WET AREA MAPS FOR THE BALTICS: IMPROVED UNDERSTANDING OF THE SPATIAL DISTRIBUTION OF SOIL MOISTURE

Open areas of bogs and wetlands are easy to identify and map by orthophoto or satellite imagery, however, in the forest under a closed canopy of trees or in the vicinity of water bodies and watercourses, wet areas are more difficult to identify (Creed, Sanford, Beall, Molot, & Dillon, 2003; Gregory, Swanson, McKee, & Cummins, 1991). In Latvia, research on the spatial distribution of soil moisture using remote sensing data was started in 2017 (Ivanovs & Lupikis, 2018) and a methodology has been developed for predicting soil moisture on different types of geological sediments.

Information on the spatial distribution of wet areas is important from both a scientific and an economic planning perspective in areas such as forestry and agriculture (McNabb, Startsev, & Nguyen, 2001). This information can help explain biological, hydrological, chemical, and other processes (Detenbeck, Galatowitsch, Atkinson, & Ball, 1999). Hydromorphic and semi-hydromorphic soils have a lower bearing capacity than automorphic soils, so they are more prone to disturbances such as compaction, rutting, etc. (Cambi, Certini, Neri, & Marchi, 2015; Mohtashami, Eliasson, Jansson, & Sonesson, 2017).

Within the framework of the LIFE OrgBalt project, we have created wet area maps for the entire territory of the Baltic States with a 5m horizontal resolution. Wet area mapping methodology was developed by Ivanovs & Lupikis, 2018. Wet area maps are developed on the basis of various indices derived from elevation data, such as depth of depression, normalized height, slope, SAGA wetness index and size of catchment area. The created maps show the prediction of soil moisture on a scale from 0 to 1, where 0 indicates dry conditions and 1 indicates conditions with high soil humidity (Figure 1). Soil wetness in this case is defined as soil with thick organic layer and pronounced signs of reductimorphic colors. Though soil wetness level is changing over time and depends on various aspects (weather conditions, soil bedrock, drainage, etc.), the soil wetness level is shown static in these maps. Answer ALS data were obtained from the Estonian Land Board (Estonia), the Latvian Geospatial Information Agency (Latvia) and the National Land Service (Lithuania).

Maps developed are available as a WMS service at https://silava.forestradar.com/geoserver/silava/wms.

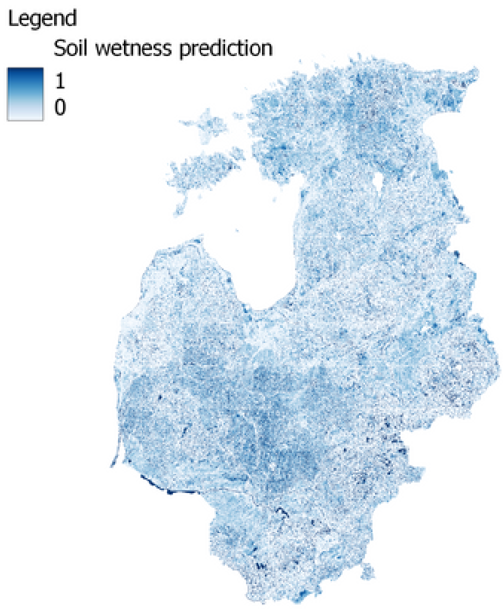

Figure 1. Wet area map

According to the validation results, it can be observed that a pronounced peat layer (> 30 cm thick) occurs at the prediction value above 0.4, while below this value the peat layer is mostly thinner or absent. There are no clear cut-off values to determine reductimorphic color occurance in soil according to validation results, however, it can still be observed that most of the signs of reductimorphic colors are observed at points where high soil moisture is predicted on the wet area map, while reductimorphic colors are practically not observed in places where dry soil conditions are predicted. Figure 2 shows an example of the prediction of wet area map in comparison to Google satellite imagery. All major wetlands are predicted as wetlands in the wet area map and also areas with shrubs on agricultural land are located in areas where high soil moisture is predicted.

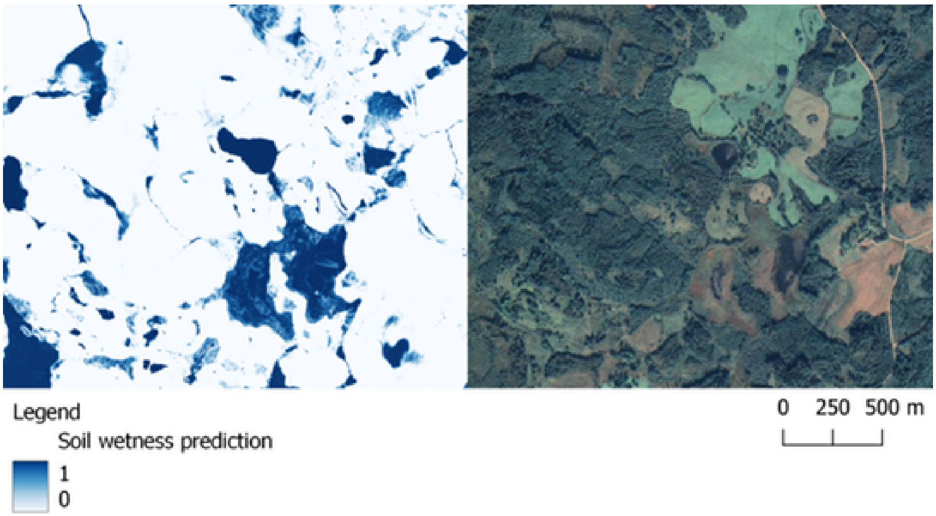

Figure 2. Wet area map example

Wet area maps can be used in a variety of forestry and agricultural areas. Wet area maps can be used to plan the movement of heavy forestry and agricultural machinery, thus reducing the risk of soil damage, to select the most suitable tree and crop species for specific forest and agricultural areas, as well as in other respects. Wet area maps, along with other data sources, can also be used in research. Within the framework of the LIFE OrgBalt project, wet area maps together with previously developed depth-to-water maps are used to assess organic soil spatial distribution in the Baltic States, thus gaining a more accurate understanding of organic soil soil spatial distribution today and changes compared to the 60-80s of the last century.

JĀNIS IVANOVS, SCIENTIFIC ASSISTANT AT LATVIAN STATE FOREST RESEARCH INSTITUTE "SILAVA", LEADING PARTNER OF THE LIFE ORGBALT PROJECT

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