CONTRIBUTION TO THE TYPOLOGICAL SUBSTANTIATION OF THE FORESTRY USING GIS TOOLS IN CRIŞUL NEGRU PLAIN AND TASADULUI HILLS

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Abstract

The existent GIS data structures, the creation of maps using GIS tools, superposition in ordrt to obtain correlations are quite usefull in typological research representing the scientific base for a sustainable forestry.

Key words: typology for forestry, G.I.S., forest ecosystem, sustainable forestry

INTRODUCTION

Typological substantiation of the forestry represents the ecological base for an efficient use of the forest which allows the forest to ensure the complex functions of sustaining and preserving living conditions.

The existing phenomena within the forest ecosystems are extremely complex and for understanding and description are not enough methods of investigation from one discipline or science. The interdisciplinary research methods are the most suitable for topological substantiation.

In order to investigate the forest ecosystem two distinct, not opposite but complementary approaches are suitable: the *analytical* approach and the *systemic* approach. Starting from the premise that the properties of the forest ecosystem is given by the sum of the properties of the components, the analytical approach isolates the components in order to study them, focusing on the precise identification of the details. The systemic approach, taking into account the relation between components, focus on the global perception (as a whole).

The G.I.S. tools succesfully use both analytical and systemic approach in reasearch activities of the forest ecosystem analyzing the structure of the ecosystems, the relations among different components, modelling, prognosis.

STUDY AREA

The reseaches were made in Crisul Negru Plain and Tasadului Hills, the forests belonging to Tinca Forest Office. The area is situatead in the south-western part of Bihor county and the relief in characterised by plains and small hills (up to 35o m)

From geomorphological point of view tle plain area could be divided into two types: the low plain and the high plain.

The low plain is the western prolongation of the Western Plain, situated on the terraces of the Crisul Repede and Crisul Negru Rivers, with an average altitude between 93-110 m, with a horisontal aspect.

The eastern part is consisted of some prolongations of the Western Hills with an average altitude between 210-290 m.

MATERIAL AND METHODS

The delimitation criteria of the types based on living conditions (stationary conditions) reflects the homogeneity of these conditions. But just if among the used criteria one could find the natural vegetation, the designated units could have a ecological homogeneity. The establishment of typological units (types of ecosystems) was made using the method of synthetic systemic indicators evaluating phytocesosises, climate indicator forest plants and edaphic conditions: acidity, humidity, humus content, compactness. The use of phytoindicators is based on the principles of modern ecology according to which the plants, as primary producers and the phytocenosises which they make up, exactly reflects not only the complex abiotic ecological factors, decisive for forest biocoenosis but also the nature and the functionality of these biocoenosises which finally represents the productivity of the forest ecosystem.

The delimitation method of the forest ecosystems had as base some typological schemes made for the study area (for ex forest corps). Within these typolocical schemes the forest ecosystem is presented in close connection with stationary conditions (see fig. 1, fig. 2) which allows a better understanding of the repartition of different forest ecosystem types thus helping the typological mapping. The herbaceous and shrub layers exactly reflects the stationary conditions, even if the forest type is far from the fundamantal, natural type.

