

***Philothea ericifolia* (A. Cunn. ex Benth.) Paul G. Wilson (Rutaceae)**

Distribution: Endemic to NSW

Current EPBC Act Status: Vulnerable

Current NSW TSC Act Status: Not listed

Proposed change for alignment: Delist from EPBC Act.

Conservation Advice: *Philothea ericifolia*

Summary of Conservation Assessment

Philothea ericifolia was found to be eligible for delisting from the EPBC Act as it no longer meets the criteria for listing as threatened after the discovery of more populations. *Philothea ericifolia* is endemic to NSW and was delisted from the *NSW Threatened Species Conservation Act* in 2009. The species did not meet the criteria for listing based on the relatively large total population size, no restriction in geographic range and the absence of evidence for continuing decline (NSW Scientific Committee, 2009).

Description and Taxonomy

The NSW Scientific Committee (2009) state that “*Philothea ericifolia* (A. Cunn. Ex Benth.) Paul G. Wilson (Rutaceae) is a ‘shrub 1-2 m high, spreading; stems sparsely glandular-warty, finely pubescent. Leaves needle-like, 0.4-0.8 cm long, c. 0.5 mm wide, narrow-grooved above, sparsely glandular-punctate, glabrous or sparsely and finely pubescent; petiole short, stipules small, black. Flowers 1-6 in sessile clusters; pedicels 2-5 mm long, minutely bracteolate at base. Petals elliptic, c. 9 mm long, purple to pink, glandular-warty, slightly white-tomentose inside and on the outside except for thick glandular midrib. Stamens free; filaments pilose; anthers glabrous. Cocci erect, c. 5 mm long, abruptly attenuate into a subulate pilose apex. Flowers spring’ (Weston & Harden 2002). Plants produce seeds in November and December, and have been observed to resprout following fire (Porteners 2008).”

Distribution and Abundance

The NSW Scientific Committee (2009) state that “*Philothea ericifolia* mainly occurs on the central and northern slopes and northwestern plains of NSW, with its distribution centred near Dubbo. It extends to the Pilliga in the north and West Wyalong in the south (Porteners 2008)”.

“Recent systematic surveys of forested areas in the central west of NSW have resulted in the discovery of populations of *Philothea ericifolia* (Porteners 2008). It has been recorded from Brigalow Belt South, NSW South Western Slopes, and Sydney Basin Bioregions (sensu Thackway and Creswell 1995). There are currently 65 records of the species, representing approximately 42 populations (Porteners 2008). Current survey based estimates on the size of individual populations range from at least 3,780 up to 10,000 – 20,000 plants (Porteners 2008). However, actual numbers of plants are thought to be much higher, with a large unsurveyed population in Breealong Community Conservation Area (CCA) Zone 1 (previously Lincoln State Forest) near Gilgandra, which may number at least 200 000 plants (Porteners 2008).”

In summary, the areas with records of *Philothea ericifolia* are:

1. Pilliga area (including Nature Reserves and State Forests managed for *Callitris glaucophylla*)*
2. Goonoo area (National Park and State Forest, and Breealong National Park)*
3. Toonghi
4. Goobang National Park (including Herveys Range and Peak Hill)
5. West Wyalong
6. Nangar

7. Wollemi National Park (including Dunn's Swamp and Mt Nagar)
8. Wingen Maid
9. Hunter Valley

* While these areas of the Pilliga and Gonoo were both in the past managed for production forestry, Gonoo National Park was created in 2005 and is no longer subject to forestry operations. Forestry operations are ongoing in the Pilliga (NSW Forestry Corporation, 2013).

The estimated extent of occurrence (EOO) for *Philothea ericifolia* is 66,600 km², measured using a convex hull polygon, as recommended by IUCN (2017), around records for which georeference data could be substantiated (i.e., through location notes).

The estimate of area of occupancy (AOO) for *Philothea ericifolia* is 304 km², based on a 2 x 2 km grid as recommended for assessing AOO by IUCN (2017).

D. Binns (pers comm., June 2017) notes that in the past *Philothea ericifolia* may have been overlooked to some extent due to confusion of non-flowering plants with *Philothea salsolifolia*.

