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(EXPLANATORY NOTE)

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ІНЖЕНЕРІЇ ТА ТЕХНОЛОГІЙ
КАФЕДРА ЕКОЛОГІЇ

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(ПОЯСНЮВАЛЬНА ЗАПИСКА)

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Тема: «Розвиток Смарагдової мережі в Україні»

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Oksana A. Zhuravel

1. Theme: «Emerald Network Development in Ukraine» approved by the Rector on April 04, 2020, № 527/CT.
2. Duration of work: from 25.05.2020 to 21.06.2020.
3. Output work (project): literary sources, legislative documents, Google Earth, map of Emerald Network objects, Shadow List map.
4. Content of explanatory note: (list of issues): analytical review of the literature on the topic of the diploma; overview of materials on Emerald Network and Natura 2000 in terms of Europe and Ukraine; evaluation of Shadow List of the Kropyvnytskyi region and Malovyskivskyi district.
5. The list of mandatory graphic (illustrated materials): tables, figures, diagrams.

6. Schedule of thesis fulfillment

№ з/п	Task	Term	Advisor's signature
1	Receive themes task, search the literature and legislation	27.04.2020	
2	Preparing the main part (Chapter I)	03.05.2020	
3	Preparing the main part (Chapter II)	15.05.2020	
4	Preparing the main part (Chapter III)	24.05.2020	
5	Formulating conclusions and recommendations of the thesis	27.05.2020	
6	Verification of graduate work by supervisor	29.05.2020	
7	Consultation with the norms controller	05.06.2020	
8	Presentation of the work at the department	10.06.2020	
9	Taking into account the comments and recommendations and training to protect	15.06.2020	
10	Thesis defense at the department	18.06.2020	

7. Date of task issue: «27» April 2020

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ЗАВДАННЯ

на виконання дипломної роботи

Журавель Оксани Анатоліївни

1. Тема роботи: «Розвиток Смарагдової мережі в Україні» затверджена наказом ректора від «27» квітня 2020 р. №527/ст.
2. Термін виконання роботи: з 25.05.2020 р. по 21.06.2020 р.
3. Вихідні дані роботи: літературні джерела, законодавчі документи, знімки Google Earth, карта об'єктів Смарагдової мережі, карта Тіньового списку.
4. Зміст пояснювальної записки: аналітичний огляд літератури за темою диплома; аналіз матеріалу щодо Смарагдової мережі і Натури 2000 в межах Європи і України; оцінка тіньового списку Кропивницької області, Маловисківського району.
5. Перелік обов'язкового графічного (ілюстративного) матеріалу: таблиці, рисунки, діаграми.

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№ з/п	Завдання	Термін виконання	Підпис керівника
1	Отримання теми завдання, пошук літературних джерел та законодавчої бази	27.04.2020	
2	Підготовка основної частини (Розділ I)	03.05.2020	
3	Підготовка основної частини (Розділ II)	05.05.2020	
4	Підготовка основної частини (Розділ III)	24.05.2020	
5	Формулювання висновків та рекомендацій дипломної роботи	27.05.2020	
6	Перевірка дипломної роботи керівником	29.05.2020	
7	Консультація з нормоконтролером	05.06.2020	
8	Представлення роботи на кафедрі	10.06.2020	
9	Урахування зауважень, рекомендацій та підготовка до захисту	15.06.2020	
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ABSTRACT

Explanatory note to thesis «The development of the Emerald Network in Ukraine»: 62 pages, 11 figures, 4 tables, 1 diagram, 39 references.

Object of research – development of the Emerald Network within the territory of Ukraine.

Aim of work – to determine the preconditions for the creation of the Emerald Network in Ukraine, its current state and prospects for the future.

Methods of research: analysis, data comparison, statistical data processing, work with maps and other literary sources.

EMERALD NETWORK, BIOGEOGRAPHICAL REGIONS, NATURE RESERVE FUND, SHADOW LIST, BERN CONVENTION, NATURA 2000.

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LIST OF SYMBOLIC NOTATIONS, ABBREVIATIONS AND NOTIONS

EN – Emerald Network;

NRF – nature reserve fund;

SL – Shadow list.

INTRODUCTION

Relevance of the work. Today, the countries of the European Union, in contrast to Ukraine, have a high percentage of nature reserves in the total area. The main purpose of the Emerald Network (EN) is to preserve the conservation of natural fauna, flora and habitats within and outside the European Union. Ukraine is considered an industrial and agricultural country, imperfect legal framework, a large number of enterprises, irresponsible attitude of the relevant authorities, all these factors have led to imperfect development of the nature reserve fund (NRF) and the EN in Ukraine.

Aim and tasks of the diploma work - the aim of the work is to determine the preconditions for the creation of the EN in Ukraine, its current state and prospects for the future.

Tasks of the work:

1. To analyze the prerequisites for the creation and development of the EN;
2. To estimate current state of the network;
3. To characterize EN and Shadow List (SL) on the example of Malovyskivskyi district of Kropyvnytskyi region.

Object of research is the process of assessment of the EN within the territory of Ukraine.

Subject of research is objects of the EN.

Methods of research – analysis, data comparison.

Personal contribution of the graduate: based on the processed sources, it was proposed to add some objects to the EN.

Approbation of results. Participation in the conference.

Publications:

Журавель О., Назарков Т., Слободенюк М. Актуальні проблеми соціально-гуманітарних і природничих наук в контексті сучасних глобальних викликів. LANDSCAPE COVER CHARACTERISTICS: CASE STUDY OF MALOVYSKIVSKYI DISTRICT, KIROVOGRADSKA OBLAST: збірник тез учасників всеукраїнської

науково-практичної конференції молодих вчених і здобувачів вищої освіти (м. Кам'янець-Подільський, 07–08 червня 2018 року). Кам'янець-Подільський: ПДАТУ, 2018. С. 356-358.

CHAPTER 1

BACKGROUND OF THE EMERALD NETWORK

1.1 Bern Convention

The Bern Convention is an international legal instrument for nature conservation, which includes the European continent and some States of Africa (fig. 1.1). This Convention aims at the protection wild fauna, flora and their natural habitats, especially those species and habitats that require the cooperation of several States. Particular attention is paid to endangered and vulnerable species, including endangered and threatened migratory species. It was created in 1979 (entered into force in 1982) by the Council of Europe in Bern and has been signed by the European Union and 50 countries that are committed to protect wildlife, species and their habitats (some countries remained in observation status). Ukraine was join in 1996 (entered into force in 1999) [1].

This Convention can be called the main environmental law of Europe. It is based on other environmental conventions, environmental legislation in most European countries, and environmental directives of the European Union.

Main activity of the Berne Convention aimed at:

- protecting biodiversity (balance between species);
- protection of natural habitats;
- solving environmental problems (climate change, environmental pollution, environmental change);
- dissemination of information to the population on the protection and preservation of natural heritage (easy access to information, formation of human consciousness);
- cooperation between states in the field of nature protection, carrying out research works [2].



Fig. 1.1. States that have ratified the Bern Convention

The governing body of the Berne Convention is the Standing Committee, which includes representatives of all parties, as well as observer States and various organizations. They annually gather and discuss the results of implementation, as well as explore new recommendations for achieving the objectives of the Convention. The Standing Committee also approves the inclusion of EN of new territories offered by the country [3].

The Standing Committee shall be responsible for supervising the application of this Convention. In particular, it can:

- review the provisions of the Convention, including appendices to it, and to consider any necessary changes;
- provide recommendations on measures to be taken to achieve the goals;
- recommend appropriate measures to inform the public about the activities;

- provide recommendations to the Committee of Ministers on inviting non-member states to accede to the Convention;
- make any proposals for efficiency gains, including proposals for the conclusion of agreements with States which are not Contracting Parties to the Convention which will enhance the conservation efficiency of species or groups of species [1].

The four annexes list the species to be protected (regularly updated by the Standing Committee through expert group reports):

- species of flora subject to strict protection (Article 5, Annex I) (about 700 species that cannot be removed from the wild and which cannot be harmed);
- species of fauna subject to strict protection (Article 6, Annex II), (about 710 species that cannot be disturbed, caught, killed, sold);
- species of fauna to be protected (Article 7, Annex III),
- (about 570 species that can be hunted or otherwise
- use in exceptional cases);
- methods of slaughter, capture and other forms of exploitation of animals and plants are prohibited (Article 8, Annex IV) [4].

The following regulatory documents are used to preserve Europe's natural heritage and pass it on to future generations: “Natura 2000”, “Emerald Network”, “List of Ramsar sites”, “World Network of Biosphere Reserves”, “Important Bird and Biodiversity Area” and others.

As for Ukraine, at the legislative level it covers all the main areas of biodiversity protection - protection of rare species, conservation of rare plant communities, regulation of extraction and commercial use of various species of animals and plants. Main legislative acts: Law of Ukraine "On the nature reserve fund of Ukraine" (determines the legal basis for the organization, protection, effective use of the NRF of Ukraine, reproduction of its natural complexes and objects), Law of Ukraine "On Environmental Impact Assessment", Forest Code of Ukraine (regulates forestry), Law of Ukraine "On Fauna" (regulates relations in the field of protection, use and reproduction of fauna), Law of Ukraine "On Environmental Protection" (defines the legal, economic and social principles of environmental protection), Law of Ukraine "On Strategic Environmental

Assessment", Law of Ukraine "On the General Scheme of Territorial Planning of Ukraine", Law of Ukraine "On the Ecological Network of Ukraine"(regulation of public relations in the field of formation, preservation and rational, inexhaustible, use of the ecological network as one of the most important prerequisites for sustainable, environmentally balanced development of Ukraine), also "Regulations on the Green Paper of Ukraine" [5].

1.2. Natura 2000

The importance of the Natura 2000 network for conservation Covering over 18% of the EU's land area and 7% of its marine territory, the Natura 2000 network is the largest coordinated network of protected areas in the world. The selection of NATURA 2000 sites is based on clearly defined criteria. This unique network includes the most valuable and threatened species and habitats of Europe. The conservation of natural heritage and cultural landscapes of ecological value, including and the reduction of biodiversity loss in both individual EU states and generally in the EU, relies to a great extent on Natura 2000 sites. Also the Natura 2000 network is considered the largest coordinated network of protected areas in the world.

Natura 2000 is network of ecologically important nature conservation areas in European Union. It is made up of Special Conservation and Protection Areas designated respectively under the Habitats Directive and Birds Directive (fig. 1.2). These zones are formed in accordance with article 3 and article 4 of the Settlement Directive sets out Special Protection Areas to ensure the favorable conservation status of each type of settlement. And according to article 4 of the Birds Directive, the network should include Special Protection Areas designated for 194 endangered birds and all migratory birds. The main purpose of the network is to preserve the most valuable and endangered European species and habitat types [6].

