RESEARCHES ON TYPES OF FOREST ECOSYSTEMS IN THE CRISUL NEGRU LOW PLAIN

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Abstract

The identification and description of types of forest ecosystems on smaller geographical units, from the level of landscapes (landschaft), in order to establish the ecological specificity within a certain territorial unit and the establishment of some sustainable management measures, gives the forest typology a strong regional feature.

Key words: forest typology, forest ecosystems, *management measures,* sustainable forestry

INTRODUCTION

Forest typology evolved from the necessity of differenciating management measures of the forests according to composition, structure, productivity, features of the stands ie after their eco-systemical features.

Forest typology have a strong geographic features because different forest types cannot be determined solely on the large areas where the repetability of some biocoenosys is evident, determined according to some species which occupying a certain ecotop.

The aim of the study was to establish the types of forest ecosystems from the Low Plain of Crisul Negru river and to esteblish the state of these ecosystems in order to fiind the best management solution for a sustainable use but preserving and conservation of the optimum biodiversity of the forest. The aim of the research was also the scientific fundamentation very usefull both in forest management and in applied forestry in order also to fiind the best management solutions for a sustainable use.

STUDY AREA - Physical and bio-geographical conditions

The Crisul Negru Plain and Tasadului Hills are located within Bihor county, having the following mathematical co-ordinates: 46°39’ and 46°55’north latitude and 21°30’ and 22°5’ east longitude, being located in the lower basin of Crisul Negru river.

From ***structural point of view*** the area belongs to tha Pannonian Basin. The lithology is diverse and vary from west to east and is the result of the evolution of the Pannonian lake during the Quaternary and the

evolution of the crystalline base. In the vicinity of Tinca, the cristallyne base is close to the surface (150 m depht) but it sunk at about 1000 m westward because of the existence of some faults.

The pannonian deposits covers the entire study area and are represented by clays sandy clays, marly clays, sands, marly sands and sandy marls. A significant percentage is covered by the red clay deposits which could be found at the edge of the plain, at about 120-130 altitude. From this area, during the Quaternary, the red clay was removed by the erosion and re-deposited in lower areas.

The existence of the red clay is debated among geographers for a long time. There are two main hypothesis related to the red clay: according to the first hypothesis, the red clay is an elluvial product, generated by the alteration of pannonian clays; the other main hypothesis consider the red clay as a result from the aeolian dust deposited during warmer periods, dust from which loess was formed in those warmer areas (Posea, 1997, Mahara, 1977). The red colour is given by the high content of iron hydroxide. The red clay is an deluvial deposit, with an extremely low content of carbonate and with a significant fraction of gravel inside the clay. Westward, the lithology is represented by loess deposits consisted of yellow sandy dust with some limestone concretions. At the contact area with the hills, large alluvial fans could be found, consisted of gravels, sandy clays, with a thickness from few meters to tens of meters.

The alluvial deposits situated upon the fluvial terraces are consisted of gravel and sand having a thickness of 5-10 m and were deposited during the entire Holocene.

From ***geomorphological point of view*** one could notice three main relief steps: Low plain, High plain and Low hills.

The existence of these three relief steps is decisive upon the evolution of the forest stands.

The main feature of the Low plain is given by the flatness of the plain, which was formed along the old, abandoned, traces of Crisul Negru and Crisul Alb rivers. It is crossed by numerous shallow meanders of the rivers (3-5 m) with sand banks along these meanders. In the low areas there are numerous marshes. This plain sector is covered by thin loess deposits.

The only large floodplain is of Crisul Negru river with thick, fine alluvial deposits usually with a low content of carbonates. Because of the fact that the river is for more than a 100 year banked, the recent alluviums are missing, the soils being in an advanced state of evolution.

The hidrography is based on the main river of the study area - Crisul Negru river which emerges from Bohor Mountains and collect its tributaries from Padurea Craiului and Codru Moma Mountains and from Tasadului Hills. From the plain area, the river has no tributaries excepting

some small brooks whick dry aut during summer period (Valea Mociar, Valea Gurbediu, Valea Călacea).

