DEFINITIONS

AND

SYNONYMY

Opener (Top): Lakes Entrance, Victoria. Wonga Vine *Pandorea pandorana s.s.* Note colour of flower, width of leaves and flowering occurs before new leaf growth. This species is common in Warm Temperate and Littoral Rainforest. Local flowering time: early August-early September..

Opener (middle): Gulaga (Mt Dromedary), New South Wales. Giant Wonga Vine *Pandorea* sp. Ipswich. Note colour of flowers, width of leaves and leaf colour; also flowering occurs after new leaf growth. This species is usual in Subtropical Rainforest. Flowering time: mid-September-October.

Synopsis. The differences between these two taxa include those listed in the photograph captions to the left with the addition of: the characteristics of the liane itself. Wonga Vine is a woody species whose maximum stem diameter is 3 cm and the bark is papery with longitudinal breaks (the wood of the vine itself is not furrowed beneath the bark). This is contrast to Giant Wonga Vine whose stem diameter can exceed 20 cm, its bark is similar, but the wood beneath has deep longitudinal furrows, giving the appearance of rope (Chapter S8: Figure S301).

Gulaga, New South Wales. This is Giant Wonga Vine *Pandorea* sp. Ipswich photographed at the same time of year (mid August) as the Wonga Vine *Pandorea pandorana* in the Opener (Top), showing that although its near relative is in full flower, this species is still in bud. It shows how speciation has begun to genetically isolated these two closely related taxa through a nearly complete local separation of flowering times, which is beginning to reduce the chance of genetic interchange. Etymylogically, this helps to further differentiate and define Giant Wonga Vine as a distinct taxon from its previous synonym: Wonga Vine.

DEFINITIONS and SYNONYMY

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Rainforest keys to south-eastern Australia

- Regional rainforest keys to south-eastern Australia
- Key to the rainforest ecological vegetation classes of New South Wales
- Key to the rainforest floristic communities of New South Wales
- Quick reference guide to the floristic communities of the rainforest EVCs of southern New South Wales
- Key to the rainforest ecological vegetation classes of Victoria
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EPBC Act disturbance thresholds for the Littoral Rainforests and Coastal Vine Thickets of Eastern Australia

LATIN AND COMMON NAME SYNONYMY

- Latin plant name synonymy between New South Wales and Victorian taxa
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Ecological Restoration

The following definitions related to *ecological restoration* are sourced from the Society for Ecological Restoration (SER) International Primer on Ecological Restoration (2004): clearly it is the wisdom of a bunch of learned and considered ecological restoration practitioners. It seems to the author unnecessarily pretentious to rewrite such well expressed material: just for the sake of doing so. Where SER (2004) is quoted verbatim it is presented in: "quotation marks" and has (where appropriate) been annotated with local examples or equivalent terms in (parentheses). Terms that appear in the Glossary are written in ***bold italics***.

Section 1: Overview

"Ecological restoration is an intentional activity that initiates or accelerates the recovery of an *ecosystem* with respect to its health, integrity and sustainability. Frequently, the ecosystem that requires restoration has been *degraded, damaged, transformed* or entirely *destroyed* as the direct or indirect result of human activities. In some cases, these impacts to the ecosystems have been caused or aggravated by natural agencies such as wildfire, floods, or storms, to the point at which the ecosystem cannot recover its pre-disturbance state or historic development *trajectory*.

Restoration attempts to return an ecosystem to its historic trajectory (note that the intention of restoration is not restore a site to the 'historic state', because the aim is to set in place *ecological processes* that carry the system forward towards that state, which means much less ongoing (and less costly) intervention). Historic conditions (*reference sites* that provide a *benchmark*) are therefore the ideal starting point for restoration design. The restored ecosystem will not necessarily recover its former state, because contemporary restraints and conditions (*habitat fragmentation*, non-complimentary land uses such as softwood plantations, etc.) may cause it to develop along an *altered trajectory*. (Regionally there are many examples of this phenomenon. Some examples include: Dry Rainforest on former Subtropical Rainforest habitat where climate is drying; Gallery Rainforest substitution for Warm Temperate Rainforest in urban areas because of *catchment hardening*; Littoral Rainforest for Warm Temperate Rainforest in salinity-affected areas (and strangely the reverse: where severely degraded sand rivers clog estuaries and change from Littoral Rainforest to Gallery and Warm Temperate Rainforest habitat) such as on the Genoa and Bega Rivers (Brian Finlayson pers. comm.); rainforest substitution for Riparian Forest because of decreased flooding and/or fire frequency in regulated river systems and/or fragmented landscapes). And perhaps most controversially, where it may be necessary to conserve rainforest species and/or *biomes* from *climate change* because they face insurmountable *migration barriers* and landscape-scale *threats*. This would require, through the planned and deliberate introduction of rainforest species from past warmer climatic zones that have moved rapidly on to novel regions where that climatic envelope now exists). The historic trajectory of a severely impacted ecosystem may be difficult or impossible to determine with accuracy. Nevertheless, the general direction and boundaries of that trajectory can be established through a combination of knowledge of the damaged ecosystem's pre-existing structure, composition and functioning, studies on comparable intact ecosystems, information about regional environmental conditions, and analysis of other ecological, cultural and historical reference information, the synthesis of which are the *pre-1750s maps* across the region (as termed in Victoria, or Predictive Mapping as it is known in New South Wales). These combined sources allow the historic trajectory or reference condition (the benchmark) to be charted from baseline ecological data (*Ecological Vegetation Class* and *Floristic Community* species lists) and predictive models (pre-1750s mapping, the *Rainforest Divination Tool*), and its emulation in the restoration process should aid in piloting the ecosystem towards improved health and integrity.

Restoration represents an indefinitely long-term commitment of land and resources, and a proposal to restore an ecosystem requires thoughtful deliberation. Collective decisions are more likely to be honoured and implemented than are those that are made unilaterally (gaining a *social license* to operate in your area). For that reason, it behoves all stakeholders to arrive at the decision to initiate a restoration project by consensus (this cements the *social contract* and gives you the 'license to operate'). Once the decision to restore is made, the project requires careful and systematic planning and a monitored (*adaptive management*) approach towards *ecosystem recovery*. The need for planning intensifies when the unit of restoration (the restoration site/s) is a complex landscape of contiguous *ecosystems*.

Interventions employed in restoration vary widely among projects, depending on the extent and duration of past disturbances, cultural conditions that have shaped the landscape (Koori fire regimes, European fire regimes, land clearing and habitat fragmentation), and contemporary constraints (linear reserves, *weed* invasion, grazing, neighbour and agency attitudes) and opportunities (tree changers, sea changers, climate change threats, etc.). In the simplest circumstances, restoration consists of removing or modifying a specific disturbance (*ecological brake*), thereby allowing ecological processes to bring about an independent recovery. For example, removing (or modifying) a dam (e.g. Jindabyne) allows the return of an historic flooding regime (spring floods on the Snowy River). In more complex circumstances, restoration may

also require the deliberate reintroduction of native species that have been lost, and the elimination or control of harmful, invasive or *exotic species* to the greatest practicable extent (control of *transforming weeds*, listing deer as a *threatening process*, fencing off rivers from domestic stock, and so on.). Often, ecosystem degradation or *transformation* has multiple, protracted sources (for rainforests in south-eastern Australia: fire, weeds, habitat loss, grazing, climate change and poaching), and the historical constituents of an ecosystem are substantially lost (whole systems: Warm Temperate Rainforest and Dry Rainforest on the Buchan River; certain *life-forms*: epiphytes and tree-ferns from near-urban remnants; or particular species: Southern Brush Kurrajong *Commersonia rossii* from the lower Snowy River). Sometimes the development trajectory (*ecosystem recovery*) of a degraded ecosystem is blocked altogether, and its recovery through natural processes appears to be delayed indefinitely (e.g. sites covered in *transforming weeds*). In all of these cases, however, ecological restoration aims to initiate or facilitate the resumption of those (ecosystem) processes that will return the ecosystem to its intended trajectory (what was there historically, if conditions on the site have not changed since that time or a modified or substituted ecological vegetation class or floristic community, based on the new or projected conditions of the restoration site).

When the desired trajectory is realised, the ecosystem under manipulation (active restoration) may no longer require external assistance to ensure its future health and integrity, in which case restoration can be considered to be complete. Nevertheless, the restored ecosystem often requires continuing management to counteract the invasion of opportunistic species, the impacts of various human activities, climate change, and other unforeseeable events. In this respect, a restored ecosystem is no different from an undamaged ecosystem of the same kind, and both are likely to require some level of *ecosystem management*. Although ecosystem restoration and ecosystem management form a continuum and often employ similar sorts of intervention, ecological restoration aims at assisting or initiating recovery, whereas ecosystem management is intended to guarantee the continued well-being of the restored ecosystem thereafter.

Some ecosystems are still managed by traditional, sustainable cultural practices (e.g. the presence of some rainforest stands with little or no topographic, climatic or vegetation-based fire protection may indicate that they are surviving, living cultural artifacts representing past protective Koori burning regimes in stand's neighbourhood). Reciprocity exists in these cultural activities and ecological processes, such that human actions reinforce ecosystem health and sustainability (clearly such a relationship exists, has existed and needs to be reinforced for rainforest in south-eastern Australia in the face of climate change and the mega-fires that this process spawns). Many cultural ecosystems have suffered from demographic growth and external pressures of various kinds (e.g. the loss and displacement of Koori peoples from the south-east, the degradation, erosion, loss or their understandable failure to trust in sharing traditional knowledge), and are in need of restoration. (The reinstatement of appropriate landscape and local fire regimes that can enhance *biodiversity* in sclerophyll ecosystems while protecting fire-sensitive rainforest ecosystems is a classic example of this need for cultural restoration being inherently intertwined with rainforest ecosystem restoration). The restoration of such ecosystems normally includes the concomitant recovery of *indigenous ecological management* practices, including the support for cultural survival of Indigenous peoples and their languages as living libraries of traditional ecological knowledge. Ecological restoration encourages and may indeed be dependent upon long-term participation of local people (increasingly both Koori and current landholders and managers). Cultural conditions in traditional cultures are currently undergoing unprecedented global change. To accommodate this change, ecological restoration may accept, and even encourage, new culturally appropriate and sustainable practices that take into account contemporary conditions and constraints."

Section 2: Attributes of Restored Ecosystems

"This section deals with what is meant by "recovery" in ecological restoration. An ecosystem has recovered – and is restored – when it contains sufficient *biotic* (living) and *abiotic* (non-living) resources to continue its development without further assistance or subsidy. It will sustain itself structurally (rainforest gaps will develop, fill with *pioneer* and *secondary species*, and ultimately close with primary canopy species of its own accord) and functionally (the necessary conditions for recovery are present and maintained: (e.g. nutrient cycling, disturbance regimes, seed sources and seed dispersers are present and doing their respective tasks at the appropriate moments in the rainforest ecosystem's cycling from closed canopy, through gap and back again). It will demonstrate resilience to normal ranges of environmental stress (droughts, canopy death, etc.) and disturbance (windthrow, flood, fire, etc.). It will interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions.

The nine attributes listed below provide a basis for determining when restoration has been accomplished (these are the things that you as *rainforest restoration* practitioners need to be on the look out for and be making sure that have been accomplished or that they are happening. If they are not, then you need to adapt your management to ensure that these attributes are or will become apparent in your restoration area). (Importantly) The full expression of all of these attributes is

not essential to demonstrate restoration (in other words, bank on those that you would expect to find at the reference site from which you have set up your restoration benchmarks). Instead, it is only necessary for these attributes to demonstrate an appropriate trajectory of ecosystem development towards the intended goal or reference (site). Some attributes are readily measured (species use, natural regeneration, rates of weed reinvasion, etc.). Others must be assessed indirectly, including most ecosystem functions (nutrient cycling, for example), which cannot be ascertained without research efforts that exceed the capabilities and budget of most restoration projects."

Section 3: Attributes of Restored Ecosystems (sites)

"The nine Attributes of Restored Ecosystems (sites) are:

1. The restored ecosystem contains a characteristic assemblage of the species that occur in the reference ecosystem and that provide appropriate community structure. (We aim for and suggest about 75% of the original plant composition of your *reference site* as an appropriate benchmark in south-eastern Australia. Note that this may either be planted over time through the *Maximum Diversity Restoration Method*, or it may be expected when using the *Natural Regeneration Method*, *Clumped Mixed Canopy Restoration Method* or the *Framework Restoration Method*, whereby natural regeneration via various *dispersal* agents ensures that these appropriate and characteristic assemblages occur at some time on your restoration site, i.e. the recovery trajectory is expected and observed to be happening).
2. The restored ecosystem consists of indigenous species to the greatest practicable extent. To date, using indigenous species only is our firm and resolute recommendation. However, notwithstanding the advent of climate change, and though we (as a community) have not yet sanctioned the importation of non-indigenous though adjacent rainforest species at this stage; the conservation of rainforests in south-eastern Australian under the new climatic regimes imposed by climate change may in fact require that 'next step'. It would be a momentous act and one that would require very wide-ranging consideration of the motives, protocols and scenarios under which it might occur. To do so would require extensive community and ecological consultation and very careful planning if ever such a process were to be adopted.
3. All functional groups (*pioneer*, *secondary* and *primary rainforest species*) necessary for the continued development and/or sustainability of the restored ecosystem are represented or, if they are not, the missing groups have the potential to colonise by natural means.
4. The physical environment of the restored ecosystem is capable of sustaining reproducing populations of the species necessary for its continued stability or development along the desired trajectory. (This represents a continuum, whereby narrow corridors or isolated restoration sites may not fully achieve these goals).
5. The restored ecosystem apparently functions normally for its ecological stage of development, and signs of dysfunction are absent. (Signs of dysfunction might include: a breakdown in structure composition or function).
6. The restored ecosystem is suitably integrated into a larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges. (This comes back to the original rainforest restoration site choice and corridor design).
7. Potential threats to the health and integrity of the restored ecosystem from the surrounding landscape have been eliminated or reduced as much as possible. (So for example on the Snowy: fencing to keep cattle at bay, regular drives to remove Sambar, *edge* closure plantings to seal edges for the maintenance of internal *homeostasis* (and to slow weed invasion), ongoing engagement with adjacent landholders about expanding the corridor's width, adding nodes or connecting it to other native vegetation etc.).
8. The restored ecosystem is sufficiently resilient to endure the normal periodic stress events in the local environment that serve to maintain the integrity of the ecosystem.
9. The restored ecosystem is self-sustaining to the same degree as its reference ecosystem, and has the potential to persist indefinitely under existing environmental conditions. Nevertheless, aspects of its biodiversity, structure and functioning may change as part of normal ecosystem development, and may fluctuate in response to normal periodic stress and occasional disturbance events of greater consequence (flood or fire). As in any intact ecosystem, the species composition and other attributes of a restored ecosystem may evolve as environmental conditions change.

Other attributes might gain relevance and should be added to the list if they are identified as goals of the restoration project. For example: the restored ecosystem might provide specified *ecosystem services* (pest control, crop and stock shelter); the provision of habitat for rare or threatened species (see Scenarios 1 and 2 Chapter S5); the provision of a regionally or site-specific gene pool (conservation of the saline-tolerant Littoral Rainforest species mix on First and Second Island for the restoration of the estuarine reach of the lower Snowy and Brodribb Rivers); and the accommodation aesthetic amenities or

the accommodation of activities of social consequence" (picnic areas, fishing platforms, canoe access, swimming holes, pump sites etc.).

Section 4: Explanation of terms: see the Glossary

Section 5: Reference Ecosystems (sites)

"A reference site serves as a model for planning a restoration project, and later (the ***benchmark***) for its evaluation. In its simplest form, the reference ecosystem is an actual site, its written description, or both. The problem with a simple reference site is that it represents a single state or expression of the ecosystem's attributes. The references site that is selected could have been manifested as any one of many potential states that fall within the historic range of variation of that ecosystem. Such sites represent a particular combination of stochastic events that occurred during the ecosystem's development. (For this reason, (where they are available), it is recommended that several reference sites are used to develop your benchmarks. Another useful technique is to locate a number of sites that are of different ages following disturbance, whether (natural or human perturbed). It is even more desirable to locate such reference sites that have had different disturbance types or combinations applied to the ecosystem. In this way, you can look back in time by locating the pioneer or secondary species in site and relate their age and health back to the date of disturbance that caused their germination and establishment. Partly with this in mind, we have created Appendix S17 so you know which species to look out for by floristic community), what role they can play (e.g. Appendix S20) and how you use them to your advantage for example in sealing edges (Appendices S12 and S21).

In the same manner, an ecosystem that is undergoing restoration can develop into any of a potentially large array of states. Any state that is expressed is acceptable as restoration, as long as it is comparable to any of the potential states into which its reference site could have developed [restoration on the lower Cann River (Figure 8.111) compared with the post flood state on Bemm River (Figure 3.8)]. Thus, a single reference site inadequately expresses the constellation of potential states and the historic range of variation expressed by the restored ecosystem. Therefore, a reference is best assembled from multiple reference sites and, if necessary, other sources. The composite description gives a more realistic basis for restoration.

Sources of information that can be used in describing reference sites include:

- Ecological descriptions (e.g. Peel 1999), species lists (and the various ecological, and restoration, meanings that can be derived from their sorting such data: Appendices 1.1, 5.1, 5.2, 5.3, 7.4, 9.2, etc.).
- Historical and recent aerial and ground-level photographs (Chapter 2 Opener); remnants of the site to be restored (numerous figures throughout the Manual), indicating previous physical conditions of the biodiversity.
- Remnants of the site to be restored, indicating previous physical conditions and biodiversity (the rear cover of Peel (1999) comparing the pre-flood condition of the floodplain to that post flood).
- Ecological descriptions and species lists of similar intact ecosystems (e.g. Chapter S6: Goalen Head and Bass Point; an indirect comparison using the next best choice).
- Herbarium and museum specimens (look to the relevant flora treatments for species historically recorded on your restoration site).
- Historical accounts (see Chapter 3: Who says it was rainforest?) and oral histories by persons familiar with the project site prior to change (see References: Personal Communications).
- Paleoecological evidence, e.g. fossil pollen (e.g. 2 of Peel 1999), charcoal, tree ring history, rodent middens.

The value of the reference site increases with the amount of information it contains, but every inventory is compromised by limitations of time and funding. Minimally, a baseline ecological inventory describes the salient attributes of the physical environment (we suggest at least ***landform*** and the disturbance regimes that can be deduced from these) and important aspects of the biodiversity such as species composition and community structure (and their spatial arrangement, or growth stage: e.g. absence of large vines in Gallery Rainforest indicating frequent and high flood energy disturbance in this riverine rainforest ecological vegetation class.). In addition, it identifies normal periodic stress events that maintain ecosystem integrity (e.g. regular flooding in Gallery Rainforests preventing its colonisation by the adjacent (but less flood-prone) Warm Temperate or Subtropical Rainforest). Descriptions of the reference for cultural ecosystems should identify the cultural practices that are critical in restoring and later in managing the ecosystem.

The description of a reference site is complicated by two factors that should be reconciled to assure its quality and usefulness. First, a reference site is normally selected for its well-developed expression of biodiversity, whereas a site in the process of restoration exhibits an earlier ecological (***successional***) stage. In such cases, the reference site (or data)

requires interpolation back to the prior developmental phase for purposes of both project planning and ***evaluation***. (We have recognised that early on the genesis of the Manual, because most of the species lists that have been taken by survey botanists (who definitely have a bias for the oldest and most mature rainforest) have effectively screened out younger earlier rainforest stages – the ones that will yield those species that are most useful to the rainforest restorer (pioneer and secondary species). For this reason, the Littoral Rainforest survey conducted by the author (Peel in prep.) deliberately sampled all successional stages. To overcome the problem of the maturity bias in the rest of the rainforest species list data set used in the Manual, we have annotated the species to indicate those that are pioneer or secondary species versus primary species. So each of the appendices that have species list frequency data (e.g. Appendix 6) come with two colour annotations: green for primary species or yellow for the pioneer and secondary species). The need for interpretation diminishes where the developmental stage at restoration project site is sufficiently advanced for direct comparison with the reference site. Second, where the goal of restoration is a natural ecosystem, nearly all available reference sites will have suffered some adverse human-mediated impacts that should not be emulated. Therefore, the reference site may require interpretation to remove these sources of artifice (that is why we have drawn your attention to the situation at Lochend Jungle on the lower Snowy River, where this rainforest stand is missing to important elements: tree-ferns, epiphytes and some ground ferns due to poaching.). For these reasons, the preparation of the description of the reference site requires experience and sophisticated ecological judgment". (Something we have been happy to provide for you in the Manual, but as you get to know your area, you too will come to add to this important body of ecological knowledge)."

Section 6: Exotic species

"An exotic species of plant or animal is one that was introduced into an area where it did not previously occur through relatively recent human activities. Because ecological restoration of natural ecosystems attempts to recover as much historical authenticity as can be reasonably accommodated, the reduction or elimination of exotic species at restoration project sites is highly desirable. Nonetheless, financial and logistical constraints often exist, and it is important to be realistic and pragmatic in approaching exotic species control. In cultural landscapes (read fragmented, cleared or logged areas), exotic species are frequently an integral part of the ecosystem (This is why we have made the distinction between background and transforming weeds and add the additional caveat for the latter category: to carefully consider their role in the ***ecology*** of your site before you act (Appendix S3) and Chapter S6: Integrated Weed Management).

In natural ecosystems, invasive exotic species commonly compete with and replace natives (we call them transforming species). However, not all exotic species are harmful. Indeed, some even fulfil ecological roles played by native species that have become rare or extirpated (see Chapter S6: Weed replacement plants for use by fruit eaters, Appendix S3: worksheet: Vic. fruit plant substitutes) and many other examples throughout the Manual). In such instances, the rationale for their removal (especially in the early stages of restoration) may be tenuous. Some exotic species were introduced centuries ago by humans or non-human agents and have become naturalised, so that their status as an exotic is debatable. Other species have migrated in and out of the region in response to climate fluctuations during the Holocene and can scarcely be regarded as exotics (the only species that might fit this bill in the region would be Cattle Egrets, but their arrival may have been mediated by factors other than climate change). Even if all exotic species are removed from the restoration site, the opportunity for reinvasion remains high (especially the case in fragmented landscapes or in linear restorations in agricultural or urban settings). Therefore it becomes essential for a policy to be developed for each exotic species present, based on biological, economic and logistic realities (that is why we wrote the section headed ***Integrated weed management***). Highest priority is best reserved for the control or extirpation of those species which pose the greatest threat. These include invasive species that are particularly mobile and pose an ecological threat at the landscape and regional levels, and animals that consume or displace native species (we call them transforming species). Care should be taken to cause the least possible disturbance to indigenous species and soils as exotics are removed (see ***Bradley Weeding*** and ***Wingham Weeding***).

In some instances, non-indigenous species plants are used for a specific purpose in the restoration project, for example, as ***cover crops***, nurse crops or nitrogen fixers (yes to the first two, but no to the last in south-eastern Australia. Examples of cover crops would include Sterile Rye-corn and Kikuyu **Pennisetum clandestinum*, whilst exotic ***nursery crops*** in the south-east of Australia could include Lantana **L. camara*, Blackberries **Rubus anglocandicans* and Deadly Nightshades **Solanum nigrum* spp. agg.). Unless these are relatively short-lived, non-persistent species that will be replaced in the course of ***succession***, their eventual removal should be included in restoration plans." (Our advice exactly!).

Section 7: Monitoring

"A properly planned restoration project aims to fulfil clearly stated goals that reflect important attributes of the reference ecosystem. Goals are achieved by pursuing specific objectives. The goals are ideals, and the objectives are concrete measures taken to attain these goals. Two fundamental questions should be asked with respect to evaluation of a restored ecosystem. Were the objectives accomplished? Were the goals fulfilled? Answers to both questions gain validity only if the goals and objectives were stated prior to the implementation of restoration project work.

Ecosystems are complex, and no two intact ecosystems are ever identical, at least not when examined in fine resolution. For that reason, no restored ecosystem project site can ever be identical to any single *reference site*. The number of ecosystem variables that can be used in an evaluation is too great for all to be measured within a reasonable period of time. The selection of which variables to assess and which to ignore requires pragmatism and value judgments by the evaluator (and that will generally be you: the restoration practitioner or project manager).

Objectives are evaluated on the basis of performance standards or success criteria (we call them measurements of success: see Chapter 9: Using habitat and birds). These criteria are conceived in large part from an understanding of the reference ecosystem. Performance standards provide an empirical basis for determining whether or not the project objectives have been attained. Objectives, performance standards, and protocols for *monitoring* and for data assessment should be incorporated into restoration plans prior to the start of a project. If interpretation of the data collected during monitoring shows that performance standards have been met, there can be no doubt that the project objectives have been achieved, and the restored ecosystem is likely to be sufficiently resilient to require little further assistance from the restoration practitioner.

It is assumed that project goals are, or soon will be, fulfilled once the objectives are attained. The validity of this assumption is not guaranteed, because the objectives and performance standards that were designated may prove to be inadequate, and unanticipated environmental vicissitudes can deflect the *restoration trajectory*. For that reason, and because goals are ideals that resist strict empirical measurement, an element of professional judgment and subjectivity is inevitable in the evaluation of goals.

Three strategies exist for conducting an evaluation: direct comparison, attribute analysis and trajectory analysis. In direct comparison, selected parameters are determined and measured in the reference ecosystem and on the restoration sites (e.g. bird censuses: see Chapter 9: Using habitat and birds). If the reference description is thorough, as many as 20 or 30 parameters can be compared that include aspects of both biodiversity and the physical environment. This can lead to ambiguity of interpretation when the results of some comparisons are close [(e.g. birds in our measurement of success) and others are not (e.g. fungi in our comparison). Our advice is to be clear-headed when selecting a comparison parameter and at that stage recognise the limitations and inferences that can be safely drawn when selecting them. Note that one parameter such as birds, may respond more quickly to your restoration efforts, than another: such as fungi. A success in one and a partial or poor result in another do not necessarily indicate failure; it may just mean ;that there are two different time scales operating in the ecological processes that underpin them].

In attribute analysis, attributes are assessed in relation to the list provided in Section 3. In this (monitoring) strategy, quantitative and semi-quantitative data from scheduled monitoring and other inventories are useful in judging the degree to which each goal has been achieved (for the lower Snowy River rainforest restoration, the goal of 50% or more of the original vascular species diversity being established is easily measured, but we have taken it a step further and assesses the ecological processes more directly by undertaking natural regeneration surveys (Appendix S4) that directly relates to Attribute 4 of a restored ecosystem, namely: that: "The physical environment of the restored ecosystem is capable of sustaining reproducing populations of the species necessary for its continued stability or development along the desired trajectory".

Trajectory analysis is a promising strategy, still under development, for interpreting large sets of comparative data (and falls beyond the capacity of current projects in south-eastern Australia). However, our biennial bird censuses across restoration sites should enable us to undertake a trend analysis by the end of the restoration phase in 2012. In this strategy, data collected periodically at the restoration site are plotted to establish trends. Trends that lead towards the reference condition confirm that the restoration (effort) is following its intended trajectory.

Evaluations include the assessment of any stated goals and objectives that pertain to cultural, economic and other societal concerns (hence our use of the use of restoration sites for camping, fishing and defecation!). For these, the techniques of

evaluation may include those of social sciences. The evaluation of socio-economic goals is important to stakeholders and ultimately policy-makers who decide whether or not to authorise and finance restoration projects. (It is for this reason that we include both the $\$ha^{-1}$ cost along with the biodiversity results in our submissions to government when seeking funding for restoration compared to *revegetation* because we know there is a significant biodiversity benefit to restoration)."

Section 8: Restoration Planning

"Plans for restoration projects include, at a minimum, the following:

- A clear rationale as to why restoration is needed (in the case of the lower Snowy it was to maximize the benefits of environmental water flows through the highly degraded lowland floodplain reach of the river).
- An ecological description of the site designated for restoration (delineated by the Crown Frontage, its landforms and historic vegetation cover as well as those that could be reasonably reconstructed and maintained given the altered environment of the restoration project area).
- A statement of the goals and objectives of the restoration project (to restore the riparian vegetation environment of that reach of the Snowy River).
- A designated description of the reference site/s (the species lists of Alluvial Terraces Warm Temperate Rainforest from Peel (1999), the reference sites from which benchmarks were developed: Lochend Jungle, Brodribb River and Bemm River).
- An explanation of how the proposed restoration will integrate with the landscape (Crown Frontage) and its flows of organisms (its attachment to key rainforest nodes in the floodplain (some of which were natural: Lochend Jungle/Lake Wat Wat, Deasey's Cutting and the rainforests of the hinterland at Stony Creek, Wibenduc Creek and Pipeclay Creek; others that were to be recreated: the Seed Orchard on Marlo Road, the Bike Track at Orbost and the Rainforest Centre at Orbost) and materials (sediment deposition and flooding, which differ at various points along the river and are manifest in the restoration plan by the proposed establishment of different riparian ecological vegetation classes ranging from Riverine Wetlands, Riparian Shrublands through to a range of rainforest ecological vegetation classes);
- Explicit plans, schedules and budgets for site preparation, installation (planting), and post–instillation activities [(maintenance and facilitating natural regeneration) all of which have been compiled, reviewed and accepted by the Catchment Management Authority and the Department of Sustainability and Environment)], and a strategy for making prompt mid-course corrections (the Snowy project runs for 7 years, but has biennial stop-points for just such an evaluation);
- Well-developed and explicitly stated performance standards, with monitoring protocols by which the project can be evaluated (these are represented in each year's sub-project, project briefs and incorporated into each operator's contract).
- Strategies for the long-term protection and maintenance of the restored ecosystem (all sites are the subject of a written agreement with the adjacent landholder and the Crown; and the Catchment Management Authority, the community and the Department are all lobbying for ongoing maintenance money to preserve the $7million dollar asset that is being created on the basis that any other physical infrastructure (roads, schools, etc.) also require maintenance; and perhaps most importantly, it will cost less to maintain it than it will to repair it should we let it fall into disrepair).

Where feasible, at least one untreated control plot should be included at the project site, for purposes of comparison with the restored ecosystem." (This was accommodated by the survey of the "Willows over Kikuyu" bird census site on Lochend Road. In part, because of the finding at this site, it has been incorporated into the restoration project because it represented an insurmountable migration barrier to rainforest birds along the river and through our restoration works. Given the pivotal role of birds in maintaining the ecological function of rainforests in south-eastern Australia, it was decided to 'trash the control' and include it in the restoration site area.).

Section 9: Relationship between Restoration Practice and Restoration Ecology

"Ecological restoration is the practice of restoring ecosystems as performed by (restoration) practitioners at specific project sites, whereas *restoration ecology* is the science upon which the practice is based. *Restoration ecology* ideally provides clear concepts, models, methodologies and tools for practitioners in support of their practice. Sometimes the practitioner and the restoration ecologist are the same person – the nexus of practice and *theory* (this is achieved by the best practitioners in their field: some of whom we are fortunate to have as contractors in eastern Australia. These are usually the most passionate among us who have a keen eye, and are intuitive ecologists with a practical bent). The field of restoration ecology is not limited to the direct service of restoration practice. Restoration ecologists can advance ecological theory by

using restoration project sites as experimental areas (this something we very strongly recommend: it stimulates debate and creates better work practices and practitioners in this fledgling field in our region). For example, information derived from project sites could be useful in resolving questions that pertain to the assembly rules for floristic communities (and that is precisely what we have done on our restoration sites; the results of which are here presented in this manual!). Further, restored ecosystems can serve as references for set-aside areas designated for conservation" (the classic example is the restored Subtropical Rainforest remnant at Wingham Brush in northern New South Wales on the Manning River, which was so successful that it is now a Flora and Fauna Reserve managed by the New South Wales National Parks and Wildlife Service: a magnificent achievement by any measure).

Section 10: Relationship of Restoration to Other Activities

"Ecological restoration is one of several activities that strive to alter the biodiversity and physical conditions at a site, and frequently confused with restoration. These activities include reclamation, rehabilitation, mitigation, ecological engineering and various kinds of resource management, including wildlife, fisheries, range management, agroforestry and forestry. All of these activities can overlap with and may even qualify as ecological restoration if they satisfy all of the criteria listed in Section 3 (above). Relative to other kinds of activities, restoration generally requires more post-instillation aftercare to satisfy all of these criteria.

The following definitions are supplied by SER and relate directlty to their use and context in this section only. They are not necessarily used in the same way or with the same meaning elsewhere in the Manual. If in doubt, consult the Glossary to be sure of the context and definitions for these terms when they are used elsewhere in the Manual.

Rehabilitation shares with (ecological) restoration a fundamental focus on historical or pre-existing ecosystems as models or reference sites, but the two activities differ in their goals and strategies. Rehabilitation emphasises the reparation of *ecosystem processes*, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of community composition and structure. Nonetheless, restoration, as broadly conceived herein, probably encompasses the majority of project work that has previously been identified as rehabilitation.

Reclamation, as commonly used in the context of mining lands in North America and the UK, has an even broader application than rehabilitation. The main objectives of reclamation include the stabilisation of terrain, assurance of public safety, aesthetic improvement, and usually a return of the land to what, within the regional context, is considered to be a useful purpose (which can range from agricultural, forestry or urban uses). Revegetation, which is normally a component of land reclamation, may entail the establishment of only one or a few species (not necessarily indigenous). Reclamation projects that are more ecologically based can qualify as rehabilitation or even ecological restoration.

Mitigation is an action that is intended to compensate for environmental damage. Mitigation is commonly required in the USA as a condition for the issuance of permits for private development and public works projects that cause damage to wetlands. Some, but perhaps relatively few, mitigation projects satisfy the attributes of a restored ecosystem listed in Section 3 (above), and thus would qualify as ecological restoration.

The term creation has enjoyed recent usage, particularly with respect to projects that are conducted as mitigation on terrain that is entirely devoid of vegetation. The alternative term fabrication is sometimes employed. Frequently, the process of voiding a site (open cut mining) causes sufficient change to the environment to require the installation of a different ecosystem from that which occurred historically. Creation that is conducted as supervised by engineering or landscape architecture cannot qualify as restoration because restoration is initiates ecosystem development along a preferred trajectory, and therefore allows autogenic processes to guide subsequent development with little or no human interference.

Ecological engineering involves the manipulation of natural materials, living organisms and the physical-chemical environment to achieve specific human goals and solve technical problems. It thus differs from civil engineering, which relies on human-made materials such as steel and concrete. Predictability is a primary consideration in all engineering design, whereas restoration recognises and accepts unpredictable development and addresses goals that reach beyond strict pragmatism and encompass biodiversity and ecosystem integrity and health."

Section 11: Integration of Ecological Restoration into a Larger Program

"Ecological restoration is sometimes only one of many elements within a larger public or private sector enterprise, such as development projects". (Project managers should be aware of the complexities involved in restoration, and allow the restoration ecologist to integrate their works into the whole plan at considerable cost savings to the project.)

DIFFERENTIAL RAINFOREST DEFINITIONS FOR SOUTH-EASTERN AUSTRALIA

The definitions for the different Ecological Vegetation Classes of rainforest are provided as one of the tools so that the rainforest restorer can confidently identify and differentiate the rainforest vegetation that they are investigating as well as being able to appreciate its ***landscape context*** and relationships to other ***rainforest types*** nearby or in the region. These definitions should assist the reader when consulting the keys to the rainforests of the region (in the Glossary or in this section). Places to see an exemplar of each of the types are provided in Chapter S1: Rainforest types covered by the Manual.

SUBTROPICAL RAINFORESTS

Habitat

Topographically fire-protected east, north and west facing gullies on fertile geologies, or in more open areas (slopes and ridge-lines) where fire protection is afforded by grassy ecosystems or other mechanisms (such as high summer rainfall (Tilba Tilba area), high and persistent maritime humidity of coastal ranges (Durras Mountain) or a combination of these. Always restricted to fertile geologies [such as dolerite (Goalen Head), monzanite (Tilba Tilba) and possibly the rich alluviums of the river flats of the Tuross, Moruya and Clyde Rivers or basalt (Durras Mountain)]. Within the subtropical climate zone Warm Temperate Rainforests are restricted to the lesser fertility geologies (metasediments, granites, sandstones etc.).

Key features

The following list describes the key features of Subtropical Rainforest, which differentiate it from other lowland rainforest EVCs with which it may co-occur:

- Species composition (see Appendix S6).
- The canopy is dense multi-layered (Keith 2004) and festooned with vines, so that the forest floor is often extremely gloomy (Preamble: Figure P3; Chapter S1: Figure S9).
- Strangler Figs are usual (Preamble: Figure P1), and in mature stands this gives rise to emergent trees (Chapter S2 Figure S50).
- Many of the largest trees have buttressed roots at the base of their trunks (Preamble: Figure P3; Chapter S1: Figure S9) and some even have stilt roots such as Small-leaved Fig *Ficus obliqua* (Preamble Figure P1);
- Some of the dominant trees are common in Warm Temperate Rainforests and these tend to form the lower canopy) but many of the following features are restricted or largely restricted to Subtropical Rainforests in the region:
    - The vegetation is dominated by a range of species and life-forms (some of which are very large) that include: Native Quince *Alectryon subcinerus*, Brush Bloodwood *Baloghia inophylla*, Giant Stinging Tree *Dendrochnide excelsa*, Koda *Ehretia acuminata*, Sandpaper Fig *Ficus coronata*, Small-leaved Fig *Ficus obliqua* and or Rusty Fig *Ficus rubiginosa*. Emergent eucalypts are rare, but may include Coast Grey Box *Eucalyptus bosistoana* and Forest Red Gum *E. tereticornis*. Dominant vines include Kangaroo Vine *Cissus antarctica*, Jungle Grape *C. hypoglauca*, Yellow Wonga Vine *Pandorea* sp. Ipswich and Giant Pepper Vine *Piper hederaceum*. Following disturbance, White Sallow Wattle *Acacia floribunda* (Durras Mountain), Mabel's Wattle *A. mabellae*, Maidens Wattle *A. maidenii* and/or Black Wattle *A. mearnsii* may be dominant.
    - Palms are usual with Bangalow Palm *Archontophoenix cunninghamiana* (north of Durras Lake) and Cabbage Fan Palm *Livistona australis* usually present.
    - Leaf lengths vary from small: microphyll (2.5-7.5 cm) through to medium: notophyll (7.5-12.5 cm long) and occasionally large: mesophyll (>12.5 mm).
    - Vines are abundant and include large woody lianes such as Kangaroo Vine *Cissus antarctica*, Jungle Grape *C. hypoglauca*, Giant Wonga Vine *Pandorea* sp. (Ipswich) (Chapter S8: Figure S301) and Giant Pepper Vine *Piper hederaceum* var. *hederaceum*.
    - Large epiphytes (where they have not been poached) such as Birds Nest Fern *Asplenium australasicum*, Rock Orchid *Thelychiton speciosum*, Elkhorn *Platycerium bifurcatum* and Leather Shield-fern *Rumhora adiantiformis* are usual.
    - Ground-ferns are present, but generally not as abundant as other types in south-eastern Australia
    - Tree-ferns are not abundant in most stands away from rivers. Though few riverine stands remain, it is expected that tree-ferns will be abundant in these habitats.
    - Mosses and lichens are present but usually not common or visually abundant; and
    - Tree-ferns may be present, but are usually rare.

Distribution

Subtropical Rainforest occurs from near sea level (but not in exposed coastal situations, which is Littoral Rainforest habitat) in gullies and on fertile geologies from the Tanja-Bega district northwards to the Clyde Catchment north of Batemans Bay (and beyond into northern New South Wales and southern Queensland).

Major differences from closest 'relatives' (Warm Temperate Rainforest and Dry Rainforest)

- Strangler figs and palms usually present (rare or absent in other types)
- Buttressing of large trees (rare or absent in both Warm Temperate and Dry Rainforests)
- Large leaves (rare or absent in Warm Temperate Rainforest and Dry Rainforest)
- Large epiphytes (not present in either Warm Temperate Rainforest or Cool Temperate Rainforest).

WARM TEMPERATE RAINFORESTS

Habitat

Lowlands below 700 m. Occurs in moist sheltered localities such as south- or-east facing gullies and on river flats away from the high flood energy zones of rivers, which are occupied by Gallery Rainforest (see below). In the subtropical climate zone it is restricted to cooler (south aspects) and poorer fertility geologies (i.e. not basalts, monzonites, gabbro etc.) compared to Subtropical Rainforests.

Key features

The following list describes the key features of Warm Temperate Rainforest, which differentiate it from other lowland rainforest EVCs with which it may co-occur:

- Species composition (see Appendix S6).
- Strangler figs are absent.
- Palms are generally absent.
- Buttressed trunks are absent (or occasionally fluted but then only in very old trees).
- Dominant species include (but can vary according to the region): Yellowwood *Acronychia oblongifolia*, Coachwood *Ceratopetalum apetalum*, Sassafras *Doryphora sassafras*, Blue Oliveberry *Elaeocarpus reticulatus*, Eastern Leatherwood *Eucryphia moorei*, Muttonwood *Rapanea howittiana*, Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. These rainforest stands can include a number of emergent eucalypts that vary according to the landform and habitat: Coast Grey Box *Eucalyptus bosistoana*, Southern Mahogany *E. botryoides*, Mountain Grey Gum *E. cypellocarpa*, River Peppermint *E. elata*, various subspecies of Blue Gum *E. globulus*, Messmate *Eucalyptus obliqua*, Yellow Stringybark *E. muelleriana* and Forest Red Gum *E. tereticornis*. Jungle Grape *Cissus hypoglauca* can be a dominant canopy species and either Black Wattle *Acacia mearnsii* or Blackwood *A. melanoxylon* can be prominent after severe disturbance.
- Leaf lengths vary from small: microphyll (2.5-7.5 cm) through to medium: notophyll (7.5-12.5 cm long) but medium-sized leaves are usual.
- Vines usually common and include a mixture of wiry and woody species.
- Moisture-dependent ferns are abundant.
- Small vascular epiphytes are often present.
- Tree-ferns are usually common.
- Mosses and lichens are common, but rarely abundant.

Distribution

In the warm temperate climate zone, abundant in the lowlands from Wilsons Promontory, the Strzelecki Ranges, East Gippsland and southern New South Wales.

Major differences from closest 'relatives' (Subtropical Rainforest and Gallery Rainforest)

- Stranglers absent (but present in Subtropical Rainforests)
- Emergents: eucalypts only
- Vines and tree-ferns abundant (rare in Gallery Rainforest).

COOL TEMPERATE RAINFORESTS

Habitat

Montane plateaus and higher mountain gullies (>650 m elevation). Occurs in high rainfall zones where cloud cover is frequent. Most stands are restricted to steep south- or east-facing gullies and occasionally broad ridges on fertile soils in the highest rainfall areas.

Key features

The following list describes the key features of Cool Temperate Rainforest, which differentiate it from other foothill rainforest EVCs with which it may co-occur:

- Species composition (see Appendix S6).
- Species tend to have small: microphyll leaves (2.5-7.5 cm in length) thought to be an adaptation to a cold climate.
- Dominant species include (but can vary according to the region): Southern Sassafras *Atherosperma moschatum*, Sassafras *Doryphora sassafras* (NSW only and also present in other lowland rainforest types), Black Oliveberry *Elaeocarpus holopetalus*, Eastern Leatherwood *Eucryphia moorei* and Myrtle Beech *Nothofagus cunninghamii*. Emergent eucalypts are rare and vary according to the landform and habitat: Brown Barrel *Eucalyptus fastigata*, Mountain Ash *E. regnans* are the most usual. After severe disturbance, Silver Wattle *Acacia dealbata*, Frosted Wattle *A. frigescens* or Blackwood *A. melanoxylon* may predominate, the particular species being locality dependent. There are no structurally dominant vines in this rainforest EVC.
- Vines are rare and low in diversity (< 5 species).
- Epiphytes are mostly mosses, which are visually abundant and diverse (Chapter S1: Figure S24).
- Vascular epiphytes are small and dominated by ferns in both states, but are augmented by orchids in NSW;
- Ground-ferns are the dominant ground-layer life-forms (Chapter S1: Figure S2).
- Tree-ferns are abundant (Chapter S1: Figure S4).

Distribution

In New South Wales, along the Monaro escarpment and the higher ranges between this area and the coast (Mount Imlay, Gulaga (Mount Dromedary). In Victoria, on the Errinundra Plateau, the Murrungowar Range and westward not until the Central Highlands, Strzelecki Ranges (rarely at Wilsons Promontory, and then only on the highest peaks), then an outlier (where abundant) in the Otway Ranges.

Major differences from closest 'relatives' (Warm Temperate Rainforest)

- The dominance of species with small leaves (Warm Temperate Rainforest also has medium-sized leaved species).
- Vines are rare and not diverse (Warm Temperate Rainforests vines are common and diverse: >5 species).
- Abundant and diverse mosses (in Warm Temperate Rainforests mosses are common, but rarely visually abundant).

GALLERY RAINFORESTS

Habitat

The overriding factors governing the distribution of Gallery Rainforest in the lowlands of south-eastern Australia are the presence of a high flood energy zone along a stream and if the stream is ephemeral, it requires topographic fire protection. Perennial streams and the humid atmosphere they generate, provide fire protection even in the absence of topographic protection from fire (Chapter S7 Figure S278). Gallery Rainforests are restricted to the banks of swift-flowing, flood-prone rivers and streams of the lowlands below 560 m, or the valley-constrained sections of smaller ephemeral streams. In higher rainfall areas of the region, the moderate fire protection is afforded by moist forests nearby and, on occasion's by Warm Temperate Rainforest on the floodplain. On rivers such as the Bemm, Combienbar, McKenzie, Thurra, Mueller, Wallagaraugh and the upper Clyde River's tributaries, it develops its classical canopy to form a tunnel (the "gallery") through which the river flows (Chapter S1 Figure S29). On the Snowy, Genoa and Bega Rivers that are larger, or where their floodplain is constrained (some sections of the Bemm, Brogo and Murrah Rivers), the classic gallery-form cannot establish and the rainforest is restricted to one or both banks (Chapter S1 Figure S30). In theses situations, open water or other vegetation that includes Riparian Shrublands in Victoria and Riparian Forest of River Oak in southern New South Wales physically separates the stands of each bank. Gallery Rainforest can also develop in drier areas in gorges that provide the fire protection (Iguana Creek, Mitchell River, Boggy Creek at Nowa Nowa and the Brogo River etc.). In these situations (often on smaller or more ephemeral streams), flood intensity is concentrated by the narrowness of the gorges in which the stands occur.

