

APPENDIX D - THREATENED SPECIES PROFILES

The following profiles are sourced from the Department of Environment and Climate Change.

Lowland Rainforest on Floodplain

Scientific name: Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion

Conservation status in NSW: **Endangered Ecological Community**

Description

Lowland Rainforest on Floodplain is a rainforest community which now occurs only as small remnants in scattered localities on the NSW north coast, with less than 1000ha in total thought to remain. Larger stands of the community typically have a dense canopy, which blocks most light from reaching the ground, creating cool, moist conditions within. Lowland Rainforest on Floodplain supports a rich diversity of plants and animals. Typical tree species in the community include figs *Ficus macrophylla*, *F. obliqua* and *F. watkinsiana*, palms *Archontophoenix cunninghamiana* and *Livistona australis*, Silky Oak *Grevillea robusta*, Black Bean *Castanospermum australe* and Brush Cherry *Syzygium australe*. Animals present include fruit-eating rainforest pigeons, Noisy Pitta, Brush-turkey, pademelons, flying foxes, the Land Mullet skink and rainforest snails.

Distribution

The NSW north coast.

Habitat and ecology

This community occurs on fertile soils in lowland river valleys.

Threats

- Clearing and fragmentation of habitat for development and agriculture.
- Invasion of community by introduced weeds, particularly exotic vines and lantana.
- Degradation of habitat by fire.
- Degradation of habitat by grazing stock.
- Dumping of rubbish within rainforest remnants.



Image: Michael Murphy ©
Michael Murphy

References

- NSW NPWS (2002). *Threatened Species of the Upper North Coast of NSW: Flora*. NSW NPWS, Coffs Harbour, NSW.
- NSW Scientific Committee (1999) *Lowland rainforest on floodplain in the NSW North Coast Bioregion - Endangered ecological community determination - final*. DEC (NSW), Sydney.

Swamp Sclerophyll Forest on Coastal Floodplains

Scientific name:

Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.

Conservation status in NSW: Endangered Ecological Community

Description

This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The trees may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality where the tree stratum is low and dense. For example, stands dominated by *Melaleuca ericifolia* typically do not exceed 8 m in height. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent.



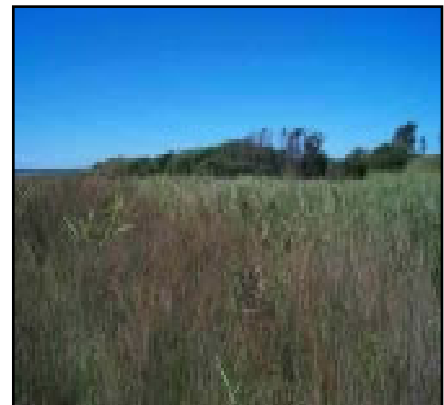
Melaleuca shrubland, Swamp Sclerophyll Forest. Image: R. Payne © DEC.

The most widespread and abundant dominant trees include *Eucalyptus robusta* (swamp mahogany), *Melaleuca quinquenervia* (paperbark) and, south from Sydney, *Eucalyptus botryoides* (bangalay) and *Eucalyptus longifolia* (woollybut). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (sweet willow bottlebrush), *Casuarina glauca* (swamp oak) and *Eucalyptus resinifera* subsp. *hemilampra* (red mahogany), *Livistona australis* (cabbage palm) and *Lophostemon suaveolens* (swamp turpentine).

A layer of small trees may be present, including *Acacia irrorata* (green wattle), *Acmena smithii* (lilly pilly), *Elaeocarpus reticulatus* (blueberry ash), *Glochidion ferdinandi* (cheese tree), *Melaleuca linariifolia* and *M. styphelioides* (paperbarks).

Shrubs include *Acacia longifolia*, *Dodonaea triquetra*, *Ficus coronata*, *Leptospermum polygalifolium* subsp. *polygalifolium* and *Melaleuca* spp.. Occasional vines include *Parsonsia straminea*, *Morinda jasminoides* and *Stephania japonica* var. *discolor*.

The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei*, *Pteridium esculentum*, *Hypolepis muelleri*, *Calochlaena dubia*, *Dianella caerulea*, *Viola hederacea*, *Lomandra longifolia*, *Entolasia marginata* and *Imperata cylindrica*.



Reedland, Swamp Sclerophyll Forest. Image: Chris Pennay © ChrisPennay.

On sites downslope of lithic substrates or with soils of clay-loam texture, species such as *Allocasuarina littoralis*, *Banksia oblongifolia*, *B. spinulosa*, *Ptilothrix deusta* and *Themeda australis*, may also be present in the understory. Characteristic species are listed in the final determination for this complex.

Distribution

This community is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, Lake Macquarie, Wyong, Gosford, Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland, Wollongong, Shellharbour, Kiama and Shoalhaven but may occur elsewhere in these bioregions. Major examples once occurred on the floodplains of the Tweed, Richmond, Clarence, Macleay, Hastings and Manning Rivers, although smaller floodplains would have also supported considerable areas of this community.

The exact amount of its original extent is unknown but it is much less than 30%. There are less than 350 ha of native vegetation attributable to this community on the Tweed lowlands, less than 2,500 ha on the Clarence floodplain, less than 700 ha on the Macleay floodplain, up to 7,000 ha in the lower Hunter – central coast district, and less than 1,000 ha in the Sydney – South Coast region.

Small areas of Swamp Sclerophyll Forest on Coastal Floodplains are contained within existing conservation reserves, including Bungawalbin, Tuckean and Moonee Beach Nature Reserves, and Hat Head, Crowdy Bay, Wallingat, Myall Lakes and Garigal National Parks. These occurrences are unevenly distributed throughout the range and unlikely to represent the full diversity of the community. In addition, wetlands within protected

areas are exposed to hydrological changes that were, and continue to be initiated outside their boundaries. Some areas of Swamp Oak Floodplain Forest are protected by State Environmental Planning Policy 14, although this has not always precluded impacts on wetlands from the development of major infrastructure.

Habitat and ecology

- Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains.
- Generally occurs below 20 m (though sometimes up to 50 m) elevation.
- The composition of the community is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil, and latitude. The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.



Forest Red Gum, Swamp Sclerophyll Forest. Image: R. Payne © DEC.

Threats

- Further clearing for urban and rural development, and the subsequent impacts from fragmentation
- Flood mitigation and drainage works

- Management of water and tidal flows
- Landfilling and earthworks associated with urban and industrial development
- Grazing and trampling by stock and feral animals (particularly pigs)
- Changes in water quality, particularly increased nutrients and sedimentation
- Weed invasion
- Climate change
- Activation of acid sulfate soils
- Removal of dead wood
- Rubbish dumping
- Frequent burning which reduces the diversity of woody plant species

References

- Benson, D. & Howell, J. (1994) The natural vegetation of the Sydney 1:100000 map sheet. *Cunninghamia* 3(4): 679-789.
- NSW Scientific Committee (2004) Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - Endangered ecological community determination - final. DEC (NSW), Sydney.

Swamp Oak Floodplain Forest

Introduction

These guidelines provide background information to assist land managers and approval authorities to identify remnants of Swamp Oak Floodplain Forest, an Endangered Ecological Community (EEC). For more detailed information refer to the Swamp Oak Floodplain Forest Profile and the NSW Scientific Committee Final Determination at: threatenedspecies.environment.nsw.gov.au



Lucas McKinnon

Many remnants of Swamp Oak Floodplain Forest are restricted to small areas surrounded by parkland with exotic grasses invading the understorey.



Lucas McKinnon

Trail bike and 4WD tracks reduce species diversity and expose large areas of edge to weed invasion

the level of salinity in the groundwater the understorey will be composed of salt tolerant grasses and herbs and in more saline areas by sedges and reeds. See 'Identifying Swamp Oak Floodplain Forest' below for further assistance.

The Scientific Committees final determination of the Swamp Oak Floodplain Forest does not delineate between higher and lower quality remnants of this community. It specifically notes that partial clearing and disturbance, in some instances, may have reduced this community to scattered trees and this disturbed type is still considered part of the EEC. Relatively few examples of this community would be unaffected by weedy taxa, including noxious species, such as those listed in a variety of key threatening processes (e.g. Lantana, introduced perennial grasses and exotic vines / creepers).

What is an Endangered Ecological Community?

An ecological community is an assemblage of species which can include flora, fauna and other living organisms that occur together in a particular area. They are generally recognised by the trees, shrubs and groundcover plants that live there. An Endangered Ecological Community is an ecological community listed as facing a very high risk of extinction in NSW under the *Threatened Species Conservation Act 1995*.

What is Swamp Oak Floodplain Forest?

Swamp Oak Floodplain Forest is a community of plants that is generally dominated by the tree/s Swamp Oak (*Casuarina glauca*) and/or Swamp Paperbark (*Melaleuca ericifolia*). The community is found in close proximity to rivers and estuaries and is generally found on soils with a saline influence. The soils of the community may be quite wet and as such the composition of species present will vary markedly from site to site. Depending on



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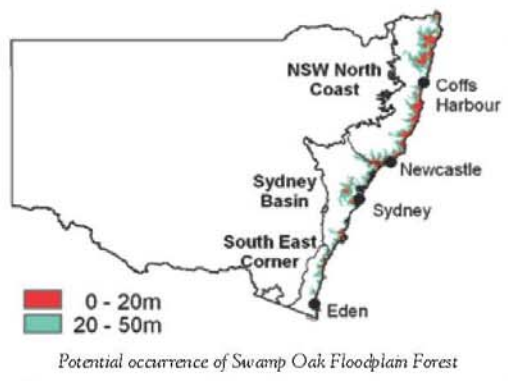
In the past, areas of Swamp Oak Floodplain Forest were cleared for grazing and have been converted to grass paddocks with no overstorey.



Identification Guidelines for Endangered Ecological Communities

Where is Swamp Oak Floodplain Forest found?

Swamp Oak Floodplain Forest is associated with humic clay and sandy loam soils on waterlogged or periodically flooded areas. These soils are generally deposited during flood events and occur on the flats and drainage lines of the Coastal Floodplain. The community is usually found below 20m in elevation although sometimes up to 50 m elevation on small floodplains or where the larger floodplains adjoin lithic (rocky) substrates or coastal sand plains. It is found in the NSW North Coast, Sydney Basin and South East Corner bioregions as mapped below.



Description of the community

Characteristic species

A list of trees, shrubs and ground cover species that characterise Swamp Oak Floodplain Forest have been identified by the NSW Scientific Committee (see table).

The tree layer

The tree layer of Swamp Oak Floodplain Forest is most commonly made up of Swamp Oak (*Casuarina glauca*), but will also include other trees such as Lilly Pilly (*Acmena smithii*), Cheese Tree (*Glochidion ferdinandi*) and Paperbarks (*Melaleuca* spp.). South from Bermagui, Swamp Paperbark (*Melaleuca ericifolia*) is the only abundant tree in this community. The density of tree

What is the Coastal Floodplain?

Floodplains are level landform patterns on which there may be active erosion and deposition by flooding where the average interval is 100 years or less.

Coastal floodplains include coastal river valleys, alluvial flats and drainage lines below the escarpment of the Great Dividing Range. While most floodplains are below 20m in elevation, some may occur on localised river flats up to 250m elevation. However, there may be local variation associated with river channels, local depressions, natural levees and river terraces. The latter are areas that rarely flood anymore due to the deepening or widening of streams.



Laura McKinnon

Swamp Oak Floodplain Forest can be seen here intergrading with Coastal Saltmarsh.

species (i.e. the number of any particular species at any one site), is not a critical factor in determining the presence or absence of this community as this will vary depending on site history (grazing, clearing etc).

