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

1 Name of the ecological community

Lowland Native Grasslands of Tasmania

This advice follows the assessment of information provided by a public nomination to include the "*Lowland Temperate Grasslands of Tasmania*" in the critically endangered category of the list of threatened ecological communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Committee recommends that the ecological community be named as above. This name reflects the nomenclature used for native grasslands in the Tasmanian Government vegetation classification system, called TASVEG (Harris and Kitchener, 2005).

2. Public Consultation

A technical workshop was held in 2006 with experts on the ecological community. The nomination and a report on technical workshop outcomes were made available for public exhibition and comment for a minimum 30 business days. The technical workshop and further consultation with experts on the ecological community assisted with the determination of the national ecological community. The Committee has had regard to all public and expert comment that was relevant to the consideration of the ecological community.

3. Summary of conservation assessment by the Committee

The Committee provides the following assessment of the appropriateness of the ecological community's inclusion in the EPBC Act list of threatened ecological communities.

- The Committee judges that the ecological community has been demonstrated to have met sufficient elements of Criterion 1 to make it **eligible** for listing as **endangered**.
- 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**.
- The Committee judges that the ecological community has been demonstrated to have met sufficient elements of Criterion 4 to make it **eligible** for listing as **endangered**.
- The Committee judges that the ecological community has been demonstrated to have met sufficient elements of Criterion 5 to make it **eligible** for listing as **vulnerable**.
- The highest category for which the ecological community is **eligible** to be listed is **critically endangered**.

4. Description

General features

Natural temperate grasslands were once widely distributed in temperate Australia, from northern New South Wales (NSW) to southeastern South Australia and Tasmania (McDougall and Kirkpatrick, 1993; Carter et al., 2003; Gilfedder et al., 2008). Remnants exist across most of that range today, including in the lowlands of Tasmania. While significant overlap exists in species composition across these grasslands, the nature of threats, the management history and the future management needs associated with them varies across bioregions. This

variability impacts on the appearance and dynamics of each component, hence, the Lowland Native Grasslands of Tasmania are different to other temperate grasslands such as those on the southern tablelands of NSW and the Australian Capital Territory, the Victorian Volcanic Plain and the iron-grass natural temperate grasslands of South Australia.

According to Kirkpatrick et al. (1988), native grasslands in Tasmania were historically concentrated in the Midlands region and scattered across the eastern half of the state. Today, the Lowland Native Grasslands of Tasmania ecological community generally occurs at elevations up to 600 m above sea level (asl) in the Tasmanian Midlands, Derwent Valley, east coast and southeast Tasmania. Localised areas of the ecological community also occur in northwest Tasmania and on Flinders and Cape Barren Islands in Bass Strait (TASVEG, 2004a).

The species composition and appearance of the ecological community and its position in the landscape are driven by the influences of precipitation, soils, temperature and historical and current land use. These influences may vary the expression of the ecological community over even small distances or from year to year and among seasons.

Tasmania has a temperate maritime climate characterised by mild winters, cool summers and rainfall in all seasons (Harris and Kitchener, 2005). The grasslands are generally concentrated where precipitation is low and the soils are heavy, deep, mineral and fertile and are typically absent from rocky or highly infertile sites (Kirkpatrick et al., 1988; Kirkpatrick, 1999; Harris and Kitchener, 2005). They generally occur on soils underlain by basalt, dolerite, deep sands or alluvial deposits (Kirkpatrick et al., 1988; DPIW, 2006).

Vegetation

Native grasslands are defined as areas of native vegetation dominated by native grasses with few or no emergent woody species (Kirkpatrick, 1999; Harris and Kitchener, 2005). The vegetation of the Lowland Native Grasslands of Tasmania ecological community is mostly limited to a ground layer of grasses and herbs. Large trees and shrubs are absent to sparse. The ecological community is comprised of two major sub-types differentiated by the dominant native tussock-forming perennial grass species: Lowland *Poa labillardierei* (Silver Tussock Grass) Grassland and Lowland *Themeda triandra* (Kangaroo Grass) Grassland. The descriptions below are taken from a range of sources including Kirkpatrick et al. (1988), Gilfedder et al. (2003), Harris and Kitchener (2005) and the Tasmanian vegetation community descriptions and benchmarks (TASVEG 2004b, 2004c, 2004d).

- Lowland *Poa labillardierei* (Silver Tussock Grass) Grassland

This sub-type is relatively species-poor and consists of grasslands typically dominated by tussocks of *P. labillardierei*. Other herbs such as lilies, daisies and orchids occupy the inter-tussock spaces. Tussocks may be large and spreading or small and tufty depending on the situation and may form a closed sward or an open layer with smaller grasses, forbs and lichens in the inter-tussock spaces. Weed species are generally more common in this sub-type of the ecological community. It is generally less floristically diverse than the Lowland *T. triandra* Grassland sub-type.

Lowland *P. labillardierei* grasslands are generally treeless and often occur adjacent to, or intermixed with, *Eucalyptus ovata* (Black Gum) grassy woodland. Where trees are present the tree cover is very low (e.g. <5%) and species may include Black Gum, *E. viminalis* (White Gum) or *E. pauciflora* (Cabbage Gum). The trees may be low (<10 m), or in wetter or more fertile alluvial areas, may reach up to 20 m in height.

Remnants of this grassland sub-type occur mainly through the Tasmanian Midlands, Derwent Valley, east coast and the southeast, generally at elevations less than 600 m asl. Some less

substantial areas also occur on Flinders and Cape Barren islands. This grassland is typically found on alluvial flats in valley bottoms and on gentle slopes. Where inundation of sites is common, the tussocks are often interspersed with flood-scoured and water-filled hollows.

A list of characteristic plant species present in the Lowland *P. labillardierei* sub-type of the ecological community is at Appendix A.

- Lowland *Themeda triandra* (Kangaroo Grass) Grassland

This sub-type is typically dominated by *T. triandra* and is floristically diverse. Other common grasses in this grassland include species of the *Austrodanthonia* (Wallaby Grasses), *Austrostipa* (Spear Grasses) and *Poa* genera. It is often characterised by a rich variety of lilies, orchids, daisies and other herbs in patches between grass tussocks although it can occur where *T. triandra* dominates almost to the exclusion of other species.

The Lowland *T. triandra* Grassland is generally treeless but scattered, low trees (e.g. Black Gum, White Gum, Cabbage Gum, *E. rubida* (Candlebark) and *E. amygdalina* (Tasmanian Black Peppermint)) can occur at low densities. *Acacia dealbata* (Silver Wattle), *A. mearnsii* (Black Wattle), *A. melanoxylon* (Blackwood), *Allocasuarina* spp., *Bursaria spinosa* (Prickly Box) and *Dodonaea viscosa* (Hop Bush) can form a scattered small-tree or tall shrub layer, especially on slopes.

Remnants of this grassland type occur on sites that are generally drier than those occupied by Lowland *P. labillardierei* grasslands. They occur on valley flats and well-drained slopes on basalt, dolerite and deep sands mainly through the Tasmanian Midlands, Derwent Valley, east coast and southeast. This type is often used as native pasture in agricultural land, and frequently occurs as small remnants on roadsides, country cemeteries and rail reserves.

There are a number of floristic variants of the Lowland *T. triandra* grassland. These include sub-coastal grasslands co-dominated by *T. triandra* and *Poa rodwayi* (Velvet Tussock Grass) on stable calcareous dunes of the near coastal zone in the Arthur-Pieman Conservation Area, northwest Tasmania and the grasslands dominated by *T. triandra* on fertile soil and areas exposed to a high incidence of salt spray at locations such as Waterhouse, Cape Portland and Butlers Point in northeast Tasmania.

Some key species in good quality patches of the Lowland *T.triandra* sub-type include:

- Native Asteraceae species (excluding *Solenogyne*, *Euchiton* (Cottonleaf) and *Senecio* (Fireweed) species), particularly *Leptorhynchos squamatus* (Scaly Buttons) and *Chrysocephalum apiculatum* (Common Everlasting)
- Short or prostrate shrubs – including *Pimelea humilis* (Dwarf Rice Flower) and *Hibbertia* species (Guinea flowers)
- Native Fabaceae (Native peas) – including *Bossiaea prostrata* (Creeping Bossiaea) and *Glycine* species (Native Clover)
- Epacridaceae species (Native heaths) - including *Lissanthe strigosa* (Peachberry Heath) and *Astroloma humifusum* (Native Cranberry)
- Orchid species (Native Orchids) – including *Pterostylis* species (Greenhoods)
- Lily species (Native Lilies) – including *Arthropodium* species (Vanilla lilies).

A list of characteristic plant species present in the Lowland *T. triandra* sub-type of the ecological community is at Appendix A.

The Lowland Native Grasslands of Tasmania ecological community may intergrade with or occur as part of a mosaic of other native vegetation communities. For example, small patches

of *P. labillardierei* or *T. triandra* in grasslands dominated by *Austrodanthonia* spp. (Wallaby Grasses) and/or *Austrostipa* spp. (Spear Grasses) can be mapped as the TASVEG communities Lowland Grassland Complex or Bursaria – Acacia Woodland and Scrub. In these cases, where a patch of vegetation meets the *Description*, *Key Diagnostic Characteristics* and the *Condition Thresholds* of the Lowland Native Grasslands of Tasmania presented in this document then it forms part of the listed national ecological community.

Disturbance induced Native Grasslands

The Lowland Native Grasslands of Tasmania ecological community includes both natural and disturbance induced (or derived) native grasslands. Disturbance induced grasslands are those native grasslands created by the disturbance of another vegetation community, generally grassy woodlands. They are often rich in native species as a result of a very sparse tree layer, allowing proliferation of herbs intolerant of heavy shading and/or competition for moisture (Carter et al., 2003). They are therefore important for biodiversity conservation, especially in the context of significant declines in natural grasslands (DPIW, 2006).

In this ecological community, the *P. labillardierei* and *T. triandra* sub-types include disturbance induced grasslands. For both sub-types, while many valley bottom remnants are likely to be natural grasslands, remnants on slopes are often disturbance-induced and result from the loss of the tree layer of grassy woodlands and sometimes forests from eucalypt dieback, tree harvesting and/or failure of regeneration due to heavy stock grazing and/or burning (Kirkpatrick, 1999; Harris and Kitchener, 2005; DPIW, 2006). For example, repeated burning of closed forest vegetation may have induced the development of the *P. labillardierei* grasslands of the Bass Strait islands (DPIW, 2006).

