis frontalis*		
White-cheeked Honeyeater	*Phylidonyris nigra*		
White-faced Heron	*Egretta novaehollandiae*		
White-headed Pigeon	*Columba leucomela*		
White-necked Heron	*Ardea pacifica*		
White-plumed Honeyeater	*Lichenostomus penicillatus*		
White-throated Gerygone (Warbler)	*Gerygone livacea*		
White-throated Nightjar	*Eurostopodus mystacalis*		
White-throated Treecreeper	*Cormobates leucophaeus*		
Willie Wagtail	*Rhipidura leucophrys*		
Yellow Thornbill	*Acanthiza nana*		
Yellow-faced Honeyeater	*Lichenostomus chrysops*		
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		
Yellow-tailed Black Cockatoo	*Calyptorhynchus funereus*		
Yellow-throated Scrubwren	*Sericornis citreogularis*		
MAMMALS			
Black Rat*	*Rattus rattus*		
Bush Rat	*Rattus fuscipes*		
Chocolate Wattle Bat	*Chalinolobus morio*		
Common Brushtail Possum	*Trichosurus vulpecula*		
Common Ringtail Possum	*Psuedochierus peregrinus*		
Domestic Cat*	*Felis catus*		
Domestic Dog*	*Canis lupus*		
Eastern Bentwing Bat	*Miniopterus schreibersii oceanensis*	Vunerable	-
Eastern Broad-nosed Bat	*Scotorepens orion*		
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable	-
Eastern Freetail-bat	*Mormopterus norfolkensis*	Vulnerable	-
Freetail Bat	*Mormopterus sp.1*		
Gould's Wattled Bat	*Chalinolobus gouldii*		
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Vulnerable	-
Grey Headed Flying Fox	*Pteropus poliocephalus*	Vulnerable	Vulnerable
House mouse*	*Mus musculus*		
Little Forest Bat	*Vespadelus vulturnus*		
Long-eared Bat	*Nyctophilus sp.*		
Long-nosed Bandicoot	*Perameles nasuta*		
Rabbit*	*Oryctolagus cuniculus*		
Red Fox*	*Vulpes vulpes*		
Short Beaked Echidna	*Tachyglossus aculeatus*		
Southern Forest Bat	*Vespadelus regulus*		
Southern Freetail Bat (short penis)	*Mormopterus sp. 2*		
Southern Myotis	*Myotis macropus*	Vulnerable	
Spotted-tailed Quoll	*Dasyurus maculatus*	Vulnerable	Endangered
Sugar Glider	*Petaurus breviceps*		
Water Rat	*Hydromys chrysogaster*		

Common Name	Scientific Name	TSC status	EPBC status
White-striped Freetail-bat	*Nyctinomus australis*		
White-striped Free-tailed Bat	*Tadarida australis*		
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	Vulnerable	
REPTILES AND AMPHIBIANS			
Bandy Bandy	*Vermicella annulata*		
Bibron's Toadlet	*Pseudophryne bibroni*		
Bleating Tree Frog	*Litoria dentata*		
Blind Snake	*Ramphotyphlops proximus*		
Broad-palmed frog	*Litoria latopalmata*		
Broad-tailed Gecko	*Phyllurus platurus*		
Brown-striped Frog	*Limnodynastes peronii*		
Burton's Legless Lizard	*Lialis burtonis*		
Common Eastern froglet	*Crinea signifera*		
Common Scaly-foot	*Pygopus lepidopodus*		
Copper-tailed Skink	*Ctenotus taeniolatus*		
Delicate or Garden Skink	*Lampropholis delicata*		
Eastern Banjo Frog	*Limnodynastes dumerilii*		
Eastern Blue Tongue Lizard	*Tiliqua scincoides*		
Eastern Brown Snake	*Pseudonaja textilis*		
Eastern Dwarf Tree Frog	*Litoria fallax*		
Eastern Long-necked Tortoise	*Chelodina longicollis*		
Eastern Stone Gecko	*Diplodactylus vittatus*		
Eastern Water Dragon	*Physignathus lesueurii*		
Eastern Water Skink	*Eulamprus quoyii*		
Garden Skink	*Lamphropolis guichenoti*		
Green & Golden Bell Frog	*Litoria aurea*	Endangered	Vulnerable
Green Tree Frog	*Litoria caeralea*		
Jacky Lizard	*Amphibolurus muricatus*		
Lace Monitor	*Varanus varius*		
One Leaf Green tree Frog	*Litoria phyllochroa*		
Perons Tree Frog	*Litoria peronii*		
Red-bellied Black Snake	*Pseudechis porphyriacus*		
Red-naped Snake	*Furina diadema*		
Red-throated Skink	*Bassiana platynota*		
Rocket frog	*Litoria nasuta*		
Smooth Toadlet	*Uperoleia laevigata*		
Southern Leaf-tailed Gecko	*Phyllurus platurus*		
Spotted Grass Frog	*Limnodynastes tasmaniensis*		
Stone Gecko	*Diplodactylus vittatus*		
Striped Marsh Frog	*Limnodynastes peronii*		
Striped Skink	*Ctenotus robustus*		
Thick-tailed Gecko	*Underwoodisaurus milii*		
Tusked Frog	*Adelotus brevis*		
Verreaux's Tree Frog	*Litoria verreauxii complex*		
Wall Skink	*Cryptoblepharus virgatus*		
Whistling tree frog	*Litoria verreauxi*		

Common Name	Scientific Name	TSC status	EPBC status
FISH			
Australian Smelt	*Retropinna semoni*		
Common Carp*	*Cyprinus carpio*		
Coxs Gudgeon	*Gobiomorphus coxii*		
Empire Gudgeon	*Hypseleotris compressa*		
Long Finned Eel	*Anguilla reinhardtii*		
Mosquito Fish*	*Gambusia holbrookii*		
Mullet	*Mugilidae* sp.		
Puffer Fish	*Tetraodontidae* sp.		
Short finned Eel	*Anguilla australis*		
INVERTEBRATES			
Blue Triangle	*Graphium sarpedon ssp. choredon*		
Citrus Butterfly	*Papilio anactus*		
Cumberland Land Snail	*Meridolum corneovirens*	Endangered	-
Moonlight Jewel	*Hypochrysops delicia*		

1.4.1 Fauna habitat

Parramatta LGA is located in the transition zone between the Hawkesbury Sandstone Hornsby Plateau and the Wianamatta Shale Cumberland Lowland (Cumberland Plain), with Quaternary alluvium following the creek lines. The Hornsby Plateau area generally receives a significantly higher rainfall than the Cumberland plain area, and the transitional variance in rainfall, geology and soil profiles across the LGA provides for a variety of vegetation communities and habitats (PCC, 2003; PCC, 2006).

Terrestrial habitat within the LGA is generally characterised by *woodland* communities. There are varying levels of understorey density, open grassland and riparian habitats across the LGA. Typically, such communities provide habitat for fauna to shelter, forage, nest, and breed. Habitat features include hollow-bearing trees, grassland, woody debris, dead trees, leaf litter, and bush rock.

1.5 CONSERVATION STATUS OF SIGNIFICANT WILDLIFE SPECIES

A number of threatened species are known, or have the potential, to occur within the LGA. Database searches of the LGA using OEH Wildlife Atlas (OEH) and Environmental Protected Matters search database (DSEWPC), along with data collated by Parramatta Council, are included in Table 4. Results of this search identified a total of 32 threatened fauna species occurring in the Parramatta LGA. This consisted of 16 birds, 12 mammals (including five microchiropteran bats), two frogs, one reptile and one invertebrate. These can be found in the tables below.

Table 4: Threatened Birds found in the LGA

Species	Scientific Name	TSC Act Status	EPBC Act Status	Recovery Plan	Source
Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered	Endangered	Fregent Honeyeater (*Xanthomyza Phrygia*) Recovery Plan 1999- 2003	DSEWPC OEH
Australasian Bittern	*Botaurus poiciloptilus*	Endangered	Endangered	None	PCC
Little Eagle	*Hieraaetus morphnoides*	Vulnerable	-	None	OEH, PCC
Comb-crested Jacana	*Irediparra gallinacea*	Vulnerable	-	None	PCC
Black Bittern	*Ixobrychus flavicollis*	Vulnerable	-	None	PCC
Swift Parrot	*Lathamus discolor*	Endangered	Endangered	Swift Parrot Recovery Plan 2001-2005	DSEWPC
Hooded Robin (southeastern subspecies)	*Melanodryas cucullata cucullata*	Vulnerable	-	None	PCC
Barking Owl	*Ninox connivens*	Vulnerable	-	Recovery Plan for Large Forest Owls 2006	OEH, PCC
Powerful Owl	*Ninox strenua*	Vulnerable	-	Recovery Plan for Large Forest Owls 2006	OEH, PCC
Scarlet Robin	*Petroica boodang*	Vulnerable	-	None	OEH, PCC
Superb Fruit- Dove	*Ptilinopus superbus*	Vulnerable	-	None	PCC
Australian Painted Snipe	*Rostratula australis*	Endangered	Endangered	None	DSEWPC
Diamond Firetail	*Stagonopleura guttata*	Vulnerable	-	None	PCC
Speckled Warbler	*Pyrrholaemus sagittatus*	Vulnerable		None	PCC
Sooty Owl	*Tyto tenebricosa*	Vulnerable		Recovery Plan for Large Forest Owls 2006	PCC
Little Lorikeet	*Cyclopsitta pusilla*	Vulnerable		None	PCC

Table 5: Threatened Mammals (including bats) found in the LGA

Species	Scientific Name	TSC Act Status	EPBC Act Status	Recovery Plan	Source
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable	None	DSEWPC
Spot-tailed Quoll (southeastern population) Spotted-tailed Quoll	*Dasyurus maculates maculates Dasyurus maculatus*	Vulnerable	Endangered	Draft National Recovery Plan for the Spotted- tailed Quoll *Dasyurus maculatus*	DSEWPC OEH
Southern Brown Bandicoot	*Isoodon obesulus obesulus*	Endangered	Endangered	Southern Brown Bandicoot Recovery Plan 2006	DSEWPC
Eastern Bentwing-bat	*Miniopterus schreibersii*	Vulnerable	-	None	OEH, PCC
Eastern Freetail-bat	*Mormopterus norfolkensis*	Vulnerable	-	None	OEH, PCC
Large-footed Myotis	*Myotis macropus*	Vulnerable	-	None	OEH
Long-nosed Bandicoot (Inner Western Sydney)	*Perameles nasuta*	Endangered Population	-	None	PCC
New Holland Mouse	*Pseudomys novaehollandiae*	-	Vulnerable	None	DSEWPC
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	Vulnerable	Grey-headed Flying-fox Draft National Recovery Plan	DSEWPC OEH, PCC
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Vulnerable	-	None	OEH, PCC
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable		None	OEH, PCC
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable		None	OEH, PCC

Note: *DSEWPC: Department of Sustainability, Environment, Water, Population and Communities. OEH:NSW Office of Environment & Heritage. PCC: Parramatta City Council.*

Table 6: Threatened Amphibians in the LGA

Species	Scientific Name	TSC Act Status	EPBC Act Status	Recovery Plan	Source
Giant Burrowing Frog	*Heleioporus australiacus*	Vulnerable	Vulnerable	None	DSEWPC
Green and Golden Bell Frog	*Litoria aurea*	Endangered	Vulnerable	Green and Golden Bell Frog – Draft Recovery Plan 2005	DSEWPC OEH PCC

Note: *DSEWPC: Department of Sustainability, Environment, Water, Population and Communities. OEH:NSW Office of Environment & Heritage. PCC: Parramatta City Council.*

Table 7: Threatened Reptiles and Invertebrates found in the LGA

Species	Scientific Name	TSC Act Status	EPBC Act Status	Recovery Plan	Source
REPTILES					
Broad-headed Snake	*Hoplocephalus bungaroides*	Endangered	Vulnerable	none	DSEWPC
INVERTEBRATES					
Cumberland Plain Land Snail	*Meridolum corneovirens*	Endangered	-	none	OEH PCC

Note: *DSEWPC: Department of Sustainability, Environment, Water, Population and Communities. OEH:NSW Office of Environment & Heritage. PCC: Parramatta City Council.*

1.5.1 Threatened Fauna listed under the NSW Fisheries Management Act 1974

The *NSW Fisheries Management Act 1994* establishes provisions for the identification, conservation and recovery of threatened fish, aquatic invertebrates, and marine vegetation. The Act also covers the identification and management of key threatening processes which affect threatened species or could cause other species to become threatened (NSW DPI 2011). No currently listed species are likely to be found in Parramatta LGA.

