Australian Government
Department of Agriculture, Water and the Environment

The Threatened Species Scientific Committee provided their advice to the Minister on 31 July 2020. The Minister approved this Conservation Advice on 6 December 2020 and agreed that no recovery plan is required at this time.

Conservation Advice[1] for the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria

This document combines the approved conservation advice and listing assessment for the threatened ecological community. It provides a foundation for conservation action and further planning.

An example of the ecological community in southern NSW © Copyright Nikki Ward

Conservation Status

The River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria is listed in the Critically Endangered category of the threatened ecological communities list under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

At the time of this advice, the ecological community corresponds closely with the NSW-listed *River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* and components are listed under various Victorian Ecological Vegetation Classes. Further details are in Section 4.2.

The ecological community was assessed by the Threatened Species Scientific Committee who recommended that the ecological community merited listing as Critically Endangered and that a recovery plan is not required for the ecological community at this time. The Committee's assessment and recommendations are at Section 6.

The Committee's assessment of the eligibility against each of the listing criteria is:
Criterion 1: Endangered
Criterion 2: Endangered
Criterion 3: Insufficient data
Criterion 4: Critically Endangered
Criterion 5: Insufficient data
Criterion 6: Insufficient data

The main factors that make the threatened ecological community eligible for listing in the Critically Endangered category are the loss of integrity of the ecological community through increased fragmentation and isolation from historic clearing, weed invasion, invasive fauna, changes to floodplain hydrology and inappropriate management regimes, including grazing and fire.

[1] The Conservation Advice is a statutory document as per Section 266B of the *Environment Protection and Biodiversity Conservation Act 1999*.

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1 CONSERVATION OBJECTIVE

To mitigate the risk of extinction of the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria, and help recover its biodiversity and function through protecting it from significant impacts as a Matter of National Environmental Significance under national environmental law, and by guiding implementation of management and recovery, consistent with the recommended priority conservation and research actions set out in this advice.

This Conservation Advice contains information relevant to the objective by:

- describing the ecological community and where it can be found (Section 2);
- identifying the key threats to the ecological community (Section 3);
- summarising the existing protections for the ecological community (Section 4);
- outlining information to guide its identification and conservation, including the key diagnostic features, condition thresholds and classes, and additional information to identify the ecological community, and the priority conservation and research actions to stop its decline, support its recovery and recognise the importance of involving landholders and Indigenous people in its maintenance (Section 5); and
- presenting evidence to explain why the ecological community merits listing as nationally threatened (Section 6).

2 DESCRIPTION OF THE ECOLOGICAL COMMUNITY AND THE AREA IT INHABITS

2.1 Description

The ecological community described in this Conservation Advice includes plants, animals and other organisms associated with a tall forest to woodland structure, with a canopy dominated by eucalypts and an understorey of small trees, shrubs, grasses, other herbs and climbers. It is found on the floodplains of the eastern and southern watershed of the Great Dividing Range from central and southern New South Wales to eastern Victoria.

This section describes the natural and largely undisturbed state of the ecological community, with more information to assist in identifying patches of the ecological community in Section 5.1. However, as a result of past disturbance, not all patches of the ecological community still exist in the natural and undisturbed state. Section 5.2 provides information to identify which patches retain sufficient conservation values to be considered a matter of national environmental significance.

2.1.1 Name

The name of the ecological community is the **River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria** (also referred to as "the ecological community"). The name primarily refers to the dominant canopy vegetation and the landscape position and geographic area that characterises the ecological community. The ecological community was originally placed on the 2016 Finalised Priority Assessment List as the "River-flat eucalypt forest on coastal floodplains of New South Wales".

2.1.2 Location and physical environment

The River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria is found in the South East Corner (SEC) and Sydney Basin (SYB) IBRA[2]

[2] IBRA refers to the Interim Biogeographical Regionalisation of Australia. IBRA regions are large geographically distinct areas of similar climate, geology and landform with corresponding similarities in their vegetation and animal communities. The version current at the time of this advice is IBRA v7 (DoE 2013).

bioregions. This encompasses the area from around Sale on the south-east coast of Victoria to around Raymond Terrace, just north of Newcastle on the New South Wales east coast.

The extent of the ecological community corresponds to country (the traditional lands) of several Indigenous groups. These include the Worimi, Wonnarua, Awabakal, Darkinung, Kurin-gai, Eora, Dharug, Tharawal/D'harawal, Yuin, Bidwell and the Kurnai.

The ecological community occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans. Floodplains may be occasionally or more often saturated, water-logged or inundated. The ecological community is typically found below 50 metres above sea-level (m ASL), although it can occur up to 250 m ASL (e.g. on floodplain pockets and plateaus above nick points).

The ecological community occurs on alluvial soils of various textures, including silts, clay loams and sandy loams, gravel and cobbles. Alluvial soils are very diverse and usually reflect the properties of their parent material in the upper catchment. They may include in-situ subsoils, fluvial sediments, and colluvial fans where they overlay the alluvial floodplain. The ecological community is typically found on deep (greater than one metre) alluvial soils but may be found on shallower soils on the margins of the floodplain and in smaller narrow alluvial systems. However, the ecological community does not occur on soils that are primarily marine or aeolian sand.

More detailed information on soils, and landforms is at Appendix D – Landforms and Soils.

2.1.3 Vegetation structure

The structure of the ecological community is generally a tall open forest to woodland, but there may be localised areas of closed forest and/or low forest, often associated with disturbance (including flooding). The structure tends to be lower and less dense in the wider floodplains, whereas taller denser forests occur in the more confined floodplains.

The canopy is dominated by eucalypt species, often with several species present. The canopy may exceed 40 m in height, but can be considerably shorter, for example in regrowth stands or where growth is inhibited (such as on waterlogged sites or in areas with lower rainfall). When intact, the canopy typically has between 40 and 60 percent crown cover, with large trees often containing hollows; but crown cover may be as low as 20 percent. Areas of higher crown cover also occur.

A mid-layer of small trees or sub-canopy may be present with scattered to dense shrubs. For example, *Melaleuca, Leptospermum* and related genera may form dense thickets beneath eucalypt canopies or in gaps between trees. The mid-layer may be sparser in lower rainfall areas, or where partially cleared, grazed or frequently burnt. The ecological community often has climbers and vines extending into the mid-storey and canopy.

The ecological community generally has a more diverse and abundant groundcover than locally adjoining slopes and typically includes grasses, forbs, ferns, sedges and scramblers. The intact ecological community may also have high litter cover and fallen logs.

The local expression of the ecological community is influenced by its location relative to the riparian areas of the floodplain, frequency of inundation by stream flows, local climate, latitude, and the contribution of biota from surrounding areas. Hence there is regional variation and intergradation of key species, although structure and function remain similar throughout the extent.

The ecological community typically forms mosaics with other floodplain forest ecological communities, lowland woodlands and treeless wetlands.

2.1.4 Flora

This section describes the assemblage of native vascular plant species that characterises the ecological community throughout its range. More comprehensive species lists are in

Appendix A – Species lists. However, even these do not include all the species that make up the ecological community and many sites may have species that are not mentioned in this Conservation Advice. The ecological community also includes fungi and cryptogamic plants (e.g. algae, lichens, mosses and ferns); however, these are less well documented.

Characteristic species may be abundant or rare and are only a subset of all the species in the ecological community. Not all characteristic species are present at every site; and some species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The number and identity of species at different sites varies, for example because of disturbance or natural variation, historical biogeography and local environmental gradients that influence soils, water and flood regimes. Contextual effects of adjacent vegetation are also important (i.e. the local species pool is strongly influenced by the surrounding vegetation).

The species recorded can also be affected by sampling scale, survey season and effort and expertise. At some sites characteristic native species are now locally extinct; and/or non-characteristic species have established themselves or have become more abundant. In general, the number of species recorded is likely to increase with the size of the site.

2.1.4.1 CANOPY SPECIES

The composition of the tree canopy varies across the extent of the ecological community. It may be dominated by a single eucalypt species, or by a mix of several eucalypt species. However, the two genera that characterise the ecological community are *Eucalyptus* and *Angophora*, notably: *Angophora floribunda* (Rough-barked Apple), *A. subvelutina* (Broad-leaved Apple), and members of the 'red gum' group of eucalypts (Exsertaria), notably *E. tereticornis* (Forest Red Gum, Red Irongum) and *Eucalyptus amplifolia* (Cabbage Gum) (NSW OEH 2018a; Keith & Scott 2005; NSW Scientific Committee 2011).

Other eucalypt species that frequently occur and may dominate or co-dominate patches of the ecological community include: *Eucalyptus baueriana* (Blue Box), *E. bosistoana* (Coast Grey Box), *E. botryoides* (Bangalay, Southern Mahogany), *E. elata* (River Peppermint) *E. ovata* (Swamp Gum) and *E. viminalis* (Manna Gum, Ribbon Gum).

The nationally and state-listed *E. benthamii* (Camden White Gum) may be locally dominant within its range (parts of the Hawkesbury-Nepean River floodplain west of Sydney) (NSW OEH 2018a; Keith & Scott 2005; NSW Scientific Committee 2011). Additional eucalypt species that may be present in low abundance, or dominate, or co-dominate the canopy in limited areas include: *E. botryoides* hybrids (such as *E. botryoides* x *E. saligna*), *E. grandis* (Flooded Gum), *E. longifolia* (Woollybutt), *E. moluccana* (Grey Box) and *E. saligna* (Sydney Blue Gum).

Other eucalypts may also be present in a mixed eucalypt canopy but are typically not dominant (see Appendix A – Species lists for full list of other eucalypt species). *Eucalyptus robusta* (Swamp Mahogany) may occur but is not dominant in this ecological community; it is more typically found in low-lying permanently waterlogged (swampier) parts of the floodplain.

Other non-eucalypt tree species may also be part of the canopy, mostly as an open sub-canopy as described in Section 2.1.4.2.

A more comprehensive list of canopy species likely to occur in the ecological community, is in Appendix A – Species lists.

2.1.4.2 UNDERSTOREY - MID-LAYER SPECIES

Non-eucalypt tree species may be part of the ecological community, mostly as an open sub-canopy. These include: *Allocasuarina littoralis* (Black Sheoak), *Elaeocarpus reticulatus* (Blueberry Ash, Blue Olive-berry), *Brachychiton populneum* (Kurrajong)[3], *Casuarina*

[3] At the drier end of the ecological community's range e.g. on the upper floodplain of the Mitchell River in Victoria (Peel 2019).

cunninghamiana (River Oak, River Sheoak), *Casuarina glauca* (Swamp Oak, Swamp Sheoak) and *Pittosporum undulatum* (Sweet Pittosporum).

A range of paperbarks may occur in the sub-canopy and shrub-layer of this ecological community, such as *Melaleuca decora* (White Feather Honey Myrtle), *M*. *linariifolia* (Flax-leaved Paperbark, Snow-in-summer) and *M. styphelioides* (Prickly-leaved Paperbark).

Other mid-layer species characteristic of this ecological community include *Acacia mearnsii* (Black Wattle), *Cassinia trinerva* (Three-veined Cassinia), *Coprosma quadrifida* (Prickly Currant-bush), *Melicytus dentatus* (Tree Violet), *Myrsine howittiana* (Brush Muttonwood), *Pomaderris aspera* (Hazel Pomaderris), *Sannantha pluriflora* (Tall Baeckea) and *Syzygium smithii* (Lilly Pilly). In Victoria *Acacia melanoxylon* (Blackwood) is often present.

Other shrubs that are widespread across a range of landscape positions are common in this ecological community, including *Acacia floribunda* (White Sally), *Breynia oblongifolia* (Breynia, Coffee Bush), *Bursaria spinosa* (Sweet Bursaria Blackthorn,), and *Prostanthera lasianthos* (Victorian Christmas-bush).

A more comprehensive list of mid-layer species likely to occur in the ecological community is in Appendix A – Species lists.

2.1.4.3 CLIMBER AND SCRAMBLER SPECIES

Scrambler species such as *Desmodium varians* (Slender Trefoil), *Glycine clandestina* (Twining Glycine) and *Veronica plebeia* (Trailing Speedwell) are found mainly in the ground-layer, whereas *Parsonsia straminea* (Common Silkpod), and *Smilax australis* (Native Sarsaparilla) may climb into the sub-canopy or mid-layer. Other commonly occurring species include *Clematis glycinoides* (Headache Vine), *Cissus hypoglauca* (Water Vine), *Eustrephus latifolius* (Wombat Berry), *Geitonoplesium cymosum* (Scrambling Lily), *Gynochthodes jasminoides* (Climbing Scrub-orange, Sweet/ Jasmine Morinda), *Marsdenia rostrata* (Common Milkvine), *Rubus parvifolius* (Native Raspberry) and *Tylophora barbata* (Bearded Tylophora).

A more comprehensive list of climbers and scramblers likely to occur in the ecological community is in Appendix A – Species lists.

2.1.4.4 UNDERSTOREY - GROUND-LAYER SPECIES

Given this is a floodplain ecological community there are several understorey species adapted to the alluvial soils and comparatively higher soil moisture compared to surrounding slopes. These are mostly perennial forbs, grasses, sedges, rushes lows shrubs and ferns including: *Centella asiatica* (Pennywort), *Commelina cyanea* (Scurvy-weed), *Dichondra repens* (Kidney Weed), *Einadia hastata* (Berry Saltbush, Saloop), *Entolasia marginata* (Bordered Panic), *Gahnia* spp. (Saw-sedge), *Lobelia purpurascens* (White Root), *Lomandra longifolia* (Spiny-headed Mat-rush), *Microlaena stipoides* (Weeping Grass), *Oplismenus hirtellus* (Basket Grass), *Plectranthus parviflorus* (Cockspur Flower) and *Viola hederacea* (Ivy-leaved Violet) (Good et al. 2017; Keith & Scott 2005; NSW Scientific Committee 2011; Miles 2020). In some areas grasses that may dominate the groundcover include: *Themeda triandra* (Kangaroo Grass), *Imperata cylindrica* (Blady Grass) and *Cymbopogon refractus* (Barbed Wire Grass).

A more comprehensive list of ground-layer species likely to occur in the ecological community is in Appendix A – Species lists.

2.1.5 Fauna

This section describes the assemblage of native vertebrate fauna species typical of the ecological community throughout its range. The ecological community includes a wide range of fauna species: in the canopy and sub-canopy, on the ground, in the soil and subsurface, as well as those dependent on wetlands. The wide variety of habitat in the ecological community is important for food, nesting, roosting and hunting. Fauna species play important

roles in the ecological community, including pollination, predator-prey relationships, seed dispersal and soil turnover.

More comprehensive fauna lists are in Appendix A – Species lists. However, even these do not include all the species that make up the ecological community and many sites may have species that are not mentioned in this Conservation Advice. Species may be abundant or rare and are only a subset of all the fauna species in the ecological community. Not all species are present at every site; and some species may be only sporadically present. The ecological community also includes many ecologically important invertebrate fauna species that are less well documented (e.g. gall forming insects, including flies, wasps, bugs and thrips).

2.1.5.1 CANOPY AND SUB-CANOPY FAUNA

The eucalypt canopy is home to a range of species that are dependent on hollows and other habitat values supplied by mature plants. The tree hollows and crevices that form in mature trees are also of particular importance to arboreal mammals, birds, frogs, reptiles and invertebrates, including bees and butterflies, which are part of this ecological community (Good et al. 2017). Certain tree species found within the ecological community, such as *Eucalyptus tereticornis* (Forest Red Gum), are preferred by a broad range of species including bats, arboreal mammals and some reptiles (Gibbons & Lindenmayer 2002). Many of the diagnostic eucalypt species are also important feed trees for *Phascolarctos cinereus* (Koala) including *Eucalyptus amplifolia*, *Eucalyptus tereticornis* and *Eucalyptus viminalis* (NSW DECC 2008; NSW OEH 2018d). Koalas generally favour habitats on soils with higher fertility and soil moisture such as the ecological community, particularly during times of high temperature and drought (Ellis et al. 1995).

Arboreal mammals play important roles in the ecological community, including pollination and seed dispersal for native plants (Turner 1983; East Gippsland CMA 2013). The ecological community includes a number of arboreal mammals such as the *Pseudocheirus peregrinus* (Common Ringtail Possum), *Trichosurus vulpecula* (Common Brushtail Possum), *Acrobates pygmaeus* (Feathertail Glider), *Petaurus australis* (Yellow-bellied Glider), *Petaurus breviceps* (Sugar Glider) and *Petaurus norfolcensis* (Squirrel Glider), while nationally threatened species include *Petauroides volans* (Greater Glider) and Koala. *Cercartetus nanus* (Eastern Pygmy Possum) is an active climber in the canopy and sub-canopy. It feeds on nectar and pollen, especially from banksias, eucalypts and bottlebrushes. It also feeds on insects and will eat soft fruits when flowers are not available. *Phascogale tapoatafa* (Brush-tailed Phascogale) is an arboreal carnivore preying on smaller mammals, birds, lizards and insects, as well as feeding on nectar from flowering trees in the ecological community (NSW OEH 2018b).

Coastal lowland forests are important foraging resources for flying foxes, for example the nationally-listed *Pteropus poliocephalus* (Grey-headed Flying-fox) is part of the ecological community across its entire extent (Eby & Law 2008). In autumn and winter the species congregates on coastal lowlands in some areas, while in summer the species spreads throughout the range. Together with *Pteropus scapulatus* (Little Red Flying-fox) they feed primarily on the nectar and pollen of eucalypt blossoms and are responsible for much of their pollination (DAWE 2020a). Fringing forests are important as roosting sites for flying foxes and for other species that may live in adjacent habitats but move through the ecological community to access water.

Microchiroptera (micro-bats) frequently forage across fertile floodplains and the riparian corridors of the ecological community. *Myotis macropus* (Southern Myotis) is Australia's only true fishing bat and is listed as Vulnerable in New South Wales. This bat may roost in small groups of 10 to 15 close to water in hollow-bearing trees or dense foliage, and forages over streams and pools catching insects and small fish by raking their feet across the water surface (NSW OEH 2017a).

Understorey plants influence bird diversity because the shrubs and twiners provide shelter, nesting substrates, foliage and include seasonal flowers which attract birds and insects. The

nationally and state-listed *Anthochaera phrygia* (Regent Honeyeater) and *Grantiella picta* (Painted Honey-eater) inhabit eucalypt forests with a reliable nectar supply, including those with Rough-barked Apple. Other birds likely to be present include other honeyeaters, cuckoos, owls, doves, whistlers, fairywrens, scrubwrens and fantails. The ecological community also includes a range of cockatoos, lorikeets, rosellas and parrots such as the Critically Endangered *Lathamus discolor* (Swift Parrot) that forage on flowers and psyllid lerps. During periods of drought, the ecological community is a particularly important refuge habitat for the Swift Parrot (Saunders & Tzaros 2011).

With a diverse range of fauna, the ecological community includes birds of prey such as: *Haliastur sphenurus* (Whistling Kite), *Haliaeetus leucogaster* (White-bellied Sea-eagle) and *Pandion cristatus* (Osprey) (Law et al. 2000; NSW OEH 2018a). It also includes *Ninox strenua* (Powerful Owl), *Tyto tenebricosa* (Sooty Owl) and *Tyto novaehollandiae* (Masked Owl), which are listed as Threatened in Victoria and Vulnerable in New South Wales. They prefer the more densely timbered areas of the ecological community (e.g. in the upper floodplain and riparian corridors) and roost and nest in large tree hollows near foraging areas. The Masked Owl often hunts along the edges of forests, including roadsides. Birds of prey feed on a wide range of animals, including rodents, small dasyurids, possums, gliders, bandicoots, rabbits, bats, birds, reptiles, fish and insects.

Some flowering plants provide large amounts of nectar for the ecological community. This attracts many insects (e.g. butterflies), which lay their eggs on the various food plants for larvae and nymphs, including *Acacia* spp. (wattles), *Lomandra* spp., sedges like *Gahnia* spp. and *Carex* spp. and the vine *Hardenbergia violacea* (Purple Coral-pea). For example, *Trapezites symmomus* (Symmomus Skipper), which is found across the whole extent of the ecological community feeds on *Lomandra* spp., most commonly *Lomandra longifolia* (Spiny-headed Mat-rush) (Braby 2004).

2.1.5.2 GROUND DWELLING FAUNA

The ground-layer vegetation provides food and shelter for a wide range of ground-dwelling animals including kangaroos, wallabies, wombats, birds, native rats and mice, reptiles and many invertebrates. Prior to non-Indigenous settlement, some areas of the ecological community also supported large ground-dwelling birds such as emus and bustards that are now locally extinct from most areas.

The understorey clumps of grasses, forbs, ferns and sedges provide cover for small to medium sized ground dwelling animals such as the *Perameles nasuta* (Long-nosed Bandicoot), the threatened *Isoodon obesulus obesulus* (Southern Brown Bandicoot), and *Tachyglossus aculeatus* (Short-beaked Echidna). Species such as the threatened *Pseudomys novaehollandiae* (New Holland Mouse) live in communal burrows and are found in habitats that are often high in floristic diversity especially leguminous perennials (Haering & Fox 1997; Kemper & Wilson 2008). The New Holland Mouse feeds primarily on seeds, though leaves, fungi and invertebrates are consumed based on seasonal or floristic characteristics of individual sites in the ecological community and it is thought to play an important role in seed and fungal spore dispersal (Seebeck et al. 1996; Smith & Quin 1996).

Predators such as the threatened *Dasyurus maculatus maculatus* (Spotted-tailed Quoll) are adept at moving through the canopy, as well as at ground level, preying on possums, rabbits, insects, lizards, crayfish, birds, small mammals, frogs and fish, as well as consuming plant material (Jones et al. 2001). *Antechinus agilis* (Agile Antechinus) and *Antechinus stuartii* (Brown Antechinus) are also part of the ecological community, living in forested habitats with dense lower ground cover and low fire frequency. These small carnivores prey on invertebrates. Most species nest communally in tree-hollows but also move and hunt terrestrially.