Disturbance induced grasslands may be similar in vegetation composition and structure to the natural grasslands. It is often impossible to determine which grasslands are natural, those that have developed as a result of post-European settlement land management practices and those which may be the result of burning over the last 40 000 years by Indigenous people or from historic severe climactic events (Carter et al., 2003).

Where a patch of grassland is consistent with the *Description* of the ecological community (including the *Key Diagnostic Characteristics*) and *Condition Thresholds* presented in this document, it should be considered to be part of the Lowland Native Grasslands of Tasmania ecological community, regardless of its history.

Faunal components

The Lowland Native Grasslands of Tasmania support a wide range of animal species, including small mammals, larger grazing mammals, insectivorous and seed foraging ground dwelling birds, birds of prey, skinks, snakes and various invertebrates. The structure and species composition of the ecological community provides shelter, food and nesting material for these groups of animals, some of which play important roles in the ongoing function of the grasslands ecosystem. A list of some key fauna species is at Appendix B. Note that not all of the animals mentioned below and in Appendix B will be found in all patches of the ecological community and others not mentioned may be present.

Unlike many of the temperate grasslands of southeastern Australia, the Lowland Native Grasslands of Tasmania still support populations of a diversity of mammal species that utilise the grassland / grassy woodland mosaic for food and shelter such as the carnivorous mammals *Sarcophilus harrisii* (Tasmanian Devil), *Dasyurus viverrinus* (Eastern Quoll) and *Dasyurus maculatus maculatus* (Spotted-tail Quoll) (Rounsvell et al., 1991; Gilfedder et al., 2003). Parts of the Midlands are strongholds for *Bettongia gaimardi gaimardi* (Tasmanian Bettong) and *Macropus giganteus tasmaniensis* (Forester Kangaroo) and other grazing marsupials such

as *Vombatus ursinus* (Common Wombat) are abundant (Gilfedder et al., 2003). *Potorous tridactylus* (Long-nosed Potoroo), *Thylogale billardierii* (Tasmanian Pademelon), *Macropus rufogriseus* (Bennetts Wallaby), *Tachyglossus aculeatus* (Short-beaked Echidna), *Perameles gunnii gunnii* (Eastern-barred Bandicoot) and *Trichosurus vulpecula* (Common Brushtail Possum) can also be found regularly using the lowland grasslands (Rounsvell et al., 1991; Visoiu and Lloyd, 2003).

The ecological community provides important habitat for many bird species, with some relying on it for food, nest sites and protection from predators while others are occasional visitors who use the grasslands. Birds of prey, such as *Aquila audax fleayi* (Tasmanian Wedge-tailed Eagle), *Falco longipennis* (Australian Hobby) and *F. berigora* (Brown Falcon) hunt over the grasslands and feed on smaller native mammals, other birds and reptiles (Visoiu and Lloyd, 2003). Some bird species are grassland specialists such as *Tribonyx mortierii* (Tasmanian Native Hen) which feed on grasses and seeds and their ideal habitat is short, grazed pasture and damp pasture near streams with grassy vegetation (Parks and Wildlife Service, 2008).

Other bird species that may be found in the ecological community include *Anthus novaeseelandiae* (Richard's Pipit or Australasian Pipit), *Acanthiza chrysorrhoa* (Yellow-rumped Thornbill), *Coturnix ypsilophora* (Brown Quail), *Neophema chrysostoma* (Blue-winged Parrot), *Petroica phoenicea* (Flame Robin) and *Cracticus tibicen* (Australian Magpie) (Visoiu and Lloyd, 2003). The migratory *Gallinago hardwickii* (Latham's Snipe) is also often found on private properties in low-lying wet tussock grasslands (Visoiu and Lloyd, 2003).

Tasmania has relatively few reptile species compared with similar sized areas on the mainland, however reptiles do inhabit Tasmania's lowland grasslands. *Pseudemoia pagenstecheri* (Tussock Skink) and *P. rawlinsoni* (Glossy Grass Skink) are grassland specialists (Bryant and Jackson, 1999) that can be found in the ecological community. *Notechis scutatus* (Tiger Snake) and *Drysdalia coronoides* (White-lipped Snake) can also be found in lowland grasslands. *Austrelaps superbus* (Lowland Copperhead) are typically found around wetlands and farm dams which may occur within or adjacent to grasslands (Visoiu and Lloyd, 2003).

Invertebrates are a notable faunal component of the Lowland Native Grasslands of Tasmania ecological community. The grasslands support a diverse array of flying and terrestrial native arthropods. Moths and butterflies occupy the grass swards feeding on nectar and leaves and finding shelter in the dense tussocks while beetles and other subterranean invertebrates occupy the soil and litter substrate. For example, *Anisynta dominula dominula* (a skipper butterfly) feeds on *Poa* (Sands and New, 2002) and *Chrysolarentia decisaria* (Tunbridge Looper Moth) can be found at Tunbridge Lagoon in grassland (Bryant and Jackson, 1999). Similarly, *Oreixenica ptunarra* (Ptunnarra Brown Butterfly) inhabits and feeds on *Poa* tussocks in grassland and favours regions with dense cover of native grasses and vegetation less than one metre high (Sands and New, 2002).

Information about the functional role that some of the above animal groups play in the ecological community is presented in the *Relevant Biology and Ecology* section. Information about current threats to these faunal groups and resulting trends in decline of key species can be found in the *Description of Threats* section. In addition, a range of introduced animals can be found in the ecological community such as the Rabbit (*Oryctolagus cuniculus*), Feral Cat (*Felis catus*), Fallow Deer (*Dama dama*), Hare (*Lepus capensis*), European Fox (*Vulpes vulpes*) and a range of introduced birds (e.g. Common Blackbird (*Turdus merula*)).

These species and their impact on the ecological community are also discussed in the *Description of Threats* section.

Threatened Species

The impact of habitat loss and alteration through a long history of agricultural use and land clearance and conversion of lowland grasslands in Tasmania has resulted in high numbers of species becoming locally extinct and threatened. Many of the threatened grassland species only survive today on private land managed for pastoral activities (Gilfedder, 1990) or in small remnants on public lands such as cemeteries.

At the national level, 23 species associated with the Native Lowland Grasslands of Tasmania are listed as threatened under the EPBC Act (see Table 1). Approximately 60 flora and fauna species associated with the grasslands are listed under the Tasmanian *Threatened Species Protection Act 1995*.

Table 1. Nationally threatened species listed under the *Environment Protection and Biodiversity Conservation Act 1999* likely to occur in or near the Lowland Native Grasslands of Tasmania ecological community. Known occurrences of some species may be in landscapes or vegetation communities nearby to the national ecological community. *Sources:* Carter et al. (2003), Bryant and Jackson (1999), Mokany et al. (2006) and DPIW (2006). Current as at November 2008.

Species name	Common name(s)	EPBC Status
Birds		
Aquila audax fleayi	Wedge-tailed Eagle (Tasmanian)	Endangered
Mammals		
Dasyurus maculatus maculatus (Tasmanian population)	Spotted-tail Quoll (Tasmanian population), Tiger Quoll	Vulnerable
Perameles gunnii gunnii	Eastern-barred Bandicoot	Vulnerable
Sarcophilus harrisii	Tasmanian Devil	Vulnerable
*Vombatus ursinus ursinus**	Bass Strait Wombat	Vulnerable
Plants		
Austrodanthonia popinensis	Roadside Wallaby Grass	Endangered
Ballantinia antipoda	Southern Ballantine	Endangered
Caladenia anthracina	Black-tipped Spider-orchid	Critically Endangered
Carex tasmanica	Curly Sedge	Vulnerable
Colobanthus curtisiae	Curtis's Colobanth	Vulnerable
Dianella amoena	Matted Flax-lily	Endangered
Glycine latrobeana	Clover Soybean	Vulnerable
Lepidium hyssopifolium	Basalt Peppercress	Endangered
Leucochrysum albicans var. *tricolor*	Grassland Paper Daisy / Hoary Sunray	Endangered
Prasophyllum tunbridgense	Tunbridge Leek-orchid	Endangered
Pterostylis wapstrarum	Fleshy Greenhood	Critically Endangered
Prasophyllum incorrectum	Golfers Leek-orchid	Endangered
Prasophyllum olidum	Pungent Leek-orchid	Critically Endangered
Pterostylis commutata	Midland Greenhood	Critically Endangered
Pterostylis cucullata	Leafy Greenhood	Vulnerable
Pterostylis rubenachii	Arthur River Greenhood	Endangered
Pterostylis ziegeleri	Grassland Greenhood	Vulnerable
Ranunculus prasinus	Tunbridge Buttercup	Endangered

* Found only on Flinders Island

Key diagnostic characteristics

The key defining attributes for the Lowland Native Grasslands of Tasmania ecological community are:

- It is typically found in valley bottoms and gentle slopes below 600 m asl (but can occur up to 700 m asl);
- It is typically treeless with, at most, a sparse tree cover;
- The vegetation is predominantly native;
- Dominant[1] grasses often form a dense sward;
- The ecological community occurs in two forms:
    - Grasslands dominated by *T. triandra* (Kangaroo Grass) – including sub-coastal grasslands co-dominated by *T. triandra* and *P. rodwayi* (Velvet Tussock Grass).
    - Grasslands dominated by *P. labillardierei* (Silver Tussock Grass)
- Inter-tussock spaces are occupied by native herbs, including grasses, grass-like plants, lilies, daisies and orchids;
- It may be utilised by a wide range of native animal species;
- It can be in a mosaic where *Themeda, Poa, Austrodanthonia* or *Austrostipa* species co-occur (but *Themeda* or *Poa* remain dominant);
- It can include natural and disturbance-induced grassland; and
- The geographic distribution is limited to the following bioregions in Tasmania: Ben Lomond, Northern Midlands, Northern Slopes, South East, King, Flinders, Central Highlands and Southern Ranges.

5. Condition Thresholds

The protection provisions of the EPBC Act will be focused on the most valuable elements, of the ecological community. Significantly degraded areas that do not meet the Condition Thresholds will not be part of the listed ecological community.

Many patches of the Lowland Native Grasslands of Tasmania ecological community are now disturbed and occur as small, fragmented patches. Some form of ongoing management is required to maintain or enhance the biodiversity of the remaining patches.

The Lowland Native Grasslands of Tasmania ecological community comprises those patches that meet the *Description* (including the *Key Diagnostic Characteristics*), above, and the *Condition thresholds*, below.