1.5.2 Internationally Significant Migratory Species – JAMBA, CAMBA and ROKAMBA

There are 34 migratory species either known, or likely, to occur in Parramatta LGA that are of international importance. Under these agreements, governments have agreed to protect migratory birds and their important habitats. These species are listed as Migratory under the EPBC Act, which refers in turn to species listed under the following International Conventions:

- The agreement between the Government of Australia and the Government of Japan for the protection of migratory birds and birds in danger of extinction and their environment is more commonly called the Japan-Australia Migratory Bird Agreement (JAMBA) and was signed on the 6 February 1974.

- The agreement between the Government of Australia and the Government of the People's Republic of China for the protection of migratory birds and their environment is more commonly called the China-Australia Migratory Bird Agreement (CAMBA) and was signed on the 20 October 1986. (Ref. EABG, 2000).

- The agreement between the Government of Australia and the Republic of Korea for the protection of migratory birds and their habitat and the prevention of the extinction of certain birds is commonly called ROKAMBA and was signed on the 13 July 2007.

1.5.3 Migratory Species

Table 9: Migratory Species

Species	Scientific Name	CAMBA	JAMBA	ROKAMBA
Fork-tailed Swift	*Apus pacificus*	Listed	Listed	Listed
Great Egret	*Ardea alba*	Listed	Listed	
Cattle Egret	*Ardea ibis*	Listed	Listed	
Ruddy Turnstone	*Arenaria interpres*	Listed	Listed	Listed
Sharp-tailed Sandpiper	*Calidris acuminate*	Listed	Listed	Listed
Red Knot	*Calidris canutus*	Listed	Listed	Listed
Curlew Sandpiper	*Calidris ferruginea*	Listed	Listed	Listed
Red-necked Stint	*Calidris ruficollis*	Listed	Listed	Listed
Great Knot	*Calidris tenuirostris*	Listed	Listed	Listed
Pectoral Sandpiper	*Calidrus melanotos*		Listed	Listed
Double-banded Plover	*Charadrius bicinctus*			
Greater Sand Plover	*Charadrius leschenaultia*	Listed	Listed	Listed
Lesser Sand Plover	*Charadrius mongolus*	Listed	Listed	Listed
Red-capped Plover	*Charadrius ruficapillus*			
Latham's Snipe	*Gallinago hardwickii*	Listed	Listed	Listed
White-bellied Sea- Eagle	*Haliaeetus leucogaster*	Listed		
Grey-tailed Tattler	*Heteroscelus brevipes*		Listed	
Black-winged Stilt	*Himantopus himantopus*			
White-throated Needletail	*Hirundapus caudacutus*	Listed	Listed	
Swift Parrot	*Lathamus discolor*			
Bar-tailed Godwit	*Limosa lapponica*	Listed	Listed	Listed
Black-tailed Godwit	Limosa limosa	Listed	Listed	Listed
Rainbow Bee-eater	*Merops ornatus*		Listed	
Black-faced Monarch	*Monarcha melanopsis*			
Satin Flycatcher	*Myiagra cyanoleuca*			
Eastern Curlew	*Numenius madagascariensis*	Listed	Listed	Listed

Appendix B: Stakeholder Consultation

1.6 ISSUES IDENTIFIED BY COUNCIL'S NATURAL RESOURCES TEAM

The table below was provided by staff as part of the background documentation for this plan. It provided a valuable base resource for issues scoping and for the composition of actions for this plan.

Table 10: Stakeholder input

Theme	Issues Identified
Aquatic	• Estuarine benthic community – saltmarsh and mangroves • Macroinvertebrates • Saltmarsh – buffer to development, mangrove encroachment, sea level rise • Native aquatic vegetation to replace exotics Ponds in Galaringi – Gambusia free Electrofishing of exotic species • Liaise with Flood engineers to discuss appropriate placement of LWD • Weirs/Fish blockages/Fish ladders – Fish Friendly • Crossings • Volume of river, stream flows
Fauna	• Nest boxes where no hollows exist (Energy Aust article) • Fauna surveys – terrestrial and aquatic • Green Golden Bell Frog Recovery Plan
Vegetation	• Fungi – Lane Cove example • Endangered Ecological Communities
Flora	• Flora surveys – terrestrial and aquatic • Wilsonia backhouseii
Habitat	• Large Woody Debris • Creation of offline frog habitat • Identify and protect niche habitats • Casuarina torulosa revegetation areas for Glossy • Black cockatoos • Soil organisms • Rafts for Moorhens/Swamp Hens to nest on Lake Parra/Parra River
Connectivity	• Enhance corridor linkages within the Parramatta LGA and between other surrounding LGA's to assist fauna movement • Corridor widths
Threats	• Key Threatening Processes (EPBC Act, Threatened Species Act, Fisheries Act) • Native Tree dieback – Quarry Branch (Huxley, Yarrabee), Vineyard Ck (Rock Farm Rd) • Exotic trees – impacts on streams (deciduous), other impacts (toxicity Camphor laurels) • Vines – impacts on native trees, fauna • Impacts of lighting impacts on nocturnal fauna • Shading/Shadow impacts • Feral Animal Control – fox, rabbit, cat, indian mynah, Gambusia, Carp • Liaise with State Govt. (e.g. DPI – ferals and weeds) • Soil toxicity • Leachate from landfills • Sewer overflows • Climate Change and Sea Level Rise
Management	• Indicators • Monitoring • Fauna/flora database – live for internet?? Enforce Bush Rock theft • Fire – frequency, impacts on flora, fauna etc • Balance mosquito control with need for microbat feeding
Community	• Liaise with NGO's (eg Bird Groups, Frog and Tadpole Study Group FATS)

1.7 BIODIVERSITY WORKSHOPS

This plan is an update to the Parramatta Biodiversity Plan 2003. The 2003 plan identified 10 overall outcomes that were to be achieved, and a number of actions related to those outcomes. A workshop with Parramatta Council staff was undertaken as part of the consultation for this updated plan. Part of this consultation included identifying what actions and outcomes staff felt had been achieved since the last plan.

Workshop 1 was conducted with Parramatta Council employees. The original document, Parramatta Biodiversity Plan 2003, is now 12 years old and many of the statements and actions are now out of date. Re-visiting these proposed outcomes from the original plan showed that the priorities are still important and relevant, but the need to set specific targets and goals is needed in order to measure the success of the outcomes proposed in the new plan.

It was suggested that many of the actions identified in the previous plan be able to be grouped under one outcome in this plan, and by achieving that one outcome it will provide success to other actions. The following table shows the original outcome rfom the 2003 plan as well as notes taken from the discussion. This information was used to formulate actions for the 2015 plan.

Table 11: Outcomes Notes

Outcome	Notes
OUTCOME 1: *Biodiversity is Recognised as a Core Business of Council*	• This outcome has been incorporated to a certain degree, such as in priorities action tool weighting criteria includes biodiversity. • 1.6 Section 94A restricts the use of funds for biodiversity restoration, with proposed changes to the EP&A Regulation further restricting the use of these funds. In the broader context, the aim of the s94A plan is to provide appropriate public facilities which are required to maintain and enhance amenity and service delivery with the LGA. For example, drainage and open space.
OUTCOME 2: *Biodiversity principles are reflected across a range of land uses*	• Overall outcome has been introduced and started, but restrictions are present.
OUTCOME 3: *Biodiversity principals are applied across council units*	• No Environmental Management System in place, but framework and principle used. • Tried to develop a training program for staff but wasn't attended. • Guidelines have been developed for park staff • 3.4 WSUD across many different • Biodiversity is incorporated through urban design in the management of infrastructure. • Management of Council's natural assets conducted by NRM/ • Catchment Management Officer
OUTCOME 4: *Biodiversity are optimised while providing for adequate recreational, access, safety and cultural heritage opportunities.*	• Generic POMs developed for all community land (natural areas/sportsgrounds/parks/general community use) • The Parramatta Aboriginal Cultural Heritage study hasn't been updated but has been used. • Parramatta LGA does not have a fire risk deemed by the Fire Services as 'negligible'.
OUTCOME 5: *Land use planning instruments and development application and compliance processes are effective in protecting biodiversity*	• One DCP apply to a parcel of land
OUTCOME 6: *The LGA will include a system of sustainable, natural corridors as well as Ecological Communities*	• Currently a strong seed collection contract of 100,000 tubes of native plants. Community giveaways, school plantings.

Outcome	Notes
OUTCOME 7: Populations of native plant and animal species are sustainable	• Do not have statistics
OUTCOME 8: Council is a recognised leader in Biodiversity Management	• Overall feeling that Council has not reached this level as yet.
OUTCOME 9: The Local Community is Empowered and involved in Biodiversity Management and values natural areas and things	• Businesses taking part through team building exercises • Currently no one is looking after aquatic biodiversity activities.
OUTCOME 10: Council has in place an effective system to manage and update biodiversity information	• Some data has been captured into system and has been increased via mapping including: • Contracts mapped • Bushcare site maps • Bushcare database updated by contractors and public sightings.

Workshop 2 was conducted with external stakeholders and agencies, and was run as more of an information session about the upcoming Strategy. However, a number of issues and matters were identified by attendees, which have informed actions in this plan. These are summarised below:

- Promote riparian setbacks and buffer zones for development and define riparian zones
- Habitat diversity: maintain diversity of habitat
- Manage areas containing known identified populations of threatened species to ensure viability of populations in the longer term
- Ensure no net loss of identified core connectivity as a result of weed invasion or nutrient enrichment
- Implement actions in bushland areas in consistent manner with published best practice guidelines
- Ensure all biodiversity information collected or utilised, privately or by Council, is captured into the Atlas of NSW Wildlife, including all veg surveys and fauna survey is captured in online version (Bionet).
- Possible habitat modeling of threatened biota
- Identify corridors and connectivity priorities across LGA boundaries
- Ground truth and consistency in community mapping
- Include private lands in biodiversity corridors
- Encourage community support for biodiversity management
- Communication between all sectors within Council to achieve biodiversity goals
- Management of the source of issues and not just treating the symptoms, e.g. stormwater
- Overarching weed strategy to remove threats work within Council properties and adjoining properties
- Ground truthing priority areas – get the baseline info to develop Plans of Management – also useful for reporting on achievements
- Community involvement and participation – inform community groups on purpose of the plan and relationship with other plans
- Partnerships with overarching community groups to undertake joint LGA-wide projects
- Provide links to the community through funding opportunities
- Prefer partnerships over volunteer/second level relationship
- Bring communities together to share stories and programs, and share learning
- Community-based communication workshops
- Rehabilitate the banks of the Parramatta River, especially in the city, to create vegetation and wildlife corridors that link with Parramatta Park
- Reduce pests, especially ibis and pigeons, to have positive effect on native animals
- Cumberland Plain Recovery plan has 10 actions relating to Parramatta
- Monitoring focus on value for money

Appendix C: Planning and Legislative Framework

C.1 INTERNATIONAL AGREEMENTS

The Australian government is a signatory to various international conventions and treaties that recognise the importance of biodiversity and provide a framework for conservation and protection. Key agreements include:

C.1.1 United Nations Convention on Biological Diversity (1992)

Provides a foundation for the conservation and sustainable use of biological resources by requiring the participating countries to develop and implement biodiversity strategies. It emphasises the need for biodiversity conservation to extend across the entire landscape, rather than being limited to special places or issues. As a signatory nation, Australia is bound to develop and implement strategies that will ensure the conservation and sustainable use of its biological resources.