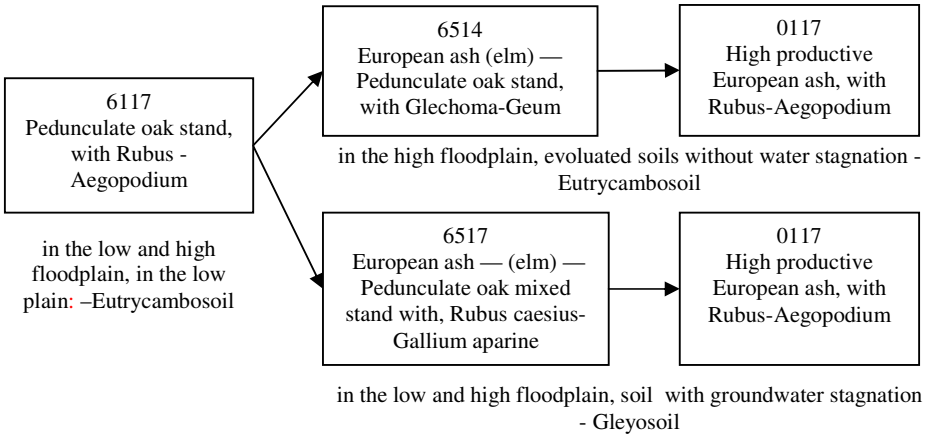

Fig. 1. Example of typological scheme in the low plain of Crisul Negru river

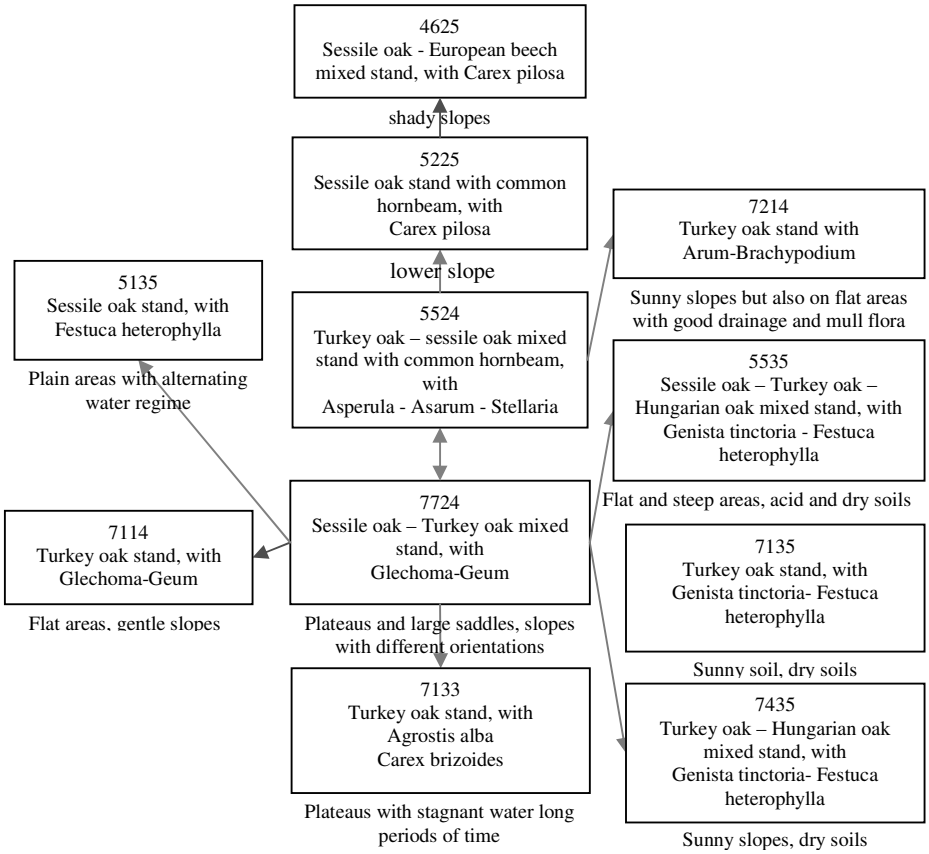

Fig. 2. Example of typological scheme in the high plain and the hilly area (Topile area)

The use of G.I.S. in the forestry is very important because it could supply a wide range of information upon which a sustainable use of the forest is possible, also offering the possibility of analyze and prognosis of different components of forest ecosystem as a whole. In this study we opted for the development of a geographic concept model.

The word „model" in GIS is use to define several concepts:

a. ***Generic information model***: representing geographic information, such as features, rasters, and other spatial data types
b. ***Geographic data model***: a method for describing a system using a structured set of data .
c. ***Model of geoprocessing***: geoprocessing work flow by stringing processes together

A data model gathers the three concepts in oder to fully describe the analyzed phenomena. The final scheme of the data model (see fig. 3) will allow the user to understand in details the mechanisms within the model.

As in the case of the data we opted for object-oriented geodatabase introduced by ESRI that represents geographic features and attributes as objects and the relationships between objects, but is hosted inside a relationaldatabase management system. A geodatabase can store objects such as feature classes, feature datasets, nonspatial tables, and relationship classes.

This model is in the early stages of development. We have made an initial attempt at this content and we are actively looking for feedback and examples from real projects. Our plan is to collaborate on a few key projects, gather feedback from the user and produce a more complete model.

