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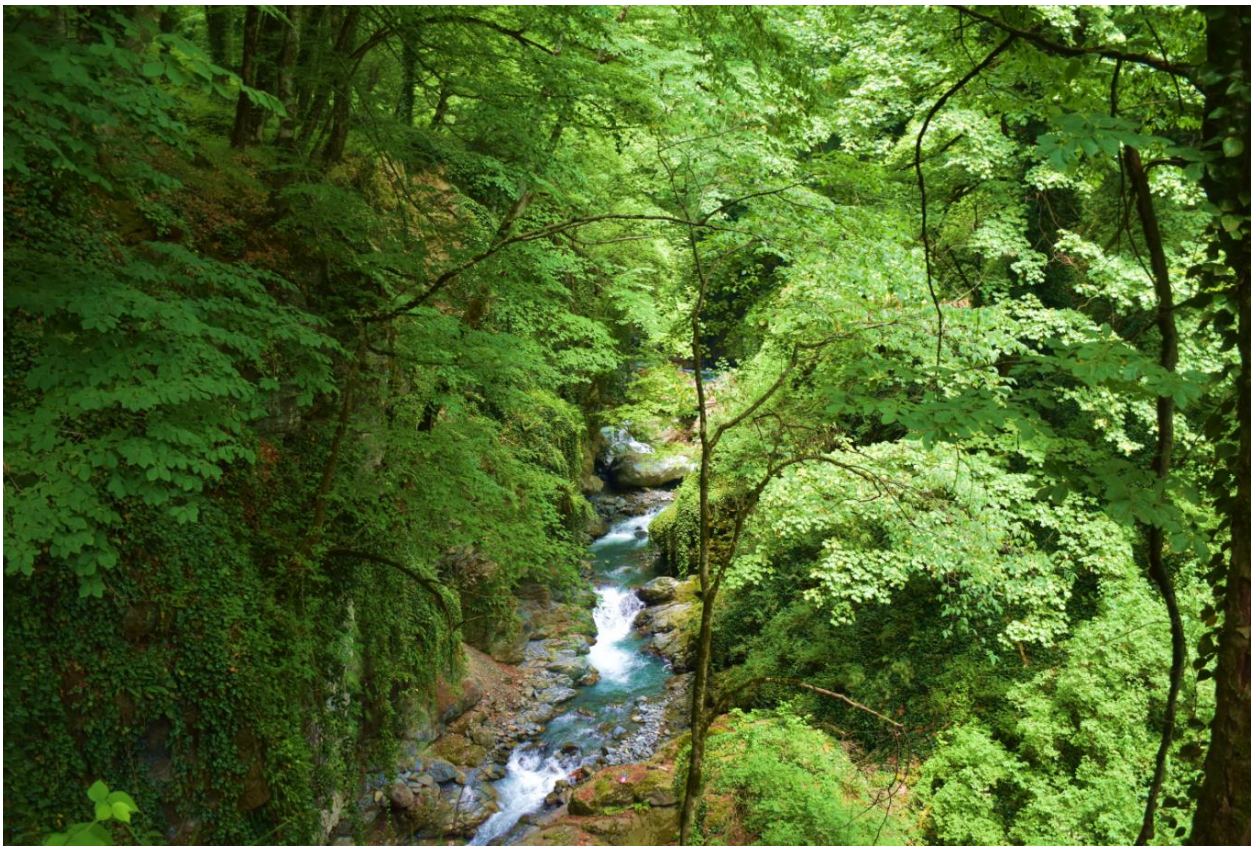
Guidelines for

Managing Forest Habitats on Georgia's Emerald Sites



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Please cite this publication as follows: EU4Environment. 2024. *Guidelines for Managing Forest Habitats on Georgia's Emerald Sites.* Washington, DC: World Bank.

Acknowledgments

We would like to thank the main contributors of these guidelines, Irakli Shavgulidze (MSc) and Kakha Artsivadze (PhD) from NACRES, for their outstanding work towards producing this document that has been based on the detailed analysis of the national context of forest management on Emerald Network sites and finding ways to harmonize national practices with the European experience and best practices, as well as NACRES' Dachi Kanchaveli (MSc) who prepared maps for this publication and also helped with data analysis and statistical information.

Deepest gratitude is extended to Otars Opermanis (PhD) who provided valuable comments and suggestions throughout the process of the development of these guidelines especially from the perspective of EU practices of forest management on the NATURA 2000 sites.

Special thanks to the following persons for providing important feedback:
From the Department of Biodiversity and Forest, Ministry of Environmental Protection and Agriculture:

Papuna Kapanadze, Forest Policy Unit; Zaza Nonashvili, Head of Biodiversity Monitoring Unit; Salome Nozadze, Senior Specialist, Biodiversity Unit.

From the National Forest Agency:

Irakli Sisvadze, Head of Department of Forest Inventory; Merab Machavariani, Head of Department of Forest Restoration; Sophio Tabagari, Head of Strategic Planning and Projects Unit.

From the Agency of Protected Areas: Avtandil Mikaberidze, Senior Specialist.

Special gratitude is extended to Ms. Natia Iordanishvili, Deputy Head of National Forest Agency , for her direct contribution to the guidelines as well as for the support throughout the study, especially in the form of providing critical information and facilitating consultations with key representatives of the forestry sector both in capital Tbilisi and in the regions.

Cover photo by Kakha Artsivadze, NACRES

Contents

List of Acronyms

APA	Agency of Protected Areas
ASCI	Areas of Special Conservation Interest
EIA	Environmental Impact Assessment
EU	European Union
EIONET	European Environmental Information Observation Network
EUNIS	European Nature Information System
FCS	Favorable Conservation Status
GIS	Geographic Information System
GIZ	German Agency for International Cooperation (*Deutsche Gesellschaft fur Internationale Zusammenarbeit*)
MEPA	Ministry of Environmental Protection and Agriculture
NACRES	Centre for Biodiversity Conservation and Research
NFA	National Forest Agency
PA	Protected Area
SDF	Standard Data Form
UTM	Universal Transverse Mercator

1. Executive Summary

1.1 Introduction

The Guidelines for Managing Forest Habitats on Georgia's Emerald Sites was prepared by the Centre for Biodiversity Conservation and Research (NACRES) as part of Developing Guidelines and Building Capacity for Forest Management in Emerald Sites commissioned by the World Bank under the EU4Environment Programme; Result Area 4: Ecosystem Services and Livelihoods.

The aim of the Guidelines for Managing Forest Habitats on Georgia's Emerald Sites is to provide comprehensive guidance to the representatives of Georgia's forestry sector on addressing forest management issues within the Emerald Network. This document seeks to offer clear and comprehensive solutions to the various challenges posed by the requirements of the Bern Convention as well as to the challenges the forestry sector may inevitably encounter in harmonizing its activities on Emerald sites with the network's standards. Hence, the primary focus of this document revolves around forest management issues in Emerald sites situated outside the national system of protected areas (PAs). (Sites within national PAs are managed by respective projected area administrations according to specific protection regime and regulations, excluding commercial forestry operations and requiring different approaches.)

Implementing the approaches outlined in these guidelines can aid in the conservation and restoration of habitats and species of pan-European interest, thereby supporting Georgia's commitments under the Bern Convention. Furthermore, adhering to these guidelines can facilitate the effective management and development of the Emerald Network, which plays a pivotal role in global biodiversity preservation and in attaining the objectives of the Convention on Biological Diversity.

Although numerous aspects regarding the development and management of the Emerald Network in Georgia remain unclear, including those awaiting clarification through the adoption of relevant national legislation, it is pertinent to note that certain European Union (EU) policies and best practices related to forest management can already be introduced in the country. Forest management policies on Natura 2000 sites in EU countries, for instance, are in alignment with the Birds and Habitats Directives, which form the cornerstone of biodiversity conservation in Europe. The Emerald Network established under the Bern Convention covers the whole European continent and surrounding seas while the Natura 2000 Network is seen as an implementation of the Emerald Network in the EU. Both ecological networks strive to preserve Europe's natural heritage and biodiversity, thereby contributing to global environmental objectives.

Given Georgia's aspirations for EU integration, it is imperative that the management of the Emerald Network in the country fully complies with the approaches adopted by EU member states. Moreover, in an EU candidate country like Georgia, the Emerald Network could serve as a foundation for the protection of European habitats, which, upon EU integration, would be assimilated into Natura 2000.

These guidelines have been formulated through a review of relevant documents, recommendations, and best practices under the Bern Convention as well as similar documents pertaining to the implementation of EU nature directives in Natura 2000 sites. The recommendations and approaches delineated in these guidelines are thus based on and adapted from European experiences and best practices, especially regarding challenges associated with potential conflicts between forestry interests and nature conservation on Natura 2000 sites. The document also addresses climate change-related issues that must

be considered to mitigate potential adverse impacts and achieve the long-term objectives set by the Emerald Network.

The Emerald Network in Georgia serves as a significant yet flexible instrument for integrating biodiversity conservation and sustainable management into various sectors. Its further development and effective management will help ensure essential benefits and services from nature, including ecosystem services such as clean air and water provision, prevention of soil degradation, protection against erosion and runoff, support for agricultural production (for example, through pollination), access to timber and non-timber forest resources, nature-based tourism, and recreational opportunities. Specifically concerning forests, the 'Emerald Network' can be envisaged as a cornerstone of the multifunctional forest concept.

These guidelines primarily target individuals responsible for or directly involved in forest management, including relevant state institutions, municipalities, private companies, environmental protection organizations, managers, and foresters. The document aims to assist forest practitioners in planning forestry operations on Emerald sites that align with the network's requirements, thereby ensuring the long-term conservation of species and habitats protected by the Bern Convention.

Specifically, the objectives of these guidelines are to

- Facilitate the practical implementation of the Bern Convention in Georgia;
- Encourage the integration of Natura 2000 Network requirements into forest management in Georgia, thereby fulfilling the EU nature directives and facilitating Georgia's integration into the EU;
- Promote multipurpose forest management and integrate Emerald Network objectives into the broader forest management sector;
- Contribute to the implementation of national conservation goals outlined in the National Biodiversity Strategy and Action Plan of Georgia; and
- Disseminate European experiences and best practices concerning forest resource utilization to policy makers and forest practitioners at all levels.

1.2 Key Findings/Messages

- Among the Emerald sites designated in Georgia that are completely or largely outside the national PA system, 26 contain Resolution No. 4 Forest habitat types. Many of these sites are very important for the conservation of forest habitats; some sites even contain 100 percent of the present range of a habitat, while others include a significant portion.
- The process of Environmental Impact Assessment (EIA) is one of the key tools for avoiding or mitigating any negative impact on the Emerald Network and its forests in Georgia. The current national legislation on EIA was adopted in 2018 and is based on EU standards.
- At the implementation level, there are multiple challenges related to EIA.
    - Very often EIA documents do not adequately cover biodiversity issues.

- EIA documents rarely contain information about the status of species and habitats protected under the Bern Convention as well as assessment of potential impact on these species and habitats protected by Resolution No. 6 and Resolution No. 4.
- The need to maintain their favorable conservation status (FCS) or otherwise of species and habitats is not adequately reflected in EIA documents.

- Many biodiversity studies conducted within EIA processes choose to apply the old habitat classification that is not compatible with the European Nature Information System (EUNIS). This creates confusion and uncertainties in relation to the identification of critical habitat types and potential impact on Resolution No. 4 habitats. This problem can be resolved by making the application of the EUNIS Habitat Classification compulsory for EIA.
- Emerald sites that are outside the national PA system currently have no management specifically for Emerald objectives other than forestry management if the site is on forested land under the National Forest Agency (NFA) or pasture management.
- There is some overlap between Resolution No. 6 and the national Red List of Georgia. However, numerous Resolution No. 6 species are relatively common in Georgia and, therefore, are not protected at the national level and *vice versa*.
- Most existing PAs in Georgia prioritize nationally protected species over the Emerald species.
- The challenge of integrating Emerald objectives into PA management is probably associated with several issues such as (a) lack of capacity of local PA administrations, (b) PA administrations' lack of Emerald awareness and the responsibility to implement it, and (c) lack of management guidelines and general guidance on how to deal with potential conflicts on the ground.
- The main forms of use of natural resources within the Emerald Network include harvesting timber and non-timber products from forest and livestock grazing and haymaking in grasslands. Timber extraction is practiced in all forest habitats including those listed in Resolution No. 4.
- Non-wood resources are harvested in all forests in Georgia within and outside the Emerald Network for both noncommercial and commercial purposes.
- Many Emerald sites contain alpine/subalpine or lowland grasslands that are extensively used as pastures and/or haymaking. With the exception of PAs, livestock grazing is not regulated in Georgia. While using subalpine pastures, livestock is sometimes illegally grazed in adjunct forest as well.
- Additional challenges may arise from the fact that the overlap between an Emerald site and an existing PA is not always 100 percent. While mostly situated within a PA, some sites also extend beyond the PA boundaries and PA administrations that usually have no mandate on those sections.
- The first priority in the management of Emerald sites within the forested land under the NFA would be ensuring full integration of Emerald objectives into the forestry sector and concrete forestry plans. It may also be predicted that balancing species and habitats protection and timber production interests will be one of the major challenges in addition to other common challenges encountered in forest management on Natura 2000 sites (see Chapter 4 for more details).

- One of the important obstacles to the effective integration of biodiversity objectives, including Emerald priorities, into forest management derives from the mere definition of forest types.
- All existing forestry regulations are based on the outdated Soviet-era habitat classification that is not compatible with EUNIS. This hampers the first important step in the process of integrating Emerald objectives into forest management—the identification and mapping of forest habitats.
- Currently, forest management plans do not include identification and mapping of Resolution No. 4 habitats nor provide any measures for their conservation.
- The new biodiversity law, currently in draft and still being finalized by the Ministry of Environmental Protection and Agriculture (MEPA), is expected to create the necessary framework for the establishment and management of Emerald sites.
- The draft law introduces the concept to assessing possible impacts on the Emerald Network site —Emerald Impact Assessment, which will be the main mechanism to regulate any new developments or activities on Emerald Network sites.
- Overall, the awareness of Emerald Network among the general public is extremely low. While some progress is noticeable among the decision-makers and private sector, local communities and local governments know very little about the Emerald Network in general or even about the sites in their own areas.
- All forests in Georgia, including Resolution No. 4 Forest habitat types, are under multiple threats and pressures of different nature.
- The threats and pressures assessment has revealed that the following major threat categories are most common:
    - F - Development, construction, and use of residential, commercial, industrial, and recreational infrastructure and areas
    - N - Climate change
    - B - Forestry
    - G - Extraction and cultivation of biological living resources (other than agriculture and forestry)
    - A - Agriculture
- The EUNIS Habitat Classification was adapted to Georgia in 2017–2019. All EUNIS habitat types found in Georgia were identified and their descriptions were modified to represent the Georgian versions of the habitats.
- As the main national body responsible for environmental protection, MEPA is in charge of the implementation of the Emerald Network in Georgia. Specific responsibilities include approval of site management plans and supervision of monitoring activities as well as regular reporting to the Convention's Secretariat on the status of Emerald species and habitats.
- If an Emerald site is located within a national forest area, it is only logical that its management matters (conservation goals and objectives) are integrated into the existing forest management plan.

- At present, 15 Emerald sites outside the national PA system have a draft management plan, developed over the last three years. However, none of them has so far been officially approved.
- At least in part due to the absence of national guidelines for Emerald site management planning, the draft documents differ greatly both in structure and the level of detail; some are more or less comprehensive documents covering main aspects of the local Emerald features, while others have obscure structure that is usually not characteristic of site management plans.

1.3 Policy Recommendations

These guidelines represent the first attempt to offer solutions to the challenges the forestry sector is likely to encounter in harmonizing its activities on Emerald sites with the network's standards. However, the recognition of those challenges and the acceptance of these guidelines may themselves pose a challenge too, especially in rural areas.

Therefore, it would be necessary to plan and implement special activities for promoting these guidelines as a tool that can help the conservation and restoration of habitats and species of pan-European interest, thus supporting Georgia's commitments under the Bern Convention. In addition, some of the concepts and approaches applied in this document would also need to be introduced and clearly explained to Georgian forestry practitioners, which can be achieved through a series of introductory meetings and even training sessions. All existing information including the list of Resolution No. 4 Forest habitats present in Georgia as well as their detailed descriptions need to be widely publicized among the foresters and other stakeholders such as experts and policy makers involved in EIA processes.

Defining the FCS for forest habitats is also considered as one of the challenges for the effective management planning on Emerald sites. There is a clear need of assistance in this regard and as a first step, the FCS should be determined for at least some of the major forest habitats that are under highest pressure from commercial logging and/or threatened by infrastructure and energy sector.

2. Georgia's Emerald Network and the Conservation of Forest Habitats

Emerald Network serves as a pan-European ecological framework aimed at preserving the continent's biodiversity. It constitutes one of the principal instruments for implementing the Convention on the Conservation of European Wildlife and Natural Habitats (Bern 1979), commonly known as the Bern Convention. Georgia acceded to this Convention in 2009.

The network comprises vital sites designated for conserving Europe's biodiversity, referred to as Areas of Special Conservation Interest (ASCI) or Emerald sites. These sites encompass diverse ecosystems, including forests, lakes, rivers, marine areas, meadows, caves, and more. Emerald sites operate under a unique yet flexible management regime, intended to ensure the long-term conservation of species and habitats protected under the Bern Convention.

Apart from being a requirement under the Bern Convention, the development of the Emerald Network in Georgia is mandated by the European Union (EU)-Georgia Association Agreement signed on August 30, 2014. Consequently, its realization holds paramount importance for Georgia's endeavors toward European integration. Furthermore, the development of the network aligns with Georgia's Biodiversity Strategy and Action Plan (2014–2020).

Natura 2000 is formed under the Habitats and Birds Directives and mandatory for new EU member states. Although both networks operate based on ecological principles, the requirements and management tools of Natura 2000 are more stringent compared to the Bern Convention and Emerald Network. As Georgia progresses toward EU integration, it will be required to transform and merge its Emerald Network into a Natura 2000 Network, adhering to the standards set by the Habitats Directive. Thus, the Emerald Network serves as a precursor for the establishment of Georgia's Natura 2000 Network.

Fundamentally rooted in the principle that species preservation necessitates habitat protection, the Emerald Network advocates for safeguarding habitats listed in Resolution No. 4 (1996) of the Standing Committee of the Bern Convention. This list encompasses approximately 200 habitat types found in Europe, over 50 of which are present in Georgia. Additionally, the network directly protects species reliant on their natural habitats for long-term survival, as listed in Resolution No. 6 (1998) of the Standing Committee.

Emerald Network may encompass various ecosystems, spanning forests, lakes, rivers, marine environments, grasslands, caves, and more. These sites may encompass lands with varied legal statuses and ownership, including national protected areas (PAs), state or private lands, agricultural lands, and even urban areas.

Diverging from conventional PAs, the Emerald Network does not impose standardized restrictions on human activities. Instead, restrictions may vary from site to site based on local Emerald features and other considerations. Activities are permitted if they do not compromise the conservation or restoration of protected species and habitats under the Bern Convention. Thus, the network does not enforce blanket regulations regarding the utilization of natural resources, such as timber or non-timber forest resources. The permissibility of resource utilization is evaluated on a case-by-case basis, considering the conservation objectives of each area.

The process toward establishing the Emerald Network in Georgia began in 2009 through studies conducted by national experts with the support of international donors. Financial assistance was provided

by the Council of Europe and the EU in 2009–2011 and 2013–2016. The process continued with support from the German Agency for International Cooperation (*Deutsche Gesellschaft fur Internationale Zusammenarbeit*) GmbH in 2017–2018. In 2017, the Government of Georgia officially designated three sites—Lagodekhi, Vashlovani, and Batsara—as the first Emerald sites in the Caucasus region. Subsequently, the network expanded gradually, comprising 66 officially recognized districts covering 18.75 percent of the country's territory as of January 2023.

An analysis of existing data and satellite images revealed that the Emerald Network covers a total of 819,382 ha of forests, constituting 64 percent of the network and approximately 30 percent of Georgia's forests. A significant portion of these forests (582,500 ha) consists of habitats protected under Resolution No. 4 of the Standing Committee of the Bern Convention. The remaining forested areas (approximately 236,882 ha) either lack definitive habitat identification or belong to habitat types not protected by the Bern Convention or EU directives.

