



Virgin Forests in Romania



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**INVENTORY AND STRATEGY FOR SUSTAINABLE
MANAGEMENT AND PROTECTION OF VIRGIN
FORESTS IN ROMANIA**

- Extended English summary -

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The project was executed by the Royal Dutch Society for Nature Conservation (KNNV) in
co-operation with Romanian Forest Research and Management Institute (ICAS). Other project
partners: IUCN-European Office and independent European forestry experts

Copies of the Extended English Summary are available at the web site: www.veenecology.nl

Other publications in the framework of this project:

- 2 types of Leaflet 'Inventory and Strategy for Sustainable Management and protection of Virgin Forests in Romania (published in English and Romanian languages)
- Brochure 'Guide for selection and ecological assessment of Virgin Forests in Romania' (published in Romanian language)
- Brochure 'The virgin forests in Romania – nature sanctuaries and biodiversity treasures' (published in Romanian language)
- Booklet 'Manual for selection and assessment of Virgin Forests in Romania (field manual in Romanian language)
- Poster Virgin Forest Project (for conferences in Ukraine, Germany, Italy and France)
- Training manual about Virgin forests for stakeholder trainings (in Romanian language)
- Report of Seminar at 10 December 2004 for stakeholders (partly in English and Romanian language)
- Report Natural areas for livelihood improvement of local communities in Romania by Kim Dekkers and Rutger de Wolf (December 2003, in English language)
- Article Natural resources of Piatra Craiului for livelihood improvement of local communities (article published in Anale ICAS, 47, 2004)
- More scientific articles planned in 2005

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Annex 2: Field forms for inventory of virgin forests (3 sheets)

1. Introduction

During the period 2001-2004 a virgin forests project was carried out by the Royal Dutch Society for Nature Conservation (KNNV) in co-operation with Romanian Forest Research and Management Institute (ICAS). Other project partners were IUCN-European Office and independent European experts on forestry.

The main goal of the project was to identify the importance and the actual presence of virgin forests in Romania. Romania is considered as one of the European countries with the highest presence of virgin forests in Europe. The future of these forests is under a severe pressure because of human activities like cutting of forests and construction of new infrastructure.

The project was executed by a team of specialists from KNNV and ICAS. The KNNV expert team supported the local team through review of project documents, training of experts and on the spot discussions in Romania. The last activity was very useful because on the spot discussions learned all of us that 'virgin forests' are difficult to define. The definition about 'virgin forests' which was prepared by expert Jozef Fanta was accepted by all experts as the leading principle for the identification of virgin forests (see definition at page 8).

We thank also the Steering group members of the Ministries of Agriculture and Environment and from the National Forest Administration who had a strong influence on the output of the project.

During the execution of the project several publications have been made to promote the project. The project was also much promoted by three stakeholder trainings and the final conference. On the stakeholder trainings about 200 stakeholders could be reached and they were enthusiastic about the output of the project. A separate socio-economic subproject was carried out by 4 students of Wageningen University in 2003 in Piatra Craiului National Park on the use of natural resources like wood from forests in local villages in the park. The researchers concluded that the connection between the virgin forests and the local population is quite limited because the forests are already for more than 50 years excluded from the local households. However, potentially, the forest landscapes can have a high value for development of tourist activities in these areas.

The results of the project in the form of the National GIS-Database on Virgin Forests can have an important contribution to the preparation of the Natura 2000 Network and the selection of woodland that is included or excluded from the privatisation process of the forests to the pre-communist private owners. Also, preparation of new national and natural parks and forest reserves benefit from the information produced by the project. Already 3 parks and reserves are in preparation now and more are planned for the coming period.

We have to conclude that the virgin forest surface in Romania has been reduced over the last 100 years. The project resulted in about 220.000 ha of untouched virgin

forests at the moment. We hope that the obtained knowledge will stimulate decision makers to protect these forests and to install sustainable management techniques. The Action Plan in this report provides experts and decision makers with a detailed work programme that can be implemented the coming years by national and regional authorities as well as by the research institutes.

Definition virgin forests

Virgin forest is a natural woodland where tree and shrub species are present in various stages of their life cycle (seedlings, young growth, advanced growth, maturity and old growth) and as dead wood (standing and lying) in various stages of decay, with a more or less complex vertical and horizontal structures as a result of natural dynamics. This process enables the natural forest community to exist continuously and without limit in time.

In virgin forests the dynamics inherent to living systems are connected to ecological properties (including longevity) of the dominant tree species, impact of other organisms (e.g. outbreak of insects) and to the impact of abiotic factors related to the substrate, climate and to the complex of topography and water table e.g. wind, snow, flooding). This dynamics may lead to the temporary occurrence of gaps or larger treeless stages.

Virgin forests differ within the given phyto-geographic zone, forming specific types of forest communities with characteristic species composition, spatial structure, dynamics and overall diversity due to site conditions related to the position above sea level and topography, macroclimate, and nutrient and water availability. Virgin forests reflect herewith the natural unity of forest community and abiotic conditions, fully rooted in their millennia-long continuous Holocene development.”

Josef Fanta, member of expert team

2. Actual situation of Rumanian forests with special reference to virgin forests

2.1. HISTORY OF FORESTS

In history the Rumanian natural forests had a surface of about 18 mill ha. This covered not only Carpathian mountains but also hills and and lower plains. About 79% of the Romanian territory was covered by forests at that time. This forest landscape was documented over centuries. Influences of agriculture and later industry and local settlements had an impact on the forests. At the end of the 19th century, the percentage of afforestation decreased from 79 to 40%. Later to 28% in 1948 and at present only 26,7% remains. That means under the European average of 33%.

Through the time the ownership of the forests changed several times. Forests got many names and owners: public asset (Roman rule), later forests owned by monasteries, communities and private society ownerships. State properties raised in the post-war period. The first Forest code (1881) referred to forests of the state, of communities and of churches which owned these forests. The Second forest code (1910) included the private forest also.

2.2. SOME QUANTITATIVE AND QUALITATIVE DATA ABOUT FORESTS

Surface and ownership conditions

At the end of 1998 the total surface of the forests was 6.367 mill ha. That means that this is 26,7% of the national territory. At the end of 2003 due to the restitution of the forests (privatisation) the state owns only a surface of 4.467.105 ha and the old owners got 1.909.574 ha back. This process is not yet finished.

The ownership is divided over the following categories (2003):

- public state forests: 74,5%
- local public forests: 11%
- private forests by private persons: 8%
- private forests by more owners: 6%
- private forests of churches and educational organizations: 0,5%

The privatization of almost 2 mill ha of forests will have a great impact on the functioning of forests in the future. This will be presented more detail in the framework of the SWOT under chapter 5.2.

Composition of the forests

The composition of Rumanian forests is divided over 69,3% broadleaved forests and 30,7% coniferous forests. Among the broadleaved forests *Fagus* forests covers 30,7%, *Quercus* forests 18,2%, other hardwood forests 15,2% and softwood forests 5,2%.

In the coniferous forests, *Picea* forests cover 22,9%, *Abies* 50%, *Pinus* 2,1% and other conifers 0,7%. *Quercus* forests decreased over the last decades and coniferous forests were planted.

Structure on the age classes

From the latest forest inventory, it was proved that a high percentage (41,8%) exists of young tree stands (1-40 years), a low percentage (15,4%) exists of so called exploitable stands (over 100 years) and a very low percentage exists of so called pre-exploitable stands (41-100 years).

The exploitable forest stands are reduced because many forests are very old and have a protection role or are included in protected areas. The deficit of exploitable and pre-exploitable tree stands is determined by the mass exploitation in the past. This situation will give a pressure on the virgin forests in the future.

Forest management styles

Natural regeneration of forests is a priority. It is applied over more than 90% of the surface of the forests. Clear cuttings and other cuttings represent only under 10%, the annual surface for afforestation is 10-16 thousand ha. The afforestation activities are reduced after 1990.

Functions of forests

Romanian forests are divided in groups in accordance with national legislation not taking into account ownership conditions:

- group I: forest with special function of protection (53,3%)
- group II: forest with protection and production functions (46,7%).

Before 1990, the percentage of forests in group I have increased constantly. Unfortunately, during the privatization process of 2 mill ha over the last 13 years it appears that the functional approach was not working properly. The neglect of protection functions resulted in a deterioration of 75% of the forests with a protection role. The consequences of this deterioration lead to a stronger impact of inundation, storms and land slides.

Biodiversity of forests

The virgin forests form an habitat for 84% of the mammal species in Romania, for 62% of the bird species, for 87% of the reptile species, for 94% of the amphibian species and for 62% of the freshwater fish species. The Romanian virgin forests are

unique in Europe. The importance of these forests was acknowledged by prof. Jean Pardé from France (Revue Forestiere Francaise, LV-2-2003, p. 182).

Biodiversity conservation by protected areas

Many species of animals and plants of forests are protected as a monument of nature or protected by law (national or regional level). We mention the following species:

- *Taxus baccata*
- *Pinus cembra*
- *Pinus nigra 'Banatica'*
- *Larix decidua*
- *Daphne species*
- *Rhododendron species*
- *Ruscus species*
- *Angelica archangelica*
- *Cypripedium calceolus*
- *Dianthus callizonus*
- *Fritillaria meleagris*
- *Gentiana lutea*
- *Leontopodium alpinum*
- *Nigritella 2 species*

Forest fauna with a protection status:

- *Capreolus nigra*
- *Lynx lynx*
- *Gypaetus barbatus*
- *Aegypius monachus*
- *Gyps fulvus*
- *Aquila chrysaetos*
- *Neophron percnopterus*
- *Tetrao urogallus*
- *Lyrurus tetrix*
- *Corvus corax*

According to the legislation the Romanian virgin forests have to be included in national and natural parks, reserves (biosphere, scientific, natural and landscape) and other protected areas included natural monuments or secular forests (included in management plans and recognized by law).

