EXECUTIVE SUMMARY

As Türkiye's largest metropolis, the city of Istanbul is located at the intersection of the Mediterranean and Euro-Siberian biogeographical regions. Owing to this transitional position, Istanbul hosts a wide variety of ecosystems, including natural landscapes, forested areas, water resources, and diverse habitats. Historical groves, wetlands, and forested zones constitute the main components of the city's biodiversity by supporting diverse vegetation types, wildlife, lichen communities, and soil structures. A high level of biodiversity enhances ecosystem resilience and ensures ecological continuity.

Biodiversity is a subject of significant interest at the international level. The targets defined in the **Kunming–Montreal Global Biodiversity Framework**, adopted by the United Nations on 19 December 2022—such as ecosystem restoration and reducing the spread of invasive species by half—underscore the importance of this project at the urban scale. In this context, the establishment of a sustainable urban ecosystem in Istanbul is only possible through a balanced and healthy interaction between human activities, the natural environment, and built environments.

The project titled **"Identification of Flora, Fauna, and Lichen Species, Soil Analyses, and Ecological Risk Assessment of Istanbul Province ISKI Drinking Water Basins, Urban Forests, and Groves"**, tendered by the Istanbul Metropolitan Municipality, Department of Parks, Gardens and Green Areas, Directorate of Green Areas and Facilities Construction, was coordinated by the Urban Ecological Systems Branch Directorate. The Biodiversity Project was implemented between **January 2023 and February 2024** with the aim of planning, implementing, and disseminating ecology-based strategies and objectives related to the protection, development, and sustainability of urban ecosystems.

In the first phase of the Istanbul Biodiversity Project, ecological risk assessments were carried out with the objectives of identifying all biotic and abiotic components and protecting the natural habitats of living organisms within **9 Historical Groves, 4 Urban Forests, and 5 Drinking Water Basins**, which play a significant role in the urban ecosystem. Within the scope of the project, species inventories for flora, fauna, and lichens were conducted for each study area, and comprehensive soil analyses were performed. Based on the data obtained, ecological risks at the urban scale were identified and evaluated using a **Likert scale ranging from 1 to 5**. Finally, recommendations were developed to support the conservation, sustainability, and enhancement of the urban ecosystem.

STUDY AREA

The study area comprises **9 Historical Groves, 4 Urban Forests**, and **5 Drinking Water Basins**, which fall under the responsibility of the Istanbul Metropolitan Municipality, Department of Parks, Gardens and Green Areas. In addition, within the scope of the **Joint Service Protocol on the Preparation and Implementation of Green Belt Master Plans and Application Projects in Drinking Water Basins, and the Maintenance of Afforested Areas**, signed between the Istanbul Metropolitan Municipality (IMM) and ISKI on **17 February 2021**, the **Büyükçekmece, Terkos, Ömerli, Sazlıdere, and Elmalı Drinking**

Water Basins (up to the medium-distance protection zone) are included within the study area (Table 1).

Within the scope of the project, ecological observations and research were conducted across **18 locations**, covering a total area of **49,002.23 hectares**.

Table 1. Study Areas of the Istanbul Biodiversity Project – Phase I

No.	Area Name	Area Type	District	Area (ha)
1	Fethi Paşa Grove	GROVES	Üsküdar	13.40
2	Hidiv İsmail Paşa Grove	GROVES	Beykoz	18.86
3	Küçük Çamlıca Grove	GROVES	Üsküdar	27.10
4	Büyük Çamlıca Grove	GROVES	Üsküdar	15.40
5	Emirgan Grove	GROVES	Sarıyer	43.00
6	Beykoz Grove	GROVES	Beykoz	27.93
7	Yıldız Grove	GROVES	Beşiktaş	36.87
8	Harem Grove	GROVES	Üsküdar	3.70
9	Gülhane Grove	GROVES	Fatih	11.70
10	Atatürk Urban Forest	URBAN FORESTS	Sarıyer	107.00
11	Florya Atatürk Forest	URBAN FORESTS	Bakırköy	64.60
12	Rahmi Demir Urban Forest	URBAN FORESTS	Çekmeköy	33.38
13	Yakuplu Urban Forest	URBAN FORESTS	Beylikdüzü	5.29
14	Büyükçekmece Basin	DRINKING WATER BASINS	—	9,815.00
15	Sazlıdere Basin	DRINKING WATER BASINS	—	7,400.00
16	Terkos Basin	DRINKING WATER BASINS	—	13,490.00
17	Elmalı Basin	DRINKING WATER BASINS	—	2,837.00
18	Ömerli Basin	DRINKING WATER BASINS	—	15,052.00
TOTAL				**49,002.23**

