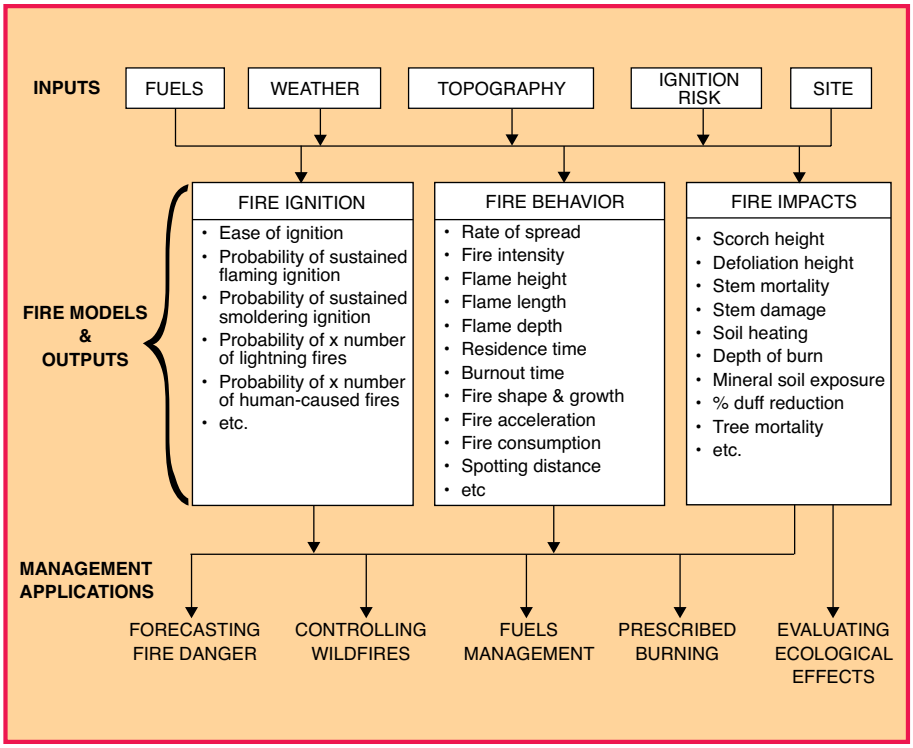
Are We Abusing Our Use of Models and Modeling in Wildland Fire and Fuel Management?

Martin E. Alexander

A whole host of computerized decision support systems and tools have emerged in recent years for use in wildland fire and fuel management (Peterson and others 2007). Few would argue with the notion that models and modeling are an integral component of modern day management practices (see figure). The question is, even with technical guidance (e.g., Stratton 2006), are we properly using such technology in light of the importance of the human element in the decision-making process?



Conceptual model of scientifically based forest fire management (adapted from Burrows 1994).

Two remarks continually remind me of the limitations of modeling. While I was attending forestry school at Colorado State University in the early 1970s, Dr. Alexander T. Cringan, a professor of wildlife biology, made the following remark in connection with the modeling of fire impacts and effects: "If you end up with a 300-pound coyote, you know something is wrong." Then, about 15 years ago, I was having a discussion with Dr. A. Kare Hellum, professor emeritus of silvicluture from the University of Alberta, about an article dealing with the modeling of a particular fire impact in relation to fire behavior. He remarked to me that "Modeling is fine as long as you know what you are doing."

These remarks have stayed with me to this day. So have the contents of an article by John J. Garland that appeared in the "My Chance" section of the April 1988 issue of the *Journal of Forestry*. I have often distributed a copy of Garland (1988) at various training courses and workshops as part of my presentation to impress upon folks the pitfalls of explicitly using and trusting models and modeling (Alexander 2000).

While the context of Garland's article, which focused on the broader issues of natural resource management, does not specifically deal with fuel and/or fire management, it now seems important for the messages contained in this article to receive wider circulation. So, towards this end, a copy of "A Modeler's Day in Court" is reproduced here for the benefit of the *Fire Management Today* readership.

At the time his original article was published, John Garland was a Timber Harvesting Extension Specialist in the Forest Engineering

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A Modeler's Day in Court*

John Garland

Scene: Courtroom of a district judge, a learned jurist especially noted for his natural-resource decisions. A resource professional who is in mid-career stands before the bench.

Judge: I have read the complaints against you. How do you plead? Guilty or not guilty?

Resource Professional: I don't understand what I'm doing here. I was just doing my job!

Judge: You are charged with seven offenses:

- Inappropriately using "models" for your natural-resource decision-making.
- Using these models outside the range of data for which the model was built.
- Using models that have not been validated or thoroughly tested for consistency.
- Failing to identify the assumptions upon which the models were dependent.
- Building your own "model" by picking and choosing relationships out of thin air or based on very little research.
- Overextending the results of these model outputs by making decisions about thousands of acres with models that oversimplify the relationships among natural variation, time, and space.
- Impressing your colleagues with these models to the point where they believe anything you do with a computer must be correct. You misrepresented your intelligence just by speaking computerese.

How do you plead?

Resource Professional: I'm not guilty. Some of the models I used weren't even mine. They were recommended to me and I didn't understand how they worked. Researchers should have validated those models before they made them available. Besides, it's a matter of policy at my organization to use models. They came from higher up. And about the one I put together: I didn't have the time to really do it right. I used the best information available. For the rest, I asked the specialists for their opinions. I was just doing what everybody in the organization was doing.

