Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Nomination *(to be completed by nominator)*

Current conservation status	
Name of ecological community:	Thumb Peak, Mid Mount Barren, Woolburnup Hill (Central Barren Ranges) *Eucalyptus acies* mallee heath
Other names:	
Description:	The community is characterised by high species richness with a strong proteaceous element. It is restricted to three quartzite mountains within the Fitzgerald River National Park. Three threatened flora occur within the community (*Daviesia obovata, Coopernookia georgei* (mauve coopernookia) and *Grevillea infundibularis* (fan-leaf grevillea) and a suite of priority flora also occur, some restricted only to mountain peaks. This community is characterised by a high diversity of proteaceous shrubs accompanied by several taxa endemic to or prevalent in high altitudinal areas of the Barren and Stirling Ranges. Common taxa include *Eucalyptus acies* (Woolburnup mallee), *Gastrolobium crenulatum* (priority 2), *Andersonia echinocephala* (priority 4), *Petrophile divaricata, Grevillea coccinea* subsp. *lanata* (priority 3) and *Xanthosia candida, Eucalyptus preissiana* subsp. *preissiana* (bell-fruited mallee)*, Banksia heliantha* (oak-leaved dryandra), *Banksia falcata* (prickly dryandra), *Banksia plumosa* subsp. *plumosa*, *Banksia baueri* (woolly banksia), *Banksia nutans* var. *nutan*s (nodding banksia), *Banksia lemanniana* (Lemman's banksia), *Banksia oreophila* (mountain banksia), *Hakea cucullata* (hood-leaved hakea), *Hakea hookeriana, Grevillea fistulosa*, *Adenanthos labillardierei*, *Beaufortia anisandra* (dark beaufortia), *Melaleuca striata*, *Sphaerolobium racemulosum*, *Daviesia striata*, *Taxandria spathulata, Acacia cedroides, Rinzia oxycoccoides* (large-flowered rinzia), *Dampiera loranthifolia*, *Stachystemon mucronatu*s and *Mesomelaena stygia* subsp. *stygia.*
Nomination for:	Listing ☐ Change of status ☒ Delisting ☐

1. *Is the ecological community currently on any conservation list, either in a State or Territory, Australia or Internationally?* 2. *Is it present in an Australian jurisdiction, but not listed?*	*Provide details of the occurrence and listing status for each jurisdiction in the following table*

Jurisdiction	**List or Act name**	**Date listed or assessed (or N/A)**	**Listing category eg. critically endangered (or none)**	**Listing criteria eg. B1ab(iii)+2ab(iii) (or none)**
National	EPBC Act			
Western Australia	Threatened list; under WA Minister ESA list in policy	6/11/2001	Vulnerable	B)
	Priority list		1 ☐ 2 ☐ 3 ☐ 4 ☐	
Other State/Territory				

Nominated conservation status: category and criteria (include recommended status for deleted ecological communities)				
Critically endangered (CR) ☐	Endangered (EN) ☐	Vulnerable (VU) ☒	Collapsed (CO) ☐	
Priority 1 ☐	Priority 2 ☐	Priority 3 ☐	Priority 4 ☐	None ☐

What criteria support the conservation status category for listing as a threatened ecological community or collapsed ecological community? *Refer to Section 32 of the Biodiversity Act 2016 for definition of 'Collapsed', and Appendix 3 table 'IUCN Red List Criteria for ecosystems version 2.2'.*	VU B3