Ecology

Philothea ericifolia grows mainly in dry sclerophyll forest and heath on damp sandy flats and gullies (Portners 2008). It has also been found in a range of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops (Portners 2008). Typical co-occurring species include *Melaleuca uncinata*, *Eucalyptus crebra*, *E. rossii*, *E. punctata*, *Corymbia trachyphloia*, *Acacia triptera*, *A. burrowii*, *Beyeria viscosa*, *Philothea australis*, *Leucopogon muticus* and *Calytrix tetragona* (Portners 2008). *Philothea ericifolia* prefers soils that have a sandy, gravelly or rocky component. It prefers moister sites, demonstrated by its abundance on the sides of a particular spur of the Hervey Ranges, where a soakage area provides sufficient moisture for the plants (Portners 2008). *Philothea ericifolia* has been recorded growing (from resprouts) in a recently burnt site (wildfire) and within a regeneration zone resulting from clearing (Portners 2008).

Philothea ericifolia flowers in spring (in general) and fruits from November to December (Portners 2008). Little is known of the reproductive biology of the species, however, flowers have been observed being pollinated by honey bees (Portners 2008). Seeds are probably released ballistically from fruits at maturity, followed by secondary seed dispersal primarily by ants (Portners 2008). There is a high level of seed dormancy at release in the Rutaceae, and members are likely to have persistent seedbanks with germination linked to fire (Auld 2001).

Threats

NSW OEH (2016) suggests that the key threats to *Philothea ericifolia* are from vegetation clearing, habitat disturbance, forestry activities and altered fire regimes (in forests where fire is suppressed to maintain the *Callitris glaucophylla* resource).

The NSW Scientific Committee (2009) state that "There is currently no evidence of any ongoing net decline in the total population of *Philothea ericifolia* (Portners 2008). Whilst clearing of native vegetation may have contributed to a decline of *P. ericifolia* in the past, particularly around Dubbo and the central wheatbelt areas, further clearing of habitat areas is considered to be unlikely at most known sites (Portners 2008)."

Philothea ericifolia is distributed in eastern central NSW from the Pilliga to West Wyalong. Of the 106 records of *Philothea ericifolia*, the majority occur on National Parks and other conservation reserves (47 records), and in state forests (23 records). *Philothea ericifolia* is present in Pilliga National Park, Wollemi National Park, Goobang National Park and Wingen Maid Nature Reserve. Risk

of decline from vegetation clearing is reduced within these areas. Some 31 records are from freehold land and only two records are from crown land. (Three records were associated with “unknown” land tenure.)

In terms of the possible threat of forestry activities, the key issue is impacts on *Philothea ericifolia* associated with the management and harvest of *Callitris glaucophylla* within State Forests, the largest of which is in the Pilliga area. The total numbers of *Philothea ericifolia* within State Forests is unknown. Forestry activities within these forests could plausibly result in losses of mature individuals and reduction in area, extent and or quality of habitat. However, D. Binns (pers. comm., September 2017) noted that “*P. ericifolia* usually occurs in areas of heath, or heathy woodland with low density of large trees. Within State forest, the extent to which these habitats are disturbed by forestry activities is low because of lack of commercial timber or low timber volumes. Even if it is assumed, as a worst case, that disturbance by forestry activities has an adverse effect on *P. ericifolia*, in my view there is a low degree of threat from forestry activities because of the small proportion of the population in State forest which is likely to be directly affected”.

Records indicate that the extent of *Philothea ericifolia* on private land (freehold land) is small, but it is likely private land is poorly represented in the databases. Vegetation clearing may be an ongoing threat on private land.

There is uncertainty about what constitutes an appropriate fire regime for *Philothea ericifolia*. The genus *Philothea* includes species that resprout after fire, and species for which fire stimulates seed germination (Auld 2001) from a persistent soil stored seed bank (Auld and Ooi 2008). Hence fire is likely to promote germination in *Philothea ericifolia*. Importantly, *Philothea ericifolia* has been noted as resprouting from a recently burnt site (Portners 2008), hence, it is likely to have greater resilience to variations in fire regimes, in comparison to obligate seeding species. Based on this ability to resprout, it is likely that *Philothea ericifolia* would also have some resilience to other disturbances, such grazing and browsing.