In 2010, signatories to the Convention agreed to the *Stretegic Plan for Biodiversity 2011-2020* which outlines 5 strategic goals and 20 targets, know as the '*Aichi Targets'*. The plan has a vision that:

> *"By 2050, biodiversity is valued, conserved, restored and wisely used, maintining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people*"

It aims to:

> *"Take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication. To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilisation of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented, and decision-making is based on sound science and the precautionary approach."*

This will be achieved through five strategic goals:

- *Goal A: Address the underlyging causes of biodiversity loss by mainstreaming biodiversity across government and society*
- *Goal B: Reduce the direct pressures on biodiversity and promote sustainable use*
- *Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity*
- *Goal D: Enhance the benefits to all from biodiversity and ecosystem services*
- *Goal E: Enhance implementation through participatory planning, knowledge management and capacity building*

C.1.2 Rio Declaration on Environment and Development (1992)

Reaffirms the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972, and highlighted the importance of including sustainability, or Environmentally Sustainable Development (ESD) principles, in decisions about land use and planning. Sustainability principles involve attempts to integrate environmental considerations into decisions about development. ESD is based on four key principles:

- The precautionary principle
- Intergenerational equity
- Conservation of biological diversity and ecological integrity
- Improved valuation and pricing of ecological resources

C.1.3 Ramsar Convention on Wetlands (1971)

Provides the framework for national action and international cooperation for the conservation and "wise use" of wetlands and their resources. "Wise use" of wetlands is defined as 'the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development'.

C.1.4 Bonn Convention on Migratory Species (1979)

Aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is concerned with the conservation of wildlife and habitats on a global scale, with signatory parties committing to the protection of identified species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.

C.1.5 Migratory Bird Agreements

- *Japan-Australia Migratory Bird Agreement (JAMBA)*
- *China-Australia Migratory Bird Agreement (CAMBA)*
- *Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)*
- *East Asian-Australasian Flyway Partnership*

Promote collaboration and co-operation between the Governments of Australia, China, Japan, South Korea and other sout-east Asian signatory countries to protect birds, and their habitats, that migrate between these countries via the East Asian - Australasian Flyway. All migratory bird species listed in these international agreements are protected as 'matters of national environmental significance' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The EPBC Act Protected Matters Search for Parramatta LGA identified 30 migratory bird species (refer to **Appendix A** for details).

C.2 COMMONWEALTH LEGISLATION & POLICY

In accordance with its international treaty obligations, the Australian government is required to demonstrate its commitment to the protection and conservation of biodiversity. This has been facilitated through the implementation of the following current key legislation and policy:

C.2.1 Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act is the Australian Government's most significant environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined as 'matters of national environmental significance'. It incorporates environmental impact assessment processes for matters of national environmental significance' and provides an extensive framework for the conservation of biodiversity including:

- listing of nationally threatened species and ecological communities, migratory species and marine species;
- preparing conservation advice and/or national recovery plans and wildlife conservation plans for listed species and additional protection for listed species in Commonwealth areas;
- identifying key threatening processes and preparing threat abatement plans for such processes
- identifying invasive species.

Appendix A outlines applicable 'matters of national environmental significance' as identified in a Protected Matters Search for Parramatta LGA.

C.2.2 Australia's Biodiversity Conservation Strategy 2010-2030

Provides a guiding framework for conserving our Australia's biodiversity over the coming decade and aims to ensure our biodiversity is healthy and resilient to threats, and valued both in its own right and for its essential contribution to our existence. It recognises that biodiversity is constantly changing, occurs in all environments (terrestrial, aquatic and marine) and comprises of three distinct levels:

- genetic diversity—the variety of genetic information contained in individual plants, animals and micro-organisms
- species diversity—the variety of species
- ecosystem diversity—the variety of habitats, ecological communities and ecological processes.

Biodiversity is recognised as being fundamental to our physical, social, cultural and economic well-being through the provision of ecosystem services e.g. we need oxygen to breathe, clean water to drink, fertile soil for food production and physical materials for shelter and fuel. These ecosystem services can be divided into four groups:

- provisioning services (e.g. food, fibre, fuel, fresh water)
- cultural services (e.g. spiritual values, recreation and aesthetic values, knowledge systems)
- supporting services (e.g. primary production, habitat provision, nutrient cycling, atmospheric oxygen production, soil formation and retention)
- regulating services (e.g. pollination, seed dispersal, climate regulation, pest and disease regulation, water purification).

It outlines strategies to improve ecosystem resilience (which is the capacity of an ecosystem to respond to changes and disturbances, yet retain its basic functions and structures) in response to declining biodiversity due to the impacts of a range of threats, including:

- habitat loss, degradation and fragmentation
- invasive species
- unsustainable use and management of natural resources
- changes to the aquatic environment and water flows
- changing fire regimes
- climate change.

C.2.3 Australian Pest Animal Strategy (2007)

This strategy aims to protect Australia's biodiversity, agricultural assets, and social values, from the impacts of vertebrate pest animals. The strategy addresses the adverse impacts caused by exotic vertebrate animals (mammals, birds, reptiles, amphibians, and fish) that have become pests in Australia, and aims to prevent the establishment of new exotic vertebrate pests.

C.2.4 Australian Weeds Strategy (2007)

The strategy provides a national guiding framework and identifies priorities for weed management with the aim of minimising the impact of weeds on Australia's environmental, economic and social assets. It forms an integral component to addressing national biosecurity, and complements other existing and new national strategies for invasive species, such as those for terrestrial vertebrate pests and marine pests.

C.2.5 National Wildlife Corridors Plan (2012)

This plan recognises that as Australia has developed; our natural environment has become increasingly fragmented resulting in significant loss of natural habitats and a decline in biodiversity, which is compounded by threats such as climate change and invasive pest species. It facilitates a collaborative national approach to the conservation of Australia's biodiversity by improving the resilience of our landscapes in a changing climate and repairing landscapes that have become fragmented.

The plan seeks to reconnect Australians with the environment by providing the community with a national network of wildlife corridors. Corridors will range from small corridors created by local communities to large corridors that stretch across many different landscapes. Landscape elements that contribute to wildlife corridors include:

- Native grasslands provide habitat and pasture
- Linear strips of roadside and fence line vegetation form important links in the landscape
- 'Stepping stones' of native vegetation such as paddock trees link larger patches
- Sensitively designed urban parks and gardens contribute habitat for native species
- Free-flowing rivers transport nutrients and sediment to the sea
- Fish travel between fresh and saltwater environments at different lifecycle stages
- Migratory bird species rely on important wetland and shore habitats
- Fauna moving through the landscape disperse pollen and seed
- Floodplain inundation triggers plant regeneration and provides habitat for aquatic species
- Large patches of native vegetation provide core habitat
- 'Buffers' around natural areas protect them from external threats
- Long distance movement of migratory species

C.2.6 Australia's Native Vegetation Framework (2012)

This national framework aims to guide native vegetation management across the Australian landscape. It acknowledges that native vegetation is crucial for the health of Australia's environment, that it supports our economy and productivity as well as our biodiversity and that it is embedded within Australia's cultural identity.

The framework identifies five key goals that are vital for long-term sustainable management of native vegetation.

- Increase the national extent and connectivity of native vegetation;
- Maintain and improve the condition and function of native vegetation;
- Maximise the native vegetation benefits of ecosystem service markets;
- Build capacity to understand, value and manage native vegetation;
- Advance the engagement and inclusion of Indigenous peoples in management of native vegetation.

These goals will guide us in maintaining ecosystem resilience, improving the productive capacity of the land and promoting healthy ecosystem function across the landscape. Achievement of these goals will require a coordinated approach between all levels of governance, business and industry sectors, private landholders and the community.

C.3 STATE LEGISLATION & POLICY

The NSW Government has also implemented significant legislation and policy which aims to conserve and protect the unique biodiversity of the State. Key legislation and policy includes:

C.3.1 Threatened Species Conservation Act 1995 (TSC Act)

This TSC Act is the key NSW legislation relating to the protection and management of biodiversity and threatened species which aims to:

- conserve biological diversity and promote ecologically sustainable development;
- prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- protect the critical habitat of those species, populations and ecological communities that are endangered;
- eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and;
- encourage the conservation of threatened species, populations and ecological communities through co-operative management.

It recognises that habitat loss, fragmentation and degradation are the most significant causes of species loss and that protecting the habitat of threatened species is fundamental to their conservation. The TSC Act also establishes a Scientific Committee to:

- identify and classify (as endangered, critically endangered or vulnerable) the species, populations and ecological communities with which it is concerned;
- identify key threatening processes that may threaten the survival of those species, populations and ecological communities.

Council must appropriately manage identified vulnerable, endangered and critically endangered species, populations, and ecological communities and implement applicable recovery plans. Furthermore, the TSC Act also identifies key threatening processes (threats or potential threats to the survival, abundance or evolutionary development of a native species or ecological communities) and Council is also responsible for implementing relevant threat abatement plans.

C.3.2 National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act protects all native fauna and flora in NSW and facilitates the:

(a) conservation of nature (including but not limited to):

- habitat, ecosystems and ecosystem processes;
- biological diversity at the community, species and genetic levels;
- landforms of significance, including geological features and processes;
- landscapes and natural features of significance including wilderness and wild rivers.

(b) conservation of objects, places or features (including biological diversity) of cultural value within the landscape (including but not limited to):

- places, objects and features of significance to Aboriginal people;
- places of social value to the people of New South Wales;
- places of historic, architectural or scientific significance.

(c) fostering of public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation.

It also provides for high conservation significance land to be established and managed for the as Wildlife Refuges or through voluntary Conservation Agreements for the protection of flora and fauna species. Lake Parramatta Reserve has been proclaimed as a Wildlife Refuge under the NPW Act.

C.3.4 Noxious Weeds Act 1993

This Act identifies noxious weeds, control measures, public and private responsibilities, and provides a framework for the management of noxious weeds across NSW. It aims to:

- minimise financial impacts of noxious weeds;
- reduce the spread of noxious weeds;
- reduce damage to environment, biodiversity, waterways, infrastructure and water quality;
- reduce impacts on health and welfare of animals and the community;
- identify and manage new or emerging weeds before they cause serious impacts.

C.3.5 Fisheries Management Act 1994

This Act aims to preserve fish stocks, habitats and species and to maintain and promote ecologically sustainable development whilst ensuring the commercial viability of fisheries. It allows for listing of threatened species, habitat, communities, and processes in a similar manner to the TSC Act.

