

Biodiversity Landscape Planning Guideline: a framework for managing biodiversity values at a landscape scale in areas regulated under the Tasmanian forest practices system



Forest Practices Authority, Hobart

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Note: This document is an advisory guideline and does not replace the need to meet the mandatory requirements of the *Forest Practices Code*.

Glossary

Adaptive management: The process of responding positively to change. The term adaptive management is used to describe an approach to managing complex natural systems that builds on common sense and learning from experience, experimenting, monitoring, and adjusting practices based on what was learnt.

Agreed procedures: The procedures agreed between the FPA and DPIPWE for the management of threatened species under the forest practices system, available on the FPA's website: (<http://dpiuwe.tas.gov.au/Documents/Final%20signed%20Procedures%20for%20the%20management%20of%20threatened%20species.pdf>)

Biodiversity: A concept encompassing the diversity of indigenous species, their genes and the ecosystems occurring in a given region. It includes 'genetic diversity', which reflects the diversity within each species; 'species diversity', which is the variety of species; and 'ecosystem diversity', which is the diversity of different communities formed by living organisms and the relations between them. Biodiversity is the variety of all life forms—the plants, animals and microorganisms—the genes they constitute, and the ecosystems they inhabit.

Biodiversity Review Panel: A panel of experts convened by the FPA to review and to provide advice on the science behind the biodiversity provisions of the Tasmanian *Forest Practices Code*.

CAR Reserve system: Comprehensive, Adequate and Representative reserve system, as defined in the Tasmanian Regional Forest Agreement 1997.

CFEV major drainage catchments: catchments created by aggregating River Section Catchments until they resembled the original Land and Water Management Catchments commonly used by water managers and scientists within Tasmania.

Conservation of Freshwater Ecosystem Values (CFEV) Program: An initiative of the Department of Primary Industries, Parks, Water and Environment (DPIPWE). Its aim is to ensure that priority freshwater values are appropriately considered in the development, management and conservation of the state's water resources.

Coupe: An area of forest that is planned for timber harvesting as a single unit. It may contain more than one silvicultural objective, such as a number of discrete gaps or clearfells or a combination of both.

Declared weeds: A plant declared to be a weed under section 9 or 10 of the *Weed Management Act 1999*.

DPIPWE: Department of Primary Industries, Parks, Water and Environment, which includes the Resources Management and Conservation Division and the Threatened Species Section.

EPBC Act: The *Environment Protection and Biodiversity Conservation Act 1999* is the Commonwealth Act which relates to the protection of the environment and the conservation of biodiversity, and for related purposes.

Environmental weeds: Weeds that can invade bushland and threaten native plants by out-competing them.

Forest Practices Act 1985: Provides for the administration of the forest practices system through the FPA.

Forest Practices Authority (FPA): The independent statutory body responsible for administering the *Forest Practices Act 1985* through the development and management of the forest practices system.

Forest Practices Code: A Code established under the *Forest Practices Act 1985* which prescribes the manner in which forest practices must be conducted in order to provide reasonable protection of the environment.

Forest practices system: The system established pursuant to the objective set out in schedule 7 of the *Forest Practices Act 1985*.

Forestry Tasmania: Government business enterprise responsible for management of PTPZ Land.

Forest Practices Advisory Council (FPAC): A representative body of stakeholders that provide technical advice to the Board of the FPA, established under the *Forest Practices Act 1985*.

Habitat: The area, locality, site or particular type of environment, or any part of them, occupied or used by any flora or fauna.

Habitat tree: A habitat tree is a mature living tree selected to be retained in a coupe because it has features of special value for wildlife (e.g., hollows). Habitat trees should be selected on the basis of size and the presence of hollows or the potential to develop hollows over time.

Land clearing: The removal and destruction of all native vegetation and vegetation types, including individual trees, woodlands, grasslands, forests and wetlands.

Landscape scale: A term used in this report to describe a multi-spatial approach to strategic planning. Four spatial scales of planning should be considered (Biodiversity Review Panel 2008):

1. State-wide
2. Bioregional (IBRA)
3. Planning Context Unit (PCU) - a notional contextual area around the planning node which depends on the scale of operations—e.g. forest block, multiple private property boundaries, CFEV major drainage catchments.
4. Coupe Context Unit (CCU) which on state forest may be a notional 400 ha unit around the coupe, or may be a private property boundary and surrounding land-use context.

Maintain: To keep at the current state, or at a state which is appropriate for the biodiversity value and/or the context of the landscape.

Mature forest: Forests are classified as mature when they are at least 100 years old and begin to develop structural features typically found in older forests.

Monitoring: The regular observation and recording of activities or a particular value of interest.

Monitoring – implementation: Monitoring which is used to determine whether prescribed management is actually conducted

Monitoring – effectiveness: Monitoring which is used to determine whether the management specified has achieved its objective.

Native forest: Any naturally occurring forest community containing the full complement of native species and habitats normally associated with that community, or having the potential to develop these characteristics. Native forests include mature, regrowth and regenerating forests.

***Phytophthora cinnamomi*:** *Phytophthora cinnamomi* is a root fungus that can impact on drier forest and non-forest communities in lowland areas of Tasmania.

Planning tool: An instrument to deliver information to forest planners on the approach to management of a species or value in areas covered by the forest practices system.

Plantation: A forest stand established by the planting of regularly-spaced seedlings or cuttings of trees (usually a monoculture of hardwood or softwood species) selected for their wood producing properties and managed intensively for the purposes of future timber harvesting.

Prescription: A detailed specification of the objectives, area, procedures and standards required.

Priority forest community: A forest community listed in Attachment 6, Section 3 (21) ‘*Forest Communities managed by prescription*’ of the Tasmanian Regional Forest Agreement 1997 (RFA).

Priority species: Fauna and flora species identified through the RFA as species requiring consideration and management through the CAR reserve system or by applying relevant ‘off-reserve’ management prescriptions.

Private land: A land tenure arrangement where the land is permanently owned and not leased.

Permanent Timber Production Zone (PTPZ) Land: Crown land declared to be permanent timber production zone land under section 10, or land referred to in section 12, or land referred to in Schedule 2 under the *Forest Management Act 2013*.

Remnant vegetation: The remaining vegetation in a landscape after land clearance/alteration. A remnant can be of any size and condition. Anything that is native and remaining from the ‘original’ forest or non-forest vegetation is a remnant including individual trees, both live and dead (dead trees are often important in supplying nesting hollows and rotten wood habitat for invertebrates and reptiles).

Reserve: The Tasmanian Reserve Estate includes formal and informal reserves on public land, reserves on private land, and Marine Protected Areas (MPAs). The Tasmanian Reserve Estate spatial layer is managed by DPIPWE.

RFA: Regional Forest Agreements (RFAs) are 20-year plans, signed by the Australian and certain *state* governments, for the conservation and sustainable management of certain areas of Australia’s native forests.

RFA Priority Species Project: Short title for Part two of the project titled ‘Developing a framework for the conservation of habitat of Regional Forest Agreement priority species and a Strategic Species Plan for the swift parrot (*Lathamus discolor*) Part 2 – Strategic landscape approach to the management of habitat for RFA priority species’.

Riparian: Pertaining to the banks of streams, rivers or lakes.

Seral stage: Successional stages in development of vegetation communities.

Significant habitat: Habitat within the known range of a species that (1) is known to be of high priority for the maintenance of breeding populations throughout the species range and/or, (2) conversion, of which, to non-native vegetation is considered to result in a long term negative impact on breeding populations of the species. It may include areas that do not currently support breeding populations of the species but that need to be maintained in order to ensure the long-term future of the species. *Significant habitat* is determined from published and unpublished scientific literature and/or via expert opinion, agreed by the Threatened Species Section (DPIPWE) in consultation with species specialists, and endorsed by the threatened species Scientific Advisory Committee (TSSAC).

Silviculture: The theory and practice of managing forest establishment, composition and growth to achieve specified management objectives.