Shrubs and Groundlayer plants

The understorey of this community is characterised by frequent occurrences of vines such as: Common Silkpod (*Parsonia straminea*), Scrambling Lily (*Geitonoplesium cymosum*) and Snake Vine (*Stephania japonica*). There may be a sparse layer of shrubs and a number of small herbs such as Indian Pennywort (*Cenella asiatica*), Commelina (*Commelina cyanea*), Slender Knotweed (*Panicum decipiens*) and Viola spp.. Grasses and grass type plants also occur like Tussock Sedge (*Carex appressa*), Tall Saw Sedge (*Gahnia clarkii*) and Basket Grass (*Oplismenus imbecillis*). On the fringes of coastal estuaries where soils are more saline the groundcover moves towards Common Reed (*Phragmites australis*), Sea Rush (*Juncus kraussii*) and saltmarsh type species.

How can I identify areas of Swamp Oak Forest?

The following are 'Key Indicators' to look for when determining whether Swamp Oak Floodplain Forest exists on a site:

1. Is the site on the coastal floodplain of the NSW North Coast, Sydney Basin or South East Corner bioregion (see map)?
2. Is the site associated with humic clay or sandy loams soils (refer to soil maps)?
3. Is the site subject to waterlogging and/or below the highest flood level (check with Local Government or Catchment Management Authority to determine highest flood mark)?
4. Is the site dominated by Swamp Oak or Swamp Paperbark? (check with local botanist, consult reference books or see plantnet.rbgsyd.nsw.gov.au)
5. Are any characteristic shrub and/or groundlayer species present (see table)?

If you answered yes to the above questions your site is likely to be Swamp Oak Floodplain Forest.

Characteristic Species List

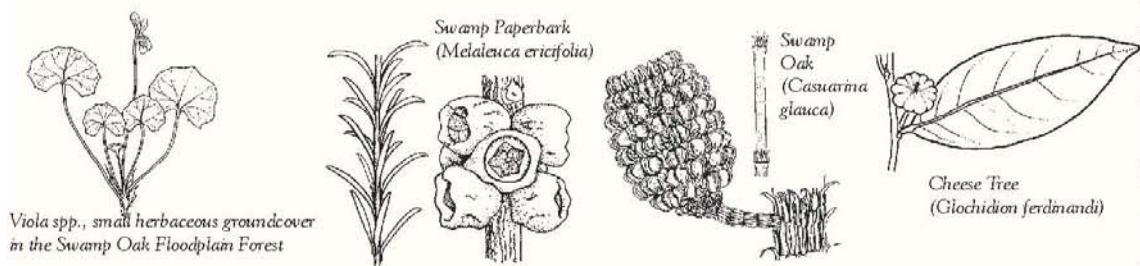
Swamp Oak Floodplain Forest is characterised by the species listed below. The species present at any site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including fire and logging) history. Note that NOT ALL the species listed below need to be present at any one site for it to constitute Swamp Oak Floodplain Forest.

| Scientific Name | Common Name (Range) |
|--|---------------------------------|
| Tree Canopy Species (>6m) | |
| <i>Alphitonia excelsa</i> | Red Ash (N-Sho) |
| <i>Casuarina glauca</i> | Swamp Oak + |
| <i>Cupaniopsis anacardioides</i> | Tuckeroo (N-Sho) |
| <i>Lophostemon suaveolens</i> | Swamp Turpentine (N-Coffs) |
| <i>Melaleuca ericifolia</i> | Swamp Paperbark + (S-P-Mac) |
| <i>Melaleuca quinquecervaria</i> | Broad leaved Paperbark (N-Syd) |
| <i>Melaleuca styphelioides</i> | Prickly-leaved Tea Tree (N-Sho) |
| Small Trees / Shrub Species (1.5-6m) | |
| <i>Acmena smithii</i> | Lilly Pilly |
| <i>Callistemon salignus</i> | Sweet Willow Bottlebrush |
| <i>Glochidion ferdinandi</i> | Cheese Tree + |
| <i>Glochidion sumatranum</i> | Umbrella Cheese Tree (N-Coffs) |
| <i>Homalanthus populifolius</i> | Bleeding Heart |
| <i>Melaleuca alternifolia</i> | Narrow-leaved paperbark (N-Gra) |
| <i>Myoporum acuminatum</i> | Boobiolla |
| Groundcover Species (0-1.5m) & Vines/Scramblers | |
| Herbs / Ferns | |
| <i>Alternanthera denticulata</i> | Lesser Joyweed |
| <i>Blechnum indicum</i> | Swamp Water-fern (N-J-Bay) |
| <i>Centella asiatica</i> | Indian Pennywort + N-Illa) |
| <i>Commelina cyanea</i> | Commelina + (N-Nar) |
| <i>Erydra fluctuans</i> | An Erydra (N-Syd) |
| <i>Hypolepis muelleri</i> | Harsh Ground Fern |
| <i>Lobelia anceps</i> (formerly <i>L. alata</i>) | Angled Lobelia |
| <i>Persicaria decipiens</i> | Slender Knotweed |
| <i>Persicaria strigosa</i> | Prickly Smartweed |
| <i>Selliera radicans</i> | Swamp Weed (S-Gos) |
| <i>Viola banksii</i> | A Violet |

| Scientific Name | Common Name (Range) |
|--|--------------------------|
| Rushes / Grasses | |
| <i>Baumea juncea</i> | Bare Twig Rush |
| <i>Carex appressa</i> | Tall Sedge + |
| <i>Cynodon dactylon</i> | Sand Couch + |
| <i>Crinum pedunculatum</i> | Swamp Lily (N-J-Bay) |
| <i>Dianella caerulea</i> | Blue Flax Lily |
| <i>Eriolasia marginata</i> | Bordered Panic |
| <i>Gahnia clarkei</i> | Tall Saw-sedge |
| <i>Imperata cylindrica</i> var. <i>major</i> | Blady Grass |
| <i>Isolepis inundata</i> | Swamp Club-sedge |
| <i>Juncus kraussii</i> subsp. <i>australiensis</i> | Sea Rush + |
| <i>Juncus planifolius</i> | A Rush |
| <i>Juncus usitatus</i> | Common Rush |
| <i>Lomandra longifolia</i> | Ribbon Grass |
| <i>Maundia triglochoides</i> | Water Ribbons (N-Gos) |
| <i>Oplismenus imbecillis</i> | Basket Grass |
| <i>Phragmites australis</i> | Common Reed + |
| Vines | |
| <i>Parsonsia straminea</i> | Common Silkpod + (N-Sho) |
| <i>Stephania japonica</i> var. <i>discolor</i> | Snake Vine |
| <i>Flagellaria indica</i> | Whip Vine (N-Illa) |

+ = Key indicator species; N = North of; S = South of; Coffs = Coffs Harbour; Gos = Gosford; Gra = Grafton; Illa = Illawarra; J-Bay = Jervis Bay; Nar = Narooma; P-Mac = Port Macquarie; Sho = Shoalhaven; Syd = Sydney.

For further help with plant identification see: plantNET.rbg.gov.au/search/simple.htm



Sand Couch (*Cynodon dactylon*)



Common Silkpod (*Parsonsia straminea*)



Commelina (*Commelina cyanea*)

Illustrations © Botanic Gardens Trust 2007

Lucas McKinnon

EECs that may adjoin or intergrade with Swamp Oak Floodplain Forest

This community occurs with or would have previously occurred in association with other coastal floodplain vegetation types which are also listed as EECs. Collectively, these EECs cover all remaining native vegetation on the coastal floodplains of NSW. These EECs are:

1. *Coastal Saltmarsh* with increasing estuarine influence;
2. *Swamp Sclerophyll Forest on Coastal Floodplains* with decreasing estuarine influence;
3. *River-Flat Eucalypt Forest* or north of Port Stephens, *Sub-tropical Coastal Floodplain Forest*, on higher ground and where soils become less waterlogged;
4. *Freshwater Wetlands on Coastal Floodplains* where they adjoin more permanent standing water; and
5. *Lowland Rainforest on Floodplains* on more basaltic type soils north from Taree.

For further details on these communities please refer to other I.D. Guidelines or the Scientific Committee Final Determinations at: threatenedspecies.environment.nsw.gov.au

Determining the conservation value of remnants

The degree of disturbance (i.e. the site condition) of any remnant of Swamp Oak Floodplain Forest may vary depending on past land use, management practices and/or natural disturbance and this should be considered at the time of assessment. Whilst not exhaustive, the following are a number of variations of Swamp Oak Floodplain Forest you may encounter:

1. Dense regrowth stand after disturbance with limited understorey;
2. Tree canopy intact with an understorey of introduced weed species and few natives due to disturbance;
3. Recolonised patches of Swamp Oak in areas that may not have previously supported the community due to changes in drainage regime;

4. Tree canopy absent due to prior clearing, grazing or fire, occurrence of regrowth of native understorey species along with herbaceous and/or woody weeds; or
5. Open sedge land with scattered immature Swamp Oak where grazing has recently been removed.

Even where a remnant is considered to be heavily degraded and in poor condition, it may still have conservation value for a number of reasons including:

1. As part of a wildlife corridor that has connective importance at local and/or regional scales;
2. Providing important winter feed trees for arboreal mammals and birds;
3. Providing a 'stepping stone' for fauna in an otherwise cleared landscape; and/or
4. Maintaining a healthy native seed bank, very important in highly cleared landscapes.

It is important to take these factors into account when determining the conservation significance of remnants.

For further assistance

This and other EEC guidelines are available on DECC Threatened Species website threatenedspecies.environment.nsw.gov.au

The references listed below also provide further information to aid in identifying EECs.

- Botanic Gardens Trust plant identification assistance: rbgsyd.nsw.gov.au/information_about_plants/botanical_info/plant_identification
- Botanic Gardens Trust PlantNET: plantnet.rbgsyd.nsw.gov.au/search/simple.htm
- Harden, G. (ed) *Flora of NSW Vols 1 – 4* (1990-2002). NSW University Press.
- NSW Scientific Committee Determinations: nationalparks.nsw.gov.au/npws.nsf/Content/Final+determinations
- Robinson, L (2003) *Field guide to native plants of Sydney revised 3rd edition*. Kangaroo Press.
- Swamp Oak Floodplain Forest species profile: threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10945
- Thackway, R, and Cresswell, I. (1995)(eds) *'An interim biogeographic regionalisation of Australia: a framework for establishing the national system of reserves.'* (Australian Nature Conservation Agency: Canberra).

Disclaimer: The Department of Environment and Climate Change has prepared this document as a guide only. The information provided is not intended to be exhaustive. It does not constitute legal advice. Users of this guide should do so at their own risk and should seek their own legal and other expert advice in identifying endangered ecological communities. The Department of Environment and Climate Change accepts no responsibility for errors or omissions in this guide or for any loss or damage arising from its use.

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Sub-tropical Coastal Floodplain Forest

Introduction

These guidelines provide background information to assist landholders to identify remnants of Sub-tropical Coastal Floodplain Forest. For more detailed information, refer to the NSW Scientific Committee's Determination Advice at <http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Final+determinations>

What is an Endangered Ecological Community?

An ecological community is a group of trees, shrubs and understorey plants that occur together in a particular area. An Endangered Ecological Community is an ecological community listed under the *Threatened Species Conservation Act 1995* as being at risk of extinction unless threats affecting these areas are managed and reduced.

What is Sub-tropical Coastal Floodplain Forest?

Sub-tropical Coastal Floodplain Forest is a tall mixed forest occurring on coastal floodplains on the north coast of NSW. The most widespread and abundant dominant trees include Forest Red Gum (*Eucalyptus tereticornis*), Grey Ironbark

(*E. siderophloia*), Pink Bloodwood (*Corymbia intermedia*) and, north of the Macleay floodplain, Swamp Turpentine (*Lephostemon suaveolens*). A layer of small trees may be present, including Forest Oak (*Allocasuarina torulosa*) and a range of rainforest species such as Red Ash (*Alphitonia excelsa*) and Cheese Tree (*Glochidion fernandi*). Scattered shrubs and occasional vines may also be present. The groundcover is composed of abundant herbs, scramblers and grasses.