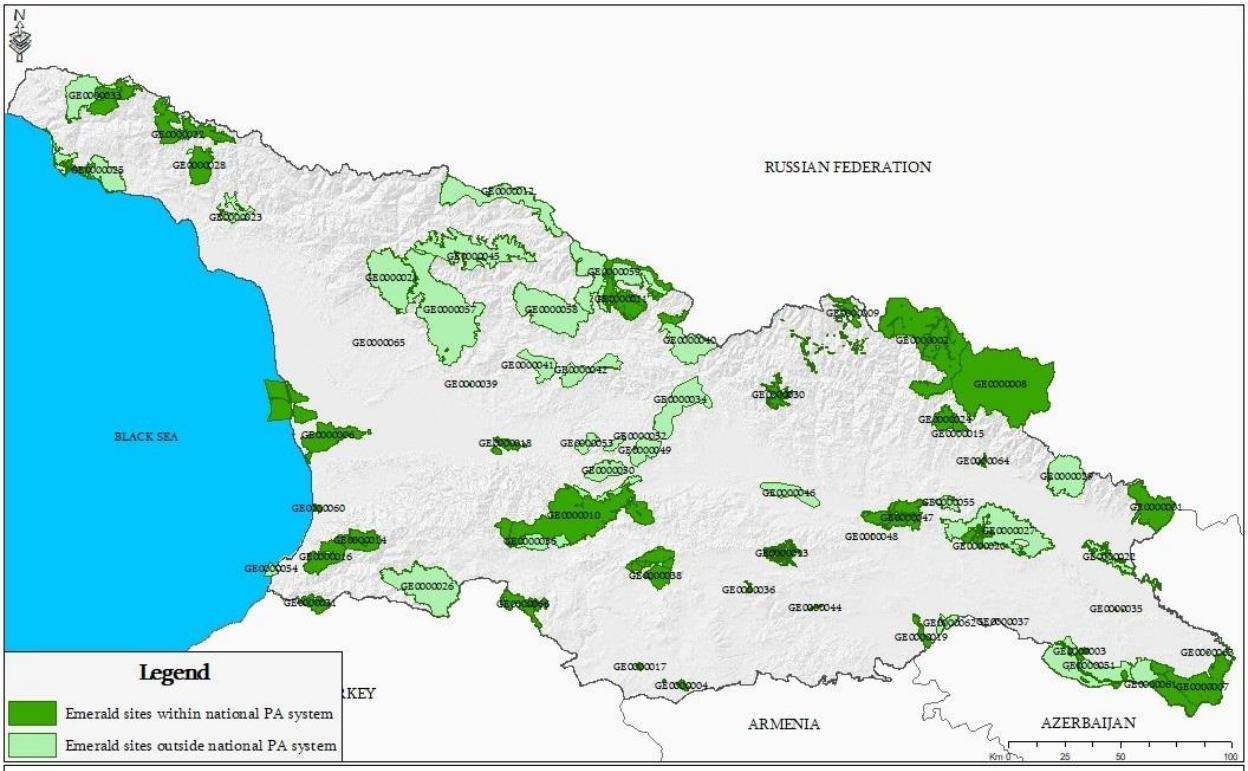
Identifying and mapping habitats in Georgia have faced challenges in establishing the Emerald Network. Habitat identification aligns with the European Nature Information System (EUNIS)[1] standards, integrated into the European Environmental Information Observation Network (EIONET). Compliance with EUNIS is mandatory for EU member states under the INSPIRE[2] directive, contributing to the EU's environmental policy and ecosystem services assessment.[3]

[1] https://eunis.eea.europa.eu/index.jsp

[2] The Directive 2007/2/EC of the European Parliament and of the Council adopted on 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies or policies and activities that have an impact on the environment. https://inspire.ec.europa.eu/legislation-details/directive-20072ec-european-parliament-and-council

[3] INSPIRE Infrastructure for Spatial Information in Europe D2.8.III.18 Data Specification on Habitats and Biotopes - Technical Guidelines

Map 1. Georgia's Emerald Network, 2023 (Developed by NACRES for the World Bank).



GE0000001	Lagodekh	GE0000012	Svaneti 1	GE0000023	Amtkeli	GE0000034	Surami 1	GE0000045	Svaneti 2	GE0000056	Borjomi-Kharagauli 2
GE0000002	Arkhoti	GE0000013	Algeti	GE0000024	Ilto	GE0000035	Artsivi valley	GE0000046	Kvernaki	GE0000057	Samegrelo 2
GE0000003	Chachuna	GE0000014	Kintrishi	GE0000025	Bichvinta-Miusera	GE0000036	Dashbashi canyon	GE0000047	Saguramo	GE0000058	Racha-Lechkumi
GE0000004	Madatapa	GE0000015	Batsara	GE0000026	Goderdzi	GE0000037	Davit Gareji	GE0000048	Tbilisi Otter island	GE0000059	Svaneti-Racha
GE0000005	Bughdasheni	GE0000016	Mtirala	GE0000027	Gombori	GE0000038	Ktsia-Tabatskuri	GE0000049	Surami 2	GE0000060	Kobuleti
GE0000006	Kolkheti	GE0000017	Khanchali	GE0000028	Gumista	GE0000039	Prometheus cave	GE0000050	Surami 3	GE0000061	Samukhi
GE0000007	Vashlovani	GE0000018	Ajameti	GE0000029	Kvareli-Shilda	GE0000040	Racha 2	GE0000051	Kotsakhura	GE0000062	Jandara lake
GE0000008	Tusheti	GE0000019	Gardabani	GE0000030	Liakhvi	GE0000041	Racha 3	GE0000052	Surami 4	GE0000063	Shavi mta
GE0000009	Kazbegi	GE0000020	Mariamjvari	GE0000031	Machakhela	GE0000042	Racha 4	GE0000053	Surami 5	GE0000064	Babaneuri
GE0000010	Borjomi-Kharagauli	GE0000021	Samegrelo	GE0000032	Psou	GE0000043	Ghliana cave	GE0000054	Chorokhi delta	GE0000065	letsurtsume cave
GE0000011	Racha 1	GE0000022	Alazani	GE0000033	Ritsa	GE0000044	Samshvilde	GE0000055	Kistauri	GE0000066	Erusheti

Habitat classification consists of the following 10 major higher categories (A–J):

A Marine habitat

B Coastal habitats

C Inland surface waters

D Mires, bogs, and fens

E Grasslands and lands dominated by forbs, mosses, or lichens

F Heathland, scrub, and tundra

G Woodland, forest, and other wooded land

H Inland unvegetated or sparsely vegetated habitats

I Regularly or recently cultivated agricultural, horticultural, and domestic habitats

J Constructed, industrial, and other artificial habitats

Each of the above categories has lower hierarchical levels, with the principles of classification thoroughly defined in the EUNIS Habitat Classification (https://eunis.eea.europa.eu/habitats-code-browser.jsp).

However, the EUNIS Habitat Classification system significantly differs from the traditional forest type classification commonly employed in Georgia. Consequently, utilizing forestry sector data and conventional forest inventory data for habitat identification and mapping is immense complex. Both the database and distribution maps for habitats, prepared during the establishment of the Emerald Network, require further refinement.

From 2017 to 2021, the team of national experts operating under Centre for Biodiversity Conservation and Research (NACRES) initiated the first efforts to adapt the EUNIS Habitat Classification to Georgia. They compiled the habitat interpretation manual titled 'Terrestrial habitats of Georgia according to the EUNIS Habitat Classification' (2017), featuring descriptions of the principal plant communities defining habitat types, soil types, geographical characteristics, and other pertinent parameters. Emphasis was placed on habitat types protected by Resolution No. 4 of the Standing Committee of the Bern Convention. Additionally, the experts prepared detailed descriptions of forests and other wooded areas in Georgia (refer to Annex 1).

Presently, Georgia's Emerald Network encompasses a total of 66 officially designated sites, of which 27 sites containing forests are located outside PAs and are under the jurisdiction of the National Forest Agency (NFA, see Map 2). Many of these sites hold significant importance for forest habitat conservation, with either 100 percent or a substantial portion of them comprising one or more habitats protected by Resolution No. 4.

To date, 16 forest habitat types from Resolution No. 4 have been confirmed to occur in Georgia:

1. G1.11 Riverine *Salix* woodland
2. G1.12 Boreo-alpine riparian galleries
3. G1.21 Riverine ash-alder woodland, wet at high but not at low water
4. G1.22 Mixed *Quercus-Ulmus-Fraxinus* woodland of great rivers
5. G1.3 Mediterranean riparian woodland
6. G1.44 Wet-ground woodland of the Black and Caspian Seas
7. G1.6 *Fagus* woodland
8. G1.8 Acidophilous *Quercus*-dominated woodland
9. G1.918 Eurasian boreal *Betula* woods
10. G1.A1 *Quercus-Fraxinus-Carpinus betulus* woodland
11. G1.A4 Ravine and slope woodland
12. G1.A7 Mixed deciduous woodland of the Black and Caspian Seas
13. G3.17 Balkano-Pontic *Abies* forests
14. G3.1H *Picea orientalis* forests
15. G3.4E Ponto-Caucasian *Pinus sylvestris* forests
16. G3.9 Coniferous woodland dominated by *Cupressaceae* or *Taxaceae*

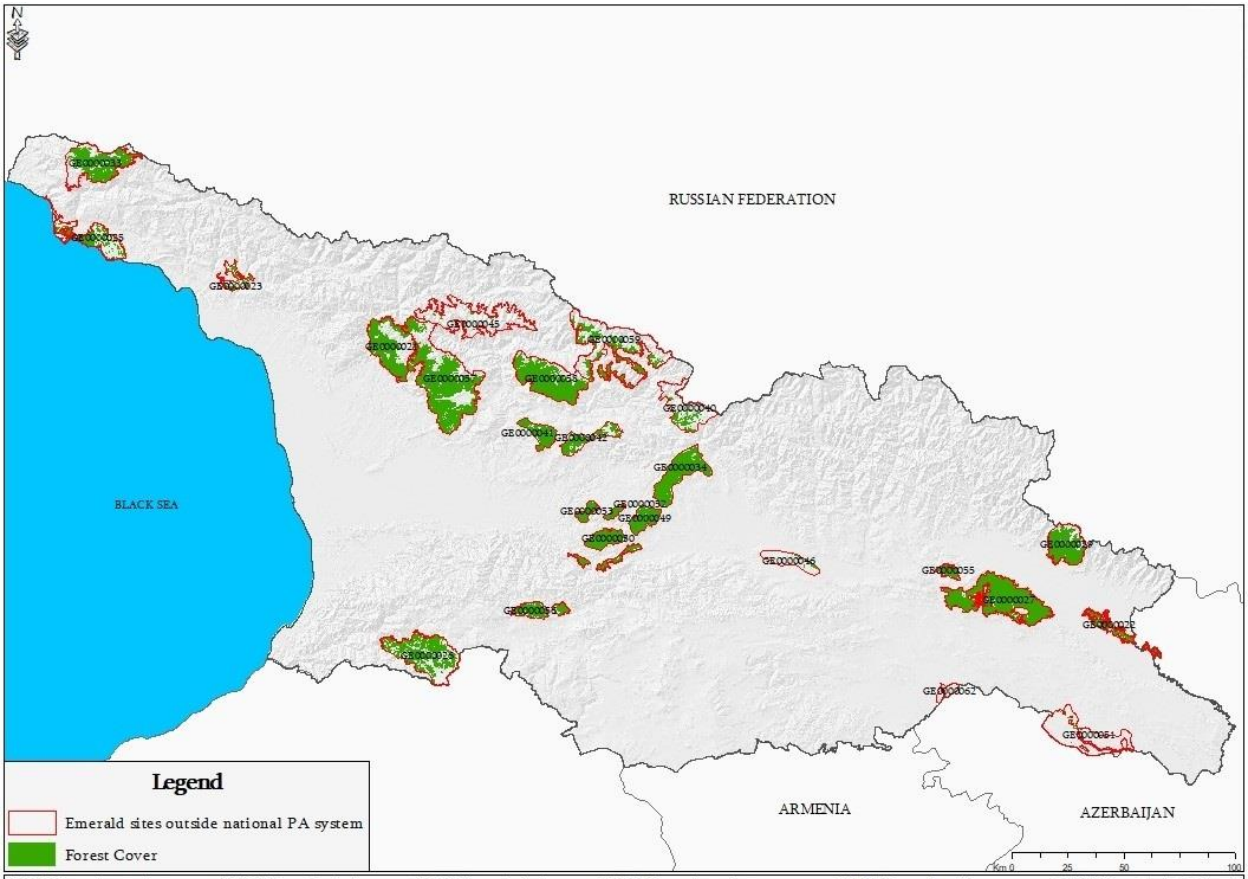
Up to 60 Emerald sites feature one or more of the above forest habitat types with Samegrelo 2 (GE0000057) having the highest diversity—nine different forest habitats from Resolution No. 4.

The distribution of Resolution No. 4 habitats by site as well as their coverage areas where available is given in Annex 2. This information is preliminary and more detailed mapping of forest habitats will be required for effective management planning on individual Emerald sites.

3. Emerald Sites outside the National Protected Areas System

Emerald sites that are situated outside the national PA system are found in different geographical and climatic zones and include diverse forest habitats. Therefore, each site has a specific conservation value. Table 1 indicates key conservation values (objectives) related to forest habitats. (Most of these sites also have other conservation values related to non-forest habitats and/or Resolution No. 6 species.)

Map 2. Emerald sites situated outside the National PA System (Developed by NACRES for the World Bank).



GE0000021	Samegrelo	GE0000027	Gombori	GE0000040	Racha 2	GE0000049	Surami 2	GE0000053	Surami 5	GE0000058	Racha-Lechkumi
GE0000022	Alazani	GE0000029	Kvareli-Shilda	GE0000041	Racha 3	GE0000050	Surami 3	GE0000055	Kistauri	GE0000059	Svaneti-Racha
GE0000023	Amtkeli	GE0000030	Liakhvi	GE0000042	Racha 4	GE0000051	Kotsakhura	GE0000056	Borjomi-Kharagauli 2	GE0000062	Jandara lake
GE0000025	Bichvinta-Miusera	GE0000033	Ritsa	GE0000045	Svaneti 2	GE0000052	Surami 4	GE0000057	Samegrelo 2		
GE0000026	Goderdzi	GE0000034	Surami 1	GE0000046	Kvernaki						

Table 1. Emerald sites outside the PA system and their conservation values/objectives in relation to forest habitats

#	Site code	Site name	Significance for forest habitats conservation
1	GE0000021	Samegrelo	Primarily important for coniferous woodland
2	GE0000022	Alazani	Important for the conservation of the Alazani floodplain forest that includes different riparian forest types
3	GE0000023	Amtkeli	Important for conservation of beech woodland
4	GE0000025	Bichvinta-Miusera	Covers 100 percent of the range of *Pinus pityusa* woodland
5	GE0000026	Goderdzi	Important for conservation of riparian forest, also coniferous, beech, and oak woodlands
6	GE0000027	Gombori	Important for conservation of oak and beech woodlands. Also, acts as an ecological corridor between the Lesser and Greater Caucasus
7	GE0000029	Kvareli-Shilda	Important for conservation of oak and beech woodlands
9	GE0000033	Ritsa	Important for conservation of coniferous and beech woodlands
10	GE0000034	Surami 1	Important for conservation of riparian forest as well as coniferous and oak woodlands. Also, acts as an ecological corridor between the Lesser and Greater Caucasus
11	GE0000040	Ratcha 2	Important for conservation of mixed coniferous and beech woodland as well as birch high mountainous forest
12	GE0000041	Ratcha 3	Important for conservation of coniferous, oak, and beech woodland; riparian forest; and yew (*Taxus baccata*)
13	GE0000042	Ratcha 4	Important for conservation of coniferous, oak, and beech woodland as well as riparian forest
14	GE0000045	Svaneti 2	Important for conservation of coniferous woodlands as well as birch high mountainous forest
15	GE0000046	Kvernaki	Important for conservation of oak woodland. Also, acts as an ecological corridor (stepping stone) between the Lesser and Greater Caucasus
16	GE0000048	Tbilisi Otter Island	Important for conservation of riparian forest and river otters
17	GE0000049	Surami 2	Important for conservation of riparian forest as well as oak and beech woodlands; an ecological corridor connecting the Lesser and Greater Caucasus
18	GE0000050	Surami 3	Important for conservation of beech woodland. Also, acts as a corridor between the Lesser and Greater Caucasus
19	GE0000051	Kotsakhura	Important for conservation of arid light woodland
20	GE0000052	Surami 4	Important for conservation of beech woodland. Also, acts as a corridor between the Lesser and Greater Caucasus
21	GE0000053	Surami 5	Acts as a corridor between the Lesser and Greater Caucasus
22	GE0000055	Kistauri	Important for conservation of beech and riparian woodlands. An example of a commercial forest that is actively used for forestry activities
23	GE0000056	Borjomi-Kharagauli 2	Important for conservation of riparian forests as well as coniferous, oak, and beech woodlands
24	GE0000057	Samegrelo 2	Important for conservation of coniferous, oak and beech woodland; riparian forest; and yew (*Taxus baccata*)
25	GE0000058	Racha-Lechkhumi	Important for conservation of coniferous and beech woodlands
26	GE0000059	Svaneti-Racha	Primarily important for the conservation of birch woodland, also riparian, beech, and pine woodlands
27	GE0000062	Jandari Lake	Important for conservation of riparian habitats and *Tramarix ramosissima*

4. Managing Emerald Network

4.1 General Principles

A forest management concept rooted in the principles of multifunctional and sustainable development is a critical element in the implementation of the Emerald Network, concurrently facilitating the provision of ecosystem services such as drinking water, soil protection, and recreation.

European experience underscores the feasibility of integrating biodiversity conservation issues into forest management plans through various approaches. On one hand, there is a need to address nature protection concerns comprehensively and effectively, while on the other hand, environmental specialists must account for national economic interests and the requirements of local communities. Pursuing strategies that address complex challenges, benefiting both biodiversity conservation and socioeconomic needs, is the most effective approach to managing the ecological network. Implementing beneficial strategies such as nature-based solutions or adopting 'close-to-nature' forest management principles can contribute to fulfilling obligations under the Bern Convention while still promoting timber production.

In general, the management of the Emerald Network is outlined in Resolution No. 8 of the Standing Committee of the Bern Convention, with procedures and best practices for the selection, subsequent management, and monitoring of network components.

The objectives of the Emerald Network can be effectively achieved through robust forest management planning and implementation, considering both local interests and national/regional objectives. Integrating environmental considerations into forest management schemes is imperative to achieving these objectives.

4.2 Responsibility for Emerald Network Management

The objectives of Emerald Network can only be attained through effective management of its sites, typically overseen by the national agencies responsible for environmental protection in countries party to the convention. Similarly, in Georgia, this responsibility falls under the MEPA. This Ministry is tasked with reporting obligations and is mandated to regularly provide information on the status of habitats and species protected by the Convention to the Secretariat of the Bern Convention. Additionally, MEPA approves site management plans and exercises general supervision over human activities and monitoring on the sites.

The actual management of an Emerald site is the responsibility of the landowner or manager of the land on which the site is situated. If an Emerald site overlaps with a PA, the Agency of Protected Areas (APA) assumes management responsibilities. If the site is outside the PA system, the NFA or other relevant body is responsible for site management. On municipal or private land, the municipality or landowner bears responsibility. In EU countries, a Natura 2000 site on privately owned land is managed by the landowner, with relevant state agencies collaborating with the landowner to offer compensations for any imposed restrictions or associated losses. While Georgia is developing relevant regulations, a similar approach is anticipated to be adopted. Consequently, the management of Emerald sites on land managed by the NFA falls within the jurisdiction of this agency. However, it is worth noting that forested land may also come under the jurisdiction of other agencies, such as the Patriarchate of Georgia of the Orthodox Church of

Georgia and local municipalities. If such an area is included in the Emerald Network, its management will be the responsibility of the relevant agency.

4.3 Network Goals and Management Objectives

To achieve the goals of the Emerald Network, it is important to clearly define conservation objectives for each site and proactively address any conflicts, duplications, uncertainties, or contradictory requirements. For instance, the pursuit of biodiversity protection may clash with the aim of enhancing timber production or improving timber quality, while sanitary felling might contradict efforts to maintain forest habitats in a close-to-natural state.

