

Threatened species nomination

For nominations to the WA Threatened Species Scientific Committee (and the Minister for Environment) to amend threatened species listings under the WA *Wildlife Conservation Act 1950* or their IUCN Red List threat status.

Cover Page *(Office use only)*

Species name (scientific and common name):	<i>Spicospina flammocaerulea</i> (sunset frog)
Nomination for (addition, deletion, change):	Change (category and criteria)
Nominated conservation category and criteria:	Vulnerable B1ab(iii)+2ab(iii)

TSSC assessment of eligibility against the criteria:		
A.	Population size reduction	•
B.	Geographic range	•
C.	Small population size and decline	•
D.	Very small or restricted population	•
E.	Quantitative analysis	•

Outcome:			
TSSC Meeting date:	5 April 2017		
TSSC comments:	Considered to be at 6 locations based on the separate clustering of (5) sites on private property and the remaining sites being one location within conservation estate.		
Recommendation:	VU B1ab(iii)+2ab(iii)		
Ministerial approval:	22 December 2017	Government Gazette:	16 January 2018

Nomination summary *(to be completed by nominator)*

Current conservation status				
Scientific name:	<i>Spicospina flammocaerulea</i>			
Common name:	sunset frog			
Family name:	Myobatrachidae	Fauna <input checked="" type="checkbox"/>		Flora <input type="checkbox"/>
Nomination for:	Listing <input type="checkbox"/>	Change of status <input checked="" type="checkbox"/>		Delisting <input type="checkbox"/>
Is the species currently on any conservation list, either in WA, Australia or Internationally?		Yes <input checked="" type="checkbox"/> If Yes; complete the following table	No <input type="checkbox"/> If No; go to the next question	
Jurisdiction	List or Act name	Date listed or assessed	Listing category i.e. critically endangered	Listing criteria i.e. B1ab(iii)+2ab(iii)
International	IUCN Red List	30/04/2004	Vulnerable	D2
National	EPBC Act	16/07/2000	Endangered	
State of WA	WC Act	14/07/1998	Vulnerable	D2
		Assessed 5/4/2017	Vulnerable	B1ab(iii)+2ab(iii)
Other States or Territories				
Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:				
<ul style="list-style-type: none"> this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria; 			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:				
<ul style="list-style-type: none"> surveys of the species were adequate to inform the assessment; 			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:	Refer to nomination			
<ul style="list-style-type: none"> the conclusion of the assessment remains current and that any further information that may have become available since the assessment was completed supports or is consistent with the conclusion of the assessment. 			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:	Reassessment of species originally listed under criterion VU D2. Eligible for listing under criterion B.			
Nominated conservation status: category and criteria (including recommended categories for deleted species)				
Presumed extinct (EX) <input type="checkbox"/> Critically endangered (CR) <input type="checkbox"/> Endangered (EN) <input type="checkbox"/> Vulnerable (VU) <input checked="" type="checkbox"/>				

None (least concern) <input type="checkbox"/>	Data Deficient <input type="checkbox"/>	Conservation Dependent <input type="checkbox"/>
What criteria support the conservation status category above? <i>Refer to 'Summary of the five criteria (A-E)' and the check version that can be completed to indicate all criteria options</i>		B1ab(iii)+2ab(iii)
Eligibility against the criteria		
<i>Provide justification for the nominated conservation status; is the species eligible or ineligible for listing against the five criteria. For delisting, provide details for why the species no longer meets the requirements of the current conservation status.</i>		
A.	Population size reduction	<ul style="list-style-type: none"> Population size estimated to be 600 mature individuals (as below – Criterion C) however there is insufficient information to estimate a percentage of continuing decline over the appropriate period; generation length unknown. Insufficient information to estimate the percentage of decline.
B.	Geographic range	<ul style="list-style-type: none"> (B1) The EOO is estimated to be 356 km² using Minimum Convex Polygon (MCP) or 220 km² using α-hull. (B2) The AOO is estimated to be 68 km² using 2 km x 2 km grid, but this is considered to be an overestimate of the occupied habitat as they are restricted to the moist peat swamp habitat. (a) The species is only found in the isolated relictual peat swamps on the Frankland, Bow and Kent River catchments. Considered to be at 6 locations based on the separate clustering of (5) sites on private property in separate drainage systems and the remaining sites being one location within conservation estate. The most plausible threats, including habitat disturbance particularly due to feral pigs, a drying climate and wildfire, could affect all individuals/sites within each land tenure in the same time frame. (b) It is inferred, due to the ongoing impact of feral pigs, a drying climate and wildfire on peat swamps, that there will be a continuing decline in (iii) area, extent and/or quality of habitat. As the species is reliant on peat based systems, if the peat substrate is impacted by wildfire removing the peat, the result may be formation of acid sulphate soils that can cause irreversible damage to the habitat. A few of the peat systems within the species range have been damaged by wildfire so far. Wildfires burned through some of the peat habitats within the species range in 2015 and 2016 and caused significant damage to habitat (peat burned down to 30 cm depth). While the species' peat swamps are not considered part of a Threatened Ecological Community or Priority Ecological Community, the threats to similar TEC/PEC peat vegetation are most likely also impacting the peat swamps on the Frankland, Bow and Kent River catchments. The Priority 1 PEC, "<i>Reedia spathacea</i> - <i>Empodisma gracillimum</i> - <i>Schoenus multiglumis</i> dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region" is threatened by too frequent fire, pig activity,

		<p>weed invasion and vegetation clearing, all of which are present in the sunset frog's distribution.</p> <ul style="list-style-type: none"> • (c) Surveys have recorded what appears to be extreme fluctuations in the number of individuals. Some sites where frogs had not been recorded for more than 10 years and had thus been considered potentially extinct had then had frogs recorded following a fire. Larger numbers of calling frogs are also recorded following high rainfall events. Fluctuations in the number of calling males have also been recorded between breeding seasons. However, these fluctuations may be attributed to call variability and call detectability rather than fluctuation in the number of locations and individuals. • Meets criteria for Endangered B1ab(iii)+2ab(iii)
C.	Small population size and decline	<ul style="list-style-type: none"> • Assuming a 1:1 sex ratio and using the maximum calls heard per site over 10 years, the population size is estimated to be 600 mature individuals. However, due to the issues with detecting calling males, this is not a reliable estimate. • (C1) Insufficient information to estimate a percentage of continuing decline. • (C2) It is inferred that there will be a continuing decline in population size due to ongoing threats to their habitat from feral pigs and a drying climate. • (a)(i) Assuming a 1:1 sex ratio and using the maximum calls heard at the largest site over 10 years, the maximum number of mature individuals at the largest site is estimated to be > 160. • (b) Surveys have recorded extreme fluctuations in the number of individuals. Some sites where frogs had not been recorded for more than 10 years and had thus been considered potentially extinct had then had frogs recorded following a fire. Larger numbers of calling frogs are also recorded following high rainfall events. However, this may be attributed to call variability and call detectability rather than fluctuation in the number of locations and individuals. • There are also fluctuations in the numbers of calling males recorded between breeding seasons. For example, Site 24 (Bow River Plantation) had an estimated 70-80 calling males in 2008 (26 calls recorded with an error quotient of an estimated 50 frogs), 54 calls recorded in 2009, none in 2010, 14 in 2011, 17 in 2012 and 9 in 2013. However, this may also be attributed to call variability and detectability (as above point). Surveys since 2012 have included acoustic recording devices to detect calls over a long period to account for call variability and detectability, however sufficient data is not yet available for analysis. • Insufficient information to assess as the population estimate is not considered to be highly reliable.
D.	Very small or restricted population	<ul style="list-style-type: none"> • (D1) Assuming a 1:1 sex ratio and using the maximum calls heard per site over 10 years, the population size is estimated to be 600 mature individuals. However, due to the issues with detecting calling males, this is not a reliable estimate. • (D2) The AOO is estimated to be 68 km² and therefore is not eligible for listing under this criterion using AOO. The species is found at 6 locations

		<p>(one on conservation estate and 5 on private property), and an estimated 600 mature individuals. Consequently, at present is thus only likely to meet Endangered under criteria B and C, and thus does not satisfy the criteria for Vulnerable D2.</p> <ul style="list-style-type: none"> • Insufficient information to assess as the population estimate is not considered to be highly reliable. 	
E.	Quantitative analysis	<ul style="list-style-type: none"> • Insufficient information to assess. 	
Reasons for change of status			
Genuine change <input type="checkbox"/> New knowledge <input checked="" type="checkbox"/> Taxonomic change <input type="checkbox"/> Previous mistake <input type="checkbox"/> Other <input type="checkbox"/>			
Summary of assessment information <i>(detailed information to be provided in the relevant sections of the form)</i>			
EOO	356 km ² (MCP, calls heard within 10yr) or 220 km ² (α-hull) 356 km ² (MCP, incl. sites with no calls recorded in 10 yr but not yet deemed potentially extinct) or 238 km ² (α-hull) 383 km ² (MCP, all known sites) or 286 km ² (α-hull)	AOO 68 km ² (2 km x 2 km grid, calls heard within 10yr) 72 km ² (2 km x 2 km grid, incl. sites where calls have not been heard in 10yr but not yet deemed potentially extinct) 80 km ² (2 km x 2 km grid, all known sites)	Generation length Unknown.
No. locations	6 (conservation estate and 5 private properties)	Severely fragmented	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
No. subpopulations	1 subpopulation based on genetics, 26 survey sites (20 surveys sites with calls heard in past 10 years)	No. mature individuals	Unknown. Estimated to be 600 (assuming 1:1 sex ratio and based on maximum calls heard per site over 10 years) but this estimate is not reliable.
Percentage global population within WA		100 %	
Percentage global population within Australia		100 %	
Percentage population decline over 10 years or 3 generations		Unknown	

Summary of subpopulation information (detailed information to be provided in the relevant sections of the form)						
Sites	Land tenure	Survey information: Date of survey and No. mature individuals	AOO	Site / habitat Condition	Threats (note if past, present or future)	Specific management actions
Extant						
Site 1: Mountain Rd North and South	National Park	See Appendix 1 for survey details	$\leq 0.06 \text{ km}^2$	Intact vegetation. No evidence of feral pigs recorded in 2013, peat was moist and spongy however no water was present north side of the road which is required for breeding. No decline in habitat condition noticed during 2015 visit.	<p>Inappropriate fire regimes and wild fire: <i>past, present and future</i></p> <p>Physical habitat disturbance leading to habitat degradation and/or loss: <i>past, present and future</i></p> <p>Alterations in hydrology: <i>future</i></p> <p><i>Phytophthora cinnamomi</i> dieback: <i>past, present and future</i></p> <p>Collection due to novelty value of colouration and apparent rarity: <i>past, present and future</i></p> <p><i>Chytridiomycosis</i> infection: <i>Future</i></p> <p>Climate change: <i>Present and future</i></p>	<p>Pig control</p> <p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Input through recommended management into prescribed burn programming and other disturbance activities</p>
Site 2: Boronia Rd 1	National Park	-	$\leq 0.06 \text{ km}^2$	Very good condition but pig disturbance has had an impact. Partially burnt in October 2014.	See Threats for Site 1	<p>Pig control</p> <p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Input through recommended management into prescribed burn programming and other</p>

						disturbance activities
Site 4: Collis Rd 1	National Park	-	$\leq 0.06 \text{ km}^2$	Very good condition but pig disturbance has had an impact. Partially burnt in October 2014.	See Threats for Site 1	<p>Pig control</p> <p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Input through recommended management into prescribed burn programming and other disturbance activities</p>
Site 6: Boronia Rd 1	National Park	-	$\leq 0.06 \text{ km}^2$	Condition of current occupation is very good but potential habitat in the area was impacted by the peat substrate being removed by fire in 2014 (south side of road) and some peat substrate at the edges of the habitat was consumed by fire in 2015 (north side of road). Pig damage has occurred.	See Threats for Site 1	<p>Pig control</p> <p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Input through recommended management into prescribed burn programming and other disturbance activities</p>
Site 7: Collis Rd 2	National Park	-	$\leq 0.06 \text{ km}^2$	Condition is generally good but pig disturbance has	See Threats for Site 1	<p>Pig control</p> <p>Chytrid hygiene protocol</p>

				impacted on condition.		Regular monitoring program through field surveys and songmeter surveys Input through recommended management into prescribed burn programming and other disturbance activities
Site 8: Boronia Rd 3	National Park	-	≤ 0.06 km ²	Extensive pig damage occurred in 2016, however frogs heard calling in 2017.	See Threats for Site 1	Pig control. Chytrid hygiene protocol Regular monitoring program through field surveys and songmeter surveys Input through recommended management into prescribed burn programming and other disturbance activities Installation of Sentek Drill and Drop probe to monitor soil moisture
Site 9: Trent Rd 1	Private property adj. National Park	-	≤0.06km ²	Very good condition Fenceline installed by landholder in 2012 which removed small percentage of habitat	Inappropriate fire regimes and wild fire: <i>past, present and future</i> Physical habitat disturbance leading to habitat degradation and/or loss: <i>past, present and future</i> Alterations in hydrology: <i>past, present</i>	Chytrid hygiene protocol Regular monitoring program through field surveys and songmeter surveys Liaise with landholder re management of population to