C.3.6 Water Management Act 2000

This Act provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. It aims to:

- apply the principles of ecologically sustainable development;
- protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality;
- recognise and foster the significant social and economic benefits to the State that result from the sustainable and efficient use of water, including:
- benefits to the environment;
- benefits to urban communities, agriculture, fisheries, industry and recreation;
- benefits to culture and heritage;
- benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water.
- recognise the role of the community, as a partner with government, in resolving issues relating to the management of water sources;
- provide for the orderly, efficient and equitable sharing of water from water sources;
- integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna;
- encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water users;
- encourage best practice in the management and use of water.

C.3.7 State Environmental Planning Policy (SEPP) 19 – Bushland in Urban Areas

This policy recognises the value of bushland to the community as part of the natural heritage, its aesthetic value, and its value as a recreational, educational and scientific resource. It applies to all land containing or adjoining bushland which is defined as '*vegetation which is either a remainder of the natural vegetation of the land or, if altered, is still representative of the structure and floristics of the natural vegetation.'*

Council must not consent to the disturbance of bushland zoned or reserved for public open space purposes unless it:

- assesses the need to protect and preserve the bushland regarding the aims of this Policy;
- is satisfied that the disturbance of the bushland is essential for a purpose in the public interest and no reasonable alternative is available to the disturbance of that bushland;
- is satisfied that the amount of bushland proposed to be disturbed is as little as possible and, where bushland is disturbed to allow construction work to be carried out, the bushland will be reinstated upon completion of that work as far as is possible.

Council must not consent to development on land which adjoins bushland zoned or reserved for public open space purposes unless it has considered:

- the need to retain any bushland on the land;
- the effect of the proposed development on the bushland, in particular, on the erosion of soils, the siltation of streams and waterways and the spread of weeds and exotic plants within the bushland,
- any other matters which are relevant to the protection and preservation of bushland.

This SEPP also requires that a plan of management applying to bushland must specify measures to:

- implement the specific aims of this Policy;
- enable recreational use of the bushland;
- reduce hazard from bushfire;
- prevent degradation of bushland, including degradation through alteration of drainage patterns, rubbish dumping, infestation with weeds and exotic plants or the intrusion of vehicles;
- restore and regenerate degraded areas of bushland.

C.3.8 NSW Invasive Species Plan 2008-2015

This plan recognises that invasive species are one of the greatest threats to biodiversity and primary production in NSW. It provides actions that aim to prevent and effectively manage the introduction and spread of invasive species so that this significant threat is minimised. It is to be implemented through collaboration and action between government, industry and the wider community and has the following core goals:

- Exclude - prevent the establishment of new invasive species.
- Eradicate or contain - eliminate, or prevent the spread of new invasive species.
- Effectively manage - reduce the impacts of widespread invasive species.
- Capacity building - ensure NSW has the ability and commitment to manage invasive species.

C.3.9 NSW Wetlands Policy (2010)

This policy promotes the sustainable conservation, management and wise use of wetlands in NSW and the need for all stakeholders to work together to protect wetland ecosystems and their catchments. The policy provides a set of guiding principles that all government agencies will adopt, and all stakeholders can refer to when making decisions on wetlands management and conservation, including:

- Wetlands are valued as significant parts of NSW landscapes – their conservation and management are most appropriately considered at the catchment scale.
- Water regimes needed to maintain or restore the ecological resilience of wetlands should be provided through water management planning, water recovery and water purchase, recognising that a balance between environmental and human requirements must be reached.
- Floodplains should be managed to maintain the natural distribution of water to and from wetlands, and to allow for the movement of aquatic biota.
- Wetlands of international, national and regional significance should be identified and given priority for conservation and investment.
- Land management practices should maintain or improve wetland habitats, ecosystem services and cultural values.
- Wetlands should be recognised as places with important cultural values, in particular that wetlands are an important part of Country for Aboriginal people.
- Degraded wetlands and their habitats should be rehabilitated and their ecological processes improved as far as is practicable.
- The potential impacts of climate change should be considered in planning for wetland conservation and management.
- Research into wetland ecology should be encouraged to better support water and land-use planning and management.
- Natural wetlands should not be destroyed or degraded. If social or economic imperatives in the public interest result in a wetland being degraded or destroyed, the establishment and protection of a wetland offset that supports similar biodiversity and ecological functions will be needed.
- Cooperation and incentives among land managers, government authorities, catchment management authorities, non-government organisations and the general community are essential for effective wetland management.
- Regular reporting of wetland extent and condition is vital to assess management performance and understand wetland dynamics.

C.3.10 DECCW Priorities for Biodiversity Adaptation to Climate Change (2010)

The NSW Government has developed these priorities in recognition of climate change having a likely effect on terrestrial, aquatic and marine biodiversity across all land tenures. It identifies rising temperatures and sea levels and climate-induced changes in fire regimes, water quality and ocean chemistry will have a wide-ranging impact on biodiversity in NSW. Climate change is also expected to intensify existing threats to biodiversity, such as habitat loss, weeds and pest animals, and drought. Species that have survived previous climatic changes by evolving, moving or changing their behaviour may find it more difficult to use these coping strategies when the change is rapid, especially where their habitat is degraded or lost.

It is to be implemented through the cooperation of scientists, conservation managers, landholders and the public and will focus on four key areas:

- Enhancing our understanding of the likely responses of biodiversity to climate change and re-adjusting management programs where necessary.
- Protecting a diverse range of habitats through building a comprehensive, adequate and representative public reserve system in NSW, with a focus on under-represented bioregions.
- Increasing opportunities for species to move across the landscape by working with partners and the community to protect habitat and create the necessary connections across landscapes.
- Assessing adaptation options for ecosystems most at risk from climate change in NSW.

C.3.11 Saving Our Species

Under the NSW Government Saving Our Species program, threatened species in NSW are allocated to one of six management streams according to their distribution, ecology and current knowledge. These 6 streams include:

i. **Site-managed species** (45%) – these species can be successfully secured by carrying out targeted conservation projects on specific sites.
ii. **Iconic species** (1%) – these species are especially valued by the community e.g. koala.
iii. **Data-deficient species** (17%) – there is currnelty insufficient information on these species to allocate them to another management stream. Further research and surveys are to be undertaken before an appropriate management approach can be developed.
iv. **Landscape-managed species** (10%) – these species are districbuted across large areas and threatened across the landscape by habitat loss and degradation.
v. **Partnership species** (17%) – these species have <10% of their distribution in NSW (some are common in other states); however those that are threatened nationally and have important populations on NSw will have conservation projects developed.
vi. **Keep watch species** (10%) – these species require no immediate investment because thare are either naturally rare, have few critical threates, or are more abundant than previously assumed

The Saving Our Species program:

- Allocates all threatened species to 1 of 6 management streams that identify the types of actions required for each species
- Provides targeted conservation projects that ste out the actions required to save specific plants and animals on mapped management sites
- Prioritises projects based on their benefits to the species, feasibility and cost, to help decision makers and investors make the most effective investments in threatened species conservation
- Regularly monitors the effectiveness of projects so they cane be improved over time
- Encourages community, corporate and government participation in threatened species conservation e.g. volunteering

C.4 REGIONAL PLANS & POLICIES

C.4.1 Greater Sydney Local Land Service Transition Catchment Action Plan 2013-2023

The 2013-2023 Greater Sydney Local Land Service Transition Catchment Action Plan is a ten year plan to guide the management of water, land and vegetation by our community and government. Parramatta LGA is within the Greater Sydney Local Land Service (LLS) region that encompasses 12,474 square kilometres of varied landscapes including farmland, highly urbanised areas, rivers, estuaries, wetlands and coastline, pristine native vegetation, sandstone escarpments and gorges.

It aims to *'Work together to achieve productive, biodiverse, resilient landscapes and liveable urban areas'* through the achievement of five priority goals:

- *Community - Communities that relate to and care for their landscapes in many ways;*
- *Productivity - A region that supports productive enterprises that use natural assets sustainably;*
- *Biodiversity - A region that has diverse and abundant native wildlife;*
- *Urban Liveability - Cities and towns that are more liveable due to protection, integration and enhancement of local ecosystem services;*
- *Resilient Landscapes - A region that has communities and landscapes that can adapt and respond to change.*

C.4.2 A Plan for Growing Sydney (2014)

A Plan for Growing Sydney is a 20 year NSW Government vision for Sydney to be a strong global city and a great place to live. This vision will be achieved throught the following goals:

- a competitive economy with world-class services and transport;
- a city of housing choice with homes that meet our needs and lifestyles;
- a great place to live with communities that are strong, healthy and well connected; and
- **a sustainable and resilient city that protects the natural environment and has a balanced approach to the use of land and resources.**

It establishes the following directions and targets that aim to safeguard our environment by adopting a balanced approach to the use of land and resources:

- *Protect and deliver a network of high conservation value land by investing in green corridors and protecting native vegetation and biodiversity*
- *Prepare a strategic framework for the metropolitan rural area to enhance and protect its broad range of environmental, economic and social assets*
- *Iinvestigate opportunities to integrate the marine estate and adjacent coastal land uses*

Key policies relating to **protecting, our natural enviroment** include:

- Land and waterways of high conservation and biodiversity value will be protected;
- Fragmentation of habitat will be avoided and green corridors will connect habitats;
- Strategic planning decisions will be guided by Government priorities and consider Threatened
- Species Recovery Plans and Threat Abatement Plans (such as the Cumberland Plain Recovery Plan);
- Biodiversity offsets will be incorporated into land use planning decisions;
- Opportunities to maintain, rehabilitate and/or create new habitats will be encouraged.

C.4.3 Cumberland Plain Recovery Plan (2011)

Parramatta LGA is located on the eastern edge of the Cumberland Plain which once covered in western Sydney; however only 13% of native vegetation now remains in highly fragmented patches of varying size and condition. This recovery plan has been adopted in accordance with the TSC Act and aims to ensure the long-term survival and protection of the threatened biodiversity of the Cumberland Plain which includes seven threatened species, four endangered populations and nine threatened ecological communities listed under the *TSC Act* that are found only on the Cumberland Plain. Seven of these are also listed as threatened under the *EBPC Act*.

Actions in the recovery plan are identified for implementation by local, State and Australian government authorities and aim to achieve the following objectives:

- *To build a protected area network, comprising public and private lands, focused on the priority conservation lands;*
- *To deliver best practice management for threatened species, populations and ecological communities across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with conservation;*
- *To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program;*
- *To increase knowledge of the threats to the survival of the Cumberland Plain's threatened species, populations and ecological communities, and thereby improve capacity to manage these in a strategic and effective manner.*

C.5 LOCAL PLANS & POLICIES

C.5.1 Parramatta 2038

Parramatta 2038 is a long-term Community Strategic Plan for the City of Parramatta and aims for Parramatta to 'be the driving force and heart of Australia's most significant economic region; a vibrant home for diverse communities and a centre of excellence in research, education and enterprise'. It recognises that Parramatta's bushland and waterways are rich and diverse, supporting an array of ecological communities; however the number of threatened species and endangered ecological communities at a local, regional and national level is increasing.

In acknowledging biodiversity as an important factor in achieving the city vision, the plan includes the key strategic objective of 'Parramatta will be an eco-efficient city that effectively manages and uses the City's growth to improve and protect the environment'. This will be achieved through 'improving, protecting and valuing our natural heritage and systems, including the extensive network of parks and bushland reserves; continuing to protect biodiversity while improving connections between these areas and people; and focussing on:

- waterways rehabilitation;
- biodiversity and bushland management;
- local air quality;
- land and soil management.

