



Consultation Document on Listing Eligibility and Conservation Actions

***Petauroides volans* (greater glider)**

You are invited to provide your views, and reasons supporting them, related to:

- 1) the eligibility of *Petauroides volans* (greater glider) for inclusion on the EPBC Act threatened species list in the Vulnerable category; and
- 2) the necessary conservation actions for the above species.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing either by email to:

species.consultation@environment.gov.au

or by mail to:

The Director
Marine and Freshwater Species Conservation Section
Wildlife, Heritage and Marine Division
Department of the Environment
PO Box 787
Canberra ACT 2601

Responses are required to be submitted by 25 November 2015.

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General background information about listing threatened species

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at: <http://www.environment.gov.au/biodiversity/threatened/index.html>.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at: <http://www.environment.gov.au/biodiversity/threatened/pubs/guidelines-species.pdf>.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at: <http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at: <http://www.environment.gov.au/biodiversity/threatened/recovery.html>.

Information about this consultation process

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

Petauroides volans

Greater glider

Note: The information contained in this conservation advice was primarily sourced from 'The Action Plan for Australian Mammals 2012' (Woinarski et al., 2014). Any substantive additions obtained during the consultation on the draft will be cited within the advice. Readers may note that conservation advices resulting from the Action Plan for Australian Mammals show minor differences in formatting relative to other conservation advices. These are reflective of the desire to achieve efficiency over preparation of a large number of advices by adopting the approach of the Action Plan for Australian Mammals in presentation of information and do not reflect any difference in the evidence used to develop the recommendation.

Taxonomy

Conventionally accepted as *Petauroides volans* (Kerr, 1792).

This is the only species in the genus. Two subspecies are conventionally recognised: *P. v. minor* (in north-eastern Queensland) and *P. v. volans* (in south-eastern Australia).

Species Information

Description

The greater glider is the largest gliding possum in Australia, with a head and body length of 35-46 cm and a long furry tail measuring 45-60 cm. The greater glider has thick fur that increases its apparent size. Its fur colour is white or cream below and varies from dark grey, dusky brown through to light mottled grey and cream above. It has large furry ears and a short snout. Its tail is not prehensile (McKay, 2008; NSW Office of Environment and Heritage, n.d).

Distribution

The greater glider is restricted to eastern Australia, from the Windsor Tableland in north Queensland to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m a.s.l. An isolated inland subpopulation occurs in the Gregory Range west of Townsville (Winter et al., 2004), and another in the Einasleigh Uplands (Vanderduys et al., 2012).

The broad extent of occurrence is unlikely to have changed appreciably since European settlement (van der Ree et al., 2004). However, the area of occupancy has decreased substantially due mostly to land clearing. This area is probably continuing to decline due to further clearing, fragmentation impacts, fire and some forestry activities. Kearney et al. (2010) predicted a 'stark' and 'dire' decline ('almost complete loss') for the northern subspecies *P. v. minor*, with a 3° C temperature increase.

Relevant Biology/Ecology

The greater glider is an arboreal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers (Kehl & Borsboom, 1984; Kavanagh & Lambert, 1990; van der Ree et al., 2004). It is found in highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows (Andrews et al., 1994; Smith et al., 1994, 1995; Kavanagh, 2000; Eyre, 2004; van der Ree et al., 2004; Vanderduys et al., 2012). The distribution may be patchy even in suitable habitat (Kavanagh, 2000). The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species (Kavanagh, 1984).

During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees (Henry, 1984; Kehl & Borsboom, 1984; Lindenmayer et al., 1991; Smith et al., 2007;

Goldingay, 2012). In Grafton/Casino, Urbenville and Urunga/Coffs Harbour Forestry Management Areas (FMAs) in northern New South Wales, the abundance of greater gliders on survey sites was significantly greater on sites with a higher abundance of tree hollows (Andrews et al., 1994; Smith et al., 1994, 1995). In the Grafton/Casino FMA, the greater glider was absent from surveyed sites with fewer than six tree hollows per hectare (Smith et al., 1994). In southern Queensland, greater gliders require at least 2-4 live den trees for every 2 ha of suitable forest habitat (Eyre, 2002).

