**Australian Government**

**Department of the Environment, Water, Heritage and the Arts**

# Key Threatening Process Nomination Form - For adding a threatening process under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

| **Nominator details** |
| :--- |
| Note: Nominator details are subject to the provision of the *Privacy Act 1988* and will not be divulged to third parties if advice regarding the nomination is sought from such parties. |

| **1. Full name** |
| :--- |
| Charles Berger, Director of Strategic Ideas, on behalf of Australian Conservation Foundation |

| **2. Body, organisation or company name (if applicable)** |
| :--- |
| Australian Conservation Foundation |

| **3. Contact details** | |
| :--- | :--- |
| Email:  c.berger@acfonline.org.au<br>Phone: 03 9345 1173<br>Mobile: 0419 134 913<br>Fax: 03 9345 1166 | Postal address:<br>1/60 Leicester Street<br>CARLTON, VIC, 3053 |

| **4. Declaration: I declare that the information in this nomination and its attachments is true and correct to the best of my knowledge.** |
| :--- |
| Signed (If available, please attach an electronic signature when submitting by email): |

| **5. Date signed: 22 March 2010** |
| :--- |

| **Nominated threatening process – summary of eligibility** |
| :--- |

| **6. Name of threatening process** |
| :--- |

**Human population growth in Australia**

| **7. Criteria under which the threatening process is eligible for listing** |
| :--- |

Identify which criteria the threatening process meets (one or more). Please note that the information you provide in this nomination form should support your claim. For further details on the criteria, please refer to <u>Part A</u> of the Threatened Species Scientific Committee guidelines attached to this form.

☒ Criterion A - Evidence that the threatening process could cause a native species or ecological community to become eligible for listing in any category, other than conservation dependant.

☒ Criterion B - Evidence that the threatening process could cause a listed threatened species or ecological community to become eligible for listing in another category representing a higher degree of endangerment.

☒ Criterion C - Evidence that the threatening process adversely affects two or more listed threatened species (other than conservation dependant species) or two or more listed threatened ecological communities.

## Important notes for completing this form

- Complete the form as far as possible. It is important for the Threatened Species Scientific Committee to have comprehensive information and the best case on which to judge a threatening process' eligibility against the EPBC Act criteria for listing.
- Nominations that do not meet the EPBC Regulations will not proceed. Division 7.2 of the EPBC Regulations 2000 (www.environment.gov.au/epbc/about/index.html) specifies the required information. Note that, if after a search, relevant information is not available, please state this under the relevant question in the nomination form (as noted under sub-regulation 7.06(2)).
- The purpose of the form is to assist the Committee to gain an understanding of the threatening process and its impact on native species.
- It is particularly important that the nomination addresses the impact of the threatening process across its national extent.
- For all facts and all information presented - identify your references and sources of information. Document the reasons and supportive data. Indicate the quality of facts/information and any uncertainty in the information. For example was it based on a peer-reviewed research publication or anecdote; or on observed data, an inference/extrapolation from the data, or a reasonable premise not yet supported by hard data.
- Personal communications - The opinion of appropriate scientific experts may also be cited (with their approval) in support of a nomination. If this is done the names of the experts, their qualifications and full contact details must also be provided at the end of this nomination.
- Confidential material – Identify any confidential material and explain the sensitivity.
- Tables – Can be included at the end of the form or prepared as separate electronic documents included as appendixes or attachments. Refer to tables in the relevant area of the text.
- Maps - If maps cannot be supplied electronically, please provide them in hardcopy.
- Cross-reference relevant areas of the nomination form where needed.

## How to lodge your nomination

Completed nominations may be lodged either:
1. by email to: epbc.nominations@environment.gov.au, **or**
2. by mail to: The Director
     Species Listing Section
     Department of the Environment, Water, Heritage and the Arts
     GPO Box 787
     Canberra ACT 2601

## Further information

The Threatened Species Scientific Committee has developed guidelines to assist nominators which are attached to this form. These include the criteria for assessing species and ecological communities as threatened under the EPBC Act.

For questions regarding nominations contact:
The Director
Species Listing Section
Department of the Environment, Water Heritage and the Arts
GPO Box 787
Canberra ACT 2601
Telephone (02) 6274 2238
Fax (02) 6274 2214

# Section 1 - Name and Description

## Conservation Theme

**1**. The conservation themes for the assessment period commencing 1 October 2010 (for which nominations close 25 March 2010) are **'heathlands and mallee woodlands', and 'terrestrial, estuarine and near–shore environments of Australia's coast'.**

*How does this nomination relate to the **conservation themes**?*

Heathlands and mallee woodlands as well as terrestrial, estuarine and near-shore environments of Australia's coast are particularly vulnerable to a variety of environmental pressures linked to human population growth.  In particular, population growth in Australia has occurred disproportionately in coastal areas, leading to increasing disruption of coastal ecosystems by human settlements. Population growth is best viewed as an underlying process, which intensifies and exacerbates numerous other proximate threats to biodiversity in the theme areas.

A major distribution of heathland is found in Western Australia, where 20 percent has been cleared since European settlement (ANRA 2009). The Australian Natural Resources Atlas identifies land clearing for urban development as the greatest threat to Australian heathlands (ANRA 2009).  Urban development is in turn a direct consequence of Australia's increasing population.  Major impacts include direct habitat clearance for residential development, as well as indirect impacts such as increased fires resulting from fire hazard reduction management in peri-urban areas, and introduction of non-native species (including weeds, pets, escapees, and livestock). Because heathlands are dominated by endemic Australian plants, the loss of heathland areas presents an increased risk to a range of threatened and non-threatened species alike. (ANRA 2009).

Clearance of land for housing is also one of the main pressures on Australia's coastal environments (Beeton et al 2006).  In 2005, 60% of Australia's coastal councils had an annual population growth rate greater than 3%, or at least twice the national average. (Sustainable Cities Inquiry, 2005) The total length of urbanised coastline has increased by a third from 1980 and 2004 – an increase which corresponds tightly with the increase in population over the same timeframe. (Beeton et al 2006, indicator CD-30) The "sea change" phenomenon is driven in part by perceived decline in amenity of urban life as our cities grow ever-larger, and so can be seen as an indirect function of urban growth. Coastal development, whether in urban, peri-urban or regional areas affects ecological systems directly through habitat clearance, and indirectly through a host of ancillary impacts, including decreased coastal water quality due to increased nutrient, chemical and sediments loads. (Beeton et al 2006). Increased introduction of exotic species, increased water extraction, and changed fire regimes present further risks to coastal ecosystems.

While mallee woodlands are at somewhat less present risk from direct clearing for urban development, population growth compounds indirect threats to those ecosystems as well. Prior to European settlement, the Murray-Darling Basin had the most extensive representation of mallee woodlands in Australia (ANRA 2009). Land clearance for cereal cropping and sheep grazing, algae blooms, over-extraction of water for irrigation, and salinisation have combined to reduce and degrade mallee woodland habitats.  These developments occurred primarily to meet the agricultural needs of a growing domestic urban population, and a desire to generate export income for Australia to pay for the increasing demand for imported goods by a growing population.  Grazing and agricultural pressures continue to be identified as key management considerations. Pressure to intensify agricultural production to meet the needs of Australia's growing population (both for domestic food supplies and to generate export products) will continue to intensify the stress these ecosystems are under.

Intensive agriculture also places particular pressure on Australia's estuaries and near shore environments, with large quantities of nitrogen and phosphorus being discharged into rivers within ten kilometres of the coast (Beeton et al 2006). Horticulture and dairy industries in particular tend to be located relatively close to urban centre, due to the need for daily deliveries and the higher unit costs of transport of those products.

Population growth is the first driver in a complex chain of direct and indirect effects on Australia's biodiversity. It underpins and exacerbates nearly every other threat to our ecological life support systems.

It should also be noted that human population growth in Australia threatens many species, ecosystems and ecological processes not covered by the conservation themes for the current assessment period.

## Name

**Human population growth in Australia**

## Description

Human population growth in Australia has biological and associated non-biological components. The primary biological component is the increase in the number of humans present in Australia, resulting from natural increase (the excess of births over deaths each year) and net overseas migration.

Australia's population has increased from 8.2 million in 1950 to 22.2 million in 2010, an increase of 170%. The Australian Bureau of Statistics projects a further increase to between 31 million and 42 million by 2056, or growth of between 40% and 89% over current figures. Demographic developments thereafter are highly sensitive to relatively minor changes in domestic fertility, life expectancy, and migration rates. (ABS 3222.0)

Population increase is, in turn, a driver of a numerous consequential biological and non-biological processes, including but not limited to the following:
- Construction and operation of human infrastructure, such as roads, housing and other buildings, dams, transmission lines, and so forth;
- Alteration of natural landscapes, such as clearance of habitat for agriculture and other purposes, dredging of marine environments for shipping access, and changed fire regimes to protect human infrastructure;
- Increased intensity of use of natural resources, such as harvesting of forests for timber and extraction of water from rivers and aquifers;
- Altered flow regimes for waterways and tidal zones;
- Introduction of pollutants into natural systems, including nutrients, waste materials, oil spills, and other pollutants into riverine and coastal ecosystems;
- Use of natural areas for recreational purposes, which may be accompanied by disturbance of organisms (such as nesting sea birds) and incidental destruction (as by boat propellers or trampling of sensitive areas);
- Generation of greenhouse gases, with consequent alteration of climatic processes and sea levels (See listed key threatening process, anthropogenic climate change); and
- Introduction of non-indigenous organisms, both intentionally (as for agricultural purposes) and unintentionally (as for a wide range of exotic pests).

The relationship between population growth and each of the above processes is complex and affected by numerous other variables. Together with the overall population level, management practices, legislation, personal lifestyle and behaviour choices, and business activities among other factors all combine to determine the severity of each of the above impacts. In theory, sound management could result in the amelioration or even reduction of particular pressures even during a period of rapid population growth. In practice, this has not occurred at any point in Australian history on a meaningful scale, and does not characterise the current state of affairs in Australia. Instead, a close correlation can be observed between the above pressures and population growth, with plausible causal explanations.

By taking a "systems view" of species threats and species loss, we can seek to understand the interrelationships among population growth, trade, economic structures and other fundamental characteristics of human societies and how they relate to environmental pressure. One recent major structural path analysis, for example, found that "As human ecology perspectives predict, population is a key and near-universal determinant of environmental degradation." (McKinney et al 2010).

*The interaction between population growth and ecosystem pressure*

Numerous official Commonwealth and state government reports have acknowledged the direct links between population growth, the physical processes listed above, and the consequent environmental

pressure. These include the following:

- The Intergenerational Report 2010 states that "Population growth has implications for the environment, including: greenhouse gas emissions, **biodiversity** and water availability; urban amenity; and infrastructure and government service delivery requirements." (p. xv)
- According to the 2006 Commonwealth State of the Environment Report, "a major pressure on and of Australia's human settlements is in coastal regions near the capital cities, where the population is growing faster than the national average. This pressure is accentuated by increasing consumption of energy, land, water and other products dependent on natural resources. Wastes are increasing despite efforts at recycling." (Section 3) This report identified Australia's coastal strip as "at most risk", due to "an **increasing demand for housing** by a growing population." (section 3.2)
- The Australian Bureau of Statistics identifies population growth as a "driver of environmental change", noting that "As the population continues to increase, both in numbers and in affluence, there is more pressure on the environment. … Where people live has environmental implications for air quality, and **land and water degradation**. Other consequences of population growth, such as increased waste generation and energy use, can also have negative environmental impacts." (ABS 4613.0) The ABS has stressed the link between population growth rates and loss of native habitat: "The high concentration of people in coastal areas of south-eastern Australia has resulted in **high rates of land clearing for urban development.** This has caused loss of habitat for native plants and animals, reducing their numbers and geographical spread. Urban developments also need landfill sites and water and sewerage services, all of which can affect the environment."
- The 2005 Parliamentary Inquiry into Sustainable Cities found that "with the numbers of urban residents increasing, our cities risk becoming more unsustainable across environmental, economic and social indicators. Larger cities are resulting in more urban travel, greater freight costs, **less bushland**, higher living costs, more social isolation, reduced air quality, greater water and energy consumption, decreased physical health, and increased levels of household and commercial waste." (Final report, para. 2.19)
- The Final report of the National Population Council, an independent Commonwealth body, in 1991 concluded that "some but not all of the major ecological problems facing Australia are linked to domestic population changes. This is less so for sectors such as mining and broad-acre agriculture, based as they are on selling to markets overseas far larger than domestic markets. In other areas there is a partial linkage, including forestry and fisheries, where domestic markets play an important part in some demand. But for ecological problems associated with energy production and use, and with urban settlement, there are clear and direct links to population size (permanent and temporary)." (p.109) The full discussion in this report of linkages between population and ecological pressure, including numerous scientific references, remains highly pertinent today.
- The Victoria 2008 State of the Environment Report found that "Victoria's population growth and the expansion of Melbourne, and associated affluence, has brought with it unsustainable levels of resource consumption and waste production, with **direct environmental impacts through changes in land use from conservation and agriculture to built environment**. The impacts include harvesting and diversion of water for residential and manufacturing purposes, altering river flows; discharge of human wastes to land and sea; loss of native vegetation; disposal of solid wastes to landfill; and discharge of liquid wastes from industrial processes to adjacent water bodies." (page 57). It also noted that some coastal areas in particular "are already experiencing environmental pressures which further population growth will intensify, such as land use change, **loss of biodiversity**, increased water consumption, generation of waste, and the impacts of road construction and transport." (page 58)
- Queensland's State of the Environment Report 2007 found that "High rates of migration to coastal Queensland and the creation of infrastructure associated with the tourism, mining and agricultural industries drive urban development in Queensland's coastal zone. Meeting the needs and expectations of this growing population with adequate resources, particularly land and water, and the treatment and disposal of waste, including wastewater, continues to place **stress upon the coastal environment**. Continuing development of urban and suburban settlements along the coastline **threatens the integrity of coastal ecosystems**, scenic amenity and the future availability of biological resources." (p.189)
- The Western Australia 2007 State of the Environment Report observes that "population growth and distribution, and patterns of consumption, are drivers of many environmental pressures in the State, including **loss of biodiversity**, air pollution, impacts on water quality and waste generation." (section 1.1) It goes on to make a direct link between rapid population growth in the Perth metropolitan area and both past and likely future loss of biodiversity: "Population increases result in **increased housing demand**, and consumption patterns show that West Australians have a preference for larger houses and fewer people per household compared to other parts of the world …. This results in large land areas being needed to accommodate urban centres and consequent **clearing of native vegetation and farmland for housing**. Urban

expansion has increased dramatically around Perth and other major coastal regional centres in the South West. The urban area of Perth has doubled since the 1970s and this has resulted in clearing of large areas of native vegetation, fragmentation of remaining areas and leads to the loss of species and ecosystems. Vegetation communities of the Swan Coastal Plain are highly represented on the list of threatened ecological communities, although this is in part due to the more extensive research in this area and it's under representation in the conservation reserve system. Continued **loss of native vegetation** in the Perth metropolitan region is forecast as many areas have been zoned urban in the planning system but have not yet been developed." (section 5.2) And further: "Continued growth will further increase pressure on **already stressed native vegetation, wetlands, estuaries, beaches and neighbouring marine ecosystems**. The impacts of unchecked urban growth are increasingly of concern in view of the continued approval and development of new urban areas with low residential densities." (Section 7.1)

- Numerous local government sustainability reports and planning frameworks draw links between population growth, urbanisation and environmental pressure. To give just one of dozens of examples, the Gosford 2006 Sustainability Report notes that "Pressures [on biodiversity] are increasing as a result of **increased urbanisation** of many parts of the City. Pressures include: Clearing/under-scrubbing and associated impacts such as **fragmentation and land and water degradation; Feral and domestic animals; Weed invasion; Loss of natural foreshore; Nutrification; Increasing fire frequency; and Climate change**." (page 68). Such urbanisation of Gosford, in turn, is clearly attributed to local human population increases: "In-migration, particularly from Sydney as Gosford is relatively affordable in regard to housing and due to sea-change phenomena, results in a steady demand for housing and businesses. This in turn, places further demands on services & infrastructure, much of which are already not meeting demand. It also increases pressure on the **fragile local environment**." (page 44).