PHASE I OF THE ISTANBUL BIODIVERSITY PROJECT

Within the completed first phase of the Istanbul Biodiversity Project, explanations, assessments, and recommendations are provided through **seven main processes**, as outlined below:

1. Identification of herbaceous and woody plant species,
2. Identification of rare and endemic flora species,
3. Identification of lichen species,
4. Determination of soil structure,
5. Identification of terrestrial fauna compositions,
6. Identification and assessment of ecological characteristics and ecological risks,
7. Development of recommendations and action scenarios to ensure the sustainability of ecosystem health.

METHODOLOGICAL APPROACH

The Istanbul Biodiversity Project was conducted through literature reviews carried out by flora, fauna, lichen, and soil working groups; ecological observations; research activities; and the preparation of field survey forms. The study employed a wide range of methods, including audio, video, and photographic recordings, camera traps, and laboratory analyses. Analyses were conducted across all study areas, and a report covering **four seasonal periods** was prepared.

Throughout the study period, no damage was caused to the study areas, and all necessary permits were obtained from the relevant authorities. The Istanbul Biodiversity Project was carried out by a team consisting of **16 academic experts**, **8 supervisory control staff**, and **15 field personnel** responsible for the study areas.

The expert teams established for each working group are presented in **Table 2**.

Within the scope of the project, the existing biodiversity inventory for each study area was identified, and issues related to the preparation of action scenarios for the sustainability of ecological balance in subsequent phases were addressed. In the final stage, an approach for the assessment of ecological risks was developed.

Table 2. Working Groups and Expert Team

Flora Working Group

Area of Expertise	Name	Institution / Location
Forest Botany Specialist	Prof. Dr. Fatma Neriman ÖZHATAY	Istanbul University / Istanbul
Flora Specialist	Prof. Dr. Evran CABİ	Namık Kemal University / Tekirdağ
Flora Specialist	Dr. Ümit SUBAŞI	Private Sector / Ankara
PhD Candidate	Burçin ÇINGAY	Ali Nihat Gökyiğit Foundation – Nezahat Gökyiğit Botanical Garden
Flora Specialist	Dr. Fatoş Şekerciler SUBAŞI	Private Sector / Ankara

Fauna Working Group

Area of Expertise	Name	Institution / Location
Mammal Specialist	Assoc. Prof. Dr. Vedat BEŞKARDEŞ	Istanbul University-Cerrahpaşa / Istanbul
Invertebrate Specialist	Assoc. Prof. Dr. Erdem HIZAL	Istanbul University-Cerrahpaşa / Istanbul
Bat, Bird and Mammal Specialist	Lecturer Ergün BACAK	Istanbul University-Cerrahpaşa / Istanbul
Bird Specialist (PhD Candidate)	Sercan BİLGİN	Istanbul University-Cerrahpaşa / Istanbul
Support Staff (PhD Candidate)	Umut GÜNGÖR	Istanbul University-Cerrahpaşa / Istanbul

Soil Working Group

Area of Expertise	Name	Institution / Location
Forest Soil Science and Ecology Specialist	Prof. Dr. Ender MAKİNECİ	Istanbul University-Cerrahpaşa / Istanbul
Soil Nutrition Specialist	Prof. Dr. Servet ÇALIŞKAN	Istanbul University-Cerrahpaşa / Istanbul
Soil Science and Ecology Specialist	Assoc. Prof. Dr. Emrah ÖZDEMİR	Istanbul University-Cerrahpaşa / Istanbul

Area of Expertise	Name	Institution / Location
Lichen Specialist	Prof. Dr. Ayhan ŞENKARDEŞLER	Ege University / İzmir
Lichen Specialist	Prof. Dr. Ali ASLAN	Yüzüncü Yıl University / Van
Lichen Specialist	Dr. Gamze GÜRSU	Maltepe University / Istanbul

Section Note

Within the first phase of the Istanbul Biodiversity Project, summary information regarding the flora, fauna, lichen, and soil working groups established under the main heading of **Groves, Urban Forests, and Basins** and the subheading of **Study Areas** is presented.