Home ranges are typically relatively small (1-4 ha: Henry, 1984; Kehl & Borsboom, 1984; Comport et al., 1996; Gibbons & Lindenmayer, 2002; Pope et al., 2005), but are larger in lower productivity forests and more open woodlands (to 16 ha: Eyre, 2004; Smith et al., 2007), and larger for males than for females (Kavanagh & Wheeler 2004; Pope et al., 2005), with male home ranges being largely non-overlapping (Henry, 1984; Kavanagh & Wheeler, 2004; Pope et al., 2005).

The greater glider is considered to be particularly sensitive to forest clearance (Tyndale-Biscoe & Smith, 1969a) and to intensive logging (Kavanagh & Bamkin, 1995; Kavanagh & Webb, 1998; Kavanagh & Wheeler, 2004; Kavanagh et al., 2005), although responses vary according to landscape context and the extent of tree removal and retention (Kavanagh, 2000; Taylor et al., 2007). The greater glider is also sensitive to wildfire (Lunney, 1987; Andrews et al., 1994; Lindenmayer et al., 2011), and is slow to recover following major disturbance (Kavanagh, 2004). In Urbenville FMA of northern New South Wales, the abundance of greater gliders on survey sites was significantly greater in forests that were infrequently burnt (Andrews et al., 1994).

Notwithstanding relatively small home ranges, but in part because of low dispersal ability, greater gliders may be sensitive to fragmentation (Eyre, 2006; McCarthy & Lindenmayer, 1999ab; Lindenmayer et al., 2000; Taylor & Goldingay, 2009), have relatively low persistence in small forest fragments, and disperse poorly across vegetation that is not native forest. Modelling suggests that they need native forest patches of at least 160 km² to maintain viable populations (Eyre, 2002).

Females give birth to a single young, from March to June (Tyndale-Biscoe & Smith, 1969b; McKay, 2008). Sexual maturity is reached in the second year (Tyndale-Biscoe & Smith, 1969b). Longevity has been estimated at 15 years (Harris & Maloney, 2010), so generation length is 7-8 years. The relatively low reproductive rate (Henry, 1984) may render small isolated populations in small remnants prone to extinction (van der Ree, 2004; Pope et al., 2005).

Threats

Threats to the greater glider are outlined in the table below (Woinarski et al., 2014).

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Habitat loss (through clearing) and fragmentation	catastrophic	moderate	absent from cleared areas, and little dispersal ability to or from fragments, through cleared areas; low reproductive output and susceptibility to disturbance ensures low viability in small remnants
Inappropriate fire regime	severe	large	population loss or declines documented in and after high intensity fires (Lindenmayer et al., 2011)
Timber production	severe	moderate	prime habitat coincides largely with logging areas;

			highly dependent on forest connectivity and large mature trees.
Climate change	severe	large (future threat)	modelling indicates severe range contraction for northern subspecies (Kearney et al., 2010)
Barbed wire fencing (entanglement)	minor	minor	occasional losses of individuals

Assessment of available information in relation to the EPBC Act Criteria and Regulations

Criterion 1. Population size reduction (reduction in total numbers)			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>	<p><i>based on any of the following</i></p> <ul style="list-style-type: none"> (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat (d) actual or potential levels of exploitation (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites 		

Evidence:

Across its broad range, the population size and rate of decline of the greater glider is unknown, however rates of decline have been recorded at some sites. In central Queensland, the abundance of greater gliders declined by 89% across a series of 31 woodland sites sampled initially in 1973-76 and re-sampled in 2001-02 (Woinarski et al., 2006). An isolated population at Royal National Park has been lost due to fire and regional-scale decline in the Illawarra area (Maloney, 2007). Kavanagh and Webb (1998) monitored greater gliders in 500 ha of wood production forest near Bombala in southern New South Wales, and found that the population declined in all logging compartments and had not recovered eight years after harvesting.

The most comprehensive monitoring program for greater gliders is in the central highlands of Victoria, where 160 permanent 1 ha sites across a 1800 km² study area (in both conservation reserves and production forests, and spanning a broad range of forest ages and environmental settings: Lindenmayer, 2009) have been monitored annually since 1997. Over the period 1997-2010, the greater glider declined by an average of 8.8% per year (a rate that if extrapolated over the 22 year period relevant to this assessment is 87%) (Lindenmayer et al., 2011). Higher rates of decline were recorded in forests subject to logging than in conservation

reserves, and there were losses (to 2010) of greater gliders at all sites burnt by a major wildfire in 2009. The decline was also associated with lower-than-average rainfall.

