Shallow ground disturbance creates a differential heat flux in the soil column due to a variation in the thermal properties between disturbed and undisturbed soils. When we observe above a canopy, the effect of vegetation growth on the thermal regime of the underlying soils is poorly understood. This paper discusses the potential of airborne thermal prospection, using the response measured by the NERC Airborne Thematic Mapper (ATM) at thermal infrared wavelengths, for detecting shallow ground disturbance where features are known to exist under variable vegetation over archaeology at Bosworth, Leicestershire and over abandoned mine shafts on Baildon Moor, W. Yorkshire. The investigation focuses on qualitative image interpretation techniques, where anomalies on day and night thermal images are compared with those manifest on the multispectral images, and a more quantitative approach of Apparent Thermal Inertia (ATI) modelling. ATI modelling examines the diurnal temperature contrast of the surface, determined from images acquired when the surface exhibits its maximum and minimum temperature, to identify volumetric variations in the soil column potentially relating to buried features. Ground temperature profiling at the Bosworth site indicated that diurnal heat dissipates between 0.20-0.50m at an early stage in vegetation development with progressively lower diurnal amplitudes observed at 0.20m as the vegetation develops. These results emphasise the importance for selecting the optimum times for thermal image acquisition of vegetated surfaces. Extensive ground geophysical prospection and soil sampling were also performed at the Bosworth site to compare the physical soil properties with the anomalies observed from the diurnal thermal, seasonal thermal and ATI response. Results suggest that there is a high correlation ($R^2=0.98$) between ATI and soil moisture properties at shallow depths during both early and late stages in cereal crop development, at 0.15-0.25m and 0.10-0.30m respectively. The high correlation between physical ground disturbance and the thermal response is also corroborated qualitatively with the results of resistivity surveys conducted over the Baildon Moor study site. These results suggest that ATI modelling can provide an indication of physical variations occurring at shallow depths in the soil column, even when a layer of vegetation covers the surface.