Forest ecosystems often face significant pressure from socioeconomic interests, necessitating the introduction of certain restrictions. Without properly defined and balanced objectives, actions outlined and executed within the same management plan may inadvertently undermine one another, jeopardizing both biodiversity conservation and the forest sector.

Practically, managing Emerald sites entails implementing active or passive conservation measures to expand the area of critical habitats protected by the Bern Convention and/or enhance their ecological status. Additionally, it involves preserving protected species in favorable conditions or, if needed, restoring their populations. In a broader context, Emerald site management encompasses avoiding any adverse impacts on protected species and habitats for which a specific site was designated. While other aspects of Emerald site management such as tourism, recreation, and resource utilization are pertinent, they must be carefully considered and harmonized with the primary conservation objectives. Thus, it is important to note that different conservation objectives may lead to different protection regimes and thus different and specific set of allowed economic activities on individual sites.

4.4 Favorable Conservation Status as a Basis of Site Management Planning

Effective management of an Emerald Network site is achieved through the establishment of a specialized and flexible management regime aimed at ensuring the long-term preservation of all habitats and species, protected by the Bern Convention. The planning and subsequent management of Emerald sites are based on the concept of favorable conservation status (FCS), as introduced by the EU Habitats Directive. While the FCS is usually applied (or defined) for larger territories such as a cluster of Emerald sites, biogeographical region, or even whole country, the management of a specific individual site should be planned in a way that effectively contributes to maintaining or achieving the FCS of a given habitat.

The FCS entails the following principles:

- The conservation status of a natural habitat is deemed favorable when its natural area remains stable or expands. Furthermore, the species composition integral to the habitat's structure remains stable, thereby ensuring the long-term preservation of species.
- The status of species is considered favorable if population dynamics and distribution remain stable, with this trend proving sustainable over an extended period. Crucially, the habitat necessary for the preservation of these species must have adequate area and be in a condition conducive to their sustainability.

4.5 General Recommendations

Parties to the Bern Convention are provided with the following overarching recommendations for managing their Emerald Network sites:

- Develop a long-term vision aligned with the National Biodiversity Strategy and Action Plan and other relevant sectoral strategies to guide site management endeavors.
- Incorporate climate change considerations into site management plans, devising long-term strategies to mitigate adverse impacts and adapt to changing climatic conditions.
- Ensure that proposed management measures account for links with surrounding areas, recognizing their significance as buffers and facilitating species migration opportunities.
- Foster the participation of all stakeholders in the preparation and implementation of site management plans, promoting inclusivity and collaboration among diverse stakeholders.
- Strategically plan and implement measures that facilitate cross-border management and foster international cooperation.

5. Emerald Site Management Plan

A prerequisite for the effective management of any Emerald Network site lies in the elaboration of a comprehensive management plan. This plan must clearly set the site's goals and objectives and outline the necessary measures to achieve them and facilitate the implementation of both the Emerald Network and the Bern Convention. The development of a dedicated management plan is essential, with its launch mandated within six years following site designation. Furthermore, the implementation of the site management plan requires regular review and monitoring, with the management goals and objectives subject to updates every five years as deemed necessary.

Presently, many Georgian Emerald sites lack dedicated management plans, except for those situated within PAs of specific national categories. In these instances, the Emerald Network requirements and conservation objectives have been integrated into existing PA management plans to a certain extent. However, none of the Emerald sites outside the national protected area system and managed by the NFA have dedicated Emerald site management plans.

5.1 Conservation Objectives

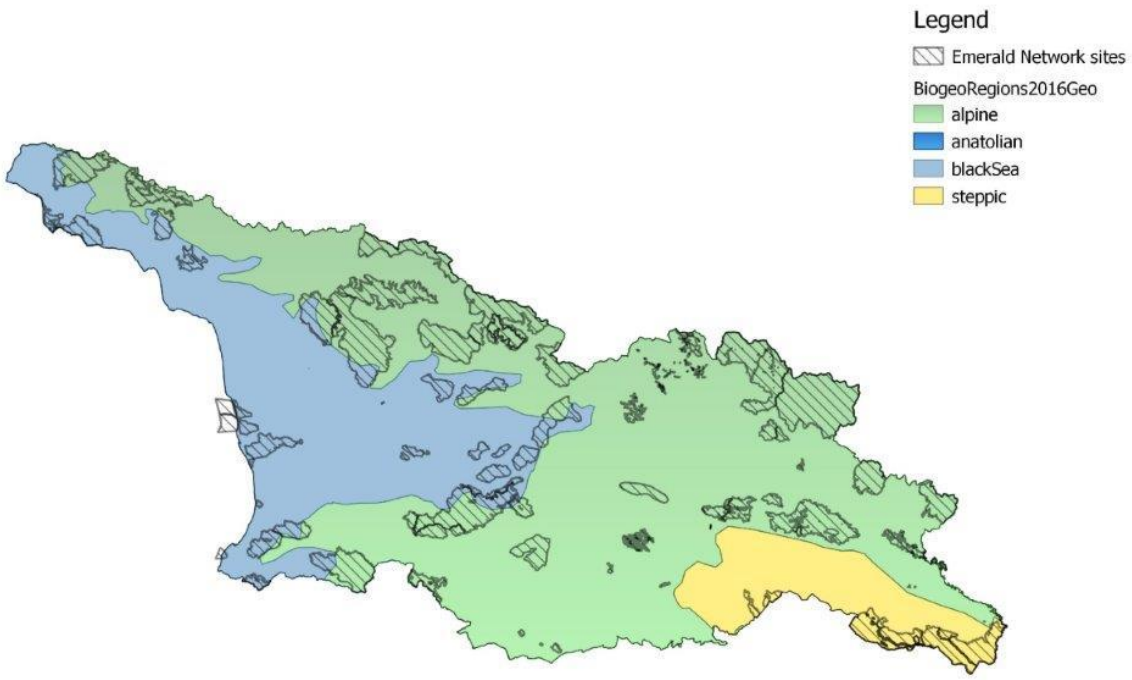
Both long-term and short-term conservation objectives need to be developed for each site. Long-term objectives may not be attainable within a relatively short period, yet they are typically regarded as the overarching goal to be achieved gradually through the implementation of short-term (perhaps five-year) objectives.

Conservation objectives must be

- Dedicated to a specific habitat or species;
- Measurable, descriptive, and subject to monitoring to evaluate progress;
- Feasible and achievable within a certain period;
- Consistent and, to the extent possible, methodologically similar to approaches used on other sites; and
- Comprehensive—variables should be selected or formulated to allow for the description of habitat and species status as favorable or unfavorable both nationally and within a site (for example, area in hectares for habitats; number of individuals, pairs, males, females, nests for species).

Specific conservation objectives should help ensure the attainment of an FCS for each habitat and species, both at the national and biogeographical levels and ultimately at the European level. (**Erreur ! Source du renvoi introuvable.** illustrates the biogeographical regions of Georgia according to the Bern Convention.)

Map 3. Distribution of Emerald sites among the biogeographical regions of Georgia (Developed by NACRES for the World Bank).



5.2 Conservation Measures

In general terms, the management of an Emerald Network site primarily involves the implementation of active or passive conservation measures that contribute to achieving the network's objectives—specifically, maintaining or achieving an FCS for the habitats and species present on the site. Specific and most appropriate conservation measures directly derive from and serve the long- and short-term conservation objectives set for a given site. Hence, they must be defined separately for each species and habitat identified on the site. They should also be site specific to reflect the unique characteristics and needs of the site.

5.3 Management Planning Process

The preparation of an Emerald Site Management Plan relies on existing or specially collected information, which must encompass lists of species and habitats found on the site, population numbers and trends, ecological characteristics, threats, and other relevant data. A significant portion of this information is usually already available for management planning since it is gathered during the preparatory stage for site designation as an Emerald Network site and that information is integrated into the corresponding standard data form (SDF). However, challenges arise due to incompatibilities between national and EUNIS classification systems, rendering the information included in SDFs insufficient or necessitating further

improvement for effective site management planning. Therefore, additional data may be necessary for effective and smooth management planning for a given site. In addition, any new data that become available through this or other processes must be entered into the site's SDF to ensure that the SDF is kept constantly updated.

The following information is of critical importance for the preparation of an Emerald Site Management Plan:

1) General Information

1.1. Precise description of the site, including location and coordinates. Boundaries must be accurately delineated in geographic information system (GIS) and relevant shape files must be available. A high-quality map depicting the site's location within the country, settlements, roads, rivers, and other physical features, as well as tourist attractions, should be created.

1.2. Legal status, such as national (for example, protection status) and/or international protection status, and its relation to international agreements and conventions should be included.

1.3. Development and management projects: Details of existing or planned development projects involving natural resource utilization that may significantly affect the site should be provided. Information on urban development projects, spatial planning documents, strategic or national policy documents affecting the site and its management, plans addressing forest fire risks or other natural disasters, climate change adaptation plans, and biodiversity conservation programs (for example, plans addressing invasive species, pasture management plans, and green infrastructure development plans) should also be included.

2) Land Ownership and Land Use

Comprehensive information regarding land ownership and existing infrastructure, including any buildings on the site, should be provided. Much of the land within Georgia's Emerald Network is state owned, necessitating the establishment of the responsible agency for land management. Complete data on land use, legal rights (for example, licenses, concessions, long-term lease agreements), and forms of traditional use by local communities (for example, timber or non-timber resource collection, hay collection, and grazing) should be collected. Additionally, all relevant stakeholders influencing the relationship between the owner/tenant and area user (for example, landowners' associations, farmers' associations, hunting clubs, business associations, and community organizations) must be identified.

3) Governance

3.1. Governance structure: This includes municipalities, administrations, and institutions (for example, PA administration, and forestry administration) as well as important stakeholders and organizations that may play a role in site management.

3.2. Funding sources: Information regarding funding sources (for example, programs, investments, and grants) earmarked for financing site management should be provided.

4) Geography, Soils, Climate

4.1. Physical description: This encompasses the site's elevation, terrain, geographical formations, landscapes, valleys, caves, and erosions. Special attention should be given to natural features and

processes influencing habitat presence and diversity (for example, dunes, sediments, and riverside gravel).

4.2. Hydrological network: Description of the hydrological network, including river terraces or other structures. It is important to depict the hydrological network on appropriate maps, showing hydrological structures, riverbed modifications, and changes in the natural hydrological regime.

4.3. Climate description

4.4. Soil description: Providing a soil map is desirable.

5) Natural Habitats

5.1. Identification, distribution, and mapping of habitats: The Bern Convention emphasizes the importance of habitat protection for long-term species conservation. Therefore, the focus lies on preserving natural habitats. The identification and mapping of habitats within the Emerald site are crucial initial steps. Accurate data should be made available for all Resolution No. 4 habitats present on the site, and this information should be incorporated in the site's SDF (A full list of Resolution No. 4 habitats in Georgia is provided in Annex 4). Habitat names and codes should adhere to the EUNIS classification, and their distribution within the site must be mapped at the highest level of detail possible, with estimates of each habitat type's size. Additionally, it is desirable to identify other habitats (according to the EUNIS classification) not included in Resolution No. 4 but of significant conservation importance at the national or international level.

Box 1. Recommendations regarding mapping of habitats within Emerald sites

While mapping habitats, it is essential to employ the most accurate approach available to determine boundaries. Frequently, habitat boundaries lack sharp edges or clear separation, making them challenging to delineate. For instance, forest habitats often blend seamlessly into one another or within a single larger habitat there may be patches of completely different plant communities. In such cases, habitat boundaries may appear arbitrary. Nevertheless, preparing habitat distribution maps remains a crucial step in site management planning.

Mapping habitats with well-defined boundaries, such as swamps, caves, reefs, riverbeds, and coastal dunes, is relatively straightforward. However, identifying forest habitats poses a more complex challenge, necessitating the assessment of plant communities and dominant vegetation. Local plant communities, indicative of the habitat, should be identified using relevant indicator species, along with consideration of soil types and physical features such as topography, aspect, and elevation characteristic of the habitat.

For smaller sites, conducting detailed field studies allows for highly accurate determination of habitat boundaries, with very small sections represented on the map as dots. Conversely, for larger sites, utilizing all available information is recommended, including botanical descriptions, vegetation cover types, forest inventory data, GIS data, and satellite imagery. Preliminary assessments should be validated on the ground, through methods such as sampling plots, to finalize distribution maps.

Descriptions of key plant communities that define habitats, soil types, physical features, and other relevant information are available in the 'Terrestrial Habitats of Georgia according to the EUNIS Habitat Classification' (2017) https://www.nacres.org/files/pdf/Emerald/EUNIS%20habitats_Interpretation%20Manual_in%20%20Georgian.pdf . Additionally, descriptions of forests and other areas covered with trees in Georgia are provided in Annex 1, with a step-by-step identification chart in Annex 3.

Distribution maps for most habitats are stored at the Department of Biodiversity and Forestry of MEPA. However, the accuracy of those maps varies, and some may only include point data rather than polygons. It is crucial to critically review existing information before incorporating it into management planning, and if necessary conduct detailed ground surveys, especially for sites lacking up-to-date habitat information.

6) Species

As a first step, it is essential to identify all species included in Resolution No. 6 that occur on the site in question and, where needed, the site's SDF should be updated accordingly except for those species that have only insignificant populations (see Annex 5 for the species list). Additionally, other important species to be identified may include those listed in the Red List of Georgia and species of international importance, protected by other international instruments such as the EU Habitat Directive, Birds Directive, and Bonn Convention and its agreements.

Unfortunately, available species data for most Emerald sites consist of simple lists of major groups of organisms. However, effective management planning requires detailed knowledge of the population of each important species within the site including their numbers (individuals, pairs, and so on) as well as distribution, with high-quality maps showing not only general distribution but also critical areas or spots such as breeding, resting, foraging, denning/wintering sites, and migration corridors. This detailed information is especially crucial for Emerald sites where significant human activity, such as forestry operations and agricultural activities, takes place.

Below, minimum standards are described for data and thematic maps for Emerald site management planning.

Plants

It is recommended that mapping of plant species be carried out together with habitat mapping. The preferred approach is to use polygons. If species distribution is available only as points on the map, polygons should be drawn based on these point data, if possible.

Insects

Sites where adult individuals of insects are regularly noted should be mapped. However, it is also necessary to identify the distribution zones of their food plants in the larval stage. For butterflies, this is an essential requirement, and their distribution map should include not only locations where adults are found but also where their caterpillars are found.

The area within a radius of 500 m from a freshwater reservoir is considered as the habitat of dragonflies, and therefore their distribution map should include these areas.

Mollusc habitats can be defined as any place that meets their ecological requirements. These may include the floors of water bodies, sand and clay beds, and so on, paying attention to flow levels. Mollusc habitats can be easily identified by the presence of empty shells, and all such areas must be included in their distribution maps.

For invertebrate distribution maps, the use of polygons is preferred. If species distribution is available only as points on the map, polygons should be drawn based on these point data if possible.

Fishes

When identifying the distribution of fish species, it is recommended to identify those sections of water bodies (streams, rivers) on which subsequent research and monitoring will be conducted. Such sites include suitable biotopes in relation to the ecology of particular species. Fish distribution maps should include monitoring sites as well as critical fish habitats such as spawning sites and migration routes.

Amphibians and Reptiles

For amphibians and reptiles, the emphasis should be placed on identifying their breeding and wintering sites. Appropriate distribution maps should be prepared to delineate these areas.

Birds

Where feasible, it is advisable to create georeferenced detailed maps of bird distribution, indicating the breeding and nesting sites of particularly important and rare species. Depending on the size of the site, a 1×1 km, 5×5 km, or 10×10 km universal transverse mercator (UTM) grid should be used.

Mammals

For mammals, distribution maps should be created using a 1×1 km, 5×5 km, or 10×10 km UTM grid, depending on the size of the site and the available data. These maps should highlight critical sites such as breeding grounds, water holes, den sites, and migration corridors.

When mapping the distribution of bats, special attention should be given to identifying roosting sites such as caves, crevices, and burrows with the highest possible accuracy. Mapping such sites should be done in as much detail as possible. Additionally, the identification of migration corridors and feeding zones should utilize specialized tools such as ultrasonic detectors, allowing the identification of both the range and movement corridors. Every effort should be made to collect abundance data for each species.

5.4 Defining Favorable Conservation Status for Habitats

The concept of ‘favorable conservation status’ is a critical element for evaluating the success of and planning the long-term conservation of species and habitats. The primary objective is to achieve an FCS for habitats and species, meaning a condition where “habitats have sufficient area and quality, and species have a sufficient population size to ensure their long-term survival, along with favorable future prospects in the face of pressures and threats.”

Each habitat type protected by Resolution No. 4 must be assessed by considering three key aspects: size, habitat structure, and the status of typical species.

Size is perhaps the most straightforward and important measure of the FCS, referring to the area covered by a given habitat. However, determining what size is considered ‘favorable’ can be challenging, as there are no specific indicators for the minimum or optimal size of any habitat. Historical range data are vital in this regard, enabling experts to establish a target habitat size for long-term conservation, which serves as the basis for management goals.

Different natural habitats vary in size and distribution based on specific physical, edaphic, or climatic conditions. Therefore, the minimum ‘favorable’ area of distribution must be determined individually for

each habitat. For example, caves may be characterized by plant communities that develop in a small area, while forest habitats typically cover larger areas.

Assessing habitat structure and functional features is more complex, involving an evaluation of how closely the habitat resembles its natural state and how healthy it is or how well it functions as an ecosystem. In degraded habitats, this approach involves determining the level of degradation. For forest habitats, assessing the natural state involves studying the composition and diversity of woody species, including the density of high-value woody species and the presence of habitat trees.

Dead biomass is another crucial variable in assessing forest habitat health as fallen or standing dead trees serve as habitats for many species. Habitat fragmentation and changes in habitat structure can be challenging to assess and often rely on expert opinion. Assessing these variables requires both quantitative and qualitative analysis of habitat-forming species, vegetation cover, and ecosystem processes.

As a general recommendation, change is 'insignificant' where the qualitative index of the habitat change is by 20 percent or less compared to the natural state. Significant degradation falls between 20 percent and 70 percent change, while changes exceeding 70 percent are considered fundamental, indicating a substantial shift in habitat composition or function.

5.5 Favorable Conservation Status for Species

Assessing the FCS of species included in Resolution No. 6 within a given Emerald site involves considering several key parameters:

- **Population numbers and dynamics**: Evaluating the size and trend of the population over time, including whether it is decreasing, increasing, or stable. This assessment should be conducted through regular monitoring processes, not just baseline surveys, with intervals typically ranging from 5 to 10 years.
- **Species distribution and range size**: Determining the geographical distribution and extent of the species' range through detailed studies, and mapping the locations where individuals are recorded. This helps understand the spatial dynamics of the population (notably range size is only relevant to relatively larger sites).
- **Size and quality of vital habitats**: Assessing whether the total size and quality of the habitat are sufficient for the long-term maintenance of the population. This includes evaluating habitat stability, vulnerability to anthropogenic factors and threats, and the provision of essential resources such as space and food for the species to thrive and reproduce.
- **Population structure**: Examining demographic characteristics such as sex ratio, age structure, and other relevant variables. Changes in these parameters can indicate increased human pressure or other negative processes affecting the population.

To collect species information, it is crucial to adhere to the requirements and entries outlined in the Emerald Network Site SDF. The assessment should consider the trend of population dynamics, measuring population size in the same unit as specified in the SDF (for example, individuals and pairs). Special attention should be given to anthropogenic factors, current threats, natural processes like succession, and the anticipated impact of climate change on habitat suitability for the species.

Overall, a comprehensive assessment of these parameters helps determine the FCS of species within the Emerald site and guides conservation efforts to ensure their long-term survival and well-being.

5.6 Priority Setting

With limited financial and human resources, it becomes paramount to set management priorities. Many sites within the Georgian Emerald Network boast rich biodiversity, harboring numerous habitats and species protected under Resolutions No. 4 and No. 6. While ensuring the long-term conservation of all these species and habitats is imperative, certain species and habitats necessitate special attention for management, either at the site level or within the network at large (that is, nationally). In some instances, a species or habitat may hold greater management significance for another site within the network, diminishing its priority status for the Emerald site, for which a management plan is developed.