					<i>and future</i> Degraded water quality: <i>past, present and future</i> <i>Phytophthora cinnamomi</i> dieback: <i>past, present and future</i> Collection due to novelty value of colouration and apparent rarity: <i>past, present and future</i> Chytridiomycosis infection: <i>Future</i> Climate change: <i>Present and future</i> <i>Changes in land ownership of private property and potential differing priorities: future</i>	promote health of population
Site 10: Trent Rd 2	Private property adj. National Park	-	≤ 0.06 km ²	Not actively farmed	See threats for Site 9	Listening surveys from a distance due to inability to access property
Site 17: Nornalup Rd 3	Private property	-	≤ 0.06 km ²	Remnant vegetation is fenced but facing hydrological changes (adjacent blue gums) and pollution (chemical and fertiliser runoff). Some blackberry presence on edge of system.	See threats for Site 9	Chytrid hygiene protocol Regular monitoring program through field surveys and songmeter surveys Liaise with landholder re management to promote health of population
Site 19. Trent Rd	National	-	≤ 0.06 km ²	Under threat from	See threats for Site 1 and 9	Pig and deer control

3	Park & private property			fence maintenance and clearing activities		<p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Liaise with landholder re management to promote health of population</p>
Site 20: Giants 1	Private property	-	$\leq 0.06 \text{ km}^2$	Degraded - due to grazing by cattle; vegetation opened up and eutrophication.	See threats for Site 9	<p>Listening surveys only</p> <p>Liaise with landholder re management to promote health of population</p>
Site 24: Bow River Plantation	Private property adj. National Park	-	$\leq 0.06 \text{ km}^2$	Remnant vegetation is fenced but facing hydrological changes (adjacent blue gums) and pollution (chemical and fertiliser runoff)	See threats for Site 9	<p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Liaise with land managers re management to promote health of population inclusive of replacement of fence and pig and deer control</p>
Site 28: Timberjack Rd	National Park	-	$\leq 0.06 \text{ km}^2$	Remnant vegetation has been fenced following extensive high impact damage by feral pigs (circa 2000), with permanent damage to areas of the peat substrate.	See threats for Site 1	<p>Pig control inclusive of fencing</p> <p>Maintenance of fence</p> <p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Input through recommended management into prescribed</p>

						<p>burn programming and other disturbance activities</p> <p>Peizometers installed to monitor hydrological change</p>
Site 29: Mountain Rd	National Park	-	$\leq 0.06 \text{ km}^2$	Very good condition	See threats for Site 1	<p>Pig control.</p> <p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Input through recommended management into prescribed burn programming and other disturbance activities</p>
Site 31: Saw Rd 1	Private property adj. National Park	-	$\leq 0.06 \text{ km}^2$	Dozer tail through site in 2016	See threats for Site 9	Propose same or similar to Site 9
Site 32: Saw Rd 2	National Park	-	$\leq 0.06 \text{ km}^2$	Intact vegetation.	See threats for Site 1	See Site 1
Previously considered extinct						
Site 5. Nornalup Rd 1	National Park	-	$\leq 0.06 \text{ km}^2$	Drying habitat and burnt in 2012	See Threats for Site 1	<p>Pig control.</p> <p>Chytrid hygiene protocol</p> <p>Regular monitoring program through field surveys and songmeter surveys</p> <p>Input through recommended management into prescribed</p>

						burn programming and other disturbance activities
Site 14: Middle Rd 2	National Park	-	$\leq 0.06 \text{ km}^2$	Burnt in 2011	See Threats for Site 1	Pig control Chytrid hygiene protocol Regular monitoring program through field surveys and songmeter surveys Input through recommended management into prescribed burn programming and other disturbance activities
No calls heard for 5 years						
Site 11: Rose Rd	Private property	-	$\leq 0.06 \text{ km}^2$	Marginal habitat but minimal disturbances	See threats for Site 9	Minimal ongoing liaison to facilitate potential further surveys
Site 21: Gum Link Rd 1	National Park	-	$\leq 0.06 \text{ km}^2$	Excellent condition	See threats for Site 1	Pig control Chytrid hygiene protocol Regular monitoring program through field surveys and songmeter surveys Input through recommended management into prescribed burn programming and other disturbance activities
No calls heard for 10 years						
Site 3: Middle Rd 1	National Park	-	$\leq 0.06 \text{ km}^2$	Proportion of potential habitat damaged by peat	See threats for Site 1	Pig control Chytrid hygiene protocol

				ignition in 2014		Regular monitoring program through field surveys and songmeter surveys Input through recommended management into prescribed burn programming and other disturbance activities
Site 26: Western Rd 1	National Park	-	$\leq 0.06 \text{ km}^2$	Significant damage by feral pigs in 2008	See threats for Site 1	Pig control. Chytrid hygiene protocol Regular monitoring program through field surveys and songmeter surveys Input through recommended management into prescribed burn programming and other disturbance activities
Potentially Extinct						
Site 12. Hazelvale Rd 1	Private property	-	0 km ²	Degraded – no suitable habitat remaining due to dam construction	See threats for Site 9	Not managed
Site 13. Hazelvale Rd 2	Private property	-	0 km ²	Degraded – no suitable habitat remaining due to dam construction Now considered to be locally extinct.	See threats for Site 9	Opportunistic surveys only
Site 18. Nornalup Rd 4	Private property	-	0 km ²	Degraded - no suitable habitat	See threats for Site 9	Not managed

				remaining due to cattle movement and associated soil damage/ eutrophication. Now considered to be locally extinct.		
Site 22. Bandit Rd 1	Private property	-	0 km ²	Degraded – due to intensive pig and goat farming	See threats for Site 9	Not managed
Translocation (Failed)						
Site 30. Edmonds*	Private property	-		Good condition	See threats for Site 9	
Potential Habitat						
Site 16. Nornalup Rd 2*	Private property	-		unknown	See threats for Site 9	Not managed and not confirmed as a population
Site 23. Bandit Rd 2*	Private property	-		unknown	See threats for Site 9	Listening surveys only

**Not included in assessment. Site 0 and Site 25 are also not included in this assessment as they are questionable sites – possibly incorrect coordinates as they are in unsuitable habitat.*

Nomination detail

Please refer to the Departments guidelines on nominating species for amendment of the Western Australian threatened species lists at http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Threatened_Species_Nomination_Guidelines_2014.pdf

For technical information on terminology used in this form, and the intent of information requirements, as they relate to an assessment of this nomination against the IUCN Red List criteria, refer to the 2001 *IUCN Red List Categories and Criteria. Version 3.1* http://www.iucnredlist.org/documents/redlist_cats_crit_en.pdf


and *Guidelines for Using the IUCN Red List Categories and Criteria Version 11* (February 2014) <http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf>

Section 1: Taxonomy

1.1 Current taxonomy			
Species name and Author:		<i>Spicospina flammocaerulea</i> (Roberts et. al., 1997)	
Subspecies name(s) and Author:		N/A	
Is the species/subspecies conventionally accepted?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Is there any controversy about the taxonomy?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<i>If not conventionally accepted and/or if there is any controversy; provide details:</i>	N/A		
Has the species/subspecies been formally named?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Has the species/subspecies been recently described?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<i>If the species has not been formally named or described; is it in the process of being described? Is there an anticipated date for the publication of the description? Has a type specimen been deposited? And if so provide the registration number and where deposited.</i>	N/A		
If there are any closely related taxa provide details and include key distinguishing features:	There are no other frogs belonging to the <i>Spicospina</i> genus in Australia. The species is most closely related to the <i>Uperoleia</i> genus, none of which are found in southwestern Australia. Breeding adults, eggs and tadpoles of <i>Crinia glauerti</i> and <i>Litoria adelaidensis</i> have been noted in and around the same ponds as <i>S. flammocaerulea</i> (Dzimnski & Anstis, 2004). However, eggs and tadpole of the sunset frog are unique and can be distinguished from other sympatric species by the use of a hand lens.		
1.2 Taxonomic history			
Are there recent synonyms for the species?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<i>If Yes; provide details of synonyms:</i>	N/A		

Have there been recent changes in the taxonomy or nomenclature?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes; provide details of changes:	N/A		
1.3 Hybridisation			
Is there any known hybridism with other species in the wild?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
If Yes; Where does this occur and how frequently?	N/A		

Section 2: Species information

2.1 Morphology / physical description	
Insert photograph(s) of species or provide as an attachment:	
	
(Photos: Grant Wardell-Johnson)	
Species description:	<p>The sunset frog is a black or very dark blue-grey frog growing to 35 mm. It has bright reddish-orange hands, feet, throat and anterior chest, as well as orange patches around the cloaca and margins of the jaws. The belly has small light to bright blue spots (Tyler & Doughty, 2009). The fingers and toes are slender and without webbing, fringes or terminal disks (Cogger, 2014). It is characterised by bulbous eyes with large glands behind each eye (Burbidge & Roberts, 2002). The male call is a very distinctive and rapidly repeated 'da duk...da duk' (Tyler & Doughty, 2009).</p>
2.2 Biology (provide details)	
<p><i>Spicospina flammocaerulea</i> breed in the late spring/early summer when rainfall levels are low, with male mating calls heard from October to December (Edwards & Roberts 2011). The species is a conventional aquatic breeder, and following inguinal amplexus, eggs are deposited singly, suspended in or on algal mats in seepages or in open water along creek margins (Dziminski & Anstis, 2004; Tyler & Doughty, 2009). Females lay 50-120 eggs, which consist of opaque capsules (Tyler & Doughty, 2009). The tadpoles are free-swimming but may be benthic specialists, with the body form and behaviour of the tadpole suggesting there is a partial burrowing existence in the algal layers or substrate of the ponds (Dziminski & Anstis, 2004). Explosive breeding appears unlikely as numbers of calling males have been observed to remain relatively stable over extended periods throughout the breeding season at some sites (Roberts, Conroy & Williams 1999).</p>	

The results of capture-mark-recapture studies over several years suggest the species has a relatively long life span and fairly high adult survival. *Crinia georgiana*, a similar-sized frog from the south-west region, reaches maturity in one year (Burbidge & Roberts, 2002)

2.3 Ecology (provide details)

The sunset frog is ground-dwelling, known from only permanently moist and peaty swamps in the headwaters of first-order streams or perched swamps in areas of diffuse drainage. Most of the locations are associated with tingle forests, organically rich soils, granite outcrops and hills rising 300-400 m above sea level. Little information about the ecology of the species is known, including food preferences, predation risk and habitat use outside of breeding season.

Section 3: Habitat

3.1 Habitat (provide details in response to the question below)

Described the habitat suitable for the species (biological and non-biological). Include descriptions of specific purpose habitat (e.g. foraging, breeding, roosting, seasonal migration, different life stages).

The sunset frog is a habitat specialist. The species is found in permanently moist peat based swamps with organically-rich soils (Roberts *et al.* 1997), in a high rainfall area of moderate relief with granite outcrops and associated ranges of hills rising to 300 to 400 m (Roberts *et al.* 1999). These sites have high moisture content in the soil and are protected from climatic extremes, often by local seepages that maintain water availability uncharacteristically into spring and summer (Roberts *et al.* 1997). A study by Dziminski & Antis (2004) found pond sizes ranged from 0.5-8 m in diameter 0.25-1.2 m deep and having a thick substrate of peat and detritus. Four of the ponds in this study were found to have a mean pH of 6.33 (SD = 0.12).

If the species occurs in a variety of habitats, is there a preferred habitat?

N/A

Does the species use refugia?
(include what is it and when is it used)

Unknown. On bright nights, male frogs have been recorded calling from beneath vegetation.

