2010/13654

Committee Secretary
Senate Standing Committee on Environment and Communications
PO Box 6100
Parliament House
Canberra ACT 2600
Australia

Dear Sir/Madam,

I am pleased to make this submission to the Senate Standing Committee on Environment and Conservation's inquiry into the status, health and sustainability of Australia's koala population.

The Department of Sustainability, Environment, Water, Populations and Communities is responsible for administering the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), including the provisions relating to the listing of nationally threatened species. These provisions, including matters that can and cannot be taken into consideration in reaching a decision on eligibility for threatened species listing, are set out in Attachment A. The koala has been nominated for possible listing as a nationally threatened species. In making decisions to list nationally threatened species under the EPBC Act, the Minister for Sustainability, Environment, Water, Population and Communities must take into account the advice of the independent Threatened Species Scientific Committee.

The Committee recently completed an assessment of the nomination to list the koala as a nationally threatened species under the EPBC Act. The Committee undertook a comprehensive assessment of the status of the national koala population, including an extensive literature review, an expert workshop, and public and expert submissions. The Committee's guidelines for assessment of the national conservation and threat status of native species are set out at Attachment B. These are applied to threatened species nominations to determine if taxa are eligible for listing and, if so, in which category.

The Committee concluded that the koala was not eligible for listing as nationally threatened but noted that reaching a conclusion was challenging. They found a key hurdle to the assessment were the significant gaps in knowledge about the national koala population.

In accordance with section 194Q of the EPBC Act, the Minister has extended his decision timeframe on the listing of the koala as a threatened species to 31 October 2011, so that he can consider the inquiry's findings before making his decision. The Minister has also publicly released the Committee's advice so that it can inform the inquiry's deliberations. The Committee's advice is usually only made public once a listing decision has been finalised. The Committee's advice is at Attachment C.

The Australian, state and territory governments are working to implement the *National Koala Conservation and Management Strategy 2009-2014*, to conserve koalas throughout their natural range. The strategy addresses a range of issues including habitat protection, management and research. The National Strategy is attached at Attachment D.

A summary of activities under way to implement the National Strategy, including those programs being implemented by the Australian Government, is provided in the National Strategy's First Implementation Report to the Natural Resource Management Ministerial Council, attached at Attachment E.

I note that the attachments provided in this submission are also available publicly on the department's website.

Yours sincerely

Kimberley Dripps
Deputy Secretary
Environment Protection and Heritage Conservation
February 2011

STATUTORY OBLIGATIONS OF THE MINISTER UNDER THE EPBC ACT

for Amending the List of Threatened Species

Obligations of the Minister

178 Listing of threatened species

(1) The Minister must, by instrument published in the *Gazette*, establish a list of threatened species divided into the following categories:

(a) extinct;

(b) extinct in the wild;

(c) critically endangered;

(d) endangered;

(e) vulnerable;

(f) conservation dependent.

(2) The list, as first established, must contain only the species contained in Schedule 1 to the *Endangered Species Protection Act 1992*, as in force immediately before the commencement of this Act.

(3) The Minister must include:

(a) in the extinct category of the list, as first established, only the species mentioned in subsection (2) that were listed as presumed extinct; and

(b) in the endangered category of the list, as first established, only the native species mentioned in subsection (2) that were listed as endangered; and

(c) in the vulnerable category of the list, as first established, only the species mentioned in subsection (2) that were listed as vulnerable.

(4) If the Minister is satisfied that a species included in the list, as first established, in:

(a) the extinct category; or

(b) the endangered category; or

(c) the vulnerable category;

is not eligible to be included in that or any other category, or is eligible to be, or under subsection 186(3), (4) or (5) can be, included in another category, the Minister must, within 6 months after the commencement of this Act, amend the list accordingly in accordance with this Subdivision.

184 Minister may amend lists

(1) Subject to this Subdivision, the **Minister** may, by legislative instrument, amend a list referred to in section 178, 181 or 183 by:

(a) including items in the list in accordance with Subdivision AA; or

(aa) including items in the list in accordance with subsection 186(3), (4) or (5); or

(b) deleting items from the list; or

(c) in the case of the list referred to in section 178 or 181—transferring items from one category in the list to another category in the list in accordance with Subdivision AA; or

(d) correcting an inaccuracy or updating the name of a listed threatened species or listed threatened ecological community.

(2) Part 6 of the *Legislative Instruments Act 2003* does not apply to an instrument made under subsection (1).

186 Amending list of threatened native species

Including native species in a category

(1) Subject to subsections (3), (4) and (5), the Minister must not include (whether as a result of a transfer or otherwise) a native species in a particular category unless satisfied that the native species is eligible to be included in that category.

(2) In deciding whether to include a native species in a particular category (whether as a result of a transfer or otherwise), the only matters the Minister may consider are matters relating to:

(a) whether the native species is eligible to be included in that category; or

(b) the effect that including the native species in that category could have on the survival of the native species.

Deleting native species from a category

(2A) The Minister must not delete (whether as a result of a transfer or otherwise) a native species from a particular category unless satisfied that:

(a) the native species is no longer eligible to be included in that category; or

(b) the inclusion of the native species in that category is not contributing, or will not contribute, to the survival of the native species.

(2B) In deciding whether to delete a native species from a particular category (whether as a result of a transfer or otherwise), the only matters the Minister may consider are matters relating to:

(a) whether the native species is eligible to be included in that category; or

(b) the effect that the inclusion of the native species in that category is having, or could have, on the survival of the native species.

189 Minister must consider advice from Scientific Committee

(1) In deciding whether to make an amendment covered by paragraph 184(1)(aa), (b) or (d), the Minister must, in accordance with the regulations (if any), obtain and consider advice from the Scientific Committee on the proposed amendment.

(1A) Subsection (1) has effect subject to section 192.

(1B) If advice from the Scientific Committee for the purposes of subsection (1) is to the effect that a particular native species, or a particular ecological community, is eligible to be included in the relevant list in a particular category, the advice must also contain:

(a) a statement that sets out:

(i) the grounds on which the species or community is eligible to be included in the category; and

(ii) the main factors that are the cause of it being so eligible; and

(b) either:

(i) information about what could appropriately be done to stop the decline of, or support the recovery of, the species or community; or

(ii) a statement to the effect that there is nothing that could appropriately be done to stop the decline of, or support the recovery of, the species or community; and

(c) a recommendation on the question whether there should be a recovery plan for the species or community.

(2) In preparing advice under subsection (1), the Scientific Committee may obtain advice from a person with expertise relevant to the subject matter of the proposed amendment.

(3) In preparing advice for a proposed amendment to delete an item:

(a) included in a category of a list referred to in section 178 or 181; and

(b) that had not been included in that category in accordance with subsection 186(3), (4) or (5);

the only matters the Scientific Committee may consider are matters relating to:

(c) the survival of the native species or ecological community concerned; or

(d) the effect that the inclusion in the list of the native species or ecological community concerned is having, or could have, on the survival of that native species or ecological community.

194N Scientific Committee to assess items on finalised priority assessment list and give assessments to Minister

(1) In relation to each item included in the finalised priority assessment list for an assessment period for a Subdivision A List, the Scientific Committee must (by the time required by section 194P):

(a) make a written assessment of:

(i) whether the item is eligible for inclusion in the Subdivision A List; and

(ii) if the Subdivision A List is the list referred to in section 178 or 181—the category of that List in which the item is eligible to be included; and

(b) give to the **Minister**:

(i) the written assessment (or a copy of it); and

(ii) a copy of the comments referred to in paragraphs (2)(a) and (b) (whether or not they have all been taken into account under subsection (2)).

(2) In making an assessment in relation to a place, the Scientific Committee, subject to subsections (3) and (4):

(a) must take into account the comments the Committee receives in response to the notice under subsection 194M(1) in relation to the item; and

(b) may seek, and have regard to, information or advice from any source.

(3) The Scientific Committee is not required to take a comment referred to in paragraph (2)(a) into account if:

(a) the Committee does not receive the comment until after the cut-off date specified in the notice under subsection 194M(1) in relation to the item; or

(b) the Committee considers that regulations referred to in paragraph 194M(4)(b) have not been complied with in relation to the comment.

(4) In making an assessment, the only matters the Scientific Committee may consider are matters relating to:

(a) whether the item is eligible for inclusion in the Subdivision A List; or

(b) the effect that including the item in that List could have on the survival of the native species or ecological community concerned.

194Q Decision about inclusion of an item in the Subdivision A List

Minister to decide whether or not to include item

(1) After receiving from the Scientific Committee an assessment under section 194N of an item, the **Minister** must:

(a) include the item in the Subdivision A List concerned; or

(b) in writing, decide not to include the item in the Subdivision A List concerned.

Note 1: Under this subsection the **Minister** can transfer an item already on a Subdivision A List to a different category in the List (see subsection 194B(1)).

Note 2: Sections 186, 187 and 188 contain rules about including items in a Subdivision A List.

(2) If, under subsection (1), the Minister transfers an item to a category of the Subdivision A List, the Minister must at the same time delete the item from the category in which it was included before the transfer.

(3) Subject to subsection (4), the **Minister** must comply with subsection (1) within **90 business days** after the day on which the **Minister** receives the assessment.

(4) The **Minister** may, in writing, extend or further extend the period for complying with subsection (1).

(5) Particulars of an extension or further extension under subsection (4) must be published on the Internet and in any other way required by regulations.

(6) For the purpose of deciding what action to take under subsection (1) in relation to the item:

(a) the **Minister** must have regard to:

(i) the Scientific Committee's assessment of the item; and

(ii) the comments (if any), a copy of which were given to the **Minister** under subsection 194N(1) with the assessment; and

(b) the **Minister** may seek, and have regard to, information or advice from any source.

Additional requirements if Minister decides to include place

(7) If the **Minister** includes the item in the Subdivision A List, he or she must, within a reasonable time:

(a) if the item was nominated by a person in response to a notice under subsection 194E(1)—advise the person that the item has been included in the Subdivision A List; and

(b) publish a copy of the instrument referred to in paragraph (1)(a) on the Internet; and

(c) publish a copy or summary of that instrument in accordance with any other requirements specified in the regulations.

Additional requirements if Minister decides not to include item

(8) If the **Minister** decides not to include the item in the Subdivision A List, the **Minister** must, within **10 business days** after making the decision:

(a) publish the decision on the Internet; and

(b) if the item was nominated by a person in response to a notice under subsection 194E(1)—advise the person of the decision, and of the reasons for the decision.

266B Approved conservation advice for listed threatened species and listed threatened ecological communities

Minister to ensure there is approved conservation advice

(1) The **Minister** must ensure that there is approved conservation advice for each listed threatened species (except one that is extinct or that is a conservation dependent species), and each listed threatened ecological community, at all times while the species or community continues to be listed.

(2) For this purpose, ***approved conservation advice*** is a document, approved in writing by the **Minister** (and as changed from time to time in accordance with subsection (3)), that contains:

(a) a statement that sets out:

(i) the grounds on which the species or community is eligible to be included in the category in which it is listed; and

(ii) the main factors that are the cause of it being so eligible; and

(b) either:

(i) information about what could appropriately be done to stop the decline of, or support the recovery of, the species or community; or

(ii) a statement to the effect that there is nothing that could appropriately be done to stop the decline of, or support the recovery of, the species or community.

Changing approved conservation advice

(3) The **Minister** may, in writing, approve changes to approved conservation advice.

Consultation with Scientific Committee

(4) If the **Minister** proposes to approve a document as approved conservation advice, the **Minister** must consult the Scientific Committee about the document, unless its content is substantially the same as material that the Committee has previously provided to the **Minister**.

(5) If the **Minister** proposes to approve a change to approved conservation advice, the **Minister** must consult the Scientific Committee about the change, unless the change is substantially the same as a change that the Scientific Committee has previously advised the **Minister** should be made.

Publication requirements

(6) If the **Minister** approves a document as approved conservation advice, the **Minister** must:

(a) within 10 days of the approval of the document, publish the approved conservation advice on the Internet; and

(b) comply with any other publication requirements of the regulations.

(7) If the **Minister** approves a change to approved conservation advice, the **Minister** must:

(a) within 10 days of the approval of the change, publish the advice, as changed, on the Internet; and

(b) comply with any other publication requirements of the regulations.

Instruments of approval are not legislative instruments

(8) An instrument of approval under subsection (2) or (3) is not a legislative instrument.

269AA Decision whether to have a recovery plan

Minister has an initial obligation and then a discretion

(1) The **Minister** must decide whether to have a recovery plan for a listed threatened species (except one that is extinct or that is a conservation dependent species) or a listed threatened ecological community within 90 days after the species or community becomes listed. The **Minister** may, at any other time, decide whether to have a recovery plan for the species or community.

(2) In this section:

(a) the decision that the **Minister** is required by subsection (1) to make in relation to the species or community within the 90 day period referred to in that subsection is the ***initial recovery plan decision***; and

(b) any subsequent decision that the Minister makes under subsection (1) in relation to the species or community is a ***subsequent recovery plan decision***.

Making the initial recovery plan decision

(3) In making the initial recovery plan decision, the **Minister** must have regard to the recommendation (the ***initial recommendation***) made by the Scientific Committee as mentioned in paragraph 189(1A)(c) in relation to the species or community.

Making a subsequent recovery plan decision (unless subsection (5) applies)

(4) In making a subsequent recovery plan decision in relation to the species or community, other than a decision to which subsection (5) applies:

(a) the **Minister** must have regard to the initial recommendation in relation to the species or community; and

(b) the **Minister** must have regard to any advice subsequently provided to the **Minister** by the Scientific Committee about whether there should be a recovery plan for the species or community.

Changing from a decision to have a recovery plan to a decision not to have a recovery plan—additional requirements

(5) If, at a time when a decision to have a recovery plan for the species or community is in force (whether or not the plan has yet been made), the **Minister** is proposing to make a subsequent recovery plan decision that there should not be a recovery plan for the species or community:

(a) the **Minister** must ask the Scientific Committee for advice relating to the proposed decision; and

(b) the **Minister** must publish a notice inviting comments on the proposed decision in accordance with subsection (7); and

(c) the **Minister** must, in deciding whether to make the proposed decision, take account of:

(i) any advice provided by the Scientific Committee in relation to the proposed decision; and

(ii) subject to subsection (6), the comments the **Minister** receives in response to the notice referred to in paragraph (b).

(6) The **Minister** is not required to take a comment referred to in subparagraph (5)(c)(ii) into account if:

(a) the **Minister** does not receive the comment until after the cut-off date specified in the notice under paragraph (5)(b); or

(b) the **Minister** considers that regulations referred to in paragraph (8)(b) have not been complied with in relation to the comment.

(7) The notice referred to in paragraph (5)(b):

(a) must be published in accordance with the regulations referred to in paragraph (8)(a); and

(b) must set out the decision the **Minister** proposed to make; and

(c) must invite people to make comments, to the Minister, about the proposed decision; and

(d) must specify the date (the ***cut-off date***) by which comments must be received, which must be at least 30 business days after the notice has been published as required by paragraph (a); and

(e) must specify, or refer to, the manner and form requirements that, under regulations referred to in paragraph (8)(b), apply to making comments; and

(f) may also include any other information that the **Minister** considers appropriate.

(8) The regulations must provide for the following:

(a) how a notice referred to in paragraph (5)(b) is to be published;

(b) the manner and form for making comments.

General publication requirements

(9) The **Minister** must publish the following:

(a) the **Minister's** initial recovery plan decision, and the reasons for it;

(b) each subsequent recovery plan decision (if any), and the reasons for it.

The regulations may specify how the publication is to be made. Subject to any such regulations, the publication must be made in a way that the Minister considers appropriate.

Note: This subsection must be complied with, even if the **Minister** has already published notice of the proposed decision in accordance with subsections (5) and (7).

Decisions not legislative instruments

(10) An instrument making a decision under subsection (1) is not a legislative instrument.

518 Non-compliance with time limits

(1) Anything done by the Commonwealth, the **Minister** or the Secretary under this Act or the regulations is not invalid merely because it was not done within the period required by this Act or the regulations.

(2) If, during a financial year, one or more things required to be done under this Act or the regulations were not done within the period required by this Act or the regulations, the **Minister** must:

(a) cause to be prepared a statement setting out the reasons why each of those things was not done within the period required by this Act or the regulations; and

(b) cause a copy of the statement to be laid before each House of the Parliament as soon as practicable after the end of the financial year.

(3) Subsection (1) does not reduce or remove an obligation under this Act or the regulations to do a thing within a particular period.

Categories and criteria for amending the list of threatened species

179 Categories of threatened species

(1) A native species is eligible to be included in the ***extinct*** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.

(2) A native species is eligible to be included in the ***extinct in the wild*** category at a particular time if, at that time:

(a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or

(b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

(3) A native species is eligible to be included in the ***critically endangered*** category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.

(4) A native species is eligible to be included in the ***endangered*** category at a particular time if, at that time:

(a) it is not critically endangered; and

(b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

(5) A native species is eligible to be included in the ***vulnerable*** category at a particular time if, at that time:

(a) it is not critically endangered or endangered; and

(b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

(6) A native species is eligible to be included in the ***conservation dependent*** category at a particular time if, at that time:

(a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or

(b) the following subparagraphs are satisfied:

(i) the species is a species of fish;

(ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;

(iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory;

(iv) cessation of the plan of management would adversely affect the conservation status of the species.

(7) In subsection (6):

fish includes all species of bony fish, sharks, rays, crustaceans, molluscs and other marine organisms, but does not include marine mammals or marine reptiles.

517 Determinations of species

(1) The Minister may, by instrument in writing, determine that a distinct population of biological entities is a species for the purposes of this Act.

(2) A determination is a disallowable instrument for the purposes of section 46A of the *Acts Interpretation Act 1901*.

(3) A determination does not apply for the purposes of:

(a) Part 13A; or

(b) the definitions of ***CITES I species***, ***CITES II species*** and ***CITES III species*** in section 528.

(4) Subsection (3) does not affect the meaning of the expression ***listed threatened species*** when used in Part 13A.

528 Definitions

In this Act, unless the contrary intention appears:

CITES I species means a species included in the list referred to in section 303CA, where there is a notation to the effect that the species is included in Appendix I to CITES.

CITES II species means a species included in the list referred to in section 303CA, where there is a notation to the effect that the species is included in Appendix II to CITES.

CITES III species means a species included in the list referred to in section 303CA, where there is a notation to the effect that the species is included in Appendix III to CITES.

listed threatened species means a native species included in the list referred to in section 178.

species means a group of biological entities that:

(a) interbreed to produce fertile offspring; or

(b) possess common characteristics derived from a common gene pool;

and includes:

(c) a sub-species; and

(ca) for the purposes of Part 13A—a distinct population of such biological entities; and

(d) except for the purposes of Part 13A—a distinct population of such biological entities that the Minister has determined, under section 517, to be a species for the purposes of this Act.

In this definition, ***the purposes of Part 13A***:

(a) include the purposes of the definitions of ***CITES I species***, ***CITES II species*** and ***CITES III species***; and

(b) do not include determining the meaning of the expression ***listed threatened species*** when used in Part 13A.

Note: Determinations under paragraph (d) are disallowable instruments. See section 517.

sub-species means a geographically separate population of a species, being a population that is characterised by morphological or biological differences from other populations of that species.

population of a species or ecological community means an occurrence of the species or community in a particular area.

taxon means any taxonomic category (for example, a species or a genus), and includes a particular population.

Regulation 7.01 Criteria for listing threatened species

For section 179 of the Act, 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:

Item	Criterion	Category		
		Critically endangered	**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:	very low	low	limited
	and:			
	evidence suggests that the number will continue to decline at:	a very high rate	a high rate	a substantial rate
	Or			
	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

Note: The Scientific Committee is to advise the Minister on the amendment and updating of the list of critically endangered, endangered or vulnerable species — see Act, paragraph 503 (b).

The are no specific criteria for listing a species as *conservation dependent* except as provided by s.179(6) of the EPBC Act: The species must be "the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of five years."

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

Guidelines for Assessing the Conservation Status of Native Species according to the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and *EPBC Regulations 2000*

Threatened Species Scientific Committee

Part A – 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	Category Critically Endangered	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: (a) evidence suggests that the number will continue to decline at: or (b) the number is likely to continue to decline and its geographic distribution is:	very low a very high rate precarious for its survival	low a high rate precarious for its survival	limited a substantial rate 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 B) 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 B – Indicative thresholds that may be used by the Committee to judge the subjective terms provided by the criteria for listing (as presented at Part A of these guidelines)

When assessing a species' eligibility against the listing criteria (see Part A), 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.

When considering thresholds for assessing commercially harvested marine fish, the Committee refers to the Commonwealth Government Harvest Strategy Policy. This policy allows that declines of up to 60% (from pre-fishing biomass levels) are acceptable for commercially harvested fish species where depletion is a managed outcome. Variations in the extent of acceptable decline depend on the biology of the individual species. The Committee is informed, but not bound, by a series of biological reference trigger points (commonly referred to as BLIM and BTARG) provided in the policy for management intervention for species that decline below 60% of their pre-fishing biomass. These interventions include listing assessments.

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: (a) direct observation (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.	≥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%

EPBC	Matters considered	Indicative Thresholds		
Criterion Two	**Geographic distribution** (based on either of B1 or B2)	**Very restricted**	**Restricted**	**Limited**
	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
	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		
Criterion Three	Estimated **total number** of mature individuals	**Very low**	**Low**	**Limited**
		<250	<2,500	<10,000
	And either of (A) or (B) is true			
	(A) **Rate** of continued decline	**Very high**	**High**	**Substantial**
		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		

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

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

Part C – 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, excluding cases of vagrancy (see Figure 1). This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g. large areas of obviously unsuitable habitat, see 'area of occupancy' 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 above) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. 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, the nature of threats and the available data. 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 have different scale-area relationships.

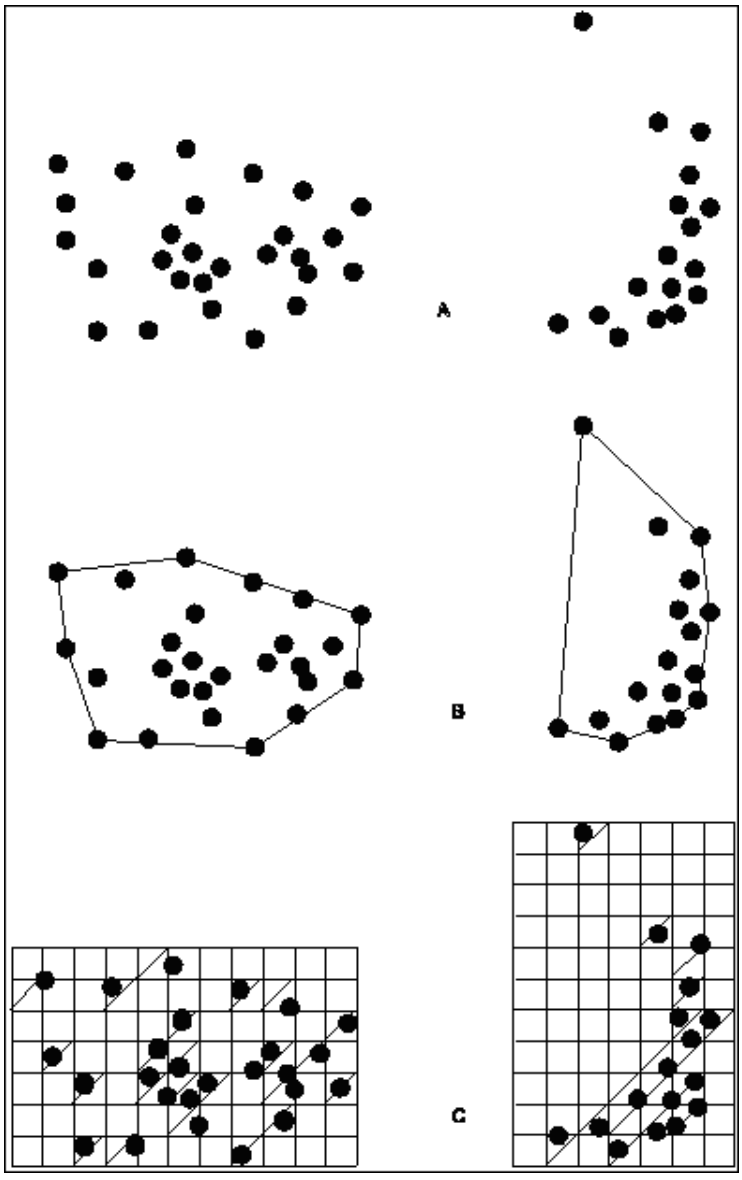

Figure 1. *Two examples of the distinction between extent of occurrence and area of occupancy. (A) is the spatial distribution of known, inferred or projected sites of present occurrence. (B) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (C) shows one measure of area of occupancy which can be achieved by the sum of the occupied grid squares.*

Guidelines for assessing climate change as a threat to native species

Guidelines for assessing climate change as a threat to native species

Anthropogenic climate change is occurring at an unprecedented rate and is likely to place greater climate stresses on species than has occurred for many thousands of years.

