

Fire Behavior as it Relates to Firefighter Safety: Six Key Points for Discussion¹

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... there is one overriding change to fire management: that of maintaining full respect for the power of fire and the effects of this power on both wildland environments and the people who live and work in these environments.
Barrows (1977)

I unfortunately could not be in Toronto this week for the 2003 International Wildland Fire Safety Summit. However, I did want to pass along some thoughts which I considered might be relevant to some of your discussions during the breakout sessions. I've got six points I'd like to make here. These are presented in no particular order of significance.

Key Point #1: The International Association of Wildland Fire Needs to Consider Broadening the "Agenda" of the International Wildland Fire Safety Summits to Include the Public at Large

- The fatalities associated with the recent California fires and earlier this year in Europe has certainly highlighted the need for a slight realignment of emphasis. The wildland fire community has an enormous amount of technical knowledge about fire behavior that can and should be applied to averting such disasters. Undoubtedly a major issue will be the pros and cons of evacuation vs. "stand and defend".
- This subject might even be the focus or theme of the next International Wildland Fire Summit.
- As an aside, last year I was asked by Bob Mutch to become involved in future revisions of the "fire" chapter in the book on Wilderness Medicine: Management of Wilderness and Environmental Emergencies (Davis and Mutch 1995).

Key Point #2: Our Understanding of Fire Behavior Dynamics in Insect- and Disease-Killed Forest Stands is Extremely Poor to Non-existent

- Our understanding of fire behavior in healthy forest stands is by and large pretty good. While dead and dying forests is not a new issue to the western United States or eastern North America, there appears to be a growing number of these kinds of fuel types in western Canada and Alaska (e.g., spruce beetle). While we have some general knowledge about fire behavior in stands killed by insects and disease as a result of past incidents, we lack quantitative studies of fire behavior; one exception is the study undertaken in spruce budworm-killed stands by the Canadian Forest Service and the Ontario Ministry of Natural Resources in the late 70s and 80s (Stocks 1987). This lack of knowledge could unknowingly threaten the safety of wildland firefighters as well as members of the public (Alexander and Stam 2003).

¹ Remarks delivered on behalf of the author by Bill Droog (Ontario Ministry of Natural Resources, Sudbury, ON) at the 7th International Wildland Fire Safety Summit held in Toronto, Ontario, November 18-20, 2003.

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- More needs to be done. This past year, I was involved in a proposal with others in the Alaskan wildland fire management/research community to study the fire behavior of spruce beetle-killed stands on the Kenai Peninsula of southeastern Alaska that was turned down by the Joint Fire Science Program.
- I'm pleased to see that Dave Marek of the British Columbia Forest Service took up my suggestion and is here this week to make a presentation dealing with the mountain pine beetle in B.C.
- The International Association of Wildland Fire, and the fire management community at large, needs to support outdoor experimental burning in these "dead forest" fuel types and lobby for financial support to carry out the necessary fire behavior research which is critical to closing the knowledge gaps that exist. An added benefit of these experimental fires would be firefighter safety related training (Cheney 1994).

Key Point #3: Avoid Placing too Much Reliance on "Trigger Points" and Continue to Stress Fire Behavior Fundamentals and Systematically Assessing Potential Fire Behavior Using Existing Aids & Guides

- It's human nature to look for "silver bullets" to help us simplify matters in order to make our jobs easier. While fire behavior rules of thumb (e.g., RH thresholds for a broad geographical region) have been around for many years, there appears to be a growing trend in the wildland fire community to place increasingly greater reliance on the use of "trigger points" (e.g., "cross-over" concept in Canada). We need to resist this movement. It seems that even the most experienced fire behavior officers or analysts are subject to this tendency.
- Perhaps part of this trend is due to the increasing complexities in our fire behavior prediction systems and models. Certainly, crude but reliable guidelines are needed at the field level. Fire behavior researchers need to understand and appreciate this fact as well as clearly stating the assumptions involved in their models/systems. However, the desire for simplicity has to have a limit and the onus is on fire operations personnel to still have a firm understanding of the basic principles of fire behavior in order to have the flexibility to make allowances or adjustments as necessary (in other words, they should have the ability to think through a problem).
- The value of the "10 Decision Traps" in effective decision making (Russo and Schoemaker 1989) with respect to fire behavior forecasting or prediction has recently been reiterated by Alexander and Thomas (2004). Recall Decision Trap #5 – Relying inappropriately on "rules of thumb" such as implicitly trusting the most readily available information or anchoring too much on convenient facts.