Is the habitat restricted in extent or number of locations?

Yes ☒ No ☐ Unknown ☐

If Yes, provide details:

The permanently moist peat swamps are only found in the higher rainfall area of the south-west of WA. The more southern peat-swamps are further restricted as they are land-locked by adjacent agricultural lands.

Is this species reliant on a threatened or priority species or ecological community?

Yes ☐ No ☒ Unknown ☐

If Yes, provide details:

The sunset frog is reliant on the relictual peat swamps, none of which are within Threatened or Priority Ecological Communities.

Are there any other species (sympatric species) that may affect the conservation status of the nominated species?

Yes ☐ No ☐ Unknown ☒

If Yes, provide details:

Breeding adults, eggs and tadpoles of *Crinia glauerti* and *Litoria adelaidensis* have been noted in and around the same ponds as *S. flammocaerulea*, but it is unknown if they affect the species in anyway. Very little is known about the predation risks for this species.

What is the area, extent, abundance of habitat?	Restricted to the relictual peat swamps in the high rainfall area of the south-west of WA.
What is the quality of habitat?	<p>While the species' habitat is not considered part of a Threatened Ecological Community or Priority Ecological Community, the threats to similar TEC/PEC peat vegetation are most likely also impacting the peat swamps on the Frankland, Bow and Kent River catchments. The Priority 1 PEC, "Reedia spathacea - Empodisma gracillimum - Schoenus multiglumis dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region" is threatened by too frequent fire, pig activity, weed invasion and vegetation clearing, all of which are present in the sunset frog's distribution.</p> <p>Of the known sunset frog survey sites, seven have been impacted by pigs and one has been impacted by fire. These disturbance activities result in the exposure of acidic soils and resulting acidification of habitat. This damage is generally not reversible. A few peat systems have been damaged by wildfire and wildfires burned through peat habitats within the species range in 2015 and 2016, causing significant damage in places (peat burned down to 30 cm depth) but the impact of this on the frog has not been assessed as yet (J. Liddelow, <i>pers. comm.</i> 2016)</p> <p>Another four survey sites have been exposed to damaging farm practices (e.g. cattle trampling). This has caused removal of habitat and eutrophication. There are three survey sites which are believed to be extinct due to complete removal of vegetation and intensive farming practices. In all of the swamps there has been erratic continuation of pools into the breeding season resulting in years where breeding is not occurring. This is potentially a continuing trend if the average winter rainfall through the habitat continues to decline (J. Liddelow, <i>pers. comm.</i> 2016).</p>
Is there a decline in habitat area, extent or quality?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
If there is a decline, is the decline continuing?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
Provide details:	See above.
What is the critical habitat or habitat important for the survival of the species?	Permanently-moist peat swamps and swamp catchments. The degradation and/or loss of these habitats would lead to the decline and likely extinction of this species.

Section 4: Survey

4.1 Survey methods (Provide details)	
What survey methods are applicable to the species?	The frog survey methods that are most applicable for this species are mating call surveys, and the District employs a combination of transects and songmeters (automated acoustic recording devices) (Details of methods provided in Section 4.4).
Are there preferred or recommended survey methods that	Survey sites should be selected based on habitat suitability (see habitat information above) or from known locations of the sunset frog.

yield better results for the species?	<p>Call surveys should be conducted during the species' breeding season when males are calling, between October and December. Surveys should be conducted at night. Total immobility and total darkness (no artificial light source) will improve detection (Bain, 2009).</p> <p>It is possible that a higher number of frog calls could be recorded following large rainfall events and on nights when the moon is bright and the sky is clear, but further work is required to determine whether environmental parameters (temperature, moon phase, cloud cover etc.) affect frog call frequency (Bain, 2009).</p> <p>Surveys of eggs and tadpoles may also be conducted, but Dziminski & Anstis (2004) found that dipnets were an ineffective and inefficient method. They suggested developing a sampling method that involves placing benthic traps or large sieves on or in the substrate and allowing the tadpoles to settle before retrieving the trap/sieve.</p>	
Are there special requirements, techniques, expertise or other considerations that are necessary when surveying for this species?	<p>Surveys should be conducted by personnel that are suitably experienced in conducting amphibian call surveys. Further expertise is required for any egg and tadpole surveys to be able to differentiate between different frog species.</p> <p>The survey design should also be considered when conducting surveys/monitoring. It is the District's opinion that listening surveys without point/transect surveys causes wildly exaggerated numbers due to the echoing nature of frog calls (J. Liddelow, <i>pers. comm.</i> 2016).</p>	
Are there reasons why the species may not be detected during surveys?	<p>As with most other frog species, male sunset frogs call in a chorus which makes differentiation of individuals very difficult at a distance, and leads to an over-estimation in the number of calling males. Sunset frog call behaviour has been inconsistent and is poorly understood, so there is not a standard formula for determining the best conditions for peak calling behaviour (Bain 2009).</p>	
Can the species be identified in the field?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Provide details:	Refer to Section 1.1 and Section 2	
Can the species be easily confused within similar species in the field?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
Provide details:	Adult sunset frogs are easily distinguished from other amphibian fauna due to their distinct colouration and male calls (Refer to Section 2), but a hand lens is required for identifying eggs and tadpoles (See Section 1.1).	
<p>List any published survey guidelines, guidance statements, protocols, standard operating procedures or other documents that are relevant to conducting surveys for this species.</p> <ul style="list-style-type: none"> Australian Government. Department of the Environment, Water, Heritage and the Arts (2010). <i>Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the EPBC Act 1999</i>. Retrieved from: https://www.environment.gov.au/resource/survey-guidelines-australias-threatened-frogs-guidelines-detecting-frogs-listed-threatened Bain, K. (2009). <i>Conservation and Management of Spicospina flammocaerulea</i> (sunset frog): A report on activities undertaken in 2008/2009 under Perth Zoo Funding. Frankland, WA: Department of Environment and Conservation. 		

<ul style="list-style-type: none"> Department of the Environment and Energy (2016). <i>Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis</i>. http://www.environment.gov.au/biodiversity/threatened/publications/tap/infection-amphibians-chytrid-fungus-resulting-chytridiomycosis-2016 	
4.2 Survey effort	
Has the species been well surveyed?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Have targeted surveys been conducted for the species?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Provide details of the successful and unsuccessful surveys undertaken for the species:	Mating call surveys at known sunset frog sites have been undertaken annually since 1994. See Appendix 1 for survey details and estimates of the number of calling males.
4.3 Research (Provide details)	
Has the species been well researched?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Unknown <input type="checkbox"/>
What research has been or is being conducted?	<ul style="list-style-type: none"> Taxonomy and habitat described by Roberts <i>et. al.</i> (1997) Genetic work on Australian frog genera by Read <i>et. al.</i> (2001) Threat of fire on frogs in south-west WA by Bamford & Roberts (2003) Breeding biology (embryonic & larval development) described by Dziminski & Anstis (2004) Frog ecology in modified Australia landscapes by Hazell (2003) Genetic diversity and biogeographic history by Edwards & Roberts (2011)
What are the knowledge gaps for the species?	<ul style="list-style-type: none"> Biological and ecological information Effects of environmental parameters Effects of threatening processes
Research recommendations:	As per knowledge gaps above
4.4 Monitoring (Provide details)	
Is the species being monitored, either directly (targeted) or indirectly (general monitoring)?	Yes. Targeted mating call surveys conducted annually since 1994.
What methods are used for monitoring?	<p>Between 1994 and 2007, call surveys during mating season were used to estimate the number of calling males as an indicator of population health. Complete counts were undertaken at two sites in 1994, but otherwise single or several point counts were conducted within subpopulations.</p> <p>Since 2008, population census surveys are undertaken by visiting each swamp at least 3 times (to account for variation in calling behaviour) with 20 sample points randomly located throughout suitable habitat. At each sample point, the number of calling males within 2 m of the point is recorded with an estimate of their distance from the point. The census is undertaken at each point for 5 minutes following a 5 minute period of total immobility and darkness (no artificial light), with an average total census time of 1.5 hr per swamp per census session. Environmental parameters (cloud cover, rain, wind strength and direction, moon</p>

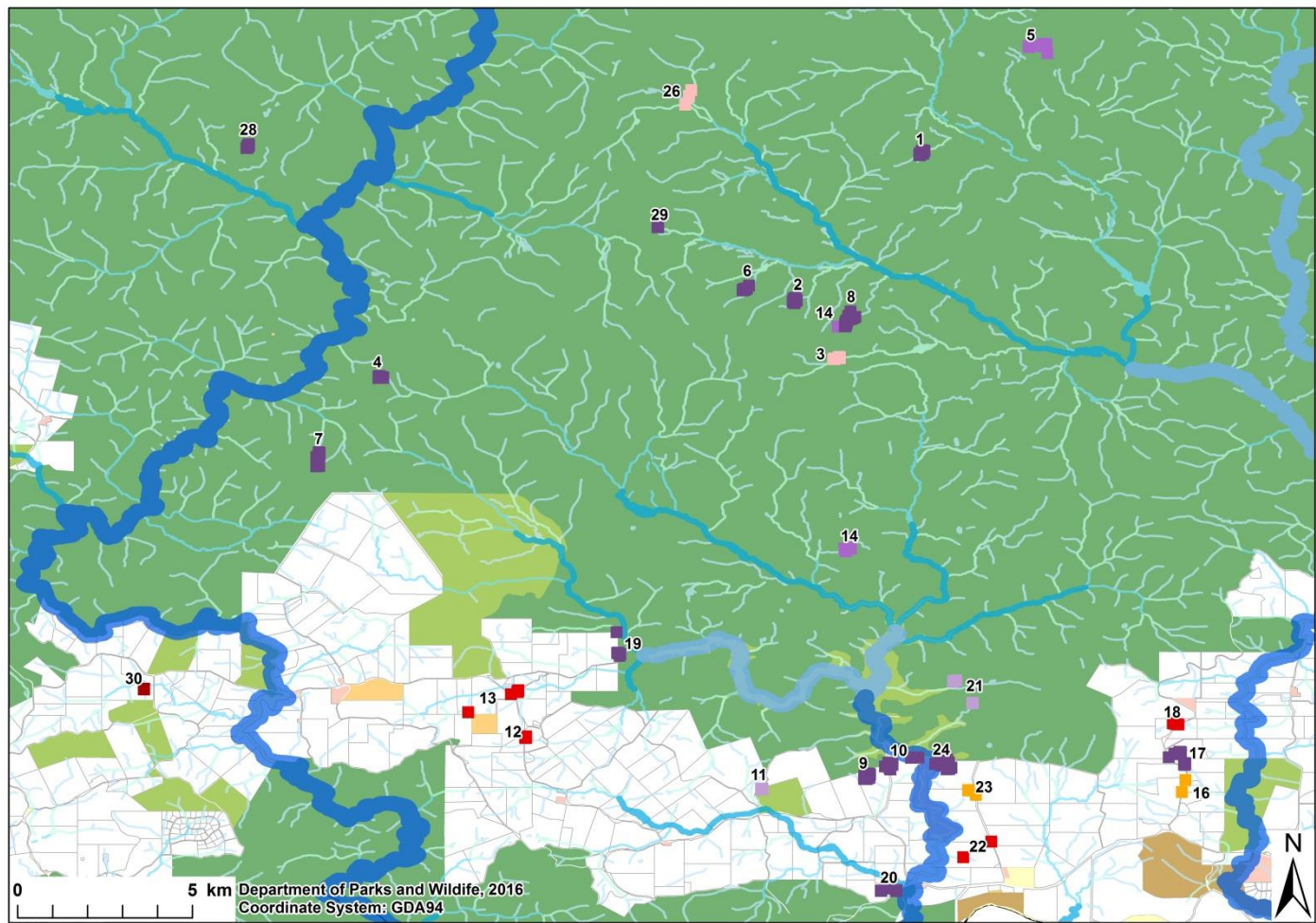
	<p>phase, air temperature, relative humidity and soil temperature, water depth in closest pool, water temperature and water pH) are also recorded at each point. This method provides a greater temporal and spatial coverage, allowing for a more robust dataset for population abundance estimates.</p> <p>Since 2012, Songmeters (automated acoustic recording devices) have been placed in the field for monitoring calling behaviour at different sites.</p>
Monitoring recommendations:	Continue annual monitoring using the population census methods in known current and historical locations of the species, as well as in areas with suitable habitat.