The diagnostic characteristics and condition thresholds generally are based on features which apply all year round, with the exception of the ground cover of native herbs. This feature is best assessed during spring and summer because it is only during this time when many native species with bulbs or tubers (e.g. lilies, orchids) occur above ground and when most species are flowering. Assessments should be taken at this time to best ascertain the biodiversity value of a grassland patch. As well, the site must not have been excessively disturbed by, for instance fire, heavy grazing or mowing, for at least two months prior to sampling. This approach is recommended because many plant species may not be visible immediately after a disturbance. In addition, the area with the most apparent diversity of native species should be selected to determine estimates of native species richness and cover.

[1] Dominance is where a species (or two more species for co-dominance) comprises the major component of its vegetation layer, usually measured as ≥ 50% of the projective foliage cover.

A patch of the listed ecological community is here defined as a discrete and continuous area of the ecological community, as described, and does not include substantial elements of other ecological communities, such as woodlands. However, a patch of the listed ecological community may include small-scale disturbances, such as tracks or breaks, that do not alter its overall functionality, for instance the easy movement of wildlife or dispersal of plant propagules, and may also include small-scale variations in vegetation that are noted in the Description and National Context.

- Patch size must be ≥1 ha

AND

- Perennial Native Tussock cover:
    - ≥ 50% of the cover of perennial tussocks must be represented by the grass genera *Poa* and/or *Themeda;* OR
    - Where the perennial tussock cover represented by these two genera is <50%, then the ground cover of native herbs (excluding grasses, other than from the genera *Poa* or *Themeda*) needs to be ≥50% of total ground cover[2].

AND

- Species Richness:
    - When *P. labillardierei* is the dominant native perennial tussock species the grassland has ≥5 native wildflower[3] species per 0.5 ha during September to March; OR
    - When *T. triandra* or *P. rodwayi* is the dominant native perennial tussock species the grassland has ≥10 native wildflower[3] species per 0.25 ha during September to March;

AND

- Tree and shrub cover:
    - ≤5 mature (>5 m tall) *Eucalyptus* trees per hectare; AND
    - ≤30% solid crown cover[4] of other native trees and tall shrubs greater than 2 m (e.g. *Bursaria, Acacia* and/or *Allocasuarina* species); AND
    - ≤10% solid crown cover[4] of regenerating *Eucalyptus* trees or other woody native species.

    The ecological community may also contain tree stumps or dead trees. Where present, these do not contribute to the calculation of solid crown cover

AND

- Weeds
    - Perennial non-native plant species account for <20% of total ground cover at any time of the year.

[2] Ground cover includes all living material in the ground layer (e.g. herbs, lichens).

[3] Wildflowers include all native herbaceous plant species, excluding grasses, sedges and rushes.

[4] Solid Crown Cover assumes the density of tree canopy is solid rather than opaque. It is equal to the crown-diameter method of cover measurement.

Additional features that add value to a patch of the ecological community include:

- a high native species richness;
- large patch size or connectivity to a large native vegetation remnant;
- minimal weed invasion;
- presence of threatened plant and/or animal species; and
- presence of mosses, lichens or a soil crust on the soil surface.

6. National Context

Distribution

Temperate grasslands have an irregular distribution from north of Adelaide around southeastern Australia to northern NSW within the zone of 500 to 1000 mm average annual winter and/or summer rainfall where the dominant genera are *Themeda, Poa* and *Austrostipa* (Mott and Groves, 1994). The Lowland Native Grasslands of Tasmania are a component of the lowland temperate grassland vegetation group that occurs in disjunct areas throughout southeastern Australia broadly associated with particular Interim Biogeographic Regionalisation for Australia (IBRA) bioregions or subregions (Carter et al., 2003). IBRA divides the Australian continent into 85 bioregions. The IBRA bioregions in which the ecological community occurs are: Ben Lomond, Northern Midlands, Northern Slopes, King, Flinders, South East, Central Highlands and Southern Ranges.

Relationships to national and State vegetation classification

The Lowland Native Grasslands of Tasmania can be related to the vegetation classification systems used at both the national and state level. National Vegetation Information System (NVIS) is an hierarchical system for classifying vegetation across the Australian continent. It ranges from broad Major Vegetation Groups (Level I) and Subgroups (Level II) to more fine-scale floristic sub-associations (down to Level VI). The Lowland Native Grasslands of Tasmania ecological community falls within the Major Vegetation Subgroup 19 - *tussock grasslands* (Department of the Environment and Water Resources, 2006, 2007). The classification of the ecological community under NVIS is detailed in Table 2.

Table 2. Classification of the Lowland Native Grasslands of Tasmania ecological community under the National Vegetation Information System (NVIS) version 3.1. Current as at October 2008.

Legend: **Bold text** = Dominant stratum, growth form or species.

NVIS Category	**Lowland *Themeda triandra* (kangaroo grass) Grassland**	**Lowland *Poa labillardierei* (silver tussock grass) Grassland**
Source Code	GTL	GPL
Major Vegetation Group (Level I)	19 Tussock grasslands	19 Tussock grasslands
Major Vegetation Subgroup (Level II)	36 Temperate tussock grasslands	36 Temperate tussock grasslands
Formation (Levels III/IV)	*Themeda* mid tussock grassland	*Poa* mid tussock grassland
Association (Levels V/VI)	**Ground stratum 1 - *Themeda triandra*, *Austrodanthonia* spp., *Austrostipa* spp. *Poa* spp.** Growth forms = **tussock grass** Height class = 2 (mid, 0.5-1 m) Cover code = c (30-70% foliage cover) Ground stratum 2 - *Gonocarpus tetragynus, Hypericum gramineum, Schoenus apogon, Poranthera microphylla, Oxalis perennans* Growth forms = forb, sedge Height class = 1 (low, <0.5 m) Cover code = c (30-70% foliage cover)	**Ground stratum 1 - *Poa labillardierei*** Growth forms = **tussock grass** Height class = 2 (mid, 0.5-1 m) Cover code = c (30-70% foliage cover)

TASVEG is the Tasmanian Government classification system used to describe and map vegetation communities across the state. Floristic attributes, altitudinal distribution and environmental situation can be used to define the communities (Harris and Kitchener, 2005). Benchmarks have been developed for each TASVEG community. These provide vegetation condition assessment reference points, species lists and general descriptions of the community. In some cases, different variants of the same TASVEG community are recognised and have separate benchmarks. The Lowland Native Grasslands of Tasmania ecological community equates with two TASVEG floristic communities.

(1) GPL - Lowland *Poa labillardierei* Grassland

This community includes all natural and disturbance induced grasslands dominated by *P. labillardierei* that occur at elevations of generally less than 600 m. It is treeless (or has a very light tree cover) with graminoids, small grasses and other herbs in the inter-tussock spaces (TASVEG, 2004b, 2004c; Harris and Kitchener, 2005). Two variants of this ecological community, differentiated by landscape position, have been described with separate benchmarks:

- Lowland *Poa labillardierei* grassland on valley bottoms and river banks, and
- Lowland *Poa labillardierei* grassland on slopes.

The Lowland Native Grasslands of Tasmania ecological community equates with this TASVEG floristic community in full where the *Condition Thresholds* presented in this document have been met.

(2) GTL - Lowland *Themeda triandra* Grassland

This community includes all natural and disturbance induced grasslands dominated by *T. triandra*, as well as sub-coastal grasslands co-dominated by *P. rodwayi* in the northwest. It is floristically diverse with many intertussock herbs and occurs on treeless valley flats and well drained slopes (TASVEG, 2004d; Harris and Kitchener, 2005). The Lowland Native Grasslands of Tasmania ecological community equates with this TASVEG floristic community in full where the *Condition Thresholds* presented in this document have been met.

Similar ecological communities in Tasmania

The Lowland Native Grasslands of Tasmania ecological community may be adjacent to, similar to, or intergrade with, a number of other native vegetation communities. It may also occur as part of a mosaic of other native vegetation communities on a scale difficult to map accurately at the TASVEG scale of 1:25,000. These vegetation types are excluded from the national ecological community in their own right. However, where a patch of vegetation meets the *Description, Key Diagnostic Characteristics* and the *Condition Thresholds* of the Lowland Native Grasslands of Tasmania presented in this document then it forms part of the listed national ecological community.

- Lowland Sedgey Grassland (GSL) is vegetation dominated by sedges and sedge-like species such as *Lomandra longifolia* (Sagg) and *Lepidosperma* species interspersed with *Poa* species and other grasses. This grassland occurs on fertile substrates such as dolerite, basalt and alluvial sites below 600 m in elevation.

- Rockplate Grassland (GRP) is vegetation that occurs on skeletal soils over rockplates and is dominated by *P. rodwayi* or *Austrodanthonia* species. It is usually devoid of all woody species as the extremes of wetting and drying of the thin soils prevents establishment of large tap-rooted species. It may be adjacent to grasslands or to woodland/forest communities.

- Lowland Grassland Complex (GCL) is vegetation generally dominated by *Austrodanthonia* or *Austrostipa* species, or grassland without a clear dominant but where *Austrodanthonia*, *Poa*, *Themeda* and/or *Austrostipa* species are all commonly present. *Austrodanthonia* and *Austrostipa* grasslands occur naturally in valley bottoms and lower slopes.

  Small patches of *P. labillardierei* in grasslands dominated by *Austrodanthonia* and *Austrostipa* are often mapped as Lowland Grassland Complex, such as along narrow creek lines. These patches would form part of the national Lowland Native Grasslands of Tasmania ecological community where they meet the *Description, Key Diagnostic Characteristics* and *Condition Thresholds* presented in this document.

- Bursaria-Acacia Woodland and Scrub (NBA) is characterised by scattered small (<10 m) shrubs of Prickly Box, Hop Bush, Silver Wattle, Black Wattle, Blackwood, *A. verticillata* (Prickly Moses) and other small trees and shrubs in a grassy sward dominated by *T. triandra* or *Austrodanthonia* species. It occurs on small hills and dry lower slopes on dolerite or basalt and results either from degradation of eucalypt forest or from regeneration of Prickly Box, *Acacia* species and Hop Bush where forest had been previously cleared or where there is a long history of the absence of grazing and/or fire.

  Patches of this vegetation type where *T. triandra* are dominant and where woody vegetation cover is light would form part of the national Lowland Native Grasslands

of Tasmania ecological community where they meet the *Description, Key Diagnostic Characteristics* and *Condition Thresholds* presented in this document.

- Highland *Poa* Grassland (GPH) is grassland dominated by large tussock grasses (*Poa gunnii* and/or *P. labillardierei*) that generally occurs between 600 m and 1000 m in elevation. Small highland grassland strips occur at higher altitudes on fertile mineral soil derived from dolerite, usually on the well-drained edges of broad basins.

