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(selection of plus trees and stands). The large-scale and purposeful activity of gene pool conservation started in Ukraine synchronously with the other Soviet republics in the early 1980s, based on methodological approaches which were contained in the regulations of national importance "Regulations on the allocation and conservation of forest

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## CONCEPT FOR THE CONSERVATION AND SUSTAINABLE USE OF FOREST GENETIC RESOURCES IN UKRAINE

Elaboration and adoption of the "Concept for the conservation and sustainable use of forest genetic resources in Ukraine" were caused by the need to define the strategic goals and objectives, methodological, methodical, organizational principles and techniques for conservation of forest genetic resources in Ukraine on a nationwide scale. The development of the Concept aims at providing stable functioning of forest ecosystems today and in the future, preserving the potential of forests for producing of their unique set of economic, environmental and social benefits. The use of the document will serve as the basis for developing of new and improving the existing legislative, departmental and administrative regulations that provide different aspects of biodiversity conservation in forests – programs, regulations, guidelines, directives, recommendations, etc. In the Concept, which is developed in Ukraine for the first time, characterized are the topicality and the necessity for conservation of forest genetic resources, the classification of factors that endanger the genetic diversity of forest tree species is described, legal basis of the process for conserving forest genetic resources is analyzed, the methods and strategy of genetic variability of forest tree species conservation are reported, attention was paid to the benefits from sustainable use of forest genetic resources, also here were indicated the necessity of scientific support of this process and outlined ways of implementing this concept.

**Keywords:** biological diversity; genetic variability; gene conservation objects; *in situ*; *ex situ*.

### Introduction

In many countries, the conservation of forest genetic resources is identified as one of the priorities of their forest policy. In Ukraine, the activities for conservation of genetic diversity of forest tree species has a long history. The first steps in this direction were taken as part of investigations on the main forest tree species provenance tests (almost 100 years ago) and during the deployment of breeding program with forest species more than half a century ago

tree species genetic pool of the USSR" (1982). Most objects and territories of the gene conservation, which entered the current state register, were selected just at that time (Patlai, et al., 1994).

The analysis of the results of inventory and investigations on genetic reserves, plus stands and trees in Ukraine, which have been made in recent years (Volosianchuk, et al., 2001; Hayda, et al., 2008; Yatsyk, et al., 2006, 2008), studying the experience of foreign countries in this area (Behm, et al., 1997; Bonfils, 1998; De Vries & Heinze, 1998; Müller & Schultze, 1998; Paul, et al., 2000), give grounds to speak about the need for some adjustment of legal, institutional and organizational principles for conservation of the genetic diversity of forests in our country.

One of the first steps to optimize the regulatory and organizational support for the process of genetic resources conservation was the development of "Concept of conservation and sustainable use of forest genetic resources in Ukraine".

This publication is a revised, shortened and translated version of the "Kontseptsii zberezhennia ta nevysnazhlyvoho vykorystannia lisovykh henetychnykh resursiv v Ukraini" (Hayda, et al., 2011).

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## 1. The importance and necessity of forest genetic resources conservation

The principle of the unity of the environment, economy and social security has become for many countries the fundamental principle in the formation of their national strategies for sustainable development. The necessary condition for sustainable development is the conservation of biodiversity at the global, regional and local levels. In 1992, at the UN conference in Rio de Janeiro, the Convention on Biological Diversity was adopted. As indicated in the Convention, the biodiversity includes diversity within the species, between species and diversity of ecosystems. Since all the levels of biodiversity are based on genetic variability, the measures, which are provided in this document, deal with the genetic variability of living organisms, including forest tree and

woody shrub species. Ukraine has committed to adhere to the Convention and ratified it in the parliament (Law No. 257/94-BP of November 29, 1994).

The problem of the conservation and sustainable utilization of forest genetic resources are connected closely with the process of the implementation of the above mentioned Convention. The transformation processes that have been taking place in the social and economic relations in Ukraine in recent decades, as well as global natural disasters have increased the likelihood of risks of reducing the genetic potential of forest ecosystems. That is why the conservation of forest genetic resources is a relevant and urgent problem of the Ukrainian state and society.

The motives, which urge humanity to deploy activities for conservation of genetic variability of forest tree species, have economic, environmental, ethical, scientific, cultural backgrounds.

