Conservation Assessment of *Dodonaea stenophylla* F.Muell. (Sapindaceae)

J Scott 08/12/2020
NSW Threatened Species Scientific Committee

***Dodonaea stenophylla* F.Muell. (Sapindaceae)**

Distribution: New South Wales, Queensland and the Northern Territory.
Current EPBC Act Status: Not listed.
Current NSW BC Act Status: Extinct.

Proposed listing on NSW BC Act: A state listing of Vulnerable in NSW only (as the species is not considered to be nationally threatened).
Proposed listing on EPBC Act: Does not require listing as the species is not considered to be nationally threatened.

Conservation Advice: *Dodonaea stenophylla*

Summary of Conservation Assessment

National threat status
Dodonaea stenophylla was not considered to be nationally threatened as it was unlikely to meet any IUCN (2012) criteria for national listing (Neldner *in litt.* November 2019). *Dodonaea. stenophylla* is a common and widespread shrub throughout Queensland and parts of the Northern Territory. There was no evidence of significant decline across its range in Queensland (which has most of the recorded occurrences) and population numbers in this state are likely to be very large.

NSW State threat status
Dodonaea stenophylla was found to be eligible for listing as Vulnerable in New South Wales (NSW) under IUCN Criterion B1ab(iii, v)+2ab(iii, v).
The main reasons for this species being eligible are: i) it has a highly restricted geographical range in NSW; ii) there is inferred decline in the quality of the habitat and the number of mature individuals due to the browsing and damage by feral animals, possibly in combination with drought; and iii) it is known to exist at no more than 10 locations in NSW.

Background

Dodonaea stenophylla is a common and widespread shrub throughout Queensland and in parts of the Northern Territory. *Dodonaea stenophylla* had not been recorded in NSW since 1907 and is currently listed as an extinct species in NSW under the *NSW Biodiversity Conservation Act* (BC Act). It has recently been recorded from the area around Bingara on the NSW north western slopes and a targeted survey indicated there were in the order of 100,000 individuals (Hunter 2019). Consequently, *D. stenophylla* requires removal from the extinct schedule of the BC Act.

Dodonaea stenophylla was not considered to be nationally threatened. It is a species of 'Least Concern' in Queensland and is not considered to be of conservation significance in that state (Qld Govt accessed April 2020). It is not listed as threatened

under the Queensland *Nature Conservation Act 1992* (NCA), nor is it listed as threatened in the Northern Territory (NT Government webpage). Neldner (*in litt.* November 2019) suggests there is no evidence for decline in the species in Queensland and hence it would be unlikely to meet any criteria for national listing under the IUCN criteria.

Though not currently considered to be nationally threatened, *Dodonaea stenophylla* has been assessed as Vulnerable in NSW at the state scale, as per the BC Act Part 4 Division 2 (4.4).

Description and Taxonomy

Dodonaea stenophylla was described by PlantNet (accessed January 2020) as an "Erect shrub to 4 m high. Leaves simple, erect, linear, 3–11 cm long, 1–2.5 mm wide, apex acute, base attenuate, margins revolute, glabrous; sessile or tapering to a petiole 5–7 mm long. Flowers usually in axillary few-flowered cymes; pedicels 2–15 mm long. Sepals 4, lanceolate or acute, 1.2–1.5 mm long, not persistent. Stamens 8. Ovary glabrous or rarely pubescent near apex. Capsule 4-, rarely 3-winged, 5–11 mm long, 11–15 mm wide, glabrous; wings 3.5–8 mm wide, membranous."

Distribution and Abundance

Dodonaea stenophylla is widespread across northern Australia throughout Queensland and into parts of the Northern Territory (Figure 1). There were 350 records in the Atlas of Living Australia database (ALA accessed 14 April 2020). Four records from South Australia and Victoria were deemed unreliable as they are based on sightings only and were dated from 1890 to 1977 (ALA Database accessed 14 April 2020). They are likely to be misidentifications as there are no herbarium collections south of the Bingara area in NSW (ALA Database accessed 14 April 2020).