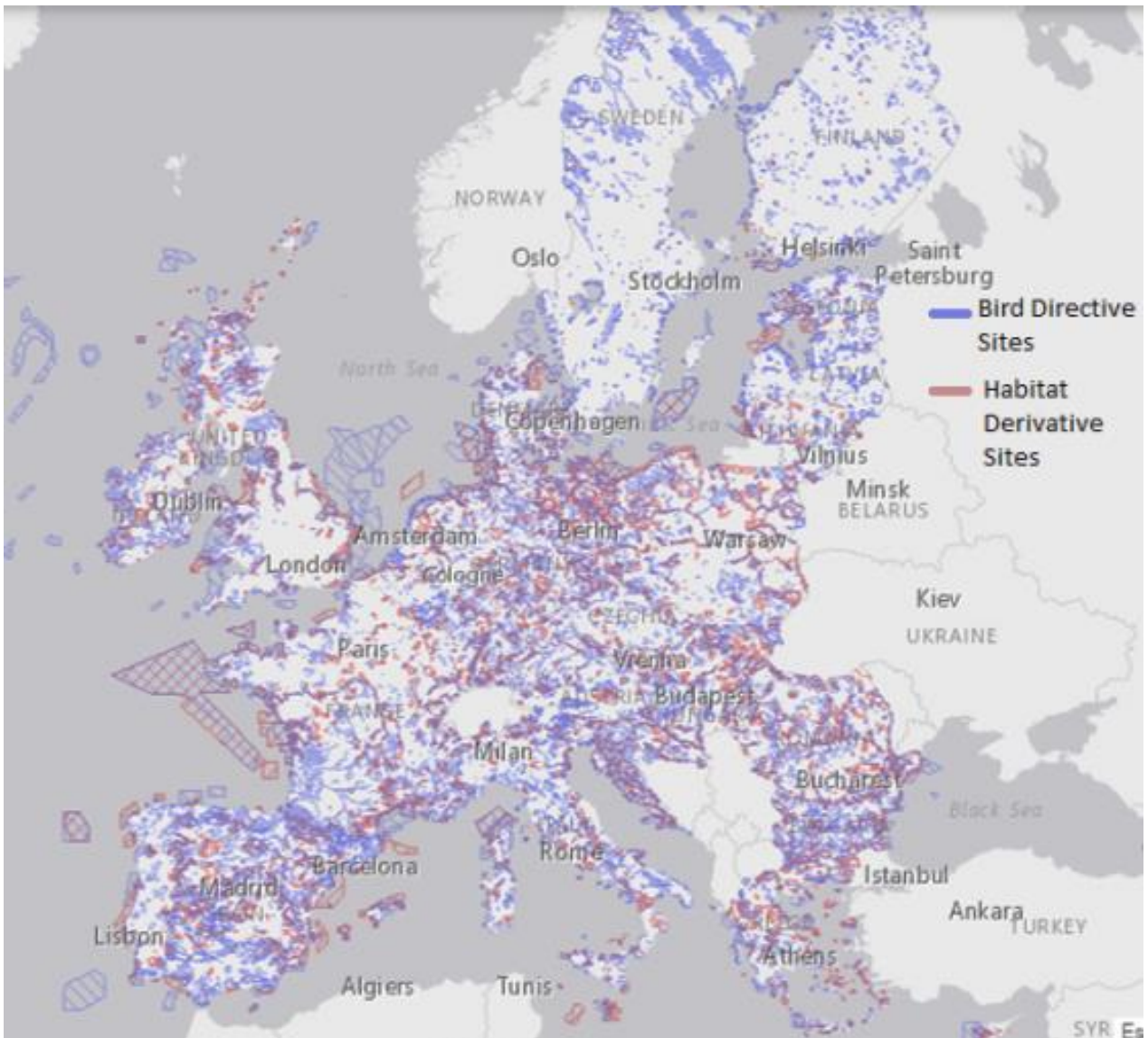


Fig.1.2. The components of Natura 2000 that includes territories of Bird Directive Sites and Habitats Directive Sites

The Natura 2000 network is not a system of protected areas where any human activity is prohibited. It will include the territories of nature reserves and protected areas of biosphere reserves, national nature parks, etc. But much of the land will still be privately or otherwise owned, and the emphasis will be on ensuring gradual, environmentally, economically viable and socially oriented management of these areas.

There is no total ban on new activities or development on the territory of Natura 2000. Any restrictions must be determined individually. The directives provide for a clear

procedure for assessing and deciding on development proposals that may affect the natural state of the site.

The Birds and Habitats Directives do not specify how much land and water area should be included in the network of Natura 2000 protected areas. This depends on the value of the biological diversity of each region. If, for example, the territory of a Member State of the European Union is particularly rich in biodiversity, it is expected that the area of the Natura 2000 network of protected areas in this country will be appropriate [7].

1.2.1. The Bird Directive

The Bird Directive was created to conserve wildlife birds. The Directive aims to establish the legal framework for the protection, management and control of wild bird species, as well as the regulation of these species in the Member States of the European Union. The requirements of the Directive apply directly to birds, their eggs and habitats. The Directive also defines the mechanism of conservation, maintenance and restoration of the population of natural bird species to a favorable conservation status [8].

The political basis for the adoption of the directive was a discussion about significant population losses of a large number of bird species found in Europe. The migratory nature of many species of birds (including hunting) meant that conservation measures in some countries are nullified in others [9].

Accordingly, European countries must comply with the requirements of this Directive, namely to protect and preserve migratory, endangered, vulnerable and endemic species; maintain biotopes; create protected areas; control the hunting process (must comply with the principles of balanced use and environmental balance); control the population; maintain a good environmental status (especially the Specially Protected Areas); to protect habitats and settlements. The Directive itself consists of the main text and 5 Annexes. As for Ukraine, the number of birds is 426 species (66 of which are listed in the Red Book) [10].

The wild bird protection mechanism provides for measures for the protection, management and control of wild birds, as well as requirements for their use. The main elements of this mechanism are:

- protection of habitats (settlements) (Articles 3 and 4);
- protection and use of birds (Articles 5-9);
- prevention of damage from invasive species (Article 11);
- research and reporting (Articles 10 and 12) [9].

The measures implemented under the Directive should address various factors that may affect the number of birds, namely the consequences of human activities such as, inter alia, the destruction and pollution of the environment, the habitats of birds, their destruction and trafficking, while the severity of such measures should be adapted to the specific situation within the framework of environmental legislation. The Directive sets out mechanisms for the conservation, maintenance and restoration of natural bird populations to favorable conservation status [8].

The directive requires states to report every three years to the European Commission on the state of implementation. Such reporting includes not only the legislation adopted to implement the Directive, but also information on the practical application of the Directive, in particular on the dynamics of the population of species, the creation of protected areas.

In Ukraine, there is no state monitoring of the number of species of wild fauna, including birds. Records of wild animals are carried out only by forestry farms on the territory of hunting grounds, in particular for 26 species of game. Given that the shooting of species listed in the Red Book is prohibited, the dynamics of their numbers is practically not observed and does not give an objective picture of the state of conservation of biodiversity [9].

1.2.2. The Habitat Derivative

The idea of preserving biodiversity as a fundamental property of living things has necessitated the substantiation of new approaches to the implementation of practical principles of nature protection, which would ensure the preservation of environmental

conditions with the inevitable increase in anthropogenic impact on the natural environment and further transformation of landscapes.

In response to these problems, the idea of an ecological network as a basis for the preservation of landscape and biotic diversity in anthropogenically transformed landscapes and the dominance of secondary ecosystems in the biogeocenotic cover was formed. The ecological network is an integrated system of territorial organization of biotic and landscape diversity, it provides coverage of both traditional conservation areas (objects of nature reserves) and areas that are somehow transformed by man and even man-made, which have a certain importance for maintaining the conditions of existence of certain species complexes or groups.

The idea of the ecological network is based on the so-called habitat concept of biodiversity conservation, namely the idea of preserving certain types of habitats as territories (places) of species or their groups that are important for the conservation of European biodiversity. At the heart of the environmental programs arising from this concept (Natura 2000, EN) is the principle of allocation of sites, which are determined by certain, conventionally agreed, properties or characteristics that meet the approaches of European environmental legislation (habitats of plant species and animals, location of rare types of groups, etc.).

The Habitat Directive was created to conserve biodiversity through the conservation of natural habitats and species of natural flora and fauna. According to this directive, European countries should have criteria for assessing the favorable conservation status associated with: the natural range of habitat types and species; the typical features of the structure and function of the types of settlements where the species referred to in the Directive; perspective on the future. Economic, social and cultural needs, as well as regional and local characteristics, must be taken into account in drawing up the proposal. The Directive consists of a series of articles and 6 appendices.

For non-European Union countries, areas of special conservation and habitats for rare and endangered species are defined by Resolution of the Standing Committee of the Berne Convention number 4 of 1996 ("List of endangered species of natural habitats in need of special conservation measures"). These protected areas form the Emerald. The

habitat approach in Ukraine the developed due to protection of rare phytocoenosis, which was formed within the concept of the Green Book of Ukraine. The Green Book of Ukraine is based on an ecosystem approach, but the criteria and methods for identifying the types of syntaxons are fundamentally different from those adopted in European practice. The Green Book covers only areas where vegetation is present and only terrestrial species, it does not take into account marine ecosystems. In addition, its approaches cannot be applied to areas where there is no vegetation, but which are important as places of life, especially animal organisms. The use of European experience in Ukraine will undoubtedly give positive results in the implementation of the priorities of the Berne Convention in the country, especially in terms of conservation of rare habitats, including habitats of rare plant and animal species listed in the annexes to the Convention, by creating the EN. The first step in implementing the provisions of the Habitats Directive in Ukraine is to translate the latest version of the Interpretative Guide for the Settlement Types of the European Union [11].

1.3. Conclusions to Chapter 1

The Berne Convention is a binding instrument of international law created to preserve wild flora, fauna and their natural habitat. It also aims at interstate cooperation in the environmental field. First of all, natural diversity is protected where it has been preserved in its natural and original state to the present day.

The Standing Committee is the governing body of the Convention, which monitors the implementation of the tasks, as well as examines new recommendations to achieve the objectives of the Convention.

The Natura 2000 network was created to implement the Bern Convention. The network includes valuable protected areas of the European Union member states. The main goal is to preserve rare and endangered species. The Natura 2000 network was created on the basis of the Birds and Habitats Directives (one of the most important legislation of the European Union in the field of nature protection).

The Habitats Directive was created to promote the conservation of biodiversity through the conservation of natural habitats and species of natural flora and fauna that are important for society in the EU Member States. The annexes to the Directive list the types of habitats and species of common European importance that require appropriate conservation forms.

As for the Birds Directive, it aims to create conditions for the protection, management and control of wild bird populations. To date, the dynamics of the bird population is compared, which shows quite contradictory results (some species have suffered losses, while others, by contrast, have increased in number).

CHAPTER 2

CREATION OF THE EMERALD NETWORK IN UKRAINE

2.1. Emerald Network

Natura 2000 operates in the territory of the European Union, in Ukraine and other non-EU countries it is represented as the EN (it support the candidate states for joining the European Union, by doing part of the preparatory work). In order to ensure complementarity and consistency between the Natura 2000 network and the EN, the Group of Experts on Protected Areas and Ecological Networks recommended that any assessment of the EN territories be based on the same rules and procedures as those developed for the Natura 2000 network (using biogeographic approach). Objects within the EN, together with Natura 2000 sites, form the core of the Pan-European Ecological Network, which is also supported by the Berne Convention. The Member States of the European Union fulfill the requirements of the Berne Convention by developing the Natura 2000 network, and its territories correspond to the territories of particular conservation importance to the EN [12].