FLORA

Within the scope of the Biodiversity Project, **observation-based field studies totaling 160 days** were conducted across **18 study areas** (groves, urban forests, and basins).

As a result of these studies:

- **1,012 plant taxa** were identified,
- **94 conservation-priority taxa**, which are endemic or rare and listed on the **International Union for Conservation of Nature (IUCN) Red List**, were identified,
- A **flora photographic archive consisting of 5,000 photographs** (Istanbul Plant Archive) was created,
- **More than 2,000 herbarium specimens** were prepared,
- Within the scope of the Biodiversity Project, **three taxa were recorded for the first time for Istanbul and introduced into the scientific literature**:
    - *Glinus lotoides* L. (Haliotu),
    - *Cornucopiae cucullatum* L. (Külahot),
    - *Eclipta prostrata* (L.) L. (Yerpaskalyası).

Plant specimens obtained through the Biodiversity Project are preserved at the **Herbarium of the Nezahat Gökyiğit Botanical Garden**, Ali Nihat Gökyiğit Foundation, in accordance with the established protocol.

Glinus lotoides L. (Haliotu)

FETHI PASHA GROVE

Within the scope of the field studies conducted in **Fethi Pasha Grove**, a total of **229 taxa belonging to 76 families** were observed. Among these taxa, it is recommended that **five taxa**, which are internationally classified as threatened, be placed under protection at the site level.

In particular, **Ginkgo biloba L.** (classified under the **Endangered – EN** category), **Aesculus hippocastanum L.** and **Platanus orientalis L.** (classified under the **Vulnerable – VU** category), as well as **Pistacia atlantica Desf.** (classified under the **Near Threatened – NT** category), are identified as conservation-priority species.

Acalypha australis L. (Burtam)
Osmanthus fragrans Lour.

KÜÇÜK ÇAMLICA GROVE

As a result of the field studies conducted in **Küçük Çamlıca Grove**, **157 taxa** were identified. Accordingly, among the plant specimens collected during the surveys, **99 taxa are classified as NE (Not Evaluated), 51 as LC (Least Concern), 3 as EN (Endangered), 2 as NT (Near Threatened), 1 as VU (Vulnerable), and 1 as DD (Data Deficient)** at the global scale.

Within the study area, species cultivated through planting and evaluated according to **IUCN criteria** include **Liquidambar orientalis** Mill. and **Ginkgo biloba** L., which are classified under the **Endangered (EN)** category at the global level; **Platycladus orientalis** and **Pistacia atlantica** Desf. (L.), which are classified under the **Near Threatened (NT)** category; and **Ulmus minor** Mill., which is classified under the **Data Deficient (DD)** category.

The cultivation of these species within the area as landscape plants is significant, as it contributes to the **ex situ conservation** of these taxa.

Ginkgo biloba L. (Maidenhair Tree)
Tilia tomentosa Moench (Silver Linden)

HAREM GROVE

As a result of the field studies conducted in **Harem Grove**, **57 taxa** were identified. Accordingly, among the plant specimens collected within the study area, **37 taxa are classified as NE (Not Evaluated), 17 as LC (Least Concern), 1 as VU (Vulnerable), 1 as NT (Near Threatened), and 1 as DD (Data Deficient)** at the global scale.

Within the area, the following taxa evaluated according to **IUCN criteria** are particularly noteworthy: the endemic **Abies nordmanniana subsp. equi-trojani**, classified under the **Endangered (EN)** category; the non-endemic **Cedrus libani A. Rich.**, classified under the **Vulnerable (VU)** category; **Pistacia atlantica** Desf. (L.), classified under the **Near**

Threatened (NT) category; and **Ulmus minor** Mill., classified under the **Data Deficient (DD)** category.

These species have been planted for landscaping purposes within the area, and their continued cultivation contributes to the **ex situ conservation** of these taxa. Harem Grove contains **one registered monumental tree approximately 320 years old**, as well as numerous historical **Pistacia atlantica** trees.

In addition, a **bulbous plant species**, *Allium neapolitanum* (Garlic Flower), was identified within the area. Although this species does not currently fall under any protection status, its natural habitats in Istanbul have been significantly reduced due to urbanization. Therefore, its continued presence within the area is important for biodiversity conservation.

