Wildland Fire Occurrence and Behavior Analysis in the Year 2000 and Beyond

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Introduction

The purpose of the Symposium on Wildland Fire 2000 was to examine the "possible, preferred, and probable status of wildland fire management and research in the year 2000 and beyond" (Davis and Martin 1987). A half-day "futuring" session was an integral component of the program. Attendees were divided into nine topic-oriented task groups. This paper is adapted from the report submitted by futuring group 8 (fire occurrence and behavior analysis) which eventually appeared in the symposium proceedings following preparation during the working session and presentation to the entire conference delegation on the final day of the program (Davis and Martin 1987).

In addition to the authors, the other members of the group included: Tim Lynham and Charlie Van Wagner, Forestry Canada (then the Canadian Forestry Service); Dick Rothermel, USDA Forest Service; Kathy Davis, USDI National Park Service; and Orvil Robinson, USDC National Weather Service. Martin Alexander served as spokesperson and both authors compiled the report. The group facilitators were Gary Brittner, Chris Scrowe, and Don Escher, all with the California Department of Forestry and Fire Protection.

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Definitions

For purposes of clarification, some simple definitions of terms, as taken from Merrill and Alexander (1987), are deemed in order:

- *Fire occurrence:* The number of fires started in a given area over a given period of time
- *Fire behavior:* The manner in which fuel ignites, flame develops, and fire spreads and exhibits other related phenomena as determined by the interaction of fuels, weather, and topography

It's worth noting that the term "fire danger rating" is used to describe fire management systems that systematically evaluate various factors influencing fire potential, chiefly for the purpose of determining fire protection needs.

The fire occurrence and behavior analysis futuring group identified 15 key trends and formulated 5 key visions with their associated strategies.

Futuring Concepts and Procedures

Futuring "is a participative process that brings together several individual ideas into a collective group perspective of a preferred future" (Albright 1987). By working in small groups, with the assistance of trained facilitators, people with different ideas and backgrounds can use futuring to develop a "vision" of a desired or preferred future.

The 4-hour futuring process used at the Wildland Fire 2000 conference involved the following:

- Identifying trends
- Focusing on key trends and their implications
- Developing visions
- Identifying actions or strategies in order to realize those visions.

The facilitators directed the administrative aspects of the futuring process but did not interfere with the technical content of the group's deliberations.

A *trend* was defined as the direction current political, economic, social, and technological factors affecting wildland fire management and research were taking. A *vision* was considered an image of a preferred future that is attainable and serves as a guide to interim strategies, behaviors, and decisions. A *strategy* was viewed as a broad, general approach to attaining a vision or part of a vision.

Identified Trends

The group identified 15 key trends:

- Continuing need to improve "fire intelligence systems" (Barrows 1969) in fire control and use programs
- Adoption and increasing use of geographic information systems in fire management (e.g., Kessell et al. 1984)
- Steadily increasing demand for three-dimensional fire growth modeling (e.g., Kourtz 1984) for use in presuppression planning, including training, and daily operations
- More and greater expectations of fire managers due to external and internal pressures (e.g., cost-effectiveness, urban-wildland interface problems)

- Increased weather data gathering activity (e.g., remote automatic weather station (RAWS) networks, lightning locator systems, precipitation radar, and satellite imagery)
- Greater demands on the existing systems used to evaluate fire danger and predict fire occurrence or behavior (i.e., they are being applied to fire problems and opportunities that exceed their original purpose or capability or both)
- Significant improvement in electronic communications
- Gradual acceptance of centralized fire control centers
- Skill level of some fire management personnel being surpassed by the state-of-knowledge and new technology
- Widespread misunderstanding of the proper application of the present analytical systems available for fire occurrence and behavior
- Growing interest in more robust schemes for predicting human-caused and lightning-ignited fire loads
- Tendency toward greater international cooperation in fire research (e.g., Albini and Stocks 1986)
- Necessity for designing systems to address all levels of fire management activities (Rothermel 1987)
- Continuing demand for "longer range" weather forecasts
- Increased interest by fire-prone countries in the use of the various other national systems of fire danger rating developed in Canada, Australia, and the United States (e.g., Valentine 1978; Peet 1980; Van Wilgen 1984)

Key Visions and Associated Strategies

The group formulated five key visions outlined below along with their associated strategies:

Basic Models of Physical Fire Phenomena. *Vision:* Comprehensive fire occurrence and behavior models would take into account nonuniformities in fuels, topography, and weather. *Strategies:*

- Conduct problem analyses to identify knowledge gaps
- Fund basic fire research and model development to address the needs identified above

