

## WILDFIRES IN MEDITERRANEAN SHRUBLANDS, PHRYGANA AND GRASSLANDS, IN GREECE: COMPARISONS OF OBSERVED FIRE BEHAVIOUR TO BEHAVEPLUS PREDICTIONS

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### Abstract

This paper presents a comparison of ninety five (95) Rate Of Spread ( $ROS_{observed}$ ) and seventy(70) Flame Length ( $FL_{observed}$ ) observations of surface wildfire behavior in Greece with predictions from the BehavePlus fire behavior prediction system for tall and short Mediterranean shrublands (maquis), phryganic lands dominated by the small xeric shrub *Sarcopoterium spinosum*, and grass.

Four fuel models, which had been developed for Greece, were used to describe the four fuel types: a) “Evergreen-schlerophyllous shrublands (1.5 - 3 m)” for tall maquis, b) “Evergreen schlerophyllous shrublands (up to 1.5 m)” for short maquis, c) “Phrygana II (*Sarcopoterium spinosum*)” for phryganic areas dominated by *Sarcopoterium spinosum* and d) “Mediterranean grasslands” for grass. The pairs of  $ROS_{observed}$  values and BehavePlus  $ROS_{predicted}$  values, were correlated via linear regression for each of the data subsets. The resulting four linear regression equations, with  $ROS_{observed}$  as the dependent variable and  $ROS_{predicted}$  as the dependent, are statistically significant ( $p < 0.001$ ) and can be used for adjusting BehavePlus ROS predictions to “real world” ROS estimates.

More specifically, BehavePlus ROS predictions were close to  $ROS_{observed}$  so adjustment is not considered as necessary. On the other hand, in the case of grasslands, BehavePlus under-predicts ROS by approximately 50%. As the grass adjustment equation is statistically significant and its adjusted  $R^2$  value is high ( $R^2_{adjusted} = 0.847$ ), it should be used for adjusting BehavePlus ROS predictions in these fine fuels.

The analysis also shows that the equations for short maquis and *Sarcopoterium spinosum* phrygana should also be used to adjust  $ROS_{predicted}$  values to the lower expected values, but this should be done with caution due to weaknesses of the equations.

In regard to flame length (FL) predictions from BehavePlus significant deviations were found for all four fuel types. The most important finding of this analysis was that BehavePlus consistently under predicted flame length for the *Sarcopoterium spinosum* dominated phrygana. The under prediction was significant and its importance is even greater because the underestimation takes place in a band of FL values that includes the threshold value of 1.2 m which is considered as the limit for direct attack on the flames with hand tools. In ten (10) out of  $N=26$  cases, the prediction was for  $FL < 1,2$  m while the observed FL value was well above this threshold. This is an important result that can be very useful for the safety of firefighters and it should be seriously taken into consideration in operational firefighting in the country.