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CONSERVATION and SUSTAINABLE MANAGEMENT of TURKEY'S STEPPE ECOSYSTEM PROJECT

GCP /TUR/ 061/GFF



Development of Management Plans for the
Şanlıurfa Merkez Kızılkuyu WDA, Tek Tek Mountains NP
and (Şanlıurfa Part Of) Karacadağ - LOT 2

Multi Species Action Plan
for Crop Wild Relatives

(2021 - 2030)





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TABLE OF CONTENTS

TABLE OF CONTENTS	i
LIST OF FIGURES.....	ii
LIST OF TABLES	iii
LIST OF ABBREVIATION	iv
PLANNING TEAM	v
EXECUTIVE SUMMARY	vi
1. INTRODUCTION.....	1
2. GENERAL INFORMATION	4
3. IDENTIFYING THE TARGET SPECIES	5
3.1. Wild Crop Relatives in Karacadağ Steppes	5
3.1.1. Wild emmer (<i>Triticum dicoccoides</i>).....	7
3.1.2. Wild einkorn (<i>Triticum baeoticum</i>).....	8
3.1.3. Goat grass (<i>Aegilops speltoides</i> var. <i>ligustica</i>).....	9
3.1.4. Field pea (<i>Pisum sativum</i> subsp. <i>sativum</i> var. <i>arvense</i>).....	11
3.1.5. Wild lentil (<i>Lens culinaris</i> subsp. <i>orientalis</i>).....	12
3.1.6. Wild chickpea (<i>Cicer echinospermum</i>).....	13
3.1.7. Conservation Status and Threat Categories.....	15
3.2. The Distribution and Population Status of the Target Species in Turkey and the World.....	15
3.2.1. The status in the World.....	15
3.2.2. The Status in Turkey	17
3.2.3. The Status of Target Species in Karacadağ Steppes.....	19
3.3. The Hot Spots Identified for Wild Crop Relatives in Karacadağ Steppes	20
3.3.1. Soydan Relic Oak Forest Glades.....	21
3.3.2. Honey Forest Glades	22
3.3.3. Simo Creek Valley.....	23
4. RELEVANT NATIONAL LEGISLATION AND INTERNATIONAL CONVENTIONS	24
5. THREATS AND LIMITING FACTORS	25
LITERATURE CITED	28
APPENDICES.....	30
APPENDIX 1: List of Observation and Collection Locations for Identification of Crop Wild Relatives	30
APPENDIX 2: The Map of Observation and Collection Locations for Detection of Crop Wild Relatives	32
APPENDIX 3: A Sampling Field Form of the Study of the Crop Wild Relatives	33

LIST OF FIGURES

Figure 1. Priority Conservation and Buffer Areas Identified in Karacadağ Steppes and its Surroundings.....	2
Figure 2. Karacadağ Steppes Project Area	4
Figure 3. Dry sample of <i>Triticum dicoccoides</i>	7
Figure 4. <i>Triticum dicoccoides</i> and its habitat.....	7
Figure 5. Dry sample of <i>Triticum baeoticum</i>	9
Figure 6. <i>Triticum baeoticum</i>	9
Figure 7. Dry sample of <i>Aegilops speltoides</i> var. <i>ligustica</i>	10
Figure 8. Dry sample of <i>Pisum sativum</i> L. subsp. <i>sativum</i> var. <i>arvense</i>	12
Figure 9. <i>Pisum sativum</i> L. subsp. <i>sativum</i> var. <i>Arvense</i>	12
Figure 10. Dry sample of <i>Lens culinaris</i> subsp. <i>orientalis</i>	13
Figure 11. <i>Lens culinaris</i> subsp. <i>Orientalis</i>	13
Figure 12. Dry sample of <i>Cicer echinospermum</i>	14
Figure 13. <i>Cicer echinospermum</i>	14
Figure 14. Identified Hot Spots and Priority Conservation Areas.....	20
Figure 15. The location of the Relic Oak Forest, one of the important habitats for the CWR, in the Project area	21
Figure 16. Relic Oak Forest Glades	21
Figure 17. The location of Honey Forest Glades in the Project area, one of the important habitats for CWR	22
Figure 18. Karacadağ Honey Forest Glades	22
Figure 19. Location of Simo Creek Valley, one of the important habitats for CWR, in the Project area	23
Figure 20. Simo Creek Valley	23

LIST OF TABLES

Table 1. The spatial distribution of the target species in the World.....	15
Table 2. The spatial distribution of the target species in Turkey	17
Table 3. The related national legislations and international conventions	24
Table 4. Classification of threats	26
Table 5. The Threats.	27

LIST OF ABBREVIATION

ANCEO	Anadolu Çevre Ormancılık Haritacılık İnş. Tic. ve San. Ltd. Şti.
CGRFA	Commission for the Conservation of Genetic Resources for Food and Agriculture
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CWR	Crop Wild Relative
FAO	Food and Agriculture Organization of the United Nations
GDF	General Directorate of Forestry
GDNCNP	General Directorate of Nature Conservation and National Parks
GDPP	General Directorate of Plant Production
GEF	Global Environment Facility
GCMA	Gene Conservation and Management Area
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
MoAF	Ministry of Agriculture and Forestry
PCA	Priority Conservation Area
TRT	Turkish Radio and Television Corporation

PLANNING TEAM

Multi Species Action Plan for Wild Crop Relatives for Karacadağ Steppes (Şanlıurfa part of) was prepared by ANÇEO within the scope of “**Conservation and Sustainable Management of Turkey’s Steppe Ecosystems**” Project carried out in cooperation with United Nations Food and Agriculture Organization (FAO), Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks (GDNCNP), General Directorate of Plant Production (GDPP) and General Directorate of Forestry (GDF) and with the financial support of the Global Environment Facility (GEF).

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EXECUTIVE SUMMARY

The "**Multi Species Action Plan for Wild Crop Relatives**", one of the important gene resources in Karacadağ steppes, has been developed under the grand project of "Conservation and Sustainable Management of Turkey's Steppe Ecosystems" (GCP/TUR/061/GFF). This report covers the general information of the target species, including their taxonomy, phenology, ecology, spatial distribution, life cycle, habitat preferences and the major threats along with their global and local conservation status.

Based on the field studies and the results of the baseline survey and assessment studies carried out in 2019, the wild relatives of cultivated plants in Karacadağ Steppes such as *Triticum dicoccoides* (wild emmer), *Triticum baeoticum* (wild einkorn), *Aegilops speltoides* var. *ligustica* (goat grass), *Pisum sativum* subsp. *sativum* var. *arvense* (field pea), *Lens culinaris* subsp. *orientalis* (wild lentil) and *Cicer echinospermum* (wild chickpea) species were identified and determined as target species. Of these species, only *Cicer echinospermum* is endemic to Turkey. Other species, that are not endemic, originate from the Middle East. The current status of the target species in the area was determined by field observations. Three important habitats where at least three of the target species coexist have been identified as "Hot Spots". These areas are; Soydan Relic Oak Forest Glades, Karacadağ Honey Forest Glades and Simo Creek Valley. *Triticum dicoccoides* is present in all three hotspots in the study area. *Triticum baeoticum* is found in Relic Oak Forest Glades and Simo Creek Valley, *Aegilops speltoides* var. *ligustica* is present only in Relic Oak Forest Glades. *Pisum sativum* and *Lens culinaris* subsp. *orientalis* taxa are only found in the openings of the Karacadağ Honey Forest, while *Cicer echinospermum* grows naturally in the Simo Creek Valley.

For all target species, the habitat preferences, the main threat factors affecting the population size and distribution of the species are common, a multi species approach has been adopted in the conservation planning of these species. In general, six species are steppe plants distributed in stony steppe areas, field edges and forest glades in the pilot area. Grazing pressure is the main threat factor for all species. As the life cycle of legumes is most sensitively affected by grazing pressure, these species are more commonly found in well-protected habitats or among the stony margins of the fields.

Among the identified crop wild relatives in Karacadağ steppes, both *Aegilops speltoides* and *Cicer echinospermum*, an endemic species to Turkey, are least concern, according to the IUCN (2021) conservation categories. The threat categories of the rest of the target species are not specified. The target species, wild relatives of major cereals and legumes, are herbaceous annuals that complete their life cycle within one year. Seeds germinate in the spring, grow and generally bloom between April and June. As many cultivars in cereals and legumes, their flowers are not open to cross pollination and are largely self-pollinating plants.

When the threats and limiting factors were analyzed in the areas where the target species were dispersed, "overgrazing" and "early grazing" are emerged as the important threat factors. Grazing is the most important pressure for the floristic structure in the area. Early grazing causes annual plants to lose their reproductive organs before starting the seed formation and unable to grow new individuals in the next year.

In order to determine the threat levels of the target species within the multi species action plan in the Karacadağ Steppes, the impact levels were calculated based on the scope and level of the threats. When the threat factors in the area were classified and analyzed according to IUCN, grazing and low precipitation due to climate change were determined as the threat categories with the highest impact levels. The threat analysis will help clarify the targets and activities of the action plan under preparation.

The multi species action plan, which will be developed with a participatory approach within the scope of the project, is both the first attempt of a multi species conservation approach and the first *in situ* conservation planning for the Karacadağ Steppes. This study will contribute to the protection of plant biodiversity and will set an example for the work to be conducted for sustainable food security.

1. INTRODUCTION

“Multi Species Action Plan for Wild Crop Relatives for Karacadağ Steppes (Şanlıurfa part of)” was prepared within the framework of “Development of Species/Taxa Action Plans and Management Plans for the Şanlıurfa Merkez Kızılkuyu WDA, Tek Tek Mountains NP and (Şanlıurfa part of) Karacadağ Steppes” which is part of the grand project entitled “Conservation and Sustainable Management of Turkey’s Steppe Ecosystem” Project (GCP/TUR/ 061/GFF).

The steppes of Karacadağ (Şanlıurfa part of) have a special status in the conservation of genetic diversity, especially with the role they play in the evolution of wild relatives of cultivated plants and their habitat characteristics. One of the conservation approaches developed for such areas is Gene Conservation and Management Area (GCMA) GCMA are areas that are determined to ensure the continuity of the genetic diversity of target species and are protected and managed for this purpose. (Ertekin, 2002). GCMA are also areas that allow the continuity of evolutionary formations and changes in the populations of plant species determined as target species.