Eligibility against the criteria		
*Provide justification for the nominated conservation status; is the ecological community eligible or ineligible for listing against the five criteria. For **delisting**, provide details for why the ecological community no longer meets the requirements of the current conservation status.*		
A.	Reduction in geographic distribution *(evidence of decline)*	☐ **A1** ☐ **A2a** ☐ **A2b** ☐ **A3**
	Justification of assessment under Criterion A.	For criteria A and B, the ecosystem was assumed to collapse when the mapped distribution declines to zero. • Aerial photography indicates that geographic distribution has not declined. • **Does not meet criterion**
B.	Restricted geographic distribution *(EOO and AOO, number of locations and evidence of decline)*	☐ **B1** (specify at least one of the following): ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☐ **b)** ☐ **c); CR** ☐ **B2** (specify at least one of the following): ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☐ **b)** ☐ **c); EN** ☒ **B3 (only for Vulnerable Listing) VU**
	Justification of assessment under Criterion B.	• B1: EOO is 27.3km^2 (ie less than minimum threshold for CR of <2,000km^2). The community's EEO is less that the 2,000km2 threshold for rank CR. • B1b): No available data indicate that the level of environmental degradation or declines in biotic processes is significantly increasing as a consequence of impacts of altered fire regimes (more frequent / more intense fire), reduced rainfall, and potential infection with dieback disease caused by *Phytophthora* species (see Appendix 1 for details of threats). Does not meet criterion.

		• B1c) Community occurs at 3 locations, and based on current knowledge the level of environmental degradation is not significantly increasing as a consequence of observed of inferred threats. Does not meet criterion. • B2: AOO. Community covers 3 grid cells. Based on current information the level of environmental degradation is not significantly increasing as a consequence of observed or inferred threats. Does not meet criterion. • B3: community is considered to consist of 3 threat-defined locations, based on the identification of 3 clusters of the community that may be subject to similar threats, and is prone to effects of stochastic events within a very short time period; dieback disease, and intense or too frequent fire, and thus capable of collapse or becoming CR within a short time period. • **Meets VU under B3.**
C.	Environmental degradation of abiotic variable *(Evidence of decline over 50-year period)*	☐ **C1** ☐ **C2** ☐ **C3**
	Justification of assessment under Criterion C.	• Too frequent fire is an abiotic variable that is a significant threat to the community. Collapse in this context is loss of all fire sensitive taxa due to fire. • The community was burnt in 1985, extensively burnt in 1997/98, a fire occurred in 2008 in West Mt Barren and Woolbernup Hill, and Thumb Peak was burnt in July 2019. The severity of impacts of the fires on the community's composition if not known but no available information indicates that the community is in significant decline. • Currently there is no information that indicates the community meets thresholds for extent (≥30%) or severity ((≥30%) over any 50-year period, or thresholds for extent (≥50%) and severity (≥50%) to meet VU under criterion C. • **No available evidence that indicates the community meets criterion C**
D.	Disruption of biotic processes or interactions *(Evidence of decline over 50-year period)*	☐ **D1** ☐ **D2** ☐ **D3**
	Justification of assessment under Criterion D.	• Dieback disease caused by *Phytophthora* species is a significant biotic threat to the community. Aerial canker disease is also a significant threat. • For criterion D, collapse of this community is defined as 100% loss of dieback sensitive species in the community. It is assumed that this would result from very severe infestation and impacts of disease. • Aerial survey dieback surveys in 2016 indicated that the range that supports the community was still considered

		dieback free but the disease was present on lowlands to north. • Does not meet criterion D.
E.	Quantitative analysis *(statistical probability of ecosystem collapse)*	• No quantitative estimates of the risk of ecosystem collapse have been completed • **Not evaluated under criterion E**

Reasons for change of status

Genuine change ☐ New knowledge ☐ Previous mistake ☐ Review/Other ☒ Listing under BC Act

Provide details: The community was initially ranked as CR using ranking criteria developed in WA that do not match those in the IUCN Red List Criteria for Ecosystems (version 2.2).

