

***Fontainea oraria* Jessup & Guymer (Euphorbiaceae)**

Distribution: Endemic to NSW

Current EPBC Act Status: Endangered

Current NSW TSC Act Status: Critically Endangered

Proposed change for alignment: List on EPBC Act as Critically Endangered

Conservation Advice: *Fontainea oraria*

Summary of Conservation Assessment

Fontainea oraria is found to be eligible for listing as Critically Endangered under Criteria B1ab(iii,v) +2ab(iii,v); C2a(i) a(ii); D.

The main reasons for the species being eligible for listing in the Critically Endangered category are that i) the species has an extremely small population, consisting of only 10 mature individuals; ii) the species has a highly restricted geographic range with EOO and AOO = 4 km²; and iii) its habitat continues to be threatened by weed invasion.

Description and Taxonomy

The NSW Scientific Committee (2008) state that "*Fontainea oraria* Jessup & Guymer (family Euphorbiaceae) is a rainforest species described by James & Harden (1990) as follows: "Shrub or small tree to 5 m high. Leaves with lamina elliptic to obovate, usually 6-9 cm long, 2.5-4 cm wide, glabrous; glands 0.5-4 mm above base of lamina; petiole jointed, 3-25 mm long. Female floral axes 8-10 mm long; male floral axes 5-6 mm long. Fruit ± globose, 18-22 mm long, 22-24 mm diam., red; seed with endocarp wrinkled and grooved."

"*Fontainea oraria* was first described by Jessup & Guymer (1985) who considered it to be most closely related to *F. australis*. *Fontainea oraria* can be distinguished from *F. australis* by its leaf glands, which are positioned much closer to the base of the lamina and by its wrinkled and grooved endocarp."

Distribution

The NSW Scientific Committee (2008) state that "*Fontainea oraria* is endemic to New South Wales where it is known only from the vicinity of Lennox Head on the far North Coast. Four groups of individuals are known and are scattered over an area with a radius of no more than 600 m (NSW DEC 2005)."

"*Fontainea oraria* has a very highly restricted geographic distribution. The species extends in a narrow strip a few hundred metres wide and approximately 1.2 km from north to south. The extent of occurrence and area of occupancy are both estimated to be no more than 4 km² (Copeland 2008). This calculation is based on the species occupying a single 2 x 2 km grid cell, the spatial scale of assessment recommended by IUCN (2008)."

"The total known population of *Fontainea oraria*, surveyed most recently in 2005, includes approximately 55 wild plants (NSW DEC 2005). Of these, only 10 plants are mature adults, while the remaining 45 were classified as seedlings or juveniles."

The Management Plan states "The northern Coastal *Fontainea* remnant is less than 1 ha in size. The southern Coastal *Fontainea* remnant is about 18.5 ha in size and is the largest remnant of littoral rainforest in the Lennox Head area (McKinley et al. 1999). These remnants are highly exposed to edge effects, including impacts of weed invasion and from salt laden winds." (NSW DECCW 2011)

Conservation actions for *Fontainea oraria* have included a translocation program. Translocation sites span a range of habitats and tenures. Representatives of each adult plant (i.e., 10 plants) have been planted at 24 translocation sites (i.e., 240 plants in total). The plantings at each site are arranged in a circle to maximize cross pollination. Many of the translocated individuals are already flowering and fruiting (Brown et al. 2017).

Ecology

NSW Scientific Committee (2008) state that “*Fontainea oraria* grows in remnant stands of littoral rainforest dominated by *Guioa semiglauca*. These highly fragmented remnants are on rich krasnozem soils derived from basalt. The altitude is approximately 50 m above sea level and all four groups of individuals are within 1 km of the ocean.”

The NSW Scientific Committee (2008) state that “Like several species in the Euphorbiaceae, *Fontainea oraria* is primarily a dioecious species, in which male and female flowers usually occur on separate plants. To date only a single adult plant is confirmed as female while the sex of several of the other adult plants remains unknown (NSW DEC 2005)”

Recent work by Brown et al. (2017) has updated the understanding of monoecy and dioecy in *Fontainea oraria*, based on observations of translocated individuals and the wild population. Observations of the translocated individuals showed that of the 10 plant types, 6 were always dioecious (two female and four male), and four were monoecious (although some predominantly male or female). Alternatively, observations of the wild population showed that of the 10 plants, 7 always produced female flowers, two always produced male flowers, and one male produced flower buds that were not able to be sexed. This research is ongoing.