Within the scope of the "*In-situ Conservation of Turkish Plant Genetic Diversity*" project (GEF-1) carried out between 1993-1998, seven GCMA were determined for five wild wheat relatives within the borders of Ceylanpınar Agricultural Enterprise. Within the scope of this project, the concept of GCMA was developed and studies were carried out on the development of GCMA (Anonymous, 2007).

The gaps in the *in situ* conservation of genetic resources in the Karacadağ Steppes have been identified once again with the baseline survey and assessment studies carried out within the scope of the "*Conservation and Sustainable Management of Turkey's Steppe Ecosystems*" Project. The important regions in terms of plant biodiversity in the area were determined. In this context; five priority areas for conservation (CPA) were identified according to biotic and abiotic criteria, together with the results of the experts who conducted field research in the Karacadağ Steppes. In this study, important habitats including flora insects, herpetofauna, avifauna and mammals were identified and PCAs were determined by overlapping their habitats (**Figure 1**). CPA1 is 5891.77 ha, CPA2 is 609.58 ha, CPA3 is 1722.81 ha, CPA4 is 2415.10 ha, and CPA5 is 2196.27 ha. In the aforementioned study, it was stated that in the Karacadağ Steppes, the resource value of CPA 1 is the gene center of cultivated plants such as wheat, chickpea, lentils, and includes their wild relatives. The area does not have any conservation status and it can be said that it has the basic features of IUCN's Category V: Protected Landscape Area in terms of resource values. One of the secondary management objectives in this category is the conservation of agricultural biodiversity (Dudley, 2008).

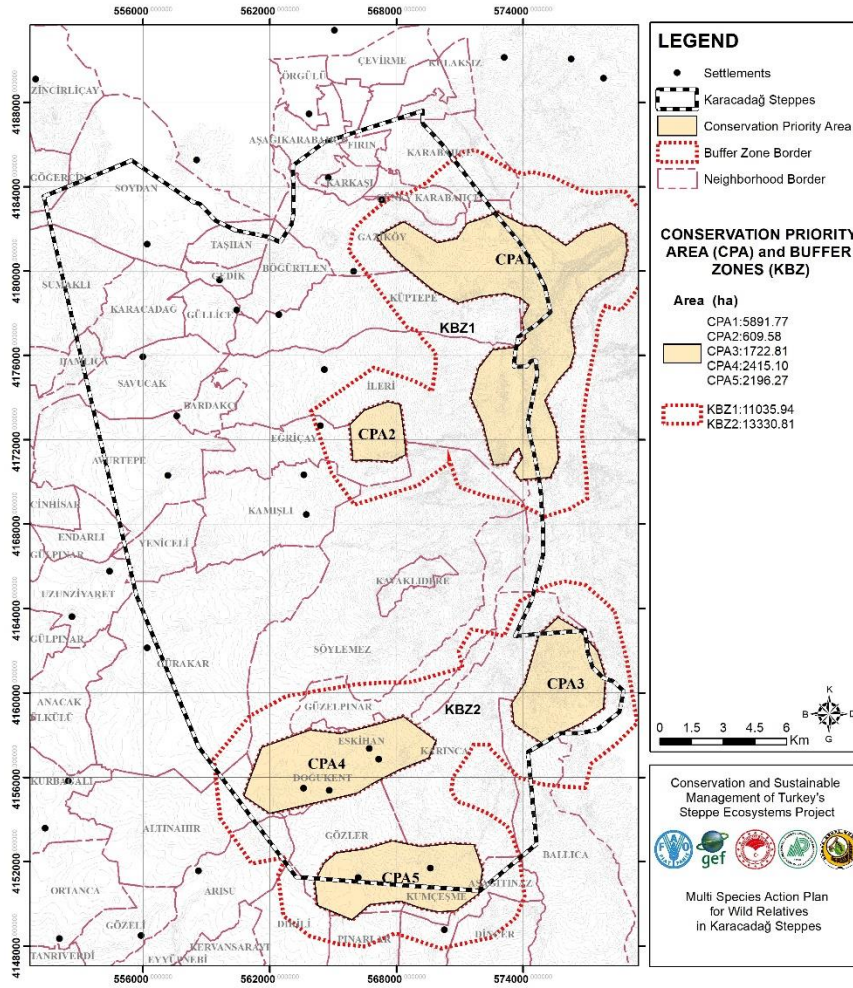


Figure 1. Priority Conservation and Buffer Areas Identified in Karacadağ Steppes and its Surroundings

The distribution areas of wild relatives of wheat and legumes were determined on the basis of field observations, literature research and previous inventory studies in Karacadağ Steppes. Only wheat, rice and legumes constitute more than half of the most consumed plant foods in the world (<http://www.fao.org/3/Y3557E/y3557e08.htm>).

In terms of sustainable food security, conserving the gene reserve of wild crop relatives of these plants and their production systems will be the guarantee of our future. Karacadağ is an important area where the wild ancestors of cultivated legumes and grasses and some rare plants are grown, where agricultural biodiversity and agricultural heritage systems coexist. Crop Wild Relatives (CWR) are under threat due to pressure factors such as loss, degradation, fragmentation of their natural habitats, competition with foreign species, and grazing. Today, many crop wild relatives are used as sources of important genes for both classical and modern breeding practices. Studies on the use of these species in breeding are increasing gradually based on new scientific knowledge and advanced technology. This wild genetic diversity is of global importance in terms of gaining new adaptive properties (resistance to diseases, drought, salinity, etc.) to cultivars.

The importance and conservation priority of the crop wild relatives in the context of their contribution to food security and economy is universally accepted. However, little effort has been made to protect these genetic resources until the beginning of the 21st century (Maxted et al, 2013). As with other plant genetic resources, there are two basic conservation approaches for crop wild relatives; *ex situ* (outside natural habitat) and *in situ* (in natural habitat) conservation. To capture the genetic diversity of wild populations that can be used to contribute to the development of new varieties, these populations must continue to evolve in their natural habitats and adapt to changing environmental conditions. *In situ* protected areas of CWR can be established for single or multiple CWR taxa (IUCN, 2008; Maxted, 2009). Protected areas for multi protection have the obvious advantage of using the limited conservation resources. However, the biggest challenge in identifying protected areas for more than one CWR taxa is that some priority taxa are found only in areas where no other priority CWRs exist (Phillips et al, 2017). Accordingly, Karacadağ Steppes, which contain different priority taxa than wheat and legumes, are quite suitable for the application of a multi species conservation approach.

In an effort to prepare the "Multi Species Action Plan for Wild Crop Relatives", investigations were carried out at 40 locations in two field studies carried out in Karacadağ (Şanlıurfa part) since the beginning of the project, the target plant taxa were observed in their natural habitats and plant samples were collected (**Appendix 1, 2 and 3**). The data obtained were integrated with the literature information and the findings of the past inventory studies. Active participation of all stakeholders in the planning process, which may affect the target types positively or negatively, was ensured. This study, which aims to develop the Karacadağ Steppes Multi Species Action Plan, is of great importance for the protection of plant biodiversity and sustainable food security. The multi species action plan, which will be developed with a participatory approach, is both the first example of a multi-species conservation approach and the first *in situ* conservation planning for Karacadağ Steppes.

2. GENERAL INFORMATION

Karacadağ is an extinct volcanic mountain located in the northeastern part of Şanlıurfa province in the Southeastern Anatolia Region, within the borders of Şanlıurfa, Diyarbakır and Mardin provinces.

It covers over an oval-shaped area with a diameter of 120 km (Figure 2). The area is located in the basic thematic maps of M43-b4, M43-c1, M43-c4, M43-d2, M43-d3, N43-a2, N43-b1, N43-b2, N43-b3 and N43-b4 on the 1/25.000 scaled topographic map.

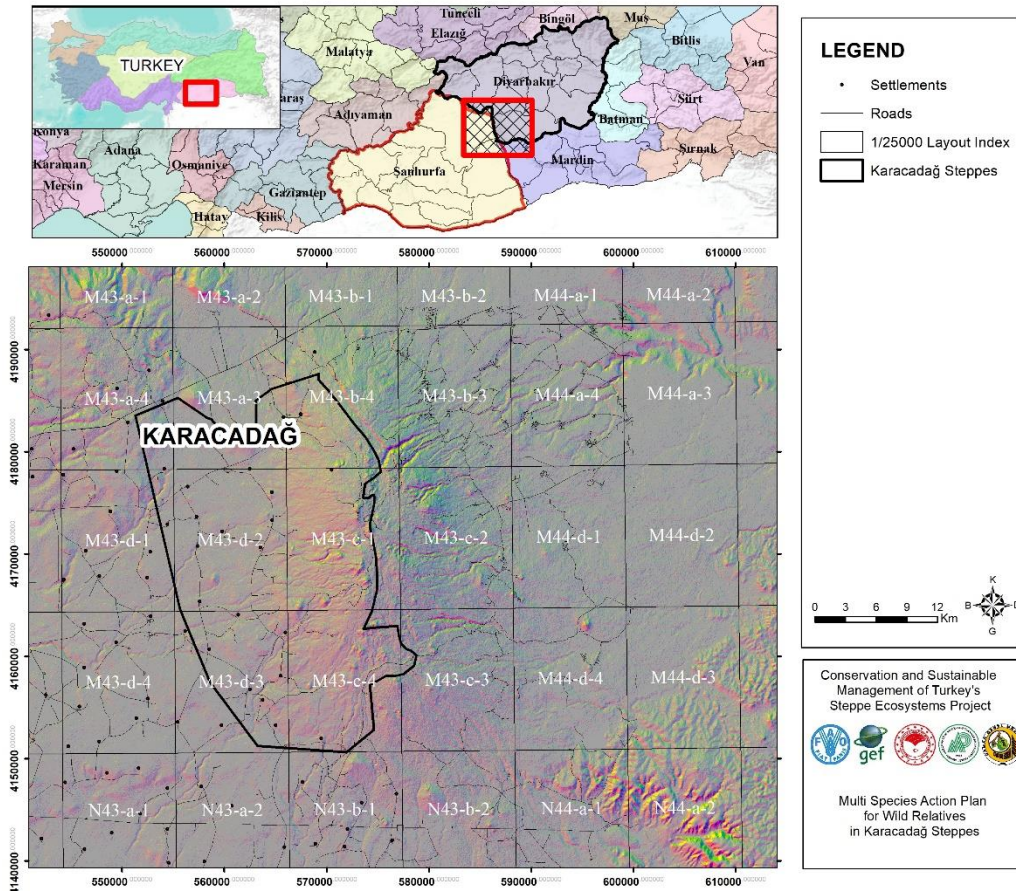


Figure 2. Karacadağ Steppes Project Area

Karacadağ volcano is in the form of a shield volcano formed by fluid lava. It has a diameter of 120 km and an area of 8000 km². It has a very low slope of 2%. It consists of basaltic lava. The eruptions occurred in three different periods (Ertekin, 2002). The volcano started its activity in the upper Miocene and erupted lava until 100,000 years ago (https://web.archive.org/web/20140303233030/http://www.emo.org.tr/ekler/ae2ace40e64d182_ek.pdf?tipi). Summers in Karacadağ are hot and dry. The Mediterranean precipitation regime is effective, with the most precipitation in winter and the least precipitation in summer. On Karacadağ, there are streams that dry in radial direction (https://web.archive.org/web/20140305073932/http://yunus.hacettepe.edu.tr/~kdirik/Gr_8.pdf).

