

Forensic science and bushfires: part 2 – reconstructing a bushfire scene

The previous *Bulletin* reported on research showing how elemental analysis can be used to link matches with fire scenes and suspects. This issue looks at another recent study that demonstrates the potential for forensic science to assist arson investigators.

Each summer Italy faces the threat of large forest fires, most commonly caused by arson and usually lit to clear wooded areas for private use. Fires intended to clear small areas sometimes get out of hand, destroying forests and fauna populations and sometimes claiming lives. Against this setting, Rella et al. applied forensic analysis techniques to reconstruct an arson scene, with the aim of sharing current knowledge with other researchers.

The fire investigated by Rella et al. occurred in August 2003 in central Italy. It caused one death and numerous serious injuries. There were no eye witnesses to the ignition and little other information, but investigators did recover five vegetation debris samples and two pieces of wire, each bent to form a figure 8. Based on previous experience, investigators believe these pieces of wire had been used to support a timed ignition device. This type of device usually involves matches and either cigarettes or sulphur tablets.

Tested with a range of extraction methods, gas chromatography and spectroscopic analysis, two of the debris samples tested positive for an accelerant, consistent with diesel fuel. Rella et al. constructed and ignited an ignition device similar to the one they believed had been used. With the use of a scanning electron microscope and X-ray microanalysis, Rella et al. were able to demonstrate that microscopic marks on the evidentiary wire loops were consistent with them having been used as part of an ignition device. The marks on the wire loops were not consistent with a sulphur-based ignition, so they were able to exclude the use of a sulphur tablet in these devices and conclude that a cigarette had been used as a fuse.

Rella et al. concluded that the analytical data allowed them to hypothetically reconstruct the ignition scene. They concluded that a number of devices had been used to deliberately start the fire, with the devices giving the arsonist an eight-minute period between lighting the cigarette and the device's explosion into flame. Diesel fuel had been used to assist the explosive part of the ignition, as its low accelerant properties stopped it being prematurely ignited during the arsonist's 'escape' period.

Through their analysis, Rella et al. were able to conclude that the fire had been deliberately lit, with planning and the prior construction of ignition devices. Two devices had been used to increase the likelihood of ignition. A scientifically supported conclusion like this can assist coronial and other inquiries and can focus police investigations. It can allow investigators to determine whether separate fires are related, based on similarities in the offender's method of operation. It could also provide critical corroborative evidence, were a suspect identified and found to possess the different articles used in construction of the ignition device.

For more information:

Rella R, Sturaro A, Parvoli G, Ferrara D, Cassellato U and Vadalà G 2005. A brush fire forensic case. *Science & justice* 45(1) 29-34.