**1.1. The economic backgrounds.** Among the economic benefits from conservation of forest genetic resources, one can distinguish the direct and indirect, as well as current and future benefits. To the direct positive effects belongs continuous utilization of material forest goods (wood, medicinal plants, wild berries and fruits). The indirect economic effects include preserving the environmental conditions of human life (one of the most important economic resources) by improving the quality of environmental factors (air, water, soil), increasing the effectiveness of the sanitary, recreational, aesthetic and other useful functions of forest ecosystems. A special place among the economic incentives is to preserve opportunities of obtaining future perspective forest varieties and new products of forest ecosystems, yet unknown due to incompleteness of human knowledge.

**1.2. Ecological backgrounds.** Gene conservation will preserve the proper (natural) levels of adaptive capacity of forest species to changing environmental conditions, their evolutionary potential and biological diversity at the levels

of species and ecosystems. Forest ecosystems will have in this case an opportunity to perform consistently protective functions for water, soil and climate regulation.

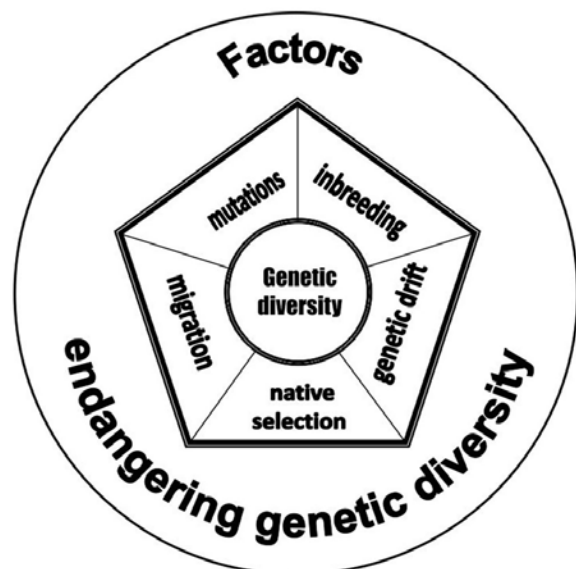
**1.3. Ethical backgrounds.** Thanks to the conservation of genetic diversity of forests today's society has the opportunity to fulfill their moral obligation to future generation – to transfer unchanged richness of forms and varieties of living organisms, species and ecological diversity.

**1.4. Motives of scientific and educational, cultural and aesthetic character.** Conservation of forest genetic resources extends a research field for current and future cognition of the laws and phenomena of animate and inanimate nature; it creates better opportunities for environmental-biological educational activity, cultural and aesthetic upbringing of the population.

## 2. Classification of factors endangering genetic diversity of forest tree species

The genetic variability is an important characteristic of all living organisms, including forest tree species, and a necessary condition for biological evolution. In addition, genetic variability is not a static phenomenon in space and time, and it is controlled by total (complex) influence of evolutionary forces of varying intensity and direction (mutation, migration, genetic drift, natural selection, and inbreeding).

The last century observed the excessive narrowing of the genetic variability of many organisms, including forest tree species, mainly because of the ill-considered human economic activity. There exists the full range of factors of such endangering genetic diversity risks. But we have always to keep in mind that these factors affect the genetic variability transitively through the action of main evolutionary driving force (Fig. 1).



**Figure 1.** Transitive model of the factor effects' risk of reducing genetic diversity of forest species

Factors of negative impact on forest genetic resources can be divided into groups of:

- global level: (significant climate change; ozone layer depletion; economic globalization processes, etc);
- national and regional levels: (excessive scope of forest utilization; consequences of implementation of groundless environmental projects (drainage, irrigation, construction of storage reservoirs, etc.); pollution, cross-border movement of air pollution, acid rain; contamination of the landscape by ra-

radioactive elements due to industrial accidents; negative consequences of ill-conceived forests privatization; unsuccessful forestry reforming; recurrent natural disasters);

- local level: (the use in reforestation and afforestation inadequate seed and planting material; intensive selection, sanitation and intermediate cutting; landscape fragmentation, which leads to a disjunction of areas of forest tree species; unscientifically based large-scale introduction of plant and animal species; unfavorable biotic and abiotic factors (invasion of pests, spread of fungal and bacterial diseases, damage by wild animals and windfall, fires, landslides, etc.); ecosystems pollution with heavy metals, toxic chemicals; moral and

physical aging of fixed assets, technology, production and transport infrastructure.

### 3. Legal framework for forest genetic resources conserving

The effective objectives achievement of conserving genetic diversity of forest tree species is impossible without proper legal support.

**3.1. International legal regulations.** The most important international legal documents which regulate the activities for conservation of genetic resources of forest species are listed in Table 1.