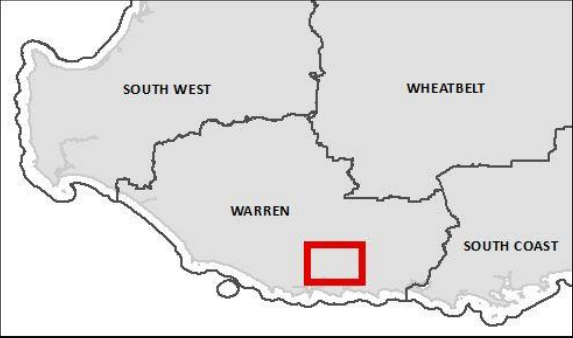
Section 5: Geographic range

5.1 Distribution

Insert map(s) of the species distribution, or provide as an attachment:

Note: Numbers refer to subpopulation (survey) sites. This map does not include the new survey sites (31 and 32) with calling males recorded in 2016. These sites are between sites 18 and 21.



		Legend Sunset frog sites <ul style="list-style-type: none"> Extant Previously considered extinct No calls for 5 years Potential Habitat No calls for 10 years Potentially Extinct Translocation (Failed) Stream Hierarchy <ul style="list-style-type: none"> 1 2 3 4 5 6 7 Land Tenure <ul style="list-style-type: none"> National Park Nature Reserve State Forest Other Dept. Reserves Crown Reserve Unallocated Crown Land Freehold 	
What is the current distribution of the species within Western Australia?		Moist peat swamps on first-order streams in the Frankland, Bow and Kent River catchments of south-west WA, within the vicinity of the western parts of the Shire of Denmark, near Walpole.	
What percentage of the species distribution is within WA?		100 %	
What is the current distribution of the species within the other Australian States and Territories?		N/A	
Does the species occur outside of Australia?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
If Yes, what percentage of the species distribution is within Australia, or what is the significance of the occurrence in Australia?		N/A	
What is the current international trend for the species? (if known)		N/A	
5.2 Migration (fauna only)			
Is the species migratory?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>	
Is the migration within WA or within Australia or international?		N/A	
5.3 Extent of Occurrence (EOO) within Australia			
What is the current EOO?		Approximately 356 km ² (MCP) or 220 km ² (α-hull)	
How has this been calculated?		The EOO has been calculated using minimum convex polygon (MCP) and α-hull using point-based survey data where calling males have been heard in the past 10 years.	
What is the historical EOO?		There is no historical information before 1994. Therefore, the historical EOO is unknown but based on survey data of all known locations, including the sites now thought to be extinct, the past EOO is approximately 383 km ² (MCP) or 286 km ² (α-hull).	
What is the current EOO trend?		Decreasing <input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>	
Provide details on the current		Unknown, but is suspected to be decreasing based on habitat decline, altered	

<i>trend – quantify if possible</i>	hydrology due to vegetation clearing and agricultural landuse. The subpopulation sites on private property in the southern part of the species range are now potentially extinct. Calling behaviour also appears to have declined, however, it is uncertain whether this is due to an improvement in survey methods or an actual decline.
If there has been a change in EOO when did this change occur?	It is possible that the EOO previously extended further south. The vegetation and areas that may have been historically suitable habitat in the southern part of the species range have been cleared for agriculture.
Was the change observed, estimated, inferred or projected?	Inferred. While there has been no observed reduction in the species' range, it is inferred based on vegetation clearing and habitat decline.
If the EOO is decreasing / declining, is it continuing?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
Is the continuing decline observed, estimated, inferred or projected?	Inferred as above, and projected due to the effects of climate change on the moist peat swamp habitat; drying and acidification.
Is there extreme fluctuation in EOO?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
<i>If Yes, provide details:</i>	N/A
5.4 Area of Occupancy (AOO) within Australia	
What is the current AOO?	68 km ² using 2 km x 2 km grid method (possibly an overestimate as they restricted to the moist peat swamp habitat). The area at the largest site, Mountain Road, is estimated to be 0.06 km ² (Roberts <i>et. al.</i> , 1999). Therefore, assuming each site has an area of occupancy of ≤ 0.06 km ² , and 18 sites with calling males recorded in the last ten years, the total AOO would be ≤ 1.08 km ² .
How has this been calculated?	2 km x 2 km grid using point-based survey data where calling males have been heard in the past 10 years.
What is the historical AOO?	108 km ² using 2 km x 2 km grid (or ≤ 0.06 km ² x 24 sites = ≤ 1.44 km ²)
What is the current AOO trend?	Decreasing <input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Unknown <input type="checkbox"/>
<i>Provide details on the current trend – quantify if possible</i>	Manning (2013) reported to the Department of Parks and Wildlife that 3 sites which were on private property have probably become extinct due to intensive farming of pigs and goats (Site 22, Bandit Rd 1), the construction of a dam (Site 12, Hazelvale Rd 1) and no remnant vegetation left where the frogs were previously recorded on the side of a road (Site 18, Nornalup Rd 4). Other sunset frog sites are within private property and because their protection is tenuous at these locations there could be further losses in the future.
If there has been a change in AOO when did this change occur?	Locations that have been presumed extinct have been recorded as being so from 2004-2008.
Was the change observed, estimated, inferred or projected? Give details.	Change was observed through survey effort and obvious degradation and loss of habitat.

If the AOO is decreasing / declining, is it continuing?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Unknown <input type="checkbox"/>
Is the continuing decline observed, estimated, inferred or projected? Give details.	Decline is both observed through extinctions and habitat degradation and inferred due to existing threats and potential threats.			
Is there extreme fluctuation in AOO?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
<i>If Yes, provide details:</i>	Some sites where frogs had not been recorded for more than 10 years and had thus been considered potentially extinct had then had frogs recorded following a fire. However, this may be attributed to call fluctuations and call detectability rather than fluctuation in AOO.			
5.5 Number of Locations				
'Locations' are defined as a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat. (IUCN 2001).				
At how many locations does the species occur?	Currently there are 26 known sites where the <i>S. flammocaerulea</i> has been recorded, all of which are within the southwest region of Western Australia between Walpole and Denmark, mostly within the boundaries of the Shire of Denmark. The species is considered to be at 6 locations based on the separate clustering of (5) sites on private property in separate drainage systems and the remaining sites being one location within conservation estate.			
Has there been a change in the number of locations?	Decrease <input checked="" type="checkbox"/>	Increase <input type="checkbox"/>	No change <input type="checkbox"/>	Unknown <input type="checkbox"/>
If there has been a change, when did this change occur?	Subpopulations (and potentially locations) that have been presumed extinct have been recorded as being so from 2004-2008.			
Was the change observed, estimated, inferred or projected? Give details.	Change was observed through survey effort and obvious degradation of habitat.			
If the number of locations is decreasing / declining, is it continuing?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Unknown <input type="checkbox"/>
Is the continuing decline observed, estimated, inferred or projected? Give details.	Decline is both observed through local extinctions and habitat degradation and inferred due to existing threats and potential threats.			
Is there extreme fluctuation in the number of locations?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
<i>If Yes, provide details:</i>	Some sites where frogs had not been recorded for more than 10 years and had thus been considered potentially extinct had then had frogs recorded following a fire. However, this may be attributed to call fluctuations and call detectability rather than fluctuation in the number of locations.			
Does this species occur on any off-shore islands?			Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<i>If Yes, provide details:</i>	N/A			

5.6 Fragmentation		
Is the distribution fragmented?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
<p>The phrase 'severely fragmented' refers to the situation in which increased extinction risks to the taxon results from the fact that most of its individuals are found in small and relatively isolated subpopulations (in certain circumstances this may be inferred from habitat information). These small subpopulations may go extinct, with a reduced probability of recolonization.</p>		
Is the distribution severely fragmented?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
<i>If Yes, provide details:</i>	<p>The sunset frog is a habitat specialist and is only found in the isolated and permanently moist peat swamps on first order streams in the higher rainfall area of south-west WA. However, genetic work demonstrates that there is low genetic variation across the entire population, and therefore individuals are not isolated to particular peat swamps, with females known to disperse ≤ 10 km (Edwards & Roberts, 2011).</p> <p>However, some of the sites in the southern range of the species distribution are on private properties which have been highly cleared for agricultural purposes. It is unlikely that individuals at these sites are able to disperse, and therefore these particular sites are considered to be highly isolated/fragmented.</p>	
5.7 Land tenure		
Is the species known to occur on lands managed primarily for nature conservation? i.e. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<i>If Yes; provide details:</i>	Fourteen sites occur on land managed by the Department of Parks and Wildlife (National Park).	
Is the species known to occur on lands that are under threat? i.e. mining tenement, zoned for development		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<i>If Yes; provide details:</i>	Twelve sites occur on privately owned land, 3 of which are adjacent to the National Park, and one site stretches across the boundary between a private property and the National Park.	
Provide details of other land tenures where the species occurs as this relates to the species conservation status	N/A	

Section 6: Population

<p>'Population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of mature individuals of the taxon. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used. (IUCN 2001)</p>
<p>'Subpopulations' are defined as geographically or otherwise distinct groups in the population between which there</p>

is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).

6.1 Subpopulations

Location (include coordinates)	Land tenure	Survey information: Date of survey and No. mature individuals	AOO	Site / habitat Condition
See survey site details provided in Summary of subpopulation information table (p. 4)				

6.2 Population size (Australian context) (include how numbers were determined/calculated)

What is the total population size?	Unknown, however there is an estimated 600 mature individuals (refer to question 6.3 below). Note: this population estimate is not highly reliable.
What is the number of subpopulations?	Based on genetic evidence, there is only one subpopulation. There are 25 survey sites known to have calling males (19 surveys sites with calls recorded in the last 10 years)
What percentage of the population is within WA?	100 %
What percentage of the population is within Australia?	100 %

6.3 Population dynamics (Australian context) (include how numbers were determined/calculated)

What is the number of mature individuals?	<p>Roberts <i>et. al.</i> (1997) assume a 1:1 sex ratio, and therefore there are an estimated 600 mature individuals based on the maximum number of calling males recorded at each site over the past 10 years (disregarding surveys not carried out by the District).</p> <p>However, despite improved census survey techniques, calling behaviour continues to be very inconsistent and the effect of temporal conditions on the number of calling males is still unknown, and therefore this type of estimate has limited accuracy.</p>
What is the number of immature individuals?	Unknown
What is the number of senescing/past reproductive individuals?	Unknown
What is the maximum number of mature individuals per subpopulation?	<p>Based on genetic evidence, there is only one subpopulation with an estimate of 600 mature individuals. However, when looking at specific survey sites, the maximum number of calling males recorded in the past 10 years was estimated to be > 80 at Site 24 (Bow River Plantation 2). Therefore, assuming a 1:1 sex ratio (Roberts et al, 1997), the total number of mature individuals at that site is estimated to be > 160. Other sites have had lower (i.e. < 100) maximum numbers of calling males.</p> <p>Note: this population estimate is not highly reliable.</p>