Additional information about the ecology of *Fontainea oraria* from the Management Plan (NSW DECCW 2011) is summarized here. *Fontainea oraria* is shade tolerant and slow growing. Some individuals are multi-stemmed, indicating the ability of *Fontainea oraria* to coppice. The species has thin bark, and may be able to resprout after low (but not high) severity fire. Potential pests and diseases recorded on *Fontainea oraria* include Longicorn Beetle (which has been recorded in dead branches) and an unidentified leaf rust. *Fontainea oraria* is primarily dioecious but may also be monoecious. The mature trees are estimated to be 40-50 years old. There is one mature female individual that produces a small number of fruit; rates of seedling survival from germination through to establishment are thought to be low. In 1989, there were 33 seedlings near the female tree, in 1991 there were 51 seedlings, in 2007 there were 40 seedlings and juveniles (NSW DECCW 2011). Recently Brown et al. (2017) stated that there are 52 *Fontainea oraria* seedlings in the wild population.

Threats

NSW Scientific Committee (2008) state that “*Fontainea oraria* is not known to occur in any conservation reserves in New South Wales.”

“It is highly likely that the original population of *Fontainea oraria* was much larger than the current estimate of 55 plants (Rossetto *et al.* 2000). It is believed that numerous plants would have been lost following widespread clearing of littoral rainforest in the Lennox Head district. In addition, the remaining plants of *Fontainea oraria* face a number of threatening processes, including further habitat destruction and fragmentation, competition with exotic woody weeds, earthworks and drainage changes associated with storm water management and erosion control, cattle grazing, increased exposure to ocean wind shear and associated dieback, inbreeding, wildfires, and illegal collection of seed for propagation (NSW DEC 2005).”

The NSW Scientific Committee used the Draft Management Plan (NSW DEC 2005) to describe threats to *Fontainea oraria*. The Management Plan (NSW DECCW 2011) has since progressed from draft

status and identifies the key threatening processes as habitat destruction, habitat fragmentation and isolation, habitat degradation, weed infestation, weed control activities, cattle grazing, ocean wind sheer, increased development pressure (recreational use, garden refuse dumping and stormwater runoff), lack of biological and ecological knowledge, inbreeding, dieback, leaf rust, fire and collection for the nursery industry (underline indicates information additional to that included in the final determination (NSW Scientific Committee 2008)).

Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Fontainea oraria* has been adequate and there is sufficient scientific evidence to support the listing outcome.

Criterion A Population Size reduction

Assessment Outcome: Data Deficient.

Justification: To be listed as threatened under Criterion A the species must have experienced a population reduction of $\geq 30\%$ (VU threshold) over three generations or 10 years (whichever is longer). Littoral rainforest, the habitat of *Fontainea oraria*, has been reduced by 90% through land clearing (NSW DECCW 2010). Many of the remaining stands of littoral rainforest are small and fragmented (NSW Scientific Committee 2004). We can infer that the population of *Fontainea oraria* was likely reduced as a result of this clearing. In addition, genetic analysis of the *Fontainea oraria* indicates that the remnant northern and southern sites were once a more or less continuous population (Rossetto et al. 2000, NSW DECCW 2011) – with the inference that the *Fontainea oraria* individuals between these remnants have since been lost. Despite this evidence of reduction in habitat and population, there is insufficient data to assess *Fontainea oraria* against this criterion.

Criterion B Geographic range

Assessment Outcome: Critically Endangered under B1ab(iii,v)+2ab(iii,v).

Justification: *Fontainea oraria* has an extremely restricted geographic range, occupying an area with a radius < 600m.

Extent of Occurrence: The NSW Scientific Committee (2008) estimated the extent of occurrence (EOO) for *Fontainea oraria* to be 4 km². (EOO is reported as equal to AOO, despite the range of the species measured with minimum convex hull polygon being less than AOO, to ensure consistency of with the definition of AOO as an area within EOO, following IUCN Guidelines (2016)). A conservation action for *Fontainea oraria* has been the establishment of 24 translocation sites (D. Brown, pers comm, December 2016). These translocation sites are not included in assessment of *Fontainea oraria* against Criterion B, in accordance with IUCN guidelines (2016), because they do not meet conditions for inclusion (i.e., viable offspring produced). To be listed as Critically Endangered under Criterion B1 a species must have an EOO of <100 km². *Fontainea oraria* meets the EOO threshold for Critically Endangered under Criterion B1.

