AN ECOLOGICALLY BASED, COMPUTER ASSISTED, FOREST REHABILITATION PROJECT IN THE AGGTELEK NATIONAL PARK, HUNGARY

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Summary
In 1996. reformation of the forest laws in Hungary provided opportunities for a new type of silviculture which is free from conflicts with environmentalists. Both the environmental and the silviculture laws state that forests in nature reserves should be protected. This paper describes a planning method which is based on forestry and ecological factors and uses the Arc/Info GIS software. The aim was to optimise the segments of functionally and environmentally protected landscapes and the result is a vegetation pattern which can be implemented by forestry managers. The advantages of the process are that the data used in the project can easily be modified and completed and that the method can be used to construct „economic forests". The technique could be used in other areas by taking the local characteristic features into consideration.

Introduction

The reformation of law in 1996 meant a great leap forward forming a new type of silviculture which is free of conflicts with the environmentalists. Both the environmental and the silviculture law state that forests in nature reserves should be ranked among protected ones and steps should be taken for the sake of the cause. That is why such a projects are needed which are based on forestry and ecological principles neglected in the past.

Object

This project can be used in other areas as well by taking the local characteristic features into consideration. However, I thought that I can give a clearer description of the project by using it in a particular model area where the above mentioned facts are everyday problems.

Aggtelek National Park (ANP) is situated in North Hungary. Thus, in north the National Park borders with the Slovak Karst Protected Landscape Area in the Slovak Republik. Considering the geology, landscape geography and cultural history, these two protected areas form an integral unit and both were declared as biosphere reserves in 1979 (UNESCO's Man and Biosphere Program). The caves of Slovak Karst and Aggtelek Karst were inscribed in UNESCO's World Heritage List in 1995. ANP's area has being protected by law since 1978 and had been declared as a National Park in 1985. There are three kinds

of protected areas in ANP, their names are zone A (the most protected part), B and C. (*Fig. 1*) *(Salamon 1998)*

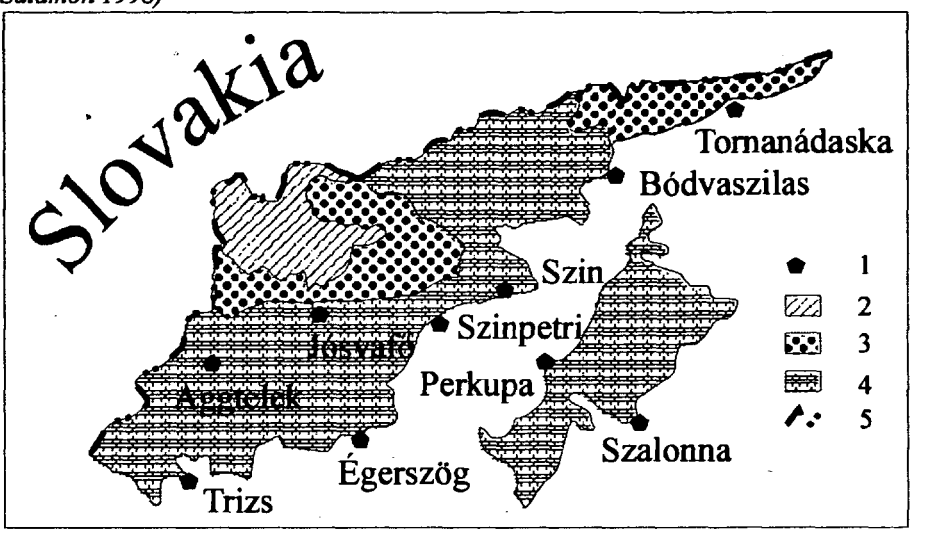

Fig. 1 Protected areas in Aggtelek National Park
(1.: settlement; 2.: zone A; 3.: zone B; 4.: zone C; 5.: border line)

I have chosen a 190 ha area of the most protected part of the zone A of Aggtelek National Park. There are very poor, poor and average qualified stands with lot of foreign species. (*Fig. 2*)