At Jervis Bay in Booderee National Park, 110 permanent 1 ha sites (stratified across vegetation types and fire histories) were established in 2002. Lindenmayer et al. (2011) reported a highly significant decline, from greater glider presence in 22 of the sites in 2002, to absence from all sites from 2007.

There is little other published information on population trends over the period relevant to this assessment (around 22 years), and the above sites are not necessarily representative of trends across the species' range. However, they provide sufficient evidence to suspect that the overall rate of population decline exceeds 30% over a 22 year (=3 generation) period (Woinarski et al., 2014). The population of the greater glider is declining due to habitat loss, fragmentation, extensive fire and some forestry practices, and this decline is likely to be exacerbated by climate change (Kearney et al. 2010). The species is particularly susceptible to threats because of its slow life history characteristics, specialist requirements for large tree hollows (and hence mature forests), and relatively specialised dietary requirements (Woinarski et al., 2014).

The data presented above appear to demonstrate that the species is **eligible for listing as Vulnerable** under criteria A2b,c; A3b,c and A4b,c. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 2. Geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (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: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Evidence:

Woinarski et al. (2014) estimate the extent of occurrence to be 1 003 300 km² and the area of occupancy to be 15 960 km². However, they consider the latter to be a significant under-estimate due to limited sampling across the occupied range.

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 3. Small population size and decline			
	Critically Endangered	Endangered Low	Vulnerable Limited

	Very low		
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generations (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

Evidence:

There is no reliable estimate of population size. Lunney et al. (2008) considered that the greater glider had a 'presumed large population' and was 'locally common'. Winter et al. (2004) considered it 'common' in the north Queensland portion of its range. In New South Wales, Kavanagh (2004) considered it 'widespread and common ... particularly in north-eastern New South Wales'. Density estimates in Victoria range from 0.6 to 2.8 individuals/ha (Henry, 1984; van der Ree et al. 2004), and across its broader range from 0.01 to 5 individuals/ha (Kavanagh 1984; Kehl and Borsboom 1984; Maloney 2007). In southern Queensland, trees with hollows are extremely limited in some extensive forest types that have been historically used for timber production, and this in turn limits greater glider distribution and abundance (Eyre, 2006). Woinarski et al. (2014) estimate the number of mature individuals to be >100 000.

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 4. Very small population			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
Number of mature individuals	< 50	< 250	< 1,000

Evidence:

Woinarski et al. (2014) estimate the population size to be >100 000 mature individuals.

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 5. Quantitative Analysis

	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

Evidence:

Several local-level population viability analyses have been undertaken (Taylor & Goldingay, 2009), but none for the full species (Woinarski et al., 2014).

There are insufficient data to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Conservation Actions

Recovery Plan

A decision about whether there should be a national recovery plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

Primary Conservation Objectives

1. Manage threats to secure or increase overall population size
2. Maintain viable populations at all known localities

Conservation and Management Actions

The greater glider occurs in many conservation reserves across its extensive range. In production forests, some logging prescriptions have been imposed to reduce impacts upon this species. Recommended management actions are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Active mitigation of threats	manage fire to benefit this species	high
	constrain impacts of hardwood production, through appropriate levels of patch and den tree retention	high
	constrain clearing in forests with significant populations	medium-high
	restore connectivity to fragmented populations	medium
Captive breeding	n/a	
Quarantining isolated populations	n/a	
Translocation	reintroduce individuals to re-establish populations at suitable sites	low
Monitoring	implement integrated monitoring program linked to assessment of management effectiveness	medium-high
	monitor the abundance and size structure of critical habitat tree species, and their responses to management	medium-high

	monitor the incidence of wildfire within the species' range	medium
Community engagement	develop conservation covenants on lands with high value for this species	low

Information and research priorities

Information and research priorities are outlined in the table below (Woinarski et al., 2014).