Swift Parrot Important Breeding Area (SPIBA): Swift Parrot important breeding areas that are known or suspected to have supported a large portion of the Swift Parrot breeding population in any given year.

Stand: A group of trees or patch of forest that can be distinguished from other groups on the basis of size, age, species composition, condition or other attribute.

Streamside reserves: All land within a minimum horizontal distance specified in the *Forest Practices Code* from the banks of a Class 1, 2, 3 or 4 watercourse.

Structure (landscape): The vertical and spatial distribution of the vegetation.

Structure (tree): Elements that make up the form of the tree, such as hollows, branches, canopy.

Threatened: When used in association with a species, population or community indicates that it is listed under the Tasmanian *Threatened Species Protection Act 1995*, Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* or *Nature Conservation Act 2002*.

Threatened Fauna Adviser (TFA): The Threatened Fauna Adviser is a decision-support system developed by the FPA, in consultation with DPIPWE, specialists and the forest industry, to deliver management recommendations for forest-dependant threatened fauna in wood production forests.

Threatened Species Protection Act 1995: An Act to provide for the protection and management of threatened native flora and fauna and to enable and promote the conservation of native flora and fauna.

Threatened Species Section (TSS): A section of the Policy and Conservation Advice Branch of the Department of Primary Industries, Parks, Water and Environment (DPIPWE), whose main function and objective is the identification, conservation and recovery of Tasmania's threatened species.

Vegetation management agreement: An agreement that an owner of land enters into with an instrumentality or agency of the Crown for the purposes of managing native vegetation on that land.

Wildlife habitat clump: An area containing habitat trees set aside in a harvesting coupe to aid in the maintenance of fauna habitat diversity.

Wildlife habitat strip: Strips of uncut forest 100 metres in width, based on streamside reserves but including links up slope and across ridges to connect with watercourses in adjoining catchments.

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Biodiversity Landscape Planning Guideline

Summary

- The Biodiversity Landscape Planning Guideline (the BLPG) is a framework for managing biodiversity values at the landscape scale in areas regulated under the Tasmanian forest practices system. The BLPG is not a mandatory requirement of the forest practices system.
- The BLPG framework helps provide guidance for longer-term forest planning to meet landscape-scale goals for biodiversity in wood production forests.
- The primary objective of the Guideline is *'To contribute to the maintenance of biological diversity, ecological function and evolutionary processes through the maintenance of viable breeding populations and habitat for all species at multiple spatial and temporal scales, in areas regulated under the forest practices system'*.
- Section D (Conservation of Natural and Cultural Values) of the Tasmanian *Forest Practices Code* emphasises the need to assess natural values at the strategic or property level. Section D3, Basic Approach, states that *'Planning for flora and fauna conservation should initially be carried out at a regional level (e.g. Whole property, forest block or district forest management plan)'*. The BLPG has been developed to assist this approach.
- The BLPG translates landscape ecological theory into guidelines for on-ground practice using a four tiered framework. The first tier of the framework comprises ecologically-based *goals*. Each *goal* is then broken down into the *management targets* that should be met in order to achieve the *goal*. The BLPG also recommends on-ground *actions* to achieve the management targets, and the *planning tools* designed to assist with the implementation of an action.
- The BLPG recognises that there may be alternative ways to meet a particular goal and/or management target. The BLPG also recognises that not all biodiversity values can be managed at the landscape scale and that local scale and/or species-specific management may also be required.
- While planning for biodiversity at the landscape-scale, through application of the BLPG, may cater for many species and habitats, conservation management of threatened species will often require a species-specific targeted approach. Therefore, the BLPG includes a section to guide the management of threatened species and their habitat at the landscape scale. This section represents the best available information at present, and it is intended for species-specific management to continually be reviewed and improved upon based on new information.
- The BLPG is underpinned by an adaptive management framework, where information gathered through monitoring and/or research can feed back into the BLPG to allow adaptations of actions or targets to make them more effective in achieving the goals.

1. Introduction

In Tasmania, forest biodiversity conservation is achieved through maintenance of a permanent native forest estate, the established CAR reserve system and subsequent new reserves on public or private land, and through applying management prescriptions in wood production forests, conducted in accordance with the forest practices system.

The forest practices system is underpinned by adaptive management principles, and landscape-level prescriptions for biodiversity have incrementally improved since the introduction of the *Forest Practices Code* (the Code). Section D3 of the Code explicitly states the need for landscape-level planning for flora and fauna conservation '*Planning for flora and fauna conservation should initially be carried out at a regional level (e.g., whole property, forest block or district forest management plan...*'. Landscape-scale provisions of the Code include wildlife habitat strips, stream-side reserves, dispersal of harvest operations, retention of remnants, restoration of habitat to link retained areas and strategic-level management plans and recommendations for some threatened species (FPA 2002; FPA 2014).

Reviews of the approach taken to the management of biodiversity values in production forests, however, have recommended the need for greater emphasis on landscape level planning for biodiversity conservation, specifically the development of a landscape approach to managing biodiversity in areas regulated under the forest practices system (Biodiversity Review Panel 2009, Ramsey 2008). In response to these recommendations the Forest Practices Authority (FPA), as part of the DPI/PWE/FPA Commonwealth funded 'RFA priority species project', developed the Biodiversity Landscape Planning Guideline (the BLPG).

1.1 The context of the BLPG

The Tasmanian forest practices system recognises 'strategic' or landscape-scale management through the *Forest Practices Code 2015* which explicitly states '*that natural and cultural values should be assessed at the strategic or property level. This is particularly important where whole landscapes and catchments are being managed intensively for wood production.*'

The BLPG clarifies the contribution of current policy and the legislative framework to landscape-scale biodiversity management, but the BLPG is not a mandatory requirement of the forest practices system.

The BLPG has been developed to guide the formulation of strategic or landscape-scale management plans for biodiversity to meet this strategic planning provision of the Code. It may be useful in the development of public authority management agreements (PAMAs) and other management agreements under the *Tasmanian Threatened Species Protection Act 1995*. Gaps in landscape-scale biodiversity management practices were identified during the development of the BLPG and this information has been used to prioritise future work.

The BLPG goals and management targets have been developed based on the principles of Lindenmayer and Franklin (2002), and a comprehensive review of national and international

landscape approaches to conservation management (Chuter & Munks 2011b; Chuter & Munks 2011a; Koch et al. 2011; Munks & Koch 2011a).

The BLPG only considers threats in the context of the forest practices system. For example, while climate change and stochastic wildfire have the potential to significantly threaten biodiversity, mitigating these threats is beyond the scope of the BLPG. However, the BLPG may indirectly provide some mitigation by adopting the principles of biodiversity conservation and ecosystem resilience within a dynamic system, and by embracing an adaptive management approach.

1.2 BLPG Objective

The overarching objective of the BLPG is *'To contribute to the maintenance of biological diversity, ecological function and evolutionary processes through the maintenance of viable breeding populations and habitat for all species at multiple spatial and temporal scales, in areas regulated under the forest practices system'*.

Implementation of the BLPG will contribute to the overarching objective of the Tasmania's Forest Practices Act, which is *'To achieve sustainable management of Crown and private forests with due care for the environment and taking into account social, economic and environmental outcomes while delivering, in a way that is as far as possible self-funding–*

(a) an emphasis on self-regulation; and

(b) planning before forest operations; and

(c) delegated and decentralized approvals for forest practices plans and other forest practices matters; and

(d) a forest practices code which provides practical standards for forest management, timber harvesting and other forest operations; and

(e) an emphasis on consultation and education; and

(ea) an emphasis on research, review and continuing improvement; and

(eb) the conservation of threatened native vegetation communities; and

(f) provision for the rehabilitation of land in cases where the forest practices code is contravened; and

(g) an independent appeal process; and

(h) through the declaration of private timber reserves– a means by which private land holders are able to ensure the security of their forest resources.