Determining management priorities demands a substantial level of expertise, entailing an evaluation of the conservation role of a specific site in the broader network context. This involves analyzing national and European conservation interests and assessing the distribution and ecological status of the habitat or species in question. Initial priority may be accorded to habitats and species for which a particular site is specifically important, especially if the species is unique to that site or if the majority of protected habitat resides there. However, it is essential to remember that the Emerald Network operates as a unified ecological network with shared conservation objectives, serving to safeguard species and their habitats collectively. Thus, prioritization does not imply neglecting other species and habitats.

In determining management priorities, thorough assessment of the key ecological processes influencing species and habitat conservation or restoration is crucial. Selecting the primary priorities (priority species and habitats) for Emerald Network sites should involve engagement with all stakeholders, including representatives from the academic sector, experts, governmental and nongovernmental organizations, among others. It is advisable to conduct this process at the national level, ideally employing a standardized approach for all sites collectively rather than individually, as it requires extensive expertise and comprehension of the broader landscape. Once priority habitats and species are identified, the preparation of the management plan should be carried out individually for each Emerald site.

5.7 Assessing Threats

Efficient management of the Emerald Network necessitates the exclusion of any action or activity that could jeopardize the maintenance of the 'favorable conservation status' of habitats and species protected by the Bern Convention or interfere with the attainment of this status.

Hence, a primary objective of the network is to administer natural resources in a manner that mitigates potential negative impacts on species protected by the Convention as well as on habitats and biodiversity at large.

To facilitate this goal, a predefined list of threats has been adopted and used for reporting purposes in accordance with Resolution No. 8 of the Standing Committee of the Bern Convention. This document presents a standardized list of threats and pressures (see Annex 6).

All forests in Georgia, including those protected by Resolution No. 4, face a multitude of threats and pressures. The primary forms of natural resource utilization in the forested areas within Emerald Network encompass timber extraction, non-timber resource utilization, grazing, and mowing.

Timber harvesting occurs across all types of forest habitats in Georgia, including those protected by Resolution No. 4. For instance, Fagus woodland (G1.6), constituting over half of Georgia's forests, is utilized for commercial timber production. Additionally, the local population uses beech wood for fuel and construction.

Communities also extract wood from other habitats protected by Resolution No. 4, such as the Balkano-Pontic *Abies* forests (G3.17), *Picea orientalis* forests (G3.1H), Mixed deciduous woodland of the Black and Caspian Seas (G1.A7), and Ponto-Caucasian *Pinus sylvestris* forests (G3.4E). Floodplain forest habitats, encompassing Resolution No. 4 habitats such as Riverine *Salix* woodland (G1.11), are protected by national legislation but remain under pressure due to local utilization.

Non-timber resource extraction is widespread throughout Georgia, both within and outside Emerald Network, serving both commercial and noncommercial purposes. Notably, the extraction of *Abies nordmanniana* seeds for commercial use is particularly intensive in habitats designated under Resolution No. 4, such as the Balkano-Pontic *Abies* forests (G3.17), primarily concentrated in Racha (western Georgia) and exported to Europe for Christmas tree cultivation.

Many Emerald sites feature alpine/subalpine or lowland grasslands extensively used for grazing and/or haymaking. While livestock grazing is regulated within PAs, subalpine pastures sometimes witness illegal grazing in surrounding forests.

From 2018 to 2020, Georgia compiled its first report to the Secretariat of the Bern Convention and the European Environment Agency regarding the status of selected species and habitats within the Emerald Network of Georgia in compliance with Resolution No. 8. In this endeavor, a team of experts, comprising representatives from academic, governmental, and nongovernmental organizations, formulated a standard list of threats and pressures for each type of forest habitat under Resolution No. 4 prevalent in Georgia (see Annex 6).

Specifically:

- Fagus woodland (G1.6) faces significant pressure from both legal and illegal logging activities. As more than 50 percent of Georgia's forests comprise beech forests, they serve as the primary timber source in the country.
- Floodplain forests (G1.11, G1.12, G1.22, G1.3, and G1.44) exhibit naturally limited distribution and have long been subject to intense anthropogenic pressure, particularly in lowland areas. Historical and ongoing threats stem from agricultural encroachment, livestock grazing, logging, alterations in river hydrological patterns and flood control measures, pollution, and, more recently, diminished rainfall due to droughts and climate change. Unlike other forest habitats that may adjust vertically in response to climate change, this adaptation is improbable for floodplain forests due to their reliance on specific geological conditions. Consequently, these habitats are among the most vulnerable forest ecosystems in Georgia.
- Decreased precipitation resulting from droughts and climate change also poses a significant threat to coniferous forest habitats (G3.17, G3.1H, G3.4E) in eastern Georgia.
- The establishment or expansion of sports, tourism, and recreational infrastructure (beyond existing urban or recreational zones), primarily in the form of winter resorts, constitutes a serious threat nationwide, affecting upland forests. Notably, habitat types such as G1.918, G1.91A, G3.17,

and G3.1H are particularly affected. This threat may extend to Tusheti (northeast Georgia) pine forests (G3.4E), given the region's appeal for certain winter sports activities, including cross-country skiing.

- Balkano-Pontic *Abies* forests (G3.17), as previously mentioned, are under pressure due to extensive seed harvesting.
- Invasive plant species predominantly colonize forest edges and rarely infiltrate intact forest areas. Among alien invasive species identified under EU Regulation No. 1143/2014 as potential threats to forest habitats, only one, *Ailanthus altissima*, is widespread in Georgia.

5.8 Elaborating Management Recommendations and Activity Planning

As previously mentioned, the clear formulation of conservation objectives, aligning with Emerald Network's goals, is an essential prerequisite for crafting a comprehensive management plan. These objectives should be achieved through associated conservation measures that may encompass the maintenance or restoration of specific habitats, along with measures aimed at safeguarding species protected by the Convention.

Recommendations for forest management and the selection and formulation of precise conservation measures will need to be tailored and will depend upon aspects such as the forest type, its species composition, and the primary actions necessary to uphold their FCS. Additionally, consideration must be given to the specific threats and detrimental factors affecting the Emerald site.

These measures should be devised to be (a) specific, (b) measurable, (c) achievable, (d) relevant, and (e) time bound. Management measures may be directed toward restoring the population of a species, enhancing habitat conditions, or mitigating existing or potential threats within a defined time frame, such as over a span of five years.

5.9 Zoning

Site zoning represents an essential phase for the effective implementation of planned conservation measures, founded upon ecological characteristics and the conservation or broader environmental significance. Properly conducted zoning serves as a cornerstone for efficient site management, as it forms the basis for spatially distributing management measures and approaches, including the adaptation of agricultural activities in accordance with zoning guidelines. This stage necessitates the availability of detailed and reliable habitat maps (see subchapter 4.2) as well as comprehensive forest inventory data.

It is advisable to delineate primary conservation areas, known as core conservation areas, and buffer zones, where conservation objectives and activities take precedence over economic pursuits. This approach would allow the application of varying protection regimes within the site boundaries and eliminate the need of imposing unnecessary general restriction over the whole territory. Primary conservation areas may encompass areas housing Resolution No. 4 forest habitats, particularly focusing on sites crucial for maintaining an FCS of these habitats.

Priority should be accorded to main habitats and species identified as crucial for the respective Emerald site (see subchapter 4.5). Such areas may serve as habitats for critical species or hold significant importance throughout various stages of their life cycle, including nesting sites, burrows, ponds, reproductive sites for protected species, or areas with habitat trees.

Other significant sections include (a) areas of undisturbed or minimally disturbed forest, characterized by high diversity of rare species and (b) areas designated by national legislation for environmental protection or other purposes, such as buffer zones surrounding PAs.

In these key conservation areas, agricultural activities should be restricted and minimized within adjacent buffer zones, though complete exclusion of such activities may be challenging.

Equally crucial are 'corridor habitats' vital for species migration and metapopulation processes, fostering connectivity between populations, as is the case between the Lesser and Greater Caucasus in Georgia. Agricultural activities along these corridors should be kept to a minimum.

Overall, the allocation of main conservation areas should align with national legislation and the conservation goals outlined by the Bern Convention. While national regulations often restrict agricultural activities in areas with steep slopes and designated 'special function sections', overlapping interests between national regulations and the Emerald Network conservation priorities can facilitate management efforts. However, it is likely that the range of habitats and species protected by the resolutions will extend beyond these 'special function forest' sections.

Simultaneously, zoning efforts entail designating sections primarily earmarked for agricultural activities, sustainable forestry, controlled tourism, traditional agricultural practices, and other compatible land uses. Utilizing sustainable forestry practices is strongly encouraged in these areas.

Zoning decisions should involve consultation with local communities, landowners, users, municipality representatives, and other stakeholders. Embracing local and traditional land use practices is recommended throughout the zoning process.

5.10 Monitoring and Reporting

Article 17 of the Habitats Directive mandates member states to engage in continuous monitoring and report on the outcomes achieved. Monitoring and reporting guidelines are set out in Resolution No. 8 (1992) of the Standing Committee of the Bern Convention, which outlines procedures for the Emerald Network. Each country is responsible for designing its own monitoring scheme that covers all species and habitats of Resolutions No. 6 and No. 4, respectively, and ensures their regular monitoring. However, the Bern Convention does not provide detailed regulations or recommendations. Consequently, the principal regulations guiding these matters stem from documents developed within the EU, specifically in the framework of implementing the Habitats and Birds Directive (Natura 2000 Network).

Article 17 of the Habitats Directive obliges member states to prepare reports for all habitats listed in Annexes I, II, IV, and V of the Directive (species of community interest). Member states are obligated to report not only on ongoing processes within Natura 2000 but also on the national level, encompassing areas both inside and outside the network, reflecting on the status of habitats and species nationwide. Furthermore, it is noteworthy that EU member states monitor not only the biodiversity status but also the effectiveness of ecological network management measures.

Monitoring activities are scheduled every six years, wherein the performance of network objectives is evaluated. The report is then submitted to the Secretariat of the Bern Convention and the European Environment Agency.

The reporting guidelines are outlined in the decision of the Scientific Council of the Bern Convention, adopted in 2017. This decision is articulated in the 'Group of Experts on Protected Areas and Ecological Networks 8th meeting: Explanatory Notes and Guidelines for the Period 2013-2018', comprising both the Report Format Field-by-Field Guidance Document and Definitions and Methods (2018) based on which the document *reporting under Resolution No. 8 (2012) period 2013–2018*[4] was prepared.

Consequently, information pertaining to all habitats and species protected by the resolutions should be systematically collected, entailing regular monitoring across all sites within Emerald Network. However, particular emphasis must be placed on the priorities established for each site. The results of site-level monitoring must be incorporated into the respective SDF as well as effectively integrated in the site management plan as appropriate to ensure adaptive management.

5.11 Adaptive Management

Adaptive management—wherein management strategies continually evolve and adjust to the prevailing, often fluctuating environmental conditions—constitutes a significant element of any effective management plan. This approach ensures the ongoing relevance of our management strategies, enabling them to address existing threats and challenges effectively and comprehensively.

Within Emerald sites, adaptive forest management should primarily prioritize addressing issues related to climate change and mitigating its adverse impacts. Adaptation measures must encompass various aspects, including increased risks posed by forest fires and diseases, undesired alterations in forest structure and species composition, invasive species, and the need for forest restoration efforts that account for shifting climatic conditions and alterations in hydrological patterns of rivers and water bodies.

It is imperative to thoroughly assess the risks and vulnerabilities associated with forest fires and other natural disasters through novel preventive, mitigation, and adaptive measures utilizing modern technologies.

5.12 Public Involvement

As a signatory to the Aarhus Convention, Georgia is obligated to guarantee access to environmental information nationwide, fostering the active dissemination of information and prompt response to inquiries from interested parties. This entails establishing minimum procedural obligations to ensure public participation and uphold human environmental rights. Citizens hold the right to be informed about environmental protection decisions that may affect them and their surroundings. Moreover, concerned individuals have the opportunity to engage in the decision-making process and participate in public discussions and consultation meetings to voice their opinions and present arguments.

Similarly, this inclusive approach extends to the management of Emerald Network and to the integration of Bern Convention requirements into forest management plans within its sites. Discussions and active involvement of all stakeholders lead to better, more sustainable decisions that enhance both human well-being and environmental conditions over the long term. Therefore, when formulating management plans for any Emerald Network site, particularly in forest management planning, the participation of all stakeholders is imperative. This is especially critical given that forest habitats provide numerous ecosystem services to local communities and the general public, with many households relying on timber

[4] https://rm.coe.int/resolution8-final-report/16809fb03c

or non-timber resources. Community involvement at the planning stage ensures the smooth implementation of forest management processes and mitigates potential conflicts.

6. Challenges and Next Steps

These guidelines represent the first attempt to offer solutions to the challenges the forestry sector is likely to encounter in harmonizing its activities on Emerald sites with the network's standards. However, the recognition of those challenges and the acceptance of these guidelines may themselves pose a challenge too, especially in rural areas.

Therefore, it would be necessary to plan and implement special activities for promoting these guidelines as a tool that can help the conservation and restoration of habitats and species of pan-European interest, thus supporting Georgia's commitments under the Bern Convention. In addition, some of the concepts and approaches applied in this document would also need to be introduced and clearly explained to Georgian forestry practitioners, which can be achieved through a series of introductory meetings and even training sessions. All existing information including the list of Resolution No. 4 Forest habitats present in Georgia as well as their detailed descriptions need to be widely publicized among the foresters and other stakeholders such as experts and policy makers involved in Environmental Impact Assessment (EIA) processes.

Defining the FCS for forest habitats is also considered as one of the challenges for the effective management planning on Emerald sites. There is a clear need of assistance in this regard and as a first step, the FCS should be determined for at least some of the major forest habitats that are under highest pressure from commercial logging and/or threatened by infrastructure and energy sector.

In addition, based on these guidelines and its annexes (1, 3, and 6), it may be advisable to prepare a *Resolution No. 4 Habitat Identification and Management Handbook for Georgia.*

Annex 1: Woodland, Forest, and Other Wooded Land

G. WOODLAND, FOREST, AND OTHER WOODED LAND

G1. Broadleaved deciduous woodland

G1.1. Riparian and gallery woodland, with dominant alder, birch, poplar or willow

G1.11. Riverine willow woodland: *Salix* spp. scrub or arborescent formations, lining flowing water and subjected to periodic flooding, developed on recently deposited alluvion. Willow brushes are particularly characteristic of rivers originating in major mountain ranges. Shrubby willow formations also constitute an element of lowland and hill riverine successions in all major biomes, often making the belt closest to the water course. Taller arborescent willow formations often constitute the next belt landwards in riverine successions of lowland western nemoral, eastern nemoral, and warm-temperate humid forest regions and a large part of the less diverse riverine systems of the steppic, mediterranean, and cold desert zones. Vegetation of alliance (*Salicion albae*) and species (*Salix alba, S. fragilis, S. viminalis, S. excelsa, S. micans, Populus alba, P. nigra, P. canescens, Lycopus europaeus, Lysimachia vulgaris, Phalaroides arundinacea,* and *Urtica dioica*) are found. They may be affected by the invasive alien species (*Solidago canadensis*, *Aster novi-belgii*, *A. novi-anglii*, *Impatiens glandulifera*).

In east Georgia, the most important stands of this forest occur in the form of more or less discrete lines along the lower flows of the rivers Alazani, Mtrkvari (Kura), Khrami, and Iori. The major shrub species of the undergrowth are *Hippophaë rhamnoides, Tamarix ramosissima, Daphne caucasica* and woody lianas are *Clematis vitalba, C. orientalis, Humulus lupulus, Lonicera caprifolium, Vitis sylvestris*. In west Georgia, they occur along rivers from lowland to 1,500–1,600 m.a.s.l. The major undergrowth shrubs and woody lianas are *Hippophaë rhamnoides, Hedera colchica, H. helix, Rhododendron ponticum, Laurocerasus officinalis, Staphylea colchica, S. pinnata, Clematis vitalba, Smilax excelsa, Dioscorea caucasica (rare), Humulus lupulus*. One or more of the following ferns are also important constituents of riverine willow woodland in west Georgia: *Athyrium filix-femina, Pteridium tauricum, Phyllitis scolopendrium, Dryopteris borreri*. The herbaceous cover (in the east and west) is constituted by *Phragmites communis, Typha latifolia, Alisma plantago-aquatica, Juncus articulatus*, and so on. In relatively dry places other species appear: *Apocynum venetum, Althaea officinalis, Inula helenium, Lactuca scariola, Melilotus officinalis, M. albus, Trifolium pratense*, and so on.

G1.12. Boreo-alpine riparian galleries: Riverside, lakeside, and seaside alder, birch, or pine galleries and cordons are found in the boreal, boreonemoral, and boreosteppic zones as well as in the high mountains of the nemoral zone and their piedmont influence region. These areas are dominated by *Alnus incana* along the montane and submontane rivers of the Alps, the Carpathians, the northern Apennines, the Dinarides, the Balkan Range, the Rhodope Mountains, and neighboring regions. The dominant species are *Alnus incana* or *A. glutinosa* in boreal Fennoscandia and northeastern Europe and *Betula pendula* or *Pinus sylvestris* in western Siberia. In the herb layer, nitrophilous and hygrophilous species dominate: *Aegopodium podagraria, Chaerophyllum hirsutum, Petasites hybridus, Crepis paludosa, and Caltha palustris ssp. Laeta.* G1.127. Ponto-Caucasian montane alder galleries: Riverside and lakeside alder galleries and cordons of the Pontic Range and the Caucasus system, with *Alnus subcordata*, *A. barbata*, or *A. incana*.

G1.2. Mixed riparian floodplain and gallery woodland

G1.21. Riverine ash-alder woodland, wet at high but not at low water: Riparian forests of *Fraxinus excelsior* and *Alnus glutinosa*, sometimes *A. incana* are found in middle European and northern Iberian lowland or hill watercourses, on soils periodically inundated by the annual rise of the river level, but otherwise well-drained and aerated during low water. They differ from riparian alder woods within units G1.41 and G1.52 by the strong representation in the dominated layers of forest species that are not able to grow in permanently waterlogged soils.

G1.22. Mixed oak-elm-ash woodland of great rivers: G1.223. Southeast European ash-oak-alder forests: Mixed riverine forests of Ponto-Pannonic and sub-mediterranean regions of southeastern Europe are usually dominated by *Quercus robur* (*Q. imeretina*, *Q. pedunculiflora*) and/or *Fraxinus angustifolia* and *F. excelsior* with varying admixtures of *Ulmus minor*, *U. laevis*, *U. glabra*, *Carpinus betulus* (*C. caucasica*), *Acer campestre*, *Alnus glutinosa* (*A. barbata*), *Salix alba*, *Populus alba*.

In east Georgia, the habitat mainly occurs along the rivers of Mtkvari (Kura), Aragvi, Iori, Alazani, and their tributaries (up to 1,000–1,100 m.a.s.l.) and occupies higher terraces compared to G1.11. The major woody lianas of these forests are *Smilax excelsa, Periploca graeca, Hedera colchica, H. helix*. Of herbs, the following are most frequent: *Oplismenus undulatifolius, Galeobdolon luteum, Asarum intermedium, Glechoma hederacea*.

G1.3. Mediterranean riparian woodland: Alluvial forests and gallery woods of the mediterranean region. Dominance may be of a single species, few species, or mixed with many species including *Fraxinus, Liquidambar, Platanus, Populus, Salix,* and *Ulmus*. Excludes mediterranean *Salix* woods (G1.1) and shrubby riparian vegetation (F9.3).

G1.36. Ponto-Sarmatic mixed poplar riverine forests: Mixed riverine forests found in the floodplains of rivers of the Pontic and Sarmatic steppes, wooded steppes, and southern nemoral forests of southern Eastern Europe, in particular of the lower Danube, the lower Prut, the lower Dniester, the lower Dnieper basin, the lower and middle Don and Donets system, the lower Volga basin, the Kouma and Terek basins, dominated by or rich in *Populus alba, P. nigra, P. canescens*. They extend west to the sub-Carpathian Getic region; poplar galleries described from the Pannonic margin of Moravia and the Bohemian basin occupy a similar ecological position and are listed with them: G1.364. Central and eastern Pontic poplar forests: Poplar galleries of the Dnieper, Don, Volga-Kama, Kouma, and Terek systems, within the steppes and wooded steppes of the northern plains of the Black Sea and of the northwestern and western Caspian Sea, with, in particular, *Populus nigra*.

