



EUROPEAN RED LIST OF SELECTED ENDEMIC SHRUBS





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Maltese Cliff Orache *Atriplex lanfrancoi* (EN) is endemic to Malta, where it is restricted to coastal areas of the islands of Malta and Gozo. Ongoing monitoring of the species and its habitat is required in order to better understand its conservation status and the effectiveness of enforcement of current legislation, especially, over illegal dumping, land reclamation and the introduction of alien species.

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European Endemic Shrubs

Shrubs are evergreen or deciduous woody plants with multiple stems branching from or near the ground. Shrub species grow all across the world, including in areas where trees cannot survive. Shrubs are widely distributed across European habitats ranging from coastal heathlands up into alpine and oromediterranean habitats with only areas exposed to extreme conditions, such as strong winds or shallow rocky soil, limiting shrub survival. In habitats across Europe, shrubs define important vegetation types, for example the Arctic tundra, lowland heathlands or Mediterranean shrublands, highlighting their importance in communities across many different climatic regions (Janssen et al., 2016). Some of these habitat types require disturbance (such as fire or grazing) to maintain this shrub dominant state. Shrubs also make up an important part of forest ecosystems providing understorey vegetation as well as dominating the forest edges.

Shrubs play an important role in maintaining ecosystem services especially through contributions to soil stabilisation, nutrient cycling and water management. Shrubs also play an important role to a great range of organisms in provision of food, habitat and shelter.

The exact number of shrub species present in the world remains unknown. Even within Europe – a well-studied region of the world – there are limited data relating to the diversity of shrubs species, and conflicting taxonomic approaches and growth-form definitions. Further to this, conservation assessments of European shrubs highlight the variety of conservation actions needed to prevent shrub species from going extinct. The long-term survival of these species depends on the protection of habitats from livestock grazing, the control of alien invasive and problematic species, reducing the widespread and growing pressure from fires and landslides, as well as increasing targeted conservation research focused on this group of plants.

Assessment Scope

This report encompasses the conservation status of 262 selected endemic European shrub species. These shrubs were selected because they are large (over 0.5 metres in height) and endemic to Europe. The report does not include 24 species endemic to Macaronesia (Madeira Archipelago or in some cases Madeira and the Canaries) because the expertise was not available to finalise their assessments within the timeframe of the project. All the assessments were made following the IUCN Red List Categories and Criteria (IUCN, 2012, 2001) and peer-reviewed through expert workshops or email consultation.

The conservation assessments of these species are found on *The IUCN Red List of Threatened Species* (www.iucnredlist.org).

All assessments were carried out on two levels: pan-Europe, and the Member States of the European Union (EU). The pan-Europe assessment is also the global assessment for these species as all species are endemic to Europe. Of the 262 species included in the assessment, 219 species are endemic to the EU region. The scope extended from Iceland in the west to the Urals in the east, and from Franz Josef Land in the north to the Canary Islands in the south. The Caucasus region is not included.

Threat Status

Overall, 48.5% and 48.3% of European endemic shrub species that have been assessed are threatened in Europe and in the EU, respectively. These mid-point values assume that a similar relative proportion of the Data Deficient (DD) species are likely to be threatened (the mid-point value), and provides the best estimation of the proportion of threatened species (IUCN 2011).

For almost a tenth (25 species) of the species included in the assessment, there was insufficient information available to evaluate their risk of extinction and they were assessed as DD. In the EU, 20 species (7.6%) were also assessed as DD. When more data become available, it is possible that many of these species may also prove to be threatened. Thus, the proportion of threatened species could lie between 43.9% (if all DD species are not threatened) and 53.4% (if all DD species are threatened) for Europe, and between 44.5% and 52.4% for the EU.

In Europe, 15.6% of species have been assessed as Critically Endangered, 17.2% as Endangered and 11.1% as Vulnerable (Table 1 and Figure 1). A further 6.5% (17 species) are considered Near Threatened. There is a similar proportion of threatened species in the EU (16.1% Critically Endangered, 16.5% Endangered and 11.8% Vulnerable), with 5.9% Near Threatened (Table 1 and Figure 2). The complete list of species evaluated and their Red List status in Europe and in the EU is available as Supplementary Material¹.