1.3 BLPG framework

The BLPG has ecologically-based goals for biodiversity conservation. These goals have been developed based on the principles of Lindenmayer and Franklin (2002) and in the context of the

Tasmanian forest practices system. The rationale for each goal is provided in Section 2. The BLPG aims to translate landscape ecological theory into on-ground practice for a wood production forest context, using a four tiered framework:

1. Ecologically-based **goals**
2. **Management targets** to achieve the goals
3. Recommended **Actions** to achieve management targets
4. Recommended **planning tools** designed to assist in implementing the actions.

It is noted that many of the management targets in this guideline relate to the sustainability indicators from the Tasmanian State of the Forests reporting (State of Tasmania and Commonwealth of Australia 2007) (see Appendix 1).

1.4 BLPG implementation

The BLPG is an advisory guideline designed to assist planners in meeting the landscape-scale provisions of the *Forest Practices Code* when developing strategic or landscape-scale management plans. It is assumed that the planner will also use expert judgement and any other available information when developing such plans.

Strategic plans developed by industry planners using the BLPG will be subject to endorsement following the procedures appropriate to the mechanism used (e.g., 3 year plan, Vegetation Management Agreement, property plan, forest management plan). If the plan includes management prescriptions for threatened species then the procedures agreed between the FPA and DPIPW will apply.

1.5 BLPG monitoring and reporting

Monitoring is an essential component of an adaptive management framework. The FPA is required to report five yearly on the state of Tasmania's forests under section 4Z of the *Forest Practices Act 1985*, through the national State of the Forests reports. These reports contain a number of criteria and indicators of sustainable forest management which are based on the international Montreal Process framework. The relationship between the sustainability indicators and the management targets in the Guideline is shown in Appendix 2.

Any strategic plans developed and implemented using the BLPG should include a program for monitoring and reporting. Monitoring should include both implementation monitoring (i.e., are the actions being implemented on the ground) and effectiveness monitoring (i.e., are the actions effective at meeting the management target).

Effectiveness monitoring should not only use GIS data analysis, but should also include field studies. It may not be possible to monitor the effectiveness of all management actions. A prioritisation approach can be used to identify actions that are in need of monitoring based on importance and effort required to monitor.

The results of the monitoring should be used to review and update the management plan, if required. If management targets are not being achieved, the review should determine why not (e.g. operational constraints, misinterpretation of the management action etc.), to facilitate continual improvement of the management plan.

1.6 BLPG review

The BLPG should be reviewed at periodic intervals (or as new information becomes available), following the process for review and continual improvement of provisions of the *Forest Practices Code* (see Appendix 1).

The BLPG recommends actions, planning tools and management targets that are all based on the best available information. It is recognised that the practicality and effectiveness of actions, planning tools and management targets should continually be reviewed and adapted as new information becomes available.

2. Goals and management targets

2.1 Summary of goals and management targets

The following goals and management targets have been designed to meet the primary objective of the BLPG (Box 1).

Box 1. Six goals and management targets to meet the primary objective of the BLPG

Goal 1: Maintain an extensive and permanent native vegetation estate.

- 1.1 Maintain a native forest estate.
- 1.2 Maintain and/or enhance the area and/or condition of threatened native vegetation communities on public and private land.
- 1.3 Ensure that conversion does not result in any non-threatened native vegetation community becoming threatened.
- 1.4 Maintain priority forest communities on public land wherever prudent and feasible.

Goal 2: Maintain or improve landscape heterogeneity and stand structure complexity.

- 2.1 Maintain the full range of seral stage patterns in native forest.
- 2.2 Maintain remnant vegetation.
- 2.3 Ensure adequate regeneration in native forest harvest areas is achieved during each harvest cycle, including regeneration of the understorey.

Goal 3: Maintain connectivity of habitat for flora and fauna species.

- 3.1 Maintain and/or enhance linkages along water courses and between water courses, capturing a range of habitat types and topographies.

Goal 4: Maintain and/or improve the condition of freshwater ecosystems.

- 4.1 Maintain water quality and flow within the range of natural variation over time.
- 4.2 Maintain and/or restore riparian vegetation and in stream habitat.

Goal 5: Maintain and/or improve the condition of native habitats for flora and fauna.

- 5.1 Manage the risk of introducing pests and disease into a 'healthy' habitat.
- 5.2 Minimise the deleterious effects of weeds in native forests and plantations with particular focus on declared environmental weeds and native forest adjacent to plantations.
- 5.3 Minimise harmful edge effects on reserves and sensitive vegetation communities and sensitive threatened species habitat.
- 5.4 Maintain soil fertility and structure.

Goal 6: Maintain and/or improve the conservation status of forest species, particularly threatened species.

- 6.1 Maintain viable populations of threatened species across their ranges, through the management of potential habitat and other actions, and ensure conversion doesn't result in a non-threatened species becoming threatened.
- 6.2 Manage the risk of genetic pollution in threatened native eucalypt populations and areas of high conservation value.

2.2 Rationale for goals and management targets

Goal 1 - Maintain an extensive and permanent native vegetation estate

Maintaining native vegetation cover is the first essential element of a management strategy for maintaining forest and non-forest dependent species. Ecological reserves in Tasmania play an important role in maintaining biodiversity, but they have limitations in terms of size, location and management options. These limitations mean that the complementary management of native vegetation in areas outside reserves is an essential element of any strategy to conserve biodiversity.

Within the Tasmanian forest practices system the *Forest Practices Act 1985* limits the clearing of threatened native vegetation communities by only permitting clearing under 'exceptional circumstances'. Threatened native vegetation communities are defined as those communities listed on the *Nature Conservation Act 2002*, and included forest and non-forest communities. A second instrument for maintaining native vegetation outside reserves is the Permanent Native Forest Estate Policy (PNFEP). The PNFEP commits the state to the maintenance of native forest cover. The current version of the PNFEP (2016) caps clearing and conversion on both public and private land to no more than 5% of the state-wide native forest (as mapped in 1996).

After maintaining native vegetation cover, maintaining the range of vegetation communities at multiple spatial scales is the next most basic element to ensure conservation of biodiversity. Maintaining the range of vegetation communities at multiple spatial scales will contribute to a heterogeneous landscape and contribute to maintaining a range of habitats for threatened species. A heterogeneous landscape will help maintain habitat during major stochastic events (e.g. fires, floods), will help cater for the varying habitat requirements between different species (e.g. stag beetles compared to owls) and for dynamic requirements of individual species (e.g. swift parrot which requires a combination of foraging and nesting habitat for breeding habitat). This is achieved, in part, through the maintenance of threatened vegetation communities (under the *Forest Practices Act 1985*), and also through the PNFEP. The PNFEP aims to maintain forest communities within each bioregion at no less than 75 percent of the 1996 area or a minimum of 2000 hectares (whichever is the higher); and limits the clearing and conversion of native forest on private land to no more than 40 hectares per property in any 12 month period.

Goal 2 – Maintain or improve landscape heterogeneity and stand structure complexity

A landscape made up of habitat patches representing different vegetation types, forest age classes, composition and structural conditions that best mimic natural conditions is important for biodiversity conservation. Lindenmayer and Franklin (2002) refer to landscape heterogeneity and stand structural complexity as two basic principles of biodiversity conservation.

Forests are dynamic landscapes and natural or managed disturbances produce a mosaic of different forest age classes. The forest mosaic changes over time as areas are subject to disturbance, and as areas age, grow and pass through a series of successional stages (seral stages). Each seral stage may provide a unique habitat values for species. For example, a young forest that flowers prolifically will provide a foraging resource for nectarivores. As that forest ages, the increasing abundance of coarse

woody debris will provide habitat for ground-dwelling invertebrates. Therefore having a heterogeneous pattern of seral stages across the landscape is important for maintaining biodiversity.

