Deliberate Wildland Fires: An Understudied Phenomenon

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When people think of arson fires, it is safe to assume that what springs to their minds initially is an image of a burning building. The crime of arson is considered a serious felony and is defined as "any willful or malicious burning or attempt to burn, with or without intent to defraud a dwelling house, public building, motor vehicle, or aircraft, personal property of another…" (Uniform Crime Reports, 2001). Wildland fires are any non-structure fires that occur in the wildland. In 2006, a total of 4,404,844 acres of wildland burned as a result of fires set by humans, either accidentally or on purpose.

According to the Uniform Crime Report (UCR, 2001) there are about 69,000 arson related offenses reported yearly by law enforcement agencies in the United States with structure fires representing about 42 percent of the total number. According to the UCR, residential properties account for about 61 percent of structure fires with the average financial loss equaling about $20,000 per arson. A concern to keep in mind however, is that few reporting agencies actually submit complete reports on the estimated financial loss, nature of the burned material and ownership of the property among other unreported data (Schmalleger, 2002). The impact of incomplete documentation results in an underestimate of actual arson fires of all kinds throughout the country.

The FBI (1997) reports that the annual clearance rate for arson fires is about 15 percent while Schmalleger (2002) places the clearance rate at about 17 percent, the same rate as for other property crimes. Brady (1983) found that 30,000 citizens are injured and 1,000 are killed as a result of arson every year while 4,000 firefighters are injured and 120 are killed fighting those fires. Twenty four wildland firefighter deaths were reported for 2006, according to the National Wildfire Coordinating Group.

Research conducted by the Center for Arson Research over the past 20 years has resulted in identification of specific firesetting subtypes, delineated by multiple variables, including: motivation, arson target(s), age of the offender at the onset of firesetting and emotions connected to the act of arson. For the purposes of better understanding the dynamics of firesetting behavior, the Center particularly studies the profiles of the subtypes: (1). accidental/curiosity, (2).thought disordered, (3). revenge, (4). thrill seeking, (5). disordered coping and (6). delinquent firesetters (Williams, 2005). Each subtype sets fires according to motivation and the results range from no damage to catastrophic loss although each deliberately set fire represents the possibility of loss of material goods, injury and even death.

No where are there more glaring examples of the magnitude of the danger of fire than in the results of wildland blazes. In fact, the most glaring comparison between wildland fires and structure fires is found in the very scope of the capacity for danger and destruction. The damage from the deliberately set Jasper fire in the Black Hills of North Dakota is a case in point. The Jasper arson began on August 24, 2000 and was not contained until September 8, 2000 and was

finally controlled on September 25, 2000. Suppression costs associated with the Jasper fire amounted to $8,200,000 (U.S. Forest Service, 2000). During the time the fire raged, it burned up to 100 acres a second , finally destroying 83, 508 acres of land, making it the worst forest fire that the Black Hills had ever seen. The wildfire endangered homes and lives and caused evacuations from multiple communities. Amazingly, only one home was lost and no civilians were injured despite the nightmarish conditions, in large part due to the heroic efforts of firefighters who worked around the clock (S. Res. 376, 1999-2000). The fire was set by 47 year old Janice Stevenson, of nearby Newcastle, Wyoming. After a three week long investigation, she was ultimately confronted and confessed to setting the fire. She later pleaded guilty and was sentenced to 25 years in prison. Investigators believed that she had set other wildfires in the past.

Another devastating deliberate wildland fire, this one resulting in the tragic deaths of five firefighters was the Esperanza arson fire, set in San Bernardino County, CA on October 26, 2006 which was finally contained on October 30, 2006. That fire was so intense that 500 acres of wildland burned in the first two hours, spurred on by Santa Ana winds blowing up to 50 miles an hour at the accident scene. In all, in addition to the deaths of the trapped firefighters, the Esperanza fire burned 40,200 acres of land, destroyed 34 homes along with 20 out buildings and roads. The damage estimate was nine million dollars (CA Department of Forestry and Fire Protection, 2006). On October 21, 2006, a suspect, Raymond Oyler, was arrested for setting two wildfires in the summer of 2006. He was subsequently charged with five counts of first degree homicide, accounting for the firefighter deaths, on November 2, 2006. Trial is set to begin in mid-April, 2008 and the prosecution is considering seeking the death penalty. As this article is written, the motivation for the wildland fires is unclear but the suspect has also been charged with 23 fires in total (Cruz & Glenn, 2007).

As Williams (2005) observes, there are certainly knowledge gaps in understanding firesetting behavior. Adult arsonists generally were youthful firesetters who either were untreated or undertreated for their behavior. Curiosity/accidental firesetting behavior in young children, delinquent firesetting in adolescence and fires set secondary to psychosis in all age groups are generally easier to identify and provide strategies around than are other firesetting subtypes. Adult thrill seekers, who enjoy setting large fires and revenge arsonists (including eco-terrorists) may well comprise the majority of deliberate firesetters in wildland fires, when children, adolescents and individuals with a major mental illness are factored out of the equation..

In order to effectively investigate and solve crimes of wildland arson fires, particularly multiple fires set by single individuals, the United States Forest Service, Law Enforcement and Investigations Branch, undertook research to acquire more definitive information on the subject of wildland serial arson. The intent of the research was to gather data that could be used by investigators to assist in these often complex and challenging cases.

The project reviewed all cases of arson that had resulted in a conviction for an approximate ten year period. From this list, cases meeting the FBI criteria for serial arson were selected for

further study. This resulted in a total of 52 serial arson cases nationwide, involving 68 offenders (several cases involved conspiracies of two or more offenders). Information derived from the case reports, court records and interviews with the individual investigators was used to develop a statistical profile. This material was then compared against the existing statistical profile developed by the FBI in their studies of serial arsonists to determine how closely they matched (Sapp, Huff, Gary & Icove, 1994). We offer selected findings from the serial wildland arsonist study below from a comprehensive data base.

Social and Criminal History

The typical wildland serial fire setter identified in this study was male (93%), Caucasian (88%) and had a median age of 23 at the time of arrest. (The four female offenders had a median age of 44.) The subject was either employed as an unskilled laborer (37%), unemployed (31%), skilled/technical (13%) with the remainder unknown. The majority of the sample were single and never married (77%) with the remainder either married/cohabitating (16%) or divorced/separated (7%). The majority resided in a single family dwelling (68%) or mobile home/trailer, (28%). The majority of the population (46%) resided with a parent or parents, while 15% resided alone. The remainder lived with a spouse, roommate or other relative.

Where known, the subject either did not finish high school (43%) or at best, was a high school graduate, found in fifty three percent of the sample. Only four percent had any education beyond high school, with none of the sample actually completing college. Forty percent had a prior criminal history, with an almost even mix of felony and misdemeanor convictions. Crimes against property (55%) accounted for the majority of the convictions. Only 11% had previous arson convictions, but 28% were identified as suspects in previous arson cases that did not lead to an arrest or conviction. Typically, the arsonist in the sample was raised by both parents (65%) or a single parent (26%) or by other relatives/foster parents at nine percent. Where noted, 17% possessed tattoos and 11% had a noticeable physical defect or disfigurement.

The aggregate of this information closely mirrors the FBI statistical profile and findings by other researchers in a number of key areas, as follows. The FBI reported their average arsonist as male (94%), Caucasian (82%) and young (59% set their fires before age 18 and 80% set their fires before the age of 29). Fifty one percent of the subjects were employed as either an unskilled or skilled laborer, however 13% were regularly unemployed. Sixty six percent of the offenders were single, with 54% reporting they had never been married. Forty three percent stated they were living in a single family dwelling and 24% were living in an apartment while 23% lived with their parent(s), 17% lived alone and 7% lived with a male roommate. The average offender completed 10.2 years of schooling, with 91% having a high school education or less, although where known, most tested at average or above average intelligence. Eighty seven percent of the sample reported prior felony arrests, (predominantly for arson and other property related crimes). Fifty seven percent were raised by both parents.

The findings from the study noted above also reflect conclusions reached by the Center for Arson Research with a particular applicability for the thrill seeking subtype. Research on thrill seeker arsonists find them generally to be psychopathic in personality construct with little ability to learn from consequences, up to and including burn injuries suffered in fires of their own making or incarceration (Williams, 2005). A random sample of 310 firesetters studied by the Center for Arson Research in 2005 determined that 38 percent of the thrill seeker arsonists self reported boredom as their motivation for setting fires in comparison to the four percent who reported boredom in all five other subtypes combined.

It is unmistakable that further research is needed to expand our knowledge of the motivation that drives arsonists to commit the kind of crime that endangers us all and destroys our property and natural resources. Wildland fires, by their very scope, are breathtaking in their destruction. More intense study will provide us with the tools we need to identify the dynamics of wildland arsonists in comparison to all other arsonists. Such information will allow for earlier recognition and intervention strategies that will benefit us all.

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The European Network of Arson Practitioners

Response to Request for Information/Assistance

Original Query:

We have a received a request for assistance from the UK for information regarding Chinese lanterns, and specifically about Chinese lanterns as a potential cause of grass fires, wildfires etc. The requester is particularly interested in obtaining copies of any research reports produced.

Date responses compiled: 17th April 2012

1. United Kingdom (1)

I haven't seen any research reports but I do know that we had an incident a few months ago where a witness had seen a lantern blowing along the street and shortly afterwards a car caught fire and it was assumed that the lantern had lodged itself under the vehicle.

Chinese flying lanterns caused the car fire which marked Buckinghamshire Fire and Rescue's final emergency response of 2011 – and also the tree fire which marked the service's first call-out of 2012.

Firefighters from Gerrards Cross were called to a car fire in Albion Road, Chalfont St Giles, just before midnight. A lantern landed on the road near the car and was blown underneath it by the wind, said the service this morning.

Forty minutes later the same crew was call to a fire in Howards Thicket, Gerrards Cross, where a lantern had become caught up in a tree.

Firefighters are again urging people to take extra care when using these lanterns to celebrate special events.

Flying lanterns – also known as sky lanterns and Chinese lanterns – are usually made of paper, wire and bamboo and contain a lit candle. They can rise to more than 1,000 feet, fly for up to 20 minutes and float for miles before landing.

Chris Bailey, head of Buckinghamshire Fire & Rescue Service's community safety team, said: "You can't control the direction they take or where they will land.

"There is no guarantee that the fuel source will be fully extinguished and cooled when the lantern lands, and that's a real fire hazard."

He said unsuitable locations for flying lanterns included areas near telephone and power lines, areas near standing crops, anywhere near buildings with thatched roofs, areas of dense woodland and areas of heath or bracken.
As well as being a potential fire hazard, the lanterns often contain wire which can kill or injure animals, damage farm machinery or end up in animal feed.
Last year the BFP reported on Lane End farmer Will Lacey's call to ban the lanterns after three of his cows suffered agonising deaths when they digested metal wire from lanterns which landed on the farm.
The lanterns have also tied up a great deal of emergency service time over the years because they are sometimes mistaken for UFOs or distress flares.

2. United Kingdom (2)

The following website includes a case study on Chinese Lanterns: www.blackmuseum.info

3. Sweden

We are more or less discussing the same issue here in Sweden at the moment. Just a couple of weeks ago we have asked our network of fire investigators to look into the problem this spring.

We had some troubles at "Skansen", an open air museum with old cultural buildings from all around Sweden. The wind blew from Söder (Stockholm's "hipster" neighbourhood) towards Skansen, a distance of 2.5 km. And the personnel at Skansen had to put out several lanterns that landed there. We can obtain more information about this.

In the Swedish safety instructions attached to the lanterns it says that they must not be used within 30 km of an airport. We have not yet talked with the aviation authority in Sweden about this recommendation, but if that's the case, then the number of places where you can use those lanterns are very limited, even in Sweden. We asked our GIS-personnel to draw a buffer zone of 30 km around the larger airports in Sweden on a map and the result was very interesting.

The Swedish Transport Agency has adopted national regulation (Dec 2011) saying that written permission is needed for the use of sky lanterns within 10 km from an active airport. A written permission is also needed if the lantern could reach an altitude above 400 meters.

4. Czech Republic

I am sending a complete material that was created for foreign purposes in English language.

Please see that following attachment:

- Flying Wish – European Risk regarding Fire Protection

5. United Kingdom (3)

A serious problem recently highlighted on the Country File television programme in the UK. Gardiner's Associates will be doing some research during 2012.

6. United Kingdom (4)

I haven't attended, or heard of, any incidents of fires caused by these lanterns, however we have had false alarms - people seeing them dropping and calling in reporting hot air balloon crash. Though not recently, perhaps as people are now more familiar with seeing them?

I would have thought that their fire-starting abilities would be limited by the heat they produce being what keeps them in the air and they drop to the ground when the candle is burnt out...though the amount of heat needed to keep them airborne may not be produced when the tea-light is near extinction, thus allowing people to see 'hot air balloons' dropping behind trees. An interesting study into the conditions in which they fall, as if the flame is out then there is little opportunity for them to be a cause of fire, but if not then there clearly is!

7. Netherlands (1)

2 years ago I have tested about 15 Chinese lanterns of different brands and shapes on their possibility to ignite dry matter.

When they came down, sometimes the burner part still contained red hot glowing and sparkling parts. If these come in direct contact with dry materials, these dry materials might ignite.

I never planned to make a report of my findings, as I did these informal tests out of pure curiosity - on request of a trader in Chinese lanterns. I certainly did not want to give these practice tests an official status as they were too improvised - and this is not my job, so the results might be disputed.

8. Finland

I'm not aware of any fires caused by them in Finland but the sale of these products has been banned, based on the fire risk.

9. United Kingdom (5)

Oxfordshire have responded to the threat of this product by education using social websites, our 365 alive pages and press releases. However, there has been no formal report carried out.

10. Netherlands (2)

I received your question about the Chinese lanterns, in my region we had the last 3 years 5 fires that were started by a Chinese lanterns.

4 fires were in the dunes in 's-Gravenzande and The Hague, 1 fire was on the roof of an apartment building were a dovecote was on fire.

I know that, in the Netherlands, we are try to get a ban for the Chinese lanterns, a specially the regions with lots of house with thatched roofs and lots of dunes/heath.

11. United Kingdom (6)

http://www.bbc.co.uk/news/uk-england-tyne-13006767

http://www.theshipinn-holyisland.co.uk/blog/2011/04/holy-island-dune-grass-inferno/

http://www.cla.org.uk/In_Your_Area/North_East/Regional_News_Archive/Land_Management/Fire/1006364.htm/

http://www.journallive.co.uk/north-east-news/todays-news/2011/04/09/fire-chiefs-issue-warning-over-chinese-lanterns-61634-28488588/

http://www.northumberland.gov.uk/default.aspx?page=6270&article=1315

http://www.northumberlandgazette.co.uk/news/local-news/warning_after_lanterns_cause_island_blazes_1_3285496

http://www.berwick-advertiser.co.uk/news/local-headlines/chinese_lanterns_spark_blaze_in_dunes_1_1576016

12. Cyprus

The Cyprus Fire Service disagrees with the use of Chinese Lanterns because there is an increased risk of grass fires and wildfires.
We also gave this answer, to the responsible department of Cyprus government, which ban the importation and the use in the country.

13. Netherlands (3)

I am pleased to refer to an investigation report of the Food Safety Authority in the Netherlands.