Although this subset of shrubs represent only a selection of the endemic shrubs of Europe over 0.5 m in height and are not an entire taxonomic or ecological group, the threat levels are high. By comparison, 58% of freshwater molluscs (Cuttelod et al., 2011), 42% of trees (Rivers et al., 2019), 40% of freshwater fishes (Freyhof and Brooks, 2011), 29% of grasshoppers, crickets and bush-crickets (Hochkirch et al., 2016), 23% of amphibians (Temple and Cox,

Table 1. Summary of numbers of selected endemic shrubs within each Red List Category.

IUCN Red List Categories	No. of species in Europe	No. of species EU Member States
Extinct (EX)	0	0
Extinct in the Wild (EW)	0	0
Regionally Extinct (RE)	0	0
Critically Endangered (CR)	41	41
Endangered (EN)	45	44
Vulnerable (VU)	29	28
Near Threatened (NT)	17	16
Least Concern (LC)	105	105
Data Deficient (DD)	25	20
Not Applicable (NA)	--	8
Total number of species	262	254*

* The total of species shown in the EU Members States (254) excludes eight species that are not present within the EU (and assessed here as Not Applicable, NA).

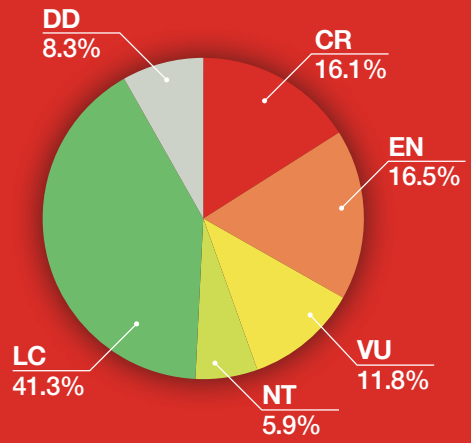
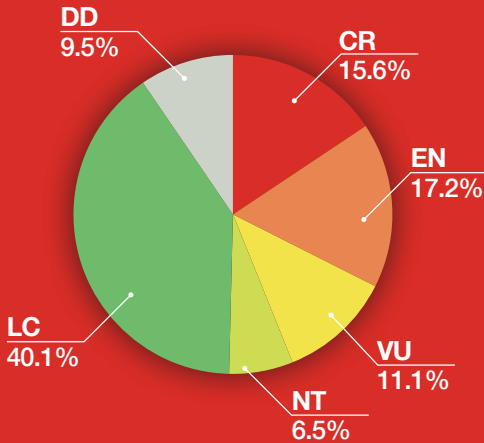
¹ Supplementary Material: <https://portals.iucn.org/library/node/48438>

2009), 20% of reptiles (Cox and Temple, 2009), 20% of lycopods and ferns (García Criado et al., 2017), 16% of dragonflies (Kalkman et al., 2010), 15% of mammals (Temple and Terry, 2007), 13% of birds (BirdLife International, 2015), 9% of butterflies and bees (van Swaay et al., 2010; Nieto et al., 2014), 8% of aquatic plants (Bilz et al., 2011) and marine fishes (Nieto et al., 2015), and 2% of medicinal plants (Allen et al., 2014) are threatened. Additional European Red Lists assessing a selection of species showed that 57% of policy plants (Bilz et al., 2011), 22% of terrestrial molluscs (Cuttelod et al., 2011), 18% saproxylic beetles (Cálix et al., 2018; Nieto and Alexander, 2010), and 16% of crop wild relatives (Bilz et al., 2011) are also threatened. Thus, the European endemic shrubs represent one of the most threatened plant groups in Europe assessed so far, with only a smaller percentage of threatened species than the freshwater

molluscs (58%) and the “policy plants” (57%; species that are listed under the four European or international policy instruments of relevance to plants; the Habitats Directive, the Bern Convention, CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), and Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora). This high level of threat of endemic shrubs is in part explained by the high number of species with restricted ranges, restricted population sizes (number of mature individuals), or both (see Figure 6). For example, of the 115 species assessed as threatened, 75 are island-endemics species (i.e., restricted to one or more islands in the European Macaronesian and Mediterranean islands). Another example are the 20 species within the *Sorbus* genus, where 13 of the 14 species for which sufficient data exist qualify as threatened due to their small population size.