Lizards such as *Cyclodomorphus gerrardii* (Pink-tongued Lizard), are a part of the ecological community, sheltering beneath leaf litter, in hollow logs, and in crevices of rocks and trees. Their slender bodies and limbs are an adaptation for moving in thick undergrowth. Although only partially arboreal, the Pink-tongued Lizard is a good climber and uses its semi-

prehensile tail as a supporting aid to climbs trees to feed when necessary. Another example lizard species of the ecological community is the *Cyclodomorphus michaeli* (Mainland She-oak Skink), listed in Victoria as a threatened species, which inhabits the groundcover, sheltering amongst grass clumps, leaf-litter and logs (Lindenmayer et al. 2002; Shea 2004).

The invertebrates of the ecological community include *Meridolum corneovirens* (Cumberland Plain Land Snail) which is listed as Endangered in New South Wales. It lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps and can dig several centimetres into soil to escape drought. It is a fungal specialist and, unlike the Garden Snail, does not eat green plants. It is generally active at night (NSW Scientific Committee 1997).

2.1.5.3 SOIL FAUNA

The grasses, herbs, ferns and deep-rooted trees of the ecological community play a prominent role in intercepting, storing and recycling nutrients, protecting soil from erosion, reducing stream sediment loads during high intensity rainfall events and regulating ground water. A broad range of invertebrates and fungi are associated with the decomposition cycles in the moist, shaded conditions on the forest floor.

Ground-dwelling and burrowing mammals such as bandicoots, *Vombatus ursinus* (Common or Bare-nosed Wombat) and Short-beaked Echidna also play many important roles, including the dispersal of fungal species important for plant growth, soil aeration and the breakdown of leaf litter through digging and raking (Fleming et al. 2014). In Western Sydney, wombats are increasingly favouring the ecological community as a refuge from high temperatures (Ridgeway 2019). The alluvial soil of the ecological community may be an important indicator of suitability of habitat for species such as the threatened New Holland Mouse, with deeper top-soils and softer substrates preferred for digging burrows (Wilson & Laidlaw 2003).

2.1.5.4 WATER DEPENDANT FAUNA

The ecological community plays an important role in maintaining river ecosystems and riverbank stability and provides essential connectivity between the slopes and rivers, and longitudinally along rivers. As an interface between terrestrial and aquatic habitats, the ecological community includes species intimately associated with water and streams such as both sub-species of *Intellagama lesueurii* (Eastern/ Gippsland Water Dragon), *Hydromys chrysogaster* (Water Rat), *Ornithorhynchus anatinus* (Platypus), turtles and frogs. Waterbirds such as cormorants (*Phalacrocorax* spp.), egrets (*Ardea* spp. and *Egretta* spp.), kingfishers, *Ephippiorhynchus asiaticus* (Black-necked Stork) and the Endangered *Botaurus poiciloptilus* (Australasian Bittern) are part of the ecological community.

The moist environment supports a number of amphibians, particularly frogs such as the threatened *Litoria aurea* (Green and Golden Bell Frog), *Litoria brevipalmata* (Green-thighed Frog) and *Mixophyes iteratus* (Giant Barred-frog). The Green and Golden Bell Frog has been found in the ecological community in New South Wales and Victoria (e.g. under debris on low, oft-flooded river-flats). In New South Wales, the species commonly occupies disturbed habitats, and breeds largely in ephemeral ponds. However, in Victoria, it occupies habitats with little human disturbance and commonly breeds in permanent ponds, as well as ephemeral ponds (Pyke & White 1996). Other species such as *Limnodynastes peronii* (Brown Striped-frog) and *Limnodynastes tasmaniensis* (Spotted Grass-frog) are found under debris in river-flats and the grassy borders of creeks (Cogger 2000). Characteristic reptiles of the ecological community that feed on these frogs and other water-dependent species in the ecological community include *Pseudechis porphyriacus* (Red-bellied Black Snake), *Varanus varius* (Tree Goanna, Lace Monitor), and *Chelodina longicollis* (Eastern Long-necked Turtle).

More comprehensive lists of fauna species that make up the ecological community, including threatened fauna, are in Appendix A – Species lists.

2.2 Cultural and community significance

Indigenous peoples have occupied the coastal flats, creeks, rivers, estuaries and sea country of the east coast of Australia for tens of thousands of years. The coastal landscape

and the ecological community provide a direct link with spiritual and material culture to the Traditional Custodians. This includes cultural land management practices that help keep it healthy, such as cultural burning, along with camping and resource use. Further information is in Appendix E – Indigenous people, cultural values and use of the ecological community.

3 THREATS

The ecological communities of coastal floodplains, including eucalypt forests, are among the most threatened in south-eastern Australia (Specht et al. 1974; Benson 1991; Keith 2004; Keith & Scott 2005). Most of the remaining patches of the ecological community occur on productive agricultural land, or in close proximity to coastal areas, where continuing population growth and urban development is expected. Historically, clearing was primarily for timber and agriculture, and actions such as culling of native fauna were undertaken largely to support agricultural productivity, while in recent times it is more likely to occur for residential and industrial development. The nature of some areas of the ecological community has changed structurally due to clearing, followed by regrowth that is likely to be subject to altered fire and water regimes and livestock grazing.

3.1 Threat table

Table 1 outlines the key threats facing the ecological community. The key threats faced by the ecological community are described to help explain why this ecological community merits listing as threatened and supports the assessment against the criteria at Section 6.1. Although presented as a list, in reality these threats often interact, rather than acting independently.

Table 1: Summary of threats facing the ecological community

Threat factor	Threat Status*	Evidence base
Clearing	*Timing*: Ongoing *Severity*: Extreme *Scope*: Whole	Coastal floodplains were severely cleared and modified, primarily for agricultural development, soon after European occupation. Large areas of forested floodplains are now occupied by exotic pastures grazed by cattle, or given over to market gardens, turf and other cropping enterprises. Overall more than 70 percent of native vegetation on the coastal floodplains in New South Wales has been destroyed since non-Indigenous settlement (Keith 2004; Keith & Scott 2005; Good et al. 2017). As the ecological community occurs on the most productive parts of the floodplain landscapes, it is likely that an even greater portion of this ecological community has been cleared. Early clearing for agriculture also included tree-felling for timber. On the Cumberland Plain, vegetation clearance was initially for this purpose, as well as clearing for crops and pastures (Benson & Howell 1990). In the Illawarra region during the 19th and early 20th centuries clearing for agriculture included large scale timber removal; and in the Bega Valley, in the latter half of the 19th century, sawn timber production prized the valley species such as Forest Red Gum (*Eucalyptus tereticornis*), over dry sclerophyll species from the surrounding ranges (Lunney & Leary 1988). Outside of protected areas (which contain an estimated 15 percent of the area of the ecological community), land clearing is an ongoing threat, with coastal development continuing across much of its range. Clearing for agriculture continues today as rural enterprises and hobby farms have expanded into the upper reaches of floodplains. Major cities, rural centres and coastal hamlets continue to expand, with the construction of new housing estates, industrial development and recreational facilities displacing alluvial forests and other adjacent native vegetation.

Threat factor	Threat Status*	Evidence base
Fragmentation legacies	*Timing*: Ongoing *Severity*: Major *Scope*: Whole	The remaining native vegetation on coastal floodplains is often degraded and has a patchy distribution across its range. Few individual patches that remain are large enough on their own to provide sufficient species and genetic diversity to ensure their long-term survival. The historic loss of patches of the ecological community, plus the decreased size of remaining patches, lead to greater vulnerability to threats and the negative impacts of edge effects. The associated loss in physical and ecological connectivity is likely to limit regeneration if there are no nearby sources of seeds, and may also affect animals that require connected areas to disperse, or have a large home range. Where this ecological community persists as long, narrow patches along rivers and waterways, the edge effects can be even greater. Small or linear patches have a large edge to area ratio which is likely to allow the introduction of weeds and incursions by feral animals, and alter microclimates, making the ecological community more vulnerable to damage during droughts, floods or other extremes
Livestock grazing	*Timing*: Ongoing *Severity*: Minor *Scope*: Minority	Remaining stands of the ecological community can suffer from overgrazing, trampling, weed invasion and other soil disturbance by domestic livestock, which are known to have a strong negative influence on riparian and floodplain vegetation (Good et al. 2017). The ecological community is susceptible to degradation by overgrazing and stock accessing waterways, causing vegetation loss (grazing and trampling), soil compaction (hard hoofed stock), riverbank erosion/collapse, disturbing sediments and increasing nutrient levels.
Weeds	*Timing*: Ongoing *Severity*: Major *Scope*: Whole	Invasion by non-native plants, especially exotic perennial grasses, is a major threat to this ecological community (Keith & Scott 2005; Tozer et al. 2010). The high levels of fertility and moisture make the ecological community prone to invasion by a number of environmental weeds that have a capacity to alter the species composition of the ecosystem through time. Many weeds have the potential to invade patches that are close to urban settlement. Invasion is often the result of physical disturbance; dumping of landfill/rubbish and garden refuse; escaping garden plants; construction of roads and other utilities, polluted runoff from urban and agricultural areas and grazing by domestic livestock. Physical disturbance reduces the ability of native plants to compete with invading species, while also directly providing bare soil and resource to allow non-native species to establish. Floodplain ecological communities are also susceptible to weeds following natural disturbance such as flooding. Weed seeds can be transported by water, wind, birds and other animals. Once established, weeds can change nutrient cycling, species composition, structure, habitat values and fire regimes in the ecological community (Good et al. 2017). There is scientific evidence that invasion by highly invasive coastal weeds has a range of detrimental impacts on native flora and fauna, for instance reduction in native plant species richness and lower abundance of certain bird feeding guilds (Cousens et al. 2013). A list of weeds species that are commonly found in the ecological community is provided in Appendix B – Weeds

Threat factor	Threat Status*	Evidence base
Invasive fauna	*Timing*: Ongoing *Severity*: Major *Scope*: Majority	The ecological community is subject to a range of negative impacts from invasive animals. These include: • predation, habitat destruction through trampling and soil disturbance, competition and disease transmission by feral pigs; • predation, disease transmission and spread of invasive plant species by dogs, foxes, cats, and other feral (or domestic) predators; • grazing and trampling pressures from rabbits, unmanaged goats, deer and other feral herbivores, which can leave the ecological community open to erosion and weed invasion; • adverse competitive, or lethal impacts to faunal elements, such as from over-abundant noisy miners, feral honeybees and other aggressive birds and insects; and • Bell Miner associated dieback, which is spreading through forests on public and private lands from south east Queensland to Victoria (Silver & Carnegie 2017).
Diseases and pathogens	*Timing*: ongoing *Severity*: Minor *Scope*: Majority	A number of diseases and pathogens can affect the eucalypt canopy of the ecological community, including dieback resulting from Armillaria root rot caused by *Armillaria* spp. (honey fungus). The ecological community includes a wide range of amphibians that are at high risk from Chytridiomycosis caused by chytrid fungus (*Batrachochytrium dendrobatidis*) (DoEE 2016a). There is a very high density (19–21 species) of non-threatened species which may be affected by Psittacine beak and feather disease (Psittacine Circoviral Disease) in the ecological community (DoEE 2016b). Infection by myrtle rust (*Austropuccinia psidii*) is also a threat to many of the trees and shrubs in the Myrtaceae family within the ecological community, including some of the common canopy species.
Hydrological changes	*Timing*: Ongoing *Severity*: Major *Scope*: Minority	The ecological community is detrimentally impacted by changes to hydrology, including from flood mitigation and drainage works, extraction and river regulation, particularly in the Hunter, Hawkesbury-Nepean and Shoalhaven catchments. In addition, water has been diverted for irrigation of crops and to fill farm dams (Keith & Scott 2005). Alteration of the natural flow regimes of rivers, streams and wetlands is recognised as a major factor contributing to loss of biological diversity and ecological function in aquatic ecosystems and their associated floodplains, (NSW Scientific Committee 2002). Hydrological changes created through levee and weir construction, artificial drainage and irrigation, can also trigger oxidisation in acid sulfate soils. This has the potential for severe negative impacts on the vegetation and fauna of the ecological community, as well as water quality. Urbanisation of the landscapes that adjoin the ecological community may also have significant hydrological effects. The 'hardening' of surfaces through development such as road building and development surrounding the ecological community results in increased runoff (and less infiltration and water retention). This changes stream flow patterns, causing erosion and the runoff often penetrates adjacent bushland. It can carry high nutrient and sediment loads, which encourage weed invasion (NSW DEC 2005; NSW DECCW 2010a).

Threat factor	Threat Status*	Evidence base
Altered fire regimes	*Timing*: Ongoing *Severity*: Major *Scope*: Unknown, likely Majority	Fire regimes have been changed throughout the extent of the ecological community in association with the growth of agriculture and urban development. Fire is used to promote regrowth (green pick) for livestock and for hazard reduction management, both of which can increase fire frequency. The amount of fallen timber and other plant litter can be diminished during such burns. Arson can also be an issue, particularly on urban fringes. Alternately, fire management, altered land practices, fragmentation and other vegetation changes can decrease fire frequency. In some areas, high intensity or too frequent fires may slow or prevent regeneration of some species in the ecological community and lead to lower species richness. Sustained high frequency fire will lead to a loss of eucalypts and other plant species, a reduction in vegetation structure and a corresponding loss of animal species in the ecological community (NSW OEH 2017b). Severe fires and the resulting habitat changes are likely to detrimentally impact on resident fauna such as koalas, bandicoots, gliders and potoroos (Tozer et al. 2010; NSW OEH 2017b). Even in areas where vegetation recovers quickly, the loss of animal species detrimentally impacts on the short-term recovery and long-term health of the ecological community, as animals provide essential functions such as soil turnover and seed dispersal. Mega-fires, such as those experienced in the 2019-2020 fire season, can burn a significant proportion of the ecological community (an estimated 50 percent of the ecological community was within the extent of the 2019-20 bushfires (DAWE 2020b)) and the surrounding vegetation in a single event, which compounds these detrimental impacts.
Urban heat effects	*Timing*: Ongoing *Severity*: Unknown *Scope*: Minority	Urbanisation can also result in an 'urban heat island effect' whereby heat is absorbed then radiated by urban structures, such as houses and paved, concreted and asphalted areas, leading to elevated temperatures. This effect has been shown to be operating in western Sydney (Santamouris et al. 2017) but is likely in any urban environment. With increased temperatures and less soil moisture, the small remnant occurrences of the ecological community in built landscapes are not sufficient to cool the surrounding environment. The altered local micro-climate may, in turn, adversely impact patches of the ecological community within and adjacent to urban developments. This process operates in addition to any temperature rise due to global climate change.
Vegetation and firewood removal	*Timing*: Ongoing *Severity*: Minor *Scope*: Minority	In rural-residential areas, patches of the ecological community are often mown, slashed or scrubbed for bushfire fuel reduction, grazing and perceived aesthetics. These activities can deplete the soil seed bank (James 1994) and contribute to the spread of weeds. Firewood collection and the removal of woody debris also damage the ecological community.
Disturbance from urbanisation and recreational activity	*Timing*: Ongoing *Severity*: Major *Scope*: Minority	The threat of recreational activity includes detrimental impacts from a range of activities where people access areas of the ecological community. Visitor disturbance results in soil compaction and disturbance, erosion from foot, cycle, trail bike and four-wheel drive tracks, fishing and boat ramp access points, the introduction of pests and the creation of new planned and unplanned tracks. Increased visitation to adjacent watercourses results in increased demand for and use of visitor facilities, such as walking tracks, viewing platforms, toilet blocks and picnic areas.

Threat factor	Threat Status*	Evidence base
		Other negative impacts in such areas include the dumping of cars, rubbish and garden waste, which can cause weed infestation. There are also a number of cumulatively detrimental impacts from urbanisation and recreational activity, such as vehicle strikes on species such as koalas, predation or disturbance by domestic animals, rubbish dumping and bush rock removal.
Climate change	Timing: Ongoing Severity: Major Scope: Whole	Major impacts of climate change are likely to be played out through interactions with other threatening processes, including habitat loss and degradation, invasion of exotic species and changes to hydrological and fire regimes (Auld & Keith 2009; Dunlop & Brown 2008). A generally warming and drying climate in southern and eastern Australia is likely to significantly reduce run-off to coastal rivers and streams within the range of the ecological community (DCC 2009). Climate change is likely to intensify drought events (Dai 2012; Mitchell et al. 2016), which may exacerbate mortality in eucalypt populations. Some functionally important fauna species of the ecological community, such as Little Red Flying-fox and Grey-headed Flying-fox, can suffer heat stress, with reported deaths when temperatures exceed 42°C. Latitudinal shift in the distribution of this ecological community is a plausible response to climate change, but the area to shift into may not be available or suitable, because of coastal development, soil types or competition with other vegetation communities (Paice & Chambers 2016). Groundwater salinity is considered a potential influence of regrowth dynamics for the ecological community. This can be affected by both altered hydrology and potentially sea water incursion as result of rising sea-levels (Keith & Scott 2005). Fires' frequency, intensity and size are expected to increase under climate change as temperatures rise, rainfall variability increases, droughts become more severe and ecosystem dynamics alter, resulting in changed biomass fuel loads and types. The projected hotter, drier, windier conditions associated with climate change caused by greenhouse warming would extend the period of fuel drying and increase rates of fire spread (Harrison & Kelley 2017).

*__Threat Status:__ ***Timing*** – the threat: occurs in the **past** (and is unlikely to return), is **ongoing** (present/continuing), is likely to occur/return in the **future,** or timing is **unknown.**

Severity – the threat causes or has the potential to cause detrimental impacts that are: **extreme** (leading to loss or transformation of affected patches/occurrences), **major** (leading to degradation of affected patches/occurrences), **minor** (detrimentally impacting some components of affected patches/occurrences), **negligible** or **unknown.**

Scope – the threat is affecting: the **whole** (>90%), a **majority** (>50%), a **minority** (<50%), a **negligible** amount, or **unknown** amount of the ecological community.

3.2 Key threatening processes

The EPBC Act provides for the identification and listing of key threatening processes (KTPs). A process is defined as a KTP if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

Table 2 outlines the EPBC-listed and NSW-listed KTPs[4], current at the date of writing, which may be relevant to the ecological community, or specific plants and animals that comprise it.

Table 2: Key threatening processes which may be relevant to the ecological community

EPBC-listed key threatening processes	NSW-listed key threatening processes
Land clearance	Clearing of native vegetation
	Removal of dead wood and dead trees
	Loss of hollow bearing trees
	Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands
	High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	Anthropogenic climate change
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Novel biota and their impact on biodiversity	Invasion, establishment and spread of *Lantana camara*
	Invasion of native plant communities by exotic perennial grasses
	Invasion and establishment of exotic vines and scramblers
	Invasion of Native Plant Communities by African Olive (*Olea europaea* subsp. *cuspidata*)
	Competition from feral honeybees *Apis mellifera* L.
	Herbivory and environmental degradation caused by feral deer
	Predation and Hybridisation by Feral Dogs, *Canis lupus familiaris* [Current name is *Canis familiaris*]
Predation, habitat degradation, competition and disease transmission by feral pigs	Predation, habitat degradation, competition and disease transmission by feral pigs
Predation by feral cats	Predation by the feral cat (*Felis catus*)
Predation by European red fox	Predation by the European red fox (*Vulpes vulpes*)
Competition and land degradation by rabbits	Competition and grazing by the feral European rabbit *(Oryctolagus cuniculus)*
Competition and land degradation by unmanaged goats	Competition and habitat degradation by Feral Goats *Capra hircus*

[4] Details of Victorian-listed Potentially Threatening Processes, under the Victorian Flora and Fauna Guarantee Act 1988, are at: https://www.environment.vic.gov.au/conserving-threatened-species/threatened-list

EPBC-listed key threatening processes	NSW-listed key threatening processes
Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*)	Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala*
	Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners
Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species	Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations
Infection of amphibians with chytrid fungus resulting in chytridiomycosis	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis

Any approved threat abatement plans or advice associated with the EPBC-listed KTPs[5] provide information to help landowners manage these threats and reduce their detrimental impacts to biodiversity. These can be found at: http://www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl.

4 EXISTING PROTECTION

4.1 Protection in reserves

Despite a number of reserves containing the ecological community, its position in the landscape means only a small area of the ecological community has been included in formal conservation reserves, typically on localised, sheltered river-flats between hills, rather than the large open floodplains that comprised the majority of its original extent.

It is estimated that around 15 percent of the remaining ecological community occurs in conservation reserves. This represents between 2 and 6 percent of the estimated original extent of the ecological community. Reserves with a significant amount of the ecological community include: the Bemm, Goolengook, Arte and Errinundra Rivers (Heritage River), the Snowy River National Park, and the Croajingolong National Park in Victoria; and the Morton National Park and Conjola National Park in New South Wales.

4.2 Existing protection under state laws

New South Wales protects threatened ecological communities by listing them under the *Biodiversity Conservation Act 2016.*

Much of this ecological community in New South Wales corresponds to the NSW-listed 'River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions'. In the Hunter/Central Coast area some patches may correspond to the NSW-listed 'Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions', or the NSW-listed 'Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion'.

Victoria protects threatened communities of flora and fauna under the *Flora and Fauna Guarantee Act 1988*; but protection under the Act only applies to patches that are on public land tenures. Patches of this ecological community towards the western end of the South East Corner IBRA Bioregion may correspond to the Vic-listed 'Forest Red Gum Grassy Woodland Community'.

4.3 Existing management plans

A number of existing plans relate to management and/or recovery of the ecological community, or its component species. These prescriptions were current at the time of

[5] Details of NSW-listed KTPs and associated Saving our Species strategies can be found at: https://www.environment.nsw.gov.au/threatenedSpeciesApp/threats.aspx.

publishing. Please refer to the relevant agency's website for any updated versions or new information that has been published.

Plans prepared for the management and/or recovery of the ecological community (or its component vegetation units and state-listed equivalent communities).