The National Forest Administration has under management 17 national and natural parks which include large surfaces of virgin forests.

The future status of the mapped virgin forests which are evaluated in the framework of this project will be established in the strategy (chapter 5). The measures which will be adopted should take into consideration also virgin forests less than 50 ha which were not included in this project. In general, the forests are situated in very inaccessible valleys or on high mountains slopes where human beings could not reach them for exploitation (see data in chapter 4.1).

2.3. CONSERVATION OF VIRGIN FOREST

The Forest code is the basic legislative document for forest management and protection. Additional Ordinance nr.96/27.08.1998 on the forest regime talks about the necessity of conservation and sustainable management of forests.

3. Work methods in the project

3.1. ELABORATION OF A SET OF SELECTION CRITERIA

Based on the definition, the main characteristics of virgin forests in order to identify these forests are:

- **naturalness**
- **occurrence of different stand development stages**, that means the occurrence of trees with different ages and sizes, including of trees with exceptional ages and sizes, at the limit of physiological longevity.

Besides these two essential characteristics of the virgin forests which represent selection criteria, two additional parameters were considered as useful information:

- **minimal area of a range with virgin forest**
- **occurrence of natural limits, at least partially, for that range.**

Table 3.1 outlines the criteria and indicators used in selecting the virgin forests in the framework of this project.

Table 3.1: Selection criteria

<p>A. CRITERIA FOR SELECTION (ADMISSION) (minimum and compulsory conditions – in their totality)</p> <p>A.1. Degree of naturalness (authenticity) – determined by:</p> <ul style="list-style-type: none">- Natural composition and distribution of composing species;- Absence of any elements showing human influences (stumps, roads, cattle grazing, etc.)- Complex structures (stratified on vertical plan and mosaic on horizontal plan), according to the development stages (specific textures);- Diversity of sizes and ages (occurrence of very old trees);- Occurrence of dead wood (standing or fallen), in different stages of decay.- Representative ecosystems for the main forest formations. <p>A.2. Minimum area (size) – depending on forest formation:</p> <ul style="list-style-type: none">- for temperate forest ecosystems: over 50 ha; <p>A.3. Age diversity of trees and stands and occurrence of some trees with outstanding performances:</p> <ul style="list-style-type: none">- presence of a broad age range both at stand level and at tree species level (in ecosystems close to the climax stage);- occurrence of very old and very large trees. <p>A.4. Natural boundaries (limits) Compact forest, delimited by natural obstacles (streams, mountain ridges a.s.o).</p>

3.2. ELABORATION OF A SET OF ASSESSMENT PARAMETERS

Assessment parameters, listed in table 3.2, are used for classification and hierarchical (biological, ecological) 'quality weighting' purposes of the selected virgin forests. The assessment is based on the type of forest and on the geographical location of the forest. Quality is expressed on a scale from 1 to 5: insufficient, satisfactory, moderate, good, excellent

Table 3.2: Assessment parameters

<p>B. ASSESSMENT PARAMETERS to be applied to the forest which completely meet the minimal conditions from A.1 to A.4</p> <p>B.1. First rank assessment parameters: B.1.1. Degree of naturalness; B.1.2. Area (size); B.1.3. Age; B.1.4. Limits (natural);</p> <p>B.2. Second rank assessment parameters: B.2.1. Representativity; B.2.2. Biological and ecological diversity, with the following indicators: Number of plant, animal and micro-organism species; Number of endemic, relict and rare species in ecosystem's flora and fauna; Number of microhabitats; Number of ecological niches. B.2.3. Absence of threats for normal forest development and biodiversity: (presentation and intensity of risk factors) B.2.4. Forest continuity (in that territory).</p> <p>B.3. Third rank assessment parameters: B.3.1. Number of protected and threatened species (according to IUCN classification, Habitat Directive, Bern Convention, Bonn Convention). B.3.2. Knowledge and scientific research stage; B.3.3. Environmental education function; B.3.4. Gene bank (resources).</p>
<p>B.4. Other assessment parameters: B.4.1. Accessibility of the forest locations; B.4.2. Land characteristics; B.4.3. Development stability and natural processes equilibrium in ecosystem; B.4.4. Existence of buffer and transition zones around the selected area.</p>

3.3. GIS-DATABASE MANAGEMENT

The field data (map: annex 1) were grouped in a database, for management of the field information, and for future possibilities of use in connection with other software applications,. The building of the database has respected the classical steps for this task: identification of the unique elements from different hierarchical levels, of the subordinations and of redundancies. The connection with GIS database was realised by a supplementary field, which was introduced during desk work. Due to flexibility reasons and exchange of data, the database was realised in Microsoft Access; for digitizing the data from filed forms into database, two ways of working were used, corresponding with the polygon and ecosystem type, as defined in the project. For the verification/editing of the already stored data, other two ways were created. For building up of the specific queries, the field IDE (ID Ecosystem) were used, which were established as primary key in all level I tables. Inside of the database, the descriptive (non-field) information were included in tables named as Cod[characteristics] and linked with the tables including the field data, named E-[characteristics]. The transfer of information to the GIS database was released with the 'subpolygon unique code', exported as .dbf files.

The transposition of the maps into the digital version required more steps: identification on the map of the virgin forest areas at the level of the forest management units, the coding with the corresponding ecosystem type, delimitation of the polygons (*sensu project*) and the transfer on the topographic map scale 1:50000. Then, the polygons were scanned, georeferenced and digitized; each sub polygon (*sensu project*) received in the GIS database the same 'unique cod' as in database, for future links. Finally, based on this work, the attached thematic maps were printed.

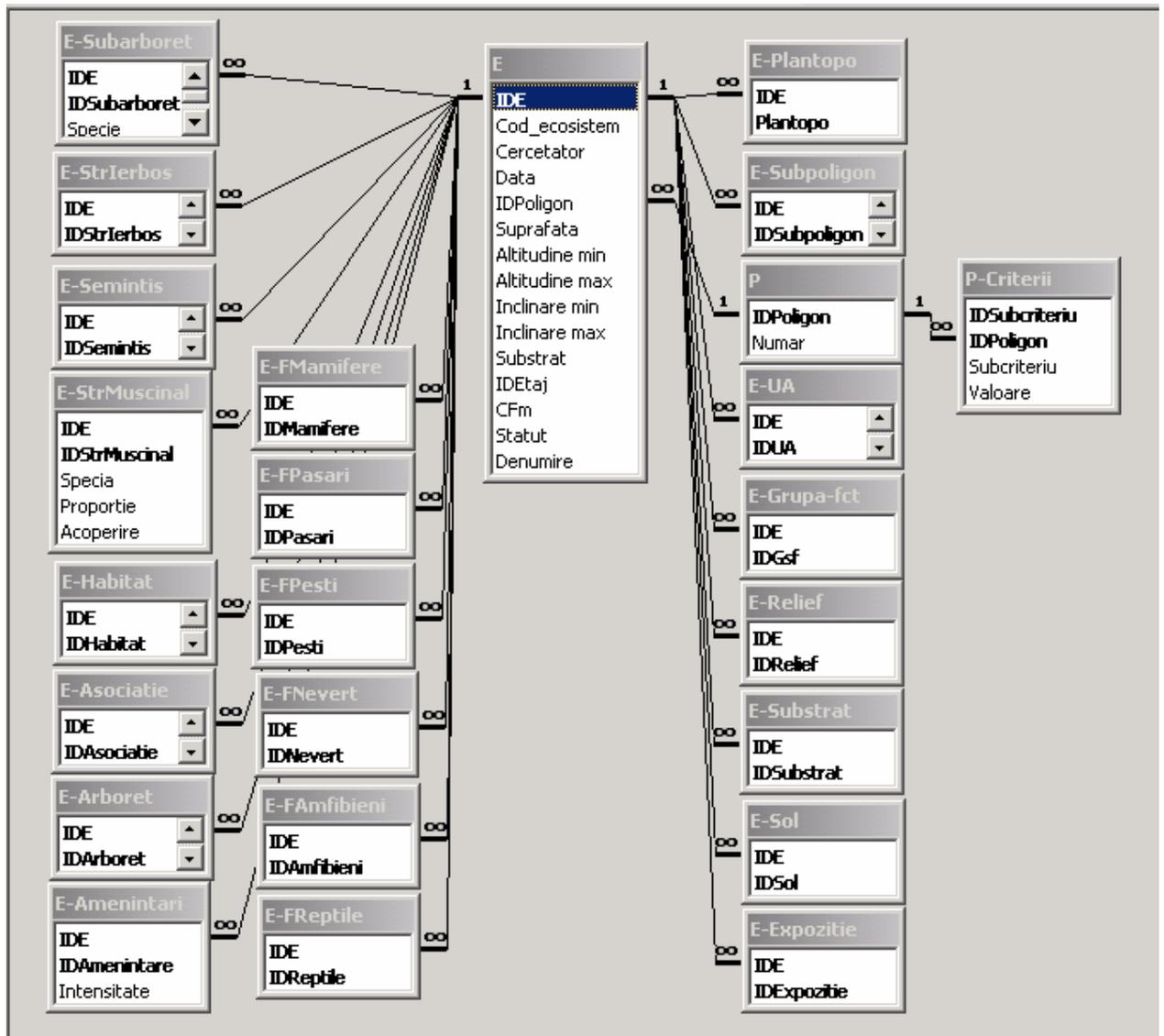


Fig.3.1 The entity-relationship model of the database

4. Description of forest types

4.1. STATISTICS OF RESULTS

In totally, 218.500 ha of virgin forests were identified in the framework of the project. The project experts concluded that more hectares can be included in this category in the coming 20 years. These could not be included in the list of virgin forests because they did not meet all the selection criteria like the absence of elements showing the influence by man, because of still visible traces of selective cutting and of grazing in the past. Also parcels smaller than 50 ha were excluded.