The groundwater level is relatively high (3-5 m) but during heavy rainfalls could reach the surface causing temporary marshes and the gleysation of the soils.

On the high plain the depht of the groundwater is about 8 m. but because of the presence of the clay horisont could form suspended groundwater located at about 1-2 m from the surface causing the gleysation of the soils.

The general climatic elements reflects the geographic location of the study area, the influence of the relief parameters and the local conditions. From climatic point of view the study area is relatively warm and wet, the precipitation being relatively evenly distributed during the year (around 600 mm/year) but with some small differences between the low plain and the high plain, at the contact with the hilly area.

The climate of the study area could be included into the Cfax formula (Kopen classification system) stating that within this type of climate there are also specific microclimates, under the influence of local factors, these influences being observable also in the structure of the vegetation.

MATHERIAL AND METHOD

The description of the forest ecosystems was made based on collected field data. In order to analyse the collected data were used different softwares such as Excel, ArcGis.

The forest ecosystems were analysed according to **location** within the sudy area; **the features of the ecosystem type**: surface area, geographical paramaters (average altitude, altitude range); relief forms: types, inclination of the slopes, slope expozition, lithology, soil types ans subtypes; the description of the stands, the description of the herbaceous layer; the **correspondance with**: types of forests, types of stations, plant associations, types of habitat, **present state of the stands and management measures (particularities)**: main features, distribution accordin age classes, the source of main elements, natural regeneration, productivity classes, manegement measures, **ecological limitative factors**.

RESULTS AND DISSCUSIONS

The following are types of forest ecosystems:

TYPE OF ECOSYSTEM: 6117 High and medium height productive Oak tree, with mull, on moist brown and redish brown soils, gley, optimal hydric with Rubus - Aegopodium.

Subtypes: 61171 high productive subtype; 61172 mid productive subtype

Spread: this type of ecosystem is spread (represented) exclusively on low plain. It could be found on high and low floodplain of Crisul Repede river, on out of flood or rarely flooded areas (Donita et al., 1990) and on the low plains of Crisul Negru river. All forests belonging to this type could be found on flat relief forms within U.P. I (100%) – Lunca, Trup Avram Iancu, Trup Batăr areas.

Main features of the ecosystem type within the searched area:

Total surface: 265.4 ha.

Stations:

Mean altitude 106 m (height variation range 92-110 m);

relief: high flood plain (81,4%); low plain (15%); low flood plain (3,6%);

slope features – flat areas (100%);

slope expozition - (100%);

lithology: sand and gravel;

soil types and subtypes: 0414 – gley luvisoil (56,7%), 0423 - molic – gley soil (32,3%), 3107 - Gley Eutricambosoil (10%), 7202 - Gley eutric soil(0,7%), 7204 - Molic gley soil (0,3%);

Composition of the arboretum: high percentage of *Quercus robursometimesc mixed with Fraxinus angustifolia diseminat;* within the dominant level *Acer campestre, Carpinus betulus, Ulmus procera, Acer tataricum, Pyrus pyraster*, from few specimen upt to facies percentage, covering 20-40% from total surface.

The composition of the stands: *Crataegus monogyna*, *C. laevigata, Rubus caesius, Sambucus nigra, Cornus sangvinaea, Evonimus europaeus, Prunus spinosa, Rosa canina.* Rarest appear *Corylus avellana* şi *Staphylea pinnata.* Among liana species one could find *Hedera helix* and *Clematis vitalba. Acer campestre, Carpinus betulus şi Acer tataricum* could be found within the subarboretum too, with a coverage of 40%-50% of overall surface.

Subarboretum is well developed, by the compactness of the two levels of the arboretum; could reach a degree of coverage of 80%-90% of surface, with a high capacity of coverage in the absence of the arboretum (Doniţă et al., 1990).