Key features

The following list describes the key features of Gallery Rainforest, which differentiate it from other lowland rainforest EVCs with which it may co-occur:

- Species composition (see Appendix S6).
- The canopy is often 'thin and airy' because the dominant tree Kanooka *Tristaniopsis laurina* allows more sunlight to be transmitted to the forest floor (Chapter S1: Figure S31).
- Low diversity of vines (with wiry species dominating) because the high flood energy rips out larger mature woody species (Chapter S1: Figures S29, S31 and S34).

- High flood energy also causes mature tree-ferns to be rare (Chapter S1: Figures S31 and S34), though in some limited situations e.g. foothill reaches of a few rivers (e.g. Combienbar River), this life-form can be quite common.
- Ground-ferns are the dominant ground-layer species (Chapter S1: Figures S31 and S34).
- Usually dominated by Kanooka *Tristaniopsis laurina* in Victoria (Chapter S1: Figures S29-S32), and in New South Wales by this species can be co-dominant with Grey Myrtle *Backhousia myrtifolia* north of the Bega district (Chapter S1: Figure S33) and Coachwood *Ceratopetalum apetalum* (Chapter S1: Figure S34). Large vines are usually absent (although Jungle Grape *Cissus hypoglauca* which is flood resistant may be present). Emergent eucalypts are usually absent. After severe disturbance Blackwood *Acacia melanoxylon* and/or Black Wattle *Callicoma serratifolia* may be dominant (depending on locality).
- Vascular epiphytes are rare below flood level (but can be common above it), whilst bryophytes can be visually abundant.

Distribution

Lowland rivers from Mitchell River in Victoria northwards.

Major differences from closest 'relatives' (Subtropical Rainforest and Warm Temperate Rainforest)

- Low diversity of canopy species (compared with both Subtropical and Warm Temperate Rainforests).
- Woody vines largely absent (compared with adjacent Warm Temperate Rainforest).
- Absence of the canopy dominants from the closest 'relative' rainforest types.
- Rarity of tree-ferns (compared to Warm Temperate Rainforests).

DRY RAINFORESTS

Habitat

Dry Rainforests generally grow on cliffs and rock scree in rain shadow valleys where there is reliable rainfall. These cliffs are often associated with river gorges, but not exclusively. Dry Rainforest also occurs in tor fields and on rocky ridges (especially in the granitic valleys of the Bega-Brogo-Candelo districts). In these habitats fire is largely excluded (or reduced in intensity by adjacent grassy ecosystems). This rainforest type is most unusual in that it usually occurs in fire shadows on north or west aspects. The other major habitat is in grassy woodlands. The fire protection in this habitat is derived from the low ground fuels of the adjacent grassy ecosystems (Chapter S1: Figures S18, S35 and S36). In the Grassy Woodland habitat (Bega-Brogo, Moruya and Araluen valleys), the necessity for rocky habitats becomes redundant and individual figs or clusters of figs can occur on open hillsides.

Key features

The following list describes the key features of Dry Rainforest, which differentiate it from other lowland rainforest EVCs with which it may co-occur:

- Species composition (see Appendix S6).
- Canopies are generally low (<10 m) and fairly uniform (usually narrowly spreading in Victoria where figs are absent), but widely spreading in New South Wales where figs dominate (Chapter S1: Figures S35-S37).
- In New South Wales Rusty Fig *Ficus rubiginosa* is usually dominant in the canopy (Chapter S1: Figures S35-S37) along with Native Quince *Alectryon subcinereus*, Kurrajong *Brachychiton populneus*, Giant Stinging Tree *Dendrochnide excelsa* and Sweet Pittosporum *P. undulatum*. Figs are absent in Victoria where the dominant species include Kurrajong *Brachychiton populneus*, Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Staff Climber *Celastrus australis* may be a dominant vine. Eucalypts are usually completely absent, although in New South Wales Forest Red Gum *Eucalyptus tereticornis* may be present. Fire or flood disturbance is very rare in these communities, but if fire occurs then Lightwood *Acacia implexa* and Black Wattle *A. mearnsii* and a range of other wattles may regenerate (depending on locality).
- All species are drought-hardy and adapted to long periods of low moisture.
- Annual life-cycles with germination stimulated by rainfall events (Star Cucumber *Sicyos australis* and Indianweed *Sigesbeckia orientalis*).
- Adaptive leaf features include: small leaves [Prickly Currant-bush *Coprosma quadrifida* and Small-leaf Bramble *Rubus parviflorus* (compared to others from genus in the region such as Rose-leaf Bramble *R. rosifolius* and Queensland Bramble *R. moluccanus*)], hairy leaves (Green Rock-fern *Cheilanthes austrotenuifolia*, Bristly Rock-fern *C. distans*, Narrow Rock-fern *C. sieberi*, Brittlewood *Claoxylon australe*, Blanket-fern *Pleurosorus rutifolius*, Sickle Fern *Pellaea falcata*, Cockspur Flowers *Plectranthus graveolens* and *P. parviflorus* and Rock Felt-fern *Pyrrosia rupestris,* Small-leaf Bramble *Rubus parviflorus*), or waxy leaves (Rusty Fig *Ficus rubiginosa*, Muttonwood *Myrsine howittiana*, Leathery Shield-fern *Rumorha adiantiformis* and Rock Orchid *Thelychiton speciosum*).

- Adaptive physiology includes: water storage [roots (Kurrajong *Brachychiton populneus*), trunks (Kurrajong *Brachychiton populneus*) and stems (Rock Orchid *Thelychiton speciosum*)] and C4 grasses such as Barbed-wire Grass *Cymbopogon refractus* and Kangaroo Grass *Themeda triandra*;
- Rain-green deciduousness (e.g. Kurrajong *Brachychiton populneus*, Staff Climber *Celastrus australis*, Koda *Ehretia acuminata*, Muttonwood *Myrsine howittiana* and Sickle Fern *Pellaea falcata*).
- Resurrection plants (e.g. Green Rock-fern *Cheilanthes austrotenuifolia*, Bristly Rock-fern *C. distans*, Narrow Rock-fern *C. sieberi*, Blanket-fern *Pleurosorus rutifolius*, Sickle Fern *Pellaea falcata* and Rock Felt-fern *Pyrrosia rupestris*);
- Large drought-tolerant lithophytes may be present [New South Wales only (Leathery Shield-fern *Rumohra andiantiformis* and Rock Orchid *Thelychiton speciosum*)].
- Ferns are rare (but those that are present have all some of the features listed above to survive droughts).
- Tree-ferns are absent.
- Extensive gaps may be marked by cliffs or rock scree.
- In Grassy Woodland examples, eucalypts (generally Forest Red Gum *Eucalyptus tereticornis*) may be present as emergents (Chapter S1: Figure S37) that are able to regenerate in the absence of fire (principally after drought).
- Buttressing is absent.

Distribution

Dry Rainforest occurs northwards from the Mitchell River National Park in Victoria, also including: Genoa Rivers (in Victoria), the Towamba valley, Bega valley, Brogo-Warragul Range area north of Bega, Verona, Candelo districts, Tilba district, Upper Deua River (south west of Araluen) and Clyde River Valley on granitoids.

Major differences from closest 'relatives' (Subtropical Rainforest and Warm Temperate Rainforest)

- No buttressing (as in Subtropical Rainforests).
- No moisture-dependent ferns (as apposed to Subtropical and Warm Temperate Rainforests).
- Tree-ferns are absent (as apposed to Subtropical and Warm Temperate Rainforests).
- Dry exposed and hot habitat (as apposed to Subtropical and Warm Temperate Rainforests).
- Abundance of drought-tolerant features (compared with all other types).
- Palms are absent (but common in Subtropical Rainforest).

DRY GULLY RAIFORESTS

Habitat

Always in gullies (often, but not always, in deeply dissected terrain) at low elevations from sea level on moderate fertility soils derived mostly from Ordovician Metasediments. Such gullies rarely have flowing water. Some stands occur on riverine cliffs with north or west aspects along some of the major river valleys of the region. Stands can occur in exposed aspect gullies (unusually for rainforest) where there is a lesser degree of topographic protection than is the case for other rainforests of south-eastern Australia. However, this is compensated for by the deep dissection of the gully-systems in which it grows and/or the adjacent vegetation's low fuel loads (Cameron pers. comm.). It also occurs on this geology in more gentle terrain, but south and east facing gully systems (Chapter S1: Figure S10) or where there is fire protection from grassy forests adjacent to the stands (Chapter S1: Figure S11).

Key features

The following list describes the key features of Dry Gully Rainforest, which differentiate it from other lowland rainforest EVCs with which it may co-occur:

- Species composition (see Appendix S6).
- Canopies are generally low (<10-15m).
- Vines are not a significant feature in these canopies.
- Buttressing (except for fluting) is rare except in the oldest individuals of species such as Grey Myrtle *Backhousia myrtifolia* (Chapter S1: Figure S13) and River Oak *Casuarina cunninghamiana*.
- Dominant species include (but may vary according to locality): Grey Myrtle *Backhousia myrtifolia*, River Oak *Casuarina cunninghamiana,* Blue Oliveberry *Elaeocarpus reticulatus*, Sandpaper Fig *Ficus coronata*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Dominant vines include Common Silkpod *Parsonsia straminea*. There are no usual eucalypts in this rainforest EVC. Following disturbance Green Wattle *Acacia irrorata* and Black Wattle *A. mearnsii* are the dominant secondary species.
- All species are drought-hardy and adapted to long periods of low soil moisture, but the presence of some small orchid (*Dockrilla* spp. And *Sarcochilus* spp.) and fern epiphytes such as Common Filmy-fern *Hymenophyllum cupressiforme* and Rock Felt-fern *Pyrrosia rupestris* (drought-tolerant though they are) indicates sufficient atmospheric moisture to sustain them (perhaps dews and valley fogs).

- Adaptive leaf features include: small, microphyll leaves (2.5-7.5 cm).
- Ferns are rare (but those that are have all some of the features listed above to survive droughts) (Chapter S1: Figure S13).
- Tree-ferns may be present, but are restricted to minor niches (such as along drainages and occasional springs in rocky gullies).
- Vascular epiphytes are small and have some of the features listed above to survive droughts.
- Emergents may be present (usually River Oak *Casuarina cunninghamiana)* and occasionally eucalypts.

Distribution

Based on the dominant species distribution, Dry Gully Rainforest occurs north from Wapengo Creek (Floyd 2008) with the Dry Gully Rainforest certainly well established a little further north at Lake Cuttagee.

Major differences from closest 'relatives' (Warm Temperate Rainforest, Gallery Rainforest and Dry Rainforests)

- No moisture-dependent ferns (as in Warm Temperate Rainforest and Gallery Rainforest).
- Dry exposed gully habitats (as apposed to Warm Temperate and Gallery Rainforests).
- Absence or only rare occurrence of large epiphytes (that are usually present in Dry Rainforest) and then principially Elkhorn *Platycerium bifurcatum*.
- The usual absence of large figs such as Rusty Figs *Ficus rubiginosa* that are more common in Dry Rainforest.

LITTORAL RAINFORESTS

Habitat

Coastal: aeolian landforms (dunes, sand flats, barrier islands); estuaries: lacustrine deposits like sand berms, cobble berms (Chapter S1: Figures S43 and S44; Additional Reading: Figures AR18 and AR19), cheniers and estuary islands; riverine deltaic deposits in estuarine reaches; headlands; and marginal bluffs (Chapter S1: Figures S39 and S41). The prevalence of salt (wind, water or soil borne) and fire protection are paramount. Host geologies are diverse, and these can dictate which floristic community is present on the site.

Key features

The following list describes the key features of Littoral Rainforest, which differentiate it from other near-coastal rainforest EVCs with which it may co-occur:

- Species composition (see Appendix S6).
- All stands are affected by salt (with nearly all occurring within 2
- km of the sea) where salt haze and atmospheric accession provide the salt (Additional Reading: Figure AR14), or around estuaries or along the estuarine reaches of rivers on deltaic deposits (where salt is delivered via the saline water table and occasional inundation during high estuary stand levels). The exception to the 2km 'rule' are those stands that occur on riverine limestone cliffs that are exposed to connate salts due to the marine origin of their limestone geologies (Additional Reading: Figure AR38).
- Includes a suite of coastal species adapted to rainforest conditions (capable of regeneration under rainforest conditions). There are usually 5 or more species such as: Coast Wattle *Acacia longifolia* ssp. *sophorae*, Sea Box *Alyxia buxifolia*, Coast Banksia *B. integrifolia*, Knobby Club-rush *Ficinia nodosa*, Coast Sword-sedge *Lepidosperma gladiatum*, Sandhill Sword-sedge *L. concavum*, Coast Beard-heath *Leucopogon parviflorus*, Giant Honey-myrtle *Melaleuca armillaris*, Boobiallas *Myoporum* spp., Seaberry Saltbush *Rhagodia candolleana* etc. Dominant species (vary according to locality, landform and geology) include: Native Quince *Alectryon subcinereus*, Swamp Oak *Casuarina glauca*, Blue Oliveberry *Elaeocarpus reticulatus*, Red Olive Plum *Elaeodendron australe*, Rusty Fig *Ficus rubiginosa*, Sweet Pittosporum *P. undulatum*, Muttonwood *Myrsine howittiana* and Lilly Pilly *Syzygium smithii*. There are no especially dominant vines and eucalypts are on the whole rare. After disturbance the following secondary species are usual: Lightwood *Acacia implexa*, Maidens Wattle *A. maidenii*, Coast Wattle *A. longifolia* ssp. *sophorae*, Black Wattle *A. mearnsii* and Blackwood *A. melanoxylon*.
- Canopies are wind sheared in exposed situations (Chapter S1: Figure S43; Additional Reading: Figures AR15, AR18 and AR19), but may be lumpy and have spreading crowns in more sheltered locations (Chapter S1: Figures S39 and S41).
- Presence of storm shutters (Additional Reading: Figures AR18 and AR19).
- Canopies may start at ground level at the frontline of a storm shutter (Additional Reading: Figures AR18 and AR19; Glossary storm shutter Figure).
- When the storm shutters fail, there is often canopy attrition (Additional Reading: Figures AR15 and AR16).
- Attrition leads to canopy decapitation: a process unique to this EVC (Additional Reading: Figures AR17).
- In exposed situations, with the exception of Rusty Figs, and eucalypts, the girth of all other trees is small as a result of cyclic canopy decapitation and site recolonisation following storm events, saline inundation or landslip.

- Ferns are rare.
- Tree-ferns are nearly always absent (except for very rare coastal soaks).
- Vascular epiphytes are only ever common in the subtropical climate zone (and where poaching has not occurred).

Distribution

The coasts and esturaries northwards from the Gippsland Lakes.

Major differences from closest 'relatives' (hinterland rainforests that vary according to climate zone)

- Only drought tolerant ferns present and general absence of tree-ferns (compared with Warm Temperate and Subtropical Rainforests with which they may be juxtaposed in the hinterland (especially along gullies that open directly into the sea).
- Often grassy (not a feature of hinterland rainforests), particularly in gaps.
- Presence of coastal rainforest-adapted species (absent from hinterland rainforests or in numbers less than 5 if nearer the coast),
- Coastal localities influenced by salt (no hinterland rainforest types grow in salt-affected sites).
- Often (but not always) with wind-sheared canopies.
- Only rainforests with storm shutters.
- The only rainforest to experience canopy attrition, canopy decapitation when the storm shutters fail.

RAINFOREST KEYS TO SOUTH-EASTERN AUSTRALIA

Keys are just oneone way of determining the identity of rainforests on your site. We have provided two alternative methods for this process, which may be useful if you find keys difficult to use. These are the Rainforest Divination Tool (Chapter 3: The divination of past rainforest habitat) and rainforest depletion (Chapter S9: Rainforest depletion). Three levels of keys are provided if you wish to use them.

The keys start broadly at the regional level, then move down to the locality and then to your site; hopefully this will lead to local rainforest reference sites that will help to confirm your rainforest identification. The keys are:

1. Regional rainforest keys: this is the open door that gives you access to the range of EVCs likely to be on your site, (based: on an EVC by locality guide).
2. Ecological Vegetation Class keys: once you have narrowed down the possible EVCs that might be on your site by locality, you can consult the EVC keys to determine which ones are actually present, or used to be present on your site (based on: appearance, broad habitat and distribution and dominant species), and lastly
3. Floristic Community keys: which offer you the most precise vegetation identity available (based on specific habitat and distribution, dominant species and distinguishing species).

Species used in the following dichotomous keys to the rainforests of south-eastern Australia are sourced from the respective species lists of: Peel (1999) Appendices 2-6; Beukers and Miles (in prep.), Tindall *et al.*. (undated) and this publication.

Some floristic communities are in quotation marks (' '). These have been used to indicate proposed floristic community names assigned by the author for floristic entities because they have yet to be named by the authors who have described them (e.g. Beukers and Miles in prep.; Tindall *et al.*. undated). This nomenclature has only been done for convenience in this publication. This approach has allowed us to refer to and discriminate between individual entities when comparing them in a way that would have otherwise been impossible. It is hoped that there will be no offence to these authors (as none is intended) and we will all be happy to use their names when and if they formulate them.

Regional rainforest keys to south-eastern Australia

1a. Your site is in Victoria……2.
1b. Your site is in New South Wales……3.

2. VICTORIA:

WESTERN VICTORIA

2a. Your site is in the Otways……..……..EVC: Cool Temperate Rainforest.

WEST AND CENTRAL GIPPSLAND

2b. Your site is in the Central Highlands above 200 m elevation……..…… EVC: Cool Temperate Rainforest.
2c. Your site is in the Central Highlands along the northern margin of the Latrobe Valley below 200 m elevation..……..……..……..EVC: Warm Temperate Rainforest.

2d. Your site is in the Strzeleckis above 240 m elevation.....EVC: Cool Temperate Rainforest.
2e. Your site is in the Strzeleckis below 240 m elevation.....EVC: Warm Temperate Rainforest.
2f. Your site is on Wilsons Promontory above 200 m elevation.....EVC: Cool Temperate Rainforest.
2g. Your site is on Wilsons Promontory below 200 m elevation.....EVC: Warm Temperate Rainforest.

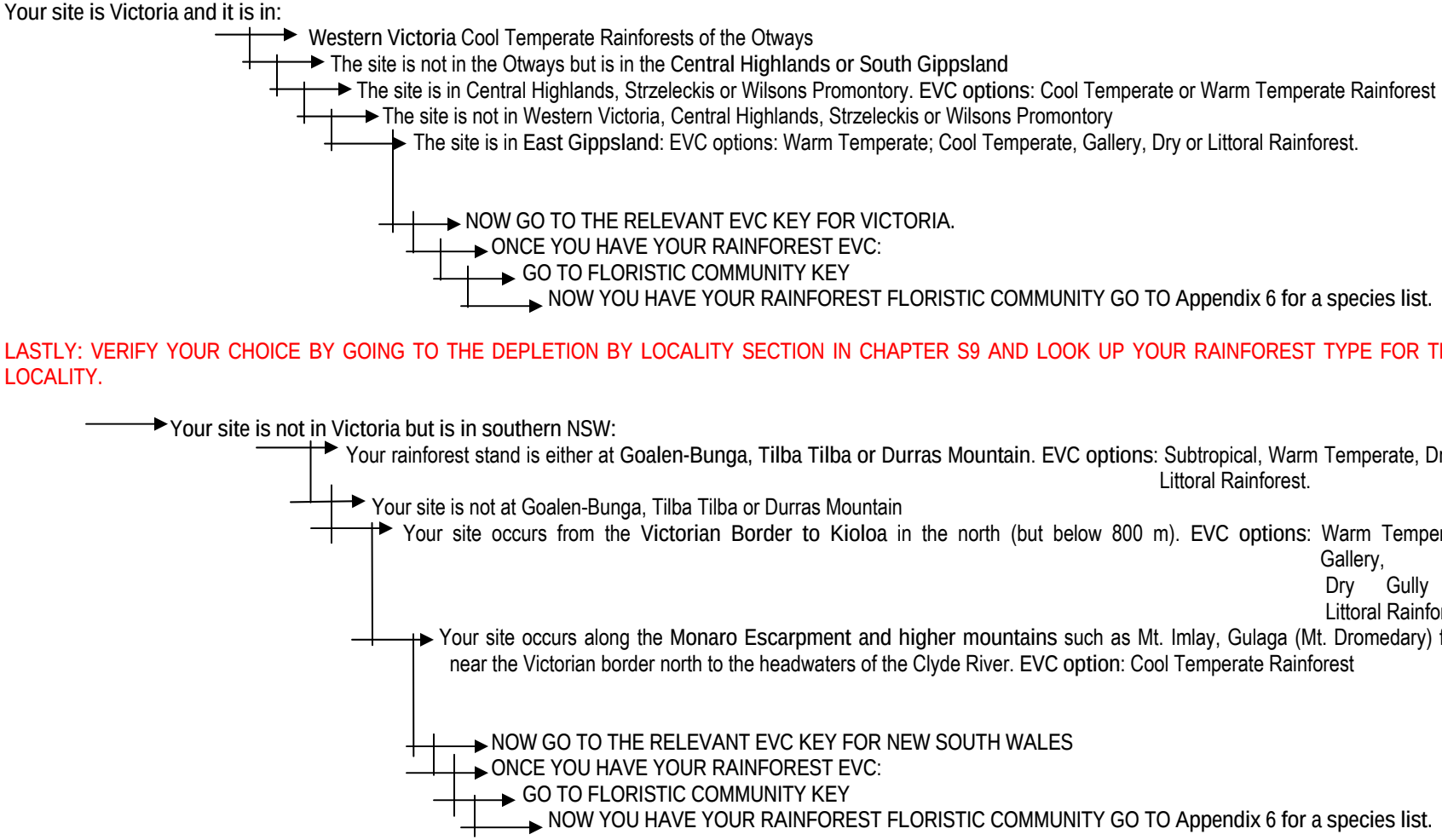
EAST GIPPSLAND

2h. Your site occurs on the Nunniong Plateau, Roger River, Murrungowar-Glen Arte Range or the Errinundra Plateau and their associated slopes and gullies as low as 600 m but usually higher than 900 m elevation.....EVC: Cool Temperate Rainforest.
2i. Your site occurs from Mount Moornapa in the west to the Victorian border in the east on the lowlands from near sea level up to 700 m elevation (but not on exposed coastal localities, around estuaries or along the saline estuarine reaches of lowland rivers (see Littoral Rainforest below) or the high flood energy margins of streams and gorges) .....EVC: Warm Temperate Rainforest.
2j. Your site occurs from the Mitchell River in the west to the Victorian Border in the east and is in the high flood energy zone of major streams or gorge-constrained ephemeral streams from 20-560 m elevation.....EVC: Gallery Rainforest.
2k. Your site occurs in the Mitchell, Buchan-Murrindal, Snowy and Genoa Rivers along their rainshadow reaches where there are cliffs and associated screes from 50-240 m elevation.....EVC: Dry Rainforest.
2l. Your site occurs around sea level along the coast from the Mitchell River in the west to the Victorian border in the east. It is closely associated with saline environments (largely, but not completely restricted to the coast and nearby estuaries and estuarine reaches of rivers) including: dunes, headlands, cliffs, marginal bluffs, cheniers, cobbles, berms, deltaic deposits and on Tertiary Limestone riverine cliffs where connate salts derived from their marine substrates are thought to provide the required salinity.....EVC: Littoral Rainforest.

3. NEW SOUTH WALES:

3a. Your site is restricted to fertile geology at one of three localities: Goalen-Bunga, Tilba Tilba and Durras Mountain from near sea level (but not in exposed coastal locations) to about 300 m elevation.....EVC: Subtropical Rainforest.
3b. Your site occurs from the Victorian border in the south north to Kioloa and the Clyde River catchment in the north, occurring from the lowlands from near sea level to the foothills up to 800 m elevation but not on exposed coastal localities, around estuaries or along the saline estuarine reaches of lowland rivers (see Littoral Rainforest below) or the high flood energy margins of streams and gorges. In the subtropical climate zone (north of Bunga Head), your site is on the lesser fertility geologies and does not occur on the most fertile geologies (gabbros, basalts, monzonites which are the exclusive province of Subtropical Rainforests).....EVC: Warm Temperate Rainforest.
3c. Your site occurs along the Monaro Escarpment and higher mountains remote from the escarpment [e.g. Mt. Imlay Gulaga (Mt. Dromedary)] from the Victorian border in the south north to the headwaters of the Clyde River catchment and their associated slopes and gullies as low as 550 m to 1050 m elevation.....EVC: Cool Temperate Rainforest.
3d. Your site occurs from the Victorian Border in the south to the lowland and foothill reaches of the Clyde River catchment in the north and is in the high flood energy zone of major streams or gorge-constrained ephemeral streams from 20-560 m elevation.....EVC: Gallery Rainforest.
3e. Your site occurs in the Towamba River valley, and then along rainshadow areas of the footslopes of the Monaro Escarpment north to the Deua River (on geologies other than granites) as well as in the granitic belt areas associated with the lowlands of the Bega-Candello, Brogo, Moruya valleys and the granitoid foothills around the Deua and Araleun valleys from elevations of around 50 m to 600-700 m .....EVC: Dry Rainforest.
3f. Your site occurs from Wapengo Creek north to the Clyde River catchment in the foothills on infertile geology (generally, but not exclusively on Ordovician Sediments) from near sea level (but not in exposed coastal locations) to 600 m.....EVC Dry Gully Rainforest.
3g. Your site occurs around sea level along the coast from the Victorian border in the south to Kioloa in the north. It is closely associated with saline environments restricted to the coast and nearby estuaries (and estuarine reaches of rivers) including: dunes, headlands, cliffs, marginal bluffs, cheniers, cobbles, berms, deltaic deposits .....EVC: Littoral Rainforest.

For those that are visually gifted but key-challenged, we have summarised the above keys using a visual aid (in case you got lost in all of the words above):



LASTLY: VERIFY YOUR CHOICE BY GOING TO THE DEPLETION BY LOCALITY SECTION IN CHAPTER S9 AND LOOK UP YOUR RAINFOREST TYPE FOR THAT LOCALITY.

LASTLY: VERIFY YOUR CHOICE BY GOING TO THE DEPLETION BY LOCALITY SECTION IN CHAPTER S9 AND LOOK UP YOUR RAINFOREST TYPE FOR THAT LOCALITY.

Key to the rainforest ecological vegetation classes of New South Wales

This key to the New South Wales EVCs are formulated using data from: Peel (1999); Tindall *et al*.. (undated); Beukers and Miles (in prep.); Peel (in prep.) and Miles pers. comm. Read the rainforest definitions above (Differential rainforest definitions for south -eastern Australia) before proceeding with the keys. Once you have found your EVC, you can refine your understanding of your restoration site by proceeding to the relevant section of floristic communities for the EVC.

1a. Appearance: Usually a dense low canopy (around 15m) sometimes with emergents (such as Giant Stinging Tree *Dendrochnide excelsa*, Small-leaved Fig *Ficus obliqua* and Cabbage Fan-palm *Livistona australis*; north from Tanja-Goalen Head district). The vegetation is dominated by large trees with leaf lengths from microphyll (2.5-7.5mm) to notophyll (7.5-12.5 cm long) that include: Native Quince *Alectryon subcinerus*, Brush Bloodwood *Baloghia inophylla*, Giant Stinging Tree *Dendrochnide excelsa*, Koda *Ehretia acuminata*, Sandpaper Fig *Ficus coronata*, Small-leaved Fig *Ficus obliqua* and or Rusty Fig *Ficus rubiginosa.* Strangler figs are usually present and buttressed trunks are present in some tree species (Supplement Preamble Figure P3 and Chapter S1 Figure S9). In the study area, this can include both Small-leaved Fig *Ficus obliqua* and less commonly Rusty Fig *F. rubiginosa*, that can also establish in the ground or more rarely as a lithophyte (cf. Dry Rainforests). The understorey is usually rich in ferns (with an average of 8 species and up to 19). In the old and protected sites there are three or more epiphyte species but as many as 9. Some of these epiphytes (ferns) may be large. Curiously in Subtropical Rainforests in this region, tree-ferns are rare. Broad habitat and distribution: this rainforest EVC occurs from near sea level (but not in exposed coastal situations) in warm gullies and on fertile geologies such as monzanite at Gulaga (Mt Dromedary) and Nachinuka (Little Dromedary), basalt at Durras Mountain, dolerite at Goalen Head and the alluvial flats of the streams on these geologies from the Tanja-Bega district (where present on feldspar-rich rhyolites) northwards to the Durras Mountain (and beyond into northern New South Wales). You will note that these localities are both low in elevation and close to the coast. This is because the subtropical climate zone is mostly sustained by the warm waters of the East Australian Current. However, Subtropical Rainforest does not occur in exposed coastal sites. Based on Moruya in the subtropics the average maximum is 20.4^{o}C with the average minimum 11.3^{o}C. Rainfall is 957mm and has a summer maximum. Dominant species: are a combination of Warm Temperate Rainforest species mentioned below (except for Coachwood) and one or a combination of the following species with subtropical affinities that have microphyll (small) to notophyll (medium) leaves: Native Quince *Alectryon subcinerus*, Brush Bloodwood *Baloghia inophylla*, Giant Stinging Tree *Dendrochnide excelsa*, Koda *Ehretia acuminata*, Sandpaper Fig *Ficus coronata*, Small-leaved Fig *F. obliqua* and or Rusty Fig *F. rubiginosa*. Palms are usual with Bangalow Palm *Archontophoenix cunninghamiana* (north of Durras Lake) and Cabbage Fan Palm *Livistona australis*. Large epiphytes (where they have not been poached) such as Birds Nest Fern *Asplenium australasicum*, Rock Orchid *Thelychiton speciosum*, Elkhorn *Platycerium bifurcatum* and Leather Shield-fern *Rumhora adiantiformis* are usual. Tree-ferns may be present, but are usually rare .....EVC: Subtropical Rainforest.

1b. Not as above……2.

2a. Appearance: usually a dense canopy often with emergent eucalypts (especially in gullies and on river flats). The canopy species have leaf sizes ranging from microphyll (small) leaves of 2.5-7.5 cm to notophyll (medium) leaves of 7.5-12.5 cm. This rainforest EVC has a diverse range of vines, ferns are usually present in the understorey and tree-ferns are generally present (and often visually abundant). Vines (including large woody species) are usually abundant and diverse. Broad habitat and distribution: in New South Wales this rainforest EVC occurs from the Victorian border northwards to the Clyde River catchment north of Batemans Bay (and beyond into northern New South Wales). Rainforest occurs below 800 m (mostly in gullies, sometimes on alluvial flats on low energy parts of the river's floodplain) and has a shared dominance of canopy species. Rainfall is greater than 900 mm annually. Dominant species: include one or a combination of: Yellowwood *Acronychia oblongifolia*, Coachwood *Ceratopetalum apetalum* (north of Benandra near Batemans Bay), Sassafras *Doryphora sassafras* (north from the Bega district), Blue Oliveberry *Elaeocarpus reticulatus*, Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and or Lilly Pilly *Syzygium smithii*. Epiphytes are comprised of non-vascular mosses and leafy liverworts and small ferns, with some small orchids present. Tree-ferns are common but may not be abundant in all stands……...EVC: Warm Temperate Rainforest.

2b. Not as above……3.

3a. Appearance: Usually a dense canopy of trees with pointed or conical (as apposed to spreading) crowns, rarely with emergent eucalypts. The understorey is dominated by ferns (with tree-ferns being visually dominant), while vines are rare. Species are dominated by species with microphyll leaves (2.5-7.5 cm in length). Epiphytes are common and

abundant, with ferns and non-vascular mosses and liverworts being dominant and augmented by orchids New South Wales. Broad habitat and distribution: this rainforest EVC occurs from near the Victorian border northwards to the Clyde River catchment north of Batemans Bay (and beyond into northern New South Wales). Rainforest occurs from 550-1050 m elevation (mostly in gullies). Annual rainfall is more than 950 mm. Dominant species include one or a combination of: Southern Sassafras *Atherosperma moschatum*, Sassafras *Doryphora sassafras*, Black Oliveberry *Elaeocarpus holopetalus* and or Eastern Leatherwood *Eucryphia moorei*. Epiphytes are often abundant but are mostly non-vascular (mosses and leafy liverworts) but usually also include ferns and small-leaved orchids such as *Dockrilla* spp. and *Sarchochilus* spp. Tree-ferns are prominent.....….EVC: Cool Temperate Rainforest.

3b. Not as above……..……4.

4a. Appearance: This rainforest EVC can be variable in canopy height depending on the frequency and height of floods and frequency of fire. Long undisturbed sites have magnificent overstoreys of Kanooka compared to flood-beaten canopies on very flood-prone and gorge-constrained reaches of major rivers such as the Mitchell and Genoa rivers. Rainforest has a dense canopy usually without emergent eucalypts. The canopy species have microphyll (small) leaf sizes of 2.5-7.5 cm. This rainforest EVC has a narrow range of vines (usually only wiry species and if ever a large woody species is present, this is usually Jungle Grape *Cissus hypoglauca*. Ferns are usually present in the understorey but tree-ferns are rarely present. These understorey life-form features are the product of frequent floods. Broad habitat and distribution: this rainforest EVC occurs from the Victorian border northwards to the Clyde River catchment north of Batemans Bay (and beyond into northern New South Wales). Rainforest is restricted to the freshwater margins of streams in the lowlands below 600 m where the high energy flood flows occur. Rainfall is greater than 900-1100 mm annually. Dominant species: Kanooka *Tristaniopsis laurina* with one or a combination of the following species: Black Wattle *Callicoma serratifolia*, Coachwood *Ceratopetalum apetalum* (both north of Batemans Bay), Sandpaper Fig *Ficus coronata*, Mountain Burgan *Kunzea peduncularis* and occasionally Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Epiphytes (ferns, mosses, leafy liverworts may be present, but mostly high in the canopy above the usual flood level). Because of the high energy floods experienced by this rainforest ecological vegetation class, adult tree-ferns are usually rare as are large woody vines: both of which are ripped down by floods. Wiry vines such as Austral Sarsaparilla *Smilax australis* may be present because they can regrow from their perennial rootstocks……..….EVC: Gallery Rainforest.

4b. Not as above……..……5.

5a. Appearance: The canopy height is usually quite low (to 10 m) and the canopy may on occasions be scattered or broken. There are usually emergent Kurrajongs. Eucalypts are generally absent. During severe drought, rain-green canopy species drop their leaves (Muttonwood, Kurrajongs and Staff Vine) but resprout after rain. In New South Wales Rusty Fig *Ficus rubiginosa* is usually present as a lithophyte, other figs from the region are always absent. Broad habitat and distribution: this rainforest EVC occurs from the Bega River north to Deua River (Araluen valley) and the Clyde River catchment north of Batemans Bay (and beyond into northern New South Wales). Rainforest occurs from near sea level (but not in exposed coastal situations) to elevations below 600 m in rocky localities associated with tor fields, cliffs and rock scree of moderate to high fertility (feldspar-rich rhyolites, granodiorites and monzonites). Annual rainfall is as low as 750 mm. Unusually for rainforests, this rainforest type is largely restricted to north and west aspects. Dominant species: one or a combination of Native Quince *Alectryon subcinereus* and Sweet Pittosporum *P. undulatum* with most sites physically dominated by Rusty Fig *Ficus rubiginosa*. Large epiphytes (where they have not been poached) such as Rock Orchid *Thelychiton speciosum*, and Leather Shield-fern *Rumhora adiantiformis* are usual. Tree-ferns and palms are always absent as are coastal species (see Littoral Rainforest for rainforests with coastal species)……..……EVC: Dry Rainforest.

5b. Not as above……..……6.

6a. Appearance: Usually a dense low canopy (around 15m) with emergents (eucalypts), but the larger figs (Small-leaved Fig *Ficus obliqua* and Rusty Fig *F. rubiginosa*) are usually both absent, though the latter may occasionally be present in rockier habitats along major streams. Leaves of the dominant canopy species are generally microphyll (2.5-7.5 cm). The understorey shrub layer is sparse, with ferns being the dominant though patchy ground layer. Vines are not as prominent as in other rainforest types of the region. As is typical of drier rainforest types: tree-ferns are absent (except for small niches such as drainages and soaks in their more pervasive dry habitat). Small vascular epiphytes are usually present but difficult to find because of their cryptic nature. Broad habitat and distribution: this rainforest EVC usually occurs to elevations below 600 m generally in steep deep dry gullies, steep rocky gorges and along river valley cliffs (often facing north or west) on low to moderate fertility geologies (often Ordovician Sediments) from near sea level (but not in exposed coastal situations). May occur in shallower gullies on suitable geology where there is fire protection

from Grassy Woodlands. Rainfall ranges from 750-1200 mm annually. The distribution of this rainforest is from the Wapengo district northwards to the Clyde River Catchment north of Batemans Bay (and beyond into northern New South Wales). Dominant species: invariably Grey Myrtle *Backhousia myrtifolia* with Sweet Pittosporum *P. undulatum* also usually present. Sandpaper Fig *Ficus coronata,* Muttonwood *Myrsine howittiana* and Lilly Pilly *Syzygium smithii* are less common but usually represented in most stands especially on gully floors. Cryptic small epiphytes are diverse but sparsely distributed on rocks and tree-trunks (particularly Grey Myrtle) with ferns such as Rock Felt-fern *Pyrrosia rupestris*, Filmy-fern *Hymenophyllum cupressiforme* and orchids such as *Dockrilla* spp., Tangle Orchid *Plectorrhiza tridentata* and *Sarcochilus* spp. usually present. Moisture loving ferns including tree-ferns are absent. The understorey is frequently low in plant cover.....EVC: Dry Gully Rainforest.

6b. Not as above……7.

7a. Appearance: Canopy species have leaf sizes that range from microphyll (2.5-7.5 cm) to notophyll (medium) leaves of 7.5-12.5 cm and are composed of a range of exposure and salt-hardy species from the coast and the rainforests of the hinterland. Emergents (usually Coast Banksia *B. integrifolia* or Southern Mahogany *Eucalyptus botryoides*) are often present. Exposed sites have wind-sheared canopies that begin at ground level and form a storm shutter up to a low canopy of around 10 m. In more sheltered locations (such as around estuaries), the canopy may be uneven. The process of canopy decapitation often means that there is a secondary canopy associated with canopy attrition, arising from basal/stem coppices or seedling regeneration. Because of the prevalence of this process, gaps may be common and are often dominated by graminoids. The understorey is usually fairly bare compared with other rainforests (due to the droughty nature of the soils and/or steep slopes). Graminoids and forbs are more common than ferns (which are restricted to a few hardy and drought-tolerant types). Except for rare niches such as soaks associated with coastal cliff lines, tree-ferns are absent (as in most cases are epiphytes). Epiphytes are extremely rare in the warm temperate climate zone, but were once more common in the subtropical climate zone. Their absence is largely due to poaching of iconic species such as Bird's Nest Fern *Asplenium australasicum* and Staghorns *Platycerium bifurcatum*. Broad habitat and distribution: this rainforest EVC occurs on the coast at sites with excellent fire protection (provided by bare sand, cliffs, estuaries, ocean shores) and wherever there is significant influence from salt (sea coasts and estuary flats, including the saline reaches of lower river deltaic deposits). Salt, which is the primary determining factor, may be delivered in the form of salt haze directly off the sea, through the water table or marine-derived geologies such as limestone (the source in the latter case being connate salts). This rainforest is found from the Victorian border northwards to Murramarang National Park (and beyond into northern New South Wales). Annual rainfall ranges from less than 750 mm in Victoria to more than 1100 m in the north. Dominant species: are drought-hardy and salt-tolerant trees with one or a combination of the following including Coast Banksia *B*. *integrifolia*, Yellowwood *Acronychia oblongifolia*, Red Olive Plum *Elaeodendron australe* (north of Tuross Head), Sandpaper Fig *Ficus coronata*, Small-leaved Fig *F. obliqua* (north from Bunga Head), Rusty Fig *F. rubiginosa* (north of Tathra), Cheese Tree *Glochidion ferdinandii* (north of Tuross Head), Mangrove Boobialla *Myoporum acuminatum* (north from Bega) Common Boobialla *Myoporum insulare* (south of Eden), Sweet Pittosporum *P*. *undulatum*, Muttonwood *Myrsine howittiana* and Lilly Pilly *Syzygium smithii*. Only the most drought-hardy ferns are present (tree-ferns are nearly always absent). Epiphytes are usually rare. Some sites have a grass-dominated gaps or understorey.....EVC: Littoral Rainforest.

Key to the rainforest floristic communities of New South Wales

Notes:

The rainforest floristic data available for the New South Wales is a mixed bag with regard to the conclusions that can be typologically drawn from it. In the meantime, the typology is still evolving and may still be quite confusing.

- Adequate data sets and floristic analyses exist to characterise rainforest floristic communities in the following EVCs by district:
    - Littoral Rainforest for the section of the New South Wales coast from south of Murramarang National Park to the Victorian border (with the key elements of that work presented in this publication).
    - Subtropical, Warm Temperate, Cool Temperate, Dry and Dry Gully Rainforests on the Araluen, Batemans Bay, Braidwood and Ulladulla 1:100,000 map sheets (which includes the Clyde River catchment and the coastal hinterland as far north as Kialoa). It missed Littoral Rainforests of this region (but these were covered by Peel in prep.) (see above). This study area overlaps with the northern parts of Beukers and Miles' (in prep.) study area (see below);
    - Dry Rainforests on the granitoids of the Bega Valley between Myrtle Mountain, Tantawangolo and Brogo to Cobargo and the hills of the Bega Valley.
- Inadequate rainforest floristic data sets and floristic analyses exist to characterise rainforest beyond the EVC level for:

- Warm Temperate, Cool Temperate, Gallery, Dry, and Dry Gully Rainforests in the Bega and Eurobodalla Shires. This area has been surveyed at the regional scale by Beukers and Miles (in prep.) but there is insufficient data to characterise the rainforest typology below EVC level to that of rainforest floristic community. For this area, rainforest restoration practitioners are encouraged to use the EVC descriptions in Chapter S1 as the starting point and double check your conclusions. To do this, use the habitat data listed in the ecological vegetation class descriptions of Chapter S1 and the examples provided in the Rainforest Divination Tool (Figures 3.2, 3.3, and 3.4) and particularly Figure 3.3, to determine the ecological vegetation class of rainforest that you are investigating or wanting to restore. To assist in the meantime, the floristic community typology for Far East Gippsland (*sensu* Peel 1999) has been tentatively integrated into the currently inadequate typology for this area of Far Southern New South Wales. However, until better data arrives: you should take species lists of your own from the nearest intact remnant on the same landform and geology at the same elevation as the site you wish to restore and thereby determine your own floristic composition for your restoration site.
- Gallery Rainforest across the entire New South Wales region covered by the Manual. However, it is known that both of the floristic communities of Gallery Rainforest described for Victoria described by Peel (1999) do occur in southern New South Wales. *Perennial Streams* Gallery Rainforest is found along the Wallagaraugh River and *Ephemeral Streams* Gallery Rainforest found on the tributaries of the Clyde River. The Victorian data from Peel (1999) is therefore used in the New South Wales keys for Gallery Rainforest.
- Dry Rainforest of the granitoids of the upper Deua and Araluen valleys. No survey data or analysis is known to the author but these rainforests do occur in these areas.

On other matters:

- Specific distribution and habitat: for the specific distribution component, the localities supplied are not meant to be an exhaustive list as to where the particular rainforest type occurs. They should be seen as a guide only: intended for you to use so that you can visit a known stand of a particular floristic entity and familiarise yourself with its habitat, structure and composition. Remember also that if your site requires major restoration, little or no structure and composition will remain on your restoration site. These localities therefore can act as your reference sites. So, if you are in a rainforest stand not listed under the specific distribution heading, use the habitat information, dominant species and distinguishing species (and the full species list in Appendix S6: worksheet: All species+FCs) to determine the stand's floristic identity as well as consulting Chapter S9 Rainforest depletion in south-eastern Australia.
- Remember always that your species list for your site trumps all other less specific or more regionally broad floristic and habitat information.

Quick reference guide to the floristic communities of the rainforest EVCs of southern New South Wales

NOTE: these lists are relevant to the New South Wales component of the region covered by the Manual: south from the Clyde River Catchment and Murramarang National Park to the Victorian border.

Subtropical Rainforest Floristic Communities

3 in New South Wales (see full FC descriptions in keys below):

- '*South Coast*' Subtropical Rainforest [formally described by Beukers and Miles (in prep.) as Subtropical-Warm Temperate Rainforest] south of Batemans Bay
- *'Tilba Tilba'* Subtropical Rainforest (this study) on monzonites around the footslopes of Gulaga (Mt Dromedary and Nachanuka (Little Dromedary)
- *'Durras Mountain'* Subtropical Rainforest: the nearest typological equivalent being Subtropical *Complex* Rainforest *sensu* Tindall *e. al*. (undated)]; which they misnamed i. e. the floristic community name is actually the EVC name. This is outside *South Coast Forests* Dry Rainforest as defined by Beukers and Miles (in prep.)]: because it is restricted to the basalt cap on the summit ridge of Durras Mountain.

7 in New South Wales Warm Temperate Floristic Communities (see full FCs descriptions in keys below):

- *'Sand Rivers'* Warm Temperate Rainforest (described in the Manual for the first time): along the low energy sections of sandy streams of the Bega, Brogo, Murrah Valleys (and probably others); and another two Floristic Communities that also occur in Far East Gippsland, Victoria.
- *'South Coast' Warm Temperate Rainforest (sensu* Beukers and Miles in prep.).