Judge: These reasons are not sufficient for dismissing the charges. There is substantial evidence against you. Not only did you extend the model decisions to thousands of acres at large financial expense and with adverse effects on the resources, you also never checked to see how these models worked in practice. Instead of getting your boots muddy, you buried your head in the computer and came up with reports, statistics, and graphs to impress supervisors and colleagues. The enormous time spent on dubious models kept you and your organization from decisions incorporating on-site conditions. Misuse of poor models actually prevented better models from being developed.

Resource Professional: Nobody ever told me I was doing anything wrong. I did have some questions and concerns, but I had to get the job done.

Judge: That is the essence of the professional statutes. (Will it come to regulation of professionalism?) The appropriate use of models and computer technology must be blended with a human system of resource management. Perhaps you should consider a common-sense approach to resource management that includes the following list:

- Identify land-management goals and objectives.
- Determine the compatibility of forest operations and associated best management practices with land-management goals. Resolve conflicts of facts and values in advance of operations.
- Construct a contract for a sale or for services that reflects best management practices.
- Provide training to land managers and contract administrators so their expectations are aligned with actual, reasonable results. Identify potential areas of difficulty for heightened awareness and enforcement actions.
- Train contractors and operators to the level of the "machine operator" in how best management practices are developed and executed.
- Develop an enforcement system with adequate contractual clout and sufficient supervision. Seek ways to reinforce positive actions by contractors with appropriate rewards.
- Develop a system to monitor land management based on important and adequate measurement, not a pseudoscientific, computer-based approach.

- Provide for auditing of operations and periodic monitoring without advance warning by outside experts.
- Review and revise policies, procedures, and contracts as needed using the best scientific information available.

Resource Professional: There seems to be plenty of opportunity for using high technology in that approach.
Judge: Indeed! Good, professional resource management requires that kind of blend. Now in the matter before me ——
(The verdict is still pending, but the resource professional is buying a new pair of boots.)

**From Garland (1988).*

Old Cowboys, Cows, and Fire Behavior Forecasting: Supplementing Models With Local Knowledge

Tim Greer

In August 2003, I accepted an assignment as a wildland fire behavior specialist in the interior of British Columbia. This was my first assignment in mountainous terrain. After receiving the customary orientation, I was assigned to the Venables Fire near Cache Creek, BC. The Venables Fire had started in the Venables Valley and made about a 6-mile (10 km) run north along an east-facing slope.

The area of concern was in a north-facing bowl at 5,000 feet (1700 m) elevation. The fire behavior prediction system indicated an impending blow-up: the fire was going to burn up everything for miles around, but day after day passed without any significant fire activity. I took a copy of the fire map and visited the meteorologist who was supplying the spot forecasts. What I needed to know was: "When is the wind going to get into the bowl and move this fire?" He did his best to give me an answer and I did mine, but still, most days the fire was quiet and our forecasts weren't borne out by reality.

Tim Greer is a wildland fire behavior specialist with the New Brunswick Department of Natural Resources.

Venables Fire near Cache Creek, British Columbia, on the afternoon of August 31, 2003. Photo: Tim Greer, New Brunswick Department of Natural Resources.

I realized that I desperately needed some knowledge of local weather patterns. Thinking about who would have such knowledge, I thought that some of the loggers in the area might include a person who could give me such information. Further thought brought me to the realization that today's loggers don't mingle much with the weather while working in modern harvesting machinery, with its climate-controlled cabs. Then it hit me! There are cows grazing throughout the area, and cows need regular tending: I needed to find an old cowboy!

To find one, I went down to the home of the owner of the biggest ranch in the area. I drove into the yard, shook off a couple of nipping cow dogs, and knocked on the door. A young man in cowboy attire answered. I introduced myself and told him what I was

looking for. He said, "You have to talk to Al." Al happened to live right in town; he was in his eighties and had been a cowboy in the area for 50 years.

After a phone call from the young man to ensure that Al was home and up to a visitor, down to Al's I went. Again, I introduced myself and informed Al of my mission. After some tea, cookies, and the usual formalities, we got down to business. I asked, "When does it get windy up there, and what are the indicators that this is about to happen?"

Al indicated that the wind didn't get into that bowl much until December, and then told me a few stories about hunting strays in that area in December. (I got the distinct impression that Al didn't have a real passion for hunting strays.) Then he said, "No trouble to tell when it is going to be windy up there: the cows will be gathered down at the Prioux Camp and be a-bawling." Turns out, the Prioux Camp was an old abandoned cowboy camp.

Cows congregating near the old abandoned Prioux cowboy camp (center of photo) located adjacent to the Venables Fire near Cache Creek, British Columbia, August 2003. Photo: Tim Greer, New Brunswick Department of Natural Resources.

With this new-found knowledge I didn't spend much time running more computer models, I just headed up the mountain in my truck to see what the cows where doing. If the cows were down near the Prioux Camp and "a-bawling," I'd send out the warning that things were going to be active in the bowl that afternoon. In the coming days, the cows were right every time!

The lesson is clear. When the models have reached their predictive limits, you have to find another way to get the information you need. I always seek out local knowledge and add it to what I already know.

Department at Oregon State University (OSU) in Corvallis. He went on to obtain his Ph.D. degree in 1990 and full professor status in the department. Dr. Garland, now retired from OSU but serving as a professor emeritus within the department, is presently a consulting forest engineer. He maintains that, "after more than 35 years at OSU working with models of various kinds, I still feel the same sentiments as in the article." I appreciate Dr. Garland's permission to share this thought-provoking article with the wider wildland fire community.

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