These official acknowledgements of the relationship between population growth and a wide range of ecological pressures are reinforced by a great number of academic studies. Some of the more salient works include the following:

- Foran & Poldy, "Future Dilemmas: Options to 2050 for Australia's population, technology, resources and environment", is a 2002 CSIRO technical report examining the links between population and numerous environmental and social parameters. The study confirmed that many, though not all, environmental pressures would increase (all other things being equal) under a high population growth future, as opposed to a lower growth future. It distinguished between "direct" and "indirect" population effects. "Direct" or first-order population effects include the actual patterns of use of resource by the population, while second-order effects include, for example, the desire to produce exports to pay for imports and service international debt. Of particular relevance to this nomination, the report found that land use, water use, energy use, and pressure on fisheries would all be higher under high growth scenarios as a direct population effect. The problems of land degradation and biodiversity loss, however, are more strongly linked to indirect population effects, particularly the need to produce agricultural and resource exports to pay for imports. Such export-oriented production is a function of population size and growth rate, affluence, and international debt levels.

- Birrell & Healy 2008 examine the linkages between population and greenhouse pollution, including a decomposition of the factors contributing to emissions growth in several countries. It concludes that an increase in Australia's population to 31.6 million by 2050 would result in 276 million tonnes of greenhouse pollution more than would be the case under a scenario of population stabilisation at around 22 million by 2050.

- Smith & Doherty 2006 outline the impact of recent population growth in coastal areas of Australia. The authors broadly conclude that the "sea change" phenomenon, which has resulted in a substantial shift in population from regional and suburban areas to coastal areas, has had a range of detrimental effects on coastal ecosystems and has strained local planning and infrastructure in coastal areas. The authors argue that "**because the suburbanisation of coastal landscapes is an ongoing process, it can be argued that the continued clearing of coastal and hinterland areas for new residential developments is the greatest continuing threat to habitats**." It may be that decreasing urban amenity due to increasing urban population size is also indirectly driving the "sea change" phenomenon.

- There have been several trans-national regression analyses published in recent years examining global links between population levels, growth and density and ecosystem pressure. A survey of this literature is provided in Gaston 2005. This article concludes, on the basis of many relevant studies, that increased human population density makes the maintenance and preservation of tracts of natural or semi-natural vegetation more difficult, and tends to increase the proportion of threatened species, as well as the prevalence of introduced species, in an area. The author concludes that although "the relationship between biodiversity and human population growth is complex …, it is clear that, alongside other motivations for so doing, limiting this growth is essential for biodiversity conservation and management."

- Among the most important trans-national studies of population and biodiversity are the following: McKee et al (2003), a multivariate regression analysis finding close correlation between population density and percentage of overall species under threat. The authors found that population growth rate is not a strong predictor of threatened species, but "**human population density alone was significantly and strongly correlated with threatened species per unit area**." It is worth noting that, while Australia's total population density is low by comparison to much of the rest of the world, population growth is resulting in rapid localised increases in population density in a number of regions, particularly surrounding capital cities and some other coastal areas. York et al (2003), a study examining six possible models for explaining differences in ecological footprint around the world. The influence of population was prevalent in all models, with a 1% increase in population translating on average to a 0.98% increase in ecological footprint. The authors conclude that "impact changes proportionately with population, consistent with neo-Malthusian and human ecological arguments, and that the age structure of population influences impacts. … Consistent with arguments from political economy, and contrary to the expectations of neo-classical economists regarding an environmental Kuznets curve, increases in GDP per capita consistently lead to increases in impacts, but the increases are not proportional. Furthermore, urbanization also increases impacts, contrary to the expectation of the modernization perspective. Factors identified by ecological modernization theorists as potentially mitigating human impacts on the environment, such as state environmentalism, political rights, civil liberties, service sector development, and the presence of a capitalist system have no significant effects on impacts. Taken together, these results suggest that basic economic and ecological factors largely determine human impact on the environment." McKinney (2001) compares population levels and threatened species across 150 countries, finding a strong correlation between human population size and species threats. The study, which includes a thorough review of relevant literature, concludes that "The evidence gathered thus far implies that about one-third of the variation in extinction threat among geographical areas is directly attributable to the number of humans present." Finally, a landmark study by McDonnell et al (2009) examined the impact on protected areas of proximity to urban centres, concluding that a wide range of adverse impacts are more intense the closer a protected area is to an urban centre. Among the most severe impacts were loss of habitat due to residential development and increased wastewater and sewage flows. Loss of habitat can affect protected areas even if the formally protected area is untouched, since urban expansion occurs preferentially towards protected areas, resulting in infringement of ecologically significant buffer zones outside the protected area, and leading to "edge effects", or degradation of the edges of an ecosystem where it directly abuts intensively developed land. (See Wade & Theobald 2009)
- The literature on the relationship between expansion of Australia's urban areas, and consequent impacts on ecosystems in the area, is large and diverse. A useful overview of major research and findings is provided by McManus (2005). (see in particular the discussion of each of Australia's five largest urban areas, pp 178-185).

*Trends in Australia's population*
Australia's current human population is approximately 22.1 million. Current demographic trends (including domestic fertility and net overseas migration) suggest Australia's population could reach 35.9 million by 2050, based on total fertility of 1.9, life expectancy increasing to 87 for men and 90 for women, and net overseas migration of 180 000 people per year. (Australian Treasury 2010) Over the longer term, population could reach between 44 million and 60 million by 2100, depending on demographic assumptions. (ABS 3222.0)
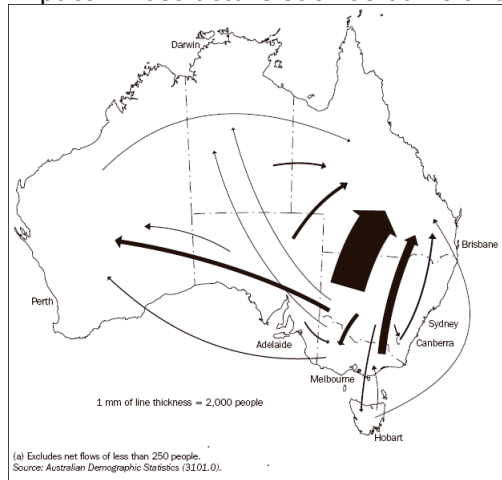
Currently, Australia adds more than 400,000 persons each year, or the equivalent of a city larger than Canberra.

Population growth is not evenly distributed across Australia. For example, the ABS "medium growth" projection estimates that Australia's population overall will rise by 69% by 2056, but a 107% increase for Queensland and a 114% increase for the Brisbane area. Rapid population growth has in recent years been particularly characteristic of Australia's coastal areas. (Sustainable Cities Inquiry, 2005)

While aggregate national population trends are important, population movements within Australia can be highly significant as well. In practice, population growth in recent years has not been even, but rather focused on a small number of urban and coastal areas. Such uneven demographic change can result in intense pressure on local ecosystems, as human communities struggle to meet the housing and infrastructure needs of a burgeoning population.

In recent decades, for example, Queensland has attracted high levels of internal migrants, with much growth concentrated in the Southeast Queensland area. (See figure below) This growth has led directly to clearing of land for residential development, as well as increased pressure for development of high-

impact infrastructure such as dams and highways.



1 mm of line thickness = 2,000 people

(a) Excludes net flows of less than 250 people.
Source: Australian Demographic Statistics (3101.0).

*The interplay of population and consumption*
The question naturally arises whether the ecological pressures identified above result from population growth, or a high-consumption lifestyle, or both. Much commentary focuses, rightly, on the impact that a consumption-oriented society has on the environment.

Certainly, it would be wrong to ignore the fact that per-capita consumption of a range of natural resources has increased dramatically in Australia, with a negative effect on our environment. To give just one example, the average Australian household size has decreased from about 3.5 in 1960 to about 2.5 in 2008, while the average dwelling size has increased. In 2007, there were 880,000 households in Australia with only one or two persons living in houses with at least four bedrooms. (ABS 4613.0) It is surely proper to question the materials, land, and energy implications of having so many extra bedrooms with nobody to sleep in them. High per-capita consumption by affluent nations during the 20th century has been a root cause of accelerated depletion of natural resources including oil and water as well as the degradation of ecological systems. Wealthy societies like Australia cannot continue to lead, nor will developing countries be able to adopt, high consumption lifestyles without risking a general collapse of global ecosystems.

The observation that unsustainable consumption patterns are at the core of our environmental challenges is sometimes followed by a suggestion that population growth is unrelated to ecosystem decline, or at least can easily be accommodated if we "fix" the problem of unsustainable consumption. It has been suggested that population growth can easily be dealt with, provided that we shift our lifestyles to a much lower ecological footprint. (See, for example, Tanner 2010)

It may well be the case that Australia could accommodate some additional millions of people sustainably, if only our planning systems, our patterns of consumption, our lifestyles, our environmental laws, our built infrastructure and our technology were all very different and much improved over the current state of affairs. But those are all long-term changes, the outcome of which remains highly uncertain; to assume that they will all occur, on the scale and timeframe needed to avert irrevocable pressure on our biodiversity, would be rash indeed. The cautious approach taken by the National Population Council on this question is far preferable:

> "Solutions should not be assumed for population-related problems throughout other policies, unless the institutional and other mechanisms required to effectively implement those solutions are in place. This contingency approach may … seem cautious. But it is fully in line with the view that government policies cannot be simply assumed to work as an act of faith. There are numerous reasons to expect collective failure in much policy implementation and a contingent approach simply allows for that in a constructive way by building in alternative or supplementary facilitating policy, which can be adjusted as other policy proves more successful or appropriate, or fails and is seen to be inappropriate." (Nat. Population Council 1991, p. 105)

We should not view consumption and population as somehow competing explanations of environmental damage.

We do not believe that the importance of per-capita consumption patterns detracts from the current nomination of population growth as a key threatening process at this time, for the following reasons:
- At any rate of per-capita consumption, a higher number of individuals consuming at that rate will consume greater resources and place greater pressure on the environment than a lower number of individuals. A growing population therefore necessitates even more dramatic reductions in per-capita impact than are otherwise required. Such dramatic changes are more

difficult to achieve and less likely to occur.
- At present, Australia is not actually achieving the sort of lifestyle changes that would be required to dramatically lower our ecological footprint in the aggregate, while accommodating population growth. On the contrary, many measures of environmental intensity are increasing. For example, per-capita energy use continues to increase, land clearing for development in sensitive coastal areas continues, and per-capita waste generation continues to increase. (ABS 2010)
- A growing population greatly compounds the planning challenges of shifting to a lower-impact lifestyle. For example, a city with a stable population can focus on improving the quality of existing housing stock, and replacing unsustainable existing energy and water infrastructure. A city with a rapidly growing population inevitably expends much of its planning and investment focus on housing and infrastructure to accommodate the increased numbers. A stable city can contemplate restoring degraded or previously developed areas for biodiversity corridors, whereas a growing city does well simply to avoid clearing already intact habitats.

If those who are optimistic about rapid lifestyle changes and technological improvements are correct, a time may come when population growth would no longer a threat to Australia's biodiversity, because Australians would be existing with an ecological footprint so low as to present no danger to our environment. But that time has not arrived, and is far from our current trajectory. The Department must take things as they are, not as we all hope they will be. For now, the process of human population growth – in the context in which is has occurred in the recent past, and the context in which it will almost certainly occur in the near future – compounds many threats to Australia's biodiversity.

# Section 2 - Impacts on Native Species and Ecological Communities

**Notes:**
- General information on the mechanism of impact should not be included in this section - this is part of the description.

- In this section only one pair of questions 4/5, 6/7 or 8/9 need to be answered. However, providing all available evidence against each question will aid in assessment on the nomination.

- The criteria for listing a species or ecological community under the EPBC Act are at Part B and Part D of the Threatened Species Scientific Committee guidelines at the end of this form. It is important to refer to these criteria when answering questions in this section.