Theme	Specific actions	Priority
Survey to better define distribution	assess population size (or relative abundance) and viability of populations across range	low
Assess relative impacts of threats	assess impacts of a range of possible fire regimes	medium-high
	assess impacts of ongoing habitat fragmentation (e.g. through peri-urban expansion, coal seam gas mining activities, road networks)	medium
Establish or enhance monitoring program	from existing monitoring projects, design an integrated monitoring program across major subpopulations	medium
	continue to model impacts of wildfire and logging on population viability	medium
Assess relative effectiveness of threat mitigation options	assess impacts of fire management on habitat, hollow availability, preferred tree species, and glider population size	high
	assess responses to habitat re-connections	medium
	continue to assess and monitor responses to imposed logging regulations and conditions	medium
	assess practicality of supplementing hollow availability with artificial hollows	low-medium
Resolve taxonomic uncertainties	assess extent of genetic variation and exchange between subpopulations	medium
	review taxonomic status	medium
Assess habitat requirements	n/a	
Assess diet, life history	n/a	

References cited in the advice

Andrews, S. P., Gration, G., Quin, D., and Smith, A. P. (1994). Description and assessment of forestry impacts on fauna of the Urbenville Forestry Management Area. Report for State Forests of New South Wales Austeco Environmental Consultants, Armidale.

Comport, S. S., Ward, S. J., and Foley, W. J. (1996). Home ranges, time budgets and food tree use in a high density tropical population of greater gliders, *Petauroides volans minor* (Pseudocheiridae: Marsupialia). *Wildlife Research* 23, 401-419.

Eyre, T. J. (2002). Habitat preferences and management of large gliding possums in southern Queensland. Ph.D. thesis, Southern Cross University, Lismore.

- Eyre, T. J. (2004). Distribution and conservation status of the possums and gliders of southern Queensland. In 'The biology of Australian possums and gliders.' (Eds R. L. Goldingay and S. M. Jackson.) pp. 1-25. (Surrey Beatty & Sons: Chipping Norton.)
- Eyre, T. J. (2006). Regional habitat selection by large gliding possums at forest stand and landscape scales in southern Queensland, Australia. I. Greater Glider (*Petauroides volans*). *Forest Ecology and Management* 235, 270-282.
- Gibbons, P., and Lindenmayer, D. B. (2002). Tree hollows and wildlife conservation in Australia (CSIRO Publishing: Collingwood.)
- Goldingay, R. L. (2012). Characteristics of tree hollows used by Australian arboreal and scansorial mammals. *Australian Journal of Zoology* 59, 277-294.
- Harris, J. M., and Maloney, S. (2010). *Petauroides volans* (Diprodontia: Pseudocheiridae). *Mammalian Species* 42, 207-219.
- Henry, S. R. (1984). Social organisation of the greater glider (*Petauroides volans*) in Victoria. In 'Possums and Gliders'. (Eds A. P. Smith and I. D. Hume.) pp. 221-228. (Surrey Beatty and Sons: Chipping Norton.)
- Jackson, S. M., and Thorington, R. W. Jr. (2012). 'Gliding mammals: taxonomy of living and extinct species'. (Smithsonian Institution Scholarly Press: Washington.)
- Kavanagh, R. P. (1984). Seasonal changes in habitat use by gliders and possums in southeastern New South Wales. In 'Possums and gliders'. (Eds A. P. Smith and I. D. Hume.) pp. 527-543. (Surrey Beatty and Sons: Chipping Norton.)
- Kavanagh, R. P. (1988). The impact of predation by the powerful owl, *Ninox strenua*, on a population of the greater glider, *Petauroides volans*. *Austral Ecology* 13, 445-450.
- Kavanagh, R. P. (2000). Effects of variable-intensity logging and the influence of habitat variables on the distribution of the Greater Glider *Petauroides volans* in montane forest, southeastern New South Wales. *Pacific Conservation Biology* 6, 18-30.
- Kavanagh, R. P. (2004). Distribution and conservation status of possums and gliders in New South Wales. In 'The biology of Australian possums and gliders.' (Eds R. L. Goldingay and S. M. Jackson.) pp. 130-148. (Surrey Beatty and Sons: Chipping Norton.)
- Kavanagh, R. P., and Bamkin, K. L. (1995). Distribution of nocturnal forest birds and mammals in relation to the logging mosaic in south-eastern New South Wales, Australia. *Biological Conservation* 71, 41-53.
- Kavanagh, R. P., and Lambert, M. (1990). Food selection by the greater glider: is foliar nitrogen a determinant of habitat quality? *Australian Wildlife Research* 17, 285-299.
- Kavanagh, R.P., and Webb, G.A. (1998). Effects of variable-intensity logging on mammals, reptiles and amphibians at Waratah Creek, south-eastern New South Wales. *Pacific Conservation Biology* 4, 326-347.
- Kavanagh, R. P., and Wheeler, R. J. (2004). Home range of the greater glider *Petauroides volans* in tall montane forest of southeastern New South Wales, and changes following logging. In 'The biology of Australian possums and gliders.' (Eds R. L. Goldingay and S. M. Jackson.) pp. 413-425. (Surrey Beatty & Sons: Sydney.)
- Kavanagh, R.P., Debus, S., Tweedie, T., and Webster, R. (1995). Distribution of nocturnal forest birds and mammals in north-eastern New South Wales: relationships with environmental variables and management history. *Wildlife Research* 22, 359-377.

