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# An Evaluation in Terms of Native Woody Taxa with Threatened Status and Conservation Strategies in the Flora of Hatay Province

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### ABSTRACT

Cities started to form the settlement of human beings. There is intense pressure on natural resources due to the increasing urbanization in recent years. The natural vegetation that forms in the area where it is located without any human-induced effects is in danger of extinction due to unconscious and overuse. In this context, with climate change emerging all over the world, environmental pollution threatens biodiversity at a national, regional, and urban scale. However, the genetic resources of countries are of international importance. Turkey flora of the location, topography, has a high level of biodiversity due to climatic differences, etc. natural factors. Likewise, the flora of Hatay province has a high level of floristic diversity, especially with the contribution of the Amanos Mountains; Many herbaceous and woody taxa are natural or endemic. Preservation of biodiversity is as important as its existence. In this context; Conservation strategies based on the conservation of the species or population in (in situ) and outside (ex-situ) of its location are accepted. With this study, the native woody species found in the flora of Hatay province were determined based on the "Flora of Turkey" work of Davis (1965-1986); The threatened status of these species has been determined by taking into account IUCN data. Accordingly, it was determined that 13 taxa belonging to 11 families in the flora of Hatay province have threatened status at NT (1), VU (1), LC (9), DD (2) levels. As a result, Hatay province has been accepted as a part of the urban green areas conservation strategies to protect these species. It has been demonstrated that if it is organized as areas with an important potential in the protection of biodiversity, it will contribute to the city scale.

### ÖZ

#### Anahtar Kelimeler:

Biyçeşitlilik,  
Koruma stratejisi,  
Doğal bitki örtüsü,  
Hatay.

İnsanoğlunun yerleşik düzene geçmesiyle birlikte kentler oluşmaya başlamıştır. Son yıllarda da artışı devam eden kentleşme nedeniyle doğal kaynaklar üzerinde yoğun bir baskı görülmektedir. Bulunduğu alanda insan kaynaklı hiçbir etki olmadan oluşan doğal bitki örtüsü de bilinçsiz ve aşırı kullanım nedeniyle yok olma tehlikesiyle karşı karşıyadır. Bu kapsamda tüm dünyada ortaya çıkan iklim değişikliği ile birlikte çevresel kirlilikler ülkesel, bölgesel ve kentsel ölçekte biyçeşitliliği tehdit etmektedir. Oysa, ülkelerin genetik kaynakları uluslararası düzeyde öneme sahiptir. Türkiye florası da konumu, topoğrafyası, iklimsel farklılıklar vb doğal etmenler nedeniyle yüksek düzeyde biyçeşitliliğe sahiptir. Aynı şekilde Hatay ili florası özellikle Amanos Dağları'nın katkısıyla yüksek düzeyde floristik çeşitliliğe sahip olup; otsu ve odunsu pek çok takson doğal ya da endemiktir. Biyçeşitliliğin varlığı kadar korunması da önemlidir. Bu kapsamda tür ya da popülasyonun bulunduğu yerde (in situ) ve bulunduğu yer dışında (ex situ) korunmasını esas alan koruma stratejileri kabul görmektedir. Bu çalışma ile Hatay ili florasında bulunan doğal odunsu türler Davis (1965-1986)'in "Flora of Turkey" eseri temel alınarak belirlenmiş; bu türlerin tehlike statüleri IUCN verileri göz önünde bulundurularak ortaya konulmuştur. Buna göre Hatay ili florasında bulunan 11 familyaya ait 13 taksonun NT (1), VU (1), LC (9), DD (2) düzeylerinde

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tehlike statüsüne sahip olduğu belirlenmiştir. Sonuç olarak bu türlerin korunması amacıyla Hatay ili kentsel yeşil alanları koruma stratejilerinin bir parçası kabul edilmiştir. Biyoçeşitliliğin korunmasında önemli bir potansiyele sahip alanlar olarak düzenlenmesi halinde kent ölçeğinde katkı sağlayacağı ortaya konulmuştur.