Compozition of herbaceous layer: *Galium aparine, Pulmonaria officinalis, Brachypodium sylvaticum,Geum urbanum, Dactilis polygama, Poligonatum multiflorum, P. latifolium, Allium ursinum, Aliaria officinalis, Stachys sylvatica, S. officinalis, Ranunculus ficaria, Veronica hederifolia, V. chamaedris, Ajuga reptans, Fragaria viridis, Carex divulsa, C. remota, C. echinata, C. sylvatica, Poa nemoralis, Anemone nemorosa, A. ranunculoides, Viola odorata, V. hirta, V. reichenbachiana. În pâlcuri mici mai pot fi întâlnite Lysimachia nummularia şi Polygonum hydropiper.*

The herbaceous layer is unevenly spread, with a 10% rate of coverage, in case of heavy shading of dominant levels. In case of a reduced development of the IInd tree level, the herbaceous layer is evenly spread, having even 90% rate of coverage.

Correspondences with:

Forest type: **6122** – Oak tree forests from meadow and plain (s) (33,3%); **6321** – Mixed oak trees from the floodplain (s) (3,6%); **6324** - Mixed oak trees from the flood plain with a medium productivity (m) (63,1%);

Types of stations: **8511** – Mixed forest situated on floodplain Pm, gley or half gley brown moist soil, edaphic medium-high (53,4%); **8512** – Mixed floodplain forest Ps,

Gley or half gley brown moist soil, edaphic high (36,9%); **9641** – Mix grass tree area, moist gley soil, save from floods or rarely flooded (9,7%);

Plant associations : *Quercetum roboris banaticum* Borza '62;

Type of habitat: R4404 – danubian and pannonian meadow forests with oak trees, *(Quercus robur*), ash trees *(Fraxinus sp*.) and elm trees (*Ulmus sp*.) with *Festuca gigantea*;

Types of corresponding forests: 6122 - Meadow oak trees from the plain area (s) (33,3%); **6324** - Mixed meadow oak trees with medium productivity (m) (63,1%);

Types of corresponding stations: 8511 - Mixed meadow plain forest Pm, brown gley or half gley moist, edaphic medium-high (53,4%); **8512** - Mixed meadow plain forest Ps, brown gley or half gley moist, edaphic high (36,9%);

The present state of the arboretum and management measures (particularities):

Mai features of the analyzed stands (u.a. 39B, U.P.I): age 110 years. Present composition – 10 st; consistency – 0.6; h_m – St 35,2 m; d_m – St 48,04 cm; coverage surface – 37.98 sqm/ha; number of trees per hectar – St 200 separated according to species, diameter categories); the three dimensional and plan representation of the canopy is shown

Distribution according to age range: 3,5% (0-5 years); 27,8% (5-10 years); 33,5% (10-20 years); 6,4% (20-40 years); 11,2% (40-80 years); 17,6% (over 80 years).

Source of main stand elements:

Element	**Oak**	
	Surface (ha)	Percentage (%)
Natural seeding	46,8	25,2
Sprout	7,1	3,8
Plantation	117,2	63
Artificial seeding	14,8	8
Total	185,9	100

