USING AUTOMATED FUEL MOISTURE SENSORS TO PLAN PRESCRIBED BURNS

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DELWP is trialing the use of a statewide network of in-situ fuel moisture sensors to provide real-time online fuel moisture information for planned burning

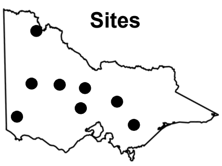
INTRODUCTION

Fuel moisture content (FMC) estimates for burn scheduling are historically based on weather observations and the deployment of field staff to take manual measurements. This process is prone to substantial prediction error, resulting in both missed burning opportunities, and inefficient scheduling and allocation of resources. To overcome these limitations the Victorian Department of Environment, Land, Water and Planning is investigating the use in-situ fuel moisture sensors (called "fuelsticks") that provide real-time online fuel moisture information. This project aims to evaluate the performance of these sensors.

Fig. 1 Typical Array of four Fuel Moisture Sticks attached to a logger and modem.

METHODS

Using data from 8 sites (40 x 40m), 8 EVCs, Victoria-wide, we compared:



Observed (gravimetric) FMC:
6-8 samples/site, 15 quadrats/sample, 5 fuel types: **Surface litter** (top 1 cm), **Sub-surface litter** (< 1cm), **Profile litter** (all litter), and **Elevated litter.**

Predicted (fuelstick) FMC:
Measured with a vertical array of 4 fuelsticks per site (Fig. 1): **Soil contact**-beneath litter, **Exposed**-resting on top of litter, **Near surface**-10 cm above ground, and **Elevated**-50 cm above ground.

RESULTS

The relationship between the fuelstick "predicted" FMC (%) and the observed gravimetric FMC (%) for each of the stick positions (horizontal axis) and fuel positions (vertical axis) is shown in Figure 2 for one of the research sites. The line of perfect agreement (ie. the 1:1 line) is shown as a dotted grey line. The red solid line shows the site-specific, and fuel-position specific, regression model (y=b(x-8)) fitted to the data.

Once calibrated using this regression, the fuel moisture sensors proved useful for monitoring changes in the local fuel moisture content at seasonal (lower left) and weekly (lower right) timescales.

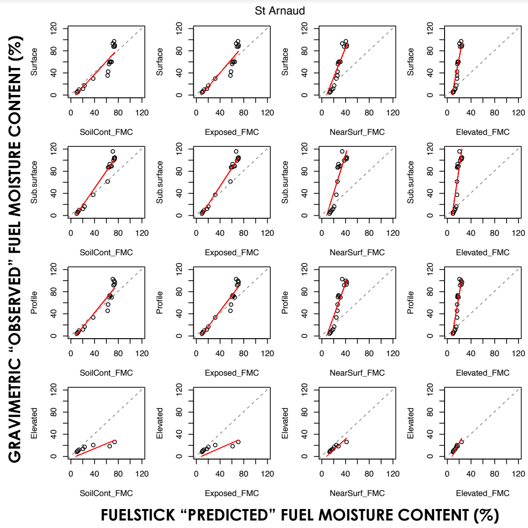


Fig. 2 Predicted and observed fuel moisture content.

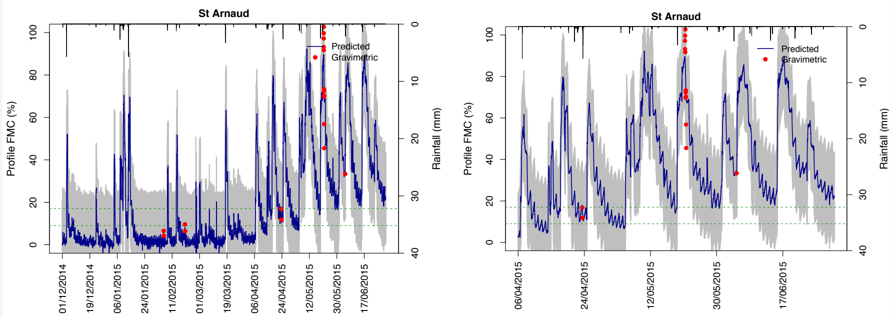


Fig. 3 Change in FMC estimated from the fuel moisture stick (blue line) compared to gravimetric measurements (red dots) and FMC thresholds for successful burning (horizontal green dashed lines). Grey shading shows the 95% prediction interval for the FMC predictions based on the regressions developed between the fuelstick and the gravimetric measurements.

Conclusion

The fuel moisture sensors provided an estimate of local-scale FMC that was substantially better than current methods based on weather information, and were particularly useful for observing rainfall effects and drying trends at seasonal and weekly time scales. The sensors do however require site-specific calibration to achieve a suitable level of accuracy to guide practical decision making.

Future work

In-situ networked sensors provide high quality real-time fuel moisture information. However even within a single region, fuel moisture can vary spatially due to factors such as topography and forest type. Future work should aim to develop methods to interpolate between a network of real time sensors to provide continuous real-time estimates of fuel moisture content across the landscape.

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