In NSW, *Dodonaea stenophylla* was originally known from the Bingara area on the NSW North Western Slopes from collections by Leichhardt in 1843 and Boorman in 1907. Hunter (2019) recorded it in 1994 to the east of Bingara and in 2001 from the Molroy section of Bingara State Conservation Area (SCA). It has been recorded in six areas of NSW, three confirmed by herbarium records and three unconfirmed sightings (see Table 1 and Figure 1). A specimen from Gilgandra collected 21 October 1988 by Metcalfe (s.n. NE 66140) has been determined as *D. truncatiales.* *Dodonaea stenophylla* is reserved in Bingara SCA and Gwydir River National Park (NP). Both reserves were former State Forests and managed for cypress logging and grazing prior to their gazettal in 2005 (NSW NPWS 2017). The reserves consist of undulating topography that is well vegetated with an established network of trails. They are surrounded by grazing and cropping properties (NSW NPWS 2017) with the township of Bingara on the southern boundary of the Molroy section of Bingara SCA.

Table 1. Occurrences of *Dodonaea stenophylla* in NSW

Map label	Record	Location Description	date	Abundance	Threats
1	NSW Herbarium record	Bingara SCA - Molroy section	3/04/2017	c. 10 000	possible goat and deer browsing Hunter *in litt*. 29 April 2020
2	NSW Herbarium confirmation	Gwydir River NP - Mehi and Noonga sections	April 2017.	c. 90 000	goat and deer browsing (Hunter 2019)
3	NSW Herbarium confirmation	Gwydir River NP - Munro section	Apr 2017.	included in the 90 000 above	goat and deer browsing (Hunter 2019)
4	sighting	Little Bora Private propery just south of Bingara township	16/03/2012	no information	goat browsing, weed invasion, track maintenance (Hunter 2012)
5	sighting	Gulf Creek Rd, c. 35km SSE of Bingara	1/06/2004	no information	no information
6	sighting	Lake Copeton SE edge	25/10/1994	no information	no information
not mapped	NSW Herbarium record	Bingara	1/09/1907	no information	no information
not mapped	NSW Herbarium record	Lower part of the Phonol[itic] wall. Head of the Gwydir [River].	17/04/1843	no information	no information