- *Coastal* Warm *Temperate Rainforest [sensu* Tindall *et al.* (undated)].
- *Sandstone Scarp* Warm Temperate Rainforest *[sensu* Tindall *et al.* (undated)]: occurs on Permian sandstones [generally above 400 m (Tindall *et al.* undated)] on the escarpment of the Morton Plateau and known with certainty from near sea level to 200 m on the eastern fall of Durras Mountain.
- *Intermediate* Warm Temperate Rainforest *[sensu* Tindall *et al.* (undated)].
- *Hinterland* Warm Temperate Rainforest: postulated to be present south from Wandella (inland from Tilba Tilba) to the Victorian border on coastal hills and riverine plains: but this requires field verification.
- *Coastal Ranges Overlap* Warm Temperate Rainforest: postulated to be present in gully systems from the Victorian border, north to the Moruya River catchment, but this requires field verification. Found in coastal ranges (in both Victoria and New South Wales) from Howe Range (between 129 and 280 m) in the south. Postulated to occur northwards along the Monaro escarpment to the Moruya catchment: but this requires field verification.

Cool Temperate Rainforest Floristic Communities

2 in New South Wales (see full FCs descriptions in keys below):

- *'Southern Escarpments'* Cool Temperate Rainforest (formally described by Beukers and Miles in prep.): along the gully systems on the eastern fall of the Monaro escarpment and higher peaks north from Mount Imlay (south west of Eden) northwards; and
- *Clyde-Deua* Cool Temperate Rainforest *[sensu* Tindall *et al..* undated):

Gallery Rainforest Floristic Communities

2 in New South Wales (see full FCs descriptions in keys below):

- *Perennial Streams* Gallery Rainforest (*sensu* Peel 1999): along major and perennial streams in moderate (>700-1000 mm) rainfall zones.
- *Ephemeral Streams Gallery Rainforest* (*sensu* Peel 1999): along ephemeral streams, gullies and gorges subject to high flood energy from the Victorian border and as far north as the Clyde River catchment (near Brooman).

Dry Rainforest Floristic Communities

2 in New South Wales (see full FCs descriptions in keys below):

- *South Coast Forests* Dry Rainforest (formally described by Beukers and Miles in prep.): on dry north- or west-facing slopes and ridges (mostly but not exclusively on granitic geology; also found on rhyolite) primarily from the Bega-Candelo (Myrtle Mountain-Tantawangolo and Brogo district from Brogo to Cobargo (possibly also in the Araluen valley) <www.threatenedspecies.environment.nsw.gov.au>; and one that is not formerly described:
- '*Grassy*' Dry Rainforest: in shallow gullies on granites in the Bega-Brogo district protected by the Grassy Woodlands of the region and possibly as far north as the granitoids south of Moruya.

Dry Gully Rainforest Floristic Communities

2 in New South Wales (see full FC descriptions in keys below):

- *'Temperate* Dry Gully' Rainforest named as *Temperate* Dry Rainforest *(sensu* Tindall *et al..* undated), but re-notated as Dry Gully Rainforest by the author for typological reasons on the basis of habitat and composition (i.e. shale gully and presence of some moisture-dependent species), none of which are known from the EVC Dry Rainforest in south-eastern Australia. Species composition and other site information are as presented by Tindall et al.. (undated).
- *'Southern'* Dry Gully Rainforest (formally described by Beukers and Miles in prep.): in dry gullies from near the coast in the Bega district north.

Littoral Rainforest Floristic Communities

14 in New South Wales (10 are endemic to New South Wales, 4 are shared with Victoria) (see full FCs descriptions in keys below):

- *Leached Sands* Littoral Rainforest (shared with Victoria): in New South Wales this rainforest type grows on highly leached sands derived from Devonian Red Bed Sandstones in the Nadgee Nature Reserve in New South Wales ;

- *Depauperate* Littoral Rainforest (shared with Victoria): these are species-poor stands that occur on a range of geologies as the result of a number of factors around Bittangabee Bay and Leatherjacket Bay;
- *South East Embayments* Littoral Rainforest (shared with Victoria): grows on a diverse array of landforms including metasediments and sands in and around embayments (estuaries and oceanic bays from Merica River Twofold Bay);
- *Ordovician Escarpments* Littoral Rainforest: this type is restricted to Ordovician Metasediments on sea cliffs or other marginal bluffs around embayments (around Twofold Bay) or estuaries (Merimbula's Top Lake);
- *Disturbed Black Sands* Littoral Rainforest: (shared with Victoria): organically enriched black sands derived from a number of parent geologies characterise this floristic community's habitat, with most sites (because of their habitat's fertility) having been disturbed by agriculture in the past from Nadgee Nature Reserve to Mogareeka Inlet;
- *New South Wales South Coast Young* Littoral Rainforest: these young stands are restricted to aeolian or lacustrine sands from Hobart Beach at Wallagoot Lake northwards to Brou Lake;
- *Clay Loams* Littoral Rainforest: clay loams derived from a range of parent geologies on a variety of landforms (including gullies and seacliffs) host this floristic community from Middle Lagoon north to the Sydney Sandstones of Durras Beach and then northwards around the coves associated with exit points of a series east-draining gullies on the eastern fall of Durras Mountain (but not including the rainforest stands in the sandy mouths of these gullies [a different floristic community of Littoral Rainforest), nor the extensive hinterland gully systems that rise up to the summit ridge of Durras Mountain itself (that are themselves *Sandstone Scarp* Warm Temperate Rainforest)];
- *Northern Deltaic* Littoral Rainforest: deltaic deposits along the estuarine reaches of rivers that include river levees and estuarine islands, and less commonly along the shoreline of metasedimentary valley sides from the Bega River estuary to Blackfellows Point on Tuross Lake;
- *Tathra-Bermagui Coast Deltaic* Littoral Rainforest: known from deltaic deposits on Nelson Creek north of Tathra (and suspected to be present on similar deposits north to the Bermagui River);
- *Rhyolite Cliffs* Littoral Rainforest: grows on rhyolite cliffs and slopes over a very narrow geographic range between Aragunnu Beach to Goalen Head;
- *Goalen Head* Littoral Rainforest: this rainforest type used to once grow only gabbro geology at Goalen Head on the coast east of Bunga Bunga;
- *South Coast Sands* Littoral Rainforest: this floristic community is geographically widespread (from Wallagoot Lake to Richmond Beach and from there associated with the sandy mouths of gullies that rise on the eastern side of Durras Mountain, north to Kialoa (the whole length of the South East Corner Bioregion in New South Wales);
- *Broulee* Littoral Rainforest: as the name says: restricted to Broulee Island on seacliffs, gullies and the top of the island itself; and
- *Estuary Berm* Littoral Rainforest: only known as recently regenerating rainforest a series of low estuary berms in the Calendula Nature Reserve.

Key to the Subtropical Rainforest floristic communities of southern New South Wales

1a. Specific habitat and distribution: In New South Wales this rainforest FC grows in areas of high rainfall (>1000 mm per annum), in fire protected gullies with warm aspects (east and north) from the Bega district north to at least Narooma. Dominant species: includes a combination of Blackwood *Acacia melanoxylon*, Wild Quince *Alectryon subcinereus*, Brush Bloodwood *Baloghia inophylla*, Brittlewood *Claoxylon australe*, Giant Stinging Tree *Dendrochnide excelsa*, Koda *Ehretia acuminata*, Sandpaper Fig *Ficus coronata*, Small-leaved Fig *F. obliqua*, Austral Mulberry *Hedycarya angustifolia*, Cabbage Fan-palm *Livistona australis*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum*, Pencil Cedar *Polyscias murrayi*, Yellowwood *Sarcomelicope simplicifolia*, Scentless Rosewood *Synoum glandulosum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this floristic community and *Tilba Tilba* Subtropical Rainforest community are: Bower Wattle *Acacia subporosa*, Austral Mulberry *Hedycarya angustifolia,* Yellow Elderberry *Sambucus australasica,* and the absence of other species restricted to *Tilba Tilba* Subtropical Rainforests that grow on the monzonites around Tilba Tilba(see 2a. below).....'*South Coast*' Subtropical Rainforest.

1b. Not as above……..……..2.

2a. Specific habitat and distribution: this rainforest FC grows on monzonites in and around the Tilba Tilba district associated with the footslopes of Gulaga (Mt Dromedary), Nachinuka (Little Dromedary) and (in the past) the

intervening creeks and gullies. Dominant species: a combination of Maidens Wattle *Acacia maidenii*, Black Wattle *A. mearnsii*, Blackwood *A. melanoxylon*, Red Ash *Alphitonia excelsa*, Wild Quince *Alectryon subcinereus*, Brush Bloodwood *Baloghia inophylla*, Kurrajong *Brachychiton populneus*, Brittlewood *Claoxylon australe*, Giant Stinging Tree *Dendrochnide excelsa*, Koda *Ehretia acuminata*, Sandpaper Fig *Ficus coronata*, Small-leaved Fig *F. obliqua*, Rusty Fig *F. rubiginosa*, Cabbage Fan-palm *Livistona australis*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum*, Pencil Cedar *Polyscias murrayi*, Yellowwood *Sarcomelicope simplicifolia*, Scentless Rosewood *Synoum glandulosum* and Lilly Pilly *Syzygium smithii*. Distinguishing species that separate this floristic community from others that may occur nearby ('*South Coast*' Subtropical Rainforest: in the south) include: Kurrajong *Brachychiton populneus*, Kangaroo Vine *Cissus antarctica*, Pink Mountain Correa *C. lawrenciana* var. *cordifolia*, Snake Orchid *Cymbidium sauve*, Shrubby Deeringia *D. amaranthiodes*, Forest Red Gum *Eucalyptus tereticornis*, Tree Hakea *H. eriantha*, Climbing Guinea-flower *Hibbertia scandens*, Forest Burgan *Kunzea* sp. (Upright form), Large Mock-olive *Notelaea longifolia* forma *longifolia*, Golden Mistletoe *Notothixos subaureus*, Cockspur Flower *Plectranthus graveolens*, White Pomaderris *P. cinerea*, Victorian Christmas-bush *Prostanthera lasianthos*, Snowy Mint Bush *Prostanthera nivea*, Seaberry Saltbush *Rhagodia candolleana*, Devil Thorn *Solanum stelligerum*, Rock Orchid *Thelychiton speciosum* and Mt Dromedary Zieria *Z. tuberculata*…….*Tilba Tilba* Subtropical Rainforest.

2b. Not as above……3.

3a. Specific habitat and distribution: although the southern-most outlier of Subtropical Rainforest as described by Tindall *et al.*. (undated) is at Milton, the author has investigated regenerating stands on the Tertiary Basalt cap (upper gully heads and ridgelines) at Durras Mountain (within Tindall's study area). Based on the floristics at this localit, ,it is believed that these regenerating rainforest stands are a distinct floristic community of Subtropical Rainforest. Dominant species includes one or a combination of: Maidens Wattle *Acacia maidenii*, Yellowwood *Acronychia oblongifolia*, Native Quince *Alectryon subcinereus*, Red Ash *Alphitonia excelsa*, Bangalow Palm *Archontophoenix cunninghamiana*, Brush Bloodwood *Baloghia inophylla*, Coachwood *Ceratopetalum apetalum*, Churnwood *Citronella moorei*, Brittlewood *Claoxylon australe*, Jackwood *Cryptocarya glaucescens*, Murrogun *Cryptocarya microneura*, Giant Stinging Tree *Dendrochnide excelsa*, Black Plum *Diospyros australis*, Myrtle (Black Ebony) *Diospyros pentamera*, Native Tamarind *Diploglottis australis*, Sassafras *Doryphora sassafras*, Koda *Ehretia acuminata*, Red Olive-plum *Elaeodendron australe*, Bolwarra *Eupomatia laurina*, Sandpaper Fig *Ficus coronata*, Rusty Fig *F. obliqua* (and possibly Small-leaved Fig *F. obliqua)*, Guioa *G. semiglauca*, Cabbage Fan-palm *Livistona australis*, Muttonwood *Myrsine howittiana*, Large Mock-olive *Notelaea venosa*, Brown Beech *Pennantia cunninghamii*, Sweet Pittosporum *P. undulatum*, Brown Plum-pine *Podocarpus elatus*, Crab-apple *Schizomeria ovata*, Maiden's Blush *Sloanea australis*, Scrub Beefwood *Stenocarpus salignus*, Buff Hazelwood *Symplocus thwaitesii*, Brush Cherry *Syzygium australe*, Lilly Pilly *S. smithii* and Veiny Wilkea *W. huegliana*. Distinguishing species between this FC and *Sandstone Scarp* Warm Temperate Rainforest that occurs adjacent to the basalt cap on relatively less fertile soils (e.g. Permian sediments) are: White Sallow Wattle Acacia floribunda (Durras Mtn furry form), Lightwood *A. implexa*, Yellowwood *Acronychia oblongifolia*, Aneilema *A. biflorum*, Strap Water-fern *Blechnum patersonii*, Coachwood *Ceratopetalum apetalum*, Churnwood *Citronella moorei*, Hairy Clerodendron *C. tomentosum*, Jackwood *Cryptocarya glaucescens*, Murrogun *Cryptocarya microneura*, Black Plum *Diospyros australis*, Myrtle (Black Ebony) *Diospyros pentamera*, Native Tamarind *Diploglottis australis*, Sassafras *Doryphora sassafras*, Red Olive-plum *Elaeodendron australe*, Guioa *G. semiglauca*, Shiny Shield-fern *Lastreopsis acuminata*, Trim Shield-fern *L. decomposita*, Anchor Vine *Palmeria scandens*, Brown Beech *Pennantia cunninghamii*, Brown Plum-pine *Podocarpus elatus*, Jungle Brake *Pteris umbrosa*, Crab-apple *Schizomeria ovata*, Maiden's Blush *Sloanea australis*, Scrub Beefwood *Stenocarpus salignus*, Burny Vine *Trophis scandens* and Veiny Wilkea *W. huegliana*……..*Durras Mountain* Subtropical Rainforest.

Key to the Warm Temperate Rainforest floristic communities of southern New South Wales

1a. Specific habitat and distribution: the sandy/silty well-drained alluvial flats of major sand rivers in the region (Bega, Brogo, Murrah and Moryua; though the evidence for this past distribution is now, nearly gone): above the Riparian Forest zone dominated by River Oak *Casuarina cunninghamiana* and back away from the edge of the bank and its high flood energy zone that can be dominated by Gallery Rainforest. '*Sand Rivers'* Warm Temperate Rainforest does not extend into the nearby gullies that may also contain rainforest (often '*South Coast'* Warm Temperate Rainforest). Dominant species (still incompletely circumscribed and not likely to be definitive) but including, one or a combination of: White Sallow Wattle *Acacia floribunda*, Blackwood *A. melanoxylon*, River Oak *Casuarina cunninghamiana*, Koda *Ehretia acuminata*, Southern Mahogany *Eucalyptus botryoides*, Mountain Grey Gum *E. cypellocarpa*, River Peppermint *E. elata*, Manna Gum *E. viminalis*, Sandpaper Fig *Ficus coronata*, Muttonwood *Myrsine howittiana*, Hazel Pomaderris *P. aspera*, Poison Peach *Trema tomentosa* and Kanooka *Tristaniopsis laurina*. Distinguishing species from '*South*

Coast' Warm Temperate Rainforest (the Warm Temperate Rainforest floristic community with which it may abut in nearby gullies) are: White Sallow Wattle *Acacia floribunda*, Common Ground-fern *Calochlaena dubia*, River Oak *Casuarina cunninghamiana*, Koda *Ehretia acuminata*, River Peppermint *Eucalyptus elata*, Manna Gum E. viminalis, Basket Grass *Oplismenus aemulus*, Sword Tussock-grass *Poa ensiformis*, Hazel Pomaderris *P. aspera*, Bracken *Pteridium esculentum* and Kanooka *Tristaniopsis laurina*…….....'*Sand Rivers'* Warm Temperate Rainforest.

1b. Not as above……..……..2.

2a. Specific habitat and distribution: in sheltered south- and east-facing gullies of the Bega and Eurobodalla Shires. Dominant species include one or a combination of: Green Wattle *Acacia irrorata*, Mabel's Wattle *A. mabellae*, Maidens Wattle *A. maidenii*, Black Wattle *A. mearnsii*, Blackwood *A. melanoxylon*, Yellowwood *Acronychia oblongifolia*, Wild Quince *Alectryon subcinerus*, Blanket-leaf *Bedfordia arborescens*, Wallaby-bush *Beyeria lasiocarpa*, Kurrajong *Brachychiton populneus* (rarely), Three-nerved Cassinia *C. trinerva*, Brittlewood *Claoxylon australe*, Brush Kurrajong *Commersonia fraseri*, Spotted Gum *Corymbia maculata*, Sassafras *Doryphora sassafras*, Blue Oliveberry *Elaeocarpus reticulatus*, Southern Mahogany *Eucalyptus botryoides*, Bolwarra *Eupomatia laurina*, Sandpaper Fig *Ficus coronata*, Austral Mulberry *Hedycarya angustifolia*, Tree Violet *Melicytus dentatus*, Muttonwood *Myrsine howittiana*, Large Mock Olive *Notelaea venosa*, Musk Daisy-bush *Olearia argophylla*, Bleeding Heart *Omolanthus populifolius*, Tree Everlasting *O. ferrugineus*, Sweet Pittosporum *P. undulatum*, Pencil Cedar *Polyscias murrayi*, Hazel Pomaderris *P. aspera*, White Pomaderris *P. cinerea*, Yellow Elderberry *Sambucus australasica*, Crab Apple *Schizomeria ovata*, Scentless Rosewood *Synoum glandulosum*, Lilly Pilly *Syzygium smithii* and Poison Peach *Trema tomentosa*. Distinguishing species between this floristic community and '*Sand Rivers'* Warm Temperate Rainforest with which it may abut along major sand rivers or *Coastal* Warm Temperate Rainforest (with whose range it may latitudinally or altitudinally overlap or abut) and two floristic communities described from Victoria (*Hinterland* Warm Temperate Rainforest and *Coastal Ranges Overlap* Warm Temperate Rainforest with which it may overlap in distribution) include: Mabel's Wattle *Acacia mabellae*, Maiden's Wattle *A. maidenii*, Bidgee-widgee *Acaena novaezelandiae*, Kurrajong *Brachychiton populneus*, Coffee Bush *Breynia oblongifolia*, Short-stem Sedge *Carex breviculmis*, Common Sedge *C. inversa*, Orange-thorn *Pittosporum pauciflorus*, Spotted Gum *Corymbia maculata*, Shining Pennywort *Hydrocotyle sibthorpioides*, Dusky Coral Pea *Kennedia rubicunda*, Bleeding Heart *Omolanthus populifolius*, White Dogwood *Ozothamnus diosmifolius*, Fine-leaf Tussock-grass *Poa meionectes*, White Pomaderris *P. cinerea*, Slender Dock *Rumex brownii*, and Golden Everlasting *Xerochrysum bracteatum*.....……..*'South Coast'* Warm Temperate Rainforest.

2b. Not as above……..……3.

3a. Specific habitat and distribution: this FC is restricted to the northern part of the area covered by this Manual (the Clyde River catchment along the coastal escarpment) and then on into the Sydney Basin north from the Camberwarra district; it occurs in moist sheltered gullies and on sheltered escarpment slopes from 0-400 m ASL with a mean annual rainfall of >900 mm (Tindall *et al.*. undated). Dominant species one or a combination of: Bodalla Wattle *Acacia trachyphloia*, Yellowwood *Acronychia oblongifolia*, Wild Quince *Alectryon subcinereus*, Bangalow Palm *Archontophoenix cunninghamiana*, Grey Myrtle *Backhousia myrtifolia*, Brush Bloodwood *Baloghia inophylla*, Black Wattle *Callicoma serratifolia*, Coachwood *Ceratopetalum apetalum*, Churnwood *Citronella moorei,* Brittlewood *Claoxylon australe,* Hairy Clerodendrum *C. tomentosum*, Jackwood *Cryptocarya glaucescens*, Murrogun *Cryptocarya microneura*, Giant Stinging Tree *Dendrochnide excelsa*, Black Plum *Diospyros australis*, Sassafras *Doryphora sassafras*, Koda *Ehretia acuminata*, Yellow Ash *Emmenosperma alphitonioides*, Bolwarra *Eupomatia laurina*, Sandpaper Fig *Ficus coronata*, Small-leaved Fig *F. obliqua*, Guioa *G. semiglauca*, Austral Mulberry *Hedycarya angustifolia*, Cabbage Fan-palm *Livistona australis*, Muttonwood *Myrsine howittiana*, Large Mock Olive *Notelaea venosa*, Brown Beech *Pennantia cunninghami*, Featherwood *Polyosma cunninghamii*, Pencil Cedar *Polyscias murrayi*, Possumwood *Quintinia sieberi*, Brush Turpentine *Rhodamnia rubescens*, Yellow Elderberry *Sambucus australasica*, Crab-apple *Schizomeria ovata*, Maiden's Blush *Sloanea australis*, Scrub Beefwood *Stenocarpus salignus*, Buff Hazelwood *Symplocus thwaitesii*, Scentless Rosewood *Synoum glandulosum*, Lilly Pilly *Syzygium smithii*, Kanooka *Tristaniopsis laurina*, Tree Heath *Trochocarpa laurina* and Veiny Wilkea *W. huegeliana*. Distinguishing species between this FC and '*South Coast*' Warm Temperate Rainforest with which it may abut (to the south) or *Sandstone Scarp* Warm Temperate Rainforest with which it may abut (upslope in the north) include: Bodalla Wattle *Acacia trachyphloia*, Bangalow Palm *Archontophoenix cunninghamiana*, Sickle Spleenwort *Asplenium polydon*, Brush Bloodwood *Baloghia inophylla*, Tiny Strand Orchid *Bulbophyllum exiguum*, Jungle Bristle-fern *Cephalomanes caudatum*, Churnwood *Citronella moorei*, Hairy Clerodendrum *C. tomentosum*, Jackwood *Cryptocarya glaucescens*,

Murrogun *Cryptocarya microneura*, Prickly Tree-fern *Cyathea leichhardtiana*, Giant Stinging Tree *Dendrochnide excelsa*, Black Plum *Diospyros australis*, Austral Lady-fern *Diplazium australe*, Dagger Orchid *Dockrilla pungioniforme*, Koda *Ehretia acuminata*, Rainforest Spinach *Elatostema reticulatum*, Yellow Ash *Emmenosperma alphitonioides*, Small-leaved Fig *Ficus obliqua*, Rough Saw-sedge *Gahnia aspera*, Guioa *G. semiglauca*, Bristly Shield-fern *L. hispida*, Cabbage Fan-palm *Livistona australis*, Yellow Milk Vine *Marsdenia flavescens*, Kangaroo Fern *Microsorum pustulatum*, Anchor Vine *Palmeria scandens*, Brown Beech *Pennantia cunninghami*, *Peperomia tetraphylla*, Bootlace Bush *Pimelea axiflora*, Giant Pepper Vine *Piper hederaceum*, Elkhorn *Platycerium bifurcatum*, Tangle Orchid *Plectorrhiza tridentata*, Featherwood *Polyosma cunninghamii*, Cut-leaf Mint-bush *Prostanthera incisa*, Brush Turpentine *Rhodamnia rubescens*, Green-leaved Bramble (Bush Lawyer) *R. nebulosus*, Maiden's Blush *Sloanea australis*, Sweet Sarsaparilla *Smilax glyciphylla*, Rock Orchid *Thelychiton speciosum*, Small Fork-fern *Tmesipteris parva*, Kanooka *Tristaniopsis laurina*, Tree Heath *Trochocarpa laurina*, Burny Vine *Trophis scandens* and Veiny Wilkea *W. huegeliana* .....*Coastal* Warm Temperate Rainforest.

3b. Not as above.....4.

4a. Specific habitat and distribution: occurs as small stands within the dissected sandstone plateaux of the Sydney Basin from 400-800 m ASL in areas with more than 850 mm annual rainfall; these conditions are found primarily in the escarpments of the Blue Mountains Budderoo and Morton plateaux. Within these areas, this FC is restricted to moist gully heads and sheltered slopes below the cliff lines. As such this FC is restricted to the headwaters of the Clyde River catchment. In contrast, *Coastal* Warm Temperate Rainforest occurs in the same habitat but below 400 m ASL. Dominant species includes one or a combination of: Cedar Wattle *Acacia elata*, Grey Myrtle *Backhousia myrtifolia*, Black Wattle *Callicoma serratifolia*, Coachwood *Ceratopetalum apetalum*, Sassafras *Doryphora sassafras*, Possumwood *Quintinia sieberi*, Scrub Beefwood *Stenocarpus salignus* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this FC and *Coastal* Warm Temperate Rainforest with which it may abut around the 400 m elevation are: Cedar Wattle *Acacia elata*. This FC is species poor compared with *Coastal* Warm Temperate Rainforest with which occurs in the same gully systems (but lower down the altitudinal profile).....*Sandstone Scarp* Warm Temperate Rainforest.

4b. Not as above.....5.

5a. Specific habitat and distribution: this FC occurs in gullies in the foothills and scarps where it has a wide distribution as small stands on relatively fertile soils between 300 and 750 m ASL where annual rainfall exceeds 900 mm. Local concentrations are found mainly in the Morton-Deua area, Budderoo and the Blue Mountains on a range of fertile geologies (other than sandstone). It occurs at similar altitudes to *Sandstone* Scarp Warm Temperate Rainforest, which is (in contrast) restricted to the less fertile sandstone substrates. Dominant species includes one or a combination of: Blackwood *Acacia melanoxylon*, Yellowwood *Acronychia oblongifolia*, Grey Myrtle *Backhousia myrtifolia*, Jackwood *Cryptocarya glaucescens*, Sassafras *Doryphora sassafras*, Eastern Leatherwood *Eucryphia moorei*, Bolwarra *Eupomatia laurina*, Sandpaper Fig *Ficus coronata*, Tree Violet *Melicytus dentatus*, Muttonwood *Myrsine howittiana*, Large Mock Olive *Notelaea venosa*, Musk Daisy-bush *Olearia argophylla*, Sweet Pittosporum *P. undulatum*, Yellow Elderberry *Sambucus australasica*, Scentless Rosewood *Synoum glandulosum*, Lilly Pilly *Syzygium smithii* and Kanooka *Tristaniopsis laurina*. Distinguishing species compared to *Sandstone Scarp* Warm Temperate Rainforest with which it may abut are: Blackwood *Acacia melanoxylon*, Blackstem *Adiantum formosum*, Gum Vine *Aphanopetalum resinosum*, Climbing Fishbone Fern *Arthropteris tenella*, Bird's Nest Fern *Asplenium australasicum*, Shade Nettle *Australina pusilla*, Kangaroo Vine *Cissus antarctica*, Veined Bristle-fern *Crepidomanes venosum*, Jackwood *Cryptocarya glaucescens*, Soft Tree-fern *Dicksonia antarctica*, Austral Lady-fern *Diplazium australe*, Dagger Orchid *Dockrilla pungioniforme*, Prickly Rasp-fern *Doodia aspera*, Rainforest Spinach *Elatostemma reticulatum*, Eastern Leatherwood *Eucryphia moorei*, Bolwarra *Eupomatia laurina*, Sandpaper Fig *Ficus coronata*, Fieldia *F. australis*, Trim Shield-fern *Lastreopsis decomposita*, Creeping Shield-fern *Lastreopsis microsora*, Hairy Psychotria *Chelicanthes lonicerioides*, Queensland Bramble *Rubus moluccanus*, Yellow Elderberry *Sambucus australasica*, Scentless Rosewood *Synoum glandulosum*, Small Fork-fern *Tmesipteris parva* and Kanooka *Tristaniopsis laurina*.....*Intermediate* Warm Temperate Rainforest.

5b. Not as above.....6.

6a. Specific habitat and distribution: postulated to be present in the southern parts of New South Wales (but has yet to be tested in the field by detailed quadrating and floristic analysis). This FC's habitat in Far East Gippsland (*sensu* Peel

1999) is described as: usually restricted to V-shaped gullies or gully-heads of coastal ranges, sometimes extending onto adjacent slopes on south-eastern aspects. It may occasionally grow on small flats of minor streams between 20 and 480 m. According to Peel (1999) it occurs along a narrow coastal zone from the Victorian border northwards to Wandella (inland from Tilba Tilba) where it is restricted to high rainfall zones of around 1014mm average annual rainfall. Dominant species includes one or a combination of: Narrow-leaved Bower Wattle *Acacia cognata*, Blackwood *A. melanoxylon*, Bower Wattle *A. subporosa*, Rough-barked Apple *Angophora floribunda*, Tall Baeckia *Sannantha pluriflora*, Blanket-leaf *Bedfordia arborescens*, Wallaby Bush *Beyeria lasiocarpa*, Black Olive-berry *Elaeocarpus holopetalus*, Blue Oliveberry *E. reticulatus*, Coast Grey-box *Eucalyptus bosistoana*, Mountain Grey Gum *E. cypellocarpa*, River Peppermint *E. elata*, Cut-tail *E. fastigata*, Yellow Stringybark *E. muelleriana*, Messmate *E. obliqua*, Eastern Leatherwood *Eucryphia moorei*, Cherry Ballart *Exocarpos cupressiformis*, Sandpaper Fig *Ficus coronata*, Austral Mulberry *Hedycarya angustifolia*, Tree Lomatia *L. fraseri*, River Lomatia *L. myricoides*, Swamp Paperbark *Melaleuca ericifolia*, Muttonwood *Myrsine howittiana*, Musk Daisy-bush *Olearia argophylla*, Sweet Pittosporum *P. undulatum*, Pencil Cedar *Polyscias murrayi* (NSW only in this FC), Broad-leaf Panax *Polyscias sambucifolia* ssp. 1, Hazel Pomaderris *P. aspera*, Victorian Christmas-bush *Prostanthera lasianthos*, Balm Mint-bush *P. melissifolia*, Yellow Elderberry *Sambucus australasica*, Lilly Pilly *Syzygium smithii*, Mountain Pepper *Tasmannia lanceolata* and Kanooka *Tristaniopsis laurina*. Distinguishing species between this FC and 'South Coast' Warm Temperate Rainforest (as currently circumscribed) are: Sallow *Wattle A. longifolia* ssp. *longifolia*, Rough-barked Apple *Angophora floribunda*, Forest Hound's-tongue *Austrocynoglossum latifolium*, Tall Baeckia *Sannantha pluriflora*, Common Apple-berry *Billardiera mutabilis*, Incense Plant *Calomeria amaranthoides*, Tall Sedge *Carex appressa*, Common Cassinia *C. aculeata*, Shiny Cassinia *C. longifolia*, Rusty Dodder-laurel *Cassytha phaeolasia*, Love Creeper *Comersperma volubile*, Gypsy Fern *Ctenopteris heterophylla*, Slender Tree-fern *Cyathea cunninghamii*, Skirted Tree-fern *C.* X *marcescens*, Leafy Flat-sedge *Cyperus lucidus*, Common Rasp Fern *Doodia australis*, Black Olive-berry *Elaeocarpus holopetalus*, River Peppermint *Eucalyptus elata*, Cut-tail *E. fastigata*, Messmate *E. obliqua*, Creeping Cudweed *Euchiton gymnocephalus*, Annual Cudweed *E. sphaericum*, Cherry Ballart *Exocarpos cupressiformis*, Wandering Bedstraw *G. migrans*, Cinquefoil Cranesbill *Geranium potentilloides*, Twining Glycine *G. clandestina*, Germander Raspwort *Gonocarpus teucriodes*, Austral Brooklime *Gratiola peruviana*, Bat's Wing Fern *Histiopteris incisa*, Blue Howittia *H. trilocularis*, Slender Pennywort *H. tripartita*, Ruddy Ground-fern *Hypolepis rugosula*, Lance Beard-heath *Leucopogon lanceolatus*, Angled Lobelia *L. anceps*, Tree Lomatia *L. fraseri*, Tree Lomatia *L. myricoides*, Common Woodrush *Luzula meridionalis*, Swamp Paperbark *Melaleuca ericifolia*, Spicy Everlasting *Ozothamnus argophyllus*, Tall Rice-flower *P. ligustrina*, Tangle Orchid *Plectorrhiza tridentata*, Sword Tussock-grass *Poa ensiformis*, Tall Mountain Tussock-grass *P. helmsii*, Ledge Tussock-grass *P. hothamensis*, Slender Tussock-grass *P. tenera*, Jersey Cudweed *Helichrysum lutealbum*, Cobra Greenhood *Pterostylis grandiflora*, Forest/Subalpine Buttercup *Ranunuculus plebia/scapiger*, Leathery Shield-fern *Rumohra adiantiformis*, Butterfly Orchid *Sarcochilus australis*, Lilac Lily *Schelhamera undulata*, Soft Skullcap *Scutellaria mollis*, Greenberry *Solanum opacum*, Silky Fan-fern *S. tener*, Mountain Pepper *Tasmannia lanceolata*, River Hook-sedge *Uncinia nemoralis*, Forest Speedwell *Veronica notabilis* and Stinkwood *Zieria arborescens*……*Hinterland* Warm Temperate Rainforest.

6b. Not as above……7.

7. Specific habitat and distribution: is postulated to be present in the southern parts of New South Wales (but has yet to be tested by detailed quadrating and floristic analysis). Dominant species includes one or a combination of: Narrow-leaf Bower Wattle *Acacia cognata*, Blackwood *A. melanoxylon*, Bower Wattle *A. subporosa*, Blanket-leaf *Bedfordia arborescens*, Blue Oliveberry *Elaeocarpus reticulatus*, Mountain Grey Gum *Eucalyptus cypellocarpa*, Yellow Stringybark *E. muelleriana*, Eastern Leatherwood *Eucryphia moorei*, Austral Mulberry *Hedycarya angustifolia*, Muttonwood *Myrsine howittiana*, Musk Daisy-bush *Olearia argophylla*, Forest Geebung *Persoonia silvatica*, Forest Phebalium *P. squamulosum*, Sweet Pittosporum *P. undulatum*, Pencil Cedar *Polyscias murrayi*, Broad-leaf Panax *Polyscias sambucifolia* ssp. 1, Hazel Pomaderris *P. aspera*, Victorian Christmas-bush *Prostanthera lasianthos*, Balm Mint-bush *P. melissifolia*, Lilly Pilly *Syzygium smithii* and Kanooka *Tristaniopsis laurina*. Distinguishing species between this FC and 'South Coast' Warm Temperate Rainforest and *Hinterland* Warm Temperate Rainforest (with which it may abut) are: Prickly Tree-fern *Cyathea leichhardtiana*, Gold-tip *Goodia lotifolia*, Forest Starwort *Hydrocotyle geraniifolia*, Shrubby Velvet-bush *Lasiopetalum macrophyllum*, Forest Geebung *Persoonia silvatica*, Forest Phebalium *P. squamulosum* and Sprawling Bluebell *Wahlenbergia gracilis*.....*Coastal Ranges Overlap* Warm Temperate Rainforest.

Key to the Cool Temperate Rainforest floristic communities of southern New South Wales

1a. Specific habitat and distribution: in the Bega and Eurobodalla shires. Dominant species include one or a combination of: Silver Wattle *Acacia dealbata*, Blackwood *A. melanoxylon*, Southern Sassafras *Atherosperma moschatum*, Blanket-leaf *Bedfordia arborescens*, Sassafras *Doryphora sassafras*, Black Oliveberry *Elaeocarpus holopetalus*, Eastern Leatherwood *Eucryphia moorei*, Austral Mulberry *Hedycarya angustifolia*, Musk Daisy-bush *Olearia argophylla*, Yellow Elderberry *Sambucus australasica* and Scentless Rosewood *Synoum glandulosum*. Note: *Deua* Cool Temperate Rainforest as described appears to have been very mature stands without obvious disturbance. Consequently the taxa underlined are listed as distinguishing species here, but are likely to be also present in *Deua* Cool Temperate Rainforest stands (though not reported in the data possibly because of the chosen sampling sites). These underlined species should not be solely relied upon as distinguishing species between these two Cool Temperate Rainforest FCs as they may be present in both FCs. Distinguishing species: Silver Wattle *A. dealbata*, Blackwood *A. melanoxylon*, Bidgee-widgee *Acaena novae-zelandiae*, Gum Vine *Aphanopetalum resinosum*, Weeping Spleenwort *Asplenium flaccidum*, Southern Sassafras *Atherosperma moschatum*, Blanket-leaf *Bedfordia arborescens*, Mountain Clematis *C. aristata*, Mountain Correa *C. lawrenciana*, Tasman Flax-lily *Dianella tasmanica*, Austral Lady-fern *Diplazium australe*, Sassafras *Doryphora sassafras*, Tall Everlasting *Helichrysum elatum*, Common Filmy-fern *Hymenophyllum cupressiforme*, Creeping Shield-fern *Lastreopsis microsora*, White Milk Vine *Marsdenia rostrata*, Sickle Fern *Pellaea falcata*, Hazel Pomaderris *P. aspera*, Victorian Christmas-bush *Prostanthera lasianthos*, Leathery Shield-fern *Rumohra adiantiformis*, Yellow Elderberry *Sambucus australasica*, Fireweed Groundsel *Senecio linearifolius*, Scentless Rosewood *Synoum glandulosum* and Bearded Tylophora *T. barbata*.....*'Southern Escarpments'* Cool Temperate Rainforest.

1b. Not as above……2.

2a. Specific habitat and distribution: restricted to moist gullies and slopes with loamy soils between 550 and 1050 m ASL receiving a mean annual rainfall of more than 950 mm from near Wog Wog Mountain on the Budawang Range where it is locally concentrated on the escarpment near Clyde Mountain and Monga State Forest, with smaller occurrences found in wetter mountain areas of Deua National Park (Tindall *et al.*. undated). Dominant species includes one or a combination of: Black Oliveberry *Elaeocarpus holopetalus*, Eastern Leatherwood *Eucryphia moorei*, Austral Mulberry *Hedycarya angustifolia* and Musk Daisy-bush *Olearia argophylla*. Distinguishing species between this FC and '*Southern Escarpments*' Cool Temperate Rainforest are: Dagger Orchid *Dockrilla pungioniforme*, Rainforest Spinach *Elatostema reticulatum* and Orange Blossom Orchid *Sarcochilus falcatus*….*Clyde-Deua* Cool Temperate Rainforest.

Key to the Gallery Rainforest floristic communities of southern New South Wales

Note: the Gallery Rainforest FCs described below are based on the Victorian Gallery Rainforest typology and the observed presence of these floristic communities in southern New South Wales at a couple of localities (ranging from the Wallagaraugh River in the south to the Clyde River in the north). However, the sampling that led to this typology was very specific and carefully limited to the high flood energy margins of streams (the habitat of Gallery Rainforest) rather than the whole of the floodplain rainforest that also contained Warm Temperate Rainforest stands. From a careful reading of the floristic data supplied by Tindall *et al.* (undated) it is likely that some of the samples for Warm Temperate Rainforest and also Dry Gully Rainforest have inadvertently included Gallery Rainforest habitat. The basis for this observation is the presence of high levels of Kanooka Tristaniopsis laurina (a diagnostic species for Gallery Rainforest) being reported in other rainforest EVCs and the presence of moisture- (if not water-)dependent species in Dry Gully Rainforest (indicating a stand of Gallery Rainforest may be present along the stream within the stand). As such, the New South Wales Gallery Rainforest typology is far from definitive and requires more targeted sampling to disentangle the characteristics of this rainforest EVC in the region south of Kioloa to the Victorian border. So, the following descriptions are presented as a stop-gap measure until more definitive information becomes available. To this end you can play a role, when looking at your restoration site and your reference sites, by being careful to note the flood-energy zonations present and limiting your characterisation (in the form of species lists and planting regimens) of the site to one zone; either the high flood energy zone, being Gallery Rainforest habitat or, the other low flood energy zone: being the habitat of Warm Temperate or Dry Gully Rainforest.

1a. Specific habitat and distribution: this FC is restricted to the high flood energy sections of perennial streams where soils are sandy to silty loams. Known to occur in New South Wales along the Wallagaraugh River and postulated to occur elsewhere in southern New South Wales, but yet to be confirmed by data in the field. Dominant species of the canopy (based on Victorian data, not yet widely confirmed for NSW) include one or a combination of: Blackwood *Acacia melanoxylon*, Blanket-leaf *Bedfordia arborescens*, Sweet Bursaria *B. spinosa*, Black Wattle *Callicoma serratifolia* (north from Batemans Bay), Coachwood *Ceratopetalum apetalum* (north from Benandra near Batemans Bay), Jungle Grape *Cissus hypoglauca*, Blue Oliveberry *Elaeocarpus reticulatus*, Mountain Grey Gum *Eucalyptus*

cypellocarpa, River Peppermint *E. elata*, Messmate *E. obliqua*, Sandpaper Fig *Ficus coronata*, Austral Mulberry *Hedycarya angustifolia*, River Lomatia *L. myricoides*, Muttonwood *Myrsine howittiana*, Large Mock-olive *Notelaea venosa*, Musk Daisy-bush *Olearia argophylla*, Hazel Pomaderris *P. aspera*, Victorian Christmas-bush *Prostanthera lasianthos*, Brush Pepper *Tasmannia insipida* (north from Moruya), Mountain Pepper *T. lanceolata*, Kanooka *Tristaniopsis laurina* and Stinkwood *Zieria arborescens*. Distinguishing species are not listed because the other FC of Gallery Rainforest occurs in completely separate environments.....*Perennial Streams* Gallery Rainforest.

1b. Not as above……..……..2.

2a. Specific habitat and distribution: this FC is restricted to high flood energy ephemeral streams, often with rocky cobbles and sandy soils and sometimes in valley-constrained gorges. Known to occur in New South Wales along the lowland tributaries of the Clyde River and postulated to occur elsewhere in southern New South Wales, but yet to be confirmed by data in the field. Dominant species of the canopy (based on Victorian data, not yet widely confirmed for NSW) include one or a combination of: White Sallow Wattle *Acacia floribunda*, Black Wattle *A. mearnsii*, Blackwood *A. melanoxylon*, Varnish Wattle *A. vernicaflua*, Tall Baeckia *Sannantha pluriflora*, Sweet Bursaria *B. spinosa*, Mountain Grey Gum *Eucalyptus cypellocarpa*, River Peppermint *E. elata*, Cherry Ballart *Exocarpos cupressiformis*, River Lomatia *L. myricoides*, Muttonwood *Myrsine howittiana*, Hazel Pomaderris *P. aspera* and Victorian Christmas-bush *Prostanthera lasianthos*. Distinguishing species are not listed because the other FC of Gallery Rainforest occurs in completely separate environments…….....*Ephemeral Streams* Gallery Rainforest.

Key to the Dry Rainforest floristic communities of southern New South Wales

Note: there may be examples of 'fig-less' Dry Rainforest stands from the Nethercote Valley south to the Victorian border. See the FC *Gorges* Dry Rainforest (in the Victorian Key for Dry Rainforest) as to the possible composition and structure of these rainforest stands.

1a. Specific habitat and distribution: on lowland granitoids usually associated with rock shields and tors, though not exclusively: also occurring on rolling hills in Grassy Woodlands. (Myrtle Mountain-Tantawangolo and Brogo district from Brogo to Cobargo <www.threatenedspecies.environment.nsw.gov.au>). Other sites may also include: granitoids in the Tilba Tilba and Moruya districts. Outliers of Rusty Fig *Ficus rubiginosa* dominated Dry Rainforests have been located on granitoids in Araluen Valley and other nearby upper tributaries of the Deua River to the south, which (to the author's knowledge), have yet to be formerly investigated and floristically described. It is possible that the south-west inland edge of range for the dominant canopy species Rusty Fig *F. rubiginosa* at Rocky Hall on the Towamba River also represents Dry Rainforest stands (PlantNET) but these have not been visited by the author. Dominant species one or a combination of: Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Blackwood *A. melanoxylon*, Native Quince *Alectryon subcinereus*, Kurrajong *Brachychiton populneus*, Three-nerved Cassinia *C. trinerva*, Brittlewood *Claoxylon australe*, Koda *Ehretia acuminata*, Forest Red Gum *Eucalyptus tereticornis*, Rusty Fig *Ficus rubiginosa*, Large Mock Olive *Notelaea venosa* and Sweet Pittosporum *P. undulatum*. Distinguishing species between this FC and '*South Coast*' Subtropical Rainforest and *Tilba Tilba* Subtropical Rainforest (that may co-occur with it) are: Forest Hound's Tongue *Austrocynoglossum latifolium*, Hillside Burr-grass *Cenchrus caliculatus*, Austral Carrot *Daucus glochidiatus*, Slender Tick-trefoil *Desmodium varians*, Streaked Rock Orchid *Thelychiton striolatum*, Common Hedge-hog Grass *Echinopogon ovatus*, Scrambling Lily *Geitonoplesium cymosum*, Austral Cranesbill *Geranium solanderi*, Variable Glycine *G. tabacina*, Stinking Pennywort *Hydrocotyle laxiflora*, Narrow-leaved Orangebark *Maytenus silvestris*, Boobialla *Myoporum bateae*, Large Mock Olive *Notelaea venosa*, Small Bleeding-heart *Omolanthus stillingifolius*, Two-coloured Panic *Panicum simile*, Shade Pellitory *Parietaria debilis*, Leathery Shield-fern *Rumohra adiantiformis*, Fragrant Senna *S. odoratus*, Star Cucumber *Sicyos australis*, and Kangaroo Grass *Themeda australis*.....*South Coast Forests* Dry Rainforest.

1b. Not as above……..…..2.

2a. Specific habitat and distribution: only three sites are known at the present (all being on private land) and, to date, only one has been sampled and all are associated with shallow gullies in former Bega Dry Grass Forest or Brogo Wet Vine Forest on the granitoids of the Bega-Brogo district. The following species list is based on that site only. Dominant species of this Dry Rainforest type are yet to be determined. Emergents are Kurrajong *Brachychiton populneus* and would probably have also have included: Blue Box *Eucalyptus baueriana*, Forest Red Gum *E. tereticornis* on the margins and Port Jackson Fig *Ficus rubiginosa* either as a strangler on Blue Box or as an endophyte on Blue Box and Forest Red Gum (*endophyte* Figure). The canopy is dominated by one or a combination of: Wild Quince *Alectryon subcinerus*, Sassafras *Doryphora sassafras* and Muttonwood *Myrsine howittiana*. After disturbance, the gaps are

occupied by Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Maidens Wattle *A. maidenii*, Three-nerved Cassinia *C. trinerva*, Hazel Pomaderris *P. aspera,* Kangaroo Apple *Solanum aviculare* and Poison Peach *Trema aspera*. Distinguishing species between this entity and ('*South Coast*' Warm Temperate Rainforest) are: Lightwood *Acacia implexa*, Sedge *Cyperus imbecillus*, Bordered Panic *Entolasia marginata*, Forest Red Gum *Eucalyptus tereticornis*, Twining Glycine *G. clandestina*, Stinking Pennywort *Hydrocotyle laxiflora*, Slender Pennywort *H. tripartita*, Blady Grass *Imperata cylindrica*, Tall Mountain Tussock-grass *Poa helmsii*, Common Tussock-grass *P. labillardeirei*, Small-leaved Bramble *Rubus parvifolius* and Star Cucumber *Sicyos australis*……..'*Grassy*' Dry Rainforest.