National Importance

Temperate grasslands are one of the most under-represented ecosystems in Australia's conservation estate (Gilfedder et al., 2008) and are recognised as one of the most threatened vegetation types (e.g. Kirkpatrick et al., 1995). By February 2009, four natural temperate grasslands have been formally listed as threatened under the EPBC Act: the Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory (listed as Endangered), the Iron-grass Natural Temperate Grassland of South Australia (listed as Critically Endangered), the Natural Temperate Grassland of the Victorian Volcanic Plain (listed as Critically Endangered) and the Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern Queensland (listed as Critically Endangered). Some others are formally protected under state legislation.

The remnant Lowland Native Grasslands of Tasmania is regarded as one of Tasmania's most threatened and fragmented ecosystems (Zacharek et al., 1997; Kirkpatrick et al., 1988; Harris and Kitchener, 2005) and the most depleted vegetation formation in Tasmania (DPIW, 2006). As at March 2009, the lowland native grasslands were not listed as a threatened vegetation community under the Tasmanian *Nature Conservation Act 2002.*

The Tasmanian Midlands, one of the main areas where Lowland Native Grasslands of Tasmania are found, is one of the 15 national biodiversity hotspots declared by the Australian Government. In addition, the grasslands, and the orchids, other herbs and reptiles which depend on them, are identified as one of the conservation priorities for the Tasmanian Northern Midlands in the Australian Natural Resources Atlas Biodiversity Assessment of Tasmania (Sattler and Creighton, 2002).

Grassy ecosystems in the Campbell Town-Ross-Tunbridge areas are considered to be particularly important (Sattler and Creighton, 2002). The Township Lagoon Nature Reserve at Tunbridge is a 16 ha site listed on the National Estate that contains lowland grasslands dominated by *T. triandra* and *P. labillardierei*. The 116 native species found in the reserve represent approximately 15% of the 750 native plant species of grasslands in Tasmania. Significant populations of a large number of threatened (at a national and/or state level) species can be found in the Reserve. These include Basalt Peppercress, Grasslands Paper Daisy, Tunbridge leek orchid, Tunbridge Buttercup, Tussock Skink, *Brachyexarna lobipennis* (a grasshopper) and Tunbridge Looper Moth (Zacharek et al., 1997).

In addition to their value as habitat for endemic and threatened species, the Lowland Native Grasslands of Tasmania are an economically valuable resource for Tasmania's agricultural sector. They are used in the wool industry where around half of Tasmania's high value fine wool sheep graze on native grasslands. Native pastures are known to produce some of the finest wool due to their lower nutritional value and more even growth through the year compared to sown pastures (Kirkpatrick et al., 1995; Parks and Wildlife Service, 2003).

7. Relevant Biology and Ecology

The presence and expression of the ecological community is a function of topography, climate, rainfall, land-use and fire history and the interaction between these variables. In response, the grasslands can vary in appearance over months, seasons, years and decades. The Lowland Native Grasslands of Tasmania may intergrade with grassy woodland communities and the wetter vegetation communities in riparian zones and share species composition and structural affinities with these other communities.

The Lowland Native Grasslands of Tasmania ecological community also shows variation with respect to past land management practices. The severity and frequency of fire, grazing or fertiliser regimes can markedly affect the density of the native grass sward and the amount of bare ground, which influence floristic composition, litter deposition and nutrient cycling (Kirkpatrick et al., 1988). Furthermore, in a human-induced changed landscape, natural grasslands and those derived through the removal of woodland trees from grassy woodland communities can be difficult to distinguish.

Herbaceous perennials are the dominant life form in Tasmania's lowland native grasslands with most of the biomass consisting of a single dominant species e.g. *T. triandra* or *P. labillardierei*. Despite the dominance of these species, grasslands can be extremely rich in plant species. For example, more than 100 native species can be found in the grasslands of small reserves, such as the 16 ha site at Tunbridge Lagoon (Kirkpatrick et al., 1995).

Grasses and graminoids (grasslike plants such as sedges, lilies, orchids) comprise 30% of the grasslands flora in lowland grasslands and can at times provide over 90% of the biomass (Kirkpatrick et al., 1988). However, not all species can be seen year round. Most are evident in spring when warmth and moisture tend to coincide. Inter-tussock spaces can be occupied in favourable parts of the year by lilies and orchids, which in inhospitable seasons survive as roots, bulbs or tubers and give way to lichen crusts that cover the soil (Kirkpatrick et al., 1995). Conversely, deep rooted perennial C4 (summer growing) grasses, in particular *Themeda*, maintain growth well into the dry summer (Kirkpatrick et al., 1988).

The tendency of *P. labillardierei* to dominate fertile river flats and *Themeda* to dominate slopes may be explained by the ability of *P. labillardierei* to outcompete *Themeda* at high nutrient levels (Kirkpatrick et al., 1988; Fensham and Kirkpatrick, 1992).

The physical properties of the soil are also important in determining the floristic composition of the grasslands. For example, grassland soils often crack during summer which allows seeds to penetrate deep in the soil and the soils swell upon wetting. This is a process that is unfavourable for tap rooted species but favours plants with tufted (caespitose) root systems and annuals that require their seeds to be held deep in the soil (Kirkpatrick, 1999).

Treelessness

A key feature of the lowland grasslands of Tasmania is the absence (or sparseness) of trees. Treelessness, or the failure of trees and shrubs to flourish, can be driven by moisture, soil type and properties, grazing, drought and competition for nutrients, light and space between the dominant grass species and tree seedlings (e.g. Kirkpatrick et al., 1988, Kirkpatrick, 1999). Fensham and Kirkpatrick (1992), in a study in central Tasmania, concluded that the primary cause of a relative lack of trees in the open areas at all altitudes was the competition for moisture and root space provided by a dense grass sward. Trees are able to establish where the grass sward is broken up by stream erosion, rock outcrops, or substantial digging by animals.

Frost can also play an important role in inhibiting tree establishment or survivorship at some sites. Kirkpatrick et al. (1988) observe that grasslands occur extensively in valley bottoms

where frost or poor drainage inhibit tree establishment and success. Frosts don't need to be very frequent for treelessness to be maintained and some grasslands are also the result of the occasional severe frost, like that of 1857 which killed large tracts of eucalypts in the valleys of inland Tasmania (Kirkpatrick, 1999).

As discussed earlier in this document, treelessness can also result from the deliberate activities of humans and result in human-induced (or derived) native grasslands. Trees can be cut down as part of broad scale land clearance in preparation for agricultural activities, they can be removed from road and rail verges, stock grazing can result in failure of tree regeneration and cutting or ring-barking of trees also occurs in paddocks (Kirkpatrick et al., 1995).

The role of fire

Fire intensity and frequency is another factor that can influence the structure and composition of vegetation. The interaction of humans, climate, vegetation and soils over time has been profound, with the frequency and intensity of fire changing throughout the period since human colonisation. Gammage (2008) argues that without the use of fire by Indigenous people in Tasmania the vegetation types would be very different. According to Kirkpatrick (1999), fire appears to be a major agent in the maintenance of much of Tasmania's grassy vegetation. For example, some areas of lowland *P. labillardierei* grassland on Flinders and Cape Barren Islands in Bass Strait have been created by the repeated burning of areas once occupied by closed forest (Kirkpatrick et al., 1995).

Fire carries easily in the dry grass swards of summer and autumn. According to Lunt (1991), most *Themeda* grasslands require burning (or some other form of canopy removal) every three to five years to prevent the *Themeda* from smothering smaller native herbs. New buds of grassland species that are held in the soil are usually not significantly damaged by the intensity of highly frequent fires however tree seedlings struggle to reach a height between fires to escape the flames (Kirkpatrick et al., 1995).

The role of fauna

Some of the fauna species associated with the Lowland Native Grasslands of Tasmania ecological community were discussed earlier (See *Description* and Appendix B). The grasslands fulfil particular ecological roles for a number of these species. For example, the native grasses and other herbs produce large quantities of seed, which is an important food source for many insects and several bird species (e.g. Native Hen) and the dense grass tussocks provide habitat for many smaller vertebrates and invertebrates. Insects and lizards can avoid predation in the dense grass sward and can hibernate during the colder months by burrowing deeply into the bases of the tussocks (Visoiu and Lloyd, 2003). For instance, the Tussock Skink is restricted to lowland *Poa* tussock grassy woodland and open grassland where there is a good cover of medium to tall tussocks where it can shelter inside the tussocks and bask inconspicuously in the spaces between them (Hutchinson et al., 2001). Similarly, *Perameles gunnii gunnii* (Eastern-barred Bandicoot) relies on native grasslands (Parks and Wildlife Service, 2003) and prefers open grassy areas for foraging and thick ground cover dominated by tussocks for shelter and nesting (Bryant and Jackson, 1999).

While the presence of a range of fauna species adds to the biodiversity of grasslands sites, those species also have a role to play in the functional ecology of the grasslands. Research shows that birds are vital to the health and ecological productivity of ecosystems. Visoiu and Lloyd (2003) state that native birds consume large numbers of leaf-eating insects and pasture grubs, and are important for the pollination and seed dispersal of many plants. They also comment that aerial-feeding species take many flying insects, and raptors help to control introduced mammal and bird populations.

Small ground dwelling native mammals play a similar functional role in the ecological community as that described for other grassy communities on the mainland (e.g. Claridge et al., 1992; Garkaklis et al., 1998). In Tasmania, the common digging marsupials and monotremes are Tasmanian Bettong, Long-nosed Potoroo, Southern Brown Bandicoot, Eastern Barred Bandicoot, Short-beaked Echidna and the Common Wombat.

Their functional roles include formation of healthy topsoils through their constant diggings and scratching and interactions with soil biota, which, in turn, have concomitant effects on water infiltration, nutrient cycling, seed dispersal and germination and seedling establishment (Pyrke, 1993; Pyrke, 1994; Martin, 2003). For example, mesomaruspials such as bettongs and bandicoots turn plant litter and dig shallow scratchings and holes when foraging for foods such as seeds, fruits, roots, tubers and invertebrates (Strahan, 1995). Pyrke (1994) showed that diggings and scratching by bandicoots and bettongs in Tasmania affected soil properties and helped with establishment of some rare and threatened plants species, some of which are known to occur in the ecological community. Such diggings and scratching can represent a substantial and ongoing impact on soil (Martin, 2003). It is expected that this function will continue to be fulfilled while these and similar small mammals remain in sufficient numbers in the lowland grasslands of Tasmania.

Bandicoots and some insects (e.g. native wasps) also play an important role in maintaining the ecological balance of insect pests. Bandicoots are known to feed on pasture pests (e.g. corbie moth larvae (*Oncopera intricata*) and cockchafer beetle larvae (Family Scarabaeidae)) in the soil of grasslands while some insect larvae parasitise these same pests (Parks and Wildlife Service, 2003).