The aim of this study was to build an accurate data base for the Tinca Forest Office, data which were checked in the field and filled with typological, phytosociologic and soil data; the researches were filled with the sudy of 96 soil profiles. The analysis of soils was made in the laboratory and it fills the previous knowledge related to humus, nitrogen, phosphorus, potessium, the sum of chamge basis, total change capacity, degree of saturation in basis, the acidity, a.s.o.

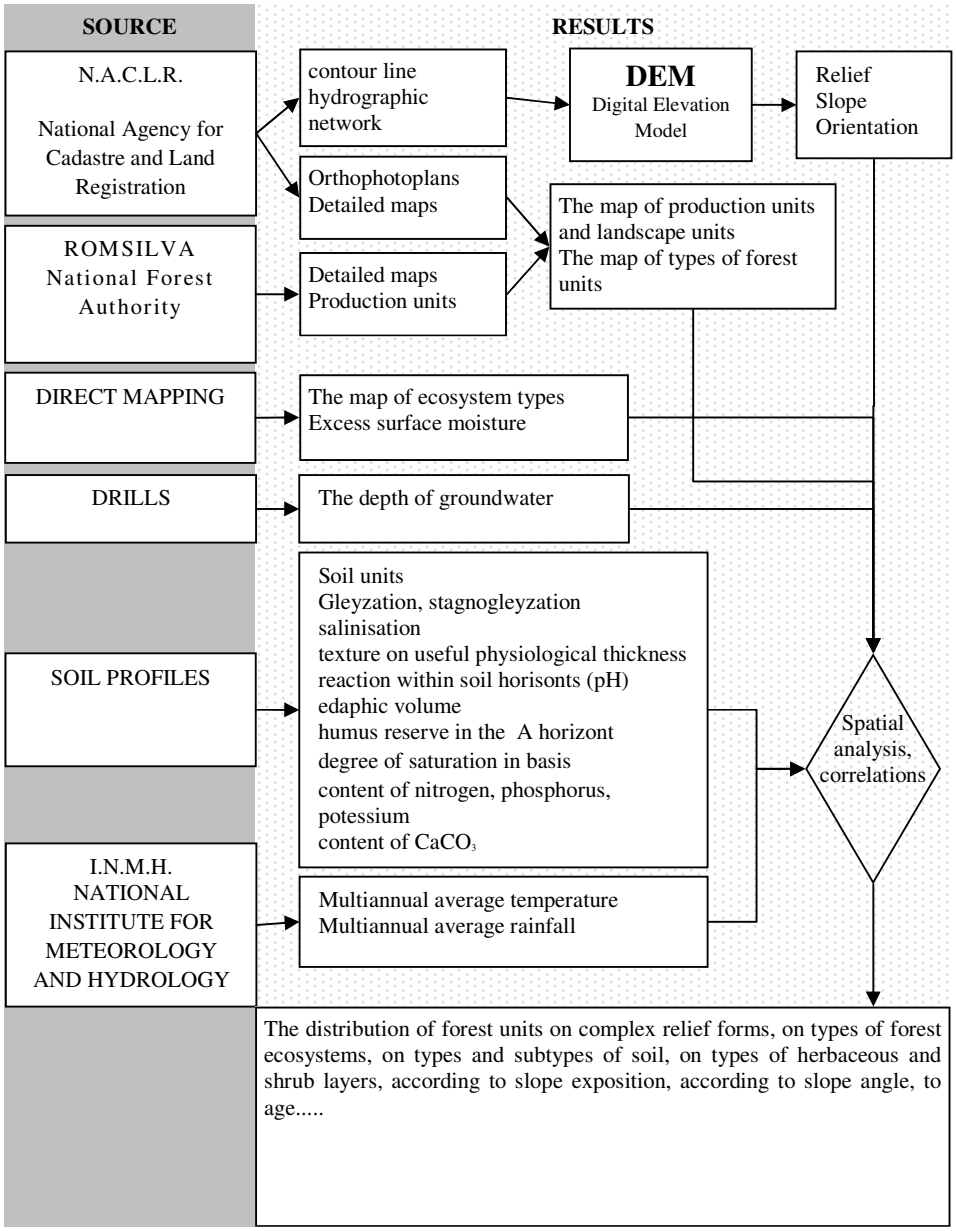

Fig. 3. Analysis model scheme

RESULTS AND DISSCUSIONS

The next step of the study will be the made of some preliminary analisys in terms of the distribution of different forest ecosystems, localization within the three main relief units: the relief form, altitude

category, slope exposition categories, slope inclination categories, correletion with different forest types, forest units types, forest habitats (Doniță N. şi colab., 2005/2006), types and subtypes of soils; the spread within different types of forest ecosystems of tree species, the association of tree species and thei proportion of forest composition, the classes of made productions.