Key to the Dry Gully Rainforest floristic communities of southern New South Wales

1a. Specific habitat and distribution: in lowland and foothill gullies (generally on Ordovician Sediments). This rainforest FC occurs from the Wapengo-Bermagui district, north to the Clyde River catchment. Dominant species include one or a combination of: Large-leaf Hickory Wattle *Acacia falciformis*, Lightwood *A. implexa*, Green Wattle *A. irrorata*, Sallow Wattle *A. longifolia* ssp. *longifolia*, Black Wattle *A. mearnsii*, Bower Wattle *A. subporosa*, Native Quince *Alectryon subcinereus*, Black Sheoak *Allocasuarina littoralis*, Tall Baeckia *Sannantha pluriflora*, Grey Myrtle *Backhousia myrtifolia*, Wallaby Bush *Beyeria lasiocarpa*, River Oak *Casuarina cunninghamiana*, Brush Kurrajong *Commersonia fraseri*, Blue Oliveberry *Elaeocarpus reticulatus*, Coast Grey Box *E. bosistoana*, Mountain Grey Gum *E. cypellocarpa*, Woollybutt *E. longifolia*, Cherry Ballart *Exocarpos cupressiformis*, Pale-fruit Ballart *E. strictus*, Sandpaper Fig *Ficus coronata*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum*, Pencil Cedar *Polyscias murrayi*, Hazel Pomaderris *P. aspera*, White Pomaderris *P. cinerea*, Victorian Christmas-bush *Prostanthera lasianthos*, Scentless Rosewood *Synoum glandulosum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this FC and '*Temperate* Dry Gully' Rainforest are a little misleading (if you consult Appendix 6 for the author's additions). The reason for these additions is that much of the '*Southern*' Dry Gully Rainforest FC has been lost to land clearing and as a consequence the author sought to find pioneer and secondary species from disturbed sites to facilitate rainforest restoration and the same process has not been done for '*Temperate* Dry Gully' Rainforest (as very little of it has been cleared). For this reason, these author-addition species have been left out of the list of distinguishing species that separates these two FCs. Distinguishing species based on quadrat data are: Austral Lady-fern *Diplazium australe*, Ironbark Orchid *Dockrilla aemulum*, Variable Sword-sedge *Lepidosperma laterale*, Tailed Rapier-sedge *L. urophorum*, Cut-leaf Mint-bush *Prostanthera incisa*, *Sarcochilus hillii* and Indianweed *Sigesbeckia orientalis*……..'*Southern'* Dry Gully Rainforest.

1b. Not as above……..2.

2a. Specific habitat and distribution: dry shale gullies and on the lower slopes of gorges and foothills with rainfall of 850-1200 mm annually and has a widespread distribution as small stands at low elevations to 300 m in the Deua Clyde catchments (and further north outside the study area at Ettrema). Dominant species includes one or a combination of: Bodalla Wattle *Acacia trachyphloia*, Yellowwood *Acronychia oblongifolia*, Wild Quince *Alectryon subcinereus*, Red Ash *Alphitonia excelsa*, Grey Myrtle *Backhousia myrtifolia*, Wallaby Bush *Beyeria lasiocarpa*, Black Wattle *Callicoma serratifolia*, River Oak *Casuarina cunninghamiana*, Coachwood *Ceratopetalum apetalum*, Churnwood *Citronella moorei*, Brittlewood *Claoxylon australe*, Jackwood *Cryptocarya glaucescens*, Murrogun *Cryptocarya microneura*, Black Plum *Diospyros australis*, Blue Oliveberry *Elaeocarpus reticulatus*, Bolwarra *Eupomatia laurina*, Sandpaper Fig *Ficus coronata*, Austral Mulberry *Hedycarya angustifolia*, Cabbage Fan-palm *Livistona australis*, Muttonwood *Myrsine howittiana*, Variable Muttonwood *M. variabilis*, Large Mock Olive *Notelaea venosa*, Sweet Pittosporum *P. undulatum*, Pencil Cedar *Polyscias murrayi*, Victorian Christmas-bush *Prostanthera lasianthos*, Crab-apple *Schizomeria ovata*, Scrub Beefwood *Stenocarpus salignus*, Scentless Rosewood *Synoum glandulosum*, Lilly Pilly *Syzygium smithii* and Kanooka *Tristaniopsis laurina*. Distinguishing species between this FC and '*Southern'* Dry Gully Rainforest are: Bodalla *Acacia trachyphloia*, Yellowwood *Acronychia oblongifolia*, Blackstem *Adiantum formosum*, Red Ash *Alphitonia excelsa*, Shade Nettle *Australina pusilla*, Fishbone Water-fern *B. nudum*, Strap Water-fern *B. patersonii*, Black Wattle *Callicoma serratifolia*, Common Ground-fern *Calochlaena dubia*, Staff Climber *Celastrus australis*, Coachwood *Ceratopetalum apetalum*, Jungle Grape *Cissus hypoglauca*, Churnwood *Citronella moorei*, Mountain Clematis *C. aristata*, Jackwood *Cryptocarya glaucescens*, Murrogun *Cryptocarya microneura*, Soft Tree-fern *Dicksonia antarctica*, Black Plum *Diospyros australis*, Bolwarra *Eupomatia laurina*, Fieldia *F. australis*, Tall Sword-sedge *Gahnia clarkei*, Rough Bedstraw *Galium gaudichaudii*, Austral Mulberry *Hedycarya angustifolia*, Cabbage Fan-palm *Livistona australis*, Yellow Milkvine *Marsdenia flavescens*, Fragrant Fern *Microsorum scandens*, Variable Muttonwood *Myrsine variabilis*, Dwarf Sickle Fern *Pellaea nana*, Bootlace Bush *Pimelea axiflora*, Mother Shield-fern *Polystichum proliferum*, Queensland Bramble *Rubus moluccanus*, Green-leaved Bramble (Bush Lawyer) *Rubus nebulosus*, Orange Blossom Orchid *Sarcochilus falcatus*, Lilac Lily *Schelhammera undulata*, Crab-apple *Schizomeria ovata*, Kangaroo Apple

Solanum aviculare, Beefwood *Stenocarpus salignus*, Snake Vine *Stephania japonica*, Brush Pepperbush *Tasmannia insipida*, Kanooka *Tristaniopsis laurina* and Burny Vine *Trophis scandens*.....'*Temperate* Dry Gully' Rainforest.

Key to the Littoral Rainforest floristic communities of southern New South Wales

The following key to the Littoral Rainforest communities of southern New South Wales is compiled from the field surveys and floristic analyses of Peel (in prep.). It begins with floristic communities in the south and moves to the north of Peel's study area ending at Durras Beach in the Murramarang National Park. In the New South Wales section, rare or threatened species' status is based on New South Wales classifications (but is indicated for Victoria where examples of those communities also occur in Victoria and have those species present).

1a. Specific habitat and distribution: this rainforest FC grows on sedimentary geologies (mostly Devonian Sandstones and one site on Ordovician Sediments) and one site on beach sands in Victoria. The stands have a low species diversity as the result of one or a number of factors including: intense *grazing/browsing* by macropods and/or Hog Deer (Drews Jetty in Victoria), occur on very harsh sites with little soil such as cobble berms (Bittangabee Bay, Leatherjacket Bay) are small, or are young and usually isolated from other rainforest stands. Dominant species of the canopy include one or a combination of: Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Coast Banksia *B. integrifolia*, Giant Honey-myrtle *Melaleuca armillaris*, Tree Broom-heath *Monotoca elliptica*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Distinguishing species that separate this floristic community from others that may occur nearby (*Southeast Embayments* Littoral Rainforest, *Ordovician Escarpment* Littoral Rainforest and *Disturbed Black Sands* Littoral Rainforest) include: Slender Wallaby-grass *Austrodanthonia racemosa*, Coast Spear-grass *Austrostipa flavescens*, Blady Grass *Imperata cylindrica*, Tree Broom-heath *Monotoca elliptica*, Kangaroo Grass *Themeda triandra* and Prickly Couch *Zoysia macrantha*.....*Depauperate* Littoral Rainforest.

1b. Not as above.....2.

2a. Specific habitat and distribution: In New South Wales this rainforest FC grows on the highly leached sands that are derived from Devonian Red Bed Sandstones, while In Victoria this rainforest grows on highly leached sands derived from two geologies: Tertiary Outwash Sands or Pleistocene Aeolian Sands. The canopy or emergent species separate into two different groups based on two widely separated geographic localities (for the Victorian examples see the FC desciptions under the Victorian headings below). Dominant species: those stands that occur in the Nadgee Nature Reserve (on Devonian Sandstones) have emergent or canopy species that include one or a combination of: Rough-barked Apple *Angophora floribunda*, Blue Oliveberry *Elaeocarpus reticulatus* and Muttonwood *Myrsine howittiana.* Distinguishing species (this community does not abut any other Littoral Rainforest community in southern New South Wales).....*Leached Sands* Littoral Rainforest.

2b. Not as above.....3.

3a. Specific habitat and distribution: this rainforest FC grows on diverse landforms (embayment berms, sand sheets, marginal bluffs and sea cliffs) and geologies including and Devonian Sandstones and Recent Sands in and around embayments in southern New South Wales including: Nadgee Nature Reserve (Merica River), Disaster Bay at Greenglades, the old stand at Baycliff, Leatherjacket Bay and Twofold Bay (between Quarantine Bay and Cocora Beach: Rotoract Park). The uniting themes: soils are generally sandy (often black) and the stands grow on or near embayments close to saline water bodies. Dominant species of the canopy or emergents include one or a combination of: Black Wattle *Acacia mearnsii*, Rough-barked Apple *Angophora floribunda*, Coast Banksia *B. integrifolia*, Blue Oliveberry *Elaeocarpus reticulatus*, Woollybutt *Eucalyptus longifolia*, Cherry Ballart *Exocarpos cupressiformis*, Giant Honey-myrtle *Melaleuca armillaris*, Common Boobialla *Myoporum insulare,* Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum,* Hazel Pomaderris *P. aspera* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and the three floristic communities (*Mallacoota Inlet Incipient* Littoral Rainforest and *Depauperate* Littoral Rainforest or *Disturbed Black Sands* Littoral Rainforest) that may co-occur with it include a range of more mature rainforest species (that are underlined) and others: Rough-barked Apple *Angophora floribunda*, Rusty Dodder-laurel *Cassytha phaeolasia*, Prickly Currant-bush *Coprosma quadrifida*, Paroo Lily *Dianella caerulea*, Giant Hop-bush *Dodonaea viscosa* ssp. *angustifolia*, Blue Oliveberry *Elaeocarpus reticulatus*, Woollybutt *Eucalyptus longifolia*,, Cherry Ballart *Exocarpos cupressiformis*, Trailing Guinea-flower *Hibbertia dentata*, Austral Indigo *Indigofera australis*, Common Woodrush *Luzula meridionalis*, Large Mock-olive *Notelaea venosa*, Wonga Vine *Pandorea pandorana*, Fine-leaved Tussock-grass *Poa meionectes*, Hazel Pomaderris *P. aspera*, Greenhood Orchid

Pterostylis spp., Austral Sarsaparilla *Smilax australis*, Lilac Lily *Schelhammera undulata* and Bearded Tylophora *T. barbata*……..*Southeast Embayments* Littoral Rainforest.

3b. Not as above……4.

4a. Specific habitat and distribution: this rainforest FC grows on coastal escarpments of Ordovician Sediments with two sites on the sea cliffs at Fisheries Beach on Twofold Bay and the other on the small marginal escarpment at Merimbula's Top Lake. Dominant species of the canopy or emergents include one or a combination of: Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Coast Grey Box *Eucalyptus bosistoana*, Woollybutt *Eucalyptus longifolia,* Cherry Ballart *Exocarpos cupressiformis*, Common Boobialla *Myoporum insulare,* Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Distinguishing species between this community and *Disturbed Black Sands* Littoral Rainforest, *Rhyolite Cliffs* Littoral Rainforest and *Depauperate* Littoral Rainforest that co-occurs with this community are: Coffee Bush *Breynia oblongifolia*, Ruby Saltbush *Enchylaena tomentosa*, Giant Hopbush *Dodonaea viscosa* ssp. *angustifolia*, Coast Grey Box *Eucalyptus bosistoana*, Woollybutt *Eucalyptus longifolia*, Cherry Ballart *Exocarpos cupressiformis* and Dense Spear-grass *Stipa densiflora*……..*Ordovician Escarpment* Littoral Rainforest.

4b. Not as above……5.

5a. Specific habitat and distribution: this rainforest FC grows on organically enriched (black) sands derived from a variety of geologies including Ordovician Sandstone, the majority of sites with soils derived from Devonian Red Beds (sandstones and mudstones), with others coming from: Devonian Rhyolite and Devonian Granite, Recent Aeolian Sands, Recent Lacustrine Sands and Recent Alluvial Sands. It occurs extensively in New South Wales: Newtons Beach in Nadgee Nature Reserve, Baycliff (the northern slope), Leatherjacket Bay and Fisheries Beach, Tura Head, Severs Beach, the dunes opposite Merimubula Airport, Turingal Head, and Mogareeka Inlet. The stands in this floristic community are nearly all recovering from clearing (and in three cases fire), most are mature (though the fire sites were less than a year old and two ~20 years post fire at the time of sampling), most are still patchy in their canopy closure. This community has large numbers of characteristic species in the herbaceous life-form category (25 forbs and 11 graminoids) and is second only to *Bung Yarnda* Littoral Rainforest in the total number herbs that are characteristic of the community. Dominant species of the canopy or emergents include one or a combination of: Black Wattle *Acacia mearnsii*, Coast Banksia *B. integrifolia*, Giant Honey-myrtle *Melaleuca armillaris*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Depauperate* Littoral Rainforest, *Mallacoota Inlet Incipient* Littoral Rainforest, *Southeast Embayments* Littoral Rainforest, *New South Wales South Coast Young* Littoral Rainforest and *South Coast Sands* Littoral Rainforest that may abut this community are: Siebers Crassula *C. sieberiana*, Sedge *Cyperus imbecillis*, Angled Lobelia *L. anceps,* Tree Violet *Melicytus dentatus* s.l., and Kangaroo Apple *Solanum aviculare*……..*Disturbed Black Sands* Littoral Rainforest.

5b. Not as above……6.

6a. Specific habitat and distribution: this rainforest FC grows on Recent Aeolian or Lacustrine Sands around small inlets or along their barrier dunes from Hobart Beach (Wallagoot Lake) in the south to Corunna Lake, Dalmeny (northern shore) to Brou Lake in the north. All are relatively young rainforest stands emerging from senescing or long-unburnt adjacent vegetation. Dominant species of the canopy or emergents include one or a combination of: Coast Banksia *B. integrifolia*, Swamp Oak *Casuarina glauca*, Cherry Ballart *Exocarpos cupressiformis*, Giant Honey-myrtle *Melaleuca armillaris*, Mangrove Boobialla *Myoporum acuminatum*, Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Distinguishing species between this community and *Disturbed Black Sands* Littoral Rainforest and *South Coast Sands* Littoral Rainforest, that may abut this community are: Swamp Oak *Casuarina glauca*, Saloop *Einadia hastata*, Maori Bedstraw *Galium propinquum*, Mangrove Boobialla *Myoporum acuminatum*, Common Silkpod *Parsonsia straminea*, Maroonhood *Pterostylis pedunculata* and Devil Thorn *Solanum stelligerum*……..*New South Wales South Coast Young* Littoral Rainforest.

6b. Not as above……7.

7a. Specific habitat and distribution: this rainforest FC grows on clay loams derived from a variety of parent geologies including: Ordovician Sediments (1 site), Devonian Rhyolites (3 sites), Tertiary Outwash Clays (4 sites) and Silurian Sydney Sandstones (1 site). They occur from the Tanja coast between Middle Lagoon and Wapengo Lake north to

Durras Beach in Murramarang National Park. These stands include some mature stands (Tanja coast and Durras Beach) and others that have been disturbed by landslip (Michael Lerner's Lookout), human activity (a rubbish tip at Breakaway Beach), and mining at Haywards Beach. Dominant species of the canopy or emergents include one or a combination of: Coast Banksia *B. integrifolia*, Swamp Oak *Casuarina glauca*, Blue Oliveberry *Elaeocarpus reticulatus*, Southern Mahogany *Eucalyptus botryoides*, Bolwarra *Eupomatia laurina*, Cherry Ballart *Exocarpos cupressiformis*, Sandpaper Fig *Ficus coronata*, Cabbage Fan-palm *Livistona australis*, Giant Honey-myrtle *Melaleuca armillaris*, Tree Broom-heath *Monotoca elliptica*, Mangrove Boobialla *Myoporum acuminatum*, Large Mock Olive *Notelaea longifolia* forma *longifolia*, Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *South Coast Sands* Littoral Rainforest, that may abut this community are: Common Maidenhair *Adiantum aethiopicum*, Gum Vine *Aphanopetalum resinosum*, Sandstone Waterfern *Blechnum ambiguum*, Gristle Fern *Blechnum cartilagineum*, Rough Tree-fern *Cyathea australis*, Rusty Dodder-laurel *Cassytha phaeolasia*, Trailing Guinea-flower *Hibbertia dentata*, Blue Oliveberry *Elaeocarpus reticulatus*, Woollybutt *Eucalyptus longifolia*, Bolwarra *Eupomatia laurina*, Sandpaper Fig *Ficus coronata*, Tall Everlasting *Helichrysum elatum*, Broad-leaf Pennywort *Hydrocotyle acutiloba*, Variable Sword-sedge *Lepidosperma laterale*, Branching Grass-flag *Libertia paniculata*, Cabbage Fan-palm *Livistona australis*, Angled Lobelia *L. alata*, Hillock Bush *Melaleuca hypericifolia*, Giant Honey-myrtle *Melaleuca armillaris*, Mangrove Boobialla *Myoporum acuminatum*, Toothed Daisy-bush *Olearia tomentosa*, Broad-leaf Stinkweed *Opercularia ovata*, Spicy Everlasting *Ozothamnus agophyllus*, Silver Phebalium *P. squamulosum* ssp. *argenteum*, Fine-leaf Tussock-grass *Poa meionectes*, Pastel Flower *Pseudanthemum variabile*, Creamy Stackhousia *S. monogyna*, Ivy-leaf Violet *Viola hederacea* and Coast Rosemary *Westringia fruticosa* .....*Clay Loams* Littoral Rainforest.

7b. Not as above……..8.

8a. Specific habitat and distribution: this rainforest FC grows on the alluviums of deltaic deposits from the estuarine reaches of the Bega River (inland from Tathra) into and including Mogareeka Inlet, then north from Wallaga Lake (Narira Creek-Back Lagoon, Snake Island) to Blackfellows Point on Tuross Lake. It mostly grows on deltaic deposits (silty sands or peaty sands) as well as along the waterline of the nearby valley sides on Ordovician Metasediments (two sites) on a variety of landforms including levees, gully mouths and low-lying islands. Dominant species of the canopy or emergents include one or a combination of: Maidens Wattle *Acacia maidenii*, Black Wattle *A. mearnsii*, Yellowwood *Acronychia oblongifolia*, Native Quince *Alectryon subcinereus*, River Oak *Casuarina cunninghamiana*, Swamp Oak *C. glauca* (and their species-specific parasite: Needle-leaf Mistletoe *Amyema cambagei*), Brittlewood *Claoxylon australe*, Coast Grey Box *Eucalyptus bosistoana*, Southern Mahogany *E. botryoides*, Forest Red Gum *E. tereticornis*, Sandpaper Fig *Ficus coronata*, Giant Honey-myrtle *Melaleuca armillaris*, Swamp Paperbark *Melaleuca ericifolia*, Mangrove Boobialla *Myoporum acuminatum (north from Wallaga Lake)*, Common Boobialla *Myoporum insulare* (south from the Bega River estuary), Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum,* Scentless Rosewood *Synoum glandulosum* ssp. *glandulosum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Clay Loams* Littoral Rainforest, that may abut this community are: White Sallow Wattle *Acacia floribunda*, Maidens Wattle *A. maidenii*, Black Wattle *A. mearnsii*, Yellowwood *Acronychia oblongifolia*, Native Quince *Alectryon subcinereus*, Necklace Fern *Asplenium flabellifolium*, Tall Sedge *Carex appressa*, Three-nerved Cassinia *C. trinerva*, Staff Climber *Celastrus australis*, Sedge *Cyperus imbecillis*, Brittlewood *Claoxylon australe*, Scurvy Grass *Commelina diffusa*, Saloop *Einadia hastata*, Lax Goosefoot *Einadia trigonos*, Giant Hop-bush *Dodonaea viscosa* ssp. *angustifolia*, Coast Grey Box *Eucalyptus bosistoana*, Rough Saw-sedge *Gahnia aspera*, Black-fruit Saw-sedge *G. melanocarpa*, Tree Violet *Melicytus dentatus s.l.*, Swamp Paperbark *Melaleuca ericifolia*, Common Boobialla *Myoporum insulare*, Basket Grass *Oplismenus aemulus*, Grassland Wood-sorrel *Oxalis perennans*, Common Silkpod *Parsonsia straminea*, Sickle Fern *Pellaea falcata*, Cockspur Flower *Plectranthus parviflorus*, Shrubby Fireweed *Senecio minimus*, Indianweed *Sigesbeckia orientalis* ssp. *orientalis*, Forest Nightshade *Solanum prinophyllum*, Eastern Nightshade *S. pungetium*, Devil Thorn *S. stelligerum*, Stout Bamboo-grass *Stipa ramosissima*, Scentless Rosewood *Synoum glandulosum* ssp. *glandulosum*, New Zealand Spinach *Tetragonia tetragonioides*, Poison Peach *Trema tomentosa* var. *virida* and Sprawling Bluebell *Wahlenbergia gracilis*.....*Northern Deltaic* Littoral Rainforest.

8b. Not as above……..9.

9a. Specific habitat and distribution: this rainforest FC probably once grew on the alluviums of deltaic deposits from Nelson Creek north of Tathra, but is only currently known from two sites on the southern branch of Nelson Creek at its estuarine interface. It is assumed to once have occurred (prior to clearing) between this locality and the Bermagui River (this habitat being occupied north from Wallaga Lake by another floristic community (*Northern Deltaic* Littoral Rainforest). Prospective but cleared localities include the deltaic reaches of Nelson Creek (main branch), Sandy

Creek's interface with Middle Lagoon, Brockelos Creek and its interface with Bunga Lagoon, Murrah River and its interface with Bunga Lagoon, Cuttagee Creek and its interface with Cuttagee Lake and the estuarine reaches of Bermagui River. Dominant species of the canopy or emergents include one or a combination of: Maidens Wattle *Acacia maidenii*, Black Wattle *A. mearnsii*, Tall Sedge *Carex appressa*, Spotted Gum *Corymbia maculata*, Leafy Flat-sedge *Cyperus lucidus*, Blue Oliveberry *Elaeocarpus reticulatus*, Upright Panic *Entolasia stricta*, Sandpaper Fig *Ficus coronata*, Swamp Paperbark *Melaleuca ericifolia*, Mangrove Boobialla *Myoporum acuminatum*, Muttonwood *Myrsine howittiana* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *South Coast Sands* Littoral Rainforest that may abut this community are: Maidens Wattle *Acacia maidenii*, Black Wattle *A. mearnsii*, Common Maidenhair *Adiantum aethiopicum*, Variable Mistletoe *Amyema congener* ssp. *congener*, Bare Twig-sedge *Baumea juncea*, Common Ground-fern *Calochlaena dubia*, Prickly Currant-bush *Coprosma quadrifida*, Spotted Gum *Corymbia maculata*, Blue Oliveberry *Elaeocarpus reticulatus*, Sandpaper Fig *Ficus coronata*, Rough Saw-sedge *Gahnia aspera*, Thatch Saw-sedge *Gahnia radula*, Hops Goodenia *G. ovata*, Broad-leaf Pennywort *Hydrocotyle acutiloba*, Shining Pennywort *Hydrocotyle sibthorpioides*, Harsh Ground-fern *Hypolepis muelleri*, Nodding Club-sedge *Isolepis cernua*, Swamp Club-sedge *Isolepis inundata*, Pale Rush *Juncus pallidus*, Loose-flower Rush *Juncus pauciflorus*, Common Blown-grass *Lachnagrostis filiformis*, Coast Cotula *Leptinella longipes*, Angled Lobelia *L. alata*, Large Mock Olive *Notelaea venosa*, White Dogwood *Ozothamnus diosmifolius*, Tree Everlasting *Ozothamnus ferrugineus*, Swamp Paperbark *Melaleuca ericifolia*, Mangrove Boobialla *Myoporum acuminatum*, Wonga Vine *Pandorea pandorana*, Common Silkpod *Parsonsia straminea*, Spotted Knot-weed *Persicaria praetermissa*, Common Reed *Phragmites australis*, Fine-leaf Tussock-grass *Poa meionectes*, Pastel Flower *Pseuderanthemum variable*, Slender Fireweed *Seneocio prenanthoides*, Austral Sarsaparilla *Smilax australis*, Violet Nightshade *Solanum silvestre*, Ivy-leaf Violet *Viola hederacea* and Sandfly Zieria *Z. smithii* ……..*Tathra-Bermagui Coast Deltaic* Littoral Rainforest.

9b. Not as above……10.

10a. Specific habitat and distribution: this rainforest FC has both a narrow geographic range and habitat. It grows on rhyolite sea cliffs and marginal bluffs between Aragunnu Beach and Hidden Valley Beach between Bunga Head and Goalen Head. Dominant species of the canopy or emergents include one or a combination of: Maidens Wattle *Acacia maidenii*, Coast Banksia *B. integrifolia*, Brittlewood *Claoxylon australe*, Southern Brush Kurrajong *Commersonia rossii*, Coast Grey Box *Eucalyptus bosistoana*, Southern Mahogany *Eucalyptus botryoides*, Bolwarra *Eupomatia laurina*, Rusty Fig *Ficus rubiginosa*, Giant Honey-myrtle *Melaleuca armillaris,* Mangrove Boobialla *Myoporum acuminatum*, Large Mock Olive *Notelaea longifolia* forma *longifolia*, Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *South Coast Sands* Littoral Rainforest, that may abut this community are: Gum Vine *Aphanopetalum resinosum*, Wallaby-bush *Beyeria lasiocarpa*, Rusty Dodder Laurel *Cassytha phaeolasia*, Dodder Laurel *Casytha pubescens*, Staff Climber *Celastrus australis*, Brittlewood *Claoxylon australe*, Chef's Cap Correa *C. baeuerlenii*, Southern Brush Kurrajong *Commersonia rossii*, Australian Carrot *Daucus glochidiatus*, Rock Orchid *Thelychiton speciosum*, Bolwarra *Eupomatia laurina*, Rough Saw-sedge *Gahnia aspera*, Trailing Guinea-flower *Hibbertia dentata*, Tree Violet *Melicytus dentatus* s.l., Angled Lobelia *L. alata*, Mangrove Boobialla *Myoporum acuminatum*, Large Mock Olive *Notelaea longifolia* forma *longifolia*, Spicy Everlasting *Ozothamnus argophyllus*, Sickle Fern *Pellaea falcata*, Elkhorn *Platycerium bifurcatum* ssp. *bifurcatum*, Fine-leaf Tussock-grass *Poa meionectes*, Sweet Pittosporum *P. undulatum*, Cockspur Flower *Plectranthus parviflorus*, Pastel Flower *Pseuderanthemum variable*, Muttonwood *Myrsine howittiana*, Leathery Shield-fern *Rumohra adiantiformis*, Austral Sarsaparilla *Smilax australis*, Forest Wire-grass *Tetrarrhena juncea and Dwarf* Zieria *Z. littoralis* ……..... *Rhyolite Cliffs* Littoral Rainforest.

10b. Not as above……11.

11a. Specific habitat and distribution: this rainforest FC once grew on only the gabbro geology associated with Goalen Head east of Bunga (between Tathra and Bermagui). Today only scattered remnant trees, shrubs, vines, graminoids, herbs and ferns remain in pasture to attest to its past glory. A full species list of most candidate species for the site is provided in Chapter S6: *Goalen Head and Bass Point; an indirect comparison using the next best choice*. Dominant species of the canopy or emergents (in the past) are most likely to have included one or a combination of: Lightwood *Acacia implexa*, Maidens Wattle *A. maidenii*, Black Wattle *A. mearnsii*, Blackwood *A. melanoxylon*, Yellowwood *Acronychia oblongifolia*, Wild Quince *Alectryon subcinereus*, Drooping Sheoak *Allocasuarina verticillata*, Coast Banksia *B. integrifolia*, Brittlewood *Cloaxylon australe*, Southern Kurrajong *Commersonia rossii*, Forest Red Gum *Eucalyptus tereticornis*, Cherry Ballart *Exocarpos cupressiformis*, Sandpaper Fig *Ficus coronata*, Small-leaved Fig *Ficus obliqua*,

Rusty Fig *Ficus rubiginosa*, Austral Mulberry *Hedycarya angustifolia*, Cabbage Fan Palm *Livistona australis*, Mangrove Boobialla *Myoporum acuminatum*, Muttonwood *Myrsine howittiana*, Large Mock Olive *Notolea longifolia*, Large Mock Olive *Notolea venosa*, Sweet Pittosporum *P. undulatum*, Yellow Elderberry *Sambucus australasica*, Yellowwood *Sarcomelicope simplicifolia*, Scentless Rosewood *Synoum glandulosum* and Lilly Pilly *Syzygium smithii.* Other species are mostly to have included the shrubs: Coast Wattle *Acacia longifolia* ssp. *sophorae*, Sea Box *Alyxia buxifolia*, Coffee Bush *Breynia oblongifolia*, Orange Thorn *Pittosporum pauciflorus*, Chef's Cap Correa *C. baurelinii*, Bolwarra *Eupomatia laurina*, Dusky Coral Pea *Kennedia rubicunda*, Coast Beard-heath *Leucopogon parviflorus*, Hillock Bush *Melaleuca hypericifolia*, Boobialla *Myoporum beattae*, Boobialla *Myoporum bonariense*, Bleeding Heart *Omolanthus nutans*, Small Bleeding-heart *Omalanthus stillingifolius*, Spicy Everlasting *Ozothamnus argophyllus*, Rough-fruit Pittosporum *P. revolutum*, Kangaroo Apple *Solanum aviculare*, *Solanum silvestre*, Devil Thorn *Solanum stelligerum*, Coast Rosemary *Westringia fruticosa; the vines:* Gum Vine *Aphanopetalum resinosum*, Staff Climber *Celastrus australis*, Jungle Grape *Cissus hypoglauca*, Wombat Berry *Eustrephus latifolius*, Scrambling Lily *Geitonoplesium cymosum*, Trailing Guinea-flower *Hibbertia scandens*, Yellow Milk Vine *Marsdenia flavescens*, White Milk Vine *Marsdenia rostrata*, Seaberry Saltbush *Rhagodia candolleana*, Pearl Vine *Sarcopetalum harveyanum*, Austral Sarsaparilla *Smilax australis;* the forbs: Bidgee Widgee *Acaena novae-zelandiae*, Karkalla *Carpobrotus rossii*, Austral Stork's-bill *Pelergonium australe*, Shade Plantain *Plantago debilis*, Cockspur Flower *Plectranthus graveolens*, Pastel Flower *Pseuderanthemum variable;* the graminoids: Stout Bamboo-grass *Stipa ramosissima*, Bergalia Tussock *Carex longebrachiata*, Margined Panic *Entolasia marginata*, Rough Saw-sedge *Gahnia aspera*, Basket Grass *Oplismenus hirtellus*, Sword Tussock-grass *Poa ensiformis;* and the ferns (including lithophytes and epiphytes): Common Maidenhair *Adiantum aeothipicum*, Blackstem *Adiantum formosum*, Climbing Fishbone Fern*Arthropteris tenella*, Necklace Fern *Asplenium flabellifolium*, Prickly Rasp-fern *Doodia aspera*, Sickle Fern *Pelleae falcata*, Bracken *Pteridium esculentum*, Bird's Nest Fern *Asplenium australasicum*, Elkhorn *Platycerium bifurcatum* and Leathery Shield-fern *Rumorha adiantiformis.* Distinguishing species: are not provided, because there is no certainty as to the exact composition of this cleared site and the dominant species are a compilation of both those that remain on the head and those from the nearest rainforests that can thrive in this littoral location……..*Goalen Head* Littoral Rainforest.

11b. Not as above……..…12.

12a. Specific habitat and distribution: this rainforest FC grows from Wallagoot Lake to Richmond Beach in Murramarang National Park, including: Wallagoot Lake's north shore, Tathra Wharf, Mogareeka Inlet (north shore), Moon Bay, Middle Lagoon Island, Middle Lagoon barrier dune (just south of the car park), Tanja coast just south of Bithry Inlet, Bithry Inlet sandy isthmus protruding into Wapengo Lake, the sandy beach south of Aragunnu Beach, the day use area at Aragunnu Beach, Mimosa Rocks Island, Mimosa Rocks bay, Barraga Bay, Cuttagee Inlet Head, Barragoot Swamp (greenfields site), Murruna Point, Mystery Bay, Corunna Lake, Handkerchief Beach, Narooma Cemetry Headland, Narooma (opposite Apex Park), Brou Lake and Richmond Beach. Stands range from quite young (Barraga Bay) to mature Tathra Wharf, the majority occurring on sands. Dominant species of the canopy or emergents include one or a combination of: Maidens Wattle *Acacia maidenii*, Coast Banksia *B. integrifolia*, Southern Mahogany *Eucalyptus botryoides*, Cherry Ballart *Exocarpos cupressiformis*, Rusty Fig *Ficus rubiginosa*, Tree Broom-heath *Monotoca elliptica*, Large Mock Olive *Notelaea longifolia* forma *longifolia*, and Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Depauperate* Littoral Rainforest, *Disturbed Black Sands* Littoral Rainforest, *New South Wales South Coast* Littoral Rainforest, *Clay Loams* Littoral Rainforest, *Tathra-Bermagui Coast* Littoral Rainforest and *Rhyolite Cliffs* Littoral Rainforest, that may abut this community are: Coast Wattle *Acacia longifolia* ssp. *sophorae*, Paroo Lily *Dianella caerulea* var. *caerulea*, Dusky Coral Pea *Kennedia rubicunda*, Common Bottle-daisy *Lagenophora stipitata*, Burrawang *Macrozamia communis*, Common Tussock-grass *Poa labillardierei*, Small-leaved Bramble *Rubus parviflorus*, Pearl Vine *Sarcopetalum harveyanum*, Lilac Lily *Schelhammera undulata* and Indianweed *Sigesbeckia orientalis* ssp. *orientalis*.....*South Coast Sands* Littoral Rainforest.

12b. Not as above……..13.

13a. Specific habitat and distribution: this rainforest FC is only known from Broulee Island. The stands grow on a range of landforms including marginal bluffs, shallow gullies and on the peneplain of the islands interior. The canopy or emergent species include: Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Drooping Sheoak *Allocasuarina verticillata*, Coast Banksia *B. integrifolia*, Swamp Oak *Casuarina glauca*, Southern Mahogany *Eucalyptus botryoides*, Cheese Tree *Glochidion ferdinandii*, Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Dominant species: this community is unusual for the study area because of the presence of a

number of rainforest species that are close to their southern edge of geographic range but much more common in Littoral Rainforest further north: Red Olive Plum *Elaeodendron australis* var. *australis* and Cheese Tree *Glochidion ferdinandii*. The other unique feature of some of these Littoral Rainforest stands is the presence of a Grey Myrtle *Backhousia myrtifolia* in some areas, which is a characteristic species of Dry Gully Rainforest. This species is known from only one other Littoral Rainforest site on dunes (between Coila Lake and Bingie Bingie Point). Being a nearshore island that has no other Littoral Rainforest communities that co-occur or abut *Broulee Island* Littoral Rainforest, the following species represent the characteristic species of this community rather than distinguishing species: Lightwood *Acacia implexa*, Sallow Wattle *A. longifolia* ssp. *longifolia*, Coast Wattle *A. longifolia* ssp. *sophorae*, Black Wattle A. mearnsii, Coffee Bush *Breynia oblongifolia*, Drooping Sheoak *Allocasuarina verticillata*, Coast Banksia *B. integrifolia*, Common Appleberry *Billardieria scandens* var. *scandens*, Common Grass-sedge *Carex breviculmis*, Bergalia Tussock *Carex longebrachiata*, Kangaroo Vine *Cissus antarctica*, Jungle Grape *Cissus hypoglauca*, Forest Clematis *C. glycinoides* var. *glycinoides*, Prickly Tree-fern *Cyathea australis*, Sedge *Cyperus imbecillis*, Swamp Oak *Casuarina glauca*, Scurvy Grass *Commelina diffusa*, Southern Tick-trefoil *Desmodium gunnii*, Paroo Lily *Dianella caerulea* var. *caerulea*, Kidney Weed *Dichondra repens*, Common Hedge-hog Grass *Echinopogon ovatus*, Saloop *Einadia hastata*, Ruby Saltbush *Enchylaena tomentosa*, Margined Panic *Entolasia marginata*, Southern Mahogany *Eucalyptus botryoides*, Wombat Berry *Eustrephus latifolius*, Knobby Club-rush *Ficinia nodosa*, Rough Saw-sedge *Gahnia aspera*, Black-fruit Saw-sedge *G. melanocarpa*, Moari Bedstraw *Galium propinquum*, Scrambling Lily *Geitonoplesium cymosum*, Cheese Tree *Glochidion ferdinandii*, Twining Glycine *G. clandestina*, Trailing Guinea-flower *Hibbertia dentata*, Climbing Guinea-flower *Hibbertia scandens*, Blady Grass *Imperata cylindrica*, Dusky Coral Pea *Kennedia rubicunda*, Sandhill Sword-sedge *Lepidosperma concavum*, Coast Beard-heath *Leucopogon parviflorus*, Spiny-headed Mat-rush *Lomandra longifolia*, White Milkvine *Marsdenia rostrata*, Weeping Grass *Microlaena stipoides* var. *stipoides*, Muttonwood *Myrsine howittiana*, Toothed Daisy-bush *Olearia tomentosa*, Broad-leaf Stinkweed *Opercularia ovata*, Australian Basket-grass *Oplismenus hirtellus*, Grassland Wood-sorrel *Oxalis perrenans*, Common Silkpod *Parsonsia straminea*, Sickle Fern *Pellaea falcata*, Sweet Pittosporum *P. undulatum*, Sword Tussock-grass *Poa ensiformis*, Common Tussock-grass *Poa labillardierei*, *Polymeia calycina*, Whiteroot *Lobelia purpurescens*, Bracken *Pteridium esculentum*, Seaberry Saltbush *Rhagodia candolleana* ssp. *candolleana*, Pearl Vine *Sarcopetalum harveyanum*, Fairy Fan-flower *Scaevola aemula*, Lilac Lily *Schelhammera undulata*, Fireweed Groundsel *Senecio linearifolius*, Shrubby Fireweed *Senecio minimus*, Slender Fireweed *Senecio prenanthoides*, Forest Nightshade *Solanum prinophyllum*, Eastern Nightshade *Solanum pungetium*, Forest Starwort *Stellaria flaccida*, Snake Vine *Stephania japonica* var. *discolor*, Lilly Pilly *Syzygium smithii*, New Zealand Spinach *Tetragonia tetragonioides*, Forest Wire-grass *Tetrarrhena juncea*, Trailing Speedwell *Veronica plebia*, Ivy-leaf Violet *Viola hederacea* and Coast Rosemary *Westringia fruticosa* .....*Broulee Island* Littoral Rainforest.

13b. Not as above……..…….14.

14. Specific habitat and distribution: this rainforest FC is restricted to a series of low estuary berm beach ridges at Calendula Nature Reserve on the northern shore of Batemans Bay, east of the Princes Highway. The site is highly disturbed but recovering well. Currently the rainforest regeneration is largely restricted to the Swamp Oak *Casuarina glauca* margins of the lower parts of the beach ridges whereas the crests of the ridges were cultivated in the past. The rainforest regeneration is gradually colonising towards these ridges. Dominant species only are listed, because this FC was not likely to have occurred with any other: canopy or emergent trees include: Coast Banksia *B. integrifolia*, Swamp Oak, Brittlewood *Claoyxlon australe*, Red Olive Plum *Elaeodendron australe* var. *australe*, Forest Red Gum *Eucalyptus tereticornis*, Sandpaper Fig *Ficus coronata* and Mangrove Boobialla *Myoporum acuminatum.* Other common species include: Needle-leaf Mistletoe *Amyema cambagei,* Coffee Bush *Breynia oblongifolia*, Kangaroo Vine *Cissus antarctica*, Forest Clematis *C. glycinoides*, Scurvy Grass *Commelina diffusa*, Paroo Lily *Dianella caerulea*, Kidney Weed *Dichondra repens*, Lax Goosefoot *Einadia trigonos*, Knobby Club-sedge *Ficinia nodosa*, Blady Grass *Imperata cylindrica*, Angled Lobelia *L. anceps*, Spiny-headed Mat-rush *Lomandra longifolia*, Tree Violet *Melicytus dentatus*, Jasmine Morinda *M. jasminoides*, Basket Grass *Oplismenus aemulus*, Australian Basket Grass *O. hirtellus*, Common Silkpod *Parsonsia straminea*, Sickle Fern *Pellaea falcata*, Rough-fruit Pittosporum *P. revolutum*, Common Tussock-grass *Poa labillardierei*, Hairy Psychotria *Chelicanthes loniceriodes*, Bracken *Pteridium esculentum*, Seaberry Saltbush *Rhagodia candolleana*, Slender Dock *Rumex brownii*, Shrubby Fireweed *Senecio minimus*, Kangaroo Apple *Solanum aviculare*, New Zealand Spinach *Tetragonia tetragonioides*, Poison Peach *Trema tomentosa* var. *viridis*, Bearded Tylophora *T. barbata*, Scrub Nettle *Urtica incisa* and Ivy-leaf Violet *Viola hederacea*.……*Estuary Berm* Littoral Rainforest.

Key to the rainforest ecological vegetation classes of Victoria

This key is in part derived from Peel (1999) with additional information on Littoral Rainforest in particular provided by Peel (in prep.) and the knowledge of the author.

1a. Appearance: usually a dense canopy often with emergent eucalypts (especially in gullies and on river flats). This rainforest EVC has a diverse range of vines, ferns are usually present in the understorey and tree-ferns are generally present (unless poached from stands in peri-urban or high visitior use areas). Canopy species have leaf sizes that range from microphyll (2.5-7.5 cm) to notophyll (medium) leaves of 7.5-12.5 cm. Broad habitat and distribution: it grows mostly in gullies as well as on alluvial flats on low energy parts of the river's floodplain and its canopy dominance is shared. Annual rainfall ranges from 734-1200 mm. This EVC is restricted to the east of Victoria at lower elevations from sea level (but not right on the coast in exposed positions) to 700 m. It occurs as far west as the Strzeleckies, as far south as Wilsons Promontory, and is best developed in East Gippsland eastwards from the Mitchell River to the border. Smaller outliers occur on the foothill fringes of the La Trobe Valley (e.g. McCalister River). Dominant species: include one or a combination of: Yellowwood *Acronychia oblongifolia*, Blue Oliveberry *Elaeocarpus reticulatus*, Muttonwood *Myrsine howittiana* Sweet Pittosporum *P. undulatum* and or Lilly Pilly *Syzygium smithii* with Kanooka *Tristaniopsis laurina* (occasional on floodplains) Epiphytes are comprised of non-vascular mosses and leafy liverworts and small ferns, with some small orchids present. Tree-ferns are common but may not be abundant in all stands, especially those towards this rainforest types rainfall limit (between Lakes Entrance and Mitchell River).....EVC: Warm Temperate Rainforest.

1b. Not as above……2.

2a. Appearance: continuous cover of emergent eucalypts with a scattered Cool Temperate Rainforest species understorey mixed with sclerophyll species (*Ignition times* Figure). Generally <70% cover of rainforest trees (Southern Sassafras *Atherosperma moschatum*, Myrtle Beech *Nothofagus cunninghamii* or Black Oliveberry *Elaeocarpus holopetalus*), few vascular epiphytes (generally only Common Finger-fern *Grammitis billardierei* and species not found in the adjacent Cool Temperate Rainforest community). This EVC is not considered further in this Rainforest Restoration Manual……EVC: Cool Temperate Mixed Forest.

2b. Not as above……3.

3a. Appearance: Usually a dense canopy of trees with pointed or conical crowns, rarely with emergent eucalypts. The understorey is dominated by ferns (with tree-ferns being visually dominant), while vines are rare. This rainforest EVC is dominated by species with microphyll (small) leaves of 2.5-7.5 cm. Epiphytes are common and abundant, with ferns and non-vascular mosses and liverworts being dominant in Victoria. Generally >70% cover of rainforest trees (except in younger stands) consisting of one or a combinaiton of: Southern Sassafras *Atherosperma moschatum*, Myrtle Beech *Nothofagus cunninghamii* or Black Oliveberry *Elaeocarpus holopetalus*, Tree-ferns are prominent and abundant. Epiphytes (usually bryophytes consisting of mosses and liverworts) are common. Vascular epiphytes (usually ferns) can also be common, but are generally small. Broad habitat and distribution: Gullies at the lower end of the rainfall scale, ridges and montane and sub-alpine plateaux in higher rainfall areas. Rainfall ranges from 1000-2000 mm annually. This rainforest occurs in gullies and saddles and ridges from near sea level in the Otway Ranges to 1440 m in the Central Highlands. In East Gippsland, it does not occur below 500 m. Dominant species: in all regions other than East Gippsland it is dominated by Myrtle Beech *Nothofagus cunninghamii*. Southern Sassafras *Atherosperma moschatum* is a co-dominant species (in all regions other than the Otway Ranges). In East Gippsland, Myrtle Beech is absent and has Southern Sassafras *Atherosperma moschatum,* Black Oliveberry *Elaeocarpus holopetalus* and/or Gippsland Waratah *Telopea oreades* as co-dominants……EVC: Cool Temperate Rainforest.

