

Non-detriment finding assessment for *Euphorbia susannae*

Reference Number: Eup_sus_Sep2024

Date: 22 September 2024

Issued by the Scientific Authority of South Africa

Summary of findings

Euphorbia susannae is included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In terms of Article IV of the Convention, an export permit shall only be granted for an Appendix II species when a Scientific Authority of the State of export has advised that such an export will not be detrimental to the survival of that species in the wild. This document details the undertaking of a Non-Detriment Finding (NDF) assessment for *E. susannae* and is based on the best available information, current as of December 2021.

Euphorbia susannae is a perennial, spineless dwarf succulent comprising of a compact rosette of numerous globose or globose-cylindrical, upward growing (but often sunken) branches. The species is dioecious and known to be slow-growing and long-lived, with populations characterised by slow recruitment and adult plant persistence. The species reproduces by seed, but dispersal is limited and seed production and recruitment occurs primarily during the winter rainfall season and in early spring. Plants are most often found growing in close association with the surrounding vegetation, and nurse objects are thought to be important for the species recruitment and regeneration. Populations of the species are dominated by small adult plants and are characterised as having healthy recruitment rates (5 – 25%) as well as well-balanced sex ratios.

Euphorbia susannae is endemic to the western Little Karoo in the Western Cape Province, with a severely restricted distribution range. The species is typically found at lower altitudes (below 500 meters above sea level) on fertile, gentle slopes within Quartz Asbosveld- and Quartz Gannaveld habitat types. The known subpopulations occur across nine localities, and they are small in size, comprising between 9 and 605 individuals. There are an estimated 1 845 plants remaining in the wild occupying an area no larger than 32 km² (EOO < 200 km²). The findings of a recent comprehensive study conducted on the population biology of the species indicate that the national population is currently stable, although the number of plants at several localities is extremely diminished and it is unlikely that these subpopulations will persist. The national conservation status of *E. susannae* is currently assessed as Endangered B1ab(iii,v)+2ab(iii,v), but the imminent loss of the two edge of range populations would immediately qualify the species as Critically Endangered in accordance with the IUCN's (International Union for Conservation of Nature) Red List Categories and Criteria.

The main threat to *E. susannae* is habitat degradation due to overgrazing and trampling, though only parts of the distribution range are affected. Subpopulations in some easily accessible as well as unfenced areas have suffered previous opportunistic removals by succulent enthusiasts, which have directly contributed to the reduced sizes of these populations. While no direct evidence of harvesting was

observed at any of the subpopulations during recent field surveys, it is suspected that several subpopulations may still be subject to low levels of ongoing opportunistic collection.

Records of exports of *E. susannae* from South Africa are monitored on a regular basis, although the quality of the data is not as good as it should be owing to errors in reporting. There has been a general upward, albeit insignificant, trend in the export of *E. susannae* over the years. The species is popular on the international market and close to 60 000 specimens have been legally traded across the globe. South Africa accounts for less than 2% of the international trade and no more than 1 100 plants have been exported since 1980 with an average of 27 plants per year over the last two decades. Two South African nurseries are able to produce artificially propagated specimens of *E. susannae*, however, domestic production capacity is currently underutilised. The international market has been well catered for by the huge volumes of plants produced out of Canada and the United States of America. There is currently no field monitoring programme for the species.

Only one subpopulation is protected within a provincial nature reserve managed by CapeNature, the provincial conservation body within the Western Cape. A large majority of *E. susannae* plants occur in the vicinity of public roads and remain easily accessible by car or on foot. The species is listed as a protected plant in the Western Cape's Nature and Environmental Conservation Ordinance No. 19 of 1974. Cape Nature have not issued any permits for the wild collection of *E. susannae* plants from anywhere in the province but due to limited staff capacity as well as a lack of specific skills and suitable mechanisms, it remains challenging to effectively implement harvest controls and to monitor the status of wild populations or any legal or illegal activities involving the species. There is no management plan for the *E. susannae*, and no incentives for species or habitat conservation as it relates to wild harvesting.

The export of wild-sourced specimens would place *E. susannae* at a high risk of unsustainable harvesting and render the trade detrimental (Fig. 1 & 2). The demand for *E. susannae* is however largely met by plants propagated in nurseries from seed or tissue culture, and there is no evidence to suggest that current international trade (in artificially propagated specimens) is detrimental to the species. Export should therefore be restricted to seedlings/small plants (with canopy area of less than 5 cm²) produced from nursery facilities that have been audited for compliance with CITES Resolution Conf. 11.11 (Rev. CoP18), specifically in relation to the definition of artificial propagation, and any other relevant legal requirements.