Mimicking the natural seral stage pattern would be ideal for conservation of biodiversity. However, in a landscape with a history (and possibly future) of irregular natural and/or anthropogenic disturbance events it is difficult to know what is a natural seral stage pattern, and at what spatial scale or scales it should be managed. Therefore, understanding the needs of indicator species or indicator groups (e.g., colonisers, mature forest specialist) is important in determining the seral-stages and patch-sizes needed for a heterogeneous and biodiverse landscape.

Within the Tasmanian forest practices system there are some mechanisms in place to assist with maintenance of a heterogeneous landscape. These include dispersal of harvesting units, limitations on the size of the harvest unit, networks of formal and informal reserves, and management of mature (hollow bearing) forest at different spatial-scales. More work is needed to understand whether the current management is meeting the requirements of the target species or species-groups at multiple scales and over the long-term.

Goal 3 - Maintain connectivity of habitat for flora and fauna species

As land-use changes and habitat is lost, the landscape can become increasingly fragmented. This fragmentation often has negative effects on biodiversity, such as isolating populations and decreasing the chance of dispersal or re-colonisation. Over the longer-term, habitat fragmentation can also decrease species' genetic diversity (Lienert 2004) and decrease the chances of a population or species surviving stochastic events (Krosby et al 2010).

Maintaining connectivity is a key concept for managing the effects of habitat fragmentation. Connectivity of habitat across the landscape can assist movement of biota which promotes gene transfer, recolonisation of species into disturbed areas and reduce the risk of population fragmentation. Connectivity can be achieved in a number of ways, depending on the type of connectivity.

Spatial connectivity refers to the physical connection of various attributes in the landscape, such as forest. Spatial connectivity is useful in reducing isolation of habitat patches and providing movement corridors, but does not necessarily take into consideration the habitat requirements of the species occupying the landscape. Alternatively, functional connectivity of habitat is more targeted at the species requirements and does not need to always be physically connected. For example, a plant species requires habitat or other populations to be within the pollen dispersal distance to be effectively connected.

This Guideline considers maintenance of both spatial and functional connectivity, as both types of connectivity are important in maintaining habitat for flora and fauna species. Although connectivity is a by-product of other management actions that maintain habitat, the main provision for achieving connectivity through the forest practices system is the implementation of landscape corridors (wildlife habitat strips) and streamside reserves. Wildlife habitat strips should be implemented across a range of habitat types, however they are not customised to meet the requirements of species habitat or landscape.

Goal 4 - Maintain and/or improve the condition of freshwater ecosystems

Freshwater ecosystems include surface features such as lakes, streams, rivers and wetlands as well as subterranean aquatic systems. Forest operations and land-use changes have the potential to have significant impacts on freshwater ecosystems by affecting hydrology, water quality and in-stream habitat.

Harvesting of trees can change the amount of water flow into a stream or catchment. Tree cover has an impact on the interception of rainfall, run-off (especially if the soil is compacted) and groundwater, therefore the extent of forest harvesting and regeneration can alter hydrological processes and change water flow in a catchment. Changes in water quality are mainly driven by increased sediment entering the waterbody. The removal of vegetation can lead to increased chance of erosion and a higher level of soil particles being washed into streams by surface run off. In-stream habitat will be impacted by changes in water flow and quality, and by direct impact on the stream and associated riparian vegetation (e.g., construction of stream crossings).

These negative impacts are mitigated to an extent by the provisions to protect soil and water delivered through the *Forest Practices Code*. These provisions include streamside reserves, limiting the access of machinery into riparian areas, and managing the type and timing of operations based on soil conditions.

Within the forest practices system management of freshwater ecosystems at the catchment scale has been primarily driven by coupe dispersal or management of habitat for threatened native fish species. There is a need to develop a catchment scale management approach which aims to maintain the condition of freshwater ecosystems across the landscape.

Goal 5 - Maintain and/or improve the condition of native habitats for flora and fauna

Degradation of environmental health can have many impacts, both environmentally and economically. Loss of health, through factors such as introduction of invasive species and disease, can have impacts on native vegetation survival and growth and wildlife habitat.

Invasive species are species that are non-native to a particular environment and whose introduction and spread causes, or are likely to cause, environmental harm. Invasive species includes pests such as feral animals and weeds. The environmental harm caused by invasive species can be seen in various ways, such as a reduction of native species abundance and diversity through increased competition for habitat and/or foraging resources and direct loss of native species through predation.

The Australian Government and each state and territory have strategies for reducing the risk of introducing invasive species and mitigating the impacts of invasive species. In Tasmania biosecurity is regulated by the Department of Primary Industries Parks Water and Environment and includes programs to detect and eradicate invasive animals and weeds. Through the *Forest Practices Code* there are some measures to reduce the risk of introducing weeds into a 'healthy' habitats, however much of the invasive species management is currently achieved outside the forest practices system.

Like invasive species, diseases have the potential to negatively affect native vegetation and native species habitats through loss of flora and fauna and changes in species composition. Diseases, such as *Phytophthora* and chytrid fungus can easily be spread by forestry activities through the movement of soil (e.g. on machinery, vehicles, people). The forest industry already implements hygiene control measures to reduce the risk of spreading diseases through forestry activities. It is important to continue to implement these hygiene measures and to monitor the result to determine if the measures are effective.

Goal 6 - Maintain and/or improve the conservation status of forest species, particularly threatened species

Almost 700 hundred species of flora and fauna in Tasmania are recognised as being ‘threatened’ and listed on the Tasmanian *Threatened Species Protection Act 1995* and/or the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*.

To maintain or improve the conservation status of threatened species is a complex goal for landscape management within the forest practices system. For some species, to maintain or improve a conservation status will not be achievable within the scope of this Guideline, particularly if the threatening process or the physical area where the species is most at risk operates outside the forest practices system. For these species, the Guideline aims to contribute to the maintenance of the conservation status of the species and to not detrimentally impact the conservation status of priority species.

Common threats to threatened species include land clearing and fragmentation, changes in forest composition and structure, and degradation of forest health. This Guideline delivers management targets through goals 1–5 that will alleviate these threats and contribute to the conservation of threatened species to an extent. These management targets include: maintenance of movement corridors to facilitate genetic diversity (under Goal 3), achieving forest regeneration (under Goal 1), maintaining a good dispersal of coupes across the landscape to reduce fragmentation and assist with maintaining the seral stage pattern (under Goal 2), and reducing the risk of introducing weeds and disease (under Goal 5).

Other threats which are specific to a species, group of species or a particular habitat type will require a more targeted approach to management. Management may be achieved at multiple scales and both strategically and on a case-by-case basis. Within the forest practices system, management actions for threatened fauna species are currently delivered on a case-by-case basis through the Threatened Fauna Adviser (TFA). To assist with managing threatened fauna at a strategic level (where possible), this guideline highlights the management actions within the TFA that may be able to be applied through a strategic process, or management actions are wholly or partially achieved through the implementation of other goals in this Guideline (see Table 2).

3. Management targets, actions and planning tools

For each management target, the BLPG recommends a number of on-ground actions that can be applied to collectively achieve the management target.

Planning tools used under the forest practices system are instruments that assist in the development of the on-ground actions needed to achieve a management target. Planning tools help clarify and guide the interpretation and implementation of actions. For the purposes of the BLPG the term 'planning tools' include decision support systems, technical documents, policies and procedures. It is recognised that alternative actions and planning tools, not referred to in this BLPG, may be applied to achieve the management targets.