Even animals that are only visitors to the grasslands can play a role in their functional ecology. Birds and mammals that forage or move through the grasslands can act as seed dispersal agents through their consumption (and defecation) of seeds, collection of nesting material or through seeds adhering to the animal's fur or feathers. For example, Bettongs collect and carry grass in their prehensile tails to suitable nesting sites (Parks and Wildlife Service, 2003) which may move grassland species seeds to new or previously disturbed sites and result in new plant establishment.

Lastly, Gilfedder et al. (2003) states that historically the major influence on grassy vegetation in Tasmania was that of the grazing animals. Marsupial grazers (e.g. Forester Kangaroo, wombats, pademelons and wallabies) have long played an import role in the functional ecology of the grasslands by influencing the height and density of the grass sward and therefore the diversity of plant species found at grassland sites. The selective way in which many marsupials graze (e.g. particular species are more palatable than others) can result in changes to species composition as unpalatable species are promoted and favoured species are depleted (Lunt, 1991). While grazing by livestock now fulfils a large part of that role in the native grasslands used by the wool industry, the marsupial grazers are still present in large numbers at many sites and can be expected to continue to play a part in the ecology of the grasslands.

8. Description of Threats

Threats to the Lowland Native Grasslands of Tasmania ecological community are well documented (e.g. Sattler and Creighton, 2002; Carter et al., 2003, DPIW, 2006). The main threats include: clearing and conversion of land and consequent fragmentation of native vegetation remnants, pasture improvement and fertilisation, invasion by weeds and feral animals, inappropriate grazing and fire regimes, climate change, urban expansion, off-road vehicle disturbance, salinity and level of protection in reserves.

Clearance, conversion and fragmentation of remnants

In 1800, grassy ecosystems covered a large proportion of central and eastern Tasmania. However, over time they have become one of the most transformed of any Tasmanian vegetation type (Kirkpatrick, 1999). Most lowland native grassland in Tasmania has been cleared for agriculture since European settlement (Kirkpatrick et al., 1988). Table 3 (see page 22) presents the current and estimated pre-European extent of the lowland *T. triandra* and *P. labillardierei* grasslands, showing an estimated decline of approximately 83%.

Land clearance rates in Tasmania between 1980-88 averaged 6000 ha per annum and included large areas of native grassland (Gilfedder and Kirkpatrick, 1997). While historical clearance clearly reduced the extent of the lowland native grasslands, land clearance continues to pose a significant threat to remnants of the ecological community.

In a landscape where soils are arable and fertile and the majority of grassland remnants are on private land, the opportunity costs of agricultural land uses other than extensive grazing are attractive to landowners and clearance and conversion often results (Gilfedder et al., 2008). Diversification of agricultural interests is putting increasing pressure on the grasslands. Exotic pastures and crops are replacing the native grasslands and ongoing drought and state water management reforms are resulting in establishment of large farm dams (some >300 ha) that flood native grassland in valley bottoms (DPIW, 2006). The 2002 Biodiversity Assessment for Tasmania (Sattler and Creighton, 2002) cites dam building and irrigation, and the consequent inundation and changes to hydrology, as a threat to both the lowland *Poa* and lowland *Themeda* components of the ecological community.

Conversion of native lowland grasslands to pivot irrigation and cropping is a relatively new threat to the biodiversity and functionality of the grasslands. Such drastically changed land management practices are occurring in some highly biodiverse areas of native grasslands in northern and southern Tasmania and placing species at risk of decline and further fragmenting the ecological community (NRM North, 2005; NRM South, 2005). This includes conversion of grasslands to commercial tree plantations. Dense plantings of trees dramatically alter the structure and species composition of grassland ecosystems. For example, *T. triandra* does not compete well beneath trees and can be replaced by *Austrostipa* and *Austrodanthonia* species and this effect may extend up to 30 m beyond the tree canopy (Lunt, 1991).

The threat of clearing also potentially applies to remnants of the ecological community on public lands, e.g. on roadside verges and railway corridors, where patches may be cleared for maintenance works.

Clearance of land for development, or the expansion of crops and improved pasture, destroys grasslands, their species diversity and their ability to maintain the complex interactions of plants and animals in the natural ecosystem (DPIW, 2006). The net result of clearing or conversion of native vegetation in the region is that remnants are typically small and fragmented with little connectivity across the entire landscape.

More than half of the remnants of lowland *Poa* and lowland *Themeda* grasslands in Tasmania have an area less than 2.5 ha and only 5% have an area exceeding 50 ha (Lowland Grassland Review Expert Group, 2008). Furthermore, small remnants have a larger proportion of their area subject to edge effects and a higher probability of low population sizes of their resident species (Kirkpatrick and Gilfedder, 1995). A similar argument stands for the shape of remnants, with narrow linear shapes more susceptible to edge effects. Fragmentation also leaves the ecological community more susceptible to other threats, for example, invasion by weeds.

Pasture improvement and fertilisation

The application of fertilisers to native vegetation is also a threat to the integrity of the ecological community. As most native plants are adapted to low nutrient levels, fertiliser use gives exotic species a competitive advantage over native plants and can promote dense stands of exotics (Lunt, 1991; Dorrough and Scroggie, 2008). Plant species and life forms vary in their responses to nutrient levels. For example, Dorrough and Scroggie (2008) found that native perennial geophytes (such as lilies and orchids), ferns and shrubs were more negatively affected by phosphorous than either forbs or grasses. The use of fertilisers is widespread among the agricultural sector and, with an increasing rate of conversion of grasslands to crops, the application of fertilisers in Tasmania can be expected to follow the same trend.

Herbicides are often used to control grass growth for fire protection, however, their indiscriminate use typically kills native plants and results in exotic species dominance which can be of greater fire hazard than the original natives (Lunt, 1991). Selective use of herbicides can play an important role in controlling weeds, including woody weeds e.g. Briar Rose (*Rosa rubignosa*) (Lunt, 1991).

Weeds and pest animals

Exotic species invasion is a known threat to the Lowland Native Grasslands of Tasmania and their impact has been well documented (e.g. Kirkpatrick et al., 1988; Zacharek et al., 1997; Sattler and Creighton, 2002; Gilfedder et al., 2003). A number of highly invasive weeds are present in the ecological community, including Hairy hawkbit (*Leontodon taraxacoides*), Gorse (*Ulex europaeus*), Serrated Tussock (*Nassella trichotoma*), Boneseed (*Chrsyanthemoides monilifera* subsp. *monilifera*), Yorkshire Fog (*Holcus lanatus*), Briar Rose (*Rosa rubiginosa*), Willows (*Salix* spp.), Orange Hawkweed (*Hieracium aurantiacum*) and Hawthorn (*Crataegus monogyna*). Each of these weeds presents a serious management issue for the ecological community, given their high invasive capability and adverse impacts on biodiversity values. The net result of unmitigated weed invasion is a loss of native species diversity from the competitive and smothering effects of weeds.

Serrated Tussock is one of Tasmania's most serious weeds and poses a significant threat to native grasslands and threatened flora, affecting more than 3000 ha (Smee, 2006). It is an aggressive and robust weed that has the capacity to affect large areas of land over space and time. For example, one hectare of Serrated Tussock can produce over two tonnes of seed per year and buried seeds can remain viable for up to 15 years (Smee, 2006). Serrated Tussock favours grazing lands but is unpalatable to stock and therefore not suppressed by grazing, which combined with its highly invasive nature, makes it a significant challenge for control.

A developing threat to lowland grasslands is ongoing commercial development of new cultivars of existing pasture species (e.g. for increased drought tolerance), plus newly introduced species such as woody fodder species (Gilfedder et al., 2008).

Gorse is also a considerable threat to the ecological community (Sattler and Creighton, 2002). It has the ability to cover large areas of native grasslands and is capable of completely excluding natives in the ground stratum. Like many of the other weeds, Gorse is not a new invader of grasslands but has proven difficult to control and eradicate. Kirkpatrick et al. (1988) predicted that Gorse potentially could occupy most of the lowland grassy country.

Woody weeds (e.g. Gorse) can also lead to further degradation of the ecological community, natural ecosystems and agricultural areas by providing protection (and habitat) for damaging feral animals (NRM South, 2005). Introduced animals that are common in the Lowland Native Grasslands of Tasmania include Feral Cat, Rabbit, Fallow Deer, Hare as well as a large number of introduced bird species (e.g. Common Blackbird). These species have varied

impacts upon the ecological community through predation and competition with native animals, grazing of native plants and soil disturbance through burrowing and diggings. For example, rabbits have a known impact on Eastern-barred Bandicoots and *Lepidium hyssopifolium* (Basalt pepper-cress).

The European Fox is a recent addition to Tasmania and can also be found in some grassland areas. According to Gilfedder et al. (2003), survival of native mammals in the critical weight range for predation for foxes, such as the Bettong, Brown Bandicoot and Eastern-barred Bandicoot, depends on the elimination or control of this introduced predator.

Fire and grazing regimes

Sheep grazing, particularly for the fine wool industry, is common on remnants of the Lowland Native Grasslands of Tasmania and surrounding vegetation types. More than 50% of sheep in Tasmania graze native pastures (Gilfedder et al., 2003). The impact of grazing on the ecological community is a complex issue. Impacts can be positive for some aspects of the community while negative for others (Harris and Kitchener, 2005). Factors that affect grazing impacts are stocking rates, stocking period, site fertility and the relationship between fire and grazing regimes. When properly managed grazing can be an effective way of maintaining the biodiversity of native grasslands. A range of sources indicate that in sites where native herbivore grazing has been reduced some stock grazing can be beneficial to the grasslands (e.g. Kirkpatrick et al., 1988).

While Zacharek et al. (1997) found that, in the Township Lagoon Nature reserve, there is no indication that occasional light grazing is detrimental to the grassland communities, *T. triandra* can be easily eliminated by heavy grazing and many grasslands now dominated by wallaby-grasses with few wildflowers are degraded kangaroo grass systems (Gilfedder et al., 2003). However, the exclusion of stock grazing on native grasslands can also be detrimental. The number of herbaceous plants, in particular annuals and geophytes declines significantly in the absence of grazing. Grazing animals reduce the biomass of the grassy sward, preventing shading of the inter-tussock spaces and reducing competition (Kirkpatrick et al., 1988; Lunt, 1991). Furthermore, persistence of some threatened species may be more likely in the presence of grazing. For example *Leucochrysum albicans* (Grassland Paper Daisy) is unpalatable to sheep so grazing reduces competition with the grasses (Zacharek et al., 1997).