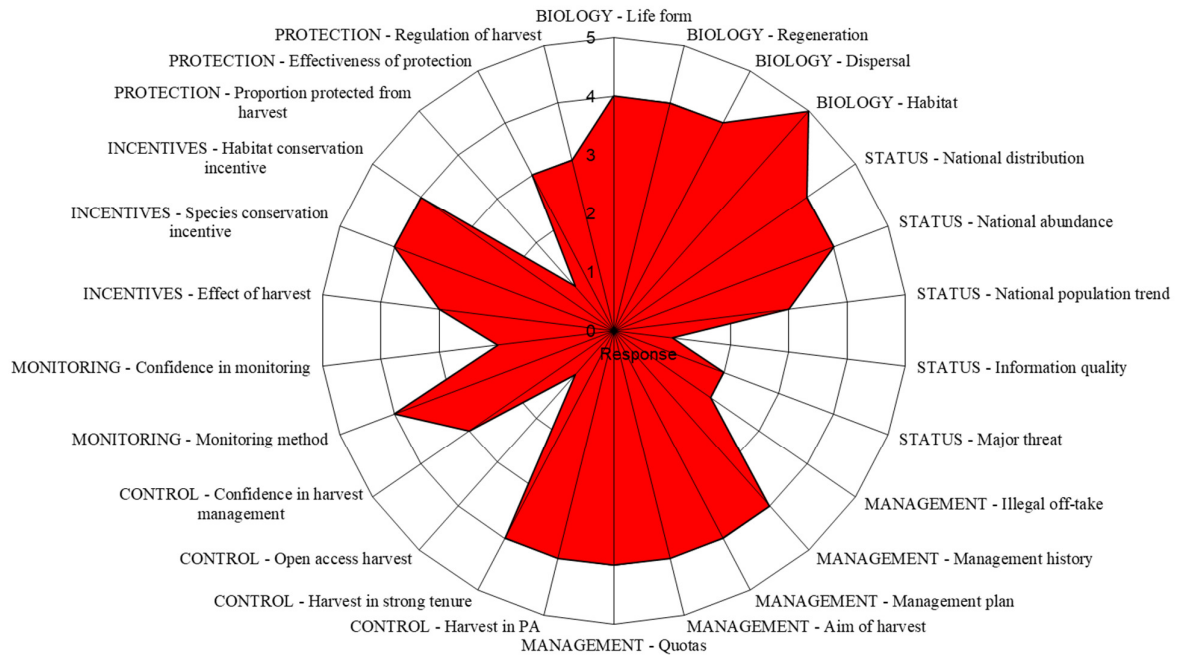


Figure 1: Radar chart summarizing the non-detriment finding assessment undertaken for *Euphorbia susannae* in accordance with the CITES NDF checklist. Explanations of scores given are detailed in Table 1. Higher scores are indicative of higher risks to the species. The shaded area in the radar chart demonstrates a high risk to the species.

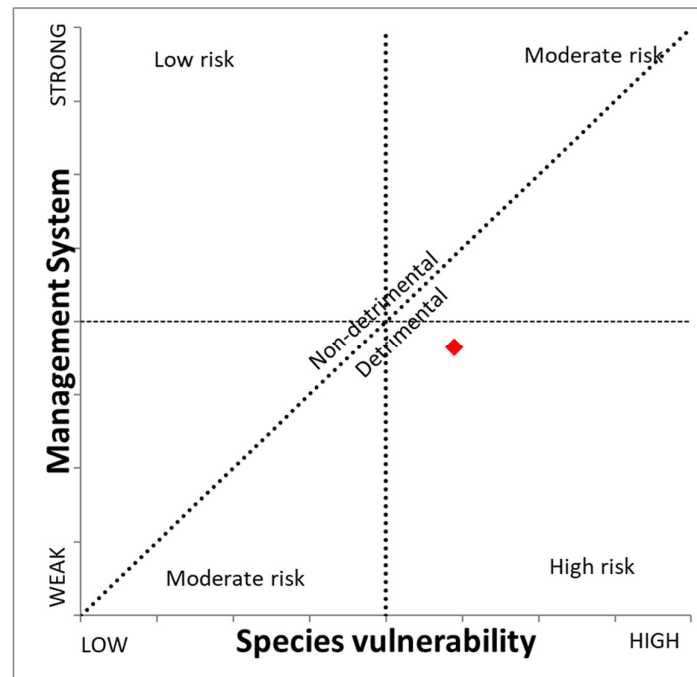


Figure 2: The risk of trading in *Euphorbia susannae* as represented by the relationship between species vulnerability (biology and status) and the strength of the management system to which the species is subjected (management, control, monitoring, incentives and protection). The figure shows that the species is at a high risk and trade is detrimental.

Table 1: Detailed NDF assessment for *Euphorbia susannae* undertaken in accordance with the CITES NDF checklist. Scores assigned to each question are indicated (bold text and shaded blocks) along with detailed explanations/justifications where relevant. Higher scores are indicative of higher risks to the species.