Unit	Surface (ha)
1	46,933.0
2	46,644.9
3	92,436.6
4	20,867.0
5	3,563.0
6	577.6
7	66.0
8	66.0
9	931.5
10	6,407.6
Total	218,493.2

Table 4.1 Area of virgin forest per typological unit

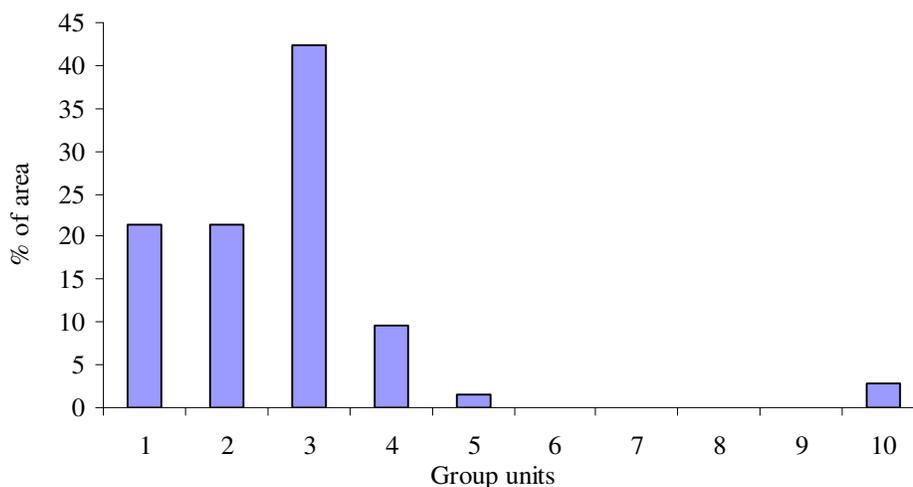


Fig.4.2 Presence of the units of virgin forest

Code	Name
1	<i>Picea abies</i> , <i>Larix decidua</i> , <i>Pinus cembra</i> and <i>Pinus sylvestris</i> pure and mixt forests
2	<i>Abies alba</i> pure and mixed forests
3	<i>Fagus sylvatica</i> pure and mixed forests in mountain areas
4	<i>Fagus sylvatica</i> pure and mixed forests in hilly areas
5	<i>Quercus petraea</i> pure and mixed forests
6	<i>Quercus robur</i> pure and mixed forests
7	<i>Quercus ceris</i> , <i>Quercus frainetto</i> pure and mixed forests
8	Xerophyllous oaks forests (<i>Q. pedunculiflora</i> and <i>Q. pubescens</i>)
9	Riparian forests
10	Others

Most of the virgin forests (45%) belong to unit 3: *Fagus sylvatica* pure and mixed forests in mountain areas. These forests are located in the middle and lower parts of the Carpathian mountains. Mainly situated in south-western part of the country. These forests are very typical for the Carpathian mountains in the Continental biogeographical zones of Europe. The main reason that this forests survived in the past was the low economic value of the timber of their trees. However, at this moment the economic value of this wood increased and this causes a continuous threat that the forests will be cut.

Units 1 and 2 are present on about 20% each. These forests consist of pure and mixed coniferous and Beech forests (Norway spruce stands, Larch stands, Scotch Pine and Black Pine stands, Silver Fir). These units are typical for the higher zones of the mountains.

Unit 4 '*Fagus sylvatica* pure and mixed forests in hilly area' is less common (10%) and connected with lower zones of the mountains. There human impact, including forest felling, is higher since several centuries.

Unit 5 '*Quercus petraea* pure and mixed forest' is very rare because these forests are situated in the plains, where human occupation is very intensive.

Forests are in Romania divided into two functional groups:

1. protective forest. Main function protection of soils, water bodies, local climate, recreational areas, biodiversity.
2. productive forest. Main function production of wood, with paying attention to protective functions.

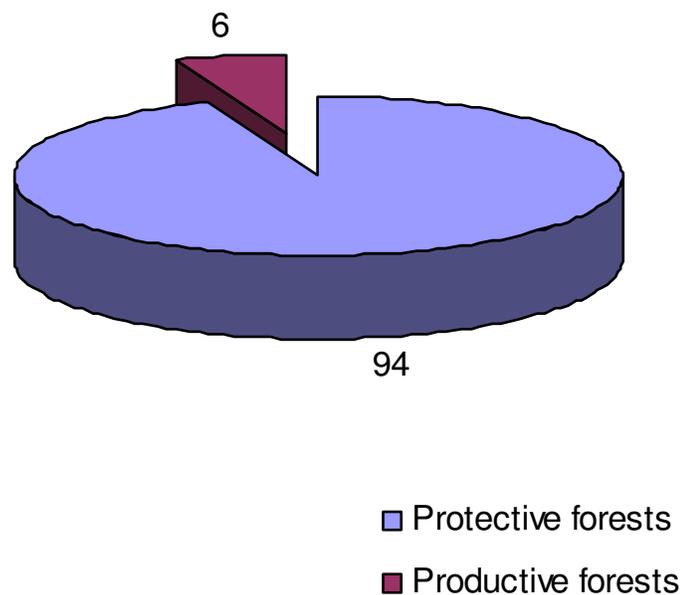


Fig.4.3 Distribution of the virgin forest areas on functional groups

Of the mapped virgin forests 94% relates to protective forests and only 6% to productive forests (fig. 4.3). That means that the majority of the virgin forests have a protective function.

The forests were treated as protected forests by the foresters and the restrictions in the management were serious like non-intervention.

More than 2/3 of the mapped forests are located on very steep slopes: over 30 degrees. Only a quarter of the forests were located on slopes between 15-30 degrees and only 8% is situated on flat and nearly flat areas (fig. 4.30). This information of the location of virgin forests gives very clear information that un-accessible locations were a precondition for survival of these forests.

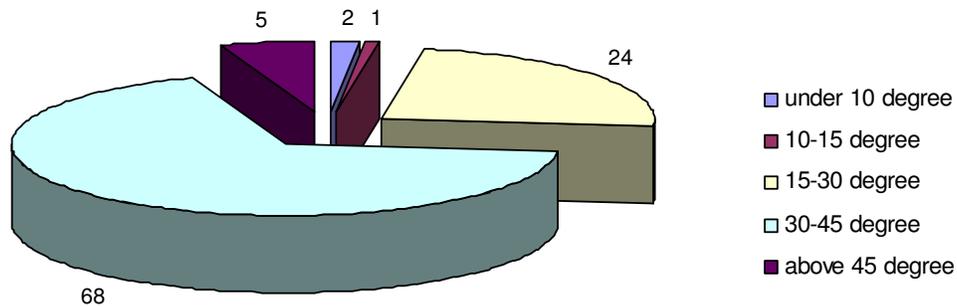


Fig.4.4 Distribution of the virgin forest areas on slope categories

65% of the mapped virgin forests are located above 1.000 m asl and 27% between 600-1000 m a.s.l. (fig.4.5). This makes it clear that virgin forests were mapped on higher altitudes in the Carpathian massive. Above 1.000 m forests are relatively well protected due to un-accessibility of the sites.

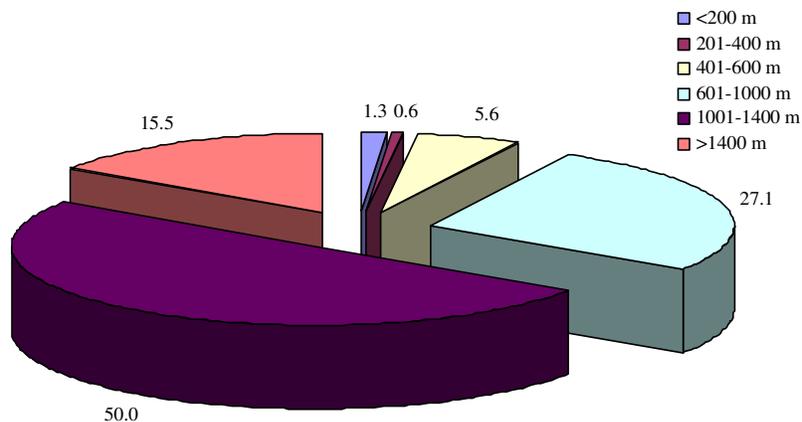


Fig.4.5 Distribution of the virgin forest areas on altitude categories

Referred to the legal protection of forests, it is concluded that 75% of the virgin forests is not located in nature protection areas. On the contrary, not more than 16% is situated in national and natural parks and 9% in forest reserves (fig. 4.6).

From 2000 onwards, the designation of protected areas developed strongly and several locations with virgin forests were brought under protection or will be brought in the short term.

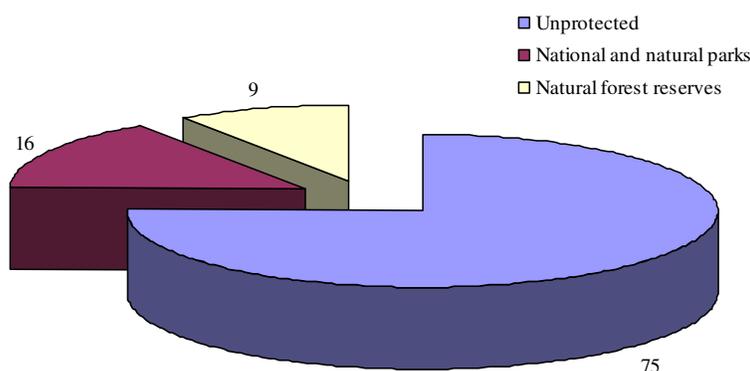


Fig.4.6 Distribution of the virgin forest areas according the legal protection status (situation of protection in 2000)

4.2. DESCRIPTION OF FOREST TYPES

Each forest type (unit) is described by means of the following variables:

- . location, e.g. altitude, soil type, exposition, climate conditions
- tree layer: species composition, production class, type of regeneration
- shrub layer: species composition
- herb layer: annotation of indicative herb species
- moss layer: annotation of indicative moss species
- adjacent forest: habitat type, succession status, vegetation types, EU habitat type according EU Habitat Directive.

