

Leaf Temperature Measurements

In each of three Fort Jackson burns sparkleberry shrubs were sampled for leaf temperature in advance of the flaming front up to the point where leaves were consumed. FLIR Inc. A-655 thermal imagers were used to capture radiant heat flux from the leaf surfaces from a near nadir perspective. The camera range was set for high gain which meant temperatures over 500C would saturate the image. However, lower gain would mean losing measurements at temperatures relevant to pyrolysis and tissue desiccation. Camera distance was approximately 2 meters from the measured leaf surface giving individual pixel sizes of approximately 6 mm². A 1 m² steel frame (1x1 m) delineated the shrubs in two adjacent plots and was used to calibrate pixel size. Data were collected at 1 Hz. In each 1 m² plot, two circular sub-samples of 30 pixels were averaged over unobstructed leaves towards the top of a sparkleberry bush with the view comprised of approximately 6-8 leaves. Fire radiative power was recorded at 1 second intervals, leaf temperatures were derived by rearranging the Stefan-Boltzmann equation assuming an emissivity of 0.98. High definition visual imagery was also captured in order to document the timing and location of the gas sampling tube and the flaming front.

Results

Figures 1 and 2 indicates the position of the shrubs and leaves sampled in each of the three burns. Figure 3 shows an example thermal image from which the leaf temperature data were extracted. Figure 4 shows the time series of the average leaf surface temperatures in the areas denoted in figures 1 and 2. Only values that occurred prior to any leaf consumption are shown.

Data files provided are Excel and CSV files for temperature data and MP4 and FLIR SEQ files for RGB video and infrared imagery respectively.



Figure 1. Plot 24A showing the areas sampled (red circles) and the naming convention for the leaf temperature samples.

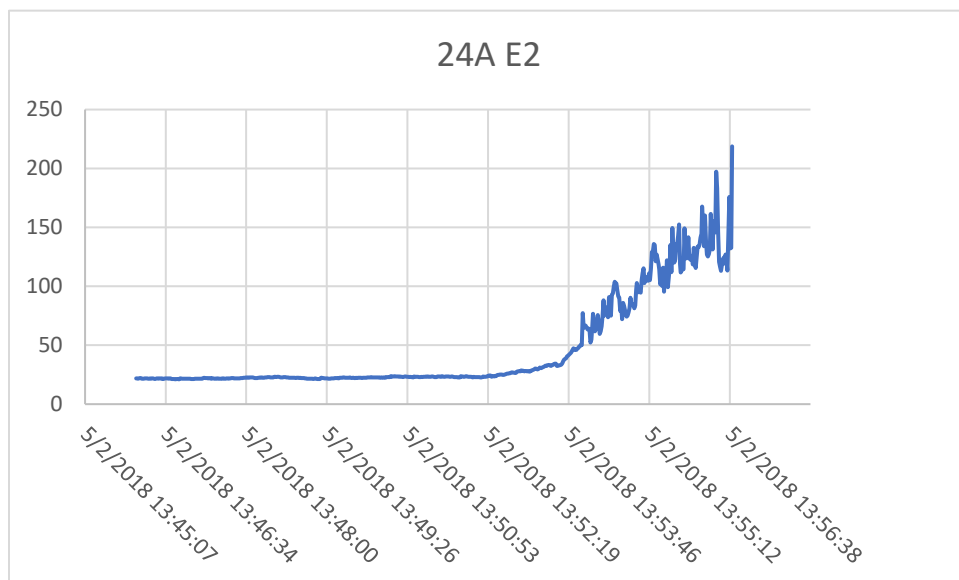
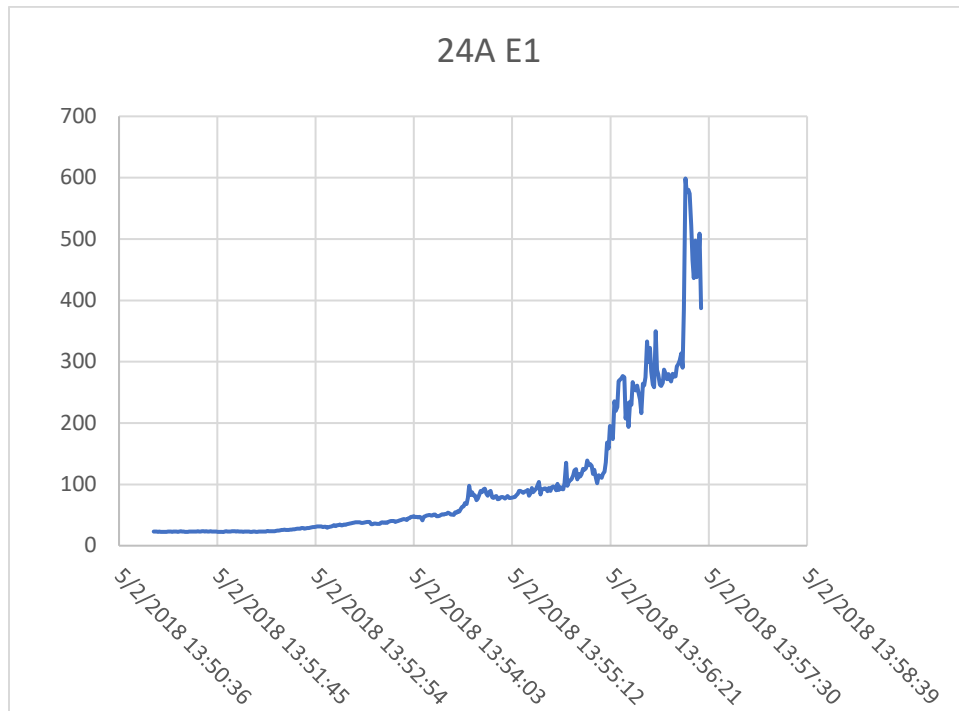