Where is Sub-tropical Coastal Floodplain Forest found?

Sub-tropical Coastal Floodplain Forest occurs north from Port Stephens. It has been recorded from all coastal and near-coastal local government areas.

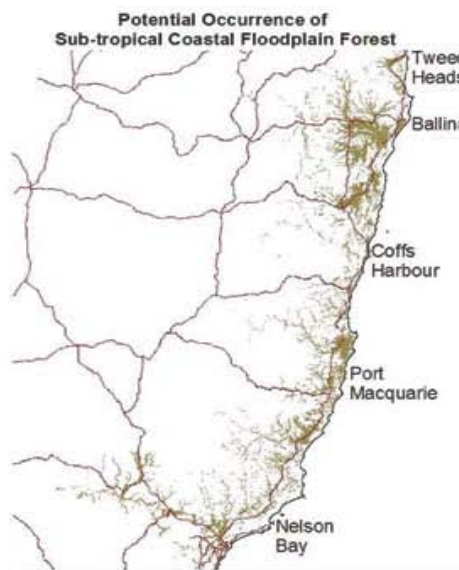
Why is it important?

Only a small area (less than 30%) of the original distribution of Sub-tropical Coastal Floodplain Forest remains, and these areas are often highly fragmented and threatened by clearing for cropping and pasture, timber harvesting, drainage works, pollution from urban run off and weed invasion.

What is the Coastal Floodplain?

Floodplains are level landform patterns on which there may be active erosion and deposition by flooding where the average interval is 100 years or less.

Coastal floodplains include coastal river valleys, alluvial flats and drainage lines below the escarpment of the Great Dividing Range. While most floodplains are below 20m in elevation, some may occur on localised river flats up to 250m elevation. Compared with the surrounding landscape, floodplains are generally quite flat. However, there may be local variation associated with river channels, local depressions, natural levees and river terraces. The latter are areas that rarely flood anymore due to deepening or widening of streams.



Identification Guidelines for Endangered Ecological Communities

Description of the community

The tree layer

The tree layer of Sub-tropical Coastal Floodplain Forest varies considerably, however, the most widespread and abundant dominant trees include Forest Red Gum, Grey Ironbark, Pink Bloodwood and, north of the Macleay floodplain, Swamp Turpentine.

Other less common trees may also be present, particularly where soil type is influenced from rocks upslope. These include Grey Box (*Eucalyptus moluccana*), Grey Gum (*E. propinqua*), Narrow-leaved Red Gum (*E. seeana*), Broad-leaved Apple (*Angophora subvelutina*), Swamp Mahogany (*E. robusta*), Red Mahogany (*E. resinifera* subsp. *hemilampra*), White mahogany (*E. acmenoides*), *Angophora woodsiana*, *A. paludosa* and rainforest trees such as Figs (*Ficus* spp.) and Tuckeroos (*Cupaniopsis* spp.). A number of other Eucalypt species may also occasionally occur.

The shrub layer

A layer of small trees may be present, including Forest Oak, Red Ash, Cheese Tree, Bottlebrushes (*Callistemon* spp.), Paperbarks (*Melaleuca* spp.) and Swamp Oak (*Casuarina glauca*).

Scattered shrubs include Coffee Bush (*Breynia*

oblongifolia), Curracabah (*Acacia concurrens*), (*Commersonia* spp.), and Native Hibiscus (*Hibiscus* spp.). Vines such as Wombat Berry (*Eustrephus latifolius*), Scrambling Lily (*Geitonoplesium cymosum*) and Common Silkpod (*Parsonsia straminea*) may occur occasionally.

The ground layer

The ground layer is made up of herbs, scramblers and grasses. These include Blady Grass (*Imperata cylindrica*), Kangaroo Grass (*Themeda australis*), Blue Flax Lily (*Dianella caerulea*), Whiteroot (*Pratia purpurascens*), Forest Fern (*Cheilanthes sieberi* subsp. *sieberi*), and Kidney Weed (*Dichondra repens*). The composition and structure of the ground layer is influenced by disturbances such as grazing and fire history, and may have a substantial component of weed species.



Forest Red Gum



Pink Bloodwood



Swamp Turpentine

John Tarrbill

How can I identify an area of Sub-tropical Coastal Floodplain Forest?

The following is a list of key characteristics to help identify an area of Sub-tropical Coastal Floodplain Forest:

- Is the site north of Port Stephens?
- Is the site on the coastal floodplain (see "What is the Coastal Floodplain" on previous page)?
- Is the tree layer made up of mixed eucalypts?
- Does the tree layer contain any of the following: Forest Red Gum, Grey Ironbark, Pink Bloodwood or, north of the Macleay floodplain, Swamp Turpentine?
- Are rainforest trees or shrubs scattered throughout?
- Are there relatively low numbers of *Casuarina* species, *Melaleuca* species and Swamp Mahogany?

If you answered yes to the above questions, the area is likely to be Sub-tropical Coastal Floodplain Forest.

Characteristic species

A list of canopy trees and understorey plants that characterise a patch of Sub-tropical Coastal Floodplain Forest is provided in the Table below. Not all the species listed need to occur at any one site for it to be considered Sub-tropical Coastal Floodplain Forest. Conversely, other species not listed may also form part of this community.

Variation in the community

At heavily disturbed sites only some of the species which characterise the community may be present. In addition, above ground plants of some species may not be present, but may be represented below ground in the soil seed banks or as bulbs, corms, rhizomes or rootstocks.

What does this mean for my property?

As a listed Endangered Ecological Community under the *Threatened Species Conservation Act 1995*, Sub-tropical Coastal Floodplain Forest has significant conservation value and some activities may require consent or approval. Please contact the Department of Environment and Conservation for further information.

Species List

Sub-tropical Coastal Floodplain Forest is characterised by the species listed in the table below. The species present at any site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including fire and logging) history. Note that **NOT ALL** the species listed below need to be present at any one site for it to constitute Sub-tropical Coastal Floodplain Forest.

| Scientific Name | Common Name | Scientific Name | Common Name |
|---|-------------------------|--|-----------------------------|
| Trees | | Grasses | |
| <i>Angophora paludosa</i> | | <i>Aristida vagans</i> | Threeawn Speargrass |
| <i>Angophora subvelutina</i> | Broad-leaved Apple | <i>Cymbopogon refractus</i> | Barbed Wire Grass |
| <i>Angophora woodsiana</i> | | <i>Dichelachne micrantha</i> | Shorthair Plumegrass |
| <i>Allocasuarina torulosa</i> | Forest Oak | <i>Digitaria parviflora</i> | Small-flowered Finger Grass |
| <i>Alphitonia excelsa</i> | Red Ash | <i>Echinopogon caespitosus</i> | Hedgehog Grass |
| <i>Brachychiton populneus</i> | Kurrajong | <i>Entolasia marginata</i> | Bordered Panic |
| <i>Callitris columellaris</i> | A native Cypress Pine | <i>Entolasia stricta</i> | Wiry Panic |
| <i>Casuarina cunninghamiana</i> | River Oak | <i>Eragrostis leptostachya</i> | Paddock Lovegrass |
| <i>Casuarina glauca</i> | Swamp Oak | <i>Imperata cylindrica</i> var. <i>major</i> | Blady Grass |
| <i>Corymbia intermedia</i> | Pink Bloodwood | <i>Microlaena stipoides</i> | - |
| <i>Drypetes australasica</i> | Yellow Tulipwood | <i>Panicum simile</i> | Two Colour Panic |
| <i>Glochidion ferdinandii</i> | Cheese Tree | <i>Themeda australis</i> | Kangaroo Grass |
| <i>Elaeocarpus reticulatus</i> | Blueberry Ash | Herbs and Ferns | |
| <i>Eucalyptus acmeniodes</i> | White Mahogany | <i>Brunoniella australis</i> | Blue Trumpet |
| <i>Eucalyptus amplifolia</i> | Cabbage Gum | <i>Centella asiatica</i> | Pennywort |
| <i>Eucalyptus mohuccana</i> | Grey Box | <i>Cheilanthes sieberi</i> | Forest Fern |
| <i>Eucalyptus propinqua</i> | Grey Gum | <i>Cymbidium suave</i> | Snake Orchid |
| <i>Eucalyptus resinifera</i> | Red Mahogany | <i>Commelina cyanea</i> | Native Wandering Jew |
| <i>Eucalyptus robusta</i> | Swamp Mahogany | <i>Cyperus enervis</i> | |
| <i>Eucalyptus seeana</i> | Narrow-leaved Red Gum | <i>Dianella caerulea</i> | Blue Flax Lily |
| <i>Eucalyptus siderophloia</i> | Small-fruited Grey Gum | <i>Dianella longifolia</i> | A flax lily |
| <i>Eucalyptus tereticornis</i> | Forest Red Gum | <i>Dichondra repens</i> | Kidney Weed |
| <i>Ficus macrophylla</i> | Moreton Bay Fig | <i>Gahnia aspera</i> | |
| <i>Ficus obliqua</i> | Small-leaved Fig | <i>Gahnia clarkei</i> | |
| <i>Ficus superba</i> var. <i>herneana</i> | Deciduous Fig | <i>Lomandra filiformis</i> | A mat rush |
| <i>Lophostemon suaveolens</i> | Swamp Box | <i>Lomandra longifolia</i> | Spiny-headed Mat Rush |
| <i>Mallotus philippensis</i> | Red Kamala | <i>Lomandra multiflora</i> | A mat rush |
| <i>Melaleuca quinquenervia</i> | Broad-leaved Paperbark | <i>Oplismenus aemulus</i> | |
| Small trees/shrubs | | <i>Oplismenus imbecillis</i> | |
| <i>Acacia concurrens</i> | Curcabah | <i>Pratia purpurascens</i> | Whiteroot |
| <i>Acacia disparima</i> | | <i>Pteridium esculentum</i> | Bracken Fern |
| <i>Breynia oblongifolia</i> | Coffee Bush | <i>Vernonia cinerea</i> | |
| <i>Callistemon salignus</i> | White Bottlebrush | <i>Viola hederacea</i> | Native Violet |
| <i>Callistemon viminalis</i> | Weeping Bottlebrush | <i>Lagenifera stipitata</i> | |
| <i>Commersonia bartramia</i> | Brown Kurrajong | <i>Laxmannia gracilis</i> | |
| <i>Commersonia fraseri</i> | Brush Kurrajong | <i>Phyllanthus virgatus</i> | |
| <i>Cordylina congesta</i> | Tooth-leaved Palm Lily | <i>Sigesbeckia orientalis</i> | |
| <i>Cupaniopsis anacardioides</i> | Tuckeroo | <i>Tricoryne elatior</i> | |
| <i>Cupaniopsis parviflora</i> | Small-leaved Tuckeroo | Vines | |
| <i>Hibiscus diversifolius</i> | Swamp Hibiscus | <i>Cissus hypoglauca</i> | Water Vine |
| <i>Hibiscus tiliaceus</i> | Cottonwood Hibiscus | <i>Desmodium rhytidophyllum</i> | |
| <i>Howea acutifolia</i> | A native pea | <i>Desmodium varians</i> | Slender Tick-trefoil |
| <i>Melaleuca alternifolia</i> | A tea tree | <i>Eustrephus latifolius</i> | Wombat Berry |
| <i>Melaleuca decora</i> | A tea tree | <i>Geitonoplesium cymosum</i> | Scrambling Lily |
| <i>Melaleuca nodosa</i> | A tea tree | <i>Glycine clandestina</i> | |
| <i>Melaleuca styphelioides</i> | Prickly-leaved Tea Tree | <i>Hardenbergia violacea</i> | False Sarsparilla |
| <i>Notelaea longifolia</i> | Native Olive | <i>Hibbertia scandens</i> | Climbing Guinea Flower |
| <i>Persoonia stradbrokeensis</i> | A Geebung | <i>Kennedia rubicunda</i> | Red Kennedy Pea |
| <i>Pimelea linifolia</i> | Rice Flower | <i>Machura cochinchinensis</i> | Cockspur Thorn |
| <i>Pittosporum revolutum</i> | Hairy Pittosporum | <i>Morinda jasminoides</i> | Morinda Vine |
| <i>Wikstroemia indica</i> | | <i>Parsonia straminea</i> | Common Silkpod |
| | | <i>Smilax australis</i> | Native Sarsparilla |
| | | <i>Smilax glycyphylla</i> | Sweet Sarsparilla |
| | | <i>Stephania japonica</i> | Snake Vine |



Determining the conservation value of remnants

The degree of disturbance (i.e. condition) of many remnants can vary, from almost pristine to highly modified. It is important to note that even small patches or areas that have been disturbed in the past by activities such as selective logging, fire or grazing may still be important remnants of Sub-tropical Coastal Floodplain Forest and be considered the EEC. Where difficulties arise when faced with decisions on whether particular sites are Sub-tropical Coastal Floodplain Forest, expert advice may be needed.