The preference of *Philothea ericifolia* for habitat on sandy soils reduces the risk from weed competition, as these soils are also likely to be low in nutrients. Its height of 1-2 m means that it will also be able to overtop weeds such as exotic perennial grasses; however, its preference for moister sites could place it in competition with *Rubus* spp.

Assessment against IUCN Red List criteria

For this assessment, it is considered that the survey of *Philothea ericifolia* 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 $\geq 30\%$ over three generations or 10 years (whichever is longer).

The NSW Scientific Committee (2009) state that “... clearing of native vegetation may have contributed to a decline of *P. ericifolia* in the past, particularly around Dubbo and the central wheatbelt areas ... (Portners 2008).” However, as the extent of this historical reduction is unknown, and there is insufficient data to assess *Philothea ericifolia* against this criterion.

Criterion B Geographic range

Assessment Outcome: Data deficient or least concern.

Justification: Extent of occurrence (EOO) is estimated to be 66,600 km² using a convex hull polygon, as recommended by IUCN (2017). The EOO threshold for listing as Vulnerable under B1 is <20,000 km². *Philotheca ericifolia* does not meet the EOO threshold for listing under Criterion B1.

Area of occupancy (AOO) is estimated to be of 304 km² based on a 2 x 2 km grid as recommended for assessing AOO by IUCN (2017), and using the same groups of records as for EOO. The AOO threshold for listing as Endangered under B2 is <500 km². *Philotheca ericifolia* meets the AOO threshold for listing as 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 not met.

Justification: There approximately 118 records of *Philotheca ericifolia*, equivalent to more than 10 locations, from West Wyalong to the Pilliga. This assessment of number of locations is based on the potential impact of land clearing, habitat disturbance and forestry activities, the most serious plausible threats.

With regard to fragmentation, counts of *Philotheca ericifolia* individuals in the Pilliga have resulted in population estimates of 300 and 400 (recorded in specimen notes), therefore a total count of 700; however, populations in the Pilliga are estimated to “consist of hundreds or thousands of individuals” (Portners 2008). In addition, there is an estimated population of 200,000 plants in Breelong National Park (near Goonoo) (Doug Binns cited in Portners 2008). Based on the presence of these larger populations, it appears likely that most individuals of *Philotheca ericifolia* are not found in “small and relatively isolated subpopulations” (IUCN 2017), and therefore the species is not subject to severe fragmentation.

- 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 not met **OR** Data deficient.

Justification: NSW OEH (2016) suggests that the key threats to *Philotheca ericifolia* are from vegetation clearing, habitat disturbance, forestry activities and altered fire regimes (in forests where fire is suppressed to maintain the *Callitris glaucophylla* resource).

The NSW Scientific Committee (2009) state that “There is currently no evidence of any ongoing net decline in the total population of *Philotheca ericifolia* (Porteners 2008). Whilst clearing of native vegetation may have contributed to a decline of *P. ericifolia* in the past, particularly around Dubbo and the central wheatbelt areas, further clearing of habitat areas is considered to be unlikely at most known sites (Porteners 2008).”

Philotheca ericifolia is distributed in eastern central NSW from the Pilliga to West Wyalong. Of the 118 records of *Philotheca ericifolia*, the majority occur on National Parks and other conservation reserves (approximately 56 records), with the remainder in state forests (approximately 22 records; two records under both). *Philotheca ericifolia* is present in conservation reserves such as the Pilliga National Park, Wollemi National Park, Goobang National Park and Wingen Maid Nature Reserve. Risk of decline from vegetation clearing is reduced within these areas. Some 32 records are from freehold land and only two records are from crown land.

In terms of the possible threat of forestry activities, the key issue is impacts on *Philothea ericifolia* associated with the management and harvest of *Callitris glaucophylla* within State Forests, the largest of which is in the Pilliga area. The total numbers of *Philothea ericifolia* within State Forests is unknown. Forestry activities within these forests could plausibly result in losses of mature individuals and reduction in area, extent and or quality of habitat. However, D. Binns (pers. comm., September 2017) noted that “*P. ericifolia* usually occurs in areas of heath, or heathy woodland with low density of large trees. Within State forest, the extent to which these habitats are disturbed by forestry activities is low because of lack of commercial timber or low timber volumes. Even if it is assumed, as a worst case, that disturbance by forestry activities has an adverse effect on *P. ericifolia*, in my view there is a low degree of threat from forestry activities because of the small proportion of the population in State forest which is likely to be directly affected”.