Practical Application of Models in Fire Management. *Vision:* An internationally accepted family of fire occurrence and behavior systems would be available to serve the needs of fire management at all levels within the organization, from planning to operations, for both wildfire and prescribed fire. *Strategies:*

- Form an international working group to coordinate system development
- Determine the needs of fire management with respect to wildfire and prescribed fire applications
- Design a family of systems
- Build and test these systems

Centralized Fire Control Operations. *Vision:* Centralized fire command centers would use data from satellite transmissions, advanced weather-gathering systems, and other state-of-the-art technology. Integrated systems would display last-known fire perimeter and intensity as well as predicted fire growth on a near real-time basis. *Strategies:*

- Conduct an in-depth feasibility study in engineering and development requirements, options and alternatives, and so on
- Follow the course of action recommended above

Role of Geographic Information Systems (GIS). *Vision:* A computerized data base on fuels, terrain, etc., would be available for use with weather models (e.g., wind flow over complex terrain) and weather forecasts for predicting the occurrence and behavior of potential or going fire situations. The predictions would include not only the probabilistic (rather than deterministic) outcomes of conventional parameters (e.g., probability of ignition, rate of spread, intensity, crowning potential, spotting distances) but other important considerations (e.g., likely location and timing of fire whirl development, "blowup" potential, and smoke column configuration). Predictions from fire growth models can be updated using near real-time surveillance of actual fire perimeter. *Strategies:*

- Survey the construction, content, and use of GIS
- Explore the feasibility of using GIS in a fire intelligence system
- Supply fire research input to GIS plans
- Incorporate GIS's into fire intelligence systems

Training of Fire Management Personnel. *Vision:* Fire managers would understand and use the appropriate analytical systems for predicting fire occurrence and behavior through training courses and field application, interpretation, and evaluation of results. *Strategies:*

- Determine the specific training needs of fire managers
- Develop and conduct a series of

modularized training courses
- Ensure that quality control for monitoring user's performance in using the systems takes place and is maintained

Concluding Thoughts

Many participants at the Symposium on Wildland Fire 2000 considered the individual futuring sessions to be a highlight of the conference. Our group certainly concurred with this observation. The futuring process can be a very useful tool in strategic planning.

A sequel to the Wildland Fire 2000 conference has been tentatively scheduled for the spring of 2001 (Davis and Martin 1987). It will be interesting to see then how many of our visions have become realities. ■

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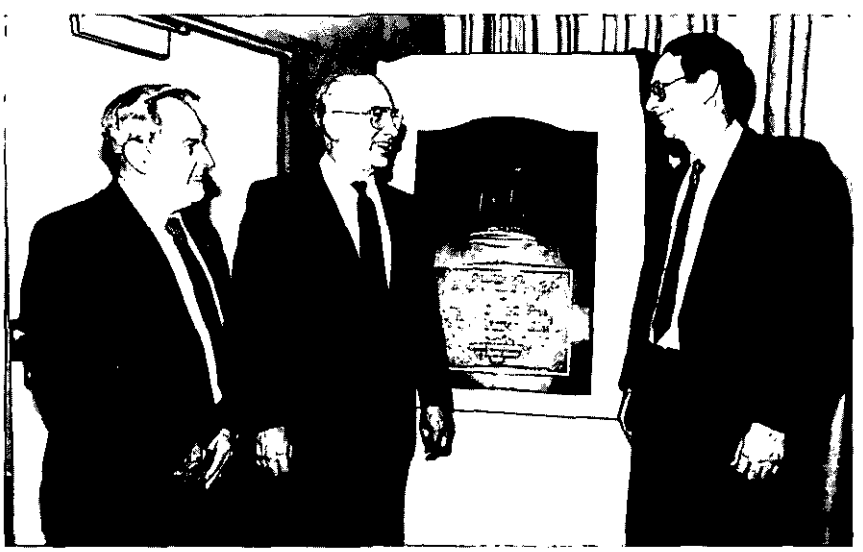
Forest Firefighters Honored

A statue honoring the men and women who fight forest fires was presented to the Forest Service by Steven Spielberg's film company, Amblin Entertainment, at a special Washington, DC, viewing for the Forest Service of its recently released film, "Always." Filming on location on the Kootenai National Forest, Region 1, Amblin Entertainment produced "Always" with considerable assistance from the Forest Service.

The statue, sculpted by retiree Rudy Wendelin, is inscribed with these words: "In honor of the courageous men and women who risk their lives to fight wildfires on the ground and from the air in defense of this country's precious lands and homes." ■



(Left to right) Deputy Chief Allan J. West, Secretary of Agriculture Clayton Yeutter, and Chief F. Dale Robertson with statue.

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Fire Control Notes first reproduced this Smokey Bear poster on the back cover of its January 1963 issue.

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