Smyrnium olusatrum L. (Alexanders)
Pistacia atlantica Desf. (Mt. Atlas Mastic Tree)

BEYKOZ GROVE

Within the scope of the field studies conducted in **Beykoz Grove**, a total of **237 taxa belonging to 75 families** were observed. Among these taxa, **17 taxa** are evaluated under threatened categories in the **IUCN Red List**.

The assessment of this area according to IUCN threat categories is as follows:

- **Endangered (EN):** *Abies nordmanniana* subsp. *equi-trojani*, *Cedrus atlantica*, *Magnolia stellata*, *Sequoia sempervirens*, *Sequoiadendron giganteum*, *Ginkgo biloba*
- **Vulnerable (VU):** *Aesculus hippocastanum*, *Cedrus libani*, *Platanus orientalis*, *Stephanotis floribunda*, *Ulmus glabra*
- **Near Threatened (NT):** *Pistacia atlantica*, *Cryptomeria japonica*, *Platycladus orientalis*, *Chamaecyparis lawsoniana*, *Fraxinus excelsior*, *Eucalyptus camaldulensis*

These taxa are considered **priority species for conservation** within the study area.

Conium maculatum L. (Poison Hemlock)
Dioscorea communis L. (Black Bryony)

BÜYÜK ÇAMLICA GROVE

As a result of the field studies conducted in **Büyük Çamlıca Grove**, a total of **117 taxa** were identified. Of these taxa, **81 are classified as NE (Not Evaluated), 31 as LC (Least**

Concern), 1 as EN (Endangered), 2 as VU (Vulnerable), and 1 as DD (Data Deficient) at the global scale.

Within the study area, taxa evaluated according to **IUCN criteria** that stand out include the endemic **Abies nordmanniana subsp. equi-trojani**, classified under the **Endangered (EN)** category; the non-endemic **Cedrus libani A. Rich.** and **Aesculus hippocastanum L.**, both classified under the **Vulnerable (VU)** category; and **Pistacia atlantica** Desf. (L.), classified under the **Near Threatened (NT)** category.

Prospero autumnale (L.) (Autumn Squill)
Aster subulatus Michx. (Eastern Annual Saltmarsh Aster)

YILDIZ GROVE

Within the scope of the field studies conducted in **Yıldız Grove**, a total of **278 taxa belonging to 75 families** were observed.

Among these taxa, there are **seven species protected at the international level**. In addition, although not yet evaluated under any threat category, **one endemic taxon** (*Hyacinthus orientalis* L. subsp. *chionophilus* Wendelbo) and **one rare taxon** (*Carex otomana* Molina Gonz., Acedo & Llamas) have been identified. In total, **nine taxa** are recommended for site-level protection within the area.

Yıldız Grove is notable for its exceptional tree specimens, including individuals that are approximately **400 years old**, as well as **three sequoia trees** and a **pedunculate oak** identified as having the thickest trunk among oak species in Türkiye.

The evaluation of this area according to **IUCN threat categories** is as follows:

- **Endangered (EN):** *Abies nordmanniana* (Steven) Spach subsp. *equi-trojani* (Asc. & Sint. ex Boiss.) Coode & Cullen, *Cedrus atlantica* (Endl.) Manetti ex Carrière, *Ginkgo biloba* L.
- **Vulnerable (VU):** *Aesculus hippocastanum* L., *Cedrus libani* A. Rich.
- **Near Threatened (NT):** *Pistacia atlantica* Desf., *Platycladus orientalis* (L.) Franco

These taxa are identified as **priority species for conservation** within the study area.

Orobanche pubescens (Hairy Broomrape)
Carex pendula (Pendulous Sedge)

EMİRGAN GROVE

As a result of the field studies conducted in **Emirgan Grove**, **125 taxa belonging to 46 families** were observed. At the global scale, **67 taxa are classified as LC (Least Concern), 47 as NE (Not Evaluated), 3 as EN (Endangered), 2 as VU (Vulnerable), 2 as DD (Data Deficient), and 1 as NT (Near Threatened)**.