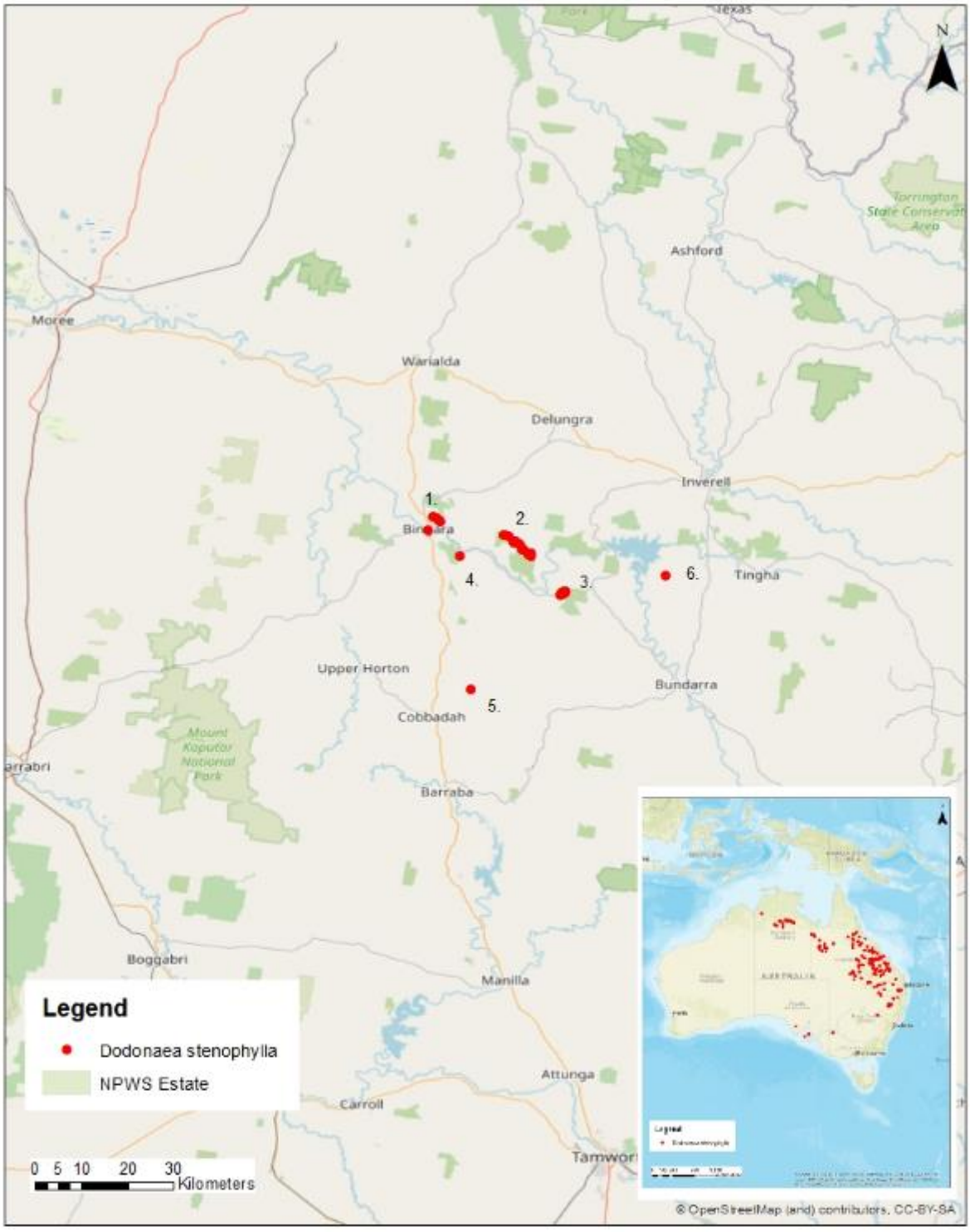

Figure 1. Distribution of *Dodonaea stenophylla* in NSW.

Dodonaea stenophylla has a highly restricted geographic distribution in NSW. The extent of occurrence (EOO) was estimated to be 799 km^2 based on a minimum convex polygon enclosing all reliably mapped occurrences of the species in NSW,

the method of assessment recommended by IUCN (2019). Whilst the species occurs in Queensland and the Northern Territory, the calculation of the EOO was confined to the NSW occurrences. The area of occupancy (AOO) for *D. stenophylla* in NSW was estimated to be 52 km^2. This calculation was based on the species occupying 13 (2 km x 2 km) grid cells, the spatial scale of assessment recommended by IUCN (2019).

Abundance

There were estimated to be in the order of 100,000 *Dodonaea stenophylla* individuals in the Bingara area including Gwydir River NP and Bingara SCA (Hunter 2019). This was based on a survey for the species in 2019 by John Hunter in the Gwydir River NP. Searches were based on previously known occurrences and likely habitat (Hunter 2019). Whilst plots were placed to estimate abundance of *D. stenophylla,* the densities of plants varied considerably throughout the distribution with very dense patches interspersed with scattered individuals or small clumps (Hunter 2019). As a result, only broad estimates were made of 90,000 plants for the Gwydir River NP and a further 10,000 plants for Bingara SCA.

Hunter (2019) states that during the survey of Gwydir River NP, "27 'populations' were mapped within 11 larger 'population groups'. The largest mapped population covered a continuous area of approximately 3.3 ha and the smallest a fraction of a hectare (0.0007 ha)." Hunter (2019) mapped approximately 13.7 ha of *Dodonaea stenophylla*, although not all suitable habitat was searched. Croft (*in litt.* February 2019) stated that he had traversed large areas of both reserves without recording any further populations.