G1.37. Irano-Anatolian mixed riverine forests: Riverine forests of the Irano-Anatolian plateau which spans across Türkiye, Iran, and Afghanistan; the Koura basin of Transcaucasia; and the Hyrcanian lowlands, of the Hindu-Kuch and western Himalayas include *Populus nigra, P. caspica, P. alba, P. euphratica, P. pruinosa, P. transcaucasica, Juglans regia, and Platanus orientalis*.

G1.4. Broadleaved swamp woodland not on acid peat

G1.44. Wet-ground woodland of the Black and Caspian Seas: Most hygrophilous communities of the mixed mesic Euxino-Hyrcanian forests (units G1.A71, G1.A74). They may include, in particular, *Fraxinus angustifolia* galleries as well as dense *Alnus barbata* forest stands occupying areas of black

damp or swampy soils on coastal alluvial plains, with *Fraxinus angustifolia* and an understory of *Rubus hirtus*, *Smilax excelsa*, and other climbers and shrubs, notably of *Rosaceae*.

G1.5. Broadleaved swamp woodland on acid peat

G1.52. Alder swamp woods on acid peat: Marshy *Alnus glutinosa*-dominated woods and scrubs of the Palaearctic region, usually with shrubby willows in the undergrowth.

Does not occur in east Georgia. In west Georgia, alder woods constituted by *Alnus barbata* (= *A. glutinosa subsp. barbata*), sometimes with *Pterocarya pterocarpa*, *Salix* spp. (mainly *S. australior*), occupy a portion of wetland areas in lower flows of the rivers Rioni, Supsa, Natanebi, Khobi, Enguri, Eristskali, and Okumi and other smaller rivers of Colchis. Alder swamp forest has more or less homogenous appearance from Sokhumi-Ochamchire to Kobuleti-Batumi. In heavily waterlogged places, low stature (6 to 16 m tall) and sometimes very sparse (with closeness of canopy of 0.2–0.5m alder stands grow on silty wetland substate. Alder occurs here in the form of solitary trees or small groups on hummocks. The undergrowth is mainly composed of the following shrubs: *Hippophaë rhamnoides, Rhododendron luteum, Rh. ponticum, Laurocerasus officinalis, Vaccinium arctostaphylos,* and *Sambucus nigra*. Lianas such as *Smilax excelsa, Hedera helix, H. colchica, Periploca graeca, Clematis vitalba, Humulus lupulus,* and *Calystegia sepium* are common. Usually each liana species dominates over a certain patch of the alder swamp forest, while only one or two individuals of other species occur on each patch. The herb cover is made up of species of the following genera Carex (*Carex lasiocarpa, C. pseudocyperus, C. riparia*), *Cyperus, Pycreus, Eleocharis* and other plants: *Juncus effusus, Molinia litoralis, Typha latifolia, Menyanthes trifoliata, Rhynchospora alba, Rh. caucasica, Alisma plantago-aquatica, Cladium mariscus, Juncellus serotinus, Schoenoplectus tabernaemontani, Sparganium polyedrum, Rhynchospora alba, Iris pseudacorus, Polygonum persicaria, Typha latifolia, Holcus lanatus, Poa trivialis, Oplismenus undulatifolius, Trifolium repens, Potentilla reptans, Ranunculus repens, Arthraxon hispidus*. The latter is an alien species. Of ferns, the following are important: *Osmunda regalis, Thelypteris palustris, Athyrium filix-femina, Pteridium tauricum*. In some places, *Sphagnum* (*S. imbricatum, S. nemoreum, S. gravitii, S. centrale, S. cuspidatum, S. papillosum*) cover is well formed.

G1.6. Beech woodland: Forests dominated by beech *Fagus sylvatica* in Western and Central Europe, and *Fagus orientalis* and other *Fagus* species in southeastern Europe and the Pontic region. Many montane formations are mixed beech-fir or beech-fir-spruce forests, which are listed under G4.6.

G1.61. Medio-European acidophilous *Fagus* forests: *Fagus sylvatica* and, in higher mountains, *Fagus sylvatica-Abies alba* or *Fagus sylvatica-Abies alba-Picea abies* forests developed on acid soils of the medio-European domain of central and northern Central Europe, with *Luzula luzuloides*, *Polytrichum formosum* and often *Deschampsia flexuosa*, *Calamagrostis villosa*, *Calamagrostis arundinacea*, *Vaccinium myrtillus*, *Pteridium aquilinum* and other species from suballiance *Luzulo-Fagenion*.

G1.62. Atlantic acidophilous beech forests: *Fagus sylvatica* or *Fagus sylvatica-Quercus* spp. forests developed on acid soils of the Atlantic domain of Western Europe, differing from the forests of unit G1.61 by, in particular, the absence of *Luzula luzuloides* and a greater abundance of *Ilex aquifolium*. They may also contain *Taxus baccata*.

G1.63. Medio-European neutrophile beech forests: *Fagus sylvatica* and, in higher mountains, *Fagus sylvatica-Abies alba* or *Fagus sylvatica-Abies alba-Picea abies* forests developed on neutral or near-neutral soils, with mild humus (mull), of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe, characterized by a strong representation of species belonging to the ecological groups of *Anemone nemorosa*, *Lamium galeobdolon*, *Carex pilosa*, *Galium odoratum*, and *Melica uniflora* and, in mountains, various *Dentaria* spp., forming a richer and more abundant herb layer than in the forests of units G1.61 and G1.62. Vegetation of alliance *Fagion* and suballiance *Eu-Fagenion* is found.

G1.65. Medio-European subalpine beech woods: *Fagus sylvatica* woods usually composed of low, low-branching trees, with much sycamore (*Acer pseudoplatanus*), situated near the tree limit, mostly in low mountains with oceanic climate of Western Europe and central and northern Central Europe, in particular the Vosges, Black Forest, Rhön, Jura, outer Alps, Central Massif, Pyrenees, the mountains of the Bohemian Quadrangle, and, very locally, the Carpathians. The herb layer is similar to that of the forests of unit G1.63 or locally of unit G1.61 and contains elements of the adjacent open grasslands.

G1.66. Medio-European limestone beech forests: Xero-thermophile *Fagus sylvatica* forests developed on calcareous, often superficial, soils, usually of steep slopes, of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe (also present in Greece), with a generally abundant herb and shrub undergrowth, characterized by sedges (*Carex* spp.), grasses (*Sesleria albicans*, *Brachypodium pinnatum*), orchids (*Cephalanthera* spp., *Neottia nidus-avis*, *Epipactis* spp.) of alliance *Cephalanthera-Fagenion* and thermophile species, transgressive of the *Quercetalia pubescenti-petraeae*. The bush layer includes several calcicolous species (*Ligustrum vulgare*, *Berberis vulgaris*), and *Buxus sempervirens* can dominate.

G1.67. Southern medio-European beech forests: G1.675. Sub-mediterranean calcicolous beech forests: G1.6751. Box beech forests: Beech forests with an undergrowth dominated by *Buxus sempervirens*.

G1.6E. Pontic beech forests: G1.6E1. Western Pontic beech forests: G1.6E13. Western Pontic rhododendron-oriental beech forests: Forests of the western Pontic Range dominated by *Fagus orientalis*, accompanied by *Quercus iberica*, *Acer cappadocium*, *A. trautvetteri*, with a lauriphile-rich 1–6 m high understory of *Rhododendron ponticum*, *Rh. flavum*, and *Ilex colchica* with *Hedera colchica*, *Smilax excelsa*, *Ruscus hypoglossum*, *Daphne pontica*, *Vaccinium arctostaphylos*, *Crataegus pentagyna*, *Aristolochia pontica*, forming a massive belt at altitudes extending from sea level to 1,100–1,200 m, under precipitations of 1,000–2,000 mm and on siliceous substrates.

G1.6H. Caucasian beech forests: Beech, beech-hornbeam, and beech-fir forests of the Caucasus.

G1.7. Thermophilous deciduous woodland

G1.7A. Steppe oak woods: G1.7A11. White cinquefoil oak woods: Xero-thermophile oak woods of Central Europe, Pannonia, and the northern approaches to the Ponto-Sarmatic wooded steppe zone with a flora of moderate thermophily and high continental affinities, mostly characteristic of sandy soil along the edges of the eastern steppeland and of clay soils in northern and western woodland areas.

The first layer species: *Quercus iberica, Acer tataricum*; Undergrowth species: *Carex bordzilowskii, C. cuspidata, C. divulsa, C. euxina, C. grioletii, C. halleriana, C. michelii, C. polyphylla, Convallaria majalis, Dactylis glomerata, Dictamnus caucasicus, Festuca rupicola, Geum urbanum, Polygonatum polyanthemum, Potentilla micrantha, Pulmonaria mollissima, Vincetoxicum amplifolium, V. hirundinaria*.

G1.7C. Mixed thermophilous woodland: Nonalluvial deciduous or semideciduous forests or woods of sub-Mediterranean climate regions and supra-Mediterranean altitudinal levels and western Eurasian steppe and substeppe zones of *Ostryo-Carpinion* alliance, dominated by *Ostrya carpinifolia*, *Carpinus orientalis*, *Acer* spp., *Fraxinus* spp., *Tilia* spp., or *Celtis australis*; like the thermophilous oak woods of unit G1.7, they may, under local microclimatic or edaphic conditions, replace the evergreen oak forests in mesomediterranean or thermo-Mediterranean areas, and irradiate far north into medio-European or sub-Atlantic regions: G1.7C2. Oriental hornbeam woods: *Carpinus orientalis*-dominated facies of the thermophilous woods of units G1.73, G1.74, G1.76, particularly abundant in Greece, the middle Balkan peninsula, Anatolia, and the Caucasus. Often of secondary nature, they replace oak forests on eroded soil after deforestation, especially on calcareous soils: G1.7C23. Anatolio-Caucasian oriental hornbeam woods: They consist of *Carpinus orientalis*-dominated facies of thermophilous woods of the Caucasus, the foothills of the Pontic Range, the Taurus, the Amanus, and Alaouites.

On limestone hills of the Samegrelo-Apkhazeti range, the Colchic *Carpinus orientalis*-dominated thermophilous woodland with occasional *Quercus iberica* admixture occurs. Often *Carpinus orientalis* forms pure scrub with seldom presence of other species. Participation of Colchic shrubs (*Buxus colchica, Rhododendron ponticum, Rh. luteum, Laurocerasus officinalis, Ruscus ponticus, R. colchicus*), which can be observed in places with sparse distribution of oriental hornbeam individuals, gives the woodland Colchic appearance. Besides, the following species are more or less common: *Punica granatum, Crataegus monogyna, Euonymus europaeus, Mespilus germanica, Fagus orientalis* (shrub-like), *Rubus sanguineus, R. discernendus, R. lepidulus, R. caucasicus, Diospyros lotus*, and so on. Herb cover is diverse: *Scabiosa sosnowskyi, Polygala anatolica, Polypodium vulgare, Pteris cretica, Asplenium ruta-muraria, A. lanuginosum, A. trichomanes*. Lianas are also present: *Smilax excelsa, Hedera colchica, H. helix, Periploca graeca*, and so on.

Species composition of east Georgia's *Carpinus orientalis*-dominated thermophilous woodland is usually as follows: *Quercus iberica, Carpinus orientalis, Paliurus spina-christi, Crataegus pentagyna, C. kyrtostyla, Corylus avellana, Daphne caucasica, Ligustrum vulgare, Lonicera caucasica, Viburnum lantana, Pyrus salicifolia, P. caucasica*. Such a woodland is a transitional phase of oak forest degradation to oriental hornbeam scrub with shrub-like tree species, thorny shrubs, and steppe herbs. Of woody plants, the major constituents are *Carpinus orientalis, Paliurus spina-christi, Quercus iberica, Rhamnus pallasii*, and single individuals of oak-hornbeam forest undergrowth species. The further stage of the woodland transformation is steppe with thorny scrub patches.

This woodland habitat occurs from lower up to upper montane forest zone within oak-hornbeam forest. More rarely it is found as an independent complex on limestone hills of the Samegrelo-Apkhazeti range in west Georgia; in east Georgia it occurs in a form of patches.

G1.7D. Chestnut woodland: G1.7DA. Euxinian chestnut forests: *Castanea sativa*-dominated forests and naturalized plantations of the foothills and piedmont of the Pontic Range and the Caucasus, characteristic, in particular, of the 100–1,100 m level of the Colchidian hills.

Chestnut forests are better formed in west than in east Georgia. In the west, the pure stands occur in places but more frequently, chestnut grows together with other species/co-dominates in oligodominant forests (hornbeam-chestnut, beech-chestnut, hornbeam-beech-chestnut forests). In east Georgia where chestnut mainly occurs on slopes and foothills of the Great Caucasus, it makes insignificant admixtures in beech, hornbeam, and other broadleaved forests or dominates on small areas. Chestnut forests usually grow on shaded or semi-shaded slopes. In west Georgia, chestnut mainly grows from 100 to 900–1,000 m.a.s.l. Above this level, chestnut rarely forms forests but makes small groups or admixtures in other forest types and rarely reaches 1,300 m.

The major subtypes of Euxinian chestnut forests are (a) chestnut forest with *Trachystemon orientale* (known only in west Georgia where it grows on northern concave and moist slopes from 50 to 700 m and is very rare above 1,000 m); (b) chestnut forest with *Symphytum asperum* (occurs in similar conditions as the previous subtype); (c) chestnut forest with blackberry (rare subtype; occurs in west as well as east Georgia); (d) chestnut forest with ferns (*Dryopteris filix-mas, D. pseudomonas, Matteuccia struthiopteris*, in stony places *Polypodium vulgare, Polystichum* spp.; this is a rare subtype, which occurs on small areas in more humid places than previous subtypes, on northern slopes from 500 to 1,000 m); (e) chestnut forest with sparse herbaceous cover (*Sanicula europaea, Asperula odorata, Festuca montana, Paris incompleta, Polygonatum polyanthemum*; *Hedera colchica* is abundant on the ground and trees; this type of forest is common in many parts of west Georgia but is less characteristic to coastal areas of Adjara and Guria); (f) chestnut forest with *Festuca montana* (a rare subtype); (g) chestnut forest with *Rhododendron luteum* (one of the most widespread subtypes in west Georgia; in east it can be found in mountains of the left bank of the river Alazani, at 900–1,200 m on convex slopes of various exposures); (h) chestnut forest with *Vaccinium arctostaphylos* (a rare subtype, occurs mainly in mountains of Abkhazia: the river Gumista basin from 950 to 1,200 m); (i) chestnut forest with *Rhododendron ponticum* (the most widespread and well formed in coastal mountains of Adjara and Guria, on northern slopes of various inclination); (j) chestnut forest with *Laurocerasus officinalis* (a relatively rare subtype).

In general, chestnut forms forests in lower and middle montane forest belts from 500 to 1,200–1,400 m. It is more common in the basins of the rivers of west Georgia: Bzipi, Gumista, Kelasuri, Kodori, Enguri, Tskhenistskali, Rioni, and Kvirila and also on the Adjara-Imereti range; in east Georgia, it occurs in the gorges of Liakhvi, Borjomi, and Alazani.

G1.8. Acidophilous *Quercus*-dominated woodland

G1.81 Atlantic pedunculate oak-birch woods. Acidophilous forests of the Baltic-North Sea plain comprise *Quercus robur*, *Betula pendula*, and *Betula pubescens*, often mixed with *Sorbus aucuparia* and *Populus tremula*, on very oligotrophic, often sandy, and podsolized or hydromorphic soils; the shrub layer, poorly developed, includes *Frangula alnus*; the herb layer, formed by the group of *Deschampsia flexuosa*, always includes *Molinia caerulea* and is often invaded by bracken. Forests of this type often prevail in the Northern European plain, from Jutland to Flanders; they occupy more limited edaphic enclaves in the Ardennes and the middle and upper Rhenish ranges, in northwestern France, Normandy, Brittany, the Paris basin, the Morvan, and Great Britain. East of the Elbe, in the Baltic lowlands, they are represented, east to Mecklenburg, by stands transitional, to a greater or lesser extent, to those of unit G4.71.

G1.83 Atlantic sessile oak woods, acidophilous *Quercus petraea* woods of the British Isles, are characterized by low, low-branched trees, with many ferns, mosses, lichens, and evergreen bushes; the herb layer is formed by the group of *Deschampsia flexuosa*.

Species

Carpinus betulus, Quercus robur = Q. imeretina, Q. petraea, Juniperus foetidissima, J. excelsa, Cotinus coggygria. **G1.A:** *Acer campestre, Sorbus torminalis, Ligustrum vulgare, Cornus mas, Rhamnus catharticus, Viola mirabilis, V. alba, V. suavis, Polygonatum multiflorum, Pulmonaria mollis ssp. mollis = P. mollissima, Convallaria majalis = C. transcaucasica, Festuca heterophylla, Melica uniflora, Poa nemoralis.* **G1.A1A***: Epimedium alpinum = E. colchicum, Erythronium dens-canis = E. caucasicum.* **G1.A1B***: Gagea lutea, Erythronium dens-canis = E. caucasicum, Adoxa moschatellina, Anemone ranunculoides.* **G1.A1C***: Pyrus mollis = P. caucasica, Lonicera caprifolium, Cotinus coggygria, Stellaria holostea, Carex pilosa, Festuca heterophylla*.

G1.9. Non-riverine woodland with birch, aspen, or rowan

G1.91. Birch woodland not on marshy terrain: G1.91A. Ponto-Caspian birch woods: Birch forests of the northern Black Sea basin, Anatolia, the Caucasus, and neighboring regions.

Birch forest is the major subalpine woodland type in Georgia. The major tree species here is *Betula litwinowii*, a species with high ecological plasticity. Birch has either upright trunks (at relatively lower elevations) or tortuous and even prostrate stature (at the treeline: 2,400–2,600 m.a.s.l.). Lower distribution limit of birch woodland passes at about 1,700–1,800 m. *B. raddeana* also occurs in the eastern Caucasus (the Great Caucasus) and *B. megrelica* and *B. medwediewii* in the western (the Lesser Caucasus and Samegrelo limestone areas, respectively); these three species are Caucasus endemics. The two latter species are light-demanding chionophytes. Subalpine birch forest is rarely monodominant; *Sorbus aucuparia* (= *S. caucasigena, S. boissieri*) is a usual species of this forest; high proportion of the mountain ash transforms this woodland to *Betuleta sorbosa*. Other subtypes can also be identified: (a) *Betuleta rhododendrosa* (with *Rhododendron caucasicum* undergrowth); (b) *Betuleta myrtillosa* (with *Vaccinium myrtillus* undergrowth); (c) *Betuleta asaleosa* (with *Rhododendron luteum* undergrowth); (d) *Betuleta subalpino-herbosa* (with various species of subalpine herbaceous species); (e) *Acereto-Betuleta* (with *Acer trautvetteri*); (f) *Betuleta mixtofruticosa* (with various deciduous shrubs in undergrowth), and so on. Because of low accessibility, diverse composition and human impact birch woodland typology is not sufficiently studied.

The major subtypes are *Betuleta sorbosa, B. rhododendrosa,* and *B. myrtillosa*. They are widespread on northern slopes in the subalpine belt (at 2,100–2,500 m) but are relatively rare in the southeastern mountains of the country.

Boreal species are characteristic to the caucasian subalpine birch woodlands, especially to *Betuleta rhododendrosa*; these are *Huperzia selago, Lycopodium annotinum, L. clavatum, Diphasiastrum alpinum, Gymnocarpium dryopteris, Cystopteris montana, Listera cordata, Deschampsia flexuosa, Orthilia secunda, Pyrola minor, Empetrum caucasicum, Vaccinium vitis-idaea, V. myrtillus, and Oxalis acetosella*. In the South Colchis, *Vaccinium uliginosum* also occurs, which does not grow elsewhere in the mountains of Georgia. Boreal bryophytes are also present: *Hylocomium splendens, Rhytidiadelphus triquetrus, Pleurozium schreberi*. Shrubs and herbs are more diverse in *Betuleta mixtofruticosa* and *B. subalpino-herbosa*. Of shrubs, the following species are worth mentioning:

Lonicera xylosteum, Ribes biebersteinii, Grossularia reclinata, Viburnum lantana; of herbs: *Festuca montana, Lilium szovitsianum, Aconitum orientale, Geranium sylvaticum, Aquilegia olympica, and Valeriana alliariifolia*.