Within the scope of the field studies, several monumental trees identified in the publication titled **"Istanbul's Natural Heritage: Monumental Trees of the European Side"**, prepared by the Istanbul Metropolitan Municipality in 2014, were also observed within Emirgan Grove. These include a **368-year-old** *Tilia argentea* **DC. (Silver Linden)**, a **128-year-old** *Cercis siliquastrum* **L. (Judas Tree)**, a **209-year-old** *Platanus × hispanica* **Mill. ex Münchh. (London Plane)**, a **438-year-old** *Sequoia sempervirens* **(D. Don) Endl. (Coast Redwood)**, a **267-year-old** *Platanus orientalis* **L. (Oriental Plane)**, a **266-year-old** *Castanea sativa* **Mill. (Anatolian Chestnut)**, and a **242-year-old** *Magnolia grandiflora* **L. (Southern Magnolia)**.

Cercis siliquastrum (Judas Tree)
Oxalis articulata Savigny (Pink Wood Sorrel)

GÜLHANE GROVE

Within the scope of the field studies conducted in **Gülhane Grove**, a total of **175 taxa belonging to 65 families** were observed.

Among these taxa, **nine species protected at the international level** were identified. In addition, although not yet evaluated under any threat category, **one rare taxon**, *Carex otomana* Molina Gonz., Acedo & Llamas, was recorded. In total, **ten taxa** are recommended for site-level protection within the area.

Vitex agnus-castus (Chaste Tree)

ATATÜRK URBAN FOREST

As a result of the field studies conducted in **Atatürk Urban Forest**, a total of **179 taxa** were identified. At the global scale, the collected plant taxa are classified as **110 NE (Not Evaluated), 66 LC (Least Concern), 1 EN (Endangered), and 2 NT (Near Threatened)**.

Within the study area, the endemic species **Lathyrus undulatus** Boiss. (*Istanbul Nazendesi*) was identified. This species is of particular importance as it is classified under the **Endangered (EN)** category according to IUCN criteria.

In addition, **Cryptomeria japonica** (Thunb. ex L.f.) D. Don and **Fraxinus excelsior** L., which are evaluated at the global level under the **Near Threatened (NT)** category according to IUCN criteria, stand out as priority taxa within the area.

Salvia forskahlei L. (Dolmayaprağı)
Lathyrus undulatus Boiss. (Istanbul Nazendesi)

FLORYA ATATÜRK URBAN FOREST

As a result of the field studies conducted in **Florya Atatürk Urban Forest**, **64 taxa belonging to 32 families** were observed. At the global scale, these taxa are classified as **34 LC (Least Concern), 20 NE (Not Evaluated), 3 NT (Near Threatened), 3 EN (Endangered), 2 DD (Data Deficient), and 2 VU (Vulnerable)**.

According to IUCN categories, the following taxa stand out as conservation-priority species within the area:

- **Endangered (EN):** *Liquidambar orientalis* Mill., *Ginkgo biloba* L., *Cedrus atlantica* (Endl.) Manetti ex Carrière
- **Vulnerable (VU):** *Cedrus libani* A. Rich., *Aesculus hippocastanum* L.
- **Near Threatened (NT):** *Pistacia atlantica* Desf., *Platycladus orientalis* (L.) Franco, *Fraxinus excelsior* L.

Pistacia atlantica Desf. (Mt. Atlas Mastic Tree)
Bromus hordeaceus L. (Soft Brome)

YAKUPLU URBAN FOREST

As a result of the field studies conducted in **Yakuplu Urban Forest**, **47 taxa** were identified. Accordingly, among the plant taxa collected within the study area, **27 are classified as NE (Not Evaluated), 17 as LC (Least Concern), 1 as NT (Near Threatened), 1 as VU (Vulnerable), and 1 as DD (Data Deficient)** at the global scale.

Along the boundaries of the urban forest, climbing shrub species such as **Lonicera** are commonly planted, and **Cupressus leylandii** has also been introduced.

Lagerstroemia indica L. (Crape Myrtle)

RAHMİ DEMİR URBAN FOREST

As a result of the field studies conducted in **Rahmi Demir Urban Forest**, a total of **150 taxa** were identified. Accordingly, among the plant taxa collected within the study area, **103 are classified as NE (Not Evaluated), 41 as LC (Least Concern), 3 as EN (Endangered), 1 as VU (Vulnerable), 1 as NT (Near Threatened), and 1 as DD (Data Deficient)** at the global scale.

Two endemic species were identified within the area: **Lathyrus undulatus** Boiss. (*Istanbul Nazendesi*) and **Colchicum micranthum** Boiss. According to IUCN criteria, both species are evaluated at the global level under the **Endangered (EN)** category. The spring geophyte **Colchicum micranthum** Boiss. is also listed in **Appendix I of the Bern Convention**.

