Harvester Seasons

Trafficability forecasts serving forestry sector

Overview

Harvester Seasons is a service designed to help with estimating evolving trafficability conditions in forested terrain. The service is built over trafficability maps that divides terrain to six classes based on conditions needed for harvesting operations. Harvester Seasons service takes advantage of climatology and seasonal forecasts produced by European Centre for Medium-Range Weather Forecasts (ECMWF) to estimate if and when the conditions presented on trafficability maps are fulfilled. This web app works on both mobile as well as on laptop to easily bring you the information needed for planning your harvesting operations.
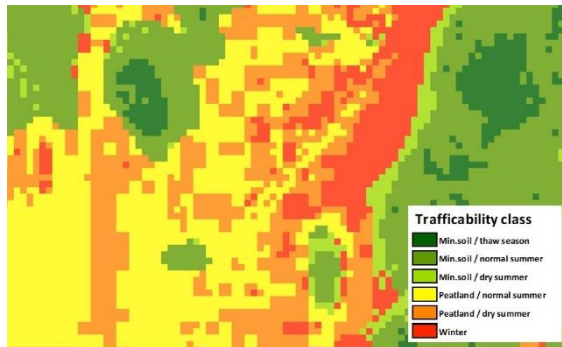

Figure 1: Trafficability map by Finnish Forest Centre. Mineral soils marked usually with different shades of green, peatlands with yellow and orange. Red is for mineral soils and peatlands with lowest bearing capacity.
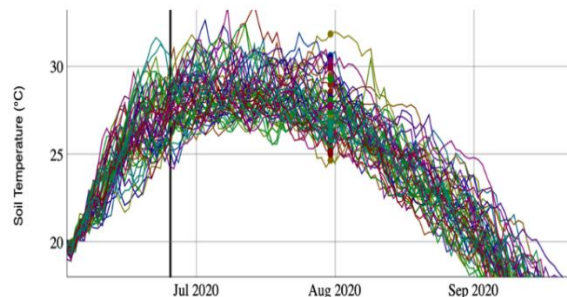

Figure 2: Ensemble of possible ground temperature values for city of Kerava.

Trafficability maps

The classification on the trafficability maps (figure 1.) is based on permanent and slowly evolving geographic information about the target such as soil type, topography, drainage and amount of wood growing there. Targets getting the best classification are those that can be harvested all year round, even during frost heave. The worst class can only be harvested during winter with thick enough ground frost and/or snow cover. Between these are classes that can be harvested during normal or dry summer conditions. The classification separates between organic and mineral soils and presently covers over 80 % of forested terrain in Finland. Full national coverage is estimated to be reached within couple of years.

Climate data

Copernicus Climate Change Services (C3S) implemented by ECMWF produces grid based climate data as well as seasonal weather forecasts updated monthly. By correcting the seasonal weather forecast with accurate local climate statistics it is possible to calculate probability of getting suitable conditions. This ensemble of 51 possible values for temperature (figure 2) and precipitation are then used as input by Hydrological Operations and Prediction System (HOPS) developed at Finnish Meteorological Institute (FMI). The output for HOPS is a range of possible values for soil moisture and ground temperature of top layer (0 to 28 cm) of the ground over next six months. During winter time also depth of the snow cover is estimated. These slowly changing variables are more closely linked with bearing capacity of the ground than aforementioned weather variables.

Trafficability forecasts

The forecast is formed by comparing results given by the model runs against thresholds values that are considered critical for bearing capacity of the ground. A forecast for good trafficability conditions is given when at least 90 % of the runs agree that one or more of these thresholds will be reached. Correspondingly if 90 % of the runs agree that thresholds are not met, a warning of bad conditions is given. When model runs disagree the original trafficability map is shown as is. The thresholds used are Soil wetness under 40 %, Soil temperature under 0 degree Celsius at 20 cm deep (Ground is frozen) and Snow depth is over 40 cm.

Reading the forecasts

The forecast itself is shown on a box above the map window (figure 3) separately for winter and summer conditions. The forecast is given for a period of six months and is an average for an area centring on coordinates pointed by user with radius of 2.5 km. Small scale geographical variation within this circle - including the trafficability classes - don't affect the forecast itself which is based on climatology and seasonal variation. The forecast together with the classification gives a good estimate on how the trafficability conditions for given terrain change over the period of the forecast (figure 4). When the forecast promises good dry summer conditions all classes harvestable during summer are turned dark green on the map. With forecast showing bad conditions, classes requiring dry summer are turned red and with good winter conditions all classes are turned dark green.
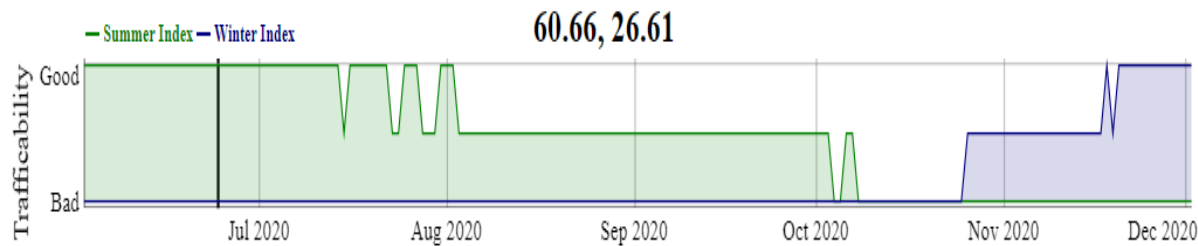

Figure 3: Forecast for summer conditions with green colour and for winter conditions with blue colour. Here good dry summer conditions can be expected until mid-July after which conditions turn unstable. Some winter frost can be expected starting late October but any benefit for harvesting condition is not expected until late November. Latitude and longitude of prediction centre are shown above the figure.

Figure 4: Colouring of classes is changed as forecast predicts good or bad conditions.

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Project partners

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