Karacadağ, which is 1000 to 1981 m asl and consists of basaltic lavas, has steppe vegetation. In the surveys carried out in the Project area, intensive cattle and sheep grazing activities were encountered in most of the areas and outside the settlement. In these areas where grazing pressure is intense, only plants that are not preferred by animals are seen. As Kaya (2006) states, "There are *Gundelia tournefortii* var. *armata* and *Astragalus plumosus* var. *akardaghicus* between 1000-1500 m of the bare areas covered with basalt rocks formed by the destruction of forest areas and *Astragalus gummifer*, *Acantholimon acerosum* var. *acerosum*, *Phlomis kurdica*, *P. armeniaca* plant communities encountered between 1500-1950 m asl. These communities include early flowering bulbous plants such as *Crocus*, *Colchicum*, *Muscari*, *Ornithogalum*, and poisonous plants such as *Ranunculus kochii*, *Ceratocephalus falcatus* and *Senecio vernalis*. As stated in the "Surveys and Assessments On Biodiversity, Socio-Economic And Socio-Cultural Aspects, Ongoing Grazing Activities And Livestock Situation" report, which is the first phase of the project, 44 families, 199 genera and 332 taxa, 15 of which are endemic, are grown in Karacadağ. According to the number of taxon, respectively; Fabaceae are represented by 67, Asteraceae 45, Poaceae 22, Apiaceae 20 and Lamiaceae 20 taxa. The genera with the highest number of taxa are *Trifolium* with 22 taxa, *Vicia* with 11 taxa, *Astragalus* with 8 taxa, *Lathyrus* with 8 taxa and *Ranunculus* with 7 taxa, respectively. 15 endemic plants grow in the parts of Karacadağ that are included in the Project area. Of the endemic plants, 1 is in CR (Critical), 1 in EN (Endangered), 4 in VU (Vulnerable), 4 in NT (Near Threatened), 4 in LC (Least Concern), 1 in DD (Data Deficient). Of the plants identified in the area, 15 have economic importance for food, 8 for medicine and herbal medicine, 83 for meadows and pastures, 43 for landscape, 6 for genetic material, 2 for herbal tea, 2 for spices and 1 for essential oil.

3. IDENTIFYING THE TARGET SPECIES

In order to prepare the "Multi Species Action Plan for Crop Wild Relatives", investigations were carried out in 40 locations, target plant taxa were observed in their natural habitats, and plant samples were collected in two field excursions conducted in Karacadağ (Şanlıurfa part of) since the beginning of the project. The data obtained were integrated with the literature information and the results of the previous field survey, and active participation of all stakeholders in the planning process, which could positively or negatively affect the target species, was ensured.

3.1. Wild Crop Relatives in Karacadağ Steppes

The study area is a region where wild ancestors of many still cultivated cereal plants (wheat, barley, chickpea, lentil, pea) naturally spread. Crop wild relatives are threatened by loss, degradation and fragmentation of their natural habitats and competition by alien species. Although there are collections of crop wild relatives in Turkey and in Gene Banks around the world, it has been reported that genetic diversity is not adequately represented (Castañeda-

Álvarez, 2016). Conservation of genetic changes occurring in the natural habitat is only possible with *in situ* conservation methods. Today, many wild relatives are used as sources of important genes for both classical and modern breeding practices. Studies on the use of these species in breeding are increasing day by day thanks to increasing scientific knowledge and advancing technology. This wild genetic diversity serves as an insurance for global food security in terms of bringing new adaptive properties (resistance to diseases, drought, salinity, etc.) to cultivars.

Crop wild relatives in the area such as *Triticum dicoccoides* (wild emmer), *Triticum baeoticum* (wild einkorn), *Aegilops speltoides* var. *ligustica* (goat grass), *Pisum sativum* subsp. *sativum* var. *arvense* (field pea), *Lens culinaris* subsp. *orientalis* (wild lentil) and *Cicer echinospermum* (wild chickpea) species were identified and determined as target species. **The target species, wild relatives of major cereals and legumes, are herbaceous annuals that complete their life cycle within one year. Seeds that germinate in the spring develop and generally bloom between April and June. As with many cereal and legume cultivars, their flowers are not cross pollinated and are largely self-pollinating plants. After pollination, the plant forms seeds and dies. Seeds that fall onto the ground and remain dormant throughout the winter then germinate when suitable conditions are found to form the new generation.**

Since the habitat preferences of the target species and the main threat factors affecting the population size and distribution of the species are common, a multi-species approach has been adopted in the conservation planning of these species. In general, all six species are steppe plants, distributed in stony steppe areas, field edges and forest glades.

In determining the target species for which conservation planning will be prepared with a multi species action plan, first of all, the relativity with the cultivated plants and their potential to create a gene pool were taken into account. Of the target species, only *Cicer echinospermum* is endemic to Turkey. **In general, the target species are not narrowly distributed throughout the country. However, as wild relatives of cultivated plants, the origin of these species is in the Middle East (Ladizinsky, 1998), and their spatial distribution area is important as a center of diversity at a global scale.** The priority of these species in conservation is due to the fact that the Project area is the center of gene and diversity center for genetic resources of global importance. Other than the current protected area approach, the most important approach to *in situ* conservation of wild relatives of cultivated plants at global and national scales is the protection of these species by prioritizing them as the majority of protected areas are established to protect specific habitats or faunal elements. For this reason, CWR taxa are not generally monitored for their population demographics. Without monitoring and active conservation, genetic diversity within and between CWR populations may deplete and may even disappear (Maxted, 2013). Taxa descriptions are gathered from Cabi (2008) and Davis (1970).

3.1.1. Wild emmer (*Triticum dicoccoides*)

Emmer wheat (*T. dicoccon*), one of the ancient landraces of Anatolia, was emerged from domestication of Wild Emmer. Emmer is the ancestor of durum and bread wheat. The species has superior characteristics such as resistance to diseases and drought, richness in mineral substance content. Therefore, it is an important gene source in the development of modern wheat. The pictures of the sample of the species collected from the Project area are given in **Figure 3** and **Figure 4**.

General information about the species is given below.

Taxonomy

Kingdom (Regnum): Plantae

Phylum (Divisio): Magnoliophyta

Class (Class): Magnoliopsida

Order (Ordo): Poales Small

Family (Familia): Poaceae Barnhart

Genus (Genus): *Triticum* L.

Taxa (Species): *Triticum dicoccoides* (Koern.) Koern.



Figure 3. Dry sample of *Triticum dicoccoides*



Figure 4. *Triticum dicoccoides* and its habitat (© Nihan YENİLMEZ ARPA)

Description

Species: *Triticum dicoccoides* (Koern.) Koern. in litt. ex Schweinf. in Ber. Deutsch. Bot. Ges. 26a:309 (1908).

Annual. Culms 30-150 cm, glaucous, with 3-4 glabrous or puberulent nodes. Leaf sheaths covering 3/4 of the culms, usually glabrous sometimes lower leaf sheaths white-pilose. Ligule membranous up to 1.5 mm long. Auricles long up to 2.5 mm long. Leaf blades 10-30 cm long, glabrous or puberulent on abaxial and/or adaxial surface. Spike laterally compressed, 4-8(-10) x 0.7(-1.5) cm. Rachis fragile, densely hairy at nodes and margins, internodes (3-)4- 5 mm. Spikelets 3-flowered; 1-2 fertile, long-awned, uppermost rudimentary, unawned. Glumes lanceolate to elliptic-lanceolate, with wide hyaline margins, 10-15 mm, coriaceous, glabrous or sericeous-pilose, 2-keeled; one keel very prominent with projecting, 1-1.5 mm tooth. Fertile lemma navicular, 10-15 mm, glabrous, with 10-13(-15) cm scabrid awn, awn of lower floret slightly longer than that of upper. Palea membranous, as long as lemma, elliptic lanceolate, 10-14 mm long, two keeled, keels ciliate throughout the keels. Anthers short c. 2.5 mm long. $2n = 28$.

Phytogeographic Element: Irano-Turanian element.

Flowering: May-June

3.1.2. Wild einkorn (*Triticum baeoticum*)

Wild einkorn (*T. monococcum*) emerged as a result of the domestication of wild einkorn. Wild einkorn, which is one of the thousands of years old local varieties, is still cultivated in some regions today. Wild einkorn is an important gene source for the development of modern wheat due to its resistance to fungal diseases and its high genetic diversity. The pictures of the sample of the species collected from the Project area are given in **Figure 5** and **Figure 6**

General information about the species is given below.

Taxonomy

Kingdom (Regnum): Plantae

Phylum (Divisio): Magnoliophyta

Class (Class): Magnoliopsida

Order (Ordo): Poales Small

Family (Familia): Poaceae Barnhart

Genus (Genus): *Triticum* L.