In addition, **Crocus pulchellus** Herb., which is distributed within the urban forest, does not fall under any protection status. However, since its natural distribution areas in Istanbul have been largely degraded, the conservation of its populations within this area is of particular importance.

Prospero autumnale L. Speta (Autumn Squill)
Crocus pulchellus Herb. (Autumn Crocus)

SAZLIDERE BASIN

As a result of the field studies conducted in the **Sazlıdere Basin**, **206 taxa** were identified. Accordingly, among the plant taxa collected within the study area, **149 are classified as NE (Not Evaluated), 55 as LC (Least Concern), and 2 as DD (Data Deficient)** at the global scale.

Among these taxa, **Orchis coriophora** subsp. *coriophora*, **Ophrys lutea** subsp. *galilaea*, **Ophrys mammosa** Desf., **Orchis laxiflora** Lam., **Ophrys speculum**, and **Galanthus elwesii** var. *elwesii* Hook.f. have been identified as **conservation-priority taxa**, as they are listed in **Appendix II of CITES**.

Geranium dissectum L. (Cut-leaved Cranesbill)
Iris sintenisii Janka (Sintenis' Iris)

BÜYÜKÇEKMECE BASIN

As a result of the field studies conducted in the **Büyükçekmece Basin**, **151 taxa** were identified. Accordingly, among the plant taxa collected within the study area, **101 are classified as NE (Not Evaluated)** and **50 as LC (Least Concern)** at the global scale.

No endemic taxa were identified within the area. However, **five taxa belonging to the Orchidaceae family**, which are classified under the **LC (Least Concern)** category according to IUCN criteria, were recorded. These taxa are also listed in **Appendix II of CITES**.

The area in which **four taxa belonging to the Orchidaceae family** were identified has been proposed as a **protected area**.

Myosotis incrassata Guss. (Thick-stem Forget-me-not)
Eryngium creticum Lam.

ELMALI BASIN

As a result of the field studies conducted in the **Elmalı Basin**, **174 taxa** were identified. At the global scale, these taxa are classified as **119 NE (Not Evaluated), 52 LC (Least Concern), 2 EN (Endangered), and 1 DD (Data Deficient)**.

During the field studies, the presence of **four endemic taxa** was identified: **Colchicum micranthum** Boiss., **Galanthus plicatus** subsp. *byzantinus* (Baker) D.A. Webb, **Lathyrus undulatus** Boiss., and **Scrophularia cryptophila** Boiss. & Heldr.

Rubus sanctus Schreb. (Blackberry)
Osyris alba L. (Osyris)

TERKOS BASIN

Within the scope of the field studies conducted in the **Terkos Basin**, **234 taxa belonging to 61 families** were observed. At the global scale, these taxa are classified as **105 LC (Least Concern), 126 NE (Not Evaluated), 2 DD (Data Deficient), and 1 NT (Near Threatened)**.

Within the study area, **two endemic plant taxa** were identified: **Erysimum sorgerae** Polatschek from the *Brassicaceae* family and **Verbascum degenii** Halacsy from the *Scrophulariaceae* family.

In addition, **eight taxa belonging to the Orchidaceae family**, classified under the **LC (Least Concern)** category according to IUCN criteria, were recorded within the area. These taxa are also listed in **Appendix II of CITES**.

Colchicum micranthum (Delicate Autumn Crocus)
Cardamine tenera (Tender Bittercress)

ÖMERLİ BASIN

Within the scope of the field studies conducted in the **Ömerli Basin**, **224 taxa belonging to 54 families** were observed. At the global scale, these taxa are classified as **95 LC (Least Concern), 127 NE (Not Evaluated), and 2 DD (Data Deficient)**.

No endemic taxa were identified within the study area. However, **five taxa belonging to the Orchidaceae family**, which are classified under the **LC (Least Concern)** category according to IUCN criteria, were recorded. These taxa are also listed in **Appendix II of CITES**.

In addition, **Aegilops comosa** subsp. *heldreichii* (Ergene kılçığı), due to its significant **agronomic importance**, has been proposed as a **conservation-priority taxon**.

Aegilops comosa subsp. *heldreichii*
Cardamine tenera (Tender Bittercress)

**ECOLOGICAL RISK ASSESSMENTS AND RECOMMENDATIONS

(FLORA AND FAUNA)**

Within the scope of the Istanbul Biodiversity Project, ecological risk assessments were carried out for flora and fauna components in all study areas. The ecological risks identified were evaluated based on field observations, species inventories, habitat conditions, and anthropogenic pressures.