All species will be affected by climate change to a greater or lesser degree. Species will respond to these stresses in a range of ways: they may remain in areas where they are able to tolerate or adapt to conditions; move to more suitable habitats where possible; or die out.

These guidelines are to assist you in determining whether the important threat posed by climate change has had, is having, or will be an important threat to the nominated species' and will increase the species' vulnerability to extinction in the immediate to medium term future (i.e. 10 to 50 years).

A species' vulnerability to climate change will depend on a combination of biological traits and microhabitat use and behaviour, as well as its degree of exposure to climate change.

***If** climate change is an **important** threat to the nominated species it is important that you provide **referenced** information on exactly **how** climate change might significantly increase the nominated species' vulnerability to extinction.*

Please cite the climate change references that you use to argue for significant climate change impact the nominated species over the immediate to medium term time frame (i.e. 10 to 50 years).

A species' sensitivity to change is reflected in its life history characteristics and can be assessed from information provided in the following questions on the nomination form: 10, 15, 23, 24, 26, 28, 29, 31, 34, 35, 37–41 and 46–48.

References:

Hobday AJ, Okey TA, Poloczanska ES, Kunz TJ, and Ricardson AJ (eds) (2006). Impacts of climate change on Australian marine life. Report to the Australian Grenhouse Office, Canberra, Australia.
http://www.australiancoralreefsociety.org/pdf/Hobday%20et%20al%202006.pdf

Steffen W, Burbidge A, Hughes L, Kitching R, Lindenmayer D, Musgrave W, Stafford Smith M & Werner P (2009). Australia's Biodiversity and Climate Change. CSIRO Publishing.

Note: the following summary is available online.
Steffen W, Burbidge A, Hughes L, Kitching R, Lindenmayer D, Musgrave W, Stafford Smith M & Werner P 2009. Australia's Biodiversity and Climate Change, Technical Synthesis. Technical synthesis of a report to the Natural Resource Management Ministerial Council. Department of Climate Change. Commonwealth of Australia.
http://www.climatechange.gov.au/publications/biodiversity/biodiversity-climatechange.aspx

☙ THREATENED SPECIES SCIENTIFIC COMMITTEE ❧

The Hon Tony Burke MP
Minister for Sustainability, Environment, Water, Population and Communities
Parliament House
CANBERRA ACT 2600

Dear Minister

The Threatened Species Scientific Committee reports its considerations of the conservation status of the koala in the formal advice that accompanies this letter. We advise that the koala population has undergone a marked decline over three generations, due to the combination of a range of factors. The Committee therefore considers the koala to be potentially eligible for listing as vulnerable. However, better demographic data are needed to make this judgement with confidence.

In addition to its formal advice, the Committee wishes to draw the following to your attention.

This is the third such statement that the Committee has provided in 10 years. It is made because of the data-interpretation challenges that the Committee has faced in considering a species that lacks precise population trend data in significant parts of its range.

This consideration of the status of the koala under the EPBC Act arose as a direct request from the then Minister, based on a 2007 election promise that an evaluation of the status of the koala would be undertaken by the Committee. This follows previous assessments of the koala by this Committee and its predecessor in 2004 and 1996.

The Committee and Department committed considerable time and effort to the collation of relevant information in the format required to assess eligibility for listing. Expert and public consultation on the nomination and the subsequent preparation of the Listing Advice followed. The process of preparing the advice coincided with a public campaign by the Australian Koala Foundation which, although requiring responses by the Minister and the Committee Chair, in no way influenced the Committee in its consideration of the nomination.

The Committee considered the status of the koala over three meetings, held a national workshop of experts on its distribution and abundance, and convened a special Committee meeting by teleconference to consider public comment on the nomination. A teleconference was held to finalise this advice. The Committee's final recommendation is based on all available information.

The eligibility for listing of the koala is totally dependent on criterion 1, relating to the extent of recent population decline. The assessment by the Committee against this criterion was an extremely difficult one due to a lack of consistent high quality demographic data across the geographic range of the koala. Consequently, the listing recommendation is based on the

Committee's considered interpretation of the available data and views of acknowledged experts. In this statement the Committee provides the rationale for its advice and indicates the caveats it wishes to place on its advice and the implications for management of the koala in Australia.

The body of data on the status of koala populations is patchy, often sparse and not nationally comprehensive or coordinated. The data quality is also variable. There has been only limited improvement in quality, relevance and integration of these data over the 15 years that the koala has been considered by this Committee and its predecessor. This situation is not unusual for the Committee but what is unusual is the huge area of occurrence and variability that the koala demonstrates. I addition there is a lack of any consistent reliable methodology for population monitoring of the koala.

There are some regions, such as south eastern Queensland and some areas of coastal New South Wales, for which there are high quality population data covering significant areas. However, for many bioregions, population estimates are based on anecdotes or opinions, or are extrapolated from adjoining areas. For others, they are based on a small number of data points that invariably involve a very small sample of the total area in question. In view of the deficiencies in data, the Committee has been obliged to exercise professional judgment.

Some populations in southern Australia are increasing and require management to prevent habitat destruction resulting from overpopulation. For most of the New South Wales and Queensland populations for which data are available, there is a generally consistent pattern of decline in recent years. In some areas this decline is directly attributable to habitat loss and disruption resulting from land development together with associated impacts of cars, dogs and disease. In other areas, especially in more inland areas of New South Wales and Queensland the recent long drought has also been a major contributor to this decline.

The Committee based its judgement of the koala's status on a systematic evaluation of all available data by bioregions, and some other defined areas for which data exist. In addition to the patchy data on population size and trends, the other area of uncertainty for the Committee was the koala's capacity to recover from drought. The species' propensity to undergo population decline in severe drought followed by recovery is well established. What is unknown is its current capacity for recovery, and the extent to which such recovery may be compromised by the degree of land clearing and habitat fragmentation that has occurred over recent decades, and by the potential medium-term impacts of unknown numbers of tree deaths caused by drought.

In its deliberations, the Committee concluded that a Conservation Dependent listing for the koala could not be justified at this time. It was the Committee's view that the National Koala Conservation and Management Strategy 2009-2014 (the Strategy) and its proposed implementation plan do not, in their current state of development, meet the requirements for Conservation Dependent listing under the Act.

The Committee's recommendations in its advice suggest an approach that would allow a more informed listing decision. In addition, if better data were available and an adequate plan in place for the NKCMS then serious consideration could be given to a Conservation

Dependent listing. The Committee would welcome such a situation as it considers that the koala could be better conserved under effective Conservation Dependent status.

The Committee draws the following additional matters to your attention, recognising that these could be subsumed into the NKCMS implementation plan:

1. Management priorities differ across the range of the koala and its listing as nationally Vulnerable will create challenges for the administration of the Act. One option that the Committee considered for resolving this conundrum was to constrain listing to only circumscribed, distinguishable regional populations of koalas. However, this option was not justifiable based on the evidence before the Committee.
2. A properly designed, funded and implemented national koala monitoring and evaluation program across the full range of the koala is imperative. This should be part of the proposed *National Environmental Reporting System* and would coincidentally provide valuable data on a number of other important species, and areas of key habitat for achieving conservation objectives.
3. The design and implementation of a nationwide development planning protocol to prevent habitat loss and manage threats in areas of significant koala populations.
4. The implementation of targeted threat management strategies.

Success in achieving the above would support the conservation of the koala and its ongoing management as a Conservation Dependent species. With this in mind, the Committee does not recommend a Recovery Plan at this time. Rather, it strongly advocates a genuine national effort to rapidly implement the Strategy through an effective action plan. If this cannot be done, our advice warrants the listing of the koala. Should this be done a National Recovery Plan would be needed that in effect would duplicate the plan required to support Conservation Dependent status.

The Committee also wishes to draw to your attention, that the interpretative challenge of determining the status of the koala is a symptom of a more general problem. Biodiversity in Australia is in decline but the available data to inform priorities and actions are generally inadequate, being both insufficient and uncoordinated. A consequence is that we are not making well informed investment decisions. The Committee would welcome a formal request from you to provide an advice on this critical issue.

Yours sincerely

Associate Professor Robert J.S. (Bob) Beeton AM FEIANZ
Chair
Threatened Species Scientific Committee

30 September 2010

Advice to the Minister for Environment Protection, Heritage and the Arts 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

Phascolarctos cinereus

The species is commonly known as the koala. It is the only species in the Family Phascolarctidae.

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information provided by the Committee nomination to list the koala. The Threatened Species Scientific Committee prepared the nomination and conducted the assessment at the request of the Minister.

This is the Committee's second consideration of the species under the EPBC Act. The species was also considered under the previous Act.

3. Summary of Conclusion

The Committee judges that the species **is not** eligible for listing on the EPBC Act list of threatened species at this time.

4. Taxonomy

The species is conventionally accepted as *Phascolarctos cinereus* (Goldfuss, 1817). It is commonly known as the koala.

Three subspecies of koala have been described: *Phascolarctos cinereus adustus* (Thomas 1923) (Queensland), *P. c. cinereus* (Goldfuss 1817 in (Iredale and Troughton 1934) (New South Wales) and *P.c. victor* (Troughton 1935) (Victoria). These are currently recognised by the Australian Biological Resources Study however their validity has been questioned by genetic and morphological anlayses (see discussion at 7.2).

5. Description

The koala is a tree-dwelling, medium-sized marsupial with a stocky body, large rounded ears, sharp claws and variable but predominantly grey-coloured fur. Males generally are larger than females and there is a gradient in body weight from north to south across their range, with larger individuals in the south and smaller individuals in the north. The average weight of males is 6.5 kg in Queensland, compared with 12 kg in Victoria. Koalas in the north tend to have shorter, silver-grey fur, whereas those in the south have longer, thicker, brown-grey fur (Martin and Handasyde 1999).

6. National Context

The koala is endemic to Australia, and is widespread in coastal and inland areas from north-eastern Queensland to Eyre Peninsula in South Australia (Figure 1) . The range extends over 22^{o} of latitude and 18^{o} of longitude, encompassing more than one million square kilometres (Martin and Handasyde 1999). The koala's distribution is not continuous across this range and it occurs in a number of populations that are separated by cleared land or unsuitable habitat (Martin and Handasyde 1999; NSW DECC 2008).

6.1 Natural Range

The natural range of the koala, which can be inferred from the estimated distribution of the species prior to European settlement in Australia, extends from north-eastern Queensland to the south-east corner of South Australia (ANZECC 1998). This is similar to the current range.

As a consequence of translocations, several koala populations occur outside the species' natural range. These include the Kangaroo Island, Eyre Peninsula, Riverland and Adelaide Hills populations in South Australia. As there are no records of natural occurrences on any Victorian islands (ANZECC 1998), the koala populations on Phillip Island, French Island, Snake Island and Raymond Island in Victoria occur outside the species' natural range (Menkhorst 2008). Similarly, there are introduced koala populations on several islands off the Queensland coast, including Brampton, St. Bees, and Magnetic Islands (Melzer et al. 2000), which could be considered outside the species' natural range. Populations on Newry and Rabbit Islands were believed to be introduced, but recent anecdotal evidence suggests that they may be natural (Lee submitted 2009; Ellis 2010 personal communication).

Not all populations that have wholly or partly originated from translocations occur outside the species' natural range. There are several re-introduced populations, in the Australian Capital Territory, mainland Victoria and the south-east of South Australia, which occur within the koala's natural range (Natural Resource Management Ministerial Council 2010).

6.2 Distribution in the States and Territories

6.2.1 Queensland

Koala populations are scattered throughout Queensland (Queensland EPA 2006), in moist forests along the coast, subhumid woodlands in southern and central Queensland, and in some eucalypt woodlands along watercourses in the semiarid environments of the western part of the state (Melzer et al. 2000). Koalas have also been found to occur in non-riverine communities in semiarid areas (Sullivan et al. 2003a). Koalas also occur on islands off the Queensland coast: populations on St. Bees and Magnetic Islands were introduced, whereas the populations on North Stradbroke, Newry and Rabbit Islands may be natural (Melzer et al. 2000; Lee submitted 2009; Ellis 2010 personal communication).

Biogeographic regions of Queensland where koalas have been recorded include the Einasleigh Uplands, Wet Tropics, Desert Uplands, Central Mackay Coast, Mitchell Grass Downs, Mulga Lands, Brigalow Belt, South Eastern Queensland and Channel Country (Patterson 1996). In addition, koalas are present in the northern parts of several biogeographic regions that extend into New South Wales.

The greatest density of koalas in the state occurs in south-east Queensland, and lower densities occur through central, and western areas (Queensland EPA 2006). For example, population densities range from moderately high in south-east Queensland and some parts of central Queensland (e.g. 1-3 koalas per hectare) to low in other parts of central Queensland (0.01 koalas per hectare) (Melzer et al. 2000 and references therein).

6.2.2 New South Wales

In New South Wales, koalas inhabit a range of forest and woodland communities, including coastal forests, woodlands on the tablelands and western slopes, and woodland communities along watercourses in the western plains (NSW DECC 2008). Many of these areas have no current population estimates available.

Koalas mainly occur on the Central and North Coasts, although significant populations also exist on the Western Slopes and Plains, such as in the Pilliga region and Gunnedah and Walgett local government areas. Koalas are known from a number of sites on the Central and Southern Tablelands and there are also records from the Northern Tablelands. Koalas occur in sparse, and possibly disjunct, populations on the South Coast (Jurskis and Potter 1997; NSW DECC 2008; Allen et al. 2009).

Population densities range from high in parts of the NSW North Coast (e.g. 3 koalas per hectare in an artificially planted reserve at Tucki Tucki (Gall 1980)) to very low (0.006 koalas per hectare (Jurskis and Potter 1997)) near Eden on the South Coast.

6.2.3 Australian Capital Territory

In the Australian Capital Territory, it is thought that there may be currently relatively low density populations of koalas through the Tidbinbilla and Brindabella Ranges, around Bushfold, and in Orroral Valley, Namadgi National Park (Fletcher 2009 personal communication).

There have been several introductions of koalas from Victoria into the ACT between 1939 and the present. It is likely that the current koala population in the ACT is derived mainly from these deliberate introductions, although it is possible that some koalas originate from surviving local populations (Fletcher 2009 personal communication).

6.2.4 Victoria

In Victoria, the koala population was reduced to extremely low numbers by the 1920s, but a re-introduction program over 75 years has resulted in koalas occupying most of the suitable habitat available in the state (Menkhorst 2004). Koalas are widespread in the low altitude forests and woodlands across central and southern mainland Victoria, and also occur on four islands (Raymond, Snake, French and Phillip) (Menkhorst 2004, 2008). Koalas are largely

absent from the arid woodlands in the north-west and the high altitude areas of the north-east (Martin and Handasyde 1999).

In Victoria, large regional koala populations occur in the Strathbogie Ranges, Cape Otway, South Gippsland (including the Strzelecki Ranges), forests of the Naracoorte Coast Plain Bioregion, forests and woodlands on Mt Eccles lava flow (between Mt Eccles and Tyrendarra) and the Victorian Midlands Bioregion.

In Victorian forests and woodlands, the population density of koalas is generally less than one koala per hectare (Menkhorst 2004). However, there are several sites where koalas can be at greater densities, including the Strathbogie Ranges, Cape Otway, Mt Eccles National Park, Warrandyte State Park, French Island and Raymond Island (Menkhorst 2008). In some areas, the high density of koalas is putting unsustainable browsing pressure on tree species (Martin 1985a; McLean 2003). These areas include Mt Eccles National Park, Snake Island, Raymond Island and parts of the Otway Ranges (Menkhorst 2008). Some of these populations are subject to population management programs.

6.2.5 South Australia

The koala was presumed extinct in South Australia in 1924 (Wood Jones 1924), but has subsequently been introduced to five locations in the state, including Kangaroo Island, the Riverland, Eyre Peninsula, Adelaide Hills and the South East which was the only area from which they had previously been recorded (Melzer et al. 2000).

Koalas were introduced to Kangaroo Island from French Island (Victoria) in the 1920s and it now supports a large population of koalas, which is putting unsustainable browsing pressure on preferred food tree species such as manna gum (*Eucalyptus viminalis*) and is subject to a population-control program (Masters et al. 2004). Prior to this program, the population density in some areas exceeded 5.5 koalas per hectare (Masters et al. 2004).

Koalas were translocated from Kangaroo Island to three sites in the Riverland between 1959 and 1965. The current Riverland population is thought to be low in numbers and widely dispersed (Robinson et al. 1989). In 1969, koalas from Kangaroo Island were also translocated to Mikkira on southern Eyre Peninsula, and this population has successfully established and dispersed into adjacent areas (Melzer et al. 2000).

Koalas were introduced to the Mount Lofty Ranges in the 1930s and 1960s from Queensland, Victoria, South Australia (Kangaroo Island and possibly the South East of South Australia and possibly New South Wales. The population has since expanded throughout the Adelaide Hills region (Bryan 1996). A preliminary survey in 2003 indicated that there are areas with high population densities in the Adelaide Hills (2.4 to 8.9 koalas per hectare) (SA Govt 2005).

The koala population in South Australia's South East was re-introduced from Kangaroo Island. Non-sterilised koalas were introduced prior to 1997 and approximately 3000 sterilised koalas have been introduced since 1997 as part of the Kangaroo Island population-control program (Masters et al. 2004; Duka and Masters 2005).

6.3 Status in Jurisdictions Across Distribution

The koala is found across several jurisdictions and has variable threatened species status as outlined below. It should be noted that the koala has been the subject of a variety of conservation plans, including the *National Koala Conservation Strategy 1998* (ANZEC 1998) and *National Koala Conservation and Management Strategy 2009-14* (Natural Resources Management Ministerial Council 2009). Additionally, it is the subject of a state management strategy in Victoria (DSE 2004), a recovery plan and specific state environmental planning policy in New South Wales (DECC 2008), and a Koala Response Strategy in Queensland that includes a south east Queensland koala conservation state planning policy, a net gain koala habitat offsets policy and $45.5 M for net expansion of koala habitat (DERM 2010).

Status

- Queensland - *vulnerable* throughout the South Eastern Queensland bioregion, and 'least concern' (common) elsewhere in the state under the *Nature Conservation Act 1992*.
- New South Wales - *vulnerable* under the *Threatened Species Conservation Act 1995* Two populations are listed as *endangered*; one in the Hawks Nest and Tea Gardens area of Great Lakes local government area, and one in the Pittwater area of Warringah local government area. A nomination for the population occupying the coastal sub-catchments between Dignams Creek and Wapengo Lagoon near Bega in south-eastern New South Wales was rejected on 14 December 2007.
- Victoria - listed as Other Protected Wildlife under the *Wildlife Act 1975*. Not listed as threatened under the *Victorian Flora and Fauna Guarantee Act 1988.*
- South Australia - protected under the *National Parks and Wildlife Act 1972* but not listed in any rare or threatened category.
- International - listed as 'of least concern' on the 2010 IUCN Red List of Threatened Species.
- Listed as threatened on the US *Endangered Species Act 1973.*

7. Relevant Biology/Ecology

7.1 Life History

Female koalas can potentially produce up to one offspring each year, with births occurring between October and May but averages tend to be lower, ranging from 0.3-0.8 per year (McLean 2003). The newly-born koala lives in its mother's pouch for 6-8 months and after leaving the pouch remains dependent on the mother, riding on its back. Young koalas are independent from 12 months of age. The generation length of koalas was estimated to be 6-8 years by Phillips (2000). Additional data from Phillips for other north eastern New South Wales sites, Pilliga and south east Queensland continues to support a figure of approximately 6 years (Phillips 2009 personal communication). Generation times from Victorian populations ranged from 4.5 years (Snake Island) to 6.0 years (Framlingham, French Island) (McLean 2010 personal communication). Population growth rates estimated for koalas range from doubling times of 3.2 in Chlamydia free, high quality habitat on French Island to 20 years (Phillips 2000; McLean 2003).

Longevity in the wild is more than 15 years for females and more than 12 years for males (Martin and Handasyde 1999). Mortality rates per annum at two sites in Queensland (Springsure and Oakey) were estimated to be: subadult females 17% and 16% for Springsure and Oakey respectively, adult females 9.2%/8.5%, subadult males 23%/23%, adult males 26%/26% (Penn et al. 2000). In Port Stephens, New South Wales, where dog attack is significant, mortality of subadult females was 39%, adult females 23%, subadult males 40%, adult males 40% (Lunney et al. 2004).

7.2 Genetic and Morphological Variation

Three subspecies of koala have been described but their validity has been questioned by genetic and morphological analyses (Takami et al. 1998; Houlden et al. 1999). The subspecies boundaries are along state boarders, but these boundaries are unlikely to represent natural barriers to koala dispersal, so populations on either side are unlikely to be isolated from one another. Southern koalas can be distinguished from northern koalas by physical features such as fur colour and size. However, the variation is considered to be predominantly clinal, changing gradually along the distribution of the koala in response to different environmental conditions (Bergmann's rule), although some regional variation is apparent (Melzer 1995).

At the national scale Houlden et al. (1999) examined variation in mitochondrial DNA from over 200 individuals from 16 populations. Their principal conclusion was that there was a lack of support for the separation of the subspecies and tentative support for a single evolutionarily significant unit for the species. Individual populations were strongly differentiated, suggesting limited gene flow and a pattern of isolation by distance. Gene flow has been further restricted by contemporary habitat fragmentation. The appropriate management unit for koalas was suggested to be the local population (Houlden et al. 1999). The exception to the trend of population differentiation was the majority of Victorian populations (except Strzelecki Ranges and South Gippsland) and South Australian

populations, which are all descendants of island populations in Victoria because of their translocation program.

Latitudinal clines may reflect important differences of adaptation to factors such as temperature, and there may also be east-west differences in adaptation. Therefore, loss of all the sub-populations in any one part of the range could reduce the ecological amplitude of the species and would certainly diminish the genetic variation (Sherwin et al. 2000).

Sherwin et al. (2000) noted that no studies had enough detail to allow mapping of the boundaries between management units. Additional studies have been undertaken since then that examine genetic variability at smaller scales. In the south east Queensland region known as the Koala Coast, a 375 km^2 area in the eastern part of Brisbane, koalas have been shown by microsatellite analysis to be distinct from adjacent populations and should be considered a distinct management unit (Lee et al. 2009). This differentiation was interpreted to be recent, as a function of isolation due to barriers to dispersal imposed by roads and urban development.

Similar research has been conducted in other areas of New South Wales, but is still in the preliminary stages (Lee 2010 personal communication). In western Sydney, three populations with very limited gene flow between them have been identified (Lee et al. 2010).

7.3 Movement/dispersal

The koala is not territorial and the home ranges of individuals extensively overlap (Ellis et al. 2009). Individuals tend to use the same set of trees, but generally not at the same time. They spend a lot of time alone and devote limited time to social interactions (Martin and Handasyde 1999). Home ranges are variable depending on the location, with those in "poorer" habitats being larger than those in higher quality habitats. Males usually have larger home ranges on average than do females. For example, at Blair Athol in central Queensland, home ranges were estimated at 135 ha for males and 101 ha for females (Ellis et al. 2002), while at Bonville south of Coffs Harbour New South Wales they were estimated at 20 ha for males, and approximately 10 ha for females (Lassau et al. 2008).

Koalas tend to move little under most conditions, changing trees only a few times each day. There is little evidence for longer movements by individuals though dispersing individuals, mostly young males, may occasionally cover distances of several kilometres over land with little vegetation (Ellis et al. 2009). In south east Queensland, the average distance between natal and breeding home ranges was similar for males and females, at approximately 3.5 km (Dique et al. 2003b). Maximum dispersal distances were up to approximately 10 km for males and females (Dique et al. 2003b). Other studies have reported moves of up to 11 km in Tucki Tucki Reserve in New South Wales (Gall 1980) and 16 km in rural south east Queensland (White 1999).

7.4 Habitat and Diet

Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by eucalypt species (Martin and Handasyde 1999). The distribution

of koalas is also affected by altitude (limited to <800m ASL), temperature and, at the western and northern ends of the range, leaf moisture (Munks et al. 1996).

The koala is a leaf-eating specialist. Its diet is restricted mainly to foliage of *Eucalyptus* species. It may also consume foliage of related genera, including *Corymbia, Angophora* and *Lophostemon* and at times supplement its diet with other species, including species from the genera *Leptospermum* and *Melaleuca* (Martin and Handasyde 1999; Moore and Foley 2000). While koalas have been observed sitting in or eating up to 120 species of eucalypt (Phillips 1990), the diet of individual koalas is usually limited to obtaining most of their nutrition from one or a few species present at a site (Moore and Foley 2000). Species-level preferences may also vary between regions or seasons (Moore and Foley 2000). Consequently, assessment of habitat quality for koalas has been based on the identification of local preferences for species and quantification of the local availability of those species (Phillips and Callaghan 2000; Phillips et al. 2000).

Koalas also show strong preferences between individual trees within species (Hindell et al. 1985; Martin 1985a). Captive no-choice experiments show that the chemical anti-feedants may limit or prevent koalas feeding on foliage of individual trees even when the species is considered preferred (Lawler et al. 1998; Moore et al. 2005). This variability creates a nutritional patchiness such that species-based assessments of habitat is likely to result in over-estimates of the availability of high quality habitat (Moore and Foley 2005; Moore et al. 2005; Moore et al. in press).