Key Point #4: The Use of Experienced Judgment in Assessing Fire Behavior Needs to be Supported by More Documentation in the Future

- It's been suggested that most wildland firefighters base their expectations of how a fire will behave largely on experience and, to a lesser extent, on fire behavior guides. If this is indeed the case, then it's worth reiterating the points made by Forest Service fire research pioneer Harry T. Gisborne (1948) about experienced judgment: "For what is experienced judgment except opinion based on

knowledge acquired by experience? If you have fought forest fires in every different fuel type, under all possible kinds of weather, and if you have remembered exactly what happened in each of these combinations, your experienced judgment is probably very good. But if you have not fought all sizes of fires in all kinds of fuel types under all kinds of weather, then your experience does not include knowledge of all the conditions.” Presumably then, case studies can help supplement and thereby strengthen (but never replace) a person’s experience level.

- Everyone needs to learn more about the fire environments they work in. Great emphasis needs to be placed on documentation of fires in order to do this (Alexander 2002a). For more elaboration on the value of wildfire case studies to fire safety, see the recent articles by Alexander and Thomas (2003a, 2003b). Note that Fire Management Today is devoting two special issues to wildland fire behavior case studies. The first issue is now available online for downloading (http://www.fs.fed.us/fire/fmt/fmt_pdfs/fmt63-3.pdf).

Key Point #5: A Concerted Effort is Needed to Bring the Fire Behavior and Human Behavior Specialists Together in Order to Improve Wildland Fire Safety in the Future

- This applies to implications for both fire operations personnel and members of the public.
- It could be argued that the technical/scientific side of predicting fire behavior has reached a limit and that further major advances and the greatest gains with respect to improving fire safety from a fire behavior standpoint are likely to be made by how this information is applied by the user (i.e., the human aspect). This includes a wide spectrum from the lay public to the individual firefighter to the fire behavior officer/analyst to the incident commander to the line or resource officer.
- I personally believe that it is time that we seek out the assistance of those specialists in the humanities and social sciences. While the “human factors” element has been acknowledged in recent years with respect to firefighter fatalities, it hasn’t specifically addressed the issue of fire behavior and fire behavior prediction. We need to understand why we do the things we do.
- A good start on the psychology of fire behavior forecasting has been made by Karl Weick (2002) but much remains to be examined and done.

Key Point #6: Initial Attack Dispatch Guidelines Should Reflect the Current State-of-Knowledge Concerning Fire Behavior and Firefighting Resource Productivity/Effectiveness

- The importance of fire behavior with respect to fire suppression is widely recognized (Alexander 2000). What is not so widely recognized or appreciated is the fact that if initial attack is based in whole or in part on ground forces, then the type and number of firefighters dispatched to a newly reported fire should have a reasonably good chance of containing the fire at a reasonable size, otherwise their safety is being jeopardized (Alexander 2002b). Audits need to be done to ensure this is actually the case.
- If fuels management is designed to increase fire suppression effectiveness and in turn improve firefighter safety then we need to communicate this point more widely, especially with respect to the wildland-urban interface (Alexander 2003).

It is only fitting that the International Association of Wildland Fire is paying tribute at this conference to the wildland firefighters who lost their lives in the line of duty during the 2003 fire season. On February 27, 2003, the wildland fire community lost one of its most staunch supporters when Paul Gleason passed away from cancer. I'd like to think that the greatest tribute we could make to Paul is ensuring that all members of the wildland fire community read the interview he did with Jim Cook and Angela Tom (2003) the day he before he died.

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