See the following attachment (in Dutch only):

- 001-12 Bijlage A rapport VWA

14. United States of America (1)

I thought I would just pass on to you that while they are not a frequent problem for us in California they are a problem. During about a five year period I had about six fires that resulted from them. I am sure that there are far more launched than the number of fires indicates. One of the six lanterns that I investigated did not start a separate fire but was found on the ground next to a commercial structure. It had burned up upon landing but since it landed in gravel it did not spread to anything. My experience is that people can use everything from candles, to sterno cans, to small cups holding combustible liquids in them. The imagination is the limit. The other five that I have come across did start fires in the wildland after the heat source began to burn out and the lantern came back to the ground before the heat source burned out completely. Typically, as the heat source starts to burn low the heat generated is not enough to keep it aloft. If it descends faster than it expends fuel, the fuel will still be on fire by the time it reaches the ground. This resulted in the lantern, normally made of paper or plastic trash bags (more common here), igniting as it landed and then setting the vegetation on fire.

Sorry to say that we do not have any specific laws which deal with this other than the persons who use them can be charged with negligently starting a fire which in extreme cases can mean prison time here. The difficult part is that most often the responsible parties are long gone by the time the lanterns land. Witnesses are key.

Interestingly enough, I was in Croatia last summer and while at Dubrovnik one night we saw about a dozen of the lanterns launched from a ridgeline above the town. They were quite big and I am not aware of what fuel source they were using. Fortunately they were headed out to sea with the prevailing winds.

15. United States of America (2)

Here is a link to some videos and photos of a field flammability test Gary White, a colleague in Oregon, did a year or two ago. While the only ones that I have had experience with are the homemade ones, (dry cleaner bag or black plastic garbage bag), this test was done with a commercially purchased one, using I believe a paraffin fuel. The mfr. claims that the bag is "fireproof", but as you will see, not so much. The conclusion was that these are definite fire hazards, at least for this one brand.

http://www.box.com/s/aqnce6r5yciij1n2xab1

Also there is a password: lantern

Finally, here is another link to a manufacturer. Note they say these are "fire retardant paper", not fireproof.

http://www.skylanterns.us/default.asp

Please remember to acknowledge Gary White as the owner of the videos and photographs if you reference these within any documents.

16. Denmark

I haven't any experience with Chinese lanterns as potential cause of fires.

17. Slovak Republic

I haven't any experience with Chinese lanterns as potential cause of fires.

18. Bulgaria

In reference to your e-mail, I would like to inform you that there are no reports for fires caused by chinese lanterns in Bulgaria.

19. Romania

In Romania we don't have recorded data about Chinese lanterns.

20. United Kingdom (7)

I received this circular a while ago and cannot recall where it came form other than the Authors service. There is some good info contained within.

See attached document:

- 05-09ChineseFlyingLanterns.pdf

21. United Kingdom (8)

A couple of things which may help.

We did a series of tests on these ourselves and have attached the report.

Also, we supplied a case study to the Black Museum which may be of interest link below

http://www.esfrs.org/blackmuseum/chineseLanterns.shtml

See attached document:

- Chinese Lanterns – practical test results

FI-210 Additional Reading Material - Online Source

Babrauskas, Vytenis. 2005. ResearchGate:. *Risk of ignition of forest fires from black powder or muzzle-loading firearms.* [Online] 2005. [Cited: 12 18, 2015.] https://www.researchgate.net/publication/280309835_Risk_of_ignition_of_forest_fires_from_black_powder_or_muzzle-loading_firearms.

—. 2004. Wood Char Depth: Interpretation in Fire Investigations. [Online] 2004. [Cited: August 4, 2015.] https://doctorfire.com/WoodCharring.pdf.

Bachelard, Gaston. 1964. Academia. *The Psycho analysis of Fire.* [Online] 1964. http://www.academia.edu/999590/Gaston_Bachelard_and_The_Psychoanalysis_of_Fire.

Baird, Robert A. 2006. Taylor Francis Online. *Pyro-Terrorism - The Threat of Arson Induced Forest Fires as a Future Terrorist Weapon of Mass Destruction.* [Online] 2006. [Cited: August 3, 2015.] http://www.tandfonline.com/doi/abs/10.1080/10576100600698477. Volume 29, Issue 5.

Bertanga, Paul J. 1997. California Department of Forestry & Fire. *Catalytic Converter Caused Fires.* [Online] 1997. [Cited: August 4, 2015.] http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fppguidepdf122.pdf.

Brown, Timothy J. 2012. National Wildfire Coordinating Group. *What is the Appropriate RAWS Network?* [Online] August 2012. [Cited: 12 22, 2015.] www.nwcg.gov/filebrowser/download/1903. PMS 1003.

Burnette Jr., Guy E. 1998. Inter FIRE Online. *Fire Scene Investigation: The Daubert Challenge.* [Online] 1998. [Cited: August 4, 2015.] http://www.interfire.org/res_file/daubert.asp.

Butry, Davod T. and Prestemon, Jeffrey P. 2005. Spatio-temporal wildland arson crime functions. *USDA Forest Service Southern Research Station.* [Online] July 2005. [Cited: 12 18, 2015.] http://www.srs.fs.usda.gov/pubs/9537.

Cadwallader, Tom and Cosgrove, Dennis. 2012. University of Wisconsin-Extension, Grazing Resources & Research. *Fencing Systems for Rotational Grazing; Keeping the Current Flowing.* [Online] 01 2012. [Cited: 12 21, 2015.] http://fyi.uwex.edu/grazres/files/2012/01/current.pdf.

California Department of Forestry & Fire Protection, USDI Bureau of Land Management, Union Pacific Railroad, Burlington Northern Santa Fe Railroad, USDA Forest Service. 1999. CalFire. *Railroad Fire Prevention Field Guide.* [Online] April 1999. [Cited: 12 21, 2015.] http://cdfdata.fire.ca.gov/fire_er/fpp_engineering_view?guide_id=9.

California Department of Forestry & Fire, Pacific Gas & Electric, Southern California Edison Company, San Diego Gas and Electric Company, Sempra Energy. 2008. Power Line Prevention Field Guide. [Online] November 2008. [Cited: August 5, 2015.] http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fppguidepdf126.pdf.

FI-210 Additional Reading Material - Online Source

California Department of Forestry & Fire; Department of Agriculture, Forest Service; Department of Interior, Bureau of Land Management. 1999. California Department of Forestry & Fire. *Industrial Operations Fire Prevention Field Guide.* [Online] July 29, 1999. [Cited: August 3, 2015.] http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fppguidepdf102.pdf.

Comeau, Ed and Tunkel, Ronald F. 2000. interFIRE online. *A Field Guide to Incident Analysis.* [Online] MA 2000. [Cited: August 6, 2015.] http://www.interfire.org/features/fieldguide.asp.

Countryman, C.M. 1986. USDA Forest Service, Fire Management Today. *Ignition of Grass Fuels by Cigarettes.* [Online] 1986. [Cited: August 4, 2015.] http://www.fs.fed.us/fire/fmt/volumes_authors.html.

De Bernardo, L. 1979. USDA Forest Service, Technology & Development Program. *Fire Start Potential of Railroad Equipment.* [Online] September 1979. [Cited: 12 22, 2015.] http://www.fs.fed.us/t-d/programs/fire/spark/PDF_Files/Fire_start_RR.pdf.

Deeming, John, et al. 1972. Frames Resouce Catalog. *The National Fire-Danger Rating System.* [Online] February 1972. [Cited: 12 22, 2015.] http://babel.hathitrust.org/cgi/pt?id=umn.31951d02986925q#view=1up;seq=1. Research Paper RM-84.

Fairbank, J.P. and Bainer, Roy. 1934. Archive. *Spark Arresters for Motorized Equipment.* [Online] 1934. [Cited: August 6, 2015.] http://www.fs.fed.us/t-d/programs/fire/spark/PDF_Files/Fairbanks.pdf.

Federal Emergency Management Agency - United States Fire Administration. 1989. United States Fire Administration. *Establishing an Arson Strike Force.* [Online] 1989. [Cited: August 4, 2015.] http://www.usfa.fema.gov/downloads/pdf/publications/fa-088.pdf.

—. 1988. US Fire Administration. *Arson Prosecution: Issues and Strategies.* [Online] 1988. [Cited: August 3, 2015.] http://www.usfa.fema.gov/downloads/pdf/publications/fa-078.pdf.

Federal Judicial Center. 2011. The National Academies Press. *Reference Manual on Scientific Evidence (Third Edition).* [Online] 2011. [Cited: 12 21, 2015.] http://www.nap.edu/catalog/13163/reference-manual-on-scientific-evidence-third-edition. ISBN 13: 978-0-309-21421-6; 0-309-21421-1.

Frandsen, William H. 1987. USDA Forest Service, Rocky Mountain Research Station. *The Influence of Moisture and Mineral Soil on the Combustion Limits of Smoldering Forest Duff.* [Online] 1987. [Cited: August 6, 2015.] http://www.fs.fed.us/rm/pubs/rmrs_gtr292/1987_frandsen.pdf.

Gary, Gordon P., et al. A motive-based offender analysis of serial arsonists. *U.S. Fire Administration Library.* [Online] [Cited: August 5, 2015.] http://usfa.kohalibrary.com/app/work/164240.

Gutsell, S. L. and Johnson, E.A. 1996. Northern Arizona University. *How fire scars are formed: coupling a disturbance process to its ecilogical effect.* [Online] 1996. [Cited: 12 21, 2015.] http://library.eri.nau.edu/gsdl/collect/erilibra/import/Gutsell_HowFireScarsFormed.pdf. Can. J. For. Res. Vol. 26:1996.

FI-210 Additional Reading Material - Online Source

Harrison, Roger T. 1977. USDA Forest Service San Dimas Equipment Development Center. *Catalytic Converter Exhaust System Temperature Tests.* [Online] February 1977. [Cited: 12 21, 2015.] http://www.fs.fed.us/t-d/programs/fire/spark/PDF_Files/cat_conv_exhaust_sys_temp_tests.pdf.

Hehman, Rick and Schwitzer, David Keiner. zhome. *Turbocharger Service is A Matter Of Common Sense.* [Online] [Cited: 12 21, 2015.] http://zhome.com/ZCMnL/PICS/turboChargerBasics/turboChargerBasics.html.

International Association of Fire Chiefs. 1989. Rural Arson Control. [Online] February 1989. [Cited: August 5, 2015.] http://www.usfa.fema.gov/downloads/pdf/publications/fa-087.pdf.

International Organization for Standardization. Country Codes - ISO 3166. *International Organization for Standardization.* [Online] [Cited: 04 24, 2014.] http://www.iso.org/iso/home/standards/country_codes.htm. ISO 3166.

—. 2013. ISO 3166-2:2013. Codes for the representation of names of countries and their subdivisions -- Part 2: Country subdivision code. *International Organization for Standardization.* [Online] 11 19, 2013. [Cited: 04 24, 2014.] http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=63546. ISO 3166-2:2013.

Kaminski, Guido C. 1974. USDA Forest Service: San Dimas Equipment Development Center. *Ignition Time vs Temperature for Selected Forest Fuels.* [Online] November 1974. [Cited: August 3, 2015.] http://www.fs.fed.us/t-d/programs/fire/spark/html/74511201/74511201.html.

Kelm, Kevin L. 2012. Arson and Bombing Behavioral Analysis LLC. *Behavioral Investigation of the Arsonist.* [Online] April 2012. [Cited: 12 21, 2015.] http://arsonbombing.com/ESW/Files/Behavioral_Investigation_of_the_Arsonist_Part_I.pdf.

Lusk, G.E. and Mak, S.T. 1976. Research Gate. *EHV wood pole fires: Their cause and potential cures.* [Online] March 1976. [Cited: August 5, 2015.] https://www.researchgate.net/publication/3458376_EHV_wood_pole_fires_Their_cause_and_potential_cures. ISSN: 0018-9510.

Matley, Marcel. 2000. The Expert Ambush. *ExpertPages.* [Online] 2000. [Cited: August 5, 2015.] http://expertpages.com/news/expert_ambush.htm.

Maxwell, Floyd D., et al. 1980. USDA Forest Service. *gnition Characteristics of Internal Combustion Engine Exhause Products: An In-Depth Study of the Characteristics of Internal Combustion Engine Exhause Products, Cellulose Fuel Ignition, and How to Prevent the Exhause Products from Igniting the Fuels.* [Online] 1980. [Cited: August 4, 2015.] http://www.fs.fed.us/t-d/programs/fire/spark/PDF_Files/ignition-chars.pdf.

FI-210 Additional Reading Material - Online Source

Maynard, T., Finney, M., McAllister, S., Grob, I. 2013. USDA Forest Service: Northern Research Station. *Tech Tips: Ignition Potential of Rifle Bullets.* [Online] July 2013. [Cited: 12 21, 2015.] http://www.nrs.fs.fed.us/pubs/44776. 5100 1351 1301-SDTDC.

National Fire Protection Association. 2014. National Fire Protection Association. *NFPA 921: Guide For Fire and Explosion Investigations.* [Online] 2014. [Cited: August 5, 2015.] http://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=921.

—. 2003. National Fire Protection Association. *Users Manual for NFPA 921.* [Online] 2003. [Cited: August 6, 2015.] http://www.amazon.com/Users-Manual-NFPA-921-Investigations/dp/0763744026. ISBN 13:978-0-7637-4402-1.

—. 2014. NFPA 1033: Standard for Professional Qualifications for Fire Investigator. *National Fire Protection Association.* [Online] 2014. [Cited: August 5, 2015.] http://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=1033.

National Wildfire Coordinating Group. 2002. *National Wildfire Coordinating Group.* [Online] July 2002. [Cited: 07 10, 2014.] http://www.nwcg.gov/pms/pubs/. PMS 932.

—. 2002. National Wildfire Coordinating Group. *Gaining an Understanding of NFDRS.* [Online] July 2002. [Cited: 07 14, 2014.] http://www.nwcg.gov/pms/pubs/MasterGaining.pdf. PMS 932.

—. 2014. National Wildfire Coordinating Group. *Interagency Wildland Fire Weather Station Standards & Guidelines.* [Online] October 2014. [Cited: 12 22, 2015.] http://www.nwcg.gov/sites/default/files/products/pms426-3.pdf. PMS 426-2.

—. 2012. National Wildfire Coordinating Group. *Investigating Railroad Caused Wildfires.* [Online] October 2012. [Cited: August 3, 2015.] http://onlinetraining.nwcg.gov/node/216.

—. 2010. National Wildfire Coordinating Group. *National Fire Danger Rating System Reference Material.* [Online] 2010. http://www.nwcg.gov/publications/national-fire-danger-rating-system-reference-materials-%28cd-rom%29. PMS 933.

—. 2013. Operating Principles and Guidelines. *National Wildfire Coordinating Group.* [Online] April 2013. [Cited: 04 25, 2014.] http://www.nwcg.gov/pms/pubs/900/toc.htm. PMS 900.

Norkeveck. 1999. California Department of Forestry & Fire: Industrial Operations Fire Prevention Field Guide. *Spontaneous Combustion in Delimber Residue Piles.* [Online] July 29, 1999. [Cited: 12 21, 2015.] http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fppguidepdf124.pdf.

Ohlemiller, T.J., Villa, K.M., Braun, E., Eberhardt, K.R., Harris, R.H., Lawson, J.R., and Gann, R.G. 1995. Wiley Online Library. *Quantifying the ignition propensity of cigarettes.* [Online] July/August 1995. [Cited: 12 21, 2015.] http://onlinelibrary.wiley.com/doi/10.1002/fam.810190402/abstract. Volume 19: Issue 4; pages 155-169.