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## 1. Introduction

Cities started to form with the settlement of human beings. Due to the rapidly increasing urbanization in recent years, intense pressure has been faced on natural resources. This situation has caused the deterioration of natural balance, environmental problems, and threats in the biological life chain. An increase in water and energy consumption, an increase in carbon emissions, and greenhouse gas emissions, and the resulting climate change resulted in the reduction of natural resources and loss of their qualities [1-5]. In the 21st century, the environmental effects resulting from climate change, which made itself felt more particularly at the regional scale, caused the natural plant population to decrease [6]. Plants have many important roles in the ecosystem. These are climate regulation, carbon dioxide absorption, purification of water and air, being a food source, building material and providing fuel, etc. can be counted as. However, plants face human-induced threats such as habitat degradation, invasive species, resource overuse, and climate change [7]. In this context, the natural vegetation that is exposed to anthropogenic effect at a very high level should be recognized, monitored, and taken under protection. For example, the Mediterranean vegetation has been severely damaged by various civilizations throughout the ages [1].

Threats to biodiversity continue to increase around the world [8,9]. Ekim et al. (2000) stated that According to the IUCN categories of 181 species in Turkey "critically -CR", 843 species "endangered-EN", also 13 plant species "extinction- EX". It has been revealed that it has status of 1457 species are "vulnerable-VU", 470 species "conservation depend-CD", 347 species are "near threatened-NT", 769 species are "least concern-LC", 514 species are "data deficient-DD" [2]. This case is very high in terms of flora biodiversity is an indication of how important the presence of Turkey's protected areas.

According to the IUCN, for an area to gain a protection status, it must bear some protection goals (conservation of genetic diversity and species, maintaining the contribution to improving environmental conditions, sustainable use of natural resources, maintaining cultural and traditional symbolic remains, etc.). These goals are aimed at eliminating or reducing human-induced negativity on natural habitats. The destruction or alteration of habitats causes species to face extinction [2]. Although there is a protected area understanding in our country that dates back to the 1970s, the "protected area" policy and management understanding has still not been in line with developed country standards [10]. According to Plachter (1991), nature conservation duties include the protection of the existence of all species, protection of biotopes, and protection of natural resources such as water, soil, and air as part of the ecosystem. However, the main goal is to protect nature completely [11].

The World Conservation Strategy 4, which was introduced in 1981, was prepared by the conservation organization (IUCN, FAO, WWF, UNEP). The main goals of the strategy are; Conservation of systems that support life, conservation of genetic diversity, and balancing the use of species and ecosystems. The strategy that supports the conservation of rare species first includes regulations for the conservation of species and varieties. In this context, it is aimed to determine and classify protected areas or species/species to be protected and to put forward the appropriate protection strategy. For this purpose, individuals or communities to be protected are protected with 2 basic strategies, which prevent processes and effects that may disrupt the living space in their location. Within the scope of these strategies, species or populations are taken under protection in their habitats (in situ) or in areas where suitable habitats are created (ex-situ) by moving from where they are located [2,8,9,12]. Ex-situ conservation strategy, which is based on the protection of plant species outside of their natural habitats, is generally considered appropriate for species that are endangered or have this potential. In this context, it is known that seeds, tissues, cells, or DNA materials of many plants are under protection in approximately 1750 gene banks in the world. In situ conservation is considered important for the protection of ecosystems and natural habitats, and therefore natural species [12]. Plants are protected by ex-situ method in botanical gardens and arboretums with tree collections, which are thought to have a very important role in preserving biodiversity in the future. It is known that the endangered species among approximately 105 000 species are protected in this way [7-9].

Although the in situ conservation strategy is accepted as the best method for the protection of habitats, it is not completely sufficient for the protection of natural species. It is known that its use together with an ex-situ conservation

strategy gives better results, especially in the conservation of rare and endangered species. The reason for this is that ex-situ protection is provided at the taxon level. Suitable living space is created for the plant and the production of the plant is provided. The size and density of the population are kept under control; plants are provided to be healthy. In another way, seeds are stored in the seed bank. It is an effective method in protecting natural populations. Within the scope of ex-situ protection, by producing with seeds and cuttings; In addition to transporting the plant to a physically safe area, the continuity of the species is also ensured by freezing pollen and tissues in liquid nitrogen [13]. In situ conservation strategy is used to protect many populations; However, it is predicted that it would be more appropriate to support it with ex situ conservation strategies since it is not sufficient alone. In this context, seed banks are very valuable as they contribute to the protection of high amounts of plants in a small area. Because it will contribute to obtaining valuable materials for future habitat restoration programs. Besides, seed banks are accepted as they allow sharing on a global scale [6].