**Table 1. International regulations on conservation of forest genetic resources**

Year, town	Legal regulations
1990, Strasbourg	Resolution S2 of the first Ministerial conference on the protection of forests in Europe (MCPFE) "Conservation of forest genetic resources"
1992, Rio de Janeiro	"Convention on Biological Diversity", was adopted at the United Nation's conference on Environment and Development (UNCED)
1993, Helsinki	Resolution H2 of the second Ministerial conference on the protection of forests in Europe (MCPFE) "General Guidelines for the Conservation of Biological Diversity of European Forests"
1994, Brussels	Council Regulation (EC) No. 1467/94 of 20 June 1994 on the conservation, characterization, collection and utilization of genetic resources in agriculture
1995, Rome	The "European Forest Genetic Resources Program"(EUFORGEN), which is coordinated by International Plant Genetic Resources Institute (IPGRI, now Bioversity International) together with Food and Agriculture Organization of the United Nations (FAO)
1995, Sofia	"Pan-European Biological and Landscape Diversity Strategy", was adopted at the third Ministerial Conference "Environment for Europe"
1998, Lisbon	Resolution L2 of the third Ministerial conference on the protection of forests in Europe (MCPFE) "Pan-European Criteria, Indicators and Operational Guidelines for a Sustainable Forestry " (with Appendix 1 i 2)
2003, Vienna	Resolution No. 4 of the fourth Ministerial conference on the protection of forests in Europe (MCPFE) "Conserving and enhancing forest biological diversity in Europe"
2003, Kyiv	Multilateral Agreements, which were adopted at the fifth Ministerial Conference "Environment for Europe"
2007, Warsaw	Warsaw Declaration of the fifth Ministerial conference on the protection of forests in Europe (MCPFE) (paragraph 12)
2011, Oslo	Oslo Ministerial Mandate for Negotiating a Legally Binding Agreement on Forests in Europe
2015, Madrid	Resolution 2 of the seventh Ministerial conference on the protection of forests in Europe (MCPFE) "Protection of forests in a changing environment"

The Convention on Biological Diversity outlines the common methods of biodiversity conservation (Articles 8 and 9), stresses the need to monitor components of biological diversity (Article 7) and reports the necessity to facilitate the exchange of genetic resources (Article 15), information (Article 19), technology (articles 16 and 19).

The main idea that permeates the entire Convention proves the impossibility to ensure the proper conservation and sustainable use of biological diversity within narrow national framework. In order to enhance collaboration and

coordination in the field of conservation and sustainable use of forest genetic resources and thus to implement the decisions of Strasbourg MCPFE conference, the pan-European program EUFORGEN was launched in 1994, in which Ukraine also participated in 1994-1999.

**3.2. National legal regulations.** The most important national legal regulations, which make a legal base for ensuring the protection of forest genetic resources in Ukraine, are presented in Table 2.

**Table 2. National regulation acts on conservation of forest genetic resources in Ukraine**

Year	Legal regulations
1980	"Guidelines on forest seed growing" (USSR)
1982	"Regulations on the allocation and conservation of the gene bank of forest tree species of the USSR"
1991	Law of Ukraine "On protection of environment"
1992	Law of Ukraine " On Nature Reserve Fund of Ukraine"
1993	"Guidelines on forest seed growing"(Ukraine)
1994	The Law of Ukraine " On Ratification of the Convention on Biological Diversity"
1994	The program of the prospective development of security in Ukraine (approved by Decree of the Verkhovna Rada of Ukraine)
1996	"The system of forest seed growing"
1999	The Law of Ukraine "On Plants life"
2000	The Law of Ukraine " On the national program formation of the national ecological network of Ukraine for 2000-2015 "
2001	"Instructions on the allocation of forest gene pool, on the selection and seed growing in the Ukrainian Carpathians"
2002	The Law of Ukraine " On Red book of Ukraine"
2002	The Law of Ukraine "On seed and planting material"
2005	"Recommendations on the conservation, reproduction and using of genetic resources of valuable less-common forest tree species in the Carpathian region and its adjacent territories"
2006	"Recommendations on improvement the protection regime and the use of genetic resources of the deciduous species in the Carpathian region"
2006	" Forest Code of Ukraine "
2006	"Instructions on the allocation, preservation, renovation and use of conservation objects of gene pool of broadleaf tree species <i>in situ</i> "
2011	"Regulations on the allocation, conservation and sustainable use of the gene pool of forest woody species in Ukraine"

An analysis of legal acts with the status of the law indicates that they regulate only the basic principles and general provisions for the processes of selection, conservation and use of genetic resources of forest tree species. Specific steps and approaches in this activity are detailed, regulated, explained and instructed by the regulations of the departmental level.