- The EPBC Act lists of threatened species and ecological communities are available on the Department of the Environment, Water, Heritage and the Arts website at: www.environment.gov.au/biodiversity/threatened/index.html

## Non-EPBC Act Listed Species/Ecological Communities

*4. Provide a summary of those species or ecological communities, other than those that are listed under the EPBC Act, that could become eligible for listing in any category, other than conservation dependent. Please include:*
   *a. For each species: the scientific name, common name (if appropriate), category it could become eligible for listing in;*
   *b. For each ecological community: the complete title (published or otherwise generally accepted), category it could become eligible for listing in.*

| Species/Ecological Community | Category |
|---|---|
| **[See next question]** | |

*5. Provide justification that the species or ecological communities detailed at question 3 could become eligible for listing in any category, other than conservation dependent. For each species/ecological community please include:*
   *a. data on the current status in relation to the criteria for listing;*
   *b. specific information on how the threatening process threatens this species/community;*
   *c. information on the extent to which the threat could change the status of the species/community in relation to the criteria for listing.*

As a fundamental driver of a great number of other threatening processes, human population growth has the potential to adversely affect nearly every Australian ecosystem in some way. It is therefore impractical for this nomination to seek to identify each species and ecological community at risk from human population growth, and to discuss the nature of that risk specific to each individual species and community. Many, perhaps even most other key threatening processes can in some way or another be traced to, and would be exacerbated by, ongoing population growth.

Instead this nomination will focus on four critical areas where human population growth is directly impacting native species and ecological communities most severely. These areas are:
- Coastal wetlands of South East Queensland;
- Mornington/Western Port biosphere, Victoria;
- Fleurieu Peninsula, South Australia; and
- Swan Coastal Plain, Western Australia.

Two of these regions are areas of existing major urban centres (SE Queensland and the Swan Coastal Plain). The other two regions are areas that have historically been agricultural regions on the periphery of urban centres, but in recent years are moving into the zone of direct urbanisation and "sea change" growth of coastal settlements.

Each of these examples is offered to illustrate the nature of the threatening process which applies far more broadly across Australia. All four examples pertain to the conservation themes for this assessment period.

In each case, while ecosystem structure and location are widely varied, all relevant scientific and government research and planning is agreed that growing human settlements have caused, and are continuing to cause, pressure on ecosystems and threatened species in the region. Habitat clearance and fragmentation as a result of development for growing human populations is a consistent theme for all four examples. Each of these areas is expected to grow rapidly in coming decades.

### *Case 1: Coastal wetlands of South East Queensland*

*Demographic profile:*
South East Queensland has experienced a sustained period of rapid population growth, with no end in sight. From 2001 to 2006, Queensland recorded an average of 2.4% growth per annum, the highest in Australia. (ABS 3218.0) Brisbane alone added 191,000 people in this 5-year period, as the fastest growing capital city in Australia. From 1996 to 2006, Brisbane and the Gold Coast were the first and second fastest growing local government areas in Australia. Several SE Queensland coastal statistical divisions recorded growth rates in excess of 3% per annum, including Sunshine Coast and Gold Coast/Tweed.

Overall, in the 25 years to 2004, SE Queensland's resident population increased from 1.5 million to 2.5 million.

This unprecedented growth is projected to continue more or less apace. According to the ABS, the greater Brisbane area is projected to more than double in population between 2007 and 2056. The SE Queensland Regional Plan is based on growth to 4.4 million people by 2031.

*Impacts of population growth (past and future):*
Rapid population growth has placed immense strain on the physical, ecological and social infrastructure of SE Queensland. In particular, expansion of urban areas in and around the Sunshine Coast, Brisbane and the Gold Coast has resulted in the direct loss of wetlands and other significant habitat. Population growth has compounded many other threats to the biodiversity of the area, including pressure on water resources, changed flow regimes, increased pollution levels, increased resource extraction, and increased intensity of use of remaining natural areas for tourism, recreational and other uses. (Queensland State of the Environment Report 2007)

The Queensland Government's own assessment of the ecological impact of this growth on SE Queensland's coastal areas is illustrative: "… population growth has led to extensive development with resultant losses of large areas of natural vegetation and a wide range of habitats. Many of the region's remaining natural areas have been degraded as human use pressures have intensified." (http://www.derm.qld.gov.au/environmental_management/coast_and_oceans/coastal_management/regional_coastal_management_plans/southeast_queensland_coast/)

The SE Queensland Regional Plan gives a further illustration of the multitude of stresses and impacts arising from urban growth that can led to decline in the health of a particular species: "The koala population of the region has, as a whole, declined over the past 10 years. Some of the major populations within the region, particularly those populations in or near urban areas such as those in Pine Rivers and the Koala Coast, are seeing larger declines than others. This is attributed to habitat loss and fragmentation and to the generally high rates of mortality from cars, domestic dogs and stress-induced disease that are evident in and near urban areas. In contrast, major populations in the predominantly rural western areas of the region are generally believed to be stable, largely due to lower levels or absence of such threats."

This complex, and interwoven set of impacts – loss of habitat, fragmentation of remaining habitat, impact of introduced predators and vehicles, stress and other factors – applies equally to numerous other, less high profile species.

In coastal areas, rapid growth continues to exacerbate pressures on natural systems. The SEQ Regional Coastal Management Plan identifies the following 16 major threats to coastal wetlands, for example (p. 7):

- coastal development
- land clearing
- access impacts
- invasive pests and weeds
- biting-insect controls
- catchment run-off
- land reclamation
- land drainage
- water pollution
- rubbish dumping
- recreational/tourism activities
- predicted impacts of climate change and sea-level rise
- dams, weirs, irrigation channels, barriers
- disturbance of acid sulfate soils
- alteration to natural water flows
- clearing and disturbance through mining

Nearly every one of these pressures will increase with an increasing local population, all other things being equal. Of the sixteen identified impacts, only climate change impacts and disturbance through mining are not clearly linked primarily to the size of the local population.

*Species and ecological communities at risk:*
Coastal wet heath / sedgeland wetlands have been particularly severely impacted by rapid growth in SE Queensland. These wetlands contain 9 EPBC-listed species, some of which have seen substantial worsening in condition due to impacts of a growing population. For example, the endangered lesser swamp orchid (Phaius australis) was present in large populations until the 1970s on the Gold Coast and until the 1980s on the Sunshine Coast. However, loss of habitat and collecting of wild plants for cultivation or sale has had a devastating impact, with 95% of local populations having become extinct. Ongoing loss of habitat, collection and other impacts continue to threaten remnant populations. (Wetland Management Profile, p.9 http://www.epa.qld.gov.au/wetlandinfo/resources/static/pdf/Profiles/p01733aa.pdf) The other listed species have similarly suffered heavily from loss of habitat and other impacts in recent decades.

Some coastal wet heath areas are now protected, but such protection is far from complete. As the Queensland EPA has noted, outside of the protected area estate, "the status of coastal wet heath/sedgeland wetlands has generally faired more poorly, with distributions being exposed to a range of environmental impacts associated with encroachment by competing land uses (especially coastal urban growth). These impacts are most evident in the southern parts of the range in Queensland (between the Sunshine and Gold Coasts), where growth and development has been strongest." (ibid, p.11)

The wetlands, coastal zone and marine habitat of Moreton Bay have also been heavily affected by development associated with population growth. According to the Queensland Government's Shorebird Management Strategy, the Moreton Bay area is significant due to the diversity of habitats including intertidal sand and mudflats, seagrass meadows, mangrove forests and salt marshes (SMS, 2010). Moreton Bay provides home to over 3500 resident and over 40,000 migratory shorebirds during the summer months.  Of these the Beach Stone-Curlew (*Esacus Neglectus*) and Eastern Curlew (*Numenius Madagascariensis*) are listed as vulnerable and the Painted Snipe (*Rostratula Benghalensis)* and Sooty Oystercatcher *(Haematopus Fuliginosus)* are listed as rare under Queensland's *Nature Conservation Act 1992*.  The Eastern Curlew is the largest and most threatened of Moreton Bay's migratory shorebirds, as it is most readily disturbed.  Human activities over 200m away can disturb shorebirds and lead them to abandoning their roosts, potentially affecting their use of the area as a whole.  Disturbance in South East Queensland is high, with growing numbers of people living and recreating in areas inhabited by shorebirds.  Many species are localised to Moreton Bay, so that excessive disturbance could lead to local extinction. (Garnett & Crowley 2000).

The Glossy Black-Cockatoo (*Calyptorhynchus lathami*) is recognised as a threatened species under Queensland's *Nature Conservation Act 1992* and under New South Wales legislation.  Increased urban growth in SE Queensland is having a significant impact on the bird, which feeds almost exclusively on

the seeds and cones of she-oaks (*Casuarina* and *Allocasuarina*). Frequently a Glossy Black Cockatoo will feed exclusively on one she-oak, ignoring nearby tress that may be full of cones. She-oaks and dead tree hollows have often been removed for aesthetic and safety reasons, reducing the feeding and breeding options for the Glossy Black-Cockatoo. The Glossy Black-Cockatoo is one of the more threatened species of cockatoo in Australia; their tendency to feed and breed on private land in residential areas makes them highly vulnerable to human impacts.

*Adequacy of current management responses:*
Recent years have seen some promising improvement in planning processes in SE Queensland. The SE Queensland Regional Plan and the Queensland Coastal Plan create an interlocking framework that may over time reduce habitat loss and other pressures. Certainly these planning frameworks represent an attempt at mitigating the worst aspects of rapid population growth.

Yet we should be careful to delineate between planning frameworks and on-the-ground outcomes. For now, many of the trends described above continue. The SE Queenland Regional Plan, for example, includes provisions designed to increase residential density and, accordingly, to reduce the need for additional habitat clearance. However, the Queensland State of the Environment Report 2007 notes, for example, that "new residential development across the state continues to be predominantly low density, and mainly in the form of larger detached houses." (p.288)

The Queensland Coastal Plan also highlights ongoing developments that will negatively affect the ecology coastal areas. These include major projects such as the Brisbane Airport Parallel Runway project and Gateway arterial duplication, which cause direct loss of coastal wetlands. Such developments also include ongoing cumulative impacts, such as declining water quality in Moreton bay, which may in turn be causing fibropapillomas on endangered green turtles, algal blooms, loss of seagrass beds and other adverse impacts.

Ongoing pressure is highlighted as well in the Ramsar listing application for Moreton Bay:
> "Increased urbanisation of the central bay islands and the adjacent mainland may result in increased demands for water extraction from North Stradbroke Island. Increases in waste discharges and runoff into the bay may also occur. The bay receives most of the sewage and industrial effluent of the wider Caloundra-Brisbane-Gold Coast metropolitan areas as well as the storm water runoff containing sediment, fertilisers, pesticides and other pollutants from the urban and rural areas.
> …
> Land reclamation and soil dumping or urban and industrial development and shipping and port activities are occurring at various sites in the Bay. Up to 1M tonnes of coral and 150 000 m3 of sand per annum are extracted from the Bay for use in the building, foundry and manufacturing purposes. Most pressure from human activities is being exerted on the western shoreline, which also attracts large numbers of wader species that favour muddy habitats."
> (http://www.wetlands.org/reports/ris/5AU041en.pdf)

Part of the difficulty with the SEQ Regional Plan is that ultimately major determinants of population growth in the area are outside the control of the Queensland Government and local authorities, and therefore very difficult to predict or plan for accurately. Rapid population growth could outstrip the commitments of these planning frameworks, as it has done to previous planning frameworks.

Further, even assuming the frameworks are fully implemented, they will not necessarily ameliorate all of the pressures outlined above. Natural areas outside the protected estate remain vulnerable to clearance and other negative impacts. As noted by Smith & Doherty 2006, "many important natural areas (such as habitats) remain in freehold title. These areas are highly valuable habitat for many declining or threatened native marsupials such as koalas, bandicoots and gliders, as they prosper and persist best in fertile landscapes. It is in these areas that increasing pressure for coastal development exists, and many are the basis of local controversies and court cases (for example, the koalas in the Port Stephens area in New South Wales and the Mahogany Glider in South East Queensland)."

The SE Queensland Regional Plan contains significant internal tension between development and conservation objectives. For example, the plan rightly recognises that mere preservation of existing habitat will not be adequate to protect the biodiversity of the area, given the fragmented nature of much habitat and the adaptation to climate change that will be required. Accordingly, the plan envisions reconnection of habitats by "clearly identifying and protecting biodiversity networks and corridors and regional and local scales." This includes "future biodiversity corridors and habitat areas e.g. areas currently developed or cleared that can be rehabilitated to restore connectivity." But which currently developed or cleared areas will be so rehabilitated? The Plan overall contemplated urban infill as a major strategy to increase density and provide more residential housing. Yet it is difficult to reconcile the goals of pursuing urban infill on the one hand, and restoring already developed land for

habitat corridors on the other. In the face of rapid population growth in the area, the Plan provides no clarity on how the restoration goal can simultaneously be accomplished. The result may well be preservation of existing fragmented habitat, which in the long term is not viable in the face of climate change and urban proximity.

Finally, the SE Queensland Regional Plan extends, at best, only as far as providing for the requirements of anticipated population growth through 2031. But if the region still has a strong demographic growth trajectory at that point, how will the demands of the additional population through 2050 be met, or through 2070, or 2100? Unless population stabilisation is at some point achieved, the protection achieved by any planning framework is provisional at best, always open to being reversed by the future requirements of an ever-growing population.

### Case 2: Mornington Peninsula and Western Port biosphere

*Demographic Profile:*
The Mornington Peninsula and Westernport biosphere are within the statistical division of Melbourne, which is currently undergoing very rapid population growth.  While some parts of the Mornington Peninsula have long been settled or developed for agriculture, the northern portion of this region is now on the rapidly expanding peri-urban frontier of Melbourne itself.

In 2007-08, the City of Casey recorded the second-largest growth of local government areas in Victoria, with 8,000 additional residents and an annual growth rate of 3.5% (ABS 3218.0) Casey covers some of the area abutting Western Port to the North. Further South, Bass Coast shire (which includes Phillip Island) grew by 2.3%, the second-most rapid growth in regional Victoria. (ABS 3218.0)

Released in 2002, *Melbourne 2030* was intended to be Melbourne's primary urban development framework. It was predicated on anticipated population growth of 1 million by 2030. However, only six years later the projected growth figures had changed dramatically. *Victoria in Future 2008* projects that metropolitan Melbourne will actually add 1.8 million people from 2006 to 2036. Much of this growth is intended to be concentrated in three identified "growth corridors", one of which is Southeast of the city in the City of Casey, pointed at the Western Port biosphere.