Goal 1: Maintain an extensive and permanent native vegetation estate

Management target	Actions	Planning tools
1.1 Maintain a native forest estate	Do not allow clearance and/or conversion of forest areas undertaken under certified forest practices plans that would exceed the 95 per cent threshold as reported in the Permanent Native Forest Estate figures.	Permanent Native Forest Estate Policy 2016
1.2 Maintain and/or enhance the area and/or condition of threatened native vegetation communities on public and private land.	Clearance and conversion of all native vegetation communities listed as threatened on the <i>Nature Conservation Act 2002</i> to be regulated in accordance with the <i>Forest Practices Act 1985</i> .	<i>Forest botany manual</i>
	Consider the use of offsets to compensate for the loss of native vegetation through the implementation of conditions designed to improve biodiversity, water quality, salinity or other land degradation issues.	FPA's offset policy DPIPWE's general offset principles
1.3 Ensure that clearance and conversion does not result in any non-threatened native vegetation community becoming threatened.	Take into consideration and apply if relevant, actions within the current Permanent Native Forest Estate Policy. Monitor the extent of non-threatened non-forest vegetation	Permanent Native Forest Estate Policy <i>Forest botany manual</i> TASVEG 3.0 – The digital Vegetation Map of Tasmania
1.4 Maintain priority forest communities on public land wherever prudent and feasible.	Priority forest communities (listed under Attachment 6, section 3 of the RFA), where they occur outside existing and new formal and informal reserves, will be protected on public land wherever prudent and feasible.	Tasmania's Regional Forest Agreement <i>Forest botany manual</i>

Goal 2: Maintain or improve landscape heterogeneity and stand structure complexity

Management Target	Actions	Planning Tools
2.1 Maintain the full range of seral stage patterns in native forest.	Maintain mature forest at multiple spatial scales.	FPA's Habitat Context Assessment Tool FPA Fauna Technical Note 2: <i>Mature habitat availability</i> FPA Fauna Technical Note 7: <i>Wildlife habitat clump flow diagram</i>
	Maintain or enhance existing wildlife habitat strips on PTPZ Land, and consider the implementation of wildlife habitat strips on private property.	FPA Fauna Technical Note 8: <i>Wildlife habitat strip location and management guidelines</i>
	Disperse harvesting coupes (spatial and temporal dispersal)	<i>Forest Practices Code 2015</i>
2.2 Maintain remnant vegetation.	Maintain or enhance patches of remnant vegetation to assist with maintenance of local flora and fauna diversity and landscape values; and for restoration of habitat including widening and linking wildlife habitat strips, particularly where species and communities of high conservation significance and known to occur.	<i>Forest Practices Code 2015</i>
2.3 Ensure adequate regeneration in native forest harvest areas is achieved during each harvest cycle, including regeneration of the understorey.	Ensure stocking standards achieved in areas regenerated to native forest following harvesting.	Forestry Tasmania Technical Bulletin 5 <i>Silvicultural systems</i> Forestry Tasmania Technical Bulletin 6 <i>Regeneration stocking standards</i> <i>Forest Practices Code 2015</i>

	Apply harvesting techniques, rotation lengths and silvicultural systems to native forest areas that are appropriate for each forest type and foster regeneration of the native understorey and overstorey.	Forestry Tasmania Technical Bulletin 5 <i>Silvicultural systems</i>
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Goal 3: Maintain connectivity of habitat for flora and fauna species

Management Target	Actions	Planning Tools
3.1 Maintain and/or enhance linkages along water courses and between water courses, capturing a range of habitat types and topographies.	Maintain streamside reserves on class 1-3 streams in native forest operations, and on class 4 streams at risk of erosion.	<i>Forest Practices Code 2015</i> FPA's guidelines for the protection of class 4 streams
	Maintain or enhance existing wildlife habitat strips on PTPZ Land, and consider the placement of wildlife habitat strips on private property (particularly for large scale operations).	FPA Fauna Technical Note 8: <i>Wildlife habitat strip location and management guidelines</i>
	Progressively re-establish streamside reserves in plantations on previously cleared sites.	<i>Forest Practices Code 2015</i>

Goal 4: Maintain and/or improve the condition of freshwater ecosystems

Management Target	Actions	Planning Tools
4.1 Maintain water quality and flow within the range of natural variation over time.	Manage harvesting within a catchment to maintain or improve spatial and temporal dispersal of harvesting units.	<i>Forest Practices Code 2015</i> Conservation of Freshwater Ecosystem Values data
	Harvest no more than 5% of a town water supply catchment annually.	<i>Forest Practices Code 2015</i>
	Incorporate dispersed coupe design into strategic plans for native forestry. To achieve coupe dispersal:	<i>Forest Practices Code 2015</i>

	<ul style="list-style-type: none"> • Apply harvesting and silvicultural regimes that are appropriate for each forest type. • Do not exceed coupe size of 100 hectares for native forest harvested by clearfelling. • Do not harvest areas of native forest until the dominant height of adjacent regrowth is at least 5 metres. 	
	Minimise use of chemicals where there is risk of water contamination through exposure to spray drift or runoff.	<i>Forest Practices Code 2015</i>
	Apply catchment-scale harvesting thresholds where appropriate and consistent with current information	
	Minimise forestry road crossings	
4.2 Maintain and/or restore riparian vegetation and in stream habitat.	<p>Maintain streamside reserves on class 1–3 streams in native forest operations, and on class 4 streams at risk of erosion.</p> <p>Apply streamside reserves on all classes of streams in catchments occupied by threatened species (see also Goal 6).</p>	<p><i>Forest Practices Code 2015</i></p> <p><i>FPA's Guidelines for the protection of class 4 streams</i></p> <p>Recommendations for aquatic fauna in the FPA Threatened Fauna Adviser</p>
	Progressively re-establish streamside reserves in plantations on previously cleared sites (i.e., where plantation trees were established up to the stream-bank).	<p><i>Forest Practices Code</i></p> <p>Recommendations for aquatic fauna in threatened Fauna Adviser</p>

Goal 5: Maintain and/or improve the condition of native habitats for flora and fauna

Management Target	Actions	Planning Tools
5.1 Manage the risk of introducing pests and disease into a 'healthy' habitat.	Apply hygiene management to prevent the risk of spreading disease (e.g. <i>Phytophthora cinnamomi</i> , chytrid fungus, myrtle rust) into healthy areas.	FPA Flora Technical Note 8: <i>Phytophthora</i> DPIPWE's Biosecurity website
	Source road material from certified <i>Phytophthora</i> -free quarries.	FPA Flora Technical Note 8: <i>Phytophthora</i> DPIPWE's Biosecurity website
	Apply hygiene measures to maintain quarries free of disease.	DPIPWE's Biosecurity website
5.2 Minimise the deleterious effects of weeds in native forests and plantations, with particular focus on declared environmental weeds and native forest adjoining plantations.	Apply hygiene management to reduce the risk of spreading exotic weed species, (e.g. pampas grass, ragwort, blackberry and Spanish heath) into native forest, particularly conservation areas (e.g. formal reserves).	DPIPWE's weeds index and related legislation and management plans.
5.3 Minimise harmful edge effects on reserves and sensitive vegetation communities and sensitive threatened species habitat.	Protect formal reserves from incursion by adjoining plantation species.	<i>Forest Practices Code 2015</i>
	Maintain a minimum 40 metre buffer (horizontal distance) adjacent to relict rainforest patches.	FPA Flora Technical Note 4: <i>Relict rainforest management</i> Forestry Tasmania's relict rainforest policy
5.4 Maintain soil fertility and structure.	Apply appropriate silviculture methods for different soils, restrict harvesting in high risk erosion areas.	Forestry Tasmania Technical Bulletin 5 <i>Silvicultural</i>

		<p><i>systems</i></p> <p>FPA's <i>Guidelines for the protection of class 4 streams</i></p>
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Goal 6: Maintain and/or improve the conservation status of forest species, particularly threatened species

Management Target	Actions	Planning Tools
<p>6.1 Maintain viable populations of threatened species across their ranges, through the management of potential habitat and other actions, and ensure conversion doesn't result in a non-threatened species becoming threatened.</p>	<p>Do not clear and convert significant habitat for threatened species</p>	<p>FPA's <i>Planning Guideline 2008/1: to avoid the clearance and conversion of significant habitat for threatened fauna</i></p> <p>FPA's Biodiversity Values Database: fauna habitat descriptions.</p>
	<p>Apply the landscape-scale recommendations delivered through the Threatened Fauna Adviser.</p>	<p>FPA's Threatened Fauna Adviser</p>
<p>6.2 Manage the risk of genetic pollution in threatened native eucalypt populations and areas of high conservation value</p>	<p>Do not establish or re-establish <i>Eucalyptus nitens</i> plantation close to a population of a threatened eucalypt with high hybridisation risk.</p>	<p>FPA flora technical note 12: <i>Management of gene flow from plantation eucalypts</i></p>

4. Planning tools

Planning tool is a generic term which has been used in the BLPG to represent a variety of policies and documents that deliver information on the implementation of *actions*.