G1.A. Meso- and eutrophic oak, hornbeam, ash, sycamore, lime, elm, and related woodland

G1.A1. Oak-ash-hornbeam woodland on eutrophic and mesotrophic soils: Atlantic, medio-European and Eastern European forests dominated by *Quercus robur* or *Q. petraea*, on eutrophic or mesotrophic soils, with usually ample and species-rich herb and shrub layers. *Carpinus betulus* is generally present. They occur under climates too dry or on soils too wet or too dry for beech or as a result of forestry practices favoring oaks: G1.A1C. Southeastern European oak-hornbeam forests: Forests of *Carpinus betulus* and *Quercus robur*, *Q. petraea*, or *Q. dalechampii*, sometimes with *Q. cerris* or *Q. frainetto*, can be found on the flanks and piedmont of the eastern and southern Carpathians and on the plateaus of the western Ukraine; azonal, often isolated oak-hornbeam woods of the Moesian *Quercion frainetto* zone, of the eastern Pannonic and western Pontic steppe woods zone, and of the pre-Pontic hills of southeastern Europe. They are characterized by an admixture of sub-mediterranean *Quercion frainetto* species and, in the east, of Euxinian species.

G1.A3. Hornbeam woodland: G1.A32. Eastern hornbeam woodland: Forests of southeastern Central Europe and of Eastern Europe, within the range of the *Carpinion illyricum*, *Fagion moesiacum*, and *F. dacicum* as well as areas east of the range of *Fagus sylvatica*, dominated by *Carpinus betulus* (*C. caucasica*), alone or with a small admixture of other species, more widespread and developed than those of unit G1.A31, sometimes primary.

Carpinus caucasica woodlands are derived either from hornbeam-oak or hornbeam-beech forests. Sometimes hornbeam stands form independently or as a result of human intrusions. Secondary hornbeam forests are much more frequent than the primeval. In west Georgia, hornbeam forests occur from the sea level to 1,000 m.a.s.l. and in east Georgia, between 800 and 1,100 m. They are fragmented in all areas. In contrast to beech, this species prefers drier and sunlit slopes.

There are hornbeam forests with and without Colchic evergreen undergrowth.

The following subtypes of hornbeam forests without Colchic undergrowth are distinguished: (a) Hornbeam forest with *Poa nemoralis* (no woody undergrowth is present; along with *P. nemoralis* the following herbs are common: *Vicia truncatula, Lathyrus laxiflorus, Campanula hohenackeri, Primula woronowii, Carex digitata, C. divulsa*; it is relatively frequent in mountains of Kvemo Kartli between 1,300 and 1,700 m on sunlit southern and eastern slopes); (b) hornbeam forest with *Festuca drymeja* (one of the most widespread subtype; more frequent in east Georgia; no woody undergrowth is present but in Colchic variant *Rhododendron luteum* is common; occurs from 500 to 1,600 m); (c) hornbeam forest with *Oplismenus undulatifolius* (occurs in Lagodekhi PA, on river terraces from 400 to 800 m); (d) hornbeam forest with *Asperula odorata* (no woody undergrowth is present; common on Tsiv-Gombori range but also occurs elsewhere in east Georgia and in Colchis); (e) hornbeam forest with *Sanicula europaea* (common in mountains of Kvemo Kartli); (f) hornbeam forest with *Asarum intermedium* (mainly occurs in Abkhazia from 500 to 900 m); and (g) hornbeam forest with *Symphytum grandiflorum* (herb cover is relatively diverse; blackberry is present in the undergrowth, among others; compared to previous subtypes prefers more humid habitats such as river terraces, lower parts of gentle slopes of ravines; from 400 to 800 m).

The following subtypes of hornbeam forests with Colchic undergrowth are distinguished: (a) hornbeam forest with *Rhododendron luteum* (the major subtype in west Georgia, where this forest occurs fragmentarily from the sea level to 900 m on convex steep southern slopes; in east Georgia, it occurs in Aragvi gorge and mountains of the left bank of the river Alazani between 800 and 1,700 m on slopes of various exposure); (b) hornbeam forest with *Vaccinium arctostaphylos* (sporadically occurs in Abkhazia, Zemo Svaneti, and Guria between 900 and 1,750 m); (c) sporadically *Rhododendron ponticum* (occurs on northern slopes in the lower montane forest belt, in non-calcareous mountains between 100 and 800 m; rarer than beech or chestnut forest with *Rh. ponticum*); (d) hornbeam forest with *Laurocerasus officinalis* (sporadically occurs on steep northern stony slopes in west Georgia between 300 and 800 m on calcareous as well as non-calcareous substrate).

G1.A4. Ravine and slope woodland: Cool, moist forests with a multispecific tree layer (especially maples *Acer* spp., lime *Tilia* spp., ash *Fraxinus* spp.) of variable dominance, most often on more or less abrupt slopes. They are of considerable biohistorical and biogeographical importance, as examples of the mixed forests of the Atlantic period, preserved in stations inaccessible to beech domination. Vegetation of alliance *Tilio-Acerion* is found. G1.A47. Euxinian ravine forests: Ravine forests of the Pontic Range, the Caucasus, Crimea, the Hyrcanic region.

G1.A7. Mixed deciduous woodland of the Black and Caspian Seas: Mixed summer-green broadleaved forests limited mainly to the mountains bordering the Black Sea and the Caspian Sea: G1.A72. Sub-Euxinian mixed oak-hornbeam forests: Mixed forests found on inner slopes of the Pontic Range generally in conditions of lower humidity and temperature than those of the Euxinian mixed forests of unit G1.A71, rich in species of *Quercus* and usually accompanied by *Carpinus betulus* or *C. orientalis*, sometimes with conifers. Characteristic species include *Quercus dshorochensis*, *Q. syspirensis*, *Q. anatolica*, *Q. iberica*, *Q.macranthera*, *Acer cappadocium*, *Fagus orientalis*, *Abies bornmuelleriana*; G1.A73. Caucasian oak-hornbeam forests: Mixed forests rich in hornbeam, oak, or beech found on slopes of the Central Caucasus of Georgia, with *Prunus avium*, *Pyrus caucasica*, *Corylus avellana*, *Euonymus europaeus*, *E. verrucosus*, *Lathyrus roseus*, *Dactylis glomerata*, *Brachypodium sylvaticum*, *Melica nutans*.

G3. Coniferous woodland

G3.1. Fir and spruce woodland

G3.17. Balkano-Pontic fir forests: Forests of *Abies nordmanniana*, *A. borisii-regis*, *A. bornmuelleriana* are found in the southern Balkans peninsula, the Pontic Range, and the Caucasus, often mixed with beech or adjacent to beech forests. G3.173. Nordmann's fir forests: *Abies nordmanniana*-dominated forests of the Caucasus and the eastern Pontic Range.

G3.1H. Oriental spruce forests: *Picea orientalis*-dominated forests of the Caucasus and the eastern Pontic Range.

G3.4. Scots pine woodland south of the taiga: Forests of *Pinus sylvestris ssp. sylvestris* and *Pinus sylvestris ssp. hamata* are found in the nemoral and mediterranean zones and their transitions to the steppe zone. Included are, in particular, the forests of Scotland, the Alpine system, the mediterranean peninsulas, the lowlands of Central Europe, the East European Nemoral zone and its adjacent wooded

steppes, formed by *Pinus sylvestris ssp. sylvestris*, as well as those of Anatolia, the Caucacus, and Crimea, formed by *Pinus sylvestris ssp. hamata*. Excluded are the formations situated within the range of natural lowland occurrence of *Picea abies*.

G3.4E. Ponto-Caucasian Scots pine forests: Forests composed of pines of the *Pinus sylvestris* group, mostly included in *Pinus sylvestris ssp. hamata* or its intermediates with *Pinus sylvestris ssp. sylvestris*, sometimes in species *Pinus kochiana*, *P. hamata*, or *P. armena*. These forests are also found on the Pontic Range, its satellites, and inner Anatolian outposts and on the mountains of the Crimea and the Caucasus.

G3.7. Lowland to montane mediterranean pine woodland (excluding black pine *Pinus nigra*): Mediterranean and thermo-Atlantic forests of thermophilous pines, mostly appearing as successional stages or plagioclimax replacements of mediterranean evergreen broadleaved woodland G2.1 or G2.4. Long-established plantations of these pines, within their natural area of occurrence and with an undergrowth basically similar to that of G2.1 and G2.4, are included.

G3.75. Aegean pine forests: *Pinus brutia* forests of Crete are found in the eastern Aegean islands, extreme southeastern continental Europe, Anatolia, Cyprus, and the eastern mediterranean coastal regions not on coastal dunes (otherwise see unit B1.71). They are eastern vicariants of Aleppo pine forests (unit G3.74); however, they comprise taller, more luxuriant, and often extensive formations. Disjunct formations of this pine or related species, described from Crimea and the Caucasian region (*Pinus pityusa*, *P. stankewiczii*, *P. eldarica*), have been included.

Pinus pytiusa forest occurs in Abkhazia, Georgia, from the northern border to the Bichvintha cape inclusive. On the seashore lowlands of the Bichvintha cape, a fragment of *P. pytiusa* forest is well preserved; the stand is a part of the Bichvintha-Miusera PA. Woody undergrowth is absent. Herb and moss cover is rather sparse. The further from the coast, the more abundant and diverse becomes the undergrowth. Shrubs present are *Cistus ponticus, Ligustrum vulgare, Ruscus colchicus*; lianas include *Lonicera caprifolium*; herbs include *Sesleria anatolica, Brachypodium sylvaticum, Psoralea bituminosa, Scabiosa sosnowskyi, Anthemis woronowii, Veronica umbrosa, Campanula longistyla, Carex transsilvanica, Scilla autumnalis*, and so on.

G3.9. Coniferous woodland dominated by *Cupressaceae* or *Taxaceae*: Woods are dominated by *Cupressus sempervirens*, *Juniperu*s spp., or *Taxus baccata* of the nemoral and mediterranean mountains and hills.

G3.93. Grecian juniper (*Juniperus excelsa*) woods: Forest formations dominated by *Juniperus excelsa* or the closely allied *Juniperus macropoda* (*J. polycarpos*, *J. seravshanica*) of the Irano-Turanian plateaus and mountains of Anatolia, Iran, Afghanistan, extending to Lebanon, the Caucasus, Crimea, Cyprus, and the Balkanic peninsula, in the periphery of the Pelagonides and Rhodope Mountains.

G3.94. Stinking juniper (*Juniperus foetidissima*) woods: Forest formations dominated by *Juniperus foetidissima* of the Balkan peninsula, Cyprus, Anatolia, and Transcaucasia.

G3.97. Western Palaearctic yew woods: Woods dominated by *Taxus baccata*, often with *Ilex aquifolium*, with very local occurrence in plains, hills, and mountains of the Western Palaearctic nemoral zone and in the mountains of the mediterranean basin, with isolated outliers in the southern and eastern Carpathian system and the northern Rhodope Mountains (Mount Vitosha).

G4. Mixed Deciduous and Coniferous Woodland

G4.1. Mixed swamp woodland broadleaved swamp woodland (G1.4 or G1.5) in combination with bog conifer woodland (G3.D or G3.E). Includes *Pinus* spp. or *Picea* spp. mixed with *Betula pubescens*, *Alnus*, *Populus*, or *Quercus*.

G4.6. Mixed fir-spruce-beech woodland: Forests in which *Fagus sylvatica* in Western and Central Europe or other *Fagus* species including *Fagus orientalis* in southeastern Europe and Pontic Asia (G1.6) are associated in the main canopy with fir *Abies* spp. and/or spruce *Picea* spp. (G3.1). Sometimes they also contain an admixture of other conifers, in particular, pines *Pinus* spp. These forests are characteristic of the montane level of the major European mountains south of the boreal zone.

In the northwestern mountains of Georgia where climate is mostly humid and bedrock is Jurassic slate, beech-fir forests grow. Here, spruce makes an insignificant admixture. In the driest parts of the dark coniferous forest distribution range—the mountains of east Georgia—spruce and pine forests predominate, where these two species alternately dominate with numerous transitional variants of mixed coniferous forests. In zones of transitional humidity, spruce occurs with both other conifers—fir and pine—and beech. Beech-spruce-fir forests are rarer than beech-fir and spruce-fir forests; this is caused by deeper penetration of fir roots into the soil compared to spruce and beech, which conditions the development of bidominant beech-fir and spruce-fir forests with different soil layers occupied by roots systems of different species. Typology of this forests corresponds to those of G3.173 and G1H.

Annex 2: Resolution No. 4 Forest Habitat Types in Georgia's Emerald Network Sites

Site code	Site name	Site area (ha)	Forest area (ha)	Habitat code	Forest habitat area (ha)
GE0000001	Lagodekhi	24,451.14	16,614.00	G1.12	264.0
				G1.3	No data
				G1.A1	793.0
				G1.6	15,561.0
GE0000002	Arkhoti	79,786.30	15,451.00	G1.6	11,153.0
				G1.12	No data
GE0000003	Chachuna	5,431.00	1,716.00	G1.11	No data
				G1.3	1,716.0
GE0000006	Kolkheti	44,604.82	16,698.00	G1.44	14 470.0
GE0000007	Vashlovani	34,741.80	6,211.00	G1.3	256.0
				G3.9	3 367.0
GE0000008	Tusheti	114,378.44	22,717.00	G1.A1	No data
				G1.6	3,678.0
				G1.91A	10,705.0
				G1.12	No data
GE0000009	Kazbegi	9,216.63	2,876.00	G1.91A	1,109.0
				G1.6	34.0
GE0000010	Borjomi-Kharagauli	82,957.58	71,356.00	G1.12	2,163.0
				G3.4E	13,116.0
				G1.A1	280.0
				G1.91A	885.0
				G3.17	24,422.0
				G1.6	27,032.0
GE0000011	Ratcha 1	14,635.90	890.00	G1.91A	5.0
				G3.17	24.0
				G1.6	769.0
GE0000012	Svaneti 1	37,389.33	612.00	G1.6	No data
				G1.91A	177.0
				G3.17	360.0
GE0000013	Algeti	7,124.62	5,726.00	G1.6	2,965.0
				G3.17	1 643.0
GE0000014	Kintrishi	13,676.24	12,297.00	G1.6	12,290.0
GE0000015	Batsara	2,985.96	2,931.00	G1.6	1,560.0
				G1.A1	712.0
				G3.9	238.0

Site code	Site name	Site area (ha)	Forest area (ha)	Habitat code	Forest habitat area (ha)
GE0000016	Mtirala	15,698.78	15,597.00	G1.6	14,879.0
GE0000018	Ajameti	4,838.75	4,776.00	G1.A1	4,726.0
				G1.6	No data
GE0000019	Gardabani	3,733.75	3,565.00	G1.21	No data
				G1.3	3,467.0
GE0000020	Mariamjvari	1,022.55	979.00	G1.A1	175.0
				G3.9	2,0
				G1.6	708.0
GE0000021	Samegrelo	38,838.38	25,283.00	G1.A1	No data
				G1.6	11,864.0
				G1.A7	291.0
				G1.91A	564.0
				G3.17	3,688.0
				G1.8	493.0
				G1.12	261.0
GE0000022	Alazani	11,611.29	10,689.00	G1.3	10,507.0
				G1.12	1.0
				G1.6	No data
GE0000023	Amtkeli	8,078.46	4,487.00	G1.6	1,489.0
				G1.A7	170.0
				G1.8	74.0
				G3.9	57.0
				G1.A1	154.0
GE0000024	Ilto	6,971.44	6,586.00	G1.6	6,479.0
GE0000025	Bichvinta-Miusera	23,794.47	10,592.00	G1.6	78.0
				G1.A7	1,218.0
				G1.12	71.0
				G1.A1	105.0
GE0000026	Goderdzi	44,901.29	30,288.00	G1.8	2,033.0
				G3.17	21,457.0
				G3.4E	321.0
				G1.22	No data
				G1.12	No data
				G1.6	4,181.0
GE0000027	Gombori	55,436.20	50,060.00	G1.21	97.0
				G1.6	39,557.0
				G1.12	19.0
				G1.A1	9,360.0
GE0000028	Gumista	13,641.48	13,448.00	G1.6	9,708.0

Site code	Site name	Site area (ha)	Forest area (ha)	Habitat code	Forest habitat area (ha)
				G3.4E	303.0
				G3.17, G3.1H	1,318.0
GE0000029	Kvareli-Shilda	24,591.79		G3.9	19.0
				G1.21	220.0
				G1.A1	4,376.0
				G1.6	17,226.0
GE0000030	Liakhvi	6,555.78	6,305.00	G1.6	4,259.0
GE0000031	Machakhela	6,103.07	5,925.00	G1.6	3,620.0
GE0000032	Pskhu	25,702.68	24,375.00	G1.6	11,345.0
				G3.4E	145.0
				G3.17, G3.1H	7,313.0
				G1.8	447.0
				G1.12	329.0
				G3.9	107.0
GE0000033	Ritsa	38,079.19	24,887.00	G1.A4	No data
				G3.17, G3.1H	15,939.0
				G1.8	554.0
				G3.9	698.0
				G1.6	4,689.0
GE0000034	Surami 1	27,332.80	26,495.00	G1.12	192.0
				G3.17, G3.1H	667.0
				G1.12	192.0
				G1.91A	1.0
				G1.6	25,252.0
GE0000035	Artsivis kheoba	100.40	80.00	G1.A1	69.0
GE0000036	Dashbashis Kanioni	668.98	409.00	G1.6	191.0
				G3.4E	18.0
				G1.A1	218.0
GE0000038	Ktsia-Tabatskuri	22,100.61	281.00	G1.6	182.0
GE0000040	Ratcha 2	26,649.01	5,779.00	G1.91A	2,921.0
				G3.17, G3.1H	139.0
				G1.6	1,305.0
GE0000041	Ratcha 3	11,543.51	10,994.00	G3.9	422.0
				G1.8	412.0
				G3.17	3,518.0
				G1.12	266.0
				G1.6	5,546.0