Biological characteristics		
1. Life form: What is the life form of the species?	Annual	1
	Biennial	2
	Perennials (herbs)	3
	Shrub and small trees (max. 12m.)	4
	Trees	5
<i>Euphorbia susannae</i> is a perennial, spineless dwarf succulent that is initially comprised of a single spherical 12 to 16-angled main stem and a caudex, with the majority of the plant sunken beneath the ground (Fig. 3). With age, the main stem produces numerous globose or globose-cylindrical branches (which may themselves rebranch with age) leading to the formation of a compact rosette (White <i>et al.</i>, 1941; Court, 2010; Vlok and Schutte-Vlok, 2015). Growth is apical and upward, but the stems are gradually dragged downwards by contractile action in the roots (Court, 2010). Tubercles are prominent, elongated and narrowly triangular, and may be recurved or straight. Leaves are reduced to tiny bristle-like hairs projecting from the tips of young tubercles but are soon abscised (White <i>et al.</i>, 1941). This species bears male and female flowers on separate plants with the staminate cyathia (flowering structures) of the male plant carried on peduncles arising from the axils of the tubercles, and pistillate cyathia of the female plant sessile between the apical tubercles (White <i>et al.</i>, 1941). The species inhabits an arid ecosystem and is known to be slow-growing and long-lived.		
		
Figure 3: <i>Euphorbia susannae</i> plant pictured in habitat. Photo by Laaiqah Jabar		
2. Regeneration potential: What is the regenerative potential of the species concerned?	Fast vegetatively	1
	Slow vegetatively	2
	Fast from seeds	3

	Slow or irregular from seeds or spores	4
	Uncertain	5
This species is dioecious and regenerates sexually through seed produced by reproductive individuals every winter. Cyathia appear between April and July (Goldblatt and Manning, 2000; Jabar, 2019) and pollination is facilitated by several species of ants, beetles and flies (Jabar, 2019). Seed capsules of <i>Euphorbia</i> species are trilocular, carrying up to three seeds each. The seeds are forcefully ejected by explosive dehiscence of the capsules and recruitment is episodic (Jabar, 2019). In arid regions, recruitment and seedling establishment is generally related to rainfall timing and quantity with populations requiring sustained high rainfall episodes in successive years to regenerate. Pulses of population renewal may occur at intervals of years, decades or even centuries (Milton <i>et al.</i>, 1999). No succulent <i>Euphorbia</i> species are known to maintain persistent seed banks (Milton <i>et al.</i>, 1999). In cultivation, fresh seeds germinate readily with plants taking up to 18 months to reach maturity (under optimal conditions). When grown under natural habitat conditions, individual plants can take between five and ten years to flower (CapeNature, 2020). <i>Euphorbia susannae</i> individuals are usually found in close association with surrounding vegetation and rock cover, indicating the importance of nurse objects for recruitment and regeneration in the species (Jabar, 2019). Subpopulations of the species are generally dominated by small adult plants (with canopy areas between 21 and 100 cm²) with all populations showing signs of healthy recruitment (5-24%). The ratios of male to female plants in all subpopulations appears to be generally well balanced (Jabar, 2019). Reproductive output is proportional to plant size (Jabar, 2019).		
3. Dispersal efficiency: How efficient is the species' dispersal mechanism?	Very good	1
	Good	2
	Medium	3
	Poor	4
	Uncertain	5
<i>Euphorbia susannae</i> employs a ballistic dispersal mechanism, and myrmecochory (i.e. secondary dispersal by ants) has been discounted since no elaiosome (i.e. nutrient rich seed coat) is present on the seeds (Jabar, 2019). Ballistic dispersal alone typically scatters seeds to within a mere 0.6-2.5 m from the parent plant (Stamp and Lucas, 1990; Narbona <i>et al.</i>, 2005). The shrunken nature of this species (as well as the surrounding shrub cover in some cases) severely limits seeds dispersal (L. Jabar- Analyst: Biodiversity Enforcement, Department of Forestry Fisheries and the Environment, pers. comm.). Many plants in arid environments have evolved toward proxichory (short dispersal distance) (Pueyo <i>et al.</i>, 2008) and it has been suggested that this strategy has a selective advantage over long distance dispersal in xeric habitats because seedlings have a higher probability of survival close to where the parent plant has survived to a reproductive age (Esler, 1999).		
4. Habitat: What is the habitat preference of the species?	Disturbed open	1
	Undisturbed open	2
	Pioneer	3
	Disturbed forest	4
	Climax	5
<i>Euphorbia susannae</i> occurs in the Rainshadow Valley Karoo Bioregion (Rutherford <i>et al.</i>, 2006) of the Succulent Karoo Biome. Plants can be found growing on gentle to moderate slopes (1.1 - 8.5 degrees), located on north-easterly and south-easterly aspects, within Karroid scrub vegetation at altitudes of between 376 and 495 meters above sea level. Mean annual precipitation over the distribution range of the species varies from 369 mm to 418 mm, with majority falling as cyclonic winter rains from May-September (Van Wyk and Smith, 2001). Fires rarely occur and do not play a role in the species habitat (A. Schutte-Vlok- Regional Ecologist, CapeNature, pers. comm.). <i>Euphorbia susannae</i> prefers soils that are characterized by the		