What is the percentage of mature individuals in the largest subpopulation?	100 %
What percentage of mature individuals is within WA?	100 %
What percentage of global mature individuals is within Australia?	100 %
What is the age of sexual maturity?	<i>Crinia georgiana</i> , a similar-sized frog from the south-west region, reaches maturity in one year (Burbidge & Roberts, 2002).
What is the life expectancy?	Adult frogs were captured from the wild and were kept in captivity for 3 years before being released.
What is the generation length?	Unknown
What is the reproductive capacity? (i.e. litter size or number of seeds)	50 - 120 eggs per clutch
What is the reproductive success?	Unknown
6.4 Population trend	
What is the current population trend (mature individuals)?	Decreasing <input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
What is the percentage of the population change and over what time period?	Unknown. Despite improved census survey techniques, calling behaviour continues to be very inconsistent and the effect of temporal conditions on the number of calling males is still unknown.
How has this been calculated?	N/A
If the trend is decreasing; are the causes of the reduction understood?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
Have the causes of the reduction ceased?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
Are the causes of the reduction reversible?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
Is the reduction continuing (continuing decline)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
Has the change been observed, estimated, inferred or is it suspected (direct observation, index of abundance appropriate to the species)?	There is an inferred decreasing population trend based on an observed loss and decline in habitat condition, particularly on the private property and national park areas that have been impacted by feral pigs. Reduced calling behaviour could potentially indicate declining populations but this is not highly reliable. The change is suspected to continue due to the current and future threats: habitat loss and decline, and the impact of climate change on the peat swamps, drying, altered hydrology and acidification.
When was the reduction or is it anticipated to occur?	Past <input checked="" type="checkbox"/> Present <input checked="" type="checkbox"/> Future <input checked="" type="checkbox"/>
What is the period of time for the reduction (in years and generations)?	Unknown. However, genetic modelling suggests that there have been past range expansions and shifts in response to very small changes in rainfall,

	with a shift in distribution in the last 30 years towards the coast (Edwards & Roberts, 2011).
Has there been a reduction in the number of subpopulations?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
<i>If Yes, provide details:</i>	Some sites have not had calling males recorded in over 10 years with habitat no longer suitable at these sites, and are therefore considered potentially extinct.
Are there extreme fluctuations in population size?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
<i>If Yes, provide details:</i>	<p>Some sites where frogs had not been recorded for more than 10 years and had thus been considered potentially extinct, or sites that had had very low numbers, had then had frogs recorded following a fire. For example, in Thames Block, a maximum of 1-2 calling males were recorded, but following a burn in 2000, 27 mating pairs were counted (Dale Roberts, <i>pers. comm.</i> 2016). Larger numbers of calling frogs are also recorded following high rainfall events.</p> <p>There are also fluctuations in the numbers of calling males recorded between breeding seasons. For example, Site 9 (Trent Road 1) had 200 calling males recorded in 2002, but by 2005 had only 6 calling males recorded. More recently, Site 24 (Bow River Plantation) had over 200 calling males recorded in 2008, but the following years there have been less than 15 recorded each survey session. However, it should be noted that the surveys that recorded large numbers were not carried out by Frankland District personnel and are believed to be listening surveys only. It is the District's opinion that listening surveys without point/transect surveys causes wildly exaggerated numbers due to the echoing nature of frog calls (J. Liddelow, <i>pers. comm.</i> 2016). This was demonstrated when the District also conducted surveys at Site 24 in 2008 but via transects, and only recorded 26 frogs. While this was considered an underestimate, an error quotient of 50 frogs still only allows for approximately 70-80 calling frogs.</p> <p>These fluctuations in calling males recorded may thus be attributed to call variability and call detectability rather than fluctuation in the number of locations and individuals, and so may not be 'extreme fluctuations' in the population size as per the IUCN Red List criteria.</p>
6.5 Translocations and captive/enclosed subpopulations	
Have there been translocations (introduction or re-introduction)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>
Are there proposed translocations (introduction or re-introduction)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
Are there captive/enclosed/cultivated subpopulations?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
Are there proposed captive/enclosed/cultivated subpopulations?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
Are there self-sustaining translocated subpopulations?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
<i>If Yes, provide details:</i>	A total of 281 frogs (adults and juveniles) from Perth Zoo, consisting of wild-caught captive individuals and captive-bred offspring, were released in December 2011 into a peat swamp near Walpole. This site was on the periphery of the known distribution of the species and sunset frogs had never been recorded at the site. Post-translocation monitoring in 2012 and 2014 has not recorded any calling males. However, the outcome of the translocation is indeterminate as the 5-year post-translocation monitoring has not been conducted. Also considering that some other monitoring sites have had over 10 consecutive years of no recordings but had then had frogs recorded in more recent years, there is still potential

	that frogs are present at the translocation site and have just not been recorded as yet.	
Are there translocated subpopulations that are not self-sustaining?		Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
If Yes, provide details:	As above.	
Are there self-sustaining captive/enclosed subpopulations?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
If Yes, provide details:	The Perth Zoo captive-breeding program, which successfully bred sunset frogs from 2008, ended in 2011.	
Are there captive/enclosed subpopulations that are not self-sustaining?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
If Yes, provide details:	There are no captive subpopulations.	
Other information on translocations and captive/enclosed subpopulations for the species (including failures):	Wild sourced individuals were successfully kept and bred in captivity. Protocols for the keeping and breeding of this species were developed by the Perth Zoo. Maintaining a captive population and breeding can be undertaken in the future if it is determined to be a required recovery action.	
6.6 Important subpopulations		
<p><i>Identify any subpopulations that are important or necessary for the long-term survival of the species and provide details for why they are considered as such (i.e. key breeding, edge or range, maintenance of genetic diversity):</i></p> <p>There is only one subpopulation, and therefore the entire population is considered important.</p>		

Section 7: Threats

7.1 Threats (detail how the species is being impacted, i.e. how severe, the extent, evidence of the impact)

Threat (describe how the threat impacts on the species. Include abiotic and biotic causes, human related e.g. exploitation, and biological characteristics of the species e.g. low genetic diversity)	Extent (give details of impact on whole species or specific subpopulations)	Impact (what is the level of threat to the conservation of the species)	Evidence	Time period (past, present, future)
<p>Inappropriate fire regimes and wild fire</p> <p>While the species is found in permanently waterlogged habitat, they appear to have some ecological requirement for fire. However, fires can reduce the amount of substrate and detritus in swamp habitats and can also foul the water, thereby causing the swamp habitat to be temporarily unsuitable.</p> <p>Fires also increase the risk of weed invasion and damage by feral pigs' increases in severity following fire, thereby causing a decline in habitat quality in the long-term.</p>	Entire, particularly sites within conservation estate	Unknown	<p>Anecdotal evidence suggests that breeding can be stimulated by the removal of dense vegetation through natural disturbances such as fire. Two sites that were thought to be potentially extinct were found to still be extant, although at low numbers, following a wild fire. Fires that are too infrequent (i.e. > 8 years) could lead to population declines because of lower breeding rates. However, frequent and extensive fires could also impact negatively on the species and its habitat and are likely to occur within the majority of the species' distribution. Therefore certain fire events (i.e. large-scale summer fires), exacerbated by climate change, could be a major threat.</p> <p>The species is reliant on peat based systems. If the peat substrate is impacted by fire removing the peat, the result may be formation of acid sulphate soils that can cause irreversible damage. Few systems have been damaged by fire so far, however wildfires burned through peat habitats within the species range in 2015 and 2016 and caused significant damage in places (peat burned down to 30 cm depth) but the impact of this on the frog has not been assessed as yet (J. Liddelow, pers. comm. 2016)</p>	Past, present and future
<p>Physical habitat disturbance leading to habitat degradation and/or loss.</p> <p>Feral pigs cause damage to breeding habitats when digging and wallowing in swamp habitat.</p> <p>Illegally harvesting, digging up or otherwise disturbing peat found in swamp habitats.</p>	Entire	Moderate – Severe	<p>Feral pigs occur across all land tenures in the south-west and can cause significant disturbance, particularly after fire or during summer when the majority of their activities (digging, wallowing) are in riparian zones. There has been damage caused by pigs recorded at seven sites on conservation estate. Burnside (2013) surveyed 3 out of 4 sunset frog sites and reported that pig visitation had caused > 50 m² of damage in areas of high moisture</p>	Past, present and future

Road and fence construction and maintenance leading to clearing, destruction and degradation of vegetation			<p>in peat or sand/peat soils. These areas tended to fringe the species' core habitat with additional evidence of pig activity within 5 km of these sites. It was also found that significant damage occurred after bushfire events with most damage caused where the peat had been partially burnt opening the moist substrate and allowing ease of digging and wallowing</p> <p>A fence was constructed at a site in 2012 and has had regular inspections and subsequent maintenance applied (J. Liddelow, <i>pers. comm.</i> 2016).</p>	
<p>Alterations in hydrology</p> <p>Due to their specific habitat requirements and biology, the sunset frog is vulnerable to hydrological changes.</p>	Entire	Severe	<p>Due to the species' presence on private properties, they are at risk from flooding or habitat degradation due to the constructions of dams. An occurrence of sunset frogs on a private property has been determined to be locally extinct following dam construction within the species' habitat. The planned constructions of the Bow River Dam and the Kent River/Styx Dam may also affect multiple sites either by flooding or experience significant alterations to surface and groundwater systems.</p>	Past, present and future
<p>Degraded water quality</p> <p>Due to their specific habitat requirements and biology, the sunset frog is vulnerable to water quality changes.</p>	Private properties	Moderate – Severe	<p>Due to the species' presence on private properties, they are at risk from water pollution due to the chemicals used on farms. Several sites have degraded water quality due to chemical and fertiliser runoff. Additionally, poorly-designed and/or executed road construction can lead to siltation.</p>	Past, present and future
<p><i>Phytophthora cinnamomi</i> dieback</p> <p><i>Phytophthora</i> could lead to a loss and/or degradation of the species' habitat.</p>	Entire	Minor	<p><i>Phytophthora cinnamomi</i> leads to a loss of vegetation cover, and therefore will create open swamps lacking in the mid to upper storeys of riparian vegetation. <i>Phytophthora</i> is known to spread quickly in moist soil conditions, and so swamp habitats where the species' is found could be rapidly affected.</p> <p>Swamps are dominated by Myrtaceae, Cyperaceae and Restionaceae families which are not overly susceptible to <i>Phytophthora</i>. However, there are less dominant components that are and the removal of these species would have an unknown effect at this stage. Overall there is not significant impact.</p>	Future
<p>Impacts of potential mining activity</p> <p>Mining activities could lead to habitat loss and/or degradation, hydrological changes and water quality degradation.</p>	Areas covered under the Regional Forest Agreement	Unknown	<p>Under the Regional Forest Agreement, there is the potential for mining activities (exploration and/or development) to occur within the species' distribution, particularly those sites within State Forest. This could lead to habitat loss and/or degradation, hydrological changes and water quality changes.</p>	Future

<p>Collection due to novelty value of colouration and apparent rarity</p> <p>Due to the small population size of the species, high collection rates could lead to local extinctions.</p>	Entire	Unknown	<p>There is no evidence of this threat but the District has heard anecdotal accounts of potential removal (J. Liddelow, <i>pers. comm.</i> 2016).</p>	Past, present and future
<p>Chytridiomycosis infection</p> <p>The amphibian disease Chytridiomycosis could cause deaths at certain sites, leading to population declines.</p>	Entire	Unknown	<p>Chytridiomycosis is an infectious fungal disease that is affecting amphibians worldwide and has been recorded in the south-west of WA. The pathogen can cause sporadic deaths to 100 % mortality in subpopulations of amphibians. There has been no evidence of the effect that it could have on the species.</p>	Future
<p>Climate change</p> <p>As the sunset frog is found in permanently inundated riparian peat swamp habitat, the hydrological changes, drying and acidification, as a result of climate change are likely to negatively impact on the species.</p>	Entire	Severe	<p>Rainfall decreases and temperature increases in the southwest of WA have been observed since the 1970s. Climate change and the associated biological, ecological and physical pressures are likely to lead to a loss of canopy continuity, increased fire intensity and frequency, and a drying out of previously wet habitats, including peat swamps.</p> <p>While genetic modelling suggests that the species has some ability to cope with a drying climate, it suspected that the species will be susceptible to climate change due to their breeding biology (not explosive breeders), a loss of their habitat due to a drying climate, and an inability to have shift towards coastal areas due to the large areas of agricultural land that have cleared suitable habitat (Edwards and Roberts, 2011).</p>	Future

Section 8: Management

8.1 Current management		
Is the species managed?	Yes, directly <input checked="" type="checkbox"/>	Yes, indirectly <input type="checkbox"/> No <input type="checkbox"/>
If Yes; provide details of current or past management actions:	<ul style="list-style-type: none"> Regular surveys of populations to determine health and numbers through both field surveys and the use of song meters Habitat condition monitoring inclusive of pH, soil and water temperature, vegetation condition ratings and disturbance impacts Feral pig and deer control through monitoring of impacts, reduction of numbers through trapping and shooting and the use of fences to control activity Chytrid hygiene protocol when entering species habitat Liaison with private property owners to facilitate management actions Input into prescribed burning practices to minimise detrimental outcomes and post burn monitoring to determine if recommendations are met and are successful Monitoring of hydrological processes through both piezometers and soil moisture probes Mapping of potential habitat Public education through articles, pamphlets and presentations 	
Does the species benefit from the management of another species or ecological community?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>	
If Yes; provide details:	N/A	
8.2 Recovery planning		
Is there an approved Recovery Plan (RP) or Interim Recovery Plan (IRP) for the species?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<p>List all relevant recovery plans or interim recovery plans (including draft, in-preparation, out-of-date, national and other State/Territory plans, and plans for other species or ecological communities that may benefit or be relevant to the nominated species)</p> <p>Burbidge, A. & Roberts, J. D. (2001). <i>Sunset Frog Recovery Plan 2002</i> (Wildlife Management Program No. 25). Perth, WA: Department of Environment and Conservation. Retrieved from: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/197-approved-recovery-plans</p>		
<p>List other documents that may be relevant to the management of the species or the lands on which it occurs (i.e. area management plans, conservation advices, referral guidelines)</p> <ul style="list-style-type: none"> Threatened Species Scientific Committee (TSSC) (2014). Commonwealth Conservation Advice for <i>Spicospina flammocaerulea</i> (Sunset Frog). Canberra: Department of the Environment. http://www.environment.gov.au/biodiversity/threatened/species/pubs/64782-conservation-advice.pdf. Department of the Environment and Energy (2016). Threat abatement plan for infection of amphibians with chytrid fungus resulting in <i>chytridiomycosis</i>. http://www.environment.gov.au/biodiversity/threatened/publications/tap/infection-amphibians-chytrid-fungus-resulting-chytridiomycosis-2016 Department of the Environment (2015). Draft revised threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (<i>Sus scrofa</i>). http://www.environment.gov.au/biodiversity/threatened/threat-abatement-plans/feral-pigs-2015 		

8.3 Management recommendations

Continue current management.

