



FLORA & FAUNA  
GUARANTEE

Nomination No. 903  
Taxon ID 504814

FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE  
FINAL RECOMMENDATION ON A NOMINATION FOR DE-LISTING  
*Nematolepis squamea* subsp. *squamea* Satinwood

DOCID107-417469679-742

**Date of receipt of nomination:** 21 December 2021

**Date of preliminary recommendation:** 5 July 2023

**Date of final recommendation decision:** 7 June 2024

**Validity:** The nomination is for a valid item.

**Prescribed Information:** The prescribed information was provided.

**Name of the Nominator** is adequately provided.

**Name of the Item** is adequately provided.

The nominated taxon is accepted by the Scientific Advisory Committee (SAC) as a valid taxon because it has been formally described and is accepted as a valid taxon by Royal Botanic Gardens Victoria.

**Current conservation status**

The taxon nominated for removal is currently listed as Vulnerable in Victoria on the *Flora and Fauna Guarantee Act 1988* (FFG Act) Threatened List under Primary Criterion 5.1 - Subcriteria 5.1.1 and 5.1.5 (International Union for Conservation of Nature (IUCN) criteria A2bcde+4bcde; D2) (State Government of Victoria 2021).

**Nomination for de-listing under the FFG Act**

The nomination to remove Satinwood from the Threatened List was made under Section 16A(2)(a) of Division 3 of the FFG Act:

*A person may make a nomination to the Committee to be considered under this Division that a taxon of flora or fauna that is specified in the Threatened List is no longer eligible to be specified in the Threatened List.*

It is contended in the nomination that the taxon has not reduced in population size by more than 30% as required in part by criteria A2 and A4. It is also the view of the nominator that threats relevant to criterion D2 would be very unlikely to cause a reduction in population to less than 50 individuals over the required timeframe (one to two generations).

**Eligibility for listing as a taxon under the Flora and Fauna Guarantee Act 1988**

The SAC has assessed the eligibility of the taxon to remain specified in the Threatened List based on its extinction risk within Victoria in accordance with Section 16C(4)(c) of the FFG Act and the criteria for determining eligibility for listing prescribed in the Flora and Fauna Guarantee Regulations 2020 (FFG Regulations). In its application of the relevant eligibility criteria, the SAC has, as required by the nationally adopted Common Assessment Method, had regard to the *IUCN Red List Categories and Criteria (Version 3.1)* and the *Guidelines for Using the IUCN Red List Categories and Criteria (version 16, 2024)*.

## **Species information**

### **Description, life history, generation length**

Satinwood is a shrub or tree to 12 m high in Family Rutaceae (the citrus and rue family); branchlets angular, smooth to glandular-verrucose, silvery-lepidote. Leaves chartaceous, lanceolate to elliptic, 3-10 cm long, 1-2.2 cm wide, apex acuminate to obtuse, rounded or retuse, upper surface smooth, glabrous, midrib impressed, lower surface densely silvery-lepidote, margin entire; petiole to 1 mm long. Inflorescence an axillary, compact or loose cyme, up to half as long as leaves, (3-)5-20-flowered; pedicel 1.5-5 mm long. Sepals free, deltoid, glandular, glabrous, c. 1 mm long; petals imbricate, elliptic, 4-5 mm long, glabrous, gland-dotted, white; staminal filaments sparsely to densely stellate or hirsute in lower half (rarely glabrous), stamens subequal to petals, anther yellow; disc prominent; ovary glabrous. Follicles slightly spreading, c. 3 mm high. Satinwood flowers in spring (VicFlora 2020). Under optimal conditions, Satinwood is recorded attaining 22 m high and 35 cm in stem diameter at Melba Gully in the Otway Ranges (Floyd 2008).

The generation length of Satinwood is estimated to be 80 to 120 years, with a minimum bound of 45 years and a maximum bound of 250 years. This is based on a plausible longevity of 80-150 years, and the inference that the taxon is a fire-sensitive obligate seed regenerator which recruits episodically post-fire at pre-settlement intervals of (45-) 80-120 (-250) years depending on local habitat conditions (State Government of Victoria 2022 unpublished). There may also be some trickle recruitment in response to localised disturbance events such as landslip, tree-fall, flood, storm or gap creation from pathogen-related overstorey mortality. In the Otway Ranges, which is the Victorian stronghold of the taxon, the optimal habitat is Wet Forest or the ecotones with Cool Temperate Rainforest, communities which were subject to catastrophic fire events at intervals of 150-500 years or more at the time of European settlement. Like most Rutaceae, Satinwood recruits from long-persistent soil-stored seedbanks, which can greatly outlast the lifespan of the last cohort of post-fire recruits (State Government of Victoria 2021), although it is unlikely that seed viability exceeds 250 years.