The European Union and its Member States fulfill their obligations to the Berne Convention and the EN of Europe within their own ecological network - Natura 2000. For the countries that are member states of the European Union, the territories of the EN of Europe include Natura 2000 territories, because these two networks are fully compatible with each other (table 2.1) [8]. The EN of Europe is created on the territory of the member states of the Bern Convention and the observer countries of the neighboring states of the European Union. The EN of Europe extends European standards for nature protection beyond borders. The expansion of the European EN in African countries is important for the conservation of migratory species. In particular, it can help reverse the negative trend that has developed in the conservation of migratory species of European importance.

Comparative table of features of the Emerald Network and Natura 2000 networks

	Emerald Network	Natura 2000
Created on the basis of	Recommendation № 16, Resolution № 3, on the network of critical areas of conservation of the Berne Convention	The Habitat Directive, The Bird Directive
Purpose of creation	conservation of natural fauna, flora and habitats	conservation of natural fauna, flora and habitats
Area of action	European countries (47) + Africa (4)	25 EU member states
Principles of construction	not a mandatory law	legally binding law for the Member States of the European Union
Activity	encourages the creation of eco-corridors	The creation of eco-corridors is mentioned in Article № 4, but is not mandatory
Protected areas:	- habitats of species of natural flora and fauna (listed in Annex I); - natural types of endangered habitats; - important areas for migratory species.	- habitats of species of natural flora and fauna (listed in Annex II); - natural types of endangered habitats; - important areas for migratory species.

The emergence of the EN starts with Recommendation number 16 (1989) of the Standing Committee, which states that the parties to the Convention should take certain steps to identify and preserve the EN. The network was also based on Resolution number 3 (1996). The actual design of the Network began only in 1998, following the adoption by Resolution 5 of the Standing Committee, which gave the Network its official name - EN. The entry of the territories to the EN is based on scientific data on the presence in these

territories of a certain proportion of the national population of the species referred to in resolution 4 or 6 of the Berne Convention. All these territories are important for rare species and natural habitats in Europe.

Areas of Special Conservation Interest had to meet several of the following criteria: promote the survival of endangered or endemic species; support a significant number of species in high species diversity; contain endangered habitats; support important species populations; contain the types of endangered habitats; be an important site for migratory species; otherwise, significantly contribute to the achievement of the objectives of the Convention. The presence in a given area of important or numerical populations of Resolution number 6 species and habitat areas from Resolution number 4, compared to their total national resource, allows to determine the compliance of this area with Areas of Special Conservation Interest criteria.

The EN cannot be included in any territory, even if it already has conservation in the territory of a State if it does not meet the criteria that are important for the conservation of species and habitats in Resolutions 4 and 6 of the Berne Convention. The decision to include territories in the network shall be taken by the Standing Committee of the Berne Convention on the proposal of any State which is a member of the EN. Currently, in most European countries, emerald territories are given much more attention than nature conservation areas defined by national law [3].

The creation of the EN consists of next steps:

- identification of species and habitats within each biogeographic region in the country;
- submission of proposals for the inclusion of territories in the EN by national authorities;
- database quality control by the Secretariat of the Berne Convention;
- evaluation of the effectiveness of the proposed sites at the biogeographical level;
- official approval of EN territories by the Berne Convention Standing Committee and their inclusion in the Network;
- approval of the emerald territories at the national level;

- implementation of management, reporting and monitoring measures;
- EN Management Area Reporting [3].

The process of creating the EN is can be repetitive. Due to the lack of proposed emerald objects or some changes in nature, to need to make new proposals and as result return to the beginning of the process of creation.

The legislation of Ukraine contains such a term as an “ecological network”. In accordance with the Law of Ukraine “On the Ecological Network of Ukraine” of June 24, 2004, the ecological network is a single territorial system created with the aim of improving the conditions for the formation and restoration of the environment, increasing the natural resource potential of the territory of Ukraine, preserving landscape and biological diversity, places of settlement and growth of valuable species of flora and fauna, genetic fund, animal migration paths through the combination of territories and objects of the NRF, as well as other territories which are especially valuable for environmental protection and are subject to special protection in accordance with the legislation and international obligations of Ukraine. According to article 5, the ecological network consists of: territories and objects of the NRF; lands of water fund, wetlands, water protection zones; lands of the forest fund; forest shelter belts and other protective plants; territories that are places of stay or growth of species of flora and fauna listed in the Red Book of Ukraine, etc [12].

But it is important to emphasize that Ukrainian legislation introduces slightly different criteria for the formation of an ecological network than the criteria for the formation of the EN. In particular, the approach is not based on the criteria for allocating habitats as a basis for choosing the constituent elements of an ecological network, but an ecological network is created as a basis on the basis of territories and objects of the NRF. Ecological network with the further involvement of protected areas of a different status (water protection, recreational, etc.).

The need to bring the current legislation of Ukraine closer to the legislation of the European Union calls attention to international acts in this field of research. At the same time, little data on the legal nature of the EN has been published in Ukrainian literature on environmental law [14].

The implementation of the EN in Ukraine started in 2001 provided by the Council of Europe with EU financial support project for process validation and determination the first fifteen EN in Ukraine. The Ukrainian part of the EN of Europe developed since 2009. The leading organization responsible for building this network is the Ministry of Ecology. The network basically intersects with the existing territories of the NRF.

151 territories had been proposed for inclusion in the network as of 2011 (as a result of the implementation of the first Joint Program of the European Union and the Council of Europe to support the extension of Natura 2000 principles through the EN) [15].

From 2013 to 2015, only 10 territories were included in the network. In 2015-2016, the first round of biogeographical seminars on assessing the sufficiency of the Network in Ukraine for the conservation of habitats and species from Resolutions number 4 and number 6 of the Berne Convention. In 2016, the Standing Committee of the Berne Convention approved the Updated List of Officially Accepted Territories of the EN, which includes 271 territories for Ukraine. The total area of the network was 5.8 million hectares (9% of the land area of Ukraine). At that time, they consisted primarily of existing nature reserves and national nature parks, which amounted to 3.6 million hectares (57% of the total area of the EN of Ukraine), which were already protected areas (thus, they do not improve the conservation status of species and habitats). Many of the territories that should be included in the EN were not protected, as they were not part of the NRF of Ukraine. Therefore, only 33% of the EN in Ukraine were territories that actually received protection status, and were guarded not as a whole system, but as parts. In 2019, 106 new territories were added to the EN (fig. 2.1), with a total area of 1.6 million hectares (2.6% of the state area). These territories include water bodies and natural canyons.

Thus, in the world, the EN includes 3,500 objects, of which 377 are located in Ukraine.

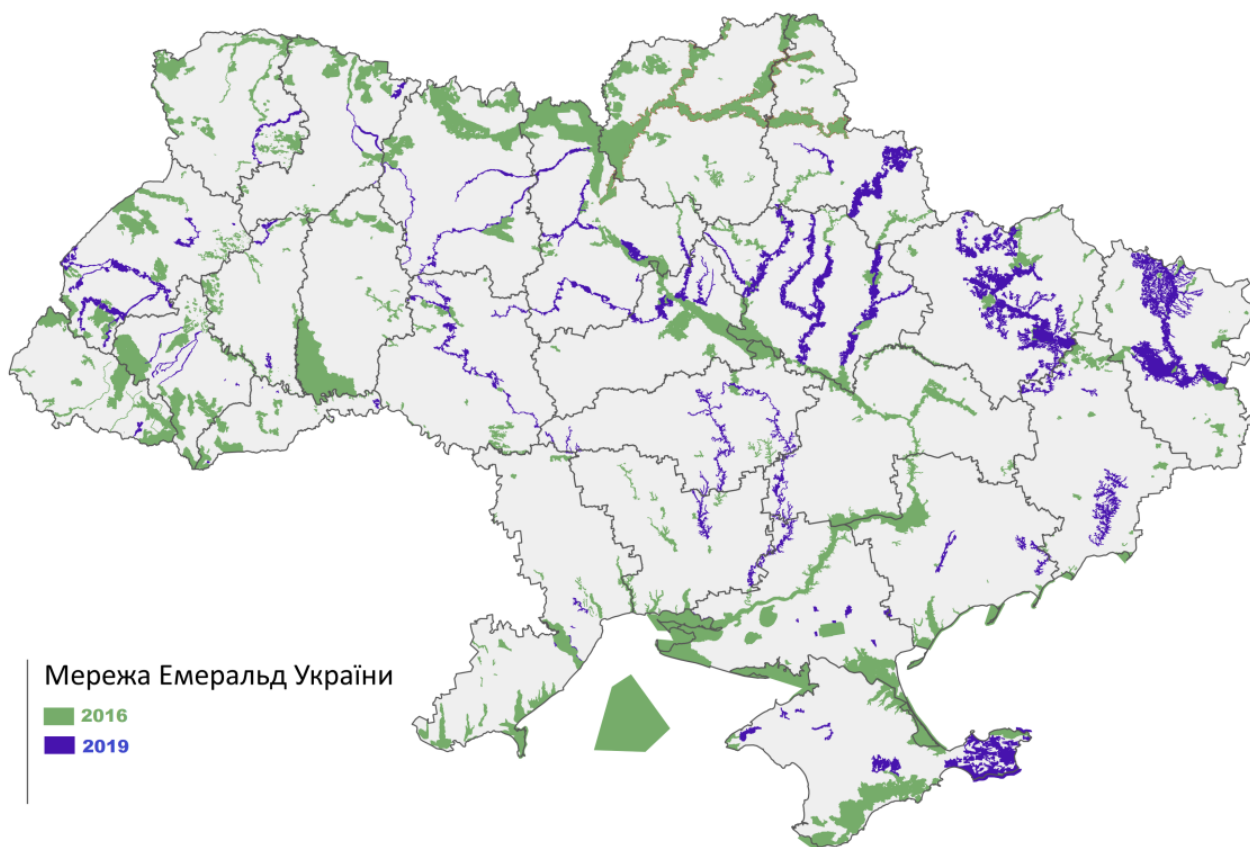


Fig. 2.1. Objects of the Emerald Network for 2019

As part of the European integration process, an Association Agreement between Ukraine and the European Union was signed in 2014. The agreement entered into force in 2017, after the EU Council adopted the final decision on concluding an Association Agreement with Ukraine on behalf of the European Union. Under the Agreement, Ukraine undertakes to gradually approximate its legislation to that of the EU, within the time limits set out in the Annexes to the Agreement. In particular, the Birds Directive and the Habitats Directive should be implemented, and by September 2021 not only to develop the EN, but also to implement effective management measures [16].

The legislation of Ukraine contains a number of acts that have a certain relationship with the EN. First of all, this is the draft Law of Ukraine "On the territory of the Emerald Network". In fulfillment of Ukraine's obligations under the Association Agreement between Ukraine and the European Union, the European Atomic Energy Community and

their Member States, this Law is aimed at the implementation of European Union legislation in the field of nature protection.