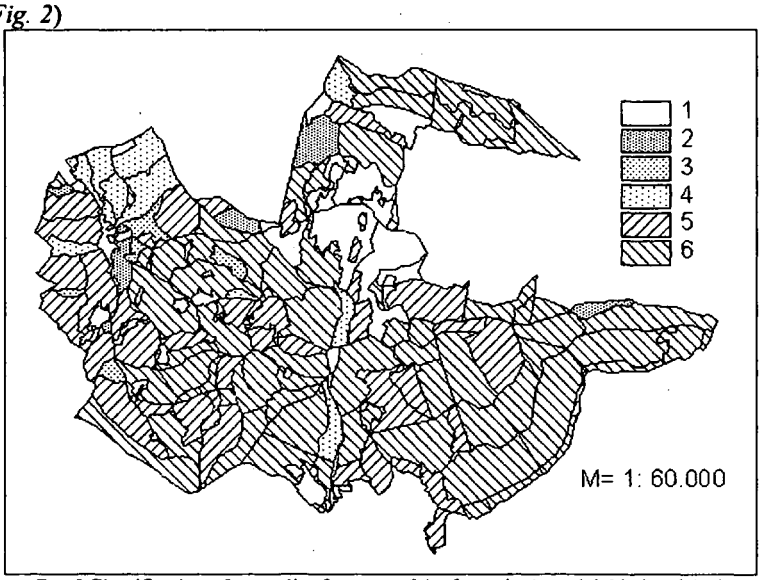

Fig. 2 Classification of naturality for parts of the forest in Aggtelek National Park
(1.: meadows; 2.: very poor; 3.: poor; 4.: average; 5.: good; 6.: very good)

This is a natural zone where according to the conception of 1998 the aim of silviculture is to maintain and restore those forests which are free of foreign species, which peculiar to a given habitat and have similar association in age and species to the original forest.

Besides in karstic areas it is very important to save or restore the soil since together with subsoil water pollutants can easily get into the karst system destroying its ecological condition. In order to solve this problem it would be advisable to form deciduous forest associations peculiar to the area.

My aim was to make a method in order to form the most appropriate forest associations.

The adopted influential factors

The most important influential factors in terms of forest associations were thought to be: Forest climate, Height above sea level, Aspect, Slope, Genetical soil conditions, Depth of soil and Physical soil conditions (*Fig. 3-9*).

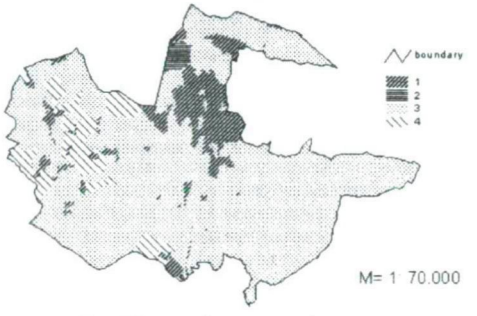

Fig. 3 Forest climate types in zone A
(1.: meadows; 2.: beech; 3.: hornbeam; 4.: turkey oak)

Fig. 4 Height above sea level in zone A
(1.: 200-300 m; 2.: 300-400 m; 3.: 400-500 m; 4.: 500 m <)

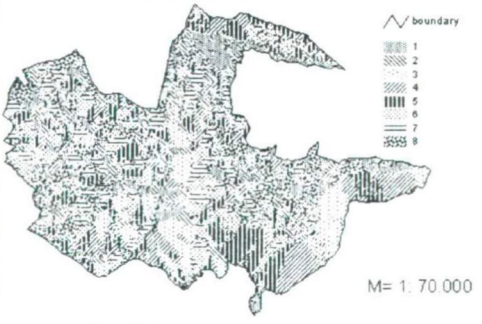

Fig. 5 Aspect categories in zone A
(1.: NNE; 2.: ENE; 3.: ESE; 4.: SSE; 5.: SSW; 6.: WSW; 7.: WNW; 8.: NNW)