Records indicate that the extent of *Philothea ericifolia* on private land (freehold land) is small, but it is likely private land is poorly represented in the databases. Vegetation clearing may be an ongoing threat on private land.

There is uncertainty about what constitutes an appropriate fire regime for *Philothea ericifolia*. *Philothea ericifolia* has been noted as resprouting from a recently burnt site (Portners 2008) and it is likely that, as in other *Philothea* species, fire may promote germination in *Philothea ericifolia*. However, the fire regimes occurring in known sites is currently unknown as is the impact of these fire regimes on the species.

The preference of *Philothea ericifolia* for habitat on sandy soils reduces the risk from weed competition, as these soils are also likely to be low in nutrients. Its height of 1-2 m means that it will also be able to overtop weeds such as exotic perennial grasses; however, its preference for moister sites could place it in competition with *Rubus* spp.

c) Extreme fluctuations.

Assessment Outcome: Subcriterion not met.

Justification: Currently there is no available data to assess the likelihood of extreme fluctuations in *Philothea ericifolia*. The species is unlikely to undergo extreme fluctuations in response to fire because of its ability to resprout.

Criterion C Small population size and decline

Assessment Outcome: Least concern **OR** Data deficient

Justification: There is no precise estimate of population abundance for *Philothea ericifolia*.

Portners (2008) noted specifically that

- “counts ranging from 3 to 400 individuals have been made at the various sites in NSW”,
- “total number of individuals is calculated at 3,780 plants for the 42 known populations”,
 - However, “this figure is highly conservative and the total number in these known populations is likely to be in the range of 10,000 to 20,000 plants”.

Portners (2008) stated that there “a large population in Lincoln State Forest near Gilgandra has been estimated to contain in excess of 200,000 plants in an area of 269 hectares” (Doug Binns pers. comm. and NSW NPWS 2002; cited Portners 2008). (Note Lincoln State Forest is now Breeelong National Park). D. Binns (pers. comm., June 2017) notes that this estimate was obtained by extrapolating sample counts across an estimate of the population extent, and was conservative. He also notes that populations of *Philothea ericifolia* can fluctuate substantially over time, so that numbers of plants may be quite different today compared to when the estimate was made.

In addition, Portners (2008) noted that “populations in Pilliga State Forest are said to consist of hundreds or thousands of individuals”.

Since the assessment in 2009 there have been four new records (all within the known range of *Philothea ericifolia*, two records with no count of individuals and one each with 6 and 12 individuals).

To be listed as threatened under Criterion C a species must have a population <10,000. Based on a combination of actual population counts and estimates of likely abundance *Philothea ericifolia* does not meet this threshold.

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

C1. An observed, estimated or projected continuing decline of at least 10% in 10 years (up to a max. of 100 years in future).

Assessment Outcome: Data Deficient.

Justification: There is currently not enough data to estimate the rate of population change in *Philothea ericifolia*.

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

Assessment Outcome: Subcriterion not met or Data deficient.

Justification: NSW OEH (2016) suggests that the key threats to *Philothea ericifolia* are from vegetation clearing, habitat disturbance, forestry activities and altered fire regimes (in forests where fire is suppressed to maintain the *Callitris glaucophylla* resource).

The NSW Scientific Committee (2009) state that “There is currently no evidence of any ongoing net decline in the total population of *Philothea ericifolia* (Porteners 2008). Whilst clearing of native vegetation may have contributed to a decline of *P. ericifolia* in the past, particularly around Dubbo and the central wheatbelt areas, further clearing of habitat areas is considered to be unlikely at most known sites (Porteners 2008).”

Philothea ericifolia is distributed in eastern central NSW from the Pilliga to West Wyalong. Of the 112 records of *Philothea ericifolia*, the majority occur on National Parks and other conservation reserves (56 records), with the remainder in state forests (22 records; two records under both). *Philothea ericifolia* is present in conservation reserves such as the Pilliga National Park, Wollemi National Park, Goobang National Park and Wingen Maid Nature Reserve. Risk of decline from vegetation clearing is reduced within these areas. Some 32 records are from freehold land and only two records are from crown land.