3b. Not as above……4.

4a. Appearance: This rainforest EVC can be variable in canopy height depending on the frequency and height of floods and frequency of fire. Long undisturbed sites have magnificent overstoreys of Kanooka compared to flood-beaten canopies on very flood-prone and gorge-constrained reaches of major rivers such as the Mitchell (Appendix S5 Figure AS5-1) and Genoa rivers. This rainforest EVC has a dense canopy usually without emergent eucalypts. The canopy species have microphyll (small) leaves of 2.5-7.5 cm. This rainforest EVC has a low diversity of vines (usually only wiry species and if ever a large woody species is present, this is usually Jungle Grape *Cissus hypoglauca)*. Ferns are usually present in the understorey but tree-ferns are rarely present. The understorey life-form composition is the result of frequent floods. Broad habitat and distribution: this rainforest EVC is restricted to the freshwater margins of streams where the high energy flood flows occur. This can include both perennial and ephemeral streams. Dominant species of the canopy include Kanooka *Tristaniopsis laurina* with one or a combination of the following species: Mountain

Burgan *Kunzea peduncularis* and occasionally Black Oliveberry *Elaeocarpus holopetalus*, Muttonwood *Myrsine h*owittiana and Sweet Pittosporum *P. undulatum*. Epiphytes (ferns mosses, leafy liverworts may be present but are mostly high in the canopy above the usual flood level). Because of the high energy floods experienced by this rainforest ecological vegetation class, adult tree-ferns are usually rare as are large woody vines: both of which are ripped down by floods. Wiry vines such as Austral Sarsaparilla *Smilax australis* may be present because they can regrow from perennial rootstocks ….....EVC: Gallery Rainforest.

4b. Not as above……5.

5a. Appearance: The canopy height is usually quite low (to 10 m) and the canopy may on occasions be scattered or broken. There are usually emergent Kurrajongs. Eucalypts are generally absent. During severe drought, rain-green canopy species drop their leaves (Muttonwood, Kurrajongs and Staff Vine) but resprout after rain. In Victoria, no figs are ever present. Broad habitat and distribution: this rainforest EVC occurs from near sea level (but not in exposed coastal situations) to elevations below 600 m in rocky localities associated with tor fields, cliffs and rock screes of moderate to high fertility (feldspar-rich rhyolites, granodiorites and limestones). Unusually for rainforest, it grows on north and west aspects. Dominant species of the canopy include one or a combination of: Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Tree-ferns are always absent as are coastal species (see Littoral Rainforest…….....EVC: Dry Rainforest.

5b. Not as above……6.

6. Appearance: Canopy species have leaf sizes that range from microphyll (2.5-7.5 cm) to notophyll (7.5-12.5 cm) leaves and are composed of a range of exposure and salt-hardy species from the coast and the rainforests of the hinterland. Emergents (usually Coast Banksia *B. integrifolia* or Southern Mahogany *Eucalyptus botryoides*) are often present. Exposed sites have wind-sheared canopies that begin at ground level and form a storm shutter up to a low canopy of around 10 m. In more sheltered locations (such as around estuaries), the canopy may be uneven. The process of canopy decapitation often means that there a secondary canopy develops from basal/stem coppices or seedling regeneration. Because of the prevalence of this process, gaps may be common and are often dominated by graminoids. The understorey is usually fairly bare compared with other rainforests (due to the droughty nature of the soils and/or steep slopes). Graminoids and forbs are more common than ferns (which are restricted to a few hardy and drought-tolerant species). Except for rare niches such as soaks associated with coastal cliff lines, tree-ferns are absent (as, in most cases, are vascular epiphytes). Non-vascular epiphytes (particularly lichens) may be common in the warm temperate climate zone. Broad habitat and distribution: as far as is known, this rainforest EVC is restricted to sites from the Victorian border to the eastern end of the Gippsland Lakes including the Mitchell River Silt Jetties. It occurs on the coast at sites with excellent fire protection (bare sand, cliffs, estuaries, ocean shores) and wherever there is significant influence from salt. Salt may be delivered in the form of salt haze directly off the sea, or through the water table. Consequently this rainforest can occur on deltaic deposits around estuaries (including the estuarine reaches of streams). It can also occur on marine limestones with connate salts along the lowland streams. Dominant species are drought-hardy and salt-tolerant canopy trees or emergents that include one or a combination of: Coast Banksia *B. integrifolia*, Yellowwood *Acronychia oblongifolia*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Only the most drought-hardy ferns are present (tree-ferns are absent). Epiphytes are largely absent. Most sites have a grassy understorey.....EVC: Littoral Rainforest.

Key to the rainforest floristic communities of Victoria

Notes:

- The distinguishing species provided below follow that of Peel (1999) except for Littoral Rainforests which are derived from Peel (in prep.).,.
- Specific distribution and habitat: for the specific distribution component, the localities supplied are not meant to be an exhaustive list as to where the particular rainforest type occurs. They should be seen as a guide only: intended for you to use so that you can visit a known stand of a particular floristic entity and familiarise yourself with its habitat, structure and composition. Remember also that if your site requires major restoration, little or no structure and composition will remain on your restoration site. The localities therefore can act as your reference sites. So, if you are in a rainforest stand not listed under the specific distribution heading, use the habitat information, dominant species and distinguishing species (and the full species list in Appendix S6: worksheet All species+FCs) to determine the stands floristic identity; and
- Remember always that your species list for your site trumps all other less specific or more regionally broad floristic and habitat information.

The specific floristic community's name is indicated by the italicised descriptors preceding the ecological vegetation class name. For Cool Temperate, Warm Temperate, Gallery and Dry Rainforests, the differential species between the floristic communities of each rainforest ecological vegetation class are derived from Peel (1999), as are the geographic ranges for each rainforest floristic community. For Littoral Rainforest this information is provided by Peel (in prep.).

Quick reference guide to the floristic communities of the rainforest EVCs of Victoria

NOTE: these lists are relevant to the Victorian component of the region covered by the Manual: east of (and including the Otway Ranges, Central Highlands, Strzelecki Ranges, Wilsons Promontory and East Gippsland) to the Victorian border.

Warm Temperate Rainforest Floristic communities

8 in Victoria (see full FCs descriptions in keys below):

- *East Gippsland Coastal* Warm Temperate Rainforest (*sensu* Peel 1999): in the deeply (and steeply) incised lowland gully systems (below 65m) of the coastal plain (often on Tertiary Limestones) from the lower Mitchell River in the west to the lower Snowy River (and its gullies upstream of Lochend Jungle) in the east. The largest concentration used to once occur between Metung and the Bunga Creek catchment (but is now largely cleared).
- *Strzeleckis* Warm Temperate Rainforest (*sensu* Peel 1999) (other Warm Temperate Rainforest entities occur there that are as yet undescribed: see FC descriptions below); restricted to moist sheltered gullies and south- and east-facing slopes around the perimeter of the Strzelecki Ranges below 240 m.
- *Alluvial Terraces* Warm Temperate Rainforest (*sensu* Peel 1999): found from the Mitchell River in the west to Mallacoota Inlet in the east (formerly on the lowland reaches of the Genoa, with some extant examples still present on the Wallagaraugh River), on the alluvial flats of larger gullies, and the low energy sections of floodplains of small to major streams below 470 m.
- *East Gippsland Foothills* Warm Temperate Rainforest (*sensu* Peel 1999): restricted to the foothills of East Gippsland from the McAlister River to Wingan River between 20 and 750 m in steep south or east-facing gullies.
- *Hinterland* Warm Temperate Rainforest (*sensu* Peel 1999): occurring between Thurra River in Victoria (20-400 m) and in the vicinity of Wandella (perhaps ranging to higher elevations in New South Wales) on coastal hills and riverine plains.
- *Wilsons Promontory Overlap* Warm Temperate Rainforest (*sensu* Peel 1999): restricted to Wilsons Promontory at elevations below 200 m.
- *East Gippsland Overlap* Warm Temperate Rainforest (*sensu* Peel 1999): restricted to East Gippsland (Mt Ellery and the escarpment of the Errinundra Plateau) in deeply incised gullies which delineate the headwaters of the Goolengook and Brodribb Rivers.
- *Coastal Ranges Overlap* Warm Temperate Rainforest (*sensu* Peel 1999): found in coastal ranges (in both Victoria and postulated to be present in New South Wales) from Howe Range (between 129 and 280 m) in the south, northwards along the Monaro escarpment to the Moruya catchment.

Cool Temperate Rainforest Floristic communities

9 in Victoria (see full FCs descriptions in keys below):

- *Otways* Cool Temperate Rainforest (*sensu* Peel 1999): river flats, gullies, saddles and in the wettest parts: ridges of the Otway Ranges on Cretaceous mudstones and the alluviums derived from them.
- *Otways Redwater* Cool Temperate Rainforest (*sensu* Peel 1999): gullies of Tertiary Sands in the western Otway Ranges..
- *Central Highlands* Cool Temperate Forest (*sensu* Peel 1999): river flats, gullies, slopes and saddles in the Central Highlands from 228-1200 m, above 240 m in the Strzelecki Ranges and the highest peaks of Wilsons Promontory.
- *Central Highlands Montane Riparian* Cool Temperate Rainforest (*sensu* Peel 1999): along streams and adjacent seepages of the Central Highlands..
- *Central Highlands Montane Scrub* Cool Temperate Rainforest (*sensu* Peel 1999): restricted to the Baw Baw and Toorongo Plateaux..

- *East Gippsland* Cool Temperate Rainforest (*sensu* Peel 1999): restricted to East Gippsland in gullies above 650 m elevation, and less commonly extending out onto slopes and saddles and montane plateaux in higher rainfall zones from the Nunniong Plateau to the Errinundra Plateau..
- *East Gippsland Montane Riparian* Cool Temperate Rainforest (*sensu* Peel 1999): along streams of East Gippsland between 620 and 1240 m mostly on the Errinundra Plateau, and occasionally also on the Nunniong Plateau and in the Roger River Basin..
- *East Gippsland Montane Scrub* Cool Temperate Rainforest (*sensu* Peel 1999): restricted to the highest parts of the Errinundra Plateau between 1100 and 1180 m..
- *East Gippsland Overlap* Cool Temperate Rainforest (*sensu* Peel 1999): restricted to elevations between 533 and 870 m in deeply incised river valleys or steep gullies of East Gippsland..

Gallery Rainforest Floristic communities
2 in Victoria (see full FCs descriptions in keys below):

- *Perennial Streams* Gallery Rainforest along all of the major river systems east of the Mitchell River (*sensu* Peel 1999).
- *Ephemeral Streams* Gallery Rainforest along smaller (often valley-constrained) streams (*sensu* Peel 1999).

Dry Rainforest Floristic communities
2 in Victoria (see full FCs descriptions in keys below):

- *Gorges* Dry Rainforest which is restricted to the gorges of the Mitchell, Snowy and Genoa Rivers (*sensu* Peel 1999).
- *East Gippsland Karst* Dry Rainforest which is only found on cliffs, dolines and rock screes of the Buchan and Murrindal Rivers where it has mostly been cleared (*sensu* Peel 1999).
- *'Grassy' Dry Rainforest* which occured in shallow gullies in Plains Grassy Woodland associated with Iguana Creek and the Mitchell River between Bairnsdale and the Mitchell River Pumping Station where it has mostly been cleared..

Littoral Rainforest Floristic communities
12 in Victoria (8 are endemic to Victoria, 4 are shared with New South Wales) (see full FCs descriptions in keys below):

- *East Gippsland Deltaic* Littoral Rainforest (*sensu* Peel in prep.): was formerly found on the deltaic deposits of the estuarine reaches of the Mitchell River Silt Jetties east to the lower Genoa and Wallagaraugh Rivers, from which it is now mostly cleared.
- *Bung Yarnda* Littoral Rainforest (*sensu* Peel in prep.): is restricted to south and east facing slopes associated with the marginal bluffs and flooded vallesy of the eastern Gippsland Lakes from Tambo Bluff to Lake Tyers;
- *Limestone* Littoral Rainforest (*sensu* Peel in prep.): is restricted to the exposed Tertiary Limestones on the north and west facing slopes associated with the marginal bluffs and flooded vallesy of the eastern Gippsland Lakes from Tambo Bluff to Lake Tyers and the lowland reaches of the Mitchell, Tambo, Nicholson and lower Snowy Rivers.
- *Depauperate* Littoral Rainforest (*sensu* Peel in prep.): which is found at Drews Jetty on the coastal barrier .
- *Leached Sands* Littoral Rainforest: (*sensu* Peel in prep.): grows on highly leached on Tertiary Outwash Sands along the marginal bluff behind Ewings Marsh between Lake Tyers and the Marlo Estuary and on the northern margin of Swan Lake.
- *Damp Sands* Littoral Rainforest (*sensu* Peel in prep.): that occurs on damp sands or silts derived from Laterised Pleistocene Sands (of old dunes) on marginal bluffs and flats between Marlo and Cape Conran, on Recent Aeolian Sands at Corringle Creek and Corringle Slips, and on two sites on Recent Alluviums (silty sands) around Sydenham Inlet and the estuarine reaches of the Bemm River.
- *Granitic Headland* Littoral Rainforest (*sensu* Peel in prep.): is restricted to granitic headlands over-run by dunes in Croajingalong National Park at Rame Head with one site between Easby Creek and Red River in the Sandpatch Wilderness .
- *Infilled Swamp Scrub* Littoral Rainforest (*sensu* Peel in prep.): grows on infilling estuarine deltaic deposits that were previously the habitat of *Estuarine* Swamp Scrub on the upper reaches of Wingan Inlet, one site on

Toorloo Arm, and several along the infilling former Reeves River (the Warm Holes) between Lake Bunga and Cunninghame Arm.

- *Croajingalong Sands* Littoral Rainforest (*sensu* Peel in prep.): grows on Pleistocene and Recent Aeolian Dunes and Lacustrine Sand Sheets between Tamboon Inlet and Wingan Point, with its most extensive development between Point Hicks and Thurra River entrance .
- *Southeast Embayments* Littoral Rainforest (*sensu* Peel in prep.): grows on diverse landforms (embayment berms, sand sheets, marginal bluffs and sea cliffs) and, in Victoria, on geologies including Ordovician Sandstones and Recent Sands in and around embayments in south-eastern Australia including: Betka River spit, Mallacoota Inlet.
- *Mallacoota Inlet Incipient* Littoral Rainforest (*sensu* Peel in prep.): occurs on a variety of landforms (lacustrine islands, marginal bluffs and sea cliffs) around Mallacoota Inlet.
- *Disturbed Black Sands* Littoral Rainforest (*sensu* Peel in prep.): is only known from the eastern side of WIngan Point adjacent to Easby Creek that was burnt in Victoria's 1983 wildfires.

Victorian Warm Temperate Rainforest floristic communities

In the area of Victoria covered by this Manual, Warm Temperate Rainforests occur in the lowland margins of the Strzelecki Ranges and then further east from the Mount Moornapa to the Victorian border with New South Wales. Scattered occurrences along the southern margin of the Great Divide north of the LaTrobe Valley have been reported to the author. However, these remain floristically undescribed and are therefore not considered further here.

1a. Specific distribution and habitat: This rainforest FC grows in deeply and steeply incised gullies (often but not always where Tertiary Limestones are exposed) at elevations from sea level to 65m and once occurred from the lower Mitchell River (in gullies running onto the floodplain downstream of Glenaladale) and in similar habitats east on the Nicholson, Tambo and Snowy Rivers. Its centre of development was (and the extant remnants remain) in the eastern Gippsland Lakes from Tambo Bluff to Lake Tyers. Its specific habitat is either in the smaller gullies (without an alluvial flat) where it occupies the whole gully (slopes and floor), but on larger systems (Maringa Creek, Bunga Creek and many others) where there is an alluvial flat, it is restricted to the well-drained gully slopes. The alluvial gully floors of these gully systems are occupied by another Warm Temperate Rainforest floristic community: *Alluvial Terraces* Warm Temperate Rainforest. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Yellowwood r *Acronychia oblongifolia*, Muttonwood *Myrsine howittiana* or Lilly Pilly *Syzygium smithii*. Distinguishing species are: Common Boobialla *Myoporum insulare*, Viscid Daisy-bush *Olearia viscosa* and Seaberry Saltbush *Rhagodia candolleana* when compared with *Alluvial Terraces* Warm Temperate Rainforest with which it may co-occur. This FC may abut another three floristic communities of Littoral Rainforest: *East Gippsland Deltaic* Littoral Rainforest, *Bung Yarnda* Littoral Rainforest and *Limestone* Littoral Rainforest), but all of these occur in exposed habitats outside the gully habitat of *East Gippsland Coastal* Warm Temperate Rainforest and so are not used in the analysis of distinguishing species. A comparative analysis is however provided in Chapter S6 Table S19 and S20……..……*East Gippsland Coastal Warm* Temperate Rainforest.

1b. Not as above with the rainforest stands occur in East Gippsland……..……2.

2a. Specific distribution and habitat: this rainforest FC is restricted to the fire-sheltered footslopes and gullies of the Strzelecki Ranges around its entire perimeter where it is only remaining as scattered remnants growing from near sea level (80 m) to 240 m, in gullies and on stream flats (but is absent from nearby Wilsons Promontory). Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*; rarely the following eucalypts as most sites are disturbed: Mountain Grey Gum *Eucalyptus cypellocarpa*, Southern Blue Gum *Eucalyptus globulus*, Messmate *Eucalyptus obliqua*, Yellow Stringybark *Eucalyptus muelleriana*; and Austral Mulberry *Hedycarya angustifolia*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum* and Hazel Pomaderris *P. aspera*. Common species in this floristic community [only four samples were taken prior to Peel (1999)] and based on this limited sample these species include: Forest Clematis *C. glycinoides*, Prickly Currant-bush *Coprosma quadrifida*, Rough Tree-fern *Cyathea australis*, Common Rasp-fern *Doodia media*, Hairy Pennywort *Hydrocotyle hirta*, Shiny Shield-fern *Lastreopsis acuminata*, Muttonwood *Myrsine howittiana*, Sickle Fern *Pellaea falcata*, Wonga Vine *Pandorea pandorana*, Sweet Pittosporum *P. undulatum*, White Elderberry *Sambucus gaudichaudiana*, Forest Starwort *Stellaria flaccida* and Kangaroo Apple *Solanum aviculare*. NOTE: based on subsequent field visits to the region (and due to a lack of sampling data), it is evident that there are at least 3 separate floristic entities in Warm Temperate Rainforest involved in the Strzeleckis (i. e. another two as yet undescribed). *Strzeleckis* Warm Temperate Rainforest occurs on sheltered steep sites (gullies and/or south- or east-facing slopes), another on riparian flats, and much rarer type (currently only known with certainty from lower Macks Creek) on north or west facing slopes protected by cliffs or steep

gullies (gorges). Local rainforest restorers should take detailed lists based on landforms and aspect as a basis of their restoration species lists before beginning their projects…..*Strzeleckis Warm* Temperate Rainforest.

2b. Not as above……3.

3a. Specific distribution and habitat: this rainforest FC grows on alluvial flats of creeks and on the lowland river valley from the Mitchell River in the west to Wallagaraugh River in the east (to date it is has not be located in southern New South Wales) at elevations below 470 m. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Yellowwood r *Acronychia oblongifolia* [only in the lowlands between the Mitchell and Bemm Rivers (note, however, that this rainforest community is currently extinct on the lower Mitchell, Nicholson and Tambo Rivers)], Mountain Grey Gum *Eucalyptus cypellocarpa*, River Peppermint *Eucalyptus elata*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum,* Lilly Pilly *Syzygium smithii* or Kanooka *Tristaniopsis laurina*. Distinguishing species are: Round Water Starwort *Callitriche muelleri*, Bergalia Tussock *Carex longebrachiata*, Forest Hounds Tongue *Austrocynoglossum latifolium*, Lacy Ground-fern *Dennstaedtia davalliodes*, Common Rasp-fern *Doodia media* ssp. *australis*, Creeping Cudweed *Euchiton gymnocephalum* s.s., Bats Wing Fern *Histiopteris incisa*, Shining Pennywort *Hydrocotyle sibthorpioides*, Downy Ground-fern *Hypolepis glandulifera*, Marsh Ground-fern *Hypolepis muelleri*, Yellow Wood-sorrel *Oxalis corniculata s.l.*, Cockspur-flower *Plectranthus parviflorus*, Butterfly Orchid *Sarcochilus australis*, Shrubby Fireweed *Senecio minimus*, Indianweed *Sigesbeckia oreinetalis*, Kangaroo Apple *Solanum aviculare* and Eastern Nightshade *Solanum pungetium*.....*East Gippsland Alluvial Terraces Warm* Temperate Rainforest.

3b. Not as above……4.

4a. Specific distribution and habitat: this rainforest FC occurs in the foothills of East Gippsland between the Mcalister River (north of Heyfield) in the west and the Wingan River in the east (with one isolated record from the Howe Range). It occurs from 20-750 m altitude, occupying steep gullies with south and east aspects. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Black Oliveberry *Elaeocarpus holopetalus*, Mountain Grey Gum *Eucalyptus cypellocarpa*, Cut-tail *Eucalyptus fastigata*, Muttonwood *Myrsine howittiana* or Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species are: Weeping Spleenwort *Asplenium flaccidum*, Mountain Clematis *C. aristata*, Tasman Flax Lily *Dianella tasmanica*, Cut-tail *Eucalyptus fastigata*, Fieldia *F. australis*, Veined Bristle-fern *Polyphlebium venosum*, Leathery Shield-fern *Rumohra adiantiformis* and Gippsland Waratah *Telopea oreades*……..*East Gippsland Foothills Warm* Temperate Rainforest.

4b. Not as above……5.

5a. Specific distribution and habitat: this rainforest FC occurs on the coastal hills and riverine plains from the Thurra River (east of Cann River township) to the Victorian border then it is postulated to occur northwards to Wandella (southwest from Tilba Tilba) in southern New South Wales at elevations of 20-400 m (in Victoria), perhaps higher in southern New South Wales. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Mountain Grey Gum *Eucalyptus cypellocarpa*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum,* Lilly Pilly *Syzygium smithii* or Kanooka *Tristaniopsis laurina*. Distinguishing species are: Shade Nettle *Australina pusilla* ssp. *muelleri*, Common Ground-fern *Calochlaena dubia*, Forest Bindweed *Calystegia marginata*, Prickly Rasp-fern *Doodia aspera*, Northern Cranesbill *Geranium homeanum*, Hop Goodenia *G. ovata*, Bats Wing Fern *Histiopteris incisa*, Swamp Club-sedge *Isolepis inundata*, White Elderberry *Sambucus gaudichaudiana*, Butterfly Orchid *Sarcochilus australis*, Fireweed Groundsel *Senecio linearifolius*, Indianweed *Sigesbeckia oreinetalis*, Forest Nightshade *Solanum prinophyllum*, Forest Starwort *Stellaria flaccida*, Mountain Pepper *Tasmannia lanceolata*, River Hook-sedge r *Uncinia nemoralis*, and Scrub Nettle *Urtica incisa*.....*Hinterland Warm* Temperate Rainforest.

5b. Not as above……6.

6a. Specific distribution and habitat: this rainforest FC occurs on Wilsons Promontory at elevations of <200 m. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Austral Mulberry *Hedycarya angustifolia*, Hazel Pomaderris *P. aspera* and Lilly Pilly *Syzygium smithii*. Distinguishing species are: Weeping Spleenwort *Asplenium flaccidum*, Fieldia *F. australis*, Tall Saw-sedge *Gahnia clarkei*, Fragrant Fern *Microsorum scandens*, Musk Daisy-bush *Olearia argophylla*, Wonga Vine *Pandorea pandorana*, White Elderberry

Sambucus gaudichaudiana, Hazel Pomaderris *P. aspera,* Lilly Pilly *Syzygium smithii* and Austral King Fern *Todea barbara*.....*Wilsons Promontory Overlap* Warm Temperate Rainforest.

6b. Not as above……7.

7a. Specific distribution and habitat: this rainforest FC occurs between 500 and 700 m in the deeply incised river valleys and the steep gullies and rugged mountain country surrounding Mount Ellery and the southern escarpment of the Errinundra Plateau where most stands occur in the headwaters of the Goolengook and Brodribb Rivers, with one stand on the Combienbar River. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Southern Sassafras *Atherosperma moschatum*, Black Oliveberry *Elaeocarpus holopetalus*, Mountain Grey Gum *Eucalyptus cypellocarpa*, Cut-tail *Eucalyptus fastigata* and Muttonwood *Myrsine howittiana* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this FC and *East Gippsland Overlap* Cool Temperate Rainforest (which occurs at higher elevations) and *East Gippsland Foothills* Warm Temperate Rainforest (which occurs at lower elevations) are: Lance Water-fern *Blechnum chambersii*, Slender Tree-fern v *Cyathea cunninghamii*, Skirted Tree-fern v *Cyathea* X *marcescens*, Austral Filmy-fern *Hymenophyllum australe* and Long Fork-fern *Tmesipteris obliqua*. This community is restricted to a narrow altitudinal range of between 300 and 700 m on the escarpments of the Errinundra Plateau, Murrungowar and Mt. Waldon. It may occur at other locations within this geographic area of East Gippsland at these altitudes. The adjacent vegetation is generally Wet Forest..... ……..*East Gippsland Overlap* Warm Temperate Rainforest.

7b. Not as above……8.

8a. Specific distribution and habitat: in Victoria, this rainforest FC occurs only in the Howe Range east of Mallacoota at elevations of between 129 and 280 m and it is postulated to occur as far north as the ranges behind Moruya in southern New South Wales. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Mountain Grey Gum *Eucalyptus cypellocarpa*, Eastern Leatherwood v *Eucryphia moorei,* Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum,* Lilly Pilly *Syzygium smithii* or Kanooka *Tristaniopsis laurina*. Distinguishing species are: Narrow-leaf Bower *Wattle Acacia cognata*, Bower Wattle r *A. subporosa*, Mother Spleenwort *Asplenium bulbiferum*, Necklace Fern *Asplenium flabellifolium*, Three-nerved Cassinia *C. trinerva*, Mountain Correa *C. lawrenciana*, Prickly Tree-fern v *Cyathea leichardtiana*, Eastern Leatherwood v *Eucryphia moorei, Scrambling Lily Geitonoplesium cymosum*, Common Finger-fern *Grammitis billardieri*, Tall Everlasting *Helichrysum elatum*, Forest Pennywort *Hydrocotyle geraniifolia,* Red Passion-flower *Passiflora cinnabarina*, Sickle Fern *Pellaea falcata*, Forest Geebung r *Persoonia sylvatica,* Broad-leaf Panax *Polyscias sambucifolia* ssp. 1, Cut-leaf Mint-bush r *Prostanthera incisa*, Gunyang *Solanum vescum* and Oval Fork-fern r *Tmesipteris ovata*..... ……..*Coastal Ranges Overlap* Warm Temperate Rainforest.

Victorian Cool Temperate Rainforest floristic communities

In Victoria, Cool Temperate Rainforests occur from near sea level in the Otway Ranges, from 228m in the Central Highlands in the higher areas of the Strzelecki Ranges (higher than 240 m) and the peaks of Wilsons Promontory; and then further east from the Nuniong Plateau, Roger River and Errinundra Plateau at elevations of greater than 900 m.

1a. Specific habitat and distribution: this rainforest FC is geographically widespread and occurs from near sea level to the highest ridges of the Otway Ranges being largely restricted to geologies other than the Tertiary Sands of the region. It occurs west of the Cumberland River headwaters (north of Kennett River township) to Lavers Hill. Dominant species: Myrtle Beech *Nothofagus cunninghamii.* Distinguishing species from *Otways Redwater* Cool Temperate Rainforest are: Mother Spleenwort *Asplenium bulbiferum*, Weeping Spleenwort *A. flaccidum*, Ground Spleenwort *A. terrestre*, Shade Nettle *Austalina pusilla* ssp. *muelleri*, Lance Water-fern *Blechnum chambersii*, Ray Water-fern *B. fluviatile*, Tall Sedge *Carex appressa*, Mountain Clematis *C. aristata*, Gipsy Fern *Ctenopteris heterophylla*, Slender Tree-fern Rr *Cyathea cunninghamii*, Austral Lady-fern *Diplazium australe*, Austral Mulberry *Hedycarya angustifolia*, Shiny Shield-fern *Lastreopsis acuminata*, Bristly Shield-fern *L. hispida*, Musk Daisy-bush *Olearia argophylla*, Mother Shield-fen *Polystichum proliferum*, Delicate Hook-sedge *Uncinia tenella* and Scrub Nettle *Urtica incisa*...……..…….*Otways* Cool Temperate Rainforest.

1b. Not as above…….1c.

1c. Specific habitat and distribution: this rainforest FC is restricted to the lower elevations of the western portion of the Otways growing on Tertiary Outwash Sands. Dominant species: Myrtle Beech *Nothofagus cunninghamii* and Mountain Ash *Eucalyptus regnans*. Distinguishing species from *Otways* Cool Temperate Rainforest are: Mountain Correa *C. lawrenciana*, Swamp Club-sedge *Isolepis inundata*, Prickly Tea-tree *Leptospermum juniperinum*, Bushy Broom Heath *Monotoca glauca*, Privet Mock Olive *Notelaea ligustrina*, Satinwood *Nematolepis squamea*, Victorian Christmas-bush *Prostanthera lasianthos,* Common Bog-sedge *Schoenus apogon,* Spreading Fan-fern *Sticherus lobatus,* Mountain Pepper *Tasmannia lanceolata,* Forest Wire-grass *Tetrarrhena juncea,* Slender Fork-fern *Tmesipteris elongata* and Long Fork-fern *T. obliqua*……..…….....*Otways Redwater* Cool Temperate Rainforest.

1d. Not as above (the canopy dominants include both Myrtle Beech *Nothofagus cunninghamii* and Southern Sassafrass *Atherosperma moschatum*) and the rainforest occurs outside the Otway Ranges and East Gippsland .....2.

2a. Specific habitat and distribution: this rainforest FC occurs in gullies, on river flats, slopes and saddles from 228-1200 m in the Central Highlands, and above 240 m in the Strzelecki Ranges and the highest peaks of Wilsons Promontory. Dominant species of the canopy or emergents include one or a combination of: Mountain Ash *Eucalyptus regnans* with Myrtle Beech *Nothofagus cunninghamii* and/or Southern Sassafras *Atherosperma moschatum*. These rainforests generally exceed 15m in height. Adjacent vegetation is generally Wet Forest. Distinguishing species from *Central Highlands Montane Riparian* Cool Temperate Rainforest are: Blackwood *Acacia melanoxylon*, Mother Spleenwort *Asplenium bulbiferum*, Lance Water-fern *Blechnum chambersii*, Mountain Clematis *C. aristata*, Prickly Currant-bush *Coprosma quadrifida*, Rough Tree-fern *Cyathea australis*, Mountain Ash *Eucalyptus regnans*, Austral Mulberry *Hedycarya angustifolia*, Austral Filmy Fern *Hymenophyllum australe*, Common Filmy Fern *H. cupressiforme*, Shiny Filmy Fern *H. flabellatum*, Kangaroo Fern *Microsorum pustulatum*, Twinging Silkpod *Parsonsia brownii*, Banyalla *Pittosporum bicolor*, Veined Bristle-fern *Crepidomanes venosum*, Leathery Shield-fern *Rumohra adiantiformis*, Forest Wire-grass *Tetrarrhena juncea* and Delicate Hook-sedge Uncinia *tenella*.....*Central Highlands* Cool Temperate Rainforest.

2b. Not as above……2c.

2c. Specific habitat and distribution this rainforest FC occurs along streams and adjacent seepages (only in the Central Highlands) at elevations of 640-1350 m. It is largely restricted to the granite/acid volcanic massifs of Lake Mountain Mount Donna Buang and the Baw Baw Plateau. Dominant species of the canopy or emergents include one or a combination of: Mountain Tea-tree *Leptospermum grandifolium*, Myrtle Beech *Nothofagus cunninghamii* and Southern Sassafras *Atherosperma moschatum*. There is a suite of usual Cool Temperate Rainforest species that are generally missing from this FC include: Musk Daisy-bush *Olearia argophylla*, Prickly Currant-bush *Coprosma quadrifida* and Austral Mulberry *Hedycarya angustifolia*. Distinguishing species from *Central Highlands* Cool Temperate Rainforest and *Central Highlands Montane Scrub* Cool Temperate Rainforest are: Alpine Ash *Eucalyptus delegatensis*, Dwarf *Leptostigma reptans*, Pretty Grass-flag *Libertia pulchella* and Sword Tussock-grass *Poa ensiformis* ……..*Central Highlands Montane Riparian* Cool Temperate Rainforest.

2d. Not as above……..……..2e.

2e. Specific habitat and distribution: this rainforest FC is geographically restricted to primarily on the Baw Baw Plateau, the Tooronga Plateau and Lake Mountain (all in the Central Highlands) at elevations of 950-1440 m. It is largely restricted to the granite/acid volcanic massifs. Dominant species of the canopy or emergents include one or a combination of: Shining Gum *Eucalyptus nitens*, Snow Gum *Eucalyptus pauciflora*, Mountain Tea-tree *Leptospermum grandifolium* and Myrtle Beech *Nothofagus cunninghamii*. There is a usual suite of Cool Temperate Rainforest species missing from this FC: Prickly Currant-bush *Coprosma quadrifida*, Musk Daisy-bush *Olearia argophylla*, Mountain Pepper *Tasmannia lanceolata* and Southern Sassafras *Atherosperma moschatum*. Distinguishing species are: Mountain Woodruff *Asperula gunnii*, Alpine Water-fern *Blechnum penna-marina*, Common Cassinia *C. aculeata*, Common Bird-orchid *Chiloglottis valida*, Rough Coprosma *C. hirtella*, Shinging Coprosma *C. nitida*, Swamp Heath *Epacris paludosa*, Gunn's Willow-herb *Epilopbium gunnianum*, Snowy Gum *Eucalyptus pauciflora*, Shining Gum *E. nitens*, Red-fruit Saw-sedge *Gahnia sieberiana*, Wax-berry *Gaultheria appressa*, Mountain Pennywort *Hydrocotyle algida*, Green Rush *Juncus gregiflorus*, Mountain Cotula *Leptinella filicula*, Drooping Beard-heath *Leucopogon gelidus*,

Subalpine Beard-heath *Acrothamnus maccraei*, Austral Caraway *Oreomyrrhis eriopoda*, Scaly Everlasting *Ozothamnus hookeri*, Sticky Everlasting *Ozothamnus thyrsoides*, Snow-drop Wood-sorrel *Oxalis magellanica*, Banyalla *Pittosporum bicolor*, Tussock Grass *Poa australis* spp. agg., Elderberry Panax *Polyscias sambucifolia*, Alpine Mint-bush *Prostanthera cuneata*, Victorian Christmas-bush *Prostanthera lasianthos*, Mueller's Bush-pea *Pultenaea muelleri*, Forest/Subalpine Buttercup *Ranunculus plebius/scapiger*, Candle Heath *Richea continentis*, Mountain Fireweed *Senecio gunnii*, Fireweed Groundsel *Senecio linearifolius*, Grass Trigger-plant *Stylidium armeria*, Alpine Pepper *Tasmannia vickeriana* and Lilac Berry *Trochocarpa clarkei*.....***Highlands Montane Scrub*** Cool Temperate Rainforest.

2f. Not as above (canopy dominants do not include Myrtle Beech *Nothofagus cunninghamii*).and the rainforest stands occur in East Gippsland……..……3.

3a. Specific habitat and distribution: this rainforest FC occurs at elevations of between 533 and 870 m in the deeply incised river valleys and the steep gullies and rugged mountain country surrounding Mount Ellery and the southern escarpment of the Errinundra Plateau, reaching its lowest altitudes around Murrungowar-Glen Arte. Dominant species of the canopy and emergents include one or a combination of: Black Oliveberry *Elaeocarpus holopetalus*, Cut-tail Eucalyptus fastigata, Southern Sassafras *Atherosperma moschatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species are: a mix of cool temperate and warm temperate species (the canopy species of which have already been listed) Blackwood *Acacia melanoxylon*, Blanket-leaf *Bedfordia arborescens*, Lance Water-fern *Blechnum chambersii*, Fishbone Water-fern *Blechnum nudum*, Three-nerved Cassinia *Cassinia trinerva*, Jungle Grape *Cissus hypoglauca*, Rough Tree-fern *Cyathea australis*, Blue Oliveberry *Elaeocarpus reticulatus*, Black-fruit Saw-sedge *Gahnia melanocarpa*, Austral Filmy-fern *Hymenophyllum australe*, Shiny Shield-fern *Lastreopsis acuminata*, White Milk-vine *Marsdenia rostrata*, Wonga Vine *Pandorea pandorana*, Bootlace Bush *Pimelea axiflora*, Hazel Pomaderris *P. aspera*, Leathery Shield-fern *Rumohra adiantiformis*, Forest Wire-grass *Tetrarrhena juncea*, Long Fork-fern *Tmesipteris obliqua* and Austral Sarsaparilla *Smilax australis*.....***East Gippsland Overlap*** Cool Temperate Rainforest.

3b. Not as above……..……3c.

3c. Specific habitat and distribution: this rainforest FC occurs above 650 m elevation (mostly in gullies). It is the most abundant and widespread floristic community of Cool Temperate Rainforest in East Gippsland where it occurs from the Nunniong Plateau, Roger River Basin, Errinundra Plateau (where it reaches its best development) to Murrungowar and Glen Arte. Dominant species of the canopy or emergents include one or a combination of: Southern Sassafras *Atherosperma moschatum* and Black Oliveberry *Elaeocarpus holopetalus*. Distinguishing species are: Frosted Wattle *Acacia frigescens*, Mother Spleenwort *Asplenium bulbiferum*, Strap Water-fern *Blechnum patersonii*, Fieldia *F. australis*, Austral Mulberry *Hedycarya angustifolia*, Shiny Filmy Fern *Hymenophyllum flabellatum*, Kangaroo Fern *Microsorum pustulatum*, Musk Daisy-bush *Olearia agophylla*, Twining Silkpod *Parsonsia brownii* and Veined Bristle-fern *Polyphlebium venosum*……..***East Gippsland*** Cool Temperate Rainforest.

3d. Not as above……..……3e.

3e. Specific habitat and distribution: this rainforest FC occurs mostly along streams at elevations between 620 and 1240 m and occurs mostly on the Errinundra Plateau with two smaller outlying occurrences on the Nunniong Plateau and in the Roger River Basin. Dominant species of the canopy or emergents include one or a combination of: Southern Sassafras *Atherosperma moschatum*, with Mountain Tea-tree *Leptospermum grandifolium* and Black Oliveberry *Elaeocarpus holopetalus* usually present. Southern Sassafras often has chlorotic (yellow) foliage in this community. There is a suite of usual Cool Temperate Rainforest species that are generally absent: Austral Mulberry *Hedycarya angustifolia* and Musk Daisy-bush *Olearia argophylla*. Distinguishing species are: Fishbone Water-fern *Blechnum nudum*, Tall Sedge *Carex appressa*, Short Bent-grass *Deyeuxia brachythera*, Red-fruit Saw-sedge *Gahnia sieberiana*, Gunn's Willow-herb *Epilobium gunnianum*, Hairy Pennywort *Hydrocotyl hirta*, Alpine Filmy-fern *Hymenophyllum peltatum*, Ruddy Ground-fern *Hypolepis rugosula*, Swamp Club-sedge *Isolepis inundata*, Mountain Rush *Juncus alexanderi*, Mountain Tea-tree *Leptospermum grandifolium*, Pretty Grass-flag *Libertia pulchella*, Dusty Daisy-bush *Olearia phlogopappa* and Shrubby Fireweed *Senecio minimus*.....***East Gippsland Montane Riparian*** Cool Temperate Rainforest.

3f. Not as above……..……4.

4a. Specific habitat and distribution: this rainforest FC occurs on gently undulating country at the highest points on the Errinundra Plateau between 1100 and 1180 m between Cobb Hill and Goonmirk Rocks. Dominant species: of the canopy or emergents include one or a combination of: Errinundra Plum-pine r *Podocarpus lawrencei* ssp. nov. (Goonmirk Rocks) Black Oliveberry *Elaeocarpus holopetalus* and Southern Sassafras *Atherosperma moschatum*. There is a suite of usual Cool Temperate Rainforest species that are generally absent: Mother Spleenwort *Asplenium bulbiferum*, Ray Water-fern Blechnum fluviatile, Strap Water-fern *Blechnum patersonii*, Prickly Currant-bush *Coprosma quadrifida*, Fieldia *F. australis*, Austral Mulberry *Hedycarya angustifolia* Shiny Filmy-fern *Hymenophyllum flabellatum*, Kangaroo Fern *Microsorum pustulatum*, Musk Daisy-bush *Olearia argophylla* Twining Silkpod *Parsonsia brownii*, Veined Bristle-fern *Polyphlebium venosum* and Banyalla *Pittosporum bicolor*. Distinguishing species are: Rough Coprosma *C. hirtella*, Tasman Bent-grass *Deyeuxia rodwayi*, Forest Geebung r *Persoonia silvatica*, Sword Tussock-grass *Poa ensiformis*, Tall Tussock-grass *Poa helmsii*, Broad-leaf Panax *Polyscias sambucifolia* ssp. 1 and Victorian Christmas-bush *Prostanthera lasianthos*.....***East Gippsland Montane Scrub*** Cool Temperate Rainforest.

Victorian Gallery Rainforest floristic communities
In Victoria, Gallery Rainforests are found from the Mitchell River east to the Victorian border with New South Wales.

1a. The streams on which the Gallery Rainforest occurs are well developed and flow during summer even during periods of drought……..2.

1b. Although the streams are well developed, they do not flow during dry periods, but the vegetation can be subjected to severe flood events……..……..……3.

2. Specific habitat and distribution: this rainforest FC occurs along the high flood-energy zones of the margins of rivers and major creeks of the lowlands at elevations of 20-560 m between the Mitchell River in Victoria and the intervening catchments northwards probably as far as the Moruya catchment. Dominant species of the canopy or emergents include one or a combination of: Kanooka *Tristaniopsis laurina*, with occasional individuals of Blackwood *Acacia melanoxylon*, Mountain Burgan *Kunzea peduncularis,* Muttonwood *Myrsine howittiana* or Lilly Pilly *Syzygium smithii*, also present. Several eucalypt species may overhang this community including Mountain Grey Gum *Eucalyptus cypellocarpa*, and Messmate *Eucalyptus obliqua*, with River Peppermint *Eucalyptus elata* regularly growing in the community as emergent trees, especially on sandier soils. Silver Wattle *Acacia dealbata*, although regularly recorded in the community is usually only present as small seedlings or relicts of past catastrophic disturbance from flooding or occasional fire. Distinguishing species from *Ephemeral Streams* Gallery Rainforest and *Alluvial Terraces* Warm Temperate Rainforest are: Robust Willow-herb *Epilobium billardierianum*, Gippsland Peppermint *Eucalyptus croajingolensis*, Scrambling Coral-fern *Gleichenia microphylla*, Grassland Wood-sorrel *Oxalis perennans*, Tall Rice-flower *Pimelea ligustrina*, Lilac Lily *Schelhamera undulata*, Narrow Groundsel *Senecio prenanthoides*, Austral King Fern *Todea barbara* and Braided Water-ribbons *Triglochin rheophilum*….....***Perennial Streams*** Gallery Rainforest.

2b. Not as above……3.

3. Specific habitat and distribution: this rainforest FC usually occurs on the valley-constrained high flood energy zones of smaller ephemeral streams (usually in gorge country) at elevations of 60-400 m between the Mitchell and Snowy Rivers, but may also be found in more open situations where there is topographic or ecosystem protection from regular high intensity wildfire. Dominant species of the canopy or emergents include one or a combination of: White Sallow Wattle *Acacia floribunda*, Black Wattle *A. mearnsii*, Blackwood *A. melanoxylon*, Varnish Wattle *A. vernicaflua*, Tall Baeckia *Sannantha pluriflora*, Sweet Bursaria *B. spinosa*, Mountain Grey Gum *Eucalyptus cypellocarpa*, River Peppermint *E. elata*, Cherry Ballart *Exocarpos cupressiformis*, River Lomatia *L. myricoides*, Muttonwood *Myrsine howittiana*, Hazel Pomaderris *P. aspera* and Victorian Christmas-bush *Prostanthera lasianthos* and Kanooka *Tristaniopsis laurina*. This community usually occurs on ***valley-constrained*** river reaches (where there are little or no associated alluvial flats between the rainforest and the valley side and the stream's volume in full flood is too extreme to support Warm Temperate Rainforest). Alternatively it can occur where the water's velocity is constrained by a deeply incised river channel on a broader floodplain. These are often characterised by rocky and/or sandy stream beds that carry large volumes of flood water at some times of the year, but no surface water flowing during drier periods (Opener Chapter 6). Such vegetation is associated with low gradient stream courses of the tributaries of the Mitchell, Tambo, Snowy and Genoa rivers (and probably similar streams in southern New South Wales). Distinguishing species (from *Perennial Streams* Gallery Rainforest) are: White Sallow Wattle *A. floribunda*, Black Wattle *A. mearnsii*, Bergalia

Tussock *Carex longebrachiata*, Green Rock Fern *Cheilanthes austrotenuiflora*, Tasman Bent-grass *Deyeuxia rodwayi*, Common Rasp-fern *Doodia media*, Margined Panic *Entolasia marginata*, Slender Lagenifera *L. gracilis*, Shade Plantain *Plantago debilis*, Elderberry *Panax Polyscias sambucifolia* and Round-leaf Mint-bush *Prostanthera rotundifolia*……..…..*Ephemeral Streams* Gallery Rainforest.

Victorian Dry Rainforest floristic communities

1a. The rainforest stand grows on a variety of (usually) relatively fertile parent geologies that include granodiorites, mudstones, acid volcanics but not limestones……..……..2.