Retaining mature native vegetation or EECs for conservation purposes may attract incentive funding. Funding is allocated to landholders by the local Catchment Management Authority (CMA) according to the priorities set out in their Catchment Action Plan and strategies. For more information contact your local CMA or email: info@nativevegetation.nsw.gov.au



John Turbill

Examples of Sub-tropical Coastal Floodplain Forest Endangered Ecological Community at Urunga Lagoon

Disclaimer: The Department of Environment and Climate Change has prepared this document as a guide only. The information provided is not intended to be exhaustive. It does not constitute legal advice. Users of this guide should do so at their own risk and should seek their own legal and other expert advice in identifying endangered ecological communities. The Department of Environment and Climate Change accepts no responsibility for errors or omissions in this guide or for any loss or damage arising from its use.

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For further assistance

This and other EEC guidelines are available on the DECC website: at www.environment.nsw.gov.au

The references listed below also provide further information on EECs.

- NSW Scientific Committee Determinations: <http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Final+determinations>
- Department of Environment and Climate Change (NSW) Threatened Species profiles: <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>
- Botanic Gardens Trust plant identification assistance: http://www.rbgsyd.nsw.gov.au/information_about_plants/botanical_info/plant_identification
- Brooker, M. and Kleinig, D. (1990) Field Guide to Eucalypts of South-eastern Australia, Vol 2. Inkata, Melbourne.
- Harden, G. (ed) Flora of NSW Vols 1 – 4 (1990-2002). NSW University Press.
- Harden, G., McDonald, W. and Williams, J. (2006) Rainforest Trees and Shrubs – A Field Guide to their identification. Gwen Harden Publishing, Nambucca Heads.



Freshwater Wetlands on Coastal Floodplains (Freshwater Wetlands)

Introduction

These guidelines provide background information to assist land managers and approval authorities to identify remnants of Freshwater Wetlands on Coastal Floodplains (hereafter referred to as Freshwater Wetlands), an Endangered Ecological Community (EEC). For more detailed information refer to the Freshwater Wetlands Profile and the NSW Scientific Committee Final Determination at: threatenedspecies.environment.nsw.gov.au

What is an Endangered Ecological Community?

An ecological community is an assemblage of species which can include flora, fauna and other living organisms that occur together in a particular area. They are generally recognised by the trees, shrubs and groundcover plants that live there. An Endangered Ecological Community is an ecological community listed as facing a very high risk of extinction in NSW under the *Threatened Species Conservation Act 1995*.

What are Freshwater Wetlands?

Freshwater Wetlands is an ecological community associated with periodic, semi-permanent or permanent inundation by freshwater, although there may be minor saline influence in some wetlands. Meadows of grasses, sedges and rushes

What is the Coastal Floodplain?

Floodplains are level landform patterns on which there may be active erosion and deposition by flooding where the average interval is 100 years or less.

Coastal floodplains include coastal river valleys, alluvial flats and drainage lines below the escarpment of the Great Dividing Range. While most floodplains are below 20m in elevation, some may occur on localised river flats up to 250m elevation. However, there may be local variation associated with river channels, local depressions, natural levees and river terraces. The latter are areas that rarely flood anymore due to the deepening or widening of streams.

occur where submersion is not prolonged, while aquatic herbs dominate where semi-permanent or permanent standing water is present. Under the influence of saline water tall reeds and rushes dominate. The boundaries of Freshwater Wetlands are dynamic, and vary greatly depending on rain and other climatic factors. A remnant may be considered part of the EEC even when the site is completely dry (see photos).

The final determination of the NSW Scientific Committee for Freshwater Wetlands does not delineate between higher and lower quality remnants of this community. It specifically notes that the composition and structure of the vegetation found is influenced by grazing history, changes to drainage regime and soil

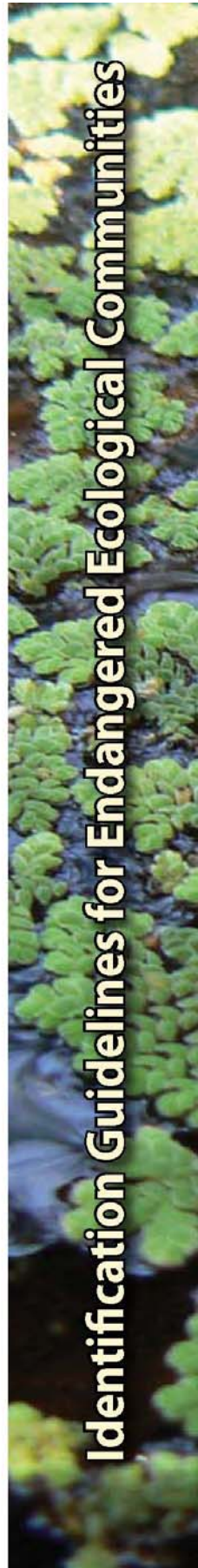
salinity, catchment runoff and disturbance, and may have a substantial component of exotic grasses and forbs. These degraded states are still considered to be part of this ecological community.

Whilst artificial wetlands created on previously dry land for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community, they may still provide important habitat for threatened species.

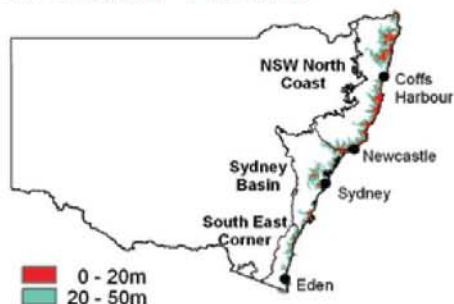
The variation in species composition and vegetation structure between seasons can be seen clearly below.



Photographs: Jocelyn Howell



Where are Freshwater Wetlands found?



Freshwater Wetlands typically occur on silts, muds or heavy loam soils in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with the Coastal Floodplain (see page 1) and are not influenced by tidal exchange. The community is usually found below 20m in elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions as mapped above.

Description of the community

The Tree and Shrub layer

Freshwater Wetlands typically have a scarcity to complete absence of woody species, but as they co-exist with other forested vegetation types (e.g. Swamp Oak Floodplain Forest), there may be scattered occurrences of *Casuarina* or *Melaleuca* species found within them, particularly around wetland edges and in transition areas between these communities.

The Reed layer

The community will often consist of large patches of Broad-leaved Cumbungi (*Typha* species) or Common Reed (*Phragmites australis*). These reeds will often exceed 2m in height and can form large monocultures.

The Ground layer - Terrestrial and Aquatic Herbs

The structure and composition of the community varies throughout the year both in space and time depending on the water regime. The structure of the community may vary between years as well as between seasons (see photos).

Wetlands or parts of wetlands that lack standing water most of the time are usually dominated by dense grassland, sedge/land or rushland vegetation, often forming a turf less than 0.5m tall and dominated by amphibious plants including Water Couch (*Paspalum distichum*), Swamp Rice-grass (*Leersia hexandra*), Spiny Mud Grass (*Pseudoraphis spinescens*) and Tall Sedge (*Carex appressa*).

Wetlands or parts of wetlands subject to regular inundation and drying may include large emergent sedges / rushes over 1m tall, such as Jointed Twig-rush (*Baumea articulata*), Spike sedges (*Eleocharis* species), *Juncus usitatus*, *Pericaria* species, *Bolboscheonus* species and *Schoenoplectus* species and *Lepironia* (*Lepironia articulata*), as well as emergent or floating herbs such as Frogbit (*Hydrocharis dubia*), Frogmouth (*Philydrium*

lanuginosum), Water Primrose (*Ludwigia peploides* subsp. *montevidensis*), Nardoo (*Marsilea matricaria*) and Water Milfoils (*Myriophyllum* species).

As standing water becomes deeper or more permanent, amphibious and emergent plants become less abundant, while floating and submerged aquatic herbs become more abundant. These latter species include Azolla (*Azolla* species), Hornwort (*Ceratophyllum demersum*), Water Thyme (*Hydrilla verticillata*), Duckweeds (*Lemna* species), Water Snowflake (*Nymphoides indica*), Swamp Lily (*Ottelia ovalifolia*) and Pondweeds (*Potamogeton* species) and in the north of NSW, Giant Waterlily (*Nymphaea gigantea*).

EECs that may adjoin or intergrade with Freshwater Wetlands

This community occurs with, would have previously occurred with or closely resembles other coastal floodplain ecological communities which are now also listed as EECs. Collectively, these EECs cover all remaining native vegetation on the coastal floodplains of NSW. These EECs are:

1. Swamp Oak Floodplain Forest, Coastal Saltmarsh or Swamp Sclerophyll Forest on Coastal Floodplains where there is increasing estuarine influence;
2. River-Flat Eucalypt Forest on Coastal Floodplains and Sub-tropical Coastal Floodplain Forest (north of Port Stephens) where soils become less waterlogged;
3. Lowland Rainforest on Floodplain in the NSW North Coast bioregion;
4. Sydney Freshwater Wetlands: this community may include a component of woody plant species and is associated with sandplains in the Sydney Basin bioregion. It is distinct from Freshwater Wetlands on Coastal Floodplains.

Collectively, these communities encompass the full range of intermediate native vegetation assemblages on the Coastal Floodplain.

How can I identify areas of Freshwater Wetlands

The following are 'Key Indicators' to look for when identifying Freshwater Wetlands:

1. Is the site on the coastal floodplain of the NSW North Coast, Sydney Basin or South East Corner bioregion (see map and box)?
2. Is the site periodically inundated with or does it maintain a body of semi-permanent or permanent freshwater?
3. Does the site consist of relatively few woody plants?
4. Are more than a few of the species present at the site listed as characteristic of Freshwater Wetlands in the table (check with local botanist, consult reference books or see plantnet.rbgsyd.nsw.gov.au/)?

If you answered yes to the above questions your site is likely to consist of Freshwater Wetlands and you should seek expert advice.