FI-210 Additional Reading Material - Online Source

Plucinski, Matthew Paul. 2003. The Investigation of Factors Governing Ignition and Development of Fires in Heathland Vegetation. *ResearchGate.* [Online] July 2003. [Cited: August 5, 2015.] http://www.researchgate.net/publication/267300266_THE_INVESTIGATION_OF_FACTORS_GOVERNING_IGNITION_AND_DEVELOPMENT_OF_FIRES_IN_HEATHLAND_VEGETATION.

Prestemon, J.P., et al. 2013. USDA Forest Service, Southern Research Station. *Wildfire Ignitions: A Review of the Science and Recommendations for Empirical Modeling .* [Online] 2013. [Cited: August 5, 2015.] http://www.srs.fs.fed.us/pubs/gtr/gtr_srs171.pdf.

Prestemon, Jeff and Butry, David. 2005. USDA Forest Service, Southern Research Station. *Time to Burn: Getting a Step Ahead of Wildland Arsonists.* [Online] September 30, 2005. [Cited: 12 21, 2015.] http://www.srs.fs.fed.us/news/52.

Rein, Guillermo. 2009. Edinburgh Research Archive. *Smoldering Combustion Phenomena in Science and Technology.* [Online] January 2009. [Cited: 12 21, 2015.] https://www.era.lib.ed.ac.uk/bitstream/handle/1842/2678/Rein_SmoulderingReview_IRECHE09.pdf?sequence=1.

Rider, Anthony O. 1980. National Criminal Justice Reference Service. *Firesetter - A Psychological Profile, Part One.* [Online] June 1980. [Cited: August 5, 2015.] https://www.ncjrs.gov/app/publications/abstract.aspx?id=68373.

Ritchie, E.C. and Huff T.G. 1999. ASTM International. *Psychiatric Aspects of Arsonists.* [Online] July 1999. [Cited: 08 03, 2015.] http://www.astm.org/DIGITAL_LIBRARY/JOURNALS/FORENSIC/PAGES/JFS14546J.htm.

Rossmo, D. Kim. 1999. CRC Press. *Geographic Profiling.* [Online] 1999. [Cited: August 5, 2015.] https://www.crcpress.com/Geographic-Profiling/Rossmo/9780849381294.

Sapp, A.D., et al. 1994. NCJRS, National Criminal Justice Reference Service. *National Criminal Justice Reference Service.* [Online] 1994. [Cited: August 5, 2015.] https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=149950.

Schiro, George. 1998. Collection and Preservation of Evidence. *Crime Scene Investigator Network.* [Online] 1998. [Cited: August 5, 2015.] http://www.crime-scene-investigator.net/evidenc3.html.

Sicking, Lois P. 1991. USDA Forest Service: Technology & Development Program. *Fire Investigation Procedures for Multipurpose Small Engine and General Purpose Spark Arrester Exhaust Systems .* [Online] April 1991. [Cited: 12 21, 2015.] http://www.fs.fed.us/eng/pubs/html/91511801/91511801.html. 9151 1801-SDTDC.

Spawn, Mark A. 2004. Spawn Group. *Effects of Fire on Fingerprint Evidence.* [Online] June 2004. [Cited: 12 21, 2015.] http://spawngroup.com/media/EFFECTS_OF_FIRE_ON_FINGERPRINTS.pdf.

Stacey, Dr. Robert, Gibson, Stephen and Hedley, Paul. 2012. University of Freiburg. *European Glossary for Wildfires and Forest Fires.* [Online] October 2012. [Cited: August 5, 2015.] http://www.fire.uni-freiburg.de/literature/EUFOFINET-Fire-Glossary.pdf.

Supreme Court of the United States. 1976. Court Listener. *Beckwith v. United States.* [Online] 1976. [Cited: August 3, 2015.] https://www.courtlistener.com/opinion/109430/beckwith-v-united-states/. 425 U.S. 341.

Tony, Avelar. 2014. ESPN. *Titanium clubs behind two blazes.* [Online] March 19, 2014. [Cited: 12 21, 2015.] http://espn.go.com/golf/story/_/id/10633957/titanium-golf-clubs-ignite-fires-study-finds.

U.S. Department of Justice. 2004. Office of Justice Programs: National Criminal Justice Reference Service. *NIJ Special Report: Crime Scene Investigation: A Reference for Law Enforcement Training.* [Online] June 2004. [Cited: 12 21, 2015.] https://www.ncjrs.gov/pdffiles1/nij/200160.pdf. NCJ 200160.

—. 2007. Office of Justice Programs: National Criminal Justice Reference Service. *NIJ Special Report: Digital Evidence in the Courtroom: A Guide for Law Enforcement and Prosecutors.* [Online] January 2007. [Cited: 12 21, 2015.] http://www.law.du.edu/images/uploads/library/evert/DigitalEvidenceinTheCourtroom.pdf. NCJ 211314.

—. 2000. Office of Justice Programs: National Institute of Justice. *Research Report: Fire and Arson Scene Evidence: A Guide for Public Safety Personnel.* [Online] June 2000. [Cited: 12 21, 2015.] https://www.ncjrs.gov/pdffiles1/nij/181584.pdf. NCJ 181584.

Union Pacific Railroad, the Burlington Northern Santa Fe Railroad, the Central Oregon and Pacific Railroad, the California Department of Forestry and Fire Protection, the United States Forest Service, and the Bureau of Land Management. 1999. California Department of Forestry & Fire. *Railroad Prevention Field Guide.* [Online] 1999. [Cited: August 5, 2015.] http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fppguidepdf100.pdf.

United States Court of Appeals Ninth Circuit. 1960. OpenJurist. *Rodella v. United States.* [Online] December 31, 1960. [Cited: August 5, 2015.] http://openjurist.org/286/f2d/306/rodella-v-united-states.

United States Court of Appeals, Eleventh Circuit. 1998. FindLaw. *Michigan Millers Mutual Insurance Company v. Benfield.* [Online] May 4, 1998. [Cited: 12 22, 2015.] http://caselaw.findlaw.com/us-11th-circuit/1396573.html.

United States Fire Administration. 1988. Internet Archive. *Preadolescent Firesetter Handbook, Ages 7-13.* [Online] February 1988. [Cited: August 5, 2015.] https://archive.org/details/preadolescentfir01netc.

United States Supreme Court. 1975. Federal Evidence Review. *Federal Rules of Evidence, Public Law 93-595, January 2, 1975, 88 Stat. 1926 as amended.* [Online] January 2, 1975. [Cited: 12 22, 2015.] http://federalevidence.com/pdf/FRE_Amendments/1975_Orig_Enact/1975-Pub.L._93-595_FRE.pdf.

—. 1988. FindLaw. *California v. Greenwood et. al. 486 U.S. 35 (1988).* [Online] May 16, 1988. [Cited: August 4, 2015.] http://caselaw.findlaw.com/us-supreme-court/486/35.html.

—. 1986. Justia, US Supreme Court. *California v. Ciraolo 476 U.S. 207 (1986).* [Online] May 19, 1986. [Cited: August 4, 2015.] https://scholar.google.com/scholar_case?case=13894501388713609672&q=california+v.+ciraolo&hl=en&as_sdt=200006&as_vis=1.

—. 1961. Justia, US Supreme Court. *Mapp v. Ohio.* [Online] June 19, 1961. [Cited: August 5, 2015.] https://supreme.justia.com/cases/federal/us/367/643/case.html.

—. 1967. Justia, US Supreme Court. *Katz v. United States.* [Online] December 18, 1967. [Cited: August 3, 2015.] https://supreme.justia.com/cases/federal/us/389/347/.

—. 1978. Justia, US Supreme Court. *Michigan v. Tyler.* [Online] May 31, 1978. [Cited: August 5, 2015.] https://supreme.justia.com/cases/federal/us/436/499/.

—. 1984. Justia, US Supreme Court. *Michigan v. Clifford.* [Online] January 1984. [Cited: August 5, 2015.] https://supreme.justia.com/cases/federal/us/464/287/.

—. 1992. Justia, US Supreme Court. *Daubert v. Merrell Dow Pharmaceuticals, Inc. 509 U.S. 579 (1993).* [Online] 1992. [Cited: August 4, 2015.] https://supreme.justia.com/cases/federal/us/509/579/case.html.

—. 1998. Justia, US Supreme Court. *Kumho Tire Co. LTD., et al. v. carmichael et. al. Certiorari to the United States Court of Appeals for the Eleventh Circuit.* [Online] 1998. [Cited: August 4, 2015.] https://supreme.justia.com/cases/federal/us/526/137/case.pdf.

—. 1993. Justia, US Supreme Court. *Daubert v. Merrill-Dow Pharmaceutical Company 509 U.S. 579.* [Online] June 28, 1993. [Cited: 12 22, 2015.] https://supreme.justia.com/cases/federal/us/509/579/case.html. 509 U.S. 579 (1993).

—. 1984. Legal Information Institute. *Oliver v. United States.* [Online] April 17, 1984. [Cited: August 5, 2015.] https://www.law.cornell.edu/supremecourt/text/466/170.

USDA Forest Service. 1980. Forest Service Equipment Development Center. *Ignition Characteristics of Internal Combution Engine Exhaust Products.* [Online] September 1980. [Cited: 12 22, 2015.] Ignition Characteristics of Internal Combution Engine Exhaust Products. 8051 1205.

—. 2003. USDA Forest Service: National Technology & Development Center. *Fire Management Tech Tips: Off-Highway Vehicle Spark Arrestors.* [Online] May 2003. [Cited: 12 18, 2015.] http://www.fs.fed.us/t-d/pubs/pdf/hi_res/03511307hi.pdf. 0351 1307—SDTDC.

—. 2003. USDA Forest Service: National Technology & Development Program. *Fire Management Tech Tips: An Introduction to Spark Arrestors.* [Online] May 2003. [Cited: 12 18, 2015.] http://www.fs.fed.us/t-d/pubs/html/03511304/03511304.htm. 0351 1304-SDTDC.

—. 2003. USDA Forest Service: National Technology & Development Program. *Fire Management Tech Tips: Multiposition Small-Engine Spark Arresters.* [Online] May 2003. [Cited: 12 18, 2015.] http://www.fs.fed.us/t-d/pubs/html/03511304/03511304.htm. 0351 1305-SDTDC.

—. 2003. USDA Forest Service: National Technology & Development Program. *Fire Management Tech Tips: Railroad Locomotive Spark Arresters.* [Online] May 2003. [Cited: 12 18, 2015.] http://www.fs.fed.us/t-d/pubs/html/03511308/03511308.htm. 0351 1308-SDTDC.

—. 2006. USDA Forest Service: National Technology & Development Program. *Fire Management Tecg Tips: Sheepherder Stove.* [Online] July 2006. [Cited: 12 21, 2015.] http://www.fs.fed.us/t-d/pubs/pdf/hi_res/06511305hi.pdf. 5100 0651 1305-SDTDC.

—. 2008. USDA Forest Service: National Technology & Development Program. *Diesel Exhaust Emission System Temperature Test.* [Online] December 2008. [Cited: 12 18, 2015.] http://www.fs.fed.us/t-d/pubs/pdf/08511816.pdf. 0851 1816-SDTDC.

—. 2011. Weather Information Management System (WIMS) User's Guide. *National Fire and Aviation Management Web Applications (FAMWEB).* [Online] 2011. [Cited: 07 10, 2014.] https://fam.nwcg.gov/fam-web/.

Wakelin, Heather M. 2010. University of Canterbury Research Repository. *Ignition Thresholds for Grassland Fuels and Implications for Activity Controls on Public Conservation Land in Cantebury.* [Online] 2010. [Cited: 12 21, 2015.] http://ir.canterbury.ac.nz/bitstream/handle/10092/4245/thesis_fulltext.pdf?sequence=1.

Waxman, Seth P., et al. 1999. Cornell University Law School. *KUMHO TIRE COMPANY, LTD., et al., PETITIONERS.* [Online] March 23, 1999. [Cited: August 4, 2015.] https://www.law.cornell.edu/supct/html/97-1709.ZO.html.

Wheaton, Sarah. 2001. American Psychiatric Association. *Memoirs of a Compulsive Firesetter.* [Online] August 2001. [Cited: 12 21, 2015.] http://ps.psychiatryonline.org/doi/full/10.1176/appi.ps.52.8.1035. Volume 52 no. 8.

Willis, Matthew. 2004. Australia Institute of Criminology. *Bushfire Arson: A Review of the Literature.* [Online] 2004. [Cited: August 6, 2015.] http://www.aic.gov.au/media_library/publications/rpp/61/rpp061.pdf. ISBN 0 642 53851 4.

Wittich, Klaus-Peter and Muller, Tania. 2009. Frames Resource Catalog. *An experiment to test the potential for glass fragments.* [Online] October 27, 2009. [Cited: 12 21, 2015.] https://www.frames.gov/catalog/8562.

Xanthopoulos, Gavrill, Ghosn, Dany and Kazakis, George. 2006. Frames Resource Catalog. *Investigation of the wind speed threshold above which discarded.* [Online] 2006. [Cited: 12 21, 2015.] https://www.frames.gov/catalog/8790. Volume 15: pp 567-576.

FI-210 Additional Reading Material - Online Source

Young, Theresa M. 2006. Northeastern University: Digital Repository Service. *Profiling Pros and Cons : an Evaluation of Contemporary Criminal Profiling Methods.* [Online] April 26, 2006. [Cited: 12 21, 2015.] https://repository.library.northeastern.edu/files/neu:376919.

FI-210 Additional Reading Material - Online Source

NWCG FI-210 Origin and Cause Determination
Sources and References Considered

Some of the following technical papers, text books and research were consulted during the development of this course. Others are listed as additional sources of information for the fire investigator.