Natural regeneration through seeding: The oak trees regenerates well through natural seeding although it fructify rarely because of other species elm, hormbeam trees and shrubs which rapidly invades the clearings opend for regeneration cuts; the lack of sunlight eliminates very quickly the seeds;
The productivity classes of main stand species: oak cl II 41,8%; oak cl III 58,2%;
Management measures for different age classes: 0-5 years - the cleansing cuts of natural regenerations and/or carefully made plantations, 5-10 years – the elimination of other species excepting oak tree and the favoring of the maple tree. It is compulsory to keep the secondary species (with the help of maple, hornbeam, elm wild peach trees in order to create an sublevel); 10-20 years - mixture proportioning for Oak by cleansing; 20-40 years – designation of the most viable trees mainly oak trees and the elimination of other unwanted species mainly ash tree; 40-80 years – the continuation of oak trees advance using cleansings around oak trees but keeping the area close; over 80 years – cleansing cuts;
Indicated composition: 8-9 oak trees 1-2 maple, 1 Dt. (hornbeam, elm, wild pear);
Other management measures: the introduction among the primary species of different other species (secondary species), the recommended species being maple tree and/or the a second tree level by adding oak. Are compulsory activities of helping natural regeneration in the years when fructification is abundant. The trees which emerges from sprouts will be gradually turned (through natural regeneration, if the trees are in their mature, fructification period). In case of allochthonous and unwanted species (acacia, red oak, hybrid poplar, common nut trees) is recommended the ecological reconstruction of the fundamental, natural ecosystem replacing the non native species with other, native species, adapted to local stations. The only exception is the American black nut tree, which appears in pure forests and, in case of favorable conditions the growth rate is very good and the quality of the wood is also very good (Moțiu P.T., 2004);
Restrictive ecological factors: moist vernal soil (for short periods) and sometimes, in case of an improper water supply, with a humidity level at the limit of plant (in the second part of vegetation period);
TYPE OF ECOSYSTEM: 6514 Ash and elm trees – oak tree with medium productivity, chernozem and brown soil, safe or rarely flooded, well balanced from hydric point of view, with Glechoma-Geum.
Subtypes: 65142 subtype, medium productiv
Spread: this type of ecosystem is spread (representative) exclusively in the low plain. Could be found on the high floodplain of Crisul Negru river, on unflooded or rarely flooded areas (Doniță et al., 1990). All the arboretum

types are commom on flat plain areas and this forest ecosystem could be found in U.P. I (100%) - Cighid Vest, Cighid Est areas.

Main feature of the ecosystem:

Surface: 197,3 ha.

Stations: Mean altitude 96 m (height variation range 93-107 m);

relief:- high floodplain (100%); according to slope inclination - flat (100%); according to slope exposition – flat (100%);

lithology: gravel and sand;

soil types and subtypes: 0414 – gley alluvial soil (81,7%), 0423 - Alluvial molic – gley soil (4,8%), 3121 - Molic gley eutricambosoil soil (13,5%);

Compozition of the arboretum: within dominant level *Quercus robur* and *Fraxinus angustifolia* in variable proportions together with *Acer campestre* up to 20%from total surface 20% and also with Quercus cerris and Prunus avium; within dominant level *Carpinus betulus, Acer campestre, Fraxinus angustifolia, Ulmus procera, Pyrus pyraster* (rare specimens), with a percentage up to 50%-70%. *Carpinus betulus and Acer campestre* are represented together;usually yhe hornbeam is the dominant species. *Fraxinus angustifolia* is present in the Iind level in all cases.

Compozition of the stands: *Crataegus monogyna*, *C. laevigata, Rubus caesius, Cornus sangvinaea, Ligustrum vulgare, Lonicera xylosteum Corylus avellana* and *Staphylea pinnata. Hedera helix* şi *Tamus communis* are common liana species.

Acer campestre, Carpinus betulus, Ulmus procera are present within the subarboretum level covering between 5%-20% of total surface; *Acer tataricum* is rare within this forest level. The subarboretum is well represented being even compact (Donita et al., 1990) in some areas depending on the consistency of the two levels of the arboretum with a coverage percentage between 10%-40%. It has a high capacity of land occupation in the absence of arboretum, strongly compiting seeded elements.

Compozition of herbaceous layer: *Geum urbanum, Pulmonaria officinalis, Brachypodium sylvaticum, Dactilis polygama, Poligonatum latifolium, Galium molugo, G. aparine, Scrophularia nodosa Allium ursinum, Stellaria holostea, Sanicula europaea, Poa nemoralis, Lathyrus niger, Viola reichenbachiana, V. odorata, Ranunculus ficaria, Carex sylvatica, C. divulsa, Fragaria vesca* and sometimes *Anthriscus sylvestris,Galium odoratum, Moehringia trinervia, Millium efusum.* The herbaceous layer is very uneven usually having a mosaic like distribution, covering 10%-20% of the total surface.