formation of a layer of gravel and stones called desert pavement. Where weathered quartz veins accompany the shales, localised fields of white desert pavement, termed quartz patches, occur. This ground cover not only acts as a protective mulch, reducing raindrop impact and enhancing water infiltration, but the reflective properties of the white quartz also lower the surface temperature of the soil (Mucina *et al.*, 2006). Associated soils range from acidic to nutrient rich loamy sands and silty loams (Jabar, 2019). The species is most frequently found in Quartz Asbosveld- and Quartz Gannaveld habitat types (Vlok *et al.*, 2005). *Euphorbia susannae* grows in close association with the surrounding shrub vegetation which act as nurse objects, affording plants cover by modifying microclimatic conditions, thus ameliorating abiotic stress and facilitating not only germination and establishment of seedlings under them, but also promoting seedling survivorship (López *et al.*, 2007; Munguía-Rosas and Sosa, 2008; Vlok and Schutte-Vlok, 2015). Only a small proportion of individuals may be found growing in the open (Jabar, 2019). The species is thus sensitive to disturbance of the surrounding vegetation, and degradation of its habitat, particularly by livestock grazing and trampling, presents a real threat to the regeneration and survival of its populations (A. Schutte-Vlok, pers. comm.). Passive recovery of perennial vegetation following cultivation and other forms of land degradation in the Succulent Karoo may take upward of 300 years to occur (Milton and Dean, 2015).

National status

5. National distribution: How is the species distributed nationally?	Widespread, contiguous in country	1
	Widespread, fragmented in country	2
	Restricted and fragmented	3
	Localized	4
	Uncertain	5

Euphorbia susannae is a severely range-restricted endemic found within the western Little Karoo in the Western Cape Province of South Africa (Fig. 4; Vlok and Schutte-Vlok, 2015). The subpopulations occur within an area of around 170 km² (AOO 36 km²) predominantly along either side of a 16 km stretch of road. Euclidean distances between *E. susannae* localities, indicates that the degree of isolation amongst populations range from 0.1 km up to 32 km (Jabar, 2019). The species distribution is limited chiefly by vegetation characteristics (Jabar, 2019).



Figure 4: Distribution of *Euphorbia susannae* within the western Little Karoo of the Western Cape Province, South Africa

	Very abundant	1
--	---------------	---

6. National abundance: What is the abundance nationally?	Common	2
	Uncommon	3
	Rare	4
	Uncertain	5
The surveyed subpopulations vary in size between nine and 605 individuals (Jabar, 2019) with higher abundances concentrated in the core of the species distribution whilst subpopulations along the eastern and western edges of the distribution range are much smaller. Plant densities across six of the subpopulations range from 16 plants/ha to 64 plants/ha (Jabar, 2019). The total <i>E. susannae</i> population is estimated to consist of less than 2 000 wild plants (Jabar, 2019).		
7. National population trend: What is the recent national population trend?	Increasing	1
	Stable	2
	Reduced, but stable	3
	Reduced and still decreasing	4
	Uncertain	5
Localized habitat degradation as well as previous opportunistic removals of individuals from certain areas have reduced subpopulation sizes, but the majority of the remaining subpopulations appear to be stable with healthy levels of recruitment and well-balanced sex ratios across most sites (Jabar, 2019). Sex ratios within five of the largest subpopulations ranged between 0.41 and 0.58, indicative of a healthy balance between male and female plants, whilst significantly negative size class distribution slopes obtained for all subpopulations indicate healthy recruitment levels for the species (Niklas <i>et al.</i> , 2003; Jabar, 2019).		
The species is currently listed as Endangered B1ab(iii,v)+2ab(iii,v) on the Red List of South African Plants (Vlok <i>et al.</i> , 2008) but does face the risk of being up-listed to a higher threat category if the two edge-of-range populations are lost in the future.		
8. Quality of information: What type of information is available to describe abundance and trend in the national population?	Quantitative data, recent	1
	Good local knowledge	2
	Quantitative data, outdated	3
	Anecdotal information	4
	None	5
A detailed study on the population biology and ecology of the species was undertaken, and provides recent, quantitative data on the national status and abundance of <i>E. susannae</i> (Jabar, 2019).		
9. Major threats: What major threat is the species facing (underline following: overuse/ <u>habitat</u> loss and <u>alteration</u> / invasive species/ other) and how severe is it?	None	1
	Limited/Reversible	2
	Substantial	3
	Severe/Irreversible	4
	Uncertain	5
The main threat to the species is habitat degradation due to overgrazing and trampling, though only parts of the distribution range are affected (Jabar, 2019). Pressures from herbivory were found to be low for the species, although plants had been trampled by cattle in one of the surveyed subpopulations. The sunken nature of plants growing between rocks in the open and the inaccessibility of plants growing under nurse shrubs affords protection from herbivory in the arid environment (Jabar, 2019). Some of the subpopulations may be subject to opportunistic collecting by hobbyists or for the succulent trade, and removals of wild plants has been noted in several easily accessible areas in the past (J. Vlok, pers. obs.).		
Harvest management		
	None	1

