# Development of digital site mapping and estimating future tree species suitability in Serbia

Janko Ljubicic[1], Olivera Kosanin[1], Dominik Sperlich[4], Marko Kazimirovic[2], Branko Stajic[2], Nenad Petrovic[2], Ivana Vasic[3], Jelena Nedeljkovic[3], Dragan Nonic[3], Marc Hanewinkel[4], Axel Weinreich[5], Dejan Bakovic[5]

1- Chair of Forest Ecology, Faculty of Forestry, University of Belgrade
2- Chair of Forest Management Planning, Faculty of Forestry, University of Belgrade
3- Chair of Forest Organization and Economics, Faculty of Forestry, University of Belgrade
4- Chair of Forest Economics and Forest Planning, University of Freiburg
5- UNIQUE Landuse Gmbh

## Introduction

- Digital site mapping is a rather new concept which has not been done in Serbia, and can serve as a basis for modern forest management
- **The division of forest area into site types, which represent homogeneous spatial units in terms of vegetation, soil, climate and position (terrain, slope and exposure) is not only ecologically relevant, but essential for forest planning and management**
- The selection of site types can be based on the synthesis of site data, i.e. on the basis of combining soil water balance level (WBL) and soil nutrient regime (NR) of a certain area
- This study presents results of WBL and NR in the area of the Boranja mountain massif (MU "Istocna Boranja") (Fig. 1), on phyllite (Fig. 2) , in beech forests- the most common forest type in Serbia

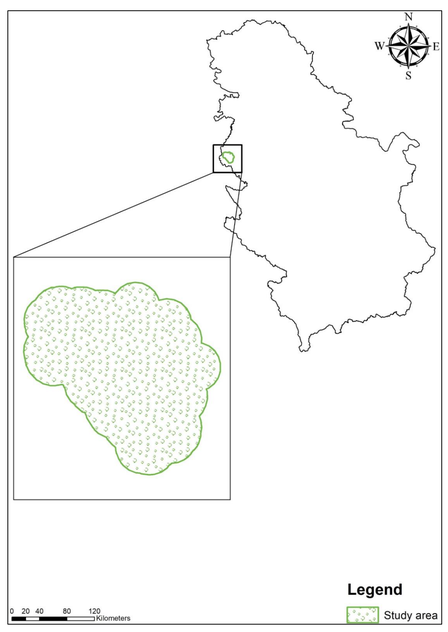


Fig. 1

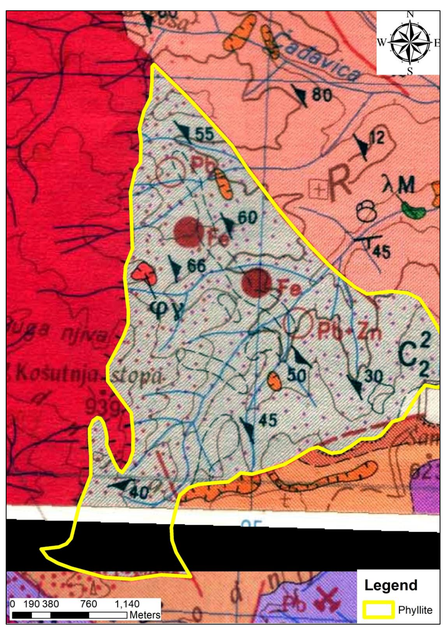


Fig 2.

## Material and methods

- Dominant landforms (geomorphons) were extracted in GIS (Fig. 3), and 46 soil profiles were opened on them (19 were analysed in laboratory) + 46 Vegetation relevés were collected
- Slopes <30° and >30° and warm (S, SW, SE, W), cold (N, NE, NW, E) and neutral aspects (slope up to 12.5°) were taken into account
- The available water capacity (AWC) is determined for each horizon based on: texture, skeletal content, soil density and humus content

$$AWC_{horizon} = (AWC_{tab} * (1- \text{skeletal content } (\%)/100) * \text{depth } (mm/dm)$$

- The obtained AWC values are supplemented by tabular corrections for humus content calculated on horizon capacity, and finally, the obtained AWC values by horizons are summed and the AWC profile is obtained

$$AWC_{profile} = {}_{AWChorizon\_n1} + AWC_{horizon\_n2} + \ldots AWC_{horizon\_n} \text{ (mm/profile)}$$

- Based on the obtained AWC values (mm), soils are classified into 7 classes (Tab. 1)

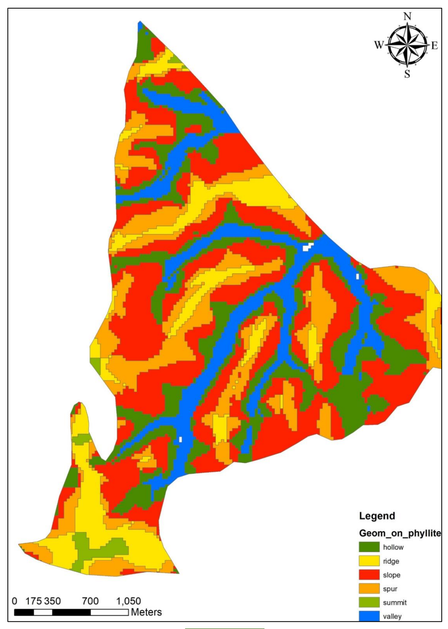


Fig. 3

| AWC [mm] | AWC classes |
|---|---|
| 1 – 10 | 1 |
| 10 - 25 | 2 |
| 25 - 45 | 3 |
| 45 - 65 | 4 |
| 65 - 95 | 5 |
| 95 - 130 | 6 |
| > 130 | 7 |

