



Consultation Document on Listing Eligibility and Conservation Actions

Geocrinia alba (white-bellied frog)

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

- 1) the eligibility of *Geocrinia alba* (white-bellied frog) for inclusion on the EPBC Act threatened species list in the Critically Endangered category; and
- 2) the necessary conservation actions for the above species.

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

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

Responses are to be provided in writing either by email to:
species.consultation@environment.gov.au

or by mail to:

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

Responses are required to be submitted by 2 March 2018.

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General background information about listing threatened species

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

<http://www.environment.gov.au/biodiversity/threatened/index.html>.

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

<http://www.environment.gov.au/biodiversity/threatened/pubs/guidelines-species.pdf>.

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

<http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

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

<http://www.environment.gov.au/biodiversity/threatened/recovery.html>.

Information about this consultation process

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

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

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

Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the Privacy Act 1988 (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the '[common assessment method](#)'. As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: <http://environment.gov.au/privacy-policy>

Geocrinia alba

(white-bellied frog)

Taxonomy

Conventionally accepted as *Geocrinia alba* (Wardell-Johnson and Roberts 1989)

Species Information

Description

The white-bellied frog is a small frog (~20-25mm snout-to-vent length) with a light brown to grey dorsal surface and a white or very faint yellow wash ventral surface. Ventral skin is smooth and the dorsal surface has two parallel rows of brown raised spots that extend along the body from the eyes to cloaca. Its toes are short and unwebbed. The males mating call is a series of 11-18 pulses repeated irregularly (Roberts et al. 1990).

Distribution

The white-bellied frog has a restricted and patchy distribution due to its dependence on specific breeding habitat provided in broad drainage lines with riparian vegetation (Wardell-Johnson & Roberts 1993). The white-bellied frog's extent of occurrence is calculated as 176 km² (DoEE 2017; Roberts et al. 1999). However, the combined area of occupied habitat patches is expected to be 1.9 km² (Wardell-Johnson and Roberts 1993) (note that this is not the same as "Area of Occupancy" as defined by the IUCN Guidelines, which require calculation based on a 2 x 2 km grid overlaid on the point records (see Criterion 2)). The discrepancy is due to the species being restricted only to corridors of riparian vegetation within extremely localised distributions (Conroy & Brook 2003). Approximately 77 per cent of the actual area of occupied habitat of the white-bellied frog is within privately managed land. Much of this land has been cleared of native vegetation and is now used for agricultural activities. Clearing activity, albeit small in scale, continues in the region (Department of Parks and Wildlife 2015).

Relevant Biology/Ecology

The white-bellied frog inhabits swampy flows along drainage depressions in an area of subdued topography (relief < 80m) near the junction of the Leeuwin-Naturaliste Ridge and Blackwood Plateau (Wardell-Johnson and Roberts 1993; Conroy 2001). Breeding sites are typically associated with sandy soils, dense overstorey vegetation dominated by *Homalospermum firmum*, *Taxandria linearifolia* (Swamp Peppermint), *Astartea fascicularis* (False Baeckea), and a dense ground layer of rhizomatous vegetation, usually composed of *Taraxis* sp., *Loxocarya* sp. and *Tetrarrhena laevis* (forest ricegrass) (Wardell-Johnson and Roberts 1993; Conroy 2001).

The white-bellied frog has a fully terrestrial breeding biology. Males form choruses throughout Spring (September to November) and call from small burrows in soil, usually under litter, moss, or other vegetation (Driscoll 1996; Conroy 2001). Amplexus and oviposition occur within the burrow. The clutch sizes are small with the average numbers of eggs being 10-12 (Conroy 2001). The eggs hatch and larvae develop and metamorphose within the burrow in the jelly associated with the egg mass, with no free swimming or feeding stage – a reproductive strategy known as direct development (Driscoll 1996; Conroy 2001). At metamorphosis, juveniles leave the nest. The juvenile stage is prolonged and recruitment into the breeding cohort occurs at 2 or 3 years of age (Conroy 2001).

Generation time is estimated to be 3.28 years (Driscoll 1999).

The white-bellied frog can live for up to six years, however as adult mortality is high (the adult survival rates are among the lowest observed for anurans) most adults only breed once (Driscoll 1996; Conroy 2001). Recruitment is the main driver of population size, with one year olds

forming the largest age-class in every year studied. Annual fluctuations in the number of breeding males are predominately driven by variations in the level of recruitment to the breeding cohort. In turn, fluctuations in recruitment appear to be influenced by local, rather than regional phenomena (Conroy 2001; Conroy & Brook 2003). As such, it is susceptible to demographic catastrophes, both environmental and stochastic.