Characteristic Species List

Freshwater Wetlands are characterised by the species listed in table below. They have been identified by the NSW Scientific Committee and from the scientific literature. The species present at any site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including grazing and drainage changes) history. Note that NOT ALL the species listed below need to be present at any one site for it to constitute Freshwater Wetlands.

| Scientific Name | Common Name (range) | Scientific Name | Common Name (range) |
|--|-----------------------------|---|-----------------------------|
| Grasses | | <i>Fimbristylis dichotoma</i> | Common Fringe-sedge |
| <i>Hemarthria uncinata</i> | Matgrass | <i>Juncus polyanthemos</i> | A Sharp Rush (N - W'Gong) |
| <i>Leersia hexandra</i> | Swamp Ricegrass (N - Syd) | <i>Juncus usitatus</i> | Common Rush |
| <i>Panicum obspeutum</i> | White Water Panic | <i>Lepironia articulata</i> | Lepironia (N - Pict) |
| <i>Paspalum vaginatum</i> | Saltwater Couch | <i>Schoenoplectus subulatus</i> (formerly <i>Scirpus litoralis</i>) | Shore Club-sedge |
| <i>Paspalum distichum</i> | Water Couch | <i>Schoenoplectus mucronatus</i> | A Club Sedge (N - Syd) |
| <i>Pseudoraphis spinescens</i> | Spiny Mud-grass | <i>Schoenoplectus validus</i> | River Club-sedge |
| Herbs | | Aquatic Herbs | |
| <i>Cenipeda minima</i> | Spreading Sneezeweed | <i>Alisma plantago-aquatica</i> | Water Plantain |
| <i>Eclipta platyglossa</i> | Yellow Twin-heads | <i>Azolla filiculoides</i> var. <i>nubra</i> | Red Azolla |
| <i>Eclipta prostrata</i> | White Eclipta | <i>Azolla pinnata</i> | Azolla |
| <i>Gratiola pedunculata</i> | Stalked Brooklime | <i>Brasenia schreberi</i> | Watershield |
| <i>Ludwigia peploides</i> subsp. <i>montevideensis</i> | Water Primrose | <i>Ceratophyllum demersum</i> | Hornwort |
| <i>Maundia triglochoides</i> (T) | Small Water-ribbons (N-Syd) | <i>Hydrilla verticillata</i> | Water-thyme |
| <i>Myriophyllum crispatum</i> | Upright Water-milfoil | <i>Hydrocharis dubia</i> | Frogbit (N - Clar) |
| <i>Myriophyllum latifolium</i> | Water-milfoil | <i>Lemna</i> spp. (<i>L. disperma</i> & <i>L. trisulca</i>). | Duckweed |
| <i>Myriophyllum varifolium</i> | Variable Water-milfoil | <i>Marsilea mutica</i> | Nardoo |
| <i>Nymphoides geminata</i> | Entire Marshwort (N - Syd) | <i>Najas marina</i> | Prickly Waternymph |
| <i>Nymphoides indica</i> | Water Snowflake (N - Syd) | <i>Najas tenuifolia</i> | Waternymph |
| <i>Persicaria attenuata</i> | Smartweed | <i>Nymphaea gigantea</i> | Giant Waterlily (N - Coffs) |
| <i>Persicaria decipiens</i> | Slender Knotweed | <i>Ottelia ovalifolia</i> | Swamp Lily |
| <i>Persicaria hydropteris</i> | Water Pepper | <i>Philydrium lanuginosum</i> | Woolly Waterlily |
| <i>Persicaria lapathifolia</i> | Pale Knotweed | <i>Potamogeton crispus</i> | Curly Pondweed |
| <i>Persicaria strigosa</i> | Prickly Smartweed | <i>Potamogeton ochreatus</i> | Blunt Pondweed |
| <i>Ranunculus inundatus</i> | River Buttercup | <i>Potamogeton perfoliatus</i> | Clasped Pondweed |
| <i>Utricularia australis</i> | Floating Bladderwort | <i>Potamogeton tricarinatus</i> | Floating Pondweed |
| Reeds | | <i>Spirodela</i> spp. (<i>S. polyrhiza</i> & <i>S. punctata</i>) | Thin Duckweed |
| <i>Phragmites australis</i> | Common Reed | <i>Triglochin procera</i> | Water Ribbons |
| <i>Typha orientalis</i> | Broad-leaved Cumbungi | <i>Vallisneria gigantea</i> | Ribbonweed |
| Sedges & Rushes | | <i>Wolffia</i> spp. | Wolffia |
| <i>Baumea articulata</i> | Jointed Twig-rush | | |
| <i>Baumea rubiginosa</i> | Twig-rush | | |
| <i>Bolboschoenus caldwelii</i> | Club-rush | | |
| <i>Bolboschoenus fluviatilis</i> | Marsh Club-rush | | |
| <i>Carex appressa</i> | Tall Sedge | | |
| <i>Cyperus lucidus</i> | Leafy Flat Sedge | | |
| <i>Eleocharis acuta</i> | Common Spike Sedge | | |
| <i>Eleocharis equisetina</i> | A Spike Sedge (N - B-Bay) | | |
| <i>Eleocharis minuta</i> | A Spike Sedge (N - J-Bay) | | |
| <i>Eleocharis sphacelata</i> | Tall Spike Sedge | | |

N = North of; B-Bay = Batemans Bay; Clar = Clarence River; Coffs = Coffs Harbour; J-Bay = Jervis Bay; Pict = Picton; Syd = Sydney; W'Gong = Wollongong; (T) = threatened species. For further help with identification see: plantNET.rbgnsyd.nsw.gov.au/search/simple.htm



Azolla & *Slender Knotweed* herb, species in Freshwater Wetlands.
Photo: Lucas McKimmon

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| <i>Carex appressa</i> | Tall Sedge | | |
| <i>Cyperus lucidus</i> | Leafy Flat Sedge | | |
| <i>Eleocharis acuta</i> | Common Spike Sedge | | |
| <i>Eleocharis equisetina</i> | A Spike Sedge (N - B-Bay) | | |
| <i>Eleocharis minuta</i> | A Spike Sedge (N - J-Bay) | | |
| <i>Eleocharis sphacelata</i> | Tall Spike Sedge | | |

N = North of; B-Bay = Batemans Bay; Clar = Clarence River; Coffs = Coffs Harbour; J-Bay = Jervis Bay; Pict = Picton; Syd = Sydney; W'Gong = Wollongong; (T) = threatened species. For further help with identification see: plantNET.rbgnsyd.nsw.gov.au/search/simple.htm



Azolla & *Slender Knotweed* herb, species in Freshwater Wetlands.
Photo: Lucas McKimmon



The transition from Freshwater Wetlands to Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest can be seen here. Photo: Lucas McKinnon



Freshwater Wetland overgrown by the weed species, Water Hyacinth (*Eichhornia crassipes*). Photo: Lucas McKinnon



Freshwater Wetlands in a cleared landscape are an important conservation significance. Photo: Hugh Robertson



Freshwater Wetlands provide important feeding and breeding habitat for migratory birds like the Cattle Egret and Australian White Ibis as seen here. Photo: Szegette Rodoreda

Degraded sites ~ conservation significance of remnants

The degree of disturbance (i.e. the site condition) of any remnant of Freshwater Wetlands may vary depending on past land use, management practices and/or natural disturbance and this should be considered at the time of assessment. Whilst not exhaustive, the following are a number of variations of Freshwater Wetlands you may encounter on your land:

1. Damp depressions no longer subject to regular flooding due to changed drainage regimes such as upstream dams or drawdown from irrigation;
2. Damp depressions with low grass structure due to grazing or slashing (wetland species will often recover if this disturbance is removed);
3. Water bodies invaded with floating weeds such as Water Hyacinth (*Eichhornia crassipes*);
4. Vegetated waterbodies enclosed by artificial earthwalls for water storage;
5. Dry cracked soil with low grass type species emerging (i.e. during drought or drying phase);
6. Large monocultures of reed species such as Common Reed and/or Cumbungi.

Even where a remnant is considered to be heavily degraded and in poor condition, it may still have conservation value for a number of reasons including:

1. As part of a stream/wetland corridor that has connective importance for dispersal of native flora and aquatic organisms;
2. Providing important habitat and food source for freshwater fish and amphibian species;
3. Providing a water and food source for native mammal and bird species;
4. It may contain threatened species of flora such as *Aldrovanda vesiculosa*, *Marsilea triglochoides* and *Persicaria latifolia*; and/or
5. Maintaining a healthy native seed bank and preserving local provenance (i.e. genetic integrity).

It is important to take these factors into account when determining the conservation significance of remnants.

Disclaimer: The Department of Environment and Climate Change has prepared this document as a guide only. The information provided is not intended to be exhaustive. It does not constitute legal advice. Users of this guide should do so at their own risk and should seek their own legal and other expert advice in identifying endangered ecological communities. The Department of Environment and Climate Change accepts no responsibility for errors or omissions in this guide or for any loss or damage arising from its use.

For further assistance

This and other EEC guidelines are available on DECC Threatened Species website threatenedspecies.environment.nsw.gov.au/

The references listed below also provide further information to aid in identifying EECs.

- Aston, H.I. (1977) *Aquatic Plants of Australia: A Guide to the Identification of the Aquatic Ferns and Flowering Plants of Australia, both Native and Naturalised*. Melbourne University Press.
- Botanic Gardens Trust plant identification assistance: rbgsyd.nsw.gov.au/information_about_plants/botanical_info/plant_identification
- Botanic Gardens Trust PlantNET: plantnet.rbgsyd.nsw.gov.au/search/simple.htm
- Freshwater Wetlands on Coastal Floodplains species profile: threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10929
- Harden, G. (ed) *Flora of NSW Vols 1 – 4* (1990-2002). NSW University Press.
- Keith, D.A. and Scott, J. (2005) *Native vegetation of coastal floodplains - a diagnosis of the major plant communities in New South Wales*. Pacific Conservation Biology, 11 (2): 81-104.
- NSW Scientific Committee Determinations: environment.nsw.gov.au/committee/FinalDeterminations.htm
- Robinson, L. (2003) *Field guide to native plants of Sydney revised 3rd edition*. Kangaroo Press.
- Sainty, G. R. and Jacobs, S. W. (2003) *Australian Waterplants – A Field Guide*. CSIRO Publishing, Australia.
- Stephens, K. M. and Dowling, R. M. (2002) *Wetland Plants of Queensland: A Field Guide*. CSIRO Publishing, Collingwood, Victoria.
- Thackway, R. and Cresswell, I. (1995) (eds) *An interim biogeographic regionalisation of Australia: a framework for establishing the national system of reserves*. (Australian Nature Conservation Agency: Canberra).

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Green-leaved Rose Walnut *Endiandra muelleri* subsp. *Bracteata*

Conservation status in NSW: **Endangered**

Description

A tree up to 30 m tall with brown bark, often with loose round plates. Twigs and branchlets are covered in hairs. The moderately glossy leaves are oval or drawn out towards the tips, and measure 6 – 12 cm long and 3 – 5 cm wide, with three to five pairs of side veins. Flushes of new growth are pinkish-green. Flowers are small, yellowish and hairless, and are held in small clusters. The fleshy fruits are egg-shaped, 2.5 – 3 cm long and black when ripe.



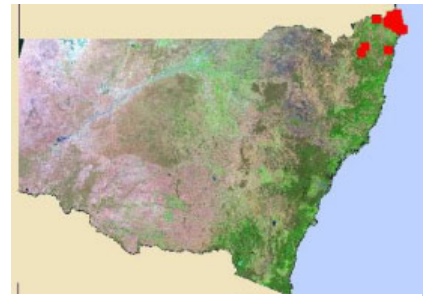
Image: Hugh Nicholson, Terania Rainforest Publishing © Hugh Nicholson

Distribution

Occurs in Queensland and in north-east NSW south to Maclean. It is sparsely distributed within this range.

Habitat and ecology

Subtropical rainforest or wet eucalypt forest, chiefly at lower altitudes.



Distribution in NSW
© NSW Government 2004

Threats

- Clearing and fragmentation of habitat for coastal development, agriculture and road-works.
- Infestation of habitat by weeds.
- Frequent fire.
- Trampling by visitors.

What needs to be done to recover this species?

- Keep to established tracks in areas of habitat to avoid trampling small plants.
- Support local Landcare groups and bush regeneration teams.
- Protect rainforest and wet eucalypt forest from fire.
- Identify populations along roadsides and protect them during road-works.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remaining habitat remnants.