Fire appears to be a major agent in the maintenance of much of Tasmania's grassy vegetation (Kirkpatrick, 1999) although the exact nature of historic indigenous burning regimes remains unclear. With its ability to impede establishment of woody species and provide disturbance that maintains high species diversity, fire can be an important management tool for native grasslands (Harris and Kitchener, 2005). However, not all fire regimes are beneficial. For example, regular burning in *Themeda* grasslands maintains the diversity of native plants by preventing *Themeda* from outcompeting smaller native plants but burning can also promote many exotic species, particularly on degraded sites (Lunt, 1991). The appropriateness of a fire regime can depend on factors such as grazing regimes, species compositions at a particular site and the values to be protected or maintained (Kirkpatrick et al., 1988).

The relationship between grazing and fire is not simple and can affect different species in different ways. According to Kirkpatrick and Gilfedder (1995) disturbances that favour threatened species do not necessarily favour more common species and disturbance-dependent species are likely to become extinct in remnants that exclude stock and fire. They also state that in order to succeed in maintaining biodiversity and prevent species extinction, remnants in a variety of condition states is required and the perpetuation of disturbance regimes at these sites may also be necessary. Overall, if managed sustainably, grazing and

burning can be effective tools for maintaining biodiversity in grasslands (Kirkpatrick et al., 1995; Peart, 2008).

Climate change

Climate change is now understood to pose a serious long-term threat to terrestrial, coastal and aquatic ecosystems and to have the potential to change the ecology of these environments. The World Temperate Grasslands Conservation Initiative workshop held in Hohhot, China, 28-29 June 2008, concluded that the primary overarching global threat to the world's temperate grasslands is climate change. Climate change can lead to habitat reduction and the impact of climate change on the interactions amongst native and exotic species under different disturbance and grazing regimes is largely unknown (Peart, 2008).

Species differ in their responses to global changes such as rising CO_2 and temperature which is likely to result in changes to the structure of plant communities (Williams et al., 2007). It is not unrealistic to assume that such effects may be important for the Lowland Native Grasslands of Tasmania.

The Tasmanian free-air CO_2 enrichment (TasFACE) global change impacts facility has been set up in a lowland native grassland in the Midlands of Tasmania to determine the impacts of elevated CO_2 and warming on the Australian temperate grassland ecosystem (Hovenden et al., 2006). A range of studies has been undertaken (e.g. Williams et al., 2007; Hovenden et al., 2007; 2008) that examine the growth, flowering and seed production of some important grassland species under elevated CO_2 and temperature conditions. Their work has shown that different grasslands species are likely to respond in different ways and that seed production, seedling emergence and establishment were important in the responses of some species to predicted global changes. Their work has also shown that climate change can slow the invasion of some types of weeds that threaten the grasslands, which is a clear benefit to the ecological community.

While the exact impact of climate change on the Lowland Native Grasslands of Tasmania ecological community is not fully understood, the TasFACE studies are providing insight that will help to better understand and respond to any threats that climate change may pose to the community. Climate change could potentially exacerbate existing threats, alter hydrological regimes, change fire regimes and influence the species composition and extent and distribution of the ecological community.

Urban expansion and peri-urban development

The subdivision of land for development and the related land-use changes that follow also threaten the ecological community. As residential development increases on urban fringes and in peri-urban areas the pressure put on surrounding areas through vegetation clearance, exotic species invasions, pesticides, herbicides and the need for new infrastructure can be substantial (DPIW, 2006; Gilfedder et al., 2008).

Off-road vehicle disturbance

The use of off-road vehicles in grassy areas contributes significantly to habitat degradation of native grasslands through soil compaction and subsequent weed invasion (Zacharek et al., 1997; DPIW, 2006). While this may be more of a problem in coastal areas on sandy substrates that are more easily destabilised, the soft, fertile soils of the wetter sites favoured by *P. labillardierei* dominated lowland grasslands may also be at risk. Similarly, *T. triandra* is very susceptible, particularly when old and unburnt and can be eliminated from wheel ruts after a single drive over soft wet ground (Lunt, 1991).

Salinity

Salinity is also a threat to the lowland *Poa* and *Themeda* grasslands of Tasmania, with the Campbell Town-Ross-Tunbridge districts being of particular concern (Sattler and Creighton, 2002). In an assessment of the relative hazard posed by salinity to a range of ecosystems in the Tasmanian Midlands, lowland *Poa* and lowland *Themeda* native grasslands were ranked in the highest category of risk (Davies and Barker, 2005). The effect of salinity on the grasslands can include the death of large areas of vegetation and the inability of species to re-establish. Irrigation from dams has the potential to exacerbate dryland salinity in susceptible areas with its potential to raise the water table (DPIW, 2006).

Level of protection in reserves

The majority of the ecological community is on private property, while some very small remnants occur along roadsides and in some cemeteries (Kirkpatrick et al., 1988; DPIW, 2006).

The total area of the lowland *T. triandra* and *P. labillardierei* grassland sub-types of the ecological community in conservation related land tenure is approximately 1 500 ha. This figure represents approximately 9% of the total area covered by lowland *T. triandra* grasslands, 9% of *P. labillardierei* grasslands in valleys and 3% of *P. labillardierei* grasslands on slopes (Lowland Grassland Review Expert Group, 2008). This equates to only 7% of the total community.

It is important to note that predominately private ownership can be either an asset or a threat to the long term survival of the ecological community. While many landowners see value in maintaining the grasslands in Tasmania, the elements of nature that are valued by individual landowners can vary significantly, as can the ways the native vegetation is used. When ownership of grasslands changes, as it often does, those differences in what is valued means that the native ecosystems are vulnerable to change or destruction. For example, in the Tasmanian Midlands, four of 100 remnants surveyed in 1993 did not survive until 1999 and seven had been partially cleared. One fifth had also changed ownership during this period and, where remnants had changed ownership twice, such remnants were twice as likely to have deteriorated than those that had not changed hands at all (Gilfedder et al., 2003).

Conversely, many of the owners of lowland grasslands in good condition are proud of their natural and historical heritage. They intend to maintain their present good management and in many cases the use of these grasslands can be compatible with nature conservation (DPIW, 2006). In addition, more than half of the many rare or threatened plant species found in lowland grasslands in southeastern Australia occur on private land, emphasising the importance of private land in grassland conservation (Kirkpatrick et al., 1995).

The above two situations are common and, if one accepts that the content of each paddock is a function of its land use history (Fensham and Kirkpatrick 1992), then the land tenure and the attitude of its owners are important factors when examining the threats to the ecological community. Therefore, the Committee acknowledges that not all threats discussed above will apply to all remnants of the ecological community.

9. How judged by the Committee in relation to the EPBC Act criteria.

The Committee 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

A range of estimates of current extent of the lowland grasslands appear in the literature (e.g. Kirkpatrick et al., 1988; DPIW, 2006; Gilfedder et al., 2008) and all demonstrate that the grasslands have suffered significant decline in geographic distribution and extent since European settlement. Both the *T. triandra* and *P. labillardierei* dominated lowland grasslands were cited as being endangered and in decline by Sattler and Creighton (2002) with a trend of rapid decline in Tasmania's Northern Midlands.

A number of projects have estimated the pre-European extent of lowland native grasslands in Tasmania (e.g. Kirkpatrick et al., 1988; CARSAG, 2002). This work indicated that the pre-European extent of grassland communities was in the order of 85 000 to 110 000 ha. However these figures represent all grasslands across Tasmania, including highland grasslands, and not just those that form the Lowland Native Grasslands of Tasmania ecological community.

A review in 2007 of the lowland grasslands in Tasmania by the Lowland Grasslands Review Expert Group yielded revised estimates of pre-European extent of approximately 130 000 ha (Lowland Grassland Review Expert Group, 2008). This estimate was generated by defining the general biophysical envelopes in which the lowland grasslands would have existed and using modelling techniques combined with the most recent mapping of current extent to produce the most recent and relevant estimate of pre-European extent for the Lowland Native Grasslands of Tasmania ecological community. Some of the previous estimates were undertaken in an era when spatial techniques, remote sensing and fine-scale topographical mapping were limited and there was only coarse-scale vegetation mapping available. Others were reliant on mapping that did not include all of the IBRA bioregions in which the grasslands occur and on lower current extents for the Lowland *Poa* and Lowland *Themeda* grasslands than is now available. In comparison, the approach taken in the 2007 review had a more specific focus on lowland *Themeda* (i.e. TASVEG code GTL) and valley-bottom lowland *Poa* grassland (i.e. TASVEG code GPL) than previous estimates. The review also used historical data to inform the reconstruction of pre-European extent.

According to TASVEG (2004a), only approximately 17 720 ha of Lowland *P. labillardierei* grassland and 8250 ha of Lowland *T. triandra* grassland remain (approximately 26 000 ha in total). However, the 2007 review of the lowland grasslands in Tasmania yielded revised estimates of extent of approximately 21 600 ha (Lowland Grassland Review Expert Group, 2008).

The most recent estimates of past and present extent relevant to the Lowland Native Grasslands of the Tasmania ecological community are summarised in Table 3.

Table 3. Estimates of pre-European and current extent for the Lowland Native Grasslands of Tasmania ecological community. Source: Lowland Grassland Review Expert Group (2008).

Component of the Ecological Community	TASVEG equivalent	Pre-European extent (ha)	Current extent (ha)	Decline (%)
Lowland *Themeda triandra* grassland sub-type	Lowland *Themeda triandra* grassland (GTL)	80 000	7600	90.5
Lowland *Poa labillardierei* grassland sub-type	Lowland *Poa labillardierei* grassland on valley bottoms & river banks (GPL - valley)	50 000	6500	87.0
	Lowland *Poa labillardierei* grassland on slopes (GPL - slope)	Limited (mostly derived)	7500	n/a
	TOTAL	130 000	21 600	83.4

On the basis of these estimates, the ecological community has declined in extent from about 130 000 ha to 21 600 ha. This represents a substantial decline in the extent of the ecological community in the order of 83%. However, when condition of remnants is considered, the decline may be greater.

Taking estimates of extent and condition (see Criterion 4, Table 5) into account it is therefore likely that the decline in the geographic extent of the ecological community is at least 90%.

The Committee considers that the ecological community has undergone a severe decline in geographic distribution. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered.**

Criterion 2 - Small geographic distribution coupled with demonstrable threat

The Lowland Native Grasslands of Tasmania ecological community occurs across seven bioregions in Tasmania, including the islands of Bass Strait. It occurs in a range of patch sizes scattered across this distribution although the majority of patches are small.