The basic criteria and process steps of selection, conservation and use of genetic resources of forest tree species are differentiated for the individual objects of gene pool conservation – genetic reserves, plus stands, plus trees, archival and clonal plantations and are regulated in the "Guidelines on the forest seed growing" (1993). The document establishes the norms of forest inventory and spatial parameters of genetic reserve stands and their buffering zones, a list of permitted forestry activities, as well as the selection criteria and ways of use of plus stands and plus trees. In the guidelines, regulations are also written out on the technology of creation and use of clone banks, family and clonal seed orchards as objects of conservation and renovation of valuable gene pool.

#### 4. The methods for conservation of genetic variability of forest tree and woody shrub species

Basic methods for conservation of forest genetic resources are divided into two groups: *in situ* and *ex situ*.

**4.1. Conservation methods *in situ*.** The methods *in situ* include conservation of genetic resources within ecosystems and natural habitats of growth, and, in the case of domesticated or cultivated species, in the environment in which they acquired their characteristic features.

In most European countries, including Ukraine, the main object of gene pool conserving *in situ* are genetic reserves.

*Forest genetic reserve* is a part of a natural forest that covers the entire population of forest tree species, or only a part which is valuable in terms of genetic selection, and is representative of the corresponding nature-climatic (forest seed) region. The genetic and breeding value of such plots is in the presence of wide amplitude of genotypic and phenotypic variability, which provides for high adaptive capacity of species to changing environmental conditions and creates the opportunities for effective breeding programs.

The objects of gene conservation *in situ* in Ukraine also include plus stands and plus trees.

*Plus stand* is a forest stand with the highest possible productivity for this type of forest growth conditions, with stand density not less than 0.6 and high quality structure (the share of plus and the best normal trees depending on the density of the forest stand should be 15-27 %).

*Plus tree* is a tree a unique genotype of which gives it a significant advantage in growth, quality and other economic important characteristics in comparison with other trees of the same species and age, growing with it in identical conditions.

For less-common, rare, endemic and relict species, for which there are significant threats of depletion of the gene pool or even extinction, some trees (even if they do not meet the plus tree criteria) or their groups can be preserved *in situ*.

**4.2. Conservation methods *ex situ*.** The methods include *ex situ* gene conservation technologies whereby the evacuation of organisms or parts of them from their natural growth habitats are undertaken. These technologies include the establishment of clonal and seedling seed orchards or the creation of collection plantations, banks of seed, plant tissue and pollen.

In Ukraine there are following gene conservation objects *ex situ*: clone banks, seed orchards, collection and test plantations.

*Clone bank (clone archive)* is a collection plantation of vegetative offspring of valuable trees, created for their conservation, reproduction and study.

*Seed orchards (clonal, seedling)* are plantations on which vegetative and seed progeny of plus trees are represented. They are created for harvesting seeds with high hereditary properties.

*Plantations for testing* are plantations in which the short- or long-term comparative tests of seed offspring of plus trees, forms or populations are conducted on the uniform environmental background.

Depending on the intraspecific taxon origin of forest tree species, the following classification of testing is used.

- *provenance tests* – plantations, in which progeny of geographically distant populations (parent stands represent different forest seed zones) is tested;
- *eco-geographical tests* – plantations in which besides the offspring of geographic populations is also the offspring of their subpopulations is tested (edafotypes)
- *eco-population tests* – plantations, in which the offspring of various subpopulations (edafotypes) of different populations from one forest seed zone is presented;
- *tests of edafotypes* – plantations, in which the offspring of subpopulations (soil ecotypes) from one population is tested;
- *progeny test*, in which open pollinated families (half-sib) of plus trees are tested;
- *progeny test*, in which the progeny from artificial controlled pollination of trees (full-sib families, intra- and interspecies hybrids) is tested;
- *progeny test*, in which the progenies of genetic reserves, plus stands and seed orchards are tested.

**4.3. Methods which are integrated into forestry practices.** Methods *in situ* and *ex situ* are specific conservation tools of genetic variability of forest species and require special knowledge and skills. There are conservation measures, which can be integrated into regular forestry practice:

- to prefer the natural regeneration of forest stands (in favorable conditions);
- to use the reproductive material of local origin in silviculture;
- to use effectively the permanent forest-seed establishments as a source of high quality seeds.
- to undertake the transfer (spatial movement) of seeds only in accordance with the valid forest-seed zoning;
- to avoid the intensive sorting plant material in size in the forest nursery;
- to establish forest plantations of optimal density in proper site conditions to facilitate natural processes of thinning and to raise their biological stability;
- to preserve the genetic diversity in forest stands during the artificial thinning;
- to achieve gradual transition from a system of clear cutting to successive and selection felling;
- to introduce methods of close-to-nature forest management.