10. Illegal off-take or trade: How significant is the national problem of illegal or unmanaged off-take or trade?	Small	2
	Medium	3
	Large	4
	Uncertain	5
The species has been impacted by historical collection and there are reports of individuals having previously been removed from several easily accessible sites (J. Vlok, pers. obs; Vlok and Raimondo, 2007). This is evidenced in the diminished number of plants present in these areas. CITES trade records show exports of 40 wild collected specimens in 2007 – the same year during which more than half of two <i>E. susannae</i> subpopulations had been removed by collectors (J. Vlok, pers. obs; Jabar, 2019). CapeNature have no record of having issued CITES export permits for any wild harvested specimens of this species (C. Arendorf-Law Admin Officer, CapeNature, pers. comm.) and it is thus suspected that illegally collected wild plants have previously been laundered through the legal trade (Jabar, 2019). Illegal collection is nevertheless thought to be a historical issue for this species and CapeNature officials have not detected <i>E. susannae</i> specimens in any of their local plant confiscation cases over the past decade (A. Wheeler- Coordinator: Landscape Conservation, CapeNature, pers. comm.). The species is now commonly available in both local and global horticultural markets through large scale artificial propagation. The international market has been well catered for by the huge volumes of plants produced out of Canada and the United States of America (USA) (Jabar, 2019). The species remains popular in the horticultural trade and a snapshot internet survey to assess the general availability of the species in the online marketplace (conducted over two days in December 2015 and July 2016), yielded 31 adverts (48% from the USA and just one advert from South Africa) for live <i>E. susannae</i> plants selling at an average price of R 147 ± 97 each (Jabar, 2019). Two South African nurseries are able to produce artificially propagated specimens of <i>E. susannae</i>, however domestic production capacity is currently underutilized (Jabar, 2019). No wild plants were found at these two nurseries during audits conducted at these facilities in 2016 (Jabar, 2019). The highly charismatic nature of the species and accessible nature of the plants occurring along the edges of the distribution range as well as in unfenced road verges may nevertheless pose the risk of opportunistic collection by hobbyists or for the succulent trade (Jabar, 2019). Any illegal offtake at this time is thought to be minimal but ongoing monitoring of populations (particularly those in poorly protected areas at the edge of the species distribution) is necessary in order to protect the species and prevent it from qualifying for the Critically Endangered category in the future.		
11. Management history: What is the history of harvest?	Managed harvest: ongoing with adaptive framework	1
	Managed harvest: ongoing but informal	2
	Managed harvest: new	3
	Unmanaged harvest: ongoing or new	4
	Uncertain	5
There has been no formal management of wild-harvesting of <i>E. susannae</i> to date. The species is listed as a protected plant in the Western Cape's Nature and Environmental Conservation Ordinance no. 19 of 1974. In line with the terms set out in the ordinance, no person may pick (i.e. uproot) a protected plant without a permit (except in the case where a person is the owner of such land or a relative of such owner and any fulltime employee of such owner acting on the instructions or with the consent of the owner). The collection of seed on private land is permissible with written landowner permission though none of the known <i>E. susannae</i> populations occur on any privately owned lands. To date, CapeNature have not issued any permits for the wild collection of the species from anywhere in the province (C. Arendorf – Law Admin Officer, CapeNature, pers. comm.) and they have a management guideline to exercise precaution in the assessment of granting permits for wild collection (C. Birss- Executive Director: Biodiversity capabilities, Cape Nature, pers. comm.). Any offtake at present is unmanaged with no oversight and the harvest is most likely unsustainable. The ongoing demand for <i>E. susannae</i> appears to be met by plants propagated in nurseries.		