## 2. Conservation Strategies

### In-Situ Strategy

In-situ conservation strategy is the conservation of species in their natural habitats or ecosystems. However, since natural areas face many different threats, protection may not be easy here. Development, determination, and management of these areas are important issues. In this context, it is necessary to fight especially invasive species [14]. According to data from Turkey in 2019 a total of 3.5364.898 hectares are located within the Ministry of Agriculture and Forestry in 1633 protected areas (Table 1). These areas are; "Nature Park", "Nature Monument", "Nature Reserve", "Wildlife Development Area", "Wetland", "Gene Protection Forest", "Urban Forest", "Seed Gardens", "Seed Stands", "Conservation Forests" and "National Park" status. Some of these are discussed in detail below.

**Table 1.** According to the 2019 data of the protected areas in Turkey [15]

	Nature Park	Nature Monument	Nature Protection Area	Wildlife Development Area	Wetland	Gene Protection Forests	Urban Forest	Seed Gardens	Seed Stands	Conservation Forests	National Park*
<b>Number (pieces)</b>	247	116	30	82	82	325	134	202	315	55	45
<b>Covered Area (ha)</b>	106.836	9.389	46.726	1.159.480	998.794	43.016	10.198	1.471	41.567	251.493	895.928

\*Hakkari Cilo and Sat Mountains National Park was added in September 2020

**National Park:** National parks are scientifically and aesthetically important internationally and nationally important, rare natural and cultural resource values, as well as protected areas for recreation and tourism. Those under protection in terms of natural plant communities owned by National Parks are also in Turkey. Some of those; Yozgat Çamlığı National Park, Karatepe-Aslantaş N.P., Soğuksu N.P., Uludağ N.P., Dilek Peninsula N.P., Spil Mountain N.P., Honaz Mountain N.P. It is also known that species endangered at various levels are protected in these areas [11]. Some examples of this are given. *Taxus baccata* protected in the LC category according to IUCN criteria in the Yedigöller National Park located in the province of Zonguldak; There are natural forests of *Cedrus libani*, which are endangered and protected in the VU category according to IUCN criteria, in Kızıldağ National Park located within the borders of Isparta province. *C.libani* also creates pure forests in the Beydağları Coastal National Park located in Antalya province. *Ostrya carpinifolia*, which is protected in the LC category according to IUCN criteria in Uludağ National Park located in the province of Bursa, forms mixed forests with some other species. *Quercus coccifera* and *Nerium oleander*, which are protected in the LC category according to IUCN criteria, have a wide distribution in Marmaris National Park, located in the province of Muğla. In Küre Mountains National Park, *O. carpinifolia* and *Taxus baccata*, and *Buxus sempervirens*, which are protected in the LC category according to IUCN criteria, show distribution [11, 16].

### Ex- Situ Strategy

The material collected in ex situ conservation methods must be stored and stored outside the natural habitat (seed bank, living collections, etc.). It was preferred more in the 1970-1980s [6].

**Botanical Garden / Arboretum:** Botanical gardens are defined as the place where plants are found for scientific research, protection, education, and exhibition. However, in 2018, BGCI updated the definition of the botanical garden, declaring that it should have the feature of “protecting rare and threatened plants, complying with international policies and emphasizing ethical initiatives”. The first botanical garden was the "Pisa University Botanical Garden" designed by Luca Ghini in 1543. Botanical gardens of this period generally serve the purpose of academic studies on medicinal plants. Later, it was started to be established in universities, especially within the pharmacy faculties. In the 17th century, plant production was started in botanical gardens, in other words, the continuity of the species began. There are botanical gardens established by municipalities and individuals in the 19th and 20th centuries. In this process, botanical gardens gain a conservation-oriented structure and support the in-situ conservation strategy [14]. Arboretums are protected areas with woody (tree and shrub) plant collections [9]. There are 1775 botanical gardens and arboretums in 148 countries all over the world [14]. Botanical gardens and arboretums in Turkey, mostly government agencies, universities, were founded by foundations and individuals. Istanbul University includes a Seed Bank within the Alfred Heilborn Botanical Garden, Ege University Botanical Garden, Çukurova University Ali Nihat Gökyiğit Botanical Garden, Eskişehir Anadolu University Botanical Garden, Balıkesir University Botanical Garden, Süleyman Demirel Botanical Garden, Ata Botanical Garden, Karaca Arboretum, Atatürk Arboretum, Muğla Yunus Emre Arboretum are important ex-situ conservation areas in our country. Özçelik et al. [17] reported that there are a total of 800 plant species, including herbaceous and woody, in the Süleyman Demirel Botanical Garden, which was established on an area of 260 da. Satıl et al. [18] reported that there are 216 taxa in Balıkesir University Botanical Garden established in an area of 190 da. Among them is *Cedrus libani*.