- NSW OEH [Office of Environment and Heritage] (2019). Saving Our Species - Help save River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. NSW Government. https://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=980&ReportProfileID=10787

Indigenous documents relating to the use or management of, areas or components of, the ecological community.

- Donaldson S (2010). Understanding aboriginal cultural heritage – A place based collection of oral histories told by Koori people with traditional and historical connections to the Bega Valley Shire[6]. Bega Valley Shire Council. https://begavalley.nsw.gov.au/page.asp?f=RES-FGL-50-44-25
- GLWAC (2015). Whole-of-Country Plan. www.gunaikurnai.org/wp-content/uploads/gk_whole-of-country%20plan%20LR%20FINAL%20270815.pdf

Recovery plans, threat abatement plans, wildlife conservation plans and other plans relevant for components of the ecological community.

- DEWHA (2008a). Threat abatement plan for predation by the European red fox. Commonwealth of Australia. www.environment.gov.au/biodiversity/threatened/publications/tap/predation-european-red-fox
- DEWHA (2008b). Threat abatement plan for competition and land degradation by unmanaged goats, Commonwealth of Australia. www.environment.gov.au/biodiversity/threatened/publications/tap/competition-and-land-degradation-unmanaged-goats
- DoE (2015a). Threat abatement plan for predation by feral cats. Commonwealth of Australia. www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats
- DoE (2015b). Arrive Clean, Leave Clean: guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems. Commonwealth of Australia. www.environment.gov.au/biodiversity/invasive-species/publications/arrive-clean-leave-clean
- DoEE (2016a). Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis. Commonwealth of Australia. www.environment.gov.au/biodiversity/threatened/publications/tap/infection-amphibians-chytrid-fungus-resulting-chytridiomycosis-2016
- DoEE (2016b). Threat Abatement Advice for the key threatening process 'Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species'. Commonwealth of Australia. Last viewed July 2020. https://www.environment.gov.au/biodiversity/threatened/threat-abatement-advices/beak-feather-disease
- DoEE (2016c). Threat abatement plan for competition and land degradation by rabbits. Commonwealth of Australia. www.environment.gov.au/biodiversity/threatened/publications/tap/competition-and-land-degradation-rabbits-2016

[6] This report, part of the Bega Valley Aboriginal Cultural Heritage Study, includes information for use in planning and land management of seasonal living and camping places, such as along the Bega River, where traditional cultural use has continued since pre-contact times. These places are usually close to resource collection places and have an important role as teaching and work places.

- DoEE (2017). Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*). Commonwealth of Australia. www.environment.gov.au/biodiversity/threatened/publications/tap/feral-pig-2017
- Makinson (2018). Myrtle Rust in Australia – a draft Action Plan. Plant Biosecurity Cooperative Research Centre. https://www.anpc.asn.au/myrtle-rust/https://www.anpc.asn.au/myrtle-rust/
- NSW DEC (2005). Recovering Bushland on the Cumberland Plain: Best Practice Guidelines for the Management and Restoration of Bushland.
- NSW DECC (2008). Recovery plan for the koala (*Phascolarctos cinereus*). https://www.environment.nsw.gov.au/research-and-publications/publications-search/recovery-plan-for-the-koala-phascolarctos-cinereus
- NSW NPWS (2014). Yuin Banggurii (Mountain) Parks: Plan of Management. Incorporating Gulaga National Park and Biamanga National Park.
- https://www.environment.nsw.gov.au/research-and-publications/publications-search/yuin-bangguri-mountain-parks-plan-of-management
- Saunders & Tzaros (2011). National Recovery Plan for the Swift Parrot *(Lathamus discolor*). http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-swift-parrot-lathamus-discolor
- Vic DELWP (2016). National recovery plan for the spotted tail Quoll *Dasyurus maculatus*. https://www.environment.gov.au/biodiversity/threatened/recovery-plans/spotted-tailed-quoll

Regional conservation or natural resource management (NRM) plans relevant to the ecological community include:

- NSW DECCW (2010b). South Coast Regional Conservation Plan*.* https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/south-coast-regional-conservation-plan-2010-12.pdf?la=en

State Environmental Planning Policies (SEPPs) that may include areas of the ecological community include:

- NSW DPIE (2020). Koala Habitat Protection SEPP State Environmental Planning Policy (Koala Habitat Protection) 2019. https://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Koala-Habitat-Protection-SEPP

5 CONSERVATION OF THE ECOLOGICAL COMMUNITY

5.1 Identification of the ecological community

The River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria intergrades with other vegetation types and nationally-listed ecological communities (see Section 5.1.2.7). Judgement is required to determine whether the ecological community is present or not at any particular site.

Key diagnostic characteristics are used to identify an area of native vegetation as being the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria. They also define the features that distinguish it from other ecological communities, noting that additional information to assist with identification is provided in the other sections of this document, particularly the description (Section 2.1) and Appendix A – Species lists.

Species composition of this ecological community is influenced by, amongst other things: the size of the patch, proximity of other native vegetation, seasonal conditions (e.g. rainfall and temperature), latitude, inundation frequency, hydrological conditions and disturbance history (including fire and grazing). Plant surveys conducted during spring and early summer will more easily identify understorey species in the ecological community and should be conducted at least 6–12 months after a major disturbance. However, the key diagnostic characteristics are designed to allow identification of the ecological community irrespective of the season.

5.1.1 Key diagnostic characteristics

Areas of vegetation that do not meet the key diagnostic characteristics are not part of the nationally-listed ecological community.

The ecological community is defined as patches of native vegetation (and associated biota) meeting the description in Section 2.1 that meet the following key diagnostic characteristics.

- Occurs in the South East Corner and Sydney Basin IBRA[7] Bioregions, in eastern Victoria and south eastern New South Wales.
- Occurs within catchments of the eastern and southern watershed of the Great Dividing Range.
- Occurs at elevations up to 250 metres above sea-level (ASL), but most typically below 50 metres ASL.
- Occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans[8].
- Occurs on alluvial soils[9] of various textures including silts, clay loams, sandy loams, gravel and cobbles. Does not occur on soils that are primarily marine sands, or aeolian sands.
- Occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland[10]. The canopy has a crown cover[11] of at least 20 percent[12].
- Has a canopy dominated[13] by one or a combination of the following species: *Angophora floribunda, A. subvelutina, Eucalyptus amplifolia, E. baueriana, E. benthamii, E. bosistoana, E. botryoides, E. botryoides* x *E. saligna*[14]*, E. elata, E. grandis, E. longifolia, E. moluccana, E. ovata, E. saligna, E. tereticornis, E. viminalis*.

Other characteristic or commonly present flora and fauna species are outlined in Appendix A – Species lists.

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[7] IBRA refers to the Interim Biogeographical Regionalisation of Australia. The version current at the time of this advice is IBRA v7 (DoE 2013).

[8] See Appendix D – Landforms and Soils, for more information on floodplains/alluvial landforms.

[9] See Appendix D – Landforms and Soils for more information on soils.

[10] Structural forms based on Specht (1970).

[11] Crown cover is measured as the percentage of the patch covered by the total area within the vertical projection of the periphery of the tree crowns, where the tree crowns are considered to be solid (as per National Committee on Soil and Terrain (2009)).

[12] Recent disturbance, such as fire, may remove the living canopy and cause a shift to a regenerative state for the ecological community. Under these circumstances, the loss of a tree canopy is likely to be a temporary phenomenon, if natural regeneration is not interrupted. There should be evidence that the dominant eucalypt species typical of the ecological community will regenerate from seedlings, saplings, lignotubers or epicormic regrowth. This temporary regenerative state is included as part of the ecological community when the other diagnostic features and condition thresholds are met, even when crown cover is temporarily less than 20 percent.

[13] A canopy dominated by one or more of the diagnostic species is where, one or a combination of the diagnostic eucalypt species are collectively the most abundant trees in the canopy — in terms of either crown cover (i.e. at least 50 percent of the canopy cover), or stem density (i.e.at least 50 percent of the trees).

[14] Hybrids of eucalypt species may be present, and hybrids should be included when assessing dominance of canopy tree species; e.g. *Eucalyptus moluccana* x *E. albens* counts towards *E. moluccana* dominance (see TSSC (2010)).

5.1.2 Additional information to assist in identifying the ecological community

The following information should also be taken into consideration when applying the key diagnostic characteristics to assess if a site may include the ecological community. Land use and disturbance history will influence the state in which a patch of the ecological community is expressed.

5.1.2.1 IDENTIFYING A PATCH

A patch is a discrete and mostly continuous area of the ecological community[15], as defined by the key diagnostic characteristics, but can include small-scale (<30 m) variations, gaps and disturbances within this area. The smallest patch size that can be identified is 0.5 ha, because the key diagnostic characteristics cannot reliably be identified for smaller areas than this. Where a larger forest or woodland area has been classified as a different vegetation type (e.g. by state vegetation mapping), localised areas of the ecological community greater than 0.5 ha may be present within this larger area.

5.1.2.2 BREAKS IN A PATCH

When it comes to defining a patch of the ecological community, allowances are made for "breaks" up to 30 m between areas that meet the key diagnostics. Such breaks may be the result of watercourses, tracks, paths, roads, gaps made by exposed areas of soil, leaf litter or cryptogams, and areas of localised variation in vegetation that do not meet the key diagnostics. Such breaks do not significantly alter the overall functionality of the ecological community and form a part of the patch. Watercourses, gaps made by exposed areas of soil, leaf litter or cryptogams, and areas of localised variation in vegetation should be included in the calculation of the size of the patch and be taken into account when determining the overall condition of the patch. Tracks, paths, roads or other man-made surfaces should be excluded from the calculation of patch size and condition.

Where there is a break in the ecological community of 30 m or more (e.g. due to permanent artificial structures, wide roads or other barriers, water bodies or other types of vegetation) then the gap indicates that separate patches are present.

5.1.2.3 VARIATION WITHIN A PATCH

Patches of the ecological community may contain areas that vary in structural or biological characteristics. Variation in canopy cover, quality or composition of vegetation across a patch should not be considered to be evidence of multiple patches, so long as it meets the key diagnostics.

5.1.2.4 REVEGETATION AND REGROWTH

Revegetated or replanted sites, or areas of vegetation regeneration (regrowth) are included in the nationally-listed ecological community, as long as they meet the key diagnostic characteristics. The inclusion of patches of natural and managed regeneration reflects the ecological community's ability to regenerate.

5.1.2.5 SURVEY REQUIREMENTS

Patches of the ecological community can vary markedly in their shape, size, condition and features. Thorough and representative on-ground surveys are essential to accurately assess the extent and condition of a patch. The New South Wales Native Vegetation Interim Type Standard (Sivertsen 2009) and the Australian Soil and Land Survey Field Handbook (National Committee on Soil and Terrain 2009) may provide guidance.

[15] Note that NSW vegetation assessment tools/methodologies define a patch differently: as including all intact native vegetation, which may include one or more ecological communities that have a gap of less than 100 m from the next area of moderate to good condition native vegetation. The national Threatened Species Scientific Committee uses the term 'patch' to describe a discrete area of a single ecological community.

The size, number and spatial distribution of plots or transects must be adequate to represent variation across the patch. Sampling should address likely variation in species composition and significant variation in the vegetation (including areas of different condition), landscape qualities and management history (where known) across the patch. Plots of 0.04 ha (e.g. quadrats of 20 x 20 m) would be suitable (Tozer 2003; Tozer et al. 2010).

Recording the search effort (identifying the number of person hours spent per plot/transect and across the entire patch; along with the surveyor's level of expertise and limitations at the time of survey) is useful for future reference.

Whilst identifying the ecological community and its condition is possible at most times of the year, consideration must be given to the role that season, rainfall and disturbance history may play in an assessment. The ecological community can vary in its appearance through the year and between years, depending on climatic conditions. Ideally, surveys should be held in more than one season to maximise the chance of detecting all species present, particularly threatened species. Many species are easier to detect or identify in spring and summer to early autumn; however, some species may require late winter surveys to observe flowering. In years of low rainfall, assessors should recognise that many species may not be detected. In these situations, it is preferable that surveys are carried out over more than one year.

In addition to the effects of rainfall variation, presence and detectability of some species may also be affected by the time since disturbance. For example, after a fire one or more vegetation layers, or groups of species (e.g. obligate seeders), may not be evident for a time. Timing of surveys should allow for a reasonable interval after a disturbance (natural or human-induced) to allow for regeneration of species to become evident, and be timed to enable diagnostic species to be identified (for example, at least six months post fire and within two months of effective rain). At a minimum, it is important to note climate conditions and what kind of disturbance may have happened within a patch, and when that disturbance occurred, as far as possible.

Surveys should also note any areas that are either significantly higher or lower in quality, gaps in canopy cover and the condition categories that would apply across different parts of the site respectively.

Fauna surveys should be conducted following best practice guidelines such as the Survey guidelines for Australia's threatened mammals (DSEWPC 2011) or equivalent.

5.1.2.6 MAPPING AND VEGETATION CLASSIFICATIONS

There are a number of mapping and vegetation classification schemes used in New South Wales and Victoria. Although at present, none directly map areas of the ecological community according to the national key diagnostic characteristics and minimum condition thresholds, they can still provide useful information on the likely occurrence of the ecological community. Appendix C – Relationship to other vegetation classification and mapping systems outlines the map units or classifications from a number of common mapping and classification systems that best relate to the ecological community.

The boundaries of coastal ecological communities may change over time due to the dynamic nature of these systems. This ecological community is often found in association with other vegetation types such as coastal wetlands, littoral rainforest, swamp oak forests, or swamp sclerophyll forests in a 'mosaic' of coastal floodplain ecological communities.

The characteristic features that distinguish it from other floodplain ecological communities are:

- its dominant canopy of eucalypts;
- the sub-dominance or relatively low abundance of *Casuarina* and *Melaleuca* species, along with the relatively low abundance of *Eucalyptus robusta* (Swamp Mahogany); and
- the prominent ground cover of soft-leaved forbs and graminoids.

5.1.2.7 OTHER NEARBY NATIONALLY-LISTED ECOLOGICAL COMMUNITIES

There are several other nationally-listed threatened ecological communities that occur in, or close to, the same areas as the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria. Table 3 outlines these ecological communities and their status at the time of listing.

In most cases an area of vegetation can be defined as one nationally-listed threatened ecological community, or as another. In some circumstances however, an area of vegetation may meet the key diagnostics of two nationally-listed threatened ecological communities, especially after disturbance. For example, some areas of the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria in New South Wales may also meet the key diagnostic characteristics for the 'Illawarra and south coast lowland forest and woodland'; and in Victoria some areas dominated by *E. tereticornis* ssp. *mediana* may also meet the key diagnostic characteristics for the 'Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland'. Areas that meet two sets of key diagnostics should be treated as both nationally-listed ecological communities.

Table 3: Other nationally-listed threatened ecological communities that can intergrade or overlap with the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria

TEC	Status
Other floodplain or coastal communities	
Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland	Endangered
Littoral Rainforest and Coastal Vine thickets of Eastern Australia	Critically Endangered
Subtropical and Temperate Coastal Saltmarsh	Vulnerable
Other communities adjoining the floodplain	
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	Endangered
Central Hunter Valley eucalypt forest and woodland	Critically Endangered
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered
Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland	Critically Endangered
Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion	Critically Endangered
Illawarra and south coast lowland forest and woodland	Critically Endangered
Lowland Grassy Woodland in the South East Corner Bioregion	Critically Endangered
Warkworth Sands Woodland of the Hunter Valley	Critically Endangered
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered

5.2 Regulated areas of the ecological community

National listing focuses legal protection on patches of the ecological community that are the most functional, relatively natural and in comparatively good condition. These patches are identified through *minimum condition thresholds*.

Condition classes also used to distinguish between patches of the ecological community of different qualities, to aid environmental management decisions.

In order to be protected as a matter of national environmental significance areas of the ecological community must meet both:

- the key diagnostic characteristics (Section 5.1.1); AND
- at least the minimum condition thresholds (Section 5.2.1).

Table 4 outlines the different condition classes that apply to the ecological community. The minimum condition thresholds (those for classes C1 and C2) are designed to identify those patches that retain sufficient conservation values to be considered a matter of national environmental significance, to which the referral, assessment, approval and compliance provisions of the EPBC Act apply. These include all patches in Classes A, B and C.

Patches that do not meet the minimum condition thresholds are excluded from protection under the EPBC Act. In many cases, the loss and degradation is irreversible because natural characteristics have been permanently removed. However, although not protected under the EPBC Act, many of these patches may still retain important natural values and may be protected through state and local laws or planning schemes.

As the ecological community has been heavily cleared, fragmented and degraded, many patches are small and/or isolated and/or modified. Small and isolated patches may contain disproportionately more unique or rare biodiversity values that may be irreplaceable (Wintle et al. 2018). Therefore, small and isolated patches that have the potential to be restored and reconnected should not be excluded from recovery and other management actions. Suitable recovery and management actions may improve a patch's condition, such that it subsequently can be included as part of the ecological community fully protected under the EPBC Act. Management actions should be designed to restore patches to high condition where practical.

When assessing condition of a patch of the ecological community it is important to also consider the key diagnostic characteristics (Section 5.1.1) and patch definition information (Section 5.1.2).

5.2.1 Condition classes and thresholds

There may be some patches of the ecological community likely to be in better condition, particularly those which have been subject to no adverse impacts, or low impacts such as light grazing, and those which retain hollow bearing trees. Patches of the ecological community that have a low incidence of weeds, contain mature habitat trees (e.g. those with hollows) and a more diverse understorey, and/or patches that are part of larger native vegetation remnants and/or patches that are known to support arboreal mammals, are a high priority for protection and management. Small, isolated patches that are subject to high disturbance and with a less diverse native understorey, do not contribute greatly to the conservation of the ecological community and may not meet the condition thresholds for national protection.

The broadest area that meets the key diagnostic characteristics of the ecological community should be used in determining patch condition. Where it falls below the minimum thresholds, the next largest area or areas that meet key diagnostic characteristics and minimum condition thresholds should be specified and protected. This may result in multiple patches of the ecological community being identified within the overall area first considered. Areas of high, good or moderate quality may then be identified within patches if that is useful to further conservation decision making.

Table 4: Condition classes and thresholds for the ecological community

Patch size thresholds ➔ / Biotic thresholds ➓	**Large patch** Patch size ≥ 2 ha	**Small contiguous[7] patch** Patch size ≥ 0.5 ha within a larger area of native vegetation ≥ 5 ha	**Small patch** Patch size ≥ 0.5 ha
High condition ≥ 80% of its total perennial understorey vegetation cover[1] is comprised of native species AND Ground cover richness[2] ≥ 10 native species per sample plot AND ≥ 20 large trees[3] per ha	CLASS A1 Large or contiguous patch in high condition		CLASS B1 Small patch in high condition
Good condition with arboreal mammals ≥ 50% of its total perennial understorey vegetation cover[1] is comprised of native species AND Ground cover richness[2] ≥ 6 native species per sample plot AND At least 10 large trees[3] per ha AND Evidence of 4 or more species of arboreal mammals[4] detected[5] in the patch	CLASS A2 Large or contiguous patch in good condition with arboreal mammals		CLASS B2 Small patch in good condition with arboreal mammals
Good condition ≥ 50% of its total perennial understorey vegetation cover[1] is comprised of native species AND Ground cover richness[2] ≥ 6 native species per sample plot AND At least 10 large trees[3] per ha	CLASS B3 Large or contiguous patch in good condition		CLASS C1 Small patch in good condition
Moderate condition ≥ 30% of its total perennial understorey vegetation cover[1] is comprised of native species AND Ground cover richness ≥ 4 native species per sample plot[2]	CLASS C2 Large or contiguous patch in moderate condition		

[1] Perennial understorey vegetation cover includes vascular plant species of all layers below the canopy with a life-cycle of more than two growing seasons. It includes herbs (graminoids and forbs), grasses, shrubs and juvenile plants of canopy species, but does not include annual plants, cryptogams, plant litter or exposed soil.

[2] Ground cover richness includes combined species richness of native grasses, forbs, ferns and sedges per 0.04 ha (20 x 20 m sample plot).

[3] Large eucalypt trees are greater than 45 cm [diameter at breast height (dbh)]. This is used as a surrogate for tree hollows and habitat values.

[4] Excluding micro-bats (Microchiroptera).

[5] Survey guidelines (DSEWPC 2011).

[7] Contiguous means the patch is connected to, or in close proximity to (i.e. within 30 m of), another area of native vegetation (i.e. an area where the total perennial vegetation cover is dominated (50 percent or more) by native plant species).

5.2.2 Areas critical to the survival

The habitat or areas most critical to the survival of the ecological community are those patches that are in the best condition (i.e. Classes A and B in Table 4). These represent those parts of the ecological community closest to the benchmark state of the ecological community; they are the patches that retain the highest diversity and most intact structure and ecological function, and have the highest chance of persisting in the long-term.

However, this does not mean that areas that otherwise meet the minimum condition thresholds (i.e. classes C1 and C2 in Table 4) are unimportant for the survival of the ecological community. Many of these patches occur in locations or landscape positions that are particularly important for biodiversity or function and/or may contain suites of species or habitat features that are important in a regional or local context. Hence these areas can still be critical to the survival of the ecological community.

5.2.3 Areas of high value – surrounding environment and landscape context

The surrounding vegetation and other landscape considerations will influence how important a patch is to the ecological community as a whole. Patches that are larger and less disturbed are likely to provide greater biodiversity value. Patches that are spatially linked, whether ecologically or by proximity, are particularly important as wildlife habitat and to the viability of those patches of the ecological community into the future. However, this still does not necessarily consider the full landscape context. For natural resource management activities or actions that may have 'significant impacts' and require approval under the EPBC Act, it is important to consider the whole environment surrounding patches of the ecological community.