Taxa (Species): *Triticum baeoticum* Boiss.



Figure 5. Dry sample of *Triticum baeoticum*



Figure 6. *Triticum baeoticum* (© Nihan YENİLMEZ ARPA)

Description

Species: *Triticum boeoticum* Boiss., *Diagnoses plantarum orientalium novarum* 2(13): 69. 1854.

Culms tufted, 30-120 cm, slender; green, pubescent or pilose at nodes. Leaf sheaths villous-pilose. Leaf blades 2-7 mm broad, villous-pilose, hairs stiff, those on the veins longer than those between, margins scabridulous. Spike erect, 5-14 cm, slender, lax, laterally compressed. Rachis fragile, densely hairy at nodes and margins, internodes 3-4 mm, readily disarticulating below spikelet at maturity spontaneously. Spikelets 12-17 mm, rectangular, 2- 3 flowered, one or two florets fertile. Glumes (4-)6-10 mm, coriaceous, yellow blackish- purple, glabrous or pubescent-pilose, 2-keeled; keels projecting as two unequal teeth, one keel prominent, scabridulous towards apex. Fertile lemma navicular, 10-14 mm, glabrous, with scabrid awn to 8 cm. Palea 8.5-11 mm, splitting at maturity. Anthers linear, c. 3-5 mm, yellow. Caryopsis ellipsoid, 6.5-8 x 2.5-3 mm. Endosperm flinty. $2n = 14$.

Flowering: May-June (July)

3.1.3. Goat grass (*Aegilops speltoides* var. *ligustica*)

Beyond being a close relative of the cultivated wheat, the goat grass is one of the species that is considered to be its ancestor. Wild emmer (*T. dicoccoides*) emerged as a result of the natural hybridization of Urartian wheat (*T. urartu*) and goat grass about 300-500 thousand years ago.

Wild emmer is the ancestor of the local landraces known today as kavlica or emmer (*T. dicoccon*).

The appearance of the sample of the species collected from the Project area is as in **Figure 7**.

General information about the species is given below.

Taxonomy

Kingdom (Regnum): Plantae

Phylum (Divisio): Magnoliophyta

Class (Class): Magnoliopsida

Order (Ordo): Poales Small

Family (Familia): Poaceae Barnhart

Genus (Genus): *Aegilops* L.

Taxa (Species): *Aegilops speltoides* Tausch var. *ligustica*



Figure 7. Dry sample of *Aegilops speltoides* var. *ligustica*

Description

Species: *Aegilops speltoides* Tausch var. *ligustica* (Savignone) Bornm. In Beih. Boots. cent. 26(2):438 (1910).

Slender, tufted annuals. Culms 20-70 cm (excl. spikes), geniculately ascending. Upper leaf blades linear-lanceolate, 5-10 cm long, 2-3 mm wide, glabrous, pilose or ciliate. Spike 6-20 cm (excl. awns), linear-oblong or narrowly cylindrical, with 6-13 spikelets ; rachis disarticulating in fruit or spike falling entire. Vestigial spikelets 1. Lateral spikelets oblong- lanceolate, 8-14 mm; glumes oblong, truncate and muticous, 5-9 mm, c. half as long as rachis segments, asymmetrical, veins parallel and of unequal width; florets 4, lemmas c.2x glumes, muticous or 1-awned. Uppermost spikelet with 2 lower lemmas each attenuate into a setaceous 2-12 cm awn. $2n=14$

Flowering: June(-July).

3.1.4. Field pea (*Pisum sativum* subsp. *sativum* var. *arvense*)

An important forage crop *Pisum sativum* subsp. *sativum* is rich in protein. Its seeds and shoots can be consumed as human food. *Pisum sativum* subsp. *sativum* taxon are a potential gene source in pea breeding. The appearances of the sample belonging to the taxon *Pisum sativum* subsp. *sativum* var. *arvense* are given in **Figure 8** and **Figure 9**.

General information about the species is given below.

Taxonomy

Kingdom (Regnum): Plantae

Phylum (Divisio): Magnoliophyta

Class (Class): Magnoliopsida

Order (Ordo): Fabales Bromhead

Family (Familia): Fabaceae Lindl.

Genus (Genus): *Pisum* L.

Taxa (Species): *Pisum sativum* L. subsp. *sativum* var. *arvense*
L. (Poiret)



Figure 8. Dry sample of *Pisum sativum* L. subsp. *sativum* var. *arvense*

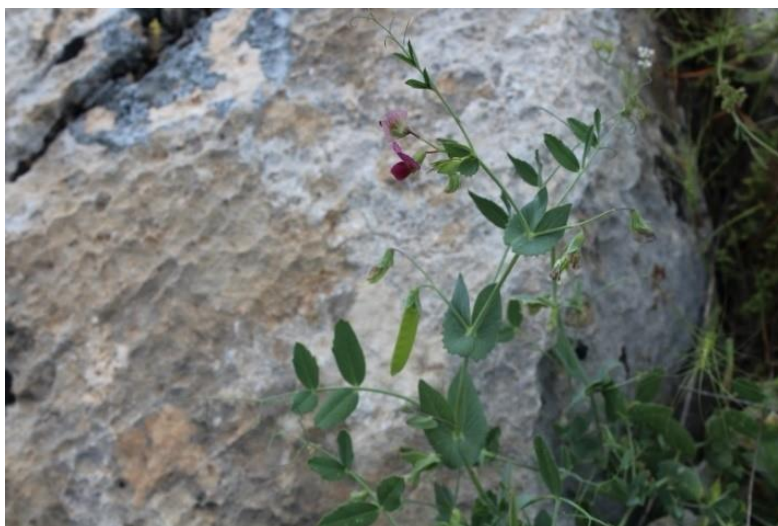


Figure 9. *Pisum sativum* L. subsp. *sativum* var. *Arvense*
(© Nihan YENİLMEZ ARPA)

Description

Species: *Pisum sativum* L. subsp. *sativum* var. *arvense* L. (Poiret), Sp. PI. 727 (1753)

Glabrous, glaucous annual, stems 10-200 cm, often climbing. Leaflets 1-4- paired, entire or dentate; stipules 1.5-8 cm long, obliquely ovate, dentate at least below, rounded and semi-amplexicaul at base; tendrils branched. Peduncle $\frac{1}{4}$ -4 x as long as the stipules, 1-3-flowered, with or without a short awn, usually larger than the leaflets. Flowers 16-30 mm, with a broad lilac standard and darker reddish-purple wings, or flowers white. Calyx 8-15(-20) mm; teeth sub-equal, longer than tube, ovate-lanceolate, \pm acuminate, herbaceous. Legume oblong-linear or linear, 40-70(-150) x 7-17(-30) mm; seeds 3-10, at least 5 mm diam., testa densely papillose, or smooth or wrinkled.

Flowering: April-May (June).

3.1.5. Wild lentil (*Lens culinaris* subsp. *orientalis*)

Wild lentil, which is in the primary gene pool of the cultivated lentil (*L. culinaris*), is an important gene source for increasing resistance to drought and diseases in breeding studies. The Pictures of the sample of the species are given in **Figure 10** and **Figure 11**.

General information about the species is given below.

Taxonomy

Kingdom (Regnum): Plantae

Phylum (Divisio): Magnoliophyta

Class (Class): Magnoliopsida

Order (Ordo): Fabales Bromhead

Family (Familia): Fabaceae Lindl.

Genus (Genus): *Lens* Mill.

Taxa (Species): *Lens culinaris* subsp. *orientalis* (Boiss.) Ponert



Figure 10. Dry sample of *Lens culinaris* subsp. *orientalis*



Figure 11. *Lens culinaris* subsp. *Orientalis* (© Nihan YENİLMEZ ARPA)

Description

Species: *Lens culinaris* subsp. *orientalis* (wild lentil-jasmine)

Slender, ± densely pilose annual, 10-30 cm tall. Leaves mucronate or the upper with simple tendrils; leaflets (2-)3-5(-7)-paired, obovate-oblong to linear, 5-9(-11) x 1-2 mm; stipules entire, obliquely lanceolate, unappendaged. Peduncles 1-3-flowered, not aristate or shortly so, 1-2 x the leaf. Calyx 4-6 mm, teeth much longer than tube. Corolla lavender, 1- 3/2 x calyx. Legume broadly rhomboid, 8-11 mm, glabrous. Seeds 2.5-3 mm.

Flowering: April-June.

3.1.6. Wild chickpea (*Cicer echinospermum*)

Wild chickpea is a close relative of the cultivated chickpea and is a species of great importance in terms of its narrow distribution. It was determined that *Cicer echinospermum* showed significant resistance to pea leaf miner (*Liriomyza huidobrensis*).

The appearance of the sample of the species collected from the Project area is as in **Figure 12** and **Figure 13**

General information about the species is given below.

Taxonomy

Kingdom (Regnum): Plantae

Phylum (Divisio): Magnoliophyta

Class (Class): Magnoliopsida

Order (Ordo): Fabales Bromhead

Family (Familia): Fabaceae Lindl.

Genus (Genus): *Cicer* L.

Taxa (Species): *Cicer echinospermum* P.H.Davis



Figure 12. Dry sample of *Cicer echinospermum*



Figure 13. *Cicer echinospermum*

Description

Species: *Cicer echinospermum* (wild chickpea-hedgehog chickpea)

Prostrate or procumbent annual, stems 20-35 cm. Leaves imparipinnate; leaflets 3-5(-6)-paired, obovate-oblong, 5-10 rom, ± doubly serrate above, pubes- cent with few glandular and numerous eglandular hairs. Stipules incised-dentate. Peduncle and pedicel much longer than the short petiole; awn usually less than 1 rom. Flowers solitary, 10-12 rom, dusky-mauve. Calyx subgibbous. Legume broadly ellipsoid, c. 16 rom, glandular-pilose. Seeds c. 2, conspicuously echinate.

Phytogeographic Element: Irano-Turanian element.

Endemism: Endemic.

Flowering: May

3.1.7. Conservation Status and Threat Categories

Aegilops speltoides "LC" and *Cicer echinospermum* "LC", which is endemic to our country, are in the category of Least Concern, according to the IUCN (2021) threat categories. The threat categories of the rest of the target species are not specified.