Anderson, Kerry; Frequently Asked Questions About Lightning; Canadian Forest Service; Edmonton, Alberta

Arson Prosecution; California District Attorney's Association; 1995

Arson Prosecution: Issues and Strategies; FEMA, United States Fire Administration, June 1988

Baird, R.A., Major; Pyro-Terrorism-The Threat of Arson Induced Forest Fires as a Future Terrorist Weapon of Mass Destruction; United States Marine Corps; 2005

Basic Tools & Resources for Fire Investigators: A Handbook; U.S. Fire Administration; 1993

Basic Tools and Resources for Fire Investigators: A Handbook; FEMA, U.S. Fire Administration; January, 1993

Bachelard, G.; The Psychoanalysis of Fire; Lowe and Brydon, London England, 1964

Beckwith v. US, 425 U.S. 341, 96 S.Ct. 1612 (1976)

Baubrauskas, V.; Ignition Handbook; Fire Science Publishers; 2003

Babrauskas, B.; Wood Char Depth Interpretation in Fire Investigations; Fire Science and Technology, Inc.; 2004

Bertagna, P.; Catalytic Converter Caused Fires; California Dept. of Forestry and Fire Protection, Sacramento, CA 1997

Black's Law Dictionary**,** Fifth Edition

Bloom, C., Fire Investigation Using "The Scientific Method", (CJB Fire Consultants, 1998)

Bourhill, Robert; A Guide to Natural Cover Wildfire Fire Direction Indicators; Oregon Department of Forestry, 1982

Bourhill, R.; Cigarette Butt Identification Guide, Sixth Edition, Oregon State Department of Forestry, 1985

Brief of *Amici Curiae* filed by the Americans for Effective Law Enforcement, Criminal Justice Legal Foundation, International Association of Arson Investigators, *et al*, in the matter of Kumho Tire v. Carmichael, (Adelman, R.; Washington, DC, 1997)

Brief of *Amici Curiae* filed by the Trial Lawyers for Public Justice, *et al*, in the matter of Kumho Tire v. Carmichael, (Rossbach, Smoger, Wolfman, Bryant; Washington, DC, 1997)

Burnette, G., Fire Scene Investigation: The Daubert Challenge, (*The California Fire and Arson Investigator*, California Conference of Arson Investigators, 10/98)

Burnette, G., Fire Scene Investigation: The Joiner Case/A Clarification of Daubert, 11/98)

California v. Ciraolo, 476 U.S. 207, 106 S. Ct. 1809 (1986)

California v. Greenwood, 486 U.S. 35, 108 S. Ct. 1625 (1988)

Canter, D., Coffey T., Huntley, M., Journal of Quantitative Criminology

Carlson and Gerlinger; Ignition Potential of Cigarettes in Dry Grass; CDF Fire Academy, Ione, CA; 1964

Coast Cascade Region Public Utility Inspection and Enforcement Guide; California Dept. of Forestry and Fire Protection; 1994

Countryman, C.; Some Physical Characteristics of Cigarettes as Firebrands; U.S. Forest Service, Equipment Development Center, San Dimas, CA; 1980

Countryman, C.; Ignition of Grass Fuels by Cigaret*tes;* U.S. Forest Service, Equipment Development Center, San Dimas, CA; 1983

Countryman, C.; Cigarette Temperatures and Burning Rates; U.S. Forest Service, Equipment Development Center, San Dimas, CA; 1982

Countryman, C.; The Fire Environment Concept; USFS, Forest and Range Experiment Station, Berkely, CA; May 1992

DeBernardo, L.; Fire Start Potential of Railroad Equipm*ent*; U.S. Forest Service Equipment Development Center; San Dimas, CA 1979

Crime Scene and Evidence Collection Handbook ; U.S. Department of Treasury,2001

Criminal Profiling; Turvey, B.; Academic Press, 1999

DeBernardo, L.; Ignition Characteristics of Internal Combustion Engines; U.S. Forest Service, San Dimas Equipment Development Center; San Dimas, CA 1980

DeHaan, J.; Kirk's Fire Investigation, Fourth Edition, Prentice Brady Hall, New York; 1997

DeHaan, J.; Kirk's Fire Investigation, Fifth Edition, Prentice Hall, New York, 2002

DeHaan, J.; Kirk's Fire Investigation, Sixth Edition, Prentice Hall, New York, 2007

DeHaan, J.; Kirks Fire Investigation, Seventh Edition, Prentice Hall, New York, 2012

Diagnostic and Statistical Manual of Mental Disorders, 5th edition, (DSM 5); American Psychiatric Association; Arlington, VA; 2013

Daubert V. Merrill-Dow Pharmaceutical Company; 509 U.S. 579, 113 S.Ct. 2786. 125 L. ED. 2nd 469; s.n. 1993

Douglas, J., *et al*; Crime Classification Manual, 1992, FBI, Quantico, VA

Eichman, D.; Cigarette Burning Rates, Fire and Arson Investigator, June, 1980

Establishing An Arson Task Force; U.S. Fire Administration; 1989

Essential Findings From a Study of Serial Arsonists, FBI Academy, NCAVC, Quantico, VA, 1993

European Glossary for Wildfires and Forest Fires; Eurofinet, Interreg IVC, European Union, October, 2012

Evidence Collection Guidelines, California Commission on Peace Officer Standards and Training; 1993

Fairbank, J.P., Bainer, R.; Spark Arrestors for Motorized Equipment; University of California Bulletin 1557; University of California, Berkley; Berkeley, CA 1934

Federal Rules of Evidence; U.S. Government Printing Office, 2013

Few, E.; Tracer and Incendiary Ammunition; U.S. Forest Service, Pacific Southwest Region, Law Enforcement Training Program; 1978

Few, Edward; Determining Fire Cause (draft); U.S. Forest Service; undated

Federal Law Enforcement Training Center, Court Testimony, U.S. Department of Treasury, 1999

Federal Law Enforcement Training Center, Physical Evidence Lesson Plan, U.S. Department of Treasury, 2001

Federal Law Enforcement Training Center, National Wildfire Investigation Training Program, Collection, Preservation, and Documentation of Physical Evidence Student Text, U.S. Department of Treasury, 2001

Federal Rules of Evidence, (West Publishing Co., 2001 Edition)

Federal Criminal Code and Rules; 1997 Edition; West Publishing Co., St. Paul, MN

Fire Effects Monitoring Reference Guide; Miller,M.; US Fish and Wildlife Service, September, 2000

Firefighter Arson; FEMA, US Fire Administration, January, 2003

Fireline Handbook, Appendix B Fire Behavior; NWCG; October, 1993

Fire Investigator; Principles and Practice to NFPA 921 and 1033, Third Edition, Jones and Barlett Learning LLC and the National Fire Protection Association

Fire Weather; US Forest Service; 1977

Ford, R.; Fire Scene Investigation of Grassland and Forest Fires; Calif. Dept. of Forestry, 1971

Ford, Richard T.; Investigation of Wildfires; Maverick Publications; Bend, Oregon; 1995

Frandsen, W., Spontaneous Combustion: It Can Happen in the Forest, USFS, Missoula, MT, October, 1993

Frandsen, W., The Influence of Moisture and Mineral Soil on the Combustion Limits of Smoldering Duff; USFS, Missoula, MT, July, 1987

Friedman, D., Levels of Certainty of Expert Opinion, (The Arson & Fire Investigation Website, 1/98)

French, H.; The Anatomy of Arson; Arco Publishing, New York, 1979

Garner, Brian: Black's Law Dictionary, 9tj s.l.; West Group, 2009

Gutsell, S.L., Johnson, E.A.; How fire scars are formed; coupling a disturbance process to its ecological effect, Can. J. For. Res. Vol. 26, 1996, p. 166-174

Hall, J.; SOS Fires: Youth Intervention Programs; NFPA Journal, Nov/Dec. 1998

Harrison, R.; Catalytic Converter Exhaust Systems Temperature Tests; U. S. Forest Service, Equipment Development Center; San Dimas, CA 1977

Hewitt, T.D., On the Hot Seat, NFPA Journal, January/February, 2000

Holmes, R., Holmes, S.; Profiling Violent Crimes; Sage Publications; 1996

Huff, T.; Fire Setting Fire Fighters: Arsonists in the Fire Department-Identification and Prevention; FBI, NCAVC, 1994, Quantico, VA

Huff, T., The Serial Firesetter; FBI Academy, NCAVC, Quantico, VA

Huff, T.; Maintenance of Power as a Motive; FBI, NCAVC, Quantico, VA

Huff, T., Gary, G., Icove, D; The Myth of Pyromania; FBI Academy, NCAVC; 1997

Huff, T., Ritchie, E.; Psychiatric Aspects of Arsonists; Journal of Forensic Sciences, 1999

Illegal Fireworks Bulletin, California Dept. of Forestry and Fire Protection; Sacramento, CA 1998

Industrial Operations Fire Prevention Field Guide; Calif. Dept. of Forestry and Fire Protection, U.S. Forest Service, Bureau of Land Management; Sacramento, CA 1999

Investigating Railroad Caused Wildfires*;* National Wildfire Coordinating Group, Boise, ID, October 2012

Jefferson, T.B.; Metals and How to Weld Them James F. Lincoln Arc Welding Foundation, Cleveland Ohio; January, 1990

Katz v. U.S., 389 U.S. 347, 87 S. Ct. 507 (1967)

Kaminski, G.; Ignition Time versus Temperature for Selected Forest Fuels; U.S. Forest Service, Equipment Development Center, San Dimas, CA 1974

Kubler, H., Heat Generating Processes as Cause of Spontaneous Ignition in Forest Products; University of Wisconsin, November, 1987

Lusk, G., Mak, S.T., EHV Wood Pole Fires: Their Cause and Potential Cure; Institute of Electrical and Electronics Engineers; IEEE Transactions on Power Apparatus and Systems; March/April 1974

Loscalzo, P.J., DeForest, P.R., and Chao, J.M.; Journal of Forensic Sciences, 25, 164, January 1980

Manarin, Brian; Witness For the Prosecution – Police Testimony; Ontario, Canada, 1995

Mapp v. Ohio, 367 U.S. 643, 81 S. Ct. 1684 (1961)

Matley,M., The Expert Ambush; ExpertPages.com, 2000

Maxwell, F. and Mohler, C.; Exhaust Particle Ignition Characteristics; University of California, Riverside, Technical Report No. 12; UCR; Riverside, CA 1973

Merriam Webster, n.d.;Merriam Webster Online Dictionary; *www.meriam –webster. com*

Michigan v. Tyler, 436 US 499, 98 S. Ct. (1942)

Michigan v. Clifford, 464 US 287, 106 S. Ct. 641 (1984)

Moore, H.; Railroad Fire Prevention Guide; U.S. Forest Service, California Dept. of Forestry and Fire Protection, Bureau of Land Management; 1978

Motive, Means and Opportunity: A Guide to Arson Investigation: American Re-Insurance Company, 1996

NFPA 921 Guide for Fire and Explosion Investigations National Fire Protection Association (NFPA), , 1998, 2001, 2005, 2008, 2011 and 2014 Editions

NFPA 1033- Professional Qualifications for Fire Investigator, 2009 Edition; National Fire Protection Association

Ness, Kenneth; Battling Arson Wildfires in the Northwest; Saskatchewan Guardian; 1999

Spontaneous Combustion in Delimber Piles; Industrial Fire Prevention Bulletin, Oregon Dept. of Forestry; Salem, OR

Oliver v. U.S., 466 U.S. 170, 104 S. Ct. 1735 (1984)

Investigation Procedures Manual; Oregon Department of Forestry, , 1998

Perkins, Luke; Dental Stone Use; Saskatchewan; 1995

Plucinski, M.; The Investigation of Factors Governing Ignition and Development of Fires in Heathland Vegetation; University of New South Wales; 2003

Powerline Fire Prevention Field Guide and Inspection Training Guide; California Dept. of Forestry and Fire Protection, U.S. Forest Service, Pacific Gas and Electric Co., Southern California

Preadolescent Firesetter Handbook; U.S. Fire Administration; 1988

Prestemon, J. Hawbaker, T., Bowden, M., Carpenter, J., Brooks, M., Abt, K., Sutphen, R., Scranton, S.; Wildfire Ignitions: A Review of the Science and Recommendations for Empirical Modeling; U.S. Forest Service, Southern Research Station, 2013

Railroad Fire Prevention Field Guide; CDF, USFS, USDOI-BLM, 1978

Railroad Fire Prevention Field Guide; CDF, USFS, USDOI-BLM, Union Pacific, BNSF, April, 1999

Rail Caused Fires; Fulford Consulting, Inc., Alberta Environmental Protection Land and Forest Services; August 2000

Recent Daubert Decisions, (IAAI Website, International Association of Arson Investigators, 2/99)

Redsicker, D., O'Connor, J.; Practical Fire and Arson Investigation, Second Edition, CRC Press, Boca Raton, FLA; 1997

Rider, Anthony; The Firesetter - A Psychological Profile; FBI; 1980

Rodella v. U.S., 286 F.2d 306 (1960)

Ross, P., Burning of Wood Structures by Leakage Currents; American Institute of Electrical Engineers; January, 1947

Rossmo, K. Geographic Profiling, CRC Press, 2000

Rural Arson Control; U.S. Fire Administration; 1989

Sapp, A.; Huff, T.; Gary, G.; Icove, D.; Horbert, P; A Report of Essential Findings from a Study of Serial Arsonists; 1996, FBI, NCAVC, Quantico, VA

Sapp, A., *et al*; A Motive-Based Offender Analysis of Serial Arsonists; 1994, FBI, NCAVC, Quantico, VA

Schiro,G.; Collection and Preservation of Evidence; Louisiana State Police Crime Laboratory, 1998

Smith, V., The Diesel From D to L; Trains Magazine, Kalmbach Publishing, 1980

Snook, B., Utility or Futility? (A Provisional Examination of the Utility of a Geographical Decision Support System*)*; Paper presented at San Diego, CA, 2000

Steensland, P., Wildland Fire Investigator Certification-A National Initiative; *The Fire and Arson Investigator-IAAI Journal*; October 2002

Steensland, P., Long-Term Thermal Residency in Woody Debris Piles*,* paper presented at Wildland Fire Litigation Conference, April 2008

Steensland, P.; *Serial Wildland Arson Analysis;* (n.p. internal agency research paper) U.S. Forest Service, Law Enforcement and Investigations, 2004

Stuckey, G.; Evidence for the Law Enforcement Officer; McGraw-Hill Book Co., 1968, New York, NY

Tamura, M., Suzuki, M., Criminal Profiling of Serial Arsonists; Reports of the National Research Institute of Police Science, 1997

Thompson, G.; Verbal Judo: Words as a Force Option; Charles C. Thomas, Springfield, Illinois; 1983

Tilton, D.; Taking the Stand: How You Can Win Arson Cases in Court; Film Communicators, North Hollywood, CA; 1981

Tunkel, R., Comeau, E.; A Field Guide to Incident Analysis; Fire and Rescue, Vol. 24, No. 3, May/June 2000

Users Manual for NFPA 921; National Fire Protection Association (NFPA), 2003

Vreeland, R.G., Walker, M.B.; The Psychology of Firesetting: A Review and Appraisal; 1979

Wheaton, S.; Memoirs of a Compulsive Firesetter; Psychiatric Services, August 2001

Willis, M., Bushfire Arson: A Review of the Literature; Australian Institute of Criminology; 2004

Wooden, W.S.; The Flames of Youth; Psychology Today; January, 1985

Wildfire Cause Determination Handbook, (Handbook #1); National Wildfire Coordinating Group, Washington, DC, 1978

Wildfire Cause and Origin Investigator Training, Student Guide, Hinton Training Centre, Alberta Canada, 2003

Wildfire Fighting Near High Voltage Transmission Lines Owned by PG&E; Pacific Gas & Electric Safety Bulletin; 1997

Wildfire Investigation: A Guide for Determining the Origin and Cause of Fires in Grasslands, Scrub and Forests; Dept. of Natural Resources and Environment, Victoria, Australia, 2001

Wildfire Investigation Handbook; Alberta Sustainable Resource Development, Forest Protection Division, Alberta, Canada, 2004

Wildfire Origin and Cause Determination Instructor's Guide P-151; National Wildfire Coordinating Group; Washington DC; 1992

Williams, D., Poague, R., Steensland, P.; Deliberate Wildland Fires, Forensic Digest, Volume 1, Issue 1; Spring 2009

Williams Dian L, Ph.D., RN, CLNC, DF-IAFN.; Understanding the Arsonist: From Assessment to Confession

Wisconsin's Power Line Forest Fire Prevention Manual; Wisconsin DNR, Publication #FR-067; 1990

Woodard, P., Renke, W.; Assigning Liability to Railways Without Evidence; 1999

Wooden, W.; The Flames of Youth; Psychology Today, January, 1985

Woods, R., Overview of Interagency Co-operative Issues and the Investigation of Bushfires; Canberra Australia 2009.