Figure 1. IUCN Red List status of endemic shrubs in Europe.

Figure 2. IUCN Red List status of endemic shrubs in the EU.





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CR

Echium portosanctense (CR) - is endemic to Porto Santo in Madeira. It inhabits north facing steep rocky slopes and warmer south-eastern slopes. The species is only known from one location where it is threatened by hybridisation and herbivory.
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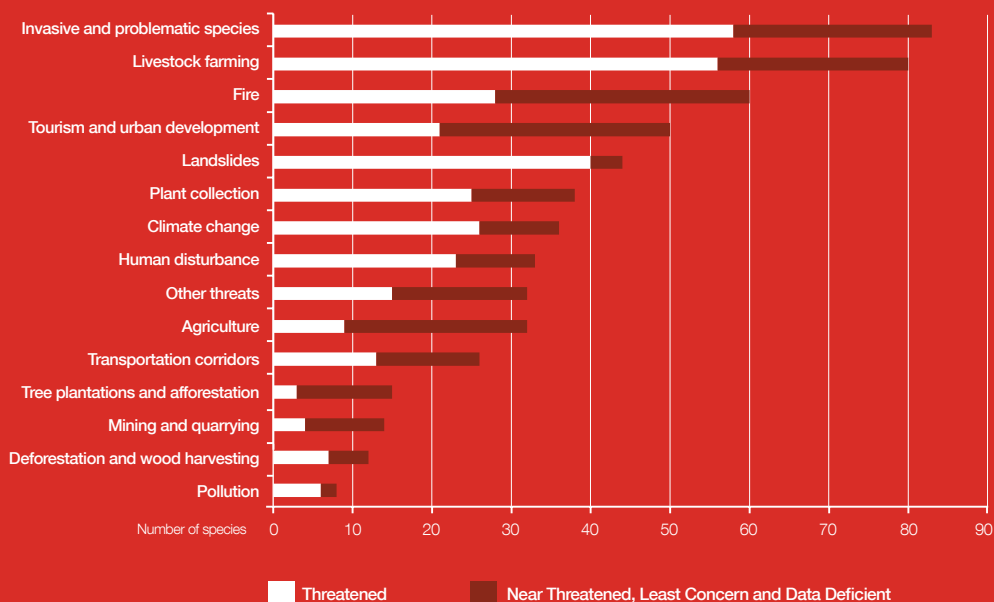
Major Threats

An overview of the major threats affecting the selected endemic European shrubs is shown in Figure 3. Introduced invasive and problematic native species, livestock farming, and fire are the three greatest threats overall, affecting more than half the species (56.1%, 147 species), including 91 threatened species (34.7% of threatened species).

The greatest risk to these shrub species are invasive alien and problematic native species, with 31.7% of species (83 species) affected. Alien invasive species are the largest threat within this category, however problematic native species are also a significant problem. These types of species directly compete with

shrubs, degrade habitat, or aid in the spread of pests and disease. Livestock farming is also a large threat to shrub species with 30.5% of all species reported here (80 species) affected by this threat. Livestock grazing leads to deterioration of adult shrubs as well as limiting regeneration of new shrubs. Fires (and fire suppression) also pose a major hazard to shrub species with 22.9% species (60 species) affected by the effects of these events. Both burning and succession processes, caused by a reduction in fire disturbance cycles, can cause extensive declines in native populations. Tourism and urban development is also a hazard to these shrub species. This threat affects 19% of shrub species (50 species).

Figure 3. Major threats to endemic shrubs in Europe.





Sorbus pauca (CR) – is a shrub endemic to northern Bohemia in the Czech Republic. It grows on dry stony slopes and cliffs within xerophilous vegetative areas. The species has been assessed as Critically Endangered because it has a very small range as it only occurs in one location where habitat is declining in both extent and quality.
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It is clear that these species are also greatly affected by landslides with 16.8% of all threatened species (44 species) affected. Landslides, which can be exacerbated by vegetation clearance, as well as by increased rainfall and changes in rainfall occurrence, clear large areas of top soil affecting nutrient distribution and soil depth as well as physically damaging shrubs that are in the way of flows.