The huge leap in projected population growth has rendered core parts of *Melbourne 2030* unviable. An "update" of the plan entitled *Melbourne @ 5 Million* is based on the revised growth figures, and envisions ongoing expansion of the urban growth boundary, thus revising one of the core precepts of *Melbourne 2030.*

*Impacts of population growth (past and future):*
The Mornington Peninsula and Western Port region of Victoria is recognised by the United Nations Educational, Scientific and Cultural Organization (UNESCO) through its Man and the Biosphere program, which seeks to foster conservation and sustainable development by creating a balanced relationship between man and nature (see www.unesco.org/mabdb/br/brdir/directory/biores.asp?code=AUL+12&mode=all). The greatest threat to this internationally significant area is from rapid urbanisation.

The Mornington Peninsula and Western Port Biosphere Reserve Foundation has described the impacts of human settlements on the natural systems of the area as follows:
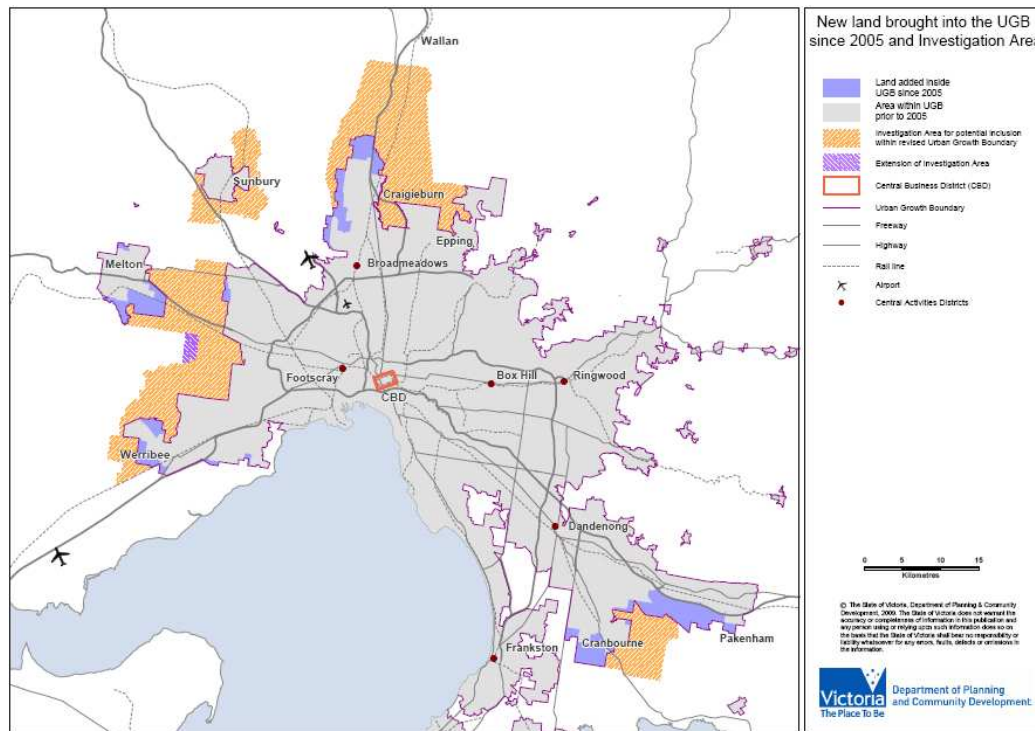
"The major issues in the Biosphere are around the pressure that human developments place on the area's ecosystems, on which the regional productivity, people's wealth and lifestyles depend. These interrelated issues include:

- Threat of pollution and waste (land, water and air)
- Deterioration in water quality
- Land degradation
- Loss of indigenous vegetation
- Introduction of exotic terrestrial and marine organisms
- Impacts of climate change (storm surge, coastal inundation and erosion; inland flooding; increased fire risk; threats to human health, water supplies and infrastructure; and pressure on biodiversity)
- Coastal erosion, inappropriate drainage and poor water quality, which adversely impacts on the natural values of Western Port and Port Phillip Bay
- Disruption to marine habitat, loss of seagrass and reduction in fish stocks
- Unemployment
- Balance between urbanisation and maintenance of rural character and landscape quality in

coastal areas
- Protection of natural resources, including farmland, from inappropriate urban development
- Identification and preservation of land stocks for urban development
- Identification of future port-related land and infrastructure requirements, and the need to ensure that further port development is socio-culturally and ecologically sustainable
- Impacts from industrial and tourism infrastructure and activities
- Development impacts on areas of cultural and heritage value"
(http://www.biosphere.org.au/biosphere.html)

One important consequence of population growth has been a steady expansion of Melbourne's urban growth boundary, such that it is beginning to impinge upon the Western Port bioregion. As the following map shows, recent expansions near Cranbourne and Pakenham have brought major urban development closer to Western Port itself, and a planned further major expansion at Cranbourne would continue this trend. The area to the East and Southeast of Cranbourne is viewed as one of Melbourne's three major growth corridors.



Aside from the impacts of resident population growth within the bioregion, growth in Melbourne's population will exacerbate a range of indirect pressures. Phillip Island and the Mornington Peninsula are popular tourist locations, which adds to development pressure. In 2006, Phillip Island alone had 5,800 unoccupied dwellings, most of which are holiday homes used for only part of the year. Tourism impacts also include increased road development and use, potential disturbance of sea birds and other wildlife in protected areas, increased potential for spread of exotic species, and increased pressure on water resources.

The Victorian Coastal Strategy identifies "population and growth" as one of three key threats to the State's coastal areas:

"Coastal growth can lead to biodiversity and habitat loss, water degradation in coastal waters, wetlands, lakes and rivers, coastal habitat loss, damage to wetlands, the introduction of pest plants and animals, coastal erosion, destruction of coastal ecosystems, loss of cultural heritage, conversion of productive agricultural land and impacts on scenic coastal landscapes, views and vistas." (p. 15)

*Species and ecological communities at risk:*
Western Port is an area of great biological diversity, with an unusually wide range of habitat types. These range from deep channels to seagrass meadows, mangroves, saltmarsh and melaleuca thickets. It supports a large number of marine invertebrates and about 65% of Victoria's bird species. Western Port is listed under the Convention on Wetlands of International Importance, especially as waterfowl habitat (Ramsar Convention). Many of the migratory birds using the area are listed under international agreements, including JAMBA, CAMBA and the Bonn Agreement. As outlined above this area is utilised extensively by the human population, placing biological diversity at high risk from population growth.

The Southern Brown Bandicoot (*Isoodon Obesulus Obesulus)* has been listed as endangered under the EPBC Act since 2001.  Until the 1970s the Southern Brown Bandicoot was common in the coastal heathlands and heathy woodlands surrounding the Melbourne and Western Port region, but today the only secure site is the Royal Botanic Gardens Cranbourne.  Isolated patches of habitat with none or just a few surviving bandicoots exist elsewhere in the area, but rapid urban development threatens these fragmented populations, and renders restoration of habitat connectivity unlikely.  The greatest threat to the Southern Brown Bandicoot is loss of habitat, and given the proximity of these habitats to Melbourne and the coast the threat is real and highly likely.

Degradation of ecosystems in the bioregion by ongoing urban and coastal development will adversely affect numerous threatened ecological communities and species, including but not limited to the following:
- Regent Honeyeater (Anthochaera phyrygia)
- Swift Parrot (Lathamus dicolor)
- Orange-bellied Parrot (Neophema chrysogaster)
- Endangered leek-orchids (Prasophyllum frenchii)

*Adequacy of current management responses:*
*Melbourne 2030* and *Melbourne @ 5 Million* recognise the limitations of growth in the area, with the Western Port Ramsar wetlands as areas to be protected from urban storm water run off and future urban development.  The planning guidelines embedded in *Melbourne @ 5 Million* outline the need to retain growth within the urban area of metropolitan Melbourne through locating development within established suburbs and along established transport routes.

However, it should not be assumed that the intention to slow and eventually cease growth in this area will be successfully realised over time. The successive expansions of the urban growth boundary suggest that political pressure to open up areas for new development often trumps the good faith efforts of any given Government to set a "once and for all" limit to the physical expansion of the city. Population growth is the primary reason that the urban growth boundary has turned out to be a shifting line, and there is little reason to think that population pressures on the boundary will be resisted in the future when they consistently have not been in the past. Possible future expansions of the urban growth boundary are explicitly linked to future population projections by the State Government in *Melbourne @ 5 Million*.

The *Victorian Coastal Strategy 2008* complements these planning frameworks, and again is a positive step, in that it identifies ecological integrity as the fundamental principle that should inform coastal planning. It cites unprecedented population growth along Victoria's coast as placing pressure on coastal environments.  The strategy recognises that "coastal growth can lead to biodiversity and habitat loss, water degradation in coastal waters, wetlands, lakes and rivers, coastal habitat loss, damage to wetlands, the introduction of pest plans and animals, coastal erosion, destruction of coastal ecosystems, loss of cultural heritage, conversion of productive agricultural land and impacts on scenic coastal landscapes, views and vistas."

In summary, planning frameworks in place for the greater Melbourne area are positive steps towards containing the effects of population growth.  However, Victorian state planning policy is yet to reflect many aspects of *Melbourne @ 5 Million* and the *Coastal Strategy 2008.* Further, both frameworks remain open to revision if Melbourne's population continues to grow as rapidly as projected.

### Case 3: Fleurieu Peninsula, South Australia

*Demographic profile:*
The Fleurieu Peninsula is the fastest growing area of South Australia, in terms of population. Located close to the South of Adelaide, with a flourishing wine industry, the Fleurieu has been seen as attractive as a sea change / tree change area in recent years.

From 2003-08, the three local government areas of the Fleurieu – Victor Harbour, Alexandrina, and Yankalilla – all experienced population growth rates of 2.5-3.2% per annum, more than twice the South Australian average. In 2008, Victor Harbor was the fastest growing local government area in the state. (ABS 3218.0)

With a total population of the region of around 42,000, the Fleurieu nearly doubled in population in the two decades from 1988.

Non-resident populations add considerably to the level of development and activity on the Fleurieu. For example, 40% of ratepayers in Victor Harbor and 36% in Alexandrina are not residents; many of these

are second homes not occupied year-round. (Fleurieu Regional Development, Blueprint Report, p.11) There are some 2 million day visitors per year, mostly from Adelaide.

South Australia's "medium growth" projection is based on an average annual growth rate of 0.5% for the state as a whole. However, the Outer Adelaide Statistical region (of which the Fleurieu is a part) is projected to grow at 1.42 – 1.75% per annum, the fastest in the state. (http://dataserver.planning.sa.gov.au/publications/1173p.pdf)

*Impacts of population growth (past and future):*

Historically, impacts on the natural ecosystems of the Fleurieu were primarily a result of agricultural activity, rather than urban expansion. The Australian Natural Resources Atlas states that in the Kanmantoo bioregion (covering the Fleurieu), "most wetlands and riparian systems have been severely degraded by clearance, grazing and trampling by domestic stock, pesticides and fertilisers in agricultural run off, and increasing salinity."

While agricultural development feeds both domestic and export markets, the growth of agriculture in this area is clearly linked to the growth of the nearby city of Adelaide. As Adelaide grew in size, so to did the demand for dairy products, among others, from the Fleurieu.

Swamps on the peninsula were subject to widespread draining and clearing, so that by 1993 only 25% remained. The swamps are crucial habitat for a number of endangered flora and fauna species, including the Mount Lofty Ranges Southern Emu-Wren. The Conservation Council of South Australia notes that less than 25% now likely remains, and ongoing threats include "clearing, drainage and water extraction, and changed landuse such as grazing." (http://www.ccsa.asn.au/index.php?option=com_content&task=blogcategory&id=121&Itemid=453)

According to the 2008 SA State of the Environment Report, only 12% of the original native vegetation of the area remains intact.

*Species and ecological communities at risk:*

The Mount Lofty Ranges Southern Emu-Wren (*Stipiturus malachurus intermedius*) is a listed endangered species, found only on the Fleurieu Peninsula and in the southern reaches of the Mount Lofty Ranges. Its remaining habitat is in small, isolated patches, including remnant swamps on the Peninsula. There remaining population is estimated at between 380 and 810 individuals. Habitat alternation due to residential development is among the many processes which threaten the bird's survival. (See SPRAT listing). Residential development on the Fleurieu is, in turn, driven by population growth, among both the seasonal (non-resident) and permanent populations of the area. As of 2009, the South Australian government reported that the species continued to be in decline. (SA Strategic Plan, Target 3.01 fact sheet)

The swamps of the Fleurieu Peninsula itself is a critically endangered ecological community under the EPBC Act. Only 4% of the community is protected. The TSSC's advice on listing the community noted that "The ecological community is continuing to decline due to a variety of demonstrable threats, which include; changed land use, **local population growth** and agriculture, **increased housing and settlement in proximity to remnants**, vegetation clearance, cattle and deer farming, strawberry farming, water extraction, invasion by exotic species (most notably by Blackberry), hybridisation and inappropriate management practices."

There are numerous additional threatened species found in the Fleurieu. The following is a small sample, drawn from the Australian Natural Resources Atlas:

- Regent Honeyeater (Xanthomyza phrygia ) – threats include fragmentation and clearing of habitat, and collection of firewood
- Southern Brown Bandicoot (Isoodon obesulus obesulus) – threats include broadscale clearing of habitat, fragmentation, and predation by cats and foxes.
- Slender-billed Thornbill (Acanthiza iredalei iredalei) – threats include changed fire regimes, ongoing clearance of habitat, and fragmentation of remaining habitat
- White Spider Orchid (White Spider-orchid) – threats includes clearing, grazing pressure, changed fire regimes, and introduced weeds
- Fat-leaved Wattle (Acacia pinguifolia) – threats include clearing, grazing pressure, and roadworks, among others

Each of the threats to the species listed above is related, directly or indirectly, to increased human populations.

*Adequacy of current management responses:*

South Australia has a strategic plan, with a specific goal to increase the human population of the state to 2 million by 2050, with an interim target of 1.64 million by 2014. The State is ahead of schedule on reaching these targets.