Leaf chemistry, and thus feeding choices, are also influenced by elevation and temperature (Moore et al. 2004), water content in semi-arid areas (Munks et al. 1996) and soil nutrients (Moore and Foley 2000 and references therein). Soil nutrients, and their influence on leaf nutrients, may be particularly important. Koalas are able to maintain positive nitrogen balance at a foliage concentration of slightly above 1% (Cork 1986). However, in significant proportions of forest the foliage of many trees may be close to, or below, this threshold. For example, in the Eden forests of southern New South Wales most arboreal marsupials are concentrated in less than 10% of the forest, and this corresponds closely with the most fertile soils (Braithwaite et al. 1983). The majority of forests do not support another eucalypt folivore, the greater glider *Petauroides volans* (Braithwaite et al. 1983) and foliage nitrogen concentrations in those forests are close to, or below, the threshold of 1% below which koalas cannot maintain a positive nitrogen balance (Cork 1986; Moore and Foley 2000).

When koala populations reach high densities they can change the species composition of the eucalypt community. This is apparent in some areas of Victoria and South Australia where koalas have been introduced and become over-abundant, causing the deaths of preferred food trees (Menkhorst 2004 and 2008). It has been suggested that koalas may impose selective pressure on favoured eucalypts, causing evolutionary divergences among related sympatric species (Moore et al. 2005).

7.5 Population Dynamics

Phases of population crashes and recovery associated with rainfall variability occur in the semi-arid west of the koala's distribution (Gordon et al. 1988; Gordon and Hrdina 2005). In these regions the riparian zones offer a refuge from drought where a subset of the population may persist. In more extreme circumstances, there may also be substantial variability in survival rates along watercourses. Gordon et al. (1988) describe koalas along dry stretches of creek occurring at lower density, being in poorer condition and suffering higher mortality during the drought, than those in habitat adjacent to permanent water. During drought the population persists in lower numbers but, following drought-breaking rain they expand out from riparian zones to occupy adjacent habitat as population size increases. While more than 63% of the individuals in the Mungalalla Creek population died in less than a year, Gordon et al. (1988) considered that survival of the population itself was not threatened.

It has also been suggested that population fluctuations associated with over-browsing may be at least partly a natural occurrence, as a function of the temporal and spatial variability in food resources and the koala's dispersal ability (Martin 1985b). Population crashes following defoliation of food trees by over-abundant koalas are often perceived to be a modern problem of unbalanced ecosystems. However, such population crashes are reported as early as 1905 at Wilsons Promontory in Victoria (Menkhorst 2008). Notwithstanding this there is debate about how landscape change can impact on koala. In the south fragmentation of habitat may increase the likelihood of localised over-population, consequential vegetation loss followed by population impact. These circumstances could also reduce the likelihood of subsequent re-colonisation (Menkhorst 2008). In contrast Gordon et. al. (2006) report that koala can cope with extensively cleared mixed farmland habitat that still contains significant remnants if other hazards are not present.

Large fluctuations in koala populations may be a feature of koala biology, but repeat events occur over a time period that is not amenable to the short time scale of many studies. Direct observational studies may report changes in koala numbers for periods of one to a few years, but establishing a baseline against which to judge them requires the use of historical and anecdotal records. In the known history of the koala they are also confounded with habitat modification and direct impacts such as harvesting. Gordon and Hrdina (2005) used the records from the possum and koala harvest period 1906-1927 in Queensland to elucidate the trends in koala population status during that period. They describe substantial fluctuations in koala populations, with multiple contributing factors. These include declines due to the harvest (but not in all regions), disease and drought but none of these was consistently a major factor in decline or recovery (Gordon and Hrdina 2005). Gordon and Hrdina (2005) suggest that the reported rapid population increases and subsequent crashes demonstrated a south to north spread, and were associated with initial clearing and flushes of high quality eucalypt regrowth foliage. Their interpretation is that populations that perhaps were relatively stable beforehand, were freed of the constraint of limited food and increased to exceed carrying capacity and subsequently collapsed due to depletion of food. This may have implications for the koala given the current vegetation management policy in Queensland.

It is thus hard to establish a baseline against which contemporary koala populations and trends may be judged. Populations at a range of scales (local, regional) may fluctuate in

response to drought or to irruptions, but their dynamics may now be significantly influenced by a range of anthropogenic factors.

8. Description of Threats

8.1 Land clearing – Habitat loss, fragmentation and/or degradation

Large scale land clearing for agricultural purposes has effectively ceased, most recently with Queensland having introduced legislation to end large scale land clearing by 2006. Prior to this, land clearing was a significant cause of mortality to koalas, particularly in the Brigalow Belt Bioregion (Cogger et al. 2003). However, even without further clearing there is likely to be an ongoing "debt" to be paid, as extinction processes continue to operate on habitat patches that are now too isolated or small to support viable populations (Cogger et al. 2003; McAlpine et al. 2006a; McAlpine et al. 2007). Habitat fragmentation may also impede post-drought recovery of koala populations.

The effects of habitat loss and fragmentation may be greater than is indicated simply by estimating the proportion of land cleared. Land clearing is focussed disproportionately on flatter, more fertile areas, which constitute high quality habitat, so that what remains is often the poorer quality habitat on steep terrain and/or poorer soils (McAlpine et al. 2006a; McAlpine et al. 2006b). The impact of fragmentation and habitat isolation is also influenced by the relative hostility of the intervening habitat matrix. Urban environments, with higher densities of roads and dogs, exacerbate the effect, while in rural settings, greater isolation has relatively less impact (White 1999; Gordon et al. 2006; McAlpine et al. 2006a; McAlpine et al. 2006b). For a given amount of habitat available, a landscape of more numerous, smaller patches is less likely to be occupied than one of fewer, larger patches (McAlpine et al. 2006a; McAlpine et al. 2006b).

Urban expansion continues to threaten koalas, particularly in coastal regions. This is particularly the case as urban development brings with it the additional threats of predation by dogs and vehicle strike. The most stark example of this in the Greater Brisbane area of South East Queensland where the koala population of the Koala Coast declined by 64% over 10 years, from 6246 (4802-7691 95% confidence limits) estimated by (Dique et al. 2004) to 2279 this is considered to be approaching functional extinction (Queensland Department of Environment and Resource Management 2009a). In the Pine Rivers District, to the north of the Koala Coast, the urban population of koalas declined by 45%, and the bushland population by 15% in a similar timeframe (GHD 2008), leading to an overall decline of 40% from an estimated 4600 (Dique et al. 2003a) in 2001 to less than 2700 in 2008 (GDH 2008). Koala populations in all SEQ coastal local government areas (Sunshine Coast; Moreton Bay; Brisbane; Redland; Logan; and Ipswich) appear to be following a downward trend, as evidenced by a rapid increase in the numbers of sick, injured and dead koalas (as a consequence of development activities), followed by a decline in reporting due to a crash in koala numbers. It is also likely that the drought between 2001 and 2007 has had an impact on these populations (McDonnell 2010).

Local extinctions of small populations have occurred in the past and have highlighted the need for recognition of metapopulation structure, and the need for facilitating movement of individuals between smaller areas (Lunney et al. 2002). However, a recent study on the koala population at Port Stephens suggests that even relatively large populations (up to 800 individuals) may be vulnerable to extinction and that this vulnerability will be increased with further fragmentation (Lunney et al. 2007). It is therefore expected that koala populations in coastal New South Wales will continue to decline (Lunney et al. 2007; Lunney et al. 2009).

Koala habitat may also be lost due to logging, however the effect at the population level is a function of the management regime. For example, while clear felling will remove habitat, koalas may persist in selectively-logged forests (Kavanagh et al. 1995; Kavanagh et al. 2007). Thus the level of threat posed by logging is situation-specific and is determined by the appropriateness of the management regime, and adherence to its prescriptions. Koalas have also been recorded to have established home ranges within revegetated eucalypt woodlands.

8.2 Dogs and Cars

Dogs and cars are two threats to koalas that are closely associated with urban expansion, with exposure to both increasing as land adjacent to koala habitat is developed and occupied. However, while these threats are most intense in the urban and peri-urban environment, both may be threats in rural areas (Crowther et al. 2010). As both directly cause mortality of individuals they are treated here together.

Data on mortality of koalas is often collected by koala care groups and some of those data were provided to inform this nomination. The data provided by care groups demonstrates that mortality from dogs and cars occurs wherever koala habitat is in proximity to urban environments and it is not restricted to the South East corner of Queensland. However, there are difficulties with the use of these data for several reasons: 1. The catchment area, and distribution of search effort over that area, is often not defined; 2. It is unclear what proportion of incidents go unreported; 3. The size of the population from which the incidents are drawn is often unknown, and 4. There may be considerable overlap in the areas for which different groups report.

To illustrate the last point, data were provided by the Friends of the Koala (FoK – Lismore), Currumbin Wildlife Sanctuary (CWS), Australian Wildlife Hospital (AWH) and the Queensland Department of Environment and Resource Management (DERM). Friends of the Koala take injured animals for which they are unable to care to both CWS and AWH. Currumbin Wildlife Sanctuary occasionally transfers animals to AWH, and DERM report data for their own Moggill Koala Hospital and AWH. Consequently, the mortality data derived from DERM (Table 1) are used below as they provide the best overall estimate of mortality within a relatively defined region and they address the other three problems with this type of data.

Table 1. Mortality of koalas in South East Queensland (derived from Queensland Department of Environment and Resource Management 2009b). n.b. These data are only for

those koalas that were located and presented to the koala hospitals and thus underestimate mortality by an unknown amount.

Year	Dog	Car	Disease	Combination (cars, dogs, disease)	Other	TOTAL DEATHS
1997	103	259	273	162	29	826
1998	63	230	244	220	44	801
1999	84	261	324	214	28	911
2000	93	304	451	333	41	1222
2001	106	320	300	386	38	1150
2002	100	344	251	396	41	1132
2003	95	346	179	451	35	1106
2004	73	331	224	425	59	1112
2005	65	240	295	307	32	939
2006	65	272	167	446	66	1016
2007	66	266	159	561	76	1128
2008	38	248	198	378	72	934
2009	31	73	69	259	36	468
Total	**982**	**3494**	**3134**	**4538**	**597**	**12745**

* 2009 figures up until September only.

Between 1997 and September 2009 in south east Queensland at least 982 koalas were killed by dogs and 3494 were killed by cars (Queensland Department of Environment and Resource Management 2009b). An additional 4538 deaths were attributed to a combination of cars, dogs and/or disease. While it is not possible to ascribe each of these deaths to a particular koala population, the substantial declines noted above for the Koala Coast and Pine Rivers populations suggest that such mortality rates are unsustainable in this area. The mortality due to vehicles alone on the Koala Coast area of south east Queensland has been formally assessed (Dique et al. 2003c). At a time when the koala population was estimated at approximately 6250 (Dique et al. 2004) mortality due to vehicle strike alone averaged some 281 koalas/year. This equates to an annual mortality rate of approximately 5% due to vehicle strikes.

Another example comes from the Tilligerry Peninsula of Port Stephens. The Hunter Koala Preservation Society has collected data on rescues for this defined area within the Port Stephens Local Government Area. In 1995 38 koalas were found dead, or died after rescue (29 attributed to dogs or vehicles). The Port Stephens koala population at the time was

estimated to be 350-800 animals (Lunney et al. 2007). The data from this subset of the habitat suggest mortality of 5-10%. Since 1995 the number of mortalities has declined linearly to less than half that level. As road deaths can be an indicator of abundance for animal species (Mallick et al. 1998) this may indicate a substantial decline in the population. This interpretation is supported by the modelling of Lunney et al. (2007) which indicated a likely rapid decline in the Port Stephens koala population, even under their base model (which included dog attack as a major source of mortality but did not include vehicles). It is also noteworthy that the Port Stephens Council has had a Comprehensive Koala Plan of Management (CKPoM) since 2002. Coffs Harbour City Council in 1999 was the first council to implement a CKPoM. A recent review of its effectiveness concluded that actions to protect koalas from road risk had been only partially achieved and those to protect koalas from dogs had not been achieved such that there was no indication that the plan had "reversed the trend of koala population decline" (Eco Logical Australia 2006).

Mortality due to dogs and cars has been invoked as a threat to koala populations throughout much of their range (Canfield 1991; Menkhorst 2004; Ward and Close 2004; Lassau et al. 2008; NSW DECC 2008; Natural Resource Management Ministerial Council 2010). Despite growing awareness of the problems, and attempts to address them, there is little evidence that such management responses have been effective thus far.

8.3 Disease

The most well known disease present in koala populations until recently is associated with chlamydia (Natural Resource Management Ministerial Council 2010). Many koalas carry chlamydia, but do not always show clinical symptoms (known as chlamydiosis). The symptoms include eye, urinary tract, respiratory tract and reproductive tract infections, and the latter can lead to infertility in female koalas (Natural Resource Management Ministerial Council 2010). Although the epidemiology of chlamydiosis is not well understood there is circumstantial evidence that chlamydiosis might increase in response to environmental stresses such as over-crowding and poor nutrition (Melzer et al. 2000 and references therein),.

Reduced female fertility caused by chlamydia infection may limit the reproductive potential of koala populations (NSW DECC 2008). Chlamydiosis may contribute to local declines or extinctions in small, isolated populations, where recruitment rates between populations are low and mortalities from other threats are high (NSW DECC 2008). However, through reducing female fertility, chlamydiosis may also prevent some koala populations from reaching very high densities and over-browsing their food trees (NSW DECC 2008). The South Australian and French Island (Victoria) populations are thought to be chlamydia-free, but the disease is present throughout the remainder of the species' range (Martin and Handasyde 1999). Recent research has shown that up to half of south east Queensland koalas have detectible reproductive disease likely to result in infertility (Hanger and Loader 2009).

Another recently discovered disease may have significant implications for koala conservation. Koala Retrovirus (KoRV) was recently identified and is thought to be responsible for a range of conditions, including leukaemia (Tarlinton et al. 2005) and an

immunodeficiency syndrome. Up to 100% of koalas in Queensland and NSW have KoRV, but the proportions are lower in southern populations (Tarlinton et al. 2006; Hanger and Loader 2009; Lee submitted 2009) which until recently showed none of the associated conditions (Bodley in Hanger and Loader 2009)(see below). There is some evidence that chlamydiosis may be exacerbated by KoRV (Tarlinton et al. 2005).

Koala Retrovirus has endogenised in koalas (Tarlinton et al. 2006) in Queensland and New South Wales. That is, it has infected germ line cells (spermatozoa or oocytes) and is transmitted genetically (by inheritance) from parents to offspring. Although this is a known mechanism of transmission, KoRV may also spread from koala to koala (horizontal spread) by close contact, and from infected mothers to their joeys via the milk, in a manner similar to the way that many other retroviruses spread (Hanger 1999). The effects of disease on koala populations are of growing concern (Lunney et al. 2002; Hanger and Loader 2009; Queensland Government 2009); this is particularly the case in south east Queensland and northern New South Wales. The south east Queensland koala hospital data (Table 1) report 3134 deaths attributable to disease in the years 1997-September 2009, with an additional 4538 due to a combination of cars, dogs and disease (Queensland Department of Environment and Resource Management 2009b).

Recently a change in the method of recording the data has occurred. In the past where the main cause of mortality may have been recorded as disease these cases are increasingly being attributed to the "combination" category. Consequently, there is a strong negative correlation between the number of deaths attributed to disease and those attributed to "combination" (Table 1). Thus disease as a primary cause of death has apparently declined from over 30% to approximately 20% of overall mortality. However, this category alone is equivalent to the mortality due to vehicles (described above) and when the combined category is added they have been consistently around 60% of the causes of mortality of koalas in south east Queensland over 10 years. Indeed 60% of mortality in the recent Koala Coast declines was attributed to disease (Queensland Department of Environment and Resource Management 2009a). The mortality data reported by koala care groups support the observation that disease is a significant contributor to overall mortality: Hunter Koala Protection Society (mean 16%, range 6-47%), Friends of the Koala (41% 2009), Coffs Harbour City Council (30% 1999-2002, 15% 2003-2006), Currumbin Wildlife Hospital (46% 2000-2009), Native Animal Trust Fund (20% 2009).

While the above focuses on the growing recognition of disease as a threat to koalas in a particular region, it is also recognized elsewhere. Both the Victorian and New South Wales state governments acknowledge that disease should be considered a threat to koala populations in some circumstances, particularly where they combine with other threats (Menkhorst 2004; NSW DECC 2008). Increasing incidence of KoRV has recently been reported on Kangaroo Island, along with the first reported case on the island of lymphoma (Koala Research Network 2010).

It has been suggested that the effects of disease may be exacerbated by the effects of habitat fragmentation and associated stress (Melzer et al. 2000; NSW DECC 2008). Hanger and Loader (2009) offer an alternative view, suggesting that the disease threat is significant and

independent of habitat fragmentation. However, they note that this does not detract from the need to protect habitat, but rather that it requires better information on the effects of disease on population dynamics in addition to those induced by habitat fragmentation directly.

8.4 Climate change and drought

Drought is a natural phenomenon that has occurred, and will continue to occur, irrespective of the extent to which predicted climate change scenarios prove accurate. However, as a hypothesised effect of climate change is more frequent and/or more intense drought, the two are considered together here.

Climate change is a potential threat to the koala, as it is expected to lead to increased temperatures, changes to rainfall, increasing frequency and intensity of droughts and increased fire risk over much of the koala's range (Natural Resource Management Ministerial Council 2010). Increased temperatures inland are expected to cause the koala's range to contract eastward (Dunlop and Brown 2008; Queensland Office of Climate Change 2008; Adams-Hosking 2009; Steffen et al. 2009). This effect would be compounded by extended drought that may be expected under climate change scenarios (Queensland Office of Climate Change 2008). In the south of the koala's range, in Victoria, more hot days, increased risk of intense fire and more droughts are expected (Victorian Department of Sustainability and Environment 2009). Adams-Hosking (2009) estimated, using bioclimatic modelling, that the koala's range, and particularly its core (10-90%) range, would contract by 20-30% by 2030.

In the west and north of their range in Queensland, the distribution of koalas is determined by heat in combination with water availability (Munks et al. 1996; Sullivan et al. 2003b). This is reflected in a tendency to find the highest densities of koalas along creek lines. Anecdotal evidence suggests that the distribution of koalas in south west Queensland contracted eastwards in response to drought in the 1920s (Sullivan et al. 2003b). Sullivan et al. (2003b) also noted that koalas were concentrated in the north and central portions of their study area and decreased to the south and west consistent with rainfall patterns. In Mungalalla Creek a koala population crashed by at least 63% in the summer of 1979-80 in response to a continued drought (Gordon et al. 1988). Gordon et al. (1988) suggested that the regional persistence of koalas may rely on the protection of 'survival' habitats around permanent water holes, from which koalas may disperse into other habitats as conditions allow (but see below). The length of the drought may also have significant implications for the capacity of a population to recover. Gordon et al. (1988) noted that dominant adults were more likely to occupy refuge habitat, such that younger individuals died earlier in the drought.

In research undertaken in 2003-2009 in northern and central western Queensland, near Hughenden and at Moorinya National Park, koalas were at very low densities and confined to drainage lines where extensive searching was required to locate them (reported at the National Koala Abundance Workshop, convened by the TSSC in November 2009). There is evidence of tree dieback along drainage lines and this is exacerbated by the practice of landowners building small dams on creek lines, with subsequent death of downstream vegetation. In central Queensland (such as at Springsure and Tambo) koala densities have

also declined markedly, although density appears to be stable at Norwood Creek where the presence of the more drought tolerant *Eucalyptus crebra* (Melzer 1995) provides a food source not available to koalas elsewhere. Here also, mature eucalypt trees were stressed or dying back along drainage lines and koala populations were contracting to refuge areas where water is more reliable.

Thus, under climate change projections there is expected to be a general eastwards shift in the edge of the distribution (Adams-Hosking 2009). Discussion at the National Koala Abundance Workshop noted that this is complicated by hydrological changes that do not necessarily follow this directional trend. It is expected that, if recovery occurs, it will include a phase shift in riparian communities, with *E. camaldulensis* replacing *E. tereticornis*. *Eucalyptus camaldulensis* is more drought tolerant, but grows at lower densities so that, if there is a post-drought recovery, koala populations may be expected to re-establish but stabilise at a lower density. This was the case at Mungalalla Creek following a drought-induced population crash in the 1980s (Gordon et al. 1988). However, the expert workshop noted that tree age in western Queensland and New South Wales is much greater than previously appreciated, such that the ability of these habitats to recover from drought is much lower than has been estimated previously even if moister conditions return. The deaths of trees substantially older than normal drought cycles may be indicative of a process not part of normal climate cycles and indicative of a long term or permanent decline (Carrick 2010 personal communication). Recent Queensland legislative protection of high value regrowth has extended protection to more than one million hectares of koala habitat.

The Mulga Lands bioregion in south western Queensland was estimated in the 1990s to have some 59 500 koalas, occupying riparian habitats but also extending out at lower densities into expansive surrounding habitats (Sullivan et al. 2003a; Sullivan et al. 2003b; Sullivan et al. 2004). A severe population decline is indicated as a result of the recent drought (Baxter 2009 personal communication; Seabrook et al. 2010). The drought has led to the distribution of koalas contracting to riparian areas and, overall, towards the north east. The density of koalas on Sullivan's 'residual' habitats is now extremely low. Using the same methods as Sullivan et al., a preliminary estimate at the height of the recent drought of 29 050 (range 22 970-37 500) koalas was calculated for the region (Seabrook et al. 2010). This is a substantial decline from Sullivan et al.'s 44 000-78 000 (mean 59 555).

While there are no new data for the semi-arid north western region of NSW, the trends are likely to be consistent with those observed for the adjacent western Queensland part of the koala's range. Days of extreme heat have been identified as a threat to koalas in the Pilliga forests (Kavanagh and Barrott 2001; Kavanagh et al. 2007). Given that climate change scenarios for the western part of the koala's range suggest higher temperatures and less rainfall overall, and more extreme hot days each year, there is potential for the distribution of the koala to be reduced permanently in New South Wales and in Queensland.

Drought may also be a factor in the decline in koalas in coastal south east Queensland (McDonnell 2010), where the substantial decline has largely been attributed to habitat fragmentation, disease, vehicle strike and predation by dogs (see above). McDonnell (2010) notes that many of the secure habitats where koalas had declined in the 2008 survey

(Queensland Department of Environment and Resource Management 2009a) are on drier sites. He also suggests that drought-related stress may have made koalas more susceptible to disease. McDonnell (2010) also suggests that if drought was a significant factor in that decline, there should be observable signs of recovery via higher fecundity rates after the end of the drought, which has occurred in 2010. These data are not yet available.

In the southern part of the koala's range, in Victoria, the effects of climate change may be manifest in, or exacerbated by, their influence on the fire regime. In recent times devastating fires have occurred (e.g. Victoria's Black Saturday in 2009 and wildfires in Pilliga 1998 and 2006) and in 2009 governments introduced a new fire risk category (Catastrophic). The mortality of koalas resulting from these fires has not been quantified, but loss of habitat was extensive and koalas are particularly exposed to injury in crown fires that occur in these intense bushfires. The National Koala Abundance Workshop noted that a substantial proportion of koala habitat has been burned in Victoria in recent years. A recent study of the influence of fire and other factors on koalas in Port Stephens suggested fire is a significant threat to koalas, but that changing the fire regime may not improve the population's viability. That is, changing the regime from infrequent, large fires to more common, smaller fires did not improve modelled population viability (Lunney et al. 2007).

Increasing atmospheric CO_2 will have effects independent of climate change *per se*. When eucalypts are grown under elevated CO_2 the ratios of carbon to nitrogen in the foliage increase such that concentrations of carbon-based anti-herbivore compounds like tannins increase while nitrogen (protein) decreases (Lawler et al. 1997). It has recently been shown that the balance between tannins and proteins determines protein digestibility and that subtle differences may have profound effects for reproductive success of eucalypt folivores (Degabriel et al. 2009). Tannins reduce the availability of nitrogen for digestion, such that a measure of "available" nitrogen is necessary to elucidate the role of leaf nitrogen in herbivore demography. Degabriel et al. (2009) showed that female common brushtail possums *Trichosurus vulpecula* with home ranges containing trees with greater nitrogen availability have higher fecundity and produce offspring that grow faster and have greater overall fitness. Thus the results "*suggest a link between the combined effects of plant nutrient concentration and chemical defence, and reproductive fitness, which is important for explaining patterns of distribution and abundance in plant-mammal systems*" (Degabriel et al. 2009). Not all nitrogen in eucalypt foliage is available to koalas (Cork et al. 1983), indicating the negative effect of tannins on protein digestibility. Koala population dynamics could be negatively impacted by the changes in leaf chemistry induced by elevated CO_2. It is not yet possible to assess forest nutritional quality over much of the koala's range, and thus to quantify the effect described above.