For example, in heavily cleared areas, some patches that meet the minimum condition thresholds occur in isolation. Such patches require protection and could benefit from revegetation activities to link them with other patches. In other areas, patches that are interconnected to other native vegetation may not, in their current state, meet the minimum condition thresholds, but still have high conservation value. Such patches could benefit from restoration works to improve their condition so that they do meet the minimum condition thresholds.

The ecological community often occurs in association with other native vegetation types. Patches of the ecological community that remain connected with other native vegetation have a better chance of future survival and restoration success, because connected patches are buffered from disturbance by the surrounding native vegetation.

The following indicators of high-value should be considered when assessing the impacts of proposed actions under the EPBC Act, or when determining priorities for protection, recovery, management and funding.

- Patches that meet, or are closest to the Class A condition class for this ecological community.
- Larger patches and/or patches with a large area to boundary ratio. Patches with larger area to boundary ratios are less exposed and more resilient to edge effect disturbances such as weed invasion and storm damage.
- Patches within or near to a larger native vegetation remnant and that contribute to a mosaic of vegetation types present at a site. Areas of mosaic native vegetation provide a wider range of habitats that benefit flora and fauna diversity. Other patches are important as linkages among remnants and for fauna to access water bodies, acting as 'stepping stones' of native remnants in the landscape. Connectivity includes actual or potential connectivity to restoration works (e.g. native plantings).
- Patches that occur in areas where the ecological community has been most heavily cleared and degraded, or that are at the natural edge of its range, particularly where there is genetic distinction, or absence of some threats. These may include unique

variants of the ecological community, e.g. with a unique flora and/or fauna composition, or a patch that contains flora or fauna that have largely declined across the broader ecological community or region.

- Patches that show evidence of recruitment of key native plant species or the presence of a range of age cohorts (including through successful assisted regeneration or management of sites) – for example, tree canopy species are present in a range of sizes from saplings to large hollow-bearing trees.
- Patches with good faunal habitat as indicated by diversity of landscape, diversity of plant species and vegetation structure, diversity of age class, presence of movement corridors, mature trees (particularly those with hollows), logs, watercourses, etc.
- Patches containing nationally or state-listed threatened species, or key functional species such as key pollinator and dispersal animals.
- Patches with high species richness, as shown by the variety of native plant species, or high number of native fauna species (vertebrates and/or invertebrates).
- Patches with relatively low levels of weeds and feral animals.

5.3 Principles and standards for conservation

To undertake priority actions to meet the conservation objective, the overarching principle is that it is preferable to maintain existing areas of the ecological community that are relatively intact and of high quality, rather than trying to restore or replace areas that have been lost or degraded. There are good, practical reasons to do so. It is typically more cost-effective to retain an intact remnant than to allow degradation and then attempt to restore it or to restore another area. The more disturbed and modified a patch of the ecological community, the greater the recovery effort that is required. Also, intact remnants are likely to retain a fuller suite of native plant and animal species, and ecological functions. Certain species may not be easy to recover in practice, if lost from a site.

This principle is highlighted in the *National Standards for the Practice of Ecological Restoration in Australia* (Standards Reference Group SERA 2016):

> *"**Ecological restoration is not a substitute for sustainably managing and protecting ecosystems in the first instance.***
>
> *The promise of restoration cannot be invoked as a justification for destroying or damaging existing ecosystems because functional natural ecosystems are not transportable or easily rebuilt once damaged and the success of ecological restoration cannot be assured. Many projects that aspire to restoration fall short of reinstating reference ecosystem attributes for a range of reasons including scale and degree of damage and technical, ecological and resource limitations."*
>
> *Standards Reference Group SERA (2016) – Appendix 2.*

The principle discourages 'offsets' where intact remnants are removed with an undertaking to set aside and/or restore other, lesser quality, sites. The destruction of intact sites represents a net loss of the functional ecological community because there is no guarantee all the species and ecological functions of the intact site can be replicated elsewhere.

Where restoration is to be undertaken, it should be planned and implemented with reference to the *National Standards for the Practice of Ecological Restoration in Australia*. These Standards guide how ecological restoration actions should be undertaken and are available online from the Standards Reference Group [SERA] (2016). They outline the principles that convey the main ecological, biological, technical, social and ethical underpinnings of ecological restoration practice.

As restoration ecology is continually developing, it is important to reflect on the experience of others who have worked on restoring the ecological community, or other eucalypt or floodplain ecological communities, as well as adapting restoration projects as site-level

experience accumulates. The knowledge and practices of Traditional Owners/Custodians should also be acknowledged and considered.

To achieve cost-effective investments in conservation management it is important to consider the likely interaction of the various management actions being undertaken at any one site, as these may be synergistic or antagonistic. There are also likely to be interactions between sites. Additionally, when allocating management resources it is important to consider what is the minimum investment required for success and the follow-up required to secure long-term recovery (for example, for how many years should weed management be repeated).

5.4 Priority conservation and research actions

Priority actions are recommended to abate threats and to support the recovery of the ecological community. They are designed to provide guidance for:

- planning, management and restoration of the ecological community by governments, landholders, NRM and community groups, Traditional Owners/Custodians and other land managers;
- conditions of approval for relevant controlled actions under the EPBC Act; and
- prioritising activities in applications for Australian Government funding programs.

Detailed advice on actions may be available in specific plans, such as management plans for weeds, fire, or for certain parks or regions. The most relevant are listed in Section 4.3.

This conservation advice identifies priority conservation actions under the following key approaches.

- PROTECT the ecological community to prevent further losses.
- RESTORE the ecological community by active abatement of threats, appropriate management, restoration and other conservation initiatives.
- COMMUNICATE, ENGAGE WITH AND SUPPORT people to increase understanding of the value and function of the ecological community and encourage their efforts in its protection and recovery.
- RESEARCH AND MONITORING to improve our understanding of the ecological community and the best methods to aid its management and recovery.

These approaches overlap in practice; and form part of an iterative approach to management that includes research, planning, management, monitoring and review.

The actions below do not necessarily encompass all actions in detail that may benefit the ecological community. They highlight general but key actions required to at least maintain survival of the ecological community at the time of preparing this Conservation Advice.

5.4.1 PROTECT the ecological community

This key approach includes priorities intended to protect the ecological community by preventing further losses in extent and integrity.

- Protecting the ecological community should be properly taken into account during the early stages of zoning and development planning decisions, including strategic planning documents at state, regional and local levels.
- Liaise with local councils and State authorities to ensure that detrimental cumulative impacts on the ecological community are reduced as part of broader strategic planning or large projects (e.g. road works, developments).

5.4.1.1 CONSERVE REMAINING PATCHES

There should be no further clearance and damage to this ecological community because it has been greatly reduced in its extent.

- Protect and conserve remaining areas of the ecological community.
- Avoid further clearance and destruction of the ecological community.
- Retain other native vegetation near patches of the ecological community, where they are important for connectivity, diversity of habitat, and/or act as buffer zones between the ecological community and threats or development zones.
- Protect patches identified as wildlife refuges, or of regional importance in formal conservation reserves. Consider other patches for less formal conservation tenures, preferably ones that aim for protection over the long-term. This includes investigating formal conservation arrangements, management agreements and covenants to protect patches on private land. This is particularly important for larger patches, or areas that link to other patches of native vegetation, or that are part of wildlife corridors or migration routes.
- Where regeneration occurs, provide measures that will support the regeneration to maturity (e.g. provide fencing to minimise grazing/trampling damage risk).
- Protect mature and over-mature trees and stags, particularly with hollows. Large and old trees may have numerous fissures that provide shelter and support diverse insects and their predators.

5.4.1.2 MANAGE ACTIONS TO MINIMISE DETRIMENTAL IMPACTS

Apply the mitigation hierarchy to avoid, then mitigate, then offset potential negative impacts on the ecological community from development, or other actions. The priority is to avoid further clearance and fragmentation of patches, with offsetting as the last resort.

- Plan projects to avoid the need to offset, by avoiding significant impacts to the ecological community.
- In circumstances where detrimental impacts cannot be totally avoided, then they should be minimised by:
    - retaining and avoiding damage to high quality patches, which should be managed to retain their benchmark state; and
    - protecting important habitat features, such as large mature trees or stags with hollows as these take many decades to develop and cannot be quickly replaced.
- Where impacts are unavoidable, offsets should be used as a last resort to compensate for the adverse impacts of the action deemed unavoidable. The outcomes of offsetting activities are generally highly uncertain. Any proposals considering offsets for this ecological community should aim to:
    - minimise the need to offset the ecological community by designing development around the ecological community and applying buffers;
    - retain moderate, good and high quality patches (Classes A, B and C) of the ecological community (especially patches including mature trees), rather than offset them (particularly with lower quality offset sites);
    - manage threats and protect offset areas in perpetuity in areas dedicated for conservation purposes — avoid risks that may reduce their size, condition and ecological function in the future;
    - select offset sites as close as possible to the impact site, to allow for local and regional variation in the ecological community;

- increase the area and improve the ecological function of existing patches, for example by enhancing landscape connectivity, habitat diversity and condition;
- focus on restoring lower quality patches of the ecological community, to achieve high quality condition (see Table 4);
- extend protection to otherwise unprotected sites (e.g. sites that are currently too small or degraded to meet the minimum condition thresholds, but can reasonably be expanded and/or restored to a better, more intact condition that does meet the thresholds); and
- monitor offset areas and the outcomes they deliver over the long-term, to manage them adaptively and improve understanding of the best ways to manage offsets to delivery biodiversity benefits.

- Minimise the risk of indirect detrimental impacts to the ecological community from actions outside but near to patches of the ecological community, including by avoiding disruption to hydrological processes in surrounding and upstream areas.
- Avoid activities that could significantly alter the fire regime of patches of the ecological community. Ensure that fire management activities (including creation of any new fire access tracks) do not have detrimental impacts on fire-sensitive species, or on the integrity of the ecological community. For further information on fire management see Section 5.4.2.3.

5.4.1.3 APPLY BUFFER ZONES

- Protect and apply appropriate buffers, particularly areas of other native vegetation, around patches of the ecological community to minimise adverse off-site impacts. A buffer zone is a contiguous area adjacent to a patch that is important for protecting the integrity of the ecological community. As the risk of indirect damage to an ecological community is usually greater where actions occur close to a patch, the purpose of the buffer zone is to reduce this risk (e.g. by making land managers, or others undertaking activities, aware that the ecological community is nearby and to take extra care, or avoid the buffer zone). For instance, the buffer zone will help protect the root zone of edge trees and other components of the ecological community from spray drift (fertiliser, pesticide or herbicide sprayed in adjacent land), weed invasion, polluted water runoff and other damage. The best buffer zones are typically areas of other native vegetation. Fire breaks and other asset protection zones do not typically provide a suitable buffer and should be additional to a vegetated buffer.
- A buffer zone of at least 50–60 m (beyond the canopy of the outermost trees in the patch) helps protect the patch from many potential adverse impacts (Smith & Smith 2010). A buffer zone must encompass an area large enough to protect the root zone of the outermost trees and other components of the ecological community from fertiliser, pesticide or herbicide applied or sprayed in adjacent land (e.g. spray drift), weed invasion, water runoff, soil erosion and most other damage and edge effects. A larger buffer zone (e.g. 100 m) should be applied, where practical, to protect patches that are of high conservation value. Judgement should be exercised to determine an appropriate buffer distance, depending on circumstances and how a patch may be detrimentally impacted.

5.4.1.4 PREVENT THE INTRODUCTION AND SPREAD OF EXOTIC SPECIES

- Support strong border biosecurity and avoid importing or accidentally introducing invasive species and pathogens that may have a serious adverse impact on this ecological community.

- Prevent planting of known or potentially invasive flora species in gardens, developments and landscaping near the ecological community, particularly known transformer weeds or bird-dispersed species.
- Avoid the sale of known invasive species in areas where the ecological community occurs.
- When conducting activities in or around the ecological community, practice good biosecurity hygiene to avoid spreading weeds or pathogens (see DoE (2015c)).
- Minimise unnecessary soil disturbance that may facilitate weed establishment.
- Prevent dumping of garden waste into bushland, especially in or near patches of the ecological community.
- If new incursions do occur, detect and control them early, as small infestations are more likely to be eradicated.
- Limit or prevent access by grazing animals to patches of the ecological community (e.g. construct fences) where practicable.
- Prevent further introduction of feral animals and, where possible, contain pets in nearby residential areas.

5.4.2 RESTORE and MANAGE the ecological community

This key approach includes priorities to restore and maintain the remaining patches of the ecological community by active abatement of threats, appropriate management, restoration and other conservation initiatives.

- Restoration actions should be based on the best available knowledge and scientific research to maximise positive biodiversity outcomes.
- Engage and liaise with landholders, NRM and community groups, Traditional Owners/Custodians and governments to support, undertake and promote programs that ameliorate threats such as grazing and human disturbance.
- Identify and prioritise action to address other specific threats and undertake appropriate on-ground site management strategies where required.

5.4.2.1 MANAGE WEEDS, PESTS AND PATHOGENS

Implement effective integrated control and management techniques for weeds, pests and diseases affecting the ecological community and manage sites to prevent the introduction of new, or the further spread of, invasive species.

- All control programs should be risk-assessed and managed to avoid detrimentally impacting non-target species or having unintended consequences (e.g. do not control pest animals with methods that harm native species, or remove weeds in a way that exposes soil to erosion).
- Identify potential new weed incursions early and manage for local eradication, where possible.
- Prioritise weed control in patches in which weed management is most urgent.
- Target control of key weeds that threaten the ecological community using appropriate methods that avoid detrimental impacts to non-target species.
- Encourage appropriate use of local native plant species in developments in the region through local government and industry initiatives and best practice strategies.
- Ensure that chemicals, or other mechanisms used to manage weeds, pests and pathogens do not have significant adverse off-target impacts on the ecological community.

- Control introduced pest animals through coordinated landscape-scale control programs. For example, work with relevant authorities to suppress feral animal numbers in line with regional pest management strategies.
- Control invasive species using best practice bush regeneration techniques by qualified bush regenerators.

5.4.2.2 MANAGE TRAMPLING, BROWSING AND GRAZING

- The ecological community naturally has a variety of understorey structural and floristic characteristics. In some cases, occasional grazing may be used to reduce exotic grass cover and manage shrub regeneration — encouraging native grass and herb growth. It may be used to help manage some weeds. However, effects must be closely monitored and grazing carefully managed in accordance with recommendations for biodiversity conservation, because grazing is more typically associated with a loss of biodiversity in grassy ecosystems (Dorrough et al. 2004).
- Ensure that the timing of grazing enables the regeneration of native plant species. Allow moderate to high intensity grazing for a short period of time (usually in early spring) and wherever possible avoid grazing during peak native plant flowering and seeding times for many species (late spring and summer).
- Promote native pastures as grazing best management practice.
- Integrate appropriate grazing management regimes with fire management requirements.
- Construct wildlife friendly fences to exclude overgrazing and that incorporate a buffer to protect patches and allow for recruitment and enhanced connectivity.
- Consult with landholders about off-creek watering for stock, such as having dams upstream of creeks and of the ecological community.

5.4.2.3 MANAGE FIRE

- Implement appropriate fire management regimes for the ecological community and for the landscapes surrounding the ecological community. Take into account Indigenous knowledge and scientific research results.
- Where hazard reduction burns or prescribed fires are undertaken in areas near to the ecological community, ensure that the potential for the fire to escape is appropriately risk assessed and management responses are in place to protect the ecological community.
- Use a landscape-scale approach and available local knowledge on fire histories to identify sites that would benefit from reinstating appropriate fire frequency to prevent further declines of patches affected by either too low, or too high, fire frequency.
    - For areas of the ecological community affected by too low fire frequency, identify opportunities for applying appropriate ecological burns, including with traditional knowledge and practices.
    - For areas of the ecological community affected by too high fire frequency, identify options for reducing the frequency of fires and protecting important features, such as habitat trees.
    - Fire management strategies at each location should take into account patch size, habitat features (e.g. protect hollow-bearing trees and large logs), vegetation structure and the surrounding landscape (including property

protection) to minimise damage, maintain refuges for fauna (during and after fire) and increase habitat variability.

- Fires (including planned burns) must be managed to: maintain the integrity of the ecological community and avoid disruption of the life cycles of the component species; support rather than degrade the habitat; avoid invasion of exotic species; and avoid increased detrimental impacts of other threats such as drought, grazing or predation by feral predators. Isolated faunal populations and threatened plants are particularly vulnerable to local extinction following intense fires combined with other threats.
    - Ensure that an invasive species risk assessment and management program is planned and budgeted for ahead of proposed burning.
    - Use available ecological information to avoid detrimental fire impacts on key and susceptible species in the ecological community. For instance, do not burn areas in or adjacent to the ecological community when key, threatened or functionally important flora and fauna (that may be adversely impacted) are flowering, nesting or otherwise reproducing.
    - Consider weather conditions. Do not burn in, or adjacent to, the ecological community when soil moisture is low, or dry conditions are predicted for the coming season because flora and fauna will already be stressed, recovery will be too slow and erosion may occur; or, weeds may become established while vegetation cover is reduced.
- Monitor the outcomes of fire and the consequences of other threats. Manage these within an appropriate timescale (e.g. immediately: put in place erosion control measures; limit access by feral predators and grazers; control weeds as they first appear with follow up treatments as necessary, until native vegetation has regenerated). Ensure monitoring results are taken into account when planning and implementing future fire regimes. For further information on monitoring priorities see Section 5.4.4.
    - Widespread and severe fire events, such as the 2019/20 bushfires, require specific actions for post-fire recovery. Appendix F – Management actions to mitigate the impacts of the 2019-2020 bushfires outlines the post-fire priority actions recommended for this ecological community.

5.4.2.4 UNDERTAKE RESTORATION

- Undertake restoration work. This includes revegetating (and encouraging bush regeneration in) poorer and moderate and good quality patches, to restore them to high quality (including restoring patches that don't currently meet the minimum condition thresholds for protection to a condition that does) — see Table 4. Restoration work to reconnect isolated patches to other areas of native vegetation is also valuable.
    - Support natural regeneration before planning and implementing replanting programs (e.g. using fenced areas, weed and pest control, and fire). Replant areas where natural regeneration has not been successful.
    - Maintain stags/snags[16], logs, and mature and old-growth trees with hollows as they provide important habitat for fauna.
    - Use local native species in restoration/revegetation projects for the ecological community and restore understorey vegetation to a structure and diversity appropriate to the site.

[16] A standing, dead or dying tree, often missing a top, or most of the smaller branches.

- In general, use locally collected seeds, where available, to revegetate native plant species. However, choosing sources of seed closer to the margins of the species' range may increase resilience to climate change.
- Seed collections should follow appropriate national guidelines and protocols with long-term storage of germplasm in an appropriate State facility.
- Ensure commitment to follow up after planting, such as the care of newly planted vegetation by watering, mulching, weeding and use/removal of tree guards.
- Consider the landscape context and other relevant species and ecological communities when planning restoration works. For example, ensure adjacent ecological communities and threatened and migratory species are not adversely impacted by tree planting or other restoration activities for the ecological community.

- Implement effective adaptive management regimes using information from available research and management guidelines, for example, see the *National Standards for the Practice of Ecological Restoration in Australia* (SERA 2016), relevant research or advice from local authorities.

5.4.3 COMMUNICATE, engage with and support

This key approach includes priorities to promote the ecological community, and to build awareness and encourage people and groups to contribute to its recovery. This includes communicating, engaging with and supporting the public and key stakeholders to increase their understanding of the value and function of the ecological community and to encourage and assist their efforts in its protection and recovery. Key groups include landholders, land managers, land use planners, NRM and community groups, commonwealth, state and local government, researchers, community members and Indigenous communities.

5.4.3.1 RAISE AWARENESS

- Educate people and groups about the fauna and ecological values of, and threats to, the ecological community (such as altered hydrology, human disturbance and weeds). This may be done through the distribution of relevant publications, erecting interpretive signs at strategic locations, school programs and establishing a demonstration site for the ecological community.
- Encourage landholders to protect patches through long-term private land conservation mechanisms.
- Communicate with landholders/managers, relevant agencies and the public to emphasise: the value of the ecological community; its significance and key threats; appropriate threat management; and the importance of its protection and restoration.
- Encourage landholders to talk with local NRM organisations and other knowledgeable groups, to promote awareness of the ecological community, and to promote cooperation to protect and restore its occurrences.
- Undertake effective community engagement and education to highlight the importance of minimising disturbance (e.g. during recreational activities) and of minimising pollution and littering (e.g. via signage).
- Inform landholders about incentives, such as conservation agreements, stewardship projects, funding and NRM programs, which may be available to help protect and restore patches of the ecological community on private land.

5.4.3.2 GATHER AND PROVIDE INFORMATION

- Develop education programs, information products and signage to help the public recognise the presence and importance of the ecological community, and their responsibilities under state and local regulations and under the EPBC Act.
- Improve understanding of traditional ecological knowledge about the ecological community. Identify and support culturally appropriate mechanisms to share this knowledge to protect and restore the ecological community.
- Install signage to discourage damaging activities such as the removal of dead timber, dumping garden waste and other rubbish, creating informal paths and tracks, and using off-road vehicles in patches of the ecological community.
- Install significant vegetation markers along roads to designate areas of the ecological community, to protect and prevent inappropriate road side maintenance.
- Promote knowledge about local weeds and what garden plants to avoid planting. Recommend local native species for revegetation and landscaping, or safe alternative garden plants. Discourage nurseries and DIY stores from selling weed species.