Zulawski, D.; Wicklander, D.; Practical Aspects of Interview & Interrogation; 1993

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1. INTRODUCTION

The fire service has long been held as one that employs true heroes. Men and women who routinely risk their own lives to save the property and lives of others. The United States Fire Administration (USFA) has estimated that as of 2003 there were 30,524 fire departments in the United States that included approximately 1,096,900 firefighters. (USFA, 2005, p. 1) The USFA estimates of the firefighters in the United States that 800,050 (72%) are volunteer firefighters. (USFA, 2005, p.1)

In 2004, U.S. fire departments responded to 1,550,050 fires that resulted in 3,900 deaths, 17,785 injuries and totaled over 9.7 billion dollars in property loss. Forty-seven percent of the fires reported were outside or wildland fires or were categorized as other types of fires, such as dumpsters. Approximately thirty-four percent of the fires reported were structure fires and nineteen percent were vehicle fires. USFA data indicates that nearly nine percent of all structure fires were intentionally set and vehicle arsons accounted for two percent of the reported fires. (USFA, 2005, p. 1-2)

Of the approximately 527,000 structure fires and the 36,000 vehicle fires, a vast majority of the fires were set by persons other than firefighters. However, a small percentage of these fires were started by firefighters. This conduct of those firefighters whom we as a citizenry expect to protect us from incidents involving fire violates an instinctive trust that we have in them and in their profession. Incidents that involve fire-setting firefighters present a unique set of investigative circumstances to the fire investigator. (USFA, 2005, p.2)

It is agreed that "with over one million volunteer and paid firefighters, the number of those who cause fires represent only a fraction of the number who otherwise serve honorably." (USFA, Special Report, p.5)

As in all fire investigations, an investigator must first determine the origin and cause of the fire through a systematic approach including the examination and documentation of the fire scene and collection, preservation, and examination of evidence. In the case of an incendiary fire, the investigator must conduct their investigation in such a way to protect the rights of those victimized by the incident as well as the constitutional rights of the offender. Over the past fifteen years national fire organizations have begun to study the incidents of fire setting firefighters. Studies have documented the motives and characteristics of fire setting firefighters but have not addressed the investigative means by which the firefighters were identified, investigated, and apprehended.

Paul Steensland, a retired special agent from the United States Forest Service (USFS), began to identify employees of the USFS and other offenders investigated by the USFS that were charged with responding to and suppressing wildland fires within the jurisdiction of the Forest Service. As special agents from around the country began to

investigate and arrest Forest Service firefighters and those associated with the wildfire response, Steensland began to query Forest Service agents regarding the investigation and the background of the offenders. Steensland developed a database of information regarding these fire incidents and offenders. This information collection tool will be referred to as the Steensland Questionnaire throughout this research.

Through this and other sources of information, general investigative methods can be identified. The investigation of a fire-setting firefighter will take a determined, competent fire investigator. The investigator must have political and media savvy and must be able to surround themselves with trusted investigators. The investigator must be willing to participate in a potentionally long-term investigation and be familiar and able to employ numerous investigative strategies. In summary, to effectively investigate and prosecute a fire-setting firefighter, the investigation will require an investigator to possess certain traits and characteristics unique to the identification, investigation, and apprehension of these offenders.

2. REVIEW OF LITERATURE

In 1994, Timothy Huff, an analyst with the Federal Bureau of Investigation's (FBI) National Center for the Analysis of Violent Crime (NCAVC), wrote a paper entitled "Fire-Setting Fire Fighters: Arsonist in the Fire Department – Identification and Prevention." Huff detailed the motives and characteristics of fire-setting firefighters based upon 25 cases obtained from the United States and Canada. Huff did not detail the investigative methods used by investigators to identify the offenders.

Huff's research was the foundation for the 2003 study by the USFA entitled: *Firefighter Arson.* The USFA report utilized Huff's profile characteristics and matched them with a similar study developed in the mid-1990s by Ken Cabe and his associates in the South Carolina Forestry Commission (SCFC).

Table 1. Firefighter Arsonist Profile Comparison	
South Carolina Forestry Commission	**FBI's Behavior Analysis Unit**
White male, age 17-26	White male, age 17-25
Product of disruptive, harsh, or unstable rearing environment	One or both parents missing from home during childhood. If from an intact home, the emotional atmosphere was mixed and unstable.
Poor relationship with father, overprotective mother	Dysfunctional. One of their parents left the home before the child reached age 17. Cold, distant, hostile or aggressive relationship with natural father.
If married, poor marital adjustment	Poor marital adjustment. If not married, still living at home with parents.
Lacking in social and interpersonal skills	Lack of stable interpersonal relationships
Poor occupational adjustment, employed in low-paying jobs	Poor occupational adjustment. Menial laborer, skilled laborer, clerical jobs
Fascinated with the fire service and its trappings	Interested in fire service in the context that it provides an arena for excitement, not for the sake of public service.
May be facing unusual stress (family, financial, or legal problems)	Alcoholism, childhood hyperactivity, homosexuality, depression, borderline personality disorder, and suicidal tendencies
Average to above-average intelligence but poor to fair academic performance in school.	Mixed findings on intelligence, but most arsonists have been found to have average to higher intelligence. Poor academic performance.

Table 1. Firefighter Arsonist Profile Comparison

In applying the data of this research to the profiles developed by Huff and the SCFC study, the offenders in the study have several of the characteristics. The average age of the offenders in this research was 25.4 years of age. Several of the offenders between 17 and 25 years of age still lived at home with their parents. The majority of the offenders were categorized as excitement motivated thus reaffirming a fire service interest and utilizing the fire service as an arena for their excitement driven behavior.

This study acknowledges the profiles generated by Huff and the SCFC as a guideline and general trends among the offenders in the research. Although the thirty-one offenders in twenty individual cases in this study do not match the profiles exactly the results of this study do not undermine Huff's or the SCFC findings.

An internet search for information regarding fire setting fire fighters provided a list of articles by news organizations documenting the arrest, trial, and/or convictions of fire setting fire fighters including:

- On September 1, 2002, the San Francisco Chronicle published an article entitled "A call to track firefighter arsonists 3rd arrest of season fuels experts' fears," documented the arrest of 19-year old Jonathan Patrick Klausen, a firefighter with the California Conservation Corps, who allegedly set five fires. (Lee, 2004, p. 1)
- A June 4, 2003, CBSNEWS.com article, "Too Close To The Fire," regarding volunteer firefighter Douglas Ford, who was arrested for setting fire to his fire house. Ford stated in the article, "I set the fire in the fire station. I burned it down. I can't say any more than that. I'm sorry for what I did." (Too Close, 2003, p. 1)
- A July 1, 2002, CBSNEWS.com article, "Firefighter Says He's Sorry," about Leonard Gregg, 29 years old, who was arrested and charged for starting the worst wildfire in Arizona history. (Firefighter, 2002, p.1)
- A recent November 3, 2005, CBS 3, web article, "Secrets In The Firehouse?" which identified Pennsylvania legislators who were submitting legislation to prohibit arsonists from joining volunteer fire departments. (Quinones, 2005, p. 1)

In 2004, Matthew Willis wrote "Brushfire Arson: A Review of the Literature" on behalf of the Australian Institute of Criminology. Willis addressed fire setting fire fighters in his examination of the phenomena of brush fire arson. Willis explained the development and deployment of New South Wales (NSW) Police's Strikeforce Tronto, a taskforce to investigate brush fires in their state. Willis reported that within the first three years of operation 50 arrests were made for arson and over twenty percent of the arrests were of volunteer members of the NSW Rural Fire Service. (Willis, 2004, p.99)

Willis concedes that the research into the incidents of fire setting fire fighters consists of "little direct research," and that much of the findings to date are anecdotal and conjectural. Willis's research demonstrates the fact that the phenomenon of fire setting fire fighters is not an American issue.

3. RESEARCH CRITERIA

This analysis of fire setting firefighters utilized data compiled by Steensland in questionnaires provided to Forest Service agents who had arrested fire setting firefighters. Steensland's Questionnaire posed several questions to agents in five major categories including Offender Characteristics, Case Status, Modus Operandi, Investigative Techniques, and Motives. Agents were asked to complete the questionnaire upon the completion of the case and the results were maintained by Steensland. This research project did not concentrate specifically on Forest Service investigations. ATF Certified Fire Investigators and Special Agents were queried to provide cases in which they had

investigated, or which they had assisted in the investigation of fire setting firefighters. The third source of information was those cases in which there was personal knowledge of the case or which assistance had been provided in the investigation.

The research contains the results of 20 cases that included 31 individual defendants all of whom were either full-time, seasonal, or volunteer fire fighters at the time the offenses occurred. Those cases that referred to the offender as a "wanna-be" or an Explorer were not included in the analysis. "Wanna-be" firefighters are those individuals who are loosely attached to the fire service through personal relationships or informal agency agreements. "Wanna-bes" are known to respond to fires and offer their unsolicited assistance to firefighters, which, at times, is welcomed. Explorer firefighters are those individuals who are attached to the fire service through a national jobs experience program. Although the explorers are not true firefighters, they participate on a higher level than the "wanna-be" firefighters.

The Steensland Questionnaire contains 78 questions used to obtain data in seven areas of the investigation:

1. Suspect Information
2. Case Information
3. MO (Modus Operandi) Information
4. Target Selection
5. Investigative Methods
6. Motive Analysis
7. Miscellaneous Information

In those cases that did not utilize the Steensland Questionnaire, the information was reviewed and pertinent information was obtained from the case information.

3.1 Suspect Information

The suspect information gathered pertained to the demographic status of each offender. Relevant details addressed were: age of the offender at the time of arrest; sex and race; the employment status of the offender; the offender's relationship to the fire service; martial status; education; prior criminal history; prior institutionalization; the number of times the offender was contacted throughout the investigation; and whether or not the case involved any participants who were identified in the case but not charged.

3.2 Case Information

The information pertaining to the case status of the investigation detailed what charges were filed against the offender; if the offender was convicted; the jurisdiction where the

offender was charged; the sentence imposed; and if the offender was charged along with multiple defendants.

3.3 MO Information

The MO, or Modus Operandi, section detailed the fire setting behavior to include: the time of day of the behavior; whether the offender used "hot sets" or time-delay devices. In this analysis, the term "hot sets" refers to an offender utilizing an open flame, such as a match or lighter, to ignite the fuel without any time delay between ignition and departure from the target location. The research examined the travel tactics of the offender and whether or not offenders left items at the scene or took items with them from the fire scenes. The research examined whether the offender discovered and reported the fire(s); whether the offender remained at the scene or retuned to the scene; if the offender assisted with the suppression of the fire; or assisted with or interjected into the investigation of the fire. The frequency of drug or alcohol use during the offense(s) and the use of some type of detection avoidance method were employed. The data examined the use of accelerants by offenders. The questionnaire addressed the escalation of the offender's fire setting behavior during the investigation as well as potential increases or decreases in the offender's fire setting behavior during the investigation. The research examined physical evidence recovered during the arrest of the offender or during a search of the offender's residence or vehicle, and if the offender attempted to contact the investigator during the investigation.

3.4 Target Selection

The Target Selection questions referred to the offender's target of choice. Targets included vegetation, vehicles, structures, or other types of targets including abandoned couches, dumpsters, etc., or a combination of targets. The research identified whether the offender's behavior was preplanned or opportunistic. An offender's attempts to minimize damage to the target was examined. Data was analyzed to determine whether or not offenders were setting fires within a "comfort zone." The term "comfort zone" is used in behavioral criminal analysis to define an area that is familiar to the offender and where the offender is comfortable in the surroundings. The term "comfort zone" is not used in the geographic profiling community due to the ambiguity of the term. Geographic profilers utilize anchor points of offenders and predict a "buffer zone" away from the offender's residence to minimize the risk of apprehension. The study also examined the estimated number of fires believed to have been set by the offender, and a determination of the perceived risk taken by the offender.

3.5 Investigative Methods

Investigative Methods document the techniques and strategies used by an investigator during the investigation. In this analysis, information regarding investigative techniques

included the surveillance techniques utilized and what types of surveillance were employed. Data was collected regarding pattern analysis that was developed through the investigation. The study examined the number of fires that occurred prior to the offender being identified as a suspect and the number of times the offender was interviewed during the investigation. Data was collected in regards to the interview strategies used and whether or not a confession was obtained. The frequency in the use of polygraphs was examined and whether or not the offender passed or failed the polygraph. The data revealed the frequency of offenders developing preplanned alibi. The research examined the types of forensic evidence recovered from the fire scene(s). Data pertaining to the use of undercover agent/officers or confidential informants was also analyzed.

3.6 Motive Analysis

The Motive Analysis compiled information on the reason for the offender's fire setting behavior. Data was collected to analyze if a motive was determined in the case or if a motive was merely assumed. Investigators were surveyed to define what the motivation was determined to be for each offender. Data was collected regarding precipitating stressors that may have influenced the offender's behavior and the stressors that were identified were analyzed.

3.7 Miscellaneous Information

The Miscellaneous Information category allowed investigators to provide relevant information to the research regarding procedures the investigator would have done differently in the investigation as well as the implementation of other resources that may have been brought into the investigation.

4. RESEACH LIMITATIONS

This research is limited to the objective information provided for the research by investigators coupled with their subjective opinions regarding the offenders. In several cases, information pertinent to the research was collected from case documents to best provide data consistent with the Steensland Questionnaire. In several cases, information was not provided in case documentation. Therefore, in several data categories, the statistical data does not equal one hundred percent of the offenders in the research, but is representative of the total number of offenders in which credible information was provided. In other categories, totals of statistical data were rounded up to provide ease of interpretation and to readily identify critical research data. There was no sample of offenders used in this research. The results are based solely on the efforts of the case investigators and results should not be interpreted as representative of all fire setting firefighters. It was the intent of the research to make the most valid attempt to provide accurate data regarding the offenders studied in order to effectively assist investigators and researchers in their continued examination of these offenders.

5. DATA ANALYSIS

5.1 Suspect Information

This research consisted of the analysis of 31 offenders involved in 20 separate investigations. At the time of the arrest of each offender, all were either full-time firefighters or members of and actively involved in a volunteer fire department. The age range of the offenders was between 17 and 48 years of age with a median age of 25.4. The highest frequency of ages was between 19 and 21 years of age with four offenders in each age group. Uniquely, two offenders were 46 years of age.

The offenders in the research were ninety percent male and ten percent females. Ninety-six percent of the offenders were white and only three percent were reported as Native American.

Forty-one percent of the offenders were employed outside of the fire service. Others were unemployed or attending college. Twelve percent of the offenders were full-time firefighters at the time of their arrest. This included seasonal firefighters and those who worked directly in fire management.

Offenders who were single accounted for seventy-four percent of the offenders. Three percent were divorced and nine percent were married at the time of their fire setting.

Twelve percent of the offenders had less than a high school education. Forty-one percent had a high school equivalency, and nine percent of offender reported education beyond high school.

Eighty-seven percent of the offenders had no criminal history prior to their fire setting behavior. Twelve percent had prior convictions for drunk driving, drug possession, or forgery.

During the investigations, thirty-two percent of the offenders were never contacted during the investigation prior to being identified as a suspect in the fires. Twenty-five percent were contacted one time during the investigation. Twenty-two percent were contacted more than once during the investigation.

Ten percent of the twenty cases analyzed included participants that were involved in the investigation and that were not charged with an offense.

