Advice to the Minister for Sustainability, Environment, Water, Population and Communities from the Threatened Species Scientific Committee (the Committee) on Amendment to the list of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

1. Name

Pseudophryne pengilleyi

The species is commonly known as the northern corroboree frog. It is in the Family Myobatrachidae.

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of new information provided to the Committee by the Australian Capital Territory and New South Wales governments to uplist the northern corroboree frog from the vulnerable category and include in the critically endangered category.

This is the Committee's first consideration of the species under the EPBC Act.

3. Summary of Conclusion

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 1 to make it eligible for listing as **endangered**.

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 2 to make it eligible for listing as **critically endangered**.

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 3 to make it eligible for listing as **endangered**.

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

4. Taxonomy

The species is conventionally accepted as *Pseudophryne pengilleyi* (Wells and Wellington, 1985).

5. Description

The northern corroboree frog is distinctive and easily recognised because of its striking dorsal colour patterns consisting of bright yellow or green longitudinal stripes alternating with black stripes (Moore, 1953). The ventral surface is boldly marked with black, yellow or lime green and white blotches. Adult corroboree frogs reach a length of between 25 and 30 mm. There are several differences between *P. corroboree* (southern corroboree frog) and the northern corroboree frog, including considerable genetic divergence (Roberts and Maxson, 1989; Osborne and Norman, 1991; Morgan et al., 2008), differences in colour-pattern and morphology (Pengilley, 1966; Osborne et al., 1996), and skin biochemistry (Daly et al., 1990). Adults of the northern corroboree frog differ from the southern corroboree frog in having: a pattern of dorsal stripes that are usually yellow with a green tinge or lime-green; mid-dorsal light-coloured stripes that are less than half the width of the adjacent black stripe at mid-body and; a significantly smaller body and tibia length (Osborne et al., 1996). The ranges of these two species do not overlap. Tadpoles of the corroboree frogs are dark in colour, have a relatively long paddle shaped tail, and grow to 30 mm in total length (Anstis, 2002).

6. National Context

The historic range of the northern corroboree frog occurs throughout the Fiery Range and Bogong Mountains in Kosciuszko National Park, Buccleuch State Forest, Bondo State Forest, Micalong State Forest, and Wee Jasper State Forest in NSW, and along the Brindabella Ranges in Namadgi National Park in the ACT, and Bimberi Nature Reserve and Brindabella National Park in NSW. This constitutes an altitudinal range between 750 m and 1800 m (Osborne, 1989). Populations in the Fiery Range and Bogong Mountains appear to be contiguous, however within the Brindabella Ranges, the northern corroboree frog occurs as two sub-populations (Osborne, 1989). The southern Brindabella sub-population is found only in the sub-alpine zone (above about 1400m) from near the summit of Mount Bimberi northwards to Ginini Flats (ACT). The northern sub-population occurs at lower altitudes along the Brindabella Range from Bushrangers Creek (ACT) northwards to near California Flats in NSW. The northern corroboree frog is separated from populations of the southern corroboree frog by the comparatively dry and wind-swept Kiandra and Coolamine Plains.

The northern corroboree frog is listed as Critically Endangered under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Endangered under the ACT *Nature Conservation Act 1980*. This species has been listed as Endangered by the International Union for Conservation of Nature (IUCN).

This species is found in the Murrumbidgee Natural Resource Management region and the South Eastern Highlands IBRA Bioregion.

7. Relevant Biology/Ecology

Habitat critical to the survival of the northern corroboree frog includes breeding habitat and adjacent areas where the species forages. The northern corroboree frog breeding habitat includes pools and seepages in sphagnum bogs, wet tussock grasslands, fens and wet heath (Osborne, 1990; Hunter et al., 2009a). The species also forages and shelters in montane forest, sub-alpine woodland and tall heath adjacent to the breeding areas. During summer adult frogs breed in shallow pools and seepages and have a strong tendency to breed in ephemeral water bodies that are dry during the breeding season (Osborne, 1990; Hunter et al., 2009a). The vegetation present at breeding sites varies from sphagnum bog and wet-heath at higher altitudes, to wet sod-tussock grasslands and seepage lines in montane forest. Outside the breeding season, northern corroboree frogs shelter in dense litter and under logs and rocks in adjacent woodland and tall moist heath (Pengilley, 1966). Northern corroboree frogs are typically found in areas with gently sloping topography on granitic and volcanic substrates (Osborne, 1990). Osborne (1988) found that following breeding, adult corroboree frogs are capable of moving over 300 metres into the surrounding woodland.