Correspondence with:

Forest types: **6321** – Mixed meadow oak trees (s) (4,8%); **6324** - Mixed meadow oak trees with medium productivity (m) (95,2%);

Types of stations: **8511** – Mixed meadow plain forest Pm, gley of mid-gley moist brown soil, medium-high edaphic (10%); **9641** – Forest steppe – mixed meadow Pm, gley moist alluvial soil, rarely flooded (85,2%); **9642** – Forest steppe – mixed meadow Ps, gley moist alluvial soil, rarely flooded (4,8%);
Plant associations: *Querco-Ulmetum* Issler 24; *Fraxino (pallisae-angustifoliae) - Quercetum roboris (*Popescu et al 1979).
Types of habitat: R4404 – pannonian and danubian mixed meadow forests with oak trees (*Quercus robur*), ash trees (*Fraxinus sp*.) and elm trees (*Ulmus sp*.) with *Festuca gigantea.*
Present state of the stands and management measures (particularities)
Main features of the analized stands (u.a.11B, U.P.I): aga 70 years; present day composition – 6 oak 2 maple 2 hornbean; consistency – 0,8; h_m – oak 34,7 m, maple 17,4 m, hornbean 16,6 m, ash 20 m; d_m – oak 35,82 cm, maple 17,83 cm, hornbean 18 cm, ash 20 cm; base surface – oak 26,84 sqm/ha, maple 2,70 sqm/ha, hornbeam 2,13 sqm/ha, ash 0,13 sqm/ha ; volume – oak 435,85 m^3, maple 24,79 m^3,hornbeam 20,04 m^3 , ash 1,17 m^3; number of trees/hectar – oak 260, maple 96, hornbeam 80, ash 4
Distribution according to age range: 1,7% (0-5 years); 17% (5-10 years); 2,6% (10-20 years); 2% (20-40 years); 59,3% (40-80 years); 17,4% (over 80 years).

Source of main stand elements:

Element	**St**		**Fr**	
	surface (ha)	percentage (%)	surface (ha)	percentage (%)
Natural seeding	7,8	5	-	-
Sprout	19	12	3	12,3
Plantation	28,2	17,9	8,3	34
Artificial seeding	102,5	65,1	13,1	53,7
Total	70,7	100	46,8	100

Natural regeneration through seeding: the oak and ash trees regenerates well through natural seeding, the oak tree regeneration is embarrassed by other species such as ash, hornbean, common maple, elm trees and also by shrubs and undergrowth species (hawthorn). The competition is fierceand the shadding of the shrubs very quickly eliminates the seed of the forest species.
Productivity classes of the main arboretum species: oak cl II 4,1%; oak cl III 95,8%; oak cl IV 0,1%; ash cl II 10,7%; ash cl III 89,3%;
Management measures for different age classes: 0-5 years – thinning of natural regenerations and/or carefully made plantations; 5-10 years – thinnings of other species excepting oak trees but just in case of necessity

favoring the common maple and ash trees. Is compulsory the preservation of secondary species (helping species): common maple, hornbean, elm trees in order to create a sublevel; 10-20 years - mixture proportioning in favor of oak tree with the help of thinnings; 20-40 years – the selection of the most vigorous oak trees and the elimination of the ash and hornbeam trees during thinnings; 40-80 years - the continuation of oak trees advance using cleansings around oak trees but keeping the area close; over 80 years – cleansing cuts;
Indicated composition: 6-7oak 2-3ash 1-2maple 1 Dt (hornbeam, elm, acacia, wild pear)
Other management measures: maintenance and promotion of stand composition of some secondary species (preferable common maple tree) and/or of a second tree level, by adding oak trees. Are compulsory activities which helps natural regenerations in the years of abundant natural fructification at oak trees The stands derived from sprouts will be gradually converted with natural regeneration (if the stands are at fructification age).
Limitative ecological factors: moist vernal soil (for short periods) and sometimes, in case of an improper water supply, with a humidity level at the limit of plant (in the second part of vegetation period);