8.5 Habitat degradation due to over-browsing

Much of the substantial population of koalas in Victoria and South Australia live in areas where over-population is a significant problem. The density of koalas is so high that they may damage the food trees on which they depend, resulting in a substantial population crash, such

as has occurred a number of times in Victoria (e.g. at Framlingham, Walkerville, Sandy Point) (Martin 1997; Martin and Handasyde 1999; Menkhorst 2008).

A range of options has been used to address the over-population problem, principally translocation and sterilisation. It was reported at the National Koala Abundance Workshop that with substantial management effort the koala population of Kangaroo Island has been reduced by approximately 40% following sterilisation of some 10 000 koalas, of which 3000 were translocated to the mainland (Duka and Masters 2005). The National Koala Abundance Workshop also noted that koala populations have also been reduced in some Victorian populations, again with substantial effort: at Mt Eccles National Park, some 8000 koalas have been sterilised over several years and the population has been reduced to approximately 6000 from approximately 11 000 in 2004. It is often noted that this expenditure comes at the cost of conservation efforts for other species (Duka and Masters 2005) and it will have to continue into the future indefinitely. While culling has been suggested to be one of the few logistically feasible ways to reduce populations before they reach the point where habitat damage occurs, it is considered an unacceptable alternative (Martin 1997; Tabart 1997; Menkhorst 2008; Natural Resource Management Ministerial Council 2010).

Significant large populations may not be amenable to control by sterilisation. Large populations occur at Otway and Strathbogies Ranges and are not subject to fertility control (Menkhorst 2008) so remain vulnerable to resource depletion and rapid and substantial population decline (Martin 1997). Current management aims to maintain koala population density at or below one koala per hectare to prevent over-browsing and damage to habitat is (Menkhorst 2004; Duka and Masters 2005). It was reported to the National Koala Abundance Workshop that in 2009 koala densities in some manna gum (*E. viminalis*) stands of Cape Otway were up to 17.1 koalas per hectare. Substantial loss of manna gums in the area, and a crash in the koala population, is a likely outcome.

8.6 Reduced genetic variability

A function of the translocation program in Victoria is that large populations of koalas began with only a very few individuals (Menkhorst 2008). Most populations in both Victoria and South Australia were established, or re-established, via individuals from islands in Victoria's Westernport Bay. Those source populations were themselves founded from a small number of individuals. As a consequence, genetic variability is low across most Victorian and South Australian koala populations and they have suffered severe bottleneck and founder effects (Houlden et al. 1996; Seymour et al. 2001; Cristescu et al. 2009).

The studies of Seymour et al. (2001) and Cristescu et al. (2009) both investigated the relationship between genetic diversity and testicular abnormalities. Seymour et al. (2001) compared inbreeding across several populations and identified a correlation between the level of inbreeding and the proportion of the population exhibiting testicular abnormality. Cristescu et al. (2009) did not find the same trend when they examined the relationship between an estimate of an individual animal's level of inbreeding and testicular abnormality, within the Kangaroo Island population. However, they cautioned that this should not be seen as

definitive as the high proportions of abnormalities means the genes are widespread and can be passed on without the individual's parents necessarily being closely related. In addition to the abnormalities considered above, inbreeding also has effects on testicular and sperm morphology, and thus on reproductive characteristics of male koalas (Montogomery 2002).

The above studies caution that the high numbers of individuals should not be taken to indicate that the populations are genetically safe. The majority of Victorian koalas, and all South Australian koalas, are derived from a limited number of individuals and thus represent little genetic capital (Houlden et al. 1996; Seymour et al. 2001; Cristescu et al. 2009). The impact of observed testicular abnormalities in some South Australian populations (Seymour et al. 2001; Cristescu et al. 2009) on individual or population fertility rates is unknown. However, the inbreeding coefficients measured for all southern Australian koala populations examined to date are above a threshold where extinction is considered substantially more likely (Frankham 1995; Houlden et al. 1996; Seymour et al. 2001; Cristescu et al. 2009). Low genetic variability, as exhibited by both Victorian and South Australian populations, also reduces the population's ability to adapt to change, which may exacerbate the effects of disease, over-browsing or climate change (Houlden et al. 1996; Seymour et al. 2001; Cristescu et al. 2009). The Koala Research Network has raised concern about the vulnerability of these populations to KoRV (Koala Research Network 2010).

9. Public Consultation

The nomination was made available for public exhibition and comment for 30 business days. The Committee has had regard to all 223 responses to consultation that was relevant to this listing advice.

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

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

There is at present no published scientifically peer-reviewed estimate of the total number of koalas in Australia and no definitive past estimate within an appropriate timeframe to enable comparison. The report on the 1986-7 national survey of koala distribution noted that a total population size was "impossible to estimate as survey techniques varied greatly from area to area" (Phillips 1990). Similarly, in the previous assessment of the koala's national status, the TSSC noted that there have been no direct measurements of change in the size of the national koala population over the past three generations (Threatened Species Scientific Committee 2006).

Nevertheless, it is necessary here to consider the available information on numbers of koalas in different areas to enable consideration of the comparative influence of identified trends in numbers or distributions in those areas when considered against the national scale. For example, while one population may be shown to be growing and another declining, the overall effect can only be judged with some evaluation of their relative size. The available information on population numbers and trends is presented below at the scale of regions within states, before synthesising them to evaluate the likely national trend.

South Australia

The main South Australian population is the introduced one on Kangaroo Island. In 2001 the population was estimated to be 22 000 to 27 000 koalas (Masters et al. 2004). Since 1997 there has been an extensive program of translocation (3000 koalas) and sterilisation (10 000 koalas) aimed at reducing over-browsing pressure on the habitat. The National Koala Abundance Workshop heard that approximately 30-60% of the population was sterilised, and the population had reduced to between 12 000 and 16 000 by 2006.

On the mainland there are four other populations at Eyre Peninsula, the Riverlands, Lucindale (a single population within 10 ha) and the Adelaide Hills. Those in the Lucindale area show some abnormalities of the skull consistent with inbreeding. There are no formal estimates of population size available, but over-population may possibly be an issue in the Adelaide Hills (Natural Resource Management Ministerial Council 2010).

Victoria

The size of the koala population in Victoria is very much a function of the translocation program that has been operating for several decades. Most potential koala habitat now has established koala populations. According to evidence presented at the National Koala Abundance Workshop, Victoria has koala populations in a range of circumstances, grouped into four broad categories: High population densities (Mt Eccles NP, Otways etc.), Medium density/large area (Ulupna Island, Brisbane Ranges etc.), Low density stable (You Yangs NP, Wilsons Promontory etc) and Low density declining (Macedon Ranges, Phillip Island). The population total summed to roughly 73 500, however these are estimates and there have been few detailed surveys in some areas. This estimate is considerably lower than previous estimates for Victoria, such as the estimate of >100 000 animals on the Strathbogie Ranges alone (Martin 1997). This is most likely to be a function of a difference in the method of calculating the estimate. However, Martin has noted that his recent observations in the Strathbogie Ranges suggest that the population has declined, based on reduced sightings of koalas overall, reduced proportion of females with back young, fewer road-killed koalas and tree death due to drought (Martin 2010 personal communication).

Northeast NSW

North-eastern NSW is often held to be the stronghold of koalas in the state. While population densities tend to be highest in this part of New South Wales, there are few contemporary estimates of the size of koala populations and it is not possible to give an overall estimate. However, there are data to assess the distribution of koalas which give a coarse indication of population density (Lunney et al. 2009). Lunney et al. (2009) reported results of a community survey to estimate changes in distribution and relative abundance between 1986 and 2006, and noted that most of the areas in NSW that indicated decline were in the north east. Of the populations for which population information is available, Iluka is considered to have gone extinct (Lunney et al. 2002) and Port Stephens had a population of 350-800 koalas in 1998 (Lunney et al. 2007). However, Lunney et al. (2007) modelled the available population parameters for Port Stephens and showed that it was susceptible to decline unless mortality due to fire and dogs were both eliminated. Lake Innes Nature Reserve was reported to have a population of approximately 600 koalas in 1999 (NSWNPWS 1999) while adjoining freehold lands comprising the remainder of the Innes Peninsula and associated Thrumster planning area collectively support an associated population of approximately 300 koalas (Forsman and Phillips 2005; Phillips 2008). In the Lismore area there is evidence that koalas may be extending their range into eucalypt forest/woodland that has become established since clearing of the Big Scrub rainforest (Lee submitted 2009).

Thus the number of koalas in north east NSW is uncertain, and population audits are required to establish current population size.

Central coast NSW and Sydney Bioregion

In the Sydney Basin Bioregion koalas occur around the Central Coast, Blue Mountains and the fringes of the Cumberland Plain. Records from reserves are uncommon, though they are found in Dharug, Wollemi and Tomaree NPs. There are scattered records through the South Eastern Highlands Bioregion. The Campbelltown (and surrounding areas) population of south west Sydney has been increasing slowly since the 1980s and is considered to have approximately 300 animals. Given the large areas of National Park in the Sydney region, low density koala populations may support several hundred individuals (Close 2010 personal communication). A number of other small populations are identified in the NSW recovery plan but these are likely to be small and some (e.g. Pittwater) may now have gone extinct (NSW DECC 2008).

Northwest NSW

In New South Wales west of the Great Dividing Range key populations occur at Pilliga and Gunnedah, with smaller populations elsewhere (NSW DECC 2008). The Pilliga population is important as it has been estimated to support some 15 000 koalas (Kavanagh and Barrott 2001). However, this estimate has been questioned because of mapping and recording matters (NSW DECC 2008), and may be a significant over-estimate. The estimate is also now 10 years old and the Pilliga has been subject to severe drought in the interim. In areas where koalas were once abundant in the 1990s they were rare or absent at the height of the drought (Parnaby 2010 personal communication).

Despite formal studies of the koala population (Smith 1992; Curran 1997), there are no quantitative estimates of population size for Gunnedah. State-wide surveys of koala distribution indicate that the Gunnedah population is regionally significant (Crowther et al. 2009) and has expanded, against the state trend, due to revegetation aimed at addressing soil salinity problems (Lunney et al. 2009). However, the proximity of plantings adjacent to roads and railway tracks creates high exposure of koalas to vehicle strike, and a heatwave in 2009 led to high mortality (Crowther et al. 2010).

Southern NSW

A synthesis of recent koala surveys was prepared for the purposes of this nomination by Chris Allen of NSW DECCW, combining the results of surveys conducted using a variety of means (Allen 2009). Densities for all areas were uniformly low or very low. The combined estimates for the region from approximately Goulburn south to the New South Wales border sums to approximately 800 koalas. Allen (2009) notes some indications of an increase in the population in the coastal forests north east of Bega, but it must be noted that this is an extremely small population. Recent intensive surveys show that a population at Tantawangalo/Yurammie is now very low and possibly extinct.

North Queensland

There are no published estimates of koala population size or density in the far northern part of the koala's range in the Wet Tropics and Einasleigh Uplands bioregions. There are some anecdotal reports of koala sightings but these are uncommon and suggestive of very low densities. The northern limit of the distribution of the koala in Queensland has contracted to the south from approximately Cooktown to inland of Cairns since the late 1960s (Phillips 1990; Gordon et al. 2006).

Northwest Queensland

There are again no published estimates of the number of koalas in this region, but some formal survey work has been undertaken to assess density. In the Desert Upland bioregion koalas occur in very low density, such that surveys of the animals were considered impractical and faecal pellet surveys were used instead to assess relative abundance (Munks et al. 1996). Munks et al. (1996) found that koalas were principally associated with creek lines and leaf moisture was probably a critical determinant of their occurrence.

It was reported at the National Koala Abundance Workshop that at sites to the west of the study area of Munks et al. (1996), in the Mitchell Grass Downs bioregion, koalas have been surveyed at Moorinya National Park in August 2000 and February 2003. With six people conducting intensive searches over two days along creek lines (areas most likely to support koalas) they found only traces of koalas in 2000 and one dead koala in 2003. At Hughenden, to the northwest of Moorinya, searches by five people over five days, covering over 16 km of drainage lines over four consecutive years (2006-2009), found an average of 2.25 koalas per year.

There are no prior estimates of koala density against which to compare the above figures. However, it is notable that distributional surveys in 1967 and 1977 recorded koalas well to the west of these sites, while they are close to the western edge of distribution recorded in the more extensive 1986/1987 national survey (Phillips 1990). This may indicate an eastward contraction of the koala's distribution (Gordon et al. 2006).

Central Queensland

Koalas have been studied at Tambo (Mitchel Grass Downs bioregion), Springsure and Blair Athol (both in Brigalow Belt North bioregion). Koalas in this region typically occur at low densities and have large home ranges (Ellis et al. 2002). The most recent estimates were provided to the National Koala Abundance Workshop for Tambo and Springsure. At Tambo densities were very low, with only two and three koalas (one of which was dead) found in 2008 and 2009 respectively, in extensive searches of approximately 10 km of creek lines.

Data are available for four sites at Springsure in 1992 and 2009 (Table 2). The koala density was estimated via intensive searches of 1 km^2 plots, and declined from an average of 0.155 to 0.01 koalas/ha (a decline of >90%). There was no decline at the Norwood Creek site, initially the lowest density of the sites, where *Eucalyptus crebra*, a more drought tolerant species, is

dominant. At the other sites the dominant tree species, *E. tereticornis* has undergone extensive mortality.

Table 2. Density of koalas (/ha) at fixed 1km^2 sites surveyed in 1992 and 2009

Site	1992	2009
Wallalee	0.4	0.02
Koala Creek	0.15	0.0
Pinnacle	0.05	0.0
Norwood Creek	0.02	0.02

Southwest Queensland

Significant research work has been undertaken in the Mulga Lands bioregion, with a method for estimating koala abundance from faecal pellets developed and calibrated for the local conditions (Sullivan et al. 2002). In 1995 the koala population of the Mulga Lands was estimated at 59 500 (44 500 - 75 600 95% confidence limits) (Sullivan et al. 2004). Sullivan et al. (2004) also estimated a decline in koala numbers of approximately 10% due to land clearing in the preceding 30 years. During this survey a substantial proportion of koalas were in habitat on residual landforms away from riparian areas.

However, the climate in western Queensland is highly variable, with drought a characteristic feature of the region. More recently, the koala population in the region has been estimated, using the same methods as Sullivan et al. (2004), to be 29 050 (range 22 970-37 500), representing a decline of approximately 50% (Seabrook et al. 2010). Seabrook et al. (2010) also noted that they expect the decline in numbers to be a significant over-estimate for a sub-set of the region where they could not sample due to adverse weather. The koala distribution has contracted under drought conditions to the riparian areas, with very few koalas currently using the habitat on residual landforms as observed by Sullivan et al. (2004). Heavy rains occurred through much of the region in early 2010 and drought declarations for the region have been removed as at 31 July 2010 (Queensland Department of Environment and Resource Management 2010).

Southeast Queensland

Attempts to derive population estimates for the southeast Queensland region have been focussed particularly on the Koala Coast and Pine Rivers Shire (the latter now part of Moreton Bay Regional Council). The Koala Coast had an estimated 6246 (4802-7691 95% confidence limits) koalas in 1996-1999 (Dique et al. 2003a). That population had declined by some 65% to 2279 koalas in 2008 and was expected to fall further (Queensland Department of Environment and Resource Management 2009a). Pine Rivers Shire supported

approximately 4600 koalas in 2001 (Dique et al. 2003a) and this declined by 40% to less than 2700 koalas in 2008.

In the Gold Coast region the koala population was estimated at 4,724 koalas (4316 - 5131 (95% confidence limits)) in 2007 (Phillips et al. 2007). This estimate includes a population of 510 koalas (381 - 639) inhabiting the Coomera-Pimpama Koala Habitat Area where already approved development will see over a third of the resident koala population lost. Anticipated further development will see additional losses, while an escalation of associated threats (e.g. cars, dogs) will invariably lead to further population decline. The population is likely to be rendered unviable (in the absence of an assertive management response) once incidental mortality arising from the associated threats referred to above, exceeded 6% of total population size (Phillips 2007).

Koala populations in all SEQ coastal local government areas (Sunshine Coast; Moreton Bay; Brisbane; Redland; Logan; and Ipswich) appear to be following a similar downward trend to the Koala Coast and Pine Rivers populations, as evidenced by a rapid increase in the numbers of sick, injured and dead koalas, followed by a decline in koala numbers . Further north, koala populations are less well known, often becoming known as a result of development applications, but are generally considered to be at low density (<0.2 koalas/ha) (White et al. 2005; Queensland EPA 2006).

Australian Capital Territory

The koala population of the ACT is likely to be very small. There have been at least six introductions from Victoria but no large or dense populations have ever become established. There have been no reports of wild koalas following a bushfire in 2003 (Fletcher 2009 personal communication).

Overall synthesis of koala trends

The Committee acknowledges that there are substantial uncertainties in the estimates of koala population sizes and trends across the species' national range. While some regions or populations are very well studied, for many others there are few data or a lack of a baseline against which to formally evaluate population trends. Nevertheless, there is sufficient information to enable inferences to be made about some regional population trends, despite the inherent uncertainty in the data.

Estimates provide evidence of decline of Kangaroo Island's translocated population due to management intervention for habitat protection.

The major consideration in koala management in Victoria is the protection of habitat, and koala populations, from damage due to over-browsing. The Victorian government has devoted substantial resources to this issue and is achieving reasonable success across several populations. The koala population of Victoria can be considered to be broadly stable at the state level, although individual population trajectories may vary. The current koala population estimate of Victoria is significantly reduced from the numbers used in previous

assessments, but this is probably mostly due to a refinement of the method of population estimation and thus cannot be taken as evidence for a decline. Nevertheless, while stability of the population at the state level is assumed here, the Committee notes that high density populations of koalas at Otway Ranges and the Strathbogie Ranges are not currently subject to active management and remain vulnerable to over-browsing. Notwithstanding the above there are similar pressures on some Victorian koala populations associated with mortality caused by cars, dogs and urban development to those faced by koala populations in New South Wales and Queensland.

In New South Wales, no reliable overall state estimate is available. The New South Wales Koala Recovery Plan estimates the total number of koalas in New South Wales is between one to ten thousand but notes that there is considerable uncertainty about the total number of koalas in New South Wales (DECC, 2008). For populations in northern and central coastal New South Wales, the available evidence suggests ongoing declines in areas subject to developmental pressures. The evidence is via a combination of models suggesting decline is likely in recent years, incidental data on declines (e.g. care group reports) and reported failure of management measures. The exception to the coastal trend is the central coast region where small koala populations, such as Campbelltown, may be increasing slowly while others may be extinct (e.g. Pittwater).

The published estimate for the koala population of the Pilliga Forests, in the northwest of the koala's NSW distribution, is large and thus exerts a strong influence on the state trend. The 1998 estimate was approximately 15 000 koalas, and the Pilliga has since been subject to wildfire and severe drought, such that an extreme population decline has been reported.

These spot data do not include any estimates of the koala population in the extensive areas of National Parks and State Forest that lay astride the Great Dividing Range and adjoining lowlands from Goulburn to the Queensland border.

For koala population and trend estimate, Queensland is also problematic because of the koala's wide distribution to the north and west, and the lack of quantitative data in those regions. The sheer extent of the koala's distribution within the state, over several large bioregions, corresponds to a very large initial population at any reasonable measure of density. There are quantitative estimates at appropriate times for the Mulga Lands and South Eastern Queensland bioregions, but the remainder of the Queensland population must be estimated from land area multiplied by very localised estimates of koala population density. The Committee judges that a reasonable estimate baseline (i.e. 3 generations ago) figure for Queensland is approximately 300 000 koalas with a plausible range of 180 000 to 550 000. Because of the high relative size of the Queensland population, the trend in this state has a strong influence on the national trend.

There are limited direct data by which to evaluate the decline in the inland Queensland koala population. However, the following may be collated to provide an indication of the scale of decline. Population estimates over the Mulga Lands bioregion suggest a decline of 50% due principally to drought. The population at Springsure (Brigalow Belt North bioregion) has declined by up to 95% over a similar timeframe, and the Blair Athol population (Brigalow Belt North) is reported to have declined by an unspecified amount and breeding to have

ceased. Additional recent reports are of very low densities of koalas at Hughenden, Tambo (Mitchell Grass Downs bioregion) and Moorinya National Park (Desert Uplands bioregion), along with reports of extensive dieback of riparian koala food trees. Again this could be due to drought.

Tree dieback has also been reported over areas of the Brigalow Belt and this bioregion has been extensively cleared and the koala habitat fragmented. Additionally, there are some indications that the koala's distribution has contracted from the north and the west in Queensland. Cumulatively, these data present a strong inferential case for a substantial decline in koala numbers and question about the capacity for population recovery in the short to medium term. The Committee considers that these data are sufficient to infer a significant decline in the Queensland population.

Combining the estimated changes in koala populations has high degrees uncertainty associated with it. The Committee considers that the national population may have declined by about 30% over three koala generations. Despite this the Committee has considerable uncertainty that the figure it has reached and recommends that a final conclusion would require that critical data gaps are filled.

The Committee recommends that this could be achieved by giving urgent attention to koala population distribution and demographics in Queensland and New South Wales.

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

The koala is endemic to Australia. It has a widespread distribution in coastal and inland areas of eastern Australia, from north-east Queensland to Eyre Peninsula in South Australia. The koala's range extends over approximately 22^{o} of latitude and 18^{o} of longitude, and encompasses at least one million square kilometres (Martin and Handasyde 1999). The koala's distribution is not continuous across this range and it occurs in a number of populations that are separated by cleared land or unsuitable habitat (Martin and Handasyde 1999; NSW DECC 2008).

The Committee does not consider that the species' geographic distribution is both precarious for the survival of the species and very restricted, restricted or limited. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 2, it is **not eligible** for listing in any category under this criterion.

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

As described under Criterion 1, the koala population is greater than 200 000 individuals, with large populations in a number of locations over four states.

The Committee does not consider that the estimated total number of mature individuals of the species is very low, low or limited. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 3, it is **not eligible** for listing in any category under this criterion.

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

As described under Criterion 1, the koala population is greater than 200 000 individuals, with large populations in a number of locations over four states.

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

While there have been Population Viability Analyses conducted for individual populations (Penn et al. 2000; Lunney et al. 2002) there are insufficient data available to estimate a probability of extinction of the whole 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 koala has an extensive distribution that spans four states and the Australian Capital Territory. Collectively this represents an area of occupancy of over one million square kilometres. The status of individual populations varies across this range, but human impact pressures overall have increased over time and act to exacerbate the effects of, or impede the recovery from, natural pressures such as drought. Where koala habitat coincides with growing human populations and urban development, koala habitat continues to be cleared despite a range of preventative management measures, and koalas in remaining habitat areas continue to be vulnerable to threats from dogs, cars and disease. The extent to which these inland populations may recover from the most recent drought remains uncertain. The vulnerability of koala populations to these effects is increased by the loss of habitat due to clearing and the fragmentation this has produced in the landscape.

The koala population has undergone a marked decline over three koala generations, due to the combination of a range of factors. The Committee considers the koala to be potentially eligible for listing as vulnerable. However, as noted under Criterion 1, better demographic data are required to make this judgement with confidence.

12. Recommendations

The Committee recommends that the list referred to in section 178 of the EPBC Act not be amended at this time by including the *Phascolarctos cinereus* **(**koala) in the list in the Vulnerable category.