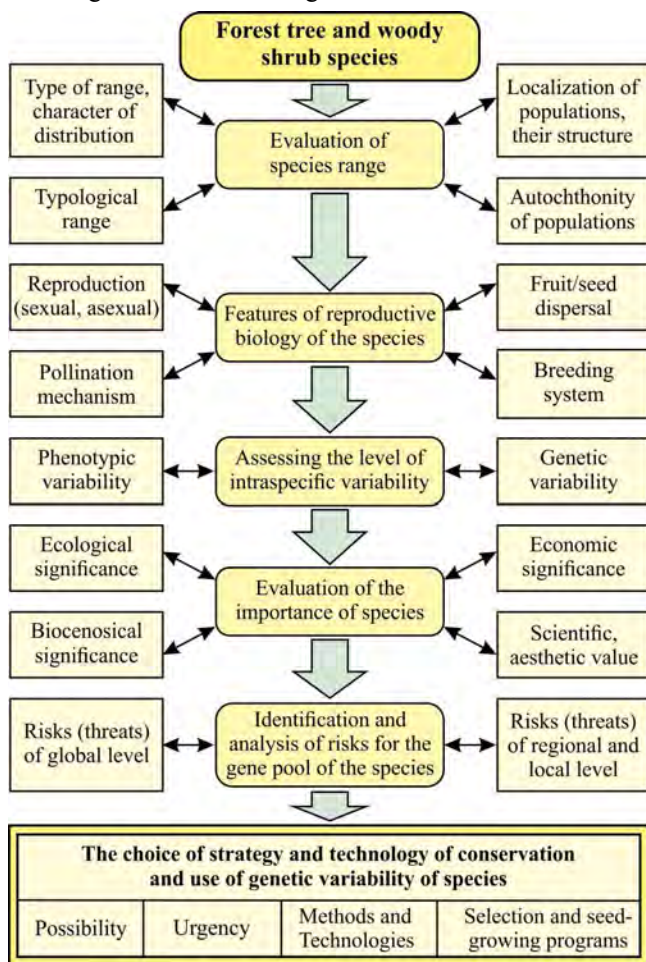
#### 5. Development of strategies of forest genetic resources conservation

The strategies (programs, regulations, instructions, guidelines, recommendations) of conservation of genetic resources of certain forest species or groups of them are the concrete instrument for implementing this concept, which regulates all the quantitative and qualitative requirements to gene conser-

vation objects, their structural and spatial organization, location within the gene ecological (forest seed) areas.

**5.1. Schematic diagram of the development of strategies for gene pool of forest tree and woody shrub species conservation.** This chart was developed based on international and national long-term theoretical research and practical experience solution of problems of conservation and sustainable use of forest genetic resources (Wolf & Braun, 1995, Matyas, Ackzell & Samuel, 2004, Ducouso & Bordacs, 2004, Geburek & Turok, 2005). The process of elaboration of national strategies and technologies for gene pool of forest tree and woody shrub species conservation should start with the assessment of the natural area of species in the country (Fig. 2).

After passing all stages of the development of the strategy for gene pool conservation, it is necessary to proceed to formulation of its basic elements: we define the possibility of conservation procedure, the level of its urgency, the methods for conserving *in situ* and *ex situ* which are most suitable for this species, quantitative and qualitative parameters of the existing gene conservation objects, the most effective ways of combination of the procedures of conservation and use of genetic variability with the purposes of breeding and seed harvesting.



**Figure 2.** Schematic diagram of development of the strategy and technology for conservation of the genetic diversity of forest tree species