12. Management plan or equivalent: Is there a management plan related to the harvest of the species?	Approved and co-ordinated local and national management plans	1
	Approved national/state/provincial management plan(s)	2
	Approved local management plan	3
	No approved plan: informal unplanned management	4
	Uncertain	5
There is no management plan for the species and no strategy to manage any harvest.		
13. Aim of harvest regime in management planning: What is harvest aiming to achieve?	Generate conservation benefit	1
	Population management/control	2
	Maximize economic yield	3
	Opportunistic, unselective harvest, or none	4
	Uncertain	5
Wild-collecting is opportunistic and for the personal benefit of the harvester.		
14. Quotas: Is the harvest based on a system of quotas?	Ongoing national quota: based on biologically derived local quotas	1
	Ongoing quotas: "cautious" national or local	2
	Untried quota: recent and based on biologically derived local quotas	3
	Market-driven quota(s), arbitrary quota(s), or no quotas	4
	Uncertain	5
There is currently no quota system for harvesting <i>E. susannae</i> from the wild.		
Control of harvest		
15. Harvesting in Protected Areas: What percentage of the legal national harvest occurs in State-controlled Protected Areas?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
There is no legal wild-harvesting of <i>E. susannae</i> taking place within the country. The species is listed as a protected plant in the Western Cape's Nature and Environmental Conservation Ordinance no. 19 of 1974. CapeNature have not issued any permits for the wild collection of <i>E. susannae</i> from anywhere in the province (C. Arendorf, pers. comm.) and it is unlikely that they would allow harvest within any of their protected areas. A single population of the species occurs within a declared nature reserve.		
16. Harvesting in areas with strong resource tenure or ownership: What percentage of the legal national harvest occurs outside Protected Areas, in areas with strong local control over resource use?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
There is no legal wild-harvesting of <i>E. susannae</i> taking place within the country. The species is not known to occur on any privately owned lands. The species is listed as a protected plant in the Western Cape's		

Nature and Environmental Conservation Ordinance no. 19 of 1974. CapeNature have not issued any permits for the wild collection of *E. susannae* from anywhere in the province (C. Arendorf, pers. comm.).

17. Harvesting in areas with open access: What percentage of the legal national harvest occurs in areas where there is no strong local control, giving <i>de facto</i> or actual open access?	None	1
	Low	2
	Medium	3
	High	4
	Uncertain	5

There is no legal wild-harvesting of *E. susannae* taking place within the country. The species is listed as a protected plant in the Western Cape's Nature and Environmental Conservation Ordinance no. 19 of 1974. CapeNature have not issued any permits for the wild collection of *E. susannae* from anywhere in the province (C. Arendorf, pers. comm.).

18. Confidence in harvest management: Do budgetary and other factors allow effective implementation of management plan(s) and harvest controls?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5

Capacity within the conservation sector across the country is an ongoing challenge. Apart from the limited number of staff (and budget) available to manage and monitor numerous species, scientists and practitioners are presently ill-equipped to deal with the evolving pressures put on the country's biodiversity - for example, it is increasingly difficult to detect instances of poaching, smuggling and laundering of succulent plants (that is facilitated largely by the internet and rapidly developing social media platforms) with existing mechanisms. The implementation of current management and harvest controls (particularly outside of protected areas) is therefore limited at present although ad hoc compliance inspections are starting to be implemented in the Western Cape. It has also been acknowledged that new skillsets and mechanisms are needed in-order to effectively detect illegal activities involving endemic species, as well as to improve the management of a legal and sustainable trade in these plants that satisfy both national and international conservation obligations.

Monitoring of harvest

19. Methods used to monitor the harvest: What is the principal method used to monitor the effects of the harvest?	Direct population estimates	1
	Quantitative indices	2
	Qualitative indices	3
	National monitoring of exports	4
	No monitoring or uncertain	5

Exports of *E. susannae* from South Africa (extracted from the CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK) are monitored by the South African National Biodiversity Institute (SANBI) on behalf of South Africa's Scientific Authority. An estimated total of 59 659 live plants of the species has been traded globally, with Canada and the USA responsible for a large portion of both the exports and imports recorded. Japan, Korea, China and Germany are all major importers of the species. South Africa accounts for less than 2% of the global trade having exported a sum total of 1 071 live plants since 1980 (Fig. 5). The majority of the plants exported from the country have been declared as artificially propagated with altogether 80 wild specimens (8%) reportedly exported to Germany in 2002 and 2007. The trade from South Africa remains small with two growing facilities able to artificially produce the low numbers of plants (± 30) being exported from the country annually (Jabar, 2019).

There is currently no field monitoring programme for the species.