5.4.3.3 COORDINATE EFFORTS

- Support opportunities for Traditional Owners/Custodians and other members of the Indigenous community to manage the ecological community, including cultural burning, in ways which will benefit areas of the ecological community.
- Encourage local participation in restoration and 'landcare' efforts, e.g. through local conservation groups, creating 'friends of' groups, field days and planting projects.
- Liaise with local fire management authorities and agencies and engage their support in sympathetic fire management of the ecological community. Request these agencies to use suitable maps and install field markers to avoid damage to sensitive areas of the ecological community. Ensure land managers are given information about how to manage fire risks to conserve any threatened species and ecological communities.
- Promote awareness and protection of the ecological community with relevant agencies and industries. For example with:
    - state and local government planning authorities, to ensure that planning takes the protection of remnants into account, with due regard to principles for long-term conservation;
    - land owners and developers, to minimise threats associated with land conversion and development;
    - local councils and state authorities, to ensure infrastructure or development works, involving substrate or vegetation disturbance, do not adversely impact the ecological community. This includes avoiding the introduction or spread of weeds; and
    - regional authorities, NRM organisations and local councils, to collaborate on threat management and planning with neighbouring authorities.

5.4.4 RESEARCH AND MONITORING

This key approach includes priorities for research into the ecological community, and monitoring, to improve understanding of the ecological community and the best methods to aid its recovery through restoration and protection. Relevant and well-targeted research and other information gathering activities are important to inform the protection and management of the ecological community.

5.4.4.1 *MAPPING*

- Collate existing vegetation mapping information and associated data for this ecological community and identify gaps in knowledge.
- Identify and map the fire interval status of the ecological community and surrounding fire-dependent and/or fire sensitive vegetation.
- Undertake, support and enhance survey programs.
    - Improve mapping of sites where the ecological community is known or likely to be present.
    - Conduct targeted field surveys and ground-truth to fill data gaps and clarify the presence and condition of patches of the ecological community.
    - Identify where the best, high quality remnants of the ecological community occur.

5.4.4.2 *OPTIONS FOR MANAGEMENT*

- Research into appropriate and integrated methods to manage pests and weeds that affect the ecological community.
- Research into potential impacts of climate change on the distribution of the ecological community.
- Research into the impacts of hydrological change (quantity, quality, seasonality and channel movement) on the extent and condition of the ecological community
- Research into the role of fire in this ecological community, including understanding the ecological consequences of fire-exclusion and the role of low intensity fires in maintaining an open vegetation structure and in the ongoing recruitment of open-forest species.
- Investigate key ecological interactions, such as the role of fauna in pollination, seed dispersal and nutrient cycling.
- Assess the vulnerability of the ecological community to climate change and investigate ways to improve resilience through other threat abatement and management actions.
- Conduct research leading to the development of effective landscape-scale restoration techniques for the ecological community. Investigate the interaction between disturbance types, such as fire and invasion by weeds and feral animals, to determine how an integrated approach to threat management can be implemented.
- Investigate the most cost-effective options for restoring landscape function, including re-vegetation or assisted regeneration of priority areas, buffering, connecting and protecting existing remnants.

5.4.4.3 *MONITORING*

It is important that any monitoring is planned before management actions commence and that planning considers what data are required to address research questions. Monitoring must also be resourced for management activities, especially for those using a novel approach, and applied during and following the management action.

- Monitor for incursions by new weeds and pest animals.
- Monitor for signs of decline, in terms of known problems e.g. dieback due to pathogens and pests, and new incursions (e.g. myrtle rust).

- Monitor changes in the condition, composition, structure and function of the ecological community, including its responses to all types of management actions and use this information to increase understanding of the ecological community and inform recommendations for future management.

6 LISTING ASSESSMENT AND RECOVERY PLAN RECOMMENDATION

6.1 Eligibility for listing against the EPBC Act criteria

On the basis of available information, it is recommended that the River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria is eligible for listing as **Critically Endangered**. This was the highest conservation category met at the time of assessment.

This assessment uses the criteria set out in Part 7 of the EPBC Regulations 2000 (Commonwealth of Australia 2018), and the indicative thresholds set out in the DEE & TSSC (2017) guidelines.

6.1.1 Criterion 1 – decline in geographic distribution

Eligible under Criterion 1 for listing as Endangered

Criterion 1 Thresholds	**Category**		
	Critically Endangered	**Endangered**	**Vulnerable**
Its decline in geographic distribution is:	very severe	**severe**	substantial
• ***decline relative to the longer-term/1750 timeframe***	*≥90%*	***≥70%***	*≥50%*
• *decline relative to the past 50 years*	*≥80%*	*≥50%*	*≥30%*

Source: DEE & TSSC (2017).

Evidence:

Coastal floodplains were severely cleared and modified primarily for timber and agricultural development soon after European occupation. Large areas are now occupied by exotic pastures grazed by cattle, or given over to market gardens and other cropping enterprises. At least 70 percent of native vegetation on the coastal floodplains of New South Wales has been destroyed since European settlement (Keith 2004; Good et al. 2017).

Along with lowland rainforests and Swamp Oak floodplain forest, the ecological community appears to have been more heavily depleted than other floodplain vegetation assemblages (Keith & Scott 2005). In general, land clearing is greater on the lower and middle reaches of floodplains, than on the upper floodplains and margins.

An estimated 10,600 ha of the ecological community remains in New South Wales, based on state government mapping of Plant Community Types (PCTs) (NSW DPIE in prep) associated with the ecological community (see Table 10 for matched New South Wales (NSW PCTs). In the Lower Hunter and Central Coast region, less than 25 to 40 percent of the ecological community remained in 1992 (NSW NPWS 2000). NSW OEH (2013) estimates suggest that less than seven percent of the Cumberland River-flat Forest (a part of the ecological community) remains on the Cumberland Plain. Further south in the Eden region, 30 percent was estimated to remain in the mid-1990s (NSW Scientific Committee (2011)). Based on these figures, it is likely that there has been an overall decline of 70 to 90 percent in the ecological community in New South Wales over the longer-term.

In Victoria, around 9,900 ha remains, based on Victorian Ecological Vegetation Classes (Vic EVCs). The areas of the Vic EVCs that are likely to correspond to the ecological community (i.e. areas on Quaternary alluvium, up to 250 m ASL, within the appropriate IBRA Subregions) have been cleared by an estimated 54 percent since European settlement (Table 5).

Table 5: Pre 1750 and current area estimates for the ecological community in Victoria, based on matched Victorian Ecological Vegetation Classes (Vic EVCs).

EVC*	Name	Pre-1750 area (ha)	Current area (ha)	% lost
4	Coastal Vine-rich Forest	1	1	0%
15	Limestone Box Forest	1,235	990	20%
18	Riparian Forest	16,442	6,735	59%
30	Wet forest	143	142	1%
47	Valley Grassy Forest	1,044	544	48%
151	Plains Grassy Forest	959	310	68%
169	Dry Valley Forest	1,943	1203	38%
TOTAL		21,767	9,924	54%
*Those parts of the relevant Victorian East Gippsland Uplands and East Gippsland Lowlands Victorian bioregion Vic EVCs that occur on Quaternary alluvium up to 250 m ASL				

Source: Vic DELWP (2018a); Vic DELWP (2018b); Vic DSDBI (2014).

When the estimates for loss of the ecological community in New South Wales and Victoria are combined, they represent an estimated loss of 65–85 percent. Given this loss figure is likely to be higher due to degradation and further subsequent losses, it is reasonable to conclude that overall there has been at least a 70 percent decline in the pre-1750 extent of the ecological community.

This represents a **severe** decline in geographic distribution. The Committee therefore considers that the ecological community has met the relevant elements of Criterion 1 to make it eligible for listing as **Endangered**.

This decline in geographic distribution since 1750 also represents an **Endangered** status under Criterion A3 of the IUCN Red List of Ecosystems (in Bland et al. 2016).

6.1.2 Criterion 2 – limited geographic distribution coupled with demonstrable threat

Eligible under Criterion 2 for listing as **Endangered.**

Criterion 2 Thresholds	Category		
	Critically Endangered	**Endangered**	**Vulnerable**
Its geographic distribution is:	**very restricted**	restricted	limited
• *Extent of Occurrence (EoO)*	*<100 km²*	*< 1,000 km²*	*< 10,000 km²*
• *Area of Occupancy (AoO)*	*<10 km²*	*< 100 km²*	*< 1,000 km²*
• ***Average patch size***	***<0.1 km² (<10 ha)***	*< 1 km² (<100 ha)*	–
AND the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in:	the immediate future	**the near future**	medium term future
• *timeframe*	*10 years or 3 generations*	***20 years or 5 generations***	*50 years or 10 generations*

Source: DEE & TSSC (2017).

Evidence:

The estimated total area of occupancy is 20,600 ha (206 km²), which is indicative of a limited distribution, and the median patch size is 0.8 ha, (Table 6), which is indicative of a **very restricted** distribution.

Table 6: Number of patches of the ecological community by patch size class, in relation to the thresholds

Criterion 2 Thresholds			Number of patches	% of patches	Cumulative % of patches	
Category		Size range (ha)				
Restricted	**Very Restricted**	0.1–0.5	1,381	37.8%	**90%**	99%
		> 0.5–1	562	15.4%		
		> 1–10	1,033	28.3%		
		> 10–100	306	8.4%		
		> 100	32	0.9%		
		Total	**3,651**	**100%**		

Source: Vic DSDBI (2014); Troedson & Deyssing (2015); DEE & TSSC (2017); Vic DELWP (2018a) NSW DPIE (in prep).

The ecological community is highly fragmented. Ninety percent of patches are smaller than 10 ha (Table 6). There are some larger patches, typically where the riparian areas of a stream network are largely intact and/or within reserves. The ecological community's highly fragmented distribution makes it very susceptible to edge effects and to the actions of various threats, including weeds, clearing, flood mitigation and drainage works, land-filling and earthworks associated with urban and industrial development, and to the cumulative losses of patches.

Most of the remaining patches of the ecological community occur on productive agricultural land, or in close proximity to coastal areas, where continuing population growth and urban development is expected. Coastal floodplain ecological communities are noted as amongst the most threatened in south eastern Australia (Specht et al. 1974; Benson 1991; Keith 2004; in Keith & Scott 2005). Land clearing is an ongoing threat to the ecological community, with coastal development continuing across much of its range. Rural enterprises and hobby farms have expanded into the upper reaches of floodplains. Major cities, rural centres and coastal hamlets have expanded inland, with the construction of new housing estates, industrial development and recreational facilities displacing alluvial forests. Invasion by non-native plants is also a major threat to this ecological community (Keith & Scott 2005; Tozer et al. 2010). The collective action of these threatening processes have the potential to cause the loss of the ecological community in the **near future** (20–100 years).

This represents a **very restricted** geographic distribution, and the nature of this distribution makes it likely that the action of a threatening process could cause it to be lost in the near future. The Committee therefore considers that the ecological community has met the relevant elements of Criterion 2 to make it eligible for listing as **Endangered**.

6.1.3 Criterion 3 – decline of functionally important species

Insufficient data to determine eligibility under Criterion 3

Criterion 3 Thresholds	Category		
	Critically Endangered	**Endangered**	**Vulnerable**
For a population of a native species that is likely to play a major role in the community, there is a:	very severe decline	severe decline	substantial decline
• *Estimated decline over the last 10 years or three generations, whichever is longer*	*80%*	*50%*	*20%*
to the extent that restoration of the community is not likely to be possible in:	the immediate future	the near future	the medium-term future
• *timeframe*	*10 years or 3 generations*	*20 years or 5 generations*	*50 years or 10 generations*

Source: DEE & TSSC (2017).

Evidence:

The dominant canopy of eucalypts is functionally important across the range of the ecological community and includes a variety of individual species. However, it is not the decline of eucalypts that is driving the decline of the ecological community. With the exception of *Eucalyptus benthamii*, none of the key eucalypt species are currently[17] listed as threatened; although an assessment of 822 Australian eucalypt species, against IUCN Red List criteria, by Fensham et al. (2020) concluded that *E. baueriana, E. longifolia, E. moluccana* and *E. ovata* qualified as threatened (in the Vulnerable category).

Faunal components of the ecological community, such as digging and arboreal mammals, birds and insects are important for nutrient cycling, dispersal of fungi, seed dispersal and/or burial, water infiltration, and pollination. A number of threatened fauna species occur in the ecological community, but only a few are identified as of particular functional significance across its range.

Birds and arboreal mammals such as flying foxes feed on the nectar and pollen of native blossoms, spreading seeds and pollinating native plants. The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable (following an estimated 30% decline in abundance over a decade); it has also suffered more recent large declines due to heat stress (TSSC 2001; NSW OEH 2019). As a key pollinator of the ecological community (SCEE 2017), this decline may impair the regeneration of key vegetation species in the ecological community. Even where vegetation is regenerating, regrowth trees lack the hollows found in older trees limiting faunal habitat, ecological complexity and functionality.

Other species are likely to be locally important to the functioning and health of the ecological community in different areas, but are not necessarily important across the full range of the ecological community. This is because different species fulfil these ecological functions in different areas. For example, bandicoot foraging performs an important role in maintaining the health of the ecological community. They dig in the leaf litter and soil to find insects, fungi, plant root nodules and bulbs (mixing and aerating the soil and litter, and recycling nutrients). They also eat fruit, seeds and other plant material on the ground (acting as a dispersal agent and further recycling nutrients). The Long-nosed Bandicoot (*Perameles nasuta*) is most commonly found in coastal Sydney, whereas the Endangered Southern Brown bandicoot (*Isoodon obesulus obesulus*) is limited to the south coast of New South Wales (NSW OEH 2017c).

[17] At the time of this advice.

Overall, there has been significant loss of area and loss of various components of the ecological community. However, data to support an analysis against this criterion (and its indicative thresholds), for decline in a particular functionally important species is not available.

The Committee considers that there is **insufficient information** to determine the eligibility of the ecological community for listing in any category under Criterion 3 at this time.

6.1.4 Criterion 4 – reduction in community integrity

Eligible under Criterion 4 for listing as **Critically Endangered**

Criterion 4 Thresholds	**Category**		
	Critically Endangered	**Endangered**	**Vulnerable**
The reduction in its integrity across most of its geographic distribution is:	**very severe**	severe	substantial
as indicated by degradation of the community or its habitat, or disruption of important community processes, that is:	**very severe**	severe	substantial
• ***such that restoration is unlikely (even with positive human intervention) within***	*the **immediate future** (10 years or 3 generations)*	*the near future (20 years or 5 generations)*	*the medium-term future (50 years or 10 generations)*

Source: DEE & TSSC (2017).

Evidence:

Factors contributing to a reduction in the integrity of the ecological community include increased fragmentation and isolation, weed invasion, invasive fauna, changes to floodplain hydrology and inappropriate management regimes (e.g. grazing and fire). Other threats, such as potential adverse impacts from climate change are likely to exacerbate these threats and further contribute to loss of integrity over time. For the full list of threats impacting this ecological community see Section 3.

Reduction in integrity through increased fragmentation

The ecological community likely exhibited a degree of natural fragmentation pre-1750, due to its position in a mosaic of floodplain ecological communities. However, patches have been further fragmented as a consequence of clearing and degradation. The present distribution of the ecological community is very severely fragmented, with an average edge density of 6,243 m/ha and with the majority (over 94 percent) of the ecological community occurring within 100 m of the edge of a patch and hence considered subject to edge effects.

Remnants are often the only vegetation left in a cleared landscape; for example, as small strips along rivers and creeks which were less suitable for development. The large open floodplains that comprised the majority of the original habitat have been largely cleared, with more patches left on localised, sheltered river flats between hills (Keith 2004). In areas now protected (e.g. state forests and national parks) there is evidence of early clearing of pockets of floodplain vegetation prior to protection, leaving native forest and woodlands on the slopes, but mostly cleared on river-flats. This has resulted in generally smaller and narrower patches, with an increased distance between patches and the isolation of some patches in a matrix of modified land use.

On the Cumberland Plain the combination of extensive clearing, plus surrounding intensive urbanisation, suggests a high likelihood that the few remaining patches of the ecological community have been fragmented into numerous smaller, more isolated patches (NSW OEH 2016). The combination of widespread clearing, coupled with intensive modified land use, across the south coast region suggests a similar pattern of fragmentation into smaller, more isolated patches (Tozer et al. 2010).

As patches become more isolated, in modified landscapes, with a higher incidence of introduced plants and feral animals, they are more susceptible to further degradation and are less amenable to successful recovery actions.

One measure of fragmentation is the reduction in 'core area', where 'core area' is defined as the area of forest free of edge effects (Laurance & Yensen 1991). Spatial data on the pre-1750 extent of the ecological community is only available for Victoria (Vic DELWP 2018b). In Victoria, an estimated 9,700 ha or 45 percent of the former extent of the ecological community was represented by 'core area' (more than 100 m from the edge of the forest). In its pre-1750 state, the edges would have adjoined other native vegetation. An edge width of 100 m was chosen for the analysis as a mid-range estimate for demonstrated edge effects in forests (various studies indicate edge effects on different forest species or functions from 10 to 500 m into patches e.g. Ewers & Didham (2007), Berry (2001), Laurence et al. (2002) and Pocock & Lawrence (2005)).

Less than 10 percent of the current Victorian extent of the ecological community occurs as 'core area' with an estimated 90 percent of the remaining ecological community likely being detrimentally impacted by edge effects. The new edges are largely the result of land clearing, and they typically adjoin agricultural or urban areas. Since the amount of clearing is greater in New South Wales than in Victoria, these figures represent a conservative estimate for the ecological community as a whole. This loss of 90 percent of the original core area since 1750 would qualify the ecological community for Critically Endangered status, for environmental degradation, under Criterion C3 of the IUCN Red List of Ecosystems (in Bland et al. 2016).

Reduction in integrity through weed invasion and invasive fauna

Invasive species are a serious threat to the ecological community. The fertile and productive nature of floodplains make them conducive to the invasion and spread of weeds. Once established weeds can change nutrient cycling, species composition, structure, habitat values and fire regimes in the ecological community (Good et al. 2017).

Weeds are frequently cited as a key threat based on observations from vegetation mapping, surveys and studies. The New South Wales Scientific Committee (2011) found that very few examples of the ecological community in New South Wales remain unaffected by weeds, citing 29 principal weed species. Most stands in the Cumberland Plain were found to be 'threatened by a diverse and abundant cover of invasive weeds' (NSW OEH 2016), with Small-leaved Privet (*Ligustrum sinense*), Bridal Creeper (*Asparagus asparagoides*) and Lantana (*Lantana camara*) identified as particularly common and invasive (NSW OEH 2016). In Western Sydney, the ecological community in the Hawkesbury-Nepean has seen a recent invasion by Prickly Pear (*Opuntia spp.*) and Tiger Pear (*O. aurantiaca*) (Ridgeway 2019). Large-scale disturbances, such as the 2019-2020 bushfires, exacerbate the threat from weeds (see Appendix F – Management actions to mitigate the impacts of the 2019-2020 bushfires).

Of the various weeds likely to be present, 'transformer' weeds are a major threat. Transformer weeds are highly invasive taxa with the potential to seriously alter the structure and function of the ecological community, 'transforming' it into a different system. Lantana, Cats-claw Creeper (*Dolichandra unguis-cati*) and Madeira Vine (*Anredera cordifolia*) are among the weed species that fall into this category; as do exotic perennial grasses such as *Dactylis glomerata* (Cocksfoot, Orchardgrass), *Paspalum dilatatum* (Paspalum) and *Cenchrus setaceus* (Fountain Grass). In Victoria, Trad (*Tradescantia fluminensis*), Honeysuckle (*Lonicera japonica*), Cape Ivy (*Delairea odorata*), Ivy (*Hedera helix*), Blue Periwinkle (*Vinca major*) and Arum Lily (*Zantedeschia aethiopica*) are noted as transformer weeds (Peel 2019).

The ecological community is also subject to a range of detrimental impacts from invasive animals. Feral pigs, feral predators, rabbits, unmanaged goats and feral honeybees all occur within the ecological community. Sambar Deer (*Rusa unicolor*) and Hog Deer (*Axis porcinus*) have been recognised as major feral herbivores adversely impacting this ecological community in Victoria (Peel 2019), and likely elsewhere (West 2011; Davis et al. 2016).

Bell Miner associated dieback is spreading through forests on public and private lands throughout the range of the ecological community (Silver & Carnegie 2017).

Reduction in integrity due to declining fauna

Faunal components of the ecological community, such as digging mammals and arboreal mammals, birds and insects are important for nutrient cycling, dispersal of fungi, seed dispersal and/or burial, water infiltration, and pollination. The loss of these animals negatively impacts the functioning of the ecological community and reduces its ability to recover from the adverse impacts of other threats.

Most threatened and near threatened Australian land mammal species are continuing to decline, including many that occur in the ecological community (Woinarski et al. 2015). The Grey-headed Flying-fox, for example, underwent an estimated 30 percent decline in abundance over a decade; and it suffered more recent large declines due to heat stress and fire (TSSC 2001; NSW OEH 2019). As a key pollinator of the ecological community (SCEE 2017), its decline is likely to impair the regeneration of key vegetation species.

Inappropriate fire regimes, grazing by stock and invasive herbivores, invasion by weeds, and hydrological alteration have resulted in the loss of groundcover and understorey structure and flora species. The loss of the native groundcover and understorey negatively impacts ground-dwelling fauna that play key roles in the ecological community. Fallen timber is also important as habitat for ground-dwelling fauna (as well as for carbon turnover) and has been selectively removed for firewood, particularly close to urban centres. All these threats reduce the habitat value and exacerbate the direct loss of fauna from the ecological community.

Insects are functionally critical to the ecological community, in a wide variety of roles. Recent studies have demonstrated a large worldwide decline, with over 40 percent of insect species declining; and a third being endangered globally. This further compromises the ecological community through cascade effects through the food chain. The analysis also indicated that the loss in biomass was in the order of 2.5 percent annually which can detrimentally impact many birds, reptiles, amphibians and fish that feed on insects (Sanchez-Bayo & Wyckhuys 2019).

Reduction in integrity through changes to hydrological regimes

Many of the larger floodplains that provide habitat for the ecological community have undergone major transformation as a result of systematic hydrological engineering for the development of agricultural land, especially in the early 20th century. Construction of drain networks and tidal gates channelised much of the floodplain sheet flow, lowered the water tables, reduced salinity and oxidised surface soils. Where native vegetation, including the ecological community, remains on the floodplain, this hydrological transformation has resulted in major shifts in biogeochemical processes and ecosystem-scale impacts (Capon et al. 2016).