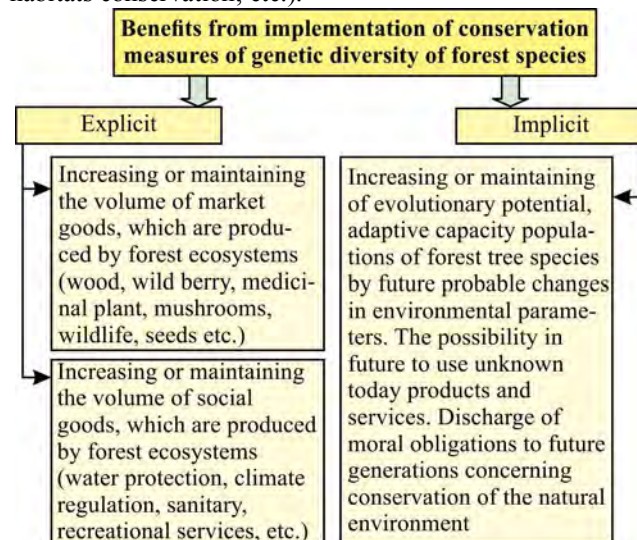
**5.2. Graduation of urgency of implementing procedures of conservation of forest genetic resources.** Forests of Ukraine are characterized by the high level of forest tree species diversity. These forest tree and woody shrub species are characterized by different levels of significance (envi-

ronmental, economic, scientific etc.), by various degrees of threat to their gene pool. Taking into consideration the limitedness of resources (financial, institutional, human) which are necessary for implementation of the gene conservation, it is advisable to unite the tree species in groups, depending on the urgency of conservation of the gene pool. It is proposed to establish three levels of urgency: 1) urgent conservation; 2) indispensable conservation; 3) desired conservation.

## 6. The sustainable use of benefits from the conservation of forest genetic resources

Pragmatic target of the conservation of forest genetic resources is to create conditions for the sustainable use of diverse and complex benefits that will arise from this today and in future. These benefits one can divide into two groups: explicit and implicit (Fig. 3).

**6.1. Explicit benefits.** To the explicit benefits of conservation of forest genetic resources belongs a set of goods and services produced by forest ecosystems and used by consumers directly or indirectly. The part of obvious benefits can be divided among the users by means of the market mechanism (the benefits such as wood, recreational services), the other part of benefits is not a market commodity, it serves all people in general (clean air, clean water, climate regulation, soil erosion reduction, CO<sub>2</sub> absorption, wildlife habitats conservation, etc.).



**Figure 3.** Benefits from measures implementation of forest species genetic diversity conservation

The obvious benefits also include the possibility to get the high quality, genetically valuable reproductive material in the form of seeds or self-sown crop in nurseries under canopy of stands, creation of conditions for the implementation of various breeding programs to improve productivity, quality and stability of forest plantations.

**6.2. Implicit benefits.** Implicit benefits include the following components of usefulness, which are perceived not through the traditional human senses, but through mental, spiritual sense (e.g. pleasure from performing a moral duty to contemporaries and future generations concerning the transfer of forests with wide genetic diversity). In addition, this group of benefits includes potential benefits from the conservation of genetic variation that may occur in the future as expected (ensuring the adaptation of populations of forest species to new environmental conditions in the future) and unexpected (receiving the new type of product or service, unknown today).

## 7. Scientific support of forest genetic resources conservation

The problem of the conservation and sustainable use of forest genetic resources is relatively new, and, therefore, contains many unresolved scientific issues. The process of selection and creation of objects of forest gene pool conservation in Ukraine, and as in many other countries, began in conditions of lack of knowledge concerning the level, dynamics, spatial structure of genetic variation of forest tree species. It was forced, but quite justified step under conditions when the rate of the gene pool depletion greatly exceeded the possibilities of contemporary science. Therefore, the task of providing scientific support for all measures of conservation of forests genetic diversity remains relevant until now.

The priority areas of research in this field are as follows:

- research of the history of species migration in the post-glacial period (refugia, periods and route of migration, tree colonization, adaptation, extinction);
- studying biological and ecological characteristics of forest tree and woody shrub species, particularly of less-common and rare;
- widening and deepening studies of genetic variability of forest tree species using morphological, biochemical and molecular techniques (level variation, genetic structure of populations, the genetic basis of reproductive processes);
- quantitative assessment of the risks of reduction and modification of the genetic variability of forest species

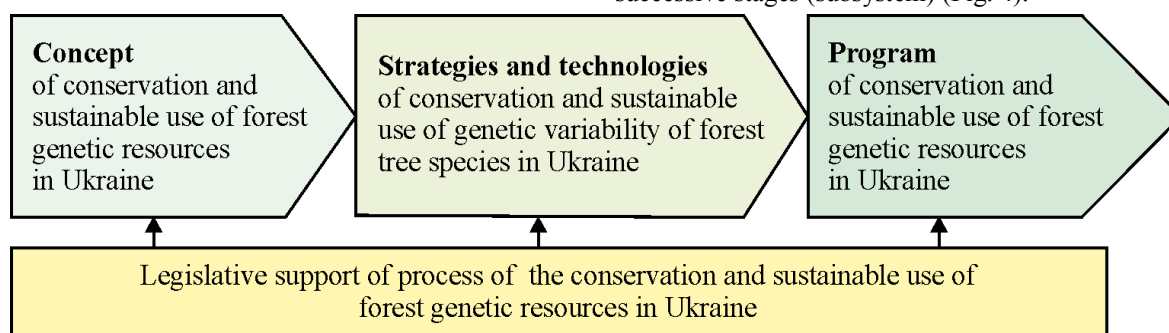


Figure 4. Structuring process of conservation and sustainable use forest genetic resources in Ukraine