In addition, an important threat that requires further research is climate change which currently affects 13.7% of all shrub species (36 species), but this may have a growing impact as weather extremes become more common.

Climate change effects can interact with other threats leading to cumulative negative consequences. These types of relationships are important to understand especially with respect to existing major threats such as invasive alien and problematic native species, fire, and landslides.

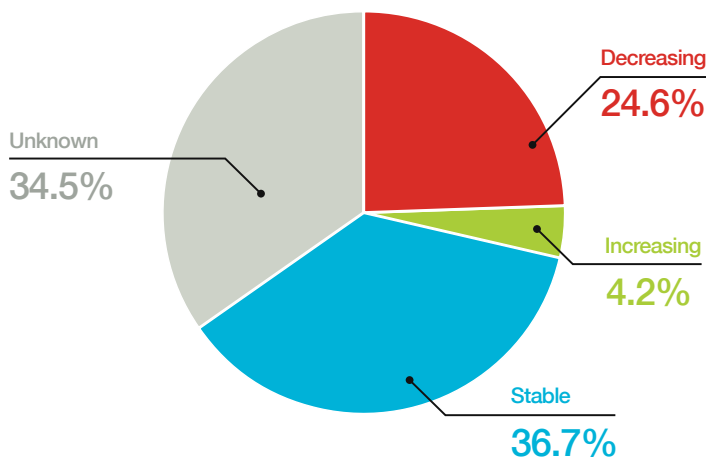
It is clear from these analyses that the threats facing shrub species are diverse. There is marked overlap between the threats to threatened and not threatened species, but the differences between species also highlight the need for context specific conservation initiatives required to protect endemic European shrubs.

Population Trends

Population trend data provides key information when assessing the Red List status of a species. Therefore, as part of the Red List process, the trend of the overall population was assessed as either declining, stable, increasing or unknown. Over a third of species in this report have an unknown population trend highlighting the need for increased monitoring and research surrounding European shrubs.

Of the assessed species, 24.6% (64 species) of shrub populations are thought to be in decline, while 36.7% are considered stable (97 species), and 4.2% (11 species) are increasing (Figure 4). For over a third of the species (90 species), the population trend is unknown, and 36.6% of these (33 species) are threatened.

Figure 4. Population trends of selected European endemic shrub species.



Spatial Distribution Patterns

The spatial distribution patterns of the selected European endemic shrubs are shown in Figures 5 (overall species richness), 6 (threatened (VU, EN and CR) species) and 7 (Data Deficient species). As might be expected, mountain areas exhibit the highest levels of overall species richness (Fig. 5). For example,

the Cantabrian and Central Sierra ranges in Spain, the Alps, and the Apennines in Italy, and to a lesser extent the Carpathians. The European Macaronesian archipelago islands and the larger Mediterranean islands also have high levels of range-restricted endemic species.

Figure 5. Species richness of selected European endemic shrubs.