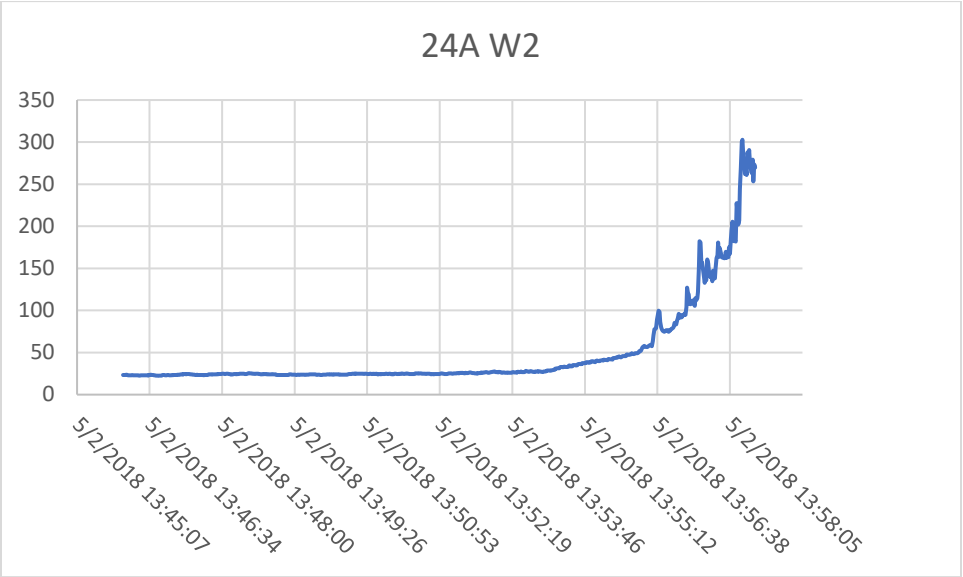
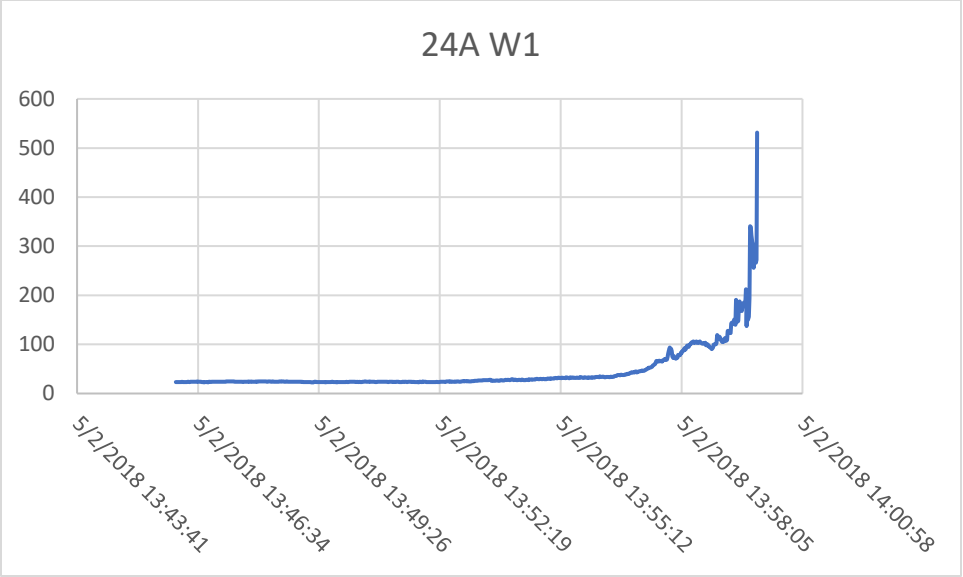
Figure 2. Plot 24B showing the areas sampled (red circles) and the naming convention for the leaf temperature samples.