Planning tools include technical documents, policies and procedures, and they can be descriptive or prescriptive (or both). Descriptive planning tools provide information and clarification for an action. For example, sections of the *Forest botany manual* describe the characteristics of a vegetation community to assist with identification. Prescriptive planning tools outline and clarify the action and management needed in order to achieve an objective. For the purposes of the BLPG prescriptive planning tools include provisions of policy documents, and other instruments tied to legislation. For example, the *Forest Practices Code* prescribes the width of streamside reserves that must be applied within forestry operations in order to manage water quality and maintain riparian and in-stream habitat.

4.1 Existing planning tools

A review of planning tools used commonly within the forest practices system identified that several existing descriptive and prescriptive planning tools can be used to assist with implementing actions.

Commonly used planning tools are listed against each action in section 3. A description of each planning tool is provided in Table 1 below. This list includes planning tools that are commonly used within the forest practices system for biodiversity management, but it is not a complete list as forest companies or other agencies may have other planning tools that also contribute to meeting management targets.

Table 1: Planning tools linked to the BLPG management targets

Planning tool	Type of planning tool	Description	Link to management target (MT)
<i>Forest Practices Code</i> provisions	Prescriptive	The <i>Forest Practices Code</i> provides a set of guidelines and standards to ensure the protection of natural and cultural values. The current Code (2015) was developed through extensive consultation and public comment. It is legally enforceable under the <i>Forest Practices Act 1985</i> .	Directly: MT: 1.2, 2.3, 3.1, 4.1, 4.2 Indirectly: all.
Permanent Native Forest Estate policy provisions	Prescriptive	A Tasmanian Government policy in place since 1996 to regulate the extent of clearing and conversion of the native forest estate. The objective of the policy is to maintain and manage the native forest estate for a variety of uses.	MT 1.1-1.4.

<i>Forest botany manual</i>	Descriptive	The <i>Forest botany manual</i> is designed to help field workers, particularly Forest Practices Officers, to identify and manage flora values (plant species and communities) in areas proposed for forestry operations.	MT: 1.2, 1.4
Biodiversity values database web map	Descriptive	An interactive map displaying fauna range boundaries and mature habitat availability.	MT: 2.1
FPA habitat context assessment tool	Descriptive	A tool to assess the predicted availability of a particular habitat within a user-specified radius from a point locality.	MT: 2.1
Policy of the FPA: The use of offsets to compensate for the loss of significant biodiversity values within forest practices plans	Prescriptive	A guide for the development of appropriate offsets to compensate the loss of habitat for threatened species or the loss of native forest or threatened native vegetation (where required under clause 6.2 of the Permanent Native Forest Estate Policy).	MT: 1.2
FPA fauna technical note 2: mature habitat availability	Descriptive	Background information on the construction and limitations of the mature habitat availability map.	MT: 2.1
FPA fauna technical note 7: wildlife habitat clump flow diagram	Descriptive and prescriptive	Background information and guidance on implementation of wildlife habitat clump provisions of the <i>Forest Practices Code</i> .	MT: 2.1
FPA fauna technical note 8: wildlife habitat strip location and management guidelines	Descriptive and prescriptive	Background information and guidance on implementation of wildlife habitat strip provisions of the <i>Forest Practices Code</i> .	MT: 2.1 and 3.1
FPA flora technical note 4: relict rainforest management	Descriptive and prescriptive	Patches of relict rainforest are of high conservation value, and this technical note outlines identification and recommends appropriate management with regard to forestry operations.	MT: 5.3
FPA flora technical note 6: sphagnum communities	Descriptive and prescriptive	A key to the various types of vegetation associated with Sphagnum communities is provided, and appropriate management practices are discussed.	MT: 5.3
FPA flora technical	Descriptive	This technical note lists species and	MT: 5.1 and

note 8: <i>Phytophthora</i>	and prescriptive	communities susceptible to <i>Phytophthora</i> , and gives hygiene measures to reduce risks of spreading <i>Phytophthora</i> . Procedures relating to roads and tracks, quarries and machinery washdown are described and illustrated.	5.2
FPA flora technical note 12: management of gene flow from plantation eucalypts	Descriptive	This technical note provides information on which native eucalypts are susceptible to hybridisation with <i>Eucalyptus nitens</i> and how to recognise hybrid seedlings. A method for assessing and managing hybridisation risk is also presented, including monitoring guidelines.	MT 5.4
Threatened native vegetation communities information sheets	Descriptive	Information to assist with the identification of a threatened native vegetation community.	MT: 1.2
FPA guidelines for the protection of class 4 streams	Descriptive and prescriptive	A guideline to assist with managing class 4 streams to maintain water quality and flow.	MT: 4.1 and 4.2
FPA's Planning Guideline 2008/1: to avoid the clearance and conversion of significant habitat for threatened fauna	Descriptive and prescriptive	This document provides a planning framework to avoid or limit the clearance and conversion of significant habitat of threatened fauna to non-native vegetation cover such as plantations, agricultural pasture. The framework does not deal with the reservation of habitat, which is addressed through other statutory mechanisms.	MT:6.1

4.2 Continuous improvement and adaptive management

In the development of the BLP, which included a review of the available planning tools, four key 'gaps' were identified in baseline knowledge and agreed management approaches (planning tools) for some management targets. These included agreed approaches to the management of threatened flora species, mature habitat, river catchments, and remnant vegetation. The FPA are prioritising the development of technical notes and other tools to address these gaps.

1. Threatened flora management: The FPA is currently developing a Threatened Plant Adviser (TPA). The TPA will be a web-based decision support system and will provide agreed management actions for threatened flora species within areas covered by the forest practices system.

2. Management of mature habitat. The FPA is currently reviewing and revising a draft approach for managing current and potential mature habitat across the landscape following stakeholder feedback.

3. Catchment management: There is currently very little guidance on the management of river catchments, other than the basic Code requirements (e.g., streamside reserves, coupe dispersal etc.). Construction of a planning tool to assist with catchment management is difficult as there is little known about the cumulative effects of different silvicultural systems or land use changes on the water quality and flow within a catchment. Added to this, the development of a broad management approach is further complicated by factors such as the differences in biodiversity 'values' between catchment (e.g., presence of threatened stream biota), size of catchments, tenure arrangement and stochastic events.

4. Remnant management: The Code references the need to consider management of remnants 'In parts of the *state* where native forest occur mainly as remnants, consideration will be given to:

- Retention of native forest remnants to aid the maintenance of local flora and fauna diversity and landscape values;
- Restoration of habitat including widening and linking wildlife habitat strips, particularly where species and communities of high conservation significance are known to occur.'

DPIPWE's *From Forest to Fjaeldmark: Descriptions of Tasmanian's vegetation* (Kitchener and Harris 2013) defines a native vegetation remnant as 'the native vegetation remaining from the 'original' forest or non-forest vegetation in a landscape after land clearance/alteration. A native vegetation remnant can be of any size and condition, but excludes modified forest, modified non-forest or paddock trees.' Although there is a definition, there is no guidance on what qualifies as a remnant, or when a remnant should be prioritised for maintenance or restoration.