**Gene / Seed Bank:** In Turkey, as in the world has contributed to ensuring the continuity of the species faced with the threat of disappearance. It contributes to research and development studies on these species and to raising awareness on the sustainability of plant resources [14]. In ex situ conservation methods, the material collected for genetic diversity is stored or produced outside of its natural habitat. In the seed banks, seeds are stored under certain cold-dry conditions. It is preferred because it is economical in terms of area, low maintenance cost, and it is protected from external factors [6]. When the conservation strategies of plant resources are evaluated in terms of both in-situ and ex-situ conservation; It is known that both strategies alone may not be sufficient. For example, one of the conservation methods such as Gene Bank, Plant Gardens, National Parks, etc. alone does not solve this problem. Important species or species within the borders of the National Park can be exposed to a wide variety of effects; comprehensive protection is not possible [2]. For this reason, in-situ and ex-situ conservation strategies should be designed to complement and strengthen each other. For this purpose, botanical gardens make an important contribution to integrated plant protection as they are areas with the ability to identify, reproduce, and grow plant species [14].

This study aims to determine the taxa that have a danger status among the woody species found naturally in the flora of Hatay province and to evaluate the potential of Hatay province for the protection of these species. The contribution of the urban green areas of the city of Hatay to the protection of biodiversity was evaluated with the study. It is thought that this study will guide the works of local administration and public institutions on this issue.

### 3. Result and Discussion

Natural woody taxa found in the flora of Hatay province; It was determined based on "Flora of Turkey" prepared by Davis (1964-1980) [19]. These taxa and their threatened status are in Table 2; Information about protection forms of the populations belonging to taxa, threat factors, threats are given in Table 3. In this context, 13 natural woody taxa with danger status were identified in the flora of Hatay province. 2 of these taxa are open seeds and 11 are angiosperms. At the same time, 7 of them develop in tree form and 6 in bush form. These taxa should be under protection in different statuses according to IUCN standards. The most striking taxa with its status are *Abies cilicica* subsp. *cilicica* (NT) and *Cedrus libani* (VU). The populations of both taxa tend to decrease. It is predicted that they faced very intense destruction due to the precious nature of their wood. *Abies cilicica* subsp. *cilicica*, cutting its wood for different purposes, eating seedlings and young shoots by goats, plateau tourism, diseases and sudden deaths due to extreme temperatures in the summer are the most important factors in the decline of the population. Also, forest fires are an important factor in this destruction. The fire risk is very high in the region due to the extreme temperatures in the

summer. *Cedrus libani*, recreational activities (winter sports etc.), plateau tourism, eating of seedlings, and young shoots by goats, drought, plant diseases are important measures. When all other taxa are considered, only *Taxus baccata* populations tend to increase. When the protection forms are evaluated, it is seen that most of them are taken under ex-situ protection.

**Table 2.** Nature woody taxa with threatened status in the flora of Hatay province [16, 19].

Latin Name	Threatened Status *	Latin Name	Threatened Status *
<i>Abies cilicica</i> subsp. <i>cilicica</i>	NT	<i>Buxus sempervirens</i>	LC
<i>Cedrus libani</i>	VU	<i>Quercus coccifera</i>	LC
<i>Taxus baccata</i>	LC	<i>Ostrya carpinifolia</i>	LC
<i>Prunus laurocerasus</i>	LC	<i>Populus alba</i>	LC
<i>Sorbus domestica</i>	LC	<i>Ulmus glabra</i>	DD
<i>Styrax officinalis</i>	LC	<i>Vitex agnus-castus</i>	DD
<i>Nerium oleander</i>	LC		