C.6 BIODIVERSITY OFFSETS

Biodiversity offsets relate to countering specific impacts of development on biodiversity. Offsets can be undertaken within the same site as where the impact occurs, or undertaken elsewhere and should result in the legal protection of land and the implementation of management actions to restore the biodiversity values affected.

In what circumstances is offsetting necessary?

- Where threatened species; ecological communities or their habitat as defined under State or federal legislation is likely to be impacted by a proposal; and
- Where this impact is not considered negligible by Parramatta City Council; and
- Where the proposal cannot be reasonably modified and a reasonable althernative land use is not available to avoid the impact.

Legislative context of offsets

Biodiversity offsets can occur within the provisions of multiple legislative instruments including:

- *NSW Environmental Planning & Assessment Act 1979*
- *NSW Threatened Species Conservation Act 1995*
- *Commonwealth Environment Protection & Biodiversity Conservation Act 1999*

These Acts also include offsetting mechanisms and other planning policy, including the *BioBanking Assessment Methodology* (NSW TSC Act) and the *EPBC Act Environmental Offsets Policy* (Federal EPBC Act).

Offsets in the Parramatta LGA must comply with this legislation and policy. Where multiple mechanisms are relevant (for example in the clearing of Sydney Turpentine-Ironbark Forest which is protected under both State and Federal legislation) the Federal policy assumes precedent.

Offsetting Principles

As outlined in the *EPBC Act Environmental Offsets Policy* the following basic principles apply to all offsetting:

- Offsets must deliver a net conservation outcome that improves or maintains the viability of the endangered species or community in the wild
- Offsets must focus on direct recovery action (not research)
- Offsets must be secure for as long as the proposed impact (e.g. offsets for landclearing must be protected in perpetuity and legally binding)
- Offsets must be in proportion to the level of statutory protection (e.g. for Critically Endangered communities)
- Suitable offsets must be of a size and scale proportionate to thei mpacts
- Suitable offsets must effectively account for and manage the risks of the offset not succeeding
- Suitable offsets must be additional to any existing requirements
- Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable
- Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced

The following provisions also apply to offsets within the Parramatta LGA:

- Bushland clearing requiring offsets includes the removal of individual trees where these are part of a Critically Endangered Ecological Community (e.g. Blue Gum High Forest)
- The principle of like-for-like applies. Offsets must target the same endangered species or ecological community which is impacted by the proposal, and in the same region as the impact. Offsets for impacts within the Parramatta LGA should be located within the Parramatta LGA
- Suitable offsets must be of a size and scale proportionate to the impacts. Offsets for loss of individual trees within a Critically Endangered Ecological Community should at a minimum provide for the establishment of an equal number of trees and their care, maintenance and where necessary replacement in perpetuity.

C.7 BIODIVERSITY BANKING SCHEME (BIOBANKING)

The Biodiversity Banking and Offset Scheme (BioBanking) has been established by the NSW Office of Environment and Heritage (OEH) to help address the loss of biodiversity and threatened species. It was implemented via the *Threatened Species Conservation Amendment (Biodiversity Banking) Bill 2006*, and is now implemented via Part 7A of the *Threatened Species Conservation Act 1995*, and creates a market in biodiversity credits that gives landowners a financial incentive to protect biodiversity values on their land and provides a transparent, consistent, and robust framework for the assessment and management of biodiversity offsets.

The type and number of credits must be assessed in accordance with the BioBanking Assessment Methodology by accredited BioBanking Assessors (information on accredited assessors can be found on the OEH webpage at www.environment.nsw.gov.au/biobanking/assessors.htm). There are two types of credits; ecosystem credits and species credits, which can overlap on the same parcel of land. BioBanking is a voluntary assessment methodology.

A proponent may choose to use BioBanking to assess the impact of a proposal. A 'BioBanking Statement' must be prepared by an accredited BioBanking assessor. If the BioBanking Statement passes the 'improve or maintain' test it switches off Part 5A (the 'assessment of significance' or '7 part test').

BioBanking contains a number of provisions for 'red flags', which are considered to be an area of land with high biodiversity conservation values. A proposal must either avoid impacts on red flags, or seek a variation to the red flag status for that site. If a BioBanking Statement is approved, then the proponent must obtain and retire the number and type of credits required. BioBanking statements are thus an alternative to the current threatened species assessment for Part 4 development and Part 5 activities. If a BioBanking Statement specifies any conditions for the carrying out of that proposal, then these conditions must be included as conditions of consent by the consent authority (such as Council). The consent authority may also impose addition conditions of consent which are not inconsistent with the conditions of a BioBanking Statement, or refuse consent on other grounds.

BioBanking Statements cannot be issued in respect of clearing requiring approval under the *Native Vegetation Act 2003* (NV Act). The BioBanking methodology does not cover fish and marine species listed under the *Fisheries Management Act 2004* (FM Act). A BioBanking Statement will also include species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and separate project approval under the EPBC Act may still be required.

A BioBanking Agreement may be prepared for specified lands (it can be a proportion of one lot or can cover multiple lots). A BioBanking Agreement is binding on the land and requires the owner, and subsequent owners, to manage the land in accordance with the agreement, as it creates a conservation covenant which is registered on land title. The owner of a BioBank site undertakes management activities to improve and maintain the conservation values of the land. Both private and public lands may become BioBank sites, though credit discounting currently applies to public lands (i.e. the number of credits generated is reduced depending on the conservation management obligations for those lands). The conservation activities at a BioBank site generate credits which can then be sold to persons who require credits to offset the impacts of their developments. The proceeds of credit sales are used to recover the costs of establishing the BioBank site and to manage the conservation values of the site in perpetuity.

The BioBank owner submits an annual report to the scheme manager (OEH) to demonstrate that they have fulfilled their management obligations. They are then provided with their annual payment (indexed to the CPI) from the Trust Fund. If management costs are less than the annual payment, the owner keeps the difference, if they are more, the owner bears the cost, hence it is important to make sure that the calculation of likely future management costs are as accurate as possible and allows for fluctuations in management requirements over future years.

C.8 BIODIVERSITY CERTIFICATION

Biodiversity certification is implemented via Part 7AA of the *Threatened Species Conservation Act 1995*. It consists of an assessment at a landscape scale of the effects on ecological values. Such an assessment involves identifying and calculating the impact of development, as well as credits to be generated by conservation lands within the biodiversity assessment area. If granted, the effect is that lands where development is proposed become 'biodiversity certified' and it switches off Part 5A (the assessment of significance' or '7 part test'). To become biodiversity certified, the "improve & maintain" test must be passed.

The *Threatened Species Conservation (Biodiversity Certification Assessment Methodology) Order 2011* was made on 14 February 2011. This methodology has many similarities to BioBanking, though there are differences due to the landscape scale of these types of assessments. At the time of writing an assessment manual is currently in preparation.

Figure 1: Parramatta Biodiversity Plan Legislative & Planning Context

Appendix D: Threats to Biodiversity

D.1 Key Threatening Processes

A key threatening process is defined in the TSC Act as '*a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities. Something can be a threatening process if it:*

- *adversely affects two or more threatened species, populations or ecological communities; or*
- *could cause species, populations or ecological communities that are not currently threatened to become threatened'*

A list of the key threatening processes as identified by the TSC Act have been identified to have the potential to negatively impact upon species, population or ecological communities in the Parramatta LGA. These include the following:

- Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands
- Bushrock removal
- Competition and grazing by the feral European rabbit
- Competition from feral honeybees
- Ecological consequences of high frequency fires
- Invasion and establishment of exotic vines and scramblers
- Human-caused climate change
- Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations
- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis
- Infection of native plants by *Phytophthora cinnamomi*
- Invasion and establishment of Scotch broom
- Invasion of native plant communities by exotic perennial grasses
- Invasion, establishment and spread of Lantana
- Loss of Hollow-bearing Trees
- Predation by feral cats
- Predation by the European red fox
- Predation by the plague minnow (*Gambusia holbrooki*)
- Removal of dead wood and dead trees

A list of the key threatening processes as identified by the EPBC Act have been identified to have the potential to negatively impact upon species, population or ecological communities in the Parramatta LGA. These include the following:

- Competition and land degradation by feral rabbits
- Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis
- Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases
- Predation by feral cats
- Predation by the European Red Fox (*Vulpes vulpes*)

A list of the key threatening processes as identified by the *Fisheries Management Act 1994* (Schedule 6) have been identified to have the potential to negatively impact upon biodiversity in the Parramatta LGA. These include the following:

- Degradation of native riparian vegetation along New South Wales water courses
- Human-caused climate change
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams
- Introduction of fish to waters within a river catchment outside their natural range
- Removal of large woody debris from New South Wales rivers and streams

D.2 Noxious Weeds

Noxious weeds, formally declared under the *Noxious Weed Act 1993*, are plants posing a threat to agriculture, the environment or the community. Noxious weeds are to be removed as soon as possible. There is a legal obligation for all public and private landholders to control noxious weeds on their properties. Responsibilities under the *Noxious Weed Act 1993* involve effective management of weeds in areas of private and public ownership, through direct action, regulation and education. Council must fulfil its statutory obligations by appropriately managing weeds in areas under Council's care, control or management. An up-to-date list of noxious weeds in the area should be referred to during any development assessment process conducted within the area. A full and comprehensive list of noxious weeds can be found below in Table 12.

Noxious weeds are classified into five control categories requiring varying levels of control/eradication under the *Noxious Weeds Act 1993*. The following weed control classes may be applied to a plant by a weed control order:

Class 1 (State Prohibited Weeds) - plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.
Legal requirement: The plant must be eradicated from the land and the land must be kept free of the plant.

Class 2 (Regionally Prohibited Weeds) - plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.
Legal requirement: Whole of NSW except the local control authorities listed as control class 3 or 4. The plant must be eradicated from the land and the land must be kept free of the plant.

Class 3 (Regionally Controlled Weeds) - plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area, and are likely to spread in the area or to another area.
Legal requirement: The plant must be fully and continuously suppressed and destroyed.

Class 4 (Locally Controlled Weeds) - plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies, and are likely to spread in the area or to another area.
Legal requirement: The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.

Class 5 (Restricted Plants) - plants that are likely, by their sale or the sale of their seeds, or movement within the State or an area of the State, to spread in the State or outside the State.
Legal requirement: The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

A noxious weed that is classified as a Class 1, 2 or 5 noxious weed is referred to in this Act as a ***notifiable weed.***

The following weeds are declared noxious in the control area of Parramatta City Council as obtained from the NSW Department of Primary Industries (http://weeds.dpi.nsw.gov.au) in 2015.