Example of forest type description:

Type: Beech and Hornbeam forest with *Asperula-Asarum-Stellaria* (code 4216)

Location: All on hilly areas and lower mountains, frequent in Moldavia plateau, in Transylvania, on the west hills, in Banat region. Altitude between 300-800 m asl, relief slopes with low-average inclination, shadow exhibition on the lower altitude and different on the higher altitudes, on the plateaus, near the valleys.

Soil types: brown forest soils, mull humus, without or few gravel, texture middle fiber, low pseudogley, humid, moderate and low acidic with high trophicity.

Climate: cool-warm, relative humid (average annual temperature 9,5 – 6,5° C, annual precipitation 650 – 900 mm/yr).

Tree layer: consists of Beech, frequent Balkan Beech with Hornbeam in different percentages of presence, Hornbeam remain in the second level (sub-tree level) and decreases if only present in second level, more frequent on the outer boundaries of the massive; *Tilia cordata* and *T.tomentosa*, *Sorbus aucuparia* (rarely *Quercus cerris* and *Q.pedunculiflora*) *Acer camprestre*, *Pyrus pyraaster*. Density 0,9-1.0. Production class for Beech is I – III, Hornbeam III – IV. Natural regeneration is easy, in seedlings with mixture of species, no succession tendency.

Shrub layer: sparse because of the shadow influence. Rare species of *Corylus* and *Crataegus spec*, *Rosa canina*, *Euonymus europaea*, *Sambucus nigra*.

Herb layer: sparse or even absent on larger surface because of the shadow. Consist of species of mull humus flora (*Dentaria bulbifera*, *Anemone nemorosa*, *Anemone ranunculoides*, *Hepatica nobilis*, *Asarum europeum*, *Stellaria holostea*, *Asperula odorata*, *Pulmonaria officinalis*, *Lamium galeobdolon*, *Polygonatum multiflorum*, *Arum maculatum*, *Salvia glutinosa*), ferns, *Rubus hirtus*, On the convex relief *Luzula luzuloides*, *Genista tinctoria*.

Moss layer: N/A

Connected types: Romanian forest habitat types 4311, 4312

Succession status: 5243

Vegetation types: *Carpino-Fagetum* Pauca 41

EU Habitat type: 9130 subtype 41135

5. Strategy and action plan

5.1. IMPORTANCE OF VIRGIN FOREST

Romania is one of the few countries in Europe that still has extensive virgin forests like Beech forests, mixed Beech-Fir-Spruce forests and Oak forests. Nevertheless a strong decrease took place after 1974, when these forests still represented about 10-12% of the total forest cover. After that period the forests decreased continuously till 5% at present.

The functions of virgin forests can be described as follows:

- historical witness
- valuable treasure of genes, species and representative ecosystems
- source of scientific information
- ecosystems well adapted to natural impacts
- natural reference to managed forests

5.2. SWOT ANALYSIS

Analysis of the Strong aspects within SWOT analysis:

- existence of 220.000 ha of virgin forests (5% of national forest heritage), more than other European countries except Russia
- selected virgin forests cover almost the whole range of forest ecosystems from floodplain (Danube plain) to the upper timber line in the Carpathian mountains
- location of virgin forests within the national and natural parks as well as other protected areas (forest reserves) give these forests a privileged status
- existence over a large surface of monumental tree stands with exceptional dimensions of natural production and ecological valence
- exceptional biodiversity (floristic, faunistic, landscape composition) at all levels of the ecosystem (genes, species, ecosystem, eco-complex) reflected in their structure and composition
- high number of forest species including endemics, rare, threatened species
- presence of numerous populations of large mammals (bears, wolves, lynx) almost disappeared in Western and Central European countries and a rich sylvical avifauna
- some virgin forests are located on extreme habitat conditions (rocky relief, sharp escarpments, at forest vegetation upper boundaries) and benefit of strictly protection measures included in special protection subgroup in the forest management plans
- after finalization of the first stage of research at national level regarding inventory, ecological evaluation and mapping of virgin forests, data are available about surface, location, species composition, ecological value, threatening factors and other characteristics
- existence of a special office in National Forest Administration which is responsible for protected areas and national and natural parks as well as the new established administrations of these parks
- forest sector develops its structures depending on the internal and external requirements

- to launch the certification of forests with biodiversity conservation criteria by preserving 5% of the forest surface and by special management of another 5%
- the national network of protected areas in course of finalization might include all virgin forests
- completing a set of technical norms for all silvicultural aspects, approved by the central authority which is the responsible body for silviculture
- finalise the EU negotiations with a signed document in the near future, which will create favourable conditions for protection of virgin forests as the European and even mondial heritage
- Romania adopted the international legislation regarding protection of fauna, flora and habitats of EU importance.

Analysis of Weak aspects in SWOT analysis:

- virgin forests are threatened by short term attitude to cut the forests because of the economic transition period,
- re-privatisation process of 2 mill ha makes it difficult to introduce sustainable management techniques according to functional categories
- due to economic pressure within the forest sector generated by the necessity to assure the rentability both in state and in private forests, there is a resistance to take forests out of production
- the asymmetric location of virgin forests; located mostly in mountain areas; in hilly areas virgin forests are more rare and in the floodplains these forests are not present in low quantity
- fragmentation of virgin forests, causing ecological isolation of dispersed areas, both over 50 ha and smaller than 50 ha
- the protection of virgin forests is complicated in some locations because of this fragmentation
- the virgin forests of the upper treeline zone on narrow belts along the alpine zone without buffer, are influenced by anthropogenic impacts from neighbouring pasturing
- *Juniper* trees located at the upper altitudinal zones with a special protection goal, are not included in forest fund and cannot apply for sustainable management
- absence of specific research unit in the Forest Research Institute working on virgin forests

Analysis of Opportunities aspects in SWOT analysis:

- the accession process to EU gives the best opportunity for conservation of virgin forests
- the increasing of the interest of international scientific communities for conservation of Romanian virgin forests for reasons of studying natural succession processes and other topics
- to initiate some recent actions regarding the establishment of habitat types after EUNIS classification for ecological network Natura 2000. Law nr.625/14.12.2000 mentions that protection of natural habitats is made by declaration of special areas for conservation (SPEC). This research project delivers data which can be used for this purpose.
- In the framework of Corine LC project some habitat types were identified which need a strict protection as well as a systematic catalogue of species and habitats threatened in some regions to adopt the necessary measures to protect them. From those 8 groups of ecosystems established in the framework of the Corine project Romanian virgin forest includes 5 groups, namely: 1) forests. 2) shrubs and meadows, 3) inland waters, 4) humid zones (marsh lands, ponds), 5) mountains (rocky, detritus)
- Natura 2000 would include virgin forests among the priority protected areas

- The Ministerial Conference for Forest Protection in Europe (2003) established one of the task forces for 2003-2005, refers to the Protected Forest Areas. Since 1999 among the criteria and indicators regarding conservation and sustainable management of boreal and temperate forests, the following indicators are used: 1) surface of forests located in protected area, on IUCN categories, forest types, age classes and development stage, 2) number of species dependent on forests, 3) threatening status of species dependent on forest, 4) effective of species population representative for different habitats
- The finalization of a first stage of the project Forest Reserves Research Network in Europe and launching of the project Protected Forest Areas in Europe – analysis and harmonization (2002-2006) and the Romanian participation to this project
- The increasing number of tourists and foreign specialists who visit Romania make a favourable climate for conservation of natural landscapes including natural forests

Analysis of Threat aspects in the SWOT analysis:

- economic pressure on the virgin forests because of the high economic value of these forests in terms of quality and quantity
- many un-accessible areas are made accessible now or could be made accessible by construction of new roads
- high touristic threat in some areas, not organized activities
- the poverty of local people threaten the local forests for reason of wood cutting, harvesting of local products like Christmas trees and mushrooms.
- development of activities in the border areas around the virgin forests like the development of infrastructure, more intensive forest grazing in connection with re-privatisation of properties around the forests.

Definition of the strategic objectives based on the SWOT analysis and in connection with the forestry and biodiversity conservation national strategies

Four strategic objectives were defined:

1. the protection and the sustainable management of virgin forests: actions under legal protection basis
2. public awareness and decision maker awareness regarding the role and importance of virgin forests: communication aspects and media campaign also on European level
3. development of the research and monitoring activities in representative virgin forest types: aim is to value the functioning of virgin forests in the sense of process in ecosystems and different functions for species. The ultimate goals will be the development of management models for these forests.
4. creation and development of a sustainable system of administration: development of a system of compensation for protection and management of virgin forests and development of a financial scheme based on 'income forgone principle' by not targeting the production function of these forests.

These objectives are transposed in a realistic Action Plan (table 5.1) with:

- actions
- measures for implementation of the Actions
- time table for implementation
- target parameters which have to be reached
- financial sources for undertaking of the actions
- organisation responsible for implementation of the measure.