It is not as successful in achieving its biodiversity targets. For example, the status of 20 threatened species is regularly tracked as part of the State's goal of achieving zero further losses of species. In the last status report, 5 were improving, 5 were stable, and 10 were declining in condition, including the endangered Mount Lofty Ranges Southern Emu-Wren.

South Australia has a variety of strategies designed to ameliorate the impact of population growth on ecosystems. Fleurieu Regional Development has produced a "Blueprint for Managing Smart Growth 2006-2026", which functions as a strategic plan for the region. Although the Blueprint contains high-level commitments to environmental sustainability, there is no detailed discussion of the environmental issues facing the area, nor of specific management or policy commitments to address the potential environmental impacts of the current rapid population growth.

### Case 4: Swan Coastal Plain, Western Australia
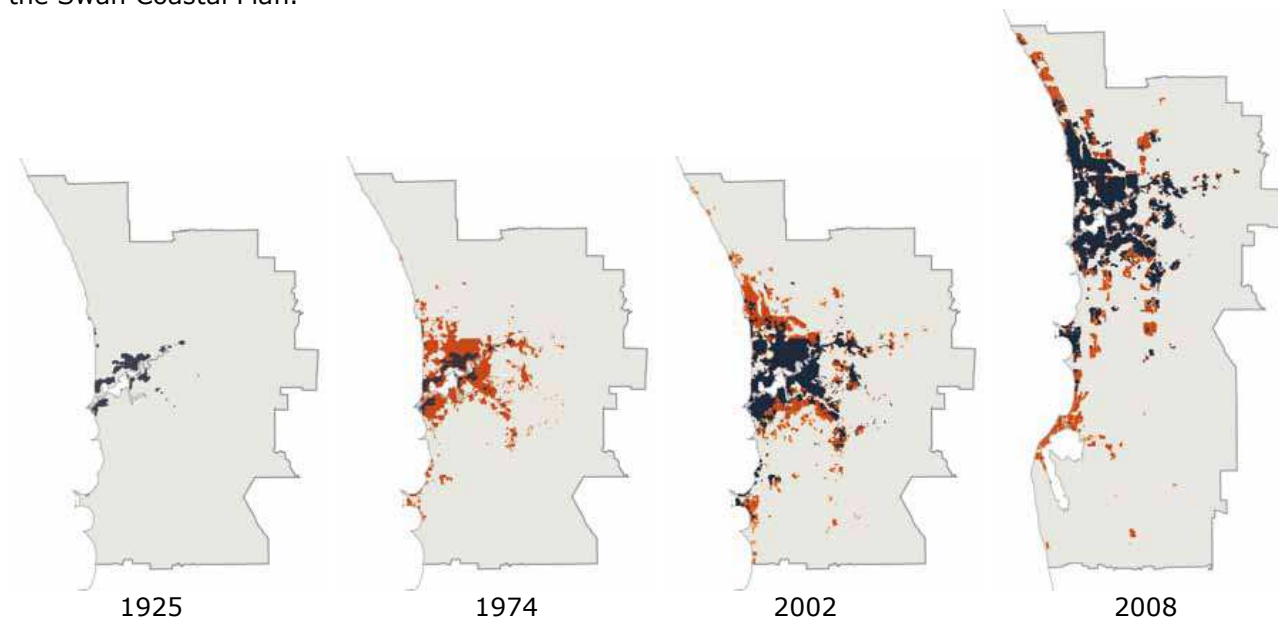
*Demographic profile:*
As of June 2008, approximately 1.6 million people lived in the Perth Statistical Division, on the Swan Coastal Plain. This represents three quarters of the population of Western Australia. In the preceding five years, Perth grew at an average of 2.1% per annum. (ABS 3218.0) Perth is adding about 800 people every day.

To the South of Perth, satellite cities on the Swan Coastal Plain have been growing even more rapidly. Mandurah, for example, grew by an astonishing 5.1% in 2007-08.

Perth is anticipating extraordinarily rapid growth in the coming decades. "Directions 2031", which is Perth's main urban planning framework, is based on an anticipated population of 2.2 million by 2031, or a 33% growth on current levels. In the ecologically sensitive Peel region to the south of Perth, 50% growth is anticipated.

To accommodation the growing population, Perth expects to build 328,000 houses through to 2031. To meet further demand for housing *after* 2031, Perth is already examining prospective development sites that are not currently zoned for urban use. (Directions 2031, p.1)

The following images from Directions 2031 show the dramatic expansion of Perth's urban footprint on the Swan Coastal Plan.



| 1925 | 1974 | 2002 | 2008 |

*Impacts of population growth (past and future):*

The growth of the greater Perth urban areas has placed severe stress on most ecosystems in the Swan

Coastal Plain. According to the Southwest Australia Ecoregion Initiative (SAEI), nearly 80% of the bioregion has been cleared, mostly for urban development and agriculture. (SAEI)

Kwongan heath ecosystems, unique worldwide, were originally widespread across the Swan coastal plain, but 80% of them have been cleared. Wetlands in the area have been similarly affected, with SABI noting that:
> "In some parts of the Ecoregion, many wetlands have been lost. On the Swan Coastal Plain, more than 75% of the permanent wetlands have been filled in or significantly modified. An even greater percentage of ephemeral wetlands and seasonal damplands has been similarly affected. In addition to the direct loss of wetlands, many of the Ecoregion's aquatic assets are degraded due to human activities including land clearing and the loss of fringing vegetation. It is estimated that, of those wetlands that remain on the Swan Coastal Plain, only 15% warrant conservation category status."

Much of the habitat that remains in the area is heavily fragmented and disturbed. Impacts from growth are anticipated to continue with the ongoing expansion of the urban footprint of Perth and the growing population of the region.

Nor is such habitat clearance a matter of distant history. In the Perth metropolitan region as a whole from 1998 to 2004, clearing of native vegetation occurred at a rate of 853 hectares per year, or one football oval per day, and accelerating toward the latter half of this period. (WA SOE 2007, p.134) In just three years from 2001 to 2004 alone, six local government areas in and around Perth cleared more than 10% of their remaining native vegetation. (WA SOE, p.135) In Joondalup and Wanneroo, in the explosive northern growth corridor, 1430 hectares were cleared in these three years.

Since 2004, and notwithstanding improvements to planning regimes, the WA State of the Environment report 2007 states that "The rate of clearing in Perth is likely to have continued (or possibly accelerated) with the economic boom and increased demand for housing in the past 3 years."

While some success has been achieved in identifying urban infill for the future development of Perth, it remains to be seen whether such efforts will arrest the pressure on critical ecosystems in the area, or merely slow the growth in pressure. For now, all major planning frameworks and studies concerning the region note the severe risk posed by ongoing growth.

For example, the 2007 WA State of the Environment report states that,
> "In some parts of WA (especially the Wheatbelt and parts of the Swan Coastal Plain) native vegetation has been cleared beyond safe ecological limits. Continued clearing will result in loss of biodiversity and extinctions, with fragmented habitats becoming more susceptible to climate change, disease, and weed and introduced animal invasion. Salinisation of land and inland waters, altered water regimes, soil erosion, eutrophication and increased greenhouse gas emissions are all direct consequences of clearing native vegetation."

WWF identifies "continuing urban expansion and human use" as "severe threats" to Swan Coastal Plain Scrub and Woodlands ecosystems.
(http://www.worldwildlife.org/wildworld/profiles/terrestrial/aa/aa1205_full.html#just)

The Southwest Australia Ecoregion Initiative agrees, noting that "clearing for urban development on the Swan Coastal Plain is a "key threatening process" for kwongan heath communities in particular.

Even Directions 2031, which is on the whole an optimistic planning framework, states that "the development and growth of a city is clearly a significant intervention into this highly biodiverse area, and one that regularly places us in conflict with our competing desire for environmental protection."

A recent government review of coastal planning frameworks in Western Australia notes, with respect to the Perth region, that "There is a wide range of uses on this section of coastline, such as recreation, residential, industry and port facilities, and as a result, it is one of the most contested spaces in Western Australia. These competing demands place huge pressures on the coast".

Just to the South of Perth, the Peel region is among the most vulnerable areas due to rapid projected population increase. The aforementioned review describes the situation succinctly:
> "Peel is one of the fastest growing regions in Western Australia, and, as a result, is under enormous development pressure. The recent infrastructure upgrades will make the Peel region more accessible and an ideal distance for commuters to Perth.
> The Peel region is also an environmentally sensitive area with an extensive wetland system that is of international and national significance, supporting unique flora and fauna with inherent values that are increasingly under pressure from population settlement, recreational and

economic activity."

Of known threatened ecological communities in Western Australia, 42% are located in the Swan Coastal Plain. (WA State of the Environment Report 2007, p.133)

There is some prospect that recent planning and legislative improvements will slow the rate of clearing for urban development in the region. As of 2006, however, SAEI noted that:
> "While active broad-scale clearing in most areas has generally ceased, it still occurs, particularly in urban, periurban and coastal areas, where clearing for urban development and tourism facilities continues to reduce the amount of native vegetation that remains. In Perth, Western Australia's capital and largest city, the clearing of Banksia woodlands and coastal heath continues to reduce the extent of native vegetation on the species-rich Swan Coastal Plain. The fragmentation of habitat and resulting degradation due to 'edge effects' such as weed invasion, different levels of exposure to wind and sun and changes in air temperature are as problematic in urban areas as they are in the agricultural zone." (SAEI, p.18)

Perhaps most to the point, as recently as January 2010, the WA Government has continued to identify "enormous development pressure" and "urban sprawl along the coast due to the increasing population of Perth" as key management issues in the Perth and Peel areas on the Swan Coastal Plain. (Coastal survey, pp. 12-13)

Of course rapid population growth would increase not only the pressure to clear additional land for development, but also the host of indirect pressures mentioned in this submission, including increased water extraction from natural systems, increased recreational use of reserved areas, and increased waste and pollution.

*Species and ecological communities at risk:*
The Southwest Australia ecosystem region is a global biodiversity hotspot, featuring a number of utterly unique ecosystems and very high levels of species endemism. Conservation International recognises it as one of 34 biodiversity hotspots around the world, and it is the only one located in Australia. It also has the highest concentration of rare and endangered species in Australia.

Kwongan coastal heath ecosystems were originally widespread across the Swan Coastal plan, but around 60% have been cleared for urban and agricultural development. Kwongan is any sclerophyllous (hard-leaved) shrubland plant community. In Australia, such ecosystems are found only in Southwest Australia; they bear some similarity to Mediterranean heathlands in South Africa (fynbos), Chile (mattoral), and California (chaparral).

Threatened species which would be adversely affected by further loss of Kwongan heath include Carnaby's black-cockatoo (*Calyptorhynchus latirostris*) and the tiny Honey Possum (*Tarsipes rostratus),*and the Graceful Sun Moth (*Synemon gratiosa*).

Numerous other threatened ecological communities and species are found in the Swan Coastal Plain. The Australian Natural Resource Audit identified 10 critically endangered and 6 endangered ecological communities in the bioregion, as well as dozens of threatened species. Especially notable is the Western Swamp Tortoise (*Pseudemydura umbrina*) is Australia's most endangered reptile, and is at particular risk from further urban development pressures around Perth.

More complete lists of threatened species and ecological communities, and descriptions of the unique ecological values of this extraordinary area, are provided in the WWF ecoregion profile, "Swan Coastal Plain Scrub and Woodlands" (www.worldwildlife.org/wildworld/profiles/terrestrial/aa/aa1205_full.html#just); A biodiversity audit of Western Australia's 53 biogeographic subregions in 2002 (http://www.naturebase.net/content/view/960/97/), and the Australian Natural Resource Audit's Assessment on the Swan Coastal Plain (http://www.anra.gov.au/topics/vegetation/assessment/wa/ibra-swan-coastal-plain.html).

*Adequacy of current management responses:*

WA has in place a range of strategies which seek to ameriorate the environmental impacts of a rapidly growing population, especially in the Swan Coastal Plan area. Among the most important of these are the State Sustainability Strategy, the Perth "Directions 2031" framework, the "Bush Forever" programme (which seeks to protect remnant bushland in and around Perth), and the State Coastal Strategy (in preparation).

Coastal planning in particular is an area where numerous planning and management tools exist. A

recent review by the WA Planning Commission identified no fewer than 16 statewide planning instruments in force or in preparation pertaining to coastal management. In addition, regional instruments such as the Perth Coastal Plan exist.

With few exceptions, these strategies and planning instruments seek to be far-sighted and to protect the environment from further degradation. The "Directions 2031" policy, for example, articulates an aspiration for a more compact city, and seeks to confine new housing developments at least to land currently zoned as urban, at least until 2031.

However, important aspects of these strategies remain highly aspirational, and the specific translation into tools and effective on-ground management practice remains uneven. For example, Directions 2031 recognises that environmental condition monitoring is critical to assessment of the success of the strategy, yet no specifics are given as to how this will occur. The plan states only that "other monitoring tools will be used or developed to measure the social, economic and environmental performance of Directions 2031."