Consistent process of passing through all these stages requires proper legal support. The analysis of the current state of the legislative support (see Chapter 3) shows that the processes of selection, conservation and use of forest genetic resources are regulated by a large number of international, national and regional legal documents. However, the declarative norms of many of them indicate the necessity of their additions and improvements.

The principle of priority means identifying first and foremost steps and measures for their implementation under conditions of limited resources (financial, material, labor, information).

The principle of permanence ensures the continuity of the implementation of programs on conservation of forest genetic resources. The first step of this process in Ukraine is precisely the elaboration of the national concept for the conservation of forest genetic resources as a basic legal document that defines the main ideas of forestry ideology in this area, sketches out the overall strategy of the process and ways of its implementation. Detailing of conservation measures concerning concrete species and regions is realized at the next stage during the development of strategies

- assessment of the impact of forestry activities on the state of forest genetic resources;
- determination of the optimal size, structure and spatial organization of gene conservation objects;
- development of the methods of genetic inventory and monitoring of forest genetic resources;
- improvement of technologies *ex situ* conservation (induction of flowering and fruiting in clonal seed orchards, long-term storage of seed, microvegetative propagation);
- interdisciplinary investigation of gene conservation objects (genetic and cenopopulation aspects of long-term stability and self-renewal);
- expansion of the network of provenance, eco-geographical, eco-population, edaphical, progeny tests in Ukraine
- intensification of scientific cooperation with international programs on gene conservation (EUFORGEN and others).

## 8. Realization of concept for conservation and sustainable use of forest genetic resources in Ukraine

**8.1. Methodological principles of implementing the concept.** The retrospective analysis of experience in conserving forest genetic resources in Ukraine, the countries of the former Soviet republics, advanced forest countries of the world show that methodologically this process should be based on the principles of systems, priority and permanence.

Systems principle consists in structuring the process of gene conservation as a system of logically interconnected successive stages (subsystem) (Fig. 4).

and technologies (regulations, guidelines, directives, recommendations) for conservation of genetic resources of individual species or their groups.

**8.2. Program of conservation of forest genetic resources in Ukraine.** Such a program is a plan of consolidated actions of different institutions for a certain period (10-15 years) concerning implementation of the total and partial strategies for conservation of genetic diversity of forests. The National Program for conservation of forest genetic resources must be a practical implementation plan of the main provisions of the Concept through the implementation of strategies for tree species conservation according to the order of their urgency. Each program has its own time horizon, after which an analysis of its implementation is made and the results of this analysis is taken into account when developing the next new program.

The main measures from each sections of the program are planned with indication of time of fulfillment, responsible institution and necessary funding.

The experience of many countries testify that national programs on forest genetic resources should be closely linked to national forest programs and vice versa.

In many countries, including Ukraine, more attention is paid to the conservation of biodiversity at the ecosystem and species levels. At the same time, insufficient resources are being sent to research and preservation of genetic diversity. Therefore, the proposed programs from the very beginning must be coordinated with the current program "Forests of Ukraine" and the draft Program of biodiversity conservation in Ukraine.

**8.3. Potential participants of the program for conservation of forest genetic resources in Ukraine.** Development and implementation of the program require the combined efforts of many institutions – government agencies, academic institutions, non-governmental organizations. Coordinating a wide range of organizational, methodological, scientific tasks needs to establish a working group (steering committee) of experts – representatives of the relevant institutions and organizations.

## Conclusion

In the "Concept for the conservation and sustainable use of forest genetic resources in Ukraine" described are the topicality and necessity for conservation, well as classification of factors endangering genetic diversity of forest tree species; also analyzed here is the legal basis for forest genetic resources conservation, the methods and strategy for genetic variability of forest tree species conservation are indicated, attention was paid to the benefits from sustainable use of forest genetic resources, the necessity of scientific support of this process was pointed out, and the ways for implementation of this concept were developed.