### **Distribution**

In Victoria, Satinwood is confined mainly to the Otway Ranges where it is locally common, but with occurrences in the east, near Bairnsdale and Orbost and more surprising records from the Pyrenees Range, Wombat Forest and Beechworth areas. The latter three records are likely to represent occurrences derived from transported seed or perhaps plantings, but the discontinuous distribution of the taxon through much of its overall range suggests the possibility that these records are natural occurrences. Satinwood also occurs in Tasmania, New South Wales and Queensland (VicFlora 2020).

Historically, Satinwood has been eliminated from forests cleared for agriculture or exotic plantation establishment in many parts of the Otway Ranges, although it can persist in such settings in its early stages of development. In areas subject to forestry operations, the intense disturbance regime may have promoted Satinwood at the expense of primary rainforest taxa. In production forests where historic forestry operations produced recurrent disturbance, Satinwood has been promoted and maintained at consistently high local densities (State Government of Victoria 2021).

### **Habitat**

In Victoria, Satinwood is confined mainly to gullies and tall wet forests in the Otways, but also occurs in similar habitats in the east, near Bairnsdale and Orbost. Records from the Pyrenees Range, Wombat Forest and Beechworth areas are from drier forest (VicFlora 2020). Interstate, Satinwood is usually restricted to the wet sclerophyll forest-rainforest ecotone, but in the Otways it is widespread in Wet Forest dominated by *Eucalyptus regnans* (Mountain Ash) or *E. obliqua* (Messmate Stringybark) or the ecotone with Cool Temperate Rainforest dominated by *Nothofagus cunninghamii* (Myrtle Beech). At Boggy Creek Gorge near Bairnsdale, it is in low dry rainforest (Floyd 2008). The taxon is recorded in Wet Forest, Shrubby Wet Forest, Cool Temperate Mixed Forest and Cool Temperate Rainforest Ecological Vegetation Classes.

### **Threats**

#### **Habitat loss**

Historic decline has been largely due to habitat loss in agricultural and exotic silvicultural landscapes. Declines based on habitat loss may have been at least partially compensated by increased density of Satinwood in forests subject to recurrent anthropogenic disturbance regimes. Satinwood is subject to continuing and incremental habitat loss due to agricultural intensification and infrastructure development and maintenance, including roadside management in rural landscapes.

#### **Wildfire / changed fire regimes**

A long-term threat is the potential impact of increasing fire risk, repeat fire events at intervals close to the tolerable fire interval (TFI) for the taxon and recruitment failure in response to climatic drying, warming and inappropriate fire regimes. The TFI for Satinwood is estimated to be in the range of 15-25 years. Whilst wildfire intervals in all four Ecological Vegetation

Classes (EVC) in which Satinwood is recorded in the Otways are currently significantly greater than the TFI for the taxon, in the longer term the risk of repeated fire events at intervals approaching the TFI is projected to emerge as the leading threat to the persistence of the taxon in the region. Repeated fires before Satinwood reaches reproductive maturity increases the risk of seedbank exhaustion and ultimately local extinction. In eastern Victoria, increasing fire frequency has already occurred: in East Gippsland, Shrubby Dry Forests have burnt at intervals of 3 years, a Shrubby Dry Forest mosaic east of the Thomson Dam experienced three wildfires in 12 years and in the Snowy River National Park, Montane Wet Forests dominated by *E. delegatensis* (Alpine Ash) burnt in 2014 were re-burnt in 2020. It is entirely plausible that Shrubby Wet Forest in the Otways could be burnt three times in 25 years (State Government of Victoria 2021).