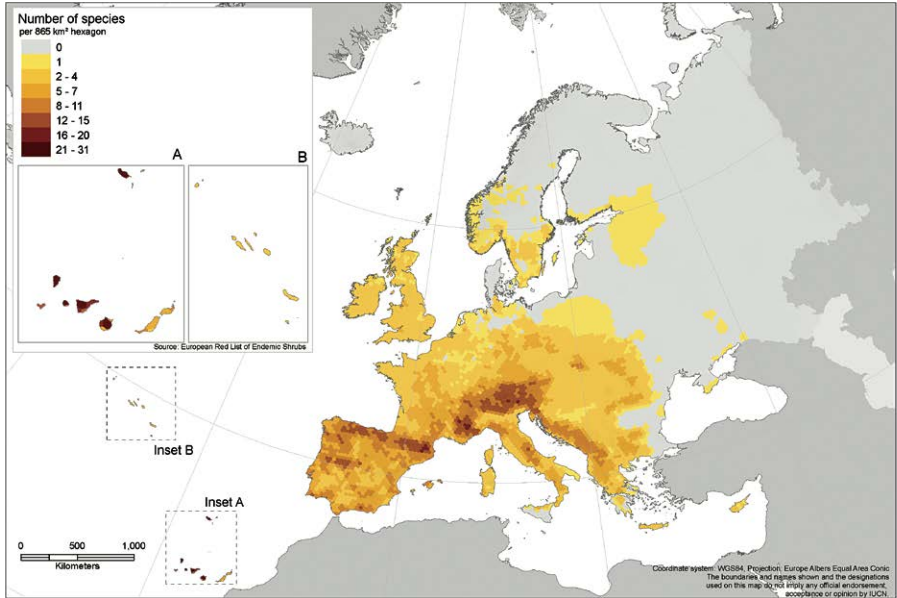
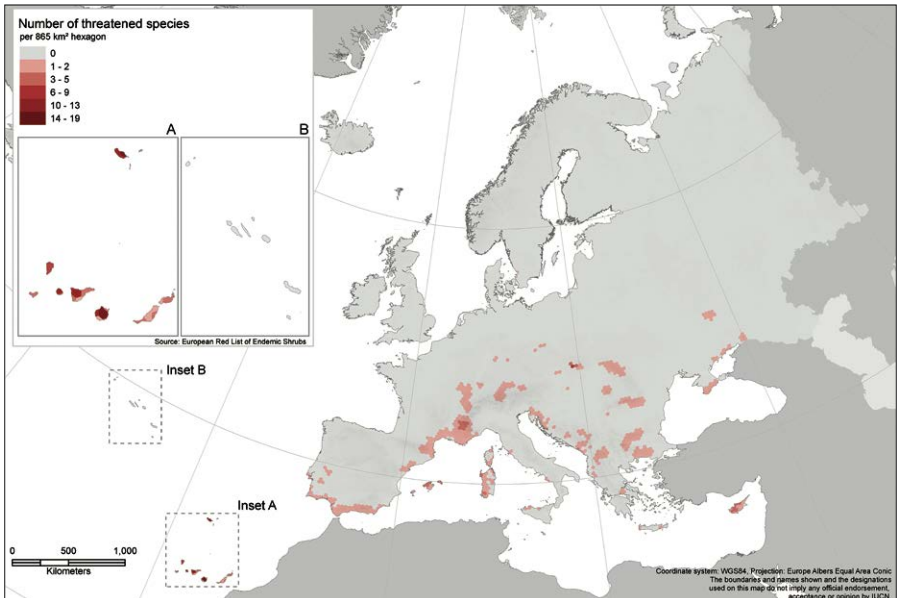


Figure 6. Distribution of selected European endemic shrubs assessed as Threatened (CR, EN, VU).