In the Gwydir River NP, a large percentage of *D. stenophylla* individuals were not fruiting (even though the survey was timed to coincide with fruiting) (Hunter 2019). Heavy browsing and damage from goats and deer in combination with drought stress, are likely to have inhibited the plants' reproductive ability (Hunter 2019). The number of seedlings or juveniles within the populations is unknown. Hunter (2019) was not able to categorise juveniles based on size classes as many old plants were damaged and reduced in height due to goats and deer grazing. With a large proportion of *D. stenophylla* individuals currently non-reproductive, current and future decline may be expected.

Ecology

In the Gwydir River NP, *Dodonaea stenophylla* mostly occurred on mid to upper slopes, that were often very steep, and sometimes on crests. The vegetation was open woodland which at times verged on Semi-evergreen Vine Thicket on stony metasedimentary soils (Hunter 2019). The dominant co-occurring species were *Callitris glaucophylla, Brunonia australis, Cymbopogon refractus, Oxytes brachypoda, Aristida personata, Austrostipa scabra, Eucalyptus melanophloia, Opuntia aurantiaca* and *Scleria mackaviensis* (Hunter 2019).

In the Bingara SCA, *Dodonaea stenophylla* occurred in *Eucalyptus melonophloia* open woodland with or without co-occurring dominants of *Callitris glaucophylla* or *Brachychiton populneus*. Other co-occurring species included *Olearia gravis, O.*

elliptica, Breynia cernua, Dodonaea viscosa, Carissa spinarum, Psydrax odorata, Acacia deanei, and *Pomaderris* sp. (NSW NPWS 2017).

Resprouting from ground level buds and stems was commonly seen in *Dodonaea stenophylla* as a response to browsing and damage from feral animals (Hunter 2019).

The fire response of *Dodonaea stenophylla* is poorly known (P. Croft *in litt.* Feb 2019). In northern Australia, *D. stenophylla* was observed to be an obligate seeder (Fensham *et al.* 2003). Germination may not depend on a disturbance event such as fire as a low number of individuals appeared to have germinated in the Gwydir River NP within recent seasons (Hunter 2019), but fires may result in adult plant mortality and post-fire pulses of germination as occurs in other *Dodonaea* species (Floyd 1966, Auld and Ooi 2008). The fire history for the two reserves is unknown, but they are thought to be long unburnt (P. Croft *in litt.* April 2019). No known populations of *D. stenophylla* were burnt in the recent fires of the 2019/2020 fire season (DPIE mapping accessed May 2020).

Threats

Browsing and damage by goats and deer is currently the major threat to *Dodonaea stenophylla.*

Feral animals: Browsing and damage by feral goats (*Capra hircus* Linnaeus 1758) and species of feral deer (family Cervidae) are currently the major threat to *Dodonaea stenophylla.* In Gwydir River NP, Hunter (2019) estimated that 80% of *D. stenophylla* individuals showed evidence of moderate to heavy browsing and damage from goats. "Any individuals largely below 2 m in height were heavily damaged with stems being twisted and broken and pulled down for browsing and smaller individuals with thinner stems and trunks eaten to almost ground level. Plants were also found to be uprooted in a number of sites which could have occurred due to trampling as the root systems appeared to be shallow." (Hunter 2019). Deer were seen on most survey days and many ring-barked *D. stenophylla* plants were observed (Hunter 2019). Seed production was mostly limited to individuals that were taller than 180 cm, (i.e. data showed that individuals needed to be greater than 180 cm tall before more than 50% of individuals were found to be flowering) as they had grown to a height that was above the browsing line of goats and deer (the survey was timed to coincide with fruiting). This reduced reproductive ability of the population of *D. stenophylla* may reduce the seed output and recruitment ability of the population and may lead to ongoing decline. Goats are also present in Bingara SCA (NSW NPWS 2020) and throughout this area of NSW. The extent of damage from feral goats and deer has not been quantified at populations apart from those surveyed by Hunter (2019). 'Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758' and 'Herbivory and environmental degradation caused by feral deer' are listed as Key Threatening Processes on the BC Act.