5. Threatened species – Meeting Goal 6

Almost 700 hundred species of flora and fauna in Tasmania are listed as ‘threatened’ under the Tasmanian *Threatened species Protection Act 1995* and/or the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*. Management of threatened species is covered under this legislation, and in wood production areas, management is provided by the *Tasmanian Regional Forest Agreement 1997*. This requires threatened species management to be undertaken in accordance with the *Forest Practices Act 1985*, which includes procedures agreed between the FPA and DPIPWE. These agreed procedures include endorsed species-specific management prescriptions, which are represented as management recommendations delivered via planning tools such as the Threatened Fauna Adviser.

The BLPG includes the goal 6, which is *to maintain and/or improve the conservation status of forest species, particularly threatened species*. For threatened species, the management target is *‘to contribute to the maintenance populations of threatened species across their ranges, through the management of potential habitat and other management actions.’*

Strategic plans that implement actions to achieve management targets associated with goals 1 to 5 can indirectly contribute to goal 6, through conserving general biodiversity, and maintaining a healthy, heterogeneous, connected and resilient landscape. However, these associated actions alone may not fully satisfy the conservation management requirements for threatened species. This is because threatened species often require a more targeted approach to management, particularly if the species requires specific habitat types, is sensitive to particular threats, has a limited or localized distribution and/or population size, requires immediate recovery actions to improve its conservation status, or there are significant gaps in knowledge.

This section of the BLPG provides guidance on the landscape-scale actions recommended for threatened fauna species (to meet Goal 6) and indicates the potential contribution that the Goal 1-5 management targets and actions make toward the maintenance of threatened species at the landscape-scale. The DPIPWE/FPA agreed landscape-scale management actions are delivered through the Threatened Fauna Adviser 2014 (examples in Table 2). It is noted that while applying the landscape-scale actions will contribute to the maintenance of populations of threatened species, fine-scale or site specific management actions will also be required for many species.

It is intended for this section of the BLPG to be reviewed and revised as appropriate, in consultation with DPIPWE (or other) specialists as required under the procedures agreed between FPA and DPIPWE. In particular, any landscape-scale actions agreed for threatened flora species, which may arise from the review conducted as part of the Threatened Plant Adviser development, will be included.

Table 2. Examples of landscape-scale recommended actions for threatened species that are currently included in the Threatened Fauna Adviser 2014 and the related management targets in the BLPG.

NOTE: this table includes examples of actions that may be applied at the landscape-scale. This table does not include all landscape-scale management actions recommended for each and every species in the Threatened Fauna Adviser. It is recommended that anyone developing a landscape-scale plan (e.g. Management Agreement) using the BLPG should consult the Threatened Fauna Adviser for the most up to date 'landscape-scale' recommended actions to ensure all relevant management actions have been applied. Actions may still need to be applied at a finer-scale of planning (e.g. forest practices plan) for some species and operations.

Species	Range	Summary of recommended 'landscape-scale' actions (from Threatened Fauna Adviser 2014 and FPA Planning Guideline 2008/1)	Related management target.
Eastern-barred bandicoot	Core range	Retention of potential habitat, targeting significant habitat.	2.1
		Establish an informal reserve network of linked strips and patches of potential habitat.	3.1
New Holland mouse	Potential range	Minimise the risk of <i>Phytophthora cinnamomi</i> being introduced to potential habitat within the core range.	5.1
Spotted-tailed quoll	Core range	Retention of a network of potential habitat, targeting mature habitat.	2.1
		Consider the maintenance of native vegetation remnants in agricultural land or plantations.	2.2
Tasmanian devil	Outside heavily diseased area	Retention of potential habitat, targeting mature habitat.	2.1
	Inside heavily diseased area	Retention of potential habitat, targeting mature habitat.	2.1
Grey goshawk	Core range	Establish streamside reserves and do not harvest each side of a class 1 and 2 stream in one year, or increase streamside reserve to 45 metres; retain 30 metre streamside reserves on class 3 streams, and 10 metre streamside reserves on class 4 streams.	4.1 and 4.2
		Retention of potential habitat, targeting mature habitat.	2.1

Species	Range	Summary of recommended 'landscape-scale' actions (from Threatened Fauna Adviser 2014 and FPA Planning Guideline 2008/1)	Related management target.
	Woolnorth	Maintain 30% of the blackwood swamp area (potential habitat) at a property or forest block.	1.4 and 3.1
		Maintain 30% of grey goshawk habitat at the property or forest block scale.	3.1
		Do not harvest coupes on each side of a streamside reserve supporting prime habitat at the same time.	2.1
Tasmanian azure kingfisher	Core range	Manage riparian zones.	4.2
Swift parrot	North and west potential breeding range	Focus retention of nesting habitat in areas where there is little mature habitat available in the landscape.	2.1
		Retain foraging habitat within the landscape.	1.4
	Core range not in a SPIBA	Retain foraging habitat with a focus on high density foraging habitat.	1.2 and 1.4
	Core range not in a SPIBA	Focus retention of nesting habitat in areas where there is little mature habitat available in the landscape.	2.1
	Core range and SPIBA	Retain a higher level of foraging habitat than in areas outside SPIBAs.	1.2 and 1.4
		Retain nesting habitat with additional retention in areas where there is little mature habitat available in the landscape.	2.1
Forty-spotted pardalote	Potential range	Retention of potential habitat, targeting mature habitat and <i>Eucalyptus viminalis</i> trees.	2.1
Masked owl	Core range	Manage mature habitat within the landscape for availability and distribution.	2.1
Threatened frog species	Core range	Manage landscape with known sites to provide protection to the water bodies and retention of suitable dispersal corridors.	3.1 and 4.2
Tussock skink	Potential range	Retention of potential habitat, targeting mature habitat.	2.1
Glossy grass skink	Core range	Retain standard streamside reserves on class 1, 2 and 3 streams and increase protection on class 4 streams to 20 metres.	4.2

Species	Range	Summary of recommended 'landscape-scale' actions (from Threatened Fauna Adviser 2014 and FPA Planning Guideline 2008/1)	Related management target.
Australian grayling	Potential range	Increase protection on class 3 streams to 30 m streamside reserve and class 4 streams to 10 m streamside reserve.	4.2
		Disperse coupes so that each side of a class 1, 2, or 3 stream is not logged until the other side of the stream reaches at least 5 metres in height.	2.1
		Revegetate cleared streamside reserves.	4.2
Swan galaxias and dwarf galaxiid	Core range and potential range	Maintain water quality and flow and condition of riparian vegetation.	4.1 and 4.2
Swamp galaxias and Clarence galaxias	Potential range	Maintain water quality and flow and condition of riparian vegetation.	4.1 and 4.2
Saddled galaxias, Arthurs paragalaxias and golden galaxias	Potential range	Maintain water quality and flow and condition of riparian vegetation.	4.1 and 4.2
Great lake paragalaxias and Shannon paragalaxias	Potential range	Apply 30 m streamside reserve on class 3 streams and 10 m on class 4 streams.	4.2
		Revegetate cleared streamside reserves.	4.2
		Maintain water quality in known localities.	4.1
Tasmanian chaostola skipper	Potential range	Retention of potential habitat, targeting mature habitat.	2.1
Marawah skipper	Potential range	Retention of potential habitat, targeting mature habitat.	2.1
Ptunarra brown butterfly	Core range and potential range	Maintain the hydrological condition of sites supporting known colonies or potential habitat.	4.1
Freshwater crayfish	Potential range	Maintain water quality, flow and condition of riparian vegetation	4.1 and 4.2
		Planning for harvest should aim for sufficient coupe dispersal so that operation areas on one side of a class 1, 2 or 3 stream are not	2.1 and 4.2