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

Chair

Threatened Species Scientific Committee

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Figure 1. Distribution of the koala and places named in the text of the nomination for listing as a threatened species under the *Environment Protection and Biodiversity Conservation Act (1999).*

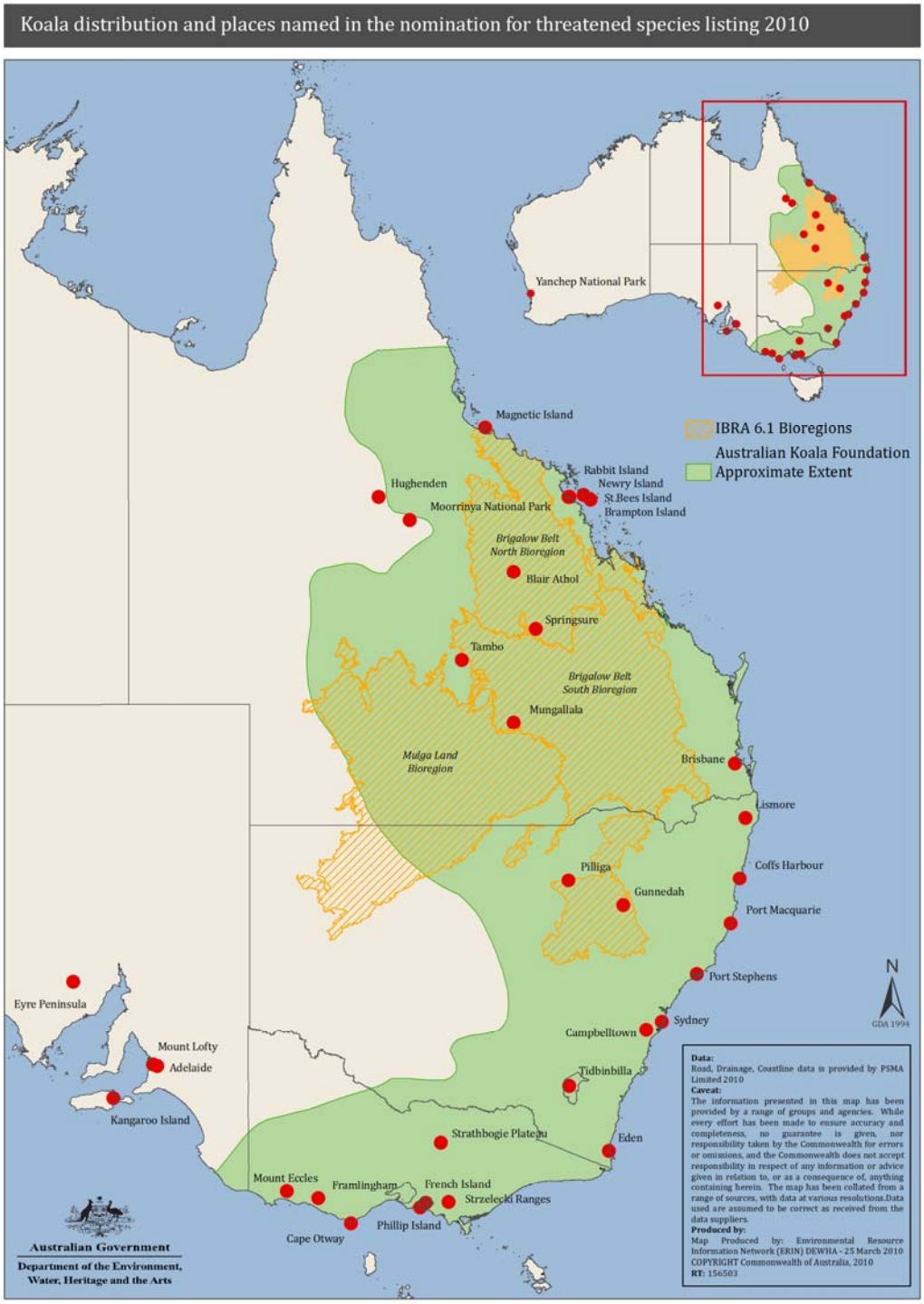

Figure 1. Distribution of the koala and places named in the text of the nomination for listing as a threatened species under the *Environment Protection and Biodiversity Conservation Act (1999).*

National Koala Conservation and Management Strategy 2009–2014

Endorsed by the Natural Resource Management Ministerial Council

ISBN: 978-1-921733-05-5

Natural Resource Management Ministerial Council (2009)
National Koala Conservation and Management Strategy 2009–2014
Department of the Environment, Water, Heritage and the Arts, Canberra.

Photo on front cover by Dan Lunney

The Natural Resource Management Ministerial Council (NRMMC) consists of the Australian state, territory and New Zealand government ministers responsible for primary industries, natural resources, environment and water policy.

Addresses of relevant government authorities may be found on the final page.

The strategy is based on the knowledge and technology available at the time of publication and may be varied over time in the light of new knowledge. Suggestions on how the strategy can be improved are welcome and should be forwarded to:

National Koala Conservation and Management Strategy Secretariat
Department of the Environment, Water, Heritage and the Arts
GPO Box 787
CANBERRA
ACT 2601

or by email to koala.strategy@environment.gov.au

First edition effective from December 2009.

This edition of the strategy will be reviewed in 2014.

Contents

Foreword

The koala attracts considerable public attention as an Australian icon and, through its appeal to international visitors, contributes significantly to Australia's tourism industry. The koala is also an important component of Australia's biodiversity, and its unique habitat supports a variety of other native species.

The koala has suffered declines due to the extensive habitat clearing and fragmentation which started with European settlement. Other threats to koalas have included hunting, disease, fire, drought and, more recently road deaths and predation by dogs. Despite considerable effort to conserve koalas, only hunting has been effectively eliminated as a threat. A growing additional threat is climate change. Not only will climate change have direct impacts on koala habitat, it may interact with other threats with unpredictable and potentially severe consequences for koalas. While the koala is not yet considered to be threatened with extinction nationally, there is no doubt that it is declining and the time to act, to ensure that this does not happen, is now.

Protecting and managing koalas today is a complex task. Much of their habitat occurs on private land where there are many competing land uses and the range of management issues is as varied and wide as the distribution of the koala. The need for a strategic approach to the management of koalas has become urgent to maximise the effectiveness of conservation efforts.

The 1998 National Koala Conservation Strategy identified the key threats to koalas, and the courses of action to be taken to tackle them. However, a review of the strategy, in October 2008, identified as its major limitation the lack of a clear process for implementing the actions. The 2009–2014 National Koala Conservation and Management Strategy includes an implementation plan, and a national implementation team has been established to coordinate the identified actions.

The new strategy takes into account the considerable amount of koala research, planning and management activity since 1998. For instance, the 1998 strategy makes no reference to climate change. Recent research has also shown that the relative importance of each threat differs from location to location. This requires local solutions, based on local studies and local plans, to manage individual koala populations across their extensive range. The task of this strategy is to give cohesion to all levels of activity, and acknowledge that there is no one universal solution for managing koalas.

Since 1998, national and state conservation efforts have increasingly focused on multi-species and landscape-scale protection and recovery. Protecting, restoring and managing koalas and their habitat will have significant benefits for a wide range of other species and ecological communities which also share the koala's habitat. This new strategy aims to integrate with, and complement, conservation efforts in all areas where the koala exists. Importantly, the koala can be a flagship with which to generate public support for these broader efforts.

Community ownership of this strategy will be vital for its successful implementation. Accordingly, public comment was sought on the draft revised strategy, and submissions were considered by the National Koala Conservation Strategy review steering committee in preparation of the final revised strategy.

This strategy was developed jointly by the Australian, state and territory governments through the Natural Resource Management Ministerial Council (NRMMC). It aims to provide a national framework for the conservation of koalas. The success of the strategy will hinge on the participation

of the community, conservation groups, industry and developers, local government authorities and researchers, working cooperatively with state and Australian Government authorities, using the attached implementation plan as a tool for coordinating action and monitoring progress. To help promote ongoing action and engagement of all stakeholders, the implementation team will meet regularly and report annually on progress. The Australian Government will take an important central role in coordinating and supporting the implementation team.

The new strategy will be formally reviewed after five years, to facilitate an adaptive approach to koala conservation management. The intention is to be proactive in koala conservation, as well as to be of sustained assistance to those who have the expertise, the commitment and the responsibility to manage our koala populations throughout their range.

The issue of culling was considered in the development of the strategy. Culling as a management tool was rejected by ministers in May 1996 and is not considered further here. Similarly, the deliberate introduction of *Chlamydia* to populations free of *Chlamydia* is not supported as a management tool for population control.

This strategy is an important step in mobilising coordinated action by the Australian Government, state and territory governments, local governments, local conservation groups, the rural community, wildlife carers and researchers everywhere.

1. Objectives

The National Koala Conservation and Management Strategy aims to conserve koalas by retaining viable populations in the wild throughout their natural range.

As part of this overall goal, the strategy identifies four broad long-term goals (1–4 below). The ability of the strategy to meet these outcomes will be demonstrated in the short term by measurable progress towards several short-term outcomes (5–9 below) that are key to producing the long-term outcomes.

Desired outcomes—long term (0–50 years)

1. *Koala populations in identified priority areas are stabilised or increasing.*[1]
2. *Overabundant koala populations are stabilised or reducing wherever they occur or arise.*[2]
3. *Threatened status of the koala at state and regional levels is reduced.*
4. *Koala remains nationally abundant and widespread, and is not nationally threatened.*

Desired outcomes—short term (0–10 years)

5. *Increased consideration of koala habitat demonstrated in development planning.*
6. *Greater area of high-quality koala habitat conserved and effectively managed through legislation, covenants or agreements.*
7. *Greater activity by land and resource managers to effectively protect and manage koala populations.*
8. *Increased community capacity to drive koala conservation and care.*
9. *Productive and integrated partnerships that foster the conservation and welfare of koalas.*

To achieve these short and long-term outcomes, the strategy will facilitate and coordinate delivery of the following major products and tools between 2009–2014:

Outputs (major products and tools to be delivered, 0–5 years)

A. Provide policy advice to ensure koala habitat is prioritised in land conservation and management initiatives (contributes to outcomes 1–4, 6–8).

B. Provide policy advice to guide the consideration of koala habitat in statutory planning strategies and applications (contributes to outcomes 1–4, 5, 7–8).

C. Develop a better understanding of koala population requirements and management responses, and maintain an information network to guide and assist planning, natural resource management processes, and other community and stakeholder activities (contributes to outcomes 1–9).

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1 Priority areas will be defined by the implementation team during implementation of several actions under the strategy.

2 In 2009 overabundant populations are identified in the following habitat areas: Victoria—Raymond Island, Snake Island, French Island, parts of the Otway Ranges, Framlingham, Mount Eccles National Park, Tower Hill Game Reserve; South Australia—Kangaroo Island and possibly the Adelaide Hills and Mount Lofty Ranges.

D. Facilitate high welfare standards for koalas kept in captivity or while under care and management (contributes to outcomes 8 and 9).

E. Recognise, motivate and commemorate koala conservation efforts (contributes to outcomes 7–9).

F. Develop and maintain productive, integrated partnerships to influence and achieve greater funding for outcomes (contributes to outcomes 7–9).

Appendix 1 outlines the actions that would need to be undertaken to deliver these outputs. Several actions may support more than one output. Appendix 1 also sets out the stakeholders, priority, and timelines for each action.

Appendix 2 contains a summary of actions.

These outcomes and outputs are not in order of priority. Each jurisdiction should assess the efficacy of the actions listed under each output according to their particular needs and situation. When developing management plans for the koala, each range state should liaise closely with the others to maximise cooperation and avoid duplication. In some cases additional funding and resources will be required to complete actions. Decisions about resourcing need to be made by jurisdictions bearing in mind the priorities identified in the strategy.

The strategy operates at several different geographic scales:

- At the national and state scale, the strategy provides a framework for coordinated cooperation and strategic action amongst the wide range of stakeholders in koala conservation. It sets priorities and focuses attention on the most important issues.
- The strategy also provides for the development of cost-effective tools to guide action at different scales.
- At the local scale, the strategy aims to improve the awareness of communities and authorities who live with koalas, and to provide relevant support and assistance for devising and implementing effective conservation actions.

1.1 Policy context

Koala conservation and management are influenced by a wide variety of cross-jurisdictional, Australian Government, and state and local government policies, regulations and programs. The strategy interacts with these policies and frameworks in a variety of ways.

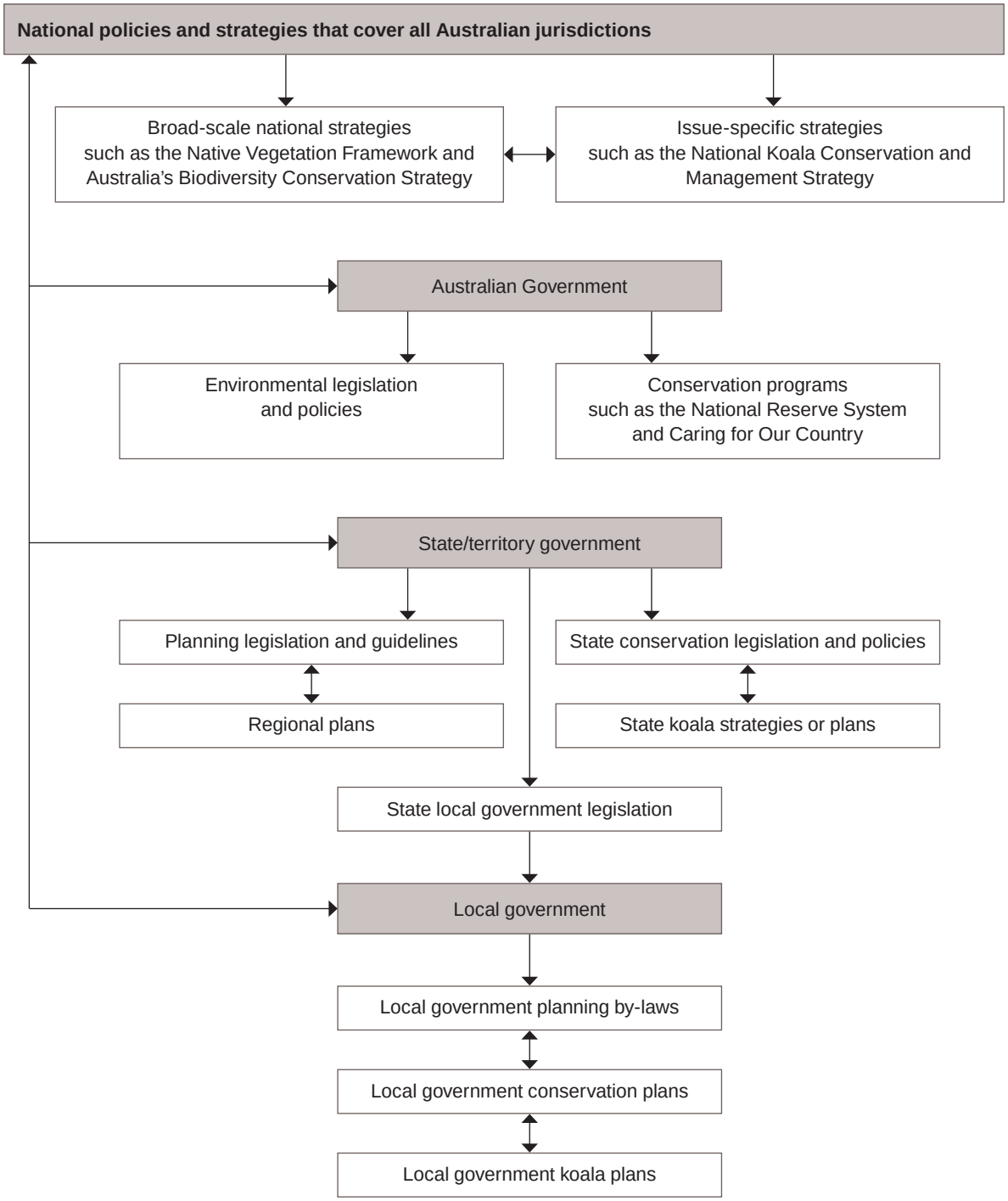
At the national scale, broad frameworks such as the National Biodiversity Conservation Strategy 2010–2020 and the Native Vegetation Framework, which are currently being revised, provide broad policy context for koala conservation. The strategy reflects a number of trends in national conservation that are outlined in these policies, such as encouraging conservation on a landscape scale, and ensuring the effects of climate change are taken into account in conservation planning. As many specific actions are also aligned, such as with the Native Vegetation Framework's goals of increasing the extent and improving the condition of native vegetation, there is scope for the strategies to support each other by explicit recognition of complementary activities.

The strategy also provides a national coordinating framework for many of the plans and actions that are already being undertaken by state and local governments to conserve and manage koalas. The National Koala Conservation and Management Strategy does not replace them, though in many cases it goes beyond what is already being done or provides a framework for incorporating current activities into broader national action. In addition to implementing the actions identified by this strategy

relevant to the jurisdiction, all states will implement their state plans in a way that is consistent with the national strategy.

Importantly, it should be noted that this strategy does not provide any legislative powers. It is a policy document that provides priorities and directions for action. Most regulatory control that affects koalas is at the state government level in the form of planning laws and regulations, and regional plans that set frameworks for development and conservation. These rules both enable and place limits on local government planning decisions. The integration of national and state koala policies with state and local regulatory decisions is a critical goal for conserving koalas and their habitat.

The diagram below illustrates these varied relationships:



2. Implementation, monitoring and review

The successful implementation of the strategy depends on sustained commitment by a variety of stakeholders, ongoing and timely exchange of information between managers, researchers, and community groups, and regular monitoring and reporting on progress to enable managers to alter their plans where required.

Stakeholders who will be involved in or responsible for actions under the plan include:

- Australian, state and local governments
- research scientists
- non-government organisations
- zoos and wildlife parks
- community groups, and
- individual members of the public.

Implementation of this strategy will have financial costs and benefits for governments, industry, business and the community, resulting in:

- increased costs resulting from improved measures to meet the objectives of this strategy
- lower costs over time because the future costs of koala conservation will be substantially reduced by timely investment in conservation measures, and
- benefits from the conservation of our natural and cultural heritage, including conservation of co-occurring species and ecosystems, sustainable land use practices and increased opportunities for ecotourism.

While there are already resources directed to koala conservation and management, resources will be required to implement this strategy. Resources from governments at all levels will be supplemented by ongoing and potentially increased commitments from community organisations, the private sector and philanthropists to assist the achievement of the strategy's objectives. Outcomes benefiting koalas may also be delivered through conservation activities that are undertaken for other species.

In implementing the strategy, there will be a need to ensure that attention is given to the most effective use of resources.

It is important that this strategy is reviewed in light of experience with its implementation and developing knowledge. A review including public consultation will be appropriate after the strategy has been implemented for a period of five years.

2.1 Implementation team and advisory group

Implementation team

Given the complexity of the conservation and management requirements of the koala, a cross-jurisdictional implementation team will be established to promote and coordinate the actions identified in the plan to achieve the goals of the strategy.

The implementation team will consist of Australian, state and territory governments (Queensland, New South Wales, Victoria, South Australia and the Australian Capital Territory) and will:

- promote action to achieve the outcomes of the strategy
- coordinate specific deliverables under the implementation plan
- disseminate information, new developments and research findings
- promote ongoing action and engagement of stakeholders
- report annually to the Natural Resource Management Ministerial Council on progress against performance targets
- provide these annual reports to the advisory group as well as other interested stakeholders and the public
- meet within six months of the commencement of the strategy, and
- discuss progress at least every 12 months by teleconference or in person.

Advisory group

The implementation team will consult with an advisory group which will consist of Australian, state and territory government members with direct involvement in koala conservation, in addition to a range of stakeholder groups that may include:

- local government
- non-government organisations including conservation groups
- researchers
- land and resource managers
- landholders/industry/developers
- Indigenous communities
- koala care groups
- veterinary organisations / animal hospitals, and
- any other appropriate group

The advisory group will:

- assist in delivering outcomes of the strategy by contributing on issues such as mapping standards, codes of practice and advising on research priorities
- consider annual reports on progress of the strategy
- promote ongoing action and engagement of stakeholders
- disseminate information, new developments and research findings to interested parties, and
- meet approximately every 12 months.

Operational arrangements

The implementation team will be established as an advisory body under the Natural Resource Management Ministerial Council (NRMMC).

Operational arrangements and composition of the implementation team will be determined by the Natural Resource Policies and Programs Committee before the implementation team's first meeting.

Operational arrangements and composition of the advisory group will be determined by the implementation team before the advisory group's first meeting, and will be reviewed after two years.

The implementation team and the advisory group will be supported by a secretariat, provided by the Australian Government.

The secretariat will arrange meetings of the implementation team and advisory group and coordinate reports to and from the implementation team, including annual performance reporting to NRMMC. On behalf of the team, and in conjunction with members tasked with particular duties, the secretariat will also coordinate many of the actions identified in this strategy, such as arranging workshops, and developing draft national guidelines. The implementation team will finalise papers and reports for approval or endorsement by NRMMC as required.

2.2 Evaluation

Progress will be monitored and evaluated annually by the implementation team. An independent external reviewer will be contracted to review and evaluate the strategy and its implementation within five years.

In delivering the actions set out in this strategy (such as developing guidelines for carers or research funding), it is anticipated that the implementation team will consider developing simple standard formats to facilitate collection of basic data to assist evaluation of actions and the strategy more generally (for example, number and health of animals cared for, location of capture, etc.)

Key performance indicators for the strategy include:

Desired outcomes—long term (0–50 years)

1. *Koala populations in identified priority areas are stabilised or increasing*

   Measure: Number and/or distribution of koalas in identified priority areas assessed, using accepted monitoring standards, at least every five years.[3]

2. *Overabundant koala populations are stabilised or reducing wherever they occur or arise*

   Measure: Number and/or distribution of koalas in identified overabundant populations assessed, using accepted monitoring standards, at least every five years.

3. *Threatened status of the koala at state and regional levels is reduced*

   Measure: Threatened status lower than in 2009.

4. *Koala remains nationally abundant and widespread, and is not nationally threatened*

   Measure: Koala does not meet national eligibility criteria for listing as threatened.

Desired outcomes—short term (0–10 years)

5. *Increased consideration of koala habitat demonstrated in development planning*

   Measures:

   - Increased percentage of local governments with koala habitat that have adopted koala planning guidelines in areas where koalas are threatened.
   - Increased percentage of planning decisions on koala habitat that take account of local koala planning guidelines.
   - Reduced percentage of planning decisions in which local koala planning guidelines are overruled.
   - Case studies of use of local koala planning guidelines.

3 Accurate population estimates are not possible in all habitat types.

6. *Greater area of high quality koala habitat conserved through legislation, covenants or agreements*

   Measures:

   - Number of hectares of high quality koala habitat conserved.
   - Number of hectares of high quality koala habitat cleared.

7. *Greater activity by land and resource managers to effectively protect and manage koala populations*

   Measure: Qualitative evidence of landholders and managers improving amount and quality of conservation and management efforts.

8. *Increased community capacity to drive koala conservation and care*

   Measures:

   - Funding received by community groups and non-government organisations for koala projects.
   - Extent and quality of information and guidance available to community groups.
   - Fewer incidents reported of carers not operating in accordance with the carers' code of practice.

9. *Productive and integrated partnerships that foster the conservation and welfare of koalas*

   Measure: Qualitative evidence of new or improved engagement between stakeholder groups.

Some of these measures may be addressed by alternative proxies or qualitative evidence where data is absent.

2.3 Reporting

The implementation team will report progress of implementation of the strategy to the NRMMC annually, including progress against the implementation plan and the key performance indicators.

Reports will be distributed to the advisory group and other key stakeholders, and will be made public.

3. Guiding principles

The objectives and actions that form this strategy were developed in the context of the following guiding principles consistent with the Intergovernmental Agreement on the Environment:

- The conservation of koalas should seek to complement existing strategies and to provide multi-species benefits, via integration with other measures to conserve Australia's biological diversity and to maintain ecological systems and processes.
- The principles of ecologically sustainable development should be followed, including □the precautionary principle', which in application means that decisions should be □guided by careful evaluation to avoid serious or irreversible damage to the environment, and by an assessment of the risk-weighted consequences of options'.
- Community input and involvement should be recognised as being crucial to the conservation of koalas.
- The strategy should build on the many existing local approaches that exist.
- Processes and decision-making at all levels of government should be efficient and transparent and provide for public participation.

4. Conservation Status

4.1 National context

Koalas formerly occurred throughout the broad band of eucalypt forest and woodland communities extending from north-eastern Queensland to the south-eastern corner of South Australia. After European settlement, clearing of habitat for agriculture in combination with hunting, disease, fire and drought resulted in a severe population decline. By the late 1930s they were considered extinct in South Australia and severe declines had occurred in New South Wales, Victoria and Queensland. However, in the late 1930s the fur trade ceased and state governments were introducing protective measures. Reintroduction programs, which moved koalas from colonies established on French Island and Phillip Island in Victoria, were used to re-establish koalas in their former range in Victoria and to a lesser extent in South Australia and the Australian Capital Territory. In South Australia, koala populations were reintroduced at various stages of the 20th century into regions outside of their original distribution: Kangaroo Island (1920s), Adelaide Hills (including escapees, 1930s to 1970s), Riverland (1960s) and Eyre Peninsula (1969).

Today, the regional conservation status of the koala varies from secure in some areas to vulnerable or extinct in others. In Queensland, they occur throughout most of their natural range, although the overall koala population continues to decline due to clearing and fragmentation of woodland and forest, ongoing drought and climate change. There is significant pressure from urban development on the koala in south-east Queensland, where it is listed as vulnerable by the state government. In some areas of south-east Queensland, such as the Koala Coast, koala populations are in sharp decline. In New South Wales, trends across the state are mixed—some populations on the New South Wales coast are declining (the population at Iluka became extinct in the 1990s), while some populations west of the Great Dividing Range have expanded. There are generally only transient animals occurring in the Australian Capital Territory, with very little of the area within the territory containing forest vegetation that is considered to be koala habitat. Koalas in Victoria occur over much of the southern and eastern lowlands and population densities are high in some areas (Raymond Island, Snake Island, French Island, parts of the Otway Ranges, Framlingham, Mount Eccles National Park, Tower Hill Game Reserve). Densities are lower in the dry forests and woodlands in northern parts of Victoria where the habitat is of lower quality. However, much of the habitat remaining in the state is fragmented and many populations are isolated. In South Australia, the koala is now found over a greater range and abundance than at the time of European settlement, because of introductions both within its natural range and areas where it did not occur naturally.

4.2 Australia

The legal status of the koala varies across Australia from secure to vulnerable, with different states affording the species different levels of significance and protection (Table 1).