The ecological community originally covered about 130 000 ha of Tasmania, however, its current area of occupancy is significantly less at approximately 21 600 ha (Lowland Grassland Review Expert Group, 2008). Of this, only about 8370 ha are known to be in good to excellent condition. However, the condition factors used in the review do not necessarily equate to the condition thresholds presented in this listing advice. An area of occupancy in the range 1000 to 10 000 ha is indicative of a restricted geographic distribution.

Patches of the ecological community range in size from <2.5 ha up to 1000 ha. An analysis of patch sizes, based on data supplied by from the 2007 review (Table 4.), indicates there are approximately 1900 patches of the ecological community. Most patches (approximately 80%) are under 10 ha in size and almost all (approximately 98%) are under 100 ha. This distribution of patch sizes is indicative of a high degree of fragmentation and a very restricted geographic distribution.

Table 4. Size and area covered by patches of the Lowland Native Grasslands of Tasmania ecological community. Source: Lowland Grassland Review Expert Group (2008).

Patch Area (ha) Group	Area (ha)	% of total area	Number of Patches	% of total number of patches
≤ 2.5	930	4.30%	1028	53.40%
2.5 – 5	1000	4.63%	282	14.65%
5 – 10	1570	7.26%	220	11.43%
10 – 50	6420	29.69%	300	15.58%
50 – 100	4100	18.96%	59	3.06%
100 – 500	6200	28.68%	34	1.77%
>500	1400	6.48%	2	0.10%
TOTAL	**21 620**		**1925**	

There have been, and continue to be, demonstrable threats to the ecological community, as detailed in the *Description of Threats*, above. These are unlikely to diminish in the foreseeable future with severe fragmentation and degradation of the ecological community continuing through clearing and conversion to cropping, irrigation and dam building and degradation through weed invasion. There may also be potential impacts through climate change.

The Committee considers that the ecological community has a very restricted geographic distribution, as evidenced by data on patch sizes, and is under ongoing threat. The nature of its 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 under Criterion 2 as **critically endangered**.

Criterion 3 - Loss or decline of functionally important species

A number of native species are critically important in the processes that sustain the ecological community. Generally, functionally important species include those that provide critical structural elements of an ecological community, seed dispersal or pollination roles or those that facilitate establishment or inhibition of other plants. In the Lowland Native Grasslands of Tasmania functionally important species include, among others, the dominant tussock forming grasses (*T. triandra* and *P. labillardierei*), small ground dwelling mammals and grazing animals.

The dominant tussock grass species provide structure to the vegetation and their presence and cover influences the dynamics of other vegetative components. For example, the density and degree of closure of the tussock grass canopy affects the capacity of wildflowers and other herbs to establish and spread and their dense swards can inhibit establishment and growth of trees (Kirkpatrick, 1999). The dominant grasses also play a role in providing habitat for important fauna species. Eastern-barred Bandicoots and Tussock Skinks rely on thick ground cover dominated by tussocks for shelter and nesting in native grasslands (Hutchinson et al., 2001; Parks and Wildlife Service, 2003).

Despite the strong evidence for overall decline in extent of the Lowland Native Grasslands of Tasmania, there is insufficient evidence to show significant decline in the tussock forming grasses to a degree that could precipitate changes in the ecological community's structure or function.

Small ground dwelling mammals play an important role in soil disturbance through digging and scratching of the soil surface which has concomitant impacts on water infiltration, nutrient cycling, seed dispersal and germination and seedling establishment (Pyrke, 1993; Pyrke, 1994; Martin, 2003). However, there is little evidence to suggest that their numbers

have declined sufficiently to impact on the processes that sustain the ecological community. Bettong, potoroos and bandicoots for example can be readily found in many lowland grasslands (Rounsvell et al., 1991; Visoiu and Lloyd, 2003).

The important role of grazing animals in influencing the height and density of the grass sward and plant diversity also continues to be maintained. That role was historically fulfilled by the marsupial grazers (e.g. Forester Kangaroo and wombats) that were abundant in pre-European times (Gilfedder et al., 2003). While those animals still graze on many grassland sites today, sheep are now the dominant grazers. While the nature of sheep grazing may be different in character to marsupial grazing they essentially fulfil the role of removing biomass of the dominant grasses and, at appropriate intensities, play an important role in maintaining plant diversity and influencing tussock cover (Kirkpatrick et al., 1988).

Overall, there are insufficient data available to determine the loss or decline of functionally important species within the ecological community. Therefore, it is **not eligible** for listing in any category under this criterion.

Criterion 4 - Reduction in community integrity

The integrity of the Lowland Native Grasslands of Tasmania ecological community has declined over time as evidenced by fragmentation, weed invasion, loss of species diversity and changes to species composition.

The ecological community has suffered declines in its extent since European settlement. The primary cause of this has been clearance and conversion of land for agricultural purposes and has resulted in significant fragmentation of the ecological community. As discussed under Criterion 2, remnants of the ecological community are generally small and isolated (<5 ha) and most (approximately 80%) are less than 10 ha in size. Fragmentation results in loss of connectivity of remnants that can be critical to the survival of certain species and to the maintenance of the ecological processes that sustain the ecological community. While such fragmentation directly affects the integrity of the whole community it also exposes it to further reduction in integrity via increased risk of weed invasion and degradation of habitat for species.

Weed invasion, particularly by woody weeds such as Gorse, have reduced and continue to threaten the integrity of the Lowland Native Grasslands of Tasmania (Sattler and Creighton, 2002). For example, Orange Hawkweed is established in the Southern Midlands and around Hobart where it invades disturbed areas, grasslands and pastures and spreads quickly by runners and seed (CRC for Australian Weed Management, 2003). Impacts from similar species in New Zealand show that the weed invades by initially replacing vegetation between native tussock grasses and then displacing the tussocks themselves. Orange Hawkweed is likely to have similar impacts on the lowland grasslands in Tasmania.

The loss of species diversity and changed species composition in lowland grassland remnants also demonstrates a reduction in community integrity and over time can affect the structure and function of remnants. As populations of species in the ecological community decline they can become threatened with extinction.

Approximately 90% of grassland species that are listed as threatened have suffered habitat loss or degradation and subsequent decreases in abundance due to past and current land use practices (DPIW, 2006). For instance, some grassland plants have such critically small populations that a breeding collapse due to lack of genetic biodiversity is a distinct possibility (Kirkpatrick et al., 1988). Furthermore, in comparing information from two flora surveys in the Midlands of Tasmania with historical botanical records, Fensham and Kirkpatrick (1989)

determined that 11.8% of the higher plant flora had vanished. They concluded that at current rates of change and land tenure further extinctions are likely to occur in grasslands.

Similarly, the loss of particular groups of species can affect the integrity of the ecological community. When comparing results of the two nationwide bird atlases (1977-1981 and 1998 onwards) Olsen et al (2006) found that more than one-third of grassland bird species have declined nationally. There is evidence of bird declines in the grasslands of Tasmania, suggesting that this national trend may be occurring there. For example, Stubble Quail which prefers areas of tall dense ground vegetation, particularly natural or improved grasslands, can sometimes be found in the ecological community but is now considered rare on mainland Tasmania (Marchant and Higgins, 1993).

An assessment of the overall condition of the lowland grasslands also demonstrates the reduction in integrity of the ecological community. The 2007 review of lowland grasslands (Lowland Grassland Review Expert Group, 2008) assessed the condition of lowland grasslands by examining factors such as native species richness, weed cover, the presence of intertussock spaces, the presence of a soil crust (cryptogamic mat) and the amount of bare soil. These condition factors used in the review do not necessarily equate to the condition thresholds presented in this listing advice. The Lowland Grassland Review Expert Group (2008) estimates that only 8370 ha of the lowland native grasslands remain in good or excellent condition and 5480 ha is estimated to be in poor condition (Table 5). However, the condition of a large proportion (35%) of the current extent of the ecological community is unknown and more good/excellent condition sites may be found through additional field testing.

Table 5. Estimates of condition for the Lowland Native Grasslands of Tasmania ecological community. Source: Lowland Grassland Review Expert Group (2008).

	Condition				
TASVEG Code	Excellent (ha)	Good (ha)	Poor (ha)	Unknown (ha)	Cleared/lost (ha)
Lowland *Themeda* grassland (GTL)	880	3000	680	3000	72 400
Lowland *Poa labillardierei* grassland (GPL)	890	3600	4800	4700	36 000
Total Area (hectares)	1770	6600	5480	7700	108 400

The Committee considers that the change in integrity experienced by the ecological community through fragmentation, weed invasion and loss of species diversity and composition is severe. Therefore, the ecological community is **eligible** for listing as **endangered** under this criterion.

Criterion 5 - Rate of continuing detrimental change

It is evident that the Lowland Native Grasslands of Tasmania ecological community has undergone a severe decline in the past and continues to be subject to ongoing threats.

A comparison of current extent estimates for the ecological community against earlier TASVEG mapping by DPIW shows that not only has the ecological community suffered declines in the past but that areas of grassland continue to be lost. The Lowland Grassland Review Expert Group (2008) estimated that 21 600 ha of the ecological community remains. They also found that the extent of lowland *P. labillardierei* and *T. triandra* grasslands has

changed by at least 4600 ha since 2000 and that this change was mostly due to conversion of grasslands to other non-native vegetation types (Lowland Grassland Review Expert Group, 2008). This represents a decline of approximately 18% and a rate of change of 575 ha per year over the last eight years.

At this current rate of decline, approximately 27% of the ecological community will be lost in the immediate future (within 10 years). If this rate of change continues it is likely that all remaining patches of the ecological community will be lost within 40 years.

The Committee considers that the rate of continuing detrimental change is substantial as indicated by a serious rate of decline in extent of the ecological community and that the change is projected to occur in the immediate future. Therefore, the ecological community is **eligible** for listing as **vulnerable** 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.

10. Conclusions

Conservation status

This advice follows the assessment of information to include the Lowland Native Grasslands of Tasmania in the list of threatened ecological communities referred to in Section 181 of the EPBC Act. The **Lowland Native Grasslands of Tasmania ecological community** meets:

- Criterion 1 as **endangered** because its decline in geographic distribution is severe;
- Criterion 2 as **critically endangered** because its geographic distribution is very restricted and the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in the immediate future;
- Criterion 4 as **endangered** because the reduction in integrity across most of its range is severe as indicated by severe degradation of the ecological community; and
- Criterion 5 as **vulnerable** because the rate of continuing detrimental change is substantial and is projected to occur in the immediate future.