The primary ecological risks identified within the study areas include **habitat fragmentation**, **urbanization pressure**, **uncontrolled recreational use**, **introduction of invasive and non-native species**, **soil compaction**, **pollution**, and **disturbance caused by intensive human activity**.

In areas where endemic, rare, or conservation-priority species are present, these pressures pose significant threats to the sustainability of ecosystem integrity. In particular, the degradation of natural habitats and changes in land use patterns negatively affect species distribution, population continuity, and habitat quality.

Based on the ecological risk analysis, the following recommendations were developed to ensure the protection and sustainability of flora and fauna:

- Limiting uncontrolled human access in ecologically sensitive areas,
- Preventing the introduction and spread of invasive species,
- Ensuring the protection of endemic and threatened species through site-specific management plans,
- Regulating recreational activities in accordance with ecological carrying capacity,
- Implementing habitat restoration and rehabilitation practices where degradation has occurred,
- Strengthening monitoring and long-term ecological observation programs,
- Raising public awareness and promoting environmental education activities related to biodiversity conservation.

The implementation of these recommendations is considered essential for maintaining ecosystem health, biodiversity continuity, and ecological resilience within urban and peri-urban areas of Istanbul.

SOIL ANALYSES AND ECOLOGICAL RISKS

Within the scope of the Istanbul Biodiversity Project, comprehensive **soil analyses** were conducted in all study areas in order to determine soil characteristics and to identify ecological risks related to soil structure. Soil samples were collected from representative points within each study area and analyzed in laboratory environments.

The analyses included assessments of **soil texture**, **pH**, **organic matter content**, **nutrient levels**, and **physical structure**. The results indicated that soil characteristics vary significantly among the study areas depending on land use patterns, vegetation cover, topography, and anthropogenic pressures.

The primary ecological risks identified in relation to soil structure include **soil compaction**, **erosion**, **loss of organic matter**, **nutrient imbalance**, and **contamination caused by urban activities**. These risks negatively affect soil fertility, water retention capacity, root development, and overall ecosystem functioning.

In areas subject to intensive recreational use and uncontrolled human access, increased soil compaction and surface degradation were observed. In addition, changes in soil structure pose a direct threat to the sustainability of vegetation and habitat quality, particularly in areas hosting endemic and conservation-priority species.

Based on the soil analysis results, the following recommendations were developed to mitigate ecological risks and improve soil health:

- Preventing excessive trampling and uncontrolled access in sensitive areas,
- Implementing erosion control and soil stabilization measures,
- Increasing organic matter content through appropriate soil management practices,
- Monitoring soil quality regularly and establishing long-term soil observation programs,
- Integrating soil conservation strategies into ecosystem management and planning processes.

The protection and sustainable management of soil resources are considered fundamental to maintaining ecosystem integrity and ensuring the long-term sustainability of biodiversity within the study areas.

GENERAL EVALUATION AND CONCLUSION

Within the scope of the Istanbul Biodiversity Project, comprehensive assessments were conducted regarding flora, fauna, lichen diversity, soil characteristics, and ecological risks across the study areas. The findings demonstrate that Istanbul hosts a high level of biodiversity despite intense urbanization pressure, and that urban green areas, drinking water basins, groves, and urban forests play a critical role in maintaining ecological balance.

The identification of endemic, rare, and conservation-priority species highlights the ecological value of the study areas and underscores the necessity of implementing protection-oriented

management strategies. The results indicate that anthropogenic pressures—particularly urban expansion, recreational intensity, habitat fragmentation, and pollution—pose significant risks to ecosystem sustainability.

Ecological risk assessments reveal that the continuity of biodiversity and ecosystem health depends on integrated planning approaches that consider ecological carrying capacity, habitat integrity, and long-term monitoring. In this context, ecosystem-based management, habitat restoration, and the regulation of human activities emerge as essential tools for mitigating ecological risks.

The data obtained from the Istanbul Biodiversity Project provide a scientific foundation for decision-making processes related to urban ecosystem management. The implementation of the proposed recommendations is expected to contribute significantly to the conservation of biodiversity, the enhancement of ecological resilience, and the sustainable management of natural resources within the metropolitan area.