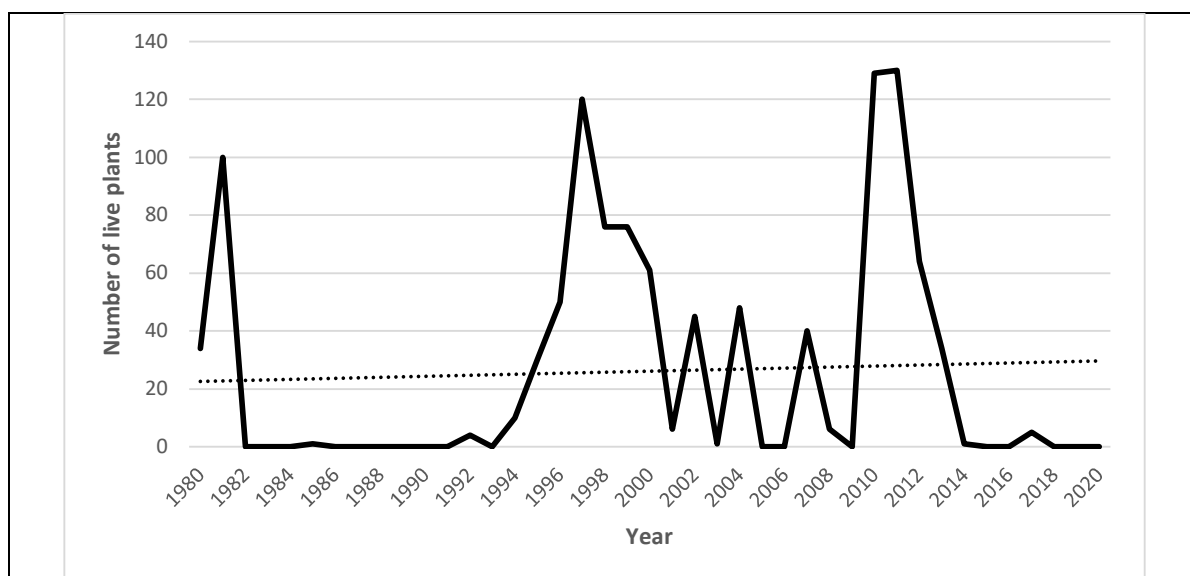


Figure 5: Gross exports of live *Euphorbia susannae* plants from South Africa (with trend in trade over time indicated by the dashed line). An average of 27 plants ($\pm$ SD 40.66) have been exported annually since the year 2000 (up to 2020).

20. Confidence in harvest monitoring:

Do budgetary and other factors allow effective harvest monitoring?

High confidence	1
Medium confidence	2
Low confidence	3
No confidence	4
Uncertain	5

Trade data are regularly extracted from the CITES Trade Database (UNEP World Conservation Monitoring Centre, Cambridge, UK) and analysed, though the quality of the trade data is not as good as it should be due to errors and inconsistencies in reporting. Lack of monitoring across local nursery facilities also undermines the accuracy of the trade data as some nurseries have been known to flout poor oversight loopholes by mis-declaring wild plants of many species as artificially propagated. With an increase in the illegal collection and laundering of wild succulents noted across the country in recent years, provincial conservation authorities are now more aware of the issue and understand the need to commit more resources towards increased and improved monitoring efforts of local exporting nurseries. CapeNature is specifically looking into improvements in compliance monitoring and are undertaking ad hoc inspections of growing and exporting facilities.

Incentives and benefits from harvesting

21. Utilization compared to other

threats: What is the effect of the harvest when taken together with the major threat that has been identified for this species?

Beneficial	1
Neutral	2
Harmful	3
Highly negative	4
Uncertain	5

The historical illegal wild harvesting of *E. susannae* has had a negative impact on the species populations in some areas. The species is however now widely available in cultivation and global demand is met largely through cultivated plants produced by tissue culture in the USA and Canada (Jabar, 2019). Although illegal collection has not been noted as a major threat to the species at present, any ongoing, localized and, opportunistic removals of plants from accessible areas by hobbyist collectors and succulent traders would further exacerbate the impact of habitat loss and degradation on the species.

High	1
------	---

22. Incentives for species conservation: At the national level, how much conservation benefit to this species accrues from harvesting?	Medium	2
	Low	3
	None	4
	Uncertain	5
There is no legal wild-harvesting of <i>E. susannae</i> taking place within the country.		
23. Incentives for habitat conservation: At the national level, how much habitat conservation benefit is derived from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
There is no legal wild-harvesting of <i>E. susannae</i> taking place within the country.		
Protection from harvest		
24. Proportion strictly protected: What percentage of the species' natural range or population is legally excluded from harvest?	>15%	1
	5-15%	2
	<5%	3
	None	4
	Uncertain	5
One locality (~20% of the total population) falls within a declared nature reserve managed by CapeNature (Jabar, 2019).		
25. Effectiveness of strict protection measures: Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
Access to the one reserve that affords protection to the species is somewhat restrictive. The reserve is fenced but the reserve area is unmanned and illegal access into the reserve is possible. Although the provincial legislation makes provisions for the management and protection of the species, enforcement of and compliance with the regulations is challenging to guarantee.		
26. Regulation of harvest effort: How effective are any restrictions on harvesting (such as age or size, season or equipment) for preventing overuse?	Very effective	1
	Effective	2
	Ineffective	3
	None	4
	Uncertain	5
In spite of adequate provincial legislation that prohibits, in the absences of a permit, the harvesting of protected plants across the province (excepting for seed on private lands), limitations with respect to the adequacy of relevant skills and mechanisms within CapeNature, renders existing harvest controls ineffective. These limitations hinder effective field monitoring of the species populations and also hinders the monitoring of nurseries trading in the species thus impeding the ability to detect laundering of wild plants into the trade. Whilst CapeNature have not issued any permits for the wild collection of <i>E. susannae</i> from anywhere in the province (C. Arendorf, pers. comm.), access to majority of the populations is largely unrestricted given the inadequate fencing within some areas as well as the proximity of several populations to public roads. The species is proposed for listing in the revised national Threatened or Protected Species (ToPS) regulations (South Africa, 2013). Unfortunately, owing to a decade of challenging government and public consultation processes, the updated regulations are yet to be gazetted for implementation.		