In coastal New South Wales, large areas of coastal floodplain habitat were directly drained by constructing artificial channels and river flows were significantly altered by weirs, levees and dams. By the early 1990s there were co-ordinated drainage systems on the major floodplains, while additional areas that were not directly drained may have been altered hydrologically by changed patterns of flooding and drainage following flood mitigation works (Keith & Scott 2005). The ecological community in Victoria is less impacted by this, with the streams in far East Gippsland recorded as least stressed, retaining natural or near natural flow regimes (Victorian DEPI 2014).

Other water regulation activities and works in coastal areas where the ecological community occurs (e.g. water held in storage for towns and farms, stormwater drains and outfalls, and constructing roads and buildings) result in hydrological changes in the rivers and their floodplains. Almost all coastal rivers in Victoria and New South Wales are affected by reduced flows caused by extraction for livestock and domestic supplies. Water extraction diminishes flows, especially during dry times and reduces the frequency of small- and medium-sized flood events (Pressey & Middleton 1982), which adversely impacts floodplain vegetation.

Constructing road and rail networks throughout the ecological community, particularly raised roadways, can also substantially affect drainage and hydrological connectivity on the floodplains.

The consequences of these changes are: continued loss and degradation of the ecological community through changes to vegetation structure and composition; and, subsequent population declines for the animals dependent on them. There are also shifts in food resources after natural flooding patterns are disrupted. For example, declining food resources are linked to a lower abundance of wetland vegetation and invertebrates, on floodplains that inundate less frequently after their natural flow regimes are disrupted.

Reduction in integrity through altered fire regimes

Fire regimes have been changed throughout the extent of the ecological community, in association with the growth of agriculture and urban development. Fire is used to promote regrowth (green pick) and to maintain higher levels of species richness of native pasture species for livestock grazing; and for hazard reduction management. These practices can increase fire frequency. The amount of fallen timber and other plant litter can be diminished during such burns; this negatively impacts the fauna that use them for shelter and their other habitat values. Arson is also an issue, particularly on urban fringes.

Bushfire frequency, intensity and size are expected to increase because of climate change, as temperatures rise, rainfall variability increases, droughts become more severe and ecosystem dynamics alter — resulting in changed biomass fuel loads and types. The projected hotter, drier, windier conditions associated with climate change will extend the period of fuel drying and increase rates of fire spread (Harrison & Kelley 2017), as was seen during the 2019-20 fire season.

In some areas, more high intensity or frequent fires may slow or prevent the regeneration and recovery of parts of the ecological community and lead to lower species richness. Sustained high frequency fire will lead to a loss of plant species, a reduction in vegetation structure and a corresponding loss of animal species in the ecological community (NSW OEH 2017b). The resulting habitat changes are also likely to detrimentally impact fauna such as bandicoots, gliders and potoroos (Tozer et al. 2010; NSW OEH 2017b). Even in areas where vegetation recovers quickly, the loss of animal species impedes the recovery, long-term health and resilience of the ecological community. Mega fires, such as those experienced in the 2019-20 fire season, can burn a significant proportion of the ecological community (an estimated 50 percent of the ecological community was within the 2019-20 fire extent (DAWE 2020b)), as well as burning the surrounding vegetation in a single event, which compounds these adverse impacts.

Conclusion

Most past damage is largely irreversible given the current trajectory of human activity and population growth, as is the case with clearing and fragmentation impacts, as well as structural changes to natural hydrology. Many of the underlying threats have ongoing detrimental impacts, most evident from invasive flora, fauna, diseases and inappropriate fire regimes. Consequently restoration is unlikely (even with positive human intervention) within any timeframe (i.e. neither the **immediate,** near, nor medium-term **future**).

The combination of all these detrimental impacts represents a **very severe** reduction in integrity across most of its geographic distribution, as indicated by a **very severe** degradation of the ecological community. The Committee therefore considers that the ecological community has met the relevant elements of Criterion 4 to make it eligible for listing as **Critically Endangered**.

6.1.5 Criterion 5 – rate of continuing detrimental change

Insufficient data to determine eligibility under Criterion 5

Criterion 5 Thresholds	Category		
	Critically Endangered	**Endangered**	**Vulnerable**
Its rate of continuing detrimental change is: as indicated by:	very severe	severe	substantial
(a) rate of continuing decline in its geographic distribution, or a population of a native species that is believed to play a major role in the community, that is: OR	very severe	severe	serious
(b) intensification, across most of its geographic distribution, in degradation, or disruption of important community processes, that is:	very severe	severe	serious
• *an observed, estimated, inferred or suspected detrimental change over the immediate past, or projected for the immediate future (10 years or 3 generations), of at least:*	*80%*	*50%*	*30%*

Source: DEE & TSSC (2017).

Evidence:

Rates of loss or degradation are not comprehensively measured for this ecological community, but there has been an intensification in development pressure, from which a rate of detrimental change could be inferred.

In recent decades the primary causes of clearing were urbanisation and coastal development. Data from the Australian Bureau of Statistics show that, at the national scale, since 1991, population growth was fastest near the coast. This trend was even stronger for 2011–2014, indicating that coastal population growth is accelerating (Clark & Johnston 2016). As a consequence of this growth in population, housing, jobs, agribusiness and related infrastructure such as roads and airports are expected to increase substantially over the next 20 years. With increasing coastal population comes increased pressures on the environment.

The New South Wales south coast is expecting a substantial population increase over the next 25 years. For example, the Illawarra-Shoalhaven region is anticipating needing an additional 35,400 new homes by 2036 to meet the demands of population growth and demographic change (NSW DPE 2015). An additional 60,000 people (representing a population increase of nearly 40 percent) are expected to move to the coastal centres of Batemans Bay, Bega, Ulladulla, Moruya, Narooma, Merimbula and Vincentia (NSW DECCW 2010b). These increases are likely to cause considerable adverse impacts to the ecological community, as remaining areas are cleared for houses and infrastructure, or subject to additional degradation from recreational activity. Because much of the remaining ecological community occurs on land under private tenure, the ecological community is likely to be subject to further attrition and fragmentation.

Although there has been, and continues to be, detrimental change to the ecological community as a result of continuing urbanisation and coastal development, data are insufficient to determine rates of loss in the recent past, or to predict them for the immediate future, across the range of the ecological community.

The Committee considers that there is **insufficient information** to determine the eligibility of the ecological community for listing in any category under Criterion 5.

6.1.6 Criterion 6 – quantitative analysis showing probability of extinction

Insufficient data to determine eligibility under Criterion 6

Criterion 6 Thresholds	Category		
	Critically Endangered	**Endangered**	**Vulnerable**
A quantitative analysis shows that its probability of extinction, or extreme degradation over all of its geographic distribution, is:	at least 50% in the immediate future	at least 20% in the near future	at least 10% in the medium-term future
• *timeframes*	*10 years or 3 generations*	*20 years or 5 generations*	*50 years or 10 generations*

Source: DEE & TSSC (2017).

Evidence:

Quantitative analysis of the probability of extinction or extreme degradation over all its geographic distribution has not been undertaken. Therefore, there is **insufficient information** to determine the eligibility of the ecological community for listing in any category under this criterion.

6.2 Recovery plan recommendation

A recovery plan is not recommended for this ecological community at this time.

The main threats to the ecological community and the priority actions required to address them are largely understood.

The Conservation Advice sufficiently outlines the priority actions needed for this ecological community and many of the threats affecting the ecological community are best managed at a landscape scale, coordinated with the management of other ecological communities. In addition, a number of existing documents are relevant to the management and/or recovery of this ecological community or the threats to it, outlined in Section 4.3.

Therefore, listing under national environment law, provision of the information contained within this Conservation Advice and implementation of the priority conservation actions are sufficient to guide protection and recovery of this ecological community at this time.

APPENDIX A – SPECIES LISTS

This Appendix lists the assemblage of native species that characterises the ecological community throughout its range at the time of listing, particularly characteristic and frequently occurring vascular plants at Table 7 and vertebrate animals at Table 8 (and a few of the many invertebrates), based on the sources cited. The ecological community also includes many other invertebrates, fungi, other cryptogamic plants, bacteria and other species; however, these are relatively poorly documented.

The species listed may be abundant, rare, or not necessarily present in any given patch of the ecological community, and other native species not listed here may be present. The total list of species that may be found in the ecological community is considerably larger than the species listed here (for example, few invertebrates or orchids are included).

Species presence and relative abundance varies naturally across the range of the ecological community based on factors such as historical biogeography, soil properties (e.g. moisture, chemical composition, texture, depth and drainage), topography, hydrology and climate. They also change over time, for example, in response to disturbance (by logging, fire, or grazing), or to the climate and weather (e.g. seasons, floods, drought and extreme heat or cold). The species recorded at a particular site can also be affected by sampling scale, season, effort and expertise. In general, the number of species recorded is likely to increase with the size of the site.

Scientific names for vascular plants are nationally accepted names as per the Australian Plant Census (Council of Heads of Australasian Herbaria 2020) and New South Wales Flora Online (Royal Botanic Gardens and Domain Trust 2020), as at the time of writing. Scientific names for fauna are nationally accepted names as per the Atlas of Living Australia (CSIRO 2020), as at the time of writing.

A1 Flora

Table 7: Characteristic, frequently occurring and/or threatened flora of the ecological community

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Canopy and emergent trees (potentially dominant eucalypt canopy species are indicated with a †)						
Allocasuarina littoralis	Black Sheoak				✓	
Angophora floribunda†	Rough-barked Apple	Vic (r)	✓	✓	✓	
Angophora subvelutina†	Broad-leaved Apple		✓	✓		
Brachychiton populneum	Kurrajong, Guraaman (Yuin)					Peel 2019
Casuarina cunninghamiana	River Oak/ River Sheoak		✓			
Casuarina glauca	Swamp Oak/ Swamp She-oak		✓	✓		
Corymbia gummifera Syn. *Eucalyptus gummifera*	Red Bloodwood				✓	
Elaeocarpus reticulatus	Blueberry Ash			✓	✓	
Eucalyptus amplifolia†	Cabbage Gum		✓	✓		
Eucalyptus baueriana†	Blue Box		✓	✓	✓	
Eucalyptus benthamii†	Bentham's Gum, Camden White Gum	Vic (e), NSW E	✓			
Eucalyptus bosistoana†	Coast Grey Box				✓	

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Eucalyptus botryoides†	Southern Mahogany, Bangalay		✓	✓	✓	
Eucalyptus botryoides x saligna†	Bangalay x Sydney Blue Gum hybrid#			✓		
Eucalyptus croajingolensis	Gippsland Peppermint				✓	
Eucalyptus cypellocarpa	Monkey (grey) Gum, Mountain Grey Gum			✓	✓	
Eucalyptus deanei	Round-leaved/ Deane's/ Mountain Blue gum			✓		
Eucalyptus elata†	River Peppermint		✓	✓	✓	
Eucalyptus eugenioides	Thin-leaved Stringybark			✓		
Eucalyptus globoidea	White Stringy Bark			✓	✓	
Eucalyptus globulus syn. *E. maidenii, E. pseudoglobulus*	Southern Blue Gum; Gippsland Blue Gum; Victorian Eurabbie					Peel 2019; Lemmon 2020
Eucalyptus grandis†	Flooded Gum		✓			
Eucalyptus longifolia†	Woollybutt		✓	✓		
Eucalyptus melliodora	Yellow Box					Peel 2019
Eucalyptus moluccana†	Grey Box		✓	✓		
Eucalyptus muelleriana	Yellow Stringybark			✓		
Eucalyptus ovata†	Swamp Gum		✓		✓	NSW EPA 2016a
Eucalyptus paniculata	Grey Ironbark, Torrangora					Economos 2020
Eucalyptus punctata	Grey Gum			✓		
Eucalyptus robusta	Swamp Mahogany			✓		
Eucalyptus saligna†	Sydney Blue Gum		✓	✓		
Eucalyptus siderophloia	Small-fruited Grey Gum, Grey Ironbark			✓		
Eucalyptus tereticornis†	Forest Red Gum		✓	✓	✓	
Eucalyptus tricarpa	Mugga/ Red Ironbark				✓	
Eucalyptus viminalis†	Ribbon Gum, Manna Gum		✓	✓	✓	
Pittosporum undulatum	Sweet Pittosporum, Native Daphne			✓		Buchan 2019
Understory trees and shrubs						
Acacia binervia	Two-veined Hickory			✓		
Acacia decurrens	Black Wattle			✓		
Acacia filicifolia	Fern-leaved Wattle			✓		
Acacia floribunda	White Sally Wattle/ Gossamer Wattle		✓	✓		
Acacia irrorata	Green Wattle			✓		

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Acacia longifolia	Sydney Golden Wattle			✓		
Acacia mearnsii	Black Wattle			✓	✓	Miles 2020; Peel 2019
Acacia melanoxylon	Blackwood				✓	
Acacia parramattensis	Parramatta Wattle, Sydney Green Wattle		✓	✓		
Acacia parvipinnula	Silver-stemmed Wattle			✓		
Backhousia myrtifolia	Grey Myrtle/ Ironwood		✓			
Breynia oblongifolia	Breynia, Coffee Bush		✓	✓		
Bursaria spinosa	Sweet Bursaria, (native) Blackthorn		✓	✓	✓	
Cassinia longifolia	Shiny Cassinia				✓	
Cassinia trinerva	3-veined Cassinia			✓		Miles 2020
Coprosma quadrifida	Prickly Currant-bush			✓	✓	
Cyathea australis	Rough Tree-fern				✓	
Einadia hastata Syn. *Chenopodium robertianum*	Berry Saltbush, Saloop		✓	✓		
Goodenia ovata	Hop Goodenia			✓	✓	
Kunzea spp	Burgan					Peel 2019
Livistona australis	Cabbage Palm	Vic L (v)	✓	✓		
Melaleuca biconvexa	Biconvex Paperbark	EPBC V, NSW V		✓		
Melaleuca decora	White Feather Honey Myrtle, Paper bark		✓	✓		
Melaleuca ericifolia	Swamp Paperbark			✓	✓	
Melaleuca linariifolia	Flax-leaved Paperbark		✓	✓		
Melaleuca nodosa	A Tea Tree			✓		
Melaleuca squarrosa	Scented Paperbark				✓	
Melaleuca styphelioides	Prickly Leaved Tea-tree		✓	✓		
Melia azedarach	White Cedar/ Chinaberry Tree		✓			
Melicytus dentatus Syn *Hymenanthera dentata*	Tree Violet		✓	✓		
Monotoca elliptica	Tree Broom-heath				✓	
Myrsine howittiana Syn. *Rapanea howittiana*	Brush Muttonwood			✓	✓	
Notelaea venosa	Large Mock-Olive			✓	✓	

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Olearia lirata	Snowy Daisy-bush				✓	
Olearia viscidula				✓		
Ozothamnus diosmifolius	Ball Everlasting (Rice Flower)		✓	✓		
Persoonia linearis	Narrow-leaved Geebung			✓		
Phebalium squamulosum	Scaly Phebalium			✓		
Phyllanthus gunnii	Scrubby Spurge		✓	✓		
Pimelea axiflora	Bootlace Bush			✓		
Platysace lanceolata	Shrubby Platysace				✓	
Plectranthus parviflorus	Cockspur Flower		✓			
Pomaderris aspera				✓	✓	
Prostanthera lasianthos					✓	
Sannantha pluriflora Syn. *Baeckea virgata*	Tall Baeckea			✓		Peel 2019
Syzygium smithii *Syn Acmena smithii*	Lilly Pilly		✓		✓	
Trema tomentosa Syn. *Trema aspera*	Native/ Poison Peach, Peach-leaved Poison-bush		✓			
Tristaniopsis laurina	Water Gum		✓		✓	
Climbers, epiphytes and scramblers						
Cayratia clematidea	Native Grape		✓			
Cissus hypoglauca	Water Vine			✓	✓	
Clematis aristata	Old Man's Beard		✓	✓	✓	
Clematis glycinoides	Headache Vine		✓	✓	✓	
Eustrephus latifolius	Wombat Berry		✓	✓	✓	
Geitonoplesium cymosum	Scrambling Lily		✓			
Glycine clandestina	Twining Glycine		✓	✓	✓	
Glycine microphylla	Small-leaf Glycine		✓			
Glycine tabacina	A Scrambler		✓	✓		
Gynochthodes jasminoides Syn. *Morinda jasminoides*	Climbing Scrub-orange, Sweet/ Jasmine morinda					Peel 2019
Hardenbergia violacea	False Sarsaparilla, Purple Coral-pea		✓			
Pandorea pandorana	Wonga Wonga Vine		✓			
Parsonsia straminea,	Common Silkpod					Miles 2020
Marsdenia rostrata	Common Milkvine					Peel 2019; Miles 2020

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Rubus parvifolius	Native Raspberry, Small-leaved Bramble		✓	✓		
Rubus rosifolius	Native Raspberry, Small-leaved Bramble			✓		
Smilax australis	Native Sarsparilla				✓	
Stephania japonica	Snake Vine		✓	✓		
Tylophora barbata	Bearded Tylophora			✓	✓	
Veronica plebeia	Trailing/ Creeping Speedwell		✓	✓	✓	
Understorey grasses						
Aristida ramosa	Purple Wiregrass			✓		
Aristida vagans	Three-awn Speargrass			✓		
Austrostipa ramosissima	Stout Bamboo-grass		✓	✓		
Cymbopogon refractus	Barbed-wire Grass		✓	✓		
Dichelachne micrantha	Shorthair Plumegrass		✓			
Digitaria parviflora	Small-flowered Finger Grass		✓			
Echinopogon caespitosus	Tufted Hedgehog-grass	Vic (e)	✓	✓		
Echinopogon ovatus	Forest Hedgehog-grass		✓	✓	✓	
Entolasia marginata	Bordered Panic Grass		✓	✓	✓	
Entolasia stricta	Wiry Panic	Vic (k)	✓			
Eragrostis leptostachya	Paddock Love-grass	Vic (k)	✓			
Hierochloe rariflora	Cane Holy-grass				✓	
Imperata cylindrica	Blady Grass		✓	✓		
Microlaena stipoides	Weeping Grass		✓	✓	✓	
Oplismenus aemulus	Creeping Shade Grass		✓	✓		
Oplismenus hirtellus Syn *O. imbecillis*	Creeping Beard Grass			✓	✓	NSW EPA 2016a
Paspalidium distans	A Paspalidium	Vic (e)	✓			
Poa ensiformis	Purple-sheathed Tussock-grass			✓		
Poa meionectes Syn *Poa exilis*	Fine-leaved/ leaf Snow-grass/ Tussock-grass			✓		
Poa tenera	Slender Tussock-grass				✓	

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Rytidosperma pilosum Syn *Austrodanthonia pilosa,*				✓		
Tetrarrhena juncea	Forest Wire-grass				✓	
Themeda triandra Syn *Themeda australis*	Kangaroo Grass		✓	✓	✓	
Other understorey herbs, including rushes, sedges, and forbs						
Carex appressa				✓	✓	Miles 2020
Carex longebrachiata	Australian Sedge			✓		
Centella asiatica	Pennywort		✓			
Commelina cyanea	Scurvy-weed, Wandering Jew	Vic (e)	✓	✓		
Cyanthillium cinereum Syn. *Vernonia cinerea*		Vic (k)	✓	✓		
Desmodium gunnii	Slender Tick Trefoil		✓		✓	
Desmodium varians	Slender Tick Trefoil	Vic (k)	✓	✓		
Dianella caerulea	Paroo/ Blue Flax Lily			✓	✓	
Dianella tasmanica	Tasman Flax-Lily				✓	
Dichondra repens	Kidney Weed, Yilibili (D'Harawal)		✓	✓	✓	
Einadia trigonos	Fishweed		✓			
Euchiton japonicus				✓		Miles 2020
Euchiton sphaericus	Cudweed		✓			
Gahnia clarkei	Tall Saw-sedge			✓	✓	
Gahnia melanocarpa	Black-fruit Saw-sedge			✓	✓	
Gahnia radula	Thatch Saw-sedge				✓	
Galium leiocarpum Syn *Galium propinquum*	Maori Bedstraw		✓			
Geranium homeanum	Rainforest Crane's Bill			✓		
Geranium potentilloides	Cinquefoil Cranesbill				✓	
Geranium solanderi	Native Geranium		✓	✓		
Gonocarpus tetragynus					✓	
Gonocarpus teucrioides	Germander Raspwort				✓	
Hackelia latifolia Syn *Austrocynoglossum latifolium*				✓		
Hydrocotyle hirta	Hairy Pennywort				✓	
Hydrocotyle laxiflora				✓		

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Hydrocotyle peduncularis	Native Pennywort		✓			
Hydrocotyle sibthorpioides				✓		
Hydrocotyle tripartita					✓	
Lagenophora stipitata Syn *Lagenifera stipitata*	Common Bottle-daisy				✓	
Lepidosperma laterale					✓	
Lobelia purpurascens Syn *Pratia purpurascens*	Whiteroot	Vic (r)	✓	✓		
Lomandra filiformis	Wattle Mat-rush		✓		✓	
Lomandra longifolia	Spiny-headed Mat-rush		✓	✓	✓	
Lomandra multiflora	Many-flowered Mat-rush		✓			
Opercularia aspera	Coarse Stinkweed				✓	
Opercularia diphylla	Stinkweed		✓			
Oxalis perennans	Native Sorrel		✓	✓		
Persicaria spp.	Knotweed					Miles 2020; Lewer 2020
Persicaria decipiens	Slender Knotweed		✓			
Plantago debilis				✓		
Poranthera microphylla	Small Poranthera		✓		✓	
Pseuderanthemum variabile	Pastel Flower			✓		
Rumex brownii Syn *Rumex alcockii*	Swamp Dock			✓		
Schoenus apogon	Common Bog-sedge				✓	
Senecio linearifolius	Fireweed Groundsel			✓		
Sigesbeckia orientalis	Indian Weed		✓	✓		
Solanum pungetium	Eastern Nightshade					Miles 2020
Solanum prinophyllum	Forest Nightshade		✓	✓	✓	
Stellaria flaccida				✓		
Tricoryne elatior	Yellow Rush-lily				✓	
Urtica incisa	Scrub Nettle			✓		
Veronica calycina	Hairy Speedwell				✓	
Viola banksii	Wild Violet					Miles 2020
Viola hederacea	Ivy Leaved Violet		✓	✓	✓	
Wahlenbergia gracilis	Australian/ Sprawling Bluebell		✓			

Scientific Name	Common Name	Listed status*	Source			
			NSW TEC	NSW PCTs	Vic EVCs	Other
Understorey ferns						
Adiantum aethiopicum	Maiden Hair Fern		✓	✓	✓	
Blechnum cartilagineum Syn *Oceaniopteris cartilaginea*	Gristle Fern, soft water fern			✓	✓	
Calochlaena dubia	Common Ground-fern			✓	✓	
Cheilanthes sieberi	Poison Rock Fern, Mulga Fern		✓	✓		
Doodia aspera Syn *Blechnum neohollandicum*	Prickly Rasp Fern		✓	✓		
Hymenophyllum cupressiforme	Common Filmy fern				✓	
Hypolepis glandulifera				✓		
Hypolepis muelleri	Harsh Ground Fern		✓	✓		
Pellaea falcata	Sickle Fern			✓	✓	Miles 2020
Pteridium esculentum	Bracken Fern		✓	✓	✓	

* Species **listed** / conservation **status** at the time this document was prepared –
Commonwealth EPBC Act 1999 and **NSW Biodiversity Conservation Act 2016**:
V = Vulnerable, E = Endangered, CE = Critically Endangered, M=migratory/marine.
Vic *Flora and Fauna Guarantee Act 1988*: L = Threatened.
Advisory List of Threatened Vertebrate plants in Victoria 2014:
(k) = poorly known, (r) = rare, (v) = vulnerable, (e) = endangered.
[#] Natural hybrids of any included taxa are included in the ecological community (see TSSC (2010)).