Area of Occupancy: The NSW Scientific Committee (2008) estimated the area of occupancy (AOO) for *Fontainea oraria* to be 4 km² (based on the species occupying a single 2 x 2 km cell, the scale of measurement recommended by IUCN 2016). To be listed as Critically Endangered under Criterion B2 a species must have an AOO of <10 km², *Fontainea oraria* meets the AOO threshold for Critically Endangered under Criterion B2.

In addition to these thresholds, at least two of three other conditions must be met. These conditions are:

- a) The population or habitat is observed or inferred to be severely fragmented or number of locations = 1 (CR), ≤ 5 (EN) or ≤ 10 (VU).

Assessment Outcome: Subcriterion met at Critically Endangered threshold.

Justification: *Fontainea oraria* is found at one location. This assessment of number of locations is based on the very small area that the 10 remaining mature trees occupy (an

area with a radius <600m), and the potential impact of weed invasion, the most serious plausible threat, across this whole area.

- b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals

Assessment Outcome: Subcriterion met for (iii) Continuing decline is inferred for quality of habitat and (v) Continuing decline is projected for number of mature individuals.

Justification: *Fontainea oraria* is known only from the Lennox Head area and its habitat is littoral rainforest. "The Coastal *Fontainea* occurs in vegetation that is particularly prone to exotic weed competition, due to highly fertile soils, disturbance and increased edge effects ... Over 40 weed species have been recorded in the habitat of Coastal *Fontainea*" (NSW DECCW 2011). Weed invasion, and weed control are ongoing. BRS and LES (2016) report that *Passiflora suberosa* is currently the most difficult weed at the *Fontainea oraria* location, requiring manual control and regular follow up. Other weeds at the location than may impact on *Fontainea oraria* include *Lantana camara*, *Asparagus aethiopicus* and *Cinnamomum camphora* (NSW DECCW 2011). Maintenance of *Fontainea oraria* habitat is reliant on ongoing weed control.

Other potential causes of decline are: (1) cattle grazing, which could damage *Fontainea oraria* and co-occurring littoral rainforest species, change soil structure and nutrient levels, and introduce weeds; however, fences were recently established to exclude cattle; (2) the possibility of land clearing remains for areas of littoral rainforest not protected by State Environmental Planning Policy 26 (NSW Scientific Committee 2004); however, the population of *Fontainea oraria* occurs within an area zoned for conservation; (3) the proximity of the population to residential development results in impacts including recreational use, garden refuse dumping, stormwater runoff (NSW DECCW 2011).

The risk of mortality of a large proportion of the population due to a stochastic environmental event (e.g. fire, windstorm, insect outbreak) is significant because of the extremely small size of the population. Moreover, *Fontainea oraria* is showing signs of inbreeding, in particular reduced genetic variability in juveniles and seedlings. If inbreeding continues this may impact on the species ability to respond to environmental change (NSW DECCW 2011), and this may impact on survival. A translocation program is underway to increase the number of *Fontainea oraria* individuals and maximize genetic diversity of offspring. In the translocated populations, some individuals are flowering and fruiting, but no viable offspring have yet been produced (D. Brown, pers comm, January 2017).

- c) Extreme fluctuations.

Assessment Outcome: Data deficient.

Justification: Currently there is no available data to assess the likelihood of extreme fluctuations in *Fontainea oraria*.

Criterion C Small population size and decline

Assessment Outcome: Critically Endangered under Criterion C via C2a(i) a(ii) .

Justification: The population size of *Fontainea oraria* is 10 mature plants (NSW Scientific Committee 2008). To be listed as Critically Endangered under Criterion C, a species must have <250 mature individuals. *Fontainea oraria* meets the total population threshold for listing as Critically Endangered under Criterion C.

At least one of two additional conditions must be met. These are:

- C1. An observed, estimated or projected continuing decline of at least 25% in 3 years or 1 generation (up to a max. of 100 years in future).

