Evaluating opportunities and risks of wildland fuels management

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Most land management agencies are locked into a reinforcing feedback cycle in which perceived risks lead to fire suppression, leading to increased risks and further fire suppression.

Existing tools and approaches for planning fire and fuels management perpetuate this cycle by focusing on risk while ignoring potential benefits of fire. In addition, the lack of functional integration of fire into agency planning processes discourages use of wildland fire which, exacerbates the build-up of hazardous fuels and inhibits achievement of National Fire Plan goals. The essence of this disconnect lies in different organizational cultures – fire as a short-term, tactical and single-focused organization, while planning and operations stress long-term strategic and multi-focused activities. An initial step in bridging the gap involves articulating these differences - in scale of operation, planning, and jargon. Such a crosswalk allows development of a bridge across which critical pieces of information may pass (e.g., fuels information to land managers and ecological information to fuels managers).

Using currently available data and computer programs (including new and developing software), we have developed and are refining a GIS-based process that quantifies - simultaneously - the potential risks and opportunities for use of fire across the landscape. By doing so we are able to deliver an immediately useful, state-of-the-art tool. The protocol is designed for use by land managers in any type of agency: federal, state and non-governmental organizations. It is being designed to address multiple types of projects at multiple scales: long-range planning, fire management plan development, and endangered species consultations.

Beginning with a conceptual model defining risks and benefits (Figure 1), we then identified existing programs that may be used to describe and process existing resource data (Figure 2). By drawing on the desired ecological conditions or targets articulated in various planning documents, we are able to class likely fire effects into 'characteristic/uncharacteristic' or 'beneficial/detrimental' categories for any set of fire weather parameters. By creating a library of fire behavior maps based on threshold fire weather conditions, it is possible to identify when and under what conditions a fire (prescribed or wild) may move an area towards or away from the desired condition. Querying across the gamut of conditions allows one to identify areas needing mechanical fuels treatment prior to re-introduction of fire, and conversely, where fire may immediately assist.

Information produced may be used to develop resource targets, fire use zones, or to prioritize areas for WFU, prescribed fire or mechanical treatment. Maps, digital data and reports produced during the process include:

- stand based information on potential fire behavior under a variety of threshold fire weather conditions,
- fire effects on vegetation,
- fire effects on species' habitat and landscape structure, and

- fire effects relative to the desired future condition of the landscape, and annual or decadal probability of an area experiencing fire.

In addition to identifying existing risks and opportunities, the process is also useful in helping managers and the public understand the trade-offs and consequences of alternative courses of action. When linked to cost data, it can help contain costs by identifying stands in which fire under particular conditions will result in a net benefit to the resource from those in which resources are 'at risk'. Armed with this information, Incident Commanders may be able to more efficiently allocate suppression forces.

The protocol is being developed *in-situ* in close communication with local land managers. Our first study sites were the Selway-Bitterroot Wilderness and Bitterroot Face along the Idaho/Montana border (Figure 3). To demonstrate the general applicability of the protocol, we are using a variety of different input data – from static, deterministic, stand-based programs such as FlamMap to dynamic, stochastic landscape programs such as SIMPPLLE. Other programs currently included are: FireFamilyPlus, Farsite and FOFEM. Over the next year, we anticipate integrating FVS-FFE, LANDSUM, and an as yet undetermined watershed erosion module.

Our current suite of outputs include protocols for identifying treatment priorities, risks and benefits in the current time-step as well as for creating future scenarios under which one may analyze potential management alternatives. Please see our website - http://leopold.wilderness.net/staff/projects/project_001.htm to view small posters of these protocols. This site is our primary outlet for products and is constantly updated. It includes additional slides and graphics to illustrate the protocol as well as a page specifically designed to address "what this project can do for me?"