To be sure, these strategies hold some promise, and so far may have slowed the rate of decline of the Swan region's critical ecosystems. But ultimately the measures we have of actual ecological outcomes gives little reason to think that continuing population growth will be accommodated while restoring ecological health. For example the WA State of the Environment report in 2007 found that, of the threatened ecological communities that had a recovery plan in place, only 15% improved, 57% were stable and 27% declined in condition. (p.124)

A recent speech by Hon. Alison Xamon, MLC, gives an indication fo the disconnect that can exist between planning frameworks, and their actual implementation in legislation and in on-the-ground management practice. As she makes clear, the existence of a world-class plan, program or strategy is no guarantee of real-world conservation outcomes:

> "The Bush Forever sites that we have already identified as worthy of preservation are under threat from development. The Anstey–Keane bushland in Forrestdale, which I have spoken about before in the Legislative Council, is Bush Forever site 342 and it contains 381 varieties of plant life. That comprises far more varieties than there are in Kings Park and includes two unusual types of vegetation complex. It is under threat from a road to be built down the middle to save a few minutes driving around the perimeter. The internationally significant Beeliar wetlands, Bush Forever site 244, is likewise threatened. This government is determined to drive Roe Highway through it, regardless of being told repeatedly by its own agencies that it will be extremely difficult to make that proposal environmentally acceptable.
>
> …
>
> All over Perth our Bush Forever sites are being cut away at the edges to allow the overflow of next-door development. We have discussed in the Legislative Council the issue of Jindee, Paganoni Swamp and Errina Road. We are looking at losing two per cent here and five per cent there. If we let this go on there will be nothing left of value to protect. State Planning Policy 2.8, otherwise known as the "Bushland Policy for the Perth Metropolitan Region" is still only in draft form, yet the opportunity for public comment closed in 2004! I want to know when we can expect to see this policy enshrined in statutory regulation. I have asked about the time frame for Bush Forever in this Parliament and have heard, at best, non-committal answers. I am finding that the management plans to protect these sites simply have not been developed. In many cases not even a manager has been appointed to look after the sites. Land has been acquired to protect Bush Forever sites and ignored while off-road vehicles, whether they be four-wheel drives or motorcycles, are tearing tracks through them, rubbish is being dumped, arsonists are repeatedly lighting fires, wildlife is being lost and weeds are being introduced. The integrity of the overall sites are being reduced." (http://alisonxamon.org.au/node/260)

## EPBC Act Listed Species/Ecological Communities

**6.** *Provide a summary of those listed threatened species or ecological communities that, due to the impacts of the threatening process, could become eligible for listing in another category representing a higher degree of endangerment. Please include:*
   a. *For each species: the scientific name, common name (if appropriate), category it could become eligible for listing in;*
   d. *For each ecological community: the complete title (published or otherwise generally accepted), category it could become eligible for listing in.*

| Species/Ecological Community | Category |
|---|---|
| **[See question 5]** | |

**7.** *Provide justification that the species or ecological communities detailed at question 6 could become eligible for listing in another category representing a higher degree of endangerment due to the impacts of the threatening process. Please include:*
   a. *data on the current status in relation to the criteria for listing (at least one criterion for the current listed category has been previously met);*
   b. *specific information on how the threatening process significantly threatens this species/community;*
   e. *information on the extent to which the threat could change the status of the species/community in relation to the criteria for listing. This does not have to be the same criterion under which the species/community was previously listed.*

**[See question 5]**

**8.** *Provide a summary of those species or ecological communities, listed as threatened under the EPBC Act, that are considered to be adversely affected by the threatening process. Please include:*
   f. *For species: the scientific name, common name (if appropriate) and category of listing under the EPBC Act;*
   g. *For ecological communities: the complete title (exactly as listed) and category of listing under the EPBC Act.*

**[See question 5]**

**9.** *Provide justification that the species or ecological communities detailed at question 8 are affected adversely by the threatening process.*

**[See question 5]**

# Section 3 – Threat Abatement Plan

## Threat Abatement

**10**. *Give an overview of how threats posed by this process are being abated by current (or proposed) activities. Identify who is undertaking these activities and how successful the activities have been to date.*

There is currently no government or non-governmental body or process that has overall responsibility for addressing population growth and abating its impact on the environment.

A distinction can be made between population growth itself, and management of the consequential impacts on the environment of population growth.

Population growth itself has accelerated in recent years, with dramatic upwards adjustments of long-term population levels for Australia.

In terms of abating the threatening process of population growth itself, it must be acknowledged that the range of acceptable points for policy intervention are limited. ACF agrees with the National Population Council's conclusion in 1991 that direct intervention in individual reproductive decision-making is inappropriate, although there is an important government role in ensuring that Australians have the "maximum extent of choice in deciding whether or not they have children and if so how many." (p.91)

This leaves migration as the primary means through which government may directly affect population growth.

The Department of Immigration and Citizenship has primary responsibility for administering the migration program, although the specification of levels for particular migration streams is a matter for the Government of the day, not the Department. Some significant contributors to net migration are effectively outside of government control. For example, government has little ability to affect departures, returns from overseas of citizens and permanent residents, and movements to and from New Zealand. Family reunion, skilled migration, and various temporary migration categories (such as international student, and short-term business visitors) are within government's direct ability to control from year to year.

The Department of Immigration has initiated a process for developing a "long term immigration planning framework".
(www.immi.gov.au/media/publications/research/_pdf/state_territory_linkages.pdf) ACF welcomes this process, which is far preferable to the ad hoc way of setting migration targets from year to year. At this point it is not clear what principles, goals or long-term targets will underpin that framework. In particular, it is not clear that addressing the ecological consequences of population growth will be a part of the framework. More importantly, without an overarching population policy within which migration decisions can be situated, it is not clear that this process can deliver the consistency of policy across governments on matters where migration and domestic policy intersect.

The Department of Immigration has an important role to play is this field, but it has neither the mandate nor the resources to develop and implement an overall population policy for Australia, and to lead work on, for example, demographic projections of internal migration, or management responses to rapid population growth in particular areas. In practice, for example, the Department has not published any research about overall demographic trends or population policy (separate from migration) since 2002.

In recent years, Government decisions have taken Australia further away from a demographic trajectory that could lead to a stable population. Australia's net overseas migration for the year ended June 2009 was 285,300, which accounted for 64% of Australia's population growth for that period. (ABS 3101.0) This is nearly three times the net overseas migration level that existed for most of the 1990s and early 2000s. As a consequence, the Australian Bureau of Statistics has consistently revised upwards its projections for Australia's future population. For example, in 1999, the ABS "middle projection" involved Australia reaching a stable population of around 25 million by 2050. In 2006, the ABS "middle projection" was for a population of 35 million by mid-century, and continuing on a rapid growth trajectory to 45 million by 2100. This drastic revision in projections is due to a rise in domestic fertility and a large increase in net migration.

A number of policies and processes exist which seek to situate population growth in various regions within an overall planning framework intended to mitigate the adverse consequences of population growth. These processes are often uncoordinated, have limited resources and political relevance, and have not generally delivered sound management and planning for developing Australia's population within ecological constraints.

Several of the states and territories have population policies, for example, but it is often difficult to discern any impact on concrete policy decisions. At least one government, South Australia, has an explicit objective to increase its population, alongside various environmental goals. A review of state policies was conducted recently by the Department of Immigration, which concluded that there is "No Commonwealth body to coordinate a national approach to facilitating and planning for population growth", and that state processes show "Inconsistent levels of response to identifying and addressing anticipated impacts of population growth."
(http://www.immi.gov.au/media/publications/research/_pdf/state_territory_linkages.pdf)

A few local governments have sought to limit population within their borders. In 1997, for example, Noosa Shire set a cap on its population of 55,000, over the heated opposition of development interests. The cap was raised over time – the 2004 "Noosa Plan", for example, contemplated residential development for a total of 62,000 residents. In 2008, the Shire was amalgamated as part of the "Sunshine Coast Region". The Region does not currently have a population cap, and the SE Queensland Regional Plan contemplates significant residential development in the Region. Local efforts to limit population growth have been very much the exception rather than the rule across Australia, and the practicability of such mechanisms were they to be widely adopted may be questioned.

The impacts of population growth on the environment are the subject of numerous policies and strategies at Commonwealth, state and local levels. In addition to overarching planning frameworks, a

range of strategies apply to specific environmental pressures arising from growing human populations. For example, energy use and greenhouse emissions are the subject of numerous government policies, such as energy efficiency ratings for buildings and appliances, mandatory renewable energy targets, the proposed Carbon Pollution Reduction Scheme, and many others. Efforts to relieve pressure on water resources are equally complex, encompassing state and local targets, investment in efficiency, water use restrictions, and plans for return of environmental flows to critical river systems. Protected areas, planning scheme, growth boundaries, building codes, and regulations pertaining to pollution, water quality and so forth all play a role as well.

The success of these mechanisms is highly variable; a full discussion of this topic is beyond the scope of this nomination. The best indicator of their overall effectiveness to date remains the various State and Commonwealth State of the Environment reports. These are not encouraging, as they on balance suggest that most measures of environmental pressure related to human populations continue to increase.

There are numerous reasons why state and local responses to population growth and planning have not on balance succeeded in mitigating ecological impacts. For one, state planning frameworks are made under a certain set of demographic assumptions, which can rapidly become out of date, since the states have no control over migration patterns. For example, the "Melbourne 2030" planning framework was developed to cover the period 2001-2030, with a projected growth to 5 million residents of the city by 2030. It is now projected that Melbourne will in fact reach 5 million by 2020, and could reach as high as 7 million by 2030. This surge in population has rendered many of the key elements of Melbourne 2030 out-of-date almost as soon as the ink was dry on the document. In response to rapid population increase, for example, in 2008 the Victorian Government abandoned the plan's commitment to the urban growth boundary to the North and West of the city. As Bernard Salt observed recently,

> "There is the very real prospect that urban planners will have to manage the development of three Australian mega-regions (Sydney, Melbourne, southeast Queensland) each rising to between five and seven million by century's end. This means Sydney and Melbourne will have to accommodate an extra three million residents, or two million more than current planning has considered. Where is Sydney going to add an extra two million residents over and above its current plans for five million? How will Melbourne provide water for an extra two million residents beyond the five million anticipated by current planning?"
> (www.theaustralian.com.au/news/executive-lifestyle/where-to-put-the-extra-millions-at-the-end-of-the-21st-century/story-e6frga5o-1225771259166)

Internal tensions between competing policy objectives are also evident in many state planning frameworks. Aspirations for ecological sustainability can compete with the perceived desirability in some jurisdictions for greater population and rapid economic growth. For example, the South Australia State of the Environment Report 2008 notes the great difficulty in simultaneously pursuing a population growth target and a reduction in environmental footprint:

> "The tension between targets in South Australia's Strategic Plan (SASP) for population growth and reducing the ecological footprint requires greater integration of policies and coordinated implementation of targets. For example, the target to reduce the state's ecological footprint by 30% would, with a population of two million people, require a per capita reduction in ecological footprint of approximately 54%. Similarly, expansion of mining in South Australia will place significant pressure on targets to reduce energy use and emissions." (p.16)

Furthermore, the time horizons of planning frameworks do not generally capture the full extent of projected future population growth. A plan for an urban area that provides for population growth through 2020 or 2030, for example, will come under great pressure if rapid population growth continues after that time frame. There is no guarantee that areas notionally protected under 10- or 20-year time frames will continue to be protected thereafter, if population continues to increase. Perth's "Direction 2031" plan is one of the few plans to recognise this fact, and indeed it explicitly contemplates future land releases being necessary if the population of Perth continues to grow rapidly after 2031.

Difficulties in resourcing and implementing overarching state population and planning frameworks, and ensuring coordination and consistency with other policy frameworks, are also evident. To give just one example, the Western Australia State Sustainability Strategy adopted in 2003 provides that population growth should be promoted in areas where there is a real social and economic disadvantage (in many rural and regional areas), and that growth should be redefined in areas where further development is a threat to sustainability, such as Perth and many South West coastal towns. However, four years later, the WA State of the Environment Report 2007 notes that the approach outlined in the State Sustainability Strategy "is yet to be adopted in WA's planning system." (Section 1.1) There are numerous other examples of worthy planning aspirations being imperfectly reflected, or entirely unimplemented, in on-the-ground practice.

Finally, it is worth observing that the National Population Council played an important role as an independent institution that was well positioned to examine long-term population policies in a holistic manner. The Council was wound up in 1991, and since then no comparable resource for integrated analysis of population questions in Australia exists.

**11.** *Would the development of a threat abatement plan be a feasible, effective and efficient way to abate the process? What other measures could be undertaken?*

A threat abatement plan (TAP) could be a feasible, effective and efficient way to abate the key threatening process of human population growth in Australia. In ACF's view, the only credible TAP would be one that is based on a commitment to stabilising Australia's population at an ecologically sustainable level.

Given that population growth is a fundamental driver of ecological pressure, with complex and interrelated causes and solutions, a TAP devised and implemented solely by the Department of the Environment, Water, Heritage and the Arts is unlikely to be successful. It is obviously impractical, for example, for DEWHA to seek to set migration levels, or establish local and state planning frameworks, which are the responsibility of other agencies of government.

A TAP for population growth should instead aim to provide an overall procedural framework within which the commitment of a broad range of government actors can be sought to the implementation of a national population policy. The TAP could therefore be viewed as an interim step, a catalytic process aiming at establishing the durable cross-governmental mechanisms that will be best placed to deal with population policy and planning on an ongoing basis.

The TAP could, for example, be a useful mechanism for identifying existing policy and institutional gaps, recommending the creation of new information and institutional capacities, undertaking research on the ecological implications of various demographic futures, and proposing long-term population target bands to frame migration decisions and to better guide state, regional and local planning frameworks.

Thus, the fact that DEWHA cannot itself implement a population policy single-handedly is not an argument against developing a TAP. Whether undertaken under the auspices of a TAP, or through some novel process somewhere else in government, development of a national approach to population issues will necessarily involve multiple agencies from within the Commonwealth as well as careful coordination with State and local governments.

In this light, we suggest that the critical need is for a cross-governmental program to examine and come up with feasible planning and solutions to the threat of population growth. That could effectively be achieved through a Threat Abatement Plan that addresses the issues set out in the following section.

**12.** *Should the threatening process be recommended for listing under the EPBC Act, what elements could a threat abatement plan include?*

Before outlining the elements of a threat abatement plan, it may be helpful to acknowledge at the outset that population policy can provoke strong emotions and strong differences of view. Acknowledgement of the link between population growth and threats to Australia's ecosystems should be treated as a matter of scientific fact, and should not be influenced by the range of views about how we as a society might choose to respond to that fact.

As with many environmental challenges, determining a socially just and ethical response to the challenge of a rapidly growing population is an integral part of an effective solution to the ecological problem. ACF strongly believes that a national population policy should be ecologically sound, but also firmly grounded in human rights, including recognition of Indigenous rights, and with a clear appreciation of the benefits many cultures have brought and continue to bring to Australia.

To be more specific, we do not believe that the link between population growth and ecological pressure can be addressed by a simplistic or reactionary commitment to coercive interventions in individual reproductive decision-making, or to a "closed borders" or xenophobic approach to migration.

ACF strongly believes that an ethical, sustainable and just national population policy can be devised. Commitment to developing such a policy:

1. Does not require any particular view about Australia's "carrying capacity", and does not require any particular view on what a desirable population for Australia might be.