In terms of the possible threat of forestry activities, the key issue is impacts on *Philothea ericifolia* associated with the management and harvest of *Callitris glaucophylla* within State Forests, the largest of which is in the Pilliga area. The total numbers of *Philothea ericifolia* within State Forests is unknown. Forestry activities within these forests could plausibly result in losses of mature individuals and reduction in area, extent and or quality of habitat. However, D. Binns (pers. comm., September 2017) noted that “*P. ericifolia* usually occurs in areas of heath, or heathy woodland with low density of large trees. Within State forest, the extent to which these habitats are disturbed by forestry activities is low because of lack of commercial timber or low timber volumes. Even if it is assumed, as a worst case, that disturbance by forestry activities has an adverse effect on *P.*

ericifolia, in my view there is a low degree of threat from forestry activities because of the small proportion of the population in State forest which is likely to be directly affected”.

Records indicate that the extent of *Philothea ericifolia* on private land (freehold land) is small, but it is likely private land is poorly represented in the databases. Vegetation clearing may be an ongoing threat on private land.

There is uncertainty about what constitutes an appropriate fire regime for *Philothea ericifolia*. *Philothea ericifolia* has been noted as resprouting from a recently burnt site (Portners 2008) and it is likely that, as in other *Philothea* species, fire may promote germination in *Philothea ericifolia*. However, the fire regimes occurring in known sites is currently unknown as is the impact of these fire regimes on the species.

The preference of *Philothea ericifolia* for habitat on sandy soils reduces the risk from weed competition, as these soils are also likely to be low in nutrients. Its height of 1-2 m means that it will also be able to overtop weeds such as exotic perennial grasses; however, its preference for moister sites could place it in competition with *Rubus* spp.

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

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

Assessment Outcome: Subcriterion not met.

Justification: There are two populations within Pilliga State Forest with counts of 300 and 400 plants respectively (Portners 2008; records SF 723302, SF 723303). There are no populations for which there are counts of mature individuals >1000 . However, there are populations *estimated* to have “hundreds or thousands of individuals” (Pilliga State Forest) (Portners 2008) and 200,000 plants (Breelong National Park) (Doug Binns pers. comm. and NSW NPWS 2002 cited in Portners 2008).

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

Assessment Outcome: Subcriterion not met.

Justification: Not all mature individuals are in one population

- b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: Data Deficient **OR** Subcriterion not met.

Justification: Currently there is no available data to assess the likelihood of extreme fluctuations in *Philothea ericifolia*. The species is unlikely to undergo extreme fluctuations in response to fire because of its ability to resprout.

Criterion D Very small or restricted population

Assessment Outcome: Criterion not met.

Justification: There is no precise estimate of population abundance for *Philothea ericifolia*, but estimates suggest it is more than 1000 mature individuals.

Portners (2008) noted specifically that

- “counts ranging from 3 to 400 individuals have been made at the various sites in NSW”,
- “total number of individuals is calculated at 3,780 plants for the 42 known populations”,
 - However, “this figure is highly conservative and the total number in these known populations is likely to be in the range of 10,000 to 20,000 plants”.

In addition, Portners (2008) noted that “populations in Pilliga State Forest are said to consist of hundreds or thousands of individuals” and “a large population in Lincoln State Forest near Gilgandra has been estimated to contain in excess of 200,000 plants in an area of 269 hectares” (Doug Binns pers. comm. and NSW NPWS 2002 cited in Portners 2008). (Note Lincoln State Forest is now Breealong National Park). D. Binns (pers. comm., June 2017) notes that this estimate was obtained by extrapolating sample counts across an estimate of the population extent, and was conservative. He also notes that subpopulations of *Philothea ericifolia* can fluctuate substantially over time, so that numbers of plants may be quite different today compared to when the estimate was made.

Since the assessment in 2009 there have been four new records (all within the known range of *Philothea ericifolia*, two records with no count of individuals and one each with 6 and 12 individuals). To be listed as threatened under Criterion D a species must have a population <1,000. *Philothea ericifolia* does not meet the threshold for listing under Criterion D.

D2. *Philothea ericifolia* is known from more than 5 locations and has an AOO of > 20 km². Consequently it will not meet the requirements of listing under D2.

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 *Philothea ericifolia*.

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