Section 9: Nominator details

Nominator name(s):	
Contact details:	
Date submitted:	30/3/2017
<i>If the nomination has been refereed or reviewed by experts, please provide their names and contact details:</i>	
<p>Janine Liddelow, Nature Conservation Co-ordinator, Frankland District (Parks & Wildlife)</p> <p>Bradley Barton, Regional Leader Conservation and Forest Management, Warren Region (Parks & Wildlife)</p> <p>Dale Roberts, University of Western Australia</p>	

Section 10: References

9.1 References

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Appendix 1: Mating call surveys at known sunset frog sites undertaken between 1994 and 2015. *Note: Surveys highlighted in red were not conducted by the Frankland District and are believed to major overestimates due to inadequate survey methodology.*

Site Number	Site Name	Date of Survey	Survey Year	Estimated Number of Calling Males
0	Middle Rd	18/11/2002	2002	0
0	Middle Rd	18/11/2004	2004	0
0	Middle Rd	19/10/2005	2005	0
0	Middle Rd	1/12/2005	2005	0
1	Mountain Rd N	1/12/1994	1994	60
1	Mountain Rd N	1/12/1996	1996	11
1	Mountain Rd N	1/12/1997	1997	2
1	Mountain Rd N	1/12/1998	1998	4
1	Mountain Rd N	1/12/1999	1999	0
1	Mountain Rd N	4/10/2002	2002	0
1	Mountain Rd N	16/10/2002	2002	0
1	Mountain Rd N	19/10/2002	2002	0
1	Mountain Rd N	8/11/2002	2002	30 to 40
1	Mountain Rd N	9/11/2002	2002	3 to 4
1	Mountain Rd N	10/11/2002	2002	1 to 2
1	Mountain Rd N	14/11/2002	2002	1 to 2
1	Mountain Rd N	18/11/2002	2002	7
1	Mountain Rd N	18/11/2004	2004	7
1	Mountain Rd N	17/11/2005	2005	6
1	Mountain Rd N	7/11/2007	2007	0
1	Mountain Rd N	7/11/2007	2007	0
1	Mountain Rd N	7/11/2007	2007	0
1	Mountain Rd N	7/11/2007	2007	0
1	Mountain Rd N	7/11/2007	2007	0
1	Mountain Rd N	15/11/2007	2007	1
1	Mountain Rd N	15/11/2007	2007	1
1	Mountain Rd N	13/11/2008	2008	0
1	Mountain Rd N	8/12/2008	2008	2
1	Mountain Rd N	8/01/2009	2009	0
1	Mountain Rd N	9/11/2009	2009	4

1	Mountain Rd N	9/11/2009	2009	6
1	Mountain Rd N	9/11/2009	2009	2
1	Mountain Rd N	9/11/2009	2009	0
1	Mountain Rd N	9/11/2009	2009	0
1	Mountain Rd N	2/12/2009	2009	13
1	Mountain Rd N	2/12/2009	2009	4
1	Mountain Rd N	2/12/2009	2009	0
1	Mountain Rd N	26/10/2010	2010	0
1	Mountain Rd N	26/10/2010	2010	0
1	Mountain Rd S	27/10/2010	2010	0
1	Mountain Rd S	27/10/2010	2010	1
1	Mountain Rd S	27/10/2010	2010	0
1	Mountain Rd S	27/10/2010	2010	0
1	Mountain Rd N	2/11/2011	2011	0
1	Mountain Rd S	9/12/2011	2011	2
1	Mountain Rd N	9/12/2011	2011	2
1	Mountain Rd N	4/10/2012	2012	0
1	Mountain Rd N	4/10/2012	2012	1
1	Mountain Rd N	4/10/2012	2012	0
1	Mountain Rd N	4/10/2012	2012	4
1	Mountain Rd S	4/10/2012	2012	0
1	Mountain Rd N	31/10/2013	2013	0
1	Mountain Rd S	31/10/2013	2013	0
1	Mountain Rd N	13/10/2014	2014	0
1	Mountain Rd N & S	2016	2016	3
2	Boronia Rd 1	1/12/1994	1994	2
2	Boronia Rd 1	1/12/1996	1996	3
2	Boronia Rd 1	1/12/1997	1997	2
2	Boronia Rd 1	1/12/1998	1998	1
2	Boronia Rd 1	4/10/2002	2002	7 to 8
2	Boronia Rd 1	5/10/2002	2002	5
2	Boronia Rd 1	16/10/2002	2002	4
2	Boronia Rd 1	17/10/2002	2002	3 to 4
2	Boronia Rd 1	19/10/2002	2002	1
2	Boronia Rd 1	9/11/2002	2002	6
2	Boronia Rd 1	10/11/2002	2002	0
2	Boronia Rd 1	14/11/2002	2002	1 to 2
2	Boronia Rd 1	17/11/2005	2005	3
2	Boronia Rd 1	1/11/2007	2007	0
2	Boronia Rd 1	1/11/2007	2007	0
2	Boronia Rd 1	1/11/2007	2007	0
2	Boronia Rd 1	1/11/2007	2007	0
2	Boronia Rd 1	15/11/2007	2007	0
2	Boronia Rd 1	7/11/2008	2008	0
2	Boronia Rd 1	7/11/2008	2008	1
2	Boronia Rd 1	7/11/2008	2008	2
2	Boronia Rd 1	7/11/2008	2008	0
2	Boronia Rd 1	7/11/2008	2008	0

2	Boronia Rd 1	29/10/2009	2009	0
2	Boronia Rd 1	29/10/2009	2009	1
2	Boronia Rd 1	9/11/2009	2009	1
2	Boronia Rd 1	2/12/2009	2009	0
2	Boronia Rd 1	2/12/2009	2009	2
2	Boronia Rd 1	27/10/2010	2010	0
2	Boronia Rd 1	27/10/2010	2010	0
2	Boronia Rd 1	2/11/2011	2011	0
2	Boronia Rd 1	19/12/2011	2011	0
2	Boronia Rd 1	3/01/2012	2011	1
2	Boronia Rd 1	4/10/2012	2012	1
2	Boronia Rd 1	4/10/2012	2012	0
2	Boronia Rd 1	4/10/2012	2012	0
2	Boronia Rd 1	5/11/2013	2013	2
2	Boronia Rd 1	5/11/2013	2013	0
2	Site 2	27/09/2014	2014	0
2	Site 2	26/09/2014	2014	0
2	Site 2	8/12/2014	2014	0
2	Boronia Rd 1	2/09/2015	2015	
2	Boronia Rd 1	30/09/2015	2015	
2	Boronia Rd 1	4/09/2015	2015	2
2	Boronia Rd 1	5/09/2015	2015	2
2	Boronia Rd 1	8/09/2015	2015	2
2	Boronia Rd 1	9/09/2015	2015	2
2	Boronia Rd 1	16/09/2015	2015	2
2	Boronia Rd 1	17/09/2015	2015	2
2	Boronia Rd 1	18/09/2015	2015	1
2	Boronia Rd 1	24/09/2015	2015	1
2	Boronia Rd 1	30/09/2015	2015	1
2	Boronia Rd 1	1/10/2015	2015	2
2	Boronia Rd 1	2/10/2015	2015	2
2	Boronia Rd 1	3/10/2015	2015	2
2	Boronia Rd 1	5/10/2015	2015	1
2	Boronia Rd 1	6/10/2015	2015	1
2	Boronia Rd 1	7/10/2015	2015	1
2	Boronia Rd 1	8/10/2015	2015	1
2	Boronia Rd 1	12/10/2015	2015	1
2	Boronia Rd 1	13/10/2015	2015	1
2	Boronia Rd 1	14/10/2015	2015	1
2	Boronia Rd 1	2016	2016	frogs calling
3	Middle Rd 1	1/12/1994	1994	2
3	Middle Rd 1	1/12/1996	1996	3
3	Middle Rd 1	1/12/1997	1997	2
3	Middle Rd 1	1/12/1998	1998	0
3	Middle Rd 1	1/12/1999	1999	0
3	Middle Rd 1	18/11/2002	2002	0
3	Middle Rd 1	18/11/2004	2004	0
3	Middle Rd 1	1/12/2005	2005	3

3	Middle Rd 1	1/11/2007	2007	0
3	Middle Rd 1	1/11/2007	2007	0
3	Middle Rd 1	1/11/2007	2007	0
3	Middle Rd 1	1/11/2007	2007	0
3	Middle Rd 1	20/11/2007	2007	0
3	Middle Rd 1	7/11/2008	2008	0
3	Middle Rd 1	8/01/2009	2009	0
3	Middle Rd 1	4/10/2012	2012	0
3	Middle Rd 1	4/10/2012	2012	0
3	Site 3	27/09/2014	2014	0
3	Site 3	8/12/2014	2014	0
3	Middle Rd 1	1/09/2015	2015	0
4	Collis Rd 1	1/12/1996	1996	10
4	Collis Rd 1	1/12/1997	1997	8
4	Collis Rd 1	1/12/1997	1997	8
4	Collis Rd 1	1/12/1998	1998	0
4	Collis Rd 1	1/12/1999	1999	3
4	Collis Rd 1	4/10/2002	2002	0
4	Collis Rd 1	20/10/2005	2005	0
4	Collis Rd 1	4/12/2008	2008	3
4	Collis Rd 1	4/12/2008	2008	3
4	Collis Rd 1	27/10/2010	2010	0
4	Collis Rd 1	19/12/2011	2011	0
4	Collis Rd 1	1/11/2012	2012	0
4	Collis Rd 1	25/11/2013	2013	2
4	Collis Rd 1	25/11/2013	2013	0
4	Collis Rd 1	25/11/2013	2013	2
4	Site 4	30/09/2014	2014	0
4	Collis Rd 1	21/09/2015	2015	frogs calling
5	Nornalup Rd 1	1/12/1997	1997	3
5	Nornalup Rd 1	1/12/1998	1998	0
5	Nornalup Rd 1	1/12/1999	1999	0
5	Nornalup Rd 1	20/10/2002	2002	1 to 2
5	Nornalup Rd 1	8/11/2002	2002	2
5	Nornalup Rd 1	18/11/2004	2004	0
5	Nornalup Rd 1	17/11/2005	2005	0
5	Nornalup Rd 1	7/11/2007	2007	0
5	Nornalup Rd 1	7/11/2007	2007	0
5	Nornalup Rd 1	7/11/2007	2007	0
5	Nornalup Rd 1	7/11/2007	2007	0
5	Nornalup Rd 1	7/11/2008	2008	0
5	Nornalup Rd 1	8/12/2008	2008	0
5	Nornalup Rd 1	2/11/2011	2011	0
5	Nornalup Rd 1	2/11/2011	2011	1
5	Nornalup Rd 1	24/09/2012	2012	0
5	Nornalup Rd 1	24/09/2012	2012	2
5	Nornalup Rd 1	24/09/2012	2012	1
5	Nornalup Rd 1	24/09/2012	2012	2