Corroboree frogs have a typical biphasic amphibian life-cycle with an aquatic tadpole stage and terrestrial post-metamorphic juvenile and adult frog stage. Adult males move into breeding areas in early to late summer, and call from late December through to mid March. The males call from small chambers (nests) in moss or other soft vegetation at the edges of the breeding pools (Osborne, 1990). The males have three call types; an advertisement call, threat call, and courtship call (Pengilley, 1971a). The advertisement call and courtship call are used to attract females to the nest site, whereas the threat call serves as a warning to other males (Pengilley, 1971a). Advertisement call intensity varies depending on the weather, with more calling occurring during warmer overcast conditions, and during late afternoon (Pengilley, 1971a; Osborne, 1989).

Females lay their eggs in the terrestrial nests occupied by the breeding males. Males remain in their nest site through the breeding season and may accumulate multiple clutches in their nest. Clutch size for this species is relatively low for amphibian species; 16 to 38 eggs per female (Pengilley, 1973). The eggs are amongst the largest in the genus (Tyler, 1989), measuring about 3.5 mm in diameter, with the transparent capsules swelling to about 9 mm

in diameter when hydrated. The eggs are laid in a terrestrial nest within or adjacent to a suitable pool, where the embryos develop to an advanced stage prior to entering diapause. Typically, the pools are dry during the breeding season when the eggs are laid. The embryos remain in diapause until flooding of the nest site in autumn or winter stimulates them to hatch. After hatching, the tadpoles move out of the nest site and into the adjacent pool where they live for the remainder of the larval period as a free swimming and feeding tadpole. The tadpoles show little growth during winter, when temperatures at the breeding sites are very low and snow often covers the ground (Hunter and Osborne, 2000). At the end of winter, when snow has melted from the breeding sites, the tadpoles continue growing slowly until metamorphosis in early summer (Hunter et al., 1999).

Drought has been observed to prevent breeding or to prevent recruitment when pools that contain developing tadpoles dry prematurely (Pengilley, 1966; Osborne, 1988, 1989). Prolonged drought that results in lack of recruitment for several years is likely to have widespread and significant impacts on corroboree frog populations, the effect of which may be compounded by fewer breeding adults due to the amphibian chytrid fungus.

Very little is known about the life history of either corroboree frog species after they leave the pools as juveniles. Pengilley (1966, 1992) suggested that they remain in moist vegetation near the breeding pools for several months, where they feed on a wide variety of small invertebrates. As they grow larger, the juveniles leave the breeding area and move into the adjacent non-breeding habitat where it is thought they remain until they are adults. The diet of sub-adults and adults consists mainly of small ants and, to a lesser extent, other invertebrates (Pengilley, 1971b).

Age to sexual maturity from metamorphosis for the northern corroboree frog was determined using skeletochronology (age determination based on growth rings in bone). Age to first reproduction was found to be four years from metamorphosis for the majority of individual males, with a small proportion of individuals attaining sexual maturity in three years (Hunter, unpublished data, 2011). The oldest individuals identified using this technique were nine years old (Hunter, 2000). It is likely that the majority of females take four or five years to attain sexual maturity (Hunter, unpublished data, 2011). Generation length is estimated to be seven years. There is currently no information on annual survivorship for the Northern Corroboree Frog, however estimates for the Southern Corroboree Frog range between 50 and 60 percent annual mortality (Hunter 2000).

8. Description of Threats

Threats to corroboree frogs include disease, fire, climate change, feral animals, weeds, habitat disturbance and degradation. Such threats rarely act in isolation and when more than one threat acts against a population the effects are often synergistic (magnifying) (Brook et al., 2008). For example, warmer temperatures and less rainfall due to climate change might modify corroboree frog breeding habitat. These conditions might also increase the frequency of fire in alpine environments, which in turn will also modify breeding habitat.