3.2. The Distribution and Population Status of the Target Species in Turkey and the World

3.2.1. The status in the World

The origin centers of the target species are the Middle East (Ladizinsky, 1998). The distributions of the species in the World are given in **Table 1**.

Table 1. The spatial distribution of the target species in the World

SPECIES	DISTRIBUTION IN THE WORLD
Wild emmer (<i>Triticum dicoccoides</i>)	It naturally grows in Turkey and also in Transcaucasia, Western Syria, Northern Iraq and Iran.
Wild eincorn (<i>Triticum baeoticum</i>)	It is widespread in Turkey and also in Balkans, Crimea, Western Syria, Northern Iraq, Iran and Afghanistan.
Goat grass (<i>Aegilops speltoides</i> var. <i>ligustica</i>)	Its distribution is known from Turkey and also in the Fertile Crescent and southeast of the Balkan Peninsula.
Field pea (<i>Pisum sativum</i> subsp. <i>sativum</i> var. <i>arvense</i>)	Known records outside of Turkey are cultivated forms.
Wild lentil (<i>Lens culinaris</i> subsp. <i>orientalis</i>)	It naturally grows in Turkey and also in Greece, Crimea, Cyprus, Western Syria, Syrian Desert, Transcaucasia, Northern Iraq and Iran.

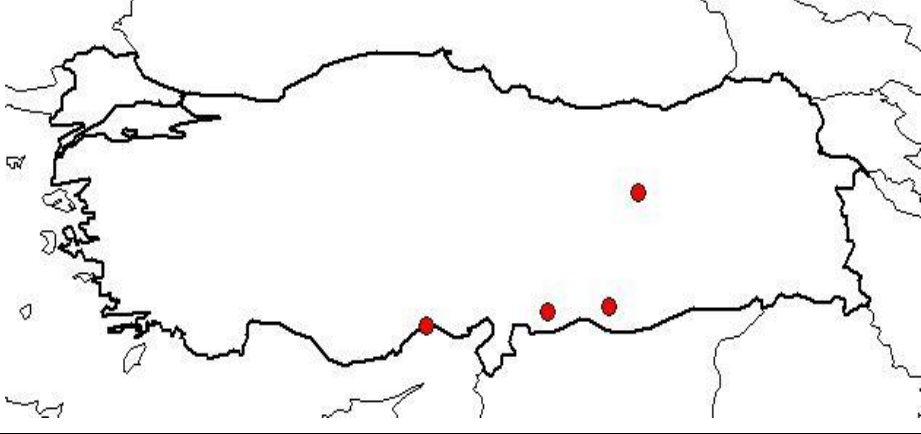
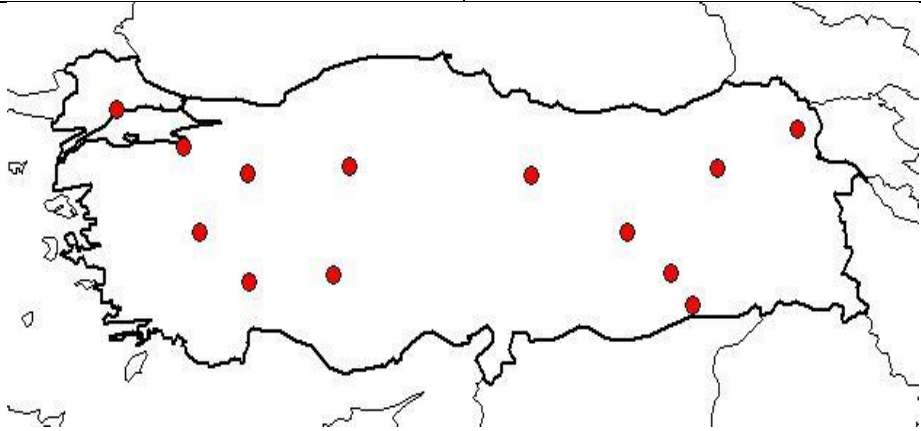
Wild chickpea (*Cicer echinospermum*)

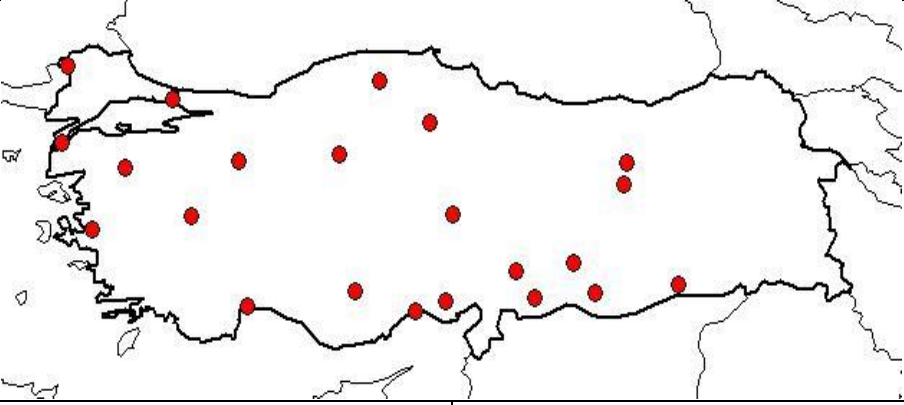
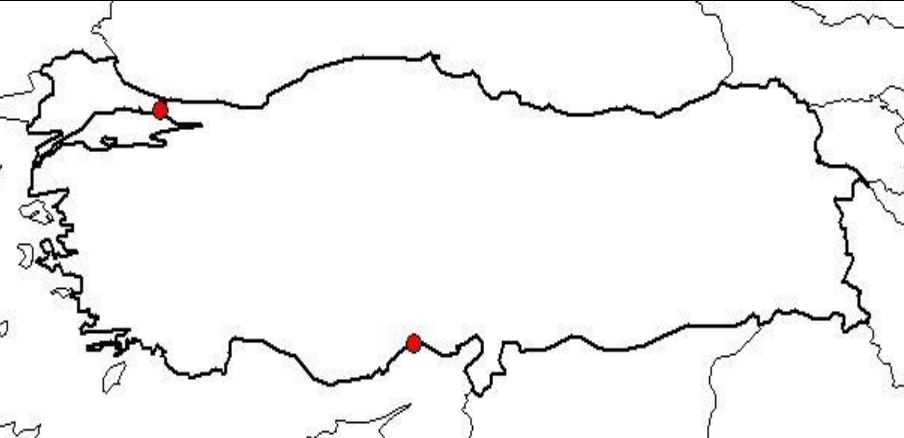
This endemic species is known only from Turkey.


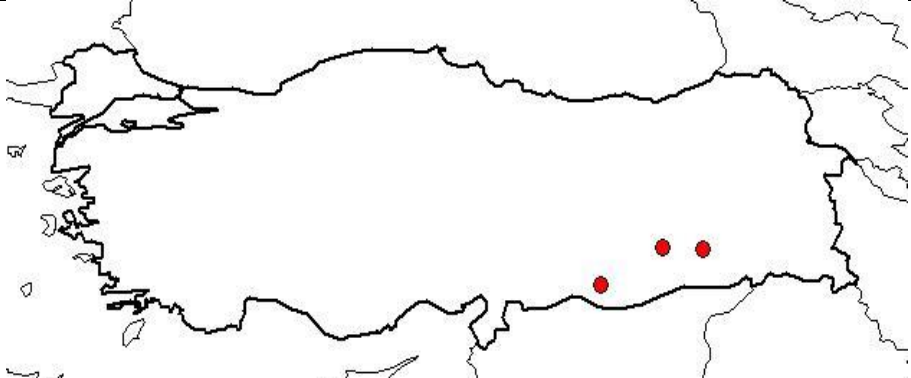
3.2.2. The Status in Turkey

The distributions of the species in Turkey are given in Table 2.

Table 2. The spatial distribution of the target species in Turkey

SPECIES	DISTRIBUTION AREA
<p>Wild emmer (<i>Triticum dicoccoides</i>)</p>	<p>It is known from Gaziantep, İçel, Tunceli and Şanlıurfa provinces. Its habitat is dry slopes and its altitude preferences are between 440-1650 m</p>
	
<p>Wild eincorn (<i>Triticum baeoticum</i>)</p>	<p>It is known from the provinces of Kars, Mardin, Ankara, Bursa, Diyarbakir, Elazig, Erzurum, Eskisehir, Isparta, Konya, Sivas, Sanliurfa, Tekirdag, Uşak. They are found in basalt and calcareous soils, steppe and field edges as habitat. Elevation preferences are between 100-2000 m.</p>
	

SPECIES	DISTRIBUTION AREA
<p>Goat grass (<i>Aegilops speltoides</i>)</p>	<p>It is known from Adana, Gaziantep, Istanbul, Mardin, Kastamonu, Adiyaman, Ankara, Antalya, Balikesir, Çanakkale, Çorum, Edirne, Erzincan, Eskişehir, İçel, İzmir, Kayseri, Kahramanmaraş, Tunceli, Şanlıurfa, Uşak and Karaman provinces. It is found in oak bushes, plains, field edges, stony slopes and coastal dunes as habitat. Altitude preferences can go up to 1400 m from sea level</p>
	
<p>Field pea (<i>Pisum sativum</i> subsp. <i>sativum</i> var. <i>arvense</i>)</p>	<p>It is known from the provinces of Istanbul, İçel and Şanlıurfa. It is usually found on field edges.</p>
	

SPECIES	DISTRIBUTION AREA
<p style="text-align: center;">Wild lentil (<i>Lens culinaris subsp. orientalis</i>)</p>	<p>It is known from the provinces of Mardin, Siirt, Şırnak, Amasya, Ankara, Antalya, Denizli, İzmir, Malatya, Kahramanmaraş, Niğde, Tokat and Şanlıurfa. It is found in the steppe and field edges as a habitat. Altitude preferences can be up to 1500 m from sea level.</p>
	
<p style="text-align: center;">Wild chickpea (<i>Cicer echinospermum</i>)</p>	<p>It is known from Batman, Diyarbakır and Şanlıurfa provinces. It has been identified from oak bushes, rocky slopes, meadows and empty areas as habitat. Elevation preferences were between 700-1100 m.</p>
	

3.2.3. The Status of Target Species in Karacadağ Steppes

Triticum dicoccoides was found in all three hot spots in the Project area.