This Law establishes the legal basis for the designation and conservation of the EN in Ukraine in accordance with the requirements of the Convention on the Conservation of European Wildlife and Natural Habitats (Berne Convention) and the Directive №2009/147/EC on the Conservation of Wild Birds and the Directive №92/43/EC on the conservation of natural habitats and of species of natural fauna and flora.

The purpose of this Law is to ensure the conservation of natural habitats and species of natural fauna and flora subject to special protection in Europe by defining the territories of the EN within Ukraine and their conservation. The provisions of this Law and other normative legal acts adopted in accordance with it shall apply to all territories proposed and defined by Ukraine as the territory of the EN [17].

The draft law stipulates that the ecological network of Ukraine and objects of the NRF include also the territory of the EN.

The ultimate goal of developing the Network is to prepare Ukraine for the transition to European environmental legislation after accession to the European Union. Over time, the number of EN areas is expected to increase due to the deepening of scientific knowledge and existing changes in nature. The modern scheme of the Network is just the beginning. In recent years, scientists from different regions of Ukraine have prepared materials for the inclusion of new territories in the EN in Ukraine. Today, these proposals are at various stages of approval. Some are only being prepared for submission to the Standing Committee of the Convention, others - already approved and included in the lists of territories of the EN [16].

2.2. Biogeographical regions

Inclusion of territories in the EN is carried out using the so-called biogeographic approach (assessment of the adequacy of designated territories of the EN for long-term conservation of species and habitats is carried out within biogeographic regions). Biogeographical region is a territory with similar ecological conditions and characteristics

of natural vegetation, animal communities and climatic conditions. It is used in the design of the Natura 2000 network in EU Member States as well as in the EN in other countries. Currently, Europe's biogeographic regions consist of 11 regions: Arctic, Atlantic, Boreal, Continental, Alpine, Pannonian, Steppic, Black Sea, Mediterranean, Macaronesian, and Anatolian.

The creation of a map of biogeographical regions began with the processing of map units of the natural vegetation map. Some plant species belonged to one specific region, so it was reclassified as "azonal" and included into neighboring regions. After the adjustment, the first map was created, which included five biogeographical regions: Alpine, Atlantic, Continental, Macaronesian and Mediterranean. After the accession of Austria, Finland and Sweden to the EU in 1995, a new Boreal region was formed. To expand the map of biogeographical regions to the European space in 1997, it was decided to add five biogeographical regions: Anatolian, Arctic, Black Sea, Pannonian and Steppic. The expansion of the map of biogeographical regions in the Pan-European geographical area began in 1998. The final version of the map was formed in 2001 and in 2005 approved by the Standing Committee of the Bern Convention for EU [18].

According to the map (fig. 2.2) of biogeographic regions, the territory of Ukraine is divided into 4 regions: Continental, Alpine, Pannonian and Steppic. The Continental region includes all of North, North-East and parts of Central and North-West territories (approximately coincides with Polissia and Forest-Steppe climatic zones). The Steppic region covers all Southern and South-Eastern territories of Ukraine (coincides with the Steppe climate zone). The Alpine region includes a territory Carpathian Mountains. The Pannonian includes part of the Transcarpathian region.

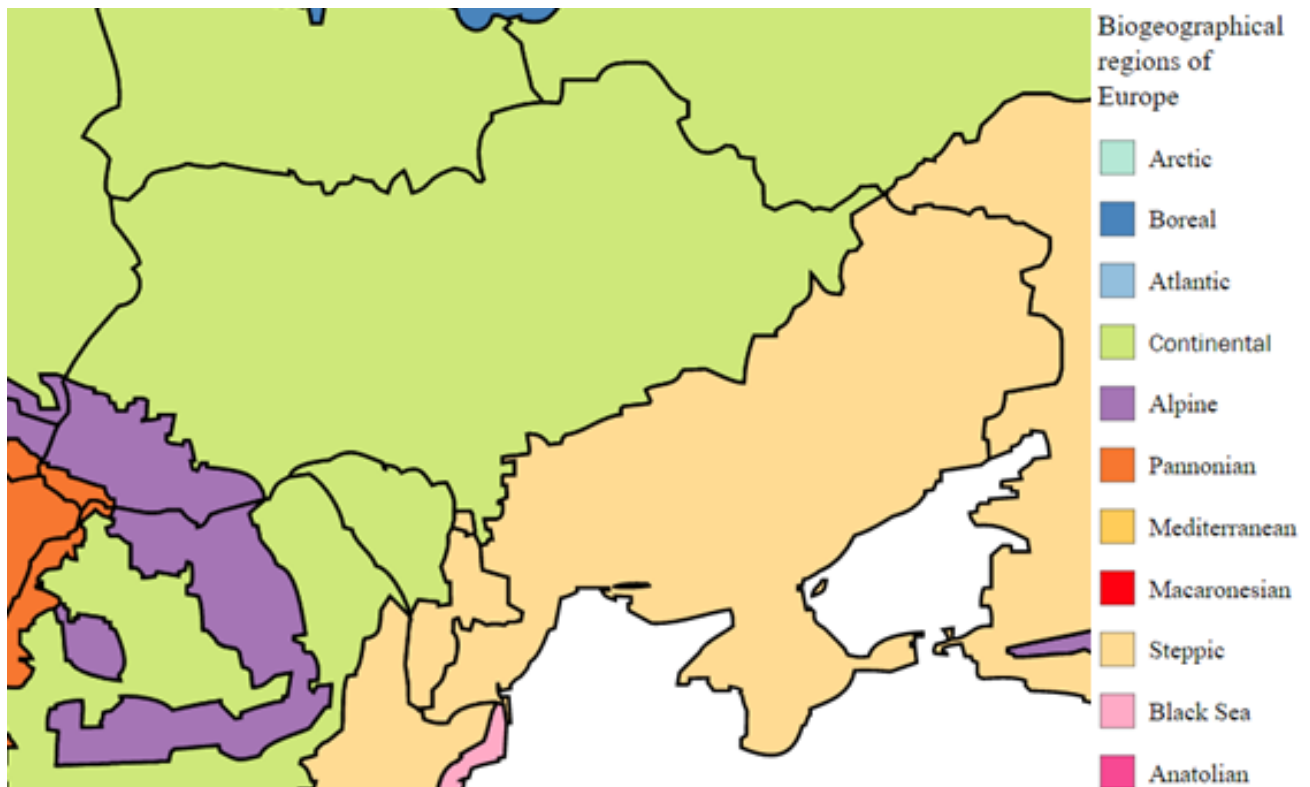


Fig. 2.2. Map of Ukraine according to biogeographic regions of Europe

The Steppic region is one of the biggest region defined by the European Environment Agency. The relief is characterized by plains, as well as hills, ravines and beams. Most of the territory is located within various tectonic structures of the ancient Precambrian Eastern European platform. The unequal origin of the forms of modern relief of the region contributes to the formation of various landscapes. The most common soils are chernozems. The continental climate has warm, dry summer and cold winter. This region is characterized by a small number of water bodies, constant winds. Among the plants prevail grasses and other drought-resistant plants [19].

The Continental region extends from west (central France) to east (Ural mountains). The climate is generally characterized the cold winters and hot summers. The landscape of the Continental Region is generally flat on the North (due to advancing and retreating glaciers) and now characterizes by floodplains, marshland and bogs. This region includes the middle courses of a large number of Europe's most important rivers: the Danube, Desna, Dnepr, Dnestr and Pripyat. These rivers have played a determining role in the formation of the landscape and its subsequent biodiversity. They also influence on the

basic settlement structure and infrastructure. A large part of the Continental region is made up of the chernozem - the most fertile soils (high humus content). As the region is large enough (it consists of 13 European countries) and borders with other regions, it is characterized by great biodiversity (as well as species from other regions) [20].

The Pannonian region is characterised by a large flat alluvial basin. Region covers 3% of the EU territory. This region has influence from the west - wet weather, drier warmer winds from the Mediterranean and cooler temperatures coming from the Carpathians and Alps nearby. There are also frequent thunderstorms in this region during the year. The region is characterized by high biodiversity. The most typical for this region are brown forest soils formed under deciduous, mixed forests. This district is characterized by a mosaic distribution of vegetation, due to complex weather patterns [21].

The Alpine region extends from the Mediterranean to western Siberia (includes Carpathian). The Carpathians are the youngest and most easterly of the mountains in the Alpine region. The whole range is heavily influenced by the surrounding continental climate. This is responsible for the large temperature variations between winter and summer. Because the Carpathians have a relatively low altitude, the upper alpine and nival zones are generally missing. Instead, montane forests cover most of the range. The foothills are dominated by sessile oak (*Quercus petraea*), whilst beech forests prevail in the montane region. On the higher reaches they merge into mixed stands of beech-fir or beech-fir-spruce, eventually giving way to pockets of larch and Arolla pine. The Carpathians are one of the main corridors for the migration of different species. The region is also characterized by a large number of lakes (most of glacial origin) and a dense network of rivers and streams, which are fed by heavy rainfall [22].

2.3. Natural zones

According to the Ukrainian classification, the territory of Ukraine is divided into natural zones. It is part of a geographical zone with homogeneous climatic conditions. The plains of the territory are characterized by latitudinal zonation, and in the mountains by high-altitude zonation. Each natural zone is characterized by its own weather conditions

(air temperature, precipitation, winds), soils, flora and fauna. From north to south in our country change the following natural areas: mixed forests, forest-steppe, steppe, Ukrainian Carpathians and Crimean mountains (fig. 2.3).



Fig. 2.3. Map of Ukraine according to natural zones of Ukraine

The zone of mixed forests of Ukraine is spread on the territory of the Ukrainian Polissya and occupies up to 20% of the area of our state. The soils are soddy-podzolic and swampy. A characteristic feature of the soil cover is its mottling. The average rainfall is 600 mm. The amount of precipitation exceeds natural evaporation from the soil surface, and thus the Ukrainian Polissya is characterized by the positive moisture balance and as a result, the area is also characterized by a dense river network and swamps. There are over 600 rivers, 20 of them are over 100 km long. Natural vegetation consists of forest, meadow and swamp species. Pine, oak-pine and oak-hornbeam forests predominate. The parent materials of zone are glacial till, glacial outwash and alluvial deposits. Polissya is

characterized by typical forest animals: roe deer, elk, wild boar, wolf, fox, marten, hare, squirrel, and birds - capercaillie, and grouse. Beavers and otter are found. Ukrainian Polissya is divided into 5 physical and geographical regions: Volyn, Zhytomyr, Kyiv, Chernihiv and Novgorod-Siversky Polissya. The following objects of the NRF are present on the territory: Polissya, Rivne, Cheremsky reserves, Shatsky and Desnyansko-Starogutsky national natural parks, reserves - "Nechymne", Dorogynsky, Dniprovsko-Desnyansky and other protected areas [23].