Disease

Recent evidence points to disease caused by an introduced fungal pathogen as the main reason for the decline of corroboree frogs (Hunter et al., 2010). The amphibian chytrid fungus *Batrachochytrium dendrobatidis* has only recently spread around the world and the disease it causes (chytridiomycosis) has resulted in mass amphibian declines and extinctions (Berger et al., 1998; Skerratt et al., 2007). 'Infection of amphibians with chytrid fungus resulting in chytridiomycosis' is listed as a key threatening process under the EPBC Act and has a Threat Abatement Plan. Frog species vary in their susceptibility to the disease; corroboree frogs are highly susceptible whereas the sympatric *Crinia signifera* (common eastern froglet) is apparently relatively unaffected and can act as a reservoir host for the disease (Hunter, 2007). Field sampling for the chytrid fungus indicates that it is present in all key corroboree frog habitats in the ACT (Hunter, 2007). The chytrid fungus can infect tadpole and frog

stages but not eggs as they do not contain keratin, which is required by the fungus. The main method of disease transmission amongst populations of corroboree frogs is likely to be from adult-adult contact during breeding and by corroboree frog tadpoles contracting the disease from tadpoles or adults of common eastern froglets using the same pools. Reducing the impact of the disease will require (a) eradicating or controlling amphibian chytrid fungus in the environment or (b) improving resistance of frog populations to the disease. Eradication of amphibian chytrid fungus from the Australian continent, appears unlikely given no introduced organism has been eradicated once it has become established in the Australian environment. There is no known method to control the pathogen on a broad geographic scale, though maintaining disease-free 'refuge' sites (particularly sites that are isolated by natural barriers to animal movement) might be achievable.

Improved disease resistance in wild populations may arise through attenuated virulence of the pathogen and/or increased defences of amphibian hosts. There is some evidence that populations of other frog species that have suffered declines from chytridiomycosis have developed resistance to this pathogen (Retallick et al., 2004; McDonald et al., 2005), probably through intense genetic selection. Corroboree frogs have persisted with amphibian chytrid fungus in their habitats for at least two decades (albeit at perilously low population levels) and thus the remaining individuals are likely to represent the most disease-resistant genes.

Corroboree frog populations might recover if given the opportunity for ongoing selection for disease resistance. Selection for disease resistance could occur naturally in the wild or artificially in captive populations, though the latter will require research into the response of the frog immune system to infection with the amphibian chytrid fungus.

There have been significant recent developments in the effectiveness of treating frogs that have chytridiomycosis, including the use of elevated temperatures and fungicides such as chloramphenicol (Woodhams et al., 2003; Bishop et al., 2009). There is also some evidence to suggest that frogs exposed to chytridiomycosis and then 'cured' may acquire lasting resistance to the disease (Woodhams et al., 2003), though such resistance is not conferred to their offspring. This type of acquired resistance may be useful for managing disease outbreaks in captivity and for boosting survival rates of individuals released from captivity to the wild.

Fire

Wildfires and prescribed burns have the potential to impact on the frogs by burning vegetation and peat in breeding and non-breeding areas (Clark, 1986). Wildfire can severely damage peat and bog areas, causing erosion and decreasing the capacity of the bogs to hold water (Good, 1973; Clark, 1986). In January 2003, wildfires burnt most of Namadgi National Park (and much of the Australian Alps) and severely burnt corroboree frog breeding sites and their heath/woodland over-wintering habitat. All breeding sites were affected, with the proportion of each site burnt ranging from 70% to 95% (Carey et al., 2003). Corroboree frogs were killed in the fires (D. Hunter pers. obs.), though breeding still occurred in unburnt areas. The recovery of breeding habitat has been variable, with some areas taking less than three years post-fire to provide suitable conditions (vegetation and pools), whereas other areas are still recovering after eight years. In some areas, sphagnum moss or wet heath have been converted to wet grassland (a less favourable breeding habitat for corroboree frogs). Some smaller bogs have not recovered their functionality due to the peat becoming hydrophobic and these areas are now dry grassland (M. Evans pers. obs.), which is unsuitable as breeding habitat. It is possible that these areas may not return back to bogs for decades, if ever. Most breeding sites, particularly the larger sites such as Ginini wetlands and Snowy Flats, now appear to be suitable breeding habitat for corroboree frogs.

Whilst the short-term effects of fire are loss of habitat and potentially loss of individual frogs, the long-term effects on the ecology or abundance of corroboree frogs are not well understood. Osborne (1991), considered that autumn fires burning through woodland and heath surrounding breeding sites had the greatest potential influence. At this time adult and

sub-adult frogs have moved into these areas to feed and to find suitable over-wintering sites. Regular burning of understorey litter and grass cover in these areas, such as occurs during prescribed burns, is likely to reduce the shelter available to the frogs and make them more vulnerable to predation, dehydration or freezing.