Table 5.1: Action Plan for conservation of virgin forests (VF) in Romania

Objective/Action	Implementation measure	Planned period	Output parameter for evaluation of Action Plan	Financial source	Responsible organisation
1. Protection and sustainable management of VF					
1.1 Finishing the inventory of VF in framework of PIN-MATRA	<ul style="list-style-type: none"> - Elaboration of maps of VF - Elaboration of database of VF and processing and interpretation of data - Publishing of information and dissemination to stakeholders 	I 2005 I 2005 III 2005	<ul style="list-style-type: none"> - GIS Maps VF inventory - Statistics VF - Publications and reports VF 	Project PINMATRA and NFA	ICAS
1.2 Elaboration of new proposal for protected forest areas including VF	<ul style="list-style-type: none"> - Elaboration of new proposals for protected VF - Submitting the list of VF in order to complete the network of protected areas and Natura 2000 network 	I 2005 II 2005	<ul style="list-style-type: none"> - Background documents - List of new proposed VF areas to be included in the national system of protected areas and Natura 2000 network 	Project PINMATRA and NFA	ICAS
1.3 Elaboration for legislative protection of VF	<ul style="list-style-type: none"> - Elaboration of documentation for legal protection - Contribution towards getting the status of protected forests 	III 2005 III 2005	<ul style="list-style-type: none"> - Documentation for ministerial decisions - Participation in discussions 	NFA and MoA/MoE	ICAS
1.4 Including the aspects of VF protection in the guideline of	<ul style="list-style-type: none"> - Elaboration of recommendations connected to VF for forest 	IV 2005	<ul style="list-style-type: none"> - Preparation of draft norms 	MoA	ICAS MoA

forest management planning and in forest norms for management	<ul style="list-style-type: none"> - management norms - Inclusion in forest management standards of guidelines related to VF protection 	IV 2005	- Guidelines for forest management plans		
1.5 Introduction in the standard for forest certification of provision connected to VF protection in order to maintain these forests for the future	<ul style="list-style-type: none"> - Including special recommendations for management of VF under FSC certification system - To co-operate with certification bodies and National Forest Administration (NFA) for implementation of certification system - Control on certification activities for VF 	IV 2005	- Guidelines for forest certification of VF	NFA	ICAS NFA
1.6 Acquisition of VF by the state from private owners	<ul style="list-style-type: none"> - Public advertisement - Negotiations with owners - Preparation of contracts 	2005 - 2007	- Scientific support on the certification process		
			- Report on status of certification		
		Permanent	- Yearly buying or exchange of fixed area	MoA and NFA	NFA
1.7 Up dating of the database VF by monitoring of the VF	<ul style="list-style-type: none"> - Continuous updating of database from PINMATRA project - Actualisation of the database including new information related certification and related to protection status and other new activities like management plan updating - Make the database accessible by internet for the stakeholders including the ministries 	Permanent	- Data base development	MoA/MoE	ICAS
		Permanent	- Yearly actualisation		
		I 2005	- Website publication		

1.8 Continuous monitoring of VF	<ul style="list-style-type: none"> - Establishment of monitoring team - Establishment of monitoring network - Information to the decision makers - Elaboration of monitoring reports 	2005 2005 yearly yearly	<ul style="list-style-type: none"> - Monitoring teams - Monitoring guidelines - Monitoring reports 	MoA/MoE	ICAS
1.9 Preparation and execution of the second phase of inventory of VF (localities <50 ha, localities of ancient forests with incidental human impact in the far past)	<ul style="list-style-type: none"> - Mapping of virgin forests 	after 2006	<ul style="list-style-type: none"> - up dating of GIS-Database 	MoA/MoE	ICAS
2. Public awareness and decision making awareness					
2.1 Organisation of workshops, conferences, training courses on VF conservation	<ul style="list-style-type: none"> - Elaboration of materials for training, coarses, workshops and conferences - Organisation of conferences, seminars, workshops and training coarses for stakeholders - Organisation of international symposia - Organisation presentations for the interested public 	05-2010 05-2010 05-2010 05-2010	<ul style="list-style-type: none"> - leaflets, booklets, presentations - training coarses, workshops - scientific publication - excusions for public 	MoE/MoA NFA Local authorities Park administrations	ICAS
2.2 Introduction of VF related lectures in courses and preparation of manuals	<ul style="list-style-type: none"> - Including aspects VF in manuals and coarses 	05-2010	<ul style="list-style-type: none"> - Information materials - Manuals VF 		ICAS
2.3 Distribution of information through internet	<ul style="list-style-type: none"> - Launching a website with VF information, research and monitoring - Continuous updating of the website 	II 2005 Perm	<ul style="list-style-type: none"> - Internet site - Actualisation of site 		ICAS

2.4 Public awareness through press publications	<ul style="list-style-type: none"> - Publication of leaflets and folders - Publication some articles in newspapers and magazines - Publication articles in scientific journals 	perm perm perm	<ul style="list-style-type: none"> - brochures - scientific papers 		ICAS
2.5 Public awareness through radio and TV	<ul style="list-style-type: none"> - Distribution of information on VF: their role, importance and conservation status - Interviews about VF with scientists and others - Elaboration of movie for TV (already one movie available) 	perm perm perm	<ul style="list-style-type: none"> - TV presentations - Interviews - Documentary movies 		ICAS
3. Developing research on VF					
3.1 Establishment representative VF plots for research	<ul style="list-style-type: none"> - Analysis of the database for selection of plots to have a preliminary list - Field investigations for final selection of the research plots 	05-2006	<ul style="list-style-type: none"> - List of sample plots - List of sample plots 	MoA/MoE NFA	ICAS
3.2 Establishment of research and monitoring program VF	<ul style="list-style-type: none"> - Consultation with potential stakeholders to reach a multi-disciplinary program - Elaboration of a research program - Present the research program to potential donors 	05-2006 2006	- Research program	NFA	ICAS
3.3 Promotion of research results dealing with VF	<ul style="list-style-type: none"> - Elaboration of research projects in the framework of the program - To introduce the research projects in 	2005 2005	- Project proposals	NFA Other donors	ICAS

	the framework of international programs				
3.4 Development of logistics and capacity for VF research and establishment of Regional Research Centre (EFI) in Romania	<ul style="list-style-type: none"> - Development of logistic support - Establishment of research teams - Elaboration of research methodology - Negotiations with EU and others 	2005 2005 2005 2006	<ul style="list-style-type: none"> - Financial resources for logistics and research capacity - Accepted methodology 	NFA others MoE/MoA	ICAS
3.5 Establishment of partnership with national and international bodies for research reasons	<ul style="list-style-type: none"> - Establishment network of potential partners - Establishment co-operation protocol 	05-2010 2005	<ul style="list-style-type: none"> - Network of partners - Protocol 	EU (network of excellence) MoE	ICAS
3.6 Execution of research programs focussed also on connectivity aspects between VF complexes	<ul style="list-style-type: none"> - Collection and storage of data, data processing and analysing 	05-2010	<ul style="list-style-type: none"> - Databases, maps 	MoA/MoE Others	ICAS
3.7 Publications of research results	<ul style="list-style-type: none"> - Publication of research reports, scientific papers, conference documents - Publication and database on website 	05-2010	<ul style="list-style-type: none"> - Scientific publications 	MoA/MoE others	ICAS
4. Development of a financial system for protection and sustainable management of VF					
4.1 Compensation funds for VF owners or their managers	<ul style="list-style-type: none"> - Setting up a compensation fund through additional funding of Natura 20000 sites by EU - Identification of other donors 	2007 (after membership EU)	<ul style="list-style-type: none"> - Fund is working for owners 	MoA/MoE EU	MoE

4.2 Development of a compensation scheme	- Establishment of norms for compensation of VF owners	2006	- Fund is established	MoA/MoE EU	MoE
4.3 Establishment of land acquisition program	- Priority program for land acquisition	2006	- Program is established	MoA/MoE EU	MoE

6. Conservation of virgin forests

The following issues were identified as important for conservation of virgin forests in Romania:

- recognition of the importance of Romanian virgin forest at the European level
- legalization of virgin forest protection in Romania
- establishment of European directive for conservation of virgin forest
- giving a legal status for all protective forests mentioned in the forest management plans
- continuation of the inventory, monitoring and research of virgin forests
- starting up a program of education and of awareness raising
- compensation of forest owners for protection of virgin forests and to stimulate alternative income from the forests like natural products

7. Policy Aspects in the Protection of Virgin Forests¹

7.1. BACKGROUND

As a key provision, which covers the integration of biodiversity conservation in forest management planning, the Convention on Biological Diversity stipulates: “Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies (CBD, 1992, Article 6).

At European level, the Ministerial Conference on the Protection of Forests in Europe (MCPFE), which comprises 40 countries, has developed further the CBD provisions by adopting the general guidelines for the conservation of the biodiversity in European forests (Helsinki 1993), pan-European operational level guidelines for sustainable forest management (Lisbon 1998) and a resolution on the conserving and enhancing forest biological diversity in Europe (Vienna 2003). The countries also implement the Pan-European Biological and Landscape Diversity Strategy which, in 1998, adopted a Work-Program on the Conservation and Enhancement of Biological and Landscape Diversity in Forest Ecosystems.

Internationally accepted strategies for the conservation of biological diversity of forests are based on a combination of (i) multifunctional and sustainable forest management in commercial production forests, and (ii) forested areas protected under specific conservation regimes (including virgin forests). An example of such strategies is illustrated by figure 7.1.

The classification of forests in various categories for conservation should start at landscape level. Ideally, a landscape analysis results in an appropriate geographic division into regions and main categories. Such analysis and division should provide the spatial framework for the forest management actions for the conservation and enhancing of biological diversity.