#### Climate change

A predicted increase in temperature and decrease in rainfall in southwestern Victoria over the next 50 years (Clarke et al. 2019a, b) will most likely result in the temporal transition of native vegetation from suitable wet forest habitat to less suitable drier forest or woodland habitat. It is plausible that significant areas of Wet Forest and Shrubby Wet Forest will transition to Shrubby Foothill Forest, Lowland Forest and potentially other EVCs that have a greater fire tolerance. This loss of habitat is considered along with the direct effects of fire on mature plants and recruitment processes. As of 2005, Cool Temperate Rainforest, Wet Forest and Shrubby Wet Forest had undergone a 17.7% decline since 1750 (State Government of Victoria 2007a, b). The combined past clearing of suitable habitat and predicted future decline of habitat due to climate change points to a steady decrease in population size and area of occupancy that supports listing as Vulnerable. Climate change will likely cause proximate threats including, but not limited to, unsuitable fire regimes and transitioning of vegetation types to reduce the overall extent of available habitat.

#### Herbivory

Recruiting stands may also be threatened by targeted browsing by native and exotic herbivores including wallabies, rabbits, deer, domestic stock and, potentially, possums, although the distinctive oil content of the foliage and bark may reduce palatability for some herbivores. *Cervus unicolor* (Sambar) have demonstrated their ability to browse and ringbark juvenile and adult stands of the closely-related *Nematolepis wilsonii* (Shiny Nematolepis) in the Central Highlands of Victoria, and now constitute the greatest threat to this highly localised endemic. Sambar have been established in the Timboon district in the Western Otways at least since 2003. It is almost inevitable that Sambar will eventually penetrate the entire Otways, in which case it can be confidently predicted that Sambar will become the leading threat to the recruitment and persistence of adult stands of Satinwood (State Government of Victoria 2021).

If any of the highly disjunct occurrences elsewhere in the state are indeed indigenous, such occurrences are subject to a wide range of site-specific threats in addition to the generic threats identified for occurrences in the Otways. For example, the isolated stand on the slope of Mt Buck, north of Orbost in East Gippsland, may be threatened by the increasing density of Sambar throughout the region, and this threat may also apply to the Boggy Creek Gorge stand (State Government of Victoria 2021).

In the long term, the emerging threats of transitional change to drier native vegetation, repeat fire events at a regional scale and the continuous impact of targeted browsing by Sambar are likely to act synergistically, resulting in adult mortality, recruitment failure, seedbank exhaustion and significant decline.

#### **Decision by the Scientific Advisory Committee**

The Committee concludes that there is sufficient basis for an estimated 30% population reduction based on criteria A2bce and A4bce. The criteria consider range (extent of occurrence), area of occupancy, abundance, and the effects of introduced taxa and other threats in causing the estimated decline. The Committee has considered available information on Satinwood, information presented in the nomination and field observations during the nomination period.

The eligibility of the taxon nominated for de-listing to remain specified in the Threatened List must be determined in accordance with the eligibility criteria prescribed for the purposes of Division 2 of Part 3 of the FFG Act.

The relevant eligibility criteria are prescribed in Schedule 1 of the FFG Regulations, which provides that a taxon is at risk of extinction in a particular category of threat if a primary criterion is met and is therefore eligible to be specified in the Threatened List.

As required under the Intergovernmental Memorandum of Understanding - Agreement on a Common Assessment Method for Listing of Threatened Species (to which Victoria is a signatory), eligibility has also been assessed in accordance with the *IUCN Red List Categories and Criteria (Version 3.1)* and the *Guidelines for Using the IUCN Red List Categories and Criteria (version16, 2024)*.

For details of the IUCN criteria see Appendix 1.

### **Criterion A – Population size reduction**

#### **Eligible as Vulnerable under IUCN Criteria A2bce + A4bce (FFG Primary Criterion 5.1 - Subcriterion 5.1.1)**

##### **Evidence:**

The population reduction over the past three generations (135 to 750 years) is estimated to be 20 to 40% (midpoint 30%), based on criterion A2 (b) an index of abundance appropriate to the taxon, (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat and (e) the effects of introduced taxa and competitors. This is based largely on historic habitat loss to agriculture and exotic plantation establishment in the Otway Ranges, acknowledging that the taxon may persist in exotic softwood plantations, at least in its early stages of development. Such stands are unlikely to persist in the dense shade of mature softwood plantations, given it only occurs at the ecotone of Cool Temperate Rainforest, and not in the heavily shaded interior. The taxon is likely to have been concentrated, at the time of European settlement, in optimally developed stands of each of the four EVCs in which the taxon is recorded. Optimal expressions of Wet Forest and Cool Temperate Mixed Forest are likely to have been in the core of the Otway region centred on Beech Forest and the Aire River Valley, which have been targeted historically for agricultural clearance, timber extraction and plantation establishment. The causes of reduction may not have ceased, be understood or be reversible.