Species	Range	Summary of recommended 'landscape-scale' actions (from Threatened Fauna Adviser 2014 and FPA Planning Guideline 2008/1)	Related management target.
		logged before the regrowth in a logged coupe on the other side of the stream reaches at least 5 m in height. Where a coupe on one side of a stream is to be logged before the regrowth in a logged coupe on the other side of the stream reaches 5 m in height the streamside reserve width should be increased by at least 50%. Where these are Machinery Exclusion Zones on Class 4 streams, they need to be increased to at least 20 m intact reserves (native forest only).	
		Restore riparian vegetation in plantations	4.2
		Within large plantation blocks, disperse harvesting over time	4.1
		Consider restricting access to areas opened up by new roads to reduce the chance of illegal fishing (this is mainly applicable to extensive areas of forest not previously accessed by a road network).	4.1 and 4.2
Burrowing crayfish	Core range	Restore riparian vegetation in plantations	4.2
		Within large plantation blocks achieve dispersal over time	4.1
		Retain streamside reserves and increase to 10 metre streamside reserve on class 4 streams	4.2
Skemps snail	Known range	Maintain a contiguous network of native forest	2.1, 3.1
		Disperse coupes	2.1
		Design coupe so that 50% of the boundary is adjacent to native forest at least 25 years old and 150 m wide.	2.1, 2.3
		Retain streamside reserves and increase streamside reserves to 20m on class 4 streams.	4.2
Burgundy snail	Core range	Maintain a contiguous network of native forest	2.1, 3.1
		Disperse coupes	2.1
		Design coupe so that 50% of the boundary is adjacent to native forest at least 25 years old	2.1, 2.3

Species	Range	Summary of recommended 'landscape-scale' actions (from Threatened Fauna Adviser 2014 and FPA Planning Guideline 2008/1)	Related management target.
		and 150 m wide.	
		Retention of potential habitat, targeting mature habitat.	2.1
Keeled snail	Core range	Maintain a contiguous network of native forest	2.1, 3.1
Freshwater snails	Known and potential range	Maintain water quality, flow and condition of riparian vegetation	4.1 and 4.2
Caddisflies	Potential range	Maintain water quality, flow and condition of riparian vegetation	4.1 and 4.2
Bornemisszas stag beetle	Known range	No forestry operations within the Special Management Zone	4.1
		Disperse coupes	2.1
		Design coupe so that 50% of the boundary is adjacent to native forest at least 25 years old and 150 m wide.	2.1, 2.3
		Retention of potential habitat, targeting mature habitat.	2.1
Vanderschoors stag beetle	Known range	Disperse coupes	2.1
		Design coupe so that 50% of the boundary is adjacent to native forest at least 25 years old and 150 m wide.	2.1, 2.3
		Retention of potential habitat, targeting mature habitat.	2.1
Simsons stag beetle	Known range	Disperse coupes	2.1
		Design coupe so that 50% of the boundary is adjacent to native forest at least 25 years old and 150 m wide.	2.1, 2.3
		Retention of potential habitat, targeting mature habitat.	2.1
Broad-toothed stag beetle	Known range	Disperse coupes	
		Design coupe so that 50% of the boundary is adjacent to native forest at least 25 years old and 150 m wide.	
		Retention of potential habitat, targeting mature habitat.	

7. References

- Biodiversity Review Panel 2009, 'Review of the biodiversity provisions of the Tasmanian Forest Practices Code', Forest Practices Authority.
- Bunnell, FL & Dunsworth, BG 2004, 'Making adaptive management for biodiversity work - The example of Weyerhaeuser in coastal British Columbia', *Forestry Chronicle*, vol. 80, no. 1, pp. 37-43.
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8. Appendices

Appendix 1: Process for the development, review and continual improvement of the provisions of the *Forest Practices Code*

The forest practices adaptive management process, in relation to many biodiversity values, can be summarised as follows:

- a. The most up-to-date information is gathered from published and non-published sources to determine the 'expert opinion' with respect to the value in question and its likely response to various forms of forest management;
- b. The science and expert opinion is used to develop management actions for the value. This may be done through a technical working group (e.g. fauna/flora strategic planning groups, hollows working group) convened for the particular value or issue;
- c. Comment is sought from all stakeholders, particularly practitioners (FPOs), on the proposed management actions and any associated implementation tools (e.g. policies, DSS, technical notes, etc.);
- d. The final decision on adoption or amendment of the management actions and any associated implementation tools is made by the Board of the FPA (and Secretary of DPIPW in the case of actions relating to threatened species) who may seek advice from the Forest Practices Advisory Council, TSSAC and any other advisory bodies as required;
- e. Training, education and awareness programs are conducted on a regular basis for forest practices officers, other planning and supervisory staff employed throughout the forest industry and landowners;
- f. The management actions are implemented through effective and efficient planning tools and procedures;
- g. Research is conducted to improve understanding of the value in question and its response to different impacts;
- h. Monitoring is carried out by specialists to assess the efficacy of management actions;

The management actions are reviewed and revised on a regular basis to incorporate the findings of new research, results from monitoring and operational experience.

Appendix 2: Management targets and related sustainability indicators

The management targets of the BLPG and their related sustainability indicator from the Tasmanian State of the Forests reporting (State of Tasmania and Commonwealth of Australia 2007).

Management Target	Sustainability indicator
1.1 A minimum of 95 per cent of the 1996 CRA native forest area is to be maintained on a state-wide basis.	<i>1.1a Extent of area of forest type</i>
1.2 Maintain and/or enhance the area and/or condition of threatened native vegetation communities on public and private land.	<i>1.1.c Extent of area by forest type and reservation status</i>
1.3 Ensure that conversion does not result in any non-threatened forest community becoming threatened.	<i>1.1.c Extent of area by forest type and reservation status</i>
1.4 Priority forest communities to be maintained on public land wherever prudent and feasible.	<i>1.1.e Extent of old growth by forest type by reservation status</i> <i>1.1.c Extent of area by forest type and reservation status</i>
2.1 Maintain the full range of seral stage pattern in native forests.	<i>1.1.b Area of forest by growth stage;</i> <i>1.1.e. Area of old growth by forest type by reservation status</i>
2.2 Maintain remnant vegetation.	<i>1.1.d Fragmentation of forest cover</i>
2.3 Ensure adequate regeneration in native forest harvest areas is achieved during each harvest cycle, including regeneration of the understorey.	<i>2.1.e. The area of native forest harvested and the proportion of that effectively regenerated and the area of plantation clearfelled and the proportion of that effectively re-established</i>
3.1 Maintain and/or enhance linkages along water courses and between water courses, capturing a range of habitat types and topographies.	<i>1.1.d Fragmentation of forest cover</i>
4.1 Maintain water quality and flow within the	<i>4.1.b Management of the risk of soil erosion and the risk to soil physical properties, water</i>

Management Target	Sustainability indicator
range of natural variation over time.	<i>quantity and water quality in forests</i>
4.2 Maintain and/or restore riparian vegetation and instream habitat.	<i>4.1.b Management of the risk of soil erosion and the risk to soil physical properties, water quantity and water quality in forests</i>
5.1 Manage the risk of introducing disease into a 'healthy' habitat.	<i>3.1.a Area and percentage of forest affected by processes or agents that may change the ecosystem health and vitality</i>
5.2 Minimise the deleterious effects of weeds in native forests and plantations, with particular focus on declared environmental weeds and native forest adjacent to plantations.	<i>3.1.a Area and percentage of forest affected by processes or agents that may change the ecosystem health and vitality</i>
5.3 Minimise harmful edge effects on reserves and sensitive vegetation communities and sensitive priority species habitat.	<i>3.1.a Area and percentage of forest affected by processes or agents that may change the ecosystem health and vitality;</i> <i>3.1.b Area of forest burnt by planned and unplanned fire</i>
5.4 Manage the risk of genetic pollution in threatened native eucalypt populations and areas of high conservation value.	<i>3.1.a Area and percentage of forest affected by processes or agents that may change the ecosystem health and vitality</i>
5.5 Maintain soil fertility and structure.	<i>4.1.b Management of the risk of soil erosion and the risk to soil physical properties, water quantity and water quality in forests</i>