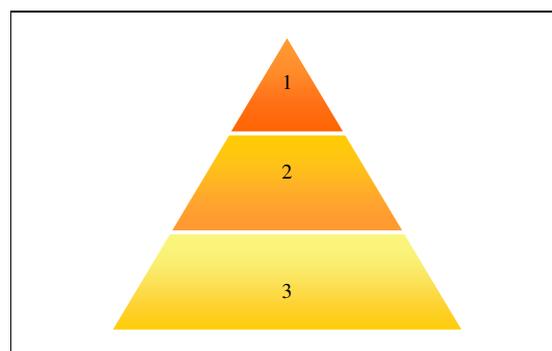


Figure 7.1. Generalized Strategy of Forest Biodiversity Conservation

1 = areas of very high conservation values, where commercial forestry is prevented;
2 = areas which require special management for biodiversity conservation;
3 = areas for commercial forest management, i.e. the majority of forest areas, in which biodiversity conservation measures are integrated.

¹ Chapter 7 prepared by Sipi Jaakkola, senior forestry consultant and expert in project

7.2. EUROPEAN POLICY-FRAMEWORK IN FOREST PROTECTION

The key regional process, and instrument for policy-setting in forestry sector, is the Ministerial Conference on the Protection of Forests in Europe (MCPFE). Romania is a signatory state within that process. In the MCPFE declaration of 2003 (Vienna Living Forest Summit Declaration), the ministers set a high level basis for sustainable forest management in Europe by saying, *inter alia*, that

- Living forests are a basis for life on earth.
- By sustaining forests, we sustain life.
- Forests play an important role for economic welfare, biological diversity, the global carbon cycle and water balance.
- We, as policy makers, are responsible for achieving a balance between the economic, ecological, social and cultural roles of forests in the context of sustainable development.

As key measures to tackle the main challenges, the ministers commit themselves, *inter alia*, to:

- take further steps to maintain, conserve, restore and enhance biological diversity of forests, including their genetic resources;
- take effective measures to promote forest law enforcement and to combat illegal harvesting of forest products and related trade;
- adopt the theme “Protected forest areas”, to cooperate and contribute to the global work on protected forest areas and the general work on protected areas for CBD-COP7 (2004) by making a link between the concepts of protected forest areas and protected areas in general. In the Pan-European context, the work will build on existing work on protected areas of the MCPFE and current work on ecological networks. (note: NATURA 2000 provides a protection network for all ecosystems.)

A European-wide research effort, “COST Action E4 Forest Reserve Network” recently made a systematic analysis of strictly protected forest areas. Lack of harmonization and the consistency in interpretation among the countries and organizations hampered the analysis, which had an aim to provide basis for policy-making.

Based upon the COST-study, a Working Group under the MCPFE developed a new classification system for forest protection. Three categories with different management objectives were identified, namely: protected forests safeguarding biodiversity, protected landscapes and specific natural features, and protective functions (for soil, water and natural hazards). This classification was innovative in the sense that it went beyond the habitual biodiversity conservation. Linkages to IUCN categories and the designation types used by the European Environment Agency (EEA) in its Data Base of Designated Areas were taken into account. The classification was adopted by the ministerial conference of Vienna, 2003, and included in their Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe (Annex 2 to Vienna Resolution 4).

7.3. MCPFE VIENNA RESOLUTION 4: CONSERVING AND ENHANCING FOREST BIOLOGICAL DIVERSITY IN EUROPE

In Vienna Resolution 4 the signatory states and the European Community commit themselves to, *inter alia*,

- address the maintenance, conservation, restoration and appropriate enhancement of forest biological diversity in national forest programmes and other relevant policies and programmes,
- assess the impact of relevant policies and programmes on forest biological diversity, collaborate in removing distortions and failures of policies resulting in loss of forest biological diversity,
- develop a regional understanding of the linkages between the ecosystem approach and sustainable forest management as defined by the MCPFE,
- apply the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe and further develop them,
- analyse and further develop protected forest networks,
- improve the assessment and monitoring of forest biological diversity in Europe, taking into account existing monitoring systems and contribute to harmonised international classification systems through developing a pan-European understanding on forest classification systems including forest types, naturalness and introduced forest species, in line with the Pan-European Criteria and Indicators for Sustainable Forest Management,
- promote forest management planning and practices and landscape planning that is specifically suited to maintain, conserve, restore and enhance forest biological diversity, making use of the natural processes of forests.

The signatory states and the EC adopted the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe.

7.4. MCPFE ASSESSMENT GUIDELINES FOR PROTECTED AND PROTECTIVE FOREST AND OTHER WOODED LAND IN EUROPE

The MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe are an outcome of the implementation of the joint “Work-Programme on the Conservation and Enhancement of Biological and Landscape Diversity in Forest Ecosystems 1997-2000” of the MCPFE and “Environment for Europe” – the pan-European ministerial process of the ministers for the Environment. They are based on the analysis of national data on protected and protective forest and other wooded land in the European countries, which has been collected in the frame of a supplementary Temperate and Boreal Forest Resource Assessment of UNECE/FAO (TBFRA) enquiry in 2000. The MCPFE Assessment Guidelines aim to give a comprehensive picture of protected and protective forest and other wooded land in Europe, while keeping links to international classification systems used for all kinds of protected areas. There is a clear distinction between *protected* forests and *protective* forests, as the first are especially dedicated to the conservation of

forest biodiversity, while protective forests are mainly managed for the protection of other natural resources, infrastructure and people. As comparability at the international level is a goal of the MCPFE Assessment Guidelines, terms and definitions used are in compliance with the TBFRA terminology.

Protected and protective forest and other wooded land have to comply to the following *general principles* in order to be assigned according to the MCPFE Assessment Guidelines:

- Existence of legal basis
- Long term commitment (minimum 20 years)
- Explicit designation for the protection of biodiversity, landscapes and specific natural elements or protective functions of forest and other wooded land "Explicit designation" in the context of these guidelines comprises both:
 - Designations defining forest and other wooded land within fixed geographical boundaries delineating a specific area, and
 - Designations defining forest and other wooded land not within fixed geographical boundaries, but as specific forest types or vertical and horizontal zones in the landscape.

Protected and protective forests and other wooded lands are grouped according to their main management objective. In addition, restrictions to interventions are used as distinguishing factors. As a result, five classes of protected and protective forest and other wooded land in Europe are defined. As far as possible these classes are associated to the respective Protected Area Management Categories of IUCN - The World Conservation Union. In addition, they are linked to the designation types used by EEA in its Data Base on Designated Areas. The intention is to establish proper linkages between the MCPFE Assessment Guidelines and these systems, which are used for all kinds of protected areas, as indicated in the table below.

MCPFE Classes		EEA*	IUCN**
1: Main Management Objective "Biodiversity"	1.1: "No Active Intervention"	A	I
	1.2: "Minimum Intervention"	A	II
	1.3: "Conservation Through Active Management"	A	IV
2: Main Management Objective "Protection of Landscapes and Specific Natural Elements"		B	III, V, VI
3: Main Management Objective "Protective Functions"		(B)	n.a.

Table 7.1 Classification of protected forests in Europe, developed by the ad hoc MCPFE working group as a co-operation project with COST E4, UN/ECE TBFRA 2000, EEA, IUCN, WWF, and COST E27 (PROFOR) .

* References as identified in the Standard Data Form of the Natura 2000 and Emerald networks, and used in the same way in the framework of the Common Database on Designated Areas (CDDA), managed by the EEA on behalf of two other organisations (Council of Europe and UNEP-WCMC). The groups (A, B or C) are related to designation types and not to individual sites.

** Indicative reference:

- The equivalence of IUCN Categories may vary according to the specific management objective (of the forested part) of each individual protected area. A technical consultation process with IUCN and its World Commission on

Protected Areas (WCPA) is underway to ensure full comparability between the MCPFE and IUCN systems.

- IUCN Categories III, V and VI have biodiversity conservation as their primary management objective. However, they fit more easily under MCPFE Class 2 than 1.

The area of forest and other wooded land assigned to the classes 1 and 2 should not be summed up with the data collected under class 3 to avoid double counting.

The individual classes of protected and protective forest and other wooded land are defined by the management objective and restrictions to interventions. Classes 1.1 and 3 are particularly relevant to the inventory and strategy for sustainable management and protection of virgin forests.

In Class 1.1., the main management objective is biodiversity. No active, direct human intervention is taking place, and activities other than limited public access and non-destructive research not detrimental to the management objective are prevented in the protected area.

In Class 3, the main management objective is “protective functions”. The management is clearly directed to protect soil and its properties or water quality and quantity or other forest ecosystem functions, or to protect infrastructure and managed natural resources against natural hazards.

Forests and other wooded lands are explicitly designated to fulfil protective functions in management plans or other legally authorised equivalents. Any operation negatively affecting soil or water or the ability to protect other ecosystem functions, or the ability to protect infrastructure and managed natural resources against natural hazards, is prevented

7.5. MONITORING, ASSESSING AND REPORTING PROGRESS ON OF SUSTAINABLE FOREST MANAGEMENT WITH QUANTITATIVE INDICATORS

Since the first set of Pan-European Indicators for Sustainable Forest Management had been developed in the early 90s, experience has shown that criteria and indicators are a very important tool for European forest policy. In the meantime knowledge and data collection systems as well as information needs have gradually developed further. Obligation for the monitoring of sustainable biological diversity has been stipulated early on by the MCPFE process. This obligation concerns all signatory states – including Romania - and the EC. Monitoring should be based on existing systems of recording, collection and processing of data on the status and trends of forest resources, i.e. on a system for permanent supply of data. The national reporting required from the participating countries shall include results of the monitoring structured according to the adopted indicators.

The MCPFE expert level meeting of 7-8 October 2002 adopted the Improved Pan-European Indicators for Sustainable Forest Management, which - according to the Vienna Declaration of 2003 - are to be applied for monitoring, assessing and reporting progress on sustainable forest management. The improved indicators are

linked to the six criteria for sustainable forest management adopted by the MCPFE in 1994. For virgin forest inventory, the criterion C 4: “Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems” and the criterion C 5: “Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water)” are of particular relevance. Those two criteria and related quantitative indicators are listed in Table 7.2.