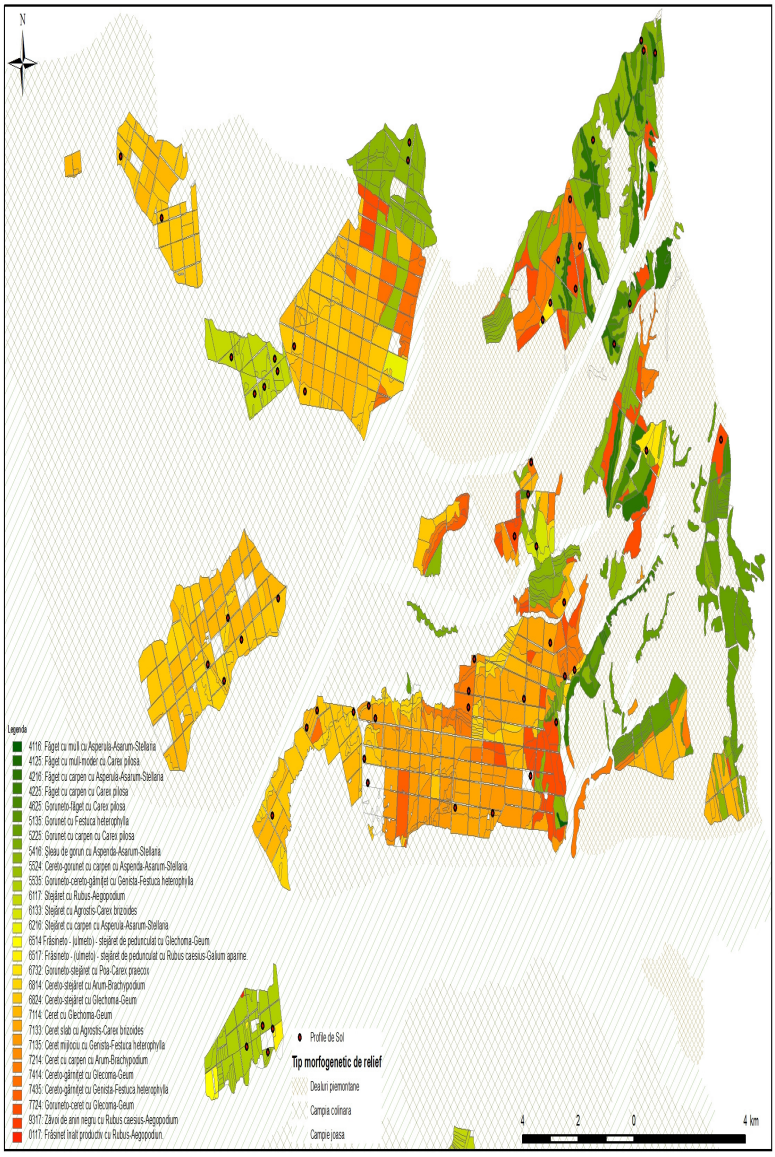

Fig. 4. Map of forest ecosystems superimposed on the relief forms

Overlapping soil, forest unit, forest type, ecosystem forest type maps and the analysis of new layers was followed the correlation of different types of forest ecisystems with forest units, forest types, and soil types and subtypes, repartition on the field of the forest ecosystems.

The areal repartition of the forest units on the basis of forest ecosystems and the overlap of this map over the relief map is shown in fig. 4. The figure also shows the soil sampling points.

The G.I.S. database will allow a rapid access to information related to forest units, forest elements.

CONCLUSIONS

The development of forest ecosystem typology respond to current concerns in modern forestry in order to promote valuable native species, the complex forest structure for a rational use of forest resources. The introduction of forest typology in the field of forest management and in forest research will create the basis for introduction the ecological forestry oriented either to wood production or environmental protection (Doniță şi colab. 1990).

The forest typology and the forestry are sciences with a high geographical degree which must base on local realities (Paşcovschi S., Leandru V., 1958).

The typological research using G.I.S. tools is usefull in practical forestry being the base for a sustainable forestry in the future.

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