The forest-steppe zone of Ukraine stretched from Prykarpattia to the border with the Russian Federation. The area of the region is about 35%. The relief is quite diverse, including the Volyn-Podolsk and Dnieper uplands, part of the Dnieper lowlands and the Middle Russian uplands. The soil cover of the zone is very complex and represented by over 160 mapping units. Soils are mostly represented by gray forest soils and typical chernozems. The amount of precipitation depends on the location and in averages is equal to 550 mm per year. The structure of the lithologic base and relief, humidity conditions determined the great density of the river and ravine-gully network and its significant degree of drainage. The most forest-covered areas are left in the western part of territory on the Prydniprovsk and Central Russian uplands. Most spread oak (one of the biggest is preserved in the Kropyvnytskyi region - Chornyi Lis, which also is an object of EN), pine and hornbeam types of tree. The forest-steppe is characterized by a combination of the fauna of Polissya and the Steppe. In the forests are found elk, wild boar, roe deer, wolf, badger, marten, squirrel. In the steppe areas typical animals - hare, fox, rodents (gophers, hamsters, mice); of birds - gray partridge, quail. The forest-steppe of Ukraine is divided into four physical-geographical provinces: Western Ukraine, Dniester-Dnieper, Left-Bank-Dnieper, Central Russia. The region includes the following objects of the NRF: nature reserves (Kanivsky, «Medobory», «Roztochchya»), national nature parks (Halytsky, «Dniester canyon», «Kremenets hory», «Podilsky Tovtry», Yavorivsky) [24].

The steppe zone occupies about 40% of the territory of Ukraine. It is subdivided into two subzones: the chernozemic steppe and the arid steppe. It is located on the territory of the Black Sea lowland, part of the Dnieper upland and the Dnieper lowland, Donetsk and Priazovsk uplands, as well as the plains of the Crimea. The average rainfall is 350 mm.

Due to the lack of precipitation, the density of the river network is insignificant. Forests are not widespread in the region. In the chernozemic steppe regions there are meadow steppes with lush grasses (clover, sage, sleep-grass, etc.) and steppe grasses. Soils - ordinary chernozems, typical chernozems. Further south, the herbaceous-fescue-feathergrass steppes on ordinary chernozems gradually turn into fescue-feathergrass on the southern chernozems. Further the arid steppe - dry steppes with sparse grassland of cereals, wormwood, salt marshes on chestnut soils. Fauna: in addition to numerous small rodents in the steppe live shrews, moles. The common marmot is now preserved only in the Luhansk reserve and in two reserves of the Kharkiv region. Gophers are characteristic of the steppe, steppe ferret, badger, fox, etc. are found, among birds - larks, quails, partridges, rarely - bustards, eagles. The steppe zone of Ukraine is divided into three sub-zones: North Steppe, Middle Steppe and South Steppe. On the territory of the steppe zone there are the following objects of the NRF: Askania-Nova Biosphere Reserve, Luhansk Nature Reserve, Ukrainian Steppe State Reserve, Danube Biosphere Reserve, Dnieper-Oryol Reserve, Azov-Sivas National Nature Park, «Svyati hory» [25].

On the territory of our state, the Ukrainian Carpathians stretch from northwest to southeast. The Carpathians are characterized by medium-high mountains, humid warm climate, pronounced vertical zonation. The Carpathians parent materials are mainly represented by the products of weathering of solid sedimentary, igneous, and metamorphic rocks. About 40% of the territory is covered with forests, which are characterized by high quality wood: beech, spruce, fir, etc. Above the forests a large area is occupied by subalpine and alpine meadows - poloninas. Varieties of brown forest soils predominate in mountainous areas. The mountainous region with the most intense precipitation. The nature of the Ukrainian Carpathians is represented by a system of high mountain, medium mountain, low mountain and foothill tiers. Precipitation is approximately 700 mm in the foothills and up to 2000 mm on the highest ridges. The Ukrainian Carpathians have the largest number of nature reserves (over 1,400), among which the largest are the following: national natural parks (Carpathian, "Hutsul", "Synevyr", "Skoliv Beskids", Vyzhnytsky), nature reserves (Carpathian,"Gorgany"), reserves of national importance ("Grofa", "Breduletsky") [26].

The Crimean Mountains occupy about one-fifth of the Crimea. Climate conditions differ in a wide range of characteristics depending on altitude above the sea level, the slope aspect and steepness, as well as the amount of heat reaching the surface, the temperature of Black Sea water, and that of the air over the peninsula steppes. The amount of precipitation increases with altitude. The average rainfall is 1200 mm per year. In the forests of the most common Crimean pine, beech, oak. Above them are subalpine meadows - yaylas. The most widely occurring parent materials are eluvium and deluvium of various solid rocks, stone talus, and clastic proluvial deposits. In the Crimean mountains there are three physical and geographical areas: foothills, mountains and the southern coast of Crimea. The height of the ridges lowers from the south to the north. Among the soils the most common are brown mountain-forest, chernozem and brown. To preserve the nature of the Crimean mountains, the Crimean and Yalta reserves (the richest in plant composition) have been created [24].

2.4. Conclusions to Chapter 2

The EN is an ecological network that includes Territories of Special Environmental Interest. The network is analogous to Natura 2000, but also extends to countries that are not members of the European Union. The EN is coordinated by the Berne Convention. It was created to preserve the natural fauna, flora and habitats.

The basis of the network is a biogeographical approach. That is, the assessment of the certain areas of the EN is carried out within the biogeographical regions (areas with similar natural conditions and characteristics). The territory of Ukraine is part of 4 regions: Continental, Alpine, Pannonian and Steppic. Also, these regions correspond to natural zones. Each has its own environmental characteristics and includes a list of objects that must be protected.

As for the development of the EN in Ukraine, it began to develop actively after 2014, when the Association Agreement between Ukraine and the European Union was signed. The last changes took place in 2019, when 106 new objects were added to the EN.

CHAPTER 3

EMERALD NETWORK WITHIN THE KROPYVNYTSKYI REGION

3.1. Physical and geographical characteristics of the region

Kropyvnytskyi region is located in the central part of Ukraine between the Dnieper and the Southern Bug and covers an area of 24.6 thousand square kilometers. The region is located within the central upland part of the Ukrainian crystalline massif. The territory of the region is an elevated undulating plain, divided by a dense network of river valleys, ravines and gullies. The territory of the region does not belong to seismically active zones.

The climate of the region is temperate-continental. Winters are mild, with frequent thaws, and summers are hot. In the second half of the summer in the Kirovohrad region is often established anticyclone type of weather with high temperatures up to + 38 °C and prolonged droughts.

Most of the region (65%) is located within the Southern Bug river basin, the other (35%) - in the Dnieper river basin. There are two large rivers in the region - the Southern Bug and the Dnieper, 8 medium rivers: Sinyukha, Velyka Vys, Chorny Tashlyk, Yatran, Ingul, Tyasmin, Ingulets, Vysun and 1589 small rivers. Most of the objects of the EN of the Kropyvnytskyi region are located within rivers. Therefore, their ecological condition should be monitored in more detail.

The location of the region in the center of the Ukrainian Crystal Shield causes the formation of large deposits of rare metals. Kropyvnytskyi region belongs to one of the most mineral-rich regions of Ukraine. 32 species have been discovered on its territory and there are almost 300 deposits of various minerals. The subsoil of the region is characterized by the presence of a number of unique components, primarily for energy development (uranium ores, lignite, oil shale), ferrous metallurgy (iron, chromium, nickel, cobalt), non-metallic minerals (kaolin, triplets, graphite), decorative and facing and building materials.

Kropyvnytskyi region is represented by 189 thousand hectares of land, of which 7.4% are directly covered with forest vegetation. Located in the Kropyvnytskyi region, forests perform mainly ecological functions such as water protection, protection, recreation. There are no operational forests. However, currently more than 70% of the former forest-steppe part of the region is plowed [27].

Initially, the creation of the EN of the territory was based on the NRF of Ukraine (although these territories do not always coincide). NRF is an area of land or water space of special value and allocation in order to preserve landscapes, species of flora or fauna. General features and regional features of protected areas and objects of Kropyvnytskyi region have developed as a result of the combined action of various factors. The first steps towards nature conservation and the formation of protected areas within the modern territory of the region were made in the nineteenth century, at a time when anthropogenic pressure on landscapes became apparent.

According to the results of the accounting of territories and objects of the NRF, submitted by the executive authorities at the local level, ensuring the implementation of the state policy in the field of environmental protection, as of 01.01.2020 the NRF of Ukraine consists of 8512 territories and facilities with a total area of 4.418 million hectares within the territory of Ukraine (actual area 4.085 million hectares) and 402500.0 hectares within the Black Sea. The ratio of the actual area of nature reserves to the area of the state ("indicator of reserves thistle") is 6.77% [28].

For the territory of Kropyvnytskyi region, where almost 80 percent of the territory is occupied by arable land, the problem of biodiversity conservation is extremely important. Quantitative changes in the network of nature reserves within the Kropyvnytskyi region are presented in figure 3.1.

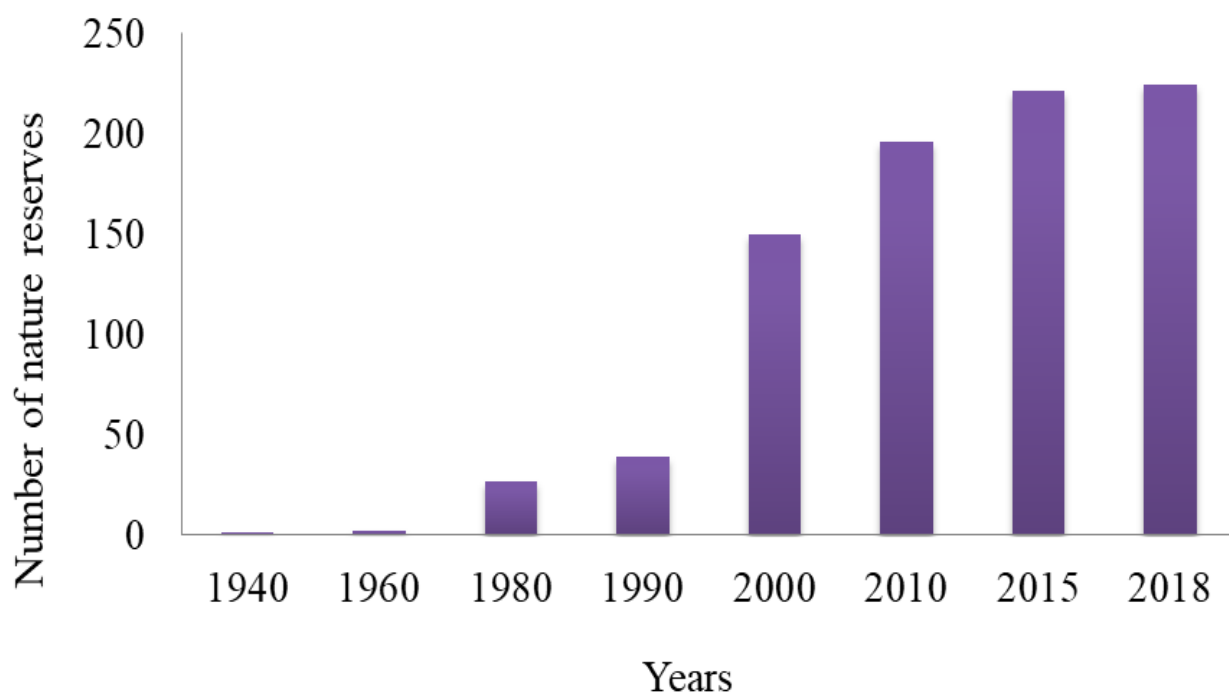


Fig. 3.1. Quantitative changes in the network of nature reserves in Kropyvnytskyi region

As of September 2018, the network of the NRF of Kropyvnytskyi region included 224 territories with a total area of over 100.5 thousand hectares. As of the beginning of 2019, the number of objects of the NRF in the region has not changed (table 3.2). Of the total number of territories, 26 have national status, and the other 198 - local status. The NRF of the region includes reserves, natural monuments, protected tracts, monument parks, regional landscape parks and dendrological park. At the same time, there are no national nature parks, biosphere and nature reserves. The percentage of protected areas in the Kropyvnytskyi region is 4.08 percent [29].