5.2 Case Status

Each offender was arrested and prosecuted for their fire setting behavior. The data demonstrates a wide range of charges and punishments for each offender. There are a wide range of charges for fire setting behaviors across the nation, as well as between the federal and state judicial systems.

Eighty-seven percent of offenders were charged with some degree of arson. The charges were applicable to the type of targets that were identified in the investigation, specifically wildland arson, or arson of a structure or other property. The degree of the charges was dependant upon the amount of damage cause by the fire(s) set by the offenders as well as the total number of provable arsons. Nine percent of the offenders were charged with crimes other than arson, including mail/wire fraud and burglary. Three percent of the offenders were not charged with a crime but were referred to the department's juvenile fire setter program.

Eighty-three percent of the offenders were convicted of these crimes. Six percent of offenders were convicted of lesser charges. Three percent of the offenders were not convicted due to a hung jury. A hung jury is defined as a jury that can not reach a unanimous verdict after sufficient deliberation of the facts of the case. Forty-five percent were charged in federal court. Fifty-one percent were charged in state court. Three percent of the offenders were charged in both state and federal court. Offenders that were convicted were sentenced to an average of sixty-one months confinement with the range of sentences from thirty-six months probation to ten years confinement. In five of the twenty separate cases there were multiple defendants with a range of between 2-6 co-defendants. Two cases were tried in which co-defendants were not firefighters. In the three remaining cases, all of the defendants were firefighters.

5.3 Modus Operandi (MO) Information

Criminal offenders are defined by their patterns of behavior and by the methodologies employed to fulfill their criminal motivation. Offenders will take only the necessary risk needed to complete the behavior. As risks are taken during their behavior, the offender may believe increased risks are warranted as their motivational fulfillment becomes less satisfactory. This increased risk will be demonstrated in the increased frequency of behavior and the escalation of the targets selection. The escalation is identified by the lack of the offender's minimization of damage to selected targets and selection of targets that move from vegetation and abandoned items and structures to unoccupied structures and to the selection occupied structures.

The time of day offenders set fires defines the perceived risk taken by the offenders. Sixteen percent of the offenders set fires during the daylight hours. Fifty-eight percent set fires at night. Twenty-five percent set fires during daylight and overnight.

The utilization of ignition devices displays a confidence on behalf of the offender to be able to set fires without detection. Eight-seven percent used hot sets to ignite the initial fuels, while twelve percent used some type of time delay device. The use of time delay devices indicates the need to establish alibis while in the company of others.

Travel methods of the offenders define the accessibility of the offender to the selected targets. Eighty-three percent travel to their fire sets by vehicle. The use of a vehicle will

obviously allow a greater “hunting area” for the offender in which to operate. The offender will take an increased risk of being observed in the area during the time the fire was started, especially if using a “hot set”. Sixteen percent traveled by foot. Offenders traveling on foot allow for more concealment during travel to and from fire sets. Foot travel will also allow for decreased target selection. Foot travel will also limit the behavior area due to the offender’s accessibility to the fire station for fire departmental response. Six percent used vehicles and travel on foot. In traveling by vehicle and on foot travel tactics, the offender could be more selective of targets.

Only three percent of the offenders reportedly left an item, specifically a gasoline can, at a fire scene. The lack of items left on the scene correlates with the number of offenders that utilize “hot sets” to initiate their fires. In one case, items were taken from the scene prior to the fire being set. This behavior was indicative of the co-defendants intending to keep possession of personal or sentimental items from the fire scene prior to the ignition of the fire.

Ninety percent of the offenders returned to the scene with the fire department response. This high percentage of offender behavior correlates with the high percentage of excitement driven offenders who seek this type of gratification through response and suppression of the fire. Six percent of the defendants were firefighters in the jurisdiction where the fires were set and did not respond back to the fire sets. One offender reportedly responded to an area nearby and did not return back to the location of the fire.

Eighty-seven percent of the offenders assisted with the fire suppression activities as a responding firefighter. This is consistent with the excitement and profit motives cited later in the study.

Sixteen percent of offenders assisted in the investigation of the fires. This may have been done because of their rank within the fire department.

Only nine percent of offenders were reported to have used alcohol or drug, or a combination of both prior to their fire setting. This appears to be in contrast to the FBI profile in which alcoholism and other forms of mental health issues were noted.

Only three percent of the offenders were reported to have taken some type of detection avoidance measure. This included a US Forest Service employee who parked his government vehicle away from the area of the fire, took off his uniform shirt and walked to the area where the fire was set.

Forty-one percent of offenders used an accelerant in setting their fires. The accelerants consisted mainly of hydrocarbon fuel, such as gasoline or diesel fuel, or some other types of easily ignitable fuels like toilet paper. This percentage of offenders is consistent with the Huff study which reported “most fire fighter arsonists acting alone used materials found at the site when setting a fire. It was less common to find one bringing gasoline to the scene or using incendiary devices.” (Huff, 1994, p. 4).

Only nine percent of offenders escalated the severity of their fire setting activities during the investigation of the fires. A majority of the fire setting behavior was either maintained at a severity level of the previous fires or had ended by the time the investigation had begun. However, sixteen percent of the offenders increased the frequency of their fire setting during their fire setting behavior. Three percent of the offenders decreased in frequency. Thirty-two percent remained the same. Forty-eight percent of offenders had ended their fire setting behavior at the time the investigation had begun.

In sixty percent of the cases, twelve of the twenty individual cases, physical evidence linking the offender to the fire scenes was located during the arrest of the offender or during the execution of a search warrant of the offender's vehicle or residence.

Nine percent of the offenders were reported to have attempted to contact investigators during the investigation. Within the Steensland Questionnaire, this question is asked to determine if the offender tried to contact the investigators though a third party, such as media outlets, or directly as in anonymous letters. There were no instances of attempted contact through the media or other types of surreptitious means.

Forty-one percent of the offenders reported the fires they had set. In ten percent of the cases, two cases out of twenty, there were co-defendants present who did not report fires. One offender was reported as being the fire chief of the department. Investigators ascertained that the fire chief had assisted in setting fire to the fire department and never reported the fire.

5.4 Target Selection

Fifty-eight percent of the offenders targeted vegetation, such as forests or grasslands. Forty-eight percent of the offenders targeted residential and/or commercial structures. Five offenders targeted vehicles, while six offenders targeted other items such as abandoned couches on the side of the road. Forty-eight percent had a combination of target categories. The target selection can be attributed to the areas to which the offenders had access. It can be assumed that in areas of the country where there are vast areas of open space and forest, wildland fire may be a more dominant target than abandoned buildings. In contrast, in more populated area, abandoned vehicle and buildings may be a more satisfactory target of choices. These targets may also correlate to the areas in which the offenders were obtaining payment for their fire suppression activities.

Seventy-four percent of the offenders were categorized as preplanning their behavior. Twenty-two percent of the offenders' behavior was opportunistic. One offender set fires that met the criteria of both categories. Preplanned fires by firefighters may have allowed for sufficient time for a calculated travel pattern and time to the fire department for the eventual response to the fire.

Ten offenders made some attempt to minimize the damage caused by their fire setting. Twenty-one offenders made no attempt or were indifferent to the damage caused by the fires set. These offenders may indicate the most violent of these types of offenders. If in command positions, the offender may ask for a purely defensive attack to the fire suppression. However, if the offender is at a lower level in the department, the progression of the fire may be such that any attempt to perform an interior or aggressive attack may lead to injury or death of responding fire personnel. Beyond the destruction of property, this is the single most important reason that these types of offender should be aggressively investigated and prosecuted.

All of the offenders were operating within an area that was considered a "comfort zone." As defined previously, the comfort zone of these offenders is that which is known and familiar to them, and which they would have the opportunity to respond with the fire department once the fire was reported.

The total number of fires set by each offender ranged between one fire to an estimated one-hundred fires over a period of fifteen years. The average over the total number of offenders was sixteen fires per offender.

Ninety-three percent of the offenders were determined to perceive their apprehension risk as low, with only two offenders that were categorized in the moderate range of risk. None of the offenders were at a high level of risk of being discovered.

5.5 Investigation Methods

Investigators used surveillance measures in the investigation of nine offenders. The surveillance techniques were primarily mobile or fixed surveillance. Investigators used aerial surveillance in one instance. The surveillance of fire-setting firefighters must incorporate the man power need to fully accomplish the surveillance. It is this evidence collection technique that is the most time and manpower intensive. It is also the most difficult especially in areas that have little room for error such as a road through a National Forest.

Investigators used some type of pattern analysis in sixty-four percent of the offenders investigated. The patterns analysis was described as chronological analysis, modus operandi analysis, or the documentation of the fire scenes. This number is indicative of the knowledge by investigators that some type of timeline or spatial analysis needs to be completed throughout these types of investigation.

The number of fires that occurred before a suspect was identified ranged from between one and eleven fires, with an average of 3.3 fires per offender.

Nine percent of the offenders were never interviewed during the investigation. Seventy percent of the offenders were interviewed once. Sixteen percent were interviewed twice. One offender was interviewed more than twice during the investigation. During the

interviews of the offenders, forty-five percent confessed to setting the fires investigated. Forty-eight percent did not confess. Two offenders did not specifically confess but made incriminating statements. Twenty-two percent of the offenders had preplanned alibis. Seventy-four percent of investigators indicated an interrogation strategy was used during the questioning of the offenders. The strategies included the Reid technique, confrontation, the presentation of the facts of the case to the offender, and the presentation of undercover conversations. It is within these categories that the recommended interview strategies can be employed as well as subsequent interviews based on data obtained from statement analysis.

Three percent of the offenders took a polygraph and subsequently failed. Polygraph was utilized in one other case to eliminate suspects from the suspect pool. The results of those polygraphs were either inconclusive or in the opinion of the examiner there was no deception indicated on behalf of the suspect. It was unreported if offenders were offered a polygraph but refused to participate. The lack of the use of polygraphs with the offenders studied, does not diminish the potential effectiveness of the analysis of the offenders by a trained and effective polygraph examiner.

In forty-five percent of the cases physical evidence was recovered from the fire scenes. The evidence included shoe and tire impressions, soil samples, and ignition devices. This relates to the majority of offenders using available combustibles during their fire setting behavior. Wildland fire sets will lend themselves to this type of physical evidence much more often than a structure fire.

In fifteen percent of the cases investigators used an informant. Five percent of the cases utilized an undercover officer. In five percent of the cases both an informant and an undercover officer were used. These techniques should be carried out by investigators that have a working knowledge of the legal aspects and potential risks to both officers and informants.

5.6 Motive Analysis

The analysis of motive was a significant part of the Steensland Questionnaire. The results reflect the conclusions offered by Huff. Investigators determined the motive of the offender's behavior in ninety-six percent of the offenders.

Eighty-three percent of the offenders were categorized as excitement motivated. Thirty-five percent were profit motivated, and six percent of the offenders were revenge motivated. Within the above figures, some of the offenders had multiple motivations such as excitement and profit. Fifty-one percent were purely excitement motivated, three percent were purely profit driven, and three percent were purely revenge driven.

Of all the offenders, twenty-nine percent had reported precipitating stressors that were linked to the offender's fire setting behaviors. The reported precipitating stressors

included behavior due to Vietnam War experiences, with child raising or family issues, a need for the camaraderie of fellow firefighters, a need to be paid for fire calls in order to raise monies to pay for a telephone sex bill before his parents found out, poor friendships out of the family and a girlfriend moved out of state.

5.7 Miscellaneous Information

The Steensland Questionnaire asked investigators to provide information regarding their opinions about the investigation pertaining to what issues may have helped the investigation along or what aspect of the investigation hindered their ability to continue or complete the investigation.

One of the main issues suggested by investigators was the initial investigation of the fire scenes by fire department personnel. Fire scenes were examined by volunteer fire fighters that had little or no training in the origin and cause investigations. Investigators had no training or experience in the documentation of the fire scene or the documentation or collection of evidence. Investigators cited these issues as a critical element in prosecutors not being able to charge the offender with multiple acts of fire setting.

Investigators believed that they should have been more aware of the local fire department's response area and the fires to which they were responding. It was determined that if the investigators would have paid more attention to the local fire departments responses within their jurisdictional area, patterns of fire setting may have been more readily identifiable and suspects developed sooner.

Investigators also believed that the documentation of the first firefighters on scene was a factor that may have forwarded their investigations sooner. As a majority of the offenders in the study responded to fires they set, and most of the offenders were excitement driven, it could be determined that the offenders were most likely one of the first fire fighters on the scene. Their behavior at the scene, if identified as being excitement motivated, could have been noted compared to other firefighters who were simply responding as a public servant.

The cooperation between the local police investigators and fire department personnel was paramount in the investigation of the offender. Investigators acknowledged that within public service organizations it has been demonstrated that problems within those departments may not resolve themselves without the intervention of another investigative agency. In a case in Pennsylvania, the offenders were at the upper management level of the department and the behavior of the chief and members of the board of directors were not going to be resolved from within the department. As a chief of the department, the authority to investigate the fire would have rested on him and a request to other investigative agencies for assistance would not have been made.

One investigator reiterated the importance of forensic evidence. As most fire investigations are circumstantial in nature, and without the direct evidence of a witness or surveillance information, the crime scene that is the fire must be critically examined by those who are properly trained in origin and cause investigations.

Investigators identified a culture within the fire service to protect the members of a department from outside scrutiny. In several investigations, members of the department in which the offender was a member believed "something was wrong" but may not have been able to identify the issue. Other members of the offender's department were willing to lie to protect the offender or protect the offender's family member who was also on the department, usually a father in a position of importance on the department. In some instances the investigator on the fire department of the offender would be hesitant to invite other agencies to participate in the investigation.

Investigators also recognized the need for better pattern analysis and more effective use of technical surveillance measures.

6. **CONCLUSIONS**

After a review of the analyzed data several investigative issues were determined. A number of the investigations, nearly half, had begun after the fire setting behavior was completed. Therefore it could be concluded, in the case of multiple fire sets, that the previous fires were not either investigated to the extent that a suspect pool was developed, to include the offender, or that the fire was of such insignificance, i.e. a dumpster fire, small brush fire, etc., that a thorough investigation was not complete. Obviously when only one fire is set by the offender, the investigation must consist of a complete origin and cause examination and the persistent follow-up investigation to identify the offender.

Within sixty percent of the investigations, physical evidence was recovered as a result of the follow-up investigation. This remains a critical element throughout all of the investigations. It is critical to accurately collect and document the fire scene and to identify and collect physical evidence that links the offender to the crime.

Experts within the behavioral and geographic profiling community were consulted after the data for this project was compiled. Concerns were addressed in both the target selection and investigative technique categories. Behavioral analysis of the offenders was consistent with previous studies of serial arsonists. Arsonists are more disorganized when compared to other serial offenders such as bombers. Seventy-four percent of the offenders were categorized as preplanning their fire setting behavior. Geographic profilers explain that as a person moves around his or her community a mental map is developed. Mental maps provide for directional maneuvering throughout a person's community without knowing the specific location that a person may be located at any specific time. This mental mapping is demonstrated by giving a stranger direction

through a community by explaining landmarks and other visible indicators as opposed to specific directions based on street names and distances. As firefighters develop a mental map of their jurisdictional area for response and fire planning purposes, other professionals will develop mental maps of their community based on their personal experiences and life events. Geographic profiling experts explain that fire-setting firefighters develop mental maps of their community and have identified targets of their fire setting behavior prior to the act occurring. For example, a typical member of the community may not have taken notice of an abandoned home or business. They are concerned with family and business locations that will benefit their lifestyle. A fire-setting firefighter, as with other serial offenders, will develop a mental map of potential targets throughout their travels and routing activity in their community, targets that will be beneficial to their specific behavioral motivation. (Trahern, 2005).