The koala is not listed under the Australian Government's national environment law—the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The most recent assessment in 2006 by the Australian Government Threatened Species Scientific Committee found that, while the species was subject to a variety of threats and that some regional populations had declined significantly, the koala did not meet the criteria for listing at the national level under the EPBC Act. However, the conservation status of the koala under the EPBC Act is due to be reassessed by 30 September 2010.

The population of koalas in the Koala Coast area of south-east Queensland has been nominated for listing under the EPBC Act.

4.3 Queensland

In Queensland, the koala is listed as vulnerable wildlife throughout the south-east Queensland bioregion, and least concern wildlife elsewhere in the state under the *Nature Conservation Act 1992*. The population of koalas in the Koala Coast area of south-east Queensland has been nominated for listing as endangered wildlife under the *Nature Conservation Act 1992*. The koala is a protected species in Queensland and cannot be taken, used or kept without a permit. In addition, the legislation acknowledges the cultural significance of the koala and requires that government agencies consider the management measures necessary to conserve existing koala populations.

In 1994, the Queensland Government approved the five-year Koala Coast protection plan, which included a comprehensive research and monitoring component. The first koala state planning policy was put in place and subsequently revised in 1997.

In 2006, the Queensland Government implemented the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006–2016 (koala plan). The operation of the koala plan was reviewed by the Queensland Government in late 2008 in response to the crisis in koalas in south-east Queensland.

A report by the Queensland Department of Environment and Resource Management released in May 2009 described a continuing substantial decline in the numbers of koalas in the Koala Coast area of Brisbane. Significant declines have also been recorded in other parts of south-east Queensland, such as the former Pine Rivers Shire (now part of Moreton Bay Regional Council).

These ongoing declines have led the Queensland Government to take urgent action via the Koala Crisis Response Strategy released in December 2008, including the possible reconsideration of the legislative status of the koala in the south-east Queensland bioregion. The legislative and regulatory approaches to koala conservation in south-east Queensland have been evolving rapidly, and will likely change soon with the release for public comment of a new draft koala planning instrument.

At the time of writing, the Queensland Government has:

- completed comprehensive mapping of koala habitat values across the south-east Queensland region to inform strategies targeted at stabilising and recovering the koala population. The koala habitat value map was recognised with an Industry Award in September 2009 at the Queensland Spatial Excellence Awards
- begun the development of a state planning policy (public consultation started 1 July 2009) for koala conservation, intended for implementation in late 2009
- implemented interim south-east Queensland koala state planning regulatory provisions concerning assessment of proposed developments, including the clearing of habitat, within interim koala habitat protection areas in south-east Queensland (these provisions expire on 28 February 2010). It is expected that the new koala planning instrument will be in place before expiry of the state planning regulatory provisions
- revised the South East Queensland Regional Plan (2009–2031) to incorporate additional measures for koala conservation, including the removal of 900 hectares at Thornlands and southern Redland Bay from the South East Queensland Regional Plan Urban Footprint in July 2009

- implemented a freeze on the disposal and clearing of state-owned land in south-east Queensland not needed for urgent social infrastructure until an assessment is made of the koala habitat values on each site, and
- significantly expanded, since December 2008, the number of national parks and other protected areas. In this time, more than 87,000 hectares has been added to the protected area estate, in turn providing protection for more than 52,000 hectares of koala habitat in south-east Queensland.

It is anticipated that the koala state planning policy will include:

- new koala habitat statutory maps, based on the Queensland Department of Environment and Resource Management's latest koala habitat map
- new development codes to better protect, maintain and improve the integrity of koala habitat and promote a more consistent approach to development assessment
- a focus on securing and rehabilitating koala habitat areas outside south-east Queensland's urban footprint, and
- guidelines to assist state agencies and local governments in their strategic planning, particularly the planning of new urban communities.

4.4 New South Wales

In New South Wales the koala is listed as vulnerable under the *Threatened Species Conservation Act 1995*. Two populations are listed as endangered: one in the Hawks Nest and Tea Gardens area of Great Lakes local government area, and one in the Pittwater area of Warringah local government area.

As with all native animals, the koala is a protected species in New South Wales under the *National Parks and Wildlife Act 1974* and cannot be harmed or possessed without authority. Controls are also in place under the *Native Vegetation Act 2003* and the *Environment Planning and Assessment Act 1979*, including the subordinate planning instrument State Environmental Planning Policy No. 44—Koala Habitat Protection.

In November 2008, the then Minister for the Environment and Climate Change, the Hon. Carmel Tebbutt, released a state-wide recovery pan for the koala. The plan was prepared by the New South Wales Department of Environment and Climate Change (now the New South Wales Department of Environment, Climate Change and Water). The recovery plan outlines actions necessary to aid the recovery of koala populations and provides a framework for local koala recovery efforts throughout the state. This plan is consistent with the National Koala Conservation and Management Strategy.

The New South Wales Department of Environment, Climate Change and Water has undertaken a statewide survey of koalas, published in 2009. This work is a precursor for further studies on:

- population dynamics that will look at koala populations, their rates of breeding, causes of mortality, home range sizes and movements across the landscape, habitat selection, tree selection, and assessment of threats in each location, and
- auditing previously implemented recovery actions in order to tailor future state programs to be more effective.

The New South Wales Government has added significant koala breeding habitat to the reserve system, including areas at Wedderburn (Dharawal Nature Reserve), Pilliga (Pilliga Nature Reserve), several reserves in the Brigalow Belt South area, Port Stephens (Tilligerry State Conservation Area), and Dorrigo (New England National Park). It has implemented cooperative, cross-tenure dog control for koala populations susceptible to dog attack including targeted control at a major population on the Tilligerry Sandbeds.

4.5 Victoria

In Victoria, the koala is listed as other protected wildlife under the *Wildlife Act 1975* which controls the possession of, trade in and research into native fauna through licensing and permits. The koala is not listed under the *Victorian Flora and Fauna Guarantee Act 1988*, which provides schedules of threatened species, communities and potentially threatening processes and has the conservation of Victoria's native flora and fauna as its main objective. The Victorian Department of Sustainability and Environment released Victoria's koala management strategy in September 2004. The strategy was intended to sit under the 1998 National Koala Conservation Strategy and to provide guidance towards achieving the aim of the national strategy and meeting its objectives in Victoria.

4.6 South Australia

In South Australia, the koala is protected under the *National Parks and Wildlife Act 1972*, which allows for the protection of habitat and wildlife and provides for the use of wildlife through a system of permits allowing certain actions (that is, keeping, selling, trading, harvesting, farming, hunting and the destruction of native species). The koala was listed as rare, but was de-listed in 2008.

4.7 International

The koala is listed as 'of least concern' on the *2008 IUCN Red List of Threatened Species* (IUCN 2008).

The United States Fish and Wildlife Service listed the koala as threatened on the United States *Endangered Species Act* in May 2000. In their ruling, they stated that 'the eucalyptus forest and woodland ecosystems on which this arboreal mammal depends have been greatly reduced [and] the limited koala habitat continues to deteriorate'. The listing requires that United States federal agencies consider the impact of their actions on the koala and prohibits commercial activity or trade in koalas by the United States, except under a threatened species permit. The listing of the koala on the United States *Endangered Species Act* does not influence the legislative responsibilities of the Australian, state or territory governments with respect to koala management and conservation. However, it does demonstrate the international interest in, and concern for, the koala.

Table 1: Legal status of the koala throughout its range in Australia

State/territory	Legislation	Status of koala
Australian	*Environment Protection and Biodiversity Conservation Act 1999*	Not listed
Queensland	*Nature Conservation Act 1992*	Vulnerable in South-East Queensland Bioregion Least concern (common) elsewhere
New South Wales	*Threatened Species Conservation Act 1995*	Vulnerable Two populations listed as endangered
	National Parks and Wildlife Act 1974	Protected
Australian Capital Territory	*Nature Conservation Act 1980*	Not listed
Victoria	*Wildlife Act 1975*	Protected wildlife
	Flora and Fauna Guarantee Act 1988	Not listed
South Australia	*National Parks and Wildlife Act 1972*	Protected Not listed as threatened

5. Species information

5.1 Description

The koala (*Phascolarctos cinereus*) is the sole member of the family Phascolarctidae. It is an arboreal marsupial with large furry ears and a vestigial tail. Its fur colour varies from pale grey in the northern parts of its range to grey-brown in the south. The koala also varies in size across its latitudinal range, from an average 6.5 kilograms in Queensland to 12 kilograms in Victoria. Male koalas can weigh up to 50 per cent more than females. Detailed accounts of the koala can be found in Cronin (1987), Lee and Martin (1988), Phillips (1990), Martin and Handasyde (1999), Jackson (2007) and Moyal (2007).

5.2 Taxonomy

Three 'races' or subspecies of *Phascolarctos cinereus* were proposed by early taxonomists, based on differences in the species' morphology across its geographic range: *Phascolarctos cinereus adjustus* (Thomas 1923) in Queensland, *P. c. cinereus* (Goldfuss 1817) in New South Wales and *P. c. victor* (Troughton 1935) in Victoria. However, analyses by Houlden et al. (1999) found relatively low levels of genetic differentiation among the proposed subspecies, which suggests that physical variations across the species' range may reflect adaptations to different climates, rather than separate subspecies.

5.3 Distribution

The koala occurs in eastern Australia, from north-eastern Queensland to south-eastern South Australia and to the west of the Great Dividing Range (Figure 1). Historically, koalas had a largely continuous distribution throughout much of coastal and inland Queensland and New South Wales, throughout the majority of Victoria and in the south-eastern portion of South Australia. However, as a result of habitat loss, drought, hunting and disease, koala populations rapidly declined and by the 1930s koalas were present in less than 50 per cent of their previous distribution. There was a decline in Queensland and observers at the time considered that small remnant populations remained in New South Wales, few animals remained in Victoria, and in South Australia koalas were considered extinct.

Koalas have since returned to many parts of their former distribution—in Queensland from a natural recovery, and in Victoria and South Australia as part of active re-introduction programs from island populations. In the latter states the species now occurs in areas where it was not recorded historically, such as Kangaroo Island, Adelaide and Mount Lofty Ranges, Eyre Peninsula and the Riverland. The apparent success of these re-established populations is tempered by unforeseen problems of over-browsing and of low genetic diversity leading to inbreeding depression.

The koala now has a fragmented distribution throughout eastern Australia, from north-eastern Queensland to the Eyre Peninsula in South Australia, and inland into the eastern margins of the arid zone of New South Wales and Queensland. In South Australian there remains a small breeding population on the Eyre Peninsula, from koalas introduced in the 1960s. There are also introduced and breeding populations in the Adelaide Hills/Mount Lofty Ranges, the Riverlands, and in the lower south-east. Some of these were established from koalas relocated from Kangaroo Island and have been demonstrated to have high levels of inbreeding associated with morphological abnormalities.

About 300 local government areas and more than 30 catchment management authorities/regional natural resource management bodies are responsible for planning decisions affecting koalas within their geographic range. The map below provides a general indication of the range of the koala and demonstrates that many jurisdictions need to be involved in koala conservation and management. This map is not intended to reflect the exact distribution of the koala.

Figure 1: Indicative range of koalas in 2005

(Source: Planning guidelines for koala conservation and recovery, McAlpine et al. 2007)

5.4 Population

Deriving reliable broad-scale koala population estimates remains very difficult, so the national population of the koala remains unclear at this stage.

Reliable population estimates are possible for specific areas at smaller scales, but usually come at significant cost. As such, the level of survey effort and precision should be evaluated on a case-by-case basis relative to the management need for precision and the priority of decisions or actions based on those data. A range of suitable sites from different regions could be selected for ongoing monitoring purposes in conjunction with the strategy. At a national level, it may be more realistic to estimate the extent of habitat loss, fragmentation and modification and declines in distribution as indicators of koala population declines rather than population size *per se*.

6. Threats and management issues

6.1 Habitat loss, fragmentation and degradation

Loss of habitat is the major threat to the koala in Queensland and New South Wales, and is the primary factor responsible for declining populations in those states. This continuing problem, which results mainly from clearing or fragmentation of forest and woodland, must be addressed.

Clearing is mainly associated with urban development in coastal regions and agricultural development (cropping and pastures) in inland regions, resulting in incremental loss and fragmentation of remaining koala habitat. Habitat loss is the most significant cause of koala population declines and reductions in long-term population viability. Fragmentation effects due to the linear infrastructure (roads, railways, powerlines) bisecting habitat may also be significant, even with relatively minor loss of habitat area.

Under the strategy it is a high priority to identify important habitat areas and protect them from clearing, through planning and legislative tools and other measures such as covenanting. Important habitats may have different features in different areas. High-quality habitat may include both bushland and urban areas. In addition, important habitat may include corridors of relatively lower-quality habitat which enable movement between other higher quality areas. Where clearing is unavoidable, it is vital to put in place meaningful conservation offsetting measures to effectively protect and restore other suitable habitat areas. However, it is imperative that all other options are explored to avoid and mitigate impacts on koala habitat before any resort is made to offsets. It is important to consider that there is a significant lag-time before successfully replanted habitat can support koalas.

Degradation of habitat can result from: some logging regimes; thinning of timber during property development; destruction of undergrowth and mid-storey shelter trees; and other disturbances, such as regular burning, excessive nutrient input or the introduction of weeds. Degraded habitats are capable of supporting fewer koalas than undisturbed habitats.

Healthy ecosystems provide a broad range of biodiversity benefits, so protecting and restoring natural habitat is essential not just for koalas but also for a wide range of other species that depend on these habitats. Habitat conservation efforts often take place at a multi-species or landscape scale, and efforts to address koala habitat should be integrated into these approaches wherever possible to achieve maximum benefit for koalas and other species and ecological communities.

6.2 Over-browsing

Where koalas have been introduced to islands, fragmented habitat, or outside their natural range—such as has occurred in areas of Victoria and South Australia—koalas may reach high densities and over-browse their food trees. Severe reductions in available food resources can in turn lead to starvation, suffering and death. Unsustainable over-browsing can also lead to ecosystem damage and jeopardise vegetation conservation. The impacts of over-browsing have been an important issue at some Victorian sites for more than 85 years and continue to be an ongoing problem in parts of Victoria and South Australia (see sections 4.1 and 5.3). Koalas were also introduced to islands in Queensland (for example Saint Bees) but have not reached the densities seen on southern islands. The reasons for the differences are not well understood.

6.3 Natural disasters

Natural disasters such as fire and drought affect koala populations both directly and indirectly. Hot crown fires can cause high numbers of koala mortalities, as well as destroy habitat or reduce it to remnant patches. However, if there are unburnt refuge areas, nearby populations may survive fires and recolonise habitat as vegetation recovers. Droughts can also cause high rates of mortality, and may have a greater impact on young koalas, especially in semi-arid and arid regions. If a natural disaster such as a drought occurs over an extended time the impact on the population will be even greater. The impact of natural disasters such as fire and drought is exacerbated by fragmentation of habitat and may also be influenced by climate change.

6.4 Disease

The most significant diseases in wild koalas are associated with chlamydial infections. Many koalas appear to carry *Chlamydia* without showing clinical symptoms. Eye or urinary tract infections due to *Chlamydia* may become apparent as overt diseases when an animal is subject to additional stress. Infection of the reproductive tract by *Chlamydia* may lead to female infertility, which may reach sufficiently high levels to cause a marked depression of the reproductive rate in the population. This may be an issue of particular concern in small, isolated populations. However, some isolated populations with *Chlamydia* also reach over-abundant levels. For example, koala populations at Raymond Island, Snake Island and Mount Eccles National Park are *Chlamydia* positive but have grown to such an extent that they have outstripped their food supplies. Other diseases also affect wild koala populations, such as the koala retrovirus. The extent, impact and possible treatment of these diseases are poorly understood at present and require further study.

The frequency of severe cases of disease in healthy koala populations is usually low, and thus does not normally threaten the survival of koala populations; however, further research is required on the potential impacts of some diseases. Vulnerability to disease may itself be an indicator of problems such as nutritional or environmental stress.

The low genetic variation found in koalas in some locations may exacerbate the risk of disease. If a new disease risk arises in such populations, low genetic variation means that a high proportion of individuals may be vulnerable to the disease.

6.5 Vehicle collisions

Injury and death of koalas due to road vehicle collisions is a problem throughout their range, particularly in urbanised areas where roads intersect koala habitat. The extent of the problem depends on the abundance of the population in the area, the frequency with which koalas cross roads, provisions for koalas to cross and on the traffic volume, road width and other attributes of the road. The problem is accentuated when koala populations occur close to roads that carry high volumes of traffic travelling at high speeds. The problem of vehicle collisions is usually a result of poor planning and road design (for example, placing new roads too close to koala habitat) but may also result when koalas are resident in urban areas, or disperse into them from adjacent forest.

6.6 Predation by dogs

Dog attacks primarily occur mainly where koalas use habitat in urban areas, on small rural holdings close to urban centres and in semi-urban and rapidly urbanising areas. They also occur in the wider landscape in areas such as national parks, reserves and on a range of rural holdings. The problem is exacerbated when dogs have the opportunity to form pairs or packs, when dogs can roam widely outside their home properties and where large and aggressive breeds are common. Dog attacks commonly result in stress, injury or death to koalas.

6.7 Climate change

The impacts of climate change on koalas are already apparent, particularly in western Queensland and New South Wales. They include:

- changes in the structure and chemical composition of koala food trees
- changes in the composition of plant communities and the range of important habitat species, including food and shelter trees
- increased frequency and intensity of drought
- increased frequency and intensity of wildfire
- sea level changes which may affect the habitats of coastal and island populations
- changes in average temperature, rainfall and humidity levels with consequent impacts on the extent of areas capable of sustaining koalas, and
- contractions in the distribution of koala populations.

Climate change is likely to compound existing stresses of habitat loss and fragmentation, leading to higher risks from disease, and may also increase the risk of injury by dog attacks and vehicles as koalas move across the landscape in search of food.

Appendix 1: Implementation plan

The following implementation plan sets out the key actions that will need to be carried out to deliver the major products and tools (outputs) under the strategy. Some actions contribute to more than one output.

The koala has received significant attention from managers, conservation groups, the general public and the research community. Consequently, most of the problems facing koalas are well known, and critical actions at a coarse scale are readily identified, if not always easily implemented. For example, the loss of habitat is widely accepted as the major threat to koalas and the broad solution, prevention of further clearing, is clear. However, this has been difficult to achieve in the past given the diverse and substantial pressures from human activity. Further action is required and innovative solutions need to be developed, requiring action by stakeholders from all sectors.

Given the diversity of the potential actions, it is important to develop national priority areas and decision-making tools early in the life of the strategy to guide its further development and implementation. Enacting these will require building or further strengthening partnerships between government and other stakeholders in landscape conservation, and with the community. There is also a need to continue to acquire new knowledge about koalas and their problems via research and monitoring to monitor trends, extend knowledge of lower priority areas and improve feedback between management and monitoring and research to further develop capacity for adaptive management.

Category 1 Habitat identification and protection

Habitat loss and fragmentation is the primary threat to koalas in key parts of their range (for example south-east Queensland). In such key areas, there is enough information to enact quickly measures to conserve koalas, and these should be taken as a matter of urgency. The pressure is immediate and the context well enough known that the opportunity cost of waiting for more research is too high, and appropriate direct action can be taken. However, monitoring may still prove to be valuable, as a means to evaluate the success of steps taken with a view to adapting management to changing circumstances. Similarly, as these populations may constitute a significant proportion of the national population, such monitoring will prove valuable to future assessments of the koala's status at all levels (regional to national).

In other parts of their range, such as where human population and development pressure is lower, there has not been the impetus to collect the data on distribution of koalas and their habitats. In these cases it is appropriate to undertake further survey effort in anticipation of the development of habitat protection actions.

These actions also need to incorporate the multi-species approach to habitat protection. Koalas occur in a variety of habitats and usually require large areas of contiguous habitat to sustain viable populations. Consequently, incorporation of koala habitats into planning for conservation of other species, and vice versa, can be beneficial for both. We identify this as a specific action as it is a recognised priority approach to reserve planning and conservation action at all levels of government.

Action 1.01 Incorporate koala habitat conservation into existing multi-species or landscape scale conservation programs.

- Department of the Environment, Water, Heritage and the Arts and states to conduct GIS (Geographic Information Systems) analysis of overlap of koala distribution with known distributions of other threatened species and communities to identify areas where maximum conservation value can be achieved via land protection.
- Discuss above analysis with managers of relevant national, state and local organisations and programs to develop priorities for land acquisition/assignment to benefit koalas and other species, consistent with the principles of those organisations and programs.
- Revision after five years to incorporate new knowledge of species and community distributions.
- Should refer to outcomes of Action 1.04.

Relates to: Outputs A, B, C.

Stakeholders: Australian, state and territory governments, local government, catchment management authorities and regional bodies.

Priority: 1

Time scale: 1–2 years; review after 5 years.

Action 1.02 Assess, develop and implement options for protecting priority koala habitat on public lands using legislation, covenants or agreements, or by new acquisition of koala habitat.

- Includes working with local government to incorporate koala conservation into planning processes.
- Includes acquisition of koala habitat by governments for conservation

Relates to: Outputs A, B, C.

Stakeholders: State and territory governments, local government.

Priority: 1

Time scale: 1–2 years for guidelines/process to be rolled out, 5 years for implementation, then review.

Action 1.03 Assess, develop and implement options for protecting koala habitat on private lands.

- Develop incentive-based mechanisms for koala conservation on private lands.
- Implement incentive-based mechanisms for koala conservation on private lands.
- Establish covenants over koala habitat via cooperation with local government, community and business.

Relates to: Outputs A, C, E, F.

Stakeholders: Australian, state and territory governments, local government, individuals.

Priority: 1–2

Time scale: 1–5 years, then review.

Action 1.04 Prioritise conservation of populations under immediate pressure.

- Workshop of experts to identify where existing koala populations are already experiencing significant loss of habitat and to identify immediate and short-term actions to secure their status.

Relates to: Outputs A, B, C.

Stakeholders: Australian, state and territory governments.

Priority: 1

Time scale: 6–12 months.

Action 1.05 Revegetate habitat to facilitate natural dispersal and reduce fragmentation effects.

Fragmentation, or the loss of connection between habitats, exacerbates the overall problem of habitat loss. A single large patch is likely to support more animals than two smaller patches with the same total area. This is particularly the case when the smaller patches are slightly below the threshold size required to maintain a viable population. Thus re-connection of existing habitat fragments via revegetation may enable recolonisation and persistence of koalas where this is currently not possible.

Such actions may not be appropriate where koalas are beyond their natural range (for example, parts of South Australia) such that dispersal may extend their range further into habitats never previously occupied by koalas.

It is important to consider that there is a significant lag-time before successfully replanted habitat can support koalas.

In future, when the impacts of climate change are better understood, it may be appropriate to identify key areas for revegetation that would enable koalas to extend their range as habitats change.

- Assess and develop options to revegetate priority habitat areas.
- Assess and develop options to ensure that vegetation planted under proposed carbon storage schemes contributes to the re-establishment of koala habitat.
- Implement revegetation programs.

Relates to: Outputs A, B, C, E, F.

Stakeholders: Australian, state and territory governments, local government, community groups, individual landholders.

Priority: 1–2

Time scale: 1 year to develop, 5 years to implement, then review.

Action 1.06 Develop standard monitoring/habitat assessment protocols.

There is some inconsistency and disagreement over how koala populations should be surveyed and mapped.

- Develop consistent protocols that enable population numbers or density to be compared between the same place at different times and between different habitats.

Relates to: Outputs A, B, C.

Stakeholders: Australian, state and territory governments, local government, researchers

Priority: 1

Time scale: 6–18 months.

Action 1.07 Establish a national database of koala population distribution and density and habitat mapping data.

To facilitate appropriate planning at all scales, it is most appropriate that all data reside in, or be accessible from, a central repository that can be accessed by relevant authorities for their needs, bearing in mind confidentiality of some unpublished data.

- Coordinate and analyse results and report to improve management strategies.

Relates to: Outputs A, B, C

Stakeholders: Australian, state and territory governments, researchers, koala carer groups.

Priority: 2

Time scale: 1–5 years.

Action 1.08 Establish or continue surveying and monitoring programs.

Monitoring fulfils two important functions: evaluating population status so that the relative need for management can be assessed; and evaluating population trends so that the efficacy of management actions can be assessed. The scale at which these are undertaken must be appropriate to the scale of management.

- Continue monitoring of populations for which there are existing long term data. In many cases these are large or important populations, so provide information on their own individual status, but in combination are also useful for evaluating status at a larger scale.
- Extensive less-detailed monitoring. At the scale of the koala's range, intensive monitoring is too expensive and laborious to be feasible. Thus, for matters at larger scales survey intensity may be reduced.
- Explore feasibility of developing guidelines for local scale monitoring, and develop guidelines if appropriate.

Relates to: Outputs A, B, C.

Stakeholders: Australian, state and territory governments, local government, researchers.

Priority: 1

Time scale: Identify programs for continued support or additional work: 2 years.

Action 1.09 Incorporate causes of habitat loss or degradation, other than land clearing, into planning for koala habitat conservation.