Summary of assessment information *(provide detailed information in the relevant sections of the nomination form)*

EOO	27.3km^2	AOO	300km^2 (Three 10x10km grid cells).
No. occurrences	3	Severely fragmented (justification below)	Yes ☒ No ☐
Justification of whether fragmented	Community is naturally fragmented and occurrences are separated by other intact vegetation.		
Current known area			1037.5ha
Pre-industrialisation extent or its former known extent (if known)			1037.5ha
Estimated percentage decline			Community has not declined in extent

Summary assessment against IUCN RLE Criteria

Criterion	Rank indicated	Overall conclusion
A1	-	• Does not meet criterion
A2a	-	• Does not meet criterion
A2b	-	• Does not meet criterion
A3	-	• Does not meet criterion
B1a	-	• EOO is <2,000km^2 • No available data indicate decline in a measure of spatial extent, environmental quality and disruption to biotic interactions that would meet minimum thresholds for the criterion (VU) • Does not meet criterion
B1b	-	• EOO is <2,000km^2 • No evidence that community is in significant decline. • Does not meet criterion
B1c	-	• EOO is <2,000km^2 • Ecosystem exists at 3 locations and no evidence to indicate significant decline • Does not meet criterion
B2a	-	• AOO is 3 grid cells • No data available that indicate decline in a measure of spatial extent, environmental quality and disruption to biotic interactions that would meet minimum thresholds for the criterion (VU) • Does not meet criterion
B2b	-	• AOO is 3 grid cells • No available data indicate significant decline • Does not meet criterion
B2c	-	• AOO is 3 grid cells, 3 locations • No available data indicate significant decline • Does not meet criterion
B3	VU	• Known from 3 threat-defined locations that may be subject to similar threats and is prone to effects of stochastic events within a very short time period • Meets criterion for VU
C1	-	• No evidence indicates that community meets criterion
C2	-	• No evidence indicates that community meets criterion
C3	-	• No evidence indicates that community meets criterion
D1	-	• Does not meet criterion
D2	-	• Does not meet criterion
D3	-	• Does not meet criterion
E	NA	• No quantitative estimates of the risk of ecosystem collapse.
		Meets VU under B3.

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Summary of location (occurrence) information *(provide detailed information in the relevant sections of the nomination form)*						
Occurrence	Land tenure	Survey information: date of survey	Condition	Area of occurrence (ha)	Threats *(note if past, present or future)*	Specific management actions
Eucacies01 (1)	DBCA Fitzgerald River NP (Reserve 31737)	2007	100% Excellent	529.5	Too frequent fire, disease (*Phytophthora cinnamomi)* and a drying climate	Hygiene procedures to prevent dieback (eg. manage vehicle access), continued implementation of fire management plan
Eucacies02 (2)	DBCA Fitzgerald River NP (Reserve 31737)	2002	100% Excellent	276.0	Too frequent fire, disease (*Phytophthora cinnamomi)* and a drying climate	Hygiene procedures to prevent dieback (eg. manage vehicle access), continued implementation of fire management plan
Eucacies03 (3)	DBCA Fitzgerald River NP (Reserve 31737)	2002	100% Excellent	231.9	Too frequent fire, disease (*Phytophthora cinnamomi)* and a drying climate	Hygiene procedures to prevent dieback (eg. manage vehicle access), continued fire management plan

*Condition category from (Keighery (1994) Vegetation Condition Scale (Government of WA 2000)) defined below:

'Excellent' - Vegetation structure intact, with disturbance only affecting individual species, weeds are non-aggressive species

APPENDIX 1 THREATS

Disease

Dieback disease caused by *Phytophthora* species is a major threat to vegetation in the south west of Western Australia. A considerable proportion of the ability of the disease to cause significant impacts is related to levels of rainfall, as indicated by the occurrence maps for the disease that show far greater impacts in higher rainfall zones. The main causes of disease spread that may occur in the future are therefore likely to be associated with human activity, as south west WA has experienced declining rainfall in the last 50 years and is likely to experience lower rainfall in future.

There is Dieback Management Plan for Fitzgerald River National Parks, with the purpose to prevent the introduction and spread of dieback disease caused by a *Phytophthora* pathogen (Department of Parks and Wildlife (DPaW) 2013).