\*NT: Near Threatened; VU: Vulnerable; LC: Least Concern; DD: Data Deficient

**Table 3.** Protection styles of populations; threat factors; Information on threats [16]

Latin Name	Population Status	Threats	Threat Statements	Conservation Format	Some Protected Areas
<i>Abies cilicica</i> subsp. <i>cilicica</i>	Decrease	Recreational activities, tourism activities, forestry activities, fire, drought, change in habitat	Cutting wood for different purposes, eating seedlings and young shoots by goats, plateau tourism, diseases and sudden deaths due to extreme temperatures in the summer are other important threats.	Ex-Situ In-Situ	National Park, Nature Reserve, Nature Reserve
<i>Cedrus libani</i>	Decrease	Recreational activities, tourism activities, forestry activities, drought, urban and industrial development, military exercises, war, animal husbandry, plant diseases	Droughts caused by winter sports and the damage caused by goats and climate change are important measures.	Ex-Situ In-Situ	World Heritage Site, National Nature Reserves, Gene Banks

<i>Taxus baccata</i>	Increase	Collection of the plant, forestry activities	It is affected by changes in forest management.	Ex-Situ In-Situ	In European countries, it is under protection in National Parks and Botanical Gardens Collections within the scope of EU Habitats Directive.
<i>Prunus laurocerasus</i>	Stabile	Non-wood use, livestock, fire, dam construction	Increase in agricultural activities and changes in the water regime are important threats.	Ex-Situ In-Situ	Strict Nature Reserve, Gene Banks, Botanical Garden Collections
<i>Sorbus domestica</i>	No data	Forestry activities	Human-induced degradation, silviculture practices and changes in habitat also threaten the existence of the species.	Ex-Situ	Collections in Botanical Garden and Arboretum.
<i>Styrax officinalis</i>	Stabile	There is no information available.	-	Ex-Situ	Collections in Botanical Garden and Arboretum.
<i>Nerium oleander</i>	No data	There is no information available.	-	-	-
<i>Vitex agnus-castus</i>	No data	Hunting activity	The plant is considered to be threatened, provided that it is collected from nature.	Ex-situ In-Situ	Natura 2000 sites, Botanical Gardens, Arboretums.
<i>Buxus sempervirens</i>	Stabile	Livestock activity	It is threatened by fungal diseases, increases in grazing land in livestock, use of wood, increase in ornamental value, drought.	Ex-situ In-Situ	Gene Banks, Natura 2000 sites, Areas covered by the EU Habitats Directive, Botanical Gardens, Arboretums.
<i>Ulmus glabra</i>	No data	Residential areas, wood cutting	Disease-causing pathogens, habitat loss due to urbanization, hybridization in nature	Ex-situ In-Situ	Gene Banks, Areas covered by the EU Habitats Directive, National Parks, Botanical Gardens, Arboretums
<i>Quercus coccifera</i>	Stabile	Agriculture and fisheries, livestock farms, fire	Human-induced activities, fires	Ex-situ	Collections in Botanical Garden and Arboretum.
<i>Ostrya carpinifolia</i>	No data	unknown	-	-	-

<i>Populus alba</i>	Urban-industrial development, agriculture-fishing, forestry activities, dam construction, pressures on natural ecosystems, diseases	Although it has a high self-renewal feature, it is adversely affected by the flow pattern of the water.	In-situ	Areas covered by the EU Habitats Directive, Natura 2000 sites.
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According to the data of 2019, information on protected areas in Hatay province is shown in Table 4. When the information on protected areas is evaluated in terms of the province of Hatay; It is seen that there are areas with all statuses except "National Park" and "Conservation Forests". Both flora and fauna members are taken under protection in all these areas. When the conservation strategies are evaluated based on species, it is seen that the in-situ conservation strategy is applied in these areas. In particular, the "Gene Protection Forest" belonging to the species *Cedrus libani*, whose conservation status is "VU", draws attention. When evaluated based on the area, Natural Parks, Onat Plane Nature Monument, Nature Conservation Areas, Wetlands, Urban Forests are protected natural structure; In other words, it appears as areas where many natural plant species are taken under protection. For this reason, it is possible to say that there is a conservation approach in both species and area scale in Hatay province, which is very rich in terms of biological diversity. When evaluated on the basis of species, it was determined that some other natural woody species (*Buxus balearica*, *Pinus brutia*, *P. nigra*, and *Fagus orientalis*) were also taken under protection in Gene Protection Forests, Seed Gardens and Seed Stands in Hatay province.

Hatay native woody taxa located in the flora also Forest Management Directorate in different regions depends on Turkey, the Forest District Office / Chief owned areas (seed stands, seed garden, gene conservation forest) is protected (Table 5). The protected taxa are *Abies cilicica*, *Cedrus libani*, *Sorbus domestica*, *Taxus baccata*, *Ulmus glabra*, *Quercus coccifera*, and *Ostrya carpinifolia*.