Tab. 1

## Material and methods

- The obtained values for AWC, which are determined in field conditions, must be corrected by applying the appropriate transformation tables: frequency table, median transfer table and WBL transfer table from which we derived WBL classes and classified sites according to the water deficit (Tab. 2)
- The most common parameter used to determine the NR is the degree of base saturation or pH value in water
- Based on the pH value and the degree of saturation of the bases, which are determined by laboratory testing or estimated on the basis of a geological map, the NR is assessed through the classification scheme (Tab. 3)

| WBL | Class | Water deficit |
|---|---|---|
| 1 | Extremely dry | Very long periods of water deficit |
| 2 | Very dry | Long periods of water deficit |
| 3 | Dry | Longer periods of water deficit |
| 4 | Medium dry | Occasionally in longer periods of water deficit |
| 5 | A little wet | In shorter periods of water deficit |
| 6 | Moderately humid | Occasionally in short periods of water deficit |
| 7 | Wet | Rarely water deficit |
| 8 | Very humid | Water deficiency is very rare |
| 9 | Extremely humid | Extremely rare water deficiency |

Tab. 2

| Coarse fraction | < 50 % | > 50 % | | |
|---|---|---|---|---|
| | | alkalinity of bedrock | | |
| pH class | | high | medium | less |
| 1 | rich | rich | rich-medium | rich-medium |
| 2 | rich-medium | rich-medium | rich-medium | medium |
| 3 | medium | rich-medium | medium | medium |
| 4 | medium | medium | medium | medium-poor |
| 5 | medium-poor | medium | medium-poor | medium-poor |
| 6 | poor | medium-poor | medium-poor | poor |

Tab. 3

## Results and conclusions

- The obtained results were used for the production of digital maps of WBL and NR
- Landforms (geomorphons) on which the data for the sites were collected are: hollow, ridge, slope (<30° and >30°), spur, summit and valley
- **WBL values range from 4 to 7 (Fig. 4): 4-medium dry; 5-a little wet (slightly moist); 6-moderately humid and 7- wet (humid)**
- **NR occurs from poor to medium (base saturation is used as a parameter) (Fig. 5)**
- By overlapping these maps, site types are obtained in digital form (Fig. 6)
- In further research we will apply multifactor spatially explicit models that include climate data (temperature, precipitation) combined with WBL and NR
- Based on this bioclimatic complex, we will assess occurrence, distribution and suitability of beech under current and future climate conditions

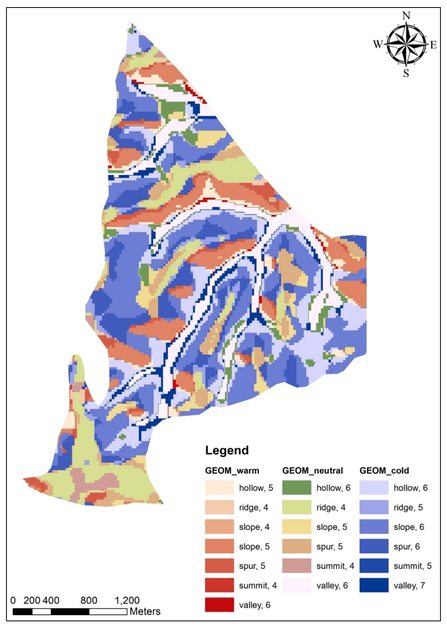


Fig. 4

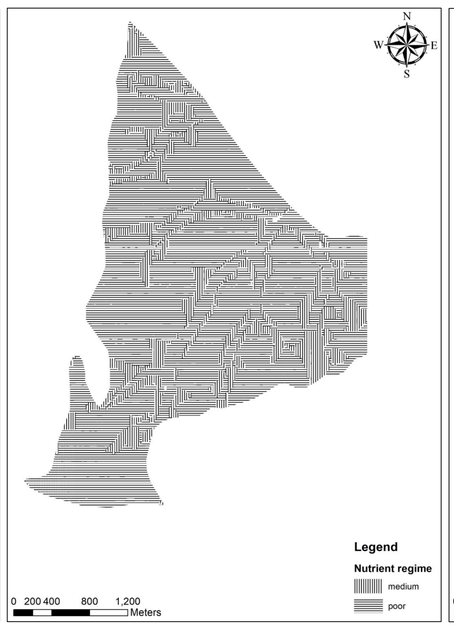


Fig. 5

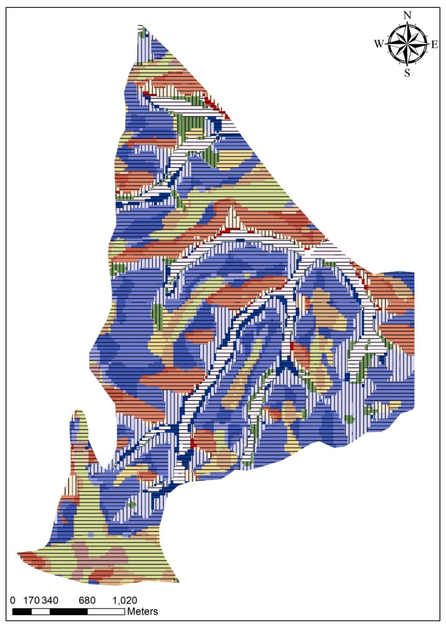


Fig. 6

## Acknowledgments

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Janko Ljubičić
Faculty of Forestry, University of Belgrade, Republic of Serbia
janko.ljubicic@sfb.bg.ac.rs