Feral Animals and Weeds

Feral pigs (*Sus scrofa*) are a threat as they disturb breeding areas by rooting up sphagnum moss and other vegetation in their search for food (M. Evans, pers. obs.), which includes insect larvae and tubers (Alexiou, 1983). Pigs also wallow in the bog pools and can disturb the breeding pools at the time they are being used by the frogs (D. Hunter, W. Osborne, pers. obs.). However, the actual extent of impact on the ecology of the frogs requires further research.

Sambar deer (*Cervus unicolour*) and fallow deer (*Dama dama*) have the potential to damage corroboree frog habitat and, whilst their abundance in the ACT is low, there is some evidence that their numbers are increasing.

In NSW trampling by feral horses (*Equus equus*) has caused extensive damage to some breeding sites (W. Osborne and D. Hunter pers. obs.) through incision of the bogs and altering drainage patterns (Dyring, 1992; Wimbush and Costin, 1979). There is no known permanent population of feral horses in the ACT, and it is important for the protection of corroboree frog habitat that horses moving into the ACT from NSW continue to be removed.

Blackberry (*Rubus fructicosus*) is a serious threat to corroboree frog habitat. Breeding sites that have been invaded by this weed in NSW appear to be no longer suitable for corroboree frogs (W. Osborne, R. Pietsch, D. Hunter, pers. obs.). In the ACT, blackberries are present in Namadgi National Park, including some of the smaller corroboree frog breeding sites. Pine wildings are occasionally found and removed from corroboree frog breeding sites, particularly Snowy Flats where the source is the arboretum near Priors Hut. Exotic grasses such as sweet vernal grass (*Anthoxanthum odoratum*) are present at the margins of some corroboree frog breeding sites, though what effect this might have on corroboree frog habitat is unknown (ACT Government, 2011).

Habitat Disturbance and Degradation

Localised human impacts are known to have had a deleterious effect on some breeding sites (Osborne, 1991). Erosion from poorly maintained roads has damaged some sites (mostly in NSW) where the species occurred (Osborne, 1988).

Almost all habitat for the northern corroboree frog in the ACT is contained within Namadgi National Park, which is a relatively undisturbed environment. Nevertheless, activities that may pose a threat in catchments with corroboree frog habitat include earthworks and road construction, which may damage soil, peat or vegetation and alter flows of water into bogs and other wet areas. Road construction without adequate environmental safeguards risks sedimentation of corroboree frog habitat, especially during unforseen storm events.

Climate Change

Climate change is expected to have a significant impact on corroboree frogs (Osborne and Davis, 1997). Climate change modelling suggests that higher elevation areas of the Australian Alps, including the Brindabellas, will experience warmer temperatures and a decrease in precipitation (both as rainfall and snow) (Hennessey et al., 2003). This will reduce the water table during late spring and early summer, and result in earlier pool drying. Given the strong tendency for corroboree frogs to breed in highly ephemeral pools (Osborne, 1990; Hunter et al., 2009b), the most immediate and direct impact of climate change will result from increased rates of pool drying prior to metamorphosis.

Higher temperatures might also be expected to result in a contraction of the lower altitudinal limit for this species, whereas higher temperatures and less precipitation, combined with an expected higher fire frequency, might result in a change in the hydrological functioning of wetlands and a reduction of suitable breeding habitat (such as sphagnum moss communities becoming wet sedgeland, grassland or heathland). This process appears to have already occurred across many sites occupied by the northern corroboree frog, as many sites previously occupied by the northern corroboree frog no longer appear to contain suitable pools (Scheele, 2010).

While pre-decline corroboree frog populations would have been robust to failed recruitment during El Niño events (Hunter, 2000), an increase in the frequency of droughts will only further compromise the capacity for this species to recover from its current low population size. Moreover, the impact of the chytrid fungus, through decreasing adult survival (Scherer et al., 2005), will increase population susceptibility to failed recruitment. This is because failed recruitment in some years is compensated by the adults being able to live longer and breed over consecutive years. The most immediate effect on the species is likely to be less reliable annual recruitment to the population due to less frequent 'favourable' breeding seasons. The long development times for corroboree frogs as eggs and tadpoles (several months) means that both species of corroboree frog are particularly susceptible to low precipitation that results in ephemeral pools not forming (loss of eggs) or pools drying before tadpoles reach metamorphosis (Osborne, 1990; Hunter et al., 2009b).

Whilst climate change is expected to have an impact on corroboree frogs, it is still uncertain whether the magnitude of such changes will be sufficient to cause the extirpation of this species. In addition to sphagnum moss, corroboree frogs are able to use a range of other wet areas for breeding, including wet grassland and wet heathland. Depending on the rate and magnitude of climate change, it is possible that its effect on the species may be ameliorated to some extent though behavioural or genetic adaptation.