Estimates of carrying capacity – the maximum population an area can sustainably support – vary widely depending on assumptions about future consumption patterns, technological developments and other social, environmental and economic trends. A useful review of very divergent approaches to this question can be found in the final report of the Parliamentary Inquiry into Australia's Population Carrying Capacity (1994).

Those with a view that Australia can sustainably grow to 50 million or more inhabitants tend to have a high degree of optimism that dramatic improvements in technology are likely and that rapid changes in lifestyle are achievable, which would dramatically reduce the per-person pressure on the environment. As CSIRO explained in its submission to the Jones Review, "CSIRO believes Australia can carry its present population – or a higher one – in an economically, environmentally and socially sustainable way only if the nation is prepared to change the way it does things. Australia lacks the necessary knowledge and understanding to manage effectively its current population at current living standards. Every extra person and every unit increase in consumption increase the need to rectify this situation."

Whatever one's degree of optimism (or pessimism) about such developments, it is worth noting for any given level of technological and cultural practice, a larger population will – all other things being equal – have a greater impact on the environment.

The national Population Council was circumspect about the usefulness of the concept of carrying capacity, not least because the *possibility* of Australia sustaining a given population level tells us nothing about whether such a population level is *desirable*.

But most importantly, one can certainly accept that Australia's interests are best furthered by an integrated, long-term approach to planning for future population levels without necessarily having consensus on a particular "target" number.

2. Does not require commitment to zero net migration or any other particular quantitative migration target.

Overseas migration currently accounts for more than half of Australia's annual increase in population. However, views will differ widely on what a sustainable migration pattern is, in accordance with views on what a desirable overall population for Australia should be. Again, acknowledging the link between population growth and environmental pressure leaves open the question of how we choose to address that link.

3. Does not entail a "one-child policy" or any other coercive government intervention in the reproductive decisions of Australians.

It is possible to achieve a stable population and to plan for some degree of population growth without resorting to direct government intervention in reproductive decision-making, which most Australians would rightly find abhorrent. Even with the recent increases in estimated total fertility levels in Australia, fertility remains just below the long-term replacement rate. Australia's relatively higher fertility levels compared to other affluent nations may be a function of flexible work practices, government support for child care, relatively low housing costs, and other factors which are generally seen as adding to the quality of life of Australians.

4. Is not anti-migrant, anti-refugee, or xenophobic.

In the past, some advocates of reduced migration have dressed up racist or xenophobic motivations in the cloak of ecological sustainability. ACF categorically rejects such reasons for reducing migration. We have in fact consistently urged an increase in the intake of refugees, while decreasing skilled migration. An overall reduction in migration levels can be undertaken consistent with maintaining a vibrant multicultural society, and with meeting or preferably exceeding Australia's international humanitarian commitments.

*Content of Threat Abatement Plan*
A Threat Abatement Plan should not itself aim to provide direct solutions to all of the various aspects and dimensions of population policy and planning. Rather, it should aim to create and embed the institutional mechanisms across Australian governments that could best address population growth on an ongoing basis. It should aim to complement rather than compete with the Department of Immigration's proposed long-term immigration framework.

We believe that a TAP should involve a two- to three-year programme of activities, including the following elements:
- A research programme, encompassing:

- implications of various possible population futures (including population stabilisation at different levels) on Australia's natural environment and the wellbeing of Australians;
- identification of possible institutional reforms to improve mitigation of environmental pressures arising from population growth; and
- identification of leading examples around the world of nations with sensible long-term population planning frameworks.

- Convening of a cross-governmental body to recommend the substantive content of a national population policy based on broad community input. In our view, such a process should canvass policies aimed at stabilising population numbers, policies to mitigate the effects of likely population growth in the coming decades, and policies to ensure Australia makes an effective contribution to sustainable development and population stabilisation in other countries.

- Seeking the commitment of the Commonwealth and the states to the desired national population policy developed under point 2, and the institutional reforms that would assist in implementing such a policy. ACF believes that such a policy should contain:
  - a commitment to stabilisation of the Australian population and our ecological footprint at sustainable levels by mid-century;
  - a process for ensuring that migration decisions are made within the overarching commitment to population stabilisation (this could reflect the current proposed long-term immigration policy framework);
  - a commitment to priority for humanitarian and family reunion migrants;
  - a commitment to appropriate skills, training and complementary policies to reduce the perceived need for many categories of skilled migrants;
  - an increase in Australia's overseas aid, including for support for environmental refugees and for sustainable development, education and family planning initiatives
  - improvements in Australia's ability to project internal migration and other demographic changes at a local, regional and state level, to enhance state and local governments' planning capabilities;
  - targeted support for local government areas that are experiencing rapid demographic shifts (including rapid increase or decline in local population numbers);
  - funding for state and local governments to undertake planning and projects aimed at ameliorating the impacts of population growth, tied to outcomes-based measures for restoring ecosystem health;
  - clear guidelines for state and local planning framework to avoid further impacts on biodiversity arising from population growth, including a clear indication that projects involving net cumulative impact on threatened species and ecosystems will not be approved under EPBC Act and corresponding state legislation;
  - creation of an influential focal point for analysis and cross-governmental recommendations on population issues, such as a Population unit within the Commonwealth Department of Prime Minister and Cabinet, and/or restoration of the National Population Council.
- Convening of public events and publication of materials regarding population policy, links to environmental and social issues, and related matters.

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**13**. *Is there other information that relates to threat abatement that you would like to provide?*

Population growth involves many complex and overlapping areas of science, economics, governance and public policy. Of necessity, this nomination provides only an overview of each of these areas, and a broad discussion of a possible way forward. ACF would be very pleased to discuss any aspect of the nomination with the Committee, and to provide more detailed information on any of the arguments advanced or case studies provided in this nomination.

## Major Studies

**14.** *Identify major studies that might assist in the assessment of the nominated threatening process.*

Foran B & Poldy F, 2002. *Future Dilemmas: Options to 2050 for Australia's population, technology, resources and environment.* CSIRO Sustainable Ecosystems, Commonwealth of Australia Department of Immigration and Multicultural and Indigenous Affairs.

Jones AR, 2007. "Homo sapiens: overabundant and the ultimate pest?" in *Pest or Guest: the zoology of overabundance*, Royal Zoological Society of New South Wales (pp 233 – 248).

Jones, G, 1997. *An Australian Population Policy*, Parliamentary Research Paper 17 / 1996-97, available at http://www.aph.gov.au/library/Pubs/rp/1996-97/97rp17.htm

National Population Council, 1991. *Population Issues and Australia's Future: Environment, Economy and Society*. Final Report of the Population Issues Committee.

Standing Committee for Long-term Strategies 1994, "Inquiry into Australia's Population Carrying Capacity: Final Report".

# Section 3 – References and Reviewers

**Notes:**
- The opinion of appropriate scientific experts may be cited (with their approval) in support of a nomination.  If this is done the names of the experts, their qualifications and full contact details must also be provided in the reference list below.
- Please provide copies of key documentation/references used in the nomination.

**15.** *Reference list*

ANRA (Australian Natural Resources Atlas), 2009. Available at http://www.anra.gov.au/

Australian Treasury 2010. *Intergenerational Report 2010*. Available at http://www.treasury.gov.au/igr/igr2010/

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McKinney ML 2001. "Role of human population size in raising bird and mammal threat among nations." *Animal Conservation* 4:45-57.

McKinney L, Kick E & Fulkerson G 2010. World System, Anthropogenic, and Ecological Threats to Bird and Mammal Species: A Structural Equation Analysis of Biodiversity Loss. *Organization Environment 2010; 23(1); 3.*

McManus, Phil 2005. *Vortex Cities to Sustainable Cities: Australia's Urban Challenge.* Sydney: University of New South Wales Press.

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Smith T and Doherty M 2006. "The suburbanisation of coastal Australia", paper prepared for the 2006 Australia State of the Environment Committee. Available at www.deh.gov.au/soe/2006/integrative/coastal/index.html

Tanner L 2010. "Issue is profligacy not population" *The Age*, 3 Feb 2010, available at http://www.theage.com.au/opinion/blogs/the-razors-edge/issue-is-profligacy-not-population/20100203-ncix.html

Wade AA & Theobald DM 2009, "Residential Development Encroachment on US Protected Areas", Conservation Biology 24(1), 151-161.

York, R., Rosa, E. A., & Dietz, T. 2003. "Footprints on the earth: The environmental consequences of modernity". *American Sociological Review, 68*, 279-300.

**16.** *Has this document been reviewed and/or have relevant experts been consulted? If so, indicate by whom (including current professional position).*

The following experts have been consulted on this nomination and have reviewed an earlier draft. While ACF is solely responsible for the content of this nomination, each of these experts supports the listing of human population growth as a key threatening process, and supports the adoption of a threat abatement plan to address the process.

Each of these experts would be pleased to speak to the Committee on matters within their area of expertise related to this nomination.

**Professor Ian Lowe AO**
Professor Lowe is currently emeritus professor of science, technology and society at Griffith University in Brisbane, an adjunct professor at Sunshine Coast University and an honorary research fellow at the University of Adelaide. The author of 18 books and more than 500 other publications, Professor Lowe's contributions to environmental science have won him a Centenary Medal, the Eureka Prize for promotion of science, the Prime Minister's Environment Award for Outstanding Individual Achievement, the Queensland Premier's Millennium Award for Excellence in Science, and the University of NSW Alumni Award for achievement in science. Professor Lowe was named Humanist of the Year in 1988 and made an Officer of the Order of Australia in 2001. Professor Lowe was elected ACF President in 2004.

**Dr Bob Birrell**
Dr Birrell is Reader in Sociology at Monash University. He is joint editor (with Katharine Betts) of the quarterly demographic journal *People and Place*, published by CPUR. Dr Birrell has a degree in economics from Melbourne University, in history from University of London (first class honours) and a PhD in Sociology from Princeton University. Most of his academic work has been at Monash University and since 1991 this work has focussed on running the CPUR. He has acted as an advisor on immigration issues to both Labor and Coalition governments and was a member of the Commonwealth Government's National Population Council from 1987–1993. Recently he was a member of the independent *Review of the General Skilled Migration Program* which reported in May 2006.

**Barney Foran** *B Ag Sc, MSc(Agric)*
Barney Foran is currently Adjunct Research Fellow at the Institute for Land, Water and Society at Charles Sturt University. He recently retired from CSIRO in Canberra where he was a futures analyst. His current projects include a body of synthesis for the World Wide Fund for Nature to come up with six laws of sustainability which nations, states and regional communities can all do.

Initially Barney worked for the Northern Territory Department of Agriculture before joining CSIRO Rangelands Research Unit studying ecology and pastoral management in Australia 's semi-arid country which is 70% of Australia . During that time he spent three years in South Africa where he did his Ecology Masters on the management of high rainfall grasslands in Natal at the University of Natal in Pietermaritzburg. From 1990 to 1993 he was based in New Zealand 's South Island and was involved in a big land-use change program (precursor to Landcare Research New Zealand ). On his return to Australia and CSIRO Wildlife and Ecology, Barney commenced an examination of long-term environmental effects of human population growth in Australia. The result was a study "Future Dilemmas" which examined everything that moved in Australia out to 2050. In collaboration with Sydney University, Barney then developed a study 'Balancing Act', which includes a comprehensive structural path analysis for each of the 135 sectors that make up the Australian economy.

# Guidelines for assessing key threatening process nominations according to the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and *EPBC Regulations 2000*

# Threatened Species Scientific Committee (TSSC)

| Part A | Guidelines for Key Threatening Process nominations |
|---|---|
| Part B | Criteria for listing species under the *Environment Protection and Biodiversity Conservation Act 1999* and *Environment Protection and Biodiversity Conservation Regulations 2000* |
| Part C | Indicative thresholds that may be used by the Committee to judge the subjective terms provided by the criteria for listing species |
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## Part A – Guidelines for key threatening process nominations

**Introduction**

The listing of a key threatening process under the EPBC Act is designed to prevent native species or ecological communities from becoming threatened or prevent threatened species and ecological communities from becoming more threatened.

There is a difference between identifying a process as threatening or potentially threatening and listing it as a Key Threatening Process under the EPBC Act. The TSSC is of the view that while many processes that occur in the landscape are or could be threatening processes, there is a lesser number that should be regarded as key threatening processes and receive the appropriate legislative status and hence regulatory recognition.

These guidelines designed to assist in the preparation of nominations of threatening processes consistent with the Regulations and Act.

**Naming the threatening process**

The name provided should accurately reflect the scope of the process based on the description and evidence provided in this form. The name nominated may not necessarily be the name adopted by the TSSC for a successful nomination.

**Describing the threatening process**

Nominators need to provide a description of the threatening process that distinguishes it from any other threatening process, by reference to

(i)     its biological and non-biological components.

Nominators need to carefully consider all the components which make up the threatening process. Each biological and non-biological component of the process nominated should be defined as accurately and concisely as possible. If appropriate, in order to distinguish the nominated threatening process from other processes, components which are specifically excluded from the nominated process can be listed.

While not wishing to restrict the generality of nominations, the TSSC would prefer that threatening processes were identified as operating in particular landscape or ecological or seascape contexts.

(ii)     the processes by which those components interact (if known).

In relation to the biological and non-biological components defined above, nominators should attempt to identify the interactions that occur between these components, ie. to describe the actual process. All terms used to name the interactions making up the process should be defined as accurately and as concisely as possible.

It would also be useful if the linkage between components demonstrated how the process threatens native species or ecological communities. For example, it is conceivable that a change in vegetation cover could be threatening to downstream aquatic species, but this linkage would need to be established before it could be understood as a threatening process. Specific examples or data demonstrating impact on named native species or ecological communities should not be included in the description (these are included in the justification section).

**Justification for why the threatening process is eligible to be treated as a key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999***

Nominators need to include reasons for their nomination and provide evidence against the criteria for listing key threatening processes. Although there are three criteria for listing, meeting any **one** of the criteria means a threatening process is eligible for listing as a key threatening process. However, provision of all available evidence against each criterion aids in assessment by the TSSC.