Table 12: Noxious weeds of Parramatta

Common name	Scientific name	Class
African boxthorn	*Lycium ferocissimum*	4
African feather grass	*Pennisetum macrourum*	5
African Olive	*Olea europaea subsp. cupidata*	4
African turnipweed (Eastern)	*Sisymbrium thellungii*	5
African turnipweed (Western)	*Sisymbrium runcinatum*	5
Alligator Weed	*Alternanthera philoxeroides*	3
Anchored water hyacinth	*Eichhornia azurea*	1
Annual ragweed	*Ambrosia artemisiifolia*	5
Arrowhead	*Sagittaria montevidensis*	4
Artichoke thistle	*Cyanara cardunculus*	5
Asparagus (Fern)	*Asparagus virgatus*	2
Asparagus (Climbing)	*Asparagus africanus*	2
Asparagus (Climbing Fern)	*Asparagus plumosus*	4
Asparagus (Ground)	*Asparagus aethiopicus*	4
Asparagus (Ming Fern)	*Asparagus macowanii var. zuluensis*	2
Asparagus (Sicklethorn)	*Asparagus falcatus*	2
Athel pine	*Tamarix aphylla*	5
Balloon Vine	*Cardiospermum grandiflorum*	4
Bear-skin fescue	*Festuca gauteri*	5
Bitou bush	*Chrysanthemoides monilifera subsp rotundata*	3
Black knapweed	*Centaurea nigra*	1
Blackberry	*Rubus fruticosus aggregate species*	4
Boneseed	*Chrysanthemoides monilifera subsp monilifera*	3
Bridal Creeper	*Asparagus asparagoides*	4
Broomrapes	*Orobanche species*	1
Burr ragweed	*Ambrosia confertifolia*	5
Caboma	*All species*	5
Cape broom	*Genista monspessulana*	3
Castor Oil plant	*Ricinus communis*	4
Cat's Claw creeper	*Dolichandra unguis-cati*	4
Cayenne snakeweed	*Stachytarpheta cayennensis*	5
Chilean needle grass	*Nassella neesiana*	4
Chinese celtis	*Celtis sinensis*	4
Chinese Violet	*Asystasia gangetica subsp micrantha*	1
Climbing asparagus fern	*Asparagus plumosus*	4
Clockweed	*Gaura parviflora*	5
Coolatai Grass	*Hyparrhenia hirta*	3
Corn sowthistle	*Sonchus arvensis*	5
Creeping lantana	*Lantana montevidensis*	
Dodder	*Cuscuta species*	5
Espartillo (Broad Kernel)	*Amelichloa caudata*	5
Espartillo (Narrow Kernel)	*Amelichloa brachychaeta*	5
Eurasian water milfoil	*Myriophyllum spicatum*	1
Fine-bristled burr grass	*Cenchrus brownii*	5
Fireweed	*Senecio madagascariensis*	4

Common name	*Scientific name*	Class
Flax-leaf broom	*Genista linifolia*	4
Fountain grass	*Pennisetum setaceum*	5
Frogbit	*Limnobium laevigatum*	1
Gallon's curse	*Cenchrus biflorus*	5
Gamba Grass	*Andropogon gayanus*	5
Giant reed	*Arundo donax*	4
Glaucous starthistle	*Carthamus glaucus*	5
Golden thistle	*Scolymus hispanicus*	5
Gorse	*Ulex europaeus*	3
Green cestrum	*Cestrum parqui*	3
Grey sallow	*Salix cinerea*	2
Groundsel bush	*Baccharia halimifolia*	3
Harrisia cactus	*Harrisia species*	4
Hawkweeds	*Hieracium species*	1
Honey locust	*Gleditsia triacanthos*	3
Horsetails	*Equisetum species*	1
Hydrocotyl	*Hydrocotyl ranunculoides*	1
Hygrophila	*Hygrophila costata*	2
Hymenachne	*Hymenachne amplexicaulis (incl. hybrids)*	1
Karoo thorn	*Acacia karroo*	1
Kidney-leaf mud plantain	*Heteranthera reniformis*	1
Kochia	*Bassia scoparia*	1
Koster’s curse	*Clidemia hirta*	1
Kudzu	*Pueraria lobata*	
Lagarosiphon	*Lagarosiphon major*	1
Lantana	*Lantana camara*	4
Leafy elodea	*Egeria densa*	4
Lippia	*Phyla canescens*	4
Long-leaf willow primrose	*Ludwigia longifolia*	3
Ludwigia	*Ludwigia peruviana*	3
Madeira vine	*Anredera cordifolia*	4
Mexican feather grass	*Nassella tenuissima*	1
Mexican poppy	*Argemone mexicana*	5
Miconia	*Miconia species*	1
Mikania vine	*Mikania micrantha*	1
Mimosa	*Mimosa pigra*	1
Morning glory (coastal)	*Ipomoea cairica*	1
Morning glory (purple)	*Ipomoea indica*	4
Mossman River grass	*Cenchrus echinatus*	5
Mother-of-millions	*Bryophyllum species*	4
Pampas grass	*Cortaderia species*	3
Paper mulberry	*Broussonetia papyifera*	2
Parthenium weed	*Parthenium hysterophorus*	1
Pond apple	*Annona glabra*	1
Prickly acacia	*Acacia nilotica*	1
Prickly pear	*Cylindropuntia species*	4
Prickly pear	*Opuntia species*	4
Privet(Broad-leaf)	*Ligustrum lucidum*	4

Common name	*Scientific name*	Class
Privet (Narrow-leaf/Chinese)	*Ligustrum sinense*	4
Red rice	*Oryza rufipogon*	5
Rhizomatous bamboo	*Phyllostachys species*	4
Rhus tree	*Toxicodendron succedaneum*	4
Rubbervine	*Cryptostegia grandiflora*	1
Sagittaria	*Sagittaria platyphylla*	5
Salvinia	*Salvinia molesta*	2
Scotch broom	*Cytisus scoparius*	4
Senegal tea plant	*Gymnocoronis spilanthoides*	1
Serrated tussock	*Nassella trichotoma*	4
Siam weed	*Chromolaena odorata*	1
Silverleaf nightshade	*Solanum elaeagnifolium*	4
Smooth-stemmed turnip	*Brassica barrelieri subspecies oxyrrhina*	5
Soldier thistle	*Picnomon acarna*	5
Spongeplant	*Limnobium spongia*	1
Spotted knapweed	*Centaurea stoebe subspecies micranthos*	1
St. John's wort	*Hypericum perforatum*	4
Texas blueweed	*Helianthus ciliaris*	5
Tropical soda apple	*Solanum viarum*	1
Tussock paspalum	*Paspalum quadrifarium*	4
Water caltrop	*Trapa species*	1
Water hyacinth	*Eichhornia crassipes*	2
Water lettuce	*Pistia stratiotes*	1
Water lettuce	Pistia stratiotes	1
Water soldier	*Stratiotes aloides*	1
Willows	*Salix species*	5
Witchweed	*Striga species (except the native Striga parviflora)*	1
Yellow bells	Tecoma stans	4
Yellow burrhead	*Limnocharis flava*	1
Yellow nutgrass	*Cyperus esculentus*	5

A comprehensive list of the weed species found in the reserves in Parramatta LGA can be found in Draft Weed Report prepared for Parramatta City Council 2010 (Applied Ecology 2010).

D.3 Introduced Fauna in Parramatta

Parramatta City Council Officers have identified a number of sightings of feral animals across Parramatta reserves. The species and the reserve in which they were sighted is shown in Table 7.

Table 13: Introduced animals found in Parramatta LGA

Common name	Scientific name
Rabbit	*Oryctolagus cuniculus*
Red Fox	*Vulpes vulpes*
Feral Bees	*Apis mellifera* L.
Carp	*Cyprinus carpio*
Gambusia	*Gambusia holbrooki*
Feral Cats	*Felis catus*
Black Rat	*Rattus rattus*
Starling	*Sturnus vulgaris*
Indian Myna	*Acridotheres tristis*
Bulbul	*Pycnonotus jocosus*
House Sparrow	*Passer domesticus*

D.4 CLIMATE CHANGE

According to NSW Government, CSIRO, and Bureau of Meteorology projections, the NSW community needs to prepare for higher temperatures, rising sea levels, less rainfall, more frequent and more severe droughts, and more extreme storms. The greatest temperature increases are expected to occur in the north and west of the state. It is predicted that north-eastern NSW will experience a slight increase in summer rainfall, while in the south-western regions a decline in winter rainfall is expected. It is further predicted that many regions in the state will experience a shift from winter-dominated to summer-dominated rainfall (OEH Online, 2011) http://www.environment.nsw.gov.au/climatechange/impacts.htm.

The predicted changes are likely to have significant impacts on agriculture, water supply, settlements and infrastructure, natural resources, biodiversity, and human health (OEH Online,2011 (http://www.environment.nsw.gov.au/climatechange/whatis.htm). Steffen and Hughes (2012) highlight that NSW, making up 31% of the national economy, is highly vulnerable to climatic changes. They emphasise the importance to quickly decarbonise the economy and make a transition into cleaner energy sources within this decade. They further highlight that investing in clean energy holds significant opportunities for NSW (Steffen and Hughes 2012, *The critical decade: New South Wales climate impacts and opportunities*, Climate Commission).

Per capita, Australia has the highest greenhouse gas emissions in the world (IPCC, 2006). In 2004 Parramatta City Council proportionally contributed to 2.24% of greenhouse gas emissions in NSW. Parramatta City Council has achieved Milestone 5 of the global Cities for Climate Protection Program (CCP) and has committed to CCP Plus – which aims to further reduce greenhouse gas emissions. To achieve reductions Council has developed a new five year Climate Action Plan, along with a variety of programs designed to assist residents and industry to reduce their environmental impact.

Council has adopted a *Climate Extremes Risk Assessment and Adaptation Plan* (2012) that describes how climatic extremes such as heatwaves and floods may affect the LGA in the future and how the risks associated with these extremes can be managed.

D.4.1 Climate Change and Biodiversity

An assessment of the vulnerability of Australia's biodiversity to climate change (Natural Resource Management Ministerial Council 2009) found that biodiversity is at risk from even moderate climate change and is already under stress, for example from habitat degradation, changed fire regimes, and invasive species. Among the recommendations of the report:

- Management objectives for the future aimed at maintaining all species in their present locations and ecosystems in their present composition will no longer be appropriate.
- A central strategy is giving ecosystems the best possible chance to adapt by enhancing their resilience with actions that include managing appropriate connectivity of fragmented ecosystems, enhancing the National Reserve System, protecting key refugia, implementing more effective control of invasive species, and developing appropriate fire and other disturbance management regimes.
- Risk assessments are a key approach to identify especially vulnerable species and ecosystems.
- Re-orientation of policy and legislative frameworks to support novel strategies for biodiversity conservation, and reform of institutional and governance architecture, are essential. These can be tailored to include socio-economic trends.

The report states that without rapid and effective mitigation of climate change, there is a high risk of an accelerating wave of extinctions throughout the 21st century and beyond. This strategy supports the need for Council to continue its response to climate change, and contribute indirectly by promoting actions that enhance ecological resilience of reserves, consolidate connectivity across the landscape, and recognise and respond to existing threatening processes, as well as new threats that may arise from Climate Change.

The Climate Extremes Risk Assessment and Adaptation Plan (PCC, 2011) identifies a number of climate change impacts that can directly affect biodiversity in Parramatta:

- Increased rainfall intensities: causes more sewer overflows and hence stormwater pollution of local waterways, increases bank erosion causing degradation and siltation on waterways
- Increased storms severity: leads to more damages and reduced service of Council's parks, sporting grounds, recreation & cultural facilities
- Hotter, drier climate: increases degradation and fragmentation of habitats causing possible local extinction of threatened species and endangered ecological communities, results in deterioration in water quality, in local waterways, changes in populations & distribution of pest plants and animals, results in reduction or loss of base flow that leads to loss of aquatic biota in small watercourses and result in increased watering costs or severe water restrictions leading to loss of trees & gardens in Council parks and possible closure of Council sporting grounds

The Climate Extremes Risk Assessment and Adaptation Plan also identified a number of actions in relation to these, which are supported under this plan.