Habitat disturbance: Past logging for timber in Bingara SCA and Gwydir River NP when they were State Forests (prior to gazettal as conservation areas in 2005) may have affected *Dodonaea stenophylla* populations and habitat, however any effects are unknown. Disturbance from road building/maintenance was noted in Bingara SCA where an area of *D. stenophylla* was cleared for a turning bay at the crest of a

hill. It is unknown if this area has been maintained as cleared (Hunter *in litt.* June 2020).

Drought: During 2019 the known range of *Dodonaea stenophylla* was in severe drought. In Gwydir River NP, most of the vegetation was showing signs of drought stress (Hunter 2019). Whilst the larger *D. stenophylla* shrubs appeared mostly unaffected, the individuals that were heavily browsed showed signs of die back and dead stems were common (Hunter 2019). The combined effects of browsing and drought may have affected the species' ability to recover (Hunter 2019).

Future Threats

Invasive weeds: Coolatai Grass (*Hyparrhenia hirta*) is an invasive weed, native to parts of Africa and the Mediterranean region and introduced into northern NSW in the 1940s (McCormick *et al.* 2002). It is a tall, tufted, summer active perennial growing to more than one metre in height (McCormick *et al.* 2002), and easily invades lands including relatively undisturbed ecosystems leading to a reduction in their biodiversity (NSW Weedwise 2020). Coolatai Grass surrounds Bingara SCA and although it is not currently present among the populations of *Dodonaea stenophylla,* it is a weed that could become a major threat to the species through interspecific competition if it spreads into the reserve (Croft *in litt.* May 2020).

Assessment against IUCN Red List criteria

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

Criterion A Population Size reduction

Assessment Outcome: Data Deficient

Justification: There are insufficient data to estimate if there is a reduction in the population size of *Dodonaea stenophylla* over three generations in NSW.

Criterion B Geographic range

Assessment Outcome: Vulnerable via B1ab(iii, v)+2ab(iii, v).

Justification:

Extent of Occurrence (EOO): The EOO was estimated to be 799 km^2 based on a minimum convex polygon enclosing all reliably mapped occurrences of the species in NSW, the method of assessment recommended by IUCN (2019). Whilst the species occurs in Queensland and the Northern Territory, the calculation of the EOO was confined to the NSW occurrences. To be listed as Endangered under Criterion B1 a species must have an EOO of <5000 km^2. *D. stenophylla* meets the EOO threshold for Endangered under Criterion B1.

Area of Occupancy (AOO): The AOO in NSW was estimated to be 52 km^2. This calculation was based on the species occupying 13 (2 km x 2 km) grid cells, the spatial scale of assessment recommended by IUCN (2019). The data used to estimate the AOO was from the Atlas of Living Australia (ALA) database and the records from Hunter (2019). Whilst there may be other populations of *D. stenophylla*

in likely habitat that were not surveyed (Hunter 2019), the area of occupancy would have to be tenfold the currently known AOO for the species to not qualify for Endangered. This would be unlikely. To be listed as Endangered under Criterion B2 a species must have an AOO of <500 km^2. *D. stenophylla* meets the AOO threshold for 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 there is 1 (CR), ≤5 (EN) or ≤10 (VU) locations.

   Assessment Outcome: met for Vulnerable for the number of locations.

   Justification: The number of locations is determined by the most likely threat. Currently, for *D. stenophylla,* the most likely threat is the damage and loss of reproductive ability caused by browsing of goats and deer. Damage to the shrubs due to goats and deer was observed throughout the area surveyed by Hunter (2019) in the Gwydir River NP, with approximately 80% of plants adversely affected. The degree of damage by goats and deer has not been assessed at other populations of *D. stenophylla,* but given the presence of goats, some damage is likely. The number of locations is estimated to be in the Vulnerable category of ≤10. In NSW *D. stenophylla* has been recorded in six areas, three confirmed by herbarium records and three unconfirmed sightings. Each of these areas is regarded as a separate location.

   Severe fragmentation is not likely to apply. Past clearing throughout the NSW North Western Slopes may have fragmented populations and may in some cases have eliminated populations of *D. stenophylla.* However, under the IUCN (2019) definition for 'severe fragmentation' the current distribution of *D. stenophylla* is not considered to consist of small and isolated patches, hence the species is not severely fragmented.