1b. The rainforest grows on Devonian Limestone geology generally in association with Limestone Pomaderris *P. oraria* ssp. *calcicola* on its fringes (if these remain intact and have not been cleared)……..…3.

2.. Specific habitat and distribution: this rainforest FC occurs between the Mitchell River and Genoa Rivers in East Gippsland at elevations of 50-180 m and possibly as far northward as the basalts of the Nethercote district in southern New South Wales. Dominant species of the canopy or emergents include one or a combination of: Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Kurrajong *Brachychiton populneus* (an emergent), Muttonwood *Myrsine howittiana* or Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii* (largely restricted to the stands at the Amphitheatre on the Mitchell River). Distinguishing species from *East Gippsland Karst* Dry Rainforest which occurs in the same region are: Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Southern Tick-trefoil *Desmodium gunnii*, Common Hedge-hog Grass *Echinopogon ovatus*, Saloop Saltbush *Einadia hastata*, Nodding Saltbush *E. nutans*, Bordered Panic *Entolasia marginata*, Scrambling Lily *Geitonoplesium cymosum*, Cinquefoil Cranesbill *Geranium potentilloides*, Burgan *Kunzea ericoides*, Shade Pellitory *Parietaria debilis* and Small-leaved Bramble *Rubus parviflorus*.....*Gorges* Dry Rainforest.

2b. Not as above……3.

3. Specific habitat and distribution: this rainforest FC is entirely restricted to the Buchan and Murrindal River valleys in East Gippsland. Previous work by Peel (1999) postulating that this community also occurred on Tertiary Limestones around the Gippsland Lakes is in error: these stands have been more fully sampled and the floristic analysis of Peel (in prep.) has determined these stands to be Littoral Rainforest. Dominant species of the canopy or emergents include one or a combination of: Limestone Blue Wattle *Acacia caerulescens*, Lightwood *A. implexa*, Black Wattle *A. mearnsii*, Drooping Sheoak *Allocasuarina verticillata*, Kurrajong *Brachychiton populneus* (an emergent) and Sweet Pittosporum *P. undulatum,* which is the major canopy species in the mature rainforest. Distinguishing species from *Gorges* Dry Rainforest, which occurs in the same region are: Drooping Sheoak *Allocasuarina verticillata*, Common Spleenwort *Asplenium trichomanes* ssp. *quadrivalens*, Bursaria *Bursaria* spp., Green Rock Fern *Cheilanthes austrotenuifolia*, Australian Stonecrop *Crassula sieberiana*, Barb-wire Grass *Cymbopogon refractus*, Black-anther Flax-lily *Dianella revoluta*, Narrow Hop-bush *Dodonaea viscosa* ssp. *angustifolia*, Twining Glycine *G. clandestina*, Stinking Pennywort *Hydrocotyle laxiflora*, Austral Tobacco *Nicotiana suaveolens*, Blanket Fern *Pleurosorus rutifolius*, Grey Tussock-grass *Poa sieberiana* var. *sieberiana*, Limestone Pomaderris *P. oraria* ssp. *calcicola*, Rough Fireweed *Senecio hispidulus* var. *dissectus*, Indianweed *Sigesbeckia orientalis* and Forest Nightshade *Solanum prinophyllum*.....……..*East Gippsland Karst* Dry Rainforest.

Victorian Littoral Rainforest floristic communities

In the area of Victoria covered by this Manual, Littoral Rainforest occurs along the ocean coast, around estuaries and the lower estuarine reaches of rivers from the Gippsland Lakes (east of the Mitchell River) to the border with New South Wales. The following key to the Littoral Rainforest communities of East Gippsland is compiled from the field surveys and floristic analyses of Peel (in prep.).

1a. Specific habitat and distribution: the rainforest FC stand grows on estuarine deltaic deposits on the lower reaches of rivers and the mouths of gullies or creeks that enter estuaries directly where the saline waters of the estuary affect the groundwater from the Gippsland Lakes to the Genoa River and Mallacoota Inlet (but to date it is not known from New South Wales). Perhaps the largest (but as yet unsampled) stand occurs on the western shores of Tamboon Inlet opposite Tamboon. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Yellowwood *Acronychia oblongifolia*, Muttonwood *Myrsine howittiana,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Although less frequently recorded in the data of Peel (in prep.), it is likely that the following usual species for this floristic community were once more common in the past prior to clearing: Coast Banksia *B. integrifolia*, Southern Mahogany *Eucalyptus botryoides* and Yellow Elderberry *Sambucus australasica*.

Distinguishing species between this community and *Bung Yarnda* Littoral Rainforest and *Limestone* Littoral Rainforest that may occasionally abut this community are: Angled Lobelia *L. alata*, New Zealand Spinach *Tetragonia tetragonioides*, and Large Bindweed *Calystegia sepium*.....*East Gippsland Deltaic* Littoral Rainforest.

1b. Not as above.....2.

2a. Specific habitat and distribution: this rainforest FC grows on south- or east-facing marginal bluffs, sea cliffs or the valley sides of valleys flooded by estuaries from the lower floodplain reaches of the Mitchell, Nicholson, and Tambo Rivers as well as on the Gippsland Lakes east of Tambo Bluff (including North Arm), Lake Bunga, Lake Tyers, Ewings Marsh and Lake Wat Wat on the lower Snowy River (including the southern side of the Devil's Backbone). The geology is variable consisting of Tertiary Outwash Clays, sands and gravels and some Tertiary Limestone. The normally alkaline soils derived from limestones are acidified in this community as the result of moister southern or eastern aspects and higher soil organic levels. The significance of which is that the obligate limestone species represented in the adjacent *Limestone* Littoral Rainforest FC(on drier westerly and northern aspects) are missing form *Bung Yarnda* Littoral Rainforesst. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Black Wattle *A. mearnsii*, Coast Banksia *B. integrifolia*, Blue Box *Eucalyptus baueriana*, Eurabbie *Eucalyptus globulus* ssp. *bicostata*, Cherry Ballart *Exocarpos cupressiformis*, Swamp Paperbark *Melaleuca ericifolia*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum,* Hazel Pomaderris *P. aspera* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Limestone* Littoral Rainforest and *East Gippsland Deltaic* Littoral Rainforest that may occasionally abut this community are: Black Wattle *Acacia mearnsii*, Common Grass-sedge *Carex breviculmis*, Tree Everlasting *Ozothamnus ferrugineus*, Cudweed *Euchiton gymnocephalus*, Yellow Pennywort *Hydrocotyle foveolata*, Hairy Pennywort *Hydrocotyle hirta*, Stinking Pennywort *Hydocotyle laxiflora*, Twining Glycine *G. clandestina*, Coast Blown-grass *Lachnagrostis billardieri*, Common Bottle-daisy *Lagenophora stipitata*, Spiny-headed Mat-rush *Lomandra longifolia*, Jagged Fireweed *Senecio biserratus*, Shrubby Fireweed *Senecio minimus*, Slender Fireweed *Senecio prenanthoides*, Prickly Starwort *Stellaria pungens*, Trailing Speedwell *Veronica plebia*, Sprawling Bluebell *Wahlenbergia gracilis*, and the usual species: Love Creeper *Comersperma volubile* and Coast Mistletoe *Muellerina celastroides*.....*Bung Yarnda* Littoral Rainforest.

2b. Not as above.....3.

3a. Specific habitat and distribution: this rainforest FC grows largely on Tertiary Limestones on west or north where connate salts derived from this marine geology help to define its habitat as littoral. It occurs on a wide variety of steep landforms that include: marginal bluffs, riverine cliffs, the hillsides of valleys flooded by estuaries from the lower floodplain reaches of the Mitchell, Nicholson, and Tambo Rivers as well as on the Gippsland Lakes (Maringa Creek and North Arm), Lake Bunga, Lake Tyers, and the riverine escarpments on the lower Snowy River between Bete Bolong and Lochend Jungle (including the Devil's Backbone). Dominant species of the canopy or emergents include one or a combination of: Limestone Blue Wattle *Acacia caerulescens*, Blackwood *A. melanoxylon*, Blanket-leaf *Bedfordia arborescens*, Coast Grey Box *Eucalyptus bosistoana*, Eurabbie *Eucalyptus globulus* ssp. *bicostata*, Red Ironbark *Eucalyptus tricarpa*, Cherry Ballart *Exocarpos cupressiformis*, Swamp Paperbark *Melaleuca ericifolia*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Distinguishing species between this community and *Bung Yarnda* Littoral Rainforest and *East Gippsland Deltaic* Littoral Rainforest that may occasionally abut this community are: Limestone Blue Wattle *Acacia caerulescens*, Crested Spear-grass *Austrastipa blackii*, Coast Grey Box *Eucalyptus bosistoana*, Red Ironbark *Eucalyptus tricarpa*, Giant Hop-bush *Dodonea viscosa* ssp. *angustifolia*, Rough Bedstraw *Galium gaudichaudiana*, Wandering Bedstraw *Galium migrans*, Limestone Pomaderris *P. oraria* ssp. *calcicola* and Shiny Swamp-mat *Sellieria radicans.* The obligate limestone species are denoted by the use of this geology in their common name.....*Limestone* Littoral Rainforest.

3b. Not as above.....4.

4a. Specific habitat and distribution: this rainforest FC grows on sedimentary geologies (mostly Devonian Sandstones and one site on Ordovician Sediments) and one site on beach sands in Victoria. The stands have a low species diversity as the result of one or a number of factors including: intense grazing/browsing by macropods and/or Hog Deer (Drews Jetty), occurence on very hash sites with little soil such as cobble berms (Bittangabee Bay, Leatherjacket Bay) are small, often young and usually isolated from other rainforest stands. Dominant species of the canopy or emergents include one or a combination of: Lightwood *Acacia implexa*, Black Wattle *A. mearnsii*, Coast Banksia *B.*

integrifolia, Tree Broom-heath *Monotoca elliptica*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana* and Sweet Pittosporum *P. undulatum*. Distinguishing species: that separate this floristic community from others that may occur nearby (*Southeast Embayments* Littoral Rainforest, *Ordovician Escarpment* Littoral Rainforest and *Disturbed Black Sands* Littoral Rainforest) include: Slender Wallaby-grass *Austrodanthonia racemosa*, Coast Spear-grass *Austrostipa flavescens*, Blady Grass *Imperata cylindrica*, Tree Broom-heath *Monotoca elliptica*, Kangaroo Grass *Themeda triandra* and Prickly Couch *Zoysia macrantha*.....*Depauperate* Littoral Rainforest.

4b. Not as above.....5.

5a. Specific habitat and distribution: in Victoria, this rainforest FC grows on highly leached sands derived from two geologies: Tertiary Outwash Sands or Pleistocene Aeolian Sands while in New South Wales the highly leached sands are derived from Devonian Red Bed Sandstones. Dominant species are separated into two different groups based on two widely separated geographic localities. For Victoria these stands occur on Tertiary Outwash Sands along the marginal bluff behind Ewings Marsh between Lake Tyers and the Marlo Estuary and on the northern margin of Swan Lake (both in Victoria) and have emergent or canopy species that include one or a combination of: Blackwood *Acacia melanoxylon*, Blue Oliveberry *Elaeocarpus reticulatus*, Blue Box *Eucalyptus baueriana*, Southern Mahogany *Eucalyptus botryoides*, Swamp Paperbark *Melaleuca ericifolia* and Muttonwood *Myrsine howittiana*. Those stands that occur in the Nadgee Nature Reserve (on Devonian Sandstones) and have emergent or canopy species that include: Rough-barked Apple *Angophora floribunda*, Blue Oliveberry *Elaeocarpus reticulatus* and Muttonwood *Myrsine howittiana.* Distinguishing species between this community and *Damp Sands* Littoral Rainforest that may occasionally abut this community (around Sydenham Inlet) are: Common Maidenhair *Adiantum aethiopicum*, Rough-barked Apple *Angophora floribunda*, Sea Celery *Apium prostratum*, Common Appleberry *Billardiera mutabilis*, Common Grass-sedge *Carex breviculmis*, Knob Sedge *Carex inversa*, Southern Tick-trefoil *Desmodium gunnii*, Blue Box *Eucalyptus baueriana*, Cudweed *Euchiton gymnocephalum*, Thatch Saw-sedge *Gahnia radula*, Rough Bedstraw *Galium gaudichaudiana*, Scrambling Lily *Geitonoplesium cymosum*, Twining Glycine *G. clandestina*, Germander Raspwort *Gonocarpus teucrioides*, Trailing Guinea-flower *Hibbertia dentata*, Tangled Guinea-flower *Hibbertia empetrifolia*, Austral Indigo *Indigofera australis*, Common Bottle-daisy *Lagenophora stipitata*, Sandhill Sword-sedge *Lepidosperma concavum*, Large Mock-olive *Notelaea venosa*, Snowy Daisy-bush *Olearia lirata*, Spicy Everlasting *Ozothamnus argophyllus*, Wonga Vine *Pandorea pandorana*, Grey Tussock-grass *Poa sieberiana*, Small-leaved Bramble *Rubus parvifolius*, Austral Sarsaparilla *Smilax australis*, Bearded Tylophora *T. barbata* and Sprawling Bluebell *Wahlenbergia gracilis*.....*Leached Sands* Littoral Rainforest.

5b. Not as above.....6.

6a. Specific habitat and distribution: this rainforest FC grows on damp sands or silts derived from two geologies: mostly Laterised Pleistocene Sands (of old dunes) on marginal bluffs and flats between Marlo and Cape Conran, on Recent Aeolian Sands at Corringle Creek and Corringle Slips, and on two sites on Recent Alluviums (silty sands) around Sydenham Inlet and the estuarine reaches of the Bemm River. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Coast Banksia *B. integrifolia*, Blue Oliveberry *Elaeocarpus reticulatus*, Southern Mahogany *Eucalyptus botryoides*, Coast Tea-tree *Leptospermum laevigatum*, Swamp Paperbark *Melaleuca ericifolia*, Tree Broom-heath *Monotoca elliptica*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum*, Hazel Pomaderris *P. aspera* and Lilly Pilly *Syzygium smithii*. *Distinguishing species* between this community and *Leached Sands* Littoral Rainforest that may occasionally co-occur with this community (around Sydenham Inlet) are: Bare Twig-sedge *Baumea juncea*, Tall Sedge *Carex appressa*, Rough Tree-fern *Cyathea australis*, Tall Saw-sedge *Gahnia clarkei*, Tree Violet *Melicytus dentatus* s.l., Pale Rush *Juncus pallidus*, Coast Tea-tree *Leptospermum laevigatum*, Angled Lobelia *Lobelia alata*, Australian Basket-grass *Oplismenus hirtellus*, Tree Everlasting *Ozothamnus ferrugineus*, Common Reed *Phragmites australis*, Common Tussock-grass *Poa labillardierei*, Hazel Pomaderris *P. aspera* Common Boobialla *Myoporum insulare*, Jagged Fireweed *Senecio biserratus*, Fireweed Groundsel *Senecio linearifolius*, Shrubby Fireweed *Senecio minimus*, Slender Fireweed *Senecio prenanthoides*, Lilly Pilly *Syzygium smithii* and New Zealand Spinach *Tetragonia tetragonioides*. It does not occur adjacent to any other Littoral Rainforest FC so there are no distinguishing species.....*Damp Sands* Littoral Rainforest.

6b. Not as above.....7.

7a. Specific habitat and distribution: this rainforest FC grows on granitic headlands over-run by dunes in Croajingalong National Park at Rame Head with one site between Easby Creek and Red River in the Sandpatch Wilderness on the same landform. Dominant species of the canopy or emergents include one or a combination of: Coast Banksia *B. integrifolia*, Giant Honey-myrtle *Melaleuca armillaris*, Tree Broom-heath *Monotoca elliptica*, Common Boobialla *Myoporum insulare,* Muttonwood *Myrsine howittiana* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Croajingalong Sands* Littoral Rainforest that co-occurs with this community near the mouth of WIngan Inlet are: Sea Celery *Apium prostratum*, Bare Twig-sedge *Baumea juncea*, Tall Sedge *Carex appressa*, Centella *C. cordifolia*, Shining Pennywort *Hydrocotyle sibthorpioides*, Shrubby Velvet-bush *Lasiopetalum macrophyllum*, Coast Cotula *Leptinella longipes*, Broad-leaf Stinkweed *Opercularia ovata*, Common Reed *Phragmites australis* and Dune Groundsel *Senecio pinnatifolius* ssp. *pinnatifolius*……..*Granitic Headland* Littoral Rainforest.

7b. Not as above……..8.

8a. Specific habitat and distribution: this rainforest FC grows on infilling estuarine deltaic deposits that were previously the habitat of *Estuarine* Swamp Scrub on the upper reaches of Wingan Inlet, one site on Toorloo Arm, and several along the infilling former Reeves River (the Warm Holes) between Lake Bunga and Cunninghame Arm. Dominant species of the canopy or emergents include one or a combination of: Black Wattle *Acacia mearnsii*, Blackwood *A. melanoxylon*, Coast Banksia *B. integrifolia*, Oyster Bay Pine *Callitris rhomboidea*, Blue Oliveberry *Elaeocarpus reticulatus*, Manna Gum *Eucalyptus viminalis*, Cherry Ballart *Exocarpos cupressiformis*, Swamp Paperbark *Melaleuca ericifolia*, Common Boobialla *Myoporum insulare,* Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum*, Hazel Pomaderris *P. aspera* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Croajingalong Sands* Littoral Rainforest that co-occurs on Wingan Inlet with this community are: Black Wattle *Acacia mearnsii*, Bare Twig-sedge *Baumea juncea*, Sweet Bursaria *B. spinosa*, Staff Creeper *Celastrus australis*, Forest Clematis *C. glycinoides*, Margined Panic *Entolasia marginata*, Annual Cudweed *Euchiton sphaericus*, Cherry Ballart *Exocarpos cupressiformis*, Manna Gum *Eucalyptus viminalis*, Black-fruit Saw-sedge *Gahnia melanocarpa*, Scrambling Lily *Geitonoplesium cymosum*, Coast Blown-grass *Lachnagrostis billardieri*, Swamp Paperbark *Melaleuca ericifolia*, Long-leaf Wallaby-grass *Notodanthonia longifolia*, Snowy Daisy-bush *Olearia lirata*, Broad-leaf Stinkweed *Opercularia ovata*, Tree Everlasting *Ozothamnus ferrugineus*, Wonga Vine *Pandorea pandorana*, Bootlace Bush *Pimelea axiflora*, Common Tussock-grass *Poa labillardierei*, Fine-leaf Tussock-grass *Poa meionectes*, Creeping Brookweed *Samolus repens*, Shiny Swamp-mat *Selliera radicans*, Shrubby Fireweed *Senecio minimus*, Forest Starwort *Stellaria flaccida* and Prickly Couch *Zoysia macrantha*. Note, however, that the two communities are geographically separated with *Infilled Swamp Scrub* Littoral Rainforest occurring at the top of the estuary on deltaic deposits and the *Croajingalong Sands* Littoral Rainforest is located around the lower estuary on sandy landforms (Pleistocene and Recent Aeolian Dunes and Lacustrine Sand Sheets)……..*Infilled Swamp Scrub* Littoral Rainforest.

8b. Not as above……..9.

9a. Specific habitat and distribution: this rainforest FC grows on Pleistocene and Recent Aeolian Dunes and Lacustrine Sand Sheets between Tamboon Inlet and Wingan Point, with its most extensive development between Point Hicks and Thurra River entrance. Dominant species of the canopy or emergents include one or a combination of: Blackwood *Acacia melanoxylon*, Coast Banksia *B. integrifolia*, Oyster Bay Pine *Callitris rhomboidea*, Blue Oliveberry *Elaeocarpus reticulatus*, Brown Stringybark *Eucalyptus baxteri*, Southern Mahogany *Eucalyptus botryoides*, Coast Tea-tree *Leptospermum laevigatum*, Tree Broom-heath *Monotoca elliptica*, Common Boobialla *Myoporum insulare,* Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum*, Hazel Pomaderris *P. aspera* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Infilled Swamp Scrub* Littoral Rainforest that co-occurs on Wingan Inlet with this community are: Coast Wattle *Acacia longifolia* ssp. *sophorae*, Bidgee-widgee *Acaena novae-zelandiae*, Mosquito Orchid *Achianthus* spp., Sea Box *Alyxia buxifolia*, Common Apple-berry *Billardiera mutabilis*, Mountain Clematis *C. aristata*, Love Creeper *Comesperma volubile*, Common Hedgehog-grass *Echinopogon ovatus*, Twining Glycine *G. clandestina*, Dusky Coral-pea *Kennedia rubicunda*, Knobby Club-rush *Isolepis nodosa*, Maori Bedstraw *Galium propinquum*, Common Bottle-daisy *Lagenophora stipitata*, Sandhill Sword-sedge *Lepidosperma concavum*, Coast Sword-sedge *Lepidosperma gladiatum*, Coast Beard-heath *Leucopogon parviflorus*, Spicy Everlasting *Ozothamnus argophyllus*, Slender Tussock-grass *Poa tenera*, Greenhood Orchid *Pterostylis* spp., Small-leaved Bramble *Rubus parviflorus*, Lilac Lily *Schelhammera undulata*, Austral Sarsaparilla *Smilax australis*, Prickly Starwort *Stellaria pungens*, Grass Triggerplant *Stylidium armeria* s.s., Bower Spinach *Tetragonia implexicoma* and Ivy-leaf Violet *Viola hederacea*……..*Croajingalong Sands* Littoral Rainforest.

9b. Not as above……..……10.

10a. Specific habitat and distribution: this rainforest FC grows on diverse landforms (embayment berms, sand sheets, marginal bluffs and sea cliffs) and, in Victoria, on geologies including Ordovician Sandstones and Recent Sands in and around embayments in south-eastern Australia including: Betka River spit, Mallacoota Inlet,. The uniting themes are that the soils are generally sandy (often black), and the stands grow on or near embayments close to saline water bodies. Dominant species of the canopy or emergents include one or a combination of: Black Wattle *Acacia mearnsii*, Rough-barked Apple *Angophora floribunda*, Coast Banksia *B. integrifolia*, Blue Oliveberry *Elaeocarpus reticulatus*, Woollybutt *Eucalyptus longifolia* (NSW only), Cherry Ballart *Exocarpos cupressiformis*, Giant Honey-myrtle *Melaleuca armillaris*, Common Boobialla *Myoporum insulare,* Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum,* Hazel Pomaderris *P. aspera* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and the three floristic communities *Mallacoota Inlet Incipient* Littoral Rainforest and *Depauperate* Littoral Rainforest and *Disturbed Black Sands* Littoral Rainforest that may co-occur with it include a range of more mature rainforest species (that are underlined) and others: Rough-barked Apple *Angophora floribunda*, Rusty Dodder-laurel *Cassytha phaeolasia*, Prickly Currant-bush *Coprosma quadrifida*, Paroo Lily *Dianella caerulea*, Giant Hop-bush *Dodonaea viscosa* ssp. *angustifolia*, Blue Oliveberry *Elaeocarpus reticulatus*, Woollybutt *Eucalyptus longifolia* (NSW only), Cherry Ballart *Exocarpos cupressiformis*, Trailing Guinea-flower *Hibbertia dentata*, Austral Indigo *Indigofera australis*, Common Woodrush *Luzula meridionalis*, Large Mock-olive *Notelaea venosa*, Wonga Vine *Pandorea pandorana*, Fine-leaved Tussock-grass *Poa meionectes*, Hazel Pomaderris *P. aspera*, Greenhood Orchid *Pterostylis* spp., Austral Sarsaparilla *Smilax australis*, Lilac Lily *Schelhammera undulata* and Bearded Tylophora *T. barbata*.....***Southeast Embayments*** Littoral Rainforest.

10b. Not as above……..……11.

11a. Specific habitat and distribution: this rainforest FC grows on a variety of landforms (lacustrine islands, marginal bluffs and sea cliffs). This rainforest is in its early stages of development (the canopy species are young and the canopy cover can be patchy). Because it is young, their rainforest species diversity is also relatively low. This rainforest grows on Ordovician Sediments and Aeolian Sand Dunes and Lacustrine Sand Sheets around Mallacoota Inlet in Victoria. Dominant species of the canopy or emergents include one or a combination of: Black Wattle *Acacia mearnsii*, Coast Banksia *B. integrifolia*, Giant Honey-myrtle *Melaleuca armillaris*, Tree Broom-heath *Monotoca elliptica*, Common Boobialla *Myoporum insulare,* Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. Distinguishing species between this community and *Southeast Embayments* Littoral Rainforest that co-occurs with this community at the mouth of Mallacoota Inlet include many plants typical of the earlier seral stages of young Littoral Rainforest. These species are underlined in the following list of distinguishing species: Coast Wattle *Acacia longifolia* ssp. *sophorae*, Sea Box *Alyxia buxifolia*, Sea Celery *Apium prostratum*, Coast Spear-grass *Austrostipa flavescens*, Common Cotula *C. australis*, Sieber Crassula *C. sieberiana*, Small-flower Flax Lily *Dianella breviculmis*, Common Plume-grass *Dichelachne rara*, Slender Pennywort *Hydrocotyle tripartita*, Branching Grass-flag r *Libertia paniculata*, Tree Broom-heath *Monotoca elliptica*, Climbing Lignum *Muehlenbeckia australis*, Sword Tussock-grass *Poa ensiformis*, Jagged Fireweed *Senecio biserratus*, Fireweed Groundsel *Senecio linearifolius* and Bower Spinach *Tetragonia implexicoma*……***Mallacoota Inlet Incipient*** Littoral Rainforest.

11b. Not as above……..……12.

12a. Specific habitat and distribution: more widespread in New South Wales, this rainforest FC is only known from one burnt site in Victoria: on the Easby Creek side of WIngan Point. In Victoria, this rainforest grows on organically enriched (black) sands derived from Devonian Granite. The stands in this floristic community are recovering from the 1983 wildfire and most are still patchy in their canopy closure. In Victoria at least, this FC represents an early disturbance seral stage of *Croajingolong Sands* Littoral Rainforest from which it is derived and which abuts it on its eastern margin. These stands escaped damage from the 1983 wildfire. As a consequence of this disturbance and the community's recovery from the fire it has large numbers of characteristic species in the herbaceous life-form category (25 forbs and 11 graminoids) and is second only to *Bung Yarnda* in the total number herbs that are characteristic of the community. Dominant species of the canopy or emergents include one or a combination of: Black Wattle *Acacia mearnsii*, Coast Banksia *B. integrifolia*, Giant Honey-myrtle *Melaleuca armillaris*, Common Boobialla *Myoporum insulare*, Muttonwood *Myrsine howittiana*, Sweet Pittosporum *P. undulatum* and Lilly Pilly *Syzygium smithii*. The distinguishing species between this community and *Depauperate* Littoral Rainforest, *Mallacoota Inlet Incipient* Littoral Rainforest, *Southeast Embayments* Littoral Rainforest, *New South Wales South Coast Young* Littoral Rainforest and *South Coast Sands*

Littoral Rainforest that may abut this community are: Siebers Crassula *C. sieberiana*, Tree Violet *Melicytus dentatus* s.l., Angled Lobelia *L. anceps* and Kangaroo Apple *Solanum aviculare*…..*Disturbed Black Sands* Littoral Rainforest.

EPBC Act condition thresholds for the Littoral Rainforests and Coastal Vine Thickets of eastern Australia

Advice to the Minister for the Environment, Water, Heritage and the Arts from the Threatened Species Scientific Committee (the Committee) on Amendments to the List of Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

1. Summary of conservation assessment by the Committee

This advice follows the assessment of information to list the Mixed microphyll/notophyll vine thicket on beach ridges (Quaternary Sands) ecological community. The nomination was made available for public exhibition and comment for a period of two months. The Threatened Species Scientific Committee (Committee) had regard to all public and expert comments that were relevant to the survival of the ecological community.

The Committee judges that the ecological community has been demonstrated to have met sufficient elements of:

- Criterion 2 to make it eligible for listing as critically endangered; and
- Criterion 4 to make it eligible for listing as critically endangered.

2. Name of the ecological community

A nomination was received for the Mixed Microphyll/Notophyll Vine Thicket on Beach Ridges ecological community that occurs on Quaternary Sands in the northern portion of the South Eastern Queensland Bioregion. Experts identified similar vine forests on beach ridges and headlands in other bioregions along the east coast of Australia, including offshore islands, as components of a broader ecological community. The broader extent of this ecological community is supported by its adaptation to coastal processes. In this context, the Committee considers it appropriate to extend the current nomination to cover littoral rainforest and coastal vine thickets on the east coast of Australia from Princess Charlotte Bay in the Cape York Peninsula Bioregion, Queensland (QLD), to the Gippsland Lakes in the South East Corner Bioregion, Victoria.

To reflect the broader extent of the ecological community, the Committee recommends that the name be changed from that nominated to the 'Littoral Rainforest and Coastal Vine Thickets of Eastern Australia'. The ecological demarcation of this ecological community is discussed in detail under Section 5, 'National Context'.

3. Description

General Features

The ecological community represents a complex of rainforest and coastal vine thickets, including some that are deciduous, on the east coast of Australia. Typically, the ecological community occurs within two kilometres of the coast or adjacent to a large salt water body, such as an estuary and, thus, is influenced by the sea. It is naturally distributed as a series of disjunct and localised stands occurring on a range of landforms derived from coastal processes that can include dunes and flats, cheniers, berms, cobbles, headlands, scree, seacliffs, marginal bluffs, spits, deltaic deposits, coral rubble and islands. As a result, the ecological community is not associated with a particular soil type and can occur on a variety of geological substrata.

The ecological community occurs from Princess Charlotte Bay, Cape York Peninsula to the Gippsland Lakes in Victoria as well as on offshore islands on the east coast. The latitudinal range where the ecological community occurs encompasses warm temperate, subtropical and tropical climate zones. In terms of temperature and humidity, the climate is more equable than sites further inland.

The ecological community is defined by habitat expressed in terms of structure, floristic composition and ecology in response to coastal processes. The unifying feature of its habitat is the salinity, derived from the ecological community's proximity to the sea. Saline influence is delivered via aerosols, saline water-tables or occasional inundation.

Whilst the ecological community's canopy species are well adapted to coastal exposure (e.g. strong and persistent salt-laden winds and storm events), the canopy protects less tolerant species and propagules in the understorey. The canopy height varies with the degree of exposure and can range from dwarf to medium (<1-25 m; Specht 1970). Due to extreme exposure to salt laden winds, the canopy often demonstrates a continuum of heights. Highly exposed

patches will display the effect of windshear in the canopy. In more sheltered sites, for example, around estuaries, wind shear may not be evident in the canopy.

The canopy is typically closed but may also be patchy and may include emergents. Those stands that occur in exposed coastal situations can have many rainforest gaps caused by storm events which, in turn, may lead to canopy decapitation. In these exposed sites, there is often a secondary canopy that has developed below the old canopy.

The diversity of plant taxa (particularly canopy species) generally declines in a north to south direction, i.e. with increasing latitude. However, species richness of adjacent patches may vary considerably within one latitudinal zone.

The ecological community provides important stepping stones along the eastern Australian coast for various migratory and marine birds. For example, the nationally listed marine species Pied Imperial Pigeon *Ducula bicolor*, a migratory species from north of New Guinea, feeds on fruit associated with mainland littoral rainforests and disperses the seeds on offshore islands where it roosts. Given its proximity to the sea, seabirds may also be associated with some stands of littoral rainforest, e.g. the nationally endangered migratory Gould's Petrel *Pterodroma leucoptera leucoptera* has one significant breeding locality at Cabbage Tree Island off the coast at Port Stephens in New South Wales (NSW) (DEC 2006a).

Key Diagnostic Characteristics

The key diagnostic features of the ecological community are described below to aid its identification.

- The ecological community occurs in the following IBRA bioregions: Cape York Peninsula (from Princess Charlotte Bay southwards), Wet Tropics, Central Mackay Coast, South-Eastern Queensland, NSW North Coast, Sydney Basin and South-East Corner.
- Patches of the ecological community occur within two kilometres of the east coast, including offshore islands, or adjacent to a large body of salt water, such as an estuary, where they are subject to maritime influence.
- The structure of the ecological community typically is a closed canopy of trees that can be interspersed with canopy gaps that are common in exposed situations or with storm events. Usually, several vegetation strata are present. However, where there is extreme exposure to salt laden winds, these strata may merge into a height continuum rather than occurring as distinct vegetation layers. The canopy forms a mosaic due to canopy regeneration, typically in the form of basal coppice following canopy decapitation due to prevailing salt laden winds and storm events. Wind sheared canopy can be present on the frontal section leading to closed secondary canopies. Emergents may be present, for example, species from the genera *Araucaria* (northern bioregions only), *Banksia* or *Eucalyptus*. The ground stratum of the vegetation typically is very sparse.
- The ecological community contains a range of plant life forms including trees, shrubs, vines, herbs, ferns and epiphytes. To the north, most plant species diversity is in the tree and shrub (i.e. canopy) layers rather than in lower strata. The converse generally occurs from the Sydney Basin Bioregion southwards. Feather palms, fan palms, large leaved vascular epiphytes and species that exhibit buttressing are generally rare. Ground ferns and vascular epiphytes are lower in diversity in littoral rainforests compared to most other rainforest types.
- Plants with xeromorphic and succulent features are generally more common in littoral rainforest than in hinterland rainforest types. Canopy stem sizes also tend to be smaller compared to that in hinterland rainforest. Trunks rarely host mosses though lichens are usually common.
- Whilst species can be regionally predictable, there may be considerable variation in the composition of individual stands of the ecological community within any given bioregion. Attachment A provides a list of flora species for each relevant bioregion.

4. Condition Thresholds

The listed Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community comprises those patches that meet the key diagnostic characteristics (above) and the condition thresholds presented below.

- Small patches can be resilient and viable, but the minimum size of a patch needs to be 0.1 ha; AND
- The cover of transformer weed species (as identified in Attachment A) is 70% or less. Transformer weeds are highly invasive taxa with the potential to seriously alter the structure and function of the ecological community. This threshold recognises the relative resilience and recoverability of the ecological community to invasion by weed species; AND

- The patch must have:
  - at least 25% of the native plant species diversity characteristic of this ecological community in that bioregion (Attachment A);

  OR

  - at least 30% canopy cover of one rainforest canopy (either tree or shrub) species (Attachment A, excluding Banksia and Eucalyptus species that may be part of the ecological community).

Condition Threshold Notes

Where gaps in the canopy exist, they should be in the process of regenerating with the usual suite of rainforest gap species for the site. Where weed invasion is significant, natural regeneration of native gap species may be limited.

As species diversity diminishes from northern to southern latitudes, it is important to take into account the natural diversity of a patch in a particular bioregion when examining specific sites. For example, it is possible to find littoral rainforest stands that are dominated by single tree species or a small number of species (Miles & Kendall 2006). If such patches are in good condition, they will also be representative of the ecological community and they may also contain rainforest dependent fauna species.

The condition criteria outlined above represent the minimum level for patches to be included in the listed ecological community.

5. National Context

Littoral rainforest occurs throughout the Indo-Pacific region, where it has a broadly similar structure and often includes widespread floristic elements (Adam 1992). Within Australia, littoral rainforest occurs along the coast from far eastern Victoria up the east coast through NSW and Qld and across the Northern Territory (NT) and Western Australia (WA). Throughout this distribution, littoral rainforest crosses different climatic zones and gradually changes in species composition. This gradual variation in composition makes it difficult to provide explicit spatial circumscription of this ecological community and a range of somewhat arbitrary disjunctions may be valid. Given this situation, the Committee considers that the ecological demarcation, discussed below, achieves the best conservation outcome.

The continuity of rainforest areas on the north-eastern coast of Australia is fragmented by a dry corridor of relatively low rainfall in the Laura Basin, which is situated in the southern portion of Cape York Peninsula and meets the coast at Princess Charlotte Bay (Winter et al. 1987). This corridor separates the northern occurrences of littoral rainforest, which encompasses most of the Cape York Peninsula, the NT and Kimberley, from the southern occurrences of littoral rainforest, which encompasses the southern portion of the Cape York Peninsula, NSW and eastern Victoria. Generally, a greater monsoonal influence further distinguishes the northern littoral rainforests from the southern littoral rainforest ecological community.

This listing advice covers the particular aspects pertaining to the southern occurrences of littoral rainforest along the eastern coastline of Australia (including offshore islands) from Princess Charlotte Bay, Cape York Peninsula to, and including, eastern Victoria. The national extent of the southern ecological community, thus, encompasses the following IBRA bioregions: Cape York Peninsula (from Princess Charlotte Bay southwards), Wet Tropics, Central Mackay Coast, South Eastern Qld, NSW North Coast, Sydney Basin and South East Corner.

In Qld, the Regional Ecosystems that equate wholly to the ecological community are: 3.2.1a, 3.2.1b, 3.2.12, 3.2.13, 3.2.28, 3.2.29, 3.2.31, 3.2.11, 3.12.20, 7.2.1a-i, 7.2.2a-h, 7.2.5a, 7.2.6b, 7.11.3b, 7.12.11d, 8.2.2 and 12.2.2. Under the Vegetation Management Act, December 2005, the vegetation management status of these regional ecosystems is mainly 'of concern' whilst the biodiversity status is mainly 'of concern' or 'endangered'.

Regional Ecosystem 11.2.3, which also equates to littoral rainforest and occurs in the Brigalow Belt North Bioregion, was listed on 4 April 2001 as a component of the nationally endangered ecological community, *Semi-Evergreen Vine Thickets of the Brigalow Belt (North and South) and Nandewar Bioregions*. As a result, Regional Ecosystem 11.2.3 is not included as part of the proposed listing of the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community.

In NSW, 'Littoral Rainforest in NSW North Coast, Sydney Basin and South East Corner Bioregions' is listed as endangered under the *Threatened Species Conservation Act 1995*. The legal definition of the ecological community

under the State Environmental Planning Policy No. 26 (SEPP 26) includes littoral rainforest occurring on headlands as well as on sand. This is consistent with the definition of the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community. The ecological community is not listed in Victoria nor was it recognised until recently, when surveys identified patches of the ecological community between Aragannu Beach, near Bermagui, NSW and the Gippsland Lakes in Victoria (Peel in prep.). The occurrence of the ecological community in Victoria is limited to eastern Gippsland.

6. Relevant Biology and Ecology

The ecological community provides a range of benefits to the landscape. It is an important buffer to coastal erosion and wind damage (Meier & Figgis 1985) and provides natural refugia, suitable nest sites and food resources for resident and seasonally migratory species (Williams 1993). For example, rainforest taxa including Lauraceae (laurels), Myrtaceae (lillypillies) and Arecaceae (palms), which are part of the ecological community, provide important fruits to the nationally endangered Southern Cassowary *Casuarius casuarius johnsonii* which occurs in the Cape York Peninsula and the Wet Tropics Bioregions. In return, the bird disperses the seeds of these rainforest fruits (Buosi & Burnett 2006). The mode of seed dispersal by this keystone species ensures the long-term viability of rainforest communities (Williams 1993). Similarly, Grey-headed Flying Fox *Pteropus poliocephalus*, which occurs along the coastal belt from south-eastern Qld to Melbourne, Victoria, is responsible for the seed dispersal of many rainforest trees, such as native figs and palms (Tidemann 1998) which are components of the ecological community. The extent of seed dispersal by the species is exceptional among Australian frugivores as the species moves seeds between isolated rainforest patches (Eby 1991).

There are also insect and other invertebrate species restricted to the ecological community as it provides refuge/critical habitat for rainforest dependent species. For example, two beetle species, *Helferella manningensis* and *H. miyal* (Buprestidae), are known only from littoral rainforest remnants at Harrington and Manning Point, NSW (Williams 1993).

The ecological community exhibits a decline in plant species diversity from northern to southern latitudes. For example, compared to southern NSW, littoral rainforest stands in northern NSW are likely to have a greater number of canopy species reflecting their derivation from subtropical rainforest (Miles & Kendall 2006). In the south coast of NSW, littoral rainforest stands may be dominated by one or few tree species, e.g. Lilly Pilly *Syzygium smithii*, Sweet Pittosporum *Pittosporum undulatum*, Port Jackson Fig *Ficus rubiginosa* or Muttonwood *Myrsine howittiana* (Miles & Kendall 2006).

The ecological community often occurs in a state of regeneration due to ongoing natural disturbance, e.g. from storm events. Consequently, patches may have canopy gaps that are temporary and, over time, will be filled-in with the usual suite of rainforest gap species for the site. Moreover, gaps are important for some gap-specialist species such as the nationally endangered White-flowered wax plant *Cynanchum elegans*.

The ecological community is somewhat protected from fire by coastal processes including oceanic aerosols, salt laden wind and storm surges. Other factors that help protect the ecological community from fire include prevailing winds (south-easterly and north-easterly winds are relatively cool and maintain relatively high levels of humidity on the coast), and the occurrence of swamps, streams, coastal inlets, mangroves or salt pans, that frequently occur on the inland side of littoral rainforest. This natural protection against fire is however significantly compromised when woody weeds invade littoral rainforest patches.

A list of nationally threatened species associated with the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community is at Attachment B. Whilst the list is not exhaustive, it includes 26 endangered species listed under the EPBC Act (19 flora and 7 fauna).

7. Description of Threats

What was once an almost continuous archipelago of patches of the ecological community along the eastern coast of Australia has been reduced and fragmented primarily by coastal development, sandmining and agriculture (Bradley & Merrilyn 1992). The resulting fragmentation and reduction in patch size render the ecological community more vulnerable to other threats including weed invasion, edge effects and fire. The key threats to this ecological community are outlined below.

Past Developments

Past development actions, including sand mining and agriculture, have resulted in the decline and fragmentation of the ecological community across its range. For example, the high quality soils on the Permian volcanic Kiama coastline led to clearance for agriculture from the early 1800s' (Mills 2006, pers. comm.). Presently, there are just small remnants left at Gerroa that are listed under SEPP 26 (Mills 2006, pers. comm.).

Coastal Development

Urban development is one of the main pressures on Australia's coastal environment (Beeton et al. 2006) where the ecological community continues to be threatened by vegetation clearance. For example, in the Wet Tropics Bioregion, residential development and the widening of the Cook Highway, between Oak Beach and White Cliffs near Cairns, represent major threats to the ecological community (EPA 2005a). Also, at Mission Beach, south of Innisfail, the ecological community is threatened by clearing for residential development and tourism.

Such development is likely to intensify over time due to the predicted increase of the human population along the eastern coastline of Australia. From 1980 to 2004 coastal urban development rose (Beeton et al. 2006). As a result, it was projected that 42.3% of the Nowra (NSW) to Noosa (Qld) coastline will be urbanised by the year 2050, with the resulting loss of much of Australia's temperate and tropical coastal systems (Beeton et al. 2006) including this ecological community.

Along the Qld coast, the human population is projected to increase significantly. For example, in Qld, the statistical division of Moreton is projected to experience an increase in population of approximately 56% between 2006 and 2026. Moreover, the statistical divisions of Wide Bay-Burnett and Fitzroy are projected to experience growth of approximately 34% and 29% respectively over the same period whilst that of Mackay and the Northern regions (which overlap with the Wet Tropics Bioregion) are projected to increase by approximately 37% and 26% respectively. The Far North statistical division is also projected to grow by 31% for the same period (Queensland and Statistical Divisions 2006).

In NSW, coastal regions will continue to have the fastest growth rates in the state. By 2030, the population living in coastal NSW is projected to grow by approximately 440 000 people or 28%. This represents almost one-third of all growth projected in the State (Culpin et al. 2000). The NSW Government's South Coast Regional Strategy expects that over the next 25 years an additional 45 600 new dwellings will be built along the coast from Nowra to the Victorian border (Pacey 2007).

In Victoria, where the ecological community occurs, the human population in East Gippsland, is projected to increase from approximately 39 000 in 2001 to 47 000 by 2031, an increase of approximately 20% (DSE 2004a). Population growth in East Gippsland is likely to be concentrated around Paynesville and Lakes Entrance where the ecological community occurs (DSE 2004a).

Tourism and Visitor Disturbance

According to the Bureau of Tourism Research (DISR 2001), 50% of international visits and 42% of domestic visits are to coastal (and marine) areas. Due to the ongoing demand for tourism and recreational facilities to cater for non-consumptive uses of coastal and marine ecosystems (Ward & Butler 2006), this trend is likely to increase over time. Such pressure is likely to result in more development on coastal land and a rise in visitor numbers in conservation areas where the ecological community occurs.

Visitor disturbance in conservation areas includes soil compaction and disturbance, erosion from foot, cycle, trail bike and four wheel drive tracks, the introduction of pests and the creation of new planned and unplanned tracks. Increased visitation results in increased demand for and use of visitor facilities, such as walking tracks, viewing platforms, toilet blocks and picnic areas, many of which are located in littoral rainforest patches because of their attractive landscape features (shade, open understorey and proximity to the sea). These impacts hinder the recruitment of key canopy species, slowing regeneration rates and facilitating establishment of weeds. Other impacts in such areas include the dumping of cars and rubbish and the dumping of garden waste which has the potential to cause weed infestation (NSW Scientific Committee 2004). For example, in the Central Mackay Coast Bioregion, the ecological community receives high use by recreational vehicles and foot traffic where it occurs close to urban areas. In addition to these impacts the ecological community is invaded by Lantana **Lantana camara* (EPA 2005b). At Corringle Slips, near Orbost, Wingan Inlet and Mallacoota, Victoria, recreational development, such as campgrounds, is the most common and ongoing key threat to this ecological community (Peel in prep.).

Climate Change

Another significant threat is climate change which has the capacity to augment the detrimental effects of natural disturbances and other threats including fire and invasive weeds. As a result of climate change, the following changes are likely to affect the ecological community: rising sea levels; increased rainfall variability; and increased frequency of severe weather events which are projected to lead to major coastal erosion events, storm surges and saline inundation (DSE 2004b).

Weeds

The establishment of transformer weeds in littoral rainforest patches can have a significantly detrimental effect. Transformer weeds are highly invasive taxa with the potential to seriously alter the structure and function of the ecological community. Whilst it is accepted that the ecological community can tolerate a significant amount of weed cover due to its relative resilience, if left unchecked, such weeds will eventually take over and destroy the affected patch. Weeds that invade littoral rainforest, notably Pond Apple **Annona glabra*, Lantana, Bitou Bush **Chrysanthemoides monilfera* subsp. *rotundata* and Rubber Vine **Cryptostegia grandiflora* are all recognised as Weeds of National Significance i.e. high impact, highly invasive species.