Table 3.2

The structure of the nature reserve fund of the region as of 01.01.2019

Name of NRF objects	Objects of the nature reserve fund					
	National significance		Local significance		Total	
	Number	Area, ha	Number	Area, ha	Number	Area, ha
1	2	3	4	5	6	7
Dendrological parks	1	109	-	-	1	109

Continue of table 3.2

1	2	3	4	5	6	7
Regional landscape parks	-	-	2	77850,7	2	77850,7
Reserves - total, including:	21	5728	84	12818,9	104	18493
Landscape	7	3844,4	49	9818,5	56	13662,9
Forest	1	43,5	7	1102,1	8	1145,6
Botanical	9	741,5	18	883,4	27	1262,6
general zoological	1	27	3	220,3	4	247,3
Ornithological	2	503,6	5	736,4	7	1240
Hydrological	1	568	-	-	1	568
Entomological	-	-	1	4,3	1	4,3
Natural monuments, including:	2	9,1	50	525,5	52	534,6
Complex	1	7,1	7	128,2	8	135,3
Botanical	-	-	28	331,6	28	331,6
Hydrological	1	2	10	55,8	11	57,8
Zoological	-	-	2	0,4	2	0,4
Geological	-	-	3	9,5	3	9,5
Park monuments of landscape art	2	63,7	6	104,5	8	171,5
Protected tracts	-	-	55	3192,8	55	3192,8
TOTAL	26	5909,8	198	94495,6	224	100405,4

Anthropogenic changes in the natural environment have led to negative consequences for the natural environment almost throughout Ukraine. Of particular concern in this regard are facts that indicate the inability of self-recovery of populations of rare and endangered species to their original state. Therefore, the issue of conservation

of species biodiversity of natural flora of Ukraine at the present stage is given considerable attention. Scientific research is being conducted in all regions of the country, cadastres of flora and new protected objects are being created, population studies of rare species are being conducted, and so on. This is due to the fact that rare species are the least competitive and are the first to disappear from ecosystems under adverse conditions. An important condition for preserving the species diversity of Ukraine is maintaining a biodiversity inventory, the Red Book of Ukraine, compiling lists of plant species and protection of these species, including those that need protection not only at the national level but also internationally. Kropyvnytskyi region is no exception [30].

Connectivity for animal migration across borders is important for every European country, so there is a need to assess the connectivity and adequacy of the EN of Ukraine using statistical methods in the form of calculating the characteristics of the Emerald objects area, which are grouped within each region [31].

3.2. Characteristics of natural reserved objects within the region

At the end of 2019, 106 new objects were added to the EN of Ukraine. Including the territory of Kropyvnytskyi region was expanded (fig. 3.3). Until 2019, the EN of this region included 6 objects. The preliminary list of EN for Ukraine was adopted in 2016. Then they included first of all all existing reserves and national nature parks. After Standing Committee added 6 new objects such as: Upper Inhul river valley, Gromoklia river valley, Oleksandriyska part of Inhulets, Kryvorizka part of Inhulets river, Nyzhniopodilsky, Middle Inhul river valley. At the moment, the territory of the EN within the Kropyvnytskyi region has 12 objects (table 3.4). The list was approved by the Standing Committee in 2019. Each object is unique and has important for Europe rare species and natural habitats [32].

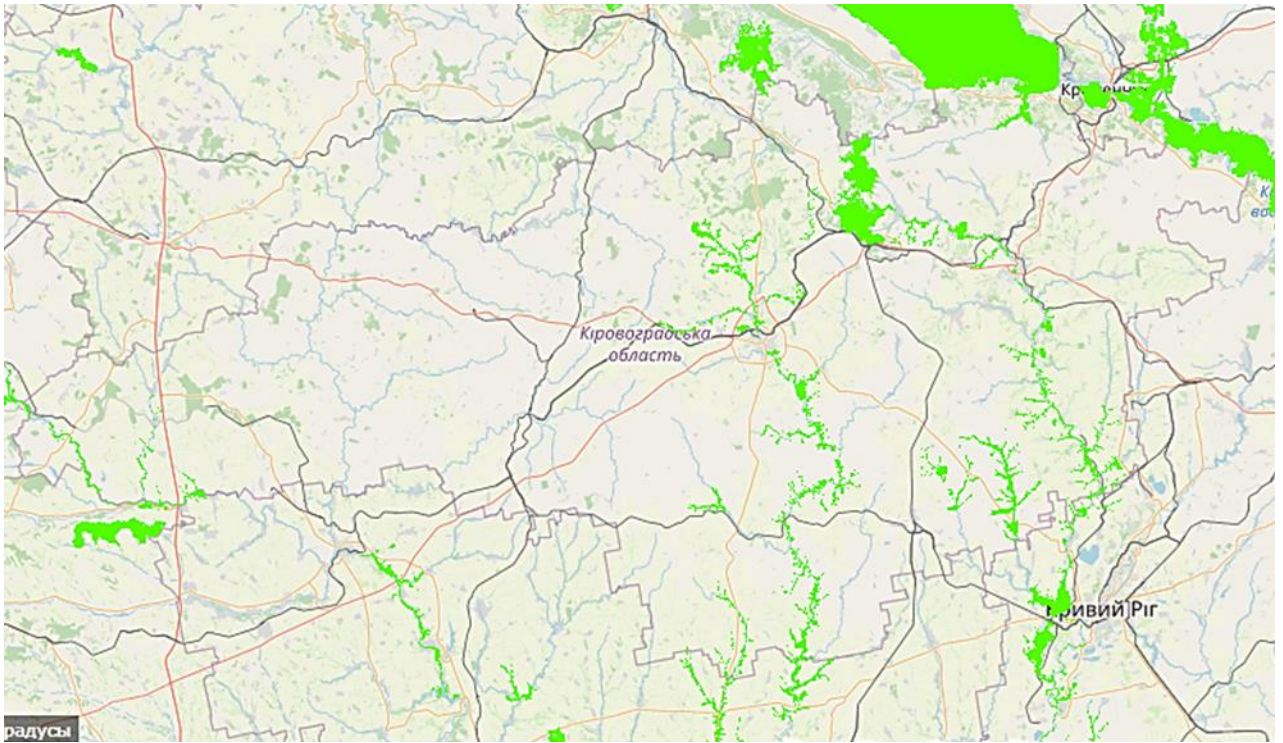


Fig. 3.3. Objects of the Emerald Network within the Kropyvnytskyi region

According to the map, it is seen that the objects of the EN are located inhomogeneously and most of them are river areas.

Table 3.4

Adopted Sites

Site Code	Site Name	Site Area (Ha)	Birds species number	Other species number	Habitat numbe	Total features
UA0000110	Kremenchutske Reservoir	222530,0	28	15	21	64
UA0000135	Dniprodzerzhynske Reservoir	54004,0	20	15	22	57
UA0000136	Bokovenkivskyi Regional Landscape Park	8154,0	28	13	9	50
1	2	3	4	5	6	7

1	2	3	4	5	6	7
UA0000205	Pokrovsko-Dolynivskyi	1064,0	27	12	3	42
UA0000255	Znamianskyi Chornyi Lis	14187,0	34	9	7	50
UA0000261	Kholodnyi Yar	10330,0	29	10	6	45
UA0000304	Upper Inhul river valley	18734,2	2	5	12	19
UA0000305	Middle Inhul river valley	31029,1	5	9	16	30
UA0000307	Gromoklia river valley	21519,5	3	2	11	16
UA0000318	Oleksandriyska part of Inhulets	10377,4	8	1	11	20
UA0000319	Kryvorizka part of Inhulets river	22472,9	8	6	15	29
UA0000341	Nyzhniopodilsky	5138,1	3	6	12	22

UA0000255 - 25 species of animals living in the Chornolisky massif are listed in the Red Book of Ukraine, and 118 species are protected by the Bern Convention. There are about 20 regionally rare species of flora in the Chornyi Lis and 12 species of plants included in the Red Book of Ukraine [33].

UA0000261 - Kholodny Yar is a relict forest massif of historical and nature protection significance. According to the number of unique archeological, historical, scientific objects, and there are more than 150 names, it ranks first in Ukraine. About 150 species of herbaceous plants grow on the territory of the tract, among which there are rare plants listed in the Red Book of Ukraine as well as 140 species of birds, among them 10 are listed in the Red Book. A number of objects of local significance have been created on the territory: reserves "Zubivsky", "Olya", "Snow White", as well as other objects - the

Square of participants of the partisan movement, Zaliznyakova krynytsia, "Monastyrskedzherelo" the purpose of which is to preserve rare plants listed in Red Book of Ukraine, historical and natural monuments [34].

UA0000304 - the upper part of the Inhul river is located in the lower part of the forest-steppe zone, so the natural vegetation of the object has a transitional character from the forest-steppe to the steppe. Typical mesophytic forests with *Quercus robur* and *Fraxinus excelsior*, flood plains and forest bogs of *Salix alba*, *Alnus glutinosa*, meadow and true steppes, floodplain meadows, eutrophic flood marshes are fragmentarily distributed here. Also air-water and immersed higher aquatic vegetation is presented. Insignificant areas are occupied by outcrops of granites with petrophyte-steppe vegetation. In general, for the territory, there are 10 species listed in the Red Book of Ukraine, in particular *Bulbocodium versicolor*, *Galanthus nivalis*, *Iris pontica*, *Stipa tirsia*, *Tulipa quercetorum*, *Adonis vernalis*, *Astragalus dasyanthus*. The area of the site is important for the conservation of biodiversity as an element on the edge of forest-steppe and steppe zones [35].

UA0000307 - the Gromoklia river valley is especially valuable in the context of steppe habitat conservation. It is also important to protect the outcrops of Sarmatian limestones with unique calcepetrophytic vegetation. These vegetation types are associated with the habitat of rare plant species included in conservation lists of various ranks. In particular, 11 species are included in the Red Book of Ukraine, of which *Caragana scythica*, *Chamaecytisus graniticus*, *Tulipa hypanica*, *Eremogone cephalotes* are endemic [15].

UA0000318 – the Oleksandriyska part of the Inhulets river, which includes the upper reaches of the river valley, is located in the southern part of the forest-steppe zone of Ukraine. The area is an important connecting element between forest-steppe and steppe zones. Here, in large areas, meadow grass and true steppes are common, while the true steppes are on the northern border of their distribution. About 1000 hectares are also the mezophyte deciduous forests of *Quercus robur* and *Fraxinus excelsior*, located on the southern border of their distribution. A number of rare and endangered species, in particular those listed in the Red Book of Ukraine, are presented on these territories. The

following birds species without population assessment were registered within the proposed territory: *Buteo rufinus*, *Ixobrychus minutus* [35].