**Table 4.** Information on protected areas in Hatay province according to 2019 data [15]

Conservation Status	Protected Areas in Hatay Province		
	Name	Covered Area (ha)	Establishing and listing Date
Nature Park	Belen Geçidi Nature Park	44.71	09.04.2014
	Şahin Tepesi Nature Park	90.70	15.05.2018
Nature Monument	Hassa Lav Tüpü Caves	1.189	26.09.2019
	Onat Çınarı Nature Monument	0.10	06.05.2003
Nature Protection Area	Habib-i Neccar Nature Protection Area	119.26	31.12.1993
	Tekkoz-Kengerlidüz Nature Protection Area	182.23	29.05.1987
Wildlife Development Area	Hatay Altınözü Wildlife Development Area	13.565	16.10.2005
	Hatay Mountain Gazelle Wildlife Development Area	13.288	25.12.2019
	Hatay-İskenderun-Arsuz Wildlife Development Area	26.076	5.10.2006
Wetland	Gölbaşı Lake	792	19.04.2017
Gene Protection Forests	<i>Buxus balearica</i> Forest	6.20	2002
	<i>Cedrus libani</i> Forest	160.9	2002
Urban Forest	Kırıkhan Urban Forest	106.10	04.05.2015
	Yayladağı Urban Forest	34	29.01.2016
Seed Gardens	Antakya-Serinyol ( <i>Pinus brutia</i> )	3.60	1977
	Antakya-Kırıkhan ( <i>Pinus brutia</i> )	4.60	2004

	Antakya-Kırıkhan ( <i>Pinus brutia</i> )	1.70	2004
Seed Stands	İskenderun-Arsuz ( <i>Pinus brutia</i> )	125.50	1970
	Antakya-Yayladağı ( <i>Pinus brutia</i> )	110.30	1973
	İskenderun-Uluçınar ( <i>Pinus nigra</i> )	129.00	1991
	Dört Yol-Ufacık ( <i>Fagus orientalis</i> )	70.90	2014
	Conservation Forests	Not available.	
National Park	Not available.		

**Table 5.** Species in the flora of Hatay province and in the conservation areas affiliated to Regional Forestry Directorates and their protection status [15]

Conservation Status	Plant Name	Forest Regional Directorate	Forest Management Directorate / Chief	Publication / Registration Date	Area (ha)	
Seed Stand	<i>Cedrus libani</i>	Muğla	Fethiye-Çaldağ	1989	301.20	
		Eskişehir	Afyonkarahisar-Sultandağı	1984	112.60	
		Konya	Ermenek-Kazancı	1986	65.20	
			Ermenek-Laçın	1986	45.80	
		Antalya	Kaş-Karaçay	1975	152.80	
			Elmalı-Çıglıkara	1984	104.20	
			Kumluca-Söğütçuma	1984	221.00	
			Finike-Aykırçay	1984	77.00	
			Kumluca-Akdağ	1987	121.50	
			Kaş-Gömbe	1997	362.30	
			Eğirdir-Yukarıgökdere	1976	156.00	
			Isparta	Isparta-Kızıldağ Milli Parkı	1984	225.00
				Isparta-Kızıldağ Milli Parkı	1984	55.00
				Isparta-Senirkent	1984	314.00
		Adana	Pozantı-Körkün	1987	173.80	
		Mersin	Mersin-Arslanköy	1981	72.00	
			Bozyazı-Kozağacı	1981	81.90	
			Anamur-Abanoz	1992	242.80	
		Kahramanmaraş	Andırın-Elmadağ	1972	109.70	
		Amasya	Erbaa-Çatalan	1972	283.60	
<i>Abies cilicica</i>	Antalya	Akseki-Yarpuz	1984	180.50		
	Isparta	Bucak-Uğurlu	1981	127.60		
<i>Sorbus domestica</i>	Balıkesir	Balıkesir-İlica	2018	1.30		
	Denizli	Çal-Çardak	1995	2.80		
	Muğla	Seydikemer-Akçay	1990	8.60		
	Isparta	Dinar-Dinar	1991	7.20		
	Eskişehir	Eskişehir-İnönü	1990	8.50		
	Antalya	Akseki-İbradi	1990	12.50		
	Mersin	Mut-Mut	1990	7.20		
Seed Garden	<i>Cedrus libani</i>	Kahramanmaraş	Kahramanmaraş-Elmalar	1995	2.70	