Criteria	No.	Indicator	Full text
C 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems	4.1	Tree species composition	Area of forest and other wooded land, classified by number of tree species occurring and by forest type
	4.2	Regeneration	Area of regeneration within even-aged stands and uneven-aged stands, classified by regeneration type
	4.3	Naturalness	Area of forest and other wooded land, classified by “undisturbed by man”, by “semi-natural” or by “plantations”, each by forest type
	4.4	Introduced tree species	Area of forest and other wooded land dominated by introduced tree species
	4.5	Deadwood	Volume of standing deadwood and of lying deadwood on forest and other wooded land classified by forest type
	4.6	Genetic resources	Area managed for conservation and utilisation of forest tree genetic resources (in situ and ex situ gene conservation) and area managed for seed production
	4.7	Landscape pattern	Landscape-level spatial pattern of forest cover
	4.8	Threatened forest species	Number of threatened forest species, classified according to IUCN Red List categories in relation to total number of forest species
	4.9	Protected forests	Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE Assessment Guidelines
C 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water)	5.1	Protective forests – soil, water and other ecosystem functions	Area of forest and other wooded land designated to prevent soil erosion, to preserve water resources, or to maintain other forest ecosystem functions, part of MCPFE Class “Protective Functions”
	5.2	Protective forests – infrastructure and managed natural resources	Area of forest and other wooded land designated to protect infrastructure and managed natural resources against natural hazards, part of MCPFE Class “Protective Functions”

Table 7.2. MCPFE Improved Quantitative Indicators for Sustainable Forest Management linked to the Criteria C4 and C5.

With a view to the inventory and strategy for sustainable management and protection of virgin forests, as well as for their monitoring in general, the indicators of “naturalness” (4.3) and “protected forests” (4.9) under the biodiversity criterion (C 4) are of major relevance. Similarly, the indicators on “protective forests” under criterion C 5 are very relevant.

8. Conclusions

1. This project was the first project to map virgin forests on a national scale in Romania and for that reason a methodology fit to the subject had to be developed
2. On the European scale, mapping of virgin forest is new and the experiences obtained in this project can be used for other projects in Europe like the development of a set of criteria for identification and evaluation
3. The data from this project (GIS-database) can be used efficiently for the designation of Natura 2000 sites and the designation of protected areas in Romania
4. This project was executed at the same time that re-privatisation of forests came in discussion in the government. This source of information which was provided by the project could help the ministries to exclude important forest complexes from the privatisation process or to develop an exchange scheme/programme
5. During the project, several public awareness campaigns (workshops, conference, training courses, information movie, brochures and leaflets) were organised by the experts in the project and this contributed to a broad understanding of the importance of these forests in Romania
6. The project started up a systematic approach of forests research and the database within the project can be used as a reference document for further research. Monitoring research was established already by identification of monitoring plots in virgin forests
7. The completed GIS-database can be used by governmental bodies and ICAS will stimulate that process
8. The scale of the project was based on a use of the information on several levels: from preparation of forest management plans of individual sites till national plans for forest conservation and Natura 2000.
9. During the project the experts notified on standard forms the threats which could damage the forest in the future. This information is available also for inspection of forests and control of management
10. During the project the forest types had been documented also by pictures and additional information concerning rare plants and animals. This documentation delivers additional information over the functioning of the virgin forests
11. The strategy in the final report was presented during a national conference to stakeholders of GOs and NGOs and broadly accepted as a useful tool to set priorities for a follow up strategy of the project. The strategy gives a precise information about the objectives which have to be reached based on an extensive SWOT analysis. The output of the strategy is defined in products which support the protection of virgin forests and the necessary research input
12. The owners of virgin forests lose a substantial income because the virgin forests have no production function for wood. The natural production of this type of forests is limited to products like mushrooms and berries. In the strategy is included that a Compensation Fund for owners of virgin forest might be a solution for a sustainable, long term management which is fully supported by the forest owner. We propose that the idea of a Compensation

Fund for virgin forests should be brought in in the on going negotiations about funding possibilities for Nature 2000 sites and EU Rural Development Regulation. The inventory of VF forms a reliable basis for development of a forest exchange scheme/programme in negotiations between NFA and private owners.

13. Due to their extent and natural status, the Romanian virgin forests deserve international attention as an important part of the European natural heritage.
14. The project at hand strongly contributes to the MCPFE objectives for achieving a balance, at national level, between the economic, ecological, social and cultural roles of forests in the context of sustainable development in Romania.
15. The new classification system for forest protection adopted by the MCPFE process (Table 7.1 in chapter 7) recognizes three categories with different management objectives, namely: 1) protected forests safeguarding biodiversity, 2) protected landscapes and specific natural features, and 3) protective functions (for soil, water and natural hazards). This classification is innovative in the sense that – by recognizing the protective functions and the need for landscape conservation - it goes beyond the usual biodiversity conservation. It also takes a step towards harmonization, since the linkages to IUCN categories and the designation types used by the European Environment Agency (EEA) in its Data Base of Designated Areas were taken into account.
16. The project at hand contributes to the implementation of the Vienna Resolution 3: “Preserving and Enhancing the Social and Cultural Dimensions of Sustainable Forest Management in Europe”. Notably, the signatory states commit themselves, *inter alia*, to: identify, assess and encourage – in collaboration with relevant institutions - the conservation and management of significant historical and cultural objects and sites in forests/related to forests.
17. The project also contributes to the implementation of Vienna resolution 4. In particular, the ministerial commitment to the assessment and monitoring of forest biological diversity is well addressed.
18. With a view to the inventory and strategy for sustainable management and protection of virgin forests, as well as for their monitoring in general, criteria and quantitative indicators are of major importance. Among the MCPFE indicators (see Table 7.2 in chapter 7), “naturalness” (4.3) and “protected forests” (4.9) under the biodiversity criterion (C 4) are relevant to this project, in which the degree of naturalness was chosen as a main criterion for the selection of virgin forests. Furthermore, the indicators “tree species composition” (4.1) and “deadwood” (4.5) are well reflected by the selection criteria adopted by the project. Finally, the indicators on “protective forests” under criterion C 5 are very relevant.
19. The project provides up-to-date data for the reporting of national level progress within various mandatory international instruments, notably the CBD, IPF/IFF and UNFF.

Ecological network of virgin forests

The forest vegetation map of Romania, produced by the GIS and remote sensing team of ICAS, gives a clear survey of the PINMATRA polygons of virgin forest.

In some parts of the Carpathian Mountains, mostly in high altitudes, they form large continuous areas. In such areas it can be expected that the characteristic biodiversity of the virgin forests will be conserved in a sustainable way.

In lower altitudes, the spatial connectivity is often less favorable than in the higher altitudes. Since the map shows where this is the case, it is possible to investigate the places with virgin forest that are at risk to lose their specific biodiversity at the long run. To prevent this loss of species and consequently the loss of ecosystems, restoration of the connection is an effective solution of the problem.

The PINMATRA map makes it possible to develop the most effective network of connections. Therefore two questions will have to be answered.

1. What is the size of the ecological minimum area of the involved forest ecosystem types?
2. What is the maximum gap that can be bridged by their characteristic species?

These two questions must be answered for each ecosystem type that is found in the virgin forests of Romania.

With this knowledge it is possible to give priority to the conservation of those virgin forests that meet with the size of the ecological minimum area.

The next step is, to design and manage in the proper way the ecological connection between these large size forests, with small woodlands in their neighborhood that do not have the minimum area, and are situated in a distance larger than the gap that the species can bridge. In case of dying out of species in small woodland, the connection makes new immigration possible, coming from the large forest.

For the same reason, a number of small woodlands can be connected with each other, even in the absence of a forest with the size of the minimum area or larger. Genetic exchange and repopulation are then possible, which is essential for sustainable existence of the virgin forest ecosystems.

The most effective ecological network can be designed by means of the information that has become available with the PINMATRA polygon map and the ecosystem specific answers on the two above mentioned questions.

Such action would also reveal the parts of Romania where the existing situation meets with the ecological conditions required for sustainable conservation of virgin forest biodiversity. Such parts do not need extra connectivity measurements.

Jacques de Smidt, member of expert team

Ancient woodland and biodiversity

- The last remnants of virgin forest are mainly to be found in the upper montane zone. Lowland virgin forest, of which a small area still exists in the Danube delta, is extremely rare. Of the several types of ecosystems that have been preserved the main ones are beech forest types, conifer zone types and mixed types. Ecosystems that are similar to oak, lime, ash, elm and willow forests have vanished virtually everywhere in Romania like this happened all over Europe. These are the forest types found in the lowlands, more accessible from the sites where man established dwellings since prehistoric times. Almost all natural woodland of the lower montane and lowland zones has been, or is still being, exploited over the last 8,000 years.
- Part of this area remained woodland, although it was no longer pristine forest since its wood was regularly harvested. This type of forests is called ancient woodland. This really is a mix of natural and culturally influenced woodland since it is used as coppice wood in a variety of cycles, or for grazing cattle (Hudewald). These forests escaped destruction because of exactly this economical importance.
- However, these types of forest are still immensely valuable, for they contain gene pools of autochthonous, original trees and shrubs, and hence they contribute to biodiversity.
- Here, the offspring of populations that used to exist in the former pristine forest is found, such as several species of *Quercus*, *Fraxinus*, *Tilia*, *Salix*, *Ulmus*, *Carpinus*, *Ostrya*, *Acer*, *Crataegus*, *Prunus*, *Cornus*, *Rhamnus*, *Staphylea*, *Rosa* and *Rubus* and other genera.
- After the Ice Age, species migrated to the north, using this plentiful area as their base. However unique the virgin forests of Romania may be, they comprise only a part of the entire woodland biodiversity.
- Therefore, it is a crucial matter that we pay due attention to these ancient forests, in view of recent dangers of extinction. Moreover these forests should be mapped with respect to the species they contain, and the most important parts should be acquired to preserve them for the future.