While land clearing clearly leads to the unambiguous loss of koala habitat, a range of other processes may lead to the loss, or severe degradation, of habitat. Developing an understanding of how these will develop in the future, and incorporating this in reserve planning will be critical to long term success. These include, but are not limited to:

- climate change
- fire, and
- drought.

While the impacts of these threats are by their nature unpredictable, some immediate actions can be taken, as the impacts will manifest by reducing habitat quality, the effects of which will be strongest at the margins of their range. This places additional emphasis on the need to identify and protect high

quality habitat (Actions 1.01–1.05) in all parts of the range (for example, riparian zones in arid areas). Future research can help to refine this precautionary approach (addressed at Category 6).

Relates to: Outputs A, B, C, E, F.

Stakeholders: State and territory governments, local government, community groups.

Priority: 1–3

Time scale: 1 year to integrate, review after 5 years.

Category 2 Over-browsed habitats

In parts of their range, notably in locations in Victoria and South Australia, koala populations have reached very high densities, and have exceeded the carrying capacity of their habitats. At the extreme, this can lead to loss of browse trees and consequent habitat degradation and to suffering or death of individual koalas. To date, efforts to tackle this problem have included translocation of individuals to new areas and sterilisation to reduce reproductive capacity of the population. Translocation is expensive, and much of the available koala habitat in Victoria and South Australia now contains koalas. There can be no guarantees that individual koalas will adjust well to a new habitat. Additionally, some translocated populations have also become overabundant and many are derived from only a few individuals, and thus have very low genetic variation.

Action 2.01 Continue and refine management programs to regulate koala density to a level below that which causes severe tree defoliation.

Relates to: Outputs A, B, C.

Stakeholders: Australian, state and territory governments, local government, community groups.

Priority: 1

Time scale: 1–5 years.

Action 2.02 Identify potential problems at an early stage through regular assessment of koala abundance and the extent of crown defoliation of preferred food tree species.

Relates to: Outputs A, B, C, E, F.

Stakeholders: State and territory governments, community groups, individual landholders.

Priority: 1

Time scale: 1–3 years.

Action 2.03 Develop and adopt national translocation guidelines for translocation of koalas for introduction, reintroduction and supplementation, and for management of overabundant populations.

These guidelines will include consideration of the welfare of koalas which are handled during management actions covered by the guidelines.

The development of new national guidelines would need to take account of any existing guidelines such as those adopted by state governments, and those prepared by the International Union for the Conservation of Nature.

Relates to: Outputs A, B, C, E.

Stakeholders: Australian, state and territory governments, local government, koala carer groups.

Priority: 5

Time scale: 1 year.

Category 3 Direct mortality of individual koalas

Even in areas where high quality habitat is available, koalas may be threatened by factors that cause the death of individuals, and which may threaten the viability of a population if this mortality exceeds the reproductive capacity of the population. These factors include death by vehicle collisions, predation by dogs and disease. Unfortunately, habitat loss and degradation often coincide with the above factors, and each may exacerbate the other. As these threats are more specific, they can also be addressed more specifically.

Action 3.01 Develop appropriate national guidelines for road design in koala habitat.

The development of new roads through koala habitat should be avoided where possible.

The development of new national guidelines for road design in koala habitat would need to take account of existing research and national, state and local government guidelines. These would need to assess the viability and effectiveness of measures including, but not limited to, speed limits, overpasses, culverts and exclusion fences. Guidelines should also address retrofitting of existing roads in koala habitat.

Relates to: Outputs A, B, C, F.

Stakeholders: Australian, state and territory governments, local government, community groups, individuals.

Priority: 1–3 (varies by region).

Time scale: 5 years, then review.

Action 3.02 Implement strategies which minimise the impacts of dogs on koala populations.

Relates to: Outputs B, C, D, E, F.

Stakeholders: State and territory governments, local government, community groups, individuals.

Priority: 1–3 (more important in urban areas).

Time scale: 5 years, then review.

Action 3.03 Assess and develop appropriate methods to reduce vulnerability of populations to disease.

Relates to: Outputs C, D, E, F.

Stakeholders: Research agencies, universities, Australian, state and territory governments.

Priority: 2

Time scale: 5 years.

Category 4 Community involvement

The koala is an Australian icon and engenders much public support for conservation effort. This enthusiasm for the species can be harnessed to provide a powerful tool to bolster many of the actions listed elsewhere in this implementation plan. The public can provide information useful for monitoring, be active in on-ground action for both habitat maintenance and restoration, assist in rescue of injured or sick animals and lobby government and industry groups to support koala conservation measures.

Action 4.01 Provide extension and advisory services to encourage retention and restoration of koala habitat and to encourage management practices on private land which are not harmful to koalas or koala habitat.

Relates to: Outputs A, C, E, F.

Stakeholders: Australian, state and territory governments, local government, community groups, businesses.

Priority: 2

Time scale: 1–3 years.

Action 4.02 Develop and distribute educational material.

Includes supporting and building on existing community, and state and local government information to develop and distribute comprehensive national information resources to promote better understanding of the koala, its status, and actions needed for its recovery.

Relates to: Outputs C, E, F.

Stakeholders: Australian, state and territory governments, local government, non-government organisations, koala carer groups, zoos, ecotourism operators.

Priority: 3

Time scale: 2–3 years.

Action 4.03 Extend community involvement in koala conservation and engagement with government.

This includes developing and maintaining productive, integrated partnerships to influence, and achieve greater funding for, actions, particularly with community groups, the private sector and philanthropists.

Relates to: Outputs C, E, F.

Stakeholders: Australian, state and territory governments, local government, non-government organisations, community groups, private sector, philanthropists.

Priority: 1

Time scale: Ongoing: 1–3 years to establish.

Category 5 Caring for koalas in captivity

Koalas may be held in captivity for several reasons. They may be held for short periods following rescue from injury or disease, or for research. They may be held for long periods for public display or because, post-rehabilitation, they are unlikely to be able to survive in the wild. In any case, it is important to ensure they are cared for in an appropriately humane manner.

Action 5.01 Develop national guidelines with states for all aspects of care, handling and management of captive, sick, injured or orphaned koalas.

The development of new national guidelines would need to take account of any existing guidelines such as those adopted by state governments. The guidelines would include guidance about where care and rehabilitation should and should not be used, including the rehabilitation for release of reproductively capable koalas.

Relates to: Outputs D, E, F.

Stakeholders: Australian, state and territory governments, (in particular, NRMMC), Australasian Regional Association of Zoological Parks and Aquaria, associations of wildlife exhibitors, koala carer groups.

Priority: 2–3

Time scale: 1–2 years.

Action 5.02 Review as necessary conditions and agreements under the *Environment Protection and Biodiversity Conservation Act 1999* (Part 13A) for export of koalas.

Relates to: Output D.

Stakeholders: Australian Government.

Priority: 5

Time scale: 3–4 years or as required.

Category 6 Research

Understanding both the biology of an animal and the nature of the problems it faces, are critical to the design of appropriate management responses. The koala has been the subject of extensive research and some of the threats to populations are well understood, as indicated by the actions described above. Nevertheless, there is considerable variation in research methods and there are large gaps in understanding of factors like genetic variability and national abundance. Further, koalas live in a changing world, and our understanding of them and their environment will continue to improve as research results accrue. These new insights will allow us to refine the actions described above, and to identify new management actions to benefit koalas.

We note here too, the statement made earlier under Category 1. To do research well takes time, for the design and execution of the data collection program and for the analysis and interpretation of the data. Then the significance of the results for management must be evaluated and management actions initiated. Nevertheless, some of the threats to koalas are current and pressing and require immediate action. Some research will directly refine or complement the knowledge, and associated

high priority actions, identified above and thus will be of high priority. Other research may be more indirect and its value to management less explicit, and thus may be afforded lower priority given the resource limitations inherent in any conservation plan.

Action 6.01 Develop techniques for, and undertake, broad-scale remote sensing to identify areas for further analysis of koala habitat and distribution.

The koala's range is extensive, and survey of its distribution over this scale is extremely laborious and time-consuming. Remote sensing offers a method by which viable habitat can be assessed over appropriate scales. However, this requires development of techniques that can either discern tree species and/or measure nutritional or other attributes important to koalas. This is technically possible, but requires further research and development and ground-truthing.

- Incorporate into the above, measures to assess the condition of koala habitat.

Relates to: Outputs A, B, C.

Stakeholders: Research agencies, universities.

Priority: 1

Time scale: 1–2 years per state.

Action 6.02 Identify and prioritise knowledge gaps in koala research.

Focal areas may include methods for conservation of habitat, improving design of programs for population monitoring or understanding the habitat requirements of koalas.

Relates to: Outputs A, B, C.

Stakeholders: Research agencies, universities, Australian, state and territory governments, local government, non-government organisations, community groups.

Priority: 1

Time scale: 1–2 years; commence in year 3 and run for 3–5 years.

Action 6.03 Identify directions for research on effects of climate change on koalas.

As noted at 1.09 climate change is a complex process that carries with it significant implications for koalas. These effects may be in the form of altered drought and fire regimes, and more directly through the effects of carbon dioxide on eucalypt leaf chemistry. The additional stresses imposed may further exacerbate existing problems of habitat loss etc. Due to the complexity of the problem we must enact both short-term precautionary and anticipatory measures, but also conduct research to better understand, and adjust, these management approaches.

Relates to: Outputs A, B, C.

Stakeholders: Research agencies, universities, Australian, state and territory governments, local government, non-government organisations, community groups.

Priority: 1

Time scale: 1–2 years; commence in year 3 and run for 3–5 years.

Action 6.04 Facilitate development of a network to support koala research.

- A virtual network should be established to help researchers and management practitioners communicate and share information about the latest developments in koala conservation.
- State governments could maintain research units/expertise including conservation biologists/teams with koala conservation expertise.

Relates to: Outputs A, B, C.

Stakeholders: Research agencies, universities, Australian, state and territory governments, local government, non-government organisations, community groups.

Priority: 1

Time scale: 5–10 years; distribution network established within one year.

Action 6.05 Develop methods for enabling comparison of disparate data on koala distribution and abundance.

Some existing datasets are valuable in their own right, but would become more valuable if they could be incorporated in analyses at a broader spatial or temporal scale. To do so requires the development of measures by which one method can be calibrated against another. Links to Action 1.06.

Relates to: Outputs A, B, C.

Stakeholders: Research agencies, universities, Australian, state and territory governments, local government, non-government organisations, community groups.

Priority: 1

Time scale: 1–2 years.

Action 6.06 Develop mechanisms to support access to funding, or conduct and disseminate dedicated research.

Research actions or directions identified above may be too expensive for direct funding by the agencies party to this strategy. However, these agencies may facilitate the conduct of that research by identifying avenues whereby funding can be secured from other sources, such as private companies, research funds or conservation organisations, and supporting applications for this funding.

Research could be disseminated more widely by funding to place selected koala articles in the open domain.

Relates to: Output F.

Stakeholders: Research agencies, universities, Australian, state and territory governments, local government, non-government organisations, community groups.

Priority: 2

Time scale: 1–2 years.

Appendix 2: Actions summary

Category	Action	Description	Contributes to outputs	Responsibility	Priority	Time scale
1 – Habitat identification and protection	1.01	Incorporate koala habitat conservation into existing multi-species or landscape scale conservation programs.	A, B, C	Australian/state/territory governments, local government, catchment management authorities, regional bodies	1	1–2 years; review after 5 years
	1.02	Assess, develop and implement options for protecting priority koala habitat on public lands using legislation, covenants or agreements, or by new acquisition of koala habitat.	A, B, C	State/territory governments, local government	1	1–2 years for guidelines/process to be rolled out; 5 years for implementation; then review
	1.03	Assess, develop and implement options for protecting koala habitat on private lands.	A, C, E, F	Australian/state/territory governments, local government, individuals	1–2	1–5 years; then review
	1.04	Prioritise conservation of populations under immediate pressure.	A, B, C	Australian/state/territory governments	1	6–12 months
	1.05	Revegetate habitat to facilitate natural dispersal and reduce fragmentation effects.	A, B, C, E, F	Australian/state/territory governments, local govt, community groups, individual landholders	1–2	1 year to develop 5 years to implement; then review
	1.06	Develop standard monitoring/habitat assessment protocols.	A, B, C	Australian/state/territory governments, local government, researchers	1	6–18 months
	1.07	Establish a national database of koala population distribution and density and habitat mapping data.	A, B, C	Australian/state/territory governments, researchers, koala carer groups	2	1–5 years
	1.08	Establish or continue surveying and monitoring programs.	A, B, C	Australian/state/territory governments, local government, researchers	1	2 years to identify programs for continued support or additional work
	1.09	Incorporate causes of habitat loss or degradation, other than land clearing, into planning for koala habitat conservation.	A, B, C, E, F	State/territory governments, local government, community groups	1–3	1 year to integrate; review after 5 years

Category	Action	Description	Contributes to outputs	Responsibility	Priority	Time scale
2 – Over-browsed habitats	2.01	Continue and refine management programs to regulate koala density to a level below that which causes severe tree defoliation.	A, B, C	Australian/state/territory governments, local government, community groups	1	1–5 years
	2.02	Identify potential problems at an early stage through regular assessment of koala abundance and the extent of crown defoliation of preferred food tree species.	A, B, C, E, F	State/territory governments, community groups, individual landholders	1	1–3 years
	2.03	Develop and adopt national translocation guidelines for translocation of koalas for introduction, reintroduction and supplementation, and for management of overabundant populations	A, B, C, E	Australian/state/territory governments, local government, koala carer groups	5	1 year
3 – Direct mortality of individual koalas	3.01	Develop appropriate national guidelines for road design in koala habitat.	A, B, C, F	Australian/state/territory governments, local government, community groups, individuals	1–3	5 years; then review
	3.02	Implement strategies which minimise the impacts of dogs on koala populations in both urban and peri-urban areas.	B, C, D, E, F	State/territory governments, local government, community groups, individuals	1–3	5 years; then review
	3.03	Assess and develop appropriate methods to reduce vulnerability of populations to disease.	C, D, E, F	Research agencies, universities, Australian/state/territory governments	2	5 years
4 – Community involvement	4.01	Provide extension and advisory services to encourage retention and restoration of koala habitat and to encourage management practices on private land which are not harmful to koalas or koala habitat.	A, C, E, F	Australian/state/territory governments, local government, community groups, businesses	2	1–3 years
	4.02	Develop and distribute educational material.	C, E, F	Australian/state/territory governments, local government, non-government organisations, koala carer groups, zoos, ecotourism operators	3	2–3 years
	4.03	Extend community involvement in koala conservation and engagement with government.	C, E, F	Australian/state/territory governments, local government, non-government organisations, community groups, private sector, philanthropists	1	1–3 years to establish; ongoing

Category	Action	Description	Contributes to outputs	Responsibility	Priority	Time scale
5 – Caring for koalas in captivity	5.01	Develop national guidelines with states for all aspects of care, handling and management of captive, sick, injured or orphaned koalas.	D, E, F	Australian/state/territory governments (in particular, NRMMC), Australasian Regional Association of Zoological Parks and Aquaria, associations of wildlife exhibitors, koala carer groups	2–3	1–2 years
	5.02	Review as necessary conditions and agreements under the *Environment Protection and Biodiversity Conservation Act 1999* (Part 13A) for export of koalas.	D	Australian Government	5	3–4 years or as required
6 – Research	6.01	Develop techniques for, and undertake, broad-scale remote sensing to identify areas for further analysis of koala habitat and distribution.	A, B, C	Research agencies, universities	1	1–2 years per state
	6.02	Identify and prioritise knowledge gaps in koala research.	A, B, C	Research agencies, universities, Australian/state/territory governments, local government, non-government organisations, community groups	1	1–2 years; commence in year 3 and run for 3–5 years
	6.03	Identify directions for research on effects of climate change on koalas.	A, B, C	Research agencies, universities, Australian/state/territory governments, local government, non-government organisations, community groups	1	1–2 years; commence in year 3 and run for 3-5 years
	6.04	Facilitate development of a network to support koala research.	A, B, C	Research agencies, universities, Australian/state/territory governments, local government, non-government organisations, community groups	1	5–10 years; distribution network established within one year
	6.05	Develop methods for enabling comparison of disparate data on koala distribution and abundance.	A, B, C	Research agencies, universities, Australian/state/territory governments, local government, non-government organisations, community groups	1	1–2 years
	6.06	Develop mechanisms to support access to funding, or conduct and disseminate dedicated research	F	Research agencies, universities, Australian/state/territory governments, local government, non-government organisations, community groups	2	1–2 years

Acknowledgments

This draft strategy was revised by the National Koala Conservation Strategy Steering Committee on behalf of the Natural Resource Management Ministerial Council.

The National Koala Conservation Strategy Steering Committee members are:

Mr David Baker (Environment Protection Agency, Qld)
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The Australian Koala Foundation has expressed concern about some aspects of the draft strategy.

Other contributors were:

Dr Ivan Lawler (Department of the Environment, Water, Heritage and the Arts, Australian Government)
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The draft strategy was released for public consultation for two months in June–August 2009. Fifty-three submissions were received and considered in the development of this revised draft.

Expert reference group:

A reference group of experts provided input to the draft strategy during a workshop in December 2008. Members of the reference group were:

Mr John Callaghan (Gold Coast City Council)
Dr Frank Carrick (University of Queensland)
Dr Greg Gordon (previously Environment Protection Authority, Queensland, now retired)
Dr Kathrine Handasyde (University of Melbourne)
Ms Alison Matthews (Charles Sturt University)
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Mr Rolf Schlagloth (Australian Koala Foundation)
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During the evaluation of the 1998 National Koala Conservation Strategy, public comment was sought through interviews and written submissions from a broad range of interested parties including state and local governments, universities, non-government organisations, community groups and individuals.

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National Koala Conservation and Management Strategy 2009-2014

First Implementation Report to the Natural Resources Management Ministerial Council

Photo on front cover by Dan Lunney

The Natural Resource Management Ministerial Council (NRMMC) consists of the Australian state, territory and New Zealand government ministers responsible for primary industries, natural resources, environment and water policy.

The Implementation Team consists of representatives of the Australian Government and the Queensland, New South Wales, Victorian and South Australian state governments.

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Contents

Introduction

This document is the first report by the implementation team for the National Koala Conservation and Management Strategy 2009–2014.

The implementation team's task has been to identify and coordinate measures to make the strategy happen. The strategy's goal is to conserve koalas by retaining viable populations in the wild throughout their natural range.

An independent review of the previous national strategy concluded that the actions proposed were sound, but that the strategy had been ineffective due to a lack of implementation.

The new strategy includes an implementation plan and a requirement that performance be reported annually to the relevant ministers.

To evaluate the performance of the strategy and the efforts made under it to conserve koalas, it is necessary first to establish the context. This will provide a reference or baseline against which to evaluate subsequent efforts and achievements. The goal of this report is to provide that baseline.

The report first provides a brief overview of the koala conservation efforts of each state government and the Australian Government, then details specific actions, underway or planned, in the table that follows, mapped against the strategy's implementation plan.

Jurisdiction summaries

Australian Government

The Department of the Environment, Water, Heritage and the Arts coordinated the development and publication of the new National Koala Conservation and Management Strategy 2009–2014. The department established a secretariat to support the implementation team and to improve coordination of information and action between jurisdictions.

The Department of the Environment, Water, Heritage and the Arts is exploring the development of a project with Queensland and New South Wales to produce a decision support framework to evaluate and prioritise koala conservation actions.

The national conservation status of the koala is being assessed by the Threatened Species Scientific Committee (TSSC) for potential listing as a threatened species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The recommendation of the TSSC will be made by September 2010. The Minister for Environmental Protection, Heritage and the Arts will then have 90 business days to decide whether to list the koala. There are three possible outcomes:

- The koala may be ineligible for listing in any category
- It may be listed as Conservation Dependent, if appropriate plans are in place, or
- It may be listed as Vulnerable or higher, in which case the koala would become a matter of national environmental significance under the EPBC Act.

Queensland

The principal concern for koalas in Queensland has been the substantial declines in the koala population of the south-east of the state. The regional population was one of the largest in the country, but has suffered from urban development and consequent exposure to the threats of cars, dogs and disease. The Queensland Government implemented the Koala Response Strategy in December 2008 and has subsequently undertaken a broad range of actions aimed at arresting the decline.

The Koala Response Strategy has committed to:

- protect an additional 52 000 hectares of koala habitat
- implement a state freeze on clearing and disposing of all state-owned land in south-east Queensland until the state planning instruments are finalised
- undertake a comprehensive koala habitat mapping project
- release a model local law for councils to help reduce dog attacks on koalas
- release for public consultation draft state planning regulatory provisions and a draft state planning policy
- release a fencing for koala habitat guideline
- put an immediate hold on important bushland habitat being cleared in south-east Queensland
- commence planning for a $10 million trial on retrofitting wildlife crossings and underpasses on south-east Queensland's hot spot roads to reduce koala strikes
- ensure all new state roads and upgraded state government main roads are koala-friendly
- introduce the Koala Habitat Acquisition Program and the Koala Nature Refuges Program – financial incentives targeted at private landowners to take action to personally contribute to the protection of koalas in south-east Queensland.

New South Wales

In NSW the koala mainly occurs on the central and north coasts, with some populations to the west of the Great Dividing Range. The koala was abundant in the Bega District on the far south coast of NSW for a brief period in the 1890s, but it now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. Koalas are concentrated on fertile, flat land much of which is outside the reserve system and found on private land. The principal threats remain land clearing, habitat fragmentation, fire, dogs, cars and climate change—especially drought.

The Department of Environment, Climate Change and Water released the NSW Recovery Plan in 2008. At least $1.2 million has been committed to actions identified in the plan.

The Department of Environment, Climate Change and Water works with a range of land managers to conserve koalas. They include national parks managers, Forests NSW, local councils and utility operators such as the NSW Roads and Traffic Authority (RTA). The RTA makes considerable investment in implementing connectivity measures to mitigate road impacts on koalas, such as land bridges and underpasses in the Pacific Highway upgrade.

In adopting a landscape scale approach to nature conservation, NSW continues to develop a range of policies and strategies designed to maintain and enhance the environmental conditions conducive to healthy koala populations across NSW.

Specifically, NSW is developing a biodiversity strategy which will lead to prioritising investment in habitat conservation and restoration as well as threat control and abatement that will directly benefit koalas. NSW is also developing a climate change statement of intent, which will identify plans for biodiversity adaptation to climate change relevant to koalas.

Further funding would enable survey, prioritisation and conservation work to be undertaken in specific high priority koala populations in partnership between government catchment management authorities, local councils and the community. The significant populations include Gunnedah, Port Stephens, Bellingen, Coffs Harbour and Iluka. The south-east forests and Campbelltown have significant but smaller populations

Victoria

While there are a few places in Victoria where koala populations have declined due to mortality from cars, dogs and habitat loss, the principal concern for managers is overabundant populations. Victorian koala populations have demonstrated that the koala population can grow beyond the carrying capacity of the habitat, resulting in collapse of the population in extreme cases. Overpopulation also results in overbrowsing of trees which can cause substantial defoliation of preferred food trees and changes in the composition of the ecological community. The results of overbrowsing are graphic and cause media attention and community concern.

Management therefore focuses on reducing koala numbers and maintaining them at levels low enough to prevent habitat damage.

Overpopulation used to be managed by moving koalas from overbrowsed areas to unoccupied habitat. However, options for translocation have diminished as most potential habitats are now occupied.

Population management is now primarily through sterilisation. This was initially surgical, but is increasingly achieved with hormone implants. Where pressure on the habitat is intense and immediate relief is necessary, koalas may still be translocated.

No matter which methods of population control are being used, it is still necessary to capture significant numbers of koalas, an expensive and labour-intensive exercise. The management of overpopulated koala populations and their habitat is an ongoing commitment.

South Australia

Koalas occur in four key regions in SA: Kangaroo Island, the Lower Eyre Peninsula, the Lower South East and the Adelaide Mount Lofty Ranges. Each region has its own set of environmental and welfare challenges in terms of koala management. Koala populations in some parts of in SA are increasing steadily in number.

Three key issues for the koala are:

- the ongoing management of an abundant koala population on Kangaroo Island
- the intervention to rescue peri-urban koalas which have been orphaned or have come into conflict with people, dogs or vehicles
- the fate of koalas in urban areas during prolonged periods of hot weather.

The koala population of Kangaroo Island has been reduced from a high of 27 000 in 2001 to less than 16 000 in 2006 via translocation and sterilisation. There is no more recent population estimate, but the proportion of sites with unsustainable koala population densities reduced between 2007–08 and 2008–09. These results were achieved with a budget of $500 000 in 2008–09.

South Australia is drafting a policy on how to respond to emergency situations involving koalas. This is pressing issue for the Adelaide area where koalas have a high profile and are often visible. The South Australian Department of Environment and Heritage can get more than 100 koala callouts each week, often attending to koalas injured as a result of dog attacks and vehicle collisions.