The Fitzgerald River National Park is one of the parks least infected by *Phytophthora* dieback in southwestern Australia. Dieback disease caused by the plant pathogens *Phytophthora* spp., and in particular by the introduced *P. cinnamomi*, is a serious threat as there are high numbers of species susceptible to the disease in this community including the dominant proteaceous component. *Phytophthora* pathogens cause the roots to rot and result in death from drought stress, they spread autonomously by root to root contact and soil water flow as well as in infected soil, mud and gravel. An aerial dieback survey by DBCA in spring 2016 indicated that the mountains are still considered free of *Phytophthora* dieback disease. The disease is much closer to the community now due to the discovery of a new *P. cinnamomi* infestation in 2012 just north of the range on Drummond track ([redacted] pers. comm[1]). Following this, management actions to minimise vehicle access to the wilderness area of the Park, including the central Barren Ranges in which the TEC occurs, were taken and tracks leading into the area traversing dieback infestations were closed. Despite this, future infestation of the TEC is now conceivable due to potential animal vectoring.

Significant aerial canker impacts have been noted on the Proteaceae near West Mt Barren causing widespread decline of the dominant overstorey species. Aerial canker impacts are likely to be a significant issue in this community also, however no comprehensive surveys have been undertaken. Canker – drought interactions may also be significant ([redacted] pers. comm.).

On ground monitoring of the TEC is limited to helicopter access.

Too frequent fire

An increase in the frequency of fire can prevent species from completing growth and reproductive cycles and result in altered community structure or local extinction of species. Occasional fire may, however, be required for regeneration of the community. Fire can also influence species composition by causing increased weed invasion. A Fire Management Plan is in place for Fitzgerald River National Park (Conservation and Land Management (CALM) 1991– newer version in prep). The area of the community burnt in 1985 and then extensively burnt in 1997/98 therefore needs a reasonable fire-free period to recover.

Effects of dieback disease are amplified by fire. Moore *et al*. (2007**,** 2015) note that fire in *Phytophthora* infested communities has the potential to increase both the severity and extent of disease, and impinge on the regeneration capabilities of susceptible species, particularly obligate seeder species. This indicates that fire in dieback infected communities has the potential to increase both the severity and extent of the disease. Moore *et al*. (2007, 2015) also found that incidence of disease was considerably higher at all recently burnt sites.

Drying climate

Decreases in winter, spring and annual rainfall are projected with high confidence in the south west of the state. There is strong model agreement and good understanding of the contributing underlying physical mechanisms driving this change (southward shift of winter and spring storm systems).

[1] [redacted], Threatened Flora Officer, DBCA, Albany

Reduction in rainfall by 2030 is predicted to be by 2-14% (median 8%), with the south west of Western Australia to experience some of the largest reductions in rainfall in all of Australia. A reduction in runoff by 10-42% (median 25%) is also anticipated by 2030 (National Climate Change Adaptation Research Facility (NCCARF) website accessed March 2019); URL https://www.nccarf.edu.au/sites/default/files/attached_files_publications/PDF%20Report%20Card%20Low%20Res.pdf).

The changes in climate may affect various components of the community. Reduced rainfall and altered hydrology may have a detrimental effect on the community. Fire frequency and intensity are also likely to increase as a consequence of reduced rainfall.

In 2019, massive collapse of the Proteaceae and other species was observed in plant communities on shallow soils on coastal quartzite immediately to the east and west of this community (pers. comm.). There is very likely to be an impact within this community also. Drought impacts affecting a range of species, but in particular the Proteaceae, have been observed intermittently for last 10 years at East Mt Barren with aerial canker causing decline and plant death at this site also. Seedlings are particularly vulnerable to drought after fire.

References

Department of Conservation and Land Management (1991). *Fitzgerald River National Park Management Plan 1991-2001*. Department of Conservation and Land Management, Perth.

Department of Parks and Wildlife (2013). *Fitzgerald River National Park Coastal Walk Trails Dieback Management Plan'*. DPaW, Perth.

Moore, N., Barrett, S., Howard, K., Craig, M.D., Bowen, B., Shearer, B. and Hardy, G. (2015). Time since fire and average fire interval are the best predictors of *Phytophthora cinnamomi* activity in heathlands of south-western Australia. Australian Journal of Botany 62 (7). 587-593.