The EPBC Act lists of threatened species and ecological communities are available on the Department of the Environment, Water, Heritage and the Arts website at: www.environment.gov.au/biodiversity/threatened/index.html

**Criterion A - evidence that the threatening process could cause a native species or an ecological community to become eligible for listing in any category, other than conservation dependent.**

This criterion refers to species or ecological communities not currently included in the EPBC Act lists, but which could become eligible for listing due to the impacts of the nominated threatening process. To meet this criterion there must a high likelihood of a significant effect, to the extent that the species or ecological community will meet at least one of the criteria for listing, within an indicated timeframe, should the threat continue.

The conservation status categories of listing relevant to this criterion are:
- for species- Extinct, Extinct in the wild, Critically Endangered, Endangered, Vulnerable.
- for ecological communities- Critically Endangered, Endangered, Vulnerable.

The criteria for listing species and ecological communities in each of these categories can be found in the Part B and Part D of these guidelines.

**Criterion B - evidence that the threatening process could cause a listed threatened species or a listed threatened ecological community to become eligible to be listed in another category representing a higher degree of endangerment.**

This criterion refers to species or ecological communities which are currently included in the EPBC Act lists. In order to cause a species or ecological community to become eligible for listing in a category representing a higher degree of endangerment, there must be a high likelihood of a significant effect, to the extent that the species or ecological community will meet at least one criterion for the higher category, within an indicated timeframe, should the threat continue.

The conservation status categories of listing relevant to this criterion are:
- for species- Extinct in the wild, Critically Endangered, Endangered, Vulnerable or Conservation Dependant.
- for ecological communities- Endangered or Vulnerable.

The categories Extinct for species and Critically Endangered for ecological communities are not relevant, since there are no categories representing a higher degree of endangerment. The criteria for listing species and ecological communities in each of these status categories can be found in Part B and Part D of these guidelines.

**Criterion C - evidence that the threatening process adversely affects two or more listed threatened species (other than conservation dependent species) or two or more listed threatened ecological communities.**

This criterion refers to species or ecological communities which are currently included in the EPBC Act lists. In order to be adversely affecting a species or ecological community, the threatening process must currently occur where the species or ecological community occurs, and there must be evidence of a current effect.

An adverse effect can include mortality, injury, spread of disease, disturbance to breeding, feeding or roosting habits, habitat alteration or habitat destruction. The extent of impact which can be considered to be an adverse effect depends on the attributes of the population, ecological characteristics, and category in which the species/ecological community is listed. For example, if a species listed as Critically Endangered has less than 50 individuals remaining, then the death of a few individuals would probably constitute an adverse effect. Conversely, the same impact in a species listed as Vulnerable, which has a population of over 9000, would not constitute an adverse impact for the purpose of this criterion.

The conservation status categories relevant to this criterion are:
- for species- Extinct in the wild, Critically Endangered, Endangered, Vulnerable
- for ecological communities- Critically Endangered, Endangered, Vulnerable

The category Extinct for species is not included since there cannot be a current adverse effect on this species. However, if there is evidence of a previous adverse impact before the species became extinct, and this is highly relevant to current impacts of the threatening process, this evidence can also be included.

Some of the information provided in criterion B will also be relevant here. In this case, it should be provided again in the context of this criterion ie. relating to adverse effects rather than population-level impacts.

**Providing information on threat abatement**

If a decision is made to list the threatening process being nominated as a key threatening process, the Minister must then make a decision on whether to have a threat abatement plan.

This section is not required for the nomination to be eligible for listing as a key threatening process under the EPBC Act. However any additional information provided by nominators can be used by the TSSC in preparing its advice to the Minister on the feasibility, effectiveness and efficiency of developing a threat abatement plan, should the threatening process be listed.

# Part B – Criteria for listing species under the *Environment Protection and Biodiversity Conservation Act 1999* and *Environment Protection and Biodiversity Conservation Regulations 2000*

For section 179 of the EPBC Act (which provides general eligibility for inclusion in a category of the list of threatened species), a native species is in the critically endangered, endangered or vulnerable category if it meets any of the criteria for the category mentioned in the following table:

| | Criterion | Critically Endangered | Category Endangered | Vulnerable |
|---|---|---|---|---|
| 1 | It has undergone, is suspected to have undergone or is likely to undergo in the immediate future: | a very severe reduction in numbers | a severe reduction in numbers | a substantial reduction in numbers |
| 2 | Its geographic distribution is precarious for the survival of the species and is: | very restricted | restricted | limited |
| 3 | The estimated total number of mature individuals is: and either of (a) or (b) is true: | very low | low | limited |
| | (a) evidence suggests that the number will continue to decline at: or | a very high rate | a high rate | a substantial rate |
| | (b) the number is likely to continue to decline and its geographic distribution is: | precarious for its survival | precarious for its survival | precarious for its survival |
| 4 | The estimated total number of mature individuals is: | extremely low | very low | low |
| 5 | The probability of its extinction in the wild is at least: | 50% in the immediate future | 20% in the near future | 10% in the medium-term future |

These criteria define situations in which a risk of extinction in the wild, some time in the future, is deemed to exist for a species (for the purposes of section 179 of the EPBC Act). It is not necessary to identify a quantitative risk of extinction, but it is important to ensure that judgements about the criteria (for example, whether a reduction in numbers represents a severe decline), are made in the context of risk of extinction. For example, the Committee's consideration of whether a reduction in numbers of a species is 'severe' takes into account the relationship between the reduction in numbers and the biological and other factors that are relevant to the species' risk of extinction in the wild (or, alternatively, the factors relevant to the species' prospects of survival in the wild).

The table above includes hyperlinks that, when clicked, will take you to indicative thresholds (Part C) that may be used by the Committee to judge the subjective terms given above. While these are modified from the "IUCN Red List Categories and Criteria Version 3.1, 2001", it should be noted that the Committee does not strictly apply these, but has regard to them when making judgments about species in terms of their biological contexts, and on a case-by-case basis.

## Part C – Indicative thresholds that may be used by the Committee to judge the subjective terms provided by the criteria for listing (as presented at Part B)

When assessing a species' eligibility against the listing criteria (see <u>Part B</u>), the Committee exercises its judgement to give practical meaning to the subjective terms of the criteria. The Committee does this by considering the information provided to it via the nomination form in the context of the species' biology and relevant ecological factors, and having regard to the degree of complexity and uncertainty associated with that context and the information provided.

The Committee is also informed by, but not bound by, indicative thresholds, which have been adapted from "IUCN Red List Categories and Criteria Version 3.1, 2001". When considering whether to use these thresholds, the Committee judges whether they are appropriate to the species in question. For example, a relatively long-lived species with slow reproduction and relative population stability (such as most mammals) might be more impacted by, for example, a 30% decline in numbers than might a relatively short-lived species with fast reproduction and naturally fluctuating populations (such as most insects). This consideration of biological attributes is placed in the context of matters such as the relative population size so as to judge whether, for the species in question, a decline is substantial, severe or very severe, for the purposes of the criteria for listing.

| EPBC | Matters considered | Indicative Thresholds | | |
|---|---|---|---|---|
| | **Reduction in numbers** (based on any of A1 – A4) | **Very severe** | **Severe** | **Substantial** |
| **Criterion One** | A1. An observed, estimated, inferred or suspected population size reduction over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:<br>(a) direct observation<br>(b) an index of abundance appropriate to the taxon<br>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat<br>(d) actual or potential levels of exploitation<br>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites. | ≥90% | ≥70% | ≥50% |
| | A2. An observed, estimated, inferred or suspected population size reduction over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1. | ≥80% | ≥50% | ≥30% |
| | A3. A population size reduction, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1. | ≥80% | ≥50% | ≥30% |
| | A4. An observed, estimated, inferred, projected or suspected population size reduction over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1. | ≥80% | ≥50% | ≥30% |

| | | Very restricted | Restricted | Limited |
|---|---|---|---|---|

**Criterion Two**

**Geographic distribution is precarious** for the survival of the species, based on at least two of a – c:
a. Severely fragmented or known to exist at a limited location.
b. Continuing decline, observed, inferred or projected, in any of the following:
   (i)   extent of occurrence
   (ii)   area of occupancy
   (iii)  area, extent and/or quality of habitat
   (iv)  number of locations or subpopulations
   (v)   number of mature individuals.
c. Extreme fluctuations in any of the following:
   (i)   extent of occurrence
   (ii)   area of occupancy
   (iii)  number of locations or subpopulations
   (iv)  number of mature individuals

**Precariousness** is judged on a case-by-case basis, having regard to the degree of threat operating on the species

| | **Very restricted** | **Restricted** | **Limited** |
|---|---|---|---|
| **Geographic distribution** (based on either of B1 or B2) | | | |
| B1. Extent of occurrence estimated to be less than | 100 km$^2$ | 5,000 km$^2$ | 20,000 km$^2$ |
| B2. Area of occupancy estimated to be less than | 10 km$^2$ | 500 km$^2$ | 2,000 km$^2$ |

**Criterion Three**

| | **Very low** | **Low** | **Limited** |
|---|---|---|---|
| Estimated **total number** of mature individuals | <250 | <2,500 | <10,000 |
| *And either of (A) or (B) is true* | **Very high** | **High** | **Substantial** |
| (A) **Rate** of continued decline | 25% in 3 years or 1 generation (up to 100 years), whichever is longer | 20% in 5 years or 2 generations (up to 100 years), whichever is longer | 10% in 10 years or 3 generations (up to 100 years), whichever is longer |

*OR*
(B) **Continued decline** and **geographic distribution is precarious**, based on at least two of a – c:
a. Severely fragmented or known to exist at a limited location.
b. Continuing decline, observed, inferred or projected, in any of the following:
   (i)   extent of occurrence
   (ii)   area of occupancy
   (iii)  area, extent and/or quality of habitat
   (iv)  number of locations or subpopulations
   (v)   number of mature individuals.
c. Extreme fluctuations in any of the following:
   (i)   extent of occurrence
   (ii)   area of occupancy
   (iii)  number of locations or subpopulations
   (iv)  number of mature individuals

**Precariousness** is judged on a case-by-case basis, having regard to the degree of threat operating on the species

*Indicative thresholds*

| | Estimated **total number of mature individuals**, based on the following:<br>   a.   Number of mature individuals only | **Extremely low**<br>< 50 | **Very low**<br>< 250 | **Low**<br>< 1,000 |
|---|---|---|---|---|
| **Criterion Four** | | | | |

| | **Probability of extinction** in the wild within a period, based on the following:<br>a. Quantitative analysis<br><br>(Note:  probability must be at least 50% for critically endangered, 20% for endangered, 10% for vulnerable) | **Immediate future**<br>10 years or three generations, whichever is the longer (up to a maximum of 100 years) | **Near future**<br>20 years or five generations, whichever is the longer (up to a maximum of 100 years) | **Medium-term future**<br>Within 100 years |
|---|---|---|---|---|
| **Criterion Five** | | | | |

*Indicative thresholds*

## Part E – Area of occupancy and extent of occurrence

### Extent of occurrence

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon/ecological community, excluding cases of vagrancy (see Figure 1). This measure may exclude discontinuities or disjunctions within the overall distributions of taxa/ecological communities (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy', point 10 below). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

### Area of occupancy

Area of occupancy is defined as the area within its 'extent of occurrence' (see point 9 above) which is occupied by a taxon/ecological community, excluding cases of vagrancy. The measure reflects the fact that a taxon/ecological community will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon/ecological community. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon/ecological community, the nature of threats and the available data (see point 7 in the Preamble). To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardize estimates by applying a scale-correction factor. It is difficult to give strict guidance on how standardization should be done because different types of taxa/ecological communities have different scale-area relationships.
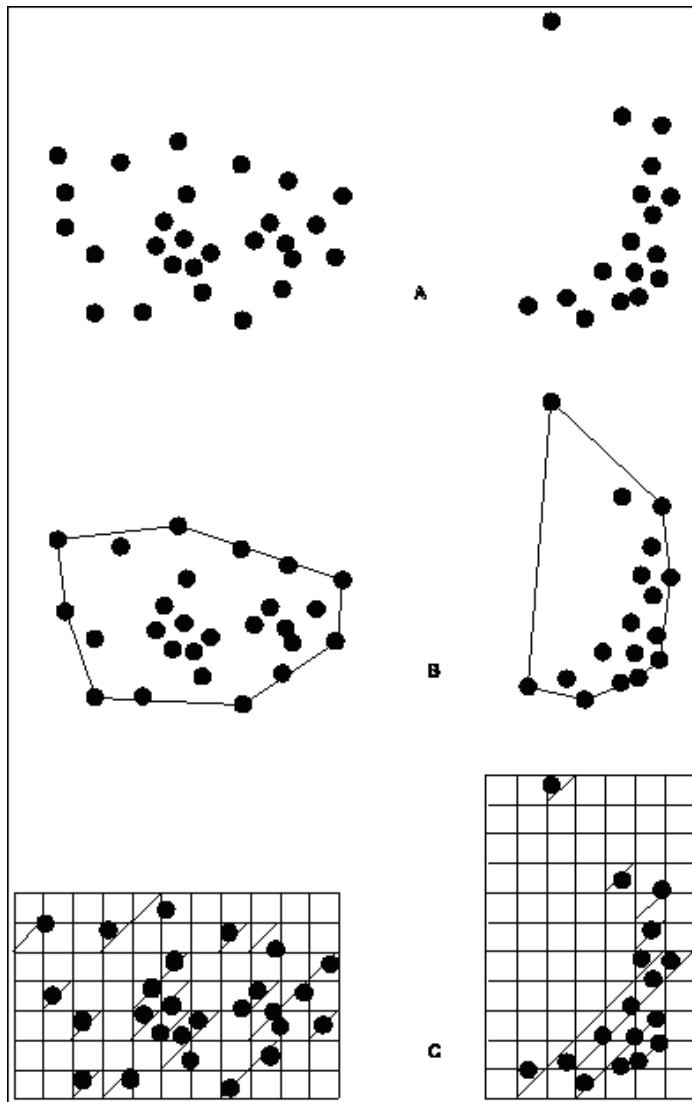
**Figure 1.** Two examples of the distinction between extent of occurrence and area of occupancy. (A) is the spatial distribution of known, inferred or projected sites of present occurrence. (B) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (C) shows one measure of area of occupancy which can be achieved by the sum of the occupied grid squares.