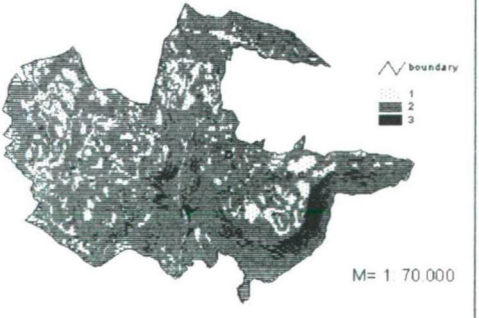

Fig. 6 Slope categories in zone A
(1.: 0°-5°; 2.: 5°-25°; 3.: 25°<)

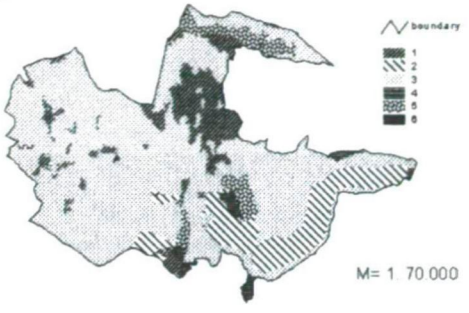

Fig. 7 Genetical soil conditions in zone A
(1.: meadows; 2.: skeletal soil, bedrock; 3.: rendzina; 4.: brown earth; 5.: brown forest soil; 6.: alluvial soil)

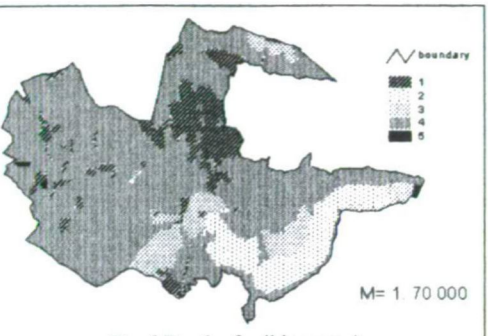

Fig. 8 Depth of soil in zone A
(1.: meadows; 2.: 0-20 cm; 3.: 20-40 cm; 4.: 40-60 cm; 5.: 60-100 cm)

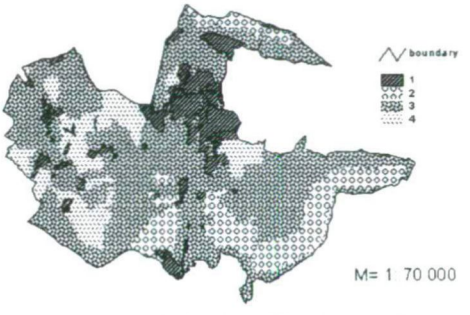

Fig. 9 Physical soil conditions in zone A
(1.: meadows; 2.: fragmentary; 3. adobe; 4. clayey)

The planning method

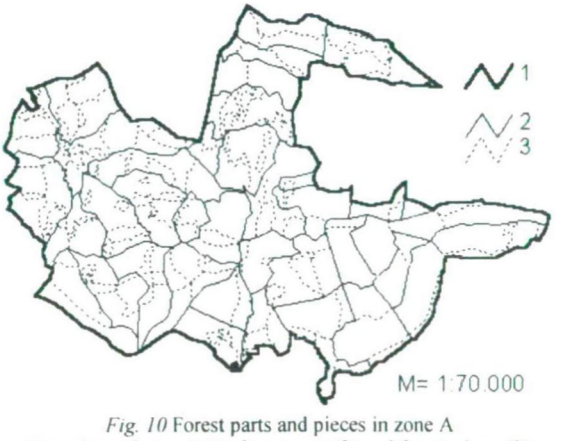

Fig. 10 Forest parts and pieces in zone A
(Boundary of zone A(1), forest parts(2) and forest pieces(3))

The question has arisen how to operate with different local data. I solved the problem with Arc/Info software using GIS. (Geographical Information System). I worked out the value of height above sea level, aspect and slope factors by using a digital elevation model. The model was constructed by the program itself from the contour lines of a digitalised topographical map, scale of 1:10.000. In all three cases I reclassified the values (which were automatically counted from the model) by using values appropriate

to the type of habitat. Then I transformed the values into polygons. The values of the other factors were collected from the current forest plans and systematised by a database-operating program. Then I digitalised the barriers of forest spieces and parts on the basis of a forestry map.