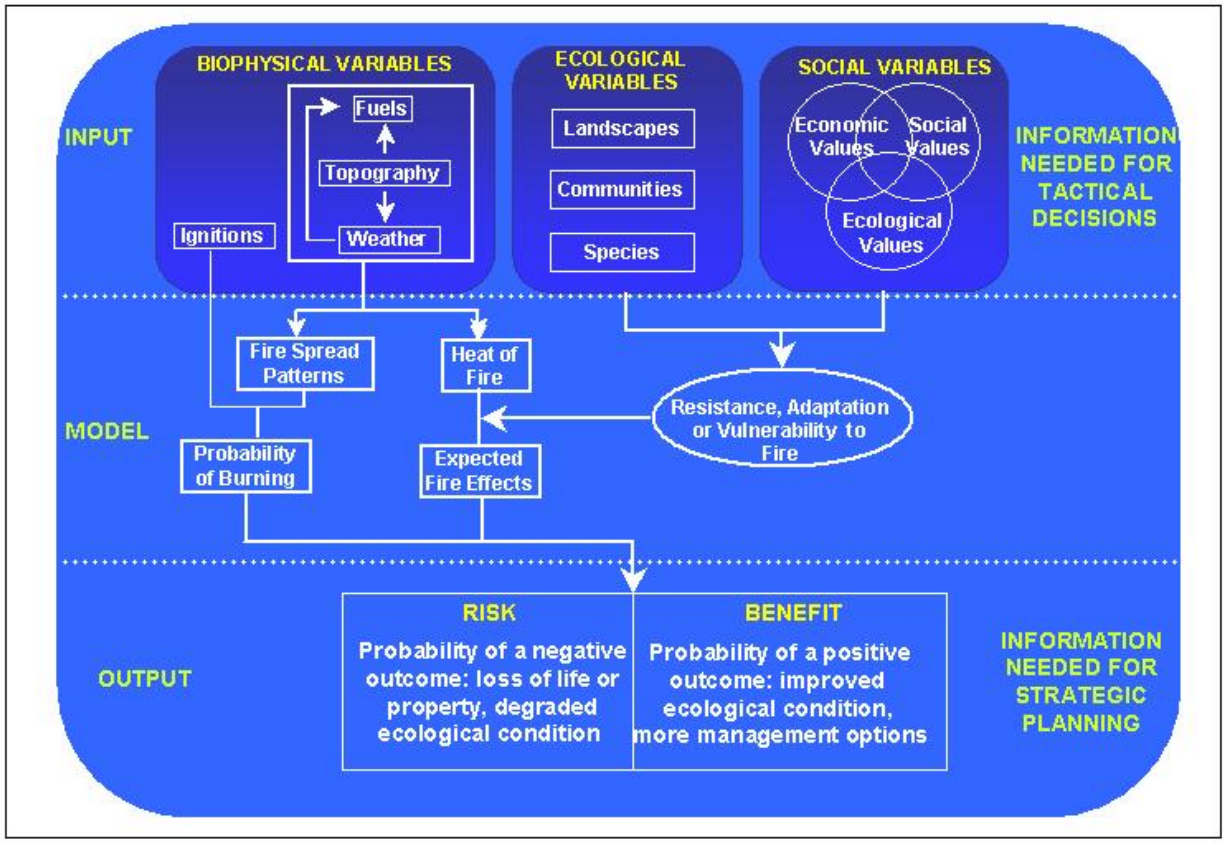

Figure 1. The conceptual model links knowledge of the biophysical process of fire with ecological and social variables, such that it is possible to identify risks and benefits of fire. The key is to be able to do this under a variety of fire weather conditions.