The highest category for which the ecological community is **eligible** to be listed is **critically endangered.**

Recovery Plan

The Committee considers that there should be a recovery plan for this ecological community.

The Committee acknowledges that some actions are already underway to recover the ecological community and that there is some effective conservation work in the region, e.g. through the development of grazing management guidelines for the sustainable use of native grasslands as pasture (see Mokany et al., 2006), the Land, Water and Wool Program and the work being done through DPIW on securing covenants on private land. However, the Committee recognises the ecological community to be critically endangered and that threats to the community are ongoing and complex in nature. Considerable work is needed to ensure continued protection for this ecological community. It is expected that all existing management plans and conservation initiatives would be taken into account for future plans.

11. Recommendation

(i) The Committee 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:

Lowland Native Grasslands of Tasmania

(ii) The Committee recommends that the Minister decide to have a recovery plan for this ecological community.

(iii) The Committee recommends that the Minister provide the following reason for his decision: The actions required to conserve and promote recovery of the ecological community include short and longer term activities that need to be evaluated and prioritised through the preparation of a recovery plan. A recovery plan would promote a coordinated approach to recover the ecological community and provide guidance to land managers.

Associate Professor Robert J.S. Beeton *AM FEIANZ*

Chair

Threatened Species Scientific Committee

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Appendix A.

List of plant species characteristic of the Lowland Native Grasslands of Tasmania ecological community. This is an indicative rather than comprehensive list of the plant species common to the ecological community. Patches may not include all species on the list and additional species may not appear in the list.

Sources: Gilfedder et al. (2003), Harris and Kitchener (2005), TASVEG (2004 b, c, d).

Lowland *Poa labillardierei* Grassland sub-type (both valley and slope variants)

Grasses & grass-like plants		**Herbs *(continued)***	
Arthropodium spp.	Vanilla-Lily	*Leptorhynchos* spp.	Buttons
Austrodanthonia spp.	Wallabygrass	*Mimulus repens*	Creeping Monkeyflower
Austrostipa spp.	Speargrass	*Oxalis perennans*	Woodsorrel
Bulbine spp.	Bulbine Lily	*Pratia pedunculata*	Matted Pratia
Burchardia umbellata	Milkmaids	*Ranunculus* spp.	Buttercup
Carex breviculmis	Shortstem Sedge	*Rumex dumosus*	Wiry Dock
Carex longebrachiata	Drooping Sedge	*Scleranthus* spp.	Knawel
Deyeuxia quadriseta	Bentgrass	*Senecio glomeratus*	Purple Fireweed
Dichelachne crinita	Longhair Plumegrass	*Senecio quadridentatus*	Cotton Fireweed
Dichelachne spp.	Plumegrass	*Senecio* spp.	Fireweed
Diplarrena morae	White Flag-Iris	*Solenogyne dominii*	Smooth Flat-Herb
Isolepis spp.	Clubsedge	*Solenogyne gunnii*	Hairy Flat-Herb
Juncus spp.	Rush	*Veronica gracilis*	Slender Speedwell
Lachnagrostis spp.	Blowngrass	*Veronica* spp.	Speedwell
Lepidosperma spp.	Swordsedge	*Vittadinia* spp.	New Holland Daisy
Lomandra longifolia	Sagg	*Wahlenbergia* spp.	Bluebell
Luzula spp.	Woodruff		
Microlaena stipoides	Weeping Grass	**Ground ferns**	
Poa labillardierei	Silver Tussockgrass	*Asplenium flabellifolium*	Necklace Fern
Schoenus apogon	Common Bogsedge	*Pteridium esculentum*	Bracken
Other herbs		**Trees & shrubs**	
Acaena echinata	Shiny Sheeps Burr	*Acacia dealbata*	Silver Wattle
Acaena novae-zelandiae	Buzzy	*Acacia melanoxylon*	Blackwood
Acaena spp.	Sheepsburr	*Allocasuarina* spp.	Sheoak
Asperula conferta	Common Woodruff	*Astroloma humifusum*	Native Cranberry
Chrysocephalum apiculatum	Common Everlasting	*Bossiaea prostrata*	Creeping Bossia
Convolvulus angustissimus	Blushing Bindweed	*Bursaria spinosa*	Prickly Box
Cynoglossum suaveolens	Sweet Houndstongue	*Epacris impressa*	Common Heath
Dichondra repens	Kidneyweed	*Eucalyptus ovata*	Black Gum
Drosera spp.	Sundew	*Eucalyptus pauciflora*	Cabbage Gum
Epilobium spp.	Willowherb	*Eucalyptus rodwayi*	Swamp Peppermint
Euchiton spp.	Cudweed	*Eucalyptus viminalis*	White Gum
Geranium spp.	Cranesbill	*Lissanthe strigosa*	Peachberry Heath
Gonocarpus tetragynus	Common Raspwort	*Lomatia tinctoria*	Guitarplant
Hydrocotyle spp.	Pennywort	*Pimelea humilis*	Dwarf Riceflower
Hypericum gramineum	Small St Johns-Wort		

Lowland *Themeda triandra* Grassland sub-type			
Grasses & grass-like plants		**Herbs** ***(continued)***	
Arthropodium minus	Small Vanilla-Lily	*Plantago varia*	Variable Plantain
Arthropodium spp.	Vanilla-Lily	*Rumex dumosus*	Wiry Dock
Austrodanthonia spp.	Wallabygrass	*Scleranthus* spp.	Knawel
Austrostipa spp.	Speargrass	*Senecio* spp.	Fireweed
Bulbine spp.	Bulbine Lily	*Solenogyne dominii*	Smooth Flat-Herb
Carex breviculmis	Shortstem Sedge	*Solenogyne gunnii*	Hairy Flat-Herb
Deyeuxia spp.	Bentgrass	*Veronica gracilis*	Slender Speedwell
Dichelachne spp.	Plumegrass	*Veronica* spp.	Speedwell
Ehrharta stipoides	Weeping Grass	*Viola* spp.	Violet
Elymus scaber	Wheatgrass	*Vittadinia* spp.	New Holland Daisy
Hypoxis spp.	Yellowstar	*Wahlenbergia* spp.	Bluebell
Lepidosperma spp.	Swordsedge		
Lomandra longifolia	Sagg	**Trees & shrubs**	
Luzula spp.	Woodruff	*Acacia dealbata*	Silver Wattle
Poa rodwayi	Velvet Tussockgrass	*Acacia mearnsii*	Blackwattle
Schoenus spp.	Bogsedge	*Acacia melanoxylon*	Blackwood
Themeda triandra	Kangaroo Grass	*Allocasuarina* spp.	Sheoak
Wurmbea spp.	Early Nancy	*Astroloma humifusum*	Native Cranberry
		Bossiaea prostrata	Creeping Bossia
Other herbs		*Bursaria spinosa*	Prickly Box
Acaena echinata	Shiny Sheeps Burr	*Dodonaea viscosa*	Hop Bush
Acaena novae-zelandiae	Buzzy	*Eucalyptus amygdalina*	Tasmanian Black Peppermint
Acaena spp.	Sheepsburr	*Eucalyptus ovata*	Black Gum
Asperula spp.	Woodruff	*Eucalyptus pauciflora*	Cabbage Gum
Chrysocephalum apiculatum	Common Everlasting	*Eucalyptus rubida*	Candlebark
Convolvulus angustissimus	Blushing Bindweed	*Eucalyptus viminalis*	White Gum
Coronidium scorpioides	Curling Everlasting	*Hibbertia hirsuta*	Hairy Guineaflower
Cymbonotus preissianus	Southern Bears-Ears	*Hibbertia* spp.	Guineaflower
Cynoglossum suaveolens	Sweet Houndstongue	*Lissanthe strigosa*	Peachberry Heath
Dichondra repens	Kidneyweed	*Pimelea humilis*	Dwarf Riceflower
Drosera spp.	Sundew		
Geranium spp.	Cranesbill	**Ground Ferns**	
Gonocarpus tetragynus	Common Raspwort	*Asplenium flabellifolium*	Necklace Fern
Hypericum gramineum	Small St Johns-Wort	*Cheilanthes austrotenuifolia*	Green Rockfern
Leptorhynchos spp.	Buttons	*Lindsaea linearis*	Screw Fern
Oxalis spp.	Woodsorrel		

Appendix B.

List of native fauna species that may be found in or near the Lowland Native Grasslands of Tasmania ecological community. Note that not all species listed below are likely to be present at all sites and other species that are not included in this list may also be common inhabitants of the ecological community.

Sources: Bryant and Jackson (1999), Visoiu and Lloyd (2003); Mokany et al. (2006) and DPIW (2006).

Species Name	**Common name(s)**
Marsupials	
Bettongia gaimardi gaimardi	Tasmanian Bettong
Dasyurus maculatus maculatus	Spotted-tail Quoll, Tiger Quoll
Dasyurus viverrinus	Eastern Quoll
Isoodon obesulus affinis	Southern Brown Bandicoot
Macropus giganteus tasmaniensis	Forester Kangaroo, Eastern Grey Kangaroo
Macropus rufogriseus	Bennetts Wallaby
Perameles gunnii gunnii	Eastern-barred Bandicoot
Potorous tridactylus	Long-nosed Potoroo
Sarcophilus harrisii	Tasmanian Devil
Thylogale billardierii	Tasmanian Pademelon
Trichosurus vulpecula	Common Brushtail Possum
Vombatus ursinus	Common Wombat
Vombatus ursinus ursinus	Bass Strait wombat
Monotremes	
Tachyglossus aculeatus	Short-beaked Echidna
Birds	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill
Anthus novaeseelandiae	Richard's Pipit, Australasian Pipit
Aquila audax fleayi	Tasmanian Wedge-tailed Eagle
Coturnix ypsilophora	Brown Quail
Cracticus tibicen	Australian Magpie
Falco berigora	Brown Falcon
Falco longipennis	Australian Hobby
Gallinago hardwickii	Latham's Snipe
Neophema chrysostoma	Blue-winged Parrot
Petroica phoenicea	Flame Robin
Tribonyx mortierii	Tasmanian Native Hen
Reptiles	
Austrelaps superbus	Lowland Copperhead
Drysdalia coronoides	White-lipped Snake
Notechis scutatus	Tiger Snake
Pseudemoia pagenstecheri	Tussock Skink
Pseudemoia rawlinsoni	Glossy Grass Skink
Invertebrates	
Anisynta dominula dominula	a butterfly
Brachyexarna lobipennis	a grasshopper
Catadromus lacordairei	Catadromous carabid beetle
Chrysolarentia decisaria	Tunbridge Looper Moth
Oreixenica ptunarra	Ptunnarra Brown Butterfly