Assessment Outcome: Data Deficient.

Justification: There is insufficient data to assess *Fontainea oraria* against this criterion.

C2. An observed, estimated, projected or inferred continuing decline

Assessment Outcome: Subcriterion met.

Justification: Continuing decline is projected for number of mature individuals. The risk of mortality of a large proportion of the population due to a stochastic environmental event (e.g. fire, windstorm, insect outbreak) is significant because of the extremely small size of the population. Moreover, *Fontainea oraria* is showing signs of inbreeding, in particular reduced genetic variability in juveniles and seedlings. If inbreeding continues this may impact on the species ability to respond to environmental change (NSW DECCW 2011), and this may impact on survival. A translocation program is underway to increase the number of *Fontainea oraria* individuals and maximize genetic diversity of offspring. In the translocated populations, some individuals are flowering and fruiting, but no viable offspring have yet been produced (D. Brown, pers comm, January 2017).

There is a very high risk to the population from stochastic environmental events. Moreover, inbreeding, leading to reduced genetic variability may impact on the species ability to respond to environmental change. Reductions in habitat quality are also ongoing.

In addition, at least 1 of the following 3 conditions:

- a (i). Number of mature individuals in each subpopulation ≤ 50 (CR), ≤ 250 (EN) or ≤ 1000 (VU).

Assessment Outcome: Subcriterion met at Critically Endangered threshold.

Justification: The total population of *Fontainea oraria* is 10 mature individuals. *Fontainea oraria* meets the threshold for listing as Critically Endangered under Criterion C2a(i).

- a (ii). % of mature individuals in one subpopulation = 90-100% (CR), 95-100% (EN), 100% (VU).

Assessment Outcome: Criterion met at Critically Endangered threshold.

Justification: All the mature individuals exist in one subpopulation and *Fontainea oraria* meets the threshold for listing as Critically Endangered under Criterion C2a(i).

- b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: Data Deficient.

Justification: Currently there is no available data to assess the likelihood of extreme fluctuations in *Fontainea oraria*.

Criterion D Very small or restricted population

Assessment Outcome: Critically Endangered under Criterion D.

Justification: The total number of mature individuals of *Fontainea oraria* is estimated to be 10. To be listed as Critically Endangered under Criterion D a species must have < 50 mature individuals *Fontainea oraria* meets the threshold for listing as Critically Endangered under Criterion D.

D2 (Vulnerable only). Restricted area of occupancy (typically $< 20 \text{ km}^2$) or number of locations (typically < 5) with a plausible future threat that could drive the taxon to CR or EX in a very short time.

Assessment Outcome: Sub criterion met at Vulnerable threshold

Justification: The species has a restricted distribution (EOO $< 4 \text{ km}^2$ and AOO = 4 km^2) and a single location and ongoing threats and a disease could plausibly drive the taxon to extinction in a very short time.

Criterion E Quantitative Analysis

Assessment Outcome: Data Deficient.

Justification: Currently there is not enough data to undertake a quantitative analysis to determine the extinction probability of *Fontainea oraria*.

Conservation and Management Actions

There is a NSW Saving Our Species site-managed program for *Fontainea oraria* (NSW OEH, 2016), see

<http://www.environment.nsw.gov.au/savingourspeciesapp/Project.aspx?results=c&ProfileID=10334>

The following actions are derived from this program:

Habitat loss, disturbance and modification

- Ensure appropriate strategic planning and environmental impact assessment is undertaken by consent and determining authorities to enable protection of all known individuals and their habitat.
- Maintain fences (already established) to protect plants from grazing, particularly by cattle.
- Expand and connect remaining areas of littoral rainforest habitat.
 - Habitat restoration actions are ongoing but land availability is limited due to proximity to residential development.
- Negotiate for the implementation of permanent protection measures for the species and its habitat on any private land the species is found on OR ensure land management is sympathetic to *Fontainea oraria*.
- Implement fire regime appropriate for the habitat of the species and ensure not all individuals are exposed to fire on a single event.
 - The translocation program will also mitigate the risk of all *Fontainea oraria* being affected by a fire.