Triticum baeoticum was found in the Oak Forest and Simo Creek Valley.

Aegilops speltoides var. *ligustica* taxon was found only in the Oak Forest.

Pisum sativum and *Lens culinaris* subsp. *orientalis* taxa were found only in the Honey Forest.

Cicer echinospermum was found only in Simo Creek Valley. Due to its sensitivity to grazing pressure, it is found in limited areas such as stony borders at the edges of the fields.

There is insufficient monitoring data on any of the target species, and changes and trends in population size or distribution in the area are unknown.

The coordinates of the points where the target species are found are given in Appendix 1, and their distribution in the area is given in Appendix 2 and **Figure 14**.

3.3. The Hot Spots Identified for Wild Crop Relatives in Karacadağ Steppes

Considering the field studies conducted in 40 locations in Karacadağ steppes (**Annex 1**) and previous inventory results, three priority areas were determined as Hot Spots in terms of *in situ* conservation within the scope of the Crop Wild Relatives (CWR) multi species action plan. Selected hotspots are sites that contain at least three of the target species together and are their natural habitats. Observations and plant collection studies were carried out in hot spots (**Appendix 3**). Identified hotspots were named based on the geographical name of the area or local names. The map obtained as a result of the comparison of the coordinates of the hotspots with the areas identified as PCA in the inventory study is given in **Figure 14**. According to this map, one of the hot spots, Simo Creek Valley is within PCA-1 borders, Karacadağ Honey Forest is within PCA-3 boundaries, but Residue Oak Forest, which was identified as a hot spot in our study, is not within PCA (**Figure 14**).

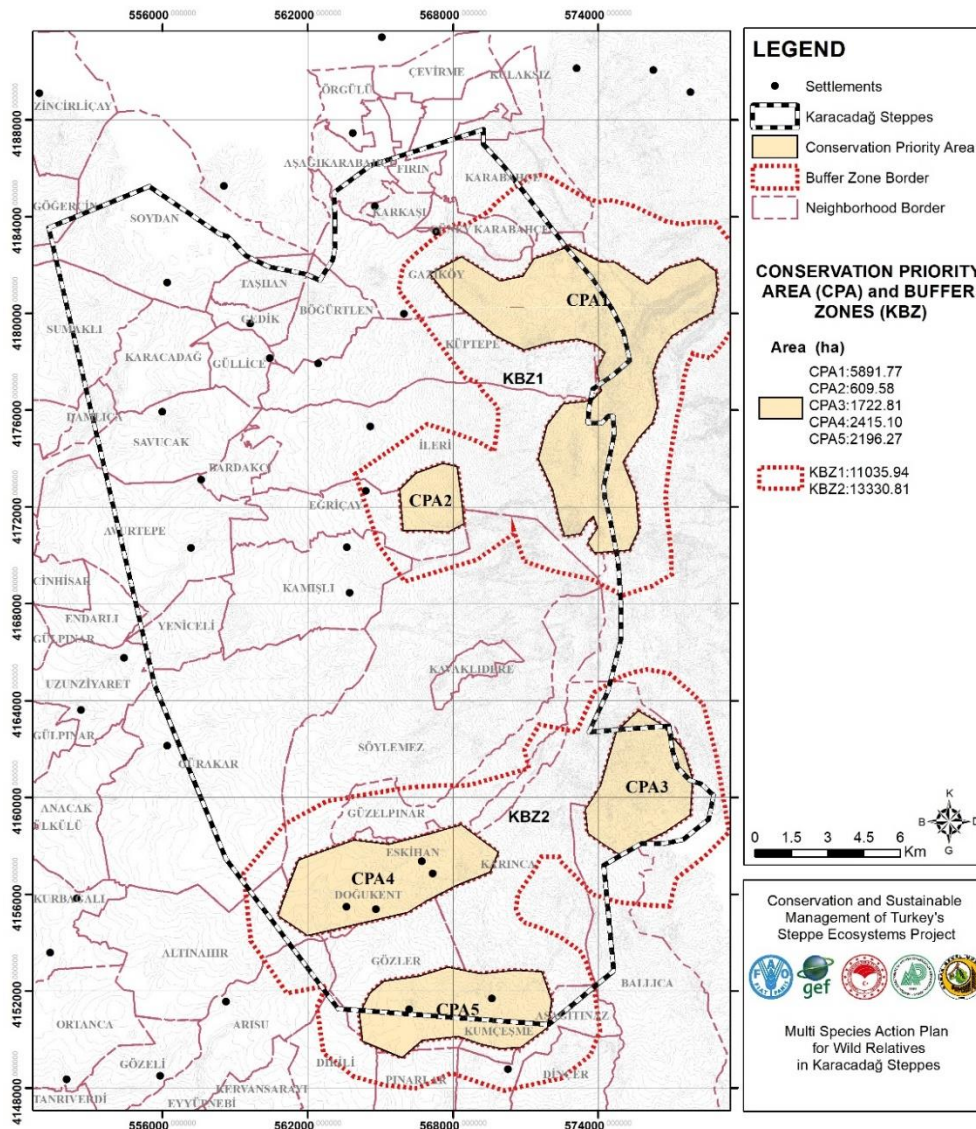


Figure 14. Identified Hot Spots and Priority Conservation Areas

3.3.1. Soydan Relic Oak Forest Glades

In Karacadağ, where forest areas were once mentioned 40-50 years ago, trees are encountered in small groups today (Ertekin, 2002). The most prominent of these tree communities is the remnant Oak Forest near Soydan Village, close to the Siverek-Diyarbakır road (Figure 15, Figure 16). The area, located approximately 4 km northwest of Soydan pond, is surrounded by pastures, steppes and agricultural fields. Basalt rocks and stones are very dense in the forest cover and vegetation is not developed in such places. However, due to this geomorphological structure, it is not suitable for grazing animals, which has caused the area to be relatively protected from grazing pressure.

There is a sparse herbaceous steppe vegetation structure mostly of Wheatgrass (Poaceae) species in the glades of the Oak Forest with *Quercus brantii* Lindl. Target species identified in oak forest steppes are *Triticum dicoccoides*, *Triticum baoticum*, *Aegilops speltoides* var. *ligustica*.

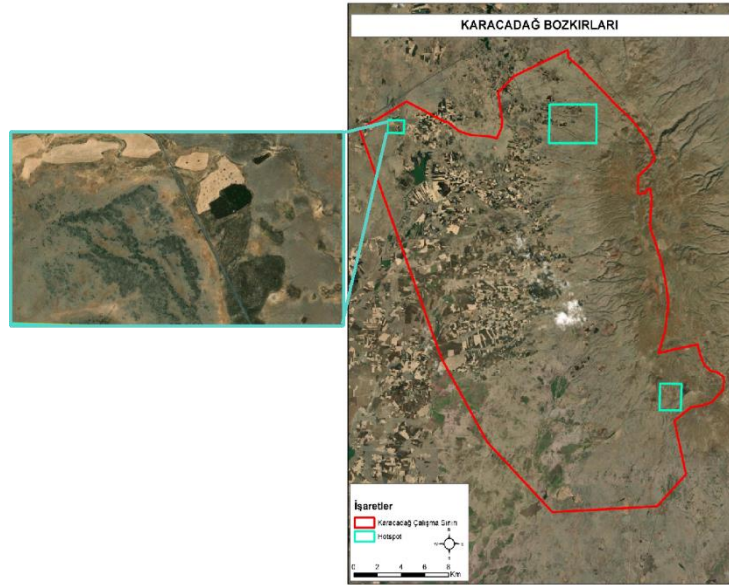


Figure 15. The location of the Relic Oak Forest, one of the important habitats for the CWR, in the Project area



Figure 16. Relic Oak Forest Glades (© Burcu TARIKAHYA HACIOĞLU)

3.3.2. Honey Forest Glades

It is located in the afforestation area established by the Şanlıurfa Regional Directorate of Forestry, approximately 15 km south-southeast of the Karacadağ ski resort (Figure 17 and Figure 18). In the field, which is afforested with almond (*Prunus dulcis* (Mill.) D.A.Webb), hives are located from place to place. The target species found in the Honey Forest Steppes, which are on the Viranşehir-Diyarbakır road and are under protection with wire mesh are; *Triticum dicoccoides*, *Pisum sativum* subsp. *sativum* var. *arvense*, *Lens culinaris* subsp. *orientalis*.

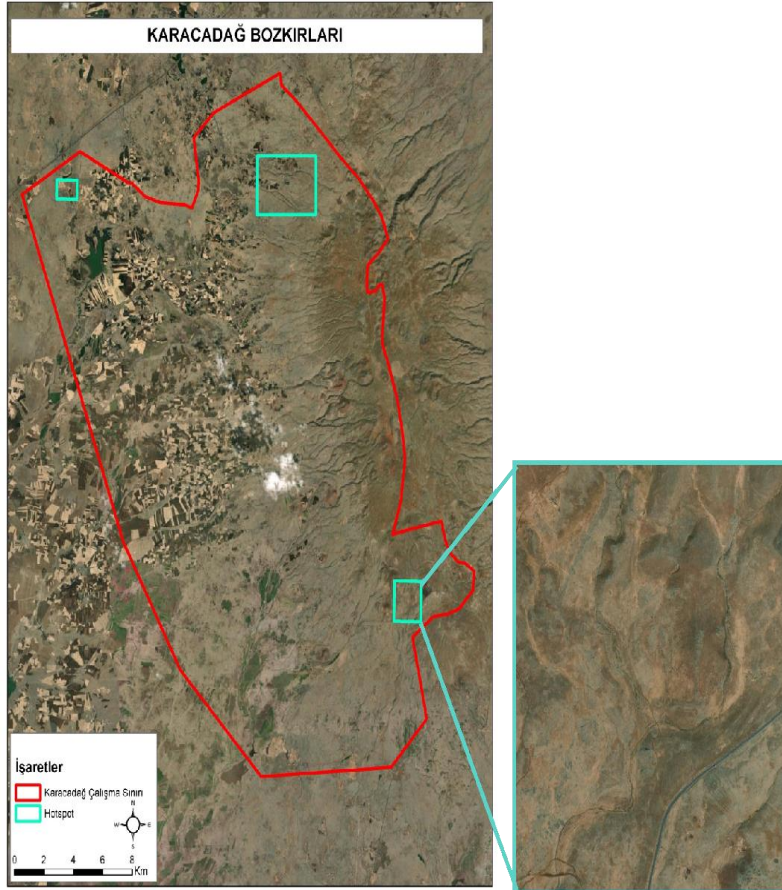


Figure 17. The location of Honey Forest Glades in the Project area, one of the important habitats for CWR



Figure 18. Karacadağ Honey Forest Glades (© Şenay BOYRAZ TOPALOĞLU)

3.3.3. Simo Creek Valley

Many of the hills in the project area were split by small streams that dried up in summer. It was determined that some of the target species generally spread along Simo Creek on the road from Karabahçe village to the north-northwest of Karacadağ to the TRT transmitter. During the field studies, the valleys on both sides of this road were scanned in detail (Figure 19 and Figure 20).