Gene Conservation Forest	<i>Taxus baccata</i>	İstanbul	Demirköy-Kurudere	2010	121.50
		Denizli	Acıpayam-Alcı	2019	4.90
		Eskişehir	Afyonkarahisar-Sultandağı	2015	36.30
		Adana	Kadirli-Bağdaş	2019	2.90
		Zonguldak	Dirgine-Aksu	2019	10.80
			Bartın-Gölderese	2019	41.90
	<i>Cedrus libani</i>	Denizli	Tavas-Konak	2000	283.50
		Muğla	Dalaman-Kavacık	1999	321.10
		Konya	Beyşehir-Beyşehir	1993	12.60
			Karaman-Ereğli	2006	24.20
		Antalya	Finike-Aykırıçay	1998	117.90
			Elmalı-Çığlıkara	2016	82.70
			Elmalı-Çığlıkara	2016	60.20
		Isparta	Göhlhisar-Dirmil	1999	164.10
			Bucak-Karlık	1999	122.90
		Adana	Feke-Maran	1998	78.60
			Feke-Aytepesi	1998	136.90
			Feke-Mansurlu	1998	117.80
			Saimbeyli-Ayvacık	1998	177.40
			Mersin	Mut-Dağpazarı	1998
		Mut-Çamlıca		1998	97.90
		Anamur-Kesmece		1998	105.80
		Anamur-Abanoz		1998	148.40
		Hatay	Antakya-Hassa	2002	160.90
		Kayseri	Kayseri-Sarız	2019	113.00
		Amasya	Niksar-Köklüce	1991	54.20
	Erbaa-Çatalan		2014	148.10	
	<i>Ulmus glabra</i>	Adana	Adana-Ceyhan	2007	11.20
		Adana	Saimbeyli-Ayvacık	2014	135.80
	<i>Abies cilicica</i>	Mersin	Tarsus-Cehennemdere	1996	70.10
		Kahramanmaraş	Onikişubat-Başkonuş	2012	81.90
		Antalya	Akseki-Akseki	2011	41.60
		Kahramanmaraş	Kahramanmaraş-Hartlap	2014	67.50
Andırın-Akifiye			2016	167.60	
Kayseri		Kayseri-Tomarza	2016	89.70	
<i>Quercus coccifera</i>	Denizli	Çameli-Yaylacık	2012	53.70	
<i>Ostrya carpinifolia</i>	Antalya	Finike-Demre	2014	226.30	
	Kahramanmaraş	Kahramanmaraş-Hartlap	2014	130.40	
	Zonguldak	Yenice-Kavaklı	2010	52.80	
	Kastamonu	Cide-Şehdağ	1999	52.00	

#### 4. Conclusion and Suggestions

The study was carried out to determine the natural woody species and their conservation status in the province of Hatay, whose flora is very rich in biodiversity. As a result, a total of 13 woody taxa that grow naturally in the provincial borders of Hatay and have various levels of threatened status were determined. These taxa develop in tree and shrub form. In the protection of these taxa in the flora of Hatay province, it is seen that an in-situ conservation strategy is applied. Also, these taxa are protected by an ex-situ conservation strategy in various scopes within the Ministry of Agriculture and Forestry. For this purpose, recommendations have been made on the following issues:

\* By establishing a Botanical Garden or Arboretum in the province of Hatay; taxa both naturally occurring and must be taken under protection should be established in the city's flora and collections of examples of Turkey and the world.

\* The parks within the municipality boundaries should be planned as a botanical garden or arboretum as a whole.

\* The campus areas of Iskenderun Technical University and Hatay Mustafa Kemal University, which are universities in the province of Hatay, should be designed as Botanical Garden or Arboretum due to the green space they provide to the city. For this purpose, campus plants should be determined; Attention should be paid to the presence of collections of taxa with various levels of protection status in the flora of Hatay province.

\* In green belt studies to be carried out in the province of Hatay, the use of woody taxa that are naturally found in the urban flora and need to be protected should be planned together with other species.

### Competing Interest / Conflict of Interest

The authors declare that they no conflict of interest. The none of the authors have any competing interests in the manuscript.

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