Invasive species

- Undertake weed control within known habitat. Key weed species include:
 - *Passiflora suberosa*
 - *Lantana camara*
 - *Asparagus aethiopicus*
 - *Cinnamomum camphora*

Ex situ conservation

- Maintain ex-situ collection of live material and seed bank.
- Continue translocation program. Currently 24 sites, each with 10 individuals (240 individuals in total).
 - Management of translocation sites including weed control and maintenance of fencing/guards.
 - Monitoring of translocated individuals.

Stakeholder Management

- Involve community in establishment of translocation sites (“Adopt a Font” program).
- Raise awareness of the importance of protecting this species from unauthorised collection.
- Undertake community education program regarding the impact of dumping of garden waste in the species habitat.
- Report new records of *Fontainea oraria* to the OEH.

Survey and Monitoring priorities

- Monitoring should be conducted annually to:
 - Investigate whether competition is negatively affecting *Fontainea oraria* or the species that define its habitat? Permanent monitoring plots should be established to record growth and mortality of *Fontainea oraria* and co-occurring species. This would also assist in tracking changes in *Fontainea oraria* habitat (e.g., weed arrivals).

Environmental measurements, such as soil nutrients and light availability, could also be taken, with the potential to relate these to changes in plant growth or mortality.

- Investigate whether there are any pathogens or insect pests affecting *Fontainea oraria*? What are the mechanisms of impact?
- Examine the response of *Fontainea oraria* to disturbance (if it occurs e.g., stem death, resprouting, leaf browning, flowering or fruiting).
- Understand the influence of management actions on threatening processes. Has the abundance of weeds decreased? Is damage from grazing reduced? Is there less rubbish?

Information and Research priorities

- To understand the ecology of *Fontainea oraria*.
 - Pollination ecology – determination of pollination method (e.g. wind, insect), identification of pollinators, pollination mechanisms of male and female plants, reasons for lack of contribution of all males to reproduction.
 - Seed biology – germination and dormancy mechanisms, seed viability and longevity, seed dispersal and predation.
 - Recruitment and establishment – survival rates of seedlings, causes of mortality, population modelling (e.g., impact of seedling loss), growth and development rates.
 - Translocation program – determining optimal numbers of plants for translocation sites, determining appropriate translocation sites, determining sex of plants prior to fruit production, maximising the survival of translocated plants.
 - Insect pests – identify pre- and post-dispersal seed predators, assess the impact of leaf rust and other pests, understand the biology of the beetle *Mesolita lineolata*.
- To understand the biology of *Fontainea oraria*.
 - To what extent is the species monocious or dioecious?
 - When does flowering and fruiting occur? Including seasonal variation, variation in rates of flowering and fruiting on individuals within and among years. Is there synchronicity in flowering and fruiting among individuals?
 - What is the average age at which plants reach reproductive maturity?
 - How to identify male and female plants in the absence of reproductive structures.
 - At what rates do monoecious and dioecious plants occur?
 - Methods to assess the health of individuals e.g., growth rate, fruiting rate.
- To understand the habitat of *Fontainea oraria*.
 - Defining commonly co-occurring species.
 - Defining environmental characteristics.
 - This would also provide a baseline against which to monitor future change.
- Ongoing research and monitoring associated with the translocation program.
 - A translocation program is underway, and there is a monitoring regime in place for translocated plants. Results from each translocation site, in terms of plant growth and survival, should be used to inform future translocation actions (e.g., planting and care methods, site selection).