Investigators surveyed in the research documented several methodologies of chronological or temporal, fire pattern, and modus operandi analysis. These methodologies range from the simplest of maps of the affected areas with push pins to indicate the locations of fires, to computer generated maps and link analysis, to time lines and visual investigative analysis charts.

Geographic profilers utilize mathematical formulas to predict the anchor points of offender's behaviors. These anchor points are usually the offender's residence. The phenomena of fire setting fire fighters suggests an alternative or second anchor point in the firefighter's station for the response to the fire. When considering excitement for these offenders as the most prevalent motivation for their behavior, a quick response to the fire station is imperative for their thrill seeking. The results of this study suggest that once a firefighter sets a fire, waiting in stand-by mode is not an option for the offenders. All of the thirty-one offenders were operating within their "comfort zone." This term is used by behavioral profilers to describe the areas in which the offender lives and is familiar with. Geographic profilers do not define this area of their hunting activity as a "comfort zone." Geographic profilers define the area around the main anchor point(s) as a "buffer zone." The buffer zone area is the area in which the offender wishes to protect and therefore will extend his/her hunting area away from the anchor point and conduct their fire setting behavior outside the buffer zone. Geographic profilers utilize a distance decay function in their analysis of an offender's behavior, namely the farther away from the offender's anchor point the less likely the behavior. (Trahern, 2005).

The data of the research indicated that most of the offenders had very low perceived risk of apprehension. Based on common knowledge, there are likely to be fewer witnesses in a remote forest, when compared to the main street of a small town served by a volunteer fire department. However, one may conclude that several fires over a short period of time, for instance ten fires within twenty-four hours, may draw significant attention especially if the fire fighter is the one who reported each fire. The low level of perceived

risk may be an indicator of insufficient resources in the jurisdictional area to effectively enforce the crime of arson either through understaffed fire departments or under trained investigators. The data also suggests a culture within the fire service to protect and accept these offenders in the fire service. As budgets for the fire service become increasingly smaller, the resources to fire investigators dwindle and available resources are redirected to fire suppression assets. This data reports instances of one hundred fires set by one offender over the course of fifteen years. The data also reports an average of sixteen fires set by each offender. When considering the data, a conclusion may be reached regarding to the unwillingness of fire service administrators and command staffs, or the lack of resources, to have even the most futile of fires investigated by properly trained personnel. This results in the inadequate determination of the fire scene's origin and cause and has been shown to exclude numerous fires from being prosecuted.

A trend was identified within the data to suggest that of the twenty-eight offenders that were interviewed during the investigation, seventy percent were interviewed only one time. Of all the offenders interviewed, only forty-five percent confessed to their crimes. Behavioral profilers suggest that when interviewing offenders of this nature, a specific interview strategy is needed. Although techniques such as Reid, confrontational, and a direct presentation of evidence are documented in the research, an interview strategy should be employed in every interview. These experts state that interviewers should have a complete knowledge of the case and an understanding of the offender's background. Interview techniques can be adapted for each offender to obtain maximum information, including confessions, from the offender based on psychological and behavioral susceptibilities. These interview strategies had shown themselves much more reliable that the use of a polygraph or other deception detection tools, although all resources should be considered.

The motives that were determined by investigators for the offenders studied fall in line with the statistical data presented by Huff. Excitement was the sole motivation in fifty-one percent of the offenders. However, when excitement was coupled with profit, it accounted for eighty-three percent.

7. RECOMMENDATIONS

7.1 Continued Research

Research and statistical data regarding fire setting fire fighters is minimal in the United States. It has been through the efforts of Timothy Huff, Paul Steensland, Ken Cabe, and others that this issue has been examined and the limited information is available. Credible data collection is paramount to the continued study of fire setting firefighters. Until 2005, no suitable data collection regarding the investigation of these offenders has been available. Localized research had been concentrated in such efforts as the SCFC research. Data collected by the USFA has been concentrated through the National Fire Incident

Reporting System (NFIRS) and through state agencies that collected information in state versions of NFIRS. Participation in NFIRS or state systems is voluntary on the part of local fire departments. NFIRS collects information primarily on the fire incident itself and not the subsequent investigation. The USFA stated in their report "such a database would be challenging to develop because it could only be populated after criminal proceedings occurred and a verdict of guilty or a confession was obtained." (USFA, 2003, p. 5)

In 2005, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) launched a nationwide data collection system that is capable of tracking national and international investigations regarding bombing and arson incidents as part of the ATF sponsored U.S. Bomb Data Center and the U.S. Arson Data Center. The Bomb and Arson Tracking System (BATS) is a web based incident database that can be queried by local investigators who have specific knowledge of a specific case. It is proposed that the BATS data base could be modified to incorporate specific information regarding suspects of public trust including police officers, teachers, public officials, and firefighters. As BATS participants populate fields in the database that include fires set by firefighters, and the system is queried to identify the investigative information, an updated Steensland Questionnaire could be sent to the investigator to obtain the most up-to-date information regarding the offenders demographics, case history, modus operandi, investigative techniques, and target selection. This information could be collected over a period of time to incorporate a significant number of offenders. Statistical data could identify the effectiveness of certain techniques during the investigation when compared to the final disposition of the case. This information would then be analyzed and used to provide offender and investigative information to researchers and investigators.

Investigative agencies and investigators are strongly encouraged to participate in the BATS program as information collected within the system will benefit their investigation and in turn, their investigative experience will benefit other investigators.

Prosecutors can play a pivotal role in the collection of data as well. Prosecutors should be made aware of the need to further interview these offenders once incarcerated. The option for post-sentencing interviews of offenders should be made available to researchers based on a judge's orders at sentencing, regardless of a plea bargain or conviction at trial. Court ordered follow-up would allow easier access to offenders once they are confined in a correctional institution.

7.2 Interagency Communication

The phenomenon of fire-setting firefighters is not limited to one specific area of the United States, or even solely to the United States. It is imperative for the continued investigation of fire setting firefighters that those agencies involved in these types of investigations begin an open dialog regarding these offenders. The first step in this

communication is the acknowledgement by the fire service that these offenders are not, in any way, beneficial to the fire service or to the communities the fire department serves.

Investigative agencies must also acknowledge that their investigations of these offenders are extremely sensitive to the fire service and within the community. These investigations must be conducted with the utmost respect of those who serve respectfully in the fire service and also with the completeness to protect the community to effectively prosecute the offenders. Effective interagency communication must be between investigative and fire service agencies to include:

- Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)
- United States Forest Service (USFS)
- South Carolina Forest Commission (SCFC)
- National Center for the Analysis of Violent Crime (NCAVC) – Arson and Bombing Investigative Services (ABIS)
- State Fire Marshal's Offices
- Local Fire and Police Department
- International Association of Arson Investigators – Behavioral Science Committee
- National Volunteer Fire Council
- International Association of Fire Chiefs
- National Association of State Fire Marshals
- District and United States Attorneys

These agencies can develop a unified research strategy and investigative procedural guidelines. Available resources can be made available to investigators as well as research and profile studies. Through effective communication among agencies, a more complete understanding of the offenders, more comprehensive data collection, and effective investigation and prosecution can occur.

7.3 Effective Use of Resources and Training

Investigators must have access to and knowledge of the available resources in order to effectively investigate these offenders. As this research demonstrated, no specific investigative techniques were unique to these offenders. However, due to the serial nature of many fire-setting firefighters, investigators need a working knowledge of geographical profiling techniques and resources available.

The use of interviewing techniques varied throughout the cases examined. As investigators develop their interviewing skills, certain reliable skills will be used during

most of the interviews conducted. Although interviewing skill is necessary, the use of interview strategies was not noted. When discussing the research with behavioral criminal analysts, the utilization of interview strategies is imperative. Only forty-five percent of the offenders in the study confessed to their fire-setting behavior. It is acknowledged that the main purpose of these types of interviews is to elicit a confession. Investigators should have completed a background investigation on the offender prior to an interview used to gain a confession. It is through the information gather in the background investigation and in the case information that is analyzed to develop an interview strategy. For example, the offender may be extremely organized in his planning of the fire sets and in their personal and public life. This generalization may lead to a series of questions that are out of chronological order which can lead to increased stress in the offender and the perpetuation of false alibis and deception. This, in turn, can provide additional information to the investigator in which to confront the offender. These strategies can also be developed based on an offender's criminal history, military service, childhood experiences, and religious beliefs. Although this study examined only those offenders who were eventually convicted, there remains the issue of other offenders who were investigated and who were not charged due to lack of evidence, specifically a confession.

Unknown information regarding the case can also be obtained through the use of the SCAN statement analysis and through the use of questionnaires.

SCAN is an analysis tool used to separate fiction from fact within the context of a written statement. The SCAN methodology was developed by Avinoam Sapir, a former Israeli police lieutenant, and polygraph examiner. Sapir devised SCAN to analyze the written statement of a subject. SCAN is used to identify areas of a written statement in which a subject may not attempt to lie, but will hedge, omit crucial facts, feign forgetfulness, and pretend ignorance. Subjects will use conversational tricks to avoid damaging admissions such as answering a question with a question or omitting periods of time in their narrative. (Law and Order, Vol. 38, No. 8, August 1990). The SCAN methodology needs to be performed by trained and competent statement examiners in order to obtain a credible analysis of the statement. This analysis will assist in the development of an interview strategy to be used during a follow-up interview of the offender.

The investigation of a fire-setting firefighter begins with the assumption that the behavior is being perpetrated by a fire-fighter. When an individual firefighter is not known, the suspect pool may consist of the entire fire department. Questionnaires can be developed to address the specific incident or pattern of incidents in which each of the fire department members would be asked to complete a survey. In contrast to the Steensland Questionnaire, the responses to these questionnaires are analyzed to identify the emotional and psychological behavior characteristics of the person surveyed. Analysis can identify controversial answers to questions and answers that suggest wrong doing, or

minimization of the behavior or appropriate punishment. A thorough analysis of completed questionnaires can shrink the suspect pool to a manageable size for the investigators.

As investigators become more aware of the available investigative resources, they must also become aware of investigations that may contain personal conflicts. As a majority of the offenders studied were members of volunteer fire departments, initial investigators may have been from a local police or sheriff's department. It is within these situations that investigators may find themselves investigating suspected offenders whom they have grown up, gone to church, attended community functions, or worked together. An investigator may find this situation uncomfortable and unwilling to afford the efforts to fully investigate the offense. Nonetheless, the investigator should effectively withdraw from the investigation and yield to other objective, competent investigators.

In conclusion, this study did not identify specific investigative techniques used in the majority of the cases examined. There were tendencies to utilize categories of techniques during the investigation of these types of offenders. In the investigation of any serial offender, geographic profiling is becoming a more crucial asset to the investigation. The study identified the lack of use of predetermined strategies during interviews of the offenders. When these techniques are incorporated into the investigation, coupled with thorough scene documentation of every fire, and firefighter and witness interviews, the investigation of fire-setting firefighters may yield a higher total number of convictions of these offenders. Investigators must have access to training regarding these techniques and the training should be readily provided. Investigators need to partner with their local, state, and federal resources, as these offenders may target the local community, but the effects of their behavior has an impact at all levels of our society.

8. REFERENCES

Firefighter Says He's Sorry. July 1, 2002. CBSNEWS.com. Retrieved February 23, http://www.cbsnews.com/stories/2002/06/17/national/printable512539.shtml

Huff, Timothy G.: *Fire-Setting Fire Fighters: Arsonists In The Fire Department – Identification and Prevention.* FBI Academy, Quantico, Virginia, 1994.

Lee, Henry K., September 1, 2002. *A Call to track firefighter arsonist 3rd arrest of season fuels experts' fears.* Retrieved August 5, 2004 http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2002/09/01BA224674.DTL

Lesco, Tony: *SCAN – Deception Detection by Scientific Content Analysis.* Law and Order, Vol. 38, No. 8, August 1990.

Quinones, Todd, November 3, 2005. *Secret In The Firehouse?* Retrieved November 7, 2005, http://kyw.com/topstories/local_story_307233530.html.

Too Close To the Fire. June 4, 2003. CBSNEWS.com. Retrieved February 23, 2005 from http://cbsnews.com/stories/2002/11/20/60II/printable530103.shtml.

Trahern, Rhonda: Personal Interview, 2005.

Tunkel, Ronald: Personal Interview, 2005.

U.S. Fire Administration: *Firefighter Arson, Special Report – January 2003.* Federal Emergency Management Agency, Emmitsberg, Maryland, 2003.

U.S. Fire Administration. 2003 Fire Department Statistics. Retrieved October 13, 2005, from http://www.usfa.fema.gov/statistics/departments/.

U.S. Fire Administration. 2004 National Fire Statistics. Retrieved October 13, 2005 from http://www.usfa.fema.gov/statistics/national/.

U.S. Fire Administration. 2004 Firefighter Statistics. Retrieved October 13, 2005, http://www.usfa.fema.gov/statistics/firefighters/.

Willis, Matthew: *Brushfire Arson: A Review of the Literature.* Australian Government – Australian Institute of Criminology. Canberra, ACT, 2004.

Overview of Inter-agency Co-operative issues

and the Investigation of Bushfires in Australia.

BACKGROUND

Australia has a Bushfire prone land, has always been subject to Bushfires beyond the European Settlement. Aboriginals are known to have used fire prior to European settlement and as a result the vegetation has adapted to a continuous fire regime and as a result is reliant on fire to maintain biodiversity. However the issue of accurately identifying Bushfire cause and the subsequent investigation of Bushfires (Wildfires) in Australia has all too often been seen as an insurmountable challenge and that the only way to convict someone of deliberate fire lighting is to 'catch them in the act'. Courts too therefore have not had a significant exposure to Bushfire arson cases as the numbers of cases presented have traditionally been low.

Research in the United States and as outlined within the Wildland Fire Investigation, FI–210 Origin and Cause Determination Training Course has suggested a number of myths surrounding Bushfire arson, namely they are thought to typically be:

- *Numerous big fires that occur in rapid succession caused by elaborate and sophisticated ignition devices. Generally there is no physical evidence at the scene. And they are random and unpredictable incidents undertaken by highly skilled and sophisticated offenders.*

However the reality is more likely to be:

- *Small nuisance fires that occur days, weeks or months apart, with no ignition source or a single match with physical evidence at the scene. They are typically made up of recognizable and predictable patterns and ignited by unskilled and unsophisticated offenders.*

In Australia this is likely to be similar however until accurate investigations are undertaken, the extent of the problem is somewhat uncertain.

Why is this the case?

The challenge of investigation of Bushfires has had a number of hurdles to overcome across a number of jurisdictions. Firstly, the 'ownership' of the problem; yes it is a crime to deliberately light a Bushfire however, given the majority of fires attended by fire services in the 'vegetation classification' is large in number, their actual size and resulting damage to properties and lives on the whole is minor. Therefore a traditional approach of policing agencies is as the resulting effect on society is minor, the dollar losses from structural fires are higher; therefore the focus of law enforcement and investigations as to their cause has been in the past, deemed to be a lower priority. So what of the fire service investigation of wildfires? Again, fire services have also traditionally focussed on their role to extinguish fires and based again on limited damages and losses from the majority of often deemed 'nuisance fires', not devote resources to their investigation.