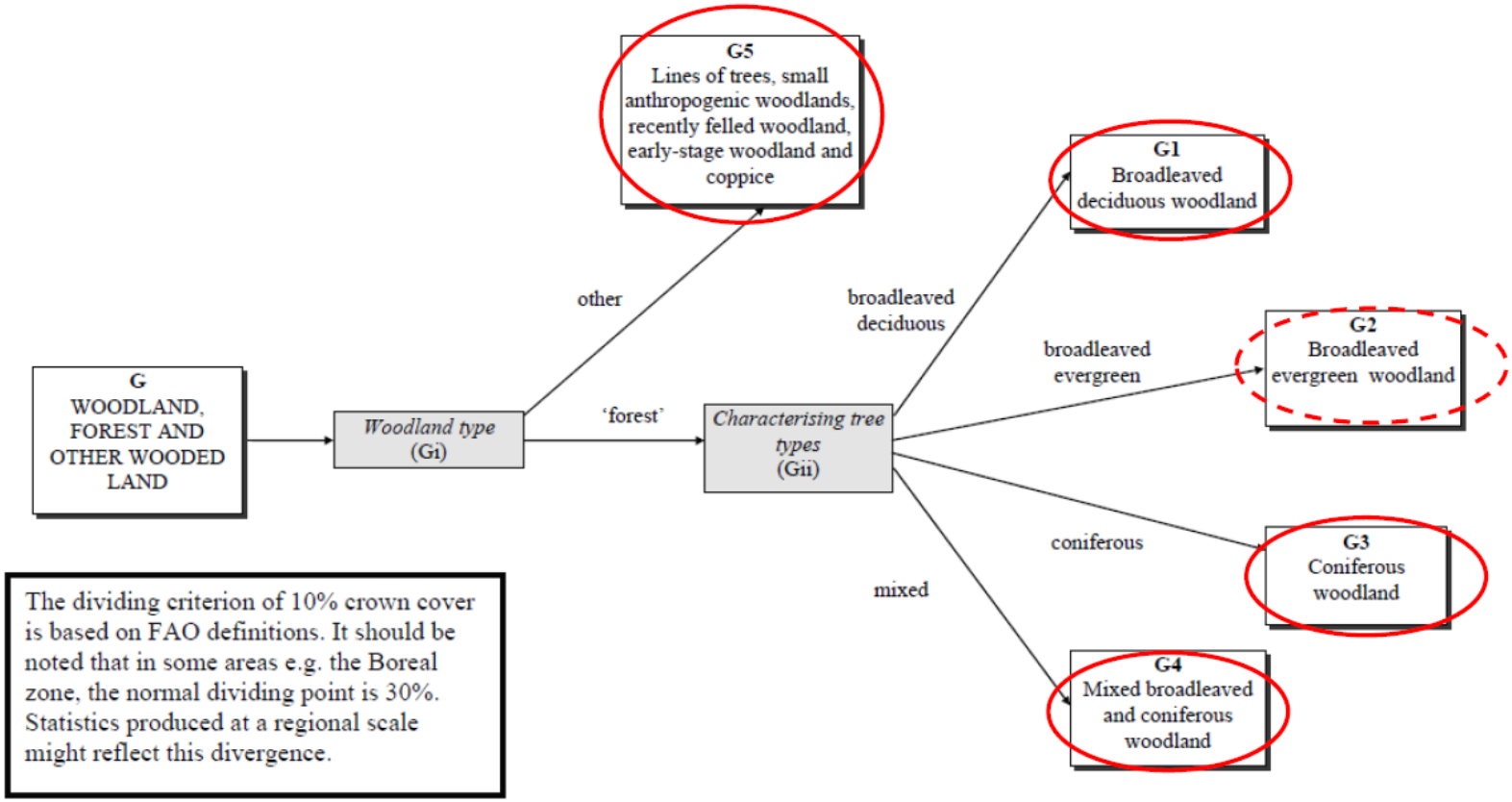
Site code	Site name	Site area (ha)	Forest area (ha)	Habitat code	Forest habitat area (ha)
GE0000042	Ratcha 4	14,305.17	10,148.00	G1.6	6,128.0
				G1.8	517.0
				G3.9	11.0
				G1.12	402.0
				G3.17	2,242.0
GE0000044	Samshvilde	474.99	389.00	G1.3	No data
				G1.A1	361.0
GE0000045	Svaneti 2	45,254.64	5,109.00	G1.6	446.0
				G1.A1	No data
				G1.91A	2,727.0
				G3.17, G3.1H	2,402.0
				G3.4E	172.0
GE0000046	Kvernaki	12,979.58	1,193.00	G1.A1	877.0
				G1.21	143.0
GE0000047	Saguramo	21,037.69	20,370.00	G1.6	14,084.0
				G1.A1	1,606.0
				G3.17	1,201.0
GE0000048	Tbilisi Otter Island	12.68	11.00	G1.3	11.0
GE0000049	Surami 2	11,118.05	10,776.00	G1.A1	1,329.0
				G1.6	8,860.0
				G1.12	572.0
GE0000050	Surami 3	10,971.78	10,361.00	G1.6	6,400.0
				G1.A7	260.0
GE0000051	Kotsakhura	38,446.93	612.00	G1.3	240.0
GE0000052	Surami 4	2,944.83	2,774.00	G1.6	1,792.0
				G1.A7	55.0
GE0000053	Surami 5	4,745.40	4,257.00	G1.6	No data
				G1.A7	1,241.0
GE0000055	Kistauri	4,397.04	4,268.00	G1.6	4,070.0
				G1.12	80.0
GE0000056	Borjomi-Kharagauli 2	18,465.32	167,773.00	G1.12	79.0
				G1.6	4,639.0
				G3.17	5,786.0
				G1.91A	478.0
				G1.8	74.0
				G1.A1	819.0
				G3.4E	4,582.0
GE0000057	Samegrelo 2	85,676.20	60,306.00	G1.6	40,821.0

Site code	Site name	Site area (ha)	Forest area (ha)	Habitat code	Forest habitat area (ha)
				G1.22	No data
				G1.A1	1,405.0
				G1.91A	230.0
				G1.A4	No data
				G3.9	1,156.0
				G1.12	131.0
				G3.17	8,576.0
				G1.A7	550.0
GE0000058	Racha-Lechkhumi	43,162.11	34,557.00	G3.17	8,245.0
				G1.6	20,985.0
GE0000059	Svaneti-Racha	59,114.55	21,751.00	G3.4E	365.0
				G3.17	2,695.0
				G1.21	No data
				G3.9	22.0
				G1.91A	4,759.0
				G1.6	10,955.0
				G1.12	553.0
GE0000062	Jandari Lake	4,319.50	26.00	G1.3	26.0
GE0000064	Babaneuri	833.62	664.00	G1.A1	549.0
				G1.6	12.0
				G3.9	120.0
GE0000066	Erusheti		6,080.00	G1.12	No data
				G3.4E	2,296.0
				G3.4E	2,296.0
				G1.A1	No data
				G3.17	No data
				G3.17, G3.1H	1,054.0
				G3.1H	No data

Annex 3: Forest Habitat Identification Charts

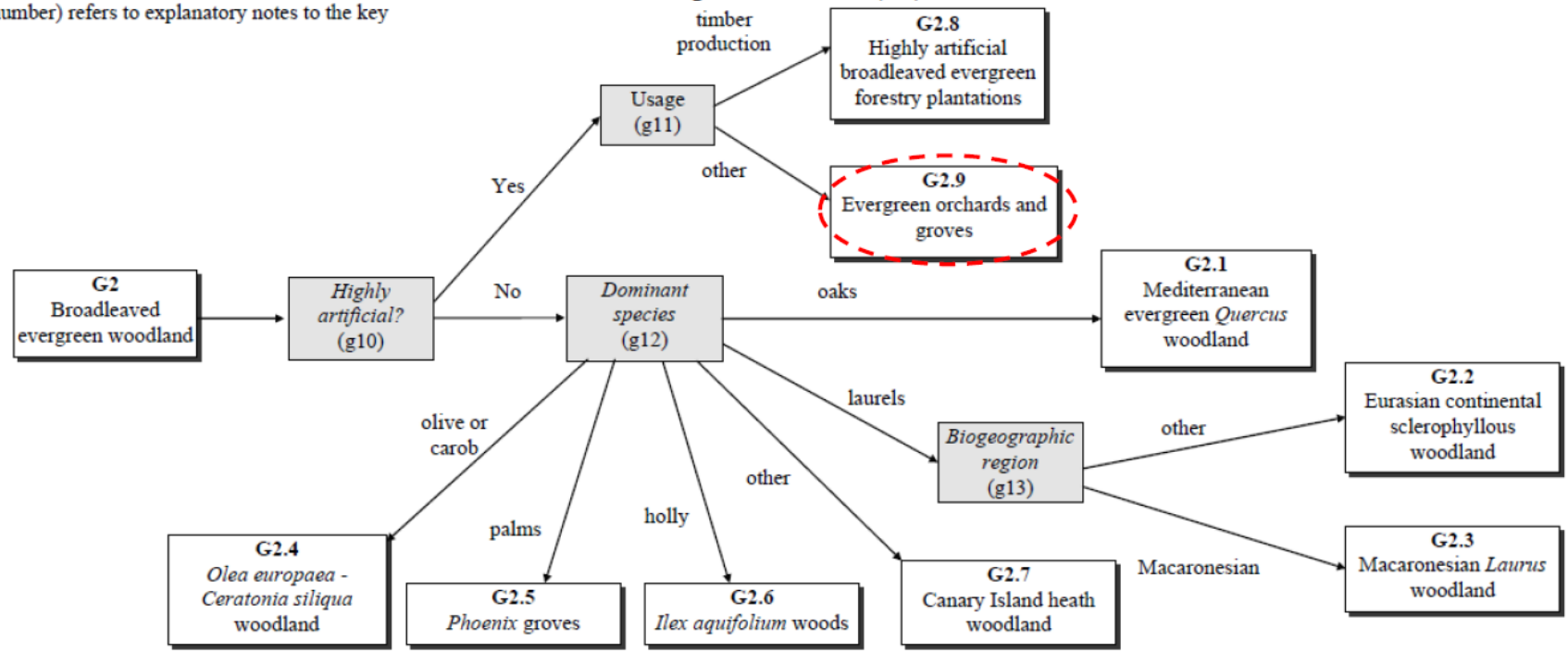
G: EUNIS Habitat Classification: criteria for woodland, forest and other wooded land (G) to Level 2

(number) refers to explanatory notes to the key (see following page).

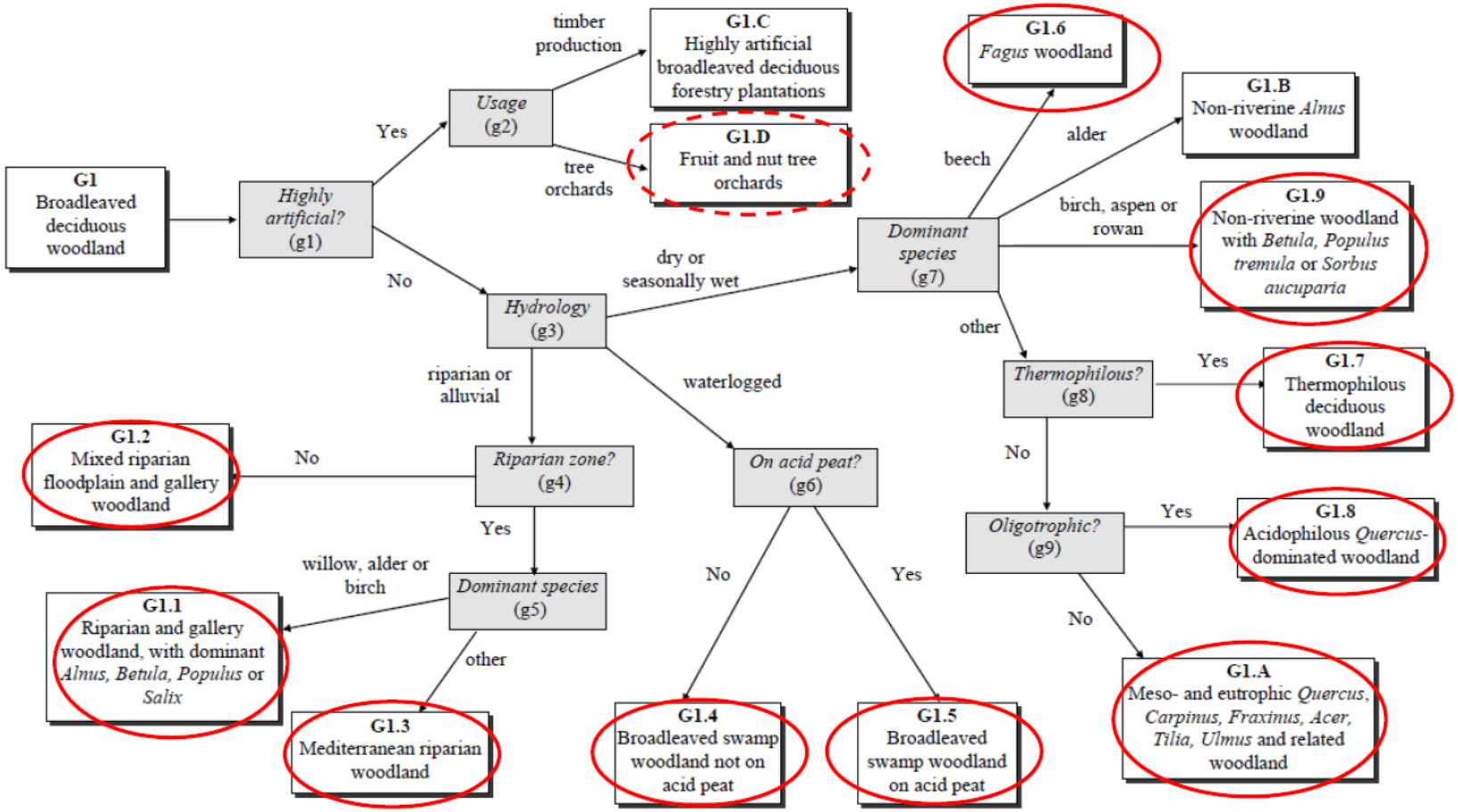


The dividing criterion of 10% crown cover is based on FAO definitions. It should be noted that in some areas e.g. the Boreal zone, the normal dividing point is 30%. Statistics produced at a regional scale might reflect this divergence.

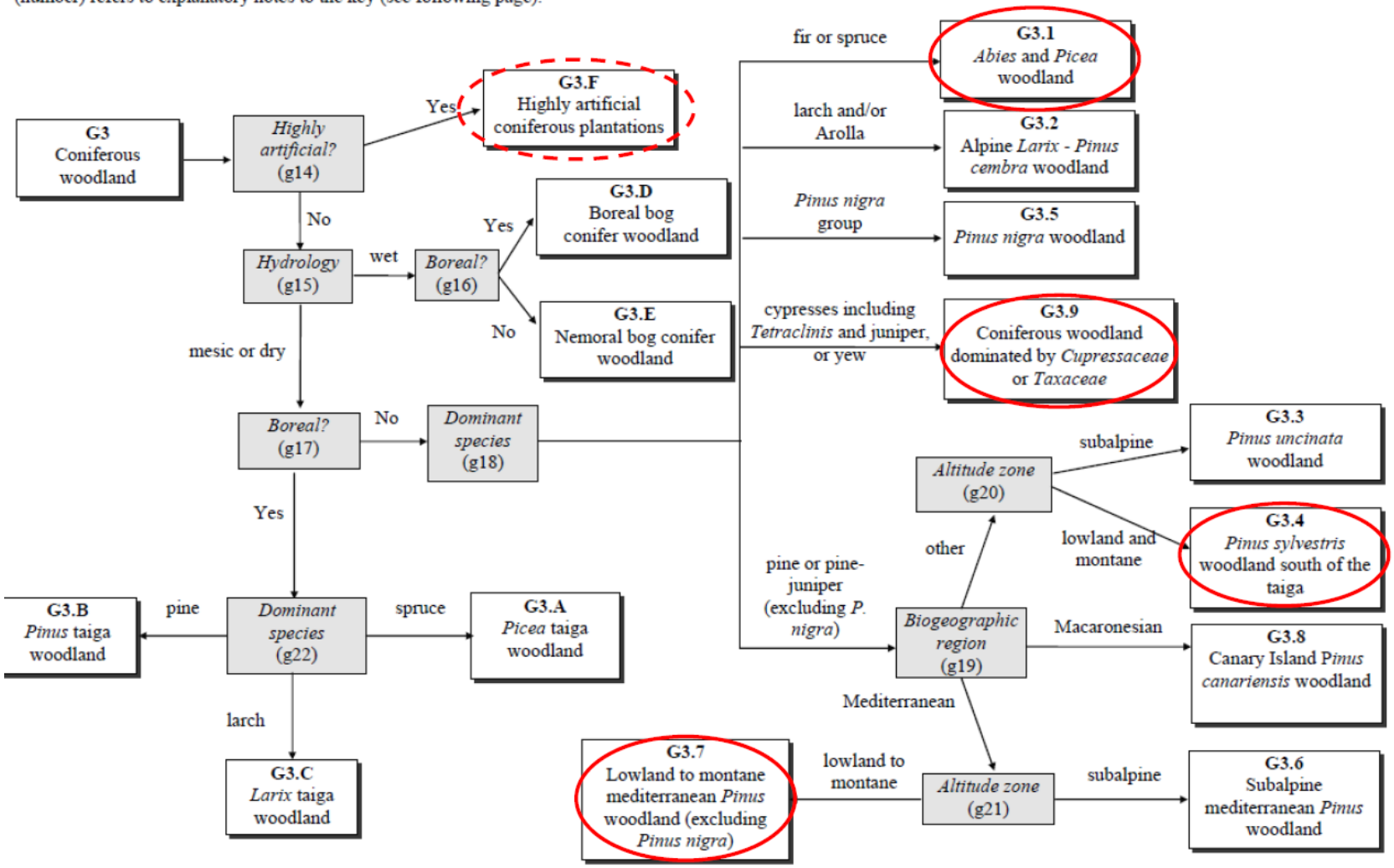
G2: EUNIS Habitat Classification: criteria for broadleaved evergreen woodland (G2) to Level 3
(number) refers to explanatory notes to the key



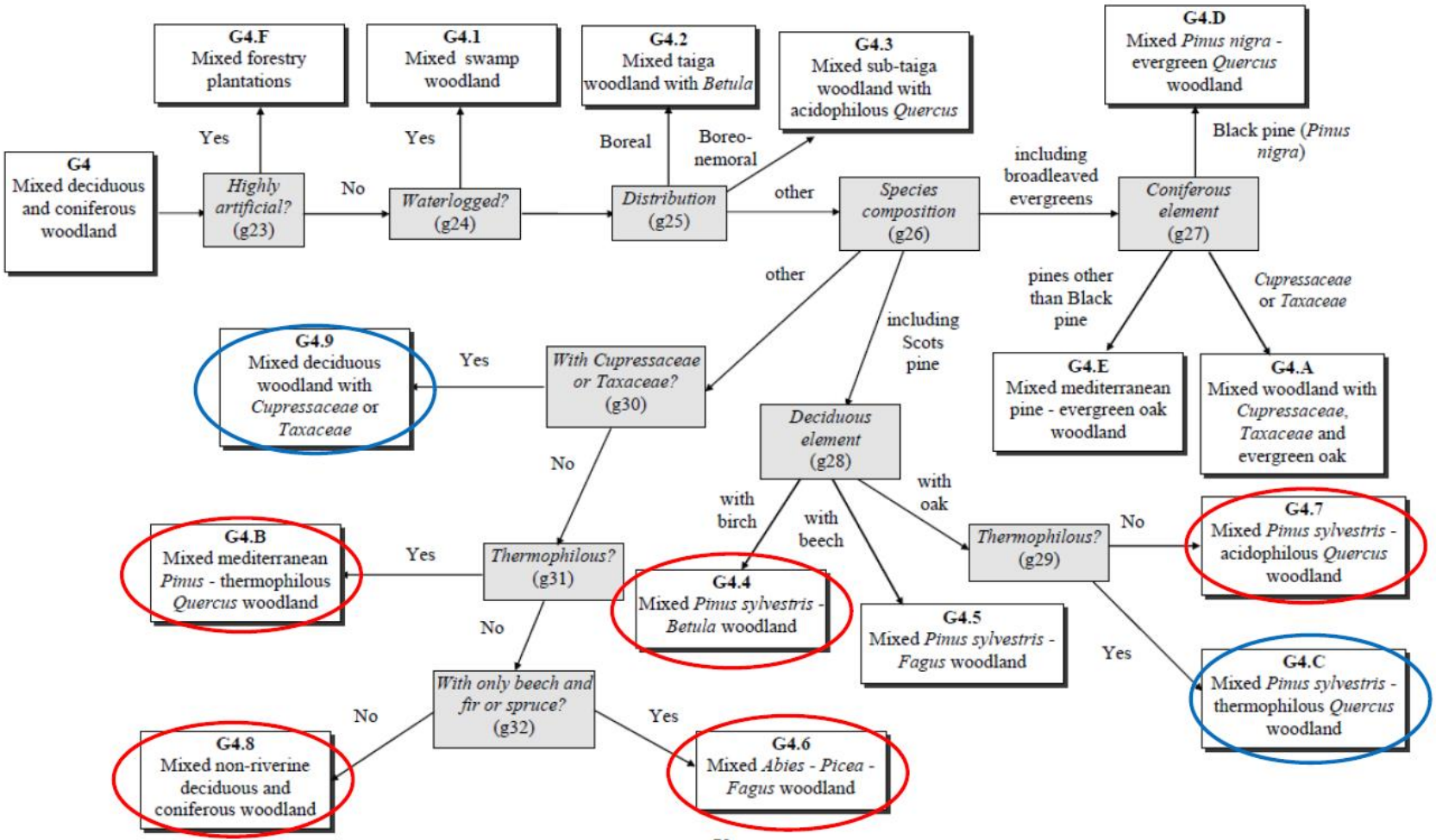
G1: EUNIS Habitat Classification: criteria for broadleaved deciduous woodland (G1) to Level 3
(number) refers to explanatory notes to the key (see following page).



G3: EUNIS Habitat Classification: criteria for coniferous woodland (G3) to Level 3
(number) refers to explanatory notes to the key (see following page).



G4: EUNIS Habitat Classification: criteria for mixed deciduous and coniferous woodland (G4) to Level 3
(number) refers to explanatory notes to the key (see following page).