5	Nornalup Rd 1	24/09/2012	2012	0
5	Nornalup Rd 1	4/10/2012	2012	3
5	Nornalup Rd 1	4/10/2012	2012	0
5	Nornalup Rd 1	4/10/2012	2012	6
5	Nornalup Rd 1	4/10/2012	2012	7
5	Nornalup Rd 1	31/10/2013	2013	2
5	Nornalup Rd 1	21/11/2016	2016	2
6	Boronia Rd 2	1/12/1997	1997	3
6	Boronia Rd 2	1/12/1998	1998	10
6	Boronia Rd 2	1/12/1999	1999	13
6	Boronia Rd 2	4/10/2002	2002	5
6	Boronia Rd 2	16/10/2002	2002	5 +
6	Boronia Rd 2	17/10/2002	2002	10 to 20
6	Boronia Rd 2	20/10/2005	2005	25 to 30
6	Boronia Rd 2	1/11/2007	2007	14
6	Boronia Rd 2	1/11/2007	2007	0
6	Boronia Rd 2	1/11/2007	2007	0
6	Boronia Rd 2	1/11/2007	2007	0
6	Boronia Rd 2	7/11/2008	2008	0
6	Boronia Rd 2	7/11/2008	2008	3
6	Boronia Rd 2	7/11/2008	2008	1
6	Boronia Rd 2	7/11/2008	2008	0
6	Boronia Rd 2	7/11/2008	2008	0
6	Boronia Rd 2	7/11/2008	2008	0
6	Boronia Rd 2	13/11/2008	2008	0
6	Boronia Rd 2	13/11/2008	2008	12
6	Boronia Rd 2	8/01/2009	2009	0
6	Boronia Rd 2	3/11/2009	2009	7
6	Boronia Rd 2	3/11/2009	2009	12
6	Boronia Rd 2	3/11/2009	2009	1
6	Boronia Rd 2	3/11/2009	2009	2
6	Boronia Rd 2	3/11/2009	2009	5
6	Boronia Rd 2	3/11/2009	2009	5
6	Boronia Rd 2	3/11/2009	2009	2
6	Boronia Rd 2	3/11/2009	2009	2
6	Boronia Rd 2	3/11/2009	2009	3
6	Boronia Rd 2	3/11/2009	2009	7
6	Boronia Rd 2	13/11/2009	2009	0
6	Boronia Rd 2	15/12/2011	2011	0
6	Boronia Rd 2	15/12/2011	2011	7
6	Boronia Rd 2	15/12/2011	2011	6
6	Boronia Rd 2	15/12/2011	2011	4
6	Boronia Rd 2	8/11/2012	2012	2
6	Boronia Rd 2	8/11/2012	2012	1
6	Boronia Rd 2	8/11/2012	2012	1
6	Boronia Rd 2	8/11/2012	2012	2
6	Boronia Rd 2	8/11/2012	2012	0
6	Boronia Rd 2	5/11/2013	2013	1

6	Boronia Rd 2	5/11/2013	2013	3
6	Boronia Rd 2	23/11/2015	2015	
6	Boronia Rd 2	2016	2016	frogs calling
7	Collis Rd 2	1/12/1997	1997	5
7	Collis Rd 2	1/12/1998	1998	0
7	Collis Rd 2	1/12/1998	1998	2
7	Collis Rd 2	4/10/2002	2002	10 +
7	Collis Rd 2	21/10/2002	2002	300 +
7	Collis Rd 2	21/10/2005	2005	0
7	Collis Rd 2	13/11/2008	2008	6
7	Collis Rd 2	5/11/2009	2009	11
7	Collis Rd 2	5/11/2009	2009	6
7	Collis Rd 2	5/11/2009	2009	1
7	Collis Rd 2	5/11/2009	2009	2
7	Collis Rd 2	5/11/2009	2009	6
7	Collis Rd 2	5/11/2009	2009	5
7	Collis Rd 2	5/11/2009	2009	4
7	Collis Rd 2	5/11/2009	2009	5
7	Collis Rd 2	9/11/2009	2009	1
7	Collis Rd 2	9/11/2009	2009	2
7	Collis Rd 2	9/11/2009	2009	3
7	Collis Rd 2	9/11/2009	2009	0
7	Collis Rd 2	9/11/2009	2009	1
7	Collis Rd 2	9/11/2009	2009	0
7	Collis Rd 2	9/11/2009	2009	2
7	Collis Rd 2	9/11/2009	2009	0
7	Collis Rd 2	9/11/2009	2009	1
7	Collis Rd 2	9/11/2009	2009	1
7	Collis Rd 2	9/11/2009	2009	5
7	Collis Rd 2	9/11/2009	2009	2
7	Collis Rd 2	9/11/2009	2009	0
7	Collis Rd 2	9/11/2009	2009	1
7	Collis Rd 2	9/11/2009	2009	1
7	Collis Rd 2	9/11/2009	2009	
7	Collis Rd 2	9/11/2009	2009	0
7	Collis Rd 2	9/11/2009	2009	
7	Collis Rd 2	2/12/2009	2009	0
7	Collis Rd 2	2/12/2009	2009	5
7	Collis Rd 2	2/12/2009	2009	0
7	Collis Rd 2	2/12/2009	2009	1
7	Collis Rd 2	2/12/2009	2009	4
7	Collis Rd 2	2/12/2009	2009	3
7	Collis Rd 2	2/12/2009	2009	6
7	Collis Rd 2	2/12/2009	2009	2
7	Collis Rd 2	2/12/2009	2009	6
7	Collis Rd 2	2/12/2009	2009	2
7	Collis Rd 2	2/12/2009	2009	0
7	Collis Rd 2	7/10/2010	2010	0

7	Collis Rd 2	19/12/2011	2011	0
7	Collis Rd 2	1/11/2012	2012	0
7	Collis Rd 2	1/11/2012	2012	2
7	Collis Rd 2	1/11/2012	2012	0
7	Collis Rd 2	1/11/2012	2012	1
7	Collis Rd 2	1/11/2012	2012	0
7	Collis Rd 2	1/11/2012	2012	2
8	Boronia Rd 3	1/12/1997	1997	2
8	Boronia Rd 3	1/12/1998	1998	0
8	Boronia Rd 3	1/12/1999	1999	2
8	Boronia Rd 3	16/10/2002	2002	10 to 20
8	Boronia Rd 3	17/10/2002	2002	0
8	Boronia Rd 3	19/10/2002	2002	20 +
8	Boronia Rd 3	20/10/2002	2002	10
8	Boronia Rd 3	10/11/2002	2002	0
8	Boronia Rd 3	14/11/2002	2002	5 +
8	Boronia Rd 3	18/11/2002	2002	5 +
8	Boronia Rd 3	18/11/2004	2004	0
8	Boronia Rd 3	19/10/2005	2005	0
8	Boronia Rd 3	17/11/2005	2005	4
8	Boronia Rd 3	15/11/2007	2007	0
8	Boronia Rd 3	20/11/2007	2007	0
8	Boronia Rd 3	24/12/2007	2007	0
8	Boronia Rd 3	24/12/2007	2007	0
8	Boronia Rd 3	24/12/2007	2007	0
8	Boronia Rd 3	24/12/2007	2007	0
8	Boronia Rd 3	8/11/2008	2008	1
8	Boronia Rd 3	8/11/2008	2008	2
8	Boronia Rd 3	8/11/2008	2008	2
8	Boronia Rd 3	8/11/2008	2008	0
8	Boronia Rd 3	9/01/2009	2009	1
8	Boronia Rd 3	9/01/2009	2009	0
8	Boronia Rd 3	9/01/2009	2009	6
8	Boronia Rd 3	9/01/2009	2009	7
8	Boronia Rd 3	9/01/2009	2009	7
8	Boronia Rd 3	9/01/2009	2009	1
8	Boronia Rd 3	9/01/2009	2009	1
8	Boronia Rd 3	29/10/2009	2009	0
8	Boronia Rd 3	29/10/2009	2009	6
8	Boronia Rd 3	29/10/2009	2009	2
8	Boronia Rd 3	29/10/2009	2009	1
8	Boronia Rd 3	29/10/2009	2009	1
8	Boronia Rd 3	29/10/2009	2009	2
8	Boronia Rd 3	29/10/2009	2009	5
8	Boronia Rd 3	2/11/2010	2010	0
8	Boronia Rd 3	2/11/2010	2010	0
8	Boronia Rd 3	19/12/2011	2011	0
8	Boronia Rd 3	4/10/2012	2012	0

8	Boronia Rd 3	4/10/2012	2012	0
8	Boronia Rd 3	4/10/2012	2012	0
8	Boronia Rd 3	27/11/2012	2012	0
8	Boronia Rd 3	27/11/2012	2012	0
8	Boronia Rd 3	27/11/2012	2012	0
8	Boronia Rd 3	31/10/2013	2013	0
8	Boronia Rd 3	31/10/2013	2013	2
8	Boronia Rd 3	29/08/2013	2013	3
8	Boronia Rd 3	2016	2016	0
8	Boronia Rd 3	2017	2017	frogs calling
9	Trent Rd 1	1/12/1997	1997	150
9	Trent Rd 1	1/12/1998	1998	10
9	Trent Rd 1	1/12/1999	1999	150
9	Trent Rd 1	23/10/2002	2002	50 +
9	Trent Rd 1	23/10/2002	2002	200 +
9	Trent Rd 1	24/10/2002	2002	50 +
9	Trent Rd 1	9/11/2002	2002	5 +
9	Trent Rd 1	14/11/2002	2002	5 to 10
9	Trent Rd 1	15/11/2002	2002	30 +
9	Trent Rd 1	17/10/2005	2005	6
9	Trent Rd 1	11/11/2008	2008	2
9	Trent Rd 1	11/11/2008	2008	0
9	Trent Rd 1	11/11/2008	2008	0
9	Trent Rd 1	11/11/2008	2008	0
9	Trent Rd 1	11/11/2008	2008	14
9	Trent Rd 1	11/11/2008	2008	1
9	Trent Rd 1	11/11/2008	2008	3
9	Trent Rd 1	11/11/2008	2008	11
9	Trent Rd 1	11/11/2008	2008	4
9	Trent Rd 1	11/11/2008	2008	2
9	Trent Rd 1	11/11/2008	2008	0
9	Trent Rd 1	11/11/2008	2008	10
9	Trent Rd 1	11/11/2008	2008	3
9	Trent Rd 1	11/11/2008	2008	3
9	Trent Rd 1	11/11/2008	2008	2
9	Trent Rd 1	11/11/2008	2008	0
9	Trent Rd 1	11/11/2008	2008	2
9	Trent Rd 1	11/11/2008	2008	0
9	Trent Rd 1	2/11/2009	2009	0
9	Trent Rd 1	2/11/2009	2009	2
9	Trent Rd 1	2/11/2009	2009	1
9	Trent Rd 1	2/11/2009	2009	0
9	Trent Rd 1	2/11/2009	2009	3
9	Trent Rd 1	2/11/2009	2009	0
9	Trent Rd 1	2/11/2009	2009	2
9	Trent Rd 1	2/11/2009	2009	3
9	Trent Rd 1	2/11/2009	2009	0
9	Trent Rd 1	2/11/2009	2009	0

9	Trent Rd 1	2/11/2009	2009	3
9	Trent Rd 1	2/11/2009	2009	4
9	Trent Rd 1	2/11/2009	2009	4
9	Trent Rd 1	2/11/2009	2009	2
9	Trent Rd 1	2/11/2009	2009	0
9	Trent Rd 1	2/11/2009	2009	1
9	Trent Rd 1	2/11/2009	2009	2
9	Trent Rd 1	2/11/2009	2009	3
9	Trent Rd 1	2/11/2009	2009	7
9	Trent Rd 1	17/11/2009	2009	5
9	Trent Rd 1	17/11/2009	2009	3
9	Trent Rd 1	17/11/2009	2009	5
9	Trent Rd 1	17/11/2009	2009	2
9	Trent Rd 1	17/11/2009	2009	10
9	Trent Rd 1	17/11/2009	2009	0
9	Trent Rd 1	17/11/2009	2009	7
9	Trent Rd 1	17/11/2009	2009	5
9	Trent Rd 1	17/11/2009	2009	6
9	Trent Rd 1	2/11/2010	2010	1
9	Trent Rd 1	2/11/2010	2010	2
9	Trent Rd 1	8/10/2012	2012	3
9	Trent Rd 1	8/10/2012	2012	5
9	Trent Rd 1	8/10/2012	2012	2
9	Trent Rd 1	8/10/2012	2012	11
9	Trent Rd 1	8/10/2012	2012	0
9	Trent Rd 1	8/10/2012	2012	0
9	Trent Rd 1	8/10/2012	2012	0
9	Trent Rd 1	8/10/2012	2012	0
9	Trent Rd 1	21/11/2013	2013	1
9	Trent Rd 1	21/11/2013	2013	5
9	Trent Rd 1	21/11/2013	2013	6
9	Trent Rd 1	21/11/2013	2013	6
9	Trent Rd 1	21/11/2013	2013	3
9	Trent Rd 1	21/11/2013	2013	2
9	Trent Rd 1	21/11/2013	2013	2
9	Trent Rd 1	21/11/2013	2013	2
9	Trent Rd 1	21/11/2013	2013	9
9	Trent Rd 1	21/11/2013	2013	2
9	Trent Rd 1	21/11/2013	2013	8
9	Trent Rd 1	21/11/2013	2013	3
9	Trent Rd 1	21/11/2013	2013	4
9	Trent Rd 1	21/11/2013	2013	6
9	Trent Rd 1	21/11/2013	2013	7
9	Trent Rd 1	21/11/2013	2013	4
9	Trent Rd 1	21/11/2013	2013	2
9	Trent Rd 1	21/11/2013	2013	3
9	Trent Rd 1	21/11/2013	2013	2
9	Trent Rd 1	21/11/2013	2013	2