Moore, N, Bowen, B, Barrett, S and Shearer, B.L. (2007). The role of fire on *Phytophthora* dieback caused by the pathogen *Phytophthora cinnamomi* in the Stirling Range National Park, Western Australia. Paper presented at the MEDECOS XI Conference on Mediterranean Ecosystems September 2007. Perth, Western Australia.

APPENDIX 2 'Thumb Peak, Mid Mount Barren, Woolburnup Hill (Central Barren Ranges) *Eucalyptus acies* mallee heath Community' distribution (green)

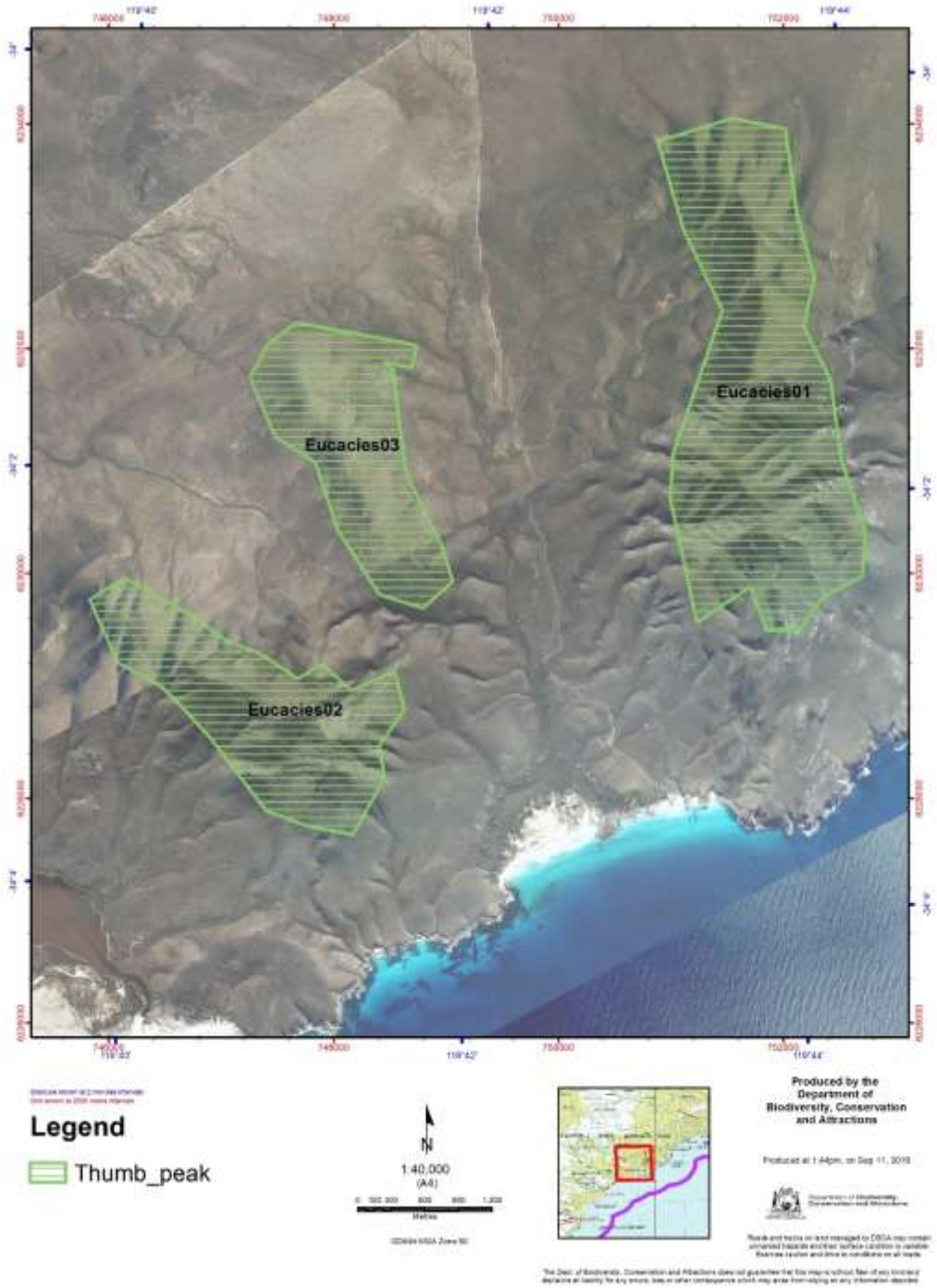

Figure 1: extent of 'Thumb Peak, Mid Mount Barren, Woolburnup Hill (Central Barren Ranges) *Eucalyptus acies* mallee heath' community.

Community occurs over a range of 6.5km, and is located within the Fitzgerald River National Park of the Southern Coast. The occurrences of the community are naturally fragmented.

The map was created from known mapped occurrences of the community contained on the Western Australian Threatened Ecological Community database (TECDB), as administered by the Department of Biodiversity and Conservation (DBCA).

APPENDIX 3 IUCN Red List Criteria for ecosystems (version 2.2) (IUCN 2017)

A. Reduction in geographic distribution over ANY of the following time periods:

		CR	EN	VU
A1	Present (over the past 50 years).	≥ 80%	≥ 50%	≥ 30%
A2a	Future (over the next 50 years).	≥ 80%	≥ 50%	≥ 30%
A2b	Future (over any 50 year period including the present and future).	≥ 80%	≥ 50%	≥ 30%
A3	Historic (since 1750).	≥ 90%	≥ 70%	≥ 50%

B. Restricted geographic distribution indicated by EITHER B1, B2 or B3:

		CR	EN	VU
B1	Extent of a minimum convex polygon enclosing all occurrences (Extent of Occurrence)	≤ 2,000 km^2	≤ 20,000 km^2	≤ 50,000 km^2
	AND at least one of the following (a-c):			
	(a) An observed or inferred continuing decline in **EITHER**:			
	i. a measure of spatial extent appropriate to the ecosystem; **OR**			
	ii. a measure of environmental quality appropriate to characteristic biota of the ecosystem; **OR**			