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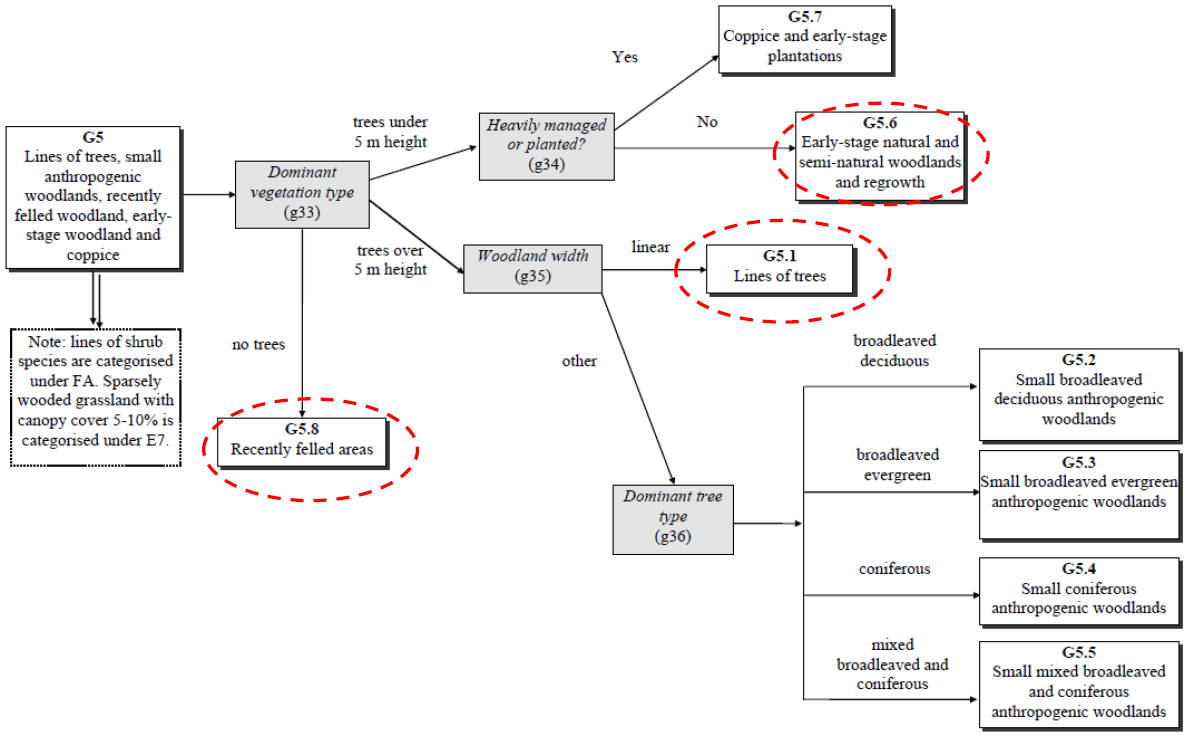
G5: EUNIS Habitat Classification: criteria for lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice (G5) to Level 3

(number) refers to explanatory notes to the key (see following page).



Annex 4: Habitats Protected under Resolution No. 4 That Are Found in Georgia

Note: This list includes only those habitat types that are confirmed to occur in Georgia. It does not include suspected habitat types assigned as scientific reserve by the biogeographical seminar.

Habitat code	Habitat name
A1.11	Mussel and/or barnacle communities
A2.5	Coastal sandmarshes and saline reedbeds
A3	Infralitoral rock and other hard substrata
B1.6	Coastal dune scrub
C1.1	Permanent oligotrophic lakes, ponds and pools
C1.224	Floating *Utricularia australis* and *Utricularia vulgaris* colonies
C1.225	Floating *Salvinia natans* mats
C1.5	Permanent inland saline and brackish lakes, ponds, and pools
C1.66	Temporary inland saline and brackish waters
C3.4	Species-poor beds of low-growing water-fringing or amphibious vegetation
C3.55	Sparsely vegetated river gravel banks
C3.62	Unvegetated river gravel banks
D4.1	Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks
D4.2	Basic mountain flushes and streamsides, with a rich arctic-montane flora
D6.1	Inland saltmarshes
E1.2	Perennial calcareous grassland and basic steppes
E1.3	Mediterranean xeric grassland
E1.71	*Nardus stricta* swards
E1.83	Mediterraneo-montane *Nardus stricta* swards
E3.4	Moist or wet eutrophic and mesotrophic grassland
E3.5	Moist or wet oligotrophic grassland
E5.4	Moist or wet tall-herb and fern fringes and meadows
E5.5	Subalpine moist or wet tall-herb and fern stands
E6.2	Continental inland salt steppes
F3.241	Central European subcontinental thickets
F7	Spiny Mediterranean heaths (phrygana, hedgehog-heaths, and related coastal cliff vegetation)
F9.1	Riverine scrub
F9.3	Southern riparian galleries and thickets
G1.11	Riverine *Salix* woodland
G1.12	Boreo-alpine riparian galleries
G1.21	Riverine ash-alder woodland, wet at high but not at low water
G1.22	Mixed *Quercus-Ulmus-Fraxinus* woodland of great rivers
G1.3	Mediterranean riparian woodland
G1.44	Wet-ground woodland of the Black and Caspian Seas
G1.6	*Fagus* woodland

Habitat code	Habitat name
G1.8	Acidophilous *Quercus*-dominated woodland
G1.918	Eurasian boreal *Betula* woods
G1.A1	*Quercus-Fraxinus-Carpinus betulus* woodland
G1.A4	Ravine and slope woodland
G1.A7	Mixed deciduous woodland of the Black and Caspian Seas
G3.17	Balkano-Pontic *Abies* forests
G3.1H	*Picea orientalis* forests
G3.4E	Ponto-Caucasian *Pinus sylvestris* forests
G3.9	Coniferous woodland dominated by *Cupressaceae* or *Taxaceae*
H1	Terrestrial underground caves, cave systems, passages, and waterbodies
X04	Raised bog complexes

Annex 5: Species Protected under Resolution No 6 That Are Found in Georgia

Code	Scientific name
A402	*Accipiter brevipes*
A400	*Accipiter gentilis arrigonii*
A401	*Accipiter nisus granti*
1101	*Acipenser sturio*
A293	*Acrocephalus melanopogon*
A324	*Aegithalos caudatus*
A223	*Aegolius funereus*
A079	*Aegypius monachus*
1930	*Agriades glandon aquilo*
1939	*Agrimonia pilosa*
A229	*Alcedo atthis*
1516	*Aldrovanda vesiculosa*
A053	*Anas platyrhynchos*
A055	*Anas querquedula*
A051	*Anas strepera*
A395	*Anser albifrons flavirostris*
A042	*Anser erythropus*
A255	*Anthus campestris*
A091	*Aquila chrysaetos*
A090	*Aquila clanga*
A404	*Aquila heliaca*
A509	*Aquila nipalensis*
A089	*Aquila pomarina*
A029	*Ardea purpurea*
A024	*Ardeola ralloides*
A222	*Asio flammeus*
A059	*Aythya ferina*
A061	*Aythya fuligula*
A060	*Aythya nyroca*
1308	*Barbastella barbastellus*
1143	*Barbus capito*
A021	*Botaurus stellaris*
A215	*Bubo bubo*
A133	*Burhinus oedicnemus*
A087	*Buteo buteo*
1386	*Buxbaumia viridis*

Code	Scientific name
A243	*Calandrella brachydactyla*
A466	*Calidris alpina schinzii*
1078	*Callimorpha quadripunctaria*
1352	*Canis lupus*
1372	*Capra aegagrus*
A224	*Caprimulgus europaeus*
A364	*Carduelis carduelis*
A363	*Carduelis chloris*
1088	*Cerambyx cerdo*
A469	*Certhia brachydactyla dorotheae*
A334	*Certhia familiaris*
1141	*Chalcalburnus chalcoides*
A138	*Charadrius alexandrinus*
A139	*Charadrius morinellus*
A196	*Chlidonias hybridus*
A198	*Chlidonias leucopterus*
A197	*Chlidonias niger*
A031	*Ciconia ciconia*
A030	*Ciconia nigra*
A080	*Circaetus gallicus*
A081	*Circus aeruginosus*
A082	*Circus cyaneus*
A083	*Circus macrourus*
A084	*Circus pygargus*
A206	*Columba livia*
A207	*Columba oenas*
A208	*Columba palumbus*
A231	*Coracias garrulus*
A350	*Corvus corax*
A349	*Corvus corone*
A113	*Coturnix coturnix*
A122	*Crex crex*
A212	*Cuculus canorus*
A037	*Cygnus columbianus bewickii*
A038	*Cygnus cygnus*
A253	*Delichon urbica*
A239	*Dendrocopos leucotos*
A428	*Dendrocopos major thanneri*
A238	*Dendrocopos medius*

Code	Scientific name
A429	*Dendrocopos syriacus*
1381	*Dicranum viride*
1689	*Dracocephalum austriacum*
1393	*Drepanocladus vernicosus*
A236	*Dryocopus martius*
A027	*Egretta alba*
A026	*Egretta garzetta*
A379	*Emberiza hortulana*
1220	*Emys orbicularis*
1932	*Erebia medusa polaris*
A101	*Falco biarmicus*
A511	*Falco cherrug*
A098	*Falco columbarius*
A095	*Falco naumanni*
A103	*Falco peregrinus*
A096	*Falco tinnunculus*
A097	*Falco vespertinus*
A321	*Ficedula albicollis*
A320	*Ficedula parva*
A442	*Ficedula semitorquata*
A448	*Fringilla coelebs ombriosa*
A154	*Gallinago media*
A002	*Gavia arctica*
A001	*Gavia stellata*
A189	*Gelochelidon nilotica*
A515	*Glareola Nordmanni*
A135	*Glareola pratincola*
A127	*Grus grus*
A076	*Gypaetus barbatus*
A078	*Gyps fulvus*
A075	*Haliaeetus albicilla*
1933	*Hesperia comma catena*
A092	*Hieraaetus pennatus*
A131	*Himantopus himantopus*
A022	*Ixobrychus minutus*
1581	*Kosteletzkya pentacarpos*
2402	*Lacerta clarkorum*
A338	*Lanius collurio*
A339	*Lanius minor*

Code	Scientific name
A180	*Larus genei*
A176	*Larus melanocephalus*
1042	*Leucorrhinia pectoralis*
1758	*Ligularia sibirica*
A157	*Limosa lapponica*
1043	*Lindenia tetraphylla*
A246	*Lullula arborea*
A272	*Luscinia svecica*
1355	*Lutra lutra*
1060	*Lycaena dispar*
1361	*Lynx lynx*
1428	*Marsilea quadrifolia*
1222	*Mauremys caspica*
1389	*Meesia longiseta*
A066	*Melanitta fusca*
A242	*Melanocorypha calandra*
A068	*Mergus albellus*
A230	*Merops apiaster*
A073	*Milvus migrans*
A074	*Milvus milvus*
1310	*Miniopterus schreibersii*
1356	*Mustela lutreola*
1323	*Myotis bechsteinii*
1307	*Myotis blythii*
1321	*Myotis emarginatus*
A077	*Neophron percnopterus*
A023	*Nycticorax nycticorax*
A129	*Otis tarda*
A071	*Oxyura leucocephala*
2098	*Paeonia tenuifolia*
A094	*Pandion haliaetus*
2023	*Panthera pardus*
A328	*Parus ater*
A020	*Pelecanus crispus*
A019	*Pelecanus onocrotalus*
A112	*Perdix perdix*
A072	*Pernis apivorus*
A393	*Phalacrocorax pygmaeus*
A170	*Phalaropus lobatus*

Code	Scientific name
A151	*Philomachus pugnax*
1351	*Phocoena phocoena*
A035	*Phoenicopterus ruber*
A034	*Platalea leucorodia*
A032	*Plegadis falcinellus*
A140	*Pluvialis apricaria*
A007	*Podiceps auritus*
A124	*Porphyrio porphyrio*
A120	*Porzana parva*
A119	*Porzana porzana*
A121	*Porzana pusilla*
A266	*Prunella modularis*
A205	*Pterocles alchata*
A420	*Pterocles orientalis*
A464	*Puffinus yelkouan*
A346	*Pyrrhocorax pyrrhocorax*
A132	*Recurvirostra avosetta*
1306	*Rhinolophus blasii*
1305	*Rhinolophus euryale*
1304	*Rhinolophus ferrumequinum*
1303	*Rhinolophus hipposideros*
1302	*Rhinolophus mehelyi*
1087	*Rosalia alpina*
A444	*Sitta krueperi*
1926	*Stephanopachys linearis*
A195	*Sterna albifrons*
A190	*Sterna caspia*
A193	*Sterna hirundo*
A191	*Sterna sandvicensis*
2333	*Steveniella satyrioides*
A307	*Sylvia nisoria*
A397	*Tadorna ferruginea*
A048	*Tadorna tadorna*
1219	*Testudo graeca*
A128	*Tetrax tetrax*
A166	*Tringa glareola*
1171	*Triturus karelinii*
A434	*Troglodytes troglodytes fridariensis*
A283	*Turdus merula*

Code	Scientific name
A285	*Turdus philomelos*
A287	*Turdus viscivorus*
1349	*Tursiops truncatus*
1354	*Ursus arctos*
2172	*Vaccinium arctostaphylos*
2008	*Vipera kaznakovi*
A167	*Xenus cinereus*
4121	*Vipera ursinii rakosiensis*

Annex 6: Threats, Challenges, and Measures by Habitat Type

G1.11 Riverine *Salix* woodland

Threats: Agricultural pressures, changing water management regimes

Conservation measures:

- MA14 - Other measures related to agricultural practices
- MA13 - Manage agricultural drainage and water abstraction (including the restoration of drained or hydrologically altered habitats)
- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC01 - Adapt/manage extraction of non-energy resources
- MC02 - Adapt/manage exploitation of energy resources
- MC04 - Reduce impact of hydropower operation and infrastructure (including the restoration of freshwater habitats)
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MG11 - Reduce/eliminate point and diffuse source pollution to surface waters from freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.12 Boreo-alpine riparian galleries

Threats: Changing water management regimes

Conservation measures:

- MA14 - Other measures related to agricultural practices
- MA13 - Manage agricultural drainage and water abstraction (including the restoration of drained or hydrologically altered habitats)
- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC01 - Adapt/manage extraction of non-energy resources
- MC02 - Adapt/manage exploitation of energy resources
- MC04 - Reduce impact of hydropower operation and infrastructure (including the restoration of freshwater habitats)
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MG11 - Reduce/eliminate point and diffuse source pollution to surface waters from freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes

G1.21 Riverine *Fraxinus-Alnus* woodland, wet at high but not at low water

Main tree species: *Fraxinus excelsior, Alnus incana, A. barbata*

Conservation measures:

- MA14 - Other measures related to agricultural practices
- MA13 - Manage agricultural drainage and water abstraction (including the restoration of drained or hydrologically altered habitats)
- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC01 - Adapt/manage extraction of non-energy resources

- MC02 - Adapt/manage exploitation of energy resources
- MC04 - Reduce impact of hydropower operation and infrastructure (including the restoration of freshwater habitats)
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure e
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MG11 - Reduce/eliminate point and diffuse source pollution to surface waters from freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.22 Mixed *Quercus-Ulmus-Fraxinus* woodland of great rivers

Threats: Changing water management regimes, pressure of various agricultural activities

Conservation measures:

- MA14 - Other measures related to agricultural practices
- MA13 - Manage agricultural drainage and water abstraction (including the restoration of drained or hydrologically altered habitats)
- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC01 - Adapt/manage extraction of non-energy resources
- MC02 - Adapt/manage exploitation of energy resources
- MC04 - Reduce impact of hydropower operation and infrastructure (including the restoration of freshwater habitats)
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure

- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MG11 - Reduce/eliminate point and diffuse source pollution to surface waters from freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.3 Mediterranean riparian woodland

Threats: Major pressures are related to human activities such as agriculture or modification of the hydrogeological conditions. Conservation demands maintenance or restoration of the natural hydrological conditions and protection against alternative land use and development.

Conservation measures:

- MA14 - Other measures related to agricultural practices
- MA13 - Manage agricultural drainage and water abstraction (including the restoration of drained or hydrologically altered habitats)
- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC01 - Adapt/manage extraction of non-energy resources
- MC02 - Adapt/manage exploitation of energy resources
- MC04 - Reduce impact of hydropower operation and infrastructure (including the restoration of freshwater habitats)
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures

- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MG11 - Reduce/eliminate point and diffuse source pollution to surface waters from freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.6 *Fagus* woodland

Threats: Inappropriate forest management

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI01 - Early detection and rapid eradication of invasive alien species of Union concern
- MI02 - Manage, control, or eradicate established invasive alien species of Union concern
- MI03 - Manage, control, or eradicate other invasive alien species

- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.8 Acidophilous *Quercus*-dominated woodland

Threats: Inappropriate forest management, pressures from agriculture

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.918 Eurasian boreal *Betula* woods

Threats: Forest fires

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MB08 - Restore Annex I forest habitats (including re-establish and improve)
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.A1 *Quercus-Fraxinus-Carpinus* woodland

Threats: Inappropriate forest management, pressures from agriculture

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure

- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G1.A7 Mixed deciduous woodland of the Black and Caspian Seas

Threats: Forest fires

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MB08 - Restore Annex I forest habitats (including re-establish and improve)
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)

- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G3.17 Balkano-Pontic *Abies* forests

Threats: Illegal cutting

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MB08 - Restore Annex I forest habitats (including re-establish and improve)
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG02 - Manage hunting, recreational fishing, and the recreational or commercial harvesting or collection of plants and fungi (including restoration of habitats)
- MG04 - Control/eradicate illegal killing, fishing, and harvesting of wild plants, fungi, and animals
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species

- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G3.1H *Picea orientalis* forests

Threats: Illegal cutting

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MB08 - Restore Annex I forest habitats (including re-establish and improve)
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G3.4E Ponto-Caucasian *Pinus sylvestris* forests

Threats: Illegal cutting

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure
- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MB08 - Restore Annex I forest habitats (including re-establish and improve)
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

G3.9 Coniferous woodland dominated by *Cupressaceae* or *Taxaceae*

Threats: Illegal cutting

Conservation measures:

- MB05 - Adapt/change forest management and exploitation practices
- MB07 - Measures to combat illegal logging
- MC06 - Reduce impact of service corridors and networks
- ME01 - Reduce impact of transport operation and infrastructure

- MF01 - Manage the impacts of converting land for construction and development of infrastructure
- MA07 - Restore Annex I agricultural habitats (including re-establish and improve)
- MF04 - Reduce/eliminate pollution to surface or ground waters from commercial, residential, and recreational areas and activities and from industrial activities and structures
- MF05 - Reduce/eliminate air pollution from industrial, commercial, residential, and recreational areas and activities
- MF08 - Manage changes in hydrological and coastal systems and regimes for construction and development (including restoration of habitats)
- MF09 - Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (including restoration of habitats)
- MG10 - Manage water abstraction and modification of hydrological conditions for marine and freshwater aquaculture
- MI03 - Manage, control, or eradicate other invasive alien species
- MI04 - Restore habitats affected by invasive alien species (including of Union concern and others)
- MI06 - Control and eradicate plant and animal diseases, pathogens, and pests
- MM01 - Manage habitats (other than agriculture and forest) to slow, stop, or reverse natural processes that occur without direct or indirect influence from human activities or climate change
- MM02 - Minimize/prevent impacts of geological and natural catastrophes
- MJ01 - Implement climate change mitigation measures
- MJ02 - Implement climate change adaptation measures

Guidelines for Managing Forest Habitats on Georgia's Emerald Sites

The "Guidelines for Managing Forest Habitats on Georgia's Emerald Sites" offer comprehensive guidance for the forestry sector in addressing management challenges within the Emerald Network. They provide solutions to meet the Bern Convention's requirements and harmonize forestry activities with the network's standards, particularly for Emerald sites outside the national protected areas system. The guidelines target state institutions, municipalities, private companies, environmental organizations, managers, and foresters, assisting them in planning forestry operations that ensure the long-term conservation of species and habitats.

The key objectives include implementing the Bern Convention in Georgia, integrating Natura 2000 Network requirements into forest management to support EU integration, and promoting multipurpose forest management within the Emerald Network. Additionally, the guidelines aim to contribute to national conservation goals outlined in Georgia's National Biodiversity Strategy and Action Plan and share European best practices in forest resource utilization with policymakers and practitioners.

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