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: met for (iii) area, extent and/or quality of habitat and (v) number of mature individuals.

   Justification: The damage caused by goats and deer, and possibly combined with the stress of the current drought, is limiting the plants' reproductive ability and hence limiting current and future recruitment. Hunter (2019) estimated 80% of plants had moderate to heavy browsing damage in a survey of Gwydir River NP. Many dead *D. stenophylla* individuals were also observed (Hunter 2019). Continuing decline is currently inferred and projected to occur in the future due to significant loss of reproductive ability and ongoing impacts from goats and deer.

c) Extreme fluctuations.

Assessment Outcome: Data Deficient.

Justification: *Dodonaea stenophylla* is a long-lived shrub. Little is known about the ecology of the species or its response to fire.

Whilst *Dodonaea stenophylla* meets the thresholds for Endangered for EOO and AOO, and meets subcriterion (b), it only meets the threshold for Vulnerable in subcriterion (a) (i.e. the number of locations is estimated to be ≤10 (VU)). Hence the overall threat category for Criterion B is Vulnerable.

Criterion C Small population size and decline

Assessment Outcome: not met.
Justification: There were estimated to be approximately 100,000 plants in the Gwydir River NP and Bingara SCA (Hunter 2019). This number exceeds the vulnerable threshold of <10,000 mature individuals.
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 (whichever is longer) (CE); 20% in 5 years or 2 generations (whichever is longer) (EN); or 10% in 10 years or 3 generations (whichever is longer) (VU).

Assessment Outcome: There are insufficient data to estimate population reduction in the population size of *Dodonaea stenophylla*.

C2. An observed, estimated, projected or inferred continuing decline in number of mature individuals.

Assessment Outcome: Whilst decline is met, no subcriteria are met.

Justification: Continuing decline is inferred in the populations of *D. stenophylla* due to plant mortality and a reduced capacity for recruitment due to damage from goats and deer.

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

a (i). Number of mature individuals in each subpopulation ≤50 (CR); ≤250 (EN) or ≤1,000 (VU).

Assessment Outcome: not met.

Justification: The number of mature individuals in at least one subpopulation is >1,000.

b (ii). % of mature individuals in one subpopulation is 90-100% (CR); 95-100% (EN) or 100% (VU)

Assessment Outcome: not met.

Justification: There are multiple large subpopulations.

c. Extreme fluctuations in the number of mature individuals

Assessment Outcome: Data Deficient.

Justification: *Dodonaea stenophylla* is a long-lived shrub. Little is known about the ecology of the species or its response to fire.

Criterion D Very small or restricted population

Assessment Outcome: not met.
Justification: There are estimated to be >1,000 mature individuals.

To be listed as Vulnerable under D, a species must meet at least one of the two following conditions:

D1. Population size estimated to number fewer than 1,000 mature individuals

Assessment Outcome: not met

Justification: There are estimated to be >1,000 mature individuals.

D2. Restricted area of occupancy (typically <20 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: not met.

Justification: There is no restricted area of occupancy or number of locations.

Criterion E Quantitative Analysis

Assessment Outcome: Data Deficient
Justification: There are insufficient data to quantify the extinction risk for this species.

Conservation and Management Actions

There has been a survey by Hunter (2019) as a part of the NSW Saving our Species Program. There is no National Recovery Plan for this species. The following is derived from the threat information and recommendations from Hunter (2019).

Habitat loss, disturbance and modification

- Feral animal control.
- Prevent any incursion of livestock or feral animals into the reserves from neighboring properties.
- Ensure reserve fencing is maintained.
- Control weeds from encroaching into or near *D. stenophylla* habitat.

Invasive species

- Increase Goat and Deer control programs around known populations.
- Control introduced weeds such as Coolatai Grass and prevent their spread into the areas/reserves where *D. stenophylla* occurs.

Ex situ conservation

- Develop a targeted seed collection program for ex situ seed banking.