Genetic studies and mark-recapture studies confirm that there is very little migration amongst and between populations. The genetic differences between populations are very large, particularly given the small distances between populations (maximum of 18km) (Driscoll 1998). These large genetic differences suggest that current levels of gene flow are approaching zero. This conclusion is consistent with a mark-recapture study which showed that movement of 95 per cent of adult male frogs within the study was less than five metres between seasons within a year, and less than 20m between years (Driscoll 1997). An extinct site was apparently recolonised by white-bellied frogs after six years, indicating that while rare, some movement may be possible between sites. This restricted mobility has important implications with regard to the potential for dispersal, gene flow and the capacity for locally extinct populations to re-establish by natural means. In the shorter term the species does not function as a metapopulation (Driscoll 1998). In 2007 102 subpopulations of white-bellied frogs were identified (defined as being >50m apart) of which 26 (25.5 per cent) are now considered locally extinct (a site is described as extinct if calling males are absent over four consecutive years)(Department of Parks and Wildlife 2015).

Threats

Threats to the white-bellied frog are principally related to habitat disturbance and loss. The table below lists the threats impacting the species in approximate order of severity of risk, based on available evidence.

Threat factor	Consequence rating	Extent over which threat may operate	Evidence base
Habitat loss and degradation (e.g. clearing, trampling, fragmentation, altered hydrology, salinity)	Severe	Whole of range	Most of the range of the white-bellied frog has been cleared for agriculture. It has been estimated that 70 per cent of potentially suitable riparian vegetation has been cleared within the range (Wardell-Johnson and Roberts 1991). The white-bellied frog appears to be able to persist within this modified environment, at least in the short term, providing the remaining riparian vegetation cover stays intact. Individuals of this species have not been found to persist at any sites where the riparian vegetation has been cleared or severely degraded. The majority of white-bellied frogs occur on private land where they are subject to the impacts of the owner's management regime. Most of the current populations have few individuals irrespective of tenure. Although vegetation clearing is regulated and the rate of broad scale clearing has declined,

		<p>vegetation is still cleared for fire break construction, maintenance of utility services and the creation of illegal drug crops. Therefore, vegetation clearing remains a significant threat to white-bellied frog, and the protection of this habitat must be taken into account when applications to clear native vegetation are assessed.</p> <p>The majority of the white-bellied frog's distribution is on private property where dairy and beef cattle has been the predominant land use. Cattle have the potential to cause severe soil disturbance, especially as they obtain water from the creek habitats. Feral pigs (<i>Sus scrofa</i>) occur throughout the south-west of WA. They are capable of causing significant disturbance, particularly during summer, when they concentrate their activity within riparian zones in their attempts to source water.</p> <p>The breeding biology of the white-bellied frog makes it particularly vulnerable to changes in hydrology. Altering surface and/or sub-surface water flow may lead to desiccation or flooding of habitat. Clearing of vegetation, establishment and harvesting of plantations, and construction of dams can all have impacts on surface and sub-surface streamflows.</p> <p>Amphibians are susceptible to changes in water quality. These threats include:</p> <ul style="list-style-type: none"> • herbicide (and associated wetting agents), pesticide, fertiliser and other agricultural chemicals that may infiltrate the sites from adjoining agricultural lands; • increased salinity levels associated with higher water tables resulting from vegetation clearing; • acidification as a result of disturbance to acid sulphate soils; and
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			<ul style="list-style-type: none"> • siltation/sedimentation that can occur from disturbances within catchments.
Climate change (temperature increase, extreme weather events e.g. cyclones, droughts)	Potential	Whole of range	<p>The south-west of WA has been assessed as being particularly vulnerable to the effects of climate change (Pouliquen-Young and Newman 2000). There has been an observed decrease of 19 per cent in May-July rainfall the south-west since the 1970s and an approximate increase in temperature of 0.7°C since the 1950s, with warming greater in winter (CSIRO and Bureau of Meteorology 2016). The future predicted trend is continued warming and a decreased winter rainfall, with CSIRO suggesting an approximate temperature rise of 1°C and a 70mm reduction in annual rainfall by 2030, for the south-west (Timbal 2004; CSIRO and Bureau of Meteorology 2016). Climate change can exert biological, ecological and physical pressures resulting in changes such as a loss of canopy continuity and increased fire frequency. The impact of reduced rainfall may be less or delayed if it is found that the main source of water into a habitat is from aquifer outflow rather than surface run-off. Modelling by CSIRO indicates that under the median future climate runoff is expected to decrease by 20-30 per cent (CSIRO 2009). Understanding the hydrology of occupied habitats and surrounding areas will assist in determining specific risk levels.</p>
Small population sizes and population fragmentation	Severe	Whole of range	<p>The species is distributed as very small subpopulations with little or no demographic exchange. The extent of such populations is typically <250 lineal metres of stream and thus they are particularly vulnerable to small scale disturbances (Department of Parks and Wildlife 2015).</p>