The population reduction over any 135 to 750 year period, including both past and future (up to 100 years in the future), is estimated to be 30 to 55% (midpoint 40%), based on criterion A4 (b), (c) and (e) as above. This is based largely on historic habitat loss to agriculture and exotic plantation establishment in the Otway Ranges. The estimate of past decline cannot be based simply on the regional decline in extent of individual vegetation types such as Shrubby Wet Forest or Wet Forest since the taxon is not evenly distributed across each EVC. Of the four EVCs where Satinwood is recorded, Cool Temperate Mixed Forest remains unmapped and stands of this community at the time of European settlement are likely to be included within the 1750 mapping of either Wet Forest or Cool Temperate Rainforest. The magnitude of future decline can be inferred from climate change modelling, which has direct implications for the future composition of native vegetation in the Otways. Associated decline in habitat caused by lower rainfall and increasing temperature is predicted to occur, adding to past decline and satisfying criteria for its current Vulnerable listing. Although Satinwood can be present in drier EVCs, the majority of the population is in the wetter EVCs in the Otways and there is insufficient direct or experimental evidence that the taxon is well-adapted to a drier climate at the present time.

### **Criterion B – Geographic range (Extent of Occurrence and Area of Occupancy)**

#### **Not eligible**

##### **Evidence:**

The Extent of Occurrence across the taxon's range, based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA), is estimated to be 30,135 km<sup>2</sup>, which exceeds the threshold for criterion B. The Area of Occupancy across the taxon's range, based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA, is estimated to be 436 km<sup>2</sup>, however other thresholds under this criterion have not been met (State Government of Victoria 2021). The population is not severely fragmented and there is currently a lack of consensus among experts on the number of threat-based locations.

### **Criterion C – Small population size and decline**

#### **Insufficient data to determine eligibility.**

There are currently no population estimates available to provide evidence for this criterion.

### **Criterion D – Very small or restricted population**

#### **Insufficient data to determine eligibility.**

There are currently no population estimates available and there is currently a lack of consensus among experts on the number of threat-based locations so there is insufficient evidence to demonstrate eligibility under this criterion.

## Criterion E – Quantitative analysis

### **Insufficient data to determine eligibility.**

There is no population viability analysis available to provide evidence for this criterion.

### **Documentation**

The published information provided to and sourced by the SAC has been assessed. To the best of their knowledge, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well-supported.

### **Advertisement for public comment**

In accordance with the requirements of Section 16D of the FFG Act, the preliminary recommendation was advertised for a period of at least 30 days.

The preliminary recommendation was advertised in:

Victorian Government Gazette on 27 July 2023  
DEECA website and social media

Public submissions closed on 27 August 2023.

### **Additional information considered by the Scientific Advisory Committee**

Following publication of the preliminary recommendation, the SAC received one submission. In formulating its final recommendation, the SAC considered the submission and was not aware of any compelling evidence to warrant a change to the preliminary recommendation that the nominated taxon is eligible to be retained on the Threatened List.

### **Final Recommendation of the Scientific Advisory Committee**

As outlined above, the taxon nominated for de-listing satisfies at least one criterion of the set of criteria prepared and maintained under Division 2 of Part 3 of the FFG Act and stated in Schedule 1 of the FFG Regulations.

The SAC concludes that on the evidence available, the taxon remains eligible for listing as Vulnerable in Victoria because Primary Criterion 5.1 – Subcriterion 5.1.1 of the FFG Regulations have been satisfied (IUCN criteria A2bce; A4bce).

**Vulnerable**, in relation to a taxon of flora or fauna, means that the taxon is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future.

The Scientific Advisory Committee therefore does not support the nomination for de-listing of the taxon and makes a final recommendation that Satinwood remain listed as Vulnerable in Victoria under the *Flora and Fauna Guarantee Act 1988*.

### **Endorsement by the Convenor of the Scientific Advisory Committee**

**Date**



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**Dr. Michelle T. Casanova**  
Convenor

**19 June 2024**

## **References**

Clarke J.M., Grose M., Thatcher M., Round V. & Heady C. (2019a). Great South Coast Climate Projections 2019. CSIRO, Melbourne Australia.