References

- NSW National Parks and Wildlife Service (2004) Draft Recovery Plan for *Endiandra muelleri* subsp. *bracteata* (Green-leaved Rose Walnut) and *Endiandra hayesii* (Rusty Rose Walnut). NSW NPWS, Sydney.
- NSW NPWS (2002). *Threatened Species of the Upper North Coast of NSW: Flora*. NSW NPWS, Coffs Harbour, NSW.

Conservation status in NSW: **Vulnerable**

National conservation status: **Vulnerable**

Description

A medium-sized tree to 30 m tall. The bark is smooth and mottled white to slaty grey. The juvenile leaves are oval in shape and blue-green with a whitish bloom, and the buds and fruit are similarly coloured. The flowers are white, or occasionally pink, and are produced between August and December. The fruits are oval-shaped and 7–10 mm long. The three to five raised valves are surrounded by a domed disk raised above the fruit.



Images: Euclid © CSIRO Publishing

Distribution

Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland.

Habitat and ecology

Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.



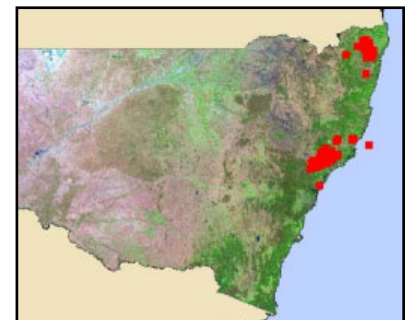
Image: Peter Richards © Peter Richards

Threats

- Clearing for agriculture and development.
- Timber harvesting activities.
- Lack of regeneration through grazing pressure.

What needs to be done to recover this species?

- Fence areas of known habitat to protect from grazing stock and to promote regeneration.
- Protect areas of habitat from timber harvesting activities.
- Protect known populations and areas of potential habitat from clearing and development.



Distribution in NSW (© NSW Government 2004)

References

- Barker, R.M., Haegi, L. and Barker, W.R. (1999) 42. *Hakea*. Flora of Australia 17B: 44.
- NSW NPWS (2002). *Threatened Species of the Upper North Coast of NSW: Flora*. NSW NPWS, Coffs Harbour, NSW

Glossy Black-cockatoo

Calyptorhynchus lathami

Conservation status in NSW: **Vulnerable**

National conservation status: **Endangered (only the South Australian sub-species)**

Description

The Glossy Black-cockatoo is a dusky brown to black cockatoo with a massive, bulbous bill and a broad, red band through the tail. The red in the tail is barred black and edged with yellow. The female usually has irregular pale-yellow markings on the head and neck and yellow flecks on the underparts and underwing. They are usually seen in pairs or small groups feeding quietly in she-oaks. They are smaller than other black-cockatoos (about 50 cm in length), with a smaller crest.

Distribution

The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia.

Habitat and ecology

- Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur.
- In the Riverina area, inhabits open woodlands dominated by Belah (*Casuarina cristata*).
- Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill.
- Dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August.

Threats

- Reduction of suitable habitat through clearing for development.
- Loss of tree hollows.
- Excessively frequent fire which reduces the abundance and recovery of she-oaks.
- Illegal bird smuggling and egg-collecting.

References

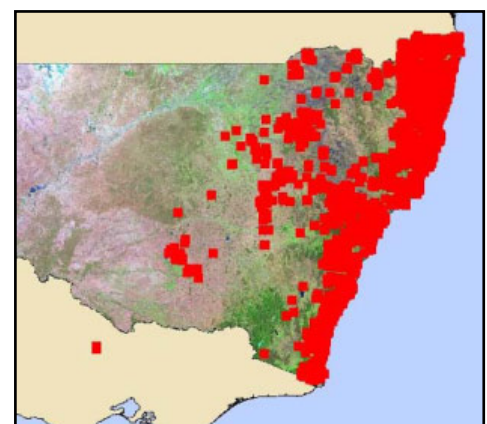
Foreshaw, J. M. (2003). *Australian Parrots*. CSIRO Publishing.



Image: Doug Mills © Doug Mills



Image: Shane Rurning © Shane Rurning



Distribution in NSW (© NSW Government 2004)

- Higgins, P.J. (ed), 1999. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 4.* Oxford University Press.
- Pizzey, G. and Knight, F. (2003). *The Field Guide to the Birds of Australia* 7th Edition. Menkhorst, P. (ed). HarperCollins.
- Robinson, D. and Traill, B. J. (1996). *Conserving woodland birds in the wheat and sheep belts of southern Australia.* RAOU Conservation Statement No. 10. Birds Australia, Melbourne.
- Walpole, S.C. and Oliver, D. L. (2000). *Observations of Glossy Black-Cockatoos *Calyptorhynchus lathami* feeding on the seeds of Bullocke *Allocasuarina luehmannii*.* Australian Bird Watcher 18, 284-285.

Powerful Owl

Ninox strenua

Conservation status in NSW: **Vulnerable**

Description

The Powerful Owl is the largest owl in Australasia. It is a typical hawk-owl, with staring yellow eyes and no facial-disc. Adults reach 60 cm in length, have a wingspan of up to 140 cm and weigh up to 1.45 kilograms. Males are larger than females. The upper parts of the Powerful Owl are dark, greyish-brown with indistinct off-white bars. The underparts are whitish with dark greyish-brown V-shaped markings. Juvenile Powerful Owls have a white crown and underparts that contrasts with its small, dark streaks and dark eye patches. The call of this species may be heard at any time of the year, but it is more vocal during the winter breeding season. It has a slow, deep and resonant double hoot, with the female's being higher pitched and expressing an upward inflection on the second note.



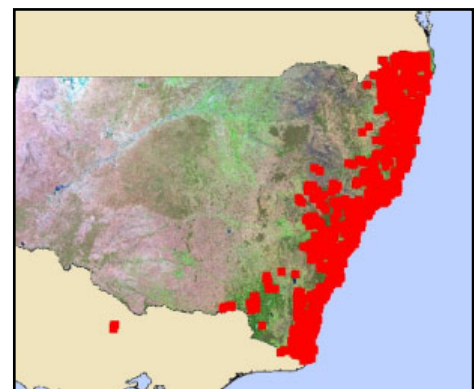
Image: Barry Brown © Australian Botanical Gardens

Distribution

The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains. Now uncommon throughout its range where it occurs at low densities.

Habitat and ecology

- The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.
- The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such



Distribution in NSW (© NSW Gov 2004)

as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angorophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species.

- The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Birds comprise about 10% of the diet, with flying foxes important in some areas. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.
- Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400-1450 ha.
- Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. During the breeding season, the male Powerful Owl roosts in a "grove" of up to 20-30 trees, situated within 100-200 metres of the nest tree where the female shelters.
- Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter, but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days.

Threats

- Historical loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development. This loss also affects the populations of arboreal prey species, particularly the Greater Glider which reduces food availability for the Powerful Owl.
- Inappropriate forest harvesting practices that have changed forest structure and removed old growth hollow-bearing trees. Loss of hollow-bearing trees reduces the availability of suitable nest sites and prey habitat.
- Can be extremely sensitive to disturbance around the nest site, particularly during pre-laying, laying and downy chick stages. Disturbance during the breeding period may affect breeding success.
- High frequency hazard reduction burning may also reduce the longevity of individuals by affecting prey availability.
- Road kills.
- Secondary poisoning.
- Predation of fledglings by foxes, dogs and cats.

What needs to be done to recover this species?

- Apply low-intensity, mosaic pattern fuel reduction regimes.
- Searches for the species should be conducted in suitable habitat in proposed development areas and proposed forest harvesting compartments.
- Retain at least a 200 metre buffer of native vegetation around known nesting sites.
- Retain large stands of native vegetation, especially those containing hollow-bearing trees.
- Protect riparian vegetation to preserve roosting areas.

- Protect hollow-bearing trees for nest sites. Younger recruitment trees should also be retained to replace older trees in the long-term.
- Minimise visits to nests and other disturbances, including surveys using call playback, when owls are breeding.
- Assess the importance of the site to the species' survival. Include the linkages the site provides for the species between ecological resources across the broader landscape.

References

- Debus, S.J.S. and Chafer, C.J. (1994). *The Powerful Owl Ninox strenua in New South Wales*. Australian Birds 28 supplement: S21-S38.
- Higgins, P.J. (ed), 1999. *Handbook of Australian, New Zealand and Antarctic Birds*. Volume 4. Oxford University Press.
- Kavanagh, R.P. (1988). The impact of predation by the Powerful Owl, Ninox strenua, on a population of the Greater Glider, *Petauroides volans*. *Australian Journal of Ecology* 13: 445-450.
- Kavanagh, R.P. (1992). Reply. The impact of predation by the Powerful Owl Ninox strenua on a population of the Greater Glider *Petauroides volans*. *Australian Journal of Ecology* 17: 469-472.
- Kavanagh, R.P. (2002). Comparative diets of the Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*) in southeastern Australia. In Newton, I., Kavanagh, R., Olsen, J. and Taylor, I. (eds.). *Ecology and Conservation of Owls*. CSIRO Publishing. Collingwood Victoria.
- Kavanagh, R.P. and Stanton, M.A. (2002c). Response to habitat fragmentation by the Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*) and other nocturnal fauna in southeastern Australia. In Newton, I., Kavanagh, R., Olsen, J. and Taylor, I. (eds.). *Ecology and Conservation of Owls*. CSIRO Publishing. Collingwood Victoria.
- NSW Department of Environment and Conservation (2005) *Draft Recovery Plan for the Large Forest Owls: Powerful Owl Ninox strenua, Sooty Owl Tyto tenebricosa, Masked Owl Tyto novaehollandiae*. NSW DEC, Sydney.
- Pavey, C.R. (1995). Food of the Powerful Owl *Ninox strenua* in suburban Brisbane, Queensland. *Emu* 95: 231-232.
- Pavey, C.R., Smyth, A.K. and Mathieson, M.T. (1994). The breeding season diet of the Powerful Owl *Ninox strenua* at Brisbane, Queensland. *Emu* 94: 278-284.
- Pizzey, G. and Knight, F. (2003). *The Field Guide to the Birds of Australia* 7th Edition. Menkhorst, P. (ed). HarperCollins.
- Robinson, D. and Traill, B. J. (1996). *Conserving woodland birds in the wheat and sheep belts of southern Australia*. RAOU Conservation Statement No. 10. Birds Australia, Melbourne.
- Soderquist, T.R., Lowe, K.W., Loyn, R.H., and Price, R. (2002). Habitat quality in Powerful Owl (*Ninox strenua*) territories in the Box-Ironbark forest of Victoria, Australia. In Newton, I., Kavanagh, R., Olsen, J. and Taylor, I. (eds.). *Ecology and Conservation of Owls*. CSIRO Publishing. Collingwood Victoria.

Conservation status in NSW: Vulnerable**Description**

A medium-sized owl to 40 - 50 cm long, with dark eyes set in a prominent flat, heart-shaped facial disc that is encircled by a dark border. The feet are large and powerful, with fully feathered legs down to the toes. The owl exists in several colour forms, with wide variation in plumage. The upperparts are grey to dark brown with buff to rufous mottling and fine, pale spots. The wings and tail are well barred. The underparts are white to rufous-brown with variable dark spotting. The palest birds have a white face with a brown patch around each eye; the darkest birds have a chestnut face. The dark form of the Masked Owl is much browner than the Sooty Owl *Tyto tenebricosa*.



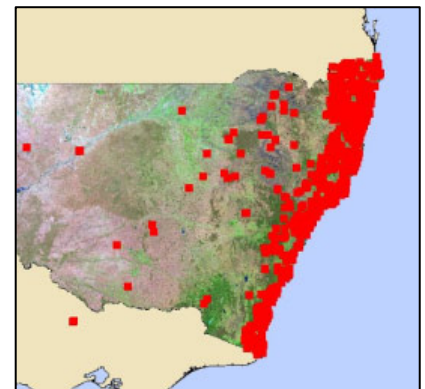
Image: Dave Watts © Dave Watts

Distribution

Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution.