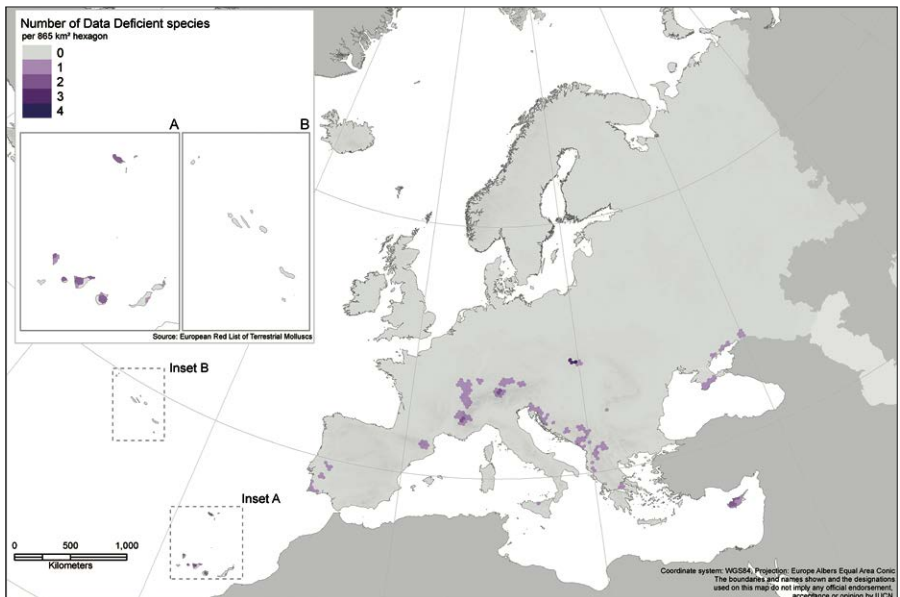


The highest levels of threatened species (Fig. 6) are found in the Macaronesian Islands (66 species, including species from the *Echium*, *Cheirolophus*, *Sideritis* and *Sinapidendron* genera), the southern Iberian peninsula (seven species, such as *Echinospartum albigicum* (CR), restricted to the Sierra de Aljibe in Cádiz and Málaga provinces), the larger Mediterranean islands (19 species), and eastern and central Europe (20 species), where many of the range-restricted *Sorbus* species with small populations are found (e.g. *Sorbus holubyana* (CR; a single locality in the Malé Karpaty Mountains in Slovakia) and *Sorbus karpatii* (VU; a small population in the Vértes Mountains in Hungary).

All Data Deficient species were mapped (Fig. 7), however for some species detailed

locality data were not available for all or parts of their distributions and the maps for some of these species are incomplete. Figure 7 shows mountain areas to hold higher levels of DD species; six species (including *Genista nissana*, *Crataegus sericea*, and *Frangula pedunculata*), through the Dinaric Alps in the western Balkan Peninsula; the Alps (*Cotoneaster raboutensis*, *Rosa abietina*, and *R. rhaetica*); and the Carpathians (*Daphne arbuscula* and six range-restricted *Sorbus* taxa). In southern Ukraine and South European Russia, the circumscription of *Crataegus karadaghensis* has recently undergone revision and its distribution is not well known. On Cyprus, *Phlomis brevibracteata* and *P. cypria* are both impacted by a range of threats, but with inadequate information on population size and trends.

Figure 7. Distribution of selected European endemic shrubs assessed as Data Deficient.



Conservation Action

The conservation assessments of the selected 262 endemic shrub species are critical to understanding the threats and status of shrubs across Europe. Increasing the information available on European shrub species enhances the capacity of conservation organisations to target action and resources. Increased targeting ensures more effective initiatives and a greater chance of successfully protecting biodiversity. This report highlights that the core effort of future conservation action to protect endemic European shrub species must target invasive alien and problematic native species. This threat affects almost a third of all assessed shrub species (31.7%, 83 species) analysed in this report. Understanding the dynamic nature of invasive species will be critical in developing eradication or control actions. Species-specific effects may highlight the complexity of these circumstances and highlight the detailed research needed to overcome these challenges. Invasive alien species need to be tackled in certain areas to prevent replacement of native flora by exotic species.

The majority of the assessed shrubs that have been found to be threatened are present within Natura 2000 sites, however significant parts of their distributions do not occur within this protected area network. For example, the highly range-restricted species *Coronilla talaverae* has three known subpopulations, however only two of these occur within Natura 2000 sites. Across the European region, only one assessed species, *Sideritis cyprica* (VU), has no part of its known range within a formal protected area. This species is endemic to the Kyrenia (Pentadaktylos) Mountain Range on Cyprus, and occurs within a proposed Important Plant Area, and the mountain range has also been proposed for inclusion within the Natura 2000 system.

Livestock farming is causing widespread severe declines in shrub habitat extent

and quality. To counteract this, improved management of protected areas should be implemented to prevent land use change as well as grazing damage within shrub habitat. In contrast, some species, such as *Sorbus pauca* and *Genista cupanii*, require management interventions to maintain open habitats to allow in sunlight or to encourage regeneration of the species. Further protected areas could be designated where threatened shrub diversity is high and to ensure that significant proportions of the distribution of range-restricted species are included within protected areas. Furthermore, livestock management policies outside of the protected area network must be carefully adapted to take into account shrub biodiversity. Policies must be put in place to guide and manage tourism activities and urban development, which also pose a significant risk to shrub populations.

There is a clear need to promote further research into European shrubs especially concerning their population trends. Currently, over a third of shrub population trends remain unknown. It is therefore critical to continue to collect data to address the knowledge gaps surrounding endemic European shrubs. This extends to threats as well especially those that are likely to change over time. Climate change already affects a number of threatened species and continued research is needed to maintain a firm understanding of climate change and other threats to limit the risks they pose to endemic European shrubs.