9	Trent Rd 1	22/10/2015	2015	0
10	Trent Rd 2	1/12/1997	1997	3
10	Trent Rd 2	1/12/1998	1998	21
10	Trent Rd 2	1/12/1999	1999	30
10	Trent Rd 2	2/10/2002	2002	2 to 3
10	Trent Rd 2	10/11/2002	2002	50 +
10	Trent Rd 2	12/11/2002	2002	10 +
10	Trent Rd 2	19/11/2002	2002	20 to 30
10	Trent Rd 2	17/10/2005	2005	12
10	Trent Rd 2	7/11/2008	2008	0
10	Trent Rd 2	9/11/2008	2008	0
10	Trent Rd 2	11/11/2008	2008	0
10	Trent Rd 2	18/11/2008	2008	50 +
10	Trent Rd 2	18/11/2008	2008	0
10	Trent Rd 2	2/11/2011	2011	0
10	Trent Rd 2	4/10/2012	2012	0
10	Trent Rd 2	5/11/2013	2013	2
11	Rose Rd	1/12/1997	1997	4
11	Rose Rd	1/12/1998	1998	3
11	Rose Rd	1/12/1999	1999	20
11	Rose Rd	5/10/2002	2002	0
11	Rose Rd	18/11/2002	2002	0
11	Rose Rd	17/11/2005	2005	0
11	Rose Rd	9/11/2008	2008	0
11	Rose Rd	2/11/2009	2009	20 to 30
12	Hazelvale Rd 1	1/12/1997	1997	8
12	Hazelvale Rd 1	1/12/1998	1998	3
12	Hazelvale Rd 1	1/12/1999	1999	3
12	Hazelvale Rd 1	18/10/2002	2002	0
12	Hazelvale Rd 1	15/11/2002	2002	0
12	Hazelvale Rd 1	17/11/2005	2005	0
12	Hazelvale Rd 1	13/11/2008	2008	0
13	Hazelvale Rd 2	1/12/1997	1997	10
13	Hazelvale Rd 2	1/12/1998	1998	3
13	Hazelvale Rd 2	1/12/1999	1999	0
13	Hazelvale Rd 2	17/11/2005	2005	2
13	Hazelvale Rd 2	13/11/2008	2008	0
13	Hazelvale Rd 2	8/10/2012	2012	0
14	Middle Rd 2	24/12/2007	2007	0
14	Middle Rd 2	24/12/2007	2007	0
14	Middle Rd 2	24/12/2007	2007	0
14	Middle Rd 2	9/11/2008	2008	0
14	Middle Rd 2	9/12/2008	2008	0
14	Middle Rd 2	8/01/2009	2009	0
14	Middle Rd 2	8/01/2009	2009	0
14	Middle Rd 2	2/11/2011	2011	2
14	Middle Rd 2	4/10/2012	2012	0
14	Middle Rd 2	4/10/2012	2012	0

16	Nornalup Rd 2	18/11/2008	2008	0
16	Nornalup Rd 2	18/11/2008	2008	0
17	Nornalup Rd 3	18/10/2002	2002	200 +
17	Nornalup Rd 3	23/10/2002	2002	5 +
17	Nornalup Rd 3	23/10/2002	2002	500 to 1000
17	Nornalup Rd 3	24/10/2002	2002	0
17	Nornalup Rd 3	17/11/2005	2005	7
17	Nornalup Rd 3	18/11/2008	2008	0
17	Nornalup Rd 3	3/12/2008	2008	6
17	Nornalup Rd 3	20/11/2012	2012	0
17	Nornalup Rd 3	20/11/2012	2012	0
17	Nornalup Rd 3	20/11/2012	2012	0
17	Nornalup Rd 3	9/12/2013	2013	2
17	Nornalup Rd 3	9/12/2013	2013	0
17	Nornalup Rd 3	9/12/2013	2013	0
17	Site 17	24/12/2014	2014	0
18	Nornalup Rd 4	17/11/2005	2005	2
18	Nornalup Rd 4	17/11/2008	2008	0
18	Nornalup Rd 4	18/11/2008	2008	0
18	Nornalup Rd 4	20/11/2012	2012	0
19	Trent Rd 3	16/11/2002	2002	200 +
19	Trent Rd 3	17/11/2005	2005	10 +
19	Trent Rd 3	13/11/2012	2012	0
19	Trent Rd 3	13/11/2012	2012	2
19	Trent Rd 3	13/11/2012	2012	1
19	Trent Rd 3	13/11/2012	2012	0
20	Giants 1	2/10/2002	2002	5 to 10
20	Giants 1	5/10/2002	2002	0
20	Giants 1	18/10/2002	2002	100 +
20	Giants 1	17/11/2005	2005	0
20	Giants 1	11/11/2008	2008	2
20	Giants 1	8/11/2011	2011	20
20	Giants 1	8/11/2012	2012	0
20	Giants 1	27/11/2012	2012	2
20	Giants 1	27/11/2012	2012	2
20	Giants 1	27/11/2012	2012	0
20	Giants 1	27/11/2012	2012	3
20	Giants 1	27/11/2012	2012	0
20	Giants 1	19/11/2013	2013	0
21	Gum Link Rd 1	15/11/2002	2002	0
21	Gum Link Rd 1	18/11/2002	2002	0
21	Gum Link Rd 1	19/11/2002	2002	0
21	Gum Link Rd 1	17/10/2005	2005	0
21	Gum Link Rd 1	12/01/2009	2009	0
21	Gum Link Rd 1	9/12/2009	2009	2
21	Gum Link Rd 1	9/12/2009	2009	4
21	Gum Link Rd 1	13/11/2012	2012	0
21	Gum Link Rd 1	9/12/2014	2014	0

22	Bandit Rd 1	12/11/2002	2002	0
22	Bandit Rd 1	18/11/2008	2008	0
23	Bandit Rd 2	12/11/2002	2002	0
23	Bandit Rd 2	18/11/2008	2008	0
23	Bandit Rd 2	18/11/2008	2008	0
24	Bow River Plantation	12/11/2002	2002	500 +
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	2
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	2
24	Bow River Plantation	30/10/2008	2008	2
24	Bow River Plantation	30/10/2008	2008	1
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	10
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	2
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	3
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	2
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	30/10/2008	2008	2
24	Bow River Plantation	30/10/2008	2008	0
24	Bow River Plantation	10/11/2008	2008	200 +
24	Bow River Plantation	12/11/2009	2009	0
24	Bow River Plantation	12/11/2009	2009	0
24	Bow River Plantation	12/11/2009	2009	7
24	Bow River Plantation	12/11/2009	2009	2
24	Bow River Plantation	12/11/2009	2009	2
24	Bow River Plantation	12/11/2009	2009	7
24	Bow River Plantation	12/11/2009	2009	0
24	Bow River Plantation	12/11/2009	2009	2
24	Bow River Plantation	12/11/2009	2009	0
24	Bow River Plantation	12/11/2009	2009	0
24	Bow River Plantation	12/11/2009	2009	0
24	Bow River Plantation	12/11/2009	2009	14

24	Bow River Plantation	12/11/2009	2009	0
24	Bow River Plantation	12/11/2009	2009	1
24	Bow River Plantation	3/12/2009	2009	0
24	Bow River Plantation	3/12/2009	2009	0
24	Bow River Plantation	3/12/2009	2009	0
24	Bow River Plantation	3/12/2009	2009	4
24	Bow River Plantation	3/12/2009	2009	0
24	Bow River Plantation	3/12/2009	2009	1
24	Bow River Plantation	3/12/2009	2009	4
24	Bow River Plantation	3/12/2009	2009	5
24	Bow River Plantation	3/12/2009	2009	0
24	Bow River Plantation	3/12/2009	2009	5
24	Bow River Plantation	3/11/2010	2010	0
24	Bow River Plantation	3/11/2010	2010	0
24	Bow River Plantation	3/11/2010	2010	0
24	Bow River Plantation	16/11/2010	2010	0
24	Bow River Plantation	16/11/2010	2010	0
24	Bow River Plantation	16/11/2010	2010	0
24	Bow River Plantation	16/11/2010	2010	0
24	Bow River Plantation	9/09/2011	2011	6
24	Bow River Plantation	9/09/2011	2011	4
24	Bow River Plantation	9/09/2011	2011	4
24	Bow River Plantation	9/10/2012	2012	0
24	Bow River Plantation	9/10/2012	2012	3
24	Bow River Plantation	9/10/2012	2012	3
24	Bow River Plantation	9/10/2012	2012	5
24	Bow River Plantation	9/10/2012	2012	0
24	Bow River Plantation	9/10/2012	2012	0
24	Bow River Plantation	9/10/2012	2012	1
24	Bow River Plantation	9/10/2012	2012	5
24	Bow River Plantation	19/11/2013	2013	2
24	Bow River Plantation	19/11/2013	2013	5
24	Bow River Plantation	19/11/2013	2013	2
24	Bow River Plantation	19/11/2013	2013	0
26	Western Rd 1	18/10/2005	2005	20 to 30
26	Western Rd 1	7/11/2008	2008	0
26	Western Rd 1	9/12/2011	2011	0
26	Western Rd 1	11/10/2012	2012	0
26	Western Rd 1	2016	2016	0
28	Timberjack Rd	6/01/2003	2003	50 +
28	Timberjack Rd	9/01/2003	2003	20 +
28	Timberjack Rd	7/11/2008	2008	1
28	Timberjack Rd	7/11/2008	2008	1
28	Timberjack Rd	7/11/2008	2008	0
28	Timberjack Rd	7/11/2008	2008	0
28	Timberjack Rd	7/11/2008	2008	0
28	Timberjack Rd	7/11/2008	2008	0
28	Timberjack Rd	7/11/2008	2008	0

28	Timberjack Rd	3/11/2010	2010	0
28	Timberjack Rd	3/11/2010	2010	1
28	Timberjack Rd	3/11/2010	2010	2
28	Timberjack Rd	16/11/2011	2011	3
28	Timberjack Rd	16/11/2011	2011	1
28	Timberjack Rd	16/11/2011	2011	3
28	Timberjack Rd	9/01/2012	2011	2
28	Timberjack Rd	16/01/2013	2012	0
28	Timberjack Rd	16/01/2013	2012	0
28	Timberjack Rd	18/12/2013	2013	0
28	Timberjack Rd	18/12/2013	2013	2
28	Timberjack Rd	22/10/2015	2015	3
28	Timberjack Rd	22/10/2015	2015	0
29	Mountain Rd	8/01/2009	2009	1
29	Mountain Rd	2/11/2011	2011	0
29	Mountain Rd	11/10/2012	2012	0
29	Mountain Rd	11/10/2012	2012	3
29	Mountain Rd	5/11/2013	2013	2
29	Mountain Rd	2016	2016	
30	Edmonds	22/11/2012	2012	0
30	Edmonds	8/10/2012	2012	0
30	Site 30	5/09/2014	2014	0
30	Edmonds	5/09/2014	2014	0
31	Saw Rd 1	27/05/2016	2016	Seen
31	Saw Rd 1	1/12/2016	2016	3
32	Saw Rd 2	21/11/2016	2016	6