The data in tabular form were coordinated to the digitalised polygons. Following this process I could use each factor type as a polygon, I could make operations with them and could easily represent them. If I indicated each factor type with different order of numbers and then added the layers containing polygons, I could get each combination of numbers which are peculiar to the type of habitat. When I added the layers, I used the „overlay" GIS function. (*Fig. 11*) Later I determined the forest associations fitting to each combination. This was the result of the project. (*Fig. 12*)

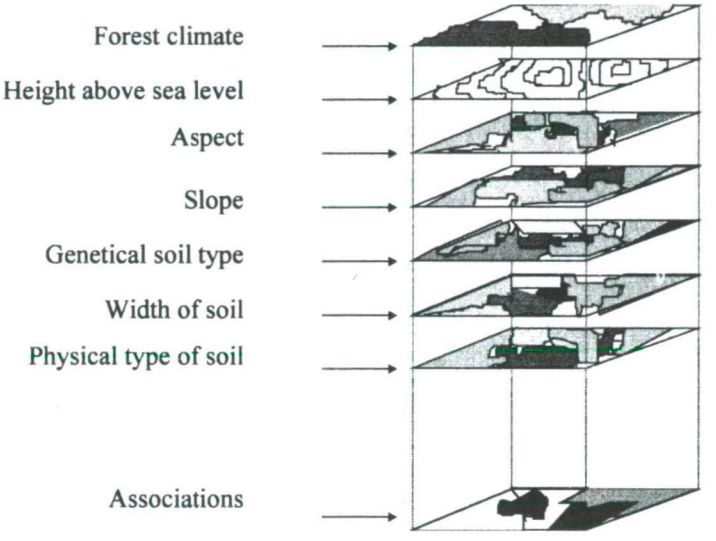

Fig. 11 The overlay GIS function

Summary

The method supports sustainable silviculture and its necessity is stated by law. The aim is to optimalize functionally the environmentally protected landscape segments. The result of the project is a vegetation pattern which can be carried out by the forestry itself. (*Fig. 12*). The advantages of the process is that the data used in the project can easily be modified and completed as well. The method is useful for constructing the so called „economic forests". Besides that, build upon the digital database we can make quickly and easily very accurate and smart thematic maps. (*Fig. 2-10, 12*).

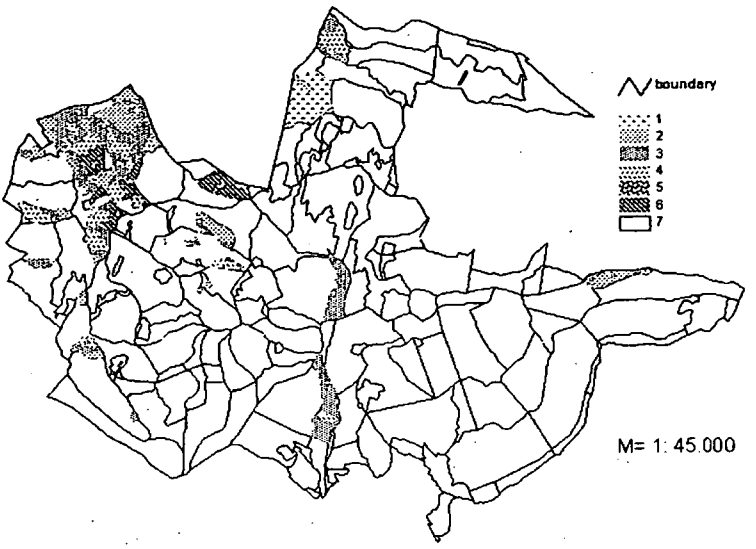

Fig. 12 Optimalized associations for the planned forest parts in zone A
(1.: mixed beech; 2.: hornbeam with beech; 3.: oak with hornbeam; 4.: oak with hornbeam and turkey oak; 5.: linden-ash forests; 6.: oak with turkey oak; 7.: not planned parts)

REFERENCES

Salamon G. (Ed.) 1998.: Az Aggteleki Nemzeti Park felszíni természetvédelmi koncepciója (Conception of surface natur conservation in Aggtelek National Park), Aggtelek.