It is also important to note the fact that 41.2% of shrub species have populations that are either stable or increasing, showing that many species populations remain healthy. Many endemic shrub species have strong populations. These need to be monitored to ensure that expanding threats do not lead to declines in currently stable or growing populations.



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EN

Genista cilentina (EN) – is endemic to the Cilento National Park in southwestern Italy. Its range is extremely limited and its habitat is declining in extent and quality due to tourism, fires, and urban development, and as a result qualifies as Endangered.
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Key Recommendations

Policy

- The IUCN European Red List should be used to inform nature and biodiversity policies to improve the status of threatened species, and should be revised at regular intervals of ten years, and whenever new data become available.
- All remaining endemic European shrubs should be assessed for the IUCN European Red List in order to have a full understanding of the status of this group.
- Tourism and urban development must be regulated to protect endemic shrub populations. This includes not just land clearance of habitat areas, but also fragmentation effects of developments.
- Fire management policies must be updated with respect to areas of high shrub abundance and diversity to promote shrub survival and safer conditions for local human populations.
- Endemic shrub data should be used to refine protected area networks to ensure diversity is captured within the European species protection plans.
- Invasive alien species and introduced pests and disease movement should be controlled through policies regarding the movement of plant material across borders as well as horticultural use. Furthermore, new policies should target the control of invasive species within key habitat areas.
- Member States should ensure the full implementation of EU Regulation 1143/2014 on Invasive Alien Species (EU, 2014).

Species and habitat conservation

- Grazing impacts must be evaluated and techniques implemented to reduce damage.
- Soil stabilisation techniques need to be investigated and implemented in areas of high landslide risk. Field surveys of these sites are needed to understand drivers of landslide activity.
- Fire management needs to be re-evaluated in areas of high fire risk and fire breaks, controlled fires, and fire prevention techniques should be implemented to reduce threats to habitats.
- Disturbance regimes for shrub-dominated landscapes should be carefully regulated and maintained.
- Invasive alien species management is critical in areas where threatened species are located.
- Key habitat areas should be protected from urban development including implementing tourism damage reduction techniques
- Strengthening populations through planting programmes should be considered and *ex situ* conservation of threatened species in nurseries or botanic gardens should be a priority to ensure there are safeguarded populations.

Research

- Data should be collected targeting the species that are currently reported as Data Deficient on the IUCN European Red List.
- The effects of less well understood threats should be studied especially with regards to climate change and its changing impact on shrubs species.
- An understanding of vulnerable landscapes should be established to determine if threatened communities are located in specific areas that are under threat from localised threats.
- Effective monitoring tools and improved research efforts on endemic European shrubs should be developed and promoted, particularly in the Natura 2000 network, in order to understand population trends and the impacts of implemented actions.
- The effects of specific invasive alien species, pests and diseases should be researched to enable focused targeting of removal and control techniques



Hypericum balearicum (LC) – is endemic to the Balearic Islands, where it inhabits dry forests, mountain thickets, stony places, and occasionally cliffs and lowland areas. It is assessed as Least Concern as its population is stable.
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Carthamus balearicus (NT)
- is endemic to northern coastal areas of Menorca. Once considered Critically Endangered, the species has benefited from LIFE Nature projects (LIFE Flora Menorca - Conservation of areas with threatened species of the flora in the island Menorca LIFE00 NAT/E/007355, and LIFE+ Renex - Priority species' habitats restoration in the island of Menorca programme LIFE07/NAT/E/000756; 2009 to 2014). Threats have been controlled at most sites and populations are showing signs of increase, however ongoing monitoring is required.
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< LEAST CONCERN >

LC

Euphorbia canariensis (LC) is endemic to the Canary Islands, where it is found on all islands except Lanzarote, where it is now extinct.
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The European Red List is available online at <http://ec.europa.eu/environment/nature/conservation/species/redlist> and <https://www.iucnredlist.org/regions/europe>

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Erica andevalensis (NT) – is endemic to southern Spain and Portugal. It inhabits acid soils high in heavy metals. It is assessed as Near Threatened as its habitat is declining in quality and extent.
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