List of participants

1. Anita Wheeler – Coordinator: Landscape Conservation (CapeNature)
2. Annelise Schutte-Vlok – Regional Ecologist (CapeNature)
3. Carin Swart – Biodiversity Officer (Eastern Cape Department of Economic Development, Environmental Affairs and Tourism)
4. Laaiqah Jabar - Analyst: Biodiversity Enforcement (Department of Environmental Affairs, Forestry and Fisheries)
5. Michèle Pfab – Scientific Co-ordinator of the Scientific Authority (South African National Biodiversity Institute)
6. Nokukhanya Mhlongo – Plant Taxonomy Intern (South African National Biodiversity Institute)
7. Ruida Stanvliet – Conservation Scientist (CapeNature)
8. Tasneem Variawa - Botanist (South African National Biodiversity Institute)

Supporting documents

Court, D. 2010. *Succulent flora of Southern Africa*. Struik Nature, Cape Town.

Esler, K.J. 1999. Plant reproductive ecology. (*In*: Dean, W.R.J. and Milton, S.J., eds. *The Karoo: ecological patterns and processes*. Cambridge University Press, New York).

Goldblatt, P. and Manning, J.C. 2000. Cape Plants: a conspectus of the Cape Flora of South Africa. *Strelitzia* 9. National Botanical Institute, Cape Town.

Jabar, L. 2019. *Conservation, management and sustainable use of Euphorbia colliculina, E. schoenlandii and E. susannae*. Potchefstroom – North West University. (Dissertation – MSc).

López, R.P., Valdivia, S., Sanjinés, N. and De la Quinta, D. 2007. The role of nurse plants in the establishment of shrub seedlings in the semi-arid subtropical Andes. *Oecologia* 152: 779-790.

Milton, S.J., Davies, R.A.G and Kerley, G.I.H. 1999. Population level dynamics. (*In*: Dean, W.R.J. and Milton, S.J., eds. *The Karoo: ecological patterns and processes*. Cambridge University Press, New York).

Milton, S.J. and Dean, R.J. 2015. Repairing compound damage in arid ecosystems – challenges and controversies. *Transactions of the Royal Society of South Africa* 70(2): 127-133.

Mucina, L. and Rutherford, M.C. 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia*, 19. South African National Biodiversity Institute, Pretoria.

Munguía-Rosas, M.A. and Sosa, V.J. 2008. Nurse Plants vs. Nurse Objects: effects of woody plants and rocky cavities on the recruitment of the *Pilosocereus leucocephalus columnar* cactus. *Annals of Botany* 101: 175-185.

- Narbona, E., Arista, M. and Ortiz, P.L. 2005. Explosive seed dispersal in two perennial Mediterranean Euphorbia species (Euphorbiaceae). *American Journal of Botany* 92(3): 510- 516.
- Niklas, K.J., Midgley, J.J. and Rand, R.H. 2003. Tree size frequency distributions, plant density, age and community disturbance. *Ecology Letters* 6: 405-411.
- Pueyo, Y., Kéfi, S., Alados, C.L. and Rietkerk, M. 2008. Dispersal strategies and spatial organization of vegetation in arid ecosystems. *Oikos* 117: 1522-1532.
- Rutherford, M.C., Mucina, L. and Powrie, L.W. 2006. Biomes and bioregions of Southern Africa. (In: Mucina, L. & Rutherford, M.C., eds. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria).
- Stamp, N.E. and Lucas, J.R. 1990. Spatial patterns and dispersal distances of explosively dispersing plants in Florida sandhill vegetation. *Journal of Ecology* 78: 589-600.
- Van Wyk, A.E. and Smith, G.F. 2001. Regions of floristic endemism in southern Africa: a review with emphasis on succulents. Umdaus Press, Hatfield.
- Vlok, J.H. and Raimondo, D. 2007. *Euphorbia susannae* Marloth. National Assessment: Red List of South African Plants v. 2017.1. <http://redlist.sanbi.org/species.php?species=574-346> Date of access: 13 Sept. 2019.
- Vlok, J.H. and Schutte-Vlok, A.L. 2015. Plants of the Klein Karoo. 2nd edition. Umdaus Press, Hatfield.
- Vlok, J.H.J, Cowling, R.M. and Wolf, T. 2005. A vegetation map for the Little Karoo. Unpublished maps and report for a SKEP project supported by CEPF grant no 1064410304.
- White, A., Dyer, R.A. and Sloane, B.L. 1941. The succulent Euphorbieae (southern Africa). Abbey Garden Press, Pasadena.