Transformer weeds of the warm temperate climate zone of south-eastern Australia, such as Cape Ivy (Delairea odorata), Bitou Bush, Lantana and Madeira Vine **Anredera cordifolia*, also extend into the subtropical zone of northern NSW (Williams 1993; Peel in prep.). Also Rubber Vine and **Senna siamea* are currently a problem near Princess Charlotte Bay and within Lakefield National Park, Cape York Peninsula, and have the potential to expand if left unchecked. This demonstrates that certain transformer weeds have the capacity to significantly expand their range on the eastern coastline.

Whether the ecological community is protected in reserves or not, the risk of weed infestation increases where patches of the ecological community are located near human habitation and/or are subject to visitor disturbance. This is supported by Peel's (in prep.) study where a positive correlation was found between proximity to human activity and weed invasion based on a sample of 251 sites. Peel (in prep.) found that the majority of weeds recorded were incidentally introduced through human activities such as agriculture, recreation, domestic gardens and associated refuse dumping.

Weed invasion can also occur through seed dispersal by birds and mammals. For example, this mode of dispersal has led to weed infestations of wilderness areas, such as Croajingolong National Park and Howe Wilderness, in Victoria. In NSW, many coastal habitats have been invaded by Bitou Bush through the spread of fruit by birds and flying foxes. Bitou Bush smothers canopy and may form dense growth around the edge of littoral rainforest (Adam 1992). This transformer weed has also spread into Qld where it has the potential to flourish in rainforest stands in southern south-east Qld. In the Cape York Peninsula Bioregion transformer weed invasion is mainly attributable to disturbance by cattle and pigs (Stanton & Fell 2005). Included in the array of transformer weeds that currently impact the ecological community in this Bioregion are Lantana, Pond Apple and Guinea Grass **Megathyrsus maximus*.

Fire

The ecological community is generally protected from fire as a result of coastal processes (including high humidity, oceanic aerosols, wind direction, abundance of surface water), the presence of fire retardant vegetation (such as mangroves and salt marshes) and indigenous fire protection to conserve food resources. However, the accumulation of fuel loads derived from weeds with a high amount of flammable material increases the risk of fire which, depending on its intensity and frequency, can destroy an adjacent patch if not suppressed. The fragmented nature of the ecological community and the relatively small sized patches increase the risk of irreversible damage from fire.

Feral Animals

Grazing and browsing by feral deer {Sambar deer **Cervus unicolor* and Hog deer **Axis porcinus*} has been shown to detrimentally impact the ecological community on both a local and landscape level. Browsing prevents regeneration of littoral rainforest canopy and understorey species and creates gaps in the vegetation which allows colonisation by weeds. This has occurred in the area near Genoa River, in Victoria, where the vegetation gaps have been colonised by Cape Ivy **Delairea odorata* and dense thickets of Madeira Winter-cherry **Solanum pseudocapsicum*. These weeds are seriously contributing to the collapse of the existing littoral rainforest patches through the smothering of shrubs and young trees. Severe damage to littoral rainforest has also been observed from Twofold Bay in NSW to the Gippsland Lakes in Victoria. Persistent infestations are documented as causing the local loss of rainforest species and whole sections of mature rainforest in Victoria (Peel et al. 2005). The coastal expansion of feral deer has reached at least as

far north as Bermagui (Peel in prep.). Where the ranges of the two deer overlap, patches of littoral rainforest (e.g. Marl Island) have been destroyed (Peel in prep.).

'Herbivory and habitat degradation caused by feral deer' is listed as a Key Threatening Process under the NSW *Threatened Species Conservation Act 1995*. 'Reduction in biodiversity of native vegetation by **Cervus unicolor* Sambar Deer' is listed as a Key Threatening Process under the Victorian *Flora and Fauna Guarantee Act 1988*.

Land Tenure

Nationally, approximately 65% of the ecological community is not protected in reserves (Accad et al. 2006; Bureau of Rural Sciences 2005; CAPAD 2004; Peel in prep.). This figure is indicative as the datasets available sometimes interface with incomplete mapping of the ecological community. Irrespective of this, residential and recreational developments and tourism will continue to exert increasing pressure both directly and indirectly on unprotected patches of the ecological community. Such development causes loss of habitat either directly through land clearing or indirectly through exposure of protected vegetation to salt and wind damage which causes loss of canopy integrity (NSW Scientific Committee 2004). Other indirect impacts include fragmentation and weed invasion which can increase the risk of fire.

Patches of the ecological community in conservation areas are detrimentally being impacted by the effects of visitor disturbance, weed invasion and feral deer browsing. If not managed effectively, such impacts will continue (Peel in prep.).

Natural Disturbance

In addition to the above anthropogenic sources of impacts, the ecological community is subject to natural disturbances, such as storm events and cyclones, which, depending on their intensity and frequency, can have a detrimental effect. For example, a severe storm can cause coastal erosion and accelerate the rate of weed invasion as the canopy and ground layer are disturbed.

8. How judged by TSSC in relation to the EPBC Act criteria.

The TSSC judges the ecological community is eligible for listing as critically endangered under the EPBC Act. The assessment against the criteria is as follows.

Criterion 1 - Decline in geographic distribution

There are significant gaps in the knowledge about the historic extent of the ecological community in Australia. In Qld, decline in extent is based on pre-European estimates and data on remnant vegetation from 1997 to 2003. The data indicate that there has been approximately an 11% decline (Table 1) (Accad et al. 2006). This figure is indicative as it is based on broad regional ecosystem datasets. With respect to individual bioregions, the greatest decline has occurred in Southeast Qld where the ecological community has experienced a 34% decline.

Data on decline over time do not exist for NSW and Victoria.

Table 1. Decline in extent of the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community based on broad regional ecosystem data in Queensland (Accad *et al*. 2006).

Bioregion	Regional Ecosystems	Pre-Clear Extent (ha)	Remnant Extent 1997 (ha)	Remnant Extent 2003 (ha)	Decline Pre-Clear to 2003 %
Cape York Peninsula	3.2.1, 3.2.31, 3.2.29, 3.2.28, 3.2.13, 3.2.12, 3.2.11, 3.12.20	9952	9946	9924	0.3
Wet Tropics	7.2.1, 7.2.2, 7.2.5, 7.2.6, 7.11.3, 7.12.11	22 717	20 012	20 009	12
Central Qld	8.2.2	2826	2513	2497	12
South-East Qld	12.2.2	2993	1995	1977	34
All Qld REs		38 488	34 466	34 407	11

There are insufficient quantitative data available to estimate the extent to which the ecological community has undergone a decline. Although the Committee recognises that the ecological community is likely to have undergone a decline, the data are insufficient to determine whether that decline is very severe, severe or substantial. Therefore, as the ecological community has not been demonstrated to have met each of the required elements of Criterion 1, it is not eligible for listing in any category under this criterion.

Criterion 2 - Small geographic distribution coupled with demonstrable threat

The linear distribution of the ecological community along the eastern coastline of Australia straddles various bioregions. Within its distribution, the ecological community occurs in a range of patch sizes. In Qld, there is generally a greater proportion of large patches compared to NSW and Victoria. A summary of mapping data sources including scale of mapping, list of pertinent regional ecosystems and associated species is at Attachment C. The following sections provide more detail on patch size and area of occupancy.

Queensland

In Qld, the total area of occupancy of the ecological community is approximately 16 135 ha (Table 2) (Accad et al. 2006)2. A total of 879 patches constitute the area of occupancy with patch sizes ranging from less than 0.1 ha to 2311 ha. More specifically, Table 2 shows that:

- the majority of patches, i.e. 77%, are less than 10 ha in size each; and
- only 18 patches (approximately 2%) are greater than 100 ha each.

Table 2. Data on area of occupancy and number of patches of the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community in Queensland including islands off the east coast (Accad et al. 2006).

Patch size (ha)	Number of patches	Total area of occupancy (ha)	Number of patches as % of total	Area of occupancy as % of total
0.1-<0.5	121	35	14	0.2
0.5-<1	122	88	14	0.5
1-<10	428	1704	49	11
10-<100	190	5770	21	36
≥100	18	8538	2	53
Total	879	16 135	100	100

[1] Individual patches that are less than 0.1 ha exist in each State. However, they are not considered in the data on area of occupancy as the condition threshold on the minimum viable patch size is 0.1 ha.

[2] Because of scale limitations, which are being refined, the regional ecosystem mapping does not identify all Littoral Rainforest patches in Queensland

[3] This patch is unmapped and is located at Iluka Nature Reserve which is the largest known stand of Littoral Rainforest in New South Wales comprising approximately 136 ha (NSW Scientific Committee 2004).

New South Wales

Littoral rainforest is the least extensive of the rainforest types that occur in NSW and represents less than one per cent of the total area of rainforest (NSW Scientific Committee 2004).

Estimates for NSW are approximate as they derive from several sources (SEPP 26; Tozer et al. 2006; Miles & Kendall 2006; Peel in prep.).

The total area of occupancy of the ecological community is approximately 1624 ha (Table 3). A total of 433 patches constitute the area of occupancy with patch sizes ranging from 0.06 ha to 136 ha. More specifically, Table 3 shows that:

- the majority of individual patches, i.e. 92%, are less than 10 ha in size; and
- only one patch3 (approximately 0.2%) is greater than 100 ha.

Table 3. Data on area of occupancy and number of patches of the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community in New South Wales (Tindall et al. 2004; Peel in prep.; Tozer et al. 2006; Miles & Kendall 2006).

Patch size (ha)	Number of patches	Total area of occupancy (ha)	Number of patches as % of total	Area of occupancy as % of total
0.1-<0.5	98	23	23	1
0.5-<1	81	60	19	4
1-<10	219	629	50	39
10-<100	34	776	8	48
≥100	1	136	0.2	8
Total	433	1624	100	100

In relation to SEPP 26, the mapping is incomplete as it does not include all patches within National Parks, Flora Reserves and Jervis Bay (Australian Capital Territory). Moreover, the mapping data have not been revised since the SEPP 26 gazettal in 1988.

In determining the above area of occupancy, there is a slight overestimate where data overlap between Tuross Head and Murramarang National Park (by approximately 30 km).

Victoria

In Victoria, the total area of occupancy of the ecological community is approximately 279 ha (Table 4). A total of 108 patches constitute the area of occupancy with patch sizes ranging from 0.01 ha to 35 ha. More specifically, Table 4 shows that:

- the majority of individual patches, i.e. 91%, are less than 10 ha in size; and
- no patches are greater than 100 ha each.

Table 4. Data on area on occupancy and number of patches of the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community in Victoria (Peel in prep.).

Patch size (ha)	Number of patches	Total area of occupancy (ha)	Number of patches as % of total	Area of occupancy as % of total
0.1-<0.5	53	6	49	2
0.5-<1	12	6	11	2
1-<10	33	102	31	37
10-<100	10	165	9	59
≥100	0	0	0	0
Total	108	279	100	100

The data used to derive the above values are based on Peel's (in prep.) latest field work on the ecological community within the South East Corner Bioregion. The Victorian portion of the analysis has been used to derive the above values.

Nationally

The available data show that the ecological community has a broad though linear extent along the eastern coastline. When data from each of the States are amalgamated, the total area of occupancy of the ecological community is approximately 18 000 ha.

Nationally, a total of 1420 patches constitute the area of occupancy with patch sizes ranging from less than 0.1 ha to 2311 ha. More specifically, Table 5 shows that:

- the majority of patches, i.e. 82%, are less than 10 ha in size and, thus, generally small; and
- only 19 patches (approximately 1%) are greater than 100 ha each. Except for the patch at Iluka Nature Reserve in NSW, all the bigger patches occur in Qld. The majority of these (i.e. 14) occur in the Cape York Peninsula

Bioregion where a significant portion of the mapping along the eastern coastline has not been updated (although development in this bioregion is likely to be less intense compared to the other Qld bioregions).

Table 5. Data on area of occupancy and number of patches of the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community including islands off the east coast (Accad et al. 2006).

Patch size (ha)	Number of patches	Total area of occupancy (ha)	Number of patches as % of total	Area of occupancy as % of total
0.1-<0.5	272	64	19	0.3
0.5-<1	215	154	15	1
1-<10	680	2435	48	13
10-<100	234	6711	17	37
≥100	19	8674	1	48
Total	1420	18 038	100	100

Using the above data, the graph below (Figure 1) shows the frequency of the patch sizes on a national level. As the majority of patches are less than 10 ha each, the ecological community is very restricted.

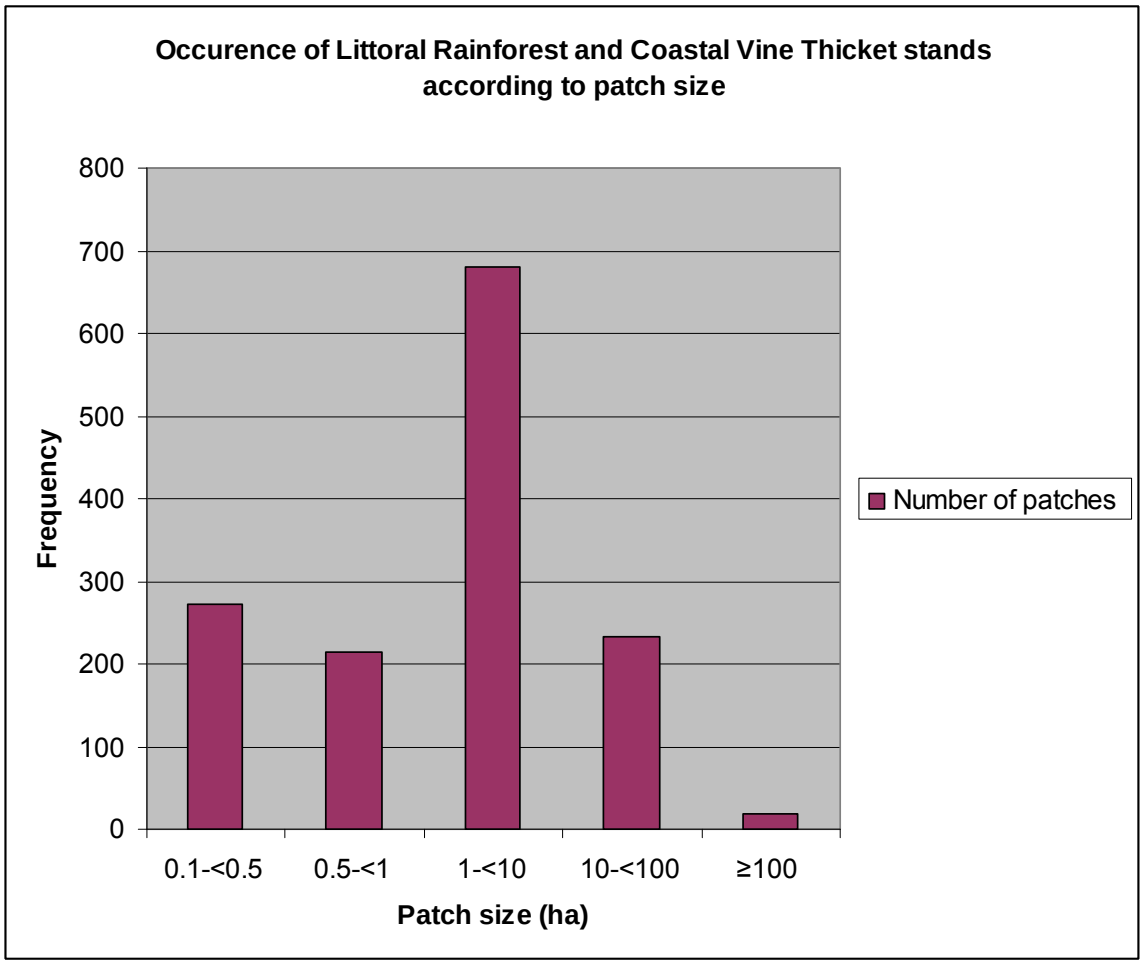


Figure 1. Frequency chart showing patch size frequency for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia.

The fragmented and linear nature of the patches, their small size and their small area to perimeter length ratios indicate that the ecological community is susceptible to disturbance including loss of fringing protective ecotones and has an inherently higher risk of extinction (Adam 1992).

Demonstrable threats to the ecological community, as outlined earlier in this document, are occurring along its entire extent on the eastern coastline. Patches with no protection are being cleared for development. This situation is unlikely to improve given the forecast of population growth in coastal areas. Patches with conservation protection are being degraded through a series of processes, including visitor disturbance, weed invasion and feral deer, on both patch and landscape scales. In addition, natural disturbances, such as cyclones, have the potential to intensify spatially and temporally due to global warming and thus increase their impact on the ecological community.

The Committee considers that the nature of the ecological community's very restricted distribution makes it likely that a threatening process could cause it to be lost in the immediate future. Therefore, the ecological community is eligible for listing as critically endangered under this criterion.

Criterion 3 - Loss or decline of functionally important species

The nationally endangered Southern Cassowary *Casuarius casuarius johnsonii* occurs in the Cape York Peninsula and the Wet Tropics Bioregions where it requires complex tropical vegetation consisting of dense tropical rainforest and associated habitats such as woodlands and swamps that can provide a year round supply of fleshy fruit (Bentrupperbaumer 1998). The species is recognised as a keystone species in north Qld rainforest communities (QPWS 2006) due to its role in the dispersal of larger fleshy rainforest fruits and seeds. The most important fruits in the bird's diet relevant to the ecological community include those belonging to the Lauraceae (laurels), Myrtaceae (lillypillies) and Arecaceae (palms) (Buosi & Burnett 2006).

Habitat loss and fragmentation are amongst the principal threats to the Southern Cassowary and the primary cause of the species' decline (Buosi & Burnett 2006). Nationally, the total population of this species ranges from less than 1500 to less than 2500 (Moore & Moore 2001). As the remaining cassowary habitat becomes increasingly fragmented by roads and development, the increased mortality rates due to vehicle collisions has the potential to eliminate many local populations (Bentrupperbaumer 1998) and the important role they play in sustaining rainforests. However, only a few areas, such as Mission Beach and Daintree lowlands, have been well studied and surveyed in the context of the cassowary's functional role in rainforests generally (Buosi & Burnett 2006; Crome & Moore 1993).

The nationally vulnerable Pteropus poliocephalus (Grey-headed Flying Fox) is also important in the processes that sustain the ecological community. The species occurs along the coastal belt from south-eastern Qld to Melbourne, Victoria. Its distribution, thus, overlaps with the ecological community. The Grey-headed Flying Fox is a canopy-feeding frugivore and nectarivore, which uses vegetation communities including different types of rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. The species is recognised as a functionally important species because of its seed dispersal function (Eby 1996), being responsible for the seed dispersal of many rainforest trees, including those of littoral rainforest, such as native figs and palms (Tidemann 1998). The extent of seed dispersal by this species is exceptional among Australian frugivores as it can transfer seeds between widely isolated rainforest patches (Eby 1991).

Grey-headed Flying Foxes are subject to ongoing threats, particularly habitat clearance in coastal areas in northern NSW (TSCC 2007). As a result, the population has experienced a 25% decline, based on the 1998 and 2004 national counts (Parry-Jones 2000). However, there are no studies on the role of Grey-headed Flying Foxes on the survival of the ecological community or the consequences of its decline on this ecological community. As a result, there are insufficient data to determine if the ecological community has undergone a loss or decline of the abovementioned functionally important species. Therefore, it is not eligible for listing in any category under this criterion.

Criterion 4 - Reduction in community integrity

There has been a reduction in the integrity of the ecological community on both patch and landscape scale due to past and present key threats outlined in detail under 'Description of Threats'.

Fragmentation

The ecological community is undergoing increasing fragmentation which, amongst other things, is causing a reduction in patch size, an increase in the distance between patches and greater susceptibility to increased degradation. As a result of fragmentation, the ecological community is more susceptible to disturbance and less amenable to recovery.

Moreover, this increased fragmentation generates secondary processes, which severely impact on the structural and compositional integrity of the ecological community. Such secondary processes include weed invasion and genetic isolation of key species, edge effects, loss of canopy integrity from salt or wind damage as a result of clearing on the margins, degradation associated with rubbish dumping and overuse associated with increased access (Miles and Kendall 2006). For example, the narrow seaward fringe of the ecological community between Manning Point and

Farquhar Inlet, NSW, which survived past sandmining operations, has largely been lost since mining ceased through erosion of the frontal dune systems (Williams 1993).

With fragmentation, the risk of fire increases due to the accumulation of weeds on the perimeter of a patch. As a result, whole patches of the ecological community can be destroyed depending on fire intensity and frequency.

Fragmentation also threatens the integrity and viability of the ecological community through its impact on functionally important species, such as the nationally endangered Southern Cassowary *Casuarius casuarius johnsonii* and the vulnerable Grey-headed Flying Fox *Pteropus poliocephalus* which are key seed dispersers of the ecological community.

Weed invasion

Transformer weeds are currently detrimentally affecting the integrity and viability of the ecological community in multiple ways. The invasion and spread of weeds have the capacity to displace native plant taxa, and alter vegetation structure, animal habitat and fire regimes pertaining to an ecological community (Tozer et al 2006). For example, many rainforest plants are capable of germinating in low light conditions and slowing their growth rate until a gap in the canopy appears, whereupon they grow rapidly to occupy the gap. However, if a weed such as Lantana occupies all such gaps, there could be a significant impact on species composition over time, whereby fast-growing primary coloniser species dominate the ecological community and suppress the establishment of rainforest canopy species (Miles and Kendall 2006).

In 2002-03 Peel (in prep.) observed that weed invasion alone (i.e. without any other disturbance) in the Marlo Estuary, Victoria, destroyed a third of the littoral rainforest stand whilst the remaining two thirds was in severe decline. The transformer weeds involved include Blue Periwinkle **Vinca major*, Cape Ivy **Delairea odorata* and Wandering Jew **Tradescantia fluminensis*. Peel (in prep.) concluded that the ecological community, in this area, could disappear in the next five to ten years without proper intervention. Given the aggressive nature of transformer weeds, it can generally be deduced that seriously infested patches of the ecological community will be lost in the short to medium term in the absence of effective weed control and recovery action.

In northern NSW, remnant stands of the ecological community have been invaded by vines such as Cat's Claw Vine **Macfadyena unguis-cati* and Madeira Vine **Anredera cordifolia* which aggressively invade disturbed rainforest and vine thickets (Adam 1992). Along the eastern coastline, Asparagus Fern **Asparagus aethiopicus* and Lantana are well established in many patches of the ecological community. These transformer weeds pose a serious threat to littoral rainforest species through their habit of climbing and smothering. Not only are established trees killed by these weeds, but germination and recruitment of seedlings are severely hindered if not inhibited (Bradley & Merrilyn 1992). The NSW Threat Abatement Plan for Bitou Bush recognises that this weed poses a serious threat to littoral rainforest in northern NSW by invading the rainforest margins and canopy gaps, thereby disrupting recruitment processes (DEC 2006b).

Fire

A further threat to the integrity of the ecological community is fire. Fire can be facilitated by the presence of weeds, fragmentation and edge effects. Moreover, climate change can alter the nature of fire with serious consequences for the ecological community. Littoral rainforest cannot develop under a regime of even occasional fires, so complete fire exclusion is necessary for full development of this community (Miles & Kendall 2006).

Fire events have the demonstrated potential to seriously impact on the structure and species composition of the ecological community. The potential impacts of fire are most obvious at Seven Mile Beach, NSW, where the area south of Beach Road, with a history of regular burning, carries only occasional young coppice of Cheese Tree *Glochidion ferdinandi*, whereas the area north of Beach Road, that is relatively unburnt, is well advanced towards littoral rainforest development (Miles and Kendall 2006).

Existing stands of the ecological community can be eroded around the edges by fire, or if small, could be overrun by wildfire. While some of the component species have capacity to recover from fire, for example, Cheese Tree, Lilly Pilly *Syzygium smithii*, Rusty Fig *Ficus rubiginosa*, Blue Oliveberry *Elaeocarpus reticulatus* and Scentless Rosewood *Synoum glandulosum*, and some mature palms are relatively fire-tolerant, immature plants of all these species are unlikely to survive a fire event. Even low intensity fires will check the gradual spread of rainforest tree saplings around stand edges (Miles and Kendall 2006).

Depending on the intensity and frequency of fire and the species composition and age structure of the ecological community, regeneration of the full suite of species may not occur.

Grazing/browsing

Grazing by feral and domestic animals results in significant changes in the species diversity and structural complexity of native vegetation, depending on the grazing regimes and resilience of component plant taxa (Tozer et al. 2006).

Overgrazing by Eastern Grey Kangaroos *Macropus giganteus*, in areas where Kikuyu **Pennisetum clandestinum* has invaded littoral rainforest, leads to the maintenance and extension of this weedy sward. This has three observable and cascading impacts (Peel in prep.) which lead to the reduction in integrity of the ecological community and its eventual demise:

- prevention of ground-layer regeneration of native grasses and forbs;
- maintenance of vegetation in a more open conformation that leads uninhibited access to any natural regeneration of rainforest trees and shrubs by Swamp Wallabies *Wallabia bicolor* and feral deer, which effectively prevents the rainforest from renewing itself or expanding; and
- loss of littoral rainforest species followed by a loss in structural integrity, which then leads to a contraction in stand area and ultimately the loss of the stand.

Natural disturbance

The ecological community exists in areas subject to ongoing natural disturbance. While the ecological community is generally resilient to changes imposed by natural events such as storm surges, wind storms and cyclones, the frequency and intensity of these disturbances can change the structure of individual patches and, thus, facilitate the intrusion and exacerbation of fire and weeds. For example, if a patch that is buffeted by a wind storm loses a number of canopy trees, it is more susceptible to weed invasion or to existing weeds spreading further into the patch. Similarly, that same patch may then be more susceptible to fire penetration.

Restorability

The present degraded state of the ecological community is difficult to reverse on private land due to the increasing demand on coastal land for urban development. The associated land clearance has various cascading and irreversible impacts on the ecological community including fragmentation and associated patch size reduction, genetic isolation of key species, edge effects and loss of canopy integrity from salt or wind damage. As the majority of the ecological community occurs on private land, the change in its integrity is such that regeneration is unlikely within the immediate future.

Whilst patches of the ecological community found in conservation areas are more amenable to regeneration with positive human intervention, the nature and extent of degradation may not necessarily allow complete regeneration of the ecological community. This situation is made more difficult with the occurrence of a fire that has the capacity to completely destroy a patch of littoral rainforest. Moreover, the makeup of patches of littoral rainforest can be altered significantly if adjacent to human habitation where the impacts are constant.

Irrespective of whether the ecological community is protected, climate change has the capacity to augment the detrimental effects of natural disturbances including fire, coastal erosion, storm surges and rising sea levels. As a result, depending on the magnitude of such events, regeneration rates and success may be affected.

As a result of the above, the ecological community continues to be degraded at both patch and landscape scale. Such degradation becomes increasingly difficult to reverse as the impacts of persistent disturbance accumulate. This ongoing modification, while not necessarily leading to the total destruction of all elements of the ecological community, threatens it with extinction.

The Committee considers that the change in the integrity of this ecological community across most of its range through land clearance, fragmentation, weed invasion, fire, animal grazing/browsing and natural disturbance is very severe. The changes have been such that re-establishment of the ecological processes, species composition and community structure of the original ecological community is unlikely in the immediate future, even with positive human intervention. The ecological community is therefore eligible for listing as critically endangered under this criterion.

Criterion 5 - Rate of continuing detrimental change

The ecological community is undergoing continuing detrimental change arising from clearance of native vegetation for coastal development, visitor disturbance, weed invasion, animal grazing/browsing, fires and the effects of

fragmentation. In addition, natural disturbances, such as storms and cyclones, are likely to continue impacting the ecological community as their frequency and intensity are likely to increase due to climate change.

Estimates on decline are available for the Qld Regional Ecosystems (REs) only. These estimates cover the period from 1997 to 2003. The data indicate that the rate of decline for the ecological community is 11% which, however, is less than the minimum threshold for this criterion. No equivalent data are available for NSW or Victoria. Therefore, it is not eligible for listing in any category under this criterion.

Criterion 6 - Quantitative analysis showing probability of extinction

There are no quantitative data available to assess this ecological community under this criterion. Therefore, it is not eligible for listing under this criterion.

9. CONCLUSION

Conservation status

The Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community meets:

- Criterion 2 as critically endangered because its geographic distribution is very restricted and the nature of its distribution makes it likely that multiple demonstrable threats could cause it to be lost in the immediate future; and
- Criterion 4 as critically endangered because the change in community integrity is very severe and regeneration is unlikely to occur in the immediate future even with positive human intervention.

Decision to have a Recovery Plan

The Committee has taken the following issues into account when considering the need to develop a recovery plan for the ecological community:

- the cross-jurisdictional nature of the ecological community and the lack of a national cohesive recovery approach;
- the need to raise public awareness of the ecological community as the public may not recognise, nor be fully aware of the threatened status, of the ecological community;
- the extensive nature of the ecological community and the potential for certain threats to expand their range on the eastern coastline e.g. certain transformer weeds;
- the presence of nationally threatened flora and fauna associated with the ecological community plus other species and ecological communities that are, or may be, under consideration by the Committee in the near future.

The Committee is of the view that a recovery plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community would make a significant contribution to the conservation of the ecological community.

10. Recommendation

TSSC recommends that:

- the list referred to in section 181 of the EPBC Act be amended by including in the list in the critically endangered category: Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community; and
- there should be a national recovery plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community.

Associate Professor Robert J.S. Beeton

Chair

Threatened Species Scientific Committee

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A statement for the purposes of approved conservation advice (s266B of the *Environment Protection and Biodiversity Conservation Act 1999*)

Approved Conservation Advice for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community

This Conservation Advice has been developed based on the best available information at the time this conservation advice was approved.

The Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community is a complex of rainforest and coastal vine thickets on the east coast of Australia influenced by its proximity to the sea. The canopy, which protects less tolerant species and propagules in the understorey from salt laden winds, can range from patchy to closed and may include emergents as well as dead trees due to ongoing natural disturbance. The vegetation height depends on the degree of exposure and can range from dwarf to medium (<1-25 m; Specht 1970) and tends to merge in a height continuum due to coastal processes. Plant diversity declines from a north to south direction with the species composition also differing with latitude subject to substrate and nutrient inflow.

The ecological community meets criteria 2 and 4 of the Guidelines for ecological community nomination. The ecological community is listed as critically endangered.

The ecological community occurs within 2 km of the eastern coastline of Australia, including offshore islands, from Princess Charlotte Bay, Cape York Peninsula to the Gippsland Lakes in Victoria. It is known to occur in Queensland, New South Wales and Victoria where the relevant Natural Resource Management regions are: Cape York, Wet Tropics, Mackay-Whitsunday, Fitzroy, Burnett-Mary and South East (Queensland); Northern Rivers, Hunter-Central Rivers, Hawkesbury-Nepean, Sydney Metro, Southern Rivers (New South Wales); and East Gippsland (Victoria).

The ecological community has been significantly reduced and fragmented by sandmining, agriculture and coastal development. Presently, the main key threats to the ecological community include clearing of native vegetation, coastal development, visitor disturbance, weed invasion, animal grazing/browsing, fire and the effects of fragmentation. In addition, natural disturbances, such as storms and cyclones, can impact the ecological community and are likely to increase in frequency and intensity with climate change.

The following are actions that can be carried out to stop the decline or support the recovery of the ecological community.

Regional Priority Actions

The regional priority recovery and threat abatement actions required for this ecological community are identified below:

Habitat Loss, Disturbance and Modification

- Identify known sites of high conservation priority and implement conservation mechanisms, such as covenants or inclusion in reserve tenure
- Protect areas of native vegetation, which contain remnants of the listed ecological community.
- Manage any changes to hydrology which may result in increased run off or sediment or changes to the water table levels.
- Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the ecological community.
- Repair, expand and connect existing remnants of the listed ecological community through appropriate rainforest rehabilitation methods.
- Maintain and monitor rehabilitated remnants of the listed ecological community.
- Undertake appropriate collection and storage of seed of component species for future planting.

Invasive Weeds

- Develop and implement a management plan for the control of transformer weeds in the local region.

Trampling, Browsing and Grazing

- Develop a management plan or for the control and, as appropriate, eradication of feral deer, such as Rusa, Sambar and Hog Deer.

Fire

- Develop and implement a suitable fire management strategy for the ecological community.
- Provide maps of known occurrences of the ecological community to local and state rural fire services and seed inclusion of mitigative measures in bush fire risk management plan(s), risk register and/or operation maps.

Conservation Information

- Raise awareness of the ecological community within the local community.

Local Priority Actions

The local priority recovery and threat abatement actions for this ecological community are identified below:

Habitat Loss, Disturbance and Modification

- Monitor known sites to identify key threats or progress of recovery.
- Modify access routes to prevent vehicular and pedestrian access.
- Ensure the proper placing of access points and orientation of track access to the beach to ensure that protected vegetation continues to be buffered from prevailing salt laden winds.
- Undertake survey work in suitable habitat or potential habitat to locate any additional remnants.
- Minimise adverse impacts from changed land use at known sites.
- Protect remnants of the listed ecological community on private land through the development of conservation agreements and covenants.
- Preserve remnants of the listed ecological community on private and leased land through the development of reserves (if possible) and/or zoning for environmental purposes.

Invasive Weeds

- Identify and undertake weed management of known sites to reduce or remove transformer weeds.
- Identify and remove weeds in the local area, which could become a threat to the ecological community.

Trampling, Browsing and Grazing

- Manage known sites in reserve areas and on private property to exclude feral deer such as Rusa, Sambar and Hog Deer.
- Control feral animals by appropriate means.

Fire

- Implement hazard reduction zones in the vicinity of remnants of the listed ecological community and fire suppression which includes keeping stand margins in as weed-free a condition as possible.

This list does not necessarily encompass all actions that may be of benefit to this ecological community, but highlights those that are considered to be of highest priority at the time of listing.

Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - Attachment A

FLORA SPECIES OF LITTORAL RAINFOREST AND COASTAL VINE THICKETS OF EASTERN AUSTRALIA BY BIOREGION

Note 1: This ecological community is defined by habitat expressed in terms of structure, flora composition and ecology in response to coastal processes. Whilst species can be regionally predictable, there may be considerable variation in the composition of individual stands of the ecological community within any given bioregion. The diagnostic characteristics presented in the listing advice should be considered when determining the presence or absence of this ecological community.

Note 2: This flora list is not exhaustive. Additional rainforest species encountered when surveying a site need to be included when determining the condition thresholds. Species in this list may not always be exclusive to this ecological community.

1 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community

CAPE YORK PENINSULA

FLORA SPECIES		
Trees	Trees *(continued)*	Shrubs (*continued*)
Acacia crassicarpa *Acacia polystachya* *Acacia solenota* *Aglaia elaeagnoidea* *Aidia racemosa* *Alectryon reticulatus* *Araucaria cunninghamii* *Arytera bifoliolata* *Asteromyrtus angustifolia* *Atractocarpus sessilis* *Beilschmiedia obtusifolia* *Bossiaea arenicola* *Buchanania arborescens* *Canarium australianum* *Celtis philippensis* var. *philippensis* *Choriceras tricorne* *Cochlospermum gillivraei* *Cryptocarya cunninghamii* *Cupaniopsis anacardioides* *Dinosperma erythrococcum* *Diospyros compacta* *Diospyros maritima* *Drypetes deplanchei* *Elaeodendron melanocarpum* *Emmenosperma cunninghamii* *Endiandra glauca* *Erythrina variegata* *Eugenia reinwardtiana* *Exocarpos latifolius* *Ficus opposita* *Ganophyllum falcatum* *Garuga floribunda* var. *floribunda* *Guettarda speciosa* *Gyrocarpus americanus* *Halfordia kendack* *Litsea glutinosa* *Mallotus nesophilus* *Manilkara kauki*	*Mimusops elengi* *Neofabricia myrtifolia* *Niemeyera antiloga* *Pisonia grandis* *Polyalthia nitidissima* *Pouteria sericea* *Premna dallachyana* *Premna serratifolia* *Rhodamnia fordii* *Stenocarpus verticis* *Sterculia quadrifida* *Strychnos lucida* *Syzygium bamagense* *Syzygium banksii* *Syzygium suborbiculare* *Terminalia muelleri* *Vavaea amicorum* *Vitex acuminata* *Xanthostemon arenarius* Shrubs *Antirhea ovatifolia* *Capparis lucida* *Carissa laxiflora* *Croton arnhemicus* *Eugenia reinwardtiana* *Glycosmis trifoliata* *Ixora timorensis*	*Leucopogon ruscifolius* *Leucopogon yorkensis* *Lithomyrtus obtusa* *Memecylon pauciflorum* var. *pauciflorum* *Micromelum minutum* *Pemphis acidula* *Suriana maritima* *Tabernaemontana orientalis* *Triflorensia australis* *Vitex acuminata* Forbs *Xenostegia tridentata* Lilies *Dianella pavopennacea* Vines *Abrus precatorius* *Alyxia spicata* *Asparagus racemosus* *Capparis sepiaria* *Cassytha filiformis* *Flagellaria indica* Orchid (epiphytic and ground) *Dendrobium discolor*
TRANSFORMER WEEDS		
Annona glabra *Bidens pilosa* var. *pilosa* *Cryptostegia grandiflora* *Hyptis suaveolens* *Lantana camara* *Senna siamea*		

2 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - WET TROPICS

FLORA SPECIES		
Trees	*Trees (continued)*	*Trees (continued)*
Acacia crassicarpa	*Diospyros maritima*	*Millettia pinnata*
Acacia oraria	*Drypetes deplanchei*	*Mimusops elengi*
Acacia polystachya	*Dysoxylum latifolium*	*Mischocarpus exangulatus*
Acmena hemilampra subsp. hemilampra	*Dysoxylum oppositifolium*	*Myristica insipida*
	Dysoxylum setosum	*Myrsine porosa*
Acronychia acronychioides	*Elaeocarpus bancroftii*	*Normanbya normanbyi*
Aidia cowleyi	*Elaeocarpus michaelii*	*Ormosia ormondii*
Alectryon connatus	*Elaeodendron melanocarpum*	*Palaquium galactoxylum*
Aleurites moluccana	*Elattostachys microcarpa*	*Paraserianthes toona*
Alphitonia excelsa	*Emmenosperma cunninghamii*	*Planchonia careya*
Anthocarapa nitidula	*Endiandra glauca*	*Pleiogynium timorense*
Antidesma erostre	*Endiandra hypotephra*	*Pleomele angustifolia*
Antirhea tenuiflora	*Endospermum myrmecophilum*	*Podocarpus grayae*
Archidendron grandiflorum	*Euroschinus falcatus*	*Polyalthia nitidissima*
Archontophoenix alexandrae	*Exocarpos latifolius*	*Polyscias australiana*
Arenga australasica	*Ficus destruens*	*Polyscias elegans*
Argyrodendron polyandrum	*Ficus obliqua var. obliqua*	*Pouteria chartacea*
Arytera divaricata	*Ficus opposita*	*Pouteria obovata*
Backhousia hughesii	*Ficus racemosa*	*Pouteria sericea*
Beilschmiedia obtusifolia	*Ficus variegata var. variegata*	*Pouteria xerocarpa*
Blepharocarya involucrigera	*Ficus virens*	*Psydrax banksii*
Brackenridgea australiana	*Flindersia bourjotiana*	*Psydrax tropica*
Brucea javanica	*Ganophyllum falcatum*	*Ptychosperma elegans*
Buchanania arborescens	*Garuga floribunda var. floribunda*	*Randia fitzalanii*
Calophyllum inophyllum	*Glochidion harveyanum var. harveyanum*	*Rhodamnia spongiosa*
Calophyllum sil		*Rhodomyrtus macrocarpa*
Canarium australianum	*Gmelina dalrympleana*	*Sarcopteryx reticulata*
Canarium vitiense	*Gomphandra australiana*	*Schefflera actinophylla*
Carallia brachiata	*Grevillea baileyana*	*Scolopia braunii*
Castanospermum australe	*Guettarda speciosa*	*Semecarpus australiensis*
Celtis paniculata	*Guioa acutifolia*	*Syzygium angophoroides*
Cerbera floribunda	*Heritiera littoralis*	*Syzygium banksii*
Chionanthus ramiflorus	*Hibiscus tiliaceus*	*Syzygium forte subsp. forte*
Cleistanthus apodus	*Intsia bijuga*	*Syzygium kuranda*
Cryptocarya cunninghamii	*Ixora timorensis*	*Syzygium monospermum*
Cryptocarya exfoliata	*Lepiderema sericolignis*	*Terminalia arenicola*
Cryptocarya hypospodia	*Lepidozamia hopei*	*Terminalia muelleri*
Cryptocarya triplinervis var. riparia	*Licuala ramsayi*	*Thespesia populnea*
Cryptocarya vulgaris	*Litsea bindoniana*	*Vavaea amicorum*
Cupaniopsis anacardioides	*Litsea breviumbellata*	*Wilkea pubescens*
Darlingia darlingiana	*Litsea fawcettiana*	*Wrightia laevis*
Dillenia alata	*Litsea glutinosa*	*Xylopia maccreae*
Diospyros compacta	*Melaleuca leucadendra*	
Diospyros cupulosa	*Melia azedarach*	
Diospyros hebecarpa	*Miliusa brahei*	

3 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community – WET TROPICS (continued)

Shrubs	Herbs	Vines (continued)
Aglaia elaeagnoidea *Aglaia meridionalis* *Alchornea rugosa* *Allophylus cobbe* *Atractocarpus sessilis* *Capparis lucida* *Clausena brevistyla* *Codiaeum variegatum var. moluccanum* *Cordyline cannifolia* *Cyclophyllum multiflorum* *Dichapetalum papuanum* *Eugenia reinwardtiana* *Gardenia actinocarpa* *Glycosmis trifoliata* *Harpullia rhyticarpa* *Ixora biflora* *Linospadix minor* *Lithomyrtus obtusa* *Mackinlaya confusa* *Maytenus fasciculiflora* *Micromelum minutum* *Morinda citrifolia* *Opilia amentacea* *Pilidiostigma papuanum* *Pisonia aculeata* *Pittosporum rubiginosum* *Psychotria dallachiana* *Rhodomyrtus trineura* subsp. *trineura* *Salacia chinensis* *Tabernaemontana orientalis* *Tabernaemontana pandacaqui* *Vitex trifolia* var. *trifolia* *Ximenia Americana*	*Achyranthes aspera* *Amorphophallus glabra* *Cyrtococcum oxyphyllum* *Dianella bambusifolia* *Hypolytrum nemorum* *Oplismenus hirtellus subsp. imbecillis* *Pseuderanthemum variabile* Vines *Abrus precatorius* *Alyxia spicata* *Calamus australis* *Calamus caryotoides* *Cansjera leptostachya* *Capparis sepiaria* *Cassytha filiformis* *Cissus hastata* *Colubrina asiatica var. asiatica* *Connarus conchocarpus* subsp. *conchocarpus* *Derris sp. Daintree (D.E.Boyland+ 469)* *Flagellaria indica* *Gynochthodes sessilis* *Hibbertia scandens* *Hippocratea barbata* *Hoya australis subsp. tenuipes* *Hugonia jenkinsii* *Hypserpa decumbens* *Hypserpa laurina* *Jasminum elongatum* *Mallotus repandus* *Melodorum uhrii* *Mucuna gigantea* *Neosepicaea jucunda* *Pachygone ovata*	*Parsonsia velutina* *Pycnarrhena novoguineensis* *Rhamnella vitiensis* *Rourea brachyandra* *Salacia chinensis* *Salacia disepala* *Sarcopetalum harveyanum* *Secamone elliptica* *Smilax australis* *Smilax blumei* *Smilax calophylla* *Stephania japonica* *Tetrastigma nitens* *Tetrastigma thorsborneorum* *Uvaria concava* *Vandasina retusa* Epiphytes *Bulbophyllum baileyi* *Cymbidium madidum* *Dendrobium discolor* var. *discolor* *Epipremnum pinnatum* *Ophioglossum pendulum* *Platycerium hillii* *Pyrrosia longifolia* *Vittaria ensiformis* *Ferns (terrestrial)* *Drynaria sparsisora* *Schizaea dichotoma* *Parasites* *Amyema glabra* *Amyema villiflora* subsp. *tomentilla* *Cassytha filiformis*
TRANSFORMER WEEDS		
Agave sp. (sisal hemp) *Cenchrus echinatus* *Hyptis suaveolens* *Lantana camara* *Opuntia* sp. (prickly pear) *Megathyrsus maximus* *Melinis minutiflora* *Passiflora foetida* *Passiflora suberosa* *Sphagneticola trilobata* *Tridax procumbens*		

4 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - CENTRAL MACKAY COAST/CENTRAL QUEENSLAND

FLORA SPECIES		
Trees *Acacia flavescens* *Acronychia laevis* *Aglaia elaeagnoidea* *Aidia racemosa* *Alectryon connatus* *Alphitonia excelsa* *Araucaria cunninghamii* *Arytera divaricata* *Banksia integrifolia* *Celtis paniculata* *Chionanthus ramiflorus* *Clerodendrum floribundum* *Corymbia tessellaris* *Cryptocarya triplinervis* *Cupaniopsis anacardioides* *Diospyros geminata* *Drypetes deplanchei* *Elaeodendron melanocarpum* *Euroschinus falcatus* *Exocarpos latifolius* *Ficus congesta* *Ficus opposita* *Ficus rubiginosa* *Ganophyllum falcatum* *Hibiscus tiliaceus* *Jagera pseudorhus* *Litsea glutinosa* *Livistona decora* *Mallotus philippensis* *Mimusops elengi* *Olea paniculata* *Pandanus tectorius* *Paraserianthes toona* *Pittosporum ferrugineum*	Trees (continued) *Planchonia careya* *Pleiogynium timorense* *Polyalthia nitidissima* *Pouteria sericea* *Psydrax odorata* *Schefflera actinophylla* *Scolopia braunii* *Sterculia quadrifida* *Xylosma ovatum* Shrubs *Alyxia ruscifolia* *Capparis lucida* *Clerodendrum inerme* *Cyclophyllum coprosmoides* *Eugenia reinwardtiana* *Lithomyrtus obtusa* *Micromelum minutum* *Psychotria polyostemma* *Tabernaemontana orientalis* Vines *Alyxia spicata* *Cissus opaca* *Eustrephus latifolius* *Hoya australis* *Jasminum didymum* *Jasminum simplicifolium subsp. australiense* *Sarcostemma viminale subsp. brunonianum* *Smilax australis* *Stephania japonica* *Trophis scandens* subsp. *scandens*	Herbs *Dianella caerulea* *Pseuderanthemum variabile* Sedges *Gahnia aspera* *Cyperus eglobosus* *Cyperus enervis* Grasses *Imperata cylindrica* *Oplismenus* spp. Orchids (epiphytic and ground) *Dendrobium discolor* Ferns *Drynaria sparsisora* *Microsorum punctatum*
TRANSFORMER WEEDS		
Cryptostegia grandiflora *Lantana camara* *Megathyrsus maximus* (var. *maximus* and var. *pubiglumis*) *Passiflora suberosa*		