Clarke J.M., Grose M., Thatcher M., Round V. & Heady C. (2019b). Barwon Climate Projections 2019. CSIRO, Melbourne Australia.

Floyd, A.G. (2008). *Rainforest Trees of Mainland South-eastern Australia*. Terania Rainforest Publishing.

State Government of Victoria (2007a). Native Vegetation - Modelled Extent 2005. Accessed 20 May 2024.

<https://discover.data.vic.gov.au/dataset/native-vegetation-modelled-extent-2005>

State Government of Victoria (2007b). Native Vegetation - Modelled 1750 Ecological Vegetation Classes. Accessed 20 May 2024.

<https://discover.data.vic.gov.au/dataset/native-vegetation-modelled-1750-ecological-vegetation-classes>

State Government of Victoria (2021). Department of Environment, Land, Water & Planning. *Nematolepis squamea* subsp. *squamea* threatened species assessment. Accessed 20 May 2024.

[https://bio-prd-naturekit-public-data.s3.ap-southeast-2.amazonaws.com/species\\_assessments/Nematolepis\\_squamea\\_subsp\\_squamea\\_504814.pdf](https://bio-prd-naturekit-public-data.s3.ap-southeast-2.amazonaws.com/species_assessments/Nematolepis_squamea_subsp_squamea_504814.pdf)

State Government of Victoria (2022 unpublished). Department of Energy, Environment and Climate Action. RAMAS expert assessment of Satinwood.

VicFlora (2020). Flora of Victoria, Royal Botanic Gardens Victoria: *Nematolepis squamea* subsp. *squamea*. Accessed 20 May 2024.

<https://vicflora.rbg.vic.gov.au/flora/taxon/4b96a628-aba6-48b4-bb2f-b2e76abe25c1>

**Appendix 1:** IUCN Red List Categories and Criteria

**SUMMARY OF THE FIVE CRITERIA (A-E) USED TO EVALUATE IF A TAXON BELONGS IN AN IUCN RED LIST THREATENED CATEGORY (CRITICALLY ENDANGERED, ENDANGERED OR VULNERABLE).<sup>1</sup>**

<b>A. Population size reduction.</b> Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	<b>Critically Endangered</b>	<b>Endangered</b>	<b>Vulnerable</b>
<b>A1</b>	≥ 90%	≥ 70%	≥ 50%
<b>A2, A3 &amp; A4</b>	≥ 80%	≥ 50%	≥ 30%
<p><b>A1</b> Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.</p> <p><b>A2</b> Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p><b>A3</b> Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3].</p> <p><b>A4</b> An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>	<i>based on any of the following:</i>		<p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.</p>
<b>B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)</b>			
	<b>Critically Endangered</b>	<b>Endangered</b>	<b>Vulnerable</b>
<b>B1. Extent of occurrence (EOO)</b>	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
<b>B2. Area of occupancy (AOO)</b>	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
<b>AND at least 2 of the following 3 conditions:</b>			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			
<b>C. Small population size and decline</b>			
	<b>Critically Endangered</b>	<b>Endangered</b>	<b>Vulnerable</b>
<b>Number of mature individuals</b>	< 250	< 2,500	< 10,000
<b>AND at least one of C1 or C2</b>			
<b>C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):</b>	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
<b>C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:</b>			
(a) (i) Number of mature individuals in each subpopulation (ii) % of mature individuals in one subpopulation =	≤ 50 90–100%	≤ 250 95–100%	≤ 1,000 100%
(b) Extreme fluctuations in the number of mature individuals			
<b>D. Very small or restricted population</b>			
	<b>Critically Endangered</b>	<b>Endangered</b>	<b>Vulnerable</b>
<b>D. Number of mature individuals</b>	< 50	< 250	<b>D1.</b> < 1,000
<b>D2. Only applies to the VU category</b> Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	<b>D2.</b> typically: AOO < 20 km <sup>2</sup> or number of locations ≤ 5
<b>E. Quantitative Analysis</b>			
	<b>Critically Endangered</b>	<b>Endangered</b>	<b>Vulnerable</b>
<b>Indicating the probability of extinction in the wild to be:</b>	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

<sup>1</sup> Use of this summary sheet requires full understanding of the IUCN Red List Categories and Criteria and Guidelines for Using the IUCN Red List Categories and Criteria. Please refer to both documents for explanations of terms and concepts used here.