The target species in Simo stream valley are; *Triticum dicoccoides*, *Triticum baeoticum*, *Cicer echinospermum*.

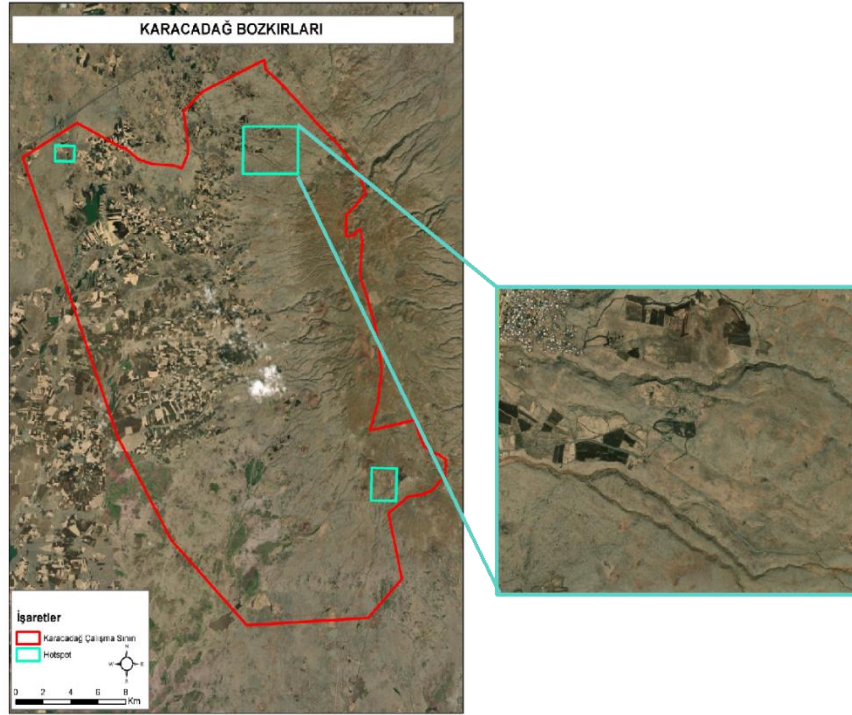


Figure 19. Location of Simo Creek Valley, one of the important habitats for CWR, in the Project area



Figure 20. Simo Creek Valley (© S. Serhat ARDA)

4. RELEVANT NATIONAL LEGISLATION AND INTERNATIONAL CONVENTIONS

Although wild relatives of cultivated plants are valuable in terms of genetic resources and under environmental threats, only one of the target species (*Cicer echinospermum*) included in this study is endemic and has been identified as IUCN endangered category LC. The study is in harmony with the “Şanlıurfa Steppe Conservation Strategy and Action Plan” and the “National Steppe Conservation Strategy and Action Plan”. However, both the provisions of national legislation and international conventions are taken into account in preparing conservation activities for the target species. Turkey is a member of one of the most important organizations operating for the protection of genetic resources, including these species, the Commission for the Conservation of Genetic Resources for Food and Agriculture (CGRFA) within the body of FAO. National legislation and international conventions regarding the protection of both these species and their habitats are given in **Table 3**.

Table 3. The related national legislations and international conventions

Legislation name	Related section	Published in the Official Gazette and/or The date when Turkey became a party to the convention
National Legislation		
Environmental Law	Article 9 subparagraphs a, c, f and g contain provisions regarding the protection of species and their habitats.	11 August 1983 RG: 18132
Regulation on the Collection, Conservation and Use of Plant Genetic Resources	It covers the regulations regarding the protection of plant genetic resources in and outside the natural habitat..	15 August 1992 RG:21316
International Conventions		
Convention on Biological Diversity	The Convention obliges the parties to make plans and develop programs for the conservation of biological diversity, its sustainable use, and the protection of threatened species.	14 May 1997 RG: 4177
Convention on Trade in Endangered Species (CITES):	-	20 June 1996 RG: 22672
Convention for the Protection of Wildlife and Habitats (Bern Convention)	-	20 February 1984 RG: 18318
International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)	In line with the Convention on Biological Diversity, it regulates the conservation of genetic resources, including wild crop relatives, in and out of their natural environment.	8 August 2006 RG: 26253

5. THREATS AND LIMITING FACTORS

Threats and limiting factors have been observed in the areas where the target species are found. Accordingly, within the scope of the study, two important threats were identified, namely "overgrazing" and "early grazing", which may cause complete extinction of CWR in some hot spots. Other threats given above are of low priority and although some of them affect the distribution and demographics of the species in the world and Turkey, they are not directly threatened for the study area (For example, road construction, urbanization, etc.).

Grazing constitutes the most important pressure in the area for the floristic structure. Grazing, especially in the early period, causes the parts of the productive organs of the annual plants to disappear before the seed formation period and they cannot form new individuals next year. For this reason, the number of individuals in the population is constantly decreasing and the existence of annual plants in the area is in danger. Since all plants included in the target species are annual species, these plants could be detected in steep rocky areas where animals could not reach or prefer. Hot spots recommended as conservation areas were also selected from areas where animal access is difficult, in order to be a sustainable conservation area.

Monitoring studies are needed to assess the impact of climate change and drought on species demographics.

In the 1st Thematic Workshop, direct and indirect threats were identified with the participatory approach of the stakeholders. Indirect threats have been identified as population growth, climate change, scarcity of scientific studies, lack of awareness (not recognizing the species), Legislation/management deficiencies, Policy deficiencies (Supporting policies are not based on CWR).

Direct threats are imminent human activities or processes that have affected, affect or may affect the status of the taxon under consideration. In the light of the results, the classification of direct threats in the area was made according to the "IUCN-CMP Unified Classification of Direct Threats" (IUCN, 2012a). Accordingly, the eight threats to the habitats of target species and their hierarchical categories in the "IUCN Threat Classification Chart" are as in **Table 4**.

Table 4. Classification of threats

IUCN Threat Category			Definition
2. Agriculture and Fisheries	2.1 Annual & Perennial Non-Timber Crops	2.1.1 Shifting Agriculture	Shift in agricultural land use for the production of new species such as tomatoes
		2.1.2 Small Holder Farming	Field and garden plantation such as crop, vegetable and pistachio plantations
	2.3 Livestock and Farming	2.3.1 Nomadic Grazing	Early and overgrazing due to nomadic livestock activities that use the area seasonally
		2.3.2 Small-holder Grazing, Ranching or Farming	Early and overgrazing due to established livestock activities
7. Natural System Changes	7.2 Dams & Water Management/Use	7.2.3 Abstraction of Surface Water (agricultural use)	Pond construction for the use of surface waters in agriculture
		7.2.7 Abstraction of Ground Water (agricultural use)	Drainage and pump irrigation activities for the use of groundwater in agriculture
9. Pollution	9.3 Agriculture and Forestry Wastewater	9.3.3 Herbicides and Pesticides	Use of pesticides in the field and surrounding agricultural areas
11. Climate Change & Severe Weather	11.2 Droughts	11.2.1 Lack of precipitation	Drought due to low rainfall

While analyzing the threats, the impact score was calculated by taking into account the scope and severity and how they affect the target species. Accordingly, the “IUCN Threat Impact Scoring System” (IUCN, 2012b) was used.





Scope is defined as the proportion of the population that can be expected to be affected by the threat within 10 years if the current situation and trends continue.

Severity is the level of damage to the species by the continuation of existing conditions and trends (including potential new threats). Threat level is evaluated within the framework of 10 years or 3 generations, whichever is longer.

Timing was not used in the calculation of threat impact. Only threats that are ongoing or expected to occur in the short term (10 years or more) are considered in the calculation of threat impact. Threats that were thought to have been ongoing for at least 10 years were stated as “past and ongoing”.

The impact level indicates the extent to which the target species of the multi species action plan are threatened in the Karacadağ Steppes. The analysis of timing, scope and severity in the scoring of each threat is given in **Table 5**. The impact scores were calculated according to scope and severity; 3 points are added for current threats and 1 point is added for future threats.