5 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - NORTHERN SOUTH EASTERN QUEENSLAND

FLORA SPECIES		
Trees *Acacia disparrima (A. aulacocarpa)* *Acronychia imperforata* *Acronychia laevis* *Aidia racemosa* *Alectryon connatus* *Alectryon tomentosus* *Alphitonia excelsa* *Arytera divaricata* *Bridelia leichhardtii* *Capparis arborea* *Celtis paniculata* *Clerodendrum floribundum* *Corymbia tessellaris* *Cryptocarya triplinervis* *Cupaniopsis anacardioides* *Cupaniopsis shirleyana* *Diospyros fasciculosa* *Diospyros geminata* *Drypetes deplanchei* *Elaeodendron melanocarpum* *Euroschinus falcatus* *Exocarpos latifolius* *Ficus rubiginosa* *Ficus opposita* *Fitzalania* sp. *Gregory River (J.Randall 624)* *Geijera salicifolia* *Glochidion lobocarpum* *Harpullia hillii*	Trees (continued) *Ixora queenslandica* *Jagera pseudorhus* *Livistona decora* *Mallotus discolor* *Maytenus disperma* *Petalostigma pubescens* *Pittosporum ferrugineum* *Pleiogynium timorense* *Polyalthia nitidissima* *Polyscias elegans* *Pouteria sericea* *Psychotria loniceroides* *Psydrax odorata* *Scolopia braunii* *Sterculia quadrifida* *Xylosma ovatum* Shrubs *Alyxia ruscifolia* *Breynia oblongifolia* *Carissa ovata* *Cyclophyllum coprosmoides* *Micromelum minutum* *Pavetta australiensis* *Pittosporum revolutum* *Psychotria loniceroides* *Myrsine variabilis* *Turraea pubescens*	Vines *Cissus opaca* *Eustrephus latifolius* *Flagellaria indica* *Hoya australis* *Jasminum didymum* *Jasminum simplicifolium* subsp. *australiense* *Geitonoplesium cymosum* *Melodorum leichhardtii* *Pandorea pandorana* *Pleogyne australis* *Sarcostemma viminae subsp. brunonianum* *Trophis scandens* subsp. *scandens* *Smilax australis* *Stephania japonica* var. *discolor* *Secamone elliptica* Forbs *Pseuderanthemum variabile* Ferns *Microsorum punctatum* Grasses *Ancistrachne uncinulata* *Imperata cylindrica* Sedges *Cyperus eglobosus*
TRANSFORMER WEEDS		
Lantana camara *Megathyrsus maximus (*var. *maximus* and var. *pubiglumis)* *Passiflora suberosa* *Psidium guajava* *Schinus terebinthifolius* *Cryptostegia grandiflora*		

FLORA SPECIES

Trees	Trees (continued)	Shrubs (continued)
Acacia disparrima	*Jagera pseudorhus**	*Rhysotoechia bifoliolata*
*Acacia maidenii**	*Litsea australis**	*Senna acclinis*
*Acacia melanoxylon**	*Litsea reticulata*	*Sterculia quadrifida*
Acmena hemilampra subsp. *hemilampra*	*Livistona australis*	*Symplocos stawellii*
Acmena smithii	*Lophostemon confertus*	*Synoum glandulosum*
Acronychia imperforata	*Macaranga tanarius**	*Wikstroemia indica*
Acronychia littoralis	*Mallotus discolor*	Epiphytes
Acronychia oblongifolia	*Mallotus philippensis*	*Asplenium australasicum*
Acronychia wilcoxiana	*Melia azedarach**	*Davallia solida var pyxidata*
*Alectryon coriaceus**	*Melicope vitiflora**	*Platycerium bifurcatum*
Alphitonia excelsa	*Mischocarpus pyriformis**	*Pyrrosia confluens*
*Aphananthe philippinensis**	*Notelaea longifolia**	*Vines and scramblers*
Archidendron grandiflorum	*Olea paniculata*	*Austrosteenisia blackii*
Archidendron hendersonii	*Pararchidendron pruinosum var. pruinosum**	*Cayratia clematidea*
Archontophoenix cunninghamiana	*Pilidiostigma rhytispermum**	*Cissus antarctica*
Arytera divaricata	*Pittosporum undulatum**	*Cissus hypoglauca*
Baloghia inophylla	*Podocarpus elatus*	*Cissus sterculiifolia*
*Banksia integrifolia subsp. integrifolia**	*Polyalthia nitidissima**	*Cynanchum elegans*
Bridelia exaltata	*Polyscias elegans**	*Dioscorea transversa*
*Callistemon salignus**	*Pouteria australis*	*Embelia australiana*
Callitris columellaris	*Pouteria chartacea**	*Flagellaria indica*
Celtis paniculata	*Pouteria myrsinoides**	*Geitonoplesium cymosum*
*Claoxylon australe**	*Pouteria queenslandica*	*Hibbertia scandens*
*Clerodendrum floribundum**	*Psydrax lamprophylla**	*Hoya australis*
*Clerodendrum tomentosum**	*Psydrax odorata**	*Maclura cochinchinensis*
*Commersonia bartramia**	*Rhodamnia acuminata*	*Marsdenia rostrata*
*Commersonia fraseri**	*Rhodamnia argentea**	*Morinda jasminoides*
Cryptocarya foetida	*Rhodomyrtus psidioides**	*Pandorea pandorana*
Cryptocarya triplinervis	*Sarcomelicope simplicifolia**	*Parsonsia straminea*
*Cupaniopsis anacardioides**	*Scolopia braunii**	*Ripogonum album*
Dendrocnide photinophylla	*Syzygium australe*	*Sarcopetalum harveyanum*
*Diospyros australis**	*Syzygium francisii*	*Smilax australis*
Diospyros fasciculosa	*Syzygium hodgkinsoniae*	*Smilax glyciphylla*
Diospyros geminata	*Syzygium leuhmannii*	*Stephania japonica*
Diospyros pentamera	*Syzygium moorei*	Herbs
Drypetes deplanchei subsp. *deplanchei*	*Syzygium oleosum**	*Alocasia brisbanensis*
*Duboisia myoporoides**	*Toechima tenax**	*Aneilema acuminatum*
Dysoxylum fraserianum	*Trema tomentosa* var. *aspera**	*Calochlaena dubia*
Elaeocarpus obovatus	*Trochocarpa laurina**	*Commelina diffusa*
Elaeocarpus reticulatus	*Wilkiea hugeliana**	*Dianella caerulea*
*Elattostachys nervosa**	Shrubs	*Doodia aspera*
*Endiandra discolor**	*Breynia oblongifolia*	*Gahnia aspera*
*Endiandra sieberi**	*Capparis arborea*	*Gymnostachys anceps*
*Ficus coronata**	*Cordyline congesta*	*Hypolepis muelleri*
*Ficus fraseri**	*Cordyline rubra*	*Lomandra longifolia*
Ficus macrophylla	*Cordyline stricta*	*Monococcus echinophorus*
Ficus obliqua	*Cyclophyllum coprosmoides*	*Oplismenus imbecillis*
Ficus rubiginosa	*Elaeodendron australe*	*Ottochloa gracillima*
Ficus superba var. *henneana*	*Eupomatia laurina*	*Ottochloa nodosa*
Ficus watkinsiana	*Euroschinus falcatus*	*Pellaea falcata* var. *falcata*
Flindersia bennettiana	*Exocarpus latifolius*	*Pteridium esculentum*
Flindersia schottiana	*Hibiscus heterophyllus*	*Scleria sphacelata*

6 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - SOUTHERN SOUTH EASTERN QUEENSLAND AND NSW NORTH COAST (continued).

FLORA SPECIES		
Trees	Shrubs	Shrubs
*Glochidion ferdinandi var. ferdinandi**	*Homalanthus populifolius*	*Psychotria loniceroides*
*Glochidion sumatranum**	*Myrsine variabilis*	
Guioa acutifolia	*Neolitsea dealbata*	
*Guioa semiglauca**	*Pittosporum multiflorum*	
*Halfordia kendack**	*Pittosporum revolutum*	
*Harpullia hillii**		
*Harpullia pendula**		
Hodgkinsonia ovatiflora		

TRANSFORMER WEEDS
Anredera cordifolia
Asparagus aethiopicus
Asparagus africanus
Asparagus plumosus
Brachiaria mutica
Cardiospermum grandiflorum
Delairea odorata
Desmodium uncinatum
Chrysanthemoides monilifera subsp. *rotundata*
Gloriosa superba
Ipomoea cairica
Lantana camara
Macfadyena unguis-cati
Megathyrsus maximus var. *maximus*
Ochna serrulata
Schefflera actinophylla
Schinus terebinthifolius
Senna pendula var. *glabrata*

Note 1: Species with * are trees and shrubs

7 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - SYDNEY BASIN

FLORA SPECIES	
Trees	Shrubs
Acmena smithii	*Breynia oblongifolia*
Acronychia oblongifolia	*Notelaea longifolia*
Banksia integrifolia	*Pittosporum revolutum*
Claoxylon australe	*Syzygium paniculatum*
Cupaniopsis anacardioides	
Diospyros pentamera	Vines/Creepers
Elaeodendron australe	*Cissus antarctica*
Eucalyptus botryoides	*Cissus hypoglauca*
Eupomatia laurina	*Eustrephus latifolius*
Ficus obliqua	*Geitonoplesium cymosum*
Glochidion ferdinandi	*Hibbertia scandens*
Guioa semiglauca	*Marsdenia rostrata*
Livistona australis	*Parsonsia straminea*
Pittosporum undulatum	*Smilax australis*
Podocarpus elatus	*Stephania japonica*
Myrsine howittiana	
Sarcomelicope simplicifolia	Ferns
Synoum glandulosum	*Pellaea falcata*
TRANSFORMER WEEDS	
Asparagus aethiopicus *Chrysanthemoides monilifera* *Delairea odorata* *Ehrharta erecta* *Lantana camara* *Senna pendula* *Tradescantia albiflora* (just goes across ground layer, not into canopy, but still impacts on the ecological community significantly if infestation is thick)	

8 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - SOUTHEAST CORNER

SPECIES		
Trees	Vines	Forbs (continued)
Acacia caerulescens	*Aphanopetalum resinosum*	*Solanum stelligerum*
Acacia maidenii	*Cassytha phaeolasia*	*Stellaria flaccida*
Acacia mearnsii	*Celastrus australis*	*Tetragonia tetragonioides*
Acmena smithii	*Cissus antarctica*	*Urtica incisa*
Acronychia oblongifolia	*Cissus hypoglauca*	*Veronica plebeia*
Alectryon subcinereus	*Clematis glycinoides* var. *glycinoides*	*Viola eminens*
Banksia integrifolia subsp. integrifolia	*Eustrephus latifolius*	
Claoxylon australe	*Geitonoplesium cymosum*	Ferns
Commersonia fraseri	*Glycine clandestina*	*Asplenium flabellifolium*
Commersonia rossii	*Hibbertia dentata*	*Doodia aspera*
Elaeocarpus reticulatus	*Hibbertia scandens*	*Pellaea falcata s.s.*
Elaeodendron australe var. australe	*Kennedia rubicunda*	*Pteridium esculentum*
Eucalyptus botryoides	*Marsdenia rostrata*	*Pteris tremula*
Exocarpos cupressiformis	*Morinda jasminoides*	
Ficus coronata	*Muehlenbeckia adpressa*	Epiphytes and/or Lithophytes
Ficus rubiginosa	*Pandorea pandorana*	*Asplenium australasicum*
Glochidion ferdinandi var. ferdinandi	*Parsonsia straminea*	*Dendrobium speciosum*
Livistona australis	*Rhagodia candolleana*	*Microsorum pustulatum subsp. pustulatum*
Monotoca elliptica s.s.	*Sarcopetalum harveyanum*	*Muellerina celastroides*
Myoporum acuminatum	*Smilax australis*	*Platycerium bifurcatum*
Myoporum insulare	*Stephania japonica* subsp. *discolor*	*Pyrrosia rupestris*
Myrsine howittiana	*Tetragonia implexicoma*	*Rumohra adiantiformis*
Notelaea longifolia forma longifolia	*Tylophora barbata*	
Pittosporum undulatum		
Pomaderris aspera	Forbs	Graminoids
	Apium prostratum subsp. *prostratum*	*Carex appressa*
Shrubs	*Commelina diffusa*	*Carex longebrachiata*
Acacia longifolia subsp sophorae	*Desmodium gunnii*	*Dianella caerulea s.l.*
Alyxia buxifolia	*Dichondra repens*	*Dianella tasmanica*
Breynia oblongifolia	*Euchiton gymnocephalus*	*Echinopogon ovatus*
Coprosma quadrifida	*Galium propinquum*	*Entolasia marginata*
Eupomatia laurina	*Geranium homeanum*	*Ficinia nodosa*
Goodenia ovata	*Hydrocotyle hirta*	*Gahnia aspera*
Helichrysum elatum	*Lagenophora stipitata*	*Gahnia melanocarpa*
Leucopogon parviflorus	*Lobelia anceps*	*Lachnagrostis billardierei*
Melicytus dentatus s.l.	*Lobelia purpurescens*	*Lepidosperma concavum*
Notelaea venosa	*Oxalis perennans*	*Lepidosperma gladiatum*
Olearia viscosa	*Plantago debilis*	*Libertia paniculata*
Omalanthus populifolius	*Plectranthus parviflorus*	*Lomandra longifolia*
Pittosporum revolutum	*Pseuderanthemum variabile*	*Luzula meridionalis*
Pomaderris oraria subsp. *calcicola*	*Rumex brownii*	*Microlaena stipoides* var. *stipoides*
Solanum aviculare	*Senecio linearifolius* var. *7*	*Notodanthonia longifolia*
Synoum glandulosum subsp. *glandulosum*	*Senecio minimus*	*Oplismenus hirtellus*
Trema tomentosa var. *viridis*	*Senecio tenuiflorus*	*Poa ensiformis*
Westringia fruticosa	*Solanum pungetium*	*Poa labillardierei*
	Solanum silvestre	*Zoysia macrantha*

8 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community - SOUTHEAST CORNER (continued)

TRANSFORMER WEEDS		
Acetosa sagittata *Agapanthus praecox* *Asparagus aethiopicus* *Asparagus asparagoides* *Asparagus densiflorus* *Asparagus plumosus* *Asparagus scandens* *Chlorophytum comosum* (spider plant) *Chrysanthemoides monolifera* subsp. *rotundata* *Coprosma repens* *Cortaderi selloana* (Pampas Grass) *Cotoneaster glaucophyllus* (large leaf) *Cotoneaster pannosus* (small leaf) *Crassula sp.* (long trailing) *Crassula multicava*	*Crataegus monogyna* *Delairea odorata* *Dolichos (=Dipogon) lignosus* *Eriobotrya japonica* (Loquat) *Festuca arundinacea* *Galium aparine* *Hedera helix* *Jasminum polyanthum* *Lantana camara* var. *camara* *Ligustrum lucidum* (large leaf) *Ligustrum sinense* *Ligustrum vulgare* *Lonicera fragrantissima* (hairy-stemmed version of *L. japonica)* *Lonicera japonica*	*Lycium ferrocissimum* *Olea europa subsp. cuspidata* *Opuntia* sp. *Oxalis incarnata* *Pennesetum clandestinum* *Phalaris* subsp. (previously *aquatica)* *Phoenix canariensis* *Pinus radiata* *Polygala myrtifolia* *Populus x canescens* *Rhaphiolepis indica* *Stenotaphrum secundatum* *Tradescantia albiflora* *Vinca major* *Zantedeschia aethiopica*

Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community – Attachment B

Species listed under the Environment Protection and Biodiversity Conservation Act 1999 as of April 2008 and associated with the Littoral Rainforest and Coastal Vine Thickets ecological community. [Vu: Vulnerable; En: Endangered; Ma: Listed Marine; Mi: Listed Migratory.]

Taxon group	Species	Common Name	EPBC Status
Plants	*Acacia caerulescens*	Buchan Blue Wattle	Vu
	Acronychia littoralis	Scented Acronychia	En
	Arenga australasica	Australian Arenga Palm	Vu
	Arthraxon hispidus	Hairy Jointgrass	Vu
	Asperula asthenes	Trailing Woodruff	Vu
	Asterolasia elegans	Jointed Baloghia	En
	Baloghia marmorata	Orara Boronia	Vu
	Boronia umbellata	Heart-leaved Bonewood	Vu
	Bosistoa selwynii	Yellow Satinheart	Vu
	Bosistoa transversa	Hoop Pine Orchid	Vu
	Bulbophyllum globuliforme	Northern Clematis	Vu
	Clematis fawcettii	Native Jute	Vu
	Corchorus cunninghamii	Corokia	En
	Corokia whiteana	Stinking Cryptocarya	Vu
	Cryptocarya foetida	Leafless Tongue Orchid	Vu
	Cryptostylis hunteriana	Wedge-leaf Tuckeroo	Vu
	Cupaniopsis shirleyana	White-flowered Wax Plant	Vu
	Cynanchum elegans	Davidson's Plum	En
	Davidsonia jerseyana	Smooth Davidson's Plum	En
	Davidsonia johnsonii	Thorny Pea	En
	Desmodium acanthocladum	Red-fruited Ebony	En
	Diospyros mabacea	Small-leaved Tamarind	Vu
	Diploglottis campbellii	Floyd's Walnut	Vu
	Durabaculum nindii	Rusty Rose Walnut	En
	Endiandra floydii	Ball Nut	En
	Endiandra hayesii	Southern Fontainea	En
	Floydia praealta	Coastal Fontainea	Vu
	Fontainea australis	Sweet Myrtle	Vu
	Fontainea oraria	Red Bopple Nut	Vu
	Gossia fragrantissima	Blue Tassel-fern	En
	Hicksbeachia pinnatifolia	Layered Tassel-fern	En
	Huperzia dalhousieana	Rough-shelled Bush Nut	Vu
	Huperzia phlegmarioides	Climbing Lignum, Native Sarsparilla	En
	Macadamia tetraphylla	Southern Swamp Orchid	Vu
	Medicosma obovata	Lady Tankerville's Swamp Orchid	Vu
	Muehlenbeckia australis	Quassia	En
	Neisosperma kilneri	Spiny Gardenia	En
	Ozothamnus eriocephalus	Eastern Australian Underground Orchid	Vu
	Phaius australis	Brush Sophora	Vu
	Phaius tankervilleae	Red Lilly Pilly	En
	Phalaenopsis rosenstromii	Rose Apple	En
	Quassia bidwillii	Magenta Lilly Pilly	En
	Randia moorei	Arrow-head Vine	Vu
	Rhizanthella slateri		En
	Sophora fraseri		En
	Syzygium hodgkinsoniae		Vu
	Syzygium moorei		Vu
	Syzygium paniculatum		Vu
	Tinospora tinosporoides		Vu
	Vappaculum superbiens		Vu

2 - Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community -

Taxon group	Species	Common Name	EPBC Status
Birds	*Amaurornis olivaceus*	Bush-hen	Ma
	Casuarius casuarius johnsonii	Southern Cassowary	En
	Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	En, Mi
	Ducula bicolor	Pied Imperial –Pigeon	Ma
	Erythrotriorchis radiatus	Red Goshawk	Vu
	Hirundapus caudacutus	White-throated needletail	Ma, Mi
	Merops ornatus	Rainbow Bee-eater	Ma, Mi
	Monarcha melanopsis	Black-face Monarch	Ma, Mi
	Monarcha trivirgatus	Spectacled Monarch	Ma, Mi
	Pandion haliaetus	Osprey	Ma, Mi
	Pterodroma leucoptera leucoptera	Gould's Petrel	En, Mi
	Ptilinopus superbus	Superb Fruit-dove	Ma
	Rhipidura rufifrons	Rufous Fantail	Ma, Mi
	Turnix melanogaster	Black-breasted Button-quail	Vu
Mammals	*Dasyurus hallucatus*	Northern Quoll	En
	Dasyurus maculatus maculatus	Spotted-tailed Quoll	En
	Petrogale persephone	Proserpine Rock-wallaby	En
	Potorous tridactylus tridactylus	Long-nosed Potoroo	Vu
	Pteropus conspicillatus	Spectacled Flying-fox	Vu
	Pteropus poliocephalus	Grey-headed Flying-fox	Vu
Frogs	*Litoria aurea*	Green and Golden Bell Frog	Vu
	Mixophyes balbus	Stuttering Barrred Frog	Vu
	Mixophyes iteratus	Giant Barred Frog	En

Attachment to Listing Advice for the Littoral Rainforest & Coastal Vine Thickets ecological community – Attachment C

Littoral Rainforest Mapping Data Sources:
9/08/07

NSW
Southeast NSW Native Vegetation Classification and Mapping – SCIVI

Attribute Mapped: p210 Temperate Littoral Rainforest

Accuracy: 20-50 m, 20-50k mapping
Endangered Ecological Communities Survey and Mapping, Coastal Vegetation Communities – Littoral Rainforest and Coastal Saltmarsh

Attribute Mapped: Validated areas of 167L – Littoral Rainforest and 5 -Bunga Head Littoral Rainforest

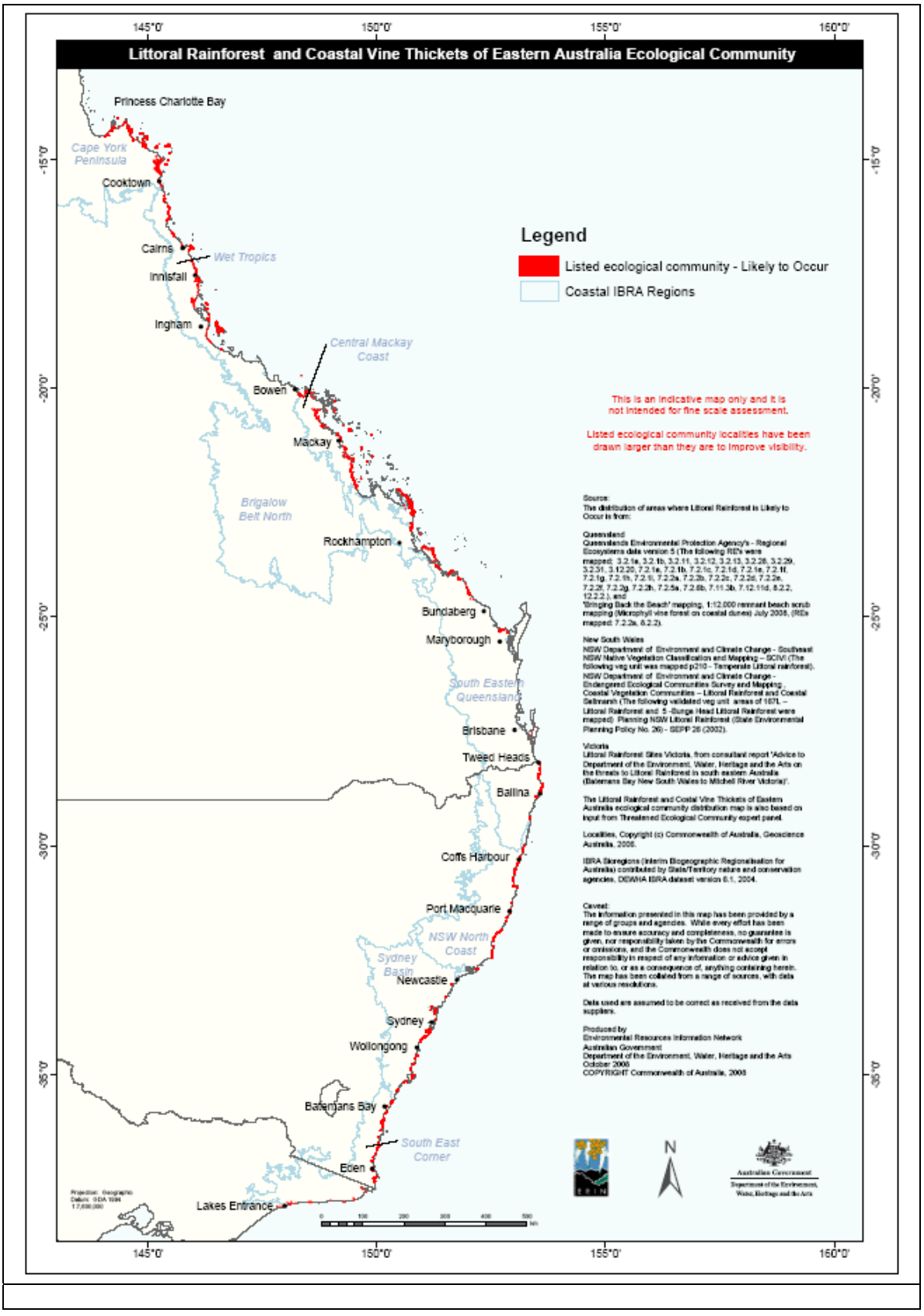
Accuracy: around 25m, 1:25k mapping
Littoral Rainforest (State Environmental Planning Policy No. 26) - SEPP 26

Attribute Mapped: All except 3 polygons removed as labelled exclude in data field

Accuracy: around 25 m, 1:25k mapping
QLD
Survey and Mapping of 2003 Remnant Vegetation Communities and Regional Ecosystems of Queensland, Version 5.0 (December 2005).

Attribute Mapped: Regional Ecosystems ('3.2.1a-b', '3.2.31', '3.2.29', '3.2.28', '3.2.13', '3.2.12', '3.2.11', '3.12.20', '12.2.2', '8.2.2', '7.2.5a', '7.2.6b', '7.11.3b', '7.12.11d', '7.2.1a-i, '7.2.2a-h')

Accuracy: 50 or 100 m, 50k or 100


Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community
145°0'
150°0'
155°0'
160°0'
-15°0'
-20°0'
-25°0'
-30°0'
-35°0'
Princess Charlotte Bay
Cape York Peninsula
Cooktown
Cairns
Wet Tropics
Innisfail
Ingham
Central Mackay Coast
Bowen
Mackay
Brigalow Belt North
Rockhampton
Bundaberg
Maryborough
South Eastern Queensland
Brisbane
Tweed Heads
Ballina
Coffs Harbour
Port Macquarie
NSW North Coast
Sydney Basin
Newcastle
Sydney
Wollongong
Batemans Bay
South East Corner
Eden
Lakes Entrance
Legend
Listed ecological community - Likely to Occur
Coastal IBRA Regions
This is an indicative map only and it is not intended for fine scale assessment.
Listed ecological community localities have been drawn larger than they are to improve visibility.
Source:
The distribution of areas where Littoral Rainforest is Likely to Occur is from:
Queensland
Queensland Environmental Protection Agency's - Regional Ecosystems data version 5 (The following REs were mapped: 3.2.1e, 3.2.1b, 3.2.1f, 3.2.1f3, 3.2.1f3, 3.2.2b, 3.2.2g, 3.2.3f, 3.12.2b, 7.2.1e, 7.2.1b, 7.2.1c, 7.2.1d, 7.2.1e, 7.2.1f, 7.2.1g, 7.2.1h, 7.2.1i, 7.2.2a, 7.2.2b, 7.2.2c, 7.2.2d, 7.2.2e, 7.2.2f, 7.2.2g, 7.2.2h, 7.2.5a, 7.2.6b, 7.11.3b, 7.12.11d, 8.2.2, 12.2.2.), and
'Bringing Back the Beach' mapping, 1:12,000 remnant beach scrub mapping (Microphyll vine forest on coastal dunes) July 2005, (REs mapped: 7.2.2a, 8.2.2).
New South Wales
NSW Department of Environment and Climate Change - Southeast NSW Native Vegetation Classification and Mapping – SCIVI (The following veg unit was mapped p210 - Temperate Littoral rainforest).
NSW Department of Environment and Climate Change - Endangered Ecological Communities Survey and Mapping - Coastal Vegetation Communities – Littoral Rainforest and Coastal Saltmarsh (The following validated veg unit areas of 1071 – Littoral Rainforest and 5 -Bunga Head Littoral Rainforest were mapped) Planning NSW Littoral Rainforest (State Environmental Planning Policy No. 26) - SEPP 26 (2002).
Victoria
Littoral Rainforest Sites Victoria, from consultant report 'Advice to Department of the Environment, Water, Heritage and the Arts on the threats to Littoral Rainforest in south eastern Australia (Batemans Bay New South Wales to Mitchell River Victoria)'.
The Littoral Rainforest and Costal Vine Thickets of Eastern Australia ecological community distribution map is also based on input from Threatened Ecological Community expert panel.
Localities, Copyright (c) Commonwealth of Australia, Geoscience Australia, 2006.
IBRA Bioregions (Interim Biogeographic Regionalisation for Australia) contributed by State/Territory nature and conservation agencies. DEWHA IBRA dataset version 6.1, 2004.
Caveat:
The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything contained herein. The map has been collated from a range of sources, with data at various resolutions.
Data used are assumed to be correct as received from the data suppliers.
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Department of the Environment, Water, Heritage and the Arts
October 2008
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Department of the Environment, Water, Heritage and the Arts

LATIN AND COMMON NAME SYNONYMY

Latin plant name synonymy between New South Wales and Victorian taxa	
New South Wales Latin name synonyms*	Victorian Latin name synonyms
Sydney Golden Wattle *Acacia longifolia*	Sallow Wattle *Acacia longifolia* ssp. *longifolia*
Coastal Wattle *Acacia sophorae*	Coast Wattle *Acacia longifolia* ssp. *sophorae*
NCN *Adriana glabrata*	Eastern Bitter-bush *Adriana tomentosa* var. *tomentosa*
Drooping Mistletoe *Amyema pendulum*	Drooping Mistletoe *Ameyema pendula*
Purple Appleberry *Billardiera macrantha*	Purple Appleberry *Billardiera longiflora*
Golden Everlasting *Bracteantha bracteata*	Golden Everlasting *Xerochrysum bracteatum*
No equivalent	Small-flower Flax-lily *Dianella brevicaulis*
Small-leaved Clematis *C. microphylla*	Small-leaved Clematis *C. microphylla* var. *microphylla*
Narrow-leaved Clematis *C. leptophylla*	Skeleton Vine *Clematis microphylla* var. *leptophylla*
Common Ground-fern *Culcita dubia*	Common Ground-fern *Calochlaena dubia*
Not recognised: lumped in with NCN *Cassytha pubescens*	Rusty Dodder-laurel *Cassytha phaeolasia*
NCN *Cassytha pubescens*	Downy Dodder-laurel *Cassytha pubescens*
Rock Lily *Dendrobium speciosum*	Rock Orchid *Thelychiton speciosus*
Not recognised: lumped in with NCN *Dianella revoluta*	Small-flower Flax-lily *Dianella brevicaulis*
Diplazium australe	Austral Lady-fern *Athyrium australe*
NCN *Doodia media* ssp. *australis*	Common Rasp-fern *Doodia australis*
Forest Red Gum *Eucalyptus tereticornis*	Not recognised in Victoria
Not recognised in New South Wales	Gippsland Red Gum *Eucalyptus tereticornis* ssp. *mediana*
Knobby Club-rush *Isolepis nodosa*	Knobby Club-rush *Ficinia nodosa*
Nestegis ligustrina	Privet Mock-olive *Notelaea ligustrina*
NCN *Stipa blackii*	Crested Spear-grass *Austrostipa blackii*
NCN *Stipa flavescens*	Coast Spear-grass *Austrostipa flavescens*
Japanese Lady-fern *Lanuthyrium petersonii*	Japanese Lady-fern *Deparia petersonii* ssp. *congrua*
Angled Lobelia *L. alata*	Angled Lobelia *L. anceps*
Kangaroo Fern *Microsorum diversifolium*	Kangaroo Fern *Microsorum pustulatum* ssp. *pustulatum*
Brush Muttonwood *Myrsine howittiana*	Muttonwood *Myrsine howittiana*
Privet Mock-olive *Nestegis ligustrina*	Privet Mock-olive *Notelaea ligustrina*
NCN: *Olearia stellulata*	Snowy Daisy-bush *Olearia lirata*
Basket-grass *Oplismenus imbecillis*	Australian Basket-grass *Oplismenus hirtellus*
Wonga Vine *Pandorea* sp. (Ipswich)*	Part of *Pandorea pandorana* s.l. (but absent from Victoria)
Sickle Fern *Pellaea falcata* var. *nana*	Dwarf Sickle Fern *Pellaea nana*
Native Shade Pellitory *Parietaria debilis*	Shade Pellitory *Parietaria debilis* s.l.
Veined Bristle-fern *Polyphlebium venosum*	Veined Bristle-fern *Crepidomanes venosum*
Elderberry Panax *Polyscias sambucifolia* ssp. A	Elderberry Panax *Polyscias sambucifolia* ssp. 1
Elderberry Panax *Polyscias sambucifolia* ssp. C	Ferny Panax *Polyscias sambucifolia* ssp. 2
Satinwood *Phebalium squameum* ssp. *squameum*	Satinwood *Nematolepis squamea* ssp. *squamea*
Whiteroot *Pratia purpurescens*	Whiteroot *Lobelia purpurescens*
NCN: not recognised as a taxon, though acknowledged as a hybrid between *Rubus moluccanus* and *Rubus parvifolius*	Hybrid Bramble *Rubus* x *novus*
Molucca Bramble *Rubus hilli*	Queensland Bramble *Rubus moluccanus* var. *trilobus*
Variable Groundsel *Senecio lautus* ssp. *maritimus*	Dune Groundsel *Senecio pinnatifolius* var. 2
No equivalent	Variable Groundsel *S. pinnatifolius* var. 7 (Eastern)

* A massive woody liane of Subtropical Rainforests (Harden pers. comm.) north from Fig Valley at Goalen Head (see Figure 301).

Common plant name synonymy between New South Wales and Victorian taxa	
New South Wales common name synonyms*	Victorian common name synonyms
Broad-leaf Hickory *Acacia falciformis*	Large-leaf Hickory *Acacia falciformis*
White Sally *Acacia floribunda*	White Sallow Wattle *Acacia floribunda*
Hickory Wattle *Acacia implexa*	Lightwood *Acacia implexa*
Sydney Wattle *Acacia longifolia*	Sallow Wattle *Acacia longifolia* ssp. *longifolia*
Coastal Wattle *Acacia sophorae*	Coast Wattle *Acacia longifolia* ssp. *sophorae*
Common Acronychia *A. oblongifolia*	Yellowwood *Acronychia oblongifolia*
Yellowwood *Sarcomelicope simplicifolia*	Not found in Victoria
Giant Maidenhair *Adiantum formosum*	Black Stem *Adiantum formosum*
Wild Quince *Alectryon subcinerus*	Native Quince *Alectryon subcinerus*
Port Jackson Pine *Callitris rhomboidea*	Oyster Bay Pine *Callitris rhomboidea*
Knob Sedge *Carex inversa*	Common Sedge *Carex inversa*
Dolly Bush *Cassinia longifolia*	Common Cassinia *C. longifolia*
Rock Fern *Cheilanthes austrotenuifolia*	Green Rock Fern *Cheilanthes austrotenuifolia*
Headache Vine *Clematis glycinoides*	Forest Clematis *C. glycinoides*
Southern Brush Kurrajong *Commersonia rossii*	Blackfellows Hemp *Commersonia* sp. aff. *fraseri*
Rock Lily *Dendrobium speciosum*	Rock Orchid *Thelychiton speciosus*
Forest Hedge-hog Grass *Echinopogon ovatus*	Common Hedge-hog Grass *Echinopogon ovatus*
Climbing Saltbush *Einadia nutans*	Nodding Saltbush *Einadia nutans*
Fishweed *Einadia trigonus*	Lax Goosefoot *Einadia trigonos* ssp. *trigonos*
Bangalay *Eucalyptus botryoides*	Southern Mahogany *Eucalyptus botryoides*
East Gippsland Peppermint *Eucalyptus croajingolensis*	Gippsland Peppermint *Eucalyptus croajingolensis*
Monkey Gum *Eucalyptus cypellocarpa*	Mountain Grey Gum *Eucalyptus cypellocarpa*
Ribbon Gum *Eucalyptus viminalis*	Manna Gum *Eucalyptus viminalis* ssp. *viminalis*
Pinkwood (Plumwood) Eucryphia moorei	Eastern Leatherwood *Eucryphia moorei*
Finger Fern Grammitis billardieri	Common Finger Fern *Grammitis billardieri*
Native Mulberry Hedycarya angustifolia	Austral Mulberry *Hedycarya angustifolia*
Twining Guinea-flower Hibbertia scandens	Trailing Guinea-flower *Hibbertia scandens*
Red Kennedy Pea/Red Coral Pea *Kennedia rubicunda*	Dusky Coral-pea *Kennedia rubicunda*
Hairy Milk Vine *Marsdenia flavescens*	Yellow Milk-vine *Marsdenia flavescens*
Native Storksbill *Pelergonium australe*	Austral Storksbill *Pelergonium australe*
Common Milk Vine *Marsdenia rostrata*	Milk Vine *Marsdenia rostrata*
Boobialla *Myoporum insulare*	Common Boobialla *Myoporum insulare*
Brush Muttonwood *Myrsine howittiana*	Muttonwood *Myrsine howittiana*
Narrow-leaved Clematis *C. leptophylla*	Skeleton Vine *Clematis microphylla* var. *leptophylla*
Native Tobacco *Nicotiana suaveolens*	Austral Tobacco *Nicotiana suaveolens*
Veined (Smooth) Mock-olive *Notelaea venosa*	Large Mock-olive *Notelaea venosa*
Native Musk (Silver Shrub) *Olearia argophylla*	Musk Daisy-bush *Olearia argophylla*
Wonga Wonga Vine *Pandorea pandorana*	Wonga Vine *Pandorea pandorana*
Native Shade Pellitory *Parietaria debilis*	Shade Pellitory *Parietaria debilis* s.l.
Native Stork's-bill *Pelergonium australe*	Austral Stork's-bill *Pelergonium australe*
Scaly Phebalium *P. squamulosum*	Forest Phebalium *P. squamulosum*
Pittosporum *P. undulatum*	Sweet Pittosporum *P. undulatum*
Tussock *Poa labillardierei*	Common Tussock-grass *Poa labillardierei*
Molucca Bramble *Rubus hilli*	Queensland Bramble *Rubus moluccanus* var. *trilobus*
Swamp Dock *Rumex brownii*	Slender Dock *Rumex brownii*
Native Elderberry *Sambucus australasica*	Yellow Elderberry *Sambucus australasica*
Sandalwood *Santalum obtusifolium*	Blunt Sandalwood *Santalum obtusifolium*
Sarsaparilla *Smilax australis*	Austral Sarsaparilla *Smilax australis*
Large-flowered Kangaroo Apple *Solanum laciniatum*	Large Kangaroo Apple *Solanum laciniatum*
Southern Nightshade *Solanum silvestre*	Violet Nightshade *Solanum silvestre*
Umbrella Fern *Sticherus flabellatus*	Shiny Fan-fern *Sticherus flabellatus* var. *flabellatus*
Mountain Pepperbush *Tasmannia lanceolata*	Mountain Pepper *Tasmannia lanceolata*
Wiry Wire-grass *Tetrarrhena juncea*	Forest Wire-grass *Tetrarrhena juncea*
King Fern *Todea barbara*	Austral King-fern *Todea barbara*

Newly described taxa	
Old taxon name	New taxon name
Brush Kurrajong *Commersonia* sp. aff *fraseri* (NSW) Blackfellows Hemp *Commersonia* sp. 1 (Victoria)	Southern Brush Kurrajong *Commersonia rossii*
Violet Nightshade *Solanum brownii*	Southern Nightshade *Solanum silvestre*
Part of Forest Clematis *C. glycinoides* var. *submutica*	Tropical Clematis *C. pickerinii*

Name changes in the recent past (last 5 years or so): see also newly described taxa	
Old taxon name	New taxon name
Lilly Pilly *Acmena smithii*	Lilly Pilly *Syzygium smithii*
Common Blown-grass *Agrostis avenacea*	Common Blown-grass *Lachnagrostis filiformis*
Tall Baeckia *Baeckia virgata*	Tall Baeckia *Sannantha pluriflora* (then: see next entry below)
Tall Baeckia *Babingtonia pluriflora*	Tall Baeckia *Sannantha pluriflora*
Common Appleberry *Billardiera scandens*	Common Appleberry *Billardiera mutabilis*
Red Olive Plum *Cassine australis*	Red Olive Plum *Elaeodendron australe* var. *australe*
Coast Cassinia *C. uncata*	Coast Cassinia *C. maritima*
Orange Thorn *Citriobatus pauciflorus*	Orange Thorn *Pittosporum pauciflorus*
Small-leaved Clematis *C. microphylla* var. *microphylla*	Slender Clematis *C. decipiens*
Scurvy Grass *Commelina cyanea*	Scurvy Grass *Commelina diffusa*
Rock Lily *Dendrobium speciosum*	Rock Lily *Thelichiton speciosum*
Ironbark Orchid *Dendrobium aemulum*	Ironbark Orchid *Dockrilla aemulum*
Tongue Orchid *Dendrobium linguiforme*	Tongue Orchid *Dockrilla linguiforme*
Dagger Orchid *Dendrobium pugioniforme*	Dagger Orchid *Dockrilla pugioniforme*
Streaked Rock Orchid *Dendrobium striolatum*	Streaked Rock Orchid *Dockrilla striolatum*
Rat's Tail Orchid *Dendrobium teretifolium*	Rat's Tail Orchid *Dockrilla teretifolium*
Rock Wax-flower *Eriostemon trachyphyllus*	Rock Wax-flower *Philotheca trachyphylla*
Tree Violet *Hymenanthera dentata*	Tree Violet *Melicytus dentatus*
Burgan *Kunzea eriocoides* spp. agg.	Burgan *Kunzea ericoides s.l.*
Climbing Lignum *Muehlenbeckia adpressa*	Climbing Lignum *Muehlenbeckia australis*
Whiteroot *Pratia purpurescens*	Whiteroot *Lobelia purpurescens*
Jersey Cudweed *Pseudognaphalium luteoalbum*	Jersey Cudweed *Helichrysum luteoalbum*
Hairy Psychotria *P. loniceriodes*	Hairy Psychotria *Chelicanthes loniceroides*
Muttonwood *Rapanea howittiana*	Muttonwood *Myrsine howittiana*
Variable Muttonwood *Rapanea variabilis*	Variable Muttonwood *Myrsine variabilis*
Fireweed Groundsel *Senecio linearifolius* var. 7 (Eastern variant)	Fireweed Groundsel *Senecio linerifolius* var. *denticulatus*
Narrow Groundsel *Senecio tenuiflorus*	Narrow Groundsel *Senecio prenanthoides*
Grass Triggerplant *Stylidium graminifolium*	Common Triggerplant *Stylidium armeria*
Ivy-leaf Violet *Viola hederacea sensu* Willis (1972)	Ivy-leaf Violet *Viola hederacea sensu* Entwhistle
Sprawling Bluebell *Wahlenbergia gracilis s.l.*	Sprawling Bluebell *Wahlenbergia gracilis s.s.*

*NCN=no common name; Common name and Latin names are sourced from the Flora Information System data base for Victoria, whilst for the New South Wales it is, in the first instance: the Flora of New South Wales [Harden (1990); Harden (1991); Harden (1992); Harden (1993)] and secondarily: Fairly and Moore (1989).

Vegetation typology synonymy*

Differences in nomenclature for the same vegetation between Victoria and New South Wales can lead to confusion. The following table equates the different terminology so that workers in either state can interpret the terms used in the Manual and its Supplement.

Vegetation synonymy (at EVC level) between New South Wales and Victoria	
New South Wales Ecological Community	Victorian Ecological Vegetation Class
Acacia Scrub (Map Unit 4) of Keith and Bedward (1999)	**Blackthorn Scrub** (Woodgate *et al.*. 1993)
Bega Dry Grass Forest (Map Unit 20) and Candelo Dry Grass Forest (Map Unit 21) of Keith and Bedward (1999) Listed as **Lowland Grassy Woodland** of the South East Corner Bioregion	**Plains Grassy Woodland** (EVC) *Gippsland* **Plains Grassy Woodland** (FC)
All referrable to: Keith and Bedward (1999) *Lowland* **Dry Shrub Forest** (Map Unit 46B); *Coastal* **Dry Shrub Forest** (Map Unit 49); and *Genoa* **Dry Shrub Forest** (Map Unit 50).	**Lowland Forest** (Woodgate *et al.*. 1993)
Dune **Dry Shrub Forest**	**Banksia Woodland** (Woodgate *et al.*. 1993)
Bunga Head Dry Rainforest (typology i.e. '**Dry**' misapplied)	*Rhyolite Cliffs* **Littoral Rainforest** (this publication)
Dry Rainforest (Map Unit 1) of Keith and Bedward (1999) Listed as: **Dry Rainforest** of the South East Forests	**Dry Rainforest** (Woodgate *et al.*. 1993)
Coast Wet Fern Forest (Map Unit 33) of Beukers and Miles (in prep.)	**Damp Forest** (Woodgate *et al.*. 1993)
Hinterland Wet Fern Forest (Map Unit 13) of Keith and Bedward (1999)	**Wet Forest** (Woodgate *et al.*. 1993)
Swamp Oak Forest (Map Unit 1) of Keith and Bedward (1999)	No equivalent
Riparian Oak Forest (Map Unit 1) of Keith and Bedward (1999)	No equivalent

* Vegetation typology units in **bold** are the EVC equivalents between States; names in *italics* are Floristic Communities.