UA0000319 - the following birds species were also registered within the site territory: *Falco vespertinus*, *Lanius collurio*, *Luscinia svecica*, *Otis tarda*. The Kryvorizka part of Inhulets river valley includes a middle flow of the river, where the grass-fescue-cochlea steppes almost disappeared in the region with a complex of rare species of plants and animals being common. This territory plays a special role as a stabilizing element in an overly anthropogenically transformed region. High cognitive diversity has a higher aquatic vegetation [35].

UA0000341 - the area of the site is important for birds' migrations. In contrast to anthropogenically transformed surrounding territories, this area is an important refugium for the conservation of species listed in the current edition of the Red Book of Ukraine: the forest cat (*Felis sylvestris*), the green lizard (*Lacerta viridis*), also *Adonis vernalis*, *Astragalus dasyanthus*, *Crocus reticulatus*, *Iris pontica*, *Ornithogalum boucheanum*, *Pulsatilla pratensis*, *Stipa pennata*, *S. dasyphylla*, *S. lessingiana*, *S. pulcherrhima*, *Tulipa hypanica* [35].

3.3 Shadow list

Also, the territory of Kropyvnytskyi region, as well as other regions of Ukraine has a SL (fig. 3.5) - a list of territories that should be included in the EN in Ukraine on the basis of scientific data. The practice of preparing a SL by the public and scientists was used, in particular, during the development of the Network of Central European Countries.

Information was collected from literary sources under time of consultations with experts and with involvement of own data of participants.

It is also important to note that the completion of the Network involves the inclusion of information not only on species and habitats from Resolutions number 4 and number 6 of the Berne Convention, but also on other species protected by international, national and regional conservation lists, endemic species and more. All this information is needed to create a detailed description of each of the territories.

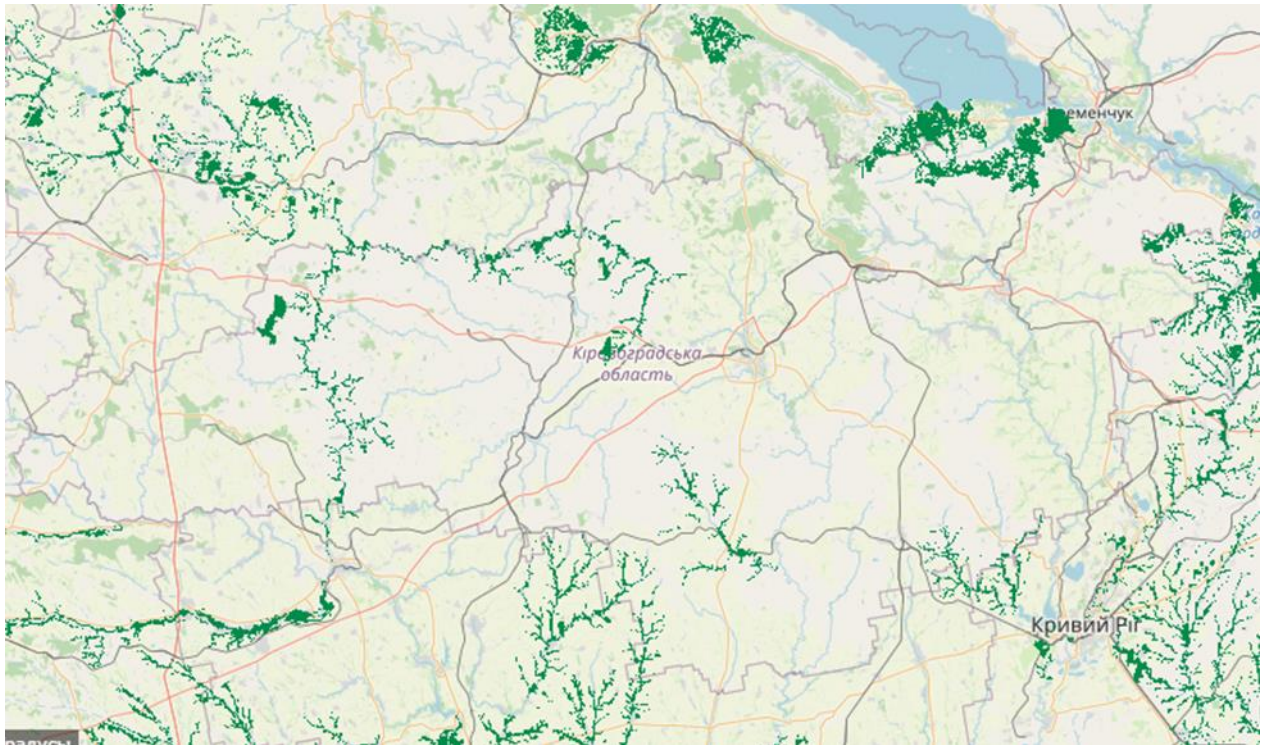


Fig. 3.5. Shadow list of the Emerald Network within the Kropyvnytskyi district

The development of the SL pursues the following goals:

- to compile the most complete Database of Distribution of Species and Habitats from Resolutions number 4 and number 6 of the Bern Convention in Ukraine, which will provide an objective assessment of the adequacy of the existing EN in Ukraine, as well as identify the most important areas that need to be included in the Network;
- establish a list of areas that meet the Areas of Special Conservation Interest criteria and establish their optimal boundaries;
- ensure the maintenance of the Database, which is constantly updated and improved, which will be an important basis for further development of management plans of the Network.

The SL is a list of territories that are not taken into account when developing the Network. The analysis of literature sources entails a number of difficulties that need to be taken into account when maintaining the database. Apart from the scattering and incompleteness of the data, the literature often lacks a detailed reference to the area. This is often caused by both the lack of coordinates and the desire to generalize the localities in scientific works to the conditional name of the research region. In other words, many

authors do not have the habit of publishing works of chorological direction, to indicate specific meeting places of certain types, and even more so - to indicate the coordinates. On the other hand, given that the exact coordinates of the localities of rare species of plants (and sometimes animals) can be used to illegally remove them from distribution for commercial use, indicating their exact coordinates in scientific and especially popular science publications is not always appropriate.

The lack of precise indications of specific areas or coordinates in the literature does not make it possible to consider such sources reliable when transferring data to a cartographic basis. Also, conditional literature does not allow to estimate the size and spatial configuration of the population (in the case of plants).

A separate problem arises at the Database level, when it includes information about the same population from different sources. The conditional nature of the data forces the compilers

Databases each time indicate the approximate coordinates, which differ, because their search is carried out when processing information from each subsequent source. In order to avoid duplication and artificial duplication of data in this way, the organizers of the Database consulted with experts.

A special block of sources consists of articles and other publications that contain maps depicting the localities of distribution of certain species, and not just a verbal description of the location. Transferring such information to a vector cartographic basis creates much more accurate information than verbal descriptions [15].

The SL of objects of Kropyvnytskyi region includes 8 objects (table 3.6). Most of them are related to water bodies. This list is not complete, so there are many more EN objects that can be given this status. And in the near future should be offered as many thorough objects for the SL.

Table 3.6

Shadow List

Site Code	Site Name	Site Area (Ha)	Areas in which they are located
UA0000410	Savakliy and Sugokliya rivers' valleys	7036.66	Kropyvnytskyi region
UA0000415	Chyhyryn-Svitlovodsk meadovy-steppic beams	15317.48	Kropyvnytskyi region Cherkasy region
UA0000416	Svitlovodskyyi	18776.11	Kropyvnytskyi region Cherkasy region
UA0000464	Bokova and Bokovenka rivers	3136.91	Kropyvnytskyi region Mykolayiv region Dnipropetrovs'k region
UA0000565	Syniukha river valley	13808.41	Cherkasy Oblast Kropyvnytskyi region Mykolayiv region
UA0000575	Hnylyi Yelanets river basin	23292.08	Mykolayiv region Kropyvnytskyi region
UA0000579	Metrvod river basin	15980.36	Kropyvnytskyi region Mykolayiv region
UA0000598	Velyka Vys'	14320.26	Kropyvnytskyi region Cherkasy region

UA0000410 - the valleys of the rivers Savakliy and Sugokliya are important to preserve the granite-petrophytic steppe complexes. Steppic and petrophytic-steppic groups with a number of rare species included in lists of different ranks are typical for the territory of the site. In particular, numerous *Dianthus hypanicus* populations are widespread in the

area. Such species as *Iris pontica*, *Sedum borissovae*, *Tulipa hypanica*, which are also associated with outcrops of crystalline rocks are common here as well [35].

UA0000415 - in a region where the total plowing percentage of the territory reaches 80%, this site is important for the conservation of vegetation types that were prevalent in prehistoric times. They are now rare even in their once widespread locations. Among birds species from Resolution 6 the following: *Alcedo atthis*, *Anthus campestris*, *Buteo rufinus*, *Crex crex*, *Emberiza hortulana*, *Ficedula parva*, *Lanius collurio*, *Luscinia svecica* [35].

UA0000416 - an analysis of the fauna of the proposed site showed that it is characterized by richness and considerable species diversity. Thus, only vertebrate fauna (excluding migratory and wintering birds) includes about 240 species. One of the reasons for its richness is the physical and geographical location of the site at the junction (ecotope) of the two physical-geographical zones of the forest-steppe and the steppe, and in the zoogeographic aspect - at the junction of the Boreal European-Siberian and Arid Mediterranean-Central Asian subregions. Thus, the peculiarities of the fauna of a region are significantly conditioned by its location, where there is a rule of increasing the species diversity on the ecotope. The richness and uniqueness of the fauna of the region is confirmed by the presence of rare and endangered animals, of which 19 species are listed in the Red Book of Ukraine. There are 37 species that are considered rare at the regional level. Many rare and widespread species are growing in the steppe areas of the site. Among birds species from Resolution 6 the following should be additionally mentioned: *Coracias garrulus*, *Circus cyaneus*, *Circus macrourus*, *Grus grus*, *Ardea purpurea*, *Emberiza hortulana* [35].

UA0000565 - Syniukha river is important for conservation of migrating routes of birds as well as for conservation of numerous habitats from the Resolution 4. It is formed from the confluence of the rivers Velyka Vys' and Hirskyi Tikych. It flows along the Prydniprovskya upland mainly to the south and to the southwest. It flows into the Southern Bug in the city of Pervomaisk [35].

UA0000575 - steppe vegetation of the site is particularly rich in rare and endemic species, among which feathergrass species (*Stipa capillata*, *S. lessingiana*, *S. ucrainica*), *Gymnospermium odessanum*, *Pulsatilla pratensis*, *Astragalus odessanus*, *Genista scythica*,

Crocus reticulatus, *Adonis vernalis* are occurring. Also, characteristic feature for the site is presence of limestone outcrops in down part of the Hnylyi Yelanets river basin, and granitic outcrops – in the upper part of the basin. Steppe vegetation on limestone outcrops is characteristic for Black Sea Lowland and rich in rare and endemic species (*Chamaecytisus graniticus*, *Linum linearifolium*, *Jurinea brachycephala* etc.). Granitic outcrops are specific for the Dnieper Upland and the territory of the site is limit of their occurrence [35].