- Kearney, M. R., Wintle, B. A., and Porter, W. P. (2010). Correlative and mechanistic models of species distribution provide congruent forecasts under climate change. *Conservation Letters* 3, 203-213.
- Kehl, J., and Borsboom, A. (1984). Home range, den tree use and activity patterns in the greater glider (*Petauroides volans*). In 'Possums and gliders'. (Eds. A. P. Smith and I. D. Hume.) pp. 229-236. (Surrey Beatty and Sons: Chipping Norton.)
- Lindenmayer, D. B. (2009). 'Forest pattern and ecological process: a synthesis of 25 years of research.' (CSIRO Publishing, Melbourne.)
- Lindenmayer, D. B., Cunningham, R. B., Tanton, M. T., Smith, A. P., and Nix, H. A. (1991). Characteristics of hollow-bearing trees occupied by arboreal marsupials in the montane ash forests of the Central Highlands of Victoria, south-east Australia. *Forest Ecology and Management* 40, 289-308.
- Lindenmayer, D. B., Lacy, R. C. and Pope, M. L. (2000). Testing a simulation model for population viability analysis. *Ecological Applications* 10, 580–597.
- Lindenmayer, D. B., Wood, J. T., McBurney, L., MacGregor, C., Youngentob, K. and Banks, S. C. (2011). How to make a common species rare: a case against conservation complacency. *Biological Conservation* 144, 1663–1672.
- Lunney, D. (1987). Effects of logging, fire and drought on possums and gliders in the coastal forests near Bega, N.S.W. *Australian Wildlife Research* 13, 67-92.
- Lunney, D., Menkhorst, P., Winter, J., Ellis, M., Strahan, R., Oakwood, M., Burnett, S., Denny, M., and Martin, R. (2008). *Petauroides volans*. In 'IUCN red list of threatened species.' Version 2012.2. <www.iucnredlist.org>. Accessed 11 December 2012.
- Maloney, K. S. (2007). The status of the Greater Glider *Petauroides volans* in the Illawarra region. M.Sc.-Res. thesis, School of Biological Sciences, University of Wollongong, Wollongong.
- Maxwell, S., Burbidge, A. A., and Morris, K. (1996). *The 1996 Action Plan for Australian Marsupials and Monotremes*. (Wildlife Australia: Canberra.)
- McCarthy, M. A., and Lindenmayer, D. B. (1999a). Conservation of the greater glider (*Petauroides volans*) in remnant native vegetation within exotic plantation forest. *Animal Conservation* 2, 203-209.
- McCarthy, M. A., and Lindenmayer, D. B. (1999b). Incorporating metapopulations dynamics of greater gliders into reserve design in disturbed landscapes. *Ecology* 80, 651–667
- McKay, G. M. (2008). Greater Glider *Petauroides volans*. In 'The mammals of Australia.' Third edition. (Eds S. Van Dyck and R. Strahan.) pp. 240-242. Reed New Holland: Sydney.
- NSW Office of Environment and Heritage. Greater Glider population in the Eurobodalla local government area - profile. Viewed: 23 February 2015.
Available on the Internet at:
<http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20056>
- Pope, M. L., Lindenmayer, D. B., and Cunningham, R. B. (2005). Patch use by the greater glider (*Petauroides volans*) in a fragmented forest ecosystem. I. Home range size and movements. *Wildlife Research* 31, 559-568.
- Smith, A. P., Moore, D. M., and Andrews, S. P. (1994). Fauna of the Grafton and Casino Forestry Study Areas description and assessment of forestry impacts. Report for State Forests of New South Wales. Austeco Environmental Consultants, Armidale.