During the period that passed after the elaboration and approval of the concept of conservation and use of the forest genetic resources, a series of events took place in Ukraine towards implementation of the main provisions of the concept. "Regulations on the allocation, conservation and sustainable use of the gene pool of forest woody species in Ukraine" were developed and approved (Hayda, et al., 2011). At a request of FAO, for the purposes of determining the state of the world's genetic resources, the national report "The state of forest genetic resources in Ukraine" was prepared (Los, et al., 2014). However, it should be noted that there is a number of points which characterize the lack of attention from the public institutions of Ukraine to the problem of forest genetic resources conservation, namely, the lack of specific programs on conservation of forest genetic resources, low legal protection of many gene conservation objects, improper integration of principles of gene conservation in forestry practice, very low level of funding for research projects concerning the problem of conservation of forest genetic resources, lack of financial support which would allow to properly cooperate with international programs, first of all with EUFORGEN. It should be noted that in any case, no one and nothing can take the responsibility off the government, academic and public institutions to the future generations of our country for the proper conservation of the basis of forest existence – their biological diversity, including the genetic variation.

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## КОНЦЕПЦІЯ ЗБЕРЕЖЕННЯ ТА НЕВИСНАЖЛИВОГО ВИКОРИСТАННЯ ЛІСОВИХ ГЕНЕТИЧНИХ РЕСУРСІВ В УКРАЇНІ

Розроблення й прийняття Концепції зумовлена потребою розробки методів збереження та невиснажливого використання лісових генетичних ресурсів в Україні, визначення стратегічної мети й завдань, методологічних, методичних, організаційних принципів і прийомів діяльності зі збереження генетичної мінливості лісів. Вона покликана забезпечити стабільність функціонування лісових екосистем сьогодні та в майбутньому, зберегти потенціал лісів стосовно продукування ними комплексу унікальних економічних, екологічних й соціальних благ. Використання документу слугуватиме основою для розробки нових й удосконалення існуючих законодавчо-правових, нормативно-регулюючих і організаційно-розпорядчих актів, що забезпечують різні сторони збереження біорізноманіття в лісах – програм, положень, настанов, вказівок, інструкцій, рекомендацій тощо. У Концепції охарактеризована актуальність й необхідність збереження лісових генетичних ресурсів, приведена класифікація загроз зниження генетичного різноманіття лісових деревних порід, проаналізовані правові засади процесу збереження лісових генетичних ресурсів, розроблені методи й стратегії збереження генетичної мінливості лісових деревних видів, приділена увага сталому користуванню вигодами від збереження лісових генетичних ресурсів, вказано на науковий супровід цього процесу і віднайдено шляхи реалізації даної Концепції, яка в Україні розроблена вперше.

**Ключові слова:** біологічне різноманіття; генетична мінливість; об'єкти збереження генофонду; *in situ*; *ex situ*.

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## КОНЦЕПЦІЯ СОХРАНЕНИЯ И НЕИСТОЩИМОГО ИСПОЛЬЗОВАНИЯ ЛЕСНЫХ ГЕНЕТИЧЕСКИХ РЕСУРСОВ В УКРАИНЕ

Разработка и утверждение Концепции обусловлено необходимостью разработки методов сохранения и неистощимого использования лесных генетических ресурсов в Украине, определения стратегической цели и задач, методологических, методических, организационных принципов и приемов деятельности по сохранению генетической изменчивости лесов. Она предназначена обеспечить стабильность функционирования лесных экосистем сегодня и в будущем, сохранить потенциал лесов в сфере продуцирования ими комплекса уникальных экономических, экологических и социальных благ. Использование документа будет служить основой для разработки новых и усовершенствования существующих законодательно-правовых, нормативно-регулирующих и организационно-распорядительных актов, обеспечивающих различные стороны сохранения биоразнообразия в лесах – программ, положений, наставлений, указаний, инструкций, рекомендаций и т.п. В Концепции охарактеризована актуальность и необходимость сохранения лесных генетических ресурсов, приведена квалификация угроз снижения генетического разнообразия лесных древесных пород, проанализированы правовые основы процесса ее сохранности, разработаны методы и стратегии сбережения генетической изменчивости лесных древесных пород, уделено внимание постоянному использованию преимуществ от сохранения лесных генетических ресурсов, обращено внимание на научное сопровождение этого процесса и найдены пути реализации данной Концепции, которая в Украине разработана впервые.

**Ключевые слова:** биологическое разнообразие; генетическая изменчивость; объекты сохранения генофонда; *in situ*; *ex situ*.