Habitat and ecology

- Lives in dry eucalypt forests and woodlands from sea level to 1100 m.
- A forest owl, but often hunts along the edges of forests, including roadsides.
- The typical diet consists of tree-dwelling and ground mammals, especially rats.
- Pairs have a large home-range of 500 to 1000 hectares.
- Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.



Distribution in NSW (© NSW Government 2004)

Threats

- Loss of mature hollow-bearing trees and changes to forest and woodland structure, which leads to fewer such trees in the future.
- Clearing of habitat for grazing, agriculture, forestry or other development.
- A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open, grassy forests.
- Secondary poisoning from rodenticides.
- Being hit by vehicles.

What needs to be done to recover this species?

- Drive carefully at night through forest areas.
- Retain and protect stands of native vegetation, especially those with hollow-bearing trees.

- Retain hollow-bearing trees as well as large, mature trees that will provide hollows in the future.
- Limit the use of pesticides used in suitable native habitat.

References

- Garnett, S. and Crowley, G. M. (2000). *The Action Plan for Australian Birds*. Published by Environment Australia. Canberra, ACT.
- Kavanagh, R. P. and Murray, M. (1996). Home range, habitat and behaviour of the Masked Owl *Tyto novaehollandiae* near Newcastle, New South Wales. *Emu* 96: 250-257.
- Newton, I., Kavanagh, R., Olson, J. and Taylor, I. (eds) (2002). *Ecology and Conservation of Owls*. CSIRO Publishing. Collingwood Victoria.
- NSW Department of Environment and Conservation (2005) *Draft Recovery Plan for the Large Forest Owls: Powerful Owl Ninox strenua, Sooty Owl Tyto tenebricosa, Masked Owl Tyto novaehollandiae*. NSW DEC, Sydney.

Wompoo Fruit-dove

Ptilinopus magnificus

Conservation status in NSW: **Vulnerable**

Description

A large and dramatically beautiful rainforest pigeon, almost twice the size of other coloured fruit-doves. It is up to 56 cm long, with a pale grey head shading into rich green back and wings. There is a broken yellow band across each wing. The breast and belly are plum-purple and the underparts are yellow.

Distribution

Occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula. It is rare south of Coffs Harbour. Three subspecies are recognised, with the most southerly in NSW and south-eastern Queensland. It used to occur in the Illawarra, though there are no recent records.

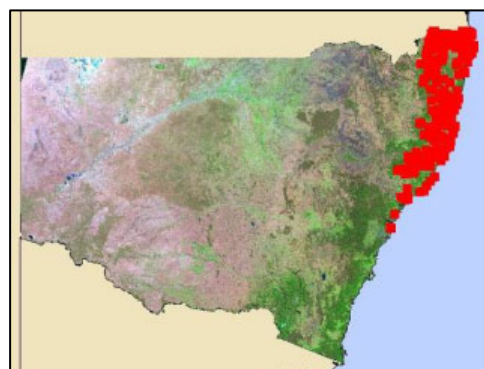


Image: David Cowen © David Cowen

Habitat and ecology

Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. Feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit; some of its feed trees rely on species such as this to distribute their seeds. Feeds alone, or in loose flocks at any height in the canopy. Despite its plumage, can be remarkably cryptic as it feeds, with the call and falling fruit being an indication of its presence.

The nest is a typical pigeon nest - a flimsy platform of sticks on a thin branch or a palm frond, often over water, usually 3 - 10 m above the ground. Breeds in spring and early summer; a single white egg is laid. Most often seen in mature forests, but also found in remnant and regenera



Distribution in NSW © NSW Gov2004

ting rainforest. Aspects of its behaviour such as social behaviour and structure, movements and breeding biology have not been well-studied.

Threats

- Clearing, fragmentation and weed invasion of low to mid-elevation rainforest due to coastal development and grazing.
- Logging and roading in moist eucalypt forest with well-developed rainforest understorey.
- Burning, which reduces remnant rainforest habitat patches.

References

- Higgins, P. and Davies, S. (eds.) (1996). *Handbook of Australian, New Zealand and Antarctic Birds Volume 3: Snipe to Pigeons*. Oxford University Press, Melbourne.
- NPWS (2000). *Threatened Species of the Lower North Coast of New South Wales*. NPWS, Sydney.
- NPWS (2002). *Threatened Species of the Upper North Coast of NSW: Fauna*. NPWS, Coffs Harbour.
- Pizzey, G. and Knight, F. (2003). *The Field Guide to the Birds of Australia* 7th Edition. Menkhorst, P. (ed). HarperCollins.

Red-backed Button-quail

Turnix maculosa

Conservation status in NSW: **Vulnerable**

Description

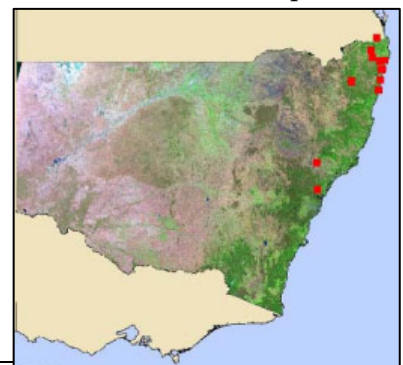
The Red-backed Button-quail is a small, ground-dwelling bird of length 12-16 cm and weight 35-45 g. Individuals have a pattern of bold black spots and bars over pale or deep-buff on the sides of the breast, flanks and wing-coverts; birds also have a rufous-brown or chestnut hindneck-collar and shoulder-patch. Red-back Button-quail may be distinguished from other quail by their fine yellow bill.

Distribution

The Red-backed Button-quail is distributed from the Philippines and eastern Indonesia, through Papua New Guinea, Australia and east to the Solomon Islands. In Australia, the species has a largely coastal and sub-coastal range from the Kimberley region, Western Australia, through the Northern Territory, Queensland and NSW. In NSW, the majority of Red-backed Button-quail records are from the North Coast Bioregion with a small number of records south as far as Sydney. Three outlying records are known from western NSW. Between 1977 and 1994, there were 17 records of Red-backed Button-quail from four NSW north coast reserves (Bundjalung, Crowdy Bay, Nymboida and Yuraygir National Parks) but since August 1994, there have been no further records of Red-backed Button-quail within reserves in NSW.

Habitat and ecology

- Red-backed Button-quail inhabit grasslands, woodlands and cropped lands of warm temperate areas that annually receive 400 mm or more of summer rain.
- Observations of populations in other parts of its range suggest the species prefers sites near water, including



grasslands and sedgelands near creeks, swamps and springs, and wetlands.

- Red-backed Button-quail usually breed in dense grass near water, and nests are made in a shallow depression sparsely lined with grass and ground litter.

Threats

- Red-backed Button-quail may be threatened by inappropriate burning and grazing regimes that destroy extensive areas of ground layer vegetation or enable occlusion of grasslands and grassy woodlands by woody weeds.
- Although the species can apparently utilise cropped or irrigated lands, the drainage of coastal wetlands for agriculture, particularly sugar cane farming, and urban development reduces the availability of breeding habitat.
- Trampling and disturbance by livestock and feral pigs may alter the quality of remaining habitat and could directly affect nesting birds.
- The ground-dwelling nature of the Red-backed Button-quail and its defensive habit of freezing when disturbed render the species susceptible to predation by introduced predators. Further, clearing and alteration of habitat increases the number of feral and domestic predators such as the feral pig, red fox and cat.

References

- Barrett G., Silcocks A., Barry S., Cunningham R. and Poulter R. (2003) *The new atlas of Australian Birds*. Royal Australasian Ornithologists Union: Hawthorn East, Vic.
- Blakers M., Davies S.J.J.F. and Reilly P.N. (1984) *The atlas of Australian Birds*. Melbourne University Press, Melbourne.
- Marchant, S. and Higgins, P.J. (Eds) (1993). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2: Raptors to Lapwings*. Oxford University Press, Melbourne.
- NSW Scientific Committee (2005) *Red-backed button-quail - vulnerable species determination - final*. DEC (NSW), Sydney.

Giant Barred Frog

Mixophyes iteratus

Conservation status in NSW: **Endangered**

National conservation status: **Endangered**

Description

Giant Barred Frogs are large frogs, up to 115 mm in length. They are olive to dark brown above with paler or darker blotches, and cream to pale yellow below. The skin is finely granular. The pupil of the eye is vertical and the iris is pale golden in the upper half and brown in the lower half. The call is a deep 'ork' breaking into a series of 'orks' and grunts. The Giant Barred Frog can be most easily distinguished from other barred frog species by the black thighs with smaller yellow spots, distinct barring on the limbs, dark blotches on the sides, absence of a creamy stripe on the upper lip and the distinctive eye colour.



Image: Michael Murphy
© Michael Murphy

Distribution

Coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. North-eastern NSW, particularly the Coffs Harbour-Dorrigo area, is now a stronghold.

Habitat and ecology

- Giant Barred Frogs forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m.
- They breed around shallow, flowing rocky streams from late spring to summer.
- Females lay eggs onto moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched.
- Tadpoles grow to a length of 80 mm and take up to 14 months before changing into frogs. When not breeding the frogs disperse hundreds of metres away from streams. They feed primarily on large insects and spiders.



Distribution in NSW (© NSW Gov 2004)

Threats

- Reduction in water quality, from sedimentation or pollution.
- Changes in water flow patterns, either increased or decreased flows.
- Reduction of leaf-litter and fallen log cover through burning.
- Timber harvesting and other forestry practices.
- Vegetation clearance.
- Predation on eggs and tadpoles by introduced fish.
- Weed spraying close to streams.
- Chytrid fungal disease.

References

- Cogger, H. G. (2000). *Reptiles and Amphibians of Australia*. 6th ed. Reed New Holland, Sydney.
- NPWS (2000). *Threatened Species of the Lower North Coast of New South Wales*. NPWS, Sydney.
- NPWS (2002). *Threatened Species of the Upper North Coast of NSW: Fauna*. NPWS, Coffs Harbour.
- NSW Scientific Committee (1999) *Giant barred frog - Endangered species determination - final*. DEC (NSW), Sydney.

Brush-tailed Phascogale

Phascogale tapoatafa

Conservation status in NSW: **Vulnerable**

Description

The Brush-tailed Phascogale is tree-dwelling marsupial carnivore. It has a characteristic, black, bushy 'bottlebrush' tail, with hairs up to 4 cm long. Its fur is grey above and pale cream below and it has conspicuous black eyes and large naked ears. Adults have a head and body length of about 20 cm, a tail length of about 20 cm and weigh 110 - 235 grams.

Distribution

The Brush-tailed Phascogale has a patchy distribution around the

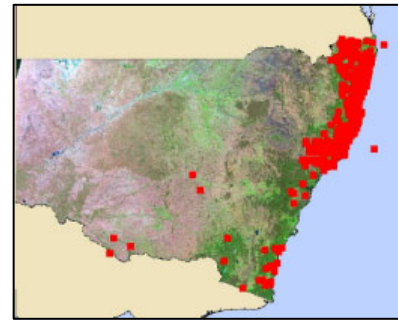


Image: Linda Broome ©
Linda Broome

coast of Australia. In NSW it is more frequently found in forest on the Great Dividing Range in the north-east and south-east of the State. There are also a few records from central NSW.

Habitat and ecology

- Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter.
- Also inhabit heath, swamps, rainforest and wet sclerophyll forest.
- Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater.
- Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates.
- Females have exclusive territories of approximately 20 - 60 ha, while males have overlapping territories of up to 100 ha.
- Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span.
- Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.



Distribution in NSW (© NSW Gov 2004)

Threats

- Loss and fragmentation of habitat.
- Loss of hollow-bearing trees.
- Predation by foxes and cats.
- Competition for nesting hollows with the introduced honeybee.