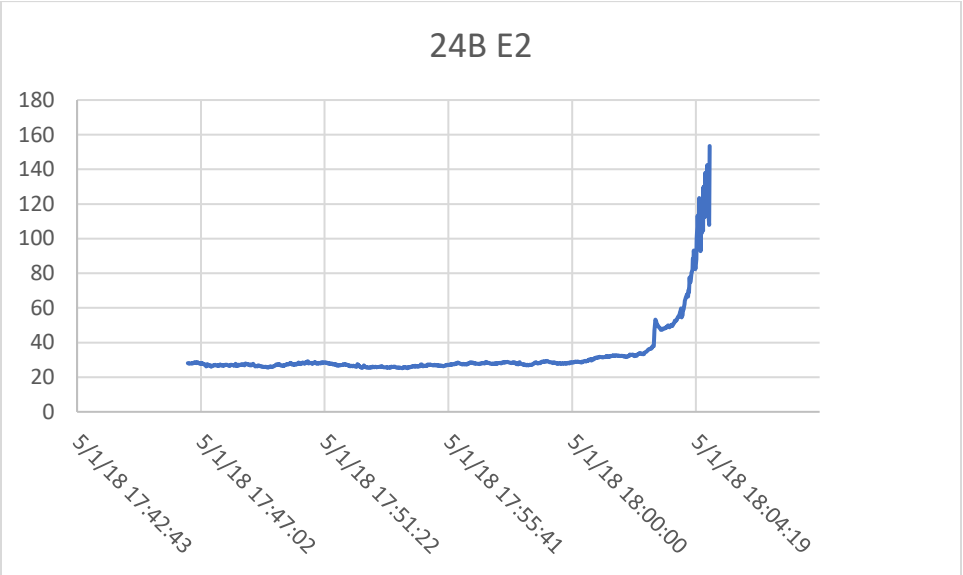
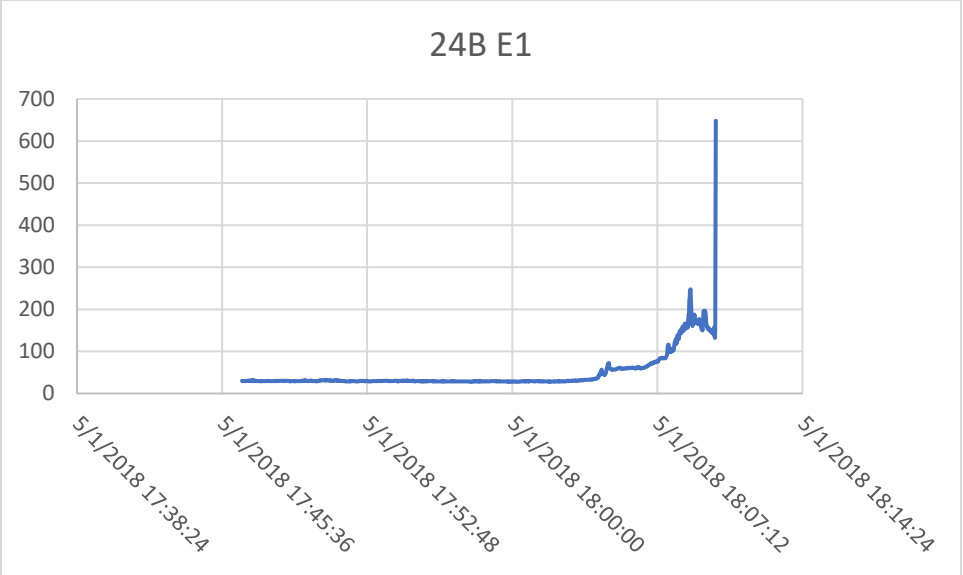


Figure 3. Example thermal image of plot 24A. The gas sampling wand is visible in the lower left.

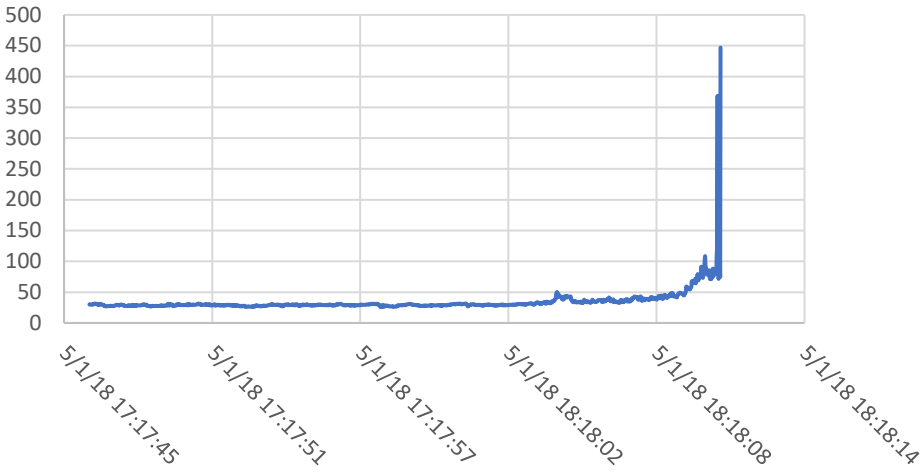
Figures of mean temperature (C) plots through time of the areas shown in Figure 1 and 2.







24B W1



24B W2