National Koala Conservation and Management Strategy

Work Plan 2010

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Category 1 Habitat identification and protection **1.01 Incorporate koala habitat conservation into existing multi-species or landscape-scale conservation programs**				
National Reserve System	Australian Government	Ongoing	Addition of properties containing koala habitat to the National Reserve System (NRS).	Koalas are one of the matters included in the assessment of the values of properties proposed for inclusion in the NRS. A recent significant addition was “Marcussen” in SE Qld.
Koala Habitat mapping project in South East Queensland	Qld	Complete	Maps of koala habitat with value (high, medium and low) assigned in the eastern Local Government areas of South East Queensland	
GIS analysis of koala distribution overlap with other threatened species.	NSW	In progress	DECCW has carried out recent mapping of koala distribution on the south coast of NSW. This will be overlaid on existing Threatened species distributions,	
Great Eastern Ranges Initiative	NSW	Planned, ongoing 2009/10	Establish a conservation corridor along the NSW section of the Great Eastern Ranges	Partnership program amongst range of conservation groups and agencies. DECCW one of the lead agencies.
Northern Rivers Regional Biodiversity Management Plan	NSW/ Australian Government	Complete	Northern Rivers Regional Biodiversity Management Plan complete, incorporates koala management	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
NatureLinks	SA	Plans released	A landscape-scale approach to conserving the state's plants and animals by managing and restoring large areas of habitat within broad 'biodiversity corridors'.	Key regions include koala habitat
N.B. Both Victoria and South Australia have programs which benefit multiple species, via protecting habitat from overbrowsing by koalas. Severe overbrowsing can cause loss of dominant trees species and thus changes in the ecological community. The programs are listed under Category 2 below.				
1.02 Habitat protection on public land				
Koala Habitat acquisition strategy	Qld	Underway	To be eligible, part or all of the property must be mapped as *high* or *medium value, suitable for rehabilitation*. The priority is securing habitat corridors and restoring cleared habitat, with a focus in the Pine Rivers and Koala Coast areas.	On 31 October 2009 the Queensland Government announced it is committing an additional $15M to the Koala Response Strategy to protect south-east Queensland's koalas. These funds are for the Koala Habitat acquisition strategy and the Koala Nature Refuge Program. This program uses maps of existing koala bushland habitat and areas suitable for rehabilitation.
State Land Freeze	Qld	Underway expected to be finalised in mid 2010	The maintenance of koala habitat on state land in south east Queensland unless exempted for urgent social infrastructure.	
Gunnedah koala conservation	NSW	Complete	DECCW worked with the Liverpool Plains Land Management Committee and the Gunnedah Council to implement koala actions as identified.	Public land includes State Forests and local councils.
National Park Plans of Management actions for habitat protection	NSW	Complete (ongoing)	Fire management strategies to reduce size, intensity and frequency of fires in significant koala habitat. Planting of food sources. Strategies to liaise with neighbouring land-holders to minimise adjacent clearing	40 National Parks and Reserves (762 000ha) have actions in their Plans of Management which involve koalas. These strategies are typically supported by surveys of koala populations on-park.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Review conditions of Eden Regional Forest Agreement Region Integrated Forestry Operations Approvals and Threatened Species Licence related to koala protection.	NSW	In progress	DECCW and Forests NSW have been gathering and analysing data to support the review process. DECCW has held preliminary discussions with Forests NSW about potential reserve options. Ongoing negotiations in south east regarding habitat in Mumbulla, Murrah and Bermagui State Forests.	Options limited by commitments in Regional Forest Agreements, Forest Agreements and Integrated Forestry Operations Approvals
Local Council Koala Plans of Management	NSW	In progress	Development and review of comprehensive Koala Plans of Management (PoM)	Port Stephens: finalised Kempsey: final draft Coffs Harbour: five-year review on public exhibition Tweed LGA: $40 000 provided to fund field surveys and habitat mapping for eastern coastal section Northern Rivers PoM to be updated with Biodiversity Management Strategy
River Red Gum forest conservation	NSW	Planned (Decision announced – pending legislation)	107,000 hectares of River Red gum forests and associated woodlands along the Major inland river systems in Southern NSW to be protected in a range of conservation reserves. Many of these reserves will adjoin newly created reserves in Victoria and create a national scale protected area corridor along the Murray, and parts of the Murrumbidgee and Lachlan Rivers. These riverine forests are known to be an important habitat for koala populations extending into semi arid regions of Southern NSW	The koala populations in many of these forests are believed to be a mix of koalas of local provenance and descendents of koalas introduced from other areas. The decision has been announced but has yet to pass through parliament.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
1.03 Habitat protection on private land				
Koala conservation integrated into land use planning	Qld	Implemented, ongoing and planned	Improved protection of koala habitat and better designed developments to enable koala populations to persist and recover.	Koala conservation is included in the SEQ Regional Plan; Elements of the Koala Conservation Plan are operational; Two planning instruments are proposed to increase the level of protection provided to koalas and their habitat in SEQ — a state Planning Regulatory Provision (SPRP) and a state Planning Policy (SPP).
Koala Nature Refuges Program	Qld	Underway	Management for koala conservation on private property identified by the Koala Response Strategy as being of high- to medium-priority for rehabilitation of koala habitat. A binding, perpetual nature refuge over at least two hectares is required to receive funding.	Program assists landholders to restore koala habitat on private land and protect it for future generations,
Develop incentive-based mechanisms to incorporate koala conservation into planning processes	NSW	Complete	Incentive based mechanisms already exist in NSW including voluntary conservation agreements, property vegetation plans, biobanking, etc.	Key example is “Woodville” adjacent to population of breeding koalas near Bermagui. Initiated by Far South coast Landcare Association with steering committee representation by DECCW.
Local Council Koala plans of management	NSW		See 1.02	Local council koala plans of management provide a consistent approach to koala planning and management on private land.
Chain of Ponds Project	NSW	Ongoing March 2010–July 2010	Chain of Ponds project will enable conservation of 10ha of riparian vegetation (including primary koala habitat in Wapengo area adjacent to breeding association of koalas.	Southern Rivers Catchment Management Authority initiated project
The regulation of native vegetation removal in Victoria ensures that important habitat, including koala habitat, is protected.	Vic	Ongoing	Net gain sought.	Through the Native Vegetation Management Framework.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Raymond Island habitat protection	Vic	Since 2004	Tree banding and exclusion plots by private landholders	Not monitored
Otways habitat protection	Vic	Ongoing	Protection of preferred food trees.	Individual trees are protected with tree bands.
1.04 Prioritise populations				
Expert workshop to identify priority populations in South Coast and Snowy Mountains Regions	NSW	Planned Dec 2010	Identify priority populations within the region.	Planned fieldwork will assist identification of priority populations
Prioritise populations in Namoi Catchment Management Area	NSW	Complete	Desktop survey undertaken to determine where priorities lie in this region. Report is available from Namoi CMA.	Gunnedah and Pilliga forests are the best koala habitats in NSW.
1.05 Revegetate habitat				
Koala Habitat programs	Qld	Underway	**Two programs fall under this banner: the Koala Habitat Acquisition Program and the Koala Nature Refuges Program.**	See 1.02 and 1.03
"Bear Care" habitat revegetation in Gunnedah study	NSW	Implemented (ongoing)	Determine the extent that the koala population uses environmental plantings of trees and how far they will travel across open paddocks to plantings.	Satellite-tracking project underway. Use of revegetated habitat is the central question being addressed. Revegetation was initiated to address rising water tables and associated salinity and trees planted were suitable for koalas. This population is of prime interest as it is expanding in contrast to the rest of the state.
Narrandera Common revegetation/restoration program	NSW	Ongoing	Narrandera Common revegetation/ restoration program for the 527 ha of River Red Gum forest.	Work undertaken by Narrandera Shire Council in conjunction with Murrumbidgee CMA river restoration project should improve important koala habitat.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Nooramunga Marine & Coastal Park (Snake Island) –restoration of manna gum woodlands	Vic	Ongoing	To restore and maintain the condition of the manna gum woodlands. Use ecological burning as a tool to regenerate canopies. Replant areas where manna gums have been killed.	High koala densities have caused significant defoliation and death of manna gum. There has been no seedling regeneration of manna gum in recent years.
Raymond Island manna gum revegetation	Vic	Ongoing	Ad hoc planting of coastal manna gum seedlings	Opportunistic plantings rather than strategic. Were limited by poor rainfall years.
Kangaroo Island Management Plan	SA	Ongoing	Monitoring of habitat and tree condition on Kangaroo Island. Tree planting in critically damaged areas.	
1.06 Develop standard monitoring protocols				
Develop consistent protocols that enable population numbers or density to be compared between the same place at different times and between different habitats.	NSW	In progress	DECCW and Forests NSW have been gathering and analysing data and reviewing protocols for habitat assessment and monitoring, specific to koalas, on the south coast of NSW.	
Statewide koala distribution survey	NSW	Completed /in progress	Determine statewide geographic distribution of koalas and changes of distribution via 'public survey' technique. A 2010 low-cost web-based survey will follow-up on the 2006 NSW survey and 1986-87 national survey.	The statewide survey is community based. Whilst highly effective, the 2006 postal survey was in fact costly. The 2010 follow up is web-based and low cost, but to date is not as effective in its reach, but is quick and economical.
Workshop to review monitoring methods	NSW	Planned December 2010	Workshop to review monitoring methods (transect and RGBSAT)	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
1.07 Establish national database				
Assessment of national status	Australian Government	Complete September 2010	Collation of most recent available data on populations to determine status of koala at a national level.	Has included extensive literature review and an expert workshop in November 2009 to produce best estimate of the trends in the national koala population.
Atlas of Living Australia (ALA)	Australian Government	Ongoing	Central repository for data on wildlife locations from all sources	DEWHA in discussion with ALA to determine whether/how it can be used to produce a national koala database.
Contribute to central data repository	NSW	Implemented (ongoing)	All data from all surveys is logged onto the NSW Wildlife Atlas and is available to all users, including any national databases.	In addition to the repeated statewide survey, the NSW recovery pan has identified a series of locations for monitoring and assessment or audit of the effectiveness of previous surveys and management.
1.08 Establish/continue monitoring				
Koala Monitoring programs	Qld	Ongoing	Monitor the numbers and trend of key populations. Monitor the behaviour of koalas in selected urban populations.	
Develop larger-scale survey and monitoring programs.	NSW	In progress	Forests NSW is developing a landscape-scale biodiversity monitoring program, which should also be relevant for koala monitoring.	Pilot programs have been established in Western Region and in Central Region.
Statewide determination leading to prioritisation	NSW	Implemented/ planned	The NSW 2008 Koala Recovery Plan identified a series of local surveys and management plans to audit for their effectiveness. These studies should yield an up to date determination of the status of the koala in NSW and a series of local areas.	Two areas implemented: Gunnedah and Campbelltown.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Continue Monitoring in the South Coast region	NSW	Ongoing July 2009 – June 2010	- Phase 1 of Escarpment and Hinterland Koala survey - Review of results of Escarpment and Hinterland Koala survey to assess whether additional work is required - Ongoing transect monitoring program in Morton and Tarlo NP (approximately 15 500 m x 40 m transects)	
Study on distribution and movement of koalas across private and public land in Campbelltown	NSW	Complete	Publication in press that reports on distribution and movement of koalas across private and public land and assessment against five different koala habitat mapping techniques.	The Campbelltown population is historically significant
Koala and vegetation monitoring at Mt Eccles National Park/Tower Hill Wildlife Reserve	Vic	Population surveys are undertaken annually. Vegetation surveys every 2 years	Monitor the koala population and manna gum woodland condition (6 000ha) in response to population control measures.	
Raymond Island koala population monitoring	Vic	Implemented	Total counts every one to two years that feedback into population management.	
Kangaroo Island monitoring	SA		Monitoring of habitat and tree condition on Kangaroo Island. Assessment of koala density on Kangaroo Island.	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
1.09 Incorporate other causes of habitat loss in planning (e.g. drought, climate change)				
"Bear Care' habitat revegetation in Gunnedah study (see 1.05)	NSW	Implemented (ongoing)	Drought and climate change are two major components of the current population study in Gunnedah.	At west of range, extreme heat may be a limiting factor for koala populations.
Strategy to minimise impacts of fuel reduction burn	NSW	Ongoing July 2009 - June 2010	Implementation of strategy to minimise overlap between areas where fuel reduction burns are undertaken (particularly in Strategic Fire Advantage Zones areas) in the Bermagui, Murrah, Mumbulla and adjacent private forests and koala activity cells delineated in 2007-9 koala survey	
Category 2 Over-browsed habitats **2.01 Refine regulation of overbrowsed populations**				
Mt Eccles National Park – Adaptive management project to model the impacts of the koala population on the forest and examine impacts on undertaking fertility control program.	Vic	This program commenced in 2004 and is ongoing.	Maintain the manna gum woodland (6 000ha). Stony Rises Herb-rich Woodland is a vulnerable EVC in Vic. Maintain a viable koala population	This project is using hormone implants to reduce the growth rate of the koala population. Incorporates koala population reduction at Tower Hill.
Nooramunga Marine & Coastal Park (Snake Island) – koala removal to allow restoration of manna gum woodlands	Vic	The program commenced in 1997 and is on going.	To restore and maintain the condition of the manna gum woodlands on the Island. To reduce the koala population by fertility control and relocation with the aim of removing all koalas from Snake Island.	High koala densities have caused significant defoliation and death of manna gum. There has been no seedling regeneration of manna gum in recent years.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Raymond Island – koala removal to allow restoration of manna gum woodlands	Vic	Ongoing	To reduce the koala population below carrying capacity and thus restore the manna gum woodlands on the Island.	High koala densities have caused significant defoliation and death of manna gum.
French Island National Park and private land koala control program	Vic	Ongoing	Reduce the French Island koala population below carrying capacity	Transitioning from translocation to hormone implants for population control but will still require translocation for some years.
Workshop for Victorian koala management and policy practitioners	Vic	Planned for April 2010	Refined management of koala populations which overbrowse their habitat.	South Australian DEH officers attended the 2009 workshop to share information and refine procedures.
Meeting of French Island koala population managers	Vic	Planned for April 2010	To refine management and monitoring of the French Island population as the program transitions from translocation to hormone implants.	
Kangaroo Island Koala Management Program	SA	In progress	Maintain habitat values, including trees favoured by koalas; To reduce the koala population by fertility control and relocation with the aim of maintaining a sustainable koala population?	Since 2006 10 602 koalas have been managed on Kangaroo Island of which 9 340 have been sterilised. Of these 3 801 have been translocated (primarily to the South-East of South Australia). 2 600 Manna Gum and Blue Gum trees have been planted in critically damaged areas and most sites show and improvement on preferred food trees.
Kangaroo Island management review	SA	Ongoing	Implementation of recommendations from the 2008 independent review of the Kangaroo Island Koala Management Program by Dr Alistair Melzer, of the Koala Research Centre of Central Queensland.	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
2.02 Identify emerging overbrowsing problems				
Develop ecological rationale for Great Otway NP	Vic	Is dependent on incoming information.	The ecological rationale together with the proposed mapping and population survey work to be undertaken will determine the extent of manna gum (and other spp) affected by koala overbrowsing and the estimate the number of koalas.	The Otways has been identified as an area where koala numbers and manna gum death and defoliation are increasing. Options for management are limited. Limited by lack of existing information
2.03 Develop national translocation guidelines				
State translocation policy	All states	Implemented/ ongoing		All states have policies on translocations in place or in development. Priorities may vary, particularly as Victoria and SA translocate to remove browsing pressure at source site.
Category 3 Direct mortality of individual koalas **3.01 Develop road design guidelines**				
Trial on retrofitting wildlife crossings and underpasses on south-east Queensland's hot spot	Qld	Underway	This $10 million trial will examine the effectiveness of retrofitting existing bridges and culverts with structures that allow koalas to safely cross state-managed roads.	
Committed to ensuring all new state roads and upgrades are koala-friendly	Qld	Underway	New roads and upgrading existing roads will incorporate design and location to reduce impact on koalas	Installing structures that allow koalas to cross roads (such as underpasses and overpasses), along with fencing, will allow koalas to move more safely between adjacent habitat, reduce road mortality and better protect koala populations.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
3.02 Implement protection of koalas from dogs				
New model local law for councils to help reduce dogs attacks on koalas	Qld	Underway	Implementation by local government will lead to reduced dog attacks on koalas	
Population Viability Analysis of effect of dog predation	NSW	Complete	A Population Viability Analysis was conducted by DECCW and published in 2007 on the koala populations in Port Stephens. This analysis informed the development of the Port Stephens Koala Plan of Management under SEPP44.	PVA showed that mortality due to dog predation is a significant threat to koala populations.
Fox and dog baiting	NSW	Ongoing from July 2009	Fox and dog baiting program throughout areas sustaining koalas in Morton NP and Bungonia SRA, Biamanga NP, Bermagui NR, Murrah and Mumbulla SF and in Nature Reserves sustaining koalas in North East Monaro.	
Dogs controlled near koala population on Raymond Island.			Dogs to be kept under control or on leash	The Shire (East Gippsland Shire Council by-law) and Parks Victoria are responsible for compliance.
Dog control information	SA	Planned	Developing website information and brochures to promote its 'Living with Wildlife' approach to koala issues.	
3.03 Disease assessment and treatment				
The Koala Disease Fund	Qld	Underway an expression of interest has been called	The Koala Disease Research Fund has been established to support high quality research into mitigating the effects of disease on wild populations of koalas.	The Koala Disease Research Fund will have a total value of $400 000. Funding will be allocated through an open competitive funding round.
Moggill Koala Hospital	Qld	Ongoing	Injured and diseased koalas are treated.	Koalas are also treated at the Wildlife Warriors' Australian Wildlife Hospital, at the Currumbin Wildlife Sanctuary Hospital, and at various private veterinarian clinics.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Monitoring	NSW (DECCW and DII)	Complete (ongoing)	Fauna rehabilitation groups are licensed by DECCW and work with veterinarians to assess and treat disease in koalas.	
	NSW	Planned	Discussions are underway with veterinarians at the University of Sydney to study the prevalence and geographic distribution of koala diseases, particularly Chlamydia.	
Koala disease program - Victoria	Vic	Planned	TBA	Zoos Victoria is starting a koala disease research program
Raymond Island Wildlife Health Surveillance	Vic	Current and opportunistic	Monitoring for Chlamydia, Mycobacterium ulcerans, Retrovirus	
Raymond Island ocular coloboma testing.	Vic	Completed	Tested sample of population for Ocular coloboma. Feeds into criteria for translocation.	Slow process for examination and very close encounter required
Category 4 Community involvement **4.01 Provide extension and advisory services for koala protection on private land**				
Daisy Hill Koala Centre (DHKC)	Qld	Ongoing	Interpretive information provided to visitors, community groups, and to schools on koala conservation issues, particularly mortality due to habitat loss, disease, cars & dogs.	Visitor Centre in Koala Coast area of SEQ. DHKC was refurbished last year.
Great Eastern Ranges Landscape scale conservation program	NSW	Planned, ongoing 2009/10	As per 1.01	
Website/brochures	SA	Planned	Developing website information and brochures to promote 'Living with Wildlife' approach to koala issues.	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
4.02 Develop and distribute education material				
Koala conservation and management information on the DERM website	Qld	Ongoing	High quality and appropriate information on the DERM website updated regularly.	An example is the recently released fencing for koala habitat guideline
Distribute education material in NSW South Coast region	NSW	Completed March 2010	Public release of *Interim Report on Surveys conducted in 2007-2009 for Koalas in the Coastal Forests of the Bermagui/Mumbulla Area* and associated media, website and email networks distribution Distribution of bilingual (English and Dhurga, the main Aboriginal language of the NSW South Coast) booklet to schools and Aboriginal land councils on local koala history and ecology Distribution of survey methods educational kit (RGBSAT method) to science students from local high schools, Bournda Environmental Educational Centre and Crossing land Education Centre DECCW maintains a threatened species website which includes a profile page for the koala and the listed endangered populations. Links are also included to the State Koala Recovery Plan, the National Koala Conservation Strategy and other reports.	
Publication: *Climate Change How will it affect the natural environment in NSW?*	NSW	Complete	Publication on the effects of climate change on the natural environment in NSW published in September 2009, including information on the koala.	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Develop Emergency protocols for the rescue of wildlife during bushfires	Vic	Ongoing, currently implemented	Coordinated, efficient and safe response to wildlife rescue from bushfires.	Conducted information sessions and sent document to practitioners. Volunteers must attend pre-season briefings and meet all requirements before they can attend firegrounds.
Website/brochures	SA	Planned	Developing website information and brochures to promote its 'Living with Wildlife' approach to koala issues.	
4.03 Extend community involvement and engagement				
Queensland Koala Fund	Qld	Planned	The Queensland Government is establishing the Queensland Koala Fund to allow businesses, householders, local government and other organisations to contribute to the Koala Response Strategy.	All donations are fully tax-deductible and will be used for koala conservation activities in south-east Queensland
Develop and maintain community partnerships and involvement in the South Coast Region	NSW	Ongoing July 2009 - June 2010	1. Koala Survey program involving volunteers undertaking approximately 50 field trips to assess sites for koala evidence. 2. Koala survey program working with Aboriginal Land Council representatives undertaking approximately 20 field trips to assess sites for koala evidence	Part of a broader program in which the distribution and abundance of Koalas in escarpment and hinterland forests to the south west of Bega (primarily South East Forests National Park). Participants search for Koala faecal pellets at predetermined locations (grid intersections) using a consistent and repeatable method. Analysis of data gathered enables koala activity to be quantified. Other ecological data are also gathered at the sites.
Local council engagement	NSW	Implemented (ongoing)	DECCW is working with councils (eg. Great Lakes Council and the Hawks Nest Koala Working Group) to implement actions from the Hawks Nest Koala Recovery Plan.	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
"Backyard Buddy" program and the Foundation for National Parks and Wildlife	NSW	Implemented (ongoing)	The Foundation for National Parks and Wildlife continues to support fund raising for koala conservation, improving public awareness and engagement in koala conservation by providing discussion forums, information and access to scientists.	The "Backyard Buddy" program includes a koala mascot.
Sam the koala on display at Melbourne Museum	Vic	Implemented	Increased community awareness of koala ecology.	Sam was the koala made famous when a photograph was published of her being offered water by a firefighter.
Raymond Island community involvement with population management	Vic	Ongoing	Community involvement with translocations, fertility control, counts and welfare rescues. Community supportive of the program	Includes wildlife shelter operators directly involved in the program and tours of the program for the local community.
Policy for dealing with koalas	SA	Planned	The development of a policy on dealing with koalas in emergency situations will explore an expanded role for the community in koala conservation, management and care.	
Category 5 Caring for koalas in captivity **5.01 Develop guidelines for handling and care**				
Guidelines	Qld	Complete		Guidelines exist
Guidelines	NSW	Complete	DECCW has 'Guidelines for the Care of Koalas' (June 1997).	The document will be reviewed within the next two years.
Develop guidelines for rescue, handling, rehabilitation, and release	Vic	June 2011	Statewide consistent guidelines document for use by rehabilitators.	DSE and Healesville Sanctuary are working with academics, veterinarians and rehabilitators.

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
Develop state-wide training for rehabilitators	Vic	Planned	Improved standards of care.	
Policy for dealing with koalas	SA	Planned	The development of a policy on dealing with koalas in emergency situations is proposed. Guidelines for handling and care of koalas in captivity will be drafted as part of this process.	
5.02 Review export conditions				
Review export conditions	Australian Government	Complete		Guidelines for export of koalas reviewed by DEWHA in 2009
Category 6 Research **6.01 Develop and use broad-scale habitat analysis**				
Bermagui-Mumbulla Forests surveys	NSW	Ongoing Jan 2010 - June 2010	Peer review of statistical analysis of data gathered in 2007–09 in Bermagui-Mumbulla Forests. Based on review, kernel density estimation will be undertaken to map habitat attributes.	
Leaf-compound study (ANU & DECCW) undertaken in Bermagui-Mumbulla Forests completed and results factored into habitat mapping	NSW	Complete	Understanding of role of leaf nutrients in determining koala habitat suitability	
Broadscale habitat analyses	NSW	Complete	A series of broadscale habitat analyses undertaken with the University of Queensland over the last 6 years, enabled by National ARC linkage grants. Papers have been published linking on ground conservation problems with broadscale landscape approaches.	

Policy/measure/action	Jurisdiction	Status/timing (Planned, Implemented, Complete)	Outcome sought/achieved	Comments (Issues/constraints)
6.02 Identify and prioritise knowledge gaps				
Develop tool to evaluate and prioritise koala conservation actions	Australian Government/ Qld/NSW	Planned	A joint project is under discussion between NSW, Queensland and DEWHA to evaluate the cost-effectiveness of existing strategies for koala conservation	
6.03 Identify climate change research				
6.04 Facilitate develop of koala research network				
6.05 Develop methods to compare disparate data on koala distribution and abundance				
Develop standard methods on the South Coast	NSW	Ongoing	Participation in process comparing disparate data on koala distribution and abundance	
National mapping workshop	Australian Government	Planned 2010	Identify method for consistent mapping and evaluation of koala habitat	
6.06 Develop mechanisms to fund and disseminate research				