9. Public Consultation

The nomination was made available for public exhibition and comment for 30 business days. No comments were received.

10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the species is **eligible** for listing as **critically endangered** under the EPBC Act. The assessment against the criteria is as follows:

Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers

Observations between 1955 and 1966 indicated that the species was abundant and occurred in large numbers during the breeding season (Colefax, 1956; Jacobson, 1963; Pengilley, 1966). However, the northern corroboree frog has declined markedly since 1986 when 500 plus calling males were identified at Ginini Flats West in the Brindabella Range, ACT. In 2007, surveys identified no calling males at this site. In 2011, only one calling male was identified at this site. This represents an almost 100% decline in population numbers at this site in the past three generations or 21 years.

Hunter estimates that the total number of males of the species is between 400 and 800 individuals (Hunter, unpublished data, 2012). Therefore, based on a 1:1 sex ratio the total estimated population figure for the species is between 800 and 1600 individuals (Hunter, unpublished data, 2012). Hunter provides a range as a total population figure, as it is not

currently possible to make an accurate assessment of numbers for the largest population in the Fiery Range in NSW (Hunter, unpublished data, 2012).

Forests NSW estimates that there has been a 50% decline in species numbers in the Buccleuch, Bondo and Micalong State Forests in the Fiery Range over the past 18 years (Forests NSW, unpublished data, 2012). Evans estimates that there has been approximately a 50% decline in the area of occupancy of the species in the ACT since the late 1990's and early 2000's (Evans, unpublished data, 2012). Hunter concludes that over the past ten years the entire northern corroboree frog distribution has declined from approximately 40% of its range with declines being more severe in the Brindabella Ranges (Hunter, unpublished data, 2011). This decline is thought to be primarily as a result of the disease chytridiomycosis (Hunter et al., 2010; Skerratt et al., 2007) and this threat is likely to continue to affect this species causing continued declines in the northern corroboree frog.

The largest population, in the Fiery Range, has declined by approximately 50% on state forest land. When combined with estimates of declines in the area of occupancy of 50% in the ACT and 40% overall, and noting the near extirpation of the large Ginnini Flats West population along with the ongoing effect of the disease chytridiomycosis on all populations indicates, a severe reduction in population numbers for the whole species can be inferred over the past three generations.

The Committee considers that the species can be inferred to have undergone a severe reduction in numbers as a result of declines in populations in the ACT and the Fiery Range in NSW. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited

The historic range of the northern corroboree frog occurs throughout the Fiery Range and Bogong Mountains in Kosciuszko National Park, Buccleuch State Forest, Bondo State Forest, Micalong State Forest, and Wee Jasper State Forest in NSW, and along the Brindabella Ranges in Namadgi National Park in the ACT, and Bimberi Nature Reserve and Brindabella National Park in NSW.

The current extent of occurrence for the northern corroboree frog is estimated to be 550 km^2. The current area of occupancy is between 4 km^2 and 10 km^2 (Hunter, unpublished data, 2012). The Committee considers that the species' geographic distribution is very restricted.

The distribution of the northern corroboree frog is severely fragmented as a result of local extinctions and as it has a high degree of habitat specificity compared to many other frog species, being only found in pools and seepages in sphagnum bogs, wet tussock grasslands, fens and wet heath between 750 m and 1800 m above sea level. This habitat is naturally fragmented across the alpine region.

Forests NSW estimates that there has been a 50% decline in species numbers in the Buccleuch, Bondo and Micalong State Forests in the Fiery Range over the past 18 years (Forests NSW, unpublished data, 2012). Evans estimates that there has been approximately a 50% decline in the area of occupancy of the species in the ACT since the late 1990's and early 2000's (Evans, unpublished data, 2012). Hunter concludes that over the past ten years the entire northern corroboree frog distribution has declined from approximately 40% of its range with declines being more severe in the Brindabella Ranges (Hunter, unpublished data, 2011). This decline is thought to be primarily as a result of the disease chytridiomycosis (Hunter et al., 2010; Skerratt et al., 2007) and this threat is likely to continue to affect this species causing continued declines in the northern corroboree frog.

The Committee considers that the species has a very restricted geographic distribution, which is precarious for the survival of the species due to its severe fragmentation and the current and potential threats operating on the species. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.

Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either

(a) evidence suggests that the number will continue to decline at a particular rate; or

(b) the number is likely to continue to decline and its geographic distribution is precarious for its survival

Hunter estimates that the total number of males of the species is between 400 and 800 individuals (Hunter, unpublished data, 2012). Therefore, based on a 1:1 sex ratio the total estimated population figure for the species is between 800 and 1600 individuals (Hunter, unpublished data, 2012). Hunter provides a range as a total population figure as it is not currently possible to make an accurate assessment of numbers for the largest population in the Fiery Range in NSW (Hunter, unpublished data, 2012).

The Committee considers that the total number of mature individuals is low for the purposes of this criterion.

The distribution of the northern corroboree frog is severely fragmented as a result of local extinctions and as it has a high degree of habitat specificity compared to many other frog species, being only found in pools and seepages in sphagnum bogs, wet tussock grasslands, fens and wet heath between 750 m and 1800 m above sea level. This habitat is naturally fragmented across the alpine region.

Over the past ten years the northern corroboree frog has declined in distribution from approximately 40% of its range with declines being more severe in the Brindabella Ranges (Hunter, unpublished data, 2011). Forests NSW estimates that there has been a 50% decline in species numbers in the Buccleuch, Bondo and Micalong State Forests in the Fiery Range over the past 18 years (Forests NSW, unpublished data, 2012). Evans estimates that there has been approximately a 50% decline in the area of occupancy of the species in the ACT since the late 1990's and early 2000's (Evans, unpublished data, 2012). These declines are thought to be primarily as a result of the disease 'chytridiomycosis' (Hunter et al., 2010; Skerratt et al., 2007) and this threat is likely to continue to affect this species, causing continued declines in the northern corroboree frog.

The Committee considers that the number of mature individuals of the species is low, this number is likely to continue to decline and the species' geographic distribution is precarious for the survival of the species. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **endangered**.

Criterion 4: The estimated total number of mature individuals is extremely low, very low or low

Hunter estimates that the total number of males of the species is between 400 and 800 individuals (Hunter, unpublished data, 2012). Therefore, based on a 1:1 sex ratio the total estimated population figure for the species is between 800 and 1600 individuals (Hunter, unpublished data, 2012). Hunter provides a range as a total population figure as it is not currently possible to make an accurate assessment of numbers for the largest population in the Fiery Range in NSW (Hunter, unpublished data, 2012).

The Committee does not consider that the estimated total number of mature individuals of the species is extremely low, very low or low. Therefore, as the species has not been demonstrated to have met any required element of Criterion 4, it is **not eligible** for listing in any category under this criterion.

Criterion 5: Probability of extinction in the wild that is at least

(a) 50% in the immediate future; or

(b) 20% in the near future; or

(c) 10% in the medium-term future

There are no data available to estimate a probability of extinction of the species in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 5, it is **not eligible** for listing in any category under this criterion.

11. Conclusion

Conservation Status

The northern corroboree frog was nominated by the Committee for inclusion in the list of threatened species referred to in section 178 of the EPBC Act.

The Committee considers that the species can be inferred to have undergone a severe reduction in numbers as a result of declines in populations in the ACT and the Fiery Range in NSW. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

The Committee considers that the species has a very restricted geographic distribution as it has an area of occupancy of between 4 km^2 and 10 km^2. This geographic distribution is precarious for the survival of the species as it is severely fragmented and the species continues to be subject to the effect of chytridiomycosis on the population. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.

The Committee considers that the number of mature individuals of the species is low, as the total adult population size is estimated to be between 800 and 1600 individuals. This number is likely to continue to decline due to the continued effect of chytridiomycosis on the species and as the geographic distribution of the species is precarious for its survival. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **endangered**.

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

Recovery Plan

The Minister does not need to make a recovery plan decision for this species as per Schedule 2, Part 3, 17(2) of the *Environment and Heritage Legislation Amendment Act 2006*, as the development of a recovery plan for this species had already commenced at the time this legislation came into effect and the Minister was deemed to have made a recovery plan decision at this time.

The NSW government has developed the draft ‘National Recovery Plan for the Southern Corroboree Frog, *Pseudophryne corroboree*, and the Northern Corroboree Frog, *Pseudophryne pengilleyi*’, in consultation with the Australian and ACT governments. This document is currently being considered for adoption by the Australian Government.

Minister transferred this species from the vulnerable category to the critically endangered category, effective from 6/04/2013

12. Recommendations

(i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **transferring** from the **vulnerable** category to the **critically endangered** category:

Pseudophryne pengilleyi

Threatened Species Scientific Committee
7 June 2012

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