References

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Expert Communications

Dianne Brown, Office of Environment and Heritage

Fontainea oraria - critically endangered species listing

NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the rainforest tree *Fontainea oraria* Jessup & Guymer (Coastal Fontainea) as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1A of the Act, and as a consequence, to omit reference to *Fontainea oraria* Jessup & Guymer from Part 1 of Schedule 1 (Endangered species) of the Act. Listing of critically endangered species is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. *Fontainea oraria* Jessup & Guymer (family Euphorbiaceae) is a rainforest species described by James & Harden (1990) as follows: "Shrub or small tree to 5 m high. Leaves with lamina elliptic to obovate, usually 6-9 cm long, 2.5-4 cm wide, glabrous; glands 0.5-4 mm above base of lamina; petiole jointed, 3-25 mm long. Female floral axes 8-10 mm long; male floral axes 5-6 mm long. Fruit ± globose, 18-22 mm long, 22-24 mm diam., red; seed with endocarp wrinkled and grooved."
2. *Fontainea oraria* was first described by Jessup & Guymer (1985) who considered it to be most closely related to *F. australis*. *Fontainea oraria* can be distinguished from *F. australis* by its leaf glands, which are positioned much closer to the base of the lamina and by its wrinkled and grooved endocarp.
3. *Fontainea oraria* is endemic to New South Wales where it is known only from the vicinity of Lennox Head on the far North Coast. Four groups of individuals are known and are scattered over an area with a radius of no more than 600 m (NSW DEC 2005).
4. *Fontainea oraria* grows in remnant stands of littoral rainforest dominated by *Guioa semiglauc*a. These highly fragmented remnants are on rich krasnozems derived from basalt. The altitude is approximately 50 m above sea level and all four groups of individuals are within 1 km of the ocean. *Fontainea oraria* is thought to be a slow-growing obligate seed-regenerator with a relatively low rate of fruit and seed production (NSW DEC 2005).
5. *Fontainea oraria* is not known to occur in any conservation reserves in New South Wales.
6. *Fontainea oraria* has a very highly restricted geographic distribution. The species extends in a narrow strip a few hundred metres wide and approximately 1.2 km from north to south. The extent of occurrence and area of occupancy are both estimated to be no more than 4 km² (Copeland 2008). This calculation is based on the species occupying a single 2 x 2 km grid cell, the spatial scale of assessment recommended by IUCN (2008).
7. The total known population of *Fontainea oraria*, surveyed most recently in 2005, includes approximately 55 wild plants (NSW DEC 2005). Of these, only 10 plants are mature adults, while the remaining 45 were classified as seedlings or juveniles. Like several species in the Euphorbiaceae, *Fontainea oraria* is primarily a dioecious species, in which male and female flowers usually occur on separate plants. To date only a single adult plant is confirmed as female while the sex of several of the other adult plants remains unknown (NSW DEC 2005).

8. It is highly likely that the original population of *Fontainea oraria* was much larger than the current estimate of 55 plants (Rossetto *et al.* 2000). It is believed that numerous plants would have been lost following widespread clearing of littoral rainforest in the Lennox Head district. In addition, the remaining plants of *Fontainea oraria* face a number of threatening processes, including further habitat destruction and fragmentation, competition with exotic woody weeds, earthworks and drainage changes associated with storm water management and erosion control, cattle grazing, increased exposure to ocean wind shear and associated dieback, inbreeding, wildfires, and illegal collection of seed for propagation (NSW DEC 2005). 'Clearing of native vegetation', 'Invasion and establishment of exotic vines and creepers', 'Invasion of native plant communities by exotic perennial grasses', 'Invasion and establishment of Lantana (*Lantana camara* L. *sens. lat*)' and 'High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' are listed as a Key Threatening Processes under the *Threatened Species Conservation Act 1995*.

9. *Fontainea oraria* Jessup & Guymer is eligible to be listed as a critically endangered species as, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future as determined in accordance with the following criteria as prescribed by the *Threatened Species Conservation Regulation 2002*:

Clause 15

The geographic distribution of the species is estimated or inferred to be:

(a) very highly restricted,

and

(d) a projected or continuing decline is observed, estimated or inferred in:

(i) an index of abundance appropriate to the taxon,

(ii) geographic distribution, habitat quality or diversity, or genetic diversity; and

(e) the following conditions apply:

(i) the population or habitat is observed or inferred to be severely fragmented;

(ii) all or nearly all mature individuals are observed or inferred to occur within a small number of populations or locations.

Clause 16

The estimated total number of mature individuals of the species is:

(a) very low,

and

(d) a projected or continuing decline is observed, estimated or inferred in:

(i) an index of abundance appropriate to the taxon,

(ii) geographic distribution, habitat quality or diversity, or genetic diversity; and

(e) the following conditions apply:

(i) the population or habitat is observed or inferred to be severely fragmented;

(ii) all or nearly all mature individuals are observed or inferred to occur within a small number of populations or locations.

Clause 17

The total number of mature individuals of the species is observed, estimated or inferred to be:

(a) extremely low.

Professor Lesley Hughes

Chairperson

Scientific Committee

Proposed Gazettal date: 21/11/08

Exhibition period: 21/11/08 – 23/01/09

References

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