Using satellite data to detect changes in habitat extent

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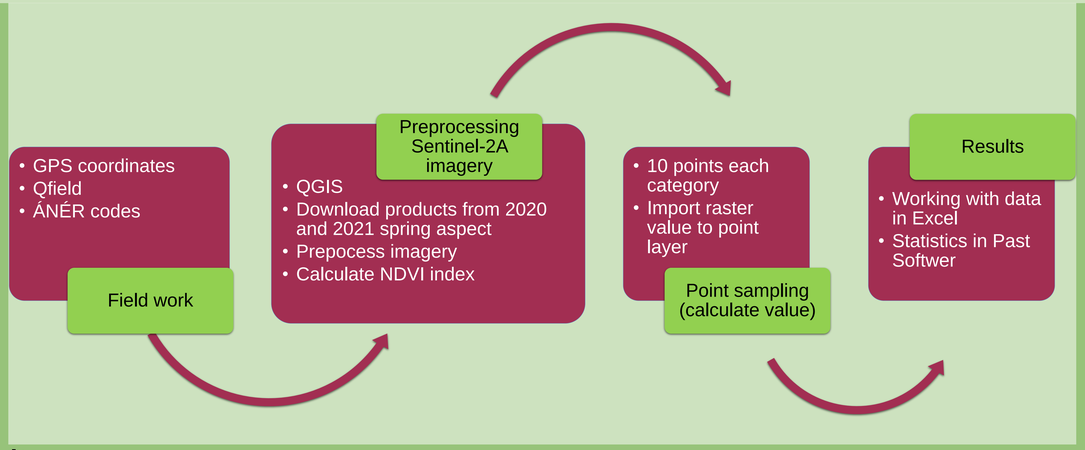
Introduction

Ipoly is one of the last rivers in Hungary, which is less affected by water management. The survey presents habitat maps of Ipoly Valley floodplains of two different years in 2020 and 2021 by satellite imageries.

Method

In this study we wanted to show how the vegetation changes in the spring of two different years in a rainy and a dry year. For this, we first conducted field surveys, categorizing all habitat patches according to ÁNÉR. Sentinel-2A satellite images were then processed and NDVI data were generated and stained quantitatively. Points were recorded in equal proportions at each habitat patch, and then the NDVI data for these points were evaluated.



Result

This map shows (Figure 1.) the two selected years. In 2020, less than 4.1 mm of precipitation fell before the selected spring aspect was recorded, while in 2021, record (Figure 2.) high precipitation above 52.2 mm fell in the 30 days before the recording. NDVI values were calculated from the satellite data of the sample areas and the map was colored according to these values. Thus, we were able to display habitat patches that were filled with water, i.e., showed a negative or nearly negative value (B1a). In addition, we could see in which areas were observed higher chlorolophilic reflection (RB, D34). In the highland meadow (B1a) and lake (U9) habitat complex, we can see that in 2020 the lake was filled with water and therefore the reflectance is negative, but the area around it is green due to the large amount of biomass. While in 2021 we colored the map yellow due to the higher reflectance value due to the dehydration of Phragmites australis, the surrounding area saturated with water showed a negative value.

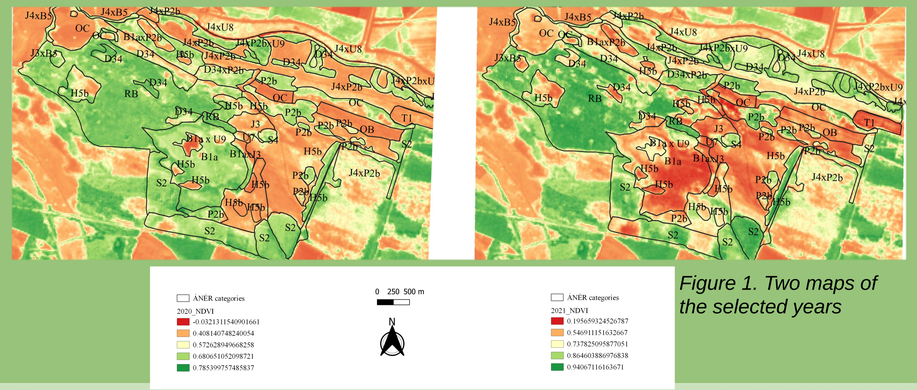


Figure 1. Two maps of the selected years

To verify our statement, the graphs (Figure 3.) here also show that the individual habitats show a difference in the studied periods. In 2020, the NDVI value was lower for almost all habitats compared to 2021. In one case, it can be seen that the value is higher in 2020 in area B1a, which was flooded with water, which affected the reflectance, but did not show only a negative value due to vegetation.

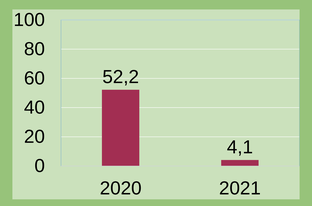
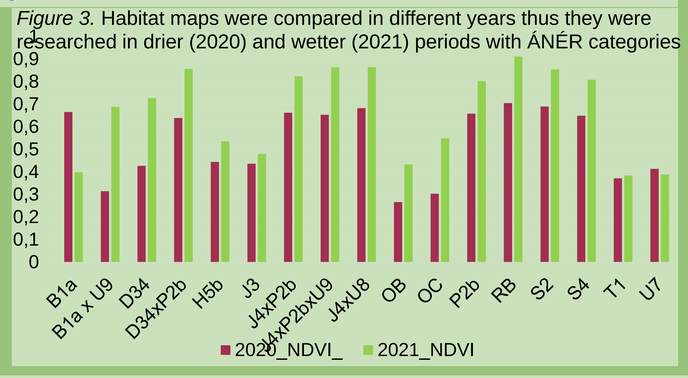


Figure 2. Precipitation of the two different researced period

Figure 3. Habitat maps were compared in different years thus they were researched in drier (2020) and wetter (2021) periods with ÁNÉR categories



Habitat maps were compared in different years thus they were researched in drier (2020) and wetter (2021) periods. ÁNÉR category system was used as a control by field sampling using hand-held GPS equipment. Satellite data and precipitation data makes it possible to measure the interpretation of maps. The aim of the study was to find an answer to the question of how can we isolate habitats most easily in the studied periods. The categories were compared with the satellite images of Sentinel-2A to look for possible correlations. Different vegetation and water indexes were generated for quantitative evaluation and monitoring of the current state of the vegetation. The results show that some habitat categories can be significantly distinguished using the satellite data, especially in urban versus natural areas and the dry grasslands.

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