Table 5. The Threats

IUCN Threat Category			Scope ¹	Severity ²	Impact score ³		Timing
					Today	Future	
2. Agriculture and Fisheries	2.1 Annual & Perennial Non-Timber Crops 2.3 Livestock and Farming	2.1.1 Shifting Agriculture	2	1	6	4	In the past and ongoing
		2.1.2 Small Holder Farming	1	2	6	4	In the past and ongoing
		2.3.1 Nomadic Grazing	2	3	8	6	In the past and ongoing
		2.3.2 Small-holder Grazing, Ranching or Farming	3	3	9	7	In the past and ongoing
7. Natural System Changes	7.2 Dams & Water Management/Use	7.2.3 Abstraction of Surface Water (agricultural use)	1	1	5	3	In the past and ongoing
		7.2.7 Abstraction of Ground Water (agricultural use)	1	1	5	3	In the past and ongoing
9. Pollution	9.3 Agriculture and Forestry Wastewater	9.3.3 Herbicides and Pesticides	1	1	5	3	In the past and ongoing
11. Climate Change & Severe Weather	11.2 Droughts	11.2.1 Lack of precipitation	3	2	8	6	In the past and ongoing
			¹ Scope score: Affects the whole population (>90%) (3) Affects the majority of the population (50-90%) (2) Affects the minority of the population (<50%) (1) Unknown (0) ² Severity score: Very rapid (3) Rapid (2) Slow (1) Fluctuating (1) Negligible (0) ³ Impact score: High (8-9)  Medium (6-7)  Low (3-5)  Negligible (0-2) 				

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APPENDICES

APPENDIX 1: List of Observation and Collection Locations for Identification of Crop Wild Relatives

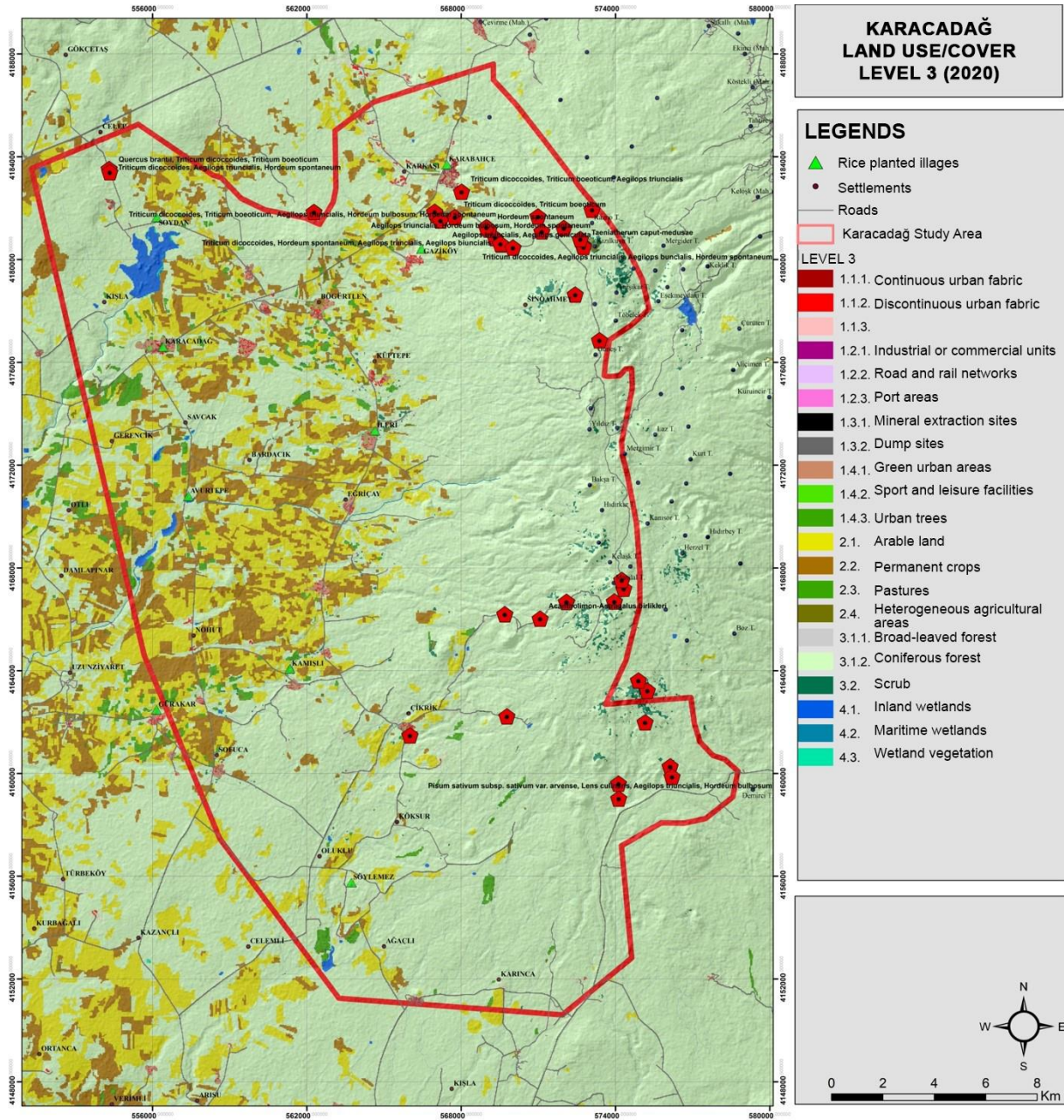
The field work carried out between 19-22 May 2021 and the target taxa determined in the relevant coordinates

Coordinates	Taxa
N 37° 46' 20" E 39° 47' 14"	<i>Aegilops triuncialis</i> , <i>Hordeum bulbosum</i> , <i>Hordeum spontaneum</i>
N 37° 46' 10" E 39° 49' 33"	<i>Taeniatherum caput-medusae</i>
N 37° 45' 08" E 39° 49' 20"	-
N 37° 46' 12" E 39° 47' 23"	<i>Triticum dicoccoides</i> , <i>Aegilops triuncialis</i> , <i>Aegilops buncialis</i> , <i>Hordeum spontaneum</i>
N 37° 47' 51" E 39° 37' 01"	<i>Triticum dicoccoides</i> , <i>Aegilops triuncialis</i> , <i>Hordeum spontaneum</i>
N 37° 34' 31" E 39° 50' 22"	<i>Pisum sativum</i> subsp. <i>sativum</i> var. <i>arvense</i> , <i>Lens culinaris</i> , <i>Aegilops triuncialis</i> , <i>Hordeum bulbosum</i>
N 37° 35' 11" E 39° 51' 44"	-
N 37° 46' 50" E 39° 45' 40"	<i>Cicer echinospermum</i> , <i>Hordeum distichon</i> (escaped from culture), <i>Triticum dicoccoides</i> , <i>Aegilops triuncialis</i> , <i>Aegilops buncialis</i> , <i>Hordeum spontaneum</i> , <i>Hordeum bulbosum</i> , <i>Lathyrus aphaca</i> ,
N 37° 46' 28" E 39° 48' 28"	-
N 37° 46' 13" E 39° 47' 22"	<i>Triticum dicoccoides</i> , <i>Hordeum spontaneum</i> , <i>Aegilops triuncialis</i> , <i>Aegilops biuncialis</i>
N 37° 46' 31" E 39° 47' 04"	<i>Hordeum spontaneum</i>
N 37° 46' 55" E 39° 42' 26"	-
N 37° 36' 47" E 39° 51' 09"	-
N 37° 37' 00" E 39° 50' 55"	-
N 37° 36' 07" E 39° 51' 05"	-
N 37° 34' 58" E 39° 51' 47"	-
N 37° 46' 54" E 39° 45' 38"	-

The field work carried out between 16-20 June 2021 and the target taxa determined in the relevant coordinates

Coordinates	Taxa
N 37° 47' 47" E 39° 37' 02"	<i>Quercus brantii</i> , <i>Triticum dicoccoides</i> , <i>Triticum boeoticum</i> , <i>Aegilops speltoides</i> var. <i>Ligustica</i>
N 37° 46' 34" E 39° 47' 0"	<i>Triticum dicoccoides</i> , <i>Triticum boeoticum</i> , <i>Aegilops triuncialis</i> , <i>Hordeum bulbosum</i> , <i>Hordeum spontaneum</i>
N 39° 46' 15" E 39° 47' 11"	<i>Triticum dicoccoides</i> , <i>Triticum boeoticum</i>
N 37° 46' 8" E 39° 47' 42"	<i>Aegilops triuncialis</i> , <i>Aegilops geniculata</i>
N 37° 46' 47" E 39° 46' 10"	<i>Triticum dicoccoides</i> , <i>Triticum boeoticum</i>
N 37° 34' 50" E 39° 50' 22"	-
N 37° 35' 53" E 39° 44' 52"	-
N 37° 46' 43" E 39° 45' 47"	-
N 37° 36' 16" E 39° 47' 26"	-
N 37° 38' 25" E 39° 47' 24"	-
N 37° 38' 19" E 39° 48' 20"	-
N 37° 38' 40" E 39° 49' 02"	-
N 37° 38' 40" E 39° 50' 18"	-
N 37° 38' 56" E 39° 50' 33"	-
N 37° 39' 07" E 39° 50' 30"	-
N 37° 44' 10" E 39° 49' 58"	-
N 37° 46' 8" E 39° 49' 34"	-
N 37° 46' 55" E 39° 49' 48"	-
N 37° 46' 18" E 39° 49' 29"	-
N 37° 46' 32" E 39° 49' 3"	<i>Aegilops triuncialis</i> , <i>Aegilops geniculata</i> , <i>Velezi pseudorigida</i>
N 37° 46' 47" E 39° 48' 22"	-
N 37° 47' 19" E 39° 46' 21"	<i>Triticum dicoccoides</i> , <i>Triticum boeoticum</i> , <i>Aegilops triuncialis</i>

APPENDIX 2: The Map of Observation and Collection Locations for Detection of Crop Wild Relatives



Point representation of the localities and identified species on the map during the field studies.

APPENDIX 3: A Sampling Field Form of the Study of the Crop Wild Relatives

SAMPLING FIELD FORM

Survey Date:	22 /05/2021		
Sample Area Number:	2		
Locality:	3 rd km between Karabahçe and Karacadağ, Simo Stream, inside the valley, basalt rock, steppe, south aspect, slope %50, 1498 m, K 37° 46' 13" D 39° 47' 22"		
Sample Size:	5 m x 5 m		
Target Species in the Field:	<i>Triticum boeoticum</i> <i>T. dicoccoides</i>		
Associated Species:	<i>Hordeum spontaneum</i> , <i>Aegilops</i> spp., <i>Astragalus</i> sp., <i>Eryngium</i> sp., <i>Capsella bursa-pastoris</i> , <i>Salvia</i> sp., <i>Gundelia tournefortii</i>		
Target species name	<i>Triticum dicoccoides</i>	Target species name	
Number of target species	7 cohorts ca. 100 individuals	Number of target species	
Abundance and degree of cover	%30	Abundance and degree of cover	
Target species name		Target species name	
Number of individuals of the target species		Number of individuals of the target species	
Abundance and degree of cover		Abundance and degree of cover	
Notes: We found the target species on approximately 2 acres of an area, <i>T. dicoccoides</i> with more than 100 in all areas.			