Source: NSW Scientific Committee (2011); NSW DPIE (in prep); Victorian DSE (2007), NSW EPA (2016a) DAWE (2020d); CSIRO (2020); Royal Botanic Gardens and Domain Trust (2020).

A2 Fauna

Table 8: Characteristic, frequently occurring or threatened fauna of the ecological community

Scientific name	Common name	Listed status*		
		EPBC Act	NSW Act	Vic Act (+ advisory list)
Mammals				
Acrobates pygmaeus	Feathertail Glider			
Aepyprymnus rufescens	Rufous Bettong		V	L (rx)
Antechinus agilis	Agile Antechinus			
Antechinus flavipes	Yellow-footed Antechinus			
Antechinus stuartii	Brown Antechinus			
Cercartetus nanus	Eastern Pygmy Possum		V	(nt)
Dasyurus maculatus maculatus	Spotted-tailed Quoll	E	V	L (en)
Falsistrellus tasmaniensis	Eastern False Pipistrelle		V	
Hydromys chrysogaster	Water Rat			
Isoodon obesulus obesulus	Southern Brown Bandicoot	E	E	L (nt)
Macropus giganteus	Eastern Grey Kangaroo			
Micronomus norfolkensis	Eastern Free-tail Bat		V	
Miniopterus australis	Little Bentwing Bat		V	
Miniopterus orianae oceanensis	Eastern Bentwing Bat		V	
Myotis macropus	Large-footed Myotis, Southern Myotis		V	(nt)
Notamacropus dorsalis	Black-striped Wallaby		E	
Notamacropus parma	Parma Wallaby		V	
Notamacropus rufogriseus	Red-necked Wallaby			
Nyctophilus bifax	Eastern Long-eared Bat		V	
Ornithorhynchus anatinus	Platypus			
Ozimops lumsdenae (syn. *Mormopterus lumsdenae*)	Northern Free-tailed Bat		V	
Perameles nasuta	Long-nosed Bandicoot			
Petauroides volans	Greater Glider	V		(vu)
Petaurus australis	Yellow bellied Glider		V	
Petaurus breviceps	Sugar Glider			
Petaurus norfolcensis	Squirrel Glider		V	L (en)
Phascogale tapoatafa	Brush-tailed Phascogale		V	L (vu)
Phascolarctos cinereus	Koala	V	V	
Phoniscus papuensis	Golden-tipped Bat		V	
Planigale maculata	Common Planigale		V	
Potorous tridactylus	Long-nosed Potoroo	V	V	L(nt)
Pseudocheirus peregrinus	Common Ringtail Possum			
Pseudomys novaehollandiae	New Holland Mouse/ Pookila	V		L (vu)
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	L (vu)
Pteropus scapulatus	Little Red Flying-fox			

Scientific name	Common name	Listed status*		
		EPBC Act	NSW Act	Vic Act (+ advisory list)
Rattus lutreolus	Swamp Rat			
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat		V	L (dd)
Scoteanax rueppellii	Greater Broad-nosed Bat		V	
Sminthopsis leucopus	White-footed Dunnart		V	L (nt)
Tachyglossus aculeatus	Short-beaked Echidna			
Trichosurus caninus	Mountain Brushtail Possum, Short-eared Possum, Bobuck			
Trichosurus cunninghami	Mountain Brushtail Possum, Southern Bobuck			
Trichosurus vulpecula	Common Brushtail Possum			
Vombatus ursinus	Common Wombat, Bare-nosed Wombat			
Birds				
Accipiter novaehollandiae	Grey Goshawk			L (vu)
Amaurornis moluccana	Pale-Vented Bush-hen		V	
Anthochaera phrygia	Regent Honeyeater	CE	CE	L (cr)
Ardea ibis	Cattle Egret			
Ardea modesta	Eastern Great Egret			L (vu)
Botaurus poiciloptilus	Australasian Bittern	E	E	L (en)
Caligavis chrysops	Yellow-faced Honeyeater			
Callocephalon fimbriatum	Gang-gang Cockatoo		V	
Calyptorhynchus funereus	Yellow-tailed Black-cockatoo			
Calyptorhynchus lathami lathami	Glossy Black-cockatoo		V	L (vu)
Carterornis leucotis	White-Eared Monarch		V	
Ceyx azureus	Azure Kingfisher			(nt)
Climacteris picumnus victoriae	Brown Treecreeper		V	(nt)
Coracina lineata	Barred Cuckoo-shrike		V	
Daphoenositta chrysoptera	Varied Sittella		V	
Dasyornis brachypterus	Eastern Bristlebird	E	E	L(en)
Dicaeum hirundinaceum	Mistletoebird			
Dromaius novaehollandiae	Emu			(nt)
Egretta garzetta	Little Egret			L (en)
Egretta novaehollandiae	White-faced Heron			
Ephippiorhynchus asiaticus	Black-necked Stork		E	
Erythrotriorchis radiatus	Red Goshawk	V	CE	
Grantiella picta	Painted Honeyeater	V	V	L (vu)
Gymnorhina tibicen	Australian Magpie			
Haliaeetus leucogaster	White-bellied Sea-eagle		V	L (vu)
Haliastur sphenurus	Whistling Kite			
Hieraaetus morphnoides	Little Eagle		V	
Ixobrychus flavicollis	Black Bittern		V	L (vu)

Scientific name	Common name	Listed status*		
		EPBC Act	NSW Act	Vic Act (+ advisory list)
Lathamus discolor	Swift Parrot	CE	E	L (en)
Leucosarcia melanoleuca	Wonga Pigeon			
Lophoictinia isura	Square-tailed Kite		V	L (vu)
Malurus cyaneus	Superb Fairy Wren			
Malurus lamberti	Variegated Fairy Wren			
Malurus melanocephalus	Red-backed Fairy Wren			
Manorina melanocephala	Noisy Miner			
Manorina melanophrys	Bell Miner			
Melithreptus gularis gularis	Black-chinned Honeyeater		V	(nt)
Merops ornatus	Rainbow Bee-eater			
Neochmia temporalis	Red Browed Finch/ Firetail			
Neophema chrysogaster	Orange-bellied Parrot	CE	CE	L (cr)
Neophema pulchella	Turquoise Parrot		V	L (nt)
Nettapus coromandelianus	Cotton Pygmy Goose		E	
Ninox connivens	Barking Owl		V	L (en)
Ninox strenua	Powerful Owl		V	L (vu)
Numenius madagascariensis	Eastern Curlew	CE, M		(vu)
Nycticorax caledonicus	Nankeen Night Heron			(nt)
Oxyura australis	Blue-billed Duck		V	L (en)
Pachycephala rufiventris	Rufous Whistler			
Pandion cristatus (syn. P. haliaetus)	Eastern Osprey	M	V	
Parvipsitta pusilla	Little Lorikeet		V	
Petroica boodang	Scarlet Robin		V	
Petroica phoenicea	Flame Robin		V	
Pezoporus wallicus	Eastern Ground Parrot		V	L (en)
Phalacrocorax spp.	Cormorants			
Phalacrocorax fuscescens	Black-faced Cormorant			(nt)
Phalacrocorax varius	Pied Cormorant			(nt)
Pomatostomus temporalis temporalis	Grey-crowned Babbler		V	L (en)
Ptilinopus superbus	Superb Fruit-dove		V	
Rhipidura albiscapa	Grey Fantail			
Rostratula australis	Australian Painted Snipe	E	E	L (cr)
Stagonopleura guttata	Diamond Firetail		V	L (nt)
Stictonetta naevosa	Freckled Duck		V	L (en)
Stipiturus malachurus	Southern Emu-wren			
Synoicus ypsilophorus (syn. *Coturnix ypsilophora*)	Brown Quail			
Threskiornis spinicollis	Straw-necked Ibis	M		
Todiramphus chloris	Collared Kingfisher		V	

Scientific name	Common name	Listed status*		
		EPBC Act	NSW Act	Vic Act (+ advisory list)
Todiramphus sanctus	Sacred Kingfisher			
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet			
Trichoglossus haematodus	Rainbow Lorikeet			
Tringa nebularia	Common Greenshank	M		(vu)
Tringa stagnatilis	Marsh Sandpiper	M		(vu)
Turnix maculosus	Red-backed Button-quail		V	
Tyto longimembris	Eastern Grass Owl		V	
Tyto novaehollandiae	Masked Owl		V	L (en)
Tyto tenebricosa	Sooty Owl		V	L (vu)
Xenus cinereus	Terek Sandpiper	M	V	L (en)
Zosterops lateralis	Silvereye	M		
Reptiles				
Amphibolurus muricatus	Jacky Lizard			
Bellatorias major	Land Mullet			
Boiga irregularis	Brown Tree Snake			
Chelodina longicollis	Eastern Long-necked Turtle			(dd)
Cyclodomorphus gerrardii	Pink-tongued Lizard			
Cyclodomorphus michaeli	Mainland She-oak Skink			L (nt)
Egernia mcpheei	Eastern Crevice Skink			
Emydura macquarii	Murray River Turtle			(v)
Hemiaspis signata	Black-bellied Swamp Snake			
Hoplocephalus bitorquatus	Pale-headed Snake		V	
Intellagama lesueurii	Eastern Water Dragon, Gippsland Water Dragon			
Pseudechis porphyriacus	Red-bellied Black Snake			
Pseudonaja textilis	Eastern Brown Snake			
Tiliqua nigrolutea	Blotched Blue Tongue Lizard			
Tropidechis carinatus	Rough-scaled Snake			
Varanus varius	Lace Monitor/ Tree Goanna			
Amphibians				
Crinia tinnula	Tinkling Frog, Wallum Froglet		V	
Heleioporus australiacus	Giant Burrowing Frog	V	V	L (cr)
Lechriodus fletcheri	Fletcher's Frog			
Limnodynastes dumerilii	Eastern Banjo Frog (Pobblebonk)			
Limnodynastes peronii	Brown-striped Frog			
Limnodynastes tasmaniensis	Spotted Grass-frog			
Litoria aurea	Green and Golden Bell Frog	V	E	(vu)
Litoria brevipalmata	Green-thighed Frog		V	
Litoria caerulea	Green Tree Frog			
Litoria chloris	Red-eyed Tree Frog			

Scientific name	Common name	Listed status*		
		EPBC Act	NSW Act	Vic Act (+ advisory list)
Litoria citropa	Blue Mountains Tree Frog			
Litoria dentata	Bleating Tree Frog			(vu)
Litoria ewingii	Brown Tree Frog			
Litoria fallax	Dwarf Green Tree Frog			
Litoria freycineti	Freycinet's Tree Frog, Wallum Rocket Frog			
Litoria jervisiensis	Jervis Bay Tree Frog			
Litoria latopalmata	Broad-palmed Frog			
Litoria revelata	Revealed Tree Frog			
Mixophyes iteratus	Giant Barred Frog	E	E	
Platyplectrum ornatum	Ornate Burrowing Frog			
Invertebrates				
Delias aganippe	Spotted Jezebel (Butterfly)			
Hypochrysops delicia	Moonlight Jewel (Butterfly)			
Megadolomedes australianus	Giant Water Spider			
Meridolum corneovirens	Cumberland Plain Land Snail		E	
Nephila spp.	Golden Orb Weaving Spider			
Psychonotis caelius taygetus	Small Green-banded Blue (Butterfly)			
Spodoptera picta	Lily Caterpillar (Moth)			
Tetragonula carbonaria	Stingless Native Bee			
Tisiphone abeona	Varied Sword Grass Brown (Butterfly)			
Trapezites symmomus	Splendid Ochre, Symmomus (Rush) Skipper			

* Species **listed** / conservation **status** at March 2019 –
Commonwealth *EPBC Act* 1999 and ***NSW Biodiversity Conservation Act 2016***:
V = Vulnerable, E = Endangered, CE = Critically Endangered, M=migratory/marine.
Vic Flora and Fauna Guarantee Act 1988: L = listed.
***Advisory List of Threatened Vertebrate Fauna in Victoria* 2013**: (dd) = data deficient, (nt) = near threatened, (vu) = vulnerable, (en) = endangered, (cr) = critically endangered, (rx) = regionally extinct.

Source: Marchant & Higgins (1990, 1993); Higgins & Davies (1996); Higgins (1999); Higgins et al. (2001); Higgins & Peter (2002); Van Dyck & Strahan (2008); Cogger (2014); DAWE (2020d).

APPENDIX B – WEEDS

Scientific names for vascular plants are nationally accepted names as per the Australian Plant Census (Council of Heads of Australasian Herbaria 2020) and New South Wales Flora Online (Royal Botanic Gardens and Domain Trust 2020), as at the time of writing.

Table 9: Weed species that are a threat to the ecological community.

Weed Species	Common Name
Trees and shrubs	
Acer negundo	Box Elder
Ailanthus altissima	Tree of Heaven
Cinnamomum camphora	Camphor Laurel
Cestrum spp.	Cestrum
Cordyline australis	New Zealand Cabbage-tree
Gleditsia triacanthos	Honey Locust
Crataegus monogyna	Hawthorn
Fraxinus spp.	Ash
Lagunaria patersonia	Norfolk Island Hibiscus
Ligustrum lucidum	Large/ Broad-leaved Privet
Ligustrum sinense	Chinese/ Small-leaved Privet
Olea europaea	African Olive, European Olive
Opuntia spp.	Prickly Pears
Opuntia aurantiaca	Tiger Pear
Prunus cerasifera	Cherry Plum
Rubus fruticosus spp. *agg.*	Blackberry
Salix spp.	Willow
Senna spp.	e.g. Easter Cassia, Smooth Senna (Arsenic Bush) and Glandular/ Downy Senna (Buttercup Bush)
Solanum mauritianum	Wild Tobacco Bush
Solanum pseudocapsicum	Madeira Winter-cherry
Scramblers or climbers	
Anredera cordifolia	Madeira Vine
Araujia sericifera	Moth Plant
Asparagus asparagoides	Bridal Creeper
Asparagus aethiopicus	Ground Asparagus Fern, Basket Asparagus
Cardiospermum grandiflorum	Balloon Vine
Delairea odorata	Cape Ivy (Groundsel)
Dolichandra unguis-cati	Cats Claw Creeper
Ipomoea spp.	Morning Glories
Lantana camara	Lantana
Lonicera japonica	Japanese Honeysuckle
Passiflora spp.	Passion-fruits
Rumex sagittatusa (formerly *Acetosa sagittata*)	Turkey Rhubarb, Rambling Dock
Senecio angulatus	Creeping/ Climbing Groundsel
Senecio tamoides	Canary Creeper

Weed Species	Common Name
Thunbergia alata	Black-eyed Susan
Grasses	
Agrostis capillaris	Brown-top Bent
Anthoxanthum odoratum	Sweet Vernal-grass
Axonopus spp.	Carpet Grasses
Briza maxima	Large Quaking-grass
Bromus catharticus	Prairie Grass
Cenchrus clandestinus	Kikuyu
Cenchrus setaceus (syn *Pennisetum setaceum)*	(African) Fountain Grass
Dactylis glomerata	Cocksfoot, Orchardgrass
Ehrharta erecta	Panic Veldt-grass
Holcus lanatus	Yorkshire Fog
Lolium perenne	Perennial Rye-grass
Paspalum dilatatum	Paspalum
Setaria spp.	e.g. Slender Pigeon Grass
Other Herbs – forbs, sedges, and rushes	
Ageratina adenophora	Crofton Weed
Ageratina riparia	Mistflower
Bidens pilosa	Cobbler's Peg
Centaurium erythraea	Common Centaury
Centaurium tenuiflorum	Slender Centaury
Cerastium glomeratum	Common Mouse-ear Chickweed
Cirsium vulgare	Spear Thistle
Conium maculatum	Hemlock
Cyperus eragrostis	Drain Flat-sedge, Umbrella Sedge
Erigeron spp.	Fleabanes
Euphorbia lathyris	Caper Spurge
Galium aparine	Cleavers
Helminthotheca echioides	Ox-tongue
Hypochaeris radicata	Cat's Ear
Juncus acutus	Sharp Rush
Leontodon saxatilis	Hairy Hawkbit
Modiola caroliniana	Red-flower Mallow
Plantago lanceolata	Ribwort, Plantain
Polycarpon tetraphyllum	Four-leaved Allseed
Prunella vulgaris	Self-heal
Ranunculus repens	Creeping Buttercup
Rorippa palustris	Marsh Yellow-cress
Rumex conglomeratus	Clustered Dock
Rumex crispus	Curled Dock
Senecio madagascariensis	Fireweed
Sida rhombifolia	Paddy's Lucerne

Weed Species	Common Name
Sonchus spp.	Sow-thistles
Symphyotrichum subulatum	Aster-weed
Tagetes minuta	Stinking Roger
Taraxacum officinale spp. agg.	Garden Dandelion
Tradescantia fluminensis	Wandering Jew/ Trad/ Sailor
Trifolium repens	White Clover
Verbena bonariensis	Purple-top Verbena
Vinca major	Periwinkle
Zantedeschia aethiopica	(White) Arum Lily

Source: Tozer (2003); Keith & Scott (2005); NSW Scientific Committee (2011); White et al. (2018); Miles (2020); DAWE (2020d); CSIRO (2020); Royal Botanic Gardens and Domain Trust (2020).

APPENDIX C – RELATIONSHIP TO OTHER VEGETATION CLASSIFICATION AND MAPPING SYSTEMS

Ecological communities are complex to classify. New South Wales and Victoria apply their own systems to classify vegetation communities. Reference to vegetation and mapping units as equivalent to the ecological community, at the time of listing, should be taken as indicative rather than definitive. A unit that is generally equivalent may include elements that do not meet the key diagnostic characteristics and minimum condition thresholds. Conversely, some areas mapped or described as other units may meet the key diagnostic characteristics for the ecological community. Judgement of whether the ecological community is present at a particular site should focus on how the site meets the description (Section 2), the key diagnostic characteristics (Section 5.1.1) and minimum condition thresholds (Section 5.2.1).

State vegetation mapping units are not the listed ecological community. However, for many locations (but not all) certain vegetation/map units will correspond sufficiently to provide indicative mapping for the national ecological community, where the description matches that of the nationally-listed ecological community.

On-ground assessment is vital to finally determine if any patch is part of the ecological community.

C1 New South Wales vegetation classifications

New South Wales has a comprehensive state-wide vegetation classification system that identifies Plant Community Types (NSW PCTs). The NSW PCT classification is designed to be the New South Wales standard for community-level vegetation mapping. Each NSW PCT includes a description of its relationship and degree-of-fit to NSW-listed threatened ecological communities. The NSW PCT classification is currently[18] being upgraded for the east coast area. The draft NSW PCTs that are indicated as having a relationship with the NSW-listed 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions' are outlined in Table 10.

Table 10: Draft NSW PCTs that are identified as having a relationship with the NSW-listed 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions'

Profile Source	NSW PCT	NSW PCT Name	TEC Relationship
R1.17p	4138	Araluen Valley Flats Red Gum Forest	yes
R1.29	4058	Sydney Hinterland Red Gum Riverflat Forest	yes
R1.46	4024	Cumberland Blue Box Riverflat Forest	yes
R1.73	3145	Cumberland Bangalay x Blue Gum Riverflat Forest	yes
R1.80	4025	Cumberland Red Gum Riverflat Forest	yes
R9.101b	3328	Lower Hunter Red Gum-Paperbark Riverflat Forest	yes
R9.107	4039	Hunter Range Creekflat Apple-Red Gum Forest	yes
R9.138	3258	Sydney Basin Creekflat Blue Gum-Apple Forest	yes
R9.38	3188	South Coast Riverflat Peppermint Forest	yes
R9.12	3181	Bega Wet Shrub Forest	sometimes
R9.16	3185	Far South Riverflat Wet Forest	sometimes
R9.56	4019	Coastal Alluvial Bangalay Forest	sometimes
R9.68	3192	South Coast Riverflat Ribbon Gum Forest	sometimes
R9.93	3272	South Coast Lowland Creekflat Forest	sometimes

Source: NSW DPIE (in prep)[19].