	iii. a measure of disruption to biotic interactions appropriate to the characteristic biota of the ecosystem.			
	(b) Observed or inferred threatening processes that are likely to cause continuing declines in geographic distribution, environmental quality or biotic interactions within the next 20 years.			
	(c) Ecosystem exists at …	1 location	≤ 5 locations	≤ 10 locations
B2	The number of 10 × 10 km grid cells occupied (Area of Occupancy)	≤ 2	≤ 20	≤ 50
	AND at least one of a-c above (same sub-criteria as for B1).			
B3	A very small number of locations (generally fewer than 5) **AND** prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus capable of collapse or becoming Critically Endangered within a very short time period (B3 can only lead to a listing as VU).			VU

C. Environmental degradation over ANY of the following time periods:

C1 The past 50 years based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	Relative severity (%) ≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

C2 The next 50 years, or any 50-year period including the present and future, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

C3 Since 1750 based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	≥ 90	≥ 70	≥ 50
≥ 90	CR	EN	VU
≥ 70	EN	VU	
≥ 50	VU		

D. Disruption of biotic processes or interactions over ANY of the following time periods:

D1 The past 50 years based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	Relative severity (%) ≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

D2	(D2a) The next 50 years, or (D2b) any 50-year period including the present and future, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table: OR		≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
		≥ 30	VU		
D3	Since 1750, based on a change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:		≥ 90	≥ 70	≥ 50
		≥ 90	CR	EN	VU
		≥ 70	EN	VU	
		≥ 50	VU		
E. Quantitative analysis					
			CR	EN	VU
… that estimates the probability of ecosystem collapse to be:			≥ 50% within 50 years	≥ 20% within 50 years	≥ 10% within 100 years