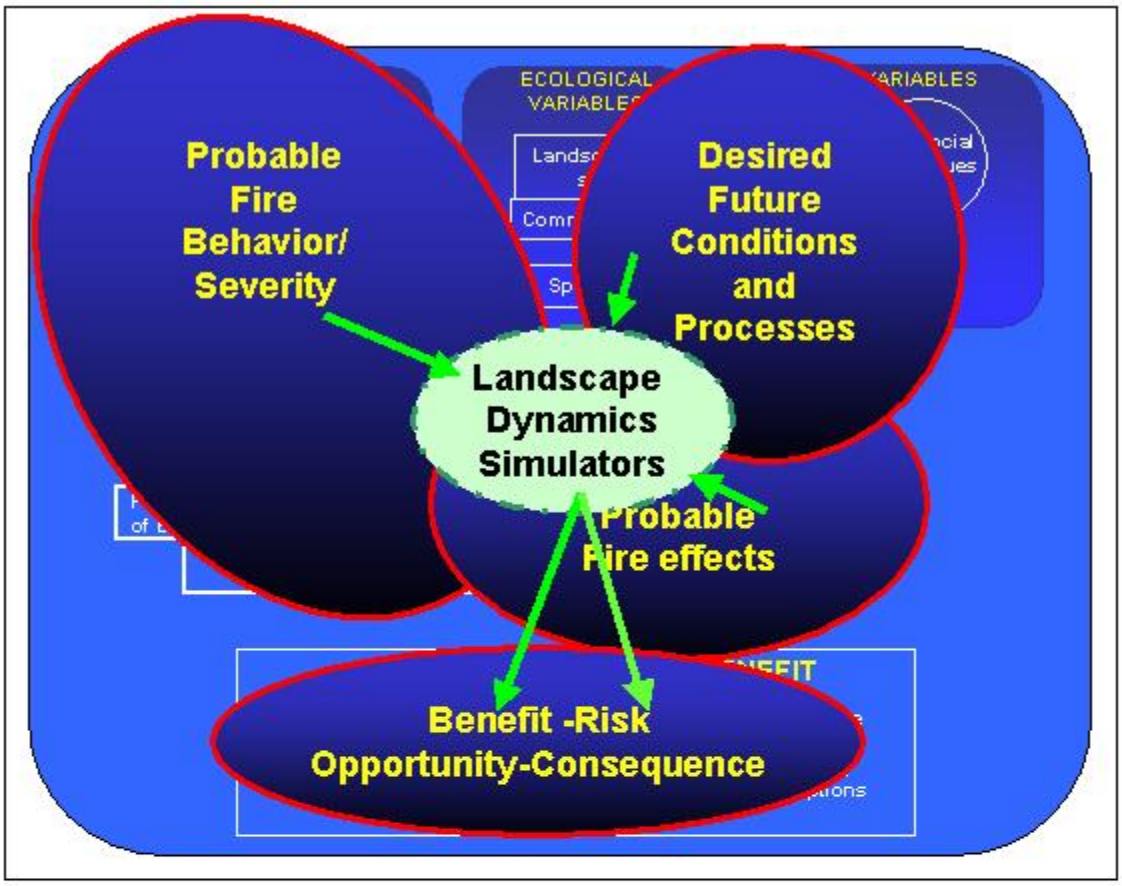

Figure 2. The biophysical process of fire is captured in a module of fire behavior and severity. The intersection of social and ecological variables is modeled as a function of desired conditions, processes and outcomes articulated in long-range planning documents and policies. Resiliency, vulnerability and adaptation are embedded in the fire effects module. Links between species and habitat characteristics are made here as well. Landscape dynamic simulation models are used to model future conditions. Finally, fire behavior and desired outcomes are combined with effects to create maps of opportunities and consequences of fire.

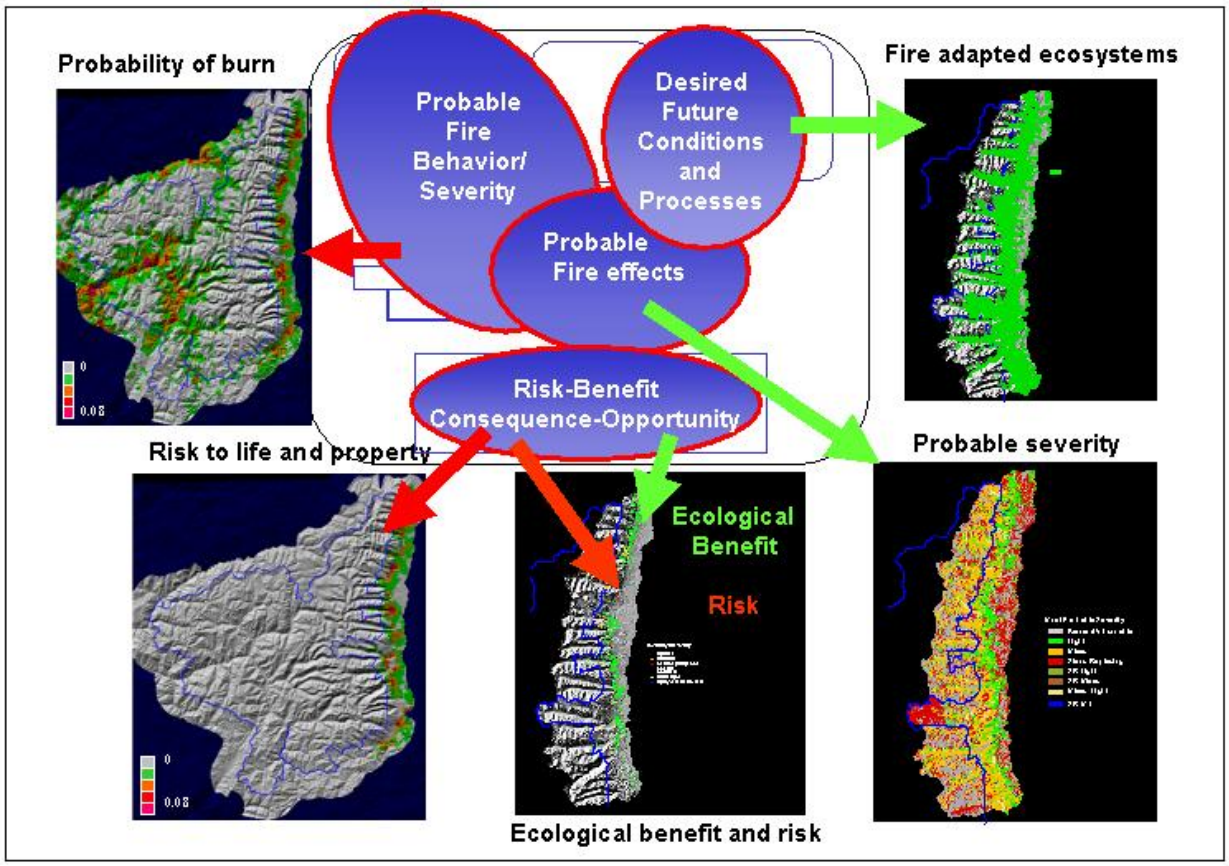

Figure 3. Preliminary results of the protocol for the Selway-Bitterroot Wilderness and adjacent Bitterroot Face. Please see our project page for additional results and updates: http://leopold.wilderness.net/staff/projects/project_001.htm