[18] At the time of this advice.

[19] Downloaded June 2020.

Table 11 outlines the PCTs in use before the 2019/20 (draft) revision that are identified as relating to the NSW-listed 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions'.

Table 11: Previously matched New South Wales vegetation types (as at 2019) that may include patches of the ecological community.

Vegetation formations	Vegetation classes	Vegetation types	Classification
Wet sclerophyll forests (shrubby sub-formation)	South Coast Wet Sclerophyll Forests	River Peppermint - Rough-barked Apple moist open forest on sheltered sites, southern South East Corner Bioregion	PCT 1109 (NSW OEH 2018c) DSF e19 (Tozer et al. 2006)
		Swamp Gum - Ribbon Gum open forest on flats of the coastal and hinterland lowlands, southern South East Corner Bioregion	PCT 1228 (NSW OEH 2018c) FoW e17 (Tozer et al. 2006)
	North Coast Wet Sclerophyll Forests	Sydney Blue Gum - Deane's Gum - River Peppermint shrubby riparian tall forest of the lower Colo River, Sydney Basin Bioregion	PCT 1504 (NSW OEH 2018c)
Forested wetlands	Coastal Floodplain Wetlands	Floodplain wetlands of the coastal lowlands, southern South East Corner Bioregion	PCT 828 (NSW OEH 2018c) FoW e60 (Tozer et al. 2006)
		Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	PCT 835 (NSW OEH 2018c) FoW 33 (Tindall et al. 2004)
		Mountain Blue Gum - Thin-leaved Stringybark open forest on river flat alluvium in the Sydney Basin Bioregion	PCT 941 (NSW OEH 2018c) FoW p31 (Tozer et al. 2006)
		Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin Bioregion	PCT 1386 (NSW OEH 2018c) 10af (Ryan et al. 1996)
	Coastal Swamp Forests	Bangalay - Smooth-barked Apple / She-oak open forest on sandy alluvium in coastal parts of the Sydney region	PCT 1794 (NSW OEH 2018c) S_FoW01 (NSW OEH 2013)
		Forest Red Gum - Woollybutt - Pithy Sword-sedge swamp woodland in dune swales near Pambula, southern South East Corner Bioregion	PCT 839 (NSW OEH 2018c)
	Eastern Riverine Forests	River Peppermint - Rough-barked Apple - River Oak herb / grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	PCT 1108 (NSW OEH 2018c) FoW p30 (Tozer et al. 2006)
		Water Gum - tea-tree- River Peppermint riparian scrub along streams, far southern South East Corner Bioregion	PCT 1293 (NSW OEH 2018c) FoW e38 (Tozer et al. 2006)

There are also a number of other mapping or classification schemes that have been used in New South Wales over the years that relate, to a greater or lesser degree, to the ecological community. The New South Wales Scientific Committee final determination for the NSW-

listed ‘River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions’ lists units from a number of vegetation surveys and mapping studies that may include components of the ecological community (whilst noting that there may be additional or unmapped occurrences beyond these surveyed areas). The identified mapping units are as follows.

- In the lower Hunter valley.
    - ‘Central Hunter Riparian Forest’ (map unit 13); ‘Wollombi Redgum-River Oak Woodland’ (map unit 14); and ‘Redgum Roughbarked Apple Swamp Forest’ (map unit 38) of NSW NPWS (2000).
- On the Cumberland Plain.
    - ‘Riparian Forest’ (map unit 12) of Tozer (2003) and parts of ‘Alluvial Woodland’ (map unit 11) that are dominated by eucalypts (Tozer 2003).
    - Benson’s (1992) ‘Camden White Gum Forest’ (map unit 6d); and those parts of ‘River Flat Forest’ (map unit 9f) dominated by eucalypts.
    - Parts of the ‘River-flat forests’ of Benson and Howell (1990) and Benson et al. (1996) that are dominated by eucalypts.
- In the Warragamba catchment.
    - Small areas of ‘Burragorang River Flat Forest’ (map unit 88b); and ‘Oakdale Alluvial Rough-barked Apple Forest’ (map unit 88c) of NPWS (2002).
- On the south coast of New South Wales.
    - Those parts of Thomas et al.’s (2000) ‘Ecotonal Coastal Swamp Forest’ (forest ecosystem 27) dominated by eucalypts; and those parts of ‘Coastal Lowlands Riparian Herb/Grass Forest’ (forest ecosystem 48) and ‘Southern Hinterland Shrub/Herb/Grass Riparian Forest’ (forest ecosystem 49) on alluvial soils.
    - Those parts of ‘Cumberland River Flat Forest’ (map unit 33) and ‘Floodplain Swamp Forest’ (map unit 105) of Tindall et al. (2004) that are dominated by eucalypts.
- In the Eden region.
    - Forested parts of ‘Floodplain Wetlands’ (map unit 60) that are dominated by eucalypts.
    - Parts of ‘Bega Wet Shrub Forest’ (map unit 19) that are on floodplains (Keith & Bedward 1999).

The New South Wales determination also says that the NSW-listed ecological community is within the ‘Coastal Floodplain Wetlands’ vegetation class of Keith (2002, 2004).

In the Lake Macquarie local government area, Bell (2016) also indicates relevant vegetation units that are likely to include areas of the ecological community (i.e. relating them to the NSW-listed 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner bioregions' threatened ecological community). These units (that are likely to be the national ecological community, where they meet the key diagnostic characteristics) are:

- Unit 5 'Alluvial Tall Moist Forest
- Unit 5a 'Alluvial Bluegum – Paperbark Forest'
- Unit 5b 'Alluvial Bluegum – Apple Moist Forest'
- Unit 5e 'Alluvial Bluegum – Spotted Gum Moist'
- Unit 37b 'Alluvial Floodplain – Woolybutt Forest'
- Unit 37d 'Alluvial Floodplain Cabbage Gum Forest'
- Unit 38 'Foreshore Redgum – Rough-barked Apple Forest'
- Unit 38a 'Floodplain Redgum – Rough-barked Apple Forest'
- Unit 38c 'Foreshore Redgum – Ironbark Forest'

C2 Victorian vegetation classification

Ecological Vegetation Classes (EVCs) are the standard unit for classifying vegetation types in Victoria. EVCs are described through a combination of floristics, lifeforms and ecological characteristics. Table 12 outlines those EVCs that may include patches of the ecological community. Many of these EVCs extend beyond the alluvial floodplains, so only a portion of them would meet the Key Diagnostics Characteristics and hence be included in the ecological community.

Table 12: Victoria – Ecological Vegetation Classes (Vic EVCs) that may include patches of the ecological community (as at 2019).

Vic EVC	Name	Status (Victoria)*
4	Coastal Vine-rich Forest	Vulnerable
15	Limestone Box Forest	Vulnerable
18	Riparian Forest	Depleted
30	Wet forest	Least Concern
47	Valley Grassy Forest	Depleted
151	Plains Grassy Forest	Endangered
169	Dry Valley Forest	Vulnerable
*__Bioregional Conservation Status__ for these EVCs in the East Gippsland Lowland Bioregion: Endangered: Contracted to less than 10% of its former range; OR less than 10% of its pre-European extent remains; OR Combination of depletion, degradation, current threats and rarity is comparable. Vulnerable: 10–30% of its pre-European extent remains; OR Combination of depletion, degradation, current threats and rarity is comparable. Depleted: Greater than 30% and up to 50% of its pre-European extent remains; OR Combination of depletion, degradation and current threats is comparable.		

Source: Victorian DSE (2007).

APPENDIX D – LANDFORMS AND SOILS

Further information is included here to help identify floodplains and alluvial soils for the purposes of identifying the ecological community.

Although floodplains may be occasionally or more often saturated, water-logged or inundated, the definition of floodplains is NOT limited to areas of any particular flood frequency. Rather, for the purposes of defining the ecological community, the floodplain is defined by the presence of alluvial landforms.

The ecological community occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans.

Compared to the surrounding landscape, the terrain of the floodplains is remarkably flat, and slopes rarely exceed 5° from horizontal, except on localized terraces and river-banks. However there may be local variation associated with river channels, local depressions, natural levees and river terraces (Keith & Scott 2005).

The edge of the floodplain (and the edge of the alluvial soils) is typically indicated by the break in slope between the river-flat (i.e. the net depositional zone) and the steeper foot slopes (i.e. the net erosional zone) of the adjoining higher land. Changes in slope within the depositional zone (i.e. because of localised terraces and river-banks), are not indicative of the edge of the floodplain. However, as terrain slope decreases, it can be more difficult to locate the edge of the floodplain.

The edge of the floodplain may also be indicated by changes in the vegetation. Vegetation on alluvial deposits is typically more diverse than vegetation in the surrounding landscape — with a denser tree canopy and ground-layer, due to greater water availability as the groundwater in alluvial systems is typically contained in unconfined aquifers within the rooting depth of the vegetation. The greater diversity and abundance of groundcover vegetation (as compared to adjacent slopes) may be visible, particularly of species associated with moister environments, including grasses, forbs, sedges and ferns.

The ecological community occurs on alluvial soils of a variety of textures, including (but not limited to) silts, clay loams and sandy loams, gravel and cobbles. Alluvial soils are very diverse, including examples from many of the major soil groups of the Australian Soil Classification (Isbell 2016) and usually reflect the properties of their parent material in the upper catchment. They may include in-situ subsoils, and colluvial fans where they overlay the alluvial floodplain.

The ecological community is typically found on deep (greater than one metre) alluvial soils but may be found on shallower soils on the margins of the floodplain and in the smaller narrow alluvial systems and floodplain pockets.

Where the alluvial soils are shallower, or occur as a veneer of alluvial soil over soils derived from other geomorphological processes, it should be considered to be an alluvial soil for the purposes of identifying the ecological community if the majority of the root zone is confined to the part of the soil horizon dominated by alluvial processes.

The ecological community does <u>not</u> occur on soils that are primarily marine sands or aeolian sands.

Table 13: Landform glossary

Term	Definition
Alluvium/alluvia (alluvial deposits)	Sediment transported and deposited by channelled or overbank stream flow (Speight & Isbell 2009).
Alluvial systems or landforms	Alluvial systems include landform patterns such as alluvial fan, alluvial plain, anastomotic plain, bar plain, covered plain, delta, flood plain, meander plain, playa plain, stagnant alluvial plain, and terrace. Each landform pattern contains one or more landform elements including back plain, bank (stream bank), bar (stream bar), channel bench, drainage depression, fan, flood-out, lagoon, lake, levee, lunette, ox-bow, playa, prior stream, scroll, stream bed, stream channel, swamp, terrace flat, terrace plain, and valley flat. In all these landforms, there may be frequent active erosion and aggradation by channel and overbank stream flow, or the landforms may be a relict (residual) from these processes (Speight 2009).
Alluvial terrace (fill terrace, terrace)	Typically a relatively flat (planar), valley marginal feature that is perched above the contemporary channel and/or floodplain. These abandoned floodplains are no longer active. They are generally separated from the contemporary floodplain by a steep slope called a terrace riser. Terrace be paired or unpaired and are often found as a flight of terraces. (Fryirs & Brierly 2013; River Styles 2020).
Colluvium (colluvial deposits)	Unconsolidated material at the base of a slope, due mainly to gravity, which includes sheet wash as a result of diffuse overland sheet erosion and deposition (Speight & Isbell 2009).
Colluvial fan	When an alluvial fan is built by debris flow, then it is referred to as a debris cone or colluvial fan.
Floodplain (alluvial flat, river-flat; includes alluvial terraces)	Floodplains are areas of sediment accumulation made up of alluvial materials between or adjacent to (active or abandoned) stream/river/channel banks and the valley margin. They are typically tabular and elongated parallel to active channels. However, they may be highly variable, ranging from featureless, flat-topped landforms, to inclined landforms (typically tilted away from the channel), to irregularly reworked (scoured) landforms (River Styles 2020). Floodplains are often poorly drained, acting as a stilling basin in which fine-grained suspended sediments settle out from over-bank flows. Older, elevated floodplain deposits along valley margins are referred to as alluvial terraces (Fryirs & Brierley 2013).
Floodplain pockets	In the middle to upper catchment of a river system floodplains typically occur as isolated pockets; and as discontinuous, alternating pockets in the sediment transfer zone downstream. Floodplain pockets tend to alternate as the river switches from one side of the valley to the other, creating planform-controlled floodplain pockets. As slope decreases even further (into the lower catchment), and the valley widens further, floodplain pockets become more frequent, eventually becoming continuous along both banks (adapted from Fryirs & Brierley 2013).
Fluvial sediments	Sediments deposited by the main channels of stream flow. This definition includes outwash and landforms that are characteristically produced by flooding conditions (i.e. point bars, floodplains, and terraces).
Nick point	A nick point (or knick point) is part of a river or channel where there is a sharp change in channel slope, such as a waterfall or lake.
Quaternary alluvial systems	Alluvial systems that formed during the last 2.5 million years.
River-flat	A river-flat is a planar landform element that is neither a crest nor a depression and is level or very gently inclined (<3% tangent approximately). Some flats and slopes may have the same inclination (1–3%). The slope line on a River-flat often runs parallel to the course line in a nearby open depression (such as a stream channel or river). The slope line of a slope seldom does so, but makes an angle with the course line (Speight 2009).

APPENDIX E – INDIGENOUS PEOPLE, CULTURAL VALUES AND USE OF THE ECOLOGICAL COMMUNITY

E1. Traditional Owners/Custodians of the ecological community

Indigenous peoples have occupied the coastal flats, creeks, rivers, estuaries and sea country of the east coast of Australia for tens of thousands of years. The coastal landscape provides a direct link with traditional spiritual and material culture. The ecological community can be found along coastal river systems and has considerable cultural heritage values to Traditional Owners/custodians. These include the Worimi, Wonnarua, Awabakal, Darkinung, Kurin-gai, Eora, Dharug, Tharawal/D'harawal, Yuin, Bidwell and the Kurnai groups.

E2. Indigenous cultural values associated with the ecological community

The ecological community has many cultural values and important cultural land management practices required to keep it healthy — like cultural burning, camping and resource use. Places, cultural values and practices, ecological features, timing/seasons, and Indigenous language are all intrinsically linked within the ecological community and the broader Indigenous landscape. For example, certain plants (flowering times, or other cyclical events) are used to indicate when to move from one camp to another.

Living and camping places are usually geographically close to resource collection places, as are teaching and work places. When natural resources are collected and processed, Elders pass on traditional ecological knowledge to the next generation, teaching them how to collect and prepare food, medicines or items of material culture (Donaldson 2010). Other important places with Aboriginal heritage significance include places of conflict, travelling routes, historical Aboriginal Reservations, burial places and spiritual places.

Native plants and animals from the ecological community are traditionally used for food, medicine and materials to build camps and for other useful implements. For example, where the ecological community occurs on Yuin country in south-east New South Wales, many of the trees in the ecological community have been used to make ***badhalwal*** (boomerangs), ***boondis***, ***nulla nullas***, spears, shields and ***coolamons*** and ***wandaya*** (water-carrying bowls); and the tall eucalypts were used to hang meat to protect it from blowflies. The wood and bark from the eucalypts have also been used to build shelters and sometimes canoes. Eucalypt trees like ***gurndiira*** (Ironbark) and ***dharawa*** (Cabbage Tree) are also important sources of ***guwanggal/gawanggal*** (honey) and provided habitat for ***garamunda*** (Flying-fox), ***gambaawa/guraban/koor-a-ban*** (Koala) and ***ngaralemu birribanj*** (Black Cockatoo). Muds are an important resource for a variety of purposes (e.g. medicinal, insect repellent).

The understorey and ground cover plants also provide food and shelter for animals like ***djundula*** (Goanna) and ***buru*** (Kangaroo). Climbers and scramblers, like native sarsaparilla were used to relieve pain, arthritis and coughs and to make a tonic that purifies the blood and manage diabetes. The shoots of Scrambling Lily, another vine, were eaten. Other important plants found within the ecological community include ***manga*** (fern), ***yuwiya*** (Myrtle) and ***guraaman*** (Kurrajong).

The ***ngadjung*** (fresh water) creeks and rivers found in the ecological community also support other culturally important animals like ***bilima*** (turtles), ***barra***/***burra*** (eels) and ***mara*** (fish), for example ***warigala*** (mullet), ***gurgard*** (frogs), ***bangawu/bungaoo*** (lizards), as well as ***wambaara*** (Black Duck) and other water birds. Important digging animals include ***miridjiga*** and ***guragur*** (long-nosed and short nosed bandicoots) and ***ganagubadh/ kan'-na-go-badh'*** (Echidna).

Source: NSW NPWS (2014); Moore (2019); Donaldson (2010).

APPENDIX F – MANAGEMENT ACTIONS TO MITIGATE THE IMPACTS OF THE 2019-2020 BUSHFIRES

The bushfires of 2019-20 severely impacted many species and ecological communities. Management intervention is needed to reduce the chance of extinctions, and to maximise the chances for long term recovery of native species and communities.

The Wildlife and Threatened Species Bushfire Recovery Expert Panel identified the species and ecological communities that are priorities for management intervention and outlined the most relevant management interventions needed. Details of these are at: http://www.environment.gov.au/biodiversity/bushfire-recovery

The River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria is in need of management intervention in its own right, with approximately half of its distribution occurring within the fire extent. Additionally it contains twelve species[20] individually identified as high priorities for management intervention. The relevant management interventions for the ecological community as a whole and for these individual species are outlined below.

F1 River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria

The following candidate management actions are recommended to mitigate immediate adverse impacts, abate ongoing threats and/or build resilience in the threatened ecological community. They are based on an assessment of the exposure and susceptibility of the threatened ecological community to the range of mechanisms likely to drive degradation, loss of diversity and function in response to fire.

- Undertake post-fire on-ground surveys to quantify impacts, management needs and monitor recovery.
- Minimise drought impacts, exclude fire, minimise disturbance to soil and vegetation, and minimise grazing.
- Protect unburnt fire refuges from future fires.
- Protect burnt areas from future fires.
- Install targeted fencing to exclude livestock, feral grazers, or overabundant native herbivores.
- Control feral pigs, deer and hares/rabbits.
- Control feral predators.
- Monitor tree heath and psyllid/carabid outbreaks, minimise nutrient influx, exclude fire, control outbreaks and re-plant trees if required.
- Manage access to enable recovery.
- Manage structural components of sites and undertake habitat supplementation.
- Undertake weed surveys, treatment and removal.
- Restore/manage groundwater or surface flows.
- Undertake erosion/sedimentation mitigation works.
- Undertake strategic research to develop or assess management options.

[20] According to the provisional list of 119 animal species released on 24 March 2020 and priority lists of plant and invertebrate species released on 23 April 2020. Additional species may be identified in subsequent updates.

F2 Individual species

The following individual species within the ecological community were identified as high priorities for management intervention[20].

- Regent Honeyeater (*Anthochaera phrygia*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*)
- Eastern Bristlebird (*Dasyornis brachypterus*)
- Greater Glider (*Petauroides volans*)
- Yellow-belied Glider (*Petaurus australis*)
- Koala (*Phascolarctos cinereus*)
- New Holland Mouse/Pookila (*Pseudomys novaehollandiae*)
- Giant Burrowing Frog (*Heleioporus australiacus*)
- Giant Barred Frog (*Mixophyes iteratus*)
- Platypus (*Ornithorhynchus anatinus*)
- Golden-tipped Bat (*Phoniscus papuensis*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

Priority activities identified for these species include:

- Survey to establish extent of population loss, and establish baseline for ongoing monitoring
    - Relevant for all affected species.
- Protect unburnt areas within or adjacent to recently burnt ground that provide refuges; also protect unburnt areas that are not adjacent to burnt areas, especially from extensive, intense fire
    - Relevant for all affected species.
- Provide supplementary resources (shelter, food, and water) for animals where appropriate
    - Relevant for the Glossy Black-cockatoo, Greater Glider (provide hollows), Koala, Yellow-belied Glider (provide hollows) and New Holland Mouse/ Pookila.
- Undertake feral herbivore control to reduce the pressure on native species by excluding herbivores from unburnt and regenerating vegetation
    - Relevant for the Glossy Black-cockatoo, Eastern Bristlebird, New Holland Mouse/ Pookila, Giant Burrowing Frog, Giant Barred Frog, and Platypus.
- Undertake feral predator control to reduce the pressure on native species by controlling introduced predators
    - Relevant for the Gang-gang Cockatoo (protect nests from native and introduced predators), Eastern Bristlebird, New Holland Mouse/ Pookila, Giant Burrowing Frog and Platypus.
- Consider emergency salvage/capture of animal species for ex-situ conservation or wild-to-wild translocation following careful risk assessment
    - May be relevant for the Regent Honeyeater (if starvation is evident), Eastern Bristlebird, Greater Glider, Yellow-belied Glider, Koala (if salvage into care

required for welfare reasons), New Holland Mouse/ Pookila, Giant Burrowing Frog, Platypus, and Grey-headed Flying-fox (if salvage into care required for welfare reasons).

- Consider salvage/translocation to nearby unburnt habitat or havens.
    - May be relevant for the Eastern Bristlebird.
- Undertake specific additional actions.
    - For the Regent Honeyeater — control native competitors such as Noisy Miner in key locations.
    - For the Glossy Black-cockatoo — on-ground assessment should include: mapping unburnt stands of *Allocasuarina*, assessing availability of hollows in proximity to these and determining fire impacts on hollow availability; re-establishing food supply in areas where fire has resulted in long-term loss of *Allocasuarina* stands and natural regeneration will be insufficient to meet future needs; re-establishing water resources where erosion and sedimentation post fire has drained/filled in critical water holes.
    - For the Grey-headed Flying-fox — engage with the community as flying foxes can move into adjacent urban areas following drought and fire.

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