Stakeholders

- Inform land-owners and managers of sites where there are known populations and consult with these groups regarding options for conservation management and protection of the species.

Survey and Monitoring priorities

- Survey for *D. stenophylla* in Bingara SCA and the three populations (of which very little is currently known) that are outside the reserves for population size, reproduction and threats.
- Survey for populations of *D. stenophylla* in similar habitat in the Gwydir River State Conservation Areas.
- Monitor populations and habitat for degree of damage from feral animals, and any habitat degradation (e.g. incursions of invasive weeds).
- Conduct systematic surveys to determine whether there is a decline in the population, particularly in relation to drought and grazing pressure.
- Monitor for recruitment, particularly in areas where plants have died or any areas that are burnt.

Information and Research priorities

- Investigate the role of disturbance (including fire) on adult survival, and recruitment of new plants Determine fire response traits.
- Assess the time for new plants to become mature and replenish the soil seed bank.
- Assess the time for new plants to become large enough to escape from goat or deer impacts.

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Expert Communications

Adam Fawcett – Department of Planning, Industry and Environment (DPIE) Senior Project Officer, Saving our Species, NSW National Parks and Wildlife Service (NPWS), Armidale.

Peter Croft – Ranger, Northern Tablelands, NSW NPWS.

John Neldner –Science Leader, Queensland Herbarium, Department of Environment and Science.

John T. Hunter – Ecological Consultant, Hewlett Hunter Pty Ltd, Invergowrie NSW.

APPENDIX 1

Appendix 1
Assessment against Biodiversity Conservation Act criteria
The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome (Clause(s) with the highest category of threat)
Vulnerable under Clause 4.3(c)(d)(e)(i)(iii)

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Data Deficient

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions
(Equivalent to IUCN criterion B)
Assessment Outcome: Vulnerable under Clause 4.3 (c) (d) (e i, iii).

* Although *Dodonaea stenophylla* meets the thresholds for restricted geographic distribution (EOO and AOO) for Endangered, the species only meets the Vulnerable threshold of Clause 4.3(d). Hence the overall assessment under Clause 4.3 is Vulnerable.

The geographic distribution of the species is:				
	(a)	for critically endangered species		very highly restricted, or
	*(b)	for endangered species		highly restricted, or
	*(c)	for vulnerable species		moderately restricted,
and at least 2 of the following 3 conditions apply:				
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,		
	(e)	there is a projected or continuing decline in any of the following:		
		(i)	an index of abundance appropriate to the taxon,	
		(ii)	the geographic distribution of the species,	
		(iii)	habitat area, extent or quality,	
		(iv)	the number of locations in which the species occurs or of populations of the species,	
	(f)	extreme fluctuations occur in any of the following:		
		(i)	an index of abundance appropriate to the taxon,	
		(ii)	the geographic distribution of the species,	
		(iii)	the number of locations in which the species occur or of populations of the species.	

Clause 4.4 - Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion C)
Assessment Outcome: Not met

The estimated total number of mature individuals of the species is:				
	(a)	for critically endangered species		very low, or
	(b)	for endangered species		low, or
	(c)	for vulnerable species		moderately low,
and either of the following 2 conditions apply:				
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):		
		(i)	for critically endangered species	very large, or
		(ii)	for endangered species	large, or
		(iii)	for vulnerable species	moderate,
	(e)	both of the following apply:		

		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and			
		(ii)	at least one of the following applies:			
			(A)	the number of individuals in each population of the species is:		
				(I)	for critically endangered species	extremely low, or
				(II)	for endangered species	very low, or
				(III)	for vulnerable species	low,
			(B)	all or nearly all mature individuals of the species occur within one population,		
			(C)	extreme fluctuations occur in an index of abundance appropriate to the species.		

Clause 4.5 - Low total numbers of mature individuals of species
(Equivalent to IUCN criterion D)
Assessment Outcome: Not met

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 - Quantitative analysis of extinction probability
(Equivalent to IUCN criterion E)
Assessment Outcome: Data deficient

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 - Very highly restricted geographic distribution of species– vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: Not met

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.