TYPE OF ECOSYSTEM: 6517 Ash, elm trees, oak trees, tall, medium productive, with mull, on mid basic brown soils, cambic and gley marshs oils, mid basic, hydric optim, with Rubus caesius-Galium aparine.
Subtypes: 65171 high productive subtype subtip înalt productiv; 65172 mid productive subtype
Spread: this type of ecosystem is spread (representative) exclusively in the low plain. Could be found on the high floodplain of Crisul Negru river, on unflooded or rarely flooded areas (Doniță et al., 1990). All the arboretum types are commom on flat plain areas and this forest ecosystem could be found in U.P. I (100%) - Lunca, Frăsinet, Lola areas.
Main feature of the ecosystem:
Surface: 139.2 ha.
Stations:
mean altitude 100 m (height variation range 97-110 m);
relief: - high flood plain (95,8%), low floodplain (4,2%); according to the degree of inclination - flat (100%); according to the slope exposition - flat (100%);
lithology: red clay, gravel, sand,

soil types and subtypes: 0423 – gley molic alluvial soil (12,5%), 3107 – Gley Eutricambosoil (1,5%), 7202 - Gley eutric soil (79,7%), 7204 - Molic gley soil (6,3%);

Composition of the stands: within the dominant level *Quercus robur* and *Fraxinus angustifolia* in variable proportion; within dominant level *Acer campestre, Ulmus procera,* from few individuals to facies proportion, with a degree of coverage of 5%-30% from total surface. *Fraxinus angustifolia* is present within the second level in most cases; *Carpinus betulus* is very rare, just in cases when stationary conditions are suitable (improvement of soil aeration).

Composition of the subarboretum: *Rubus caesius, Crataegus monogyna*, *C. laevigata, Cornus sangvinaea, Evonimus europaeus, Sambucus nigra, Ligustrum vulgare, Prunus spinosa, Rosa canina, Staphylea pinnata, Corylus avellana.* In some cases the lianas are quite frequent: *Hedera helix, Clematis vitalba, Humulus lupulus* within the high productive subtype; Acer campestre and Acer tataricum also could be found in these situations. The subarboretul is relativel well developed by the consistency of the two arboretum levels and could cover up to 40%-60% from total surface.

Composition of the herbaceous level: *Galium aparine, Carex brizoides, C. pilosa, Festuca gigantea,Circaea lutetiana, Cruciata laevipes, Anthriscus sylvestris, Dentaria bulbifera, Geum urbanum, Lysimachia nummularia, Urtica dioica;* these species are characteristic for the ecosystem. The species differenciated for the mid productive subtype are: *Cruciata laevipes, Deschampsia caespitosa, Agrostis stolonifera, Calamagrostis epigeios, Euphorbia amigdaloides, Centaurium umbelatum, Symphitum officinale, Agrimonia eupatoria*. For the high productive subtype the species are: *Allium ursinum, Pulmonaria officinalis, Poligonatum latifolium, Ranunculus ficaria, Stachys sylvatica, S. officinalis, Alliaria petiolata, Anemone nemorosa, A. ranunculoides, Geranium robertianum, Glechoma hederacea, Veronica chamaedris, Viola odorata, Taraxacum oficinale, Lamium galeobdolon, L. maculatum, Carex sylvatica, C. remota, C. divulsa, C. echinata.*

The herbaceous layer is evenly, well developed, having a coverage rate of 50%-100%. Because of the relatively low development of the IInd level of the trees, the degree of illumination is high within the lower levels: in the areas where the shrubs are missing, the herbaceous layer is evenly spread, with a degree of coverage of 100%.