THE CHALLENGE OF THE TRADITONAL APPROACH

Given the priorities faced in limited resources and an operational focus, many fire services in Australia have taken the attitude, as they as they are not law enforcers, the issue of detection and investigation of Bushfire arson is a "Policing problem". Traditionally they have been prepared to assist in providing 'low level' information as witnesses and an opinion or worse, a guess, as to a likely cause, however their role in the majority of Bushfire cases is that of ensuring the fire is out and that the community is safe. Similarly challenges in the Policing sphere has been one of, "it's only a small fire, no damage or injuries have occurred, we have more important crimes to solve". Resourcing and agency policy has been to provide limited resources to the high volume and significant impact crime areas and to the only become involved in major Bushfire events.

This approach is understandable given the limitations and expectations of their roles both internally and externally. What is often overlooked, is the Bushfire is only results as small in size as a number of factors-

- *the fire service attended and intervened and extinguished the fire, thus preventing it's spread to a larger area or to cause damage;*
- *the prevailing weather conditions were such that the fire behaviour and intensity were low, with minimal rates of spread;*
- *members of the public extinguished the fire before it was able to spread;*
- *the fire was prevented in gaining to a large area due to barriers preventing its spread;*
- *or a combination of all these factors.*

Nevertheless it needs to be considered that whilst a half hectare fire is considered to be resulting in inconsequential damage, the response of the fire service in responding fire appliances at speed to attend the fire, putting at risk the community, depleting fire resources for response to other incidents let alone the cost to the community in the fire service response, is often overlooked in the attendance of these 'nuisance' fires.

Any unplanned Bushfire has the potential to cause damage and is a risk to lives, both the public and firefighters.

Experience has shown in more recent years that the focus has shifted significantly in a number of States and Territories in Australia. More common now is a more integrated approach to addressing the issue of Bushfire arson and the need to ensure a number of areas are refined to focus on the problem. Integral to this has been off the back of a number of significant fire events, eg NSW 2001-2003 Bushfires in the establishment of Police Strike Force Tronto; the South Australian model of Operation Nomad and Victorian co-location initiatives arising out of the 2009 Black Saturday Bushfires, based on similar lines. Whilst these models provide a focus for Police to more proactively investigate Bushfire cause, it has included education programs for frontline staff to train them on the importance of documenting and recording Bushfire arson scenes and to call on specialist resources if needed, earlier. These are also underpinned by a number of Memorandum of Understanding to ensure that the engagement of fire services is more accepted and undertaken as a matter of course.

Furthermore, fire services have enhanced their investigation capability over recently years to ensure that a more accurate picture of their fire causes is identified and that they have the adequate skilled personnel to confidently investigate a Bushfire scene. Fundamentally, how can a fire service resource effective programs targeting ignition prevention if it cannot clearly identify the profile of the cause of Bushfires within their jurisdiction.

INTERAGENCY ENGAGEMENT.

The model of police and fire service investigators working closely together is one which has been more readily accepted in recent years in Australia. Essentially the success of this is based on the sharing of skill sets. As part of this equation is the recognition of each agency's technical ability and experience in the Bushfire investigation field.

Fire service investigators need police to-

- *Use crime event intelligence programs to link events leading up to the fire ignition and during the fire. To gain a complete picture of fire occurrence intelligence and background data, and;*
- *Formally interview witnesses in accordance with legal process;*
- *Provide guidance relating to crime scene management at fire scenes on issues surrounding possible legal action/prosecutions;*
- *Manage fire scene evidence in relation to continuity and analysis issues.*

Similarly police need fire service investigators to-

- *Provide specialist advice in fire scene interpretation linked to fire behaviour knowledge to confirm witness's versions of events;*
- *Assist with supply of fire service response information;*
- *Provide key interpretative evidence of fire indicators and evidence within the fireground;*
- *Provide specialist Bushfire cause opinions.*

Why are joint investigations important? This mixing of these skillsets provides a more robust investigation of the fire scene. The complex amount of information that needs to be analysed (weather records, fire behaviour, fire scene evidence, lightning strike data, fire service records etc) apart from the fire scene analysis, needs to be fully appreciated and analysed to include in a brief of evidence. The inclusion and analysis of all aspects of this data can be more thoroughly analysed when the skillsets of investigators are mixed.

The result is;

- *Joint investigations benefit the community increase the successful outcome of court matters be they criminal, coronial or civil;*
- *Through the skills mix, the investigations are more thorough considering a broader range of issues through this process;*

- *The deliberate fire lighting problem is given a higher level of importance.;*
- *More detailed sharing of intelligence leading to above;*
- *A greater appreciation by all involved of a community's Bushfire arson problem.*

The ideal model is one of "co-operation at all levels". Key issues to be included in the multi-layered support package to address this problem of Bushfire Arson.

<u>Federal Level</u>

- *Establishment of a Federal Level Policy Group to address consistency of Legislation across States/Territories;*
- *Federal level strategies to track 'cross-state' offenders;*
- *Provide consistent approach across Australia for Fire/Police Agencies to address the problem;*
- *To drive research;*
- *Host national forums to share knowledge within industry experts.*

This has been evident through the Commonwealth sponsorship of National Bushfire Arson Forum. At this event, experts from across the country come together to share experience and research findings. Needs at the national level are discussed and the opportunity to collaborate on Bushfire arson issues between the States and Territories.

<u>State Level</u>

- *(Joint Bushfire Arson Prevention Committees) Agency Representatives to address MOU/MAA's, financial support for joint strategies, shared strategies to address deliberate fire lighting;*
- *To provide common direction for frontline agency staff to address deliberate firelighting problems;*
- *State & Territory Legislative reform forum;*
- *Sharing of training & educational strategies and initiatives;*
- *Government opportunity to host joint forums to address issues as they arise.*

In NSW the Interagency Bushfire Arson Committee Functional document, the core intent is confirmed,

> *"The IAC has identified that it's primary goal is to reduce the impact of Arson on the Community of NSW though:-*
>
> - *Ensuring the flow of information occurs between Agencies pertaining to deliberately lit fires.*
> - *Joint and uniform approach to Investigation, Training and Research that is relevant to each agency.*

- *Development of Prevention Programs to address and reduce the incidence of fires at a local, regional and/or State level".*

(IAC Overview V1, pp 2, 2005).

Local Level

- *Joint Bushfire Investigation Working Parties;*
- *Forum to re-enforce State level strategies;*
- *Opportunity to profile of Bushfire cause incidents in the local area via the sharing of police / fire service intelligence;*
- *Establish models for running joint investigations;*
- *Fostering of local training and educational strategies;*
- *Joint training planning and operations in the investigation of wildfires.*

Prevention example from NSW..

The above initiative demonstrates that jointly investigation intelligence can be gathered at the fire scene and remain in place after the fire has been extinguished. This joint program with police to encourage reporting of arson related information and also works as a prevention strategy.

How can fire & police investigators work more successfully? Models recently trialed in Australia based on the successful FI310 Wildland Fire Investigation Case Development (Wildfire Arson Investigation Management Course- WAIMC pilot in Australia) provide an opportunity for joining of skillsets between police and fire service investigators from across Australia and New Zealand- and provided a framework for investigators to work together in the future. This model provides some key initiatives to breakdown barriers in a joint investigation forum. One of the key areas is the sharing of information (intelligence) regarding Bushfire occurrence. Until the scale of the problem is fully realized, it could be construed as being premature to try to address the problem. This is

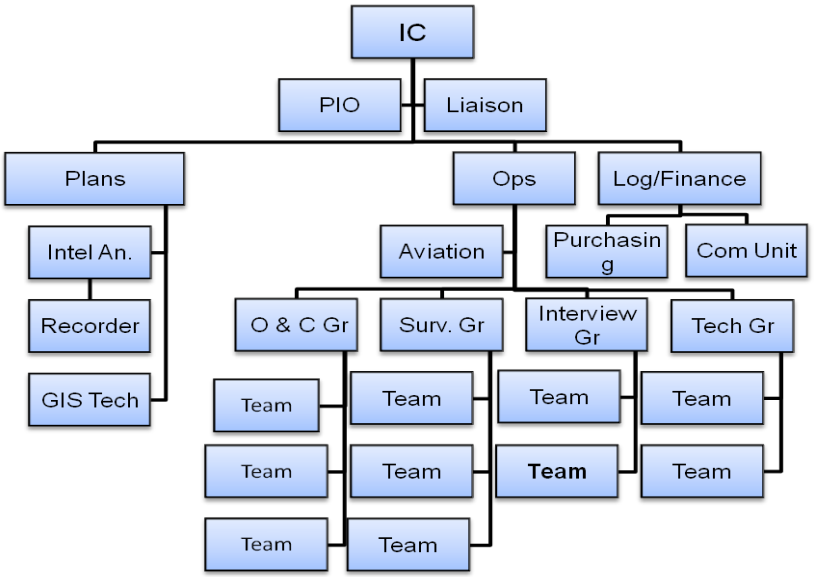
confirmed via the NSW Rural Fire Service "Fire Investigation District Working Party" template document, where the purpose is identified, "Coordinating the collection and analysis of origin and cause information in co-operation with all agencies in order that problems can be identified which will then enable suitable strategies to be established" ("Fire Investigation District Working Party", NSW Rural Fire Service, n.d). A number of agencies ensure this occurs through the colocation placement of investigation officers within investigation teams, confirming the opportunity to have fire and police investigators embedded in investigation teams.

The Victorian Fire Investigation Policy and Procedures document also confirms the collaborative approach is of benefit to the investigation of Bushfires, "The benefits of an all-agency integrated approach to fire investigation in the State would be increased skill levels, availability of specific staff and enhanced training of employees in investigation techniques." ("Victorian Fire Investigation Policy and Procedures" document, p3, 1999).

To ensure the co-operative arrangement works in a serial investigation, the use of ICS (Incident Command System) to manage each agency's role in investigation via an ICP (Investigation Command Post) is recommended. This model is promoted in the United States based National Wildfire Co-ordinating Group, FI 310 Wildland Fire Investigation Case Development Course. It is emphasised that integral to serial Bushfire arson investigations is the need to have all involved on board via a written investigation plan and ensure that the goals, objectives, and tactics are clear to everyone. Roles need to be defined along with all issues such as resourcing and the like, similar to running any operation.

This training course further reinforces and identifies the need to have clear investigation plans to include a brief that describes history & current situation, location of fires and history in the area; causes; threats/values at risk; goals of the operation; tactics; and the like. The Course provides students with the ability to test these areas of a serial Bushfire arson case under the role of a multi-agency investigation.

A typical complex Serial Bushfire Investigation Team may need to be resourced with the following roles;



(Wildland Fire Investigation Case Development Course, NWCG).

Unified Command

The Wildland Fire Investigation Case Development Course suggests in many cases the adoption of a Unified Command arrangement will be necessary. This may be due to circumstances where more than one IC may be necessary, involving more than one jurisdiction (multiple agencies etc.) Whereby police focus on policing issues/ fire service investigators focus on ongoing fire events.

Integral to this approach is the need to incorporate Safety Operations and Security matters such as; operational area hazards, environmental hazards and concerns, known criminal activity areas/concerns. Critical to an integrated investigation team is the need to manage the team as a whole. This includes the local law enforcement/agency 'need to know' issues; accommodation locations- common and secure; low profile of the team; document security and autonomy.

Operational meetings need to engage the whole team to ensure all are fully informed and included as a trusted member of the group. Traditionally this has posed issues including the non-sworn fire service investigator. However these concerns can be addressed through protocol documents before the investigation commences. The value of the team approach needs to be fully appreciated as confirmed in the models within the Course.

Other issues that need to be included in the success of a team approach are the technical specialist needs, number and length of shifts, rest days, local liaison needs, evidence security and storage and case file record storage. All common to police investigators but critical to ensure the smooth running of the investigation.

Potential problems faced through experience has been inadequate records of investigations or fire incidents in the past. This has evolved from inconsequential fires being poorly recorded and investigated creating a camouflage of fire lighting trends. Cumulative to this are poorly prepared fire reports, investigative reports, political opposition for investigations, and importantly parochialism (jurisdictional issues) "this is our jurisdiction- not your role/responsibility". Ultimately the community expects Bushfires to be investigated, the cause to be accurately identified and in the case of deliberate ignitions, offenders brought to justice. They would expect that the process reflects cooperation at all levels.

Critical to the success of investigation is the need to ensure training is provided not only to the investigation team but also to the first responders. By improving their ability to hone their skills in observation and evidence identification and recording, vital information can be obtained from fire scenes for the use of investigation teams. This is confirmed by 'Protect and Preserve the Incident Scene' Course as adopted across a number of fire agencies in Australia.

CONCLUSION

The complicated nature of serial Bushfire arson confirms the need to have the ability to engage the right mix of skillsets to gain a full appreciation of all aspects of the case. In the past, a single service has often been left with the problem to investigate these incidents, often with little successful outcome. Experience in Australia and overseas has confirmed that if tackled in isolation, police or the fire service face a complex task to identify those responsible. As a result, the investigation of Bushfire arson was more often considered to be un-solvable across many levels of fire management. Certainly, on at least one occasion, this was echoed from those in authority from fire and police, with lines such

as 'Bushfire arson is one of the most hardest crimes to solve' reinforcing to the offenders that the chances of detection were minimal.

Fire service investigators and police service investigators are an essential part of the investigation model and as such, the responsibility for solving this crime then becomes a shared one. The sharing of the investigation provides a critical path to successfully identifying and ultimately convicting those responsible, leading to improved safety of the community.

Richard Woods
ACT Rural Fire Service,
Canberra Australia, 2009.

REFERENCES

Victorian Fire Investigation Working Party, 'Victorian Fire Investigation Policy and Procedures', Melbourne Victoria, 1999.

National Wildfire Co-ordinating Group, 'FI 310 Wildland Fire Investigation Case Development Course', Development Avenue, Boise, Idaho, United States, (nd).

NSW Interagency Arson Committee, 'Overview Document, V1', Sydney NSW, 2005.

National Wildfire Co-ordinating Group, 'Wildland Fire Investigation, FI–210 Origin and Cause Determination Course', Development Avenue, Boise, Idaho, United States (nd).

Web Site Links for the Fire Investigator

The following list of websites contains useful links for the fire investigator. It is recommended that you access these sites and explore some of the reference materials they offer. Several of these sites offer additional links. These sites will prove useful to you in your job as a fire investigator.

1. International Association of Arson Investigators: This website contains an online distance learning page, information, articles and links to other fire investigation related materials. Some areas can only be accessed if you are a member of the association.

   http://www.firearson.com/

2. National Association of Fire Investigators: This website contains information, articles and links to other fire investigation related websites.

   http://www.nafi.org/

3. InterFire VR: This site contains a vast amount of fire investigation research material, tutorials and references. Great article on serial arsonists

   www.interfire.org/

4. Find Law: This is an excellent website for appellate court case searches.

   www.findlaw.com

5. The FBI study of serial arson. This document is considered essential reading for fire investigators. (It is located on the InterFire VR website.)

   http://www.interfire.org/features/serialarsonists/Motive_based/cover.asp

6. Mesowest: University of Utah maintains and collects weather information from weather stations throughout the United States. Many records go back several years.

   http://mesowest.utah.edu/

7. CFItrainer.net: This site has numerous on line courses specific to fire investigators. A new one added recently is specific to wildland fire investigations. Maintained by the IAAI.

   https://www.cfitrainer.net/