Disease - Chytrid fungus	Unknown	Whole of range	Chytridiomycosis is an infectious disease caused by the amphibian chytrid fungus (<i>Batrachochytrium dendrobatidis</i>) that affects amphibians worldwide, causing mass die-offs and some species extinctions (Department of the Environment and Energy 2016). Chytridiomycosis has been detected in the white-bellied frog. Despite detection there is no evidence to indicate that it has had, or is having any significant impact on the species to date. However based on the impact this disease has had on other frog species both in Australia and internationally, vigilance regarding hygiene practices is highly recommended until the risks are fully understood.
Chemicals	Potential	Most of range	Most of the range of white-bellied frog is within established agricultural areas, where application of agricultural chemicals to farming land is a regular occurrence. The application of fungicides, fertilisers, herbicides and pesticides to land adjoining known frog populations poses the risk of these entering and contaminating habitat areas or causing direct harm to the individual animals. The level of knowledge on the response of this species of frog to the range of agricultural chemicals is poor. However there is literature that highlights the sensitivity of frog species to commonly used agricultural chemicals (Mann et al. 2009).
Invasive species	Potential	Most of range	There are no data with which to assess this threat.
Inappropriate fire regimes	Potential	Most of range	The related <i>Geocrinia vitellina</i> (orange-bellied frog) takes 5-7 years to recover post-fire, while frequent and extensive fires occur within the species area of occurrence. Increasing fire frequency appears to have reduced the extent of permanently waterlogged

		habitats such as that occupied by the white-bellied frog.
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Assessment of available information in relation to the EPBC Act Criteria and Regulations

Criterion 1. Population size reduction (reduction in total numbers)			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) <i>cannot be used for A3</i>]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>			
<p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p> <p><i>based on any of the following</i></p>			

Evidence:

Given the generation length of the white-bellied frog is estimated to be 3.28 years (Driscoll 1999), the appropriate time scale for this criterion is 10 years.

Data presented in the Western Australian recovery plan for the white-bellied frog (Department of Parks and Wildlife 2015) shows the frequency of discrete sites occupied by populations of certain sizes. The number of extant populations has declined since approximately 2004 from slightly over 80 to slightly less than 70. Additionally, the frequency of smaller populations (<5 individuals) has increased relative to larger (>20 individuals), suggesting a decline in the total population size. However, the decline appears unlikely to be significantly greater than 20% over three generations.

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

Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²

AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Evidence:

The white-bellied frog is restricted to corridors of riparian vegetation within an extremely localised distribution in the south-west of Western Australia (Conroy & Brook 2003). The total amount of suitable habitat for the white-bellied frog is reported to be approximately 1.9 km² within a range of 130 km² (Wardell-Johnson and Roberts 1989, 1993; Conroy & Brook 2003). However, the calculated extent of occurrence is 176 km², and the area of occupancy is 120 km² (DoEE 2017). These figures are based on the mapping of point records from 1983 to 1994, compiled from state and Commonwealth agencies along with museums, herbaria, research institutions and non-government organisations. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2014. The species demonstrates extremely limited dispersal ability and thus its distribution is severely fragmented. The recovery plan for the species notes that the number of subpopulations has decreased since approximately 2004.

The data presented above appear to demonstrate that the species is **eligible for listing as either Critically Endangered or Endangered** under this criterion. The purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it will be confirmed as a result of responses to this consultation process.

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

Evidence:

The recovery plan for the white-bellied frog presents population data as number of sites ("subpopulations") within separate size classes. Multiplying the frequencies by the mid-point of each size class enables a coarse estimate of population size to be calculated. Between 2005 and 2009 the corresponding estimate is approximately 700 individuals. The majority of subpopulations consist of fewer than 20 individuals.

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

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

Evidence:

As described above for Criterion 3, the total population is approximately 700 individuals.

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

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

Evidence:

Population viability analysis has been undertaken and models predict that one third of the extant populations will decline to local extinction over a 20 year time frame (Conroy & Brook 2003). This predicted rate of decline is supported by observational data showing that 23 populations have disappeared in the 20 years since the species was discovered (Roberts et al. 1999). Conroy and Brook conclude that the species will likely undergo substantial range reductions, making it increasingly vulnerable to threats such as habitat clearance, but is not likely to go extinct within the next century.

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

Conservation Actions

Recovery Plan

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

The actions below are drawn from the recovery plan for the species developed by the Western Australian Department of Parks and Wildlife (Department of Parks and Wildlife 2015), now Department of Biodiversity, Conservation and Attractions Western Australia.

Primary Conservation Actions

- To protect and effectively manage populations and their habitat.