Correspondences with:

Forest type: **6122** – meadow oak forests from plain areas (s) (4,9%); **6321** – mixed meadow oak forests (s) (9,1%); **6324** - mixed meadow oak forests with mid productivity (m) (86%);

Type of stations: **8512** – Plain meadow mixed forest Ps, brown phreatic gley and half gley soils, edaphic high (14%); **9641** – forest steppe – mixed meadow forest Pm, moist gley phreatic soil, save from floods or rarely flooded (79,7%); **9642** – forest steppe - mixed meadow forest Ps, phreatic moist soil, save from floods or rarely flooded, very profound (6,3%);
Plant associations: *Querco-Ulmetum* Issler 24; *Fraxino (pallisae-angustifoliae) - Quercetum roboris (*Popescu et al. 1979);
Type of habitat: R4404 – pannonian and danubian mixed meadow forests with oak trees (*Quercus robur*), ash trees (*Fraxinus sp*.) and elm trees (*Ulmus sp*.) with *Festuca gigantea.*

Present state of the stands and management measures (particularities)

Distribution according to age range: 1,3% (0-5 years); 2,5% (5-10 years); 11,1% (10-20 years); 13,1% (20-40 years); 38,9% (40-80 years 10,1% (over 80 years).

Source of main stand elements:

Element	**Oak**		**Ash**	
	Surface(ha)	Percentage (%)	Surface(ha)	Percentage (%)
Natural seeding	9,9	14	2,4	5,1
Sprout	13,9	19,6	17	36,3
Plantation	42,9	60,7	20,5	43,8
Artificial seeding	4	5,7	6,9	14,8
Total	70,7	100	46,8	100

Natural regeneration through seeding: the ash trees regenerates well through natural seeding, the oak tree regeneration is embarrassed by other species such as ash, hornbean, common maple, elm trees and also by shrubs and undergrowth species (hawthorn);

Productivity classes of the main arboretum species:: oak cl I 6,1%; oak cl II 3,1%; oak cl III 90,8%; ash cl II 47,6%; ash cl III 52,4%;

Management measures for different age classes: 0-5 years – carefully made thinnings in order to protect oak trees; 5-10 years – keeping oak and ash trees. Is compulsory the preservation of the secondary species: commom maple ash, wild pear and acacia in order to create a forest sublevel; 10-20 years – using thinnings the increase of the percentage of oak trees and the ellimination mainly of the ash trees; 20-40 years - the selection of the most vigorous oak trees and the elimination of the ash and hornbeam trees during thinnings; 40-80 years - the continuation of oak trees advance using cleansings around oak trees but keeping the area close; over 80 years – cleansing;

Indicated composition: 6-7oak 2-3ash 1-2common maple

Other management measures: maintenance and promotion of stand composition of some secondary species (preferable common maple tree) and/or of a second tree level, by adding oak trees. Are compulsory activities

which helps natural regenerations in the years of abundant natural fructification at oak trees. The stands derived from sprouts will be gradually converted with natural regeneration (if the stands are at fructification age). In case of not indigenous species there are some not indicated species (hybrid poplar, acacia, red oak), it is recommended the replacement of these species with native species adapted to stationary local conditions (thus reconstructing the basic natural forest ecosystem type).

Limitative ecological factors: moist vernal soil (for short periods of time the appearance of marshes); in cases when the phreatic level is high, the edaphic volume is reduced;

CONCLUSIONS

The typological research using GIS tools is usefull in practical forestry, being the base for sustainable forestry. The variability of general conditions (climatic, geologic) is very high and this variability induces a high variability of forest types. Each geographical unit, either it is about zones – subzones, levels-sublevels, regions-provinces have distinct features which causes the existence of some inventory of types, with strong regional features.

This moment priority is the tendency to establish types of forests on small geographic units, at the level of landscapes (landschafts), the typology having thus a strong regional feature.

Regarding forestry measures by type of forest culture have revealed that there were concerns relating to differentiating normal types but not the present state of the as result of more or less proper management methods. Forester practitioner is forced to differentiate on the basis of this action and the current state of forest types that manages them.

That is why we tried, as the research of this paper to establish ecosystem-based forest types existing in a territory smaller but representative Crisurilor Plain, to state the current status of types and propose appropriate management measures this state and designed to bring a type similar to the natural state.

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