Appendix E: Background to Targets

E.1 OPPORTUNITIES AND CHALLENGES – THE FUTURE

E.1.1 Challenges

There are a range of current and future opportunities and challenges in the LGA with respect to biodiversity planning and management. The *Parramatta State of the Environment Report* identifies a number of challenges related to biodiversity in the LGA. These include

- Increasing urban development and fragmentation of bushland,
- Including competing demands for open space,
- Stormwater and water pollution,
- Invasion by introduced plants and animals,
- Vandalism and
- Impact from over use of our natural environment (PCC, 2010).

The main threats to biodiversity in the Parramatta LGA are similar to the threats that apply across most of Western Sydney – namely: land clearing, weeds, feral animals, and inappropriate fire regimes. Threats to biodiversity have been listed in Federal and State Legislation and have legal implications for the management and planning of biodiversity on the LGA.

The *TSC Act*, *Fisheries Management Act 1994* and the *EPBC Act* provide for the listing of key threatening processes and the preparation of threat abatement plans. Although each piece of legislation has a different scope and scale, there is overlap in the State and Commonwealth sets of key threatening process.

Under the EBPC Act, a process is defined as a key threatening process if it threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community. Key threatening processes as defined by the TSC Act are the things that threaten, or could threaten, the survival or evolutionary development of species, populations or ecological communities. A process can be listed as a key threatening process if it could:

- Cause a native species or ecological community to become eligible for adding to a threatened list (other than conservation dependent)
- Cause an already listed threatened species or threatened ecological community to become more endangered
- If it adversely affects two or more listed threatened species or threatened ecological communities

For a summary of threatening processes and threats in Parramatta, please see Volume 2 appendix B

E.1.2 Opportunities

Stakeholder workshops

During the workshops, meetings, and discussions with Parramatta City Council staff a number of issues to be considered, and the basis for actions for the strategy, were identified. These encompassed issues and actions related to flora, fauna, aquatic habitat, community engagement, planning considerations, and internal and external stakeholder engagement. Staff were able to identify a number of key outcomes from the actions identified and also provide valuable feedback on the upcoming plan. Highlights identified include:

- Implementation of Water Sensitive Urban Design across many different developments
- Generic Plans of Management developed for all community land
- Establishment and management of a strong seed collection contract and partnerships with local nurseries, and via Councils own nursery, culminating in the production of 100,000 tubes of native plants for National Tree Day, World Environment Day, Free Tree Giveaways for residents, Street Tree program, bushland regeneration and parks as well as various other special events throughout the year.

E.2 TARGETS

Establish the LGA's biodiversity indicators and targets, and a baseline for biodiversity management.

E.2.1 NSW State Plan

The NSW Government State Plan '*NSW 2021: A Plan to Make NSW Number One' (2011)* has identified 'protection of the natural environment' as a key priority (Goal 22) and states:

'The NSW Government will work with the community to protect our local environment and provide more opportunities to enjoy parks, waterways and natural bushland. We will work with landholders to revegetate and improve land, manage weeds and pests in our national parks and improve the management of water to protect natural habitats. We will protect high value conservation land, native vegetation and biodiversity, as well as target illegal dumping.
'

This plan establishes the following targets that aim to protect and restore priority land, vegetation and water habitats over the nest 10 years within NSW:

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Targets	Priority Actions
Manage weeds and pests i. Reduce the impact of invasive species at priority sites on NPWS parks and reserves leading to a positive response of native biodiversity at 50% of these sites by October 2015	We will use the knowledge and experience of local communities to target our resources to protect and restore natural ecosystems.
Protect and conserve land, biodiversity and native vegetation i. Identify and seek to acquire land of high conservation and strategic conservation value, for permanent conservation measures ii. Establish voluntary arrangements with landowners over the next decade to bring: • an average 20,000 hectares per year of private land under conservation management • an average 300,000 hectares per year of private land being improved for sustainable management	We will work with Catchment Management Authorities and local community groups to protect and improve habitats on private lands.
Protect rivers, wetlands and coastal environments i. Improve the environmental health of wetlands and catchments through actively managing water for the environment by 2021	We will strategically recover and manage water for the environment to improve the health of the most stressed rivers and wetlands.

E.3 PARRAMATTA CITY COUNCIL CORPORATE ENVIRONMENTAL PLAN

Parramatta City Council has a number of Corporate Environmental Objectives and Targets that were derived in 2009 as part of the Corporate Environmental Plan. These targets have been integrated into the Targets for this biodiversity plan.

Table 15: Parramatta City Council Corporate Environmental Objectives and Targets 2009

Target	Target date
Objective 1. Sustainable use of resources in all Council operations.	
A Green Travel Plan for staff and visitors	2009
A sustainable procurement program to reduce consumption and increase product sustainability	2010
The total energy consumption by Council assets consists of not less than 50% renewable energy	2020
Greenhouse gas emissions are reduced by 30% from the 1998 baseline	2020
Increase the average fuel efficiency of Council's vehicles by 20% from 2008 levels	2015
Annual greenhouse gas emission data is accurate for all assets	2010
Energy and water consumption is reduced by at least 5% annually	yearly
99% organic waste is diverted from landfill	2012
95% recyclables diverted from landfill	2012
80% total waste diverted from landfill	2012
Objective 2. Protection and rehabilitation of land, water and biodiversity from past, present and future Council activities.	
All natural assets are confirmed as having current Plans of Management as per State policy and legislative requirements	yearly
All Plans of Management are taken into account when setting annual operational works plans and budgets	yearly
Weed density is less than 10% at all core bushland areas including Wategora Reserve, Lake Parramatta Reserve, Edna Hunt Reserve, Galaringi Reserve/Cox Park, Quarry Branch Creek bushland, Campbell Hill Reserve/Waddangalli Woodland and Lower Toongabbie Creek bushland.	2015
20% of Council's contaminated sites are remediated or prevented from having an impact on the natural environment	2025
All core bushland sites are connected through corridors and linked to regional corridors	2020
Objective 3. Council practices that are responsible and considerate to our neighbours.	
A Green Building Policy	2009
A sustainable asset policy and guidelines applied through all relevant operations	2010
The environmental risk from council operations has been assessed in light of legislation	2010
Environmental procedures are integrated into safe work method statements and the WHS incident reporting system	2011

E.4 CONSERVATION SIGNIFICANCE ASSESSMENT – MAPPING CRITERIA

Applied Ecology Conservation Significance Assessment (CSA) Mapping (2010) was undertaken to inform the review of the 2003 Biodiversity Plan. The CSA updates the NPWS Vegetation Mapping of the Cumberland Plain in the 2003 Biodiversity Plan. It is based on OEH Native Vegetation of the Sydney Metropolitan Area mapping.

Table 16: CSA Mapping Criteria

Category	Objective	Criteria
Core	To protect remaining high conservation value vegetation, No trading or offsets permitted unless the proposed development is considered to have a social and economic benefit of state significance, To protect and restore buffer areas to high conservation value vegetation, and To protect the contribution high conservation value vegetation has to regional and local connectivity areas.	All remnants of 10 Ha with canopy cover > 10% All Remnants of critically endangered ecological communities
Wetlands		EEC Communities *Coastal Saltmarsh* & *Freshwater Wetlands on Coastal Floodplain*
Support for Core	To ensure that these lands provide a buffer and protection for Core vegetation, Allow some flexibility for trading and offsets, To provide target areas for restoration projects To protect the contribution these lands have to regional and local connectivity areas.	All remnants with canopy cover < 10% which are contiguous (to 10m) with core habitat (excluding weed categories) All remnants with canopy cover >10% which are less than 10 Ha and contiguous (to 10m) with above (excluding weed categories)
Other Remnant Vegetation	To protect any viable remnants of native vegetation. To protect the contribution native vegetation makes to regional and local connectivity.	This category contains all native vegetation that does not fall within the above significance categories

E.5 PRIORITISATION FOR PROTECTION, RETENTION AND MANAGEMENT

Prioritisation of areas for protection, retention, and management in this plan is based on conservation priorities identified by the updated CSA undertaken by Applied Ecology (2010).

These priority areas form the basis of the quantitative targets for this strategy.

A CSA uses vegetation mapping and supporting ecological criteria to evaluate a number of biodiversity variables as being present or absent for each mapped polygon of vegetation, thereby giving an indication of relative ranking of areas of native vegetation in terms of ecological importance. Traditionally these categories are defined as follows:

- **Core:** These lands are considered significant to achieving local conservation management goals and should be protected
- **Support for Core:** These are patches of vegetation that are in relatively poorer condition (based on predetermined measures) but are adjacent to Core lands. They have values in buffering and, in the longer term, increasing the size of Core, and should be retained, and where possible, protected. Loss of vegetation on these lands should be offset accordingly.
- **Other Remnant Vegetation:** Native Vegetation that does not fall into the above categories.

At a finer scale, identifying the presence of specific environmental variables associated with mapped polygons of vegetation also facilitates consideration of these variables when assessing the impact of development proposals on biodiversity.

Applied Ecology CSA Mapping (2010) was undertaken to inform the review of the 2003 Biodiversity Plan. The CSA was undertaken as an update to that which was prepared for the 2003 Plan and based on NPWS Vegetation Mapping of the Cumberland Plain. It is based on OEH Native Vegetation of the Sydney Metropolitan Area mapping.

The criteria used during the revision of the CSA Mapping are provided in Volume 2. Overall conservation objectives for these lands – i.e. what they aim to achieve, are presented in Table 16 below. The area of land that falls within each category is shown in Table 18.

Table 17: CSA Mapping Objectives

Category	Objective
Core	• To protect remaining high conservation value vegetation • No trading or offsets permitted unless the proposed development is considered to have a social and economic benefit of state significance • To protect and restore buffer areas to high conservation value vegetation, and • To protect the contribution high conservation value vegetation has to regional and local connectivity areas.
Support for Core	• To ensure that these lands provide a buffer and protection for Core vegetation • Allow some flexibility for trading and offsets • To provide target areas for restoration projects • To protect the contribution these lands have to regional and local connectivity areas.
Other Remnant Vegetation	• To protect any viable remnants of native vegetation. • To protect the contribution that native vegetation makes to regional and local connectivity.

Table 18 presents the total breakdown of areas for conservation significance land categories. It shows that, for vegetation classified as Core, nearly 237 Ha or 66% are located in Parramatta's reserve system, as is 37% of Support for Core lands.

Table 18: CSA category breakdown

Classification	Area (ha)	Area in PCC Parks & Reserves (ha)
Core	359.32	236.7
Support for Core	107.04	40.22
Subtotal	**466.36**	**276.92**
Other Remnant Vegetation	367.5	47.33
weeds/exotics	98.22	47.76
Wetland EEC	7.35	2.06
Total	**939.43**	**374.07**

Table 19 identifies the distribution of conservation significance lands across the LEP 2011 zoning. The table provides an insight into the existing opportunities that exist for vegetation targets in the LGA. The table shows that 236 Ha of land classified as Core vegetation and 40 Ha of land classified as Support for Core is already under the care and control of Council and can be protected and retained through management. The remaining 123 Ha of Core and 67 Ha of Support for Core classified vegetation present the largest challenge for this plan.