References

- Menkhorst P.W. (1995). Brush-tailed Phascogale in *The Mammals of Victoria - Distribution, Ecology and Conservation*. Oxford University Press, Australia.
- Menkhorst, P. and Knight, F. (2001). *A Field Guide to the Mammals of Australia*. Oxford Uni Press, Melbourne.
- Sodderquist T. (1995) Brush-tailed Phascogale, in Strahan, R.(ed.), *The Australian Museum Complete Book of Australian Mammals*. Angus & Robertson, Sydney.

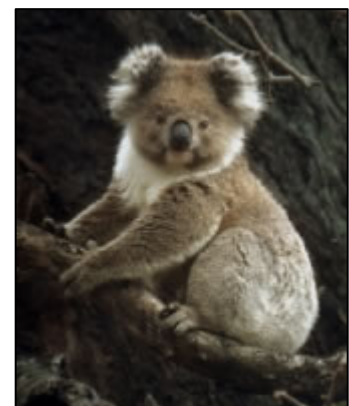
Koala

Phascolarctos cinereus

Conservation status in NSW: Vulnerable

Description

The Koala is an arboreal marsupial with fur ranging from grey to brown above, and is white below. It has large furry ears, a prominent black nose and no tail. It spends most of its time in trees and has long, sharp claws, adapted for climbing. Adult males weigh 6 - 12 kg and adult females weigh 5 - 8 kg. During breeding, males advertise with loud snarling coughs and bellows.



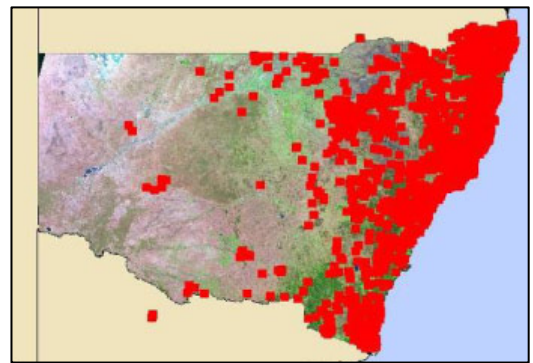
Distribution

The Koala has a fragmented distribution throughout eastern Australia from north-east

Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of NSW, but now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands.

Habitat and ecology

- Spend most of their time in trees, but will descend and traverse open ground to move between trees.
- Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.
- Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.
- Females breed at two years of age and produce one young per year.
- Inhabit eucalypt woodlands and forests.
- Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.
- Inactive for most of the day, feeding and moving mostly at night.



Distribution in NSW © NSW Gov 2004

Threats

- Loss, modification and fragmentation of habitat.
- Predation by feral and domestic dogs.
- Intense fires that scorch or kill the tree canopy.
- Road-kills.

References

- Martin R.W. and Handasyde K.A. (1995). *Koala* (pp. 196-8) in Strahan, R.(ed.), *The Australian Museum Complete Book of Australian Mammals*. Angus & Robertson, Sydney.
- Martin, R. & Handasyde, K. 1999. *The Koala: natural history, conservation and management*. University of New South Wales Press Ltd, Sydney.
- Menkhorst P.W. (1995). *Koala*, In *The Mammals of Victoria - Distribution, Ecology and Conservation*. Oxford University Press, Australia. (pp.85-8)
- Menkhorst, P. and Knight, F. (2001). *A Field Guide to the Mammals of Australia*. Oxford Uni Press, Melbourne.
- NSW National Parks and Wildlife Service (2003) *Draft Recovery Plan for the Koala (Phascolarctos cinereus)*. NSW NPWS, Sydney.
- Reed, P.C., Lunney, D. and Walker, P. 1990. A 1986-1987 survey of the koala *Phascolarctos cinereus* (Goldfuss) in New South Wales and an ecological interpretation of its distribution. In *Biology of the Koala*. Eds. Lee, A.K., Handasyde, K.A. and Sanson, G.D.

Description

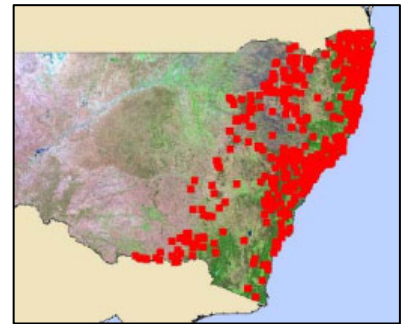
Adult Squirrel Gliders have a head and body length of about 20 cm. They have blue-grey to brown-grey fur above, white on the belly and the end third of the tail is black. There is a dark stripe from between the eyes to the mid-back and the tail is soft and bushy averaging about 27 cm in length. Squirrel Gliders are up to twice the size of Sugar Gliders, their facial markings are more distinct and they nest in bowl-shaped, leaf lined nests in tree hollows. Squirrel Gliders are also less vocal than Sugar Gliders.

Distribution

The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.

Habitat and ecology

- Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.
- Prefers mixed species stands with a shrub or Acacia midstorey.
- Live in family groups of a single adult male one or more adult females and offspring.
- Require abundant tree hollows for refuge and nest sites.
- Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.



Distribution in NSW (© NSW Gov 2004)

Threats

- Loss and fragmentation of habitat.
- Loss of hollow-bearing trees.
- Loss of flowering understorey and midstorey shrubs in forests.
- Individuals can get caught in barbed wire fences while gliding.

References

- Davy S. (1984). Habitat preferences of arboreal marsupials within a coastal forest in southern NSW. *Possums and Gliders* (ed. A.P. Smith and I.D. Hume): 509-16. Surrey Beatty and Sons, Sydney.
- Menkhorst, P. and Knight, F. (2001). *A Field Guide to the Mammals of Australia*. Oxford Uni Press, Melbourne.
- Suckling G.C. 1995 Squirrel Glider in R Strahan (Ed.) *The Mammals of Australia*. Pp234-235. Reed Books, Chatswood.

Yellow-bellied Glider

Petaurus australis

Conservation status in NSW: **Vulnerable**

Description

The Yellow-bellied Glider is a large, active, sociable and vocal glider. Adults weigh 450 - 700 grams, have a head and body length of about 30 cm and a large bushy tail that is about 45 cm long. It has grey to brown fur above with a cream to yellow belly, which is paler in young animals. The dark stripe down the back is characteristic of the group. It has a large gliding membrane that extends from the wrist to the ankle. It has a loud, distinctive call, beginning with a high-pitched shriek and subsiding into a throaty rattle.

Image: Joel Winter © DEC



Distribution

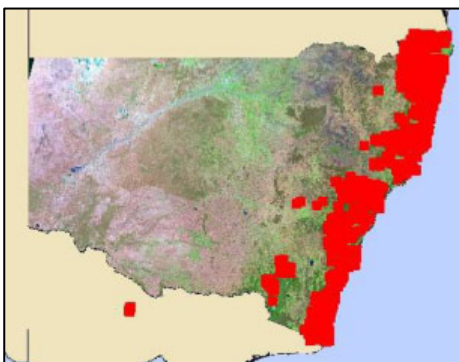
The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.

Habitat and ecology

Yellow-bellied gliders occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. They feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. They extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. They live in small family groups of two - six individuals and are nocturnal. Den, often in family groups, in hollows of large trees. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.



*Feed tree scars,
Image: Shane Ruming
© Shane Ruming*



*Distribution in NSW
© NSW Gov 2004*

Threats

- Loss and fragmentation of habitat.
- Loss of hollow-bearing trees.
- Loss of feed trees.

References

- Goldingay R.L. and Kavanagh R.P. (1991). The Yellow-bellied Glider: a review of its ecology and management considerations. In *Conservation of Australia's Forest Fauna* (ed. D. Lunney): 365-75. Royal Zoological Society of NSW.
- Menkhorst, P. and Knight, F. (2001). *A Field Guide to the Mammals of Australia*. Oxford Uni Press, Melbourne.
- NSW National Parks and Wildlife Service (2003) *Recovery Plan for Yellow-bellied Glider (Petaurus australis)*. NSW NPWS, Hurstville NSW.
- Russell, R. (1995). Yellow-bellied Glider (pp. 226-8) in Strahan, R. (ed.), *The Australian Museum Complete Book of Australian Mammals*. Angus & Robertson, Sydney.

Grey-headed Flying-fox

Pteropus poliocephalus

Conservation status in NSW: **Vulnerable**

National conservation status: **Vulnerable**

Description

The Grey-headed Flying-fox is the largest Australian bat, with a head and body length of 23 - 29 cm. It has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black and the wingspan can be up to 1 m. It can be distinguished from other flying-foxes by the leg fur, which extends to the ankle.

Distribution

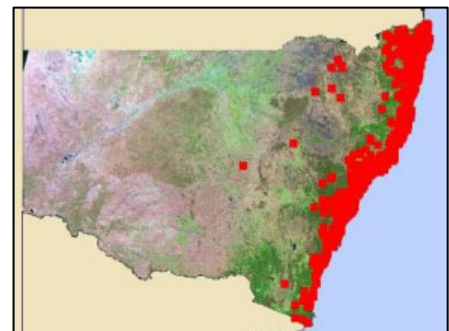
Grey-headed Flying-foxes are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria.

Image: Linda Broome © Linda Broome



Habitat and ecology

- Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.
- Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.
- Individual camps may have tens of thousands of animals and are used for mating, birth and the rearing of young.
- Annual mating commences in January and a single young is born each October or November.
- Site fidelity to camps is high with some camps being used for over a century.
- Travel up to 50 km to forage.
- Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.
- Also forage in cultivated gardens and fruit crops and can inflict severe crop damage.



Distribution in NSW © NSW Gov 2004

Threats

- Loss of foraging habitat.
- Disturbance of roosting sites.
- Unregulated shooting.
- Electrocution on powerlines.

References

- Churchill, S. (1998) *Australian Bats*. New Holland, Sydney.
- Conder, P. (1994). *With Wings on their Fingers*. Angus and Robertson, Sydney.
- Hall, L. and Richards, G. (2000). *Flying Foxes; fruit and blossom bats of Australia*. UNSW Press, Sydney.
- NSW Scientific Committee (2001) *Grey-headed flying fox - Vulnerable species determination - final*. DEC (NSW), Sydney.
- Tidemann, C.R. (1995). Grey-headed Flying-fox *Pteropus poliocephalus* Temminck, 1925. In *The Australian Museum Complete Book of Australian Mammals*. Strahan, R. (ed.) Reed Books, Sydney.

Emu (population)

Dromaius novaehollandiae

Conservation status in NSW: **Endangered Population**

Description

The Emu is a large flightless bird up to 2 m tall. The feathers are sparse around the upper neck revealing blue skin, which is darker in females. Males hatch the eggs and care for the chicks, which are dark brown with cream stripes. Immature birds have a dark head and neck. The Emu's call is a deep grunting or booming.



Image: Shane Ruming ©
Shane Ruming

Distribution

Throughout mainland Australia but now generally absent from south-east coastal regions. Previously widespread on the NSW north coast, but now largely restricted to coastal and near coastal areas between Evans Head and Red Rock and west to the Bungawalbin area. There have also been some recent records from the Port Stephens area. The Emu population in the NSW north coast bioregion and Port Stephens Local Government Area has been listed as an endangered population under the Threatened Species Conservation Act.

Habitat and ecology

On the NSW north coast Emus occur in open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.

Threats

- Risk of local extinction due to small population size and isolation.
- Clearing and fragmentation of areas of habitat for agriculture and urban development.

- Burning of suitable habitat at too frequent intervals.
- Predation of young and eggs by foxes, feral and domestic dogs and feral pigs.
- Being hit by vehicles.
- Deliberate killing through poisoning or shooting.

References

McGrath, R. J. and Bass, D. (1999). Seed dispersal by Emus on the New South Wales North-east Coast. *Emu* 99: 248-52.

NSW Scientific Committee (2002) *Emu population in the NSW North Coast Bioregion and Port Stephens LGA - Endangered population determination - final*. DEC (NSW), Sydney.