- Smith, A. P., Andrews, S. P., Gration, G., Quin, D., and Sullivan, B. (1994). Description and assessment of forestry impacts on fauna of the Urunga - Coffs Harbour Forestry Management Area. Report for State Forests of New South Wales. Austeco Environmental Consultants, Armidale.
- Smith, G. C., Mathieson, M., and Hogan, L. (2007). Home range and habitat use of a low-density population of Greater Glider, *Petauroides volans* (Pseudocheiridae: Marsupialia), in a hollow-limiting environment. *Wildlife Research* 34, 472-483.
- Taylor, A. C., Tyndale-Biscoe, C. H. and Lindenmayer, D. B. (2007). Unexpected persistence on habitat islands: genetic signatures reveal dispersal of a eucalypt-dependent marsupial through a hostile pine matrix. *Molecular Ecology* 16, 2655–2666.
- Taylor, B. D., and Goldingay, R. L. (2009). Can road-crossing structures improve population viability of an urban gliding mammal? *Ecology and Society* 14(2): 13. [online].
- Tyndale-Biscoe, C. H., and Smith, R. F. C. (1969a). Studies on the marsupial glider *Schoinobates volans* (Kerr). III. Response to habitat destruction. *Journal of Animal Ecology* 38, 651-659.
- Tyndale-Biscoe, C. H., and Smith, R. F. C. (1969b). Studies on the marsupial glider, *Schoinobates volans* (Kerr). II. Population structure and regulatory mechanisms. *Journal of Animal Ecology* 38, 637–650.
- Vanderduys, E. P., Kutt, A. S., and Kemp, J. E. (2012). Upland savannas: the vertebrate fauna of largely unknown but significant habitat in north-eastern Queensland. *Australian Zoologist* 36, 59-74.
- van der Ree, R., Ward, S. J., and Handasyde, K. A. (2004). Distribution and conservation status of possums and gliders in Victoria. In 'The biology of Australian possums and gliders.' (Eds R. L. Goldingay and S. M. Jackson.) pp. 91-110. (Surrey Beatty and Sons: Sydney.)
- Winter, J. W., Dillewaard, H. A., Williams, S. E., and Bolitho, E. E. (2004). Possums and gliders of north Queensland: distribution and conservation status. In 'The biology of Australian possums and gliders.' (Eds R. L. Goldingay and S. M. Jackson.) pp. 26-50. (Surrey Beatty and Sons: Sydney.)
- Woinarski, J. C. Z., Burbidge, A. A., & Harrison, P. L. (2014). *The Action Plan for Australian Mammals 2012*. Collingwood, Australia: CSIRO Publishing.
- Woinarski, J. C. Z., McCosker, J. C., Gordon, G., Lawrie, B., James, C., Augusteyn, J., Slater, L., and Danvers, T. (2006). Monitoring change in the vertebrate fauna of central Queensland, Australia, over a period of broad-scale vegetation clearance, 1975-2002. *Wildlife Research* 33, 263-274.

Consultation questions

1. Do you agree with the current taxonomic position of the Australian Faunal Directory for this taxon (as identified in the draft conservation advice)
2. Can you provide any additional references, information or estimates on longevity, age of maturity, average life span and generation length?
3. Has the survey effort for this taxon been adequate to determine its national distribution and adult population size?
4. Do you accept the estimate provided in the nomination for the current population size of the taxon?

5. For any population with which you are familiar, do you agree with the population estimate provided? If not, are you able to provide a plausible estimate based on your own knowledge? If so, please provide in the form:
 - Lower bound (estimated minimum):
 - Upper bound (estimated maximum):
 - Best Estimate:
 - Estimated level of Confidence: %
6. Can you provide any additional data, not contained in the current nomination, on declines in population numbers over the past or next 10 years or 3 generations, whichever is the longer?
7. Is the distribution as described in the nomination valid? Can you provide an estimate of the current geographic distribution (extent of occurrence or area of occupancy in km²) of this taxon?
8. Has this geographic distribution declined and if so by how much and over what period of time?
9. Do you agree that the taxon is eligible for inclusion on the threatened species list, in the category listed in the nomination?
10. Do you agree that the threats listed are correct and that their effects on the taxon are significant?
11. To what degree are the identified threats likely to impact on the taxon in the future?
12. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect this taxon at any stage of its life cycle?
13. In seeking to facilitate the recovery of this taxon, can you provide management advice for the following:
 - What individuals or organisations are currently, or need to be, involved in planning to abate threats and any other relevant planning issues?
 - What threats are impacting on different populations, how variable are the threats and what is the relative importance of the different populations?
 - What recovery actions are currently in place, and can you suggest other actions that would help recover the taxon? Please provide evidence and background information.
14. Can you provide additional data or information relevant to this assessment?