Bert Maes, member of expert team

ANNEX 1 : Map Virgin Forests of Romania

ANNEX 2: Field forms used for inventory of virgin forests (3 sheets)

FIELD FORM
for the identification and selection of virgin forests

General data:

Researcher name:		Date:	
Code of the topographical plan:		Range code:	
<i>Territorial administrative status:</i>			
Forestry Branch		Forestry District	
Production Units (PU):		Management planning unit (MPU)	
PU:		MPU	
PU:		MPU	
Surface :		G.F.	Sg.F.
Protection status (PN, RN, NP)		Protection area name:	
Natural background:			
Relief shape:		Altitude min.	Altitude max.
Substratum:		Soil types:	
Phytoclimatic layers:		Forest formations:	

A. CRITERIA AND INDICATORS FOR SELECTION OF VIRGIN FORESTS

YES NO

A1 Naturalness (authenticity):

- | | | |
|---|--------------------------|--------------------------|
| A11 if the phytocoenosis is formed of local/site-specific species | <input type="checkbox"/> | <input type="checkbox"/> |
| A12 if there are specific animal species (from information and own observations) | <input type="checkbox"/> | <input type="checkbox"/> |
| A13 if there are no signs of human influence | <input type="checkbox"/> | <input type="checkbox"/> |
| A14 if the ecosystems have complex structures and different development stages on small areas | <input type="checkbox"/> | <input type="checkbox"/> |
| A15 if dead wood occur, standing or on the ground | <input type="checkbox"/> | <input type="checkbox"/> |

A2 MINIMAL SURFACE

- | | | |
|--|--------------------------|--------------------------|
| A21 if the range area with virgin forests (without the sections which do not respond to the selection criteria) is larger than 10 ha | <input type="checkbox"/> | <input type="checkbox"/> |
|--|--------------------------|--------------------------|

A3 DIVERSITY IN TREE AGE AND OCCURRENCE OF TREES WITH EXCEPTIONAL DIMENSIONS

- | | | |
|--|--------------------------|--------------------------|
| A31 if there is a diversity in ages | <input type="checkbox"/> | <input type="checkbox"/> |
| A32 if there are trees with exceptional dimensions | <input type="checkbox"/> | <input type="checkbox"/> |

A4 Natural limits

- | | | |
|---|--------------------------|--------------------------|
| A41 if the forest has natural limits at least partially | <input type="checkbox"/> | <input type="checkbox"/> |
|---|--------------------------|--------------------------|

FIELD FORM for the ecological evaluation of virgin forests

General data:

Researcher name:		Date:	
Code of the topographical plan:		Range code:	
<i>Territorial administrative status:</i>			
Forestry Branch		Forestry District	
Production Units (PU):		Management planning unit (MPU)	
PU:		MPU	
PU:		MPU	
Surface :		Functional group	Functional subgroup
Protection status (PN, RN, NP)		Protection area name:	
Natural and vegetation background:			
Relief shape:		Altitude min.	Altitude max.
Substratum:		Soil types:	
Phytoclimatic layers:		Forest formations:	
Vegetal associations:			

B. CRITERIA AND INDICATORS FOR THE ECOLOGICAL EVALUATION OF VIRGIN FORESTS

B.1. 1st degree evaluation criteria

B11 Naturalness degree (*is assessed according to the indicators A11-A15*):

5	4	3	2	1
fulfills naturalness indicators A11-A15	fulfills indicators A11-A14	fulfills indicators A11-A13	fulfills indicators A11-A12	fulfills indicator A11

B12 Range area:

5	4	3	2	1
range area over 1 000 ha	range area between 500-1000 ha	range area between 100-500 ha	range area between 10-100 ha	range area between 0,5-10 ha

B13 Age (*is assessed according to the indicators A31-A32*):

5	4	3	2	1
all ages are present, including dead trees	there are 4 age elements including dead trees	there are 3 age elements including dead trees	there are 2 age elements including dead trees	there is 1 age elements including dead trees

B14 Natural range limits (*is assessed according to the indicators A41*):

5	4	3	2	1
all the limits are natural	at least 75% of the limits are natural	at least 50% of the limits are natural	at least 25% of the limits are natural	at least 10% of the limits are natural

B.2. 2nd degree evaluation criteria:

B21 Representativity (of the forest for the ecological region unit) (*in conformity with the „Ecological zoning and regioning of forests in Romania”, Doniță et al., 1980*):

5	4	3	2	1
all the area representative	75-99 % of the area representative	50-74 % of the area representative	25-49 % of the area representative	Below 25% of the area representative

B22. Biological and ecological diversity (*is assessed by the indicators presented below*):

B22a Biological diversity: Number of plant species (*only the superior plants are taken into account – ferns, spermatophyte*):

5	4	3	2	1
over 100 sp	76 – 100 sp	51 – 75 sp	26 – 50 sp	below 26 sp

B22b Biological diversity: Number of endemic, relict, rare plant species (*assessed according to the „Red list” of plants from Romania existing in the forest ecosystems – Annex 6*):

5	4	3	2	1
over 10	6 – 10	3 – 5	1 – 2	nothing

B22c Ecological diversity: Number of ecosystem types (*assessed according to the ecosystem types presented in the „Types of forest ecosystems in Romania”, Doniță et al., 1990; Annex 5*):

5	4	3	2	1
over 10 types of ecosystems	6 – 10 types of ecosystems	3 – 5 types of ecosystems	1 – 2 types of ecosystems	Only one ecosystem type

B22d Ecological diversity: Number of habitat and microhabitat types (*assessed according to the number of existing habitat types – See the Methodological guide*):

5	4	3	2	1
More than 20 types	11 – 20 types	6 – 10 types	3 – 5 types	1 - 2 types

B23 Impact and intensity of threats and dangers related to the forest structure and functioning (*assessed according to the frequency and intensity of the present risk factors / see Chapter 4.2.2. from the Methodological Guide*):

5	4	3	2	1
insignificant	weak	medium	strong	Very strong

B24 Continuity of the forest in time for that range (*assessed according to the phytogeographic data, existing historical documents, etc.*):

5	4	3	2	1
very high: millenary	high: 500-1000 years	middle : 300 – 500 years	low : 100- 300 years	very low : less than 100 years

B.3. 3rd degree evaluation criteria:

B31 Number of protected and endangered species (*assessed according to the number of species with a regulated protection status – Annexes 6 and 7*):

5	4	3	2	1
over 10	6 – 10	3 – 5	1 – 2	no species

B32 Degree of knowledge on that forest (*assessed according to the data and information existing about a certain forest – the forest management plan ensure a degree of knowledge of about 25-30% about a forest*):

5	4	3	2	1
100% unknown	75% unknown	50% unknown	25% unknown	10% unknown

B33 Existence of an educational means (assessed according to the biological diversity indicators: number of plant and animal species; rare, endemic, relict, endangered species; species with a protection status; number of ecosystem types; number of habitat types; occurrence of special ecosystems and habitats; landscape value):

5	4	3	2	1
very good offer	good offer	sufficient offer	low offer	very low offer

B34 Gene banks (assessed according to the number of species and their phylogeographic and biohistorical importance):

5	4	3	2	1
very rich	rich	middle rich	poor	very poor

B.4. 4TH DEGREE ASSESSMENT CRITERIA:

B41 Accessibility (assessed according to the existing transportation ways and accessibility):

5	4	3	2	1
very difficult	difficult	relatively difficult	relatively good	good

B42 Land features (assessed according to the slope inclination, occurrence of steep rocky area, rocks at the surface, etc.):

5	4	3	2	1
very uneven (slopes over 45°)	uneven (slopes 30-45°)	relatively uneven (slopes 15-30°)	slightly uneven (slopes 10-15°)	even (slopes below 10°)

B43 Stability of the development and balance of the natural processes in the ecosystem (assessed according to the capacity of the ecosystem of self-regulation, absorption, resistance and restoration due to disturbing factors):

5	4	3	2	1
very stable and balanced	stable, balanced	relatively stable and balanced	slightly stable and balanced	unstable, unbalanced

B44 Occurrence of buffer and transition areas (assessed according to the size and efficiency of the areas taking the impact between the range area with virgin forests and the neighboring areas supporting destabilizing activities):

5	4	3	2	1
there are buffer areas on more than 75% of the perimeter	there are buffer areas on more than 50-75% of the perimeter	there are buffer areas on more than 25-50% of the perimeter	there are buffer areas on more than 10-25% of the perimeter	there are buffer areas on less than 10% of the perimeter

**FIELD FORM
for describing the forest ecosystem**

Ecosystem type (ET)

Code:	Name:
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General data

Researcher name:	Date:	
Code of the topographical plan:	Range code:	
<i>Territorial administrative status:</i>		
Forestry Branch	Forestry District	
Production Units (PU):	Management planning unit (MPU)	
PU:	MPU	
PU:	MPU	
Surface :	Functional group	Functional subgroup
Protection status (PN, RN, NP)	Protection area name:	
Natural and vegetation background:		
Relief shape:	Altitude min.	Altitude max.
Exposure:	Inclination:	
Substratum:	Soil types:	
Phytoclimatic layers:	Forest formations:	

Stand:

Species	Proportion	Canopy cover	Age	Mean height	Mean diameter	Productivity category	Total volume

Substand:

Species	Proportion	Mean height	Coverage	Species	Proportion	Mean height	Coverage

Herbaceous layer:

Species	Coverage	Species	Coverage