Conservation and Management Priorities

Habitat loss and disturbance

- Incorporate white-bellied frog habitat management and protection into the appropriate management plans and programs including:
 - zoning mechanisms;
 - access rationalisation by limiting access points;
 - interpretive information and signage for visitors (while not disclosing exact locations); and
 - management of disturbances to minimise impacts on *Geocrinia* habitat such as prescribed fire, track construction and maintenance, and visitor amenities.
 - Investigate reasons for the disappearance of the species from much of its former range and examine options for increasing the range.
- Liaise and work with landholders to ensure they are implementing the most up to date land management practices, to minimise the impacts on white-bellied frog populations, including:
 - maintain regular contact with landholders;
 - reinforce the importance of management practices to minimise disturbance or direct impact on populations; and
 - disseminate new information on land management practices.
- Identify and implement strategies to achieve protection of white-bellied frog habitat on private land including consideration of populations and important habitat as part of environmental impact assessments and assessment of vegetation clearing applications.
- Maintain pig control programs on DPaW-managed lands and liaise with landowners to monitor disturbance by pigs and take actions if required.
- Install and assist in the maintenance of fences to exclude livestock from known and potential habitat on private land.
- Develop habitat protection guidelines for land uses such as tree plantations, vineyards and other horticultural pursuits on land adjacent to white-bellied frog sites. Define acceptable limits and thresholds and outline suitable parameters to guide the

development of these agricultural activities that include vegetation buffers, water interception system setbacks and water system offsets.

- Ensure appropriate fire management (on private and public land) is conducted in all known and potential habitat and includes:
 - excluding fire from swamp habitat;
 - early spring prescribed burns in adjacent forested areas to prevent wildfire – at a minimum frequency of eight years;
 - locating fire breaks near but not within swamp habitat; and
 - monitoring if fire does occur to determine the impact on frog populations.
- As opportunities arise, add lands containing white-bellied frog populations to the conservation estate.
- Continue to implement hygiene standards to minimise spread of Chytrid fungus by all persons accessing sites, and particularly those moving between sites.

Disease

- Minimise the spread of the chytrid fungus by implementing suitable hygiene protocols (Murray 2011) to protect priority populations as described in the *Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis* (Department of the Environment and Energy 2016).
- Provide disease identification and prevention protocols (methods of handling, diagnostic keys, etc.) to researchers and land managers for use in the field.

Captive breeding and population augmentation

- Maintain captive program at Perth Zoo to provide stock for:
 - Translocate captive reared white-bellied frogs to augment existing small, but declining populations.
 - Translocate captive reared white-bellied frogs into areas of suitable habitat (possibly recently extinct sites), increasing the area of occurrence of the species and avoiding potential outbreeding impacts.
 - Develop a captive breeding strategy to inform the selection of release sites and genetic management.

Community engagement

- Provide public information to landholders in the Shire of Augusta - Margaret River and the broader community including:
 - distribution of annual frog newsletter on *G. alba* (particularly to landholders with and adjacent to known populations);
 - displays at community events;
 - articles in local press; and
 - targeted rehabilitation of riparian habitats, though Natural Resource Management (NRM) incentives and initiatives.

Survey and Monitoring priorities

- More precisely assess the population size, distribution and ecological requirements of white-bellied frog.

- Design and implement a monitoring program for white-bellied frog. Note that *Geocrinia* monitoring practices should be restricted to those techniques that do not require entering the swamp – i.e. all monitoring activities performed on the dryland edge of the habitat.
- Conduct monitoring annually during the peak breeding season

Information and Research priorities

- Identify and quantify the specific landscape and catchment characters and elements that potentially impact on existing populations.
- Determine specific site/system hydrology and the ecological water requirements to maintain sites which consider future changes resulting in climate change and land use changes. Continue monitoring variables (e.g. ground water levels, rainfall, temperature etc.).
- Determine the influence of condition/structure of vegetation on habitat use. Identify key site specific characteristics, their natural limits of variation and what parameters should be measured.
- Investigate habitat manipulation (e.g. artificial water systems) as mitigation against future threats such a climate change.
- Determine the biomass accumulation rate and other properties of the organic litter/humus layer favoured by the species and evaluate the role of fire to maintain riparian vegetation and/or produce these properties.
- Undertake research and monitoring to determine the presences and potential effects of chemicals (e.g. herbicides, pesticides, fertilizers, wetting agents) on the frogs and their habitat, and develop guidelines for their use in areas adjacent to occupied or suitable habitat.
- Establish quarantine reference sites where access into the swamp habitat is prohibited. Sites with the following characteristics would be suitable candidates:
 - Contain a single isolated subpopulation of size class 10-20, or a subpopulation that occurs upstream (preferably at the head of the creek) and separated from the next population by a significant distance.
 - The site is not accessed by the public, agencies or researchers.
- Support research into field detection and treatment of disease, and apply to sub-populations experiencing unexplained declines in population size.

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Consultation questions

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

15. Can you advise as to whether this species is of cultural significance to Indigenous Australians?