UA0000579 - Mertvovod river basin is located in the northern part of Steppe zone in Ukraine and characterised by presence of well-preserved and representative granitic outcrops, which is specific for the Dnieper Upland, and limestone outcrops in down part of the river basin, which are characteristic for Black Sea Lowland. Therefore, the landscapes are very diverse. Vegetation of the site is represented by zonal steppe vegetation, azonal petrophytic vegetation, wetlands, and also some vegetation types, which are the most southern in Southern Bug river basin - fragments of the deciduous oak and ash-tree forests, floodplain forests and meadows [35].

UA0000598 - Velyka Vys' River Valley and its tributaries situated in Continental Biogeographic Region. The most dominant type of habitats is steppes, which are distributed on the slopes of the valleys and in gulleys. Also, in the flood-plain of the river there are meadow and wetland habitats which are very valuable for this region [35].

3.4. Malovyskiv district

Unfortunately, a significant part of the natural and semi-natural landscapes of Ukraine, its species of flora and fauna are rapidly degrading under the influence of human activities. Including one of the main reasons for changes in biodiversity in the Kropyvnytskyi region is uranium mining. Also these processes directly affect on the objects of the EN.

According to the new scheme of physical and geographical zoning, the main uranium ore mining area in Ukraine is located at the junction of two natural zones - forest-

steppe and steppe, where Kropyvnytskyi region is located. So for this areas characterized the specific conditions of both regions [36].

Uranium is a radioactive, metallic element that has silver color. It's also one of the more common elements in the Earth's crust (most found in rocks and soils). It uses as a source of energy in nuclear reactors and atomic bombs.

As a result of energy consumption, the need for uranium ore production increases with age. Over two-thirds of the world's uranium productions from mines are in Kazakhstan (41% of world supply in 2018), Canada (13%) and Australia (12%) [37].

Ukraine is also in the top ten for uranium ore mining (the first in Europe). The largest deposits of uranium in the Ukraine located in the Dnipropetrovsk and Kropyvnytskyi regions. The geological structure of the Kropyvnytskyi region was formed due to the location on the square of the East European Plain (Ukrainian crystalline shield (Dnieper Upland)) and its structural unit of the Kropyvnytskyi tectonic block, which underlies the ancient Precambrian foundation. The crystalline foundations of the central part of the Ukrainian Shield contain uranium deposits of the Central Ukrainian and Kropyvnytskyi uranium mining areas. The Kropyvnytskyi uranium mining areas includes uranium deposits such as Michurin and Central (Ingulsk Mine), Vatutinsky (Smolin Mine) and Novokostyantynivsky (Novokostyantyniv Mine) [38].

Impact from uranium mining includes: geo-exploration works (violation of soil cover and groundwater); creation of radiation dust; creation of dumps with radioactive waste, polluted air, water and soil environment; uranium deposits occupies a large area, which violates its natural state, resulting in changes in landscapes and natural biodiversity; uranium mining involves its transportation, resulting in the formation of new roads around it. Since there are no controlled legal acts at the legislative level, uranium mining poses an environmental hazard.

For example, the Novokostyantynivska mine (is in the center of fig. 3.7), located in the Malovyskiv district of the Kropyvnytskyi region, is considered to be the newest among others in the region, and was opened in 1975.



Fig. 3.7. Territory around the Novokostyantynivska mine (2016)

Ecotope is the smallest spatial object or component of a geographic landscape. Ecotope features can be classified using a four-level a priori ecological classification system based on the hierarchy: form > use > cover > group + type [24].

On the territory around the Novokostyantynivska mine, I identified 3 ecotops:

1. First ecotope – reservoir: RE_C_W_wa;
2. Second ecotope – village: AN_C_S_ho;
3. Third ecotope – forest: FP_T_P_dt.

After the Novokostyantynivsky mine was opened, its construction and exploration of mining operations were quite intense. In 2010, we can see that the mine has already been functioning well. Around it there was a modern infrastructure (in comparison with other uranium mining mines in Kropyvnytskyi region).

One of the features that distinguishes industrial landscapes in the region of mining uranium ores - the quarry-dump landscapes, in which there is no quarry. Here formed

dumps, often terraced landscapes complexes of crystalline rocks taken out in the process underground uranium developments. There are no open uranium developments, and there are no quarries geocomplexes are formed as auxiliary.

In 2011, regular extraction of uranium ore has started, for the first time since the deposit was discovery.

In 2016, the mine functioned more intensively (fig. 3.8). Dumps have grown more than 2 times around the mine in width, length and height. The infrastructure has improved around the mine. There are new dirt roads that have created new routes of communication. There is also a tendency towards the abandonment of land on which certain crops were grown around the investigated facility. This is due to emissions from radioactive waste due to uranium mining, which is a confirmation of the negative impact on the environment.



Fig. 3.8. Comparison of the territory of Novokonstantinovskaya mine in 2011 and 2016, respectively

On the resultant maps are clearly recorded converted areas. The map reflects landscapes that have undergone significant changes from anthropogenic impact. During the study, the focus was on the territory of uranium mines. The mines are being developed underground, so the terrain changes lead to landscape changes work, including the impact

of vehicles providing rock transportation, deposition of dumps, construction of an industrial site of the mine.

To the south of Novokonstantinovskaya mine there is a forest. On the Fig. 8 it marked as "Ecotope 3". In my opinion, this forest should first of all be included in the SL as a part of the object UA0000598 - Velyka Vys' River Valley. And in the future it should be included in the EN itself. Due to the fact that the forest is located a short distance from the mine, it is necessary to pay special attention to its protection. Novokostiantynivska mine is one of the newest discovered deposits. Therefore, the main peak of uranium production is in the future. As a result, the number of embankments around will increase, which will negatively affect the environment, including the forest. Therefore, right now we need to pay attention to this serious issue and include the forest in the SL.

Also in the Malovyskiv district located Smolin mine (fig. 3.9) that was founded in 1972. It contains uranium deposits, which are mined underground and sand deposits, which are mined in the open way.



Fig. 3.9. Territory around the Smolin mine (2019)

Around the territory of the Smolin mine, I also identified 3 ecotops:

1. First ecotope - urban village: AN_C_S_ho;
2. Second ecotope – pond: PB_C_W_wa;
3. Third ecotope – river: RV_C_W_wa.

Due to the fact that the mine is located near the town of Smolin, the radiation impact has the greatest impact on mine workers and local residents. Also one of the negative effects is a change in stability and permeability of soils, groundwater. And the formation of artificial relief - embankments, dumps (fig. 3.10).



Fig. 3.10. Comparison of the territory of Smolin mine in 2006 and 2019, respectively

Comparing the two pictures, with a difference of almost 15 years, I can say that the number of dumps near the mine has increased significantly. However, according to the latest data for January 2019, the residual uranium reserves in the mine amounted to 1487.2 thousand tons. It is estimated that in 2023 the field will be fully developed [39].

The main ultimate goal of the decommissioning of the Smolin mine and its liquidation is to bring the territory of the industrial sites of the mine and the surrounding areas to an environmentally safe condition.

Much attention should be paid to the river Kilten (the part is shown as "Ecotope 3" in Fig. 9) which stretches near the Smolin mine. Due to climatic conditions, the river began to shrink. Wastewater treatment plants do not provide the required wastewater treatment due to their wear, so water quality deteriorates, the number of flora and fauna decreases. The river also flows into the river Velyka Vys, which also has a negative impact on it. Therefore, it would be appropriate to include the Kilten River Valley as a separate object, first of the SL, and then to the EN itself. Or to attach it to an existing SL object UA0000598 - Velyka Vys' River Valley, as Kilten flows into the Velyka Vys.

3.5. Conclusions to Chapter 3

The territory of Kropyvnytskyi region is located on the border of steppe and forest-steppe natural zones (Steppe and Continental biogeographical regions), so the region has the characteristics of both areas. Thus, it differs from other regions of Ukraine, and has a fairly wide list of objects leading to the list of the Berne Convention. Therefore, attention should be paid to the creation of a nature reserve and the EN within the region.

Kropyvnytskyi region is characterized by agricultural and extractive properties. Most of the territory is used as arable land, and the rest as an area for mining. There are two uranium mining mines in the region - Nookonstyantynivska and Smolinska. Around them are urban village Smolino and village Oleksiyivka, which have the greatest impact from uranium mining. There are also sites near the mines that could become areas of the EN.

Near the Novokonstantinovskaya mine there is a forest, which is not part of the territory, which is now the SL, although it is located quite close. Therefore, in the near future it should be considered as an area that can join first to the SL, and in the future to the EN itself. Since this forest is strongly influenced by uranium mining from the Novokonstantinovskaya mine. There are also species that are listed in the Berne Convention and the forest is part of the ecological network.

As for the Smolin mine, according to some sources, uranium reserves in it are nearing the end, so the main task is to properly closed it. Not far from the chess is the lake

and the river Kiltén, which should first enter the SL, and then the EN. Another reason to connect the river to the network is that Kiltén flows into the Velyka Vysa River, which is already the object of the SL today.

The whole Kropyvnytskyi region has a rather low indicator of the objects of the EN and the territories of the NRF. Therefore, one of the main tasks in the near future is to create these zones.

There is no need to dwell on the development of the network within the region, as eco-corridors are also important. If one region adheres to all norms, controls special territories, and the other does not, then the preservation of species is impossible. The same applies to countries. Every country that has the objects of the EN must responsibly fulfill all the conditions.

CONCLUSIONS

After analyzing the Berne Convention as an important international agreement on the protection of wild fauna, flora and natural habitats, I can conclude that based on it, the Natura 2000 network was created for the countries of the European Union, and as an analogue the EN for other countries, including Ukraine. The network is based on Habitats (conservation of natural habitats) and Birds (control of wild bird populations) Directives. The EN, as a Natura 2000, is based on a biogeographical approach. There are 11 biogeographical regions, 4 of which are in Ukraine (Continental, Steppic, Alpine and Pannonian). Also, these regions territorially almost correspond to natural zones.

Today Ukraine has 377 objects of the EN. Territories that include the EN should be based on scientific data on the presence in these territories of a certain proportion of the national population of the species (it important for rare species and natural habitat). After reviewed the literature about list of EN, I can conclude, that the network needs to be expanded.

The network expansion is based on a so-called SL - objects that can be included in the EN based on sound scientific data. Having considered materials on lists I can conclude that on the territory of Ukraine it is necessary to study and control natural territories more, and our state must comply with all the rules and conditions regarding the network and the Convention.

On the example of Malovyskivskyi district of Kropyvnytskyi region, a detailed description of the EN and the SL was considered. The territory most of all used as arable land or as an area for mining. So very few objects of the EN are in it (especially until 2019). It is necessary to pay more attention first of all to objects of the SL (constantly to update them, to add, offer), and also to already existing objects of a network. In the study area, I proposed to include at least two objects in the SL: a forest near the Novokonstantinovskoye mine and a river near the Smolin mine.

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