Table 19: CSA Mapping by LEP 2011 and City Centre LEP 2007 Zone

LEP 2011 and City Centre LEP 2007 Zoning	Core (ha)	Support for Core (ha)	Other Remnant Vegetation (ha)	Weeds / exotics (ha)	Wetland EEC (ha)
B1 – Neighbourhood Centre	0.01	0.02	0.36	0.00	0.00
B2 - Local Centre	0.01	0.02	0.35	0.00	0.00
B3 – Commercial Core	0.00	0.00	0.39	0.00	0.00
B4 - Mixed Use	1.56	0.53	7.71	2.05	0.00
B5 – Business Development	0.00	0.00	1.03	0.32	0.00
B6 – Enterprise Corridor	0.00	0.00	0.39	0.44	0.00
E2 – Environmental Conservation	103.42	13.74	0.43	14.60	1.11
E3 – Environmental Management	0.57	0.00	0.00	0.95	0.00
IN1 – General Industrial	3.23	1.63	11.60	4.95	0.04
IN2 - Light Industrial	0.00	0.02	0.46	0.66	0.00
IN3 – Heavy Industrial	6.26	2.41	5.66	1.96	3.08
R1 – General Residential	0.01	1.31	0.32	0.00	0.00
R2 - Low Density Residential	37.11	39.46	199.10	9.34	0.64
R3 – Medium Density Residential	1.30	1.75	16.30	0.16	0.00
R4 - High Density Residential	0.99	2.81	23.73	3.54	0.05
RE1 – Public Recreation	86.93	23.70	44.05	21.74	0.17
RE2 – Private Recreation	6.23	3.45	7.24	1.79	0.00
SP1 – Special Activities	0.23	0.00	1.63	0.11	0.00
SP2 - Infrastructure	4.80	4.26	31.57	11.68	0.00
W1 – Natural Waterways	84.23	10.17	9.90	20.92	1.85
W2 – Recreational Waterways	19.63	1.22	3.05	2.64	0.25
Total	**356.52**	**106.50**	**365.27**	**97.85**	**7.19**

Examining the breakdown of the distribution of vegetation across LEP zonings provides an insight into where significant vegetation is located. The zonings that have the greatest ability to provide opportunities for conservation are:

- E2 - Environmental Conservation
- E3 - Environmental Management
- RE1 - Public Recreation
- RE2 - Private Recreation
- W1 - Natural Waterways
- W2 - Recreational Waterways

Across these 6 zones, there is 301 Ha of land in Core and 52 Ha land in Support for Core. These zones provide the greatest opportunity for protection and retention. This plan recommends consideration of the use of the Standard Instrument LEP E3 zone for those lands in recreation zonings that have been identified as Core and Support for Core, particularly where restoration is occurring, with the view to provide restoration, retention, and, ultimately, protection of significant values.

In the remaining zones there is a low to moderate opportunity for retention of vegetation, the most significant areas of vegetation occur on land zoned as R2 – Low Density residential (37.11 Ha Core, 39.46 Ha Support for Core), IN3 – Heavy Industrial (6.25 Ha Core, 2.41 Ha Support for Core, 3.08 Ha of Wetland EEC), SP2 – Infrastructure (4.8 Ha Core, 4.26 Ha Support for Core) and IN1 – General Industrial (3.23 Ha Core, 1.63 Ha Support for Core). Total areas in these remaining zones are 51.4 Ha of Core and 47.76 Ha of Support for Core.

Based on the breakdown of data above, the following table provides a proposed Vegetation retention target for Parramatta City Council under this plan:

Table 20: Proposed vegetation targets

Opportunity for Protection/Retention	High	Moderate	Total
Proposed % target	90%	50%	
Area remaining	301Ha Core 52 Ha Support for Core	51.4Ha Core 47.76 Support for Core	
Proposed Target	270.9 Ha Core 46.8 Ha Support for Core	25.7 Ha Core 23.88 Ha Support for Core	296.6 Ha Core 70.68 Support for Core

Other vegetation in Parramatta should be retained wherever possible, particularly to promote the enhancement of fragmented habitat islands – with the aim to support regional total habitat (e.g. opportunistic habitat for highly mobile species), and to support Regional connectivity generally.

E.6. Local Connectivity

Small and isolated remnants of bushland in an urban landscape present a number of management challenges, however the effective size of remnants can be increased by effectively linking adjacent remnants.

Potential corridor linkage areas within Parramatta LGA have been identified in accordance with the following methodology.

- Plotting known areas of biological significance, such as significant bushland areas (in both public and private ownership), watercourses, and wetlands
- Considering the regional context, e.g. linkages to the Regional Connectivity Mapping
- Consideration of the results of the CSA to maximise higher quality habitat to support threatened and other species
- Considering proximity of known good patches of vegetation to one another using a 50 m buffer
- Considering the principles for corridors
- Mapping areas identified as having potential significance as a corridor and small fragmented areas of other vegetation as opportunistic islands for mobile species

The results of this investigation provide guidance to support a network of corridors or linkages that could be established within Parramatta LGA.

Appendix F: Recovery Strategies relevant to Parramatta City Council

A total of **71** priority actions have been identified by OEH to help recover threatened species and tackle threatening processes in the Parramatta City Council. These priority actions can be grouped into 14 recovery strategies and one threat abatement strategy, and these are presented below. Further information can be obtained from the OEH website.

Table 21: OEH Recovery Strategies

Strategy	Description
Assess threats and determine recovery strategies	For many animals and plants there is often a lack of information about the nature and severity of the threats affecting them. An initial recovery strategy, therefore, is to identify and assess the threats and determine what recovery actions need to be implemented.
Community and land-holder liaison/ awareness and/or education	Threatened animals and plants occur across NSW and their continued survival in the wild is a collective partnership involving all land managers. Community support and involvement is crucial to the continued success of recovery programs, particularly for those species whose distribution predominantly occurs on private land. Engaging community interest and participation ensures that important aspects of the ecology of species and threats facing them are understood, and provides opportunities to become involved with species recovery locally. Community liaison, awareness, and education includes on-site meetings and open days, and preparing and distributing species profiles, school resource kits, posters, fact sheets and other promotional materials.
Develop and implement protocols and guidelines	Protocols and guidelines provide advice on how to best manage a species and enables recovery to be facilitated in an efficient, cost effective and consistent manner. This strategy is broad in scope and includes such things as best practice guidelines, site management plans, codes of practice and can relate to policy and procedures for managers who have threatened species on their land.
Establish management agreements with public authorities CMAs and land managers/owners	-
Habitat management	The PAS recommends various strategies to manage the habitat of threatened species. These include both planning and on ground works to control weeds, pest animals, fire and other human related threats.
Fire	Native animals and plants respond differently to fire. Some can persist under a range of fire regimes. However, in many cases, too frequent fire may harm species by killing them, preventing them from spreading, depleting the soil seed bank, or modifying their habitat. Planning for threatened species recovery in relation to fire may mean implementing variable fire regimes and excluding those that are detrimental. Fire management may involve managing hazard reduction activities such as slashing and mowing, to prevent these activities from impacting on species and their habitats.

Strategy	Description
Ongoing EIA - Advice to consent and planning authorities	Advising on the implications and impacts of proposed development activities on threatened species and their habitats is an ongoing recovery action. OEH advises authorities responsible for regional and local planning and development approvals. OEH also informs and advises consultants and other investigators who assess the potential impacts of developments or activities, leading to better conservation outcomes for threatened species. Advice includes environmental impact assessment guidelines, survey guidelines and species profiles, or ongoing liaison and consultation on statutory obligations.
Habitat management (other)	Habitat management includes other actions that are not currently part of a PAS strategy. These include developing best practice guidelines or standards for habitat management, pursuing incentive schemes and stewardship programs, preparing site management plans or managing issues such as erosion, subsidence or flooding. Over time OEH will develop a broader range of strategies to incorporate these habitat management initiatives.
Site Protection (eg Fencing / Signage)	Habitats for threatened species often require protection from disturbances such as vehicles, over visitation, livestock and native animal grazing, roadside maintenance or feral animals. Site protection may involve restricting access to a site by installing fencing or bollards, or placing signs or markers along roads, tracks and utility easements. Aboriginal communities should be involved in decision making when site protection involves restricting access. It may be necessary to discuss balancing protecting threatened species with cultural issues.
Weed Control	Weeds compete with native plants for resources such as light and nutrients, and can aggressively invade areas, displacing native plants and animals. The impacts of a number of weed species such as Bitou Bush (*Chrysanthemoides monilifera*) are identified as KTPs. The control of weeds at priority sites can help recover threatened species.
Habitat Protection	Habitat protection enables conservation of an area that a threatened species occupies or primarily relies on. Protection may be required where habitat is poorly represented in reserves or pressured by development or other land clearing or modifying activities. Several legislative mechanisms protect habitat. They include the listing of 'Critical Habitat', where OEH identifies habitat that is crucial to the survival of an endangered or critically endangered species, population or ecological community. Other mechanisms include voluntary conservation agreements between private landowners and OEH and joint management agreements between public authorities and OEH to permanently protect threatened species' habitat. An additional mechanism may be the acquisition of land to form part of a national park.
Habitat Rehabilitation / Restoration and/or Regeneration	Habitat loss or modification for urban development and agricultural practices has been a major factor in the decline of many native plants and animals. Rehabilitation and regeneration of lost or modified habitat can help many threatened species continue to survive in the wild. Actions include planting local native plants to provide food, shelter and roosting sites, or bush regeneration to reduce the impact on native plants from weeds. Many local community groups are enhancing and restoring the natural environment and assisting in the continued survival and increase of native species.
Monitoring	It is important to monitor key characteristics of a species or its habitat to ensure management actions are meeting their objectives for recovery. For example, managers may monitor: • changes to species abundance, for an assessment of population health • predator numbers, to indicate the effectiveness of pest control programs • water quality or vegetation understorey cover, to assess the condition of a species' preferred habitat. Aboriginal people may wish to be involved in monitoring species or their habitats they hold kinship associations for. Involvement in monitoring enables Aboriginal people to actively care for the wellbeing of species of cultural importance.

Strategy	Description
Research	Research is needed to further our knowledge and understanding of threatened species and the factors influencing their survival to enhance their future management. PAS research actions are directed toward the following areas: • General biological and ecological studies to help increase knowledge of a species' biology, ecology, habitat requirements or behaviour patterns. For example, research into a plant species' response to fire can help managers apply appropriate fire regimes, or understanding the reproductive requirements of a species enables threats to be abated so populations remain viable. • Research into causes of decline to clarify understanding of the threats and consequences of threats impacting on species and to inform managers of solutions requiring implementation. For example, investigating the susceptibility of certain threatened plant species to pathogens such as Phytophera will result in the implementation of hygiene control measures or restricted site access. • Research into solutions to increase knowledge of how to design strategies to recover a species. Strategies may include research into predator or disease control, methods for restoring degraded ecological communities, or developing captive breeding or ex-situ propagation techniques (see below for definition of 'ex-situ collection and propagation').
Survey/Mapping and Habitat assessment	Surveys are useful in: • Updating or confirming information about the distribution of a threatened species, by increasing knowledge of where a threatened species is located and the habitats and land tenures it occupies • Clarifying understanding of the conservation status of a threatened species and the threats that may be operating at a site. Surveys may benefit from the involvement of Aboriginal people to ensure that relevant cultural knowledge on species distribution is considered with the results of scientific assessments. Mapping and habitat assessment enables a clearer interpretation of the locations or distribution of threatened species and their habitats. It also incorporates habitat analysis and modelling of predictive distributions, allowing biologists to more effectively target surveys and predict where habitats may be situated and where recovery actions may be directed. This information